throughout the range of motion or under simulated crash impact conditions.

(d) The structural properties of the dummy are such that the dummy conforms to this part in every respect both before and after its use in any test similar to those specified in Standard No. 208, *Occupant Crash Protection* and Standard No. 213, *Child Restraint Systems.*

4. Section 572.123(b)(1) and (2) as proposed to be added at 63 FR 35173 are revised to read as follows:

§ 572.123 Neck assembly and test procedure.

* * * * *

(b) * * *

(1) Flexion. Plane D referenced in Figure N2, shall rotate in the direction of preimpact flight with respect to the pendulum's longitudinal centerline not less than 74 degrees and not more than 92 degrees. During this rotation interval, the peak moment measured by the neck transducer (drawing SA–572 S11) about the occipital condyles shall not be less than 27Nm (19.9 ft-lb) and not more than 33 Nm (24.3 ft-lb). The moment shall be calculated by the following formula: Moment (Nm) = My—(0.01778m) × (Fx). The positive moment shall decay for the first time to 5 Nm between 103 ms and 123 ms.

(2) Extension. Plane D referenced in Figure N3, shall rotate in the direction of preimpact flight with respect to the pendulum's longitudinal centerline not less than 94 degrees and not more than 106 degrees. During this rotation interval, the peak moment measured by the neck transducer (drawing S–572 S11) about the occipital condyles shall not be more than -19 Nm (-14 ft-lb) and not less than -24 Nm (-17.7 ft-lb). The moment shall be calculated by the following formula: Moment (Nm) = My—(0.01778m) × (Fx). The negative moment shall decay for the first time to -5 Nm between 127 ms and 147ms.

* * * * *

Issued on: August 31, 1998.

L. Robert Shelton,

Associate Administrator for Safety Performance Standards.

[FR Doc. 98–23794 Filed 9–2–98; 8:45 am]

BILLING CODE 4910–59–P

DEPARTMENT OF TRANSPORTATION

National Highway Traffic Safety Administration

49 CFR Part 572

[Docket No. NHTSA–98–4283]

RIN 2127–AG66

Anthropomorphic Test Dummy; Occupant Crash Protection

AGENCY: National Highway Traffic Safety Administration (NHTSA), Department of Transportation.

ACTION: Notice of proposed rulemaking.

SUMMARY: This document proposes to amend 49 CFR Part 572 by adding design and performance specifications for a new dummy whose height and weight are representative of a fifth percentile female adult. This new dummy, which is part of the family of Hybrid III test dummies, could be used to accurately assess the potential for injuries to small women, particularly those who sit close to an air bag. The new dummy is especially needed to ensure that air bags protect small women in frontal crashes and to minimize the risk from air bags during those crashes. The dummy would also provide a means of gathering useful information in a variety of crash environments to better evaluate vehicle safety. The issue of amending various safety standards to specify use of the dummy in determining compliance with the performance requirements of those standards, e.g., the agency's occupant protection standard, will be addressed in other rulemakings, particularly the agency's advanced air bag rulemaking for which an NPRM will be published later this year. The agency is also proposing to remove the current requirement that test dummies remain undamaged at the conclusion of a compliance test. It plans to apply this change to other test dummies in subsequent rulemakings.

DATES: Comments must be received by December 2, 1998.

ADDRESSES: Comments should refer to the docket number, and be submitted to: Docket Management, Room PL–401, 400 Seventh Street, S.W., Washington, DC 20590 (Docket hours are from 10:00 a.m. to 5:00 p.m.)

FOR FURTHER INFORMATION CONTACT: For non-legal issues: Stan Backaitis, Office of Crashworthiness Standards, (telephone: 202–366–4912). For legal issues: Rebecca MacPherson, Office of the Chief Counsel (202–366–2992). Both can be reached at the National Highway Traffic Safety Administration, 400 Seventh St., S.W., Washington, DC, 20590.

SUPPLEMENTARY INFORMATION: Recent air bag fatalities and injuries in low speed crashes to small female drivers seated close to the deploying air bag have raised serious concerns about the safety of air bags for this portion of the population.[1] One way to evaluate the risks associated with air bag systems is through the use of human mechanical surrogates with a high degree of biofidelity such as the family of Hybrid III-type crash test dummies. The desirability of a fifth percentile adult female dummy has been apparent for a number of years; however, the need for such a dummy has become more urgent with the emergence of potential safety problems that some of the current driver-side air bags may pose for small statured females. During the March 1997 NTSB hearing on the safety of air bag systems, several industry commenters addressed the need to revise FMVSS No. 208, Occupant Crash Protection, by adopting new test procedures and test devices and by assessing the safety of the occupant protection systems with suitable injury assessment criteria. The commenters noted that the Hybrid III-type fifth percentile female dummy has been used by industry for research purposes for several years and asserted that there was no reason not to use the dummy in air bag certification programs.

The fifth percentile adult female dummy (H–III5F) is part of a family of Hybrid III-type dummies. The first Hybrid III dummy was a 50th percentile male dummy. NHTSA has specified use of that dummy for compliance testing under FMVSS No. 208, since 1986, initially on an optional basis, and more recently on a mandatory basis. The second dummy, the six-year-old child, was the subject of an NPRM published on June 28, 1998 (63 FR 35170). The need for a family of Hybrid III-type dummies having considerably improved biofidelity and anthropometry was recognized by the Centers for Disease Control and Prevention (CDC) in 1987 when it awarded a contract to Ohio State University under the title ''Development for Multi-Sized Hybrid III Based Dummy Family.'' Development of the H–III5F has continued since then

[1] Distance from the air bag is the primary factor leading to serious injury or fatality. Several factors can lead to an individual being too close to the air bag at the time of deployment, including failure to wear a safety belt. Nevertheless, very small-statured women appear to constitute the largest segment of the population that may not be able to sit a safe distance from the air bag, even when properly restrained. Additionally, differences in body size may lead to more severe injury for a small-statured woman than for an unrestrained average-size male.

under the guidance of the Hybrid III Dummy Family Task Force of SAE.[2] The task force invited experts from biomechanics, instrumentation, and dummy design to guide this development. In defining the specifications for an adult small female dummy, the task force selected key body lengths and weights based on anthropometry data for the smallest fifth percent of the United States adult female population. Geometric and mass scale factors were developed to assure that each body segment had the same mass density as the corresponding Hybrid III body segment.

NHTSA has been involved in the development of the H–III5F dummy, initially as an observer in meetings of the SAE taskforce. Subsequently, around 1994, as the dummy's design began to mature, the agency started to use the dummy in several test and development programs. However, the dummy's continuous use had to be supported by significant repairs and modifications, which did not allow the agency to conduct a conclusive assessment of the dummy's capabilities and utility. The agency indicated to the SAE task group as early as 1994 its interest in seeing dummy development brought to a quick conclusion. Subsequent testing of the H–III5F dummy revealed additional problems requiring further redesigns in the neck and thorax area, which stretched the first availability of preproduction dummies into midsummer 1997. At that time NHTSA began an extensive test and evaluation program of the dummy. The dummies were exposed to a variety of crash environments to determine their suitability and stability as measuring tools in the most severe crashes.

The agency has now completed its evaluation of the H–III5F dummy and has tentatively concluded that it is ready for incorporation into Part 572. NHTSA is placing in the docket a technical report entitled ''Development and Evaluation of the Hybrid III 5th Percentile Adult Female Dummy,'' minutes of SAE Hybrid III dummy family Task Group meetings relating to the dummy, and drawings of the proposed dummy. These documents provide the technical information supporting this rulemaking.

Several adaptations have been made to the H-III5F as a result of the NHTSA evaluation program, use of the dummy in the agency's development programs, and SAE task group recommendations. The dummy being proposed today has been modified as follows:

- The head skin contains TMJ configuration (a structural skin filler that bridges the temporo-mandibular notch in the dummy's skull and the voids underneath the chin) to prevent the deploying air bag from snagging under the chin.
- The neck is of segmented construction and made of flexible, molded butyl rubber with steel discs as end plates. The discs are designed to provide human-like flexion (forward bending), extension (rearward bending), and dynamic response to meet biofidelity response requirements. Potential for cervical spine injury is assessed with a six channel neck transducer consisting of three force and three moment channels.
- The thorax now meets documented biofidelity impact performance requirements. It is capable of compression displacement of at least 2.5 inches before contacting spine based bumper stops. The spine box contains provisions for mounting three uniaxial accelerometers at the T4 level, three uniaxial accelerometers at its upper, middle and lower portions, and a chest deflection potentiometer. The sternum has provisions for attachment of uniaxial accelerometers at the upper, middle and lower ends of the sternum slider. They are in co-linear alignment with the uniaxial accelerometers on the spine and permit the monitoring of chest compression velocity and deflection at several points on the sternum. Upper and lower rib guides are used to limit vertical movement of the ribs, which were found to be significantly prevalent in out-of-position tests.
- The lower torso lumbar spine and abdominal insert designs provide human-like and repeatable motion capabilities between the upper and lower torso halves. Appropriate flexion tests have been added to the proposed test procedure to assure that the torso flexion stiffness is similar between dummies. Provisions are available for mounting a lumbar load cell, and three uniaxial accelerometers in the instrument cavity at the rear of the pelvis casting. The pelvis bone also has provisions for mounting submarine-indicating transducers on the front face of the iliac wings.
- The femurs are capable of human-like tibia articulation in the flexion direction, with plastic bumper stops limiting the amount of motion and preventing metal-to-metal contact with the pelvic bone. The femurs may be equipped with either uniaxial or multiaxial force transducers. Optional knee slider mechanisms allow for limited displacement of the tibia relative to the femur with provisions for mounting deflection transducers.
- The feet are of new construction. They are attached to the tibias via a ball joint ankle, which allows motion of the foot in plantar flexion, dorsi flexion, inversion and eversion, as well as medial and lateral rotations. A rubber bumper mounted on the ankle limits the range of motion of the foot to human-like limits and prevents metal-to-metal contact between the foot and the ankle-tibia structure. An Ensolite pad is incorporated into the heel of the foot, providing a degree of human-like heel compliance.

The agency is proposing specifications and performance criteria for the H-III5F dummy. The specifications would consist of the following two items:[3]

(1) A drawings and specifications package entitled ''Parts List and Drawings for the Hybrid III 5th Percentile Adult Female Dummy (August, 1998)''; and

(2) A user's manual entitled ''User's Manual for the Hybrid III 5th Percentile Adult Female Dummy [a date would be inserted in the final rule]''.

These specifications are intended to ensure that the dummies are uniform in their construction and assembly, and capable of uniform and repeatable response in the impact environment. The agency notes that the first item listed above, the drawings and specifications, is available for inspection in NHTSA's docket. (Since this item is non-scannable, it cannot be placed in the DOT Dockets Management System (DMS). Instead a statement indicating where it may be viewed, *i.e.*, in NHTSA's docket, has been placed in the DMS.) Copies may also be obtained from Reprographic Technologies, 9000 Virginia Manor Road, Beltsville, MD 20705; Telephone: (301) 419–5070.

A draft user's manual has been placed in NHTSA's docket to assist commenters in evaluating the proposed drawing and specifications. The manual is similar to the user's manual specified by Part 572 for other dummies.

As with other dummies, NHTSA is proposing impact performance criteria to serve as calibration checks, and to further assure the kinematic uniformity of the dummy and the absence of

[2] Minutes of the meetings of the taskforce are located in NHTSA's docket, Room 5111, 400 Seventh St., SW, and are available for public inspection. The minutes address development of the entire family of Hybrid III dummies, including the six-year-old dummy that is the subject of a previous rulemaking.

[3] NHTSA may produce a digital description of the proposed dummy's external contours after the final rule has been adopted. If the agency produces a digital description, the document will be made available for reference in NHTSA's docket.

damage from previous use. The tests address head, neck, thorax and femur impact responses and stiffness assessments of the lumbar spine-abdomen area to torso flexion motion.

The agency is proposing generic specifications for all of the dummy-based sensors. For most earlier dummies, the agency specified sensors by make and model. However, NHTSA believes that approach is unnecessarily restrictive. Instead, the proposed specifications reflect the characteristics and expected performance response of the sensors that were used in NHTSA's dummy evaluation series and are identified by make and model in the above referenced technical report. Interested persons are encouraged to comment on the adequacy of the proposed specifications; potential impact on the measured test data, including the comparability of data using sensors manufactured by different companies; and issues related to calibration assurance tests.

NHTSA notes that the H-III5F dummy is the second of several new dummies it will propose to add to Part 572. The agency has already proposed incorporating the advanced 6-year old child dummy (63 FR 35170) and plans to propose adding the 3-year old child dummy and the CRABI 12-month old child dummy later this year. The agency intends to use these dummies in its rulemaking for advanced air bags. All of these dummies could be specified for use in a variety of potential Standard No. 208 tests, including out-of-position tests and/or various dynamic tests. The child dummies could also be specified for use in Standard No. 213 tests.

Historically NHTSA has required that the structural properties of a dummy satisfy the specifications set out in the applicable regulation in every respect both before and after its use in any test specified in a FMVSS. The text proposed in today's notice would remove the requirement that the H-III5F dummy meet these requirements after testing. The agency plans to make similar changes with respect to other Part 572 dummies.

NHTSA is concerned that the post-test calibration requirement could handicap and delay its ability to resolve a potential vehicle or motor vehicle equipment test failure solely because the post-test dummy might have experienced a component failure and might no longer conform to all of the specifications. On several occasions during the past few years, a dummy has been damaged during a compliance test such that it could not satisfy all of the post-test calibration requirements. Yet the damage to the dummy did not affect its ability to accurately measure the performance requirements of the standard. The agency is also concerned that the interaction between the vehicle or equipment and the dummy could be directly responsible for the dummy's inability to meet calibration requirements. In such an instance, the failure of the test dummy should not preclude the agency from seeking compliance action. Thus, NHTSA has tentatively concluded that removal of the post-calibration requirement would be in the public interest, since it would permit the agency to proceed with a compliance investigation in those cases where the test data indicate that the dummy measurements were not markedly affected by the dummy damage or that some aspect of vehicle or equipment design was responsible for the dummy failure. Alternatively, the post-test calibration requirement could be retained, but the inability of a dummy to meet the requirements could be presumed to be either irrelevant or the result of the vehicle or motor vehicle equipment test failure unless the vehicle or equipment manufacturer can show that a calibration failure adversely affected the test results. In either case, dummies would still be required to meet the pre-test calibration requirements before being used in subsequent tests. NHTSA seeks comment on this issue. The text proposed in today's notice would remove the requirement that the H–III5F dummy meet these requirements after testing. The agency plans to make similar changes with respect to other Part 572 dummies.

This notice only concerns the H–III5F dummy, and is limited to adding the dummy to Part 572. The issue of specifying the use of the H–III5F dummy as part of Standard No. 208 will be addressed in other rulemakings. However, since one of the primary purposes of adding the dummy to Part 572 is to enable it to be specified for use in the Federal motor vehicle safety standards, NHTSA encourages commenters to address its suitability for the types of tests discussed above. The agency also encourages commenters to address the suitability of the underlying tests used for NHTSA's assessment of dummy performance.[4]

Rulemaking Analyses and Notices

A. Executive Order 12866 and DOT Regulatory Policies and Procedures

NHTSA has considered the impact of this rulemaking action under Executive Order 12866 and the Department of Transportation's regulatory policies and procedures. This rulemaking document was not reviewed by the Office of Management and Budget under E.O. 12866, ''Regulatory Planning and Review.'' The rulemaking action has been determined not to be significant under the Department's regulatory policies and procedures.

This document proposes to amend 49 CFR Part 572 by adding design and performance specifications for a 5th percentile small adult female dummy which the agency may later separately propose for use in the Federal motor vehicle safety standards. If this proposed rule becomes final, it would affect only those businesses which choose to manufacture or test with the dummy. It does not impose any requirements on anyone.

The cost of an uninstrumented H–III5F dummy is approximately $33,400. Instrumentation would add $29,000 to $99,100 to the cost, depending on the amount of instrumentation.

Because the economic impacts of this proposal are so minimal, preparation of a full regulatory evaluation is not necessary.

B. Regulatory Flexibility Act

NHTSA has considered the effects of this rulemaking action under the Regulatory Flexibility Act (5 U.S.C. 601 *et seq.*) I hereby certify that the proposed amendment would not have a significant economic impact on a substantial number of small entities. The proposed amendment would not impose or rescind any requirements for anyone. Therefore, this proposal would not have a significant economic impact on a substantial number of small entities.

C. National Environmental Policy Act

NHTSA has analyzed this proposed amendment for the purposes of the National Environmental Policy Act and determined that it would not have any significant impact on the quality of the human environment.

D. Executive Order 12612 (Federalism)

The agency has analyzed this proposed amendment in accordance with the principles and criteria set forth in Executive Order 12612. NHTSA has determined that the proposed amendment does not have sufficient federalism implications to warrant the preparation of a Federalism Assessment.

Request for Comments

Interested persons are invited to submit comments on this proposal. Two copies should be submitted.

[4] See the technical report for test matrix.

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 two 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 by NHTSA before the close of business on the comment closing date indicated above 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 this action will be considered as suggestions for further rulemaking action. Comments 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 recommends 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.

In consideration of the foregoing, NHTSA proposes to amend 49 CFR Part 572 as follows:

PART 572—ANTHROPOMORPHIC TEST DUMMIES

1. The authority citation for part 572 would continue to read as follows:

Authority: 49 U.S.C 332, 30111, 30115, 30117, and 30166; delegation of authority at 49 CFR 1.50.

2. 49 CFR part 572 would be amended by adding a new subpart O, consisting of §§ 572.130 through 572.137, to read as follows:

Subpart O—Hybrid III 5th Percentile Female

Sec.

Subpart O—Hybrid III 5th Percentile Female

§ 572.120 Incorporation by reference.

(a) The following materials are hereby incorporated in subpart O by reference:

(1) A drawings and specifications package entitled ''Parts List and Drawings for the Hybrid III 5th Percentile Female Dummy (August 1998)'';

(2) A user's manual entitled ''User's Manual for the Hybrid III 5th Percentile Female Dummy [a date will be inserted in the final rule]'';

(3) 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, NW, Suite 700, Washington, DC.

(b) The drawings and specifications package referred to in paragraph (a)(1) of this section and the user's manual referred to in paragraph (a)(2) of this section are available from Reprographic Technologies, 9000 Virginia Manor Road, Beltsville, MD 20705 (301) 419–5070.

§ 572.131 General description.

(a) The Hybrid III type 5th percentile female size test dummy is defined by drawings and specifications which contain the following materials:

(1) Technical drawings and specifications package 880105–000, the titles of which are listed in Table A;

(2) Operation and Maintenance Manual (not available until final rule).

(b) The dummy assembly (P/N 880105–000) is made up of the component assemblies set out in Table A (June 1998):

TABLE A

Component assembly	Drawing No.
Head Assembly	880105–100X
Neck Assembly	880105–250
Upper Torso Assembly	880105–300
Lower Torso Assembly	880105–450
Leg Assembly	880105–560
Arm Assembly	880105–728

(c) Adjacent segments are joined in a manner such that, except for contacts existing under static conditions, there is no contact between metallic elements throughout the range of motion or under simulated crash impact conditions.

(d) The structural properties of the dummy are such that the dummy conforms to this Part in every respect before its use in any test similar to those specified in Standard 208, Occupant Crash Protection, and ISO Out-of-Position 1 and 2.

§ 572.132 Head assembly and test procedure

(a) *Head assembly.* The head consists of the assembly designated as 880105–100X, and 3 accelerometers (SA–572 S4) mounted in conformance to drawing 880105–000.

(b) When the head assembly described in paragraph (a) is dropped from a height of 376.0+/-1.0 mm (14.8+/-0.04 in) in accordance with paragraph (c) of this section, the peak resultant acceleration at the location of the accelerometers at the head CG shall not be less than 250 g's and more than 300 g's. The resultant acceleration vs. time history curve shall be unimodal; oscillations occurring after the main pulse shall be less than 10 percent of the peak resultant acceleration. The lateral acceleration shall not exceed 15 g's (zero to peak).

(c) *Head test procedure.* The test procedure for the head is as follows:

(1) Soak the head assembly in a controlled environment at any temperature between 18.9 and 25.6 °C (66 and 78 °F) and at any relative humidity between 10 and 70 percent for at least four hours prior to a test.

(2) Prior to the test, clean the impact surface of the skin and the impact plate surface with isopropyl alcohol, trichloroethane, or an equivalent. The skin of the head must be clean and dry for testing.

(3) Suspend and orient the head assembly as shown in 49 CFR 572.32, Figure 19 (10/1/97) with the lowest point on the forehead 376.0+/−1.0 mm (14.8 +/−0.04 in) from the impact surface. The 1.57 mm (0.062 in.) diameter holes located on either side of the dummy's head are used to ensure that the transverse axis of the head is level with respect to the impact surface.

(4) Drop the head assembly from the specified height by a means that ensures

a smooth, instant release onto a rigidly supported flat horizontal steel plate which is 51 mm (2 in) thick and 610 mm (24 in) square. The impact surface shall be dry and have a finish of not less than 0.2 microns (8 micro inches) (RMS) and not more than 2 microns (80 micro inches) (RMS).

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

§ 572.133 Neck assembly and test procedure.

(a) The neck assembly consists of the assembly of components designated in drawing P/N 880105–250.

(b) *Neck assembly.* When the head-neck assembly (head 880105–100X, neck 880105–250, bib simulator 880105–371, upper neck adjusting bracket 880105–207, lower neck adjusting bracket 880105–208, six axis neck transducer SA–572 S11, and either three accelerometers SA572 S4 or their equivalent installed in the head assembly as specified in 880105–100X) is tested according to the test procedure in 572.133(c), it shall have the following characteristics:

(1) *Flexion.* Plane D referenced in Figure O1 (attached), shall rotate in the direction of preimpact flight with respect to the pendulum's longitudinal centerline not less than 80 degrees and not more than 92 degrees. During this rotation interval, the peak moment measured by the neck transducer SA–572 S11 about the occipital condyle shall not be less than 69 Nm (51 ft-lb) and not more than 83 Nm (61 ft-lb). The moment shall be calculated by the following formula: Moment (Nm) = My − (0.01778m)×(Fx). The positive moment shall decay for the first time to 10 Nm between 80 ms and 100 ms.

(2) *Extension.* Plane D referenced in Figure O2 (attached), shall rotate in the direction of preimpact flight with respect to the pendulum's longitudinal centerline not less than 97 degrees and not more than 109 degrees. During this rotation interval, the peak moment measured by the neck transducer S–572 S11 about the occipital condyle shall not be more than −55 Nm (−41 ft-lb) and not less than −69 Nm (−51 ft-lb). The moment shall be calculated by the following formula: Moment (Nm) = My − (0.01778m)×(Fx). The negative moment shall decay for the first time to −10 Nm between 94 ms and 114ms.

(c) *Test Procedure.* The test procedure for the neck assembly is as follows:

(1) Soak the neck assembly in a controlled environment at any temperature between 20.6 and 22.2°C (69 and 72 F) and at any relative humidity between 10 and 70 percent for at least four hours prior to a test.

(2) Torque the jam nut 9000018 on the neck cable 880105–206 to 1.4 Nm (12 in-lbs).

(3) Mount the head-neck assembly defined in paragraph (b) of this section, on the pendulum described in 49 CFR 572.33, Figure 22 (10/1/97) (pendulum specifications) so that the midsagittal plane of the head is vertical and coincides with the plane of motion of the pendulum as shown in Figure O1 (attached) for flexion and Figure O2 (attached) for extension tests.

(4) Release the pendulum and allow it to fall freely from a height to achieve an impact velocity of 7.01+/−0.12 m/s (23.0 +/−0.4 ft/s) for flexion and 6.07 +/−0.12 m/s (19.9+/−0.4 ft/s) for extension tests.

(i) Time-zero is defined as the time of initial contact between the pendulum striker plate and the honeycomb material. All data channels should be at the zero level at this time.

(ii) Stop the pendulum from the initial velocity with an acceleration vs. time pulse which meets the velocity change as specified below. Integrate the pendulum acceleration data channel to obtain the velocity vs. time curve:

Time	Pendulum pulse			
ms	Flexion		Extension	
	m/s	ft/s	m/s	ft/s
10	2.1–2.5	6.9–8.2	1.5–1.9	4.9–6.2
20	4.0–5.0	13.1–16.4	3.1–3.9	10.2–12.8
30	5.8–7.0	19.0–23.0	4.6–5.6	15.1–18.4

§ 572.134 Thorax assembly and test procedure.

(a) The thorax consists of the part of the upper torso assembly designated as 880105–300.

(b) *Thorax assembly.* When the anterior surface of the thorax of a completely assembled dummy (880105–000) is impacted by a test probe conforming to § 572.137(a) at 6.71 +/−0.12 m/s (22.0 +/−0.4 ft/s) according to the test procedure in paragraph (c) of this section.

(1) The maximum sternum displacement relative to the spine, measured with the chest deflection transducer (SA–572 S51), shall not be less than 48 mm (1.9 in) and not more than 55 mm (2.2 in). During this displacement interval the peak force, measured by the probe in accordance with paragraph § 572.137, shall not be less than 3900 N (876 pounds) and not more than 4400 N (989 pounds), and the peak force at any time prior to reaching the maximum permissible sternum displacement shall not exceed by more than 5% the value of the peak force measured within the specified displacement limit.

(2) The internal hysteresis of the ribcage in each impact as determined by the plot of force vs. deflection in paragraph (b)(1) of this section shall be not less than 69 percent but not more than 85 percent.

(c) *Test procedure.* The test procedure for the thorax assembly is as follows:

(1) Soak the dummy in a controlled environment at a temperature between 20.6 and 22.2°C (69 and 72 F) and at any relative humidity between 10 and 70 percent for at least four hours prior to a test.

(2) Seat and orient the dummy, that wears light weight cotton stretch short sleeve shirt and above the knee pants on a seating surface without back support as shown in Figure O3, with the limbs extended horizontally and forward, parallel to the midsagittal plane, the midsagittal plane vertical within +/−1 degree and the ribs level in the anterior-poster and lateral directions within +/−0.5 degrees.

(3) Establish the impact point at the chest midsagittal plane so that the impact point of the longitudinal centerline of the probe is centered on the midsagittal plane of the dummy within +/−2.5 mm (0.1 in.) and is 12.7 +/−1.0 mm (0.5+/−0.04 in.) below the horizontal centerline of the No. 3 rib and is within 0.5 degrees of a horizontal line in the dummy's midsagittal plane.

(4) Adjust the dummy so that the tangent plane at the surface on the ribs immediately adjacent to the designated impact point is vertical and parallel to the face of the test probe.

(5) Impact the thorax with the test probe so that at the moment of contact

the probe's longitudinal center line falls within 2 degrees of a horizontal line in the dummy's midsagittal plane.

(6) Guide the test probe during impact so that there is no significant lateral, vertical or rotational movement.

(7) Allow at least 30 minutes between successive tests.

§ 572.135 Upper and lower torso assemblies and torso flexion test procedure.

(a) *Upper/lower torso assembly.* The test objective is to determine the stiffness effects of the lumbar spine 880105–1096 and abdominal insert 880105–434 on resistance to articulation between upper torso assembly 880105–300 and the lower torso assembly 880105–450.

(b) When the upper torso assembly of a seated dummy is subjected to a force continuously applied at the head to neck pivot pin level through a rigidly attached adaptor bracket as shown in Figure O4 according to the test procedure set out in paragraph (c) of this section, the lumbar spine-abdomen assembly shall:

(1) Flex by an amount that permits the upper torso assembly to rotate relative to the fixed seating reference surface by 45 degrees at which time the force level is not less than 289 N (65 pounds) and not more than 378 N (85 pounds), and

(2) Upon removal of the force the torso assembly returns to within 5 degrees of its initial position.

(c) *Test procedure.* The test procedure for the upper/lower torso assembly is as follows:

(1) Soak the dummy in a controlled environment at any temperature between 20.6° and 22°C (69 and 72 F) and at any relative humidity between 10 and 70 percent for at least 4 hours prior to a test.

(2) Assemble the complete dummy (with or without the legs below the femurs) and attach to the fixture in a seated posture as shown in Figure O4.

(3) Secure the pelvis to the fixture at the pelvis instrument cavity rear face by threading four ¼ in cap screws into the available threaded attachment holes. Tighten the cap screws so that the pelvis casting is rigidly affixed to the test fixture and the pelvic-lumbar joining surface is horizontal.

(4) Attach a lightweight, rigid loading adaptor bracket (not to exceed 0.77 kg (1.7 lbs)) to the posterior of the spine at the machined surface of the upper instrumentation cavity as shown in Figure O4. The loading bracket is designed such that the point of load application coincides with the longitudinal axis of the head-neck condyle pin and also provides means for measuring the rotation of the upper torso.

(5) Inspect and adjust, if necessary, the seating of the abdominal insert within the pelvis cavity and with respect to the torso flesh to assure uniform fit and clearances.

(6) Attach means of loading the dummy through the point of load application as shown in Figure O4.

(7) The initial orientation of the angle reference plane of the seated, unsupported dummy shall not exceed 20 degrees of flexion as shown in Figure O4. The angle reference plane is defined by the transverse plane the machined surface of the upper thoracic instrumentation cavity makes with respect to the vertical as shown in Figure O4.

(8) Apply a forward force in the midsagittal plane through the adaptor bracket as shown in Figure O4 at any upper torso deflection rate between 0.5 and 1.5 degrees per second, until the angle reference plane reaches 45 degrees of flexion with the applied force at 59 degrees from horizontal.

(9) Continue to apply a force sufficient to maintain 45 degrees of flexion for 10 seconds, and record the highest applied force during the 10 seconds period.

(10) Release all force as rapidly as possible, and measure the return angle with respect to the initial angle reference plane as defined in paragraph (c)(6) of this section 3 minutes after the release.

§ 572.136 Knees and knee impact test procedure.

(a) The knee assembly is part of the leg assembly shown in drawing 880105–560.

(b) *Knee assembly.* When the knee assembly (knee cap 880105–560 −1(left) −2 (right), knee skin flesh P/N 880105–508, knee flesh insert 880105–511, lower leg 105–4014, and femur load transducer SA–572 S14 or its structural replacement 78051–319 is tested according to the test procedure in 572.137(c), the peak resistance force as measured with the test probe mounted accelerometer shall be not less than 3360 N (755 lbs) but not more than 4080 N (916 lbs).

(c) *Test procedure.* The test procedure for the knee assembly is as follows:

(1) Soak the knee assembly in a controlled environment at any temperature between 18.9 and 25.6°C (66 to 78 F) and at any relative humidity between 10 and 70 percent for at least four hours prior to a test.

(2) Mount the test material and secure it to a rigid test fixture as shown in Figure O5. No contact is permitted between any part of the foot and tibia and any exterior surface.

(3) Align the test probe so that throughout its stroke and at contact with the knee it is within 2 deg. of horizontal and collinear with the longitudinal centerline of the femur.

(4) Guide the pendulum so that there is no significant lateral vertical or rotational movement at time zero. Time-zero is defined as the time of initial contact between the impactor and the knee.

(5) The test probe velocity at the time of contact shall be 2.1+/−0.03 m/s (6.9+/−0.1 ft/s).

§ 572.137 Test conditions and instrumentation.

(a) The test probe for thoracic impacts is a 152.4+/−0.25 mm (6.00+/−0.01 in.) diameter cylinder that weighs 13.97+/−0.01 kg (30.8+/−0.02 lb) including instrumentation. Its impacting end has a flat right angle face that is rigid and has an edge radius of 12.7 mm (0.5 in.). The test probe has an accelerometer mounted on the end opposite from impact with its sensitive axis collinear with the longitudinal centerline of the cylinder.

(b) The test probe for knee impact tests is a 76.2+/−0.25mm (3.0+/−0.01 in.) diameter cylinder that weighs 2.99+/−.01 kg (6.6+/−0.02 lbs) including instrumentation. Its impacting end has a flat right angle face that is rigid and has an edge radius of 2 mm (0.08 in.) max. The test probe has an accelerometer mounted on the end opposite from impact with its sensitive axis collinear to the longitudinal centerline of the cylinder.

(c) Head accelerometers shall have dimensions, response characteristics, and sensitive mass locations specified in drawing SA–572 S4 or equivalent and be mounted in the head as shown in drawing 880105–000 sheet 3.

(d) The neck force/moment transducer shall have the dimensions, response characteristics, and sensitive axis locations specified in drawing SA–572 S11 or its equivalent and be mounted in the head-neck assembly as shown in drawing 880105–100X sheet 3.

(e) The thorax accelerometers shall have the dimensions, response characteristics, and sensitive mass locations specified in drawing SA–572 S4, or its equivalent and are mounted in the upper torso assembly in triaxial configuration within the spine box instrumentation cavity and as options in uniaxial for-and-aft oriented configuration as corresponding pairs in three locations on the sternum on and at the spine box of the upper torso

assembly as shown in 880105–000 sheet 3.

(f) The optional lumbar spine force-moment transducer shall have the dimensions, response characteristics, and sensitive axis locations specified in drawing SA–572 S15 or its equivalent and be mounted in the lower torso assembly as shown in drawing P/N 880105–450.

(g) The optional iliac spine force transducers shall have the dimensions and response characteristics specified in drawing SA–572 S16 or equivalent and be mounted in the torso assembly as shown P/N 880105–450.

(h) The pelvis accelerometers shall have the dimensions, response characteristics, and sensitive mass locations specified in drawing SA–572 S4 or its equivalent and be mounted in the torso assembly in triaxial configuration in the pelvis bone as shown P/N 880105–000 sheet 3.

(i) The femur force transducer shall have the dimensions and response characteristics specified in drawing SA–572 S14 or its equivalent and be mounted in the leg assembly as shown in 880105–500 and –501.

(j) The outputs of acceleration and force-sensing devices installed in the dummy and in the test apparatus specified by this part are recorded in individual data channels that conform to the requirements of SAE Recommended Practice J211, Rev. Mar 95 ''Instrumentation for lmpact Tests,'' with channel classes as follows:

(1) Head acceleration—Class 1000
(2) Neck:
  (i) Forces—Class 1000
  (ii) Moments—Class 600
  (iii) pendulum acceleration—Class 180
(3) Thorax:
  (i) Rib acceleration—Class 1000
  (ii) Spine and pendulum accelerations—Class 180
  (iii) Sternum deflection—Class 600
(4) Lumbar:
  (i) Forces—Class 1000
  (ii) Moments—Class 1000
(5) Pelvis accelerations—Class 1000
(6) Femur forces—Class 600

(k) Coordinate signs for instrumentation polarity conform to the Sign Convention For Vehicle Crash Testing, Surface Vehicle Information Report, SAE J1733, 1994–12.

(l) The mountings for sensing devices shall have no resonance frequency within range of 3 times the frequency range of the applicable channel class.

(m) Limb joints shall be set at 1g, barely restraining the weight of the limb when it is extended horizontally. The force required to move a limb segment shall not exceed 2g throughout the range of limb motion.

(n) Performance tests of the same component, segment, assembly, or fully assembled dummy shall be separated in time by period of not less than 30 minutes unless otherwise noted.

(o) Surfaces of dummy components are not painted except as specified in this part or in drawings subtended by this part.

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FIGURE 01.
NECK FLEXION TEST SETUP SPECIFICATIONS

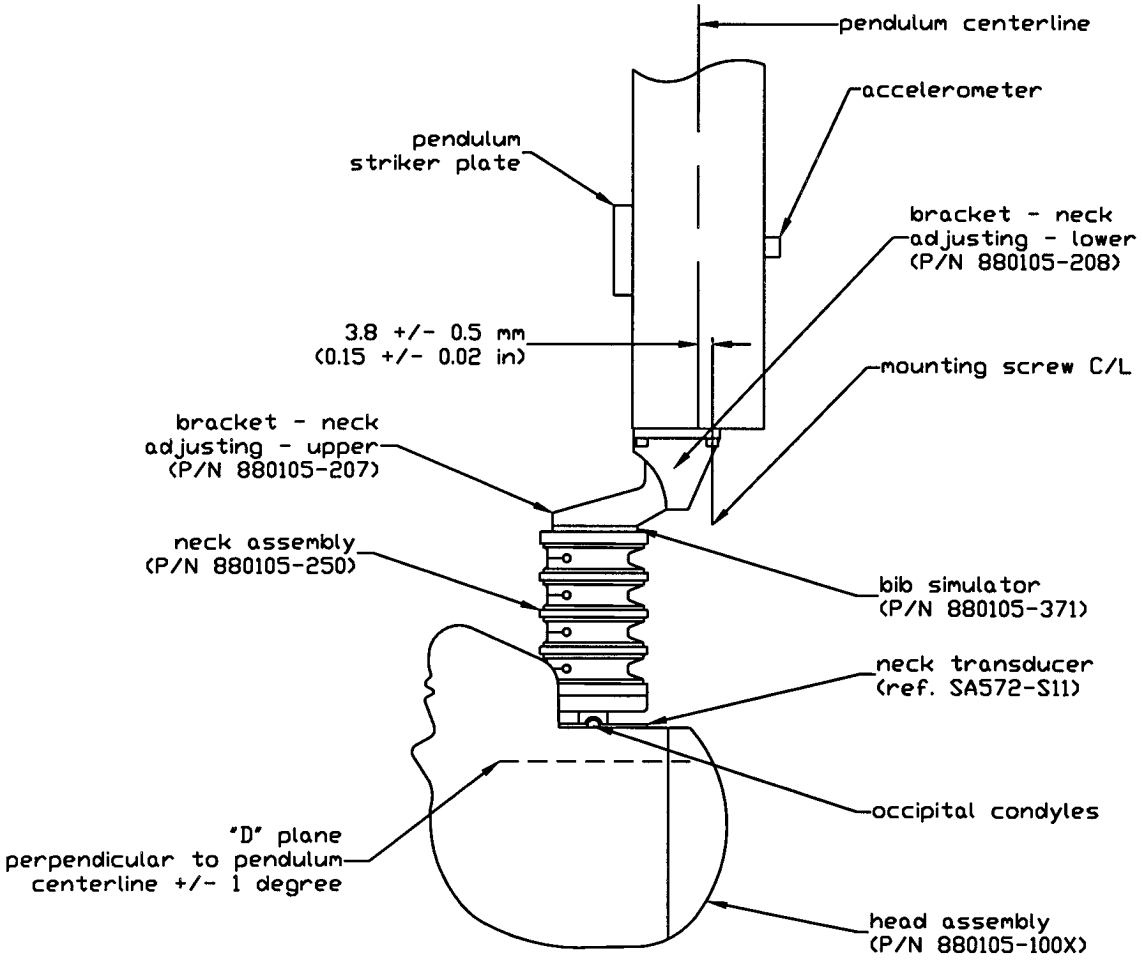


FIGURE 02.
NECK EXTENSION TEST SETUP SPECIFICATIONS

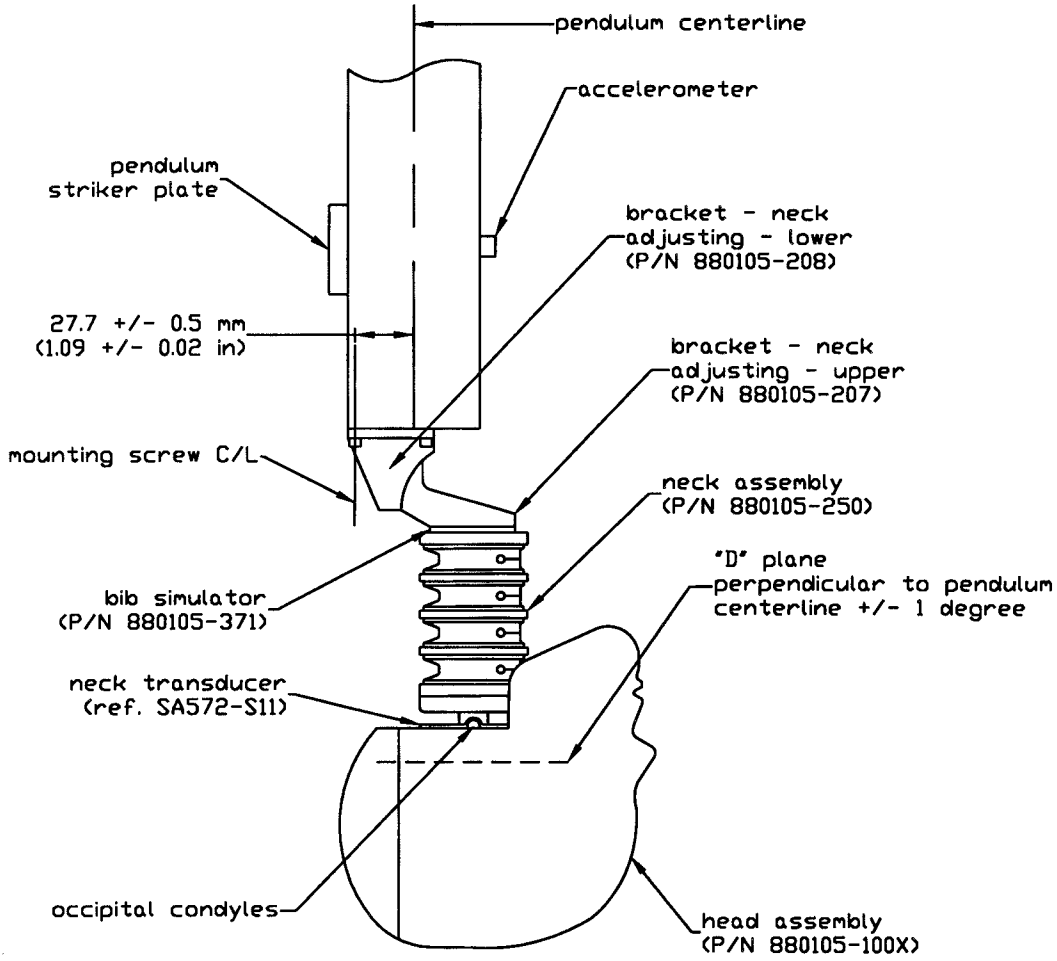


FIGURE 03.
THORAX IMPACT TEST SETUP SPECIFICATIONS

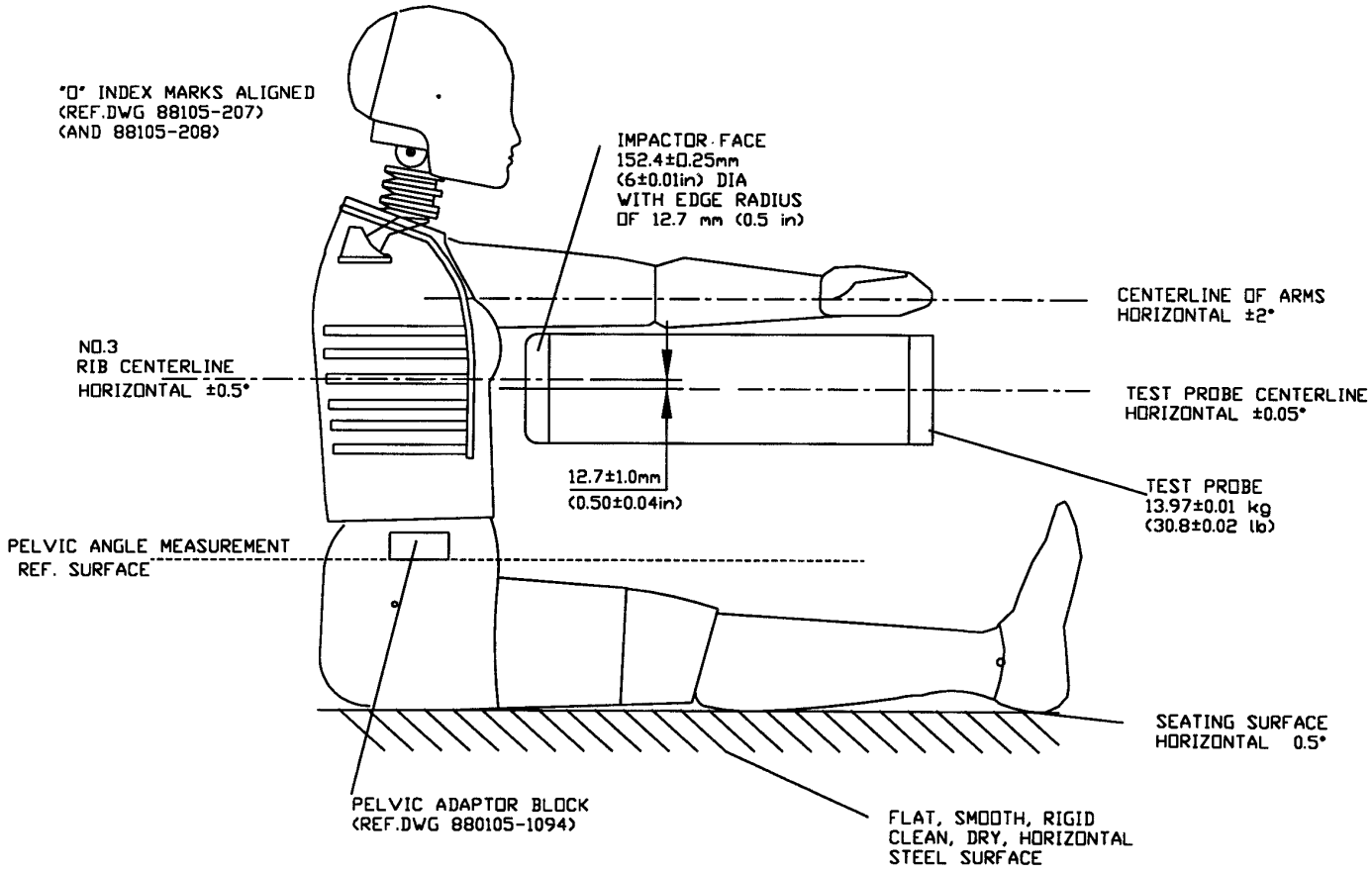


FIGURE 04.
TORSO FLEXION TEST

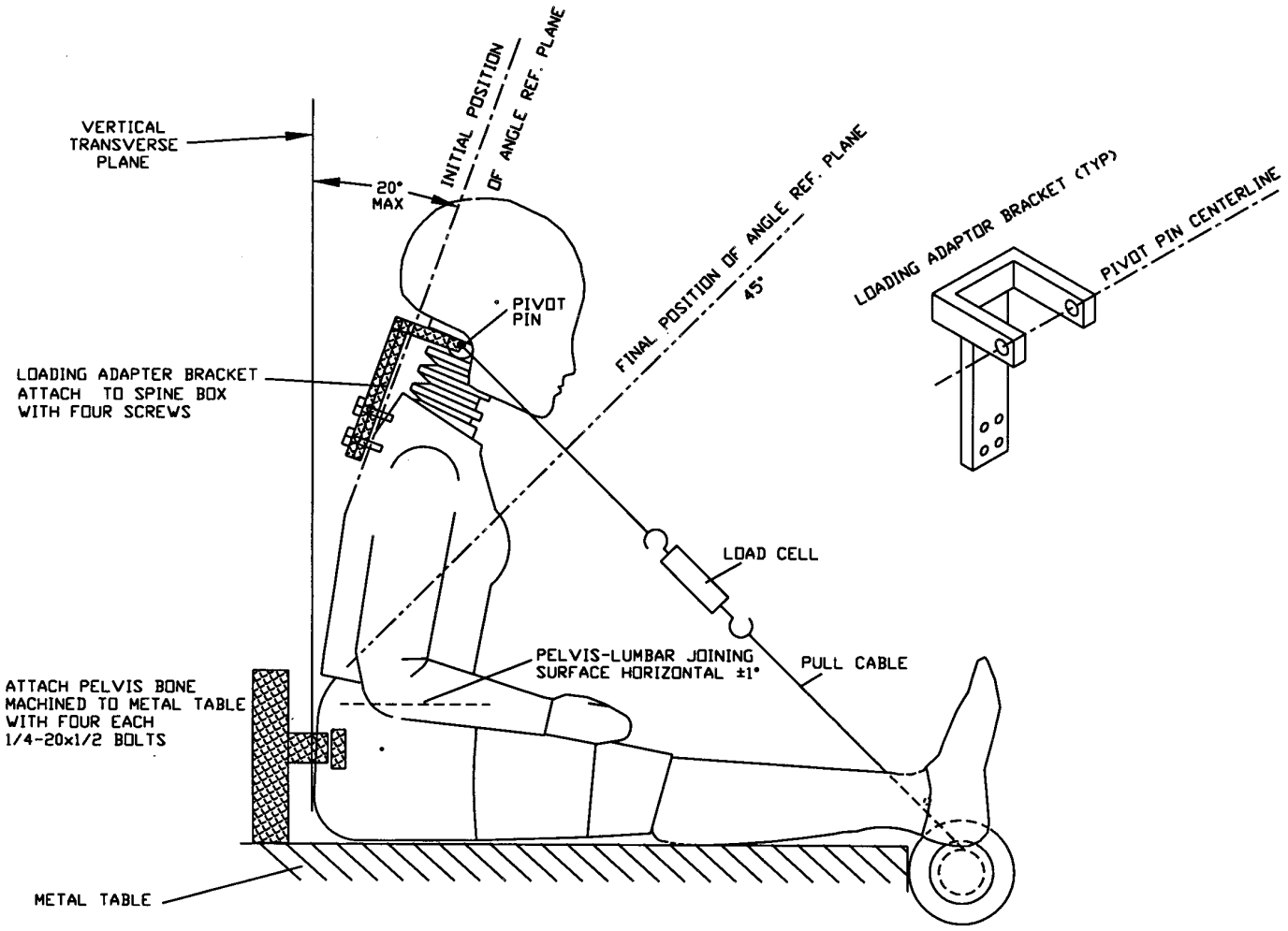
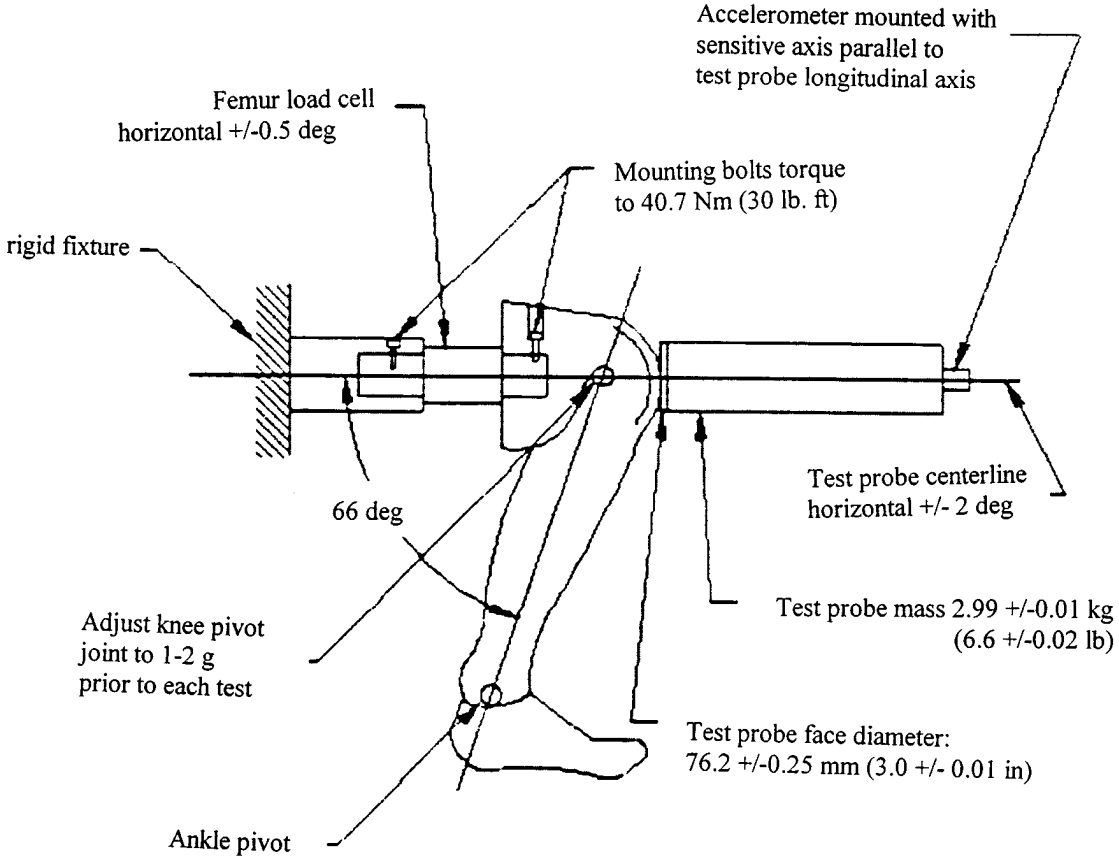


Figure 05. Knee Impact Test Setup Specification



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L. Robert Shelton,

Associate Administrator for Safety Performance Standards.

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