

U.S. DEPARTMENT OF TRANSPORTATION
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION

LABORATORY TEST PROCEDURE

FOR

FMVSS 201

Occupant Protection in Interior Impact



SAFETY ASSURANCE
Office of Vehicle Safety Compliance
Room 6115, NSA-30
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OVSC LABORATORY TEST PROCEDURE NO. 201
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1. PURPOSE AND APPLICATION

The Office of Vehicle Safety Compliance (OVSC) provides contracted laboratories with Laboratory Test Procedures (TPs) which serve as guidelines for obtaining compliance test data. The data are used to determine if a specific vehicle meets the minimum performance requirements of the subject Federal Motor Vehicle Safety Standard (FMVSS). The purpose of the OVSC Laboratory Test Procedures is to present a uniform testing and data recording format, and provide suggestions for the use of specific equipment and procedures. Any contractor interpreting any part of an OVSC Laboratory Test Procedure to be in conflict with a Federal Motor Vehicle Safety Standard or observing any deficiencies in a Laboratory Test Procedure is required to advise the Contracting Officer's Technical Representative (COTR) and resolve the discrepancy prior to the start of compliance testing.

Contractors are required to submit a detailed test procedure to the COTR before initiating the compliance test program. The procedure must include a step-by-step description of the methodology to be used.

The OVSC Laboratory Test Procedures are not intended to limit or restrain a contractor from developing or utilizing any testing techniques or equipment which will assist in procuring the required compliance test data.

NOTE: The OVSC Laboratory Test Procedures, prepared for use by independent laboratories under contract to conduct compliance tests for the OVSC, are not intended to limit the requirements of the applicable FMVSS(s). In some cases, the OVSC Laboratory Test Procedures do not include all of the various FMVSS minimum performance requirements. Sometimes, recognizing applicable test tolerances, the Test Procedures specify test conditions which are less severe than the minimum requirements of the standards themselves. Therefore, compliance of a vehicle or item of motor vehicle equipment is not necessarily guaranteed if the manufacturer limits certification tests to those described in the OVSC Laboratory Test Procedures.

2. GENERAL REQUIREMENTS

Within the provisions of the National Traffic and Motor Vehicle Safety Act of 1966 and the Highway Safety Act of 1966, the Department of Transportation is charged with the responsibility of setting Motor Vehicle Safety Standards and ensuring that they are met. Within the charter, the Department of Transportation has specified various minimum performance requirements for motor vehicles and motor vehicle equipment.

FMVSS 201 sets forth minimum requirements for instrument panels, seat backs, interior compartment doors, sun visors and armrests. The purpose of this standard is to afford impact protection for occupants.

FMVSS 201 applies to passenger cars and to multipurpose passenger vehicles, trucks and buses with a GVWR of 10,000 pounds or less.

IMPACT PROTECTION REQUIREMENTS

Instrument Panel and Seat Backs

A point within the "head impact area" is impacted by a 15 pound, 6.5 inch diameter head form at a velocity of 15 miles per hour. The deceleration of the head form shall not exceed 80g continuously for more than 3 milliseconds (ms).

Interior Compartment Doors

The interior compartment doors are subjected to the inertia load requirements of SAE J839b, Passenger Car Side Door Latch Systems, May 1965, or approved equivalent.

Sun Visors

Constructed of or covered with energy absorbing material and have no rigid material edge radius of less than 0.125 inch.

Armrests

The armrest shall meet the requirements under S3.5 of FMVSS 201.

3. SECURITY

The contractor shall provide appropriate security measures to protect the OVSC test vehicles and Government Furnished Property (GFP) from unauthorized personnel during the entire compliance testing program. The contractor is financially responsible for any acts of theft and/or vandalism which occur during the storage of test vehicles and GFP. Any security problems which arise shall be reported by telephone to the Industrial Property Manager (IPM), Office of Contracts and Procurement, within two working days after the incident. A letter containing specific details of the security problem will be sent to the IPM (with copy to the COTR) within 48 hours.

The contractor shall protect and segregate the data that evolves from compliance testing and test dummy calibration (if applicable) before and after each vehicle test. No information concerning the vehicle safety compliance testing program shall be released to anyone except the COTR, unless specifically authorized by the COTR or the COTR's Group Supervisor or Division Chief.

NOTE: NO INDIVIDUALS, OTHER THAN CONTRACTOR PERSONNEL DIRECTLY INVOLVED IN THE COMPLIANCE TESTING PROGRAM OR OVSC PERSONNEL, SHALL BE ALLOWED TO WITNESS ANY VEHICLE OR EQUIPMENT ITEM COMPLIANCE TEST OR TEST DUMMY CALIBRATION UNLESS SPECIFICALLY AUTHORIZED BY THE COTR.

4. GOOD HOUSEKEEPING

Contractors shall maintain the entire vehicle compliance testing area, test fixtures and instrumentation in a neat, clean and painted condition with test instruments arranged in an orderly manner consistent with good test laboratory housekeeping practices.

5. TEST SCHEDULING AND MONITORING

The contractor shall submit a vehicle test schedule to the COTR prior to conducting the first compliance test. Tests shall be completed as required in the contract.

Scheduling of vehicle tests shall be adjusted to permit vehicles to be tested to other FMVSSs as may be required by the OVSC. All vehicle compliance testing shall be coordinated with the COTR in order to allow monitoring by the COTR and/or other OVSC personnel if desired.

6. TEST DATA DISPOSITION

The contractor shall make all vehicle preliminary compliance test data available to the COTR immediately. Final test data, including digital printouts and computer generated plots (if applicable), shall be furnished to the COTR within five working days. Additionally, the contractor shall analyze the preliminary test results as directed by the COTR.

6. TEST DATA DISPOSITION....Continued

All backup data sheets, strip charts, recordings, plots, technician's notes, etc., shall be either sent to the COTR or destroyed at the conclusion of each delivery order, purchase order, etc.

7. GOVERNMENT FURNISHED PROPERTY (GFP)

GFP shall consist of test vehicles.

ACCEPTANCE OF VEHICLE

The Contractor has the responsibility of accepting the test vehicle from either a new car dealer or a vehicle transporter. In both instances, the contractor acts in the OVSC's behalf when signing an acceptance of the test vehicle. If the vehicle is delivered by a dealer, the contractor must check to verify the following:

- A. All options listed on the "window sticker" are present on the test vehicle.
- B. Tires and wheel rims are new and the same as listed.
- C. There are no dents or other interior or exterior flaws.
- D. The vehicle has been properly prepared and is in running condition.
- E. The glove box contains an owner's manual, warranty document, consumer information, and extra set of keys.
- F. Proper fuel filler cap is supplied on the test vehicle.

If the test vehicle is delivered by a government contracted transporter, the contractor should check for damage which may have occurred during transit.

A "Vehicle Condition" form will be supplied to the contractor by the COTR when the test vehicle is transferred from the new car dealer or between test contracts. The upper half of the form describes the vehicle in detail, and the lower half provides space for a detailed description of the post test condition. Vehicle Condition forms must be returned to the COTR with the copies of the Final Test Report or the reports will NOT be accepted.

NOTIFICATION OF COTR

The COTR must be notified within 24 hours after a vehicle has been delivered.

8. CALIBRATION OF TEST INSTRUMENTS

Before the contractor initiates the safety compliance test program, a test instrumentation calibration system will be implemented and maintained in accordance with established calibration practices. The calibration system shall be set up and maintained as follows:

- A. Standards for calibrating the measuring and test equipment will be stored and used under appropriate environmental conditions to assure their accuracy and stability.
- B. All measuring instruments and standards shall be calibrated by the contractor, or a commercial facility, against a higher order standard at periodic intervals NOT TO EXCEED TWELVE (12) MONTHS! Records, showing the calibration traceability to the National Institute of Standards and Technology (NIST), shall be maintained for all measuring and test equipment.
- C. All measuring and test equipment and measuring standards will be labeled with the following information:
 - (1) Date of calibration
 - (2) Date of next scheduled calibration
 - (3) Name of the technician who calibrated the equipment
- D. A written calibration procedure shall be provided by the contractor which includes as a minimum the following information for all measurement and test equipment:
 - (1) Type of equipment, manufacturer, model number, etc.
 - (2) Measurement range
 - (3) Accuracy
 - (4) Calibration interval
 - (5) Type of standard used to calibrate the equipment (calibration traceability of the standard must be evident)
- E. Records of calibration for all test instrumentation shall be kept by the contractor in a manner which assures the maintenance of established calibration schedules. All such records shall be readily available for inspection when requested by the COTR. The calibration procedure must be approved by the COTR before the test program commences.

9. PHOTOGRAPHIC DOCUMENTATION

Photographs, if required, shall be glossy black and white, 8½ x 11 inches, and properly focused for clear images. A tag, label or placard identifying the test vehicle model, NHTSA number and date shall appear in each photograph and must be legible. Each photograph shall be labeled as to the subject matter. As a minimum the following photographs shall be included in each final test report:

- A. Left side view of vehicle
- B. Right side view of vehicle
- C. 3/4 frontal view from left side of vehicle
- D. 3/4 rear view from right side of vehicle
- E. Vehicle's certification label
- F. Vehicle's tire information label
- G. Head impact location fixture
- H. Instrument panel and seat backs marked to indicate areas to be investigated
- I. Instrument panel, seat backs and sun visors marked to show areas of possible head impact
- J. Instrument panel and seat backs with impact locations marked and identified
- K. Areas on the instrument panel creating local stiffness.
- L. Impactor fixture
- M. Instrument panel and seat backs before and after impact
- N. Sun visor marked to indicate which edges could suffer head impact
- O. Interior compartment doors that will have their latch analyzed
- P. Armrests marked to indicate areas of possible pelvic impact
- Q. Armrests before and after evaluation
- R. Instrumentation setup
- S. Any areas of potential failure or hazard not clearly evident in the above list of photographs

10. DEFINITIONS

INSTRUMENT PANEL AREA TO BE INVESTIGATED

Area of the instrument panel **NOT** excluded by the following (see Figure 1):

- Console assemblies

- Areas less than 5 inches inboard from the juncture of the instrument panel attachment to the body side inner structure

- Areas closer to the windshield juncture than those statically contactable by the head form with the windshield in place

- Areas outboard of any point of tangency on the instrument panel of a 6.5 inch diameter head form tangent to and inboard of a vertical longitudinal plane tangent to the inboard edge of the steering wheel

- Areas below any point at which a vertical line is tangent to the rearmost surface of the panel

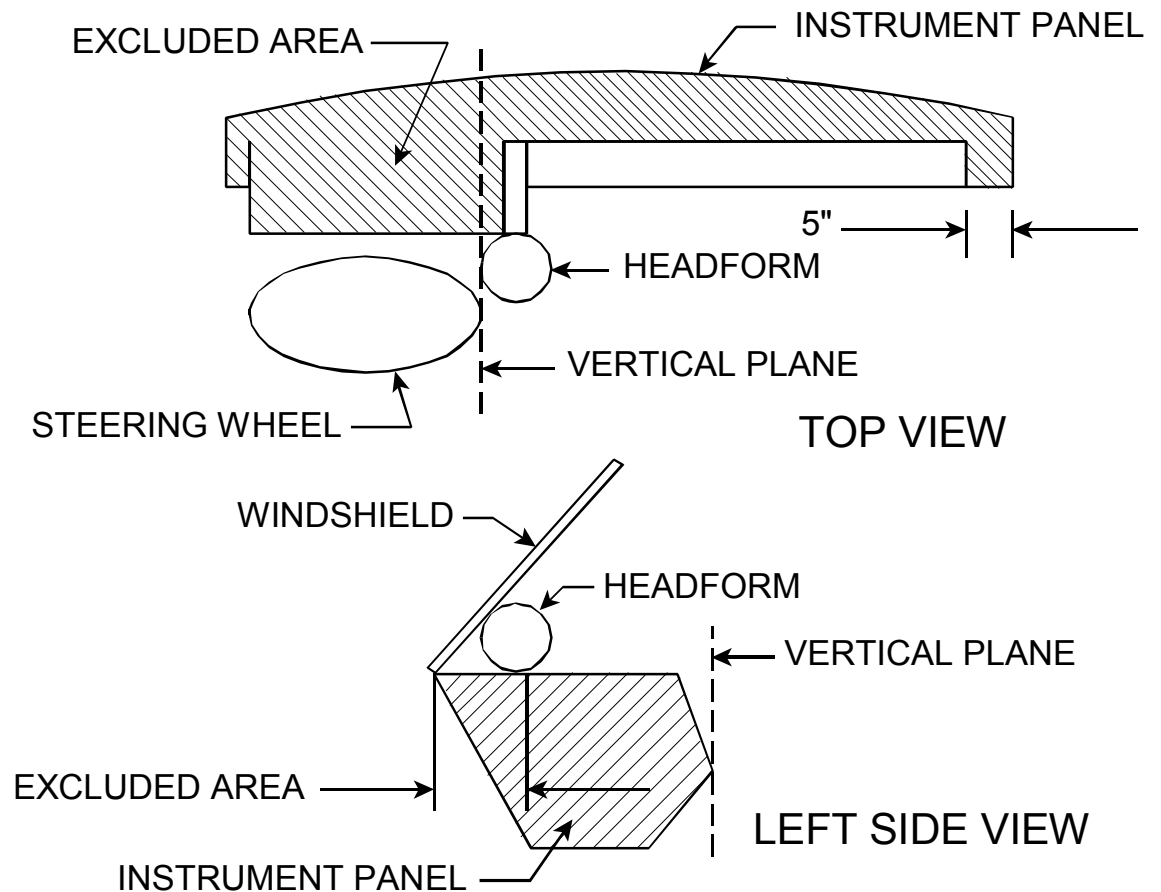


FIGURE 1

10. DEFINITIONS...Continued

HEAD IMPACT LOCATION FIXTURE

Fixture that is placed in each Designated Seating Position (DSP) to determine areas of possible head impact for each position. Fixture has a pivoted arm with a head form attached to determine points of contact as the arm is swung forward.

HEAD IMPACT AREA

All nonglazed surfaces of the interior of a vehicle that are statically contactable by 6.5 inch diameter head form of a measuring device having a pivot point to "top-of-head" dimension infinitely adjustable from 29 to 33 inches in accordance with the following procedure, or its graphic equivalent:

- A. At each Designated Seating Position (DSP), place the pivot point of the measuring device —
 - (1) For seats that are adjustable fore and aft, at —
 - (A) the Seating Reference Point (SRP).
 - (B) a point 5 inches horizontally forward of the Seating Reference Point (SRP) and vertically above the SRP an amount equal to the rise which results from a 5 inch forward adjustment of the seat or 0.75 inch.
 - (2) For seats that are not adjustable fore and aft, at the SRP.
- B. With the pivot point to "top-of-head" dimension at each value allowed by the device and the interior dimensions of the vehicle, determine all contact points above the lower windshield glass line and forward of the SRP.
- C. With the head form at each contact point, and with the device in a vertical position if no contact points exists for a particular adjusted length, pivot the measuring device forward and downward through all arcs in vertical planes to 90 degrees each side of the vertical longitudinal plane through the SRP, until the head form contacts an interior surface or until it is tangent to a horizontal plane 1 inch above the SRP, whichever occurs first.

INTERIOR COMPARTMENT DOOR

Any door in the interior of the vehicle installed by the manufacturer as a cover for storage space normally used for personal effects.

10. DEFINITIONS....Continued

PELVIC IMPACT AREA

Any area of the door or body side panel adjacent to any outboard Designated Seating Position (DSP) which is bounded by horizontal planes 7 inches above and 4 inches below the SRP and vertical transverse planes 8 inches forward and 2 inches rearward of the SRP.

SEATING REFERENCE POINT (SRP)

Manufacturer's Design Reference Point which does the following:

- A. Establishes the rearmost normal design driving or riding position of each DSP in a vehicle
- B. Has coordinates established relative to the designed vehicle structure
- C. Simulates the position of the pivot center of the human torso and thigh
- D. Is the reference point employed to position the two dimensional templates described in SAE J826, Manikins for Use in Defining Vehicle Seating Accommodations, Nov62

11. PRETEST REQUIREMENTS

Prior to conducting any compliance tests, contractors are required to submit a detailed in-house compliance test procedure to the COTR which includes a step-by-step description of the methodology to be used. Written approval must be obtained from the COTR before initiating the compliance test program so that all parties are in agreement.

The contractor's test procedure shall contain a complete listing of test equipment and a detailed check-off list. There shall be no contradiction between the OVSC Laboratory Test Procedure and the contractor's in-house test procedure. The list of test equipment shall include instrument accuracy and calibration dates.

TEST DATA LOSS

A compliance test is not to be conducted unless all of the various test conditions specified in the applicable OVSC Laboratory Test Procedure have been met. Failure of a contractor to obtain the required test data and to maintain acceptable limits on test parameters (such as impact velocity) in the manner outlined in the applicable OVSC Laboratory Test Procedure may require a retest at the expense of the contractor. The retest costs will include the cost of the replacement vehicle (with the same equipment as the original vehicle) or item of motor vehicle equipment and all costs associated with conducting the retest. The original test specimen (vehicle or equipment item) used for the invalid test shall remain the property of OVSC, and the retest specimen shall remain the property of the contractor. If there is a test failure, the contractor shall retain the retest specimen for a period not exceeding 180 days. If there is no test failure, the Contractor may dispose of the test specimen upon notification from the COTR that the final test report has been accepted.

The Contracting Officer of NHTSA is the only NHTSA official authorized to notify the contractor that a retest is required. The retest shall be completed within two (2) weeks after receipt of notification by the Contracting Officer that a retest is required. If a retest is conducted, no test report is required for the original test.

12. COMPLIANCE TEST EXECUTION

12.1 PREPARATION OF VEHICLE

- A. Place vehicle on rigid supports such that side sills are parallel to the ground. Set parking brake and provide ground supports so that vehicle will not move.
- B. Place front seats in rearmost position.
- C. Place adjustable seat backs in their Nominal Design Driving Position, as furnished by the manufacturer, through the COTR.
- D. Close and latch all interior compartment doors. If any doors have locking devices, set locks to the unlocked position.

NOTE: In an instance where the desired direction of impact is not possible to attain because of space constraints or otherwise, the COTR shall be notified. A decision can be made in using a suitable laboratory fixture or the COTR may authorize cutting up of the intruding vehicle parts to permit the impact test sequence.

12.2 PREPARATION OF THE AREAS TO BE INVESTIGATED

INSTRUMENT PANEL

As shown in Figure 1, outline the area on the instrument panel that is to be investigated with a marker or tape. The instrument panel area to be evaluated for head impact is specified in S201 S3.1.1.

Photograph the panel with the outlined area.

SEAT BACKS

As shown on Figures 2 and 2A, outline the area on the seat backs that are to be investigated. The seat back area to be evaluated for head impact is specified in S201 S3.2.2

Photograph the seat backs with the outlined areas.

12. COMPLIANCE TEST EXECUTION....Continued

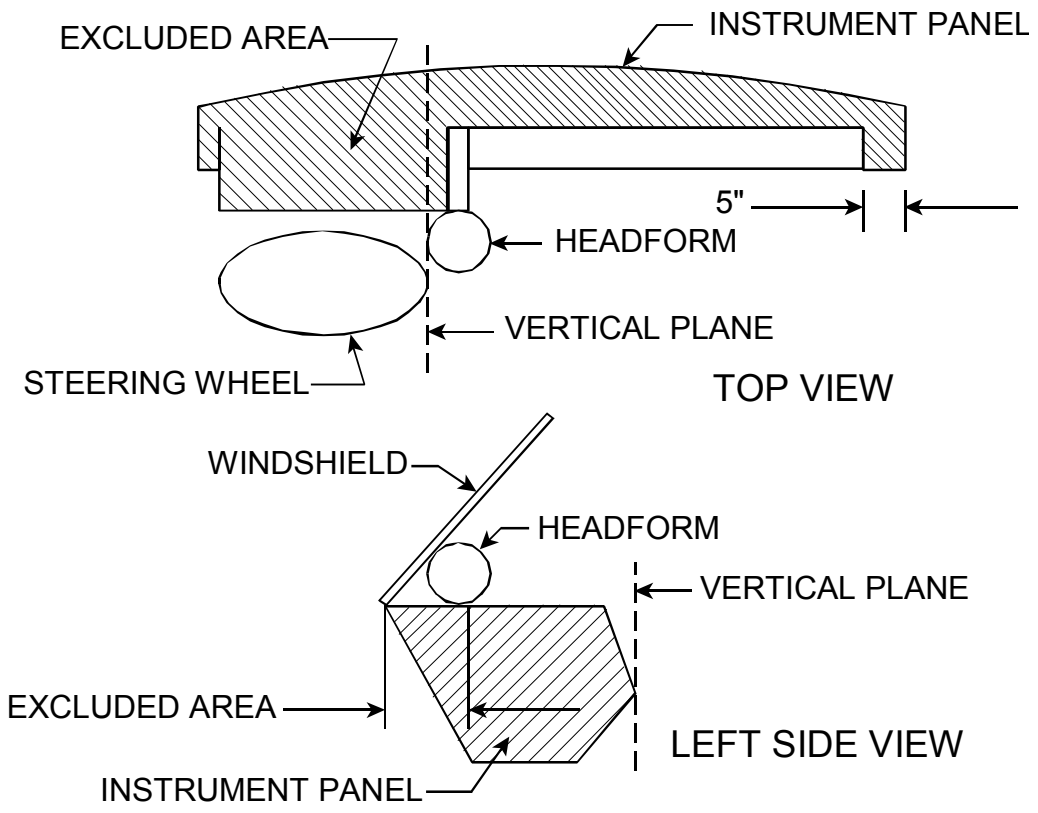


FIGURE 1

SEATS WITHOUT HEAD RESTRAINTS

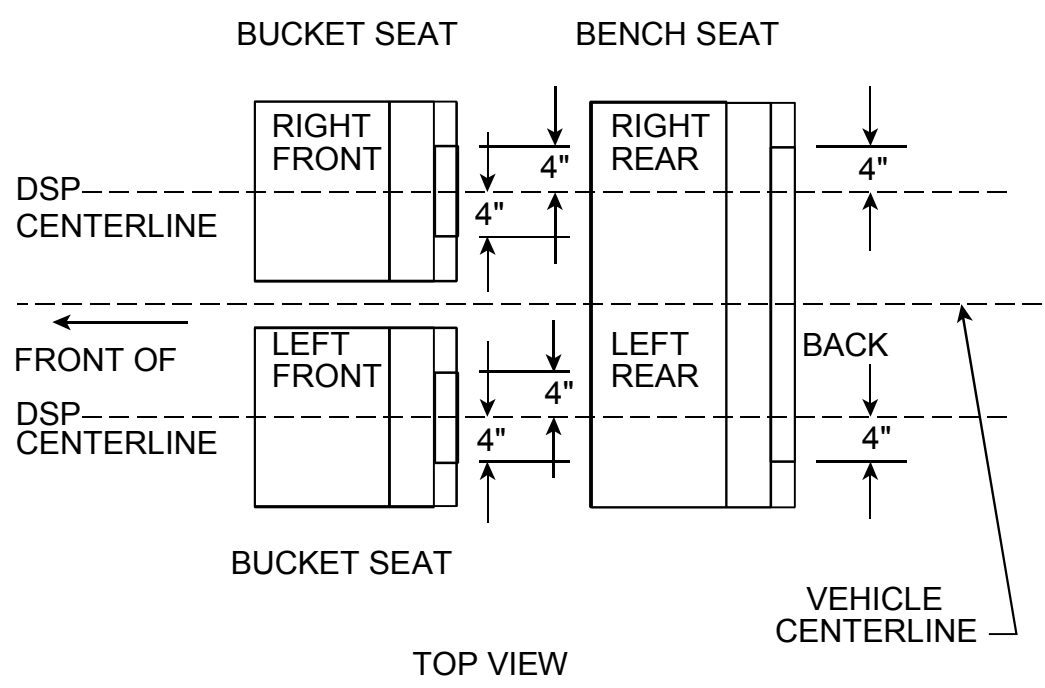


FIGURE 2

12. COMPLIANCE TEST EXECUTION....Continued

SEATS WITH HEAD RESTRAINTS

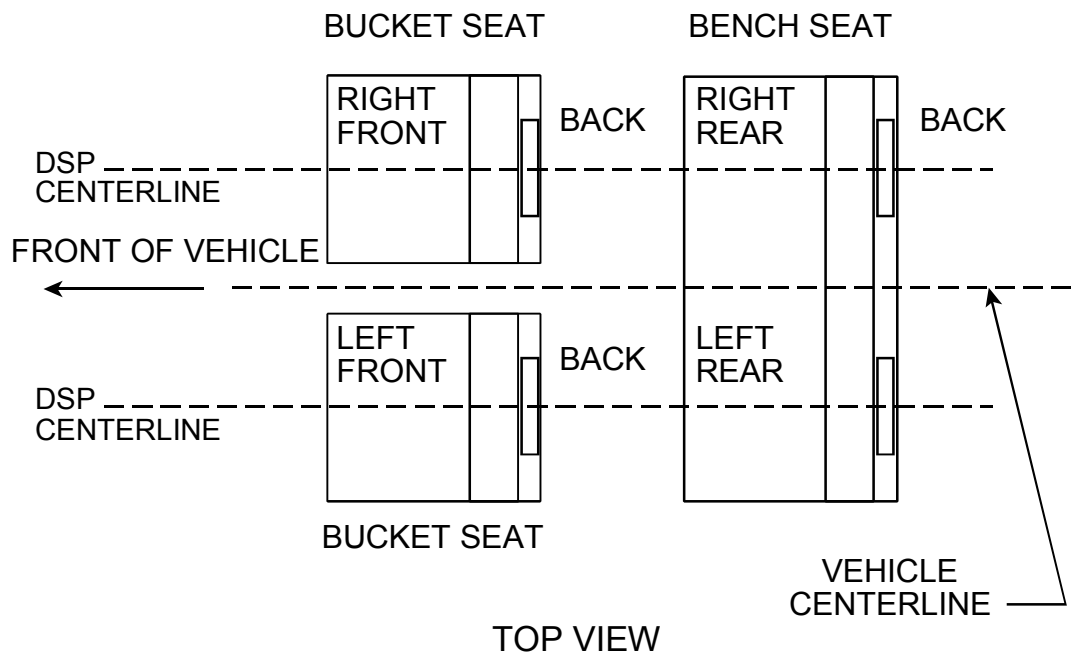


FIGURE 2A

12.3 DETERMINATION OF THE AREA OF POSSIBLE HEAD IMPACT

12.3.1 INSTRUMENT PANEL AND SUN VISORS

- A. Using information provided by the COTR, locate the SRP for the right front seating position.
- B. Place the base of the Head Impact Location Fixture in the right front seating position as described in Sec. 12.10.1. A representative head impact location fixture is shown in Figure 3.
- C. Adjust the base and the pivot until the pivot is located at the SRP.
- D. Assemble the arm to the base of the fixture.
- E. Adjust the head form to the 33 inch radius position.
- F. Adjust the arm to a position where it will swing in a plane parallel to the vehicle centerline.
- G. Swing the arm forward until it contacts the instrument panel.

12. COMPLIANCE TEST EXECUTION....Continued

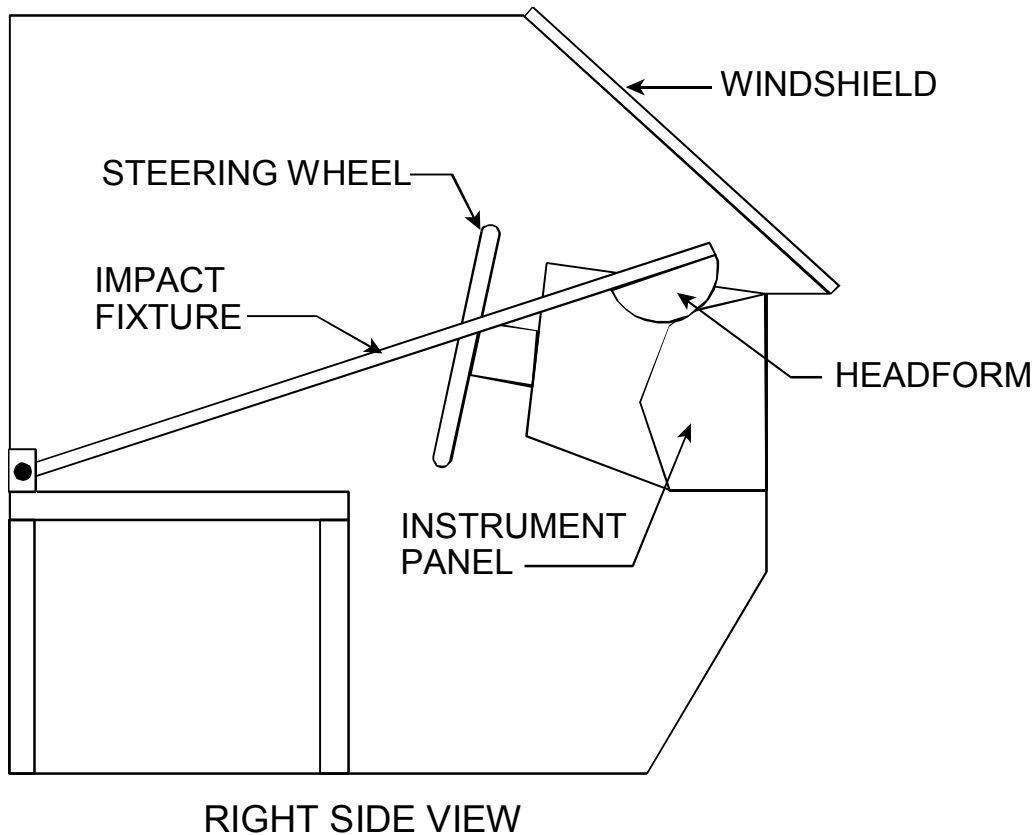


FIGURE 3

- H. Keeping the head form in contact with the instrument panel, rotate the arm about the vertical axis through the pivot. Rotating to the left and right, find the locus of points for head impacts. Only the points that fall within the "Area to investigated" are permissible, as shown in Figure 1.
- I. With the fixture arm again in the plane parallel to the vehicle centerline, swing the arm forward and the sun visor down to find a contact with the edge of the visor.
- J. Move the arm forward to left and right to find all possible contacts along the edge of the visor.

Adjust head form to each value allowed by the device including the 29 inch radius position and repeat steps F to J.

For seats that are ADJUSTABLE FORE AND AFT, move the pivot of the measuring device to a point 5 inches horizontally forward and 0.75 inches vertically above the SRP.

Repeat all above steps for the center and/or driver's DSP. Outline the extremities of the loci found above on the instrument panel and sunvisor.

Photograph these areas of possible impact.

12. COMPLIANCE TEST EXECUTION....Continued

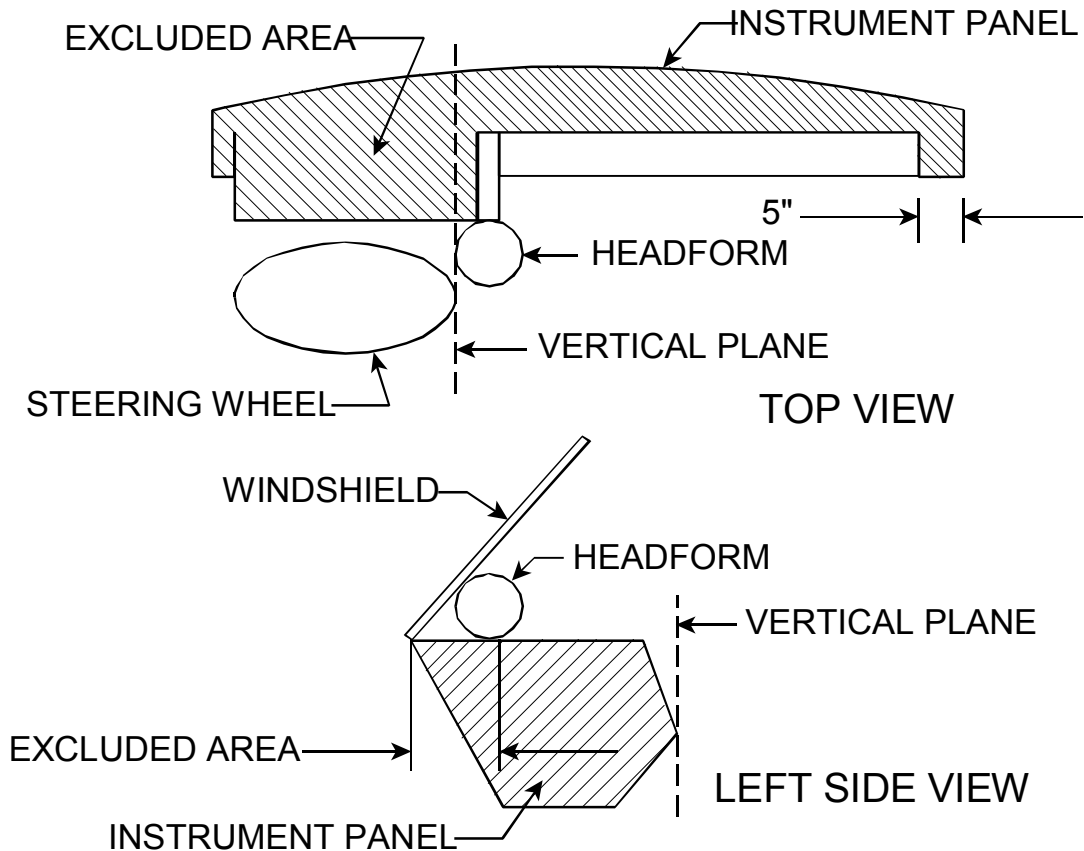


FIGURE 1

12.3.2 SEAT BACKS

12.3.2.1 SEATS WITHOUT HEAD RESTRAINTS

Repeat the above procedure by placing the head impact location fixture in the rear DSPs and locating the areas of possible impact on the seat backs.

12.3.2.2 SEATS WITH HEAD RESTRAINTS

Place head restraint in its lowest adjustable position. Only points along the centerline of the head restraint that are parallel to the vehicle longitudinal centerline, may be considered.

In an instance where the impact on the seat back is not possible within the vehicle interior because of space constraints, or otherwise, the COTR shall be notified. A decision can be made in using a suitable laboratory fixture or the COTR may authorize cutting up of the intruding vehicle structure or removal of vehicle parts to permit impact test sequence.

12. COMPLIANCE TEST EXECUTION....Continued

12.4 SELECTION OF THE POINTS OF IMPACT

12.4.1 INSTRUMENT PANEL

The points of impact shall be located on a line (maximum length of 33 inches) tangent to the instrument panel surface. The origin of the line tangent to the instrument panel surface shall be a point on a transverse horizontal line through the FORWARD SRP.

Construct a perpendicular at the point of tangency. The intersection is the location of the point of impact.

NOTE: POINTS OF IMPACT MUST BE WITHIN THE IMPACT AREA.

12.4.2 SEAT BACKS

The points of impact shall be located on a line (maximum length of 33 inches) tangent to the seat back frame. The origin of the line tangent to the seat back frame shall be on a point on a transverse horizontal line through the SRP of the right rear DSP.

Construct a perpendicular at the point of tangency. The intersection is the location of the point of impact.

Adjustable front seats shall be in their rearmost Design Driving Position.

Adjustable front seat backs shall be in their Nominal Design Driving Position (information will be obtained from vehicle manufacturer and supplied by the COTR).

NOTE: POINTS OF IMPACT MUST BE WITHIN THE IMPACT AREA

12.5 DIRECTION OF IMPACT

Direction of impact shall be one of the following:

- A. In a vertical plane parallel to the vehicle longitudinal axis
- B. In a plane normal to the surface at the point of contact

Mark selected points for impact and number each point.

Photograph the impact points.

12. COMPLIANCE TEST EXECUTION....Continued

12.6 IMPACT TEST FOR SEAT BACKS AND INSTRUMENT PANELS

12.6.1 GENERAL REQUIREMENTS

Maintain test samples and the head form at 72°F ± 5°F for 12 hours prior to test. Statement of measurement requirements is in Section 12.10.3 and representative components are shown below.

ITEM	MANUFACTURE R/ MODEL	SERIAL NUMBER	CALIBRATI ON DATE	CALIBRATIO N DUE
Computer	486DX2/66Mz	486DX2-2203		
Charge Amplifier	Endevco 2735PQ	GP14		
Accelerometer	Endevco 2272	PA49		
Time Interval Meter	CMC915	09150116		
Time Trap No. 1	MS 1"/01	1		
Time Trap No. 2	MS 1"/02	2		
Integrator Processor	Fine Engineering	BOOKD		
Temperature	Weather Instrument			

FIGURE 4

Use a 6.5 inch diameter head form (cross-section shown in Figure 5) which weighs 14.7 pounds ± 0.2 pounds.

Impact velocity shall be 14.7 mph ± 0.2 mph. Deceleration shall not exceed 80g continuously for more than 3 milliseconds (ms) to pass the test.

12.6.2 IMPACT TEST STEPS

The following steps will be followed in accomplishing the impact tests on seat backs and the instrument panel:

- A. Install the head form actuator mount in the area of the test vehicle aft of the impact area selected for the test.

12. COMPLIANCE TEST EXECUTION....Continued

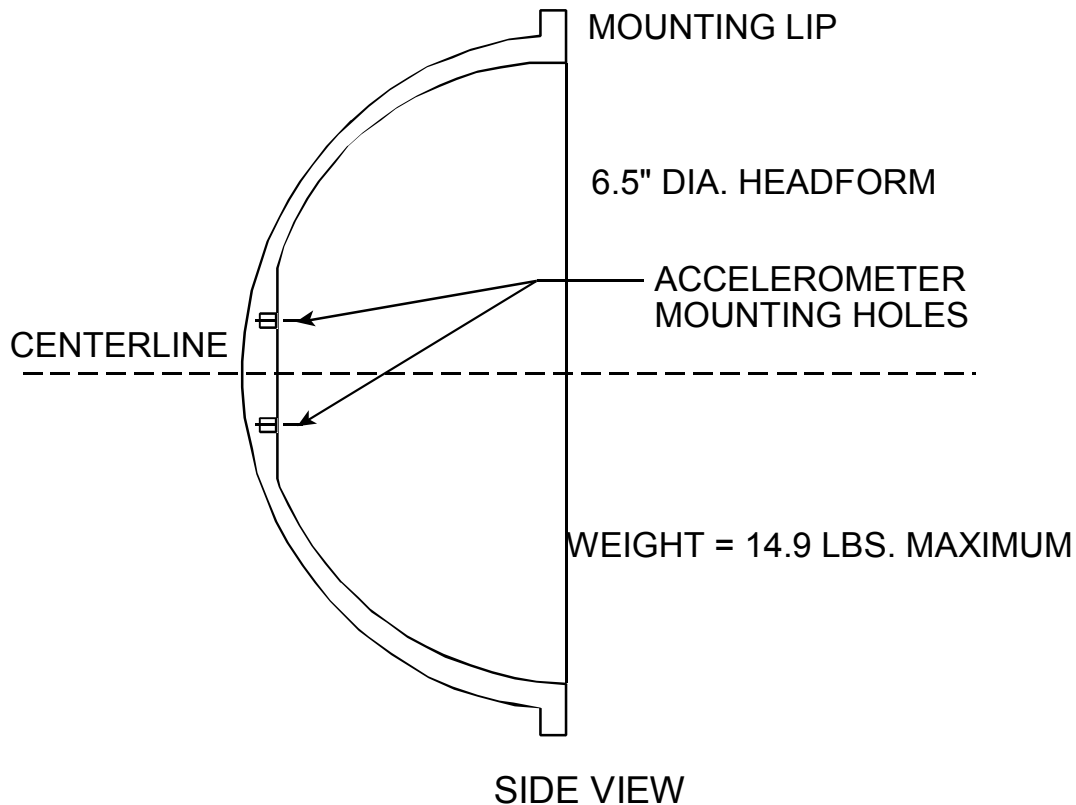


FIGURE 5

- B. The test engineer will select approximately five "worse case" impact locations within the head impact zone where the local area is hard or stiff. The COTR will be consulted before finalizing the selection.
- C. Record X and Y coordinates of each impact location and angle of impact with reference to a common reference axis system that will be selected by the test engineer.
- D. Ensure that the accelerometer is properly mounted at the designated location on the head form (SAE J984 Jun80) and that the accelerometer output is properly connected to the recorder.
- E. Set the actuator pressure to previously calibrated level to achieve $14.7 \text{ mph} \pm 0.2 \text{ mph}$ impact velocity. Activate the velocity timing trap. Fire the actuator and verify that the specified velocity is achieved.
- F. Position the head form actuator as required and impact the selected impact point at the locations/angles selected in step B and C, with the head form traveling at $14.7 \text{ mph} \pm 0.2 \text{ mph}$. Record the actual velocity from the speed trap.
- G. The same procedure will be repeated at each selected impact zone.

12. COMPLIANCE TEST EXECUTION....Continued

- H. The test engineer will process the acceleration versus time data recorded from the head form accelerometer by using "3 ms clip" computer routine to establish the maximum (3 ms clip) value of head form acceleration data using SAE J211 recommended filter class 1000.
- I. The test engineer will process the accelerometer versus time head form acceleration data to obtain the dynamic head form displacement. This will be accomplished by double integrating the head form accelerometer data from time zero to find the maximum value.
- J. Document each impact location photographically with pretest and post test still black and white photographs.
- K. Note any unusual events, occurrence or anomalies in test log and the data sheet.
- L. Record all parameters and the results.

The details of the instrumentation required are provided in Section 11.10, Test Equipment. A representative list of measurement system components is shown in Figure 4.

ITEM	MANUFACTURE R/ MODEL	SERIAL NUMBER	CALIBRATI ON DATE	CALIBRATIO N DUE
Computer	486DX2/66Mz	486DX2-2203		
Charge Amplifier	Endevco 2735PQ	GP14		
Accelerometer	Endevco 2272	PA49		
Time Interval Meter	CMC915	09150116		
Time Trap No. 1	MS 1"/01	1		
Time Trap No. 2	MS 1"/02	2		
Integrator Processor	Fine Engineering	BOOKD		
Temperature	Weather Instrument			

FIGURE 4

A representative recording setup is shown in Figure 6 on the next page.

12. COMPLIANCE TEST EXECUTION....Continued

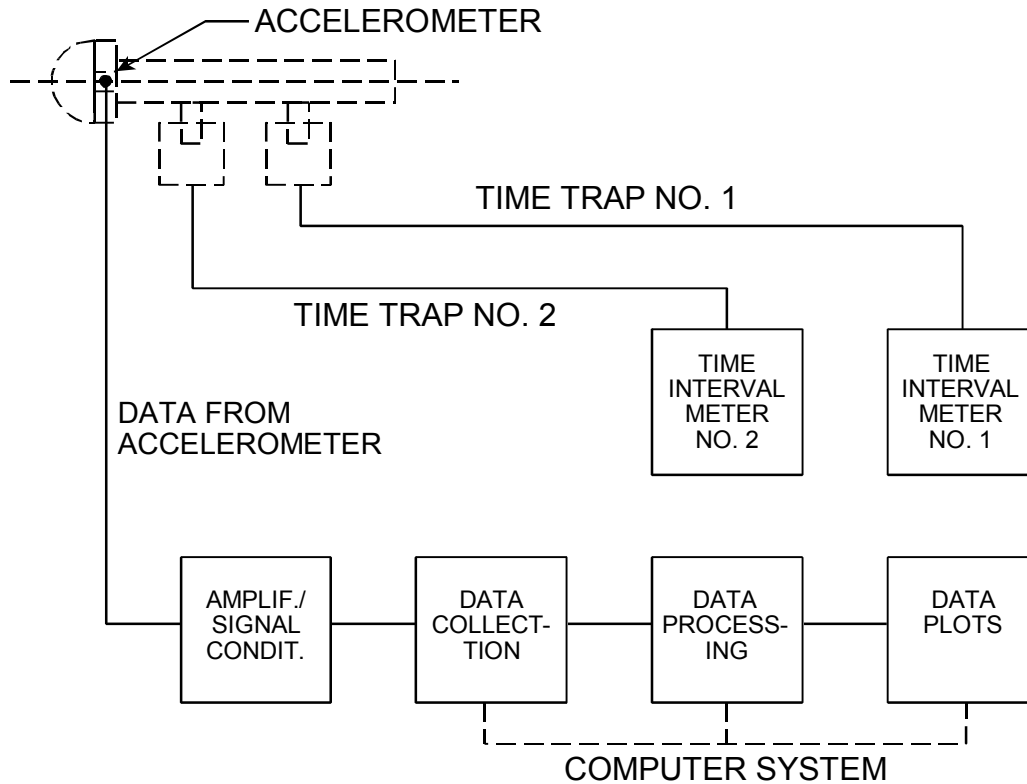


FIGURE 6

12.7 SUN VISOR EVALUATION

- A. Check that the sun visor is covered with energy absorbing material.
- B. Determine areas of sun visor mounting that are contactable by a spherical 6.5 inch diameter head form.
- C. Measure the edge radii that were found to be contact areas with the head form. Radius must equal or exceed 0.125 inch to be acceptable. Mark edges that are not acceptable and photograph.
- D. Disassemble the sun visor and identify the construction material.

12.8 ARMREST EVALUATION

This evaluation includes attached armrests, such as on door panels, and folding armrests that fold into the seat back.

12.8.1 REQUIREMENTS

The armrest shall conform to at least one of the following:

12. COMPLIANCE TEST EXECUTION....Continued

- A. It shall be constructed with energy absorbing material and shall deflect or collapse laterally at least 2 inches without permitting contact with any underlying rigid material.
- B. It shall be constructed with energy absorbing material that deflects or collapses to within 1.25 inches of a rigid test panel surface without permitting contact with any rigid material. Any rigid material between 0.5 and 1.25 inches from the panel surface shall have a minimum vertical height of not less than 1 inch.
- C. Along not less than 2 continuous inches of its length, the armrest shall, when measured vertically in side elevation, provide at least 2 inches of coverage within the pelvic impact area.

If the armrest folds into the seat back or in between the two seat backs it shall conform to at least one of the following requirements:

- A. One of the three requirements identified in items A, B, C as they apply to fixed armrests
- B. Be constructed of or covered with energy absorbing material

12.8.2 ARMREST EVALUATION PROCEDURE

- A. Test engineer will inspect each armrest to establish if its of a fixed configuration or a folding configuration.
- B. Each armrest will be further evaluated to record if it is constructed or covered with energy absorbing material, such as foam, padding, soft fabric or other material designed to absorb impact energy.
- C. Mark the pelvic impact area as defined in Section 10. A cardboard or sheet metal cutout may be required to identify the pelvic impact area. A representative cutout is shown in Figure 7.
- D. Place the pelvic area cutout in proper orientation in a vertical plane next to the armrest under evaluation.
- E. Mark the outline of the armrest on the cutout (representative sample shown on previous page).
- F. Examine the armrest outline on the cutout to record if at least 2 inches of vertical coverage has been provided by the armrest along at least 2 inches of its continuous length.
- G. Use a scale graduated in 1/32 inch to make the measurements.

12. COMPLIANCE TEST EXECUTION....Continued

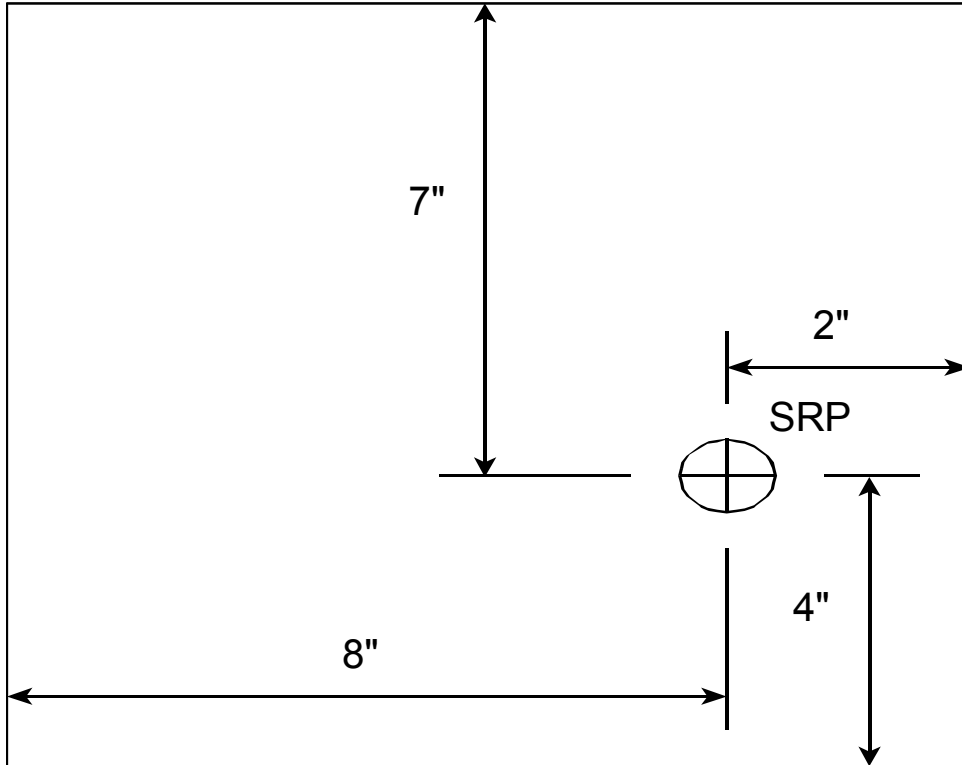


FIGURE 7

- H. Record the results.
- I. Document the measurement using black and white photographs.
- J. Position a portapower or equivalent device with which to load the armrest along a lateral axis at the center point of the armrest. A representative device is shown in Figure 8.
- K. Load the armrest laterally until a deflection of the 1-1/4 inches is observed.
- L. Examine if any underlying rigid material has been contacted. If the answer is no go to step M. If the answer is yes go to step N.
- M. Continue loading until a deflection of 2 inches is reached. At each 1/4 inch deflection repeat step L.
- N. At any stage, in step L or M, if underlying rigid material is contacted, stop the loading test, examine the armrest construction to establish if the underlying rigid material between 0.5 inches to 1.25 inches from the end has a minimum height of 1 inch. Record the actual height. The examination may require tearing down of the armrest.

12. COMPLIANCE TEST EXECUTION....Continued

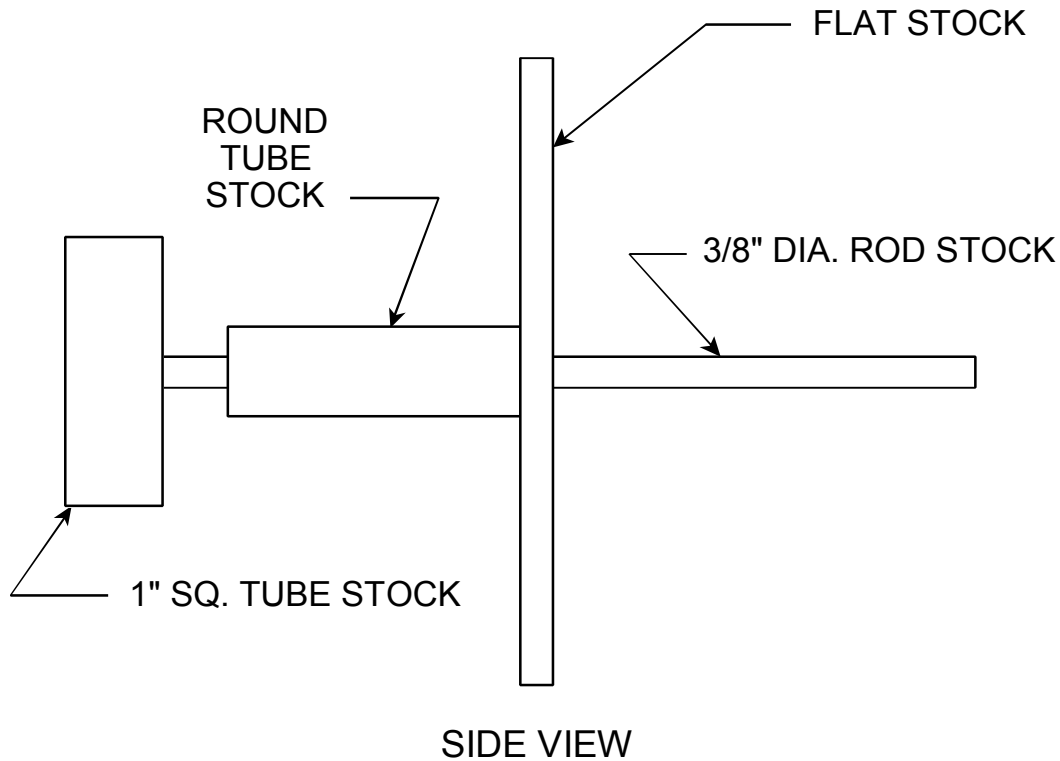


FIGURE 8

- O. Use collected data in steps A to N to evaluate PASS/FAIL performance of the tested armrest.

12.9 INTERIOR COMPARTMENT DOORS

Doors located in the instrument panel, console assembly, seat back or side panel area adjacent to a designated seating position shall be evaluated for unlatching due to inertial loads developed during an accident

12.9.1 LOADING CONDITIONS

- A. Inertial load of 10 g in a horizontal transverse direction.
- B. Inertial load of 10 g in a vertical direction.
- C. Inertial load of 30 g in a horizontal longitudinal direction.

12.9.2 EVALUATION

Each latch assembly evaluation shall be conducted mathematically by using the algebraic method described in SAE Recommended Practice J839b Section 5 and shown in the Appendix C or equivalent. The latch assembly evaluation method must be approved by the COTR.

12. COMPLIANCE TEST EXECUTION....Continued

INTERIOR COMPARTMENT DOOR LATCH DATA:

COTR will provide manufacturer's data that will be used as input to the analysis. Such data will include:

- A. Geometric details of the latch/lock configuration.
- B. Mass data for each element in the linkage.
- C. Spring rates for each spring element in the configuration.
- D. Any additional details unique to the design yet necessary for the calculations.

12.10 TEST EQUIPMENT REQUIREMENTS

The test equipment requirements for S201 testing in terms of overall performance guidelines are outlined in this section. Two designs are described: one for the Head Impact Location Fixture and the other for the impact fixture. Measurement equipment is also identified.

12.10.1 HEAD IMPACT LOCATION FIXTURE

The fixture consists of a head form rigidly attached to an arm that pivots about the SRP with both horizontal and vertical axes of rotation.

The length of the arm must be infinitely adjustable between 29 and 33 inches, measured from the pivot to the top of the head.

Provision must be made for placing the pivot at the SRP and also at a position five inches in front of and 0.75 inch above the SRP.

The lower end of the pivot has a threaded shaft that serves two purposes. It permits height adjustment of the pivot to align it with the SRP. Rotation of the shaft also provides the vertical axis of rotation.

12.10.2 IMPACTOR FIXTURE

The impactor fixture can be installed by removing the side doors of the vehicle and by setting up the base of the impactor test setup frame going across the test vehicle at right angles to vehicle longitudinal centerline. The fully adjustable impactor setup then can be mounted and operated from this base. The type of impact fixture shown in Figure 11 on the next page can be utilized. The head form, rod and actuator would be mounted on a ball-joint attached to a frame member extending through the vehicle. The accumulator and controls would be mounted outside the vehicle.

12. COMPLIANCE TEST EXECUTION....Continued

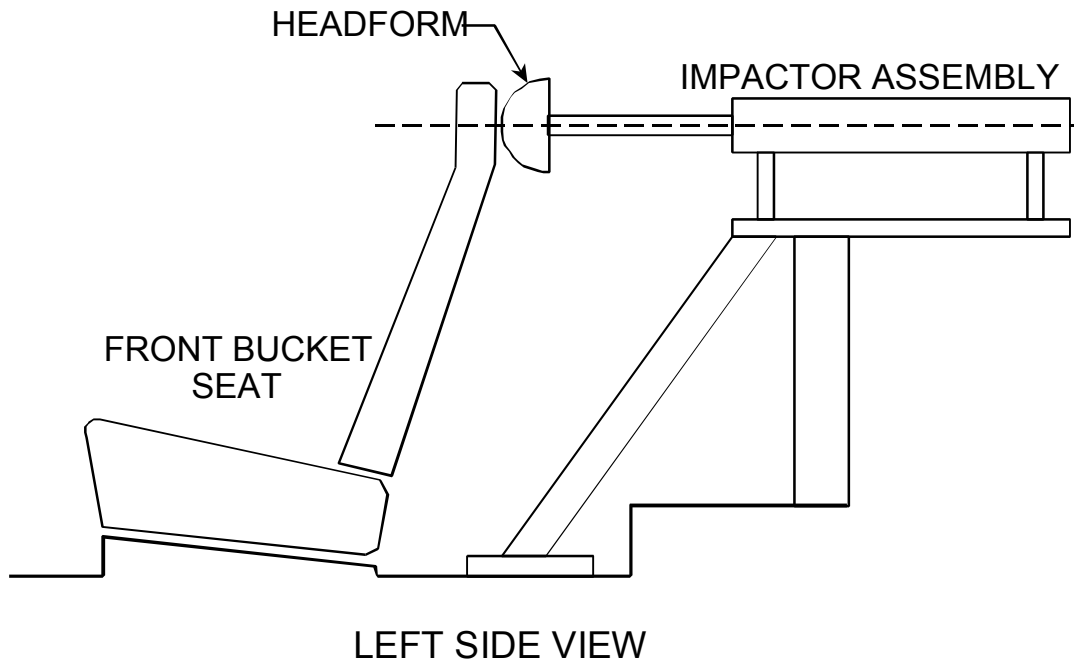


FIGURE 11

The impactor shown above is not suitable for an impact on almost horizontal surfaces of the instrument panel. A swinging type impactor end as shown in Figure 10 on the next page or equivalent could be used to accomplish the impact sequence.

12.10.3 MEASUREMENT SENSORS

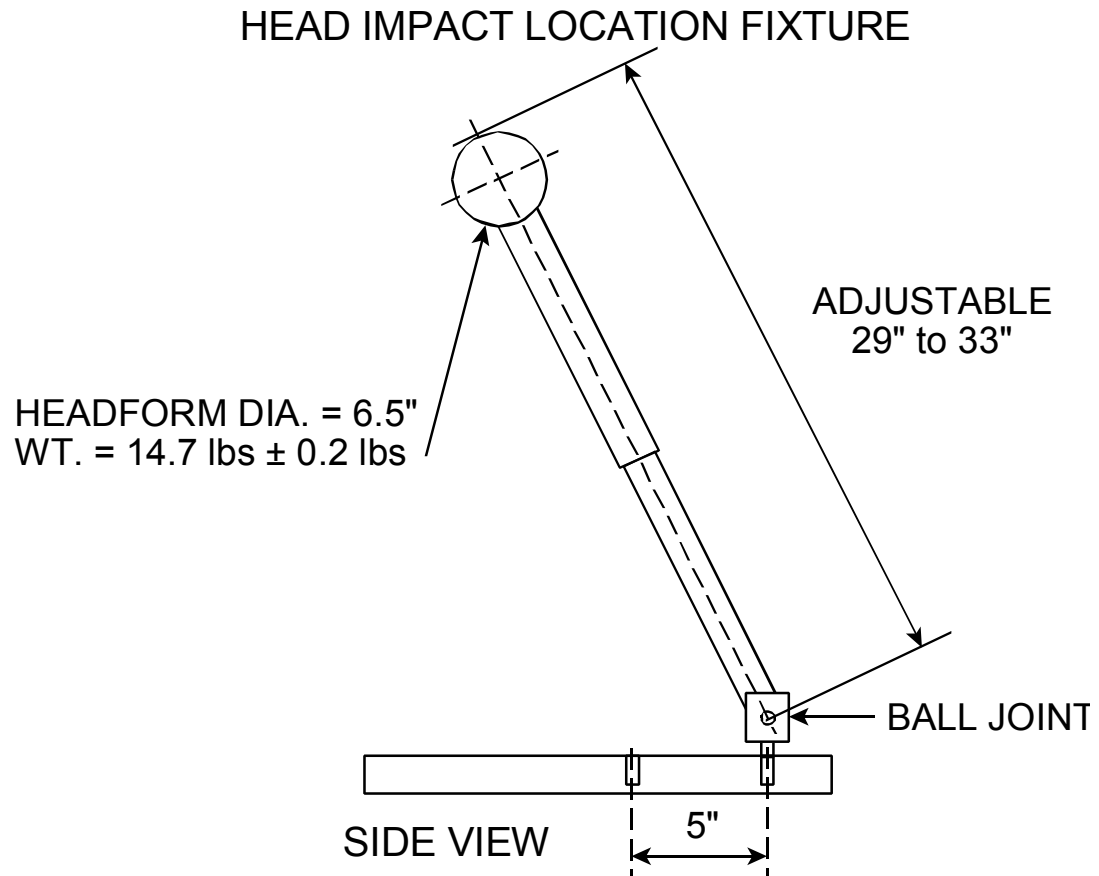
VELOCITY SENSORS

Two noncontacting optical velocity sensors are required to obtain a redundant measurement of the impact speed. The sensors should be capable of measuring velocity of 14.70 mph to an accuracy of plus or minus 0.05 mph. The sensors should be operated from independent power supplies such that no single failure results in a loss of both speed measurements.

ACCELEROMETER

An accelerometer suitable for impact testing with full scale range of at least 200g's will be required. The frequency response of the accelerometer shall be consistent with the requirements of SAE J211.

12. COMPLIANCE TEST EXECUTION....Continued

**FIGURE 10****ZERO TIME MARKER**

A trigger switch capable of accurately signaling the first contact of the impactor with the impacted part will be used.

TEMPERATURE

The temperature will be continuously recorded on a "Hyrothermograph" by Weather Measurement Corp. or a similar device.