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August 2007

U.S. DEPARTMENT OF TRANSPORTATION

NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION

LABORATORY TEST PROCEDURE

FOR

FMVSS 214

RIGID POLE SIDE IMPACT TEST

U.S. Department of Transportation
National Highway Traffic Safety Administration
Office of Vehicle Safety Compliance (NVS-220)
1200 New Jersey Ave., S.E.
Washington, DC 20590

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REVISION CONTROL LOG
FOR OVSC LABORATORY
TEST PROCEDURES

TP-214P
RIGID POLE SIDE IMPACT TEST

TEST PROCEDURE		FMVSS 214		DESCRIPTION
REV. No.	DATE	AMENDMENT	EFFECTIVE DATE	
00	5/18/04			Draft release signed by O.D.
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1. PURPOSE AND APPLICATION

The Office of Vehicle Safety Compliance (OVSC) provides contractor laboratories with Laboratory Test Procedures as guidelines for obtaining compliance test data. The data are used to determine if a specific vehicle or item of motor vehicle equipment 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. If any contractor views any part of an OVSC Laboratory Test Procedure to be in conflict with a Federal Motor Vehicle Safety Standard (FMVSS) or observes deficiencies in a Laboratory Test Procedure, the contractor is required to advise the Contracting Officer's Technical Representative (COTR) and resolve the discrepancy prior to the start of compliance testing.

Every contractor is 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 contractor's test procedure shall contain a complete listing of test equipment with make and model number and a detailed check-off sheet. The list of test equipment shall include instrument accuracy and calibration dates. All equipment shall be calibrated in accordance with the manufacturer's instructions. There shall be no contradictions between the Laboratory Test Procedure and the contractor's in-house test procedure. Written approval of the in-house test procedures shall be obtained from the COTR before initiating the compliance test program. 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. These Laboratory Test Procedures do not constitute an endorsement or recommendation for use of any product or method. However, the application of any such testing technique or equipment is subject to prior approval of the COTR.

NOTE: The OVSC Laboratory Test Procedures, prepared for the limited purpose of use by independent laboratories under contract to conduct compliance tests for the OVSC, are not rules, regulations or NHTSA interpretations regarding the meaning of a FMVSS. The Laboratory Test Procedures 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. Recognizing applicable test tolerances, the Laboratory Test Procedures may specify test conditions that are less severe than the minimum requirements of the standard.

1. PURPOSE AND APPLICATION....Continued

In addition, the Laboratory Test Procedures may be modified by the OVSC at any time without notice, and the COTR may direct or authorize contractors to deviate from these procedures, as long as the tests are performed in a manner consistent with the standard itself and within the scope of the contract. Laboratory Test Procedures may not be relied upon to create any right or benefit in any person. Therefore, compliance of a vehicle or item of motor vehicle equipment is not necessarily guaranteed if the manufacturer limits its certification tests to those described in the OVSC Laboratory Test Procedures.

2. GENERAL REQUIREMENTS

This laboratory test procedure is specific to the requirements of S9 of FMVSS No. 214, "Vehicle to pole requirements." Each vehicle shall be tested by impacting it into a fixed, rigid pole 254 mm (10 inches) in diameter, at any speed up to and including 32 km/h (20 mph). These requirements apply to passenger cars, multipurpose passenger vehicles, trucks and buses with a gross vehicle weight rating (GVWR) of 4,536 kilograms (10,000 lb) or less, except for walk-in vans, motor homes, tow trucks, dump trucks, ambulances and other emergency rescue/medical vehicles (including vehicles withy fire-fighting equipment), vehicles equipped with wheelchair lifts, vehicles with a raised roof or altered roof and vehicles which have no doors, or exclusively have doors that are designed to be easily attached or removed so that the vehicle can be operated without doors.

When tested according to the test conditions outlined in this test procedure, each vehicle shall comply with the following criteria;

NOTE: *The vehicle may be tested on either the left side (driver's side) or right side (passenger's side) with a 50th percentile male ES-2re or 5th percentile female SID-IIs dummy placed in the front outboard seating position. The selection of the test dummy and impact speed will be made by the COTR.*

A. Injury Criteria - ES-2re Male Dummy

(1) **HEAD** - The HIC(d) shall not exceed **1000**. HIC(d) is the maximum HIC value when calculated in accordance with the following formula:

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

where $A_R = [A_x^2 + A_y^2 + A_z^2]^{½}$ is the resultant acceleration magnitude in g units at the dummy head CG, and t_1 and t_2 are any two points in time during the impact event which are separated by not more than a 36 millisecond time.

2. GENERAL REQUIREMENTS……Continued

(2) **THORAX** -The deflection of any of the upper, middle and lower ribs shall not exceed **44 mm (1.65 in).**
(3) **ABDOMEN** - The sum of the front, middle and rear abdominal forces shall not exceed **2.5kN (562 lb).**
(4) **PUBIC SYMPHYSIS** - The pubic symphysis force shall not exceed **6.0kN (1,350 lb).**

B. Dummy Injury Criteria - SID-IIs Female Dummy

(1) **HEAD** - The HIC(d) shall not exceed **1000**. HIC(d) is the maximum HIC value when calculated in accordance with the following formula:

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

where $A_R = [A_x^2 + A_y^2 + A_z^2]^{½}$ is the resultant acceleration magnitude in g units at the dummy head CG, and t_1 and t_2 are any two points in time during the impact event which are separated by not more than a 36 millisecond time interval.

(2) **SPINE** - The resultant lower spine acceleration shall not exceed **82 g**.
(3) **PELVIS** - The sum of the acetabular and iliac pelvic forces shall not exceed **5,525 N (1,242 lb)**.

C. Door Opening Requirements

(1) Any side door that is struck by the pole shall not separate totally from the vehicle
(2) Any door (including a rear hatchback or tailgate) that is not struck by the pole shall meet the following requirements;
    i. The door shall not disengage from the latched position
    ii. The latch shall not separate from the striker, and the hinge components shall not separate from each other or from their attachment to the vehicle.
    iii. Neither the latch nor the hinge systems of the door shall pull out of their anchorages.

3. SECURITY

The Contractor shall provide appropriate security measures to protect the OVSC test vehicles and other 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 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 Branch or Division Chief.

> **NOTE:** NO INDIVIDUALS, OTHER THAN CONTRACTOR PERSONNEL DIRECTLY INVOLVED IN THE COMPLIANCE TESTING PROGRAM, SHALL BE ALLOWED TO WITNESS ANY VEHICLE COMPLIANCE TEST UNLESS SPECIFICALLY AUTHORIZED BY THE COTR.

4. GOOD HOUSEKEEPING

Contractors shall maintain the entire vehicle testing area, dummy calibration 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 test schedule to the COTR prior to testing. Tests shall be completed as required in the contract. The COTR will make adjustments to the crash test schedule in cases of unusual circumstances such as inclement weather or difficulty experienced by the Agency in the procurement of a particular vehicle make and model.

Scheduling shall be adjusted to permit sample motor vehicles to be tested to other FMVSS as may be required by the NHTSA. All testing shall be coordinated to allow monitoring by the COTR.

6. FACILITY AND EQUIPMENT – PRETEST REQUIREMENTS

6.1 TEST PAD AREA

The test pad area shall be a level, smooth and uniformly constructed surface that is large enough such that all four wheels of the test vehicle remain in the same plane throughout the impact event.

6.2 TOW ROAD

The tow road surface shall be a straight, level, smooth and uniformly constructed surface that is long enough to allow the vehicle velocity to stabilize prior to impacting the pole.

6.3 TEST VEHICLE PREPARATION BUILDING/STRUCTURE

The test vehicle preparation building/structure encloses the area where the test vehicle is prepared during pre-test set-up that occurs just prior to the impact test. This building or structure shall be temperature-controlled and large enough to house the test vehicle, test equipment and instrumentation while allowing room for personnel to move freely about the test vehicle. The temperature inside the test vehicle must be maintained between 20.6ºC and 22.2ºC (69ºF and 72ºF) for a minimum of four (4) hours prior to the side impact event.

6.4 TOW AND GUIDANCE SYSTEMS

The tow system must be capable of ensuring that the test vehicle impacts the rigid pole laterally at a speed of 31 km/h ± 0.9 km/h. The test vehicle conveyance is continuously towed up until 600 mm (± 60 mm) from impact. The tow cable attachment device must release from the tow cable before impact. The test vehicle impact velocity measurement is taken after cable release.

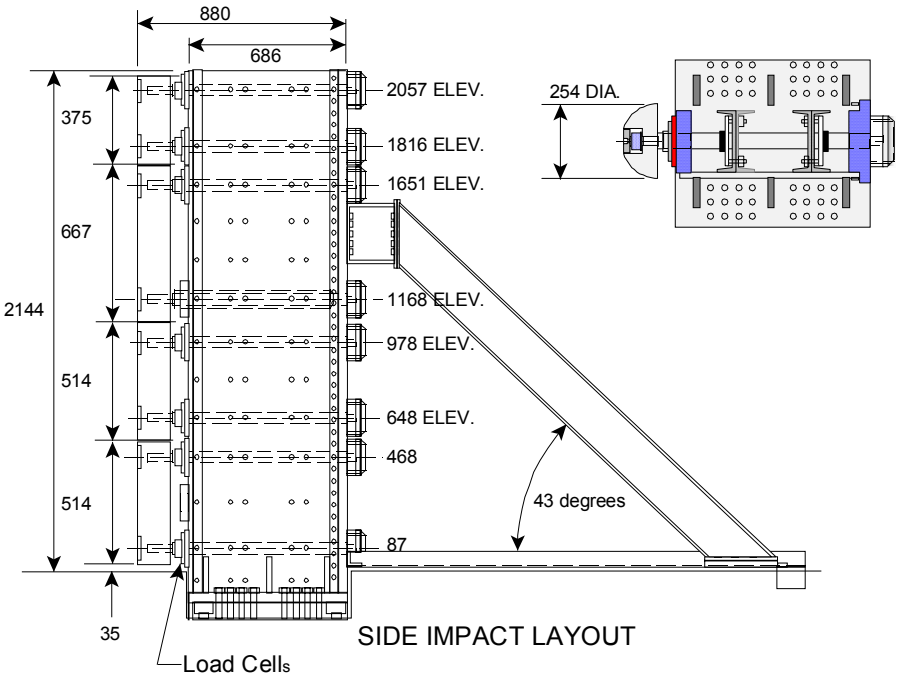
A guidance system is required to assure that the test vehicle is propelled sideways so that its line of forward motion forms an angle of 75 degrees (± 3 degrees) with the vehicle's longitudinal center line and within ± 38 mm (± 1.5 in) horizontally of the vehicle's impact reference line.

6.5 RIGID POLE

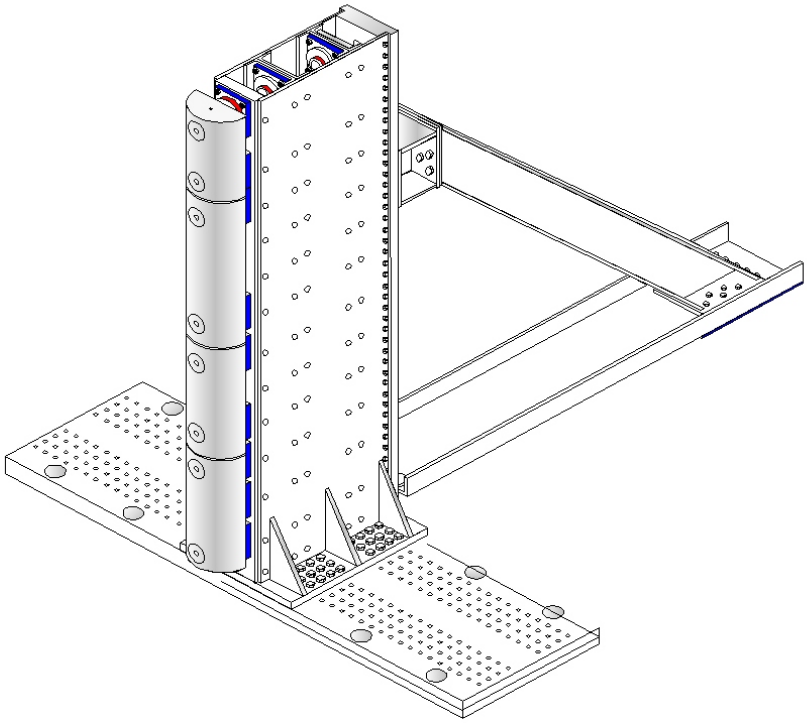
The impact face of the rigid pole shall be a vertically oriented metal structure with a diameter of 254 mm ± 3 mm and beginning no more than 102 mm above the lowest point of the tires on the struck side of the fully loaded test vehicle and extending at least 150 mm above the highest point of the roof of the test vehicle. The pole face shall be offset from its mounting and support such that the vehicle will not contact the mounting and support structures within 100 ms from the initial vehicle-to-pole contact. The pole illustrated in the following figures is from the Federal Highway Administration's Turner-Fairbank Highway Research Center and is provided for illustrative purposes only.

6. FACILITY AND EQUIPMENT – PRETEST REQUIREMENTS

FOIL 300K RIGID POLE - All Measurements in mm



FOIL 300K RIGID POLE



6. FACILITY AND EQUIPMENT – PRETEST REQUIREMENTS

6.6 TEST VEHICLE VELOCITY MEASUREMENT

The final impact velocity is measured after the tow system releases. Final impact velocity is measured by no less than two sets of timing devices accurate to within ±0.08 km/h and calibrated by an instrument traceable to the National Institute of Standards and Technology (NIST). The reported final impact velocity shall take into consideration all of the response characteristics of the entire velocity measurement system utilized in its determination.

6.7 TEST BRAKE ABORT SYSTEM

The vehicle conveyance system shall be equipped with a brake abort system that when triggered is capable of preventing the vehicle from impacting the pole. Abort criteria consists of vehicle velocity, data acquisition and instrumentation system readiness, and stability of the vehicle conveyance system on the tow road. The first two criteria are to be automatically monitored by the test brake abort system. The third criteria shall be monitored manually by test personnel.

7. GOVERNMENT FURNISHED PROPERTY (GFP)

7.1 TEST VEHICLES

The Contractor has the responsibility of accepting test vehicles. The Contractor acts in the NHTSA's behalf when signing an acceptance of test vehicles. If a 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 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.
G. Spare tire, jack, lug wrench and tool kit (if applicable) is located in the vehicle cargo area.

7. GOVERNMENT FURNISHED PROPERTY (GFP)…….Continued

The Contractor shall check for damage that may have occurred during transit. The COTR is to be notified of any damage prior to preparation of the vehicle for testing.

A "Report of Vehicle Condition" form shall be completed by the Contractor and submitted to the COTR when the test vehicle is transferred from the new car dealer to the test lab or between test contracts. Vehicle Condition forms must be returned to the COTR with the copies of the Final Test Report.

7.2 ANTHROPOMORPHIC TESTING DEVICES

An adequate number of **non-instrumented** anthropomorphic testing devices (e.g., 50^{th} male and 5^{th} female dummies) will be furnished to the contract laboratory by NHTSA. The dummies shall be stored in an upright-seated position with the weight supported by the internal structure of the pelvis. The eye-bolt in the top of the dummy's head shall not be used to support the dummy during storage between tests. These dummies shall be stored in a secured room kept between 12.8^{o} C and 29.4^{o} C. The Contractor will check the dummy components for damage when performing the calibrations and complete a dummy damage checklist.

The Contractor shall report to the COTR the condition of the dummies in order that replacement parts can be provided.

The Contractor shall keep a detailed record for each dummy, describing parts replaced and the results of calibration tests.

8. CALIBRATION AND TEST INSTRUMENTATION

Before the Contractor initiates the vehicle safety compliance test program, a test instrumentation calibration system must be implemented and maintained in accordance with established calibration practices. The calibration system shall include the following as a minimum:

A. Standards for calibrating the measuring and test equipment will be stored and used under appropriate environmental conditions to assure their accuracy and stability.

8. CALIBRATION AND TEST INSTRUMENTATION….Continued

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 exceeding **12 months for instruments and 12 months for the calibration standards**. Records, showing the calibration traceability to the National Institute of Standards and Technology (NIST), shall be maintained for all measuring and test equipment.

Accelerometers shall be calibrated every twelve months or after a vehicle fails to meet the FMVSS 208 performance requirements or after any indication from calibration checks that there may be a problem with the accelerometer whichever occurs sooner.

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)

(6) The actual procedures and forms used to perform the calibrations.

8. CALIBRATION AND TEST INSTRUMENTATION….Continued

D. Records of calibration for all test instrumentation shall be kept by the Contractor in a manner that assures the maintenance of established calibration schedules.

F. All such records shall be readily available for inspection when requested by the COTR. The calibration system will need the acceptance of the COTR before vehicle safety compliance testing commences.

G. Test equipment shall receive a system functional check out using a known test input immediately before and after the test. This check shall be recorded by the test technician(s) and submitted with the final report.

H. Anthropomorphic test devices shall be calibrated before and after each crash test. The calibration data shall be submitted with the final report.

Further guidance is provided in the International Standard ISO 10012-1, “Quality Assurance Requirements for Measuring Equipment” and American National Standard ANSI/NCSL Z540-1, “Calibration Laboratories and Measuring and Test Equipment General Requirements.”

NOTE: In the event of a failure to meet the standard's minimum performance requirements additional calibration checks of some critically sensitive test equipment and instrumentation may be required for verification of accuracy. The necessity for the calibration will be at the COTR's discretion and will be performed without additional cost.

9. PHOTOGRAPHIC DOCUMENTATION

9.1 CAMERAS

High-Speed Digital Cameras

The contractor shall document the crash event with high-speed digital cameras that operate at 1000 frames per second for at least 10 ms before the vehicle contacts the pole and for at least 300 ms after the vehicle contacts the pole.

The minimum resolution for these cameras shall be 1536 CMOS sensors per every two rows of pixels, with 80% of the horizontal distance of the two rows covered by effective light sensors. There shall be a minimum of 1024 rows of sensors.

A time zero impact mark must be registered in a frame to indicate when contact with the pole occurs. Each frame shall contain the camera speed and the frame number beginning with the time zero frame labeled as “Frame 0.” The frame numbers prior to time zero shall be negative numbers.

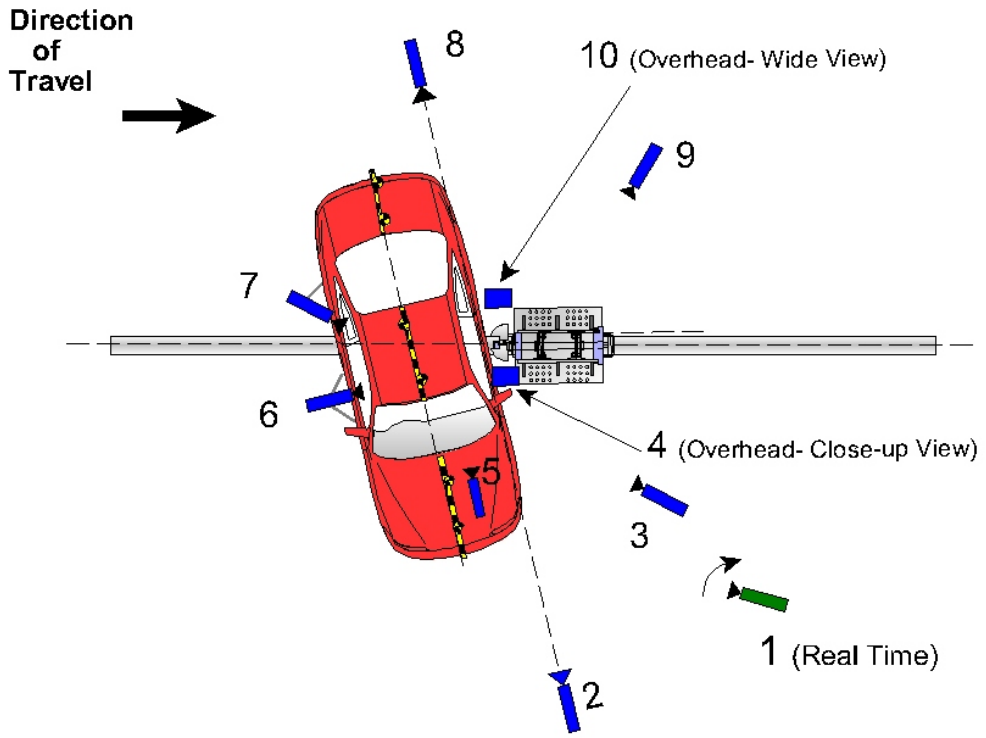
Digital files shall be transferred to a compact disc (CD) or DVD as AVI or MPEG format with standard or generally available “codec.” Other types of files can be used if approved by the COTR. The film shall be scanned in at a resolution of 1920 x 1035 pixels. Any other resolution level must be approved by the COTR.

Real Time Camera

The contractor shall use a “real time” color digital video camera that operates at 24 frames per second shall be used to document the views indicated below. The video footage shall be transferred to a compact disc (CD) or DVD as AVI or MPEG files with standard or generally available “codec.”

9. PHOTOGRAPHIC DOCUMENTATION….Continued

Camera Locations



Camera 1 A real-time (24 fps) camera shall be used to provide the following views;

a. lab technician securing the fuel filler gas cap
b. test vehicle's impact side, front, non-impact side and rear (including views of the dummy seated in the front outboard position with seat belts on) prior to the test
c. a pan view of the test vehicle traveling down the track and impacting the pole.
d. impact side, front, non-impact side and rear of the test vehicle after impact

Camera 2 A high-speed digital camera positioned at the front of the test vehicle, in-line with (or parallel to) the vertical plane of impact.

Camera 3 A high-speed digital camera positioned approximately 45º to the impacted side of the vehicle viewing the impact area forward of the pole.

9. PHOTOGRAPHIC DOCUMENTATION….Continued

Camera 4 A high-speed digital camera positioned directly overhead to provide a close-up view of impact.

Camera 5 A high-speed digital camera positioned on the hood structure and placed to the left side (for driver's side impacts) or right side (for front passenger side impacts) to provide a frontal view of dummy kinematics.

Camera 6 A high-speed digital camera mounted to the non-struck side front door structure to provide a side view of dummy kinematics through the vehicle's front side door window.

Camera 7 A high-speed digital camera mounted to the non-struck side rear door structure or rear window opening to provide a view of the dummy kinematics.

Camera 8 A high-speed digital camera positioned at the rear of the test vehicle, in-line with (or parallel to) the vertical plane of impact.

Camera 9 A high-speed digital camera positioned approximately 45º to the impacted side of the vehicle viewing the impact area forward of the pole.

Camera 10 A high-speed digital camera positioned directly overhead to provide a wide view of impact.

9.2 COLORING REQUIREMENTS FOR PHOTOGRAPHIC PURPOSES

A. Vehicle interior surfaces such as the A, B, C-pillars and trim panels, interior door trim panels, etc., on the impact side of the vehicle shall be painted with flat white paint. The area around surfaces where the air bag or dynamic system deploys shall **NOT** be painted. In addition, the air bag or dynamic system indicator light on the instrument panel shall **NOT** be painted so as to be visible prior to testing.

B. Parts of the anthropomorphic test device shall be coated with colored chalk/water solutions to show contact points with the vehicle's door and interior components. The chalk/water solution shall be applied after final dummy positioning.

9. PHOTOGRAPHIC DOCUMENTATION....Continued

CHALK COLORS TO BE USED ON TEST DUMMIES

DUMMY PART	COLOR
Face	**Blue**
Top of Head	**Yellow**
Left Side of Head	**Green**
Back of Head	**Red**
Left Hip	**Red**
Left Shoulder	**Orange**

9.3 VEHICLE AND DUMMY PHOTOGRAPHIC COVERAGE (REAL-TIME)

The real-time camera (24 fps) shall be used to document the pretest and post test condition of the test vehicle in addition to the pretest and post test positions of the test dummy including but not limited to the placement of the lap and shoulder belt on the dummy.

9.4 IMPACT EVENT MARKERS

It is strongly recommended that in-camera light emitting diodes (LEDS) be used to record the side impact event time zero point. If this is not possible, strobe lights or taped flash bulbs shall be placed in the field-of-view of all twelve high-speed cameras to mark the time zero point. The contractor shall use pressure switches attached to the test vehicle or pole impact face in order to trigger the time zero indicators.

9.5 PHOTOGRAPHIC TARGETS AND TAPE FOR TEST VEHICLE

A. VERTICAL IMPACT REFERENCE LINE

(1) Position the vehicle on the test pad area so that its longitudinal centerline is approximately at 75° (for a left-side impact) or 285°(for a right-side impact) relative to the forward motion of travel.

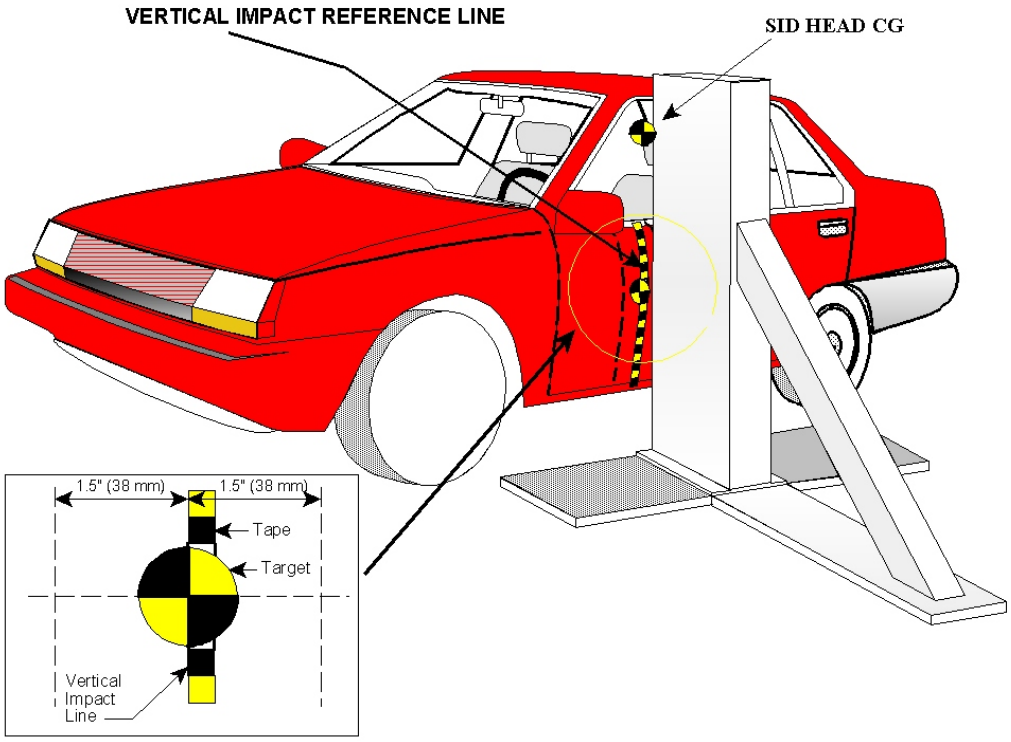
9. PHOTOGRAPHIC DOCUMENTATION....Continued

(2) Position the dummy in accordance with the seating procedure in Appendix B. Strike a plane perpendicular to the ground along the centerline of the pole.

(3) Adjust the position of the vehicle so that the dummy's head CG intersects the plane determined in step 2.

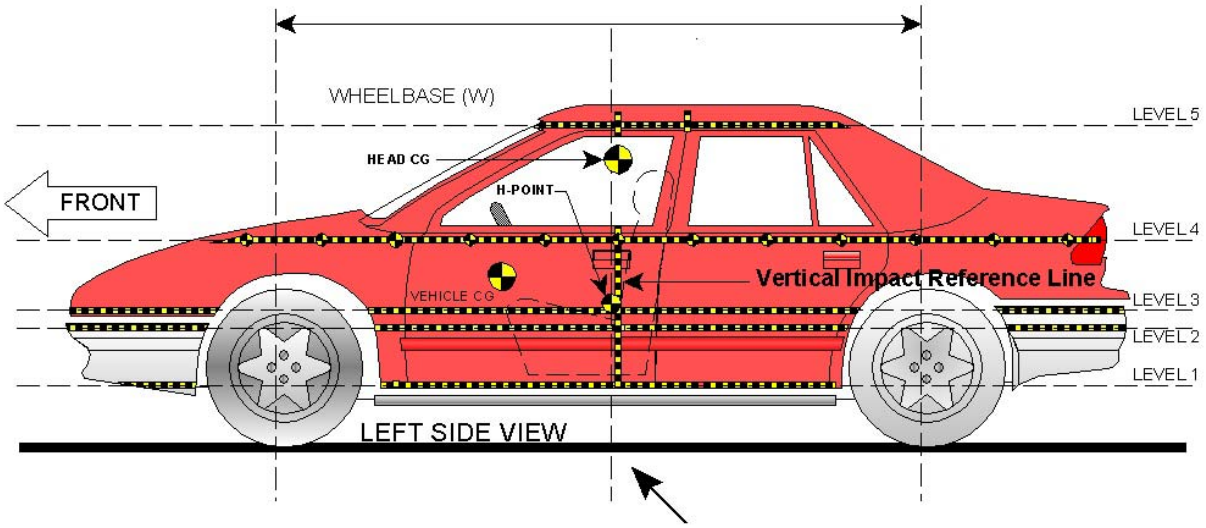
(4) Place 25 mm (1 inch) wide yellow/black checkerboard tape vertically along the front door to mark where the plane determined in step 2 intersects the door. This is the vertical impact reference line. Measure the distance from the front axle to the vertical impact reference line and record on Data Sheet No. 1.

(5) Place a 50 mm (2 inch) target over the impact reference line at the mid-door level as illustrated in the figure below. Affix a cement tack (or other marker) to the pole such that it will transfer into the vehicle's door skin at the target located on the impact reference line upon initial contact.



9. PHOTOGRAPHIC DOCUMENTATION....Continued

PHOTOGRAPHIC TARGETS - Impacted Side View



B. Place 25 mm (1 inch) wide yellow/black checkerboard tape along the impact side of the test vehicle at the following five levels above the ground surface. Record the height of each level on Data Sheet No.

(1) LEVEL 1 – side sill top height

(2) LEVEL 2 – occupant H-Point height

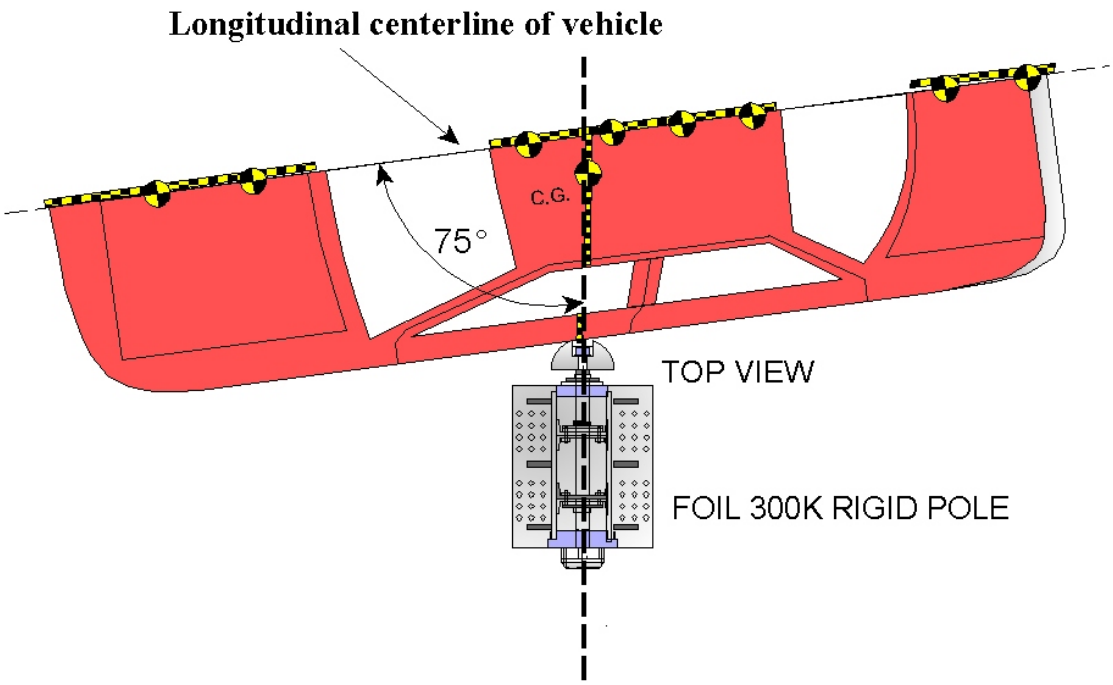
(3) LEVEL 3 – mid-door height (midpoint of distance from the bottom of the windowsill to bottom of door).

(4) LEVEL 4 – windowsill height

(5) LEVEL 5 – top of window height

9. PHOTOGRAPHIC DOCUMENTATION....Continued

PHOTOGRAPHIC TARGETS - Top View



(6) Place 25 mm (1 inch) wide yellow/black checkerboard tape on the hood and roof along the longitudinal centerline of the entire vehicle (excluding glazing surfaces).

(7) Place 25 mm (1 inch) wide yellow/black checkerboard tape laterally across the roof, perpendicular to the vertical impact reference line and in-line with the direction of vehicle travel.

C. Place 100 mm (4-inch) diameter targets on the vehicle as follows:

(1) the front door to denote the vehicle CG location,

(2) the roof to mark the head CG location,

(3) along the roof aligned with the longitudinal centerline of the test vehicle

9. PHOTOGRAPHIC DOCUMENTATION....Continued

9.6 TARGET VEHICLE INFORMATION PLACARDS

Test vehicle identification placards shall be positioned so that at least one placard will be visible in each of the 10 camera's field of view. The following information shall be shown:

A. Target vehicle's NHTSA number

B. The words "Rigid Pole Side Oblique Impact", FMVSS 214

C. Date of the side impact test

D. Name of contract laboratory

E. Vehicle year, make and model

9.7 STILL PHOTOGRAPHS

Clear and properly focused digital stills photographs shall be taken to document the test. A target vehicle information placard shall appear in each photograph and be legible. Each photograph shall be labeled as to subject matter. Prints that are at least 8 in. x 10 in. (or 8.5 X 11in.) shall be included in the final test report. All digital still photographs shall be transferred to a CD for delivery with the final test report. As a minimum the following photographs shall be included in Appendix A of the final test report:

9. PHOTOGRAPHIC DOCUMENTATION....Continued

1 Pretest Frontal View of Test Vehicle

2 Post Test Frontal View of Test Vehicle

3 Pretest Rear View of Test Vehicle

4 Post Test Rear View of Test Vehicle

5 Pretest Impacted Side View of Test Vehicle

6 Post Test Impacted Side View of Test Vehicle

7 Pretest Left 3/4 Front View of Vehicle and Pole

8 Pretest Left 3/4 Rear View of Vehicle and Pole

9 Pretest Overhead View of Test Vehicle

10 Post Test Overhead View of Test Vehicle

11 Pretest Dummy Thru Opposite Window

12 Post Test Dummy Thru Opposite Window

13 Pretest Close-up of Dummy w/Door Closed (Impact Side)

14 Post Test Dummy w/Door Closed (Impact Side)

15 Pretest Dummy Door Open

16 Pretest Dummy Shoulder and Door Top View

17 Post Test Dummy Shoulder and Door Top View

18 Pretest Interior of Front Door Closed (thru Opposite Window)

19 Post Test Interior of Front Door Showing Dummy Impact Locations (thru opposite window w/dummy removed)

20 Impact Event (stuck side)

21 Post Test Impact Zone Close-up View

22 Post Test 3/4 Front View of Impact Zone

23 Post Test 3/4 Rear View of Impact Zone

24 Post test Close-up View of Impact Point Target

25 Close-up View of Vehicle's Certification Label

26 Close-up View of Vehicle's Tire Placard Label

27 Post Test Vehicle at 90 degree Rollover

28 Post Test Vehicle at 180 degree Rollover

29 Post Test Vehicle at 270 degree Rollover

30 Post Test Vehicle at 360 degree Rollover

10. DEFINITIONS

DESIGNATED SEATING CAPACITY

The number of designated seating positions provided.

DESIGNATED SEATING POSITION (DSP)

Any plan view location capable of accommodating a person at least as large as a 5th percentile adult female, if the overall seat configuration and design and vehicle design is such that the position is likely to be used as a seating position while the vehicle is in motion, except for auxiliary seating accommodations such as temporary or folding jump seats. Any bench or split-bench seat in a passenger car, truck or multipurpose passenger vehicle with a GVWR less than 10,000 pounds, having greater than 1270 mm of hip room (measured in accordance with SAE Standard J 1100(a)) shall not have less than three designated seating positions, unless the seat design or vehicle design is such that the center position cannot be used for seating.

DOUBLE SIDE DOORS

A pair of hinged doors with the lock and latch mechanisms located where the door lips overlap.

H-POINT

The mechanically hinged hip point of a manikin which simulates the actual pivot center of the human torso and thigh, described in SAE Recommended Practice J826, "Manikin for Use in Defining Vehicle Seating Accommodations," May 1987

SEAT CUSHION REFERENCE POINT (SCRP)

A point placed on the outboard side of the seat cushion at a horizontal distance between 150 mm (5.9 in.) and 250 mm (9.8 in.) from the front edge of the seat used as a guide in positioning the seat.

SEAT CUSHION REFERENCE LINE (SCRL)

A line on the side of the seat cushion, passing through the seat cushion reference point, whose projection in the vehicle vertical longitudinal plane is straight and has a known angle with respect to the horizontal.

UNLOADED VEHICLE WEIGHT (UVW)

The weight of a vehicle with maximum capacity of all fluids necessary for operation of the vehicle, but **WITHOUT** cargo or occupants.

11. TEST EXECUTION

11.1 TEST VEHICLE PREPARATION

A. TEST VEHICLE INFORMATION

Using the owner's manual, certification labels, information provided by the COTR and any other data available, determine the following vehicle information and record on Data Sheet No. 1;

(1) Model Year, make, model and body style
(2) Body Color and VIN
(3) NHTSA No. (supplied by COTR)
(4) Build date (or month and year of manufacture)
(5) Engine Data – Number of cylinders, displacement (CID, liters or cc) and placement (longitudinal or lateral)
(6) Transmission Data – Number of speeds, manual or automatic and whether it is equipped with overdrive
(7) Final Drive – rear, front or four wheel drive
(8) Current odometer reading
(9) Safety Restraints – List and describe all available front occupant restraints
(10) Options – List major options

B. TIRE DATA RECORDED FROM FMVSS 110 VEHICLE PLACARD OR OPTIONAL TIRE INFLATION PRESSURE LABEL

Record the following information onto Data Sheet No. 1;

(1) Recommended tire size
(2) Recommended cold tire pressure
(3) Number of occupants
(4) Vehicle Capacity Weight (VCW)

C. DATA RECORDED FROM TIRE SIDEWALL

Record the following information onto Data Sheet No. 1;

(1) Size of tires (Verify that the tire size(s) meet the mfr's spec. as listed on the vehicle placard or optional tire label)
(2) Tire Manufacturer
(3) Tire Pressure for maximum load carrying capacity (Verify that this pressure exceeds or is equal to the recommended cold tire pressure listed on the vehicle placard).
(4) Treadwear, traction and temperature ratings.

11. TEST EXECUTION…..Continued

D. SEAT TYPE

Record the following information from Form 1 onto Data Sheet No. 1. Visually inspect the seat to verify seat type.
(1) Type of front seat – bucket, bench or split bench
(2) Type of front seat back – fixed or adjustable w/lever or knob

E. VEHICLE ACCELEROMETERS

Place the following accelerometers in the test vehicle. Record coordinates and accelerometer responses on Data Sheet No. 12.

1. Vehicle CG: One triaxial or three uniaxial accelerometer(s) mounted to the floorpan at the longitudinal and lateral location of the vehicle CG to provide Ax, Ay and Az data. Triaxial angular rate (deg/sec) sensor mounted at the longitudinal and lateral location of the vehicle CG to provide pitch, roll and yaw data.

2. Left Floor Sill: Uniaxial accelerometer mounted on the impacted side sill forward of the impact line but rearward of the A pillar to provide Ay data.

3. A Pillar Sill: Uniaxial accelerometer mounted on the impacted side A pillar at the lower sill level to measure Ay data.

4. A Pillar Low: Uniaxial accelerometer mounted on the impacted side A pillar (1/3 the distance from the floor to the bottom of the doors window opening) to measure Ay data.

5. A Pillar Mid: Uniaxial accelerometer mounted on the impacted side A pillar (2/3 the distance from the floor to the bottom of the doors window opening) to measure Ay data.

6. B Pillar Sill: Uniaxial accelerometer mounted on the impacted side B pillar at the lower sill level to measure Ay data.

7. B Pillar Low: Uniaxial accelerometer mounted on the impacted side B pillar (1/3 the distance from the floor to the bottom of the doors window opening) to measure Ay data.

11. TEST EXECUTION…..Continued

8. B Pillar Mid: Uniaxial accelerometer mounted on the impacted side B pillar (2/3 the distance from the floor to the bottom of the doors window opening) to measure Ay data

9. Seat: Uniaxial accelerometer mounted on the seat track approximately aligned with the dummy's H-point to obtain Ay data.

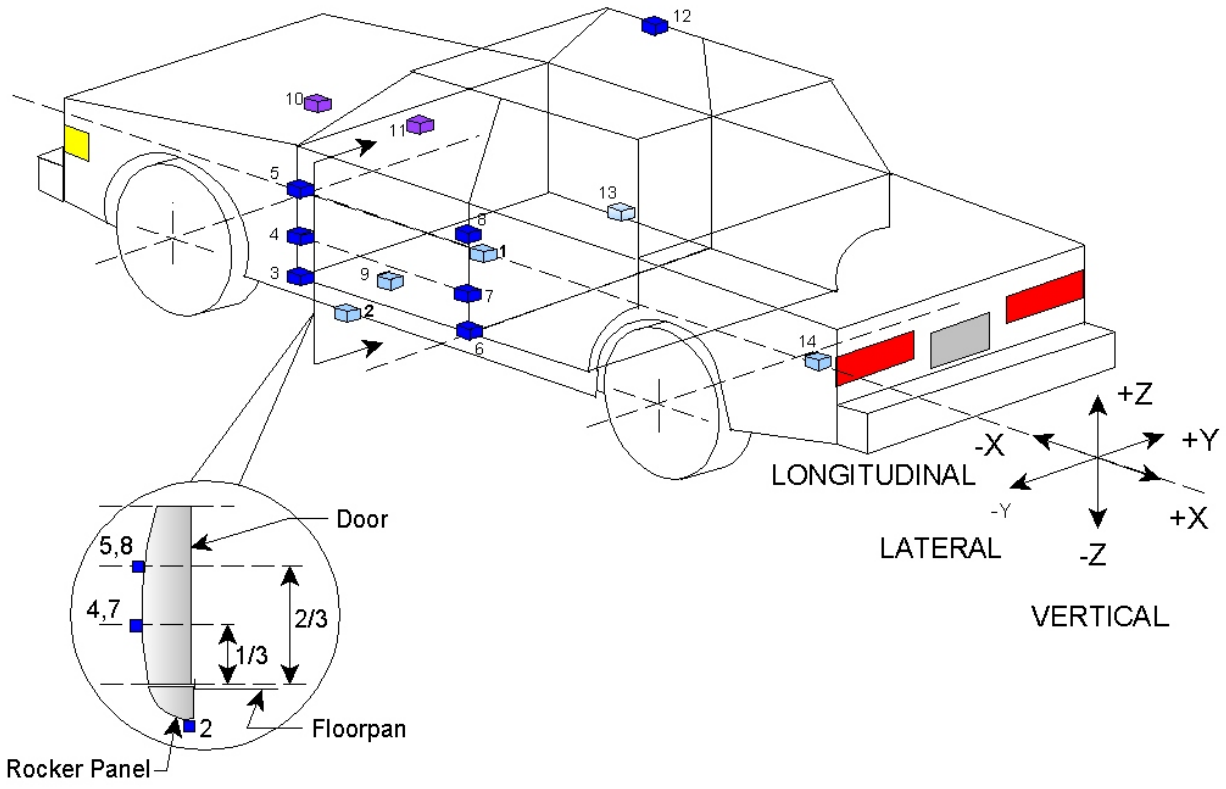
10. Engine: Biaxial accelerometer mounted on the top of the engine to measure Ax and Ay data.

11. Firewall: Uniaxial accelerometer mounted on the center of the firewall to measure Ay data.

12. Roof: Uniaxial accelerometer mounted on the non-impact side roof rail in line with pole impact location to measure Ay data.

13. Floor Sill: Uniaxial accelerometer mounted on the non-impact side floor sill in line with the pole impact location to measure Ay data.

14. Rear Deck: Biaxial accelerometer mounted on the rear floorpan behind the rear axle laterally centered to measure Ax and Ay data.



11. TEST EXECUTION…..Continued

F. AS DELIVERED VEHICLE WEIGHT CONDITION

(1) Fill the transmission with transmission fluid to full capacity.
(2) Drain fuel from vehicle
(3) Run the engine until fuel remaining in the fuel delivery system is used and the engine stops
(4) Record the useable fuel tank capacity supplied by the COTR.
(5) Record the fuel tank capacity supplied in the owner's manual.
(6) Using purple dyed Stoddard solvent having the physical and chemical properties of Type 1 solvent or cleaning fluid, Table 1, ASTM Standard D484-71, "Standard Specifications for Hydrocarbon Dry-cleaning Solvents," or gasoline, fill the fuel tank. Record the amount.
(7) Fill the coolant system to capacity.
(8) Fill the engine with motor oil to the max. mark on the dip stick.
(9) Fill the brake reservoir with brake fluid to its normal level
(10) Fill the windshield washer reservoir to capacity.
(11) Inflate the tires to the cold tire pressure indicated on the tire placard. If no tire placard is available, inflate the tires to the recommended pressure in the owner's manual. Record on Data sheet.
(12) Record the vehicle weight at each wheel to determine the "As Delivered" weight condition.

G. VEHICLE ATTITUDE MEASUREMENTS – AS DELIVERED

(1) With the vehicle in the "As Delivered" weight condition, place it on a flat, level surface.
(2) Pitch Angle Measurement - Mark a reference point on the driver's and front passenger's door sills. Measure and record the angle of the door sills at that point.
(3) Roll Angle Measurement – Mark a reference point at the front and rear of the vehicle along a vertical plane that passes through the longitudinal centerline of the vehicle. Mark reference planes that are perpendicular to the vertical plane that passes through the longitudinal centerline of the vehicle and coincide with the reference points. Measure and record the left to right (roll) angles at the front and rear of the vehicle.

11. TEST EXECUTION….Continued

H. CALCULATION OF VEHICLE TARGET TEST WEIGHT

(1) Calculate the Rated Cargo and Luggage Weight (RCLW) as follows; **RCLW = VCW – (68.04 kg x DSC)**

VCW = the vehicle capacity weight from the vehicle placard. Record VCW on data sheet.

DSC = the designated seated capacity as indicated on the vehicle placard. Record the DSC on the data sheet.

FOR TRUCKS, MPV's or BUSES - If the RCLW calculated above is greater than 136 kg, use 136 kg as the RCLW.

Record RCLW on Data Sheet No.1.

(2) Calculate the Test Vehicle Target Weight by adding the As Delivered weight, the RCLW and the actual weight of the dummy. Record on Data Sheet No.1.

I. FULLY LOADED VEHICLE WEIGHT CONDITION

(1) With the vehicle in the As Delivered condition, load the vehicle with the RCLW placed in the luggage or load carrying/cargo area. Center the load over the longitudinal centerline of the vehicle.
(2) Place the weight of the dummy in the appropriate front outboard seating position.
(3) Record the vehicle weight at each wheel to determine the Fully Loaded Weight.

11. TEST EXECUTION….Continued

J. VEHICLE ATTITUDE MEASUREMENTS – FULLY LOADED WEIGHT CONDITION

(1) With the vehicle in the Fully Loaded Weight condition, place it on a flat, level surface.
(2) Pitch Angle Measurement - Measure and record the angle of the door sills relative to the ground surface using the same reference points on the driver's and front passenger's door sills to determine the pitch attitude with the vehicle in the As Delivered weight condition.
(3) Roll Angle Measurement - Measure and record the left to right (roll) angles at the front and rear of the vehicle using the same reference point and reference planes to determine the roll attitude with the vehicle in the As Delivered weight condition.

K. AS TESTED VEHICLE WEIGHT CONDITION

(1) With the test vehicle in the Fully Loaded test weight condition, drain the fuel system and operate the engine until the fuel system is dry.
(2) Slowly refill the entire fuel system with Stoddard solvent which has been dyed purple, having the physical and chemical properties of Type 1 solvent or cleaning fluid, Table 1, ASTM Standard D484-71, "Standard Specifications for Hydrocarbon Dry-cleaning Solvents."
(3) Fill the tank to 93 percent (± 1%) of usable capacity. Crank the engine to fill the fuel system delivery system with Stoddard solvent.
(4) Drain transmission fluid, engine coolant, motor oil, and windshield washer fluid from the test vehicle.
(5) Remove ballast and RCLW from the cargo area.
(6) Load the vehicle with the necessary on-board test equipment (including all instrumentation boxes, cameras, lighting, etc.) Secure the equipment in the load carrying area and distribute it, as nearly possible, to obtain the proportion of axle weight indicated by the gross axle weight ratings and center it over the longitudinal centerline of the vehicle.
(7) Load the appropriate dummy (5^{th} female or 50^{th} male) in the front outboard position.

11. TEST EXECUTION….Continued

(8) Calculate the actual test weight range as follows;

(Test Vehicle Target Weight **-** 4.5 kg.) **≤** As Tested Weight ≤ (Test Vehicle Target Weight - 9 kg.))

(9) Record the vehicle weight at each wheel. Verify that the As Tested Weight is within the range specified in (8). If necessary, to achieve the As Tested Weight adjust the weight of the test vehicle by either adding ballast or removing vehicle components in accordance with the manufacturer's data provided by the COTR.

(10) On the data sheet, record the weight of the added ballast, if any.

(11) On the data sheet, record the weight of each vehicle component that was removed.

NOTE: If the calculated Test Vehicle Target Weight is exceeded, the Contractor must notify the COTR to discuss the possible removal of additional vehicle components or instrumentation to decrease the weight. Under no circumstances shall the As Tested Weight be greater than the Test Vehicle Target Weight.

L. VEHICLE ATTITUDE MEASUREMENTS – AS TESTED WEIGHT CONDITION

(1) With the vehicle in the As Tested Weight condition, place it on a flat, level surface.
(2) Pitch Angle Measurement - Measure and record the angle of the door sills relative to the ground surface using the same reference points on the driver's and front passenger's door sills to determine the pitch attitude with the vehicle in the As Delivered weight condition.
(3) Roll Angle Measurement - Measure and record the left to right (roll) angles at the front and rear of the vehicle using the same reference point and reference planes to determine the roll attitude with the vehicle in the As Delivered weight condition.
(4) Verify that the As Tested vehicle attitude measurements are equal to or between the As Delivered and Fully Loaded vehicle attitude measurements.

NOTE – The As Tested vehicle attitude measurements shall be taken within an hour of impact to assure the proper attitude is met.

11. TEST EXECUTION….Continued

M. SEAT ADJUSTMENT REFERENCE MARKS

Prior to placing the dummy in the driver **or** right front outboard seating position as specified by the COTR, mark for reference the seat adjustment as follows:

Driver and Right Front Outboard Seats

1.1 Position the seat's adjustable lumbar supports so that the lumbar supports are in the lowest, retracted or deflated adjustment positions.

1.2 Position any adjustable parts of the seat that provide additional support so that they are in the lowest or most open adjustment position.

1.3 **Mark** a point (seat cushion reference point - **SCRP**) on the side of the seat cushion that is between 150 mm and 250 mm from the front outermost edge of the seat cushion.

1.4 Draw a line (seat cushion reference line - **SCRL**) through the seat cushion reference point.

1.5 Using only the controls that primarily move the seat in the fore-aft direction, move the **SCRP** to the rearmost position.

1.6 If the seat cushion adjusts fore-aft, independent of the seat back, use only the controls that primarily move the seat cushion in the fore-aft direction to move the **SCRP** to the rearmost position.

1.7 Using any part of any control, other than the parts just used for fore-aft positioning, determine and record the range of angles of the **SCRL** and set the **SCRL** at the mid-angle.

1.8 If the seat and/or seat cushion height is adjustable, use any part of any control other than those which primarily move the seat or seat cushion fore-aft, to put the **SCRP** in its lowest position with the **SCRL** line angle at the mid-angle found in 1.7.

1.9 Using only the controls that primarily move the seat in the fore-aft direction, verify the seat is in the rearmost position.

11 TEST EXECUTION….Continued

1.10 Using only the controls that primarily move the seat in the fore-aft direction, **mark** for future reference the fore-aft seat positions. **Mark** each position so that there is a visual indication when the seat is at a particular position. For manual seats, move the seat forward one detent at a time and **mark** each detent. For power seats, **mark** only the rearmost, middle, and foremost positions. Label three of the positions with the following: F for foremost, M for mid-position (if there is no mid-position, label the closest adjustment position to the rear of the mid-point), and R for rearmost.

1.11 Use only the controls that primarily move the seat in the fore-aft direction to place the seat in the rearmost position.

1.12 Using any controls, other than the controls that primarily move the seat and/or seat cushion in the fore-aft direction, find and visually mark for future reference the maximum, minimum, and middle height of the **SCRP** with the **SCRL** at the mid-angle determined in 1.7.

1.13 Using only the controls that primarily move the seat and/or seat cushion in the fore-aft direction, place the seat in the mid-fore-aft position.

1.14 Using any controls, other than the controls that primarily move the seat in the fore-aft direction, find and visually **mark** for future reference the maximum, minimum, and middle height of the **SCRP** with the **SCRL** at the mid-angle determined in 1.7.

1.15 Using only the controls that primarily move the seat in the fore-aft direction, place the seat in the foremost position.

1.16 Using any controls, other than the controls that primarily move the seat in the fore-aft direction, find and visually mark for future reference the maximum, minimum, and middle height of the **SCRP** with the **SCRL** at the mid-angle determined in 1.7.

1.17. Visually **mark** for future reference the seat back angle, if adjustable, at the manufacturer's nominal design riding position for the dummy in the manner specified by the manufacturer.

Note: If the front outboard passenger seat does not adjust independently of the driver's seat, the driver's seat shall control the final position of the passenger seat. In this case, set the driver's seat adjustment in according to the instructions above and then set the seat back angle of the passenger's seat at the manufacturer's nominal design riding position.

11. TEST EXECUTION….Continued

N. SETTING THE SEATS

For a 50th Male dummy positioned in the driver or right front outboard seat

Using the reference marks determined in section 11,M., set the seat accordingly;

1.1 Using only the control that primarily moves the seat fore and aft, move the **SCRP** to the mid-travel position. If an adjustment position does not exist midway between the forwardmost and rearmost positions, set the seat in the closest adjustment position to the rear of the midpoint.

1.2 If the seat or seat cushion height is adjustable, other than by the controls that primarily move the seat or seat cushion fore and aft, set the height of the **SCRP** to the minimum height, with the SCRL set as closely as possible to the mid-angle determined in section 11,M

1.3 If adjustable, set the seat back angle at the manufacturer's nominal design riding position for a 50th percentile adult male in the manner specified by the manufacturer.

For a 5th Female dummy positioned in the driver or right front outboard seat

Using the reference marks determined in section 11,M., set the seat accordingly;

1.1 Using only the control that primarily moves the seat fore and aft, move the **SCRP** to the most forward position.

1.2 If the seat or seat cushion height is adjustable, other than by the controls that primarily move the seat or seat cushion fore and aft, set the height of the **SCRP** to the minimum height, with the SCRL set as closely as possible to the mid-angle determined in section 11,N.

1.3 If adjustable, set the seat back angle at the manufacturer's nominal design riding position for a 5th percentile female in the manner specified by the manufacturer.

11. TEST EXECUTION….Continued

O. ADJUSTABLE HEAD RESTRAINTS

1.1 **50th Male Dummy** - Use any adjustment of the head restraint to position it at its highest and most full forward position. If it rotates, rotate it such that the head restraint extends as far forward as possible. Measure the most forward position of the front edge of the head restraint from a fixed point on the seat back along a horizontal plane parallel to the longitudinal centerline of the test vehicle. Mark the point on the seat back where the measurement was taken for future reference.

1.2 **5th Female Dummy** - Use any adjustment of the head restraint to position it at its lowest and most full forward position. Measure the lowest position of the bottom edge of the head restraint from a fixed point on the seat back along a vertical plane perpendicular to the longitudinal centerline of the test vehicle. Mark the point on the seat back where the measurement was taken for future reference.

P. STEERING WHEEL ADJUSTMENT

1.1 If the steering wheel is adjustable up and down and/or in and out complete the following steps to set the final steering wheel location.

1.2 Determine each up and down position. Label three of the positions with the following: H for highest, M for mid-position (if there is no mid-position, label the next lowest adjustment position), and L for lowest.

1.3 Determine each in and out position. Label three of the positions with the following: F for foremost, M for mid-position (if there is no mid-position, label the next rearmost adjustment position), and R for rearmost.

1.4 Place the steering wheel in the mid up/down and mid in/out position.

Q. ADJUSTABLE ARMRESTS

Place any adjustable armrest in the retracted position.

11. TEST EXECUTION….Continued

R. ADJUSTABLE BELT ANCHORAGES

5th female dummy - Place adjustable anchorages in the nominal adjustment position in accordance with the manufacturer's data supplied by the COTR.

50th male dummy – Place adjustable anchorages at the mid-adjustment position

S. WINDOWS

Place any movable windows and vents located on the struck side of the vehicle in the fully closed position

T. SUNROOF

Place sunroof(s) in the full closed position

U. CONVERTIBLE TOPS

Place convertible tops in the closed passenger compartment configuration

V. DOORS

Place all doors, hatchback or tailgate, in the fully closed and latched position. Check instrument panel telltales just prior to test to ensure that all doors and hatches are closed. Do not lock any door, hatchback or tailgate.

W. TRANSMISSION ENGAGEMENT

1.1 Manual Transmission
Place manual transmissions in 2nd gear

1.2 Automatic Transmission
Place automatic transmissions in neutral

X. PARKING BRAKE ENGAGEMENT

Engage the parking brake.

Y. IGNITION SWITCH

The key shall be in the ignition and switched to the **"ON"** position.

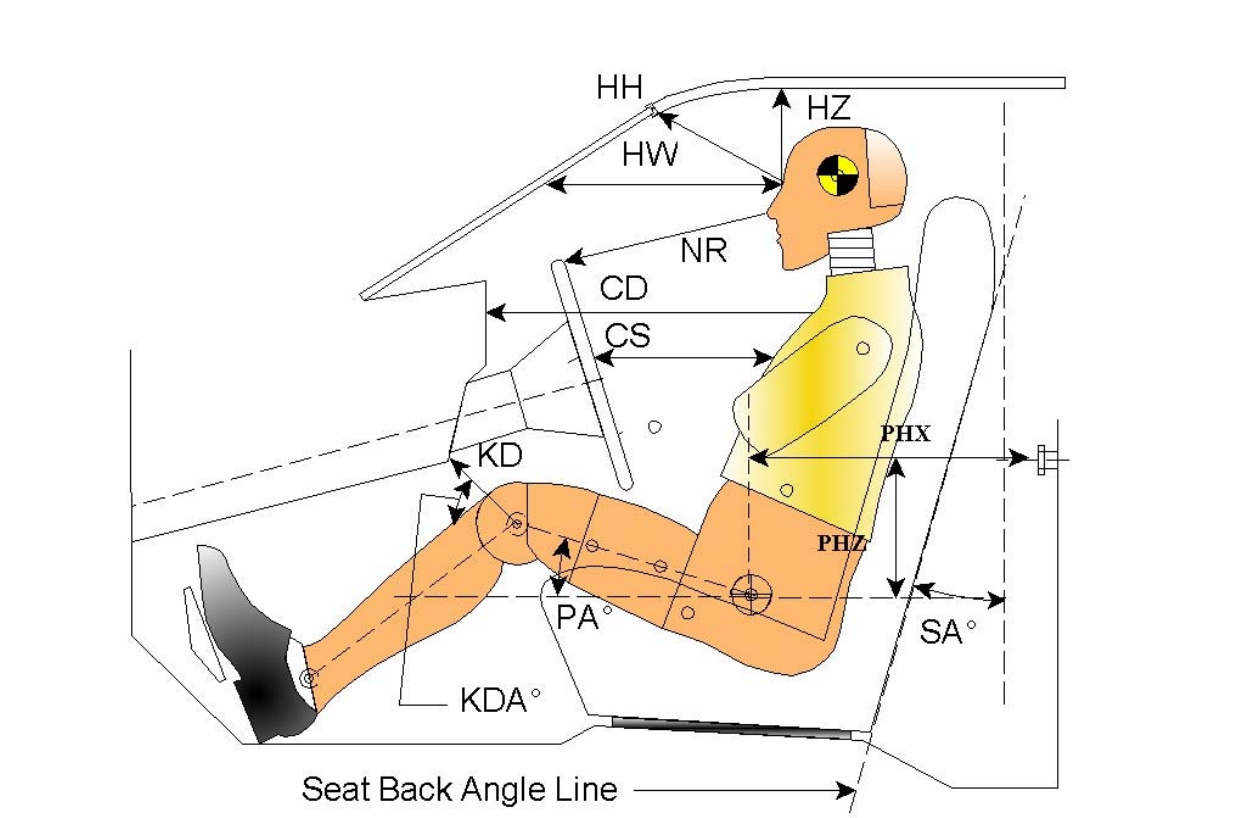
11. TEST EXECUTION….Continued

11.2 DUMMY PREPARATION, POSITIONING AND PLACEMENT

Place a properly clothed and calibrated 50th percentile male (in accordance with Appendix B) and a 5th percentile female dummy (in accordance with Appendix A) in the front outboard seat located on the impact side of the vehicle in accordance with Appendix C– Positioning Dummies in the Test Vehicle.

Document the final positions of the dummy after it is seated in the test vehicle by taking the following measurements (accurate to ±3 mm). Record measurements on Data Sheet No. 3

DUMMY LONGITUDINAL CLEARANCE DIMENSIONS



HH HEAD TO HEADER – measure from the point where the dummy's nose meets his forehead (between the eyes) to the furthest point forward on the header.

HW HEAD TO WINDSHIELD - measure from the point where the dummy's nose meets his forehead (between the eyes) in to a point on the windshield directly in front of it. Use a level or plumb-bob.

11. TEST EXECUTION….Continued

HZ HEAD TO ROOF – measure from the point where the dummy's nose meets his forehead (between the eyes) to the point on the roof directly above it. Use a level.

*CS STEERING WHEEL TO CHEST - measure from the center of the steering wheel hub to the dummy's chest. Use a level.

CD CHEST TO DASH - place a tape measure on the tip of the driver dummy's chin and rotate 125 mm of it downward toward the dummy to the point of contact on the transverse center of the dummy's chest. Measure from this point to the closest point on the dashboard either between the upper part of the steering wheel between the hub and the rim, or measure to the dashboard placing the tape measure above the rim, whichever is a shorter measurement.

*NR NOSE TO RIM - measure from the tip of the driver dummy's nose to the closest point on the top of the steering wheel rim

KDL/KDR LEFT AND RIGHT KNEES TO DASHBOARD - measure from the center of the knee pivot bolt's outer surface to the closest point forward acquired by swinging the tape measure in continually larger arcs until it contacts the dashboard. Also reference the angle of this measurement with respect to the horizontal for the outboard knee (KDA).

PHX H-POINT TO STRIKER (X) - locate a point on the striker; project this point (preferably, with a level) vertically downward; place tape measure on H-point and extend horizontally until it intersects level; record this measurement.

PHZ H-POINT TO STRIKER (Z) - locate a point on the striker; project this point (preferably, with a level) horizontally toward the H-point; place tape measure on H-point and extend vertically until it intersects level; record this measurement.

ANGLES

SA SEAT BACK ANGLE - measure the seat back angle using the instructions provided in the manufacturer’s data supplied by the COTR.

PA PELVIC ANGLE – measure by inserting the pelvic angle gauge into the H-point gauging hole on the dummy and taking this angle with respect to the horizontal;

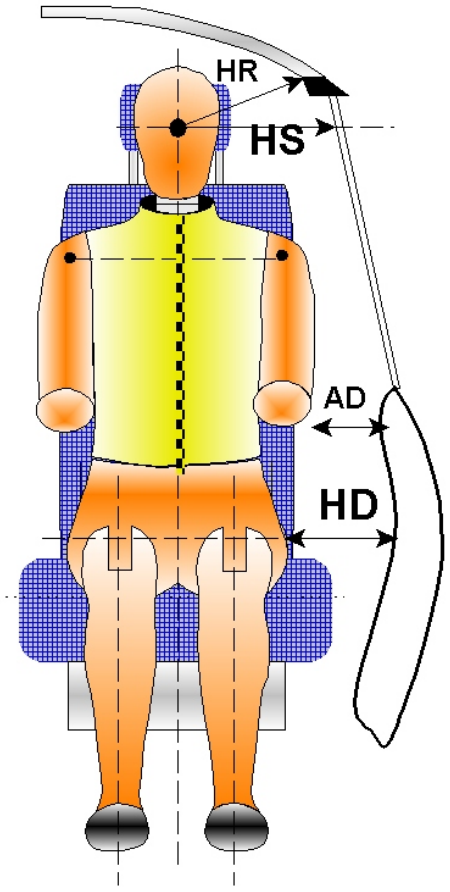
NOTE: The B-pillar striker will be used as the reference point for PHX & PHZ measurements.

* - NR and CS only apply to the driver's position.

11. TEST EXECUTION....Continued

Record the following measurements on Data Sheet No. 4.

LATERAL CLEARANCE DIMENSIONS



HR HEAD TO SIDE HEADER - measure the shortest distance from the point where the dummy's nose meets his forehead (between the eyes) to the side edge of the header just above the window frame, directly adjacent to the dummy.

HS HEAD TO SIDE WINDOW - taken from the point where the dummy's nose meets his forehead (between the eyes) to the outside of the side window. In order to make this measurement, roll the window down to the exact height that allows a level measurement. Use a level.

AD ARM TO DOOR - taken from the center of the bottom of the arm segment where it meets the dummy's torso to the closest point on the door

HD H-POINT TO DOOR - taken from the H-point on the dummy to the closest point on the door. Use a level.

11. TEST EXECUTION....Continued

When a level is to be used, it is to ensure that the line containing the two points described is either parallel or perpendicular to the ground. If a measurement to be made is less than 250 mm ignore the directions to use a level and approximate a level measurement. Also, when a measurement is to be taken to or from the center of a bolt on the dummy, take the measurement from the center of the bolt hole if the bolt is recessed.

11.3 VEHICLE MEASUREMENTS

A. EXTERIOR CRUSH MEASUREMENTS

(1) Establish a fixed reference plane that is parallel to the vehicle's longitudinal centerline.

(2) Prior to the test, with the vehicle in the "As Tested" configuration, measure from the fixed reference plane to the exterior vehicle body across the entire length of the impact side at all five levels (as determined in Section 9.5). Take measurements at 150 mm intervals forward and rearward of the impact reference line. Mark the location where each measurement is taken for future reference.

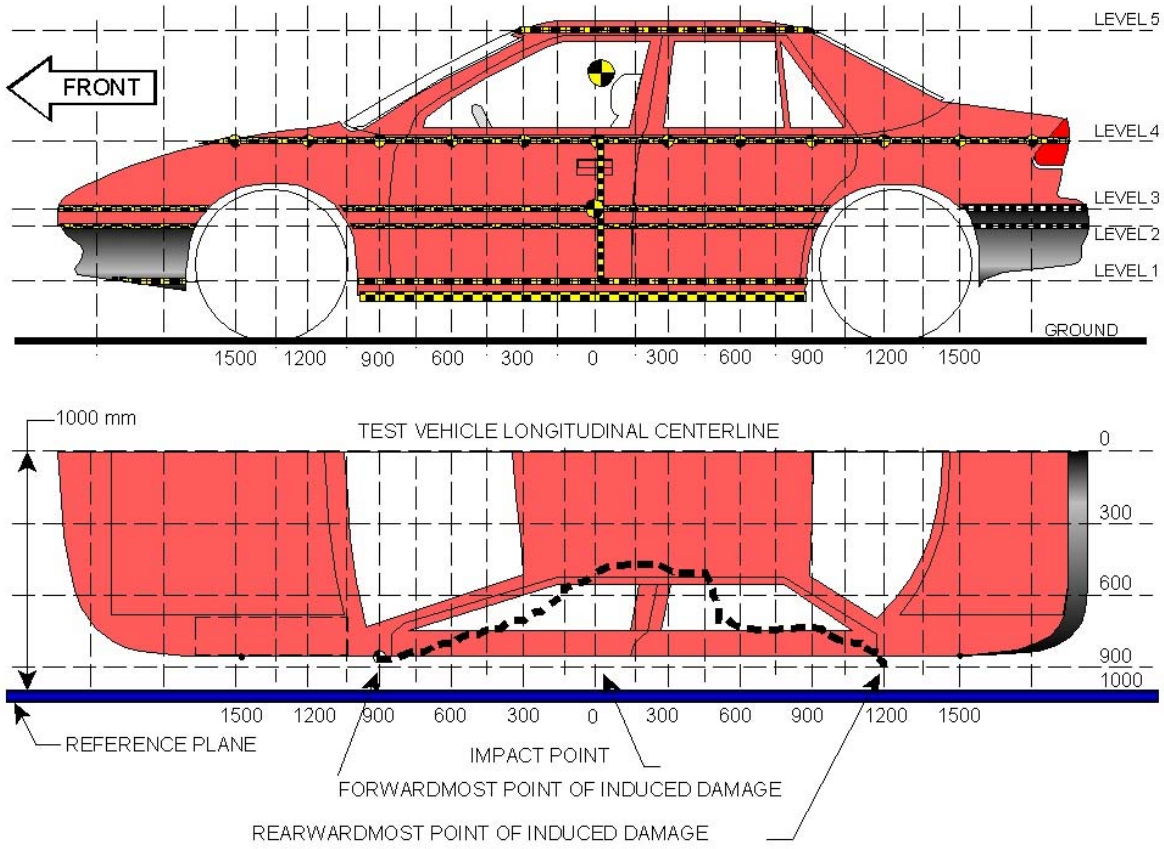
(3) Post test, place the test vehicle on a flat, level surface. Inflate the test vehicle's tires to maximum cold pressure.

(7) Using the same reference locations established in step (2) above, begin taking static crush measurements at the first 150mm interval forward of the forward-most point of the induced body damage and end at the first 150 mm interval past the rearward-most point of induced body damage.

(8) Compute static crush at each interval. Determine the maximum static crush at each level and record on Data Sheet No. 10.

(9) Plot static crush measurements at each level.

11. TEST EXECUTION....Continued



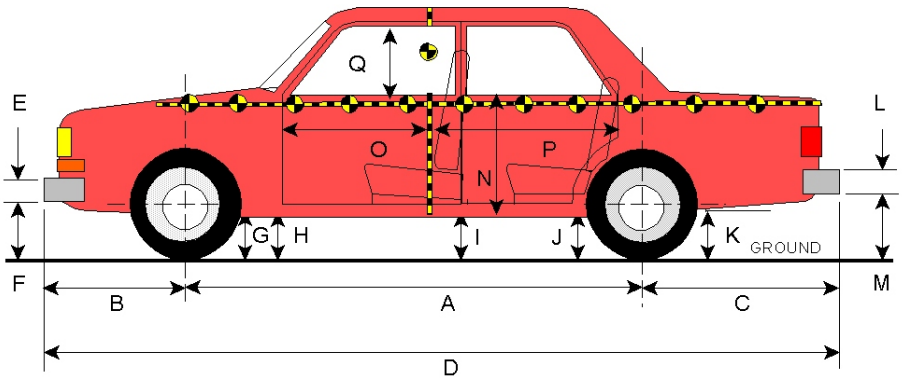
NOTE: All measurements are in millimeters (mm)

11. TEST EXECUTION...Continued

B. VEHICLE PROFILE MEASUREMENTS (IMPACT SIDE ONLY)

(1) Take the following measurements A thru Q listed below prior to impact with the vehicle in the "As Tested" condition resting on a level surface and post-test with the vehicle's tires inflated and resting on a level surface. Record measurements on Data Sheet No. 9.

(2) Compute the difference between the pre and post measurements and record on Data Sheet No. 9.



IMPACT SIDE VIEW

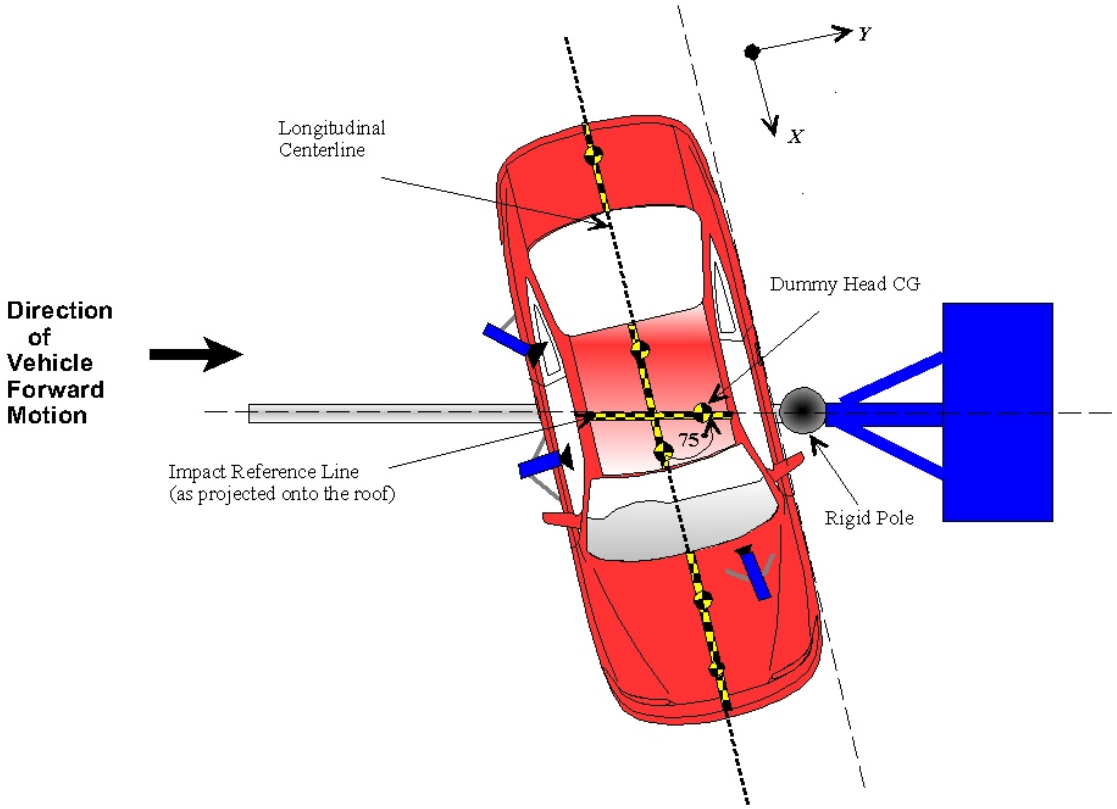
A	Wheelbase
B	The longitudinal distance between the front axle centerline and the front bumper
C	The longitudinal distance between the rear axle centerline and the rear bumper
D	Overall length of the impacted side of the vehicle measured parallel to the plane which includes the vehicle's longitudinal centerline
E	Front bumper vertical height
F	Vertical distance from ground to the front bumper
G	Vertical distance from ground to the sill at the front wheel well
H	Vertical distance from ground to the sill at the front door seam
I	Vertical distance from ground to the ill in line with the front door striker or B-pillar if no striker exist
J	Vertical distance from ground to the sill at the rear wheel well
K	Vertical distance from ground to the vehicle sheet body at the rear of the rear tire's wheel well
L	Rear bumper vertical height
M	Vertical distance from the ground to the rear bumper
O	Longitudinal distance from the vertical impact reference line to the front door seam

P Longitudinal distance from the vertical impact reference line to the rear door seam

Q Vertical distance that measures the front window opening on the impact side

11. TEST EXECUTION...Continued

11.4 POLE TEST IMPACT CONDITION



A. Prior to impact, affix a cement tack (or other marker) to the pole such that it will transfer into the test vehicle's sheet metal at the target located on the impact reference line upon initial contact.

B. Tow the test vehicle (at the test speed designated by the COTR) toward the stationary pole so that its line of forward motion forms an angle of 75° (or 285°) ± 3° for left (or right) side impact with the vehicle's longitudinal centerline.

C. At impact, the test vehicle's impact reference line is aligned with the centerline of the pole ± 38 mm (1.5 in).

D. After impact, measure the horizontal distance from the center of the cement tack (or other marker) to the impact reference line. Record the distance on the appropriate Data Sheets.

12. TEST DATA DISPOSITION

The Contractor shall provide a copy of preliminary test data that includes, as a minimum, dummy injury measures, impact speed and impact point to the NHTSA representative within one hour after the test. If there is no NHTSA representative at the test, the Contractor shall send the preliminary test data to the COTR via e-mail or fax. Additionally, the Contractor shall send a data summary of results to the COTR via e-mail or fax within two days of the test.

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

12.1 TEST DATA LOSS

A. INVALID TEST DESCRIPTION

An invalid compliance test is one, which does not conform precisely to all requirements/specifications of the OVSC Laboratory Test Procedure and Statement of Work applicable to the test.

B. INVALID TEST NOTIFICATION

The Contractor shall notify NHTSA of any test not meeting all requirements/specifications of the OVSC Laboratory Test Procedure and Statement of Work applicable to the test, by telephone, within 24 hours of the test and send written notice to the COTR within 48 hours or the test completion.

C. RETEST NOTIFICATION

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 2 weeks after receipt of notification by the Contracting Officer that a retest is required.

D. WAIVER OF RETEST

NHTSA, in its sole discretion, reserves the right to waive the retest requirement. This provision shall not constitute a basis for dispute over the NHTSA's waiving or not waiving any requirement.

12. TEST DATA DISPOSITION….Continued

E. TEST VEHICLE

NHTSA shall furnish only one vehicle for each test ordered. The Contractor shall furnish the test vehicle required for the retest. The retest vehicle shall be equipped as the original vehicle. The original vehicle used in the invalid test shall remain the property of NHTSA, and the retest vehicle shall remain the property of the Contractor. The Contractor shall retain the retest vehicle for a period not exceeding 180 days if it fails the test. If the retest vehicle passes the test, the Contractor may dispose of it upon notification from the COTR that the test report has been accepted

F. TEST REPORT

No test report is required for any test that is determined to be invalid unless NHTSA specifically decides, in writing, to require the Contractor to submit such report. The test data from the invalid test must be safeguarded until the data from the retest has been accepted by the COTR. The report and other required deliverables for the retest vehicle are required to be submitted to the COTR within 3 weeks after completion of the retest.

G. DEFAULT

The Contractor is subject to the default and subsequent re-procurement costs for non-delivery of valid or conforming test (pursuant to the Termination For Default clause in the contract).

12.2 DATA PROCESSING

A. 50^{th} percentile male dummy

(1) **Head acceleration data**
Filter the data at channel frequency class of 1000 Hz.

(2) **Abdominal and Pubic Force data**
Filter the data at channel frequency class 600 Hz.

(3) **Chest and Rib Deflection data**
Filter the data at channel frequency class 180 Hz.

12. TEST DATA DISPOSITION….Continued

B. 5th percentile female dummy

(1) **Head acceleration data**
Filter the data at channel frequency class 1000 Hz.

(2) **Lower Spine data**
Filter the data at channel frequency class 180 Hz.

(3) **Iliac and Acetabular Forces**
Filter the data at channel frequency class 600 Hz.

12.3 PERFORMANCE REQUIREMENTS – NOTIFICATION OF TEST RESULTS

The performance requirements are found in Section 2 – General Requirements of this TP. If the test results indicate that the test vehicle has exceeded any of the injury criteria or has not met a requirement, the Contractor shall notify the COTR in accordance with section 13.2 of this test procedure.

12.4 COMPUTER DATA DISK

The Contractor shall deliver to NHTSA a disk (CDROM) with all of the test data formatted as specified in the Office of Crashworthiness Research Data Reference Guide -Volume I: Vehicle Tests. The guide can be located at ;

www-nrd.nhtsa.dot.gov/pdf/software/vehdb-v4.pdf

Data entry software (ENTRÉE) may also be downloaded from the website and used to generate the specification data files as defined in the guides. ENTRÉE for Windows can be located at ;

www-nrd.nhtsa.dot.gov/nrd10/software/entrée/index/html

12.5 DATA RETENTION BY CONTRACTOR

The Contractor shall retain, reproducible copies of all data disks, 16 mm movie films, digital video and still photograph negatives for at least 5 years (at no extra cost to the agency)

13. REPORTS

13.1 MONTHLY STATUS REPORTS

The contractor shall submit a Monthly Status Report to the COTR on the first Friday of every month. The Monthly Status Report shall be submitted until all vehicles or items of equipment are disposed of. Samples of the required Monthly Status Reports are contained in the report forms Section 15.

13.2 APPARENT TEST FAILURE

An apparent test failure shall be communicated by telephone to the COTR within 24 hours with written notification mailed within 48 hours (Saturday and Sundays excluded). A Laboratory Notice of Test Failure (see Section 15) with a copy of the particular compliance test data sheet(s) and preliminary data plot(s) shall be included. In the event of a test failure, a post test calibration check of some of the critically sensitive test equipment and instrumentation may be required for verification of accuracy. The necessity for the calibration shall be at the COTR's discretion and shall be performed without additional costs to the OVSC.

13.3 FINAL TEST REPORTS

COPIES

In the case of a test failure, SEVEN copies of the Final Test Report shall be submitted to the COTR for acceptance within three weeks of test completion. When there has been no indication of a test failure, FIVE copies of each Final Test Report shall be submitted to the COTR within three weeks of test completion. The Final Test Report format to be used by all contractors can be found in the "Report Section".

Contractors are required to submit the first Final Test Report in draft form within two weeks after the compliance test is conducted. The contractor and the COTR will then be able to discuss the details of both test conduct and report content early in the compliance test program.

Contractors are required to PROOF READ all Final Test Reports before submittal to the COTR. The OVSC will NOT act as a report quality control office for contractors. Reports containing a significant number of errors will be returned to the contractor for correction, and a "hold" will be placed on invoice payment for the particular test.

13. REPORTS....Continued

REQUIREMENTS

The Final Test Report is relied upon as the chronicle of the compliance test. The Final Test Report will be released to the public domain after review and acceptance by the COTR. For these reasons, each final report must be a complete self-standing document.

The Contractor should use DETAILED descriptions of all compliance test events. Any events that are not directly associated with the standard but are of technical interest should also be included. The contractor should include as much DETAIL as possible in the report.

Instructions for the preparation of the final test report are provided in this section. To maintain standardization of final reports, the format outlined below must be adhered to.

13. REPORTS....Continued

FIRST THREE PAGES

A. FRONT COVER – A heavy paperback cover (or transparency) shall be provided for the protection of the final report. The information required on the cover is as follows:

(1) Final Report Number such as 214P-ABC-0X-001 where

214P	the FMVSS tested, Side Impact Protection
ABC	the initials for the laboratory
0X	the Fiscal Year of the test program ()
001	the Group Number (001 for the 1st test, 002 for the 2nd test, etc.)

(2) Final Report Title And Subtitle such as

SAFETY COMPLIANCE TESTING FOR FMVSS 214
SIDE IMPACT PROTECTION
* *
World Motors Corporation
2000 Ace Super 4-door sedan
NHTSA No. CX0401

(3) Contractor's Name and Address such as

ABC LABORATORIES
405 Main Street
Detroit, MI 48070

NOTE: DOT SYMBOL WILL BE PLACED BETWEEN ITEMS (2) AND (3)

(4) Date of Final Report completion

(5) The words "FINAL REPORT"

13. REPORTS....Continued

(6) The sponsoring agency's name and address as follows

U. S. DEPARTMENT OF TRANSPORTATION
National Highway Traffic Safety Administration
Enforcement
Office of Vehicle Safety Compliance
1200 New Jersey Ave. S.E.
West Bldg. (NVS-220)
Washington, DC 20590

B. FIRST PAGE AFTER FRONT COVER – A disclaimer statement and an acceptance signature block for the COTR shall be provided as follows;

This publication is distributed by the U.S. Department of Transportation, National Highway Traffic Safety Administration, in the interest of information exchange. The opinions, findings and conclusions expressed in this publication are those of the author(s) and not necessarily those of the Department of Transportation or the National Highway Traffic Safety Administration. The United States Government assumes no liability for its contents or use thereof. If trade or manufacturers' names or products are mentioned, it is only because they are considered essential to the object of the publication and should not be construed as an endorsement. The United States Government does not endorse products or manufacturers.

Prepared By:

Approved By:

Approval Date:

FINAL REPORT ACCEPTANCE BY OVSC:

Accepted By:

Acceptance Date:

13. REPORTS....Continued

C. SECOND PAGE AFTER FRONT COVER – A completed Technical Report Documentation Page (Form DOT F1700.7) shall be completed for those items that are applicable with the other spaces left blank. Sample data for the applicable block numbers of the title page follows.

Block 1 – REPORT NO.

214P-ABC-0X-001

Block 2 – GOVERNMENT ACCESSION NUMBER (Leave blank)

Block 3 – RECIPIENT'S CATALOG NUMBER (Leave blank)

Block 4 – TITLE AND SUBTITLE

Final Report of FMVSS 214P Compliance Test
Side Impact Protection Testing of 200X Ace Super Sedan,
NHTSA No. CX0401

Block 5 – REPORT DATE

March 1, 200X

Block 6 – PERFORMING ORGANIZATION CODE

ABC

Block 7 – AUTHOR(S)

John Smith, Project Manager
Bill Doe, Project Engineer

Block 8 – PERFORMING ORGANIZATION REPORT NUMBER

ABC-DOT-XXX-001

Block 9 – PERFORMING ORGANIZATION NAME AND ADDRESS

ABC Laboratories
405 Main Street
Detroit, MI 48070

13. REPORTS....Continued

Block 10 – WORK UNIT NUMBER (Leave blank)

Block 11 – CONTRACT OR GRANT NUMBER

DTNH22-0X-D-12345

Block 12 – SPONSORING AGENCY NAME AND ADDRESS

US Department of Transportation
National Highway Traffic Safety Administration
Office of Vehicle Safety Compliance (NVS-220)
1200 New Jersey Ave. S.E.
Washington, DC 20590

Block 13 – TYPE OF REPORT AND PERIOD COVERED

Final Test Report
Feb. 15 to Mar. 15, 200X

Block 14 – SPONSORING AGENCY CODE

NVS-220

Block 15 – SUPPLEMENTARY NOTES (Leave blank)

Block 16 – ABSTRACT

A 32 km/h (20 mph), 75° oblique impact compliance test was conducted on the subject 200X Ace Super 4-door sedan in accordance with the specifications of the Office of Vehicle Safety Compliance TP-214P-0X for the determination of FMVSS No. 214 Side Impact Protection compliance. The test was conducted at the ABC Laboratories facility in Detroit, Michigan, on November 15, 200X.

13. REPORTS....Continued

The impact velocity was 31.5 km/h, and the ambient temperature at the struck side of the test vehicle at the time of impact was 28°C. The test vehicle post test maximum crush was 250 mm at level 3. The test vehicle's performance follows:

ES-2re 50th male dummy in driver's seat	
HIC	400
Left Upper Rib Defl. (mm)	37
Left Middle Rib Defl. (mm)	38
Left Lower Rib Defl. (mm)	38
Sum of Abd. Forces (kN)	2.0
Pubic Symphysis force (kN)	4.0

The doors on the struck side of the vehicle did not separate from the body at the hinges or latches and the opposite side doors did not open during side impact event.

Block 17 – KEY WORDS

Compliance Testing
Side Impact Protection
FMVSS 214
Part 572 Dummy

Block 18 – DISTRIBUTION STATEMENT

Copies of this report are available from--

National Highway Traffic Safety Administration
Technical Information Services (TIS)
Room E12-100 East Bldg.
1200 New Jersey Ave.
Washington, DC 20590
Telephone No. (202) 366-2588

13. REPORTS....Continued

Block 19 – SECURITY CLASSIFICATION OF REPORT

Unclassified

Block 20 – SECURITY CLASSIFICATION OF PAGE

Unclassified

Block 21 – NUMBER OF PAGES

Add appropriate number

Block 22 – PRICE (Leave blank)

D. TABLE OF CONTENTS

Final test report Table Of Contents shall include the following:

Section 1 – Purpose of Compliance Test

Section 2 – Summary of Test Results

Section 3 – Pre-Test Dummy and Vehicle Data

Section 4 – Post Test Dummy and Vehicle Data

Appendix A – Photographs

Appendix B – Vehicle and Dummy Response Data Plots

Appendix C – Dummy Configuration and Performance Verification Data

Appendix D – Test Equipment List and Calibration Information

13. REPORTS....Continued

SECTION 1 – PURPOSE OF COMPLIANCE TEST

This section briefly outlines the purpose for conducting the side impact test and states the appropriate test procedure followed during the test. The following is provided as an example;

This side impact test is part of the FY__ FMVSS 214 Side Impact Protection Compliance Test Program sponsored by the National Highway Traffic Safety Administration (NHTSA), under contract No. _____. The purpose of this test was to evaluate side impact protection in a (description of vehicle being tested). The side impact test was conducted in accordance with the Office of Vehicle Safety Compliance's Laboratory Test Procedure (TP-214P-_____, dated _____, 200_).

NOTE: This section should be double-spaced and requires an entire separate page.

SECTION 2 – SUMARY OF TEST RESULTS

This section gives a brief summary of the side impact event. The following is an example of the content needed in this section;

A rigid pole side impact test was conducted on a 200x Ace Super 4-door sedan. The subject vehicle was towed into the rigid pole at an angle of ___ and a velocity of ____. The test was conducted by the ABC Laboratories in Detroit, Michigan, on November15, 200X. Pre-test and post test photographs of the test vehicle and side impact dummy are included in Appendix A of this report.

One Part 572_ dummy was placed in the (left/right) front outboard designated seating position according to instructions specified in TP-214P-__ dated _____. The side impact event was documented by ___ cameras.

The Part 572_ Dummy was instrumented accordingly;

Head CG triaxial accelerometers
…..
…..
……

Appendix B contains the vehicle and dummy response data. A summary of the side impact configuration and performance verification test data is shown in Appendix C. Dummy and vehicle instrumentation calibration data can be found in Appendix D of this report.

The following table summarized the results of the test;

13. REPORTS....Continued

	HIC (36ms)	Thorax Defl. (mm)	Sum of Abd. Forces (kN)	Pubic Symphysis Force (kN)
ES-2re 50th percentile male	400	Upr = 37	2.0	4.0
		Mid = 38		
		Lwr = 38		

SECTION 3 – PRE-TEST DUMMY AND VEHICLE DATA

This section requires the reporting of all information found in the following Data Sheets;

Data Sheet No. 1 – General Test and Vehicle Parameter Data
Data Sheet No. 2 – Seat Adjustment, Fuel Systems and Steering Wheel Data
Data Sheet No. 3 – Dummy Longitudinal Clearance Dimensions
Data Sheet No. 4 – Dummy Lateral Clearance Dimensions
Data Sheet No. 5 – High Speed Camera Data
Data Sheet No. 6 – Vehicle Accelerometer Data

SECTION 4 – POST TEST DUMMY AND VEHICLE DATA

This section requires the reporting of all information found in the following Data Sheets;

Data Sheet No. 7 – Dummy Injury Response Data
Data Sheet No. 8 – Posttest Observations
Data Sheet No. 9 – Vehicle Profile Measurements
Data Sheet No. 10 – Exterior Crush Measurements

13. REPORTS....Continued

APPENDIX A – PHOTOGRAPHS

The following photographs shall be included in this appendix;

TABLE OF PHOTOGRAPHS

13. REPORTS....Continued

APPENDIX B – VEHICLE AND DUMMY RESPONSE DATA PLOTS
Appendix B includes vehicle and dummy data plots.

APPENDIX C – DUMMY CONFIGURATION AND PERFORMANCE VERIFICATION DATA
Appendix C includes all of the dummy pre and posttest calibration data tables and corresponding data plots.

APPENDIX D – TEST EQUIPMENT LIST AND CALIBRATION INFORMATION
Appendix D includes a list of all of the equipment and instrumentation used during the test with calibration dates.

14. DATA SHEETS

The data sheets are provided as templates for documenting test data in the Final Test Report format outlined in the previous section. The Contractor is not restricted from using other data sheets or expanding the data sheets provided herein. However, all of the information required to fill-in the following data sheets shall be included in the final report in the format prescribed.

14. DATA SHEETS…..Continued

DATA SHEET No.1
GENERAL TEST AND VEHICLE PARAMETER DATA

TEST VEHICLE INFORMATION:
Year/Make/Model/BodyStyle:_____
Body Color _____ VIN:_____
NHTSA No.:_____ Build Date:_____
ENGINE DATA: _____ cylinders _____ CID _____ Liter ____ cc
Engine Placement : ___ longitudinal; or ___ lateral
TRANSMISSION: ____ speed ____ manual ____ automatic ____ overdrive
FINAL DRIVE: ____ rear wheel drive ____ front wheel drive ____ 4 WD
ODOMETER READING: ____ km.
SAFETY RESTRAINTS:_____
OPTIONS: ___ A/C ___ power steering ___ power brakes ___ power windows

DATA FROM TIRE SIDEWALL;
Size of the tires on test vehicle: _____ Manufacturer:_____
Tire Pressure for Max. Load Carrying Capacity: ____ kPa Front; ____ kPa Rear
Treadwear: _____; Traction:_____; Temperature:_____;

DATA RECORDED FROM VEHICLE PLACARD OR OPTIONAL TIRE LABEL:
Recommended Tire Size:_____
Recommended Cold Tire Pressure: ____ kPa Front; ____ kPa Rear

VEHICLE CAPACITY DATA:
Number of Occupants: ____ front ____ rear ____ Total
Type of Front Seat(s): ____ buckets ____ bench ____ split bench
Type of Rear Seat: ____ bucket ____ bench ____ contoured
Type of Front Seat Back: ____ fixed ____ adjustable with ___ lever or ___ knob
Type of Rear Seat Back: ____ fixed ____ adjustable with ___ lever or ___ knob

Vehicle Capacity Weight (VCW) = ____ kg. (A)
Designated Seating Capacity (DSC) X 68.04 kg. = ____ kg. (B)
Rated Cargo and Luggage Weight (RCLW) (A-B) = ____ kg.

AS DELIVERED WEIGHT (WITH MAXIMUM FLUIDS):

Right Front =	_____ kg.	Right Rear =	____ kg.
Left Front =	_____ kg.	Left Rear =	____ kg.
Total Front =	_____ kg.	Total Rear =	____ kg.

TOTAL WEIGHT= _____ kg.

% of Total weight in Front = _____ % of Total weight in Rear =_____

14. DATA SHEETS....Continued

DATA SHEET No.1
GENERAL TEST VEHICLE PARAMETER DATA

CALCULATION OF TEST VEHICLE TARGET WEIGHT:

As Delivered Test Weight (with Maximum Fluids) = ____ kg. (A)
Maximum Cargo Carrying Capacity of Test Vehicle = ____ kg. (B)
Weight of Dummy = ____ kg. (C)

TEST VEHICLE TARGET WEIGHT: = ____kg. (A+B+C)

FULLY LOADED WEIGHT:

Right Front = _____ kg. Right Rear = ____ kg.
Left Front = _____ kg. Left Rear = ____ kg.
Total Front = _____ kg. Total Rear = ____ kg.

TOTAL WEIGHT = _____ kg.

% of Total weight in Front = _____ % of Total weight in Rear =____

AS TESTED WEIGHT

Right Front = _____ kg. Right Rear = ____ kg.
Left Front = _____ kg. Left Rear = ____ kg.
Total Front = _____ kg. Total Rear = ____ kg.

Total Weight of Ballast = _____kg.
Total Weight of Vehicle components that were removed = _____kg.

TOTAL VEHICLE WEIGHT = _____ kg.

% of Total weight in Front = _____ % of Total weight in Rear = _____

TEST VEHICLE ATTITUDE:

Degree	As Delivered	As Tested	Fully Loaded
Right Door Sill Angle			
Left Door Sill Angle			
Front Bumper			
Rear Bumper			

LOCATION OF IMPACT REFERENCE LINE

Total Vehicle Length:
Right Side = ____ mm Left Side = ____ mm Centerline = ____ mm
Test Vehicle Wheelbase = _____ mm
Impact Reference Line is _____ mm rearward of front axle centerline

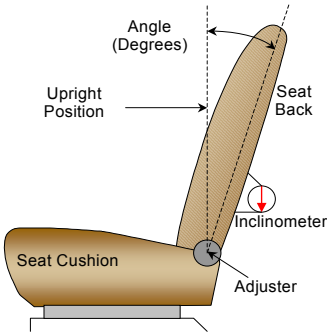
14. DATA SHEETS....Continued

DATA SHEET No. 2
SEAT ADJUSTMENT, FUEL SYSTEMS AND STEERING WHEEL DATA

Year /Make/Model/BodyStyle:_____NHTSA NO.:_____;

NORMAL DESIGN RIDING POSITION

Describe how the driver seat was positioned to the manufacturer's designated seating angle._____
_____



FRONT SEAT ASSEMBLY

Driver seat back angle: _____
Passenger seat back angle: _____

SEAT FORE/AFT POSITIONS

Describe the fore and aft operation of the front and rear seats and explain how the seats were set to the mid position:_____
_____
_____

Driver seat fore/aft total travel: _____
Passenger seat fore/aft total travel: _____
Driver seat fore/aft position: _____
Passenger seat fore/aft position: _____

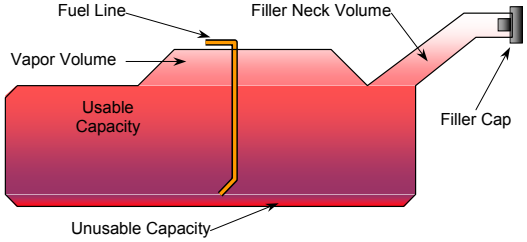
SEAT BELT UPPER ANCHORAGE

Describe the seat belt upper anchorages and explain how they are positioned
_____
_____

FUEL TANK CAPACITY DATA

The "Usable Capacity" of the standard equipment fuel tank is: _____liters
The "Usable Capacity" of any optional equipment fuel tank is: _____liters
92-94% of "Usable Capacity" for certification to FMVSS 301 requirements:_____liters
Actual amount of Stoddard solvent added to vehicle for certification test: _____liters

The test vehicle is equipped with an electric fuel pump. The fuel filler door is located on the right rear fender.



VEHICLE FUEL TANK ASSEMBLY

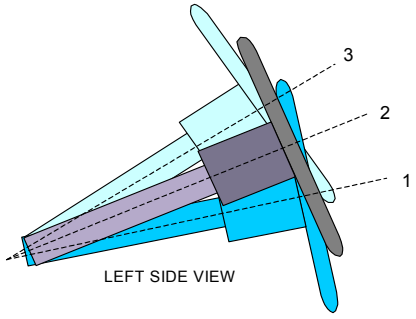
14. DATA SHEETS....Continued

DATA SHEET No. 2
SEAT ADJUSTMENT, FUEL SYSTEMS AND STEERING WHEEL DATA

STEERING COLUMN ADJUSTMENT

Describe how the steering wheel and column adjustments are made:_____
_____
_____
_____
_____
_____

Lowermost, position 1: _____
Geometric center, position 2: _____
Uppermost, position 3: _____
Telescoping steering wheel travel:_____
Test position: _____

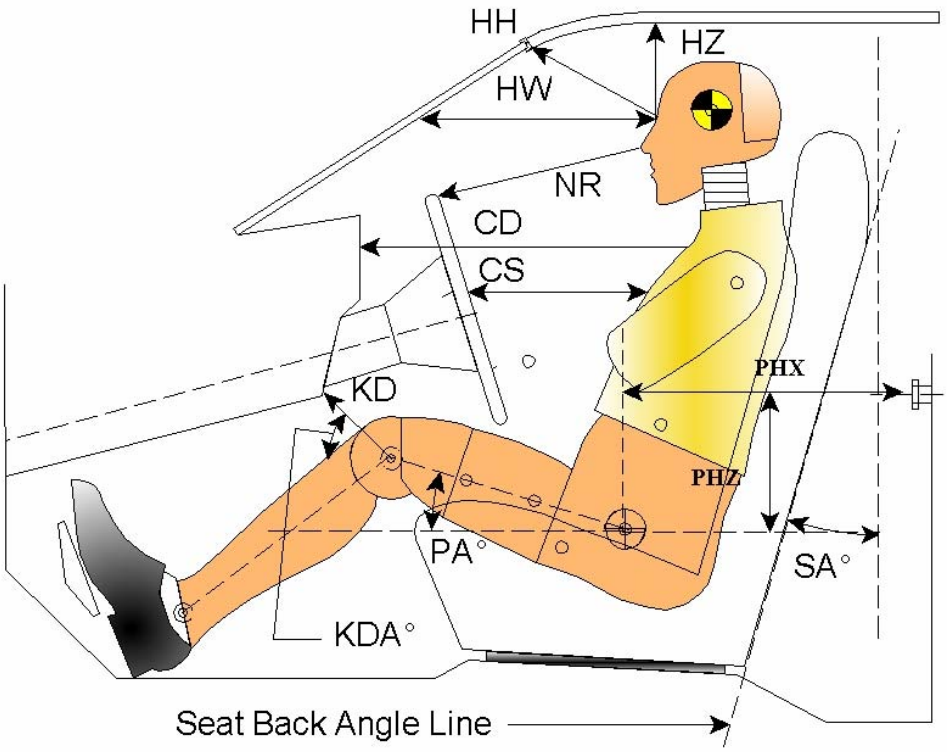


STEERING COLUMN ASSEMBLY

14. DATA SHEETS....Continued

DATA SHEET No. 3
DUMMY LONGITUDINAL CLEARANCE DIMENSIONS

TEST VEHICLE: _____ ; NHTSA NO.: _____



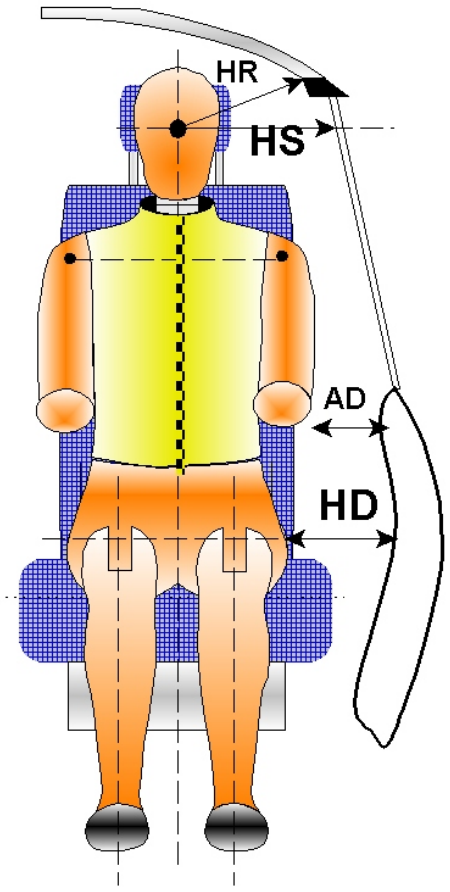
DUMMY ID#____

Measurement Description		mm / degree◦
HH	Head to Header	
HW	Head to Windshield	
HZ	Head to Roof	
CS	Steering Wheel to Chest	
CD	Chest to Dash	
NR	Nose to Rim	
KDL/KDAL	Left Knee to Dashboard	
KDR/KDAR	Right Knee to Dashboard	
PHX	H-Point to Striker (X)	
PHZ	H-Point to Striker (Z)	
PA◦	Pelvic Angle	
SA◦	Seat Back Angle	

14. DATA SHEETS....Continued

DATA SHEET No. 4
DUMMY LATERAL CLEARANCE DIMENSIONS

TEST VEHICLE: _____ ; NHTSA NO.: _____



DUMMY ID# _____

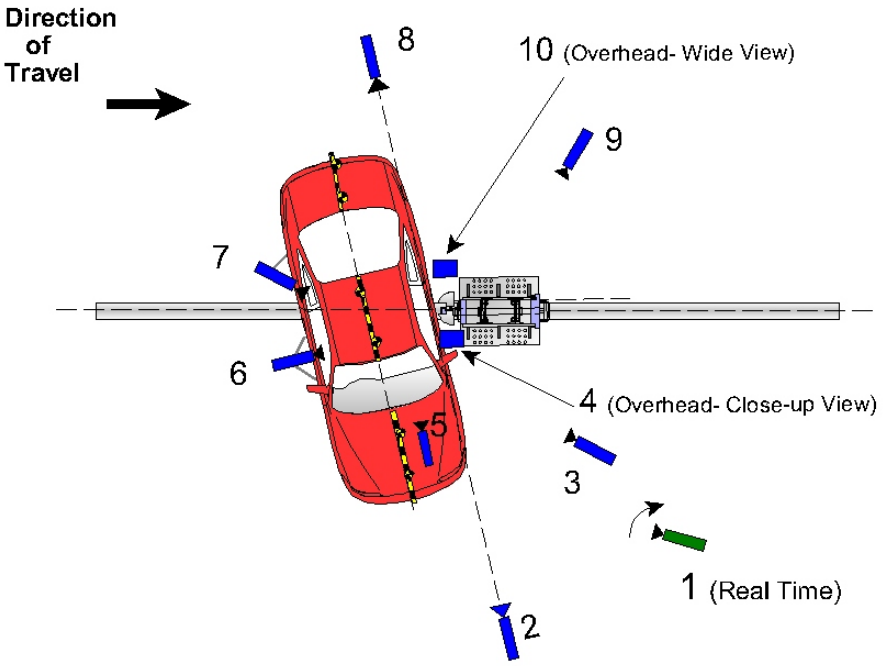
Measurement Description		mm
HR	Head To Side Header	
HS	Head to Side Window	
AD	Arm to Door	
HD	H-Point to Door	

14. TEST DATA....Continued

DATA SHEET No. 5
HIGH SPEED CAMERA LOCATIONS AND DATA

TEST VEHICLE: _____ ; NHTSA NO.: _____

Camera Locations



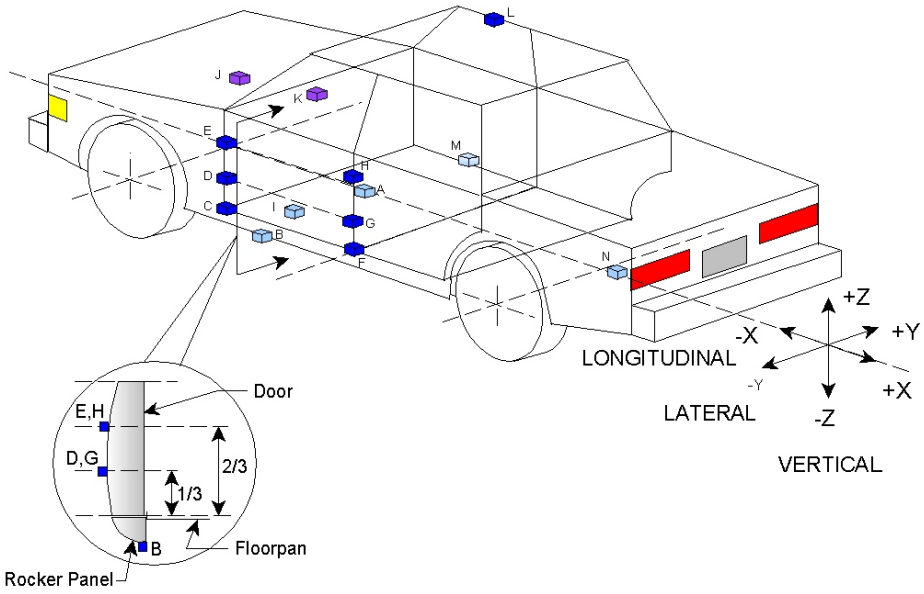
REFERENCE (from Point of Impact): + X = Rearward, + Y = To Right, + Z = Up
* All measurements accurate to ± 6 mm.

CAMERA No.	VIEW	COORDINATES (mm)			LENS (mm)	FILM SPEED (fps)
		X*	Y*	Z*		
1	Real time (24 fps) film coverage of test					
2	Front ground level - impact view					
3	Impact side 45* - forward pole view					
4	Overhead Close-up view of impact					
5	Onboard – dummy front view					
6	Onboard – dummy side view					
7	Onboard – dummy rear view					
8	Rear ground level – impact view					
9	Impact side 45º - rearward pole view					
10	Overhead wide-view of impact					

14. TEST DATA....Continued

DATA SHEET No. 6
VEHICLE ACCELEROMETER DATA
(Left-side Impact)

TEST VEHICLE: _____ ; NHTSA NO.: _____



	Accelerometer Location				Peak Values (g's)				
	ID	Coordinates (mm)			Axis	Max	Time	Min	Time
		X	Y	Z					
A	Vehicle CG				X				
					Y				
					Z				
					RES				
B	Left Floor Sill				Y				
C	A Pillar Sill				Y				
D	A Pillar Low				Y				
E	A Pillar Mid				Y				
F	B Pillar SIII				Y				
G	B Pillar Low				Y				
H	B Pillar Mid				Y				
I	Driver Seat				Y				
L	Engine				X				
					Y				
J	Firewall				Y				
K	Right Roof				Y				
M	Right Floor				Y				
N	Rear Deck				X				
					Y				

14. DATA SHEETS....Continued

DATA SHEET No. 7
DUMMY INJURY RESPONSE DATA (for ES-2re)

TEST VEHICLE: _____ ; NHTSA NO.: _____

	DUMMY ID#____			
	Positive		Negative	
	MAX	TIME (ms)	MAX	TIME (ms)
HEAD ACCELERATION (g)				
Longitudinal (X)				
Lateral (Y)				
Vertical (Z)				
Resultant (R)				
HIC 36 (t1, t2)				
THORAX – Deflection (mm)				
Upper Rib				
Middle Rib				
Lower Rib				
ABDOMINAL FORCES (N)				
Front				
Middle				
Rear				
SUM				
PELVIS FORCE (N)				
Pubic Symphysis				

REFERENCE:

Positive Direction:	Longitudinal (X) =	Rearward
	Lateral (Y) =	To Right
	Vertical (Z) =	Up
Negative Direction:	Longitudinal (X) =	Forward
	Lateral (Y) =	To Left

14. DATA SHEETS....Continued

DATA SHEET No. 7
DUMMY INJURY RESPONSE DATA (for SID-IIs)

TEST VEHICLE: _____ ; NHTSA NO.: _____

	DUMMY ID#____			
	Positive		Negative	
	MAX	TIME (ms)	MAX	TIME (ms)
HEAD ACCELERATION (g)				
Longitudinal (X)				
Lateral (Y)				
Vertical (Z)				
Resultant (R)				
HIC 36 (t1, t2)				
LOWER SPINE (g)				
Longitudinal (X)				
Lateral (Y)				
Vertical (Z)				
Resultant (R)				
PELVIS FORCE (N)				
Acetabular				
Iliac				

REFERENCE:

Positive Direction:	Longitudinal (X) =	Rearward
	Lateral (Y) =	To Right
	Vertical (Z) =	Up
Negative Direction:	Longitudinal (X) =	Forward
	Lateral (Y) =	To Left
	Vertical (Z) =	Down

14. DATA SHEETS....Continued

DATA SHEET No. 8
POST TEST OBSERVATIONS

TEST VEHICLE: _____ ; NHTSA NO.:_____

DUMMY CONTACT WITH VEHICLE INTERIOR

Body Part	Vehicle Interior contact area(s)
Head	
Upper Torso	
Lower Torso	
Left Knee	
Right Knee	

POST TEST DOOR OPENING DATA AND SEAT TRACK MOVEMENT

Description	Front	Rear
Left Side Door Opening		
Right Side Door Opening		
Seat Movement (mm)		
Seat Back Failure		

POST TEST STRUCTURAL OBSERVATIONS

Critical Areas of Performance	Observations and Conclusions
Pillar Performance	
Sill Separation	
Windshield Damage	
Window Damage	
Other Notable Effects	

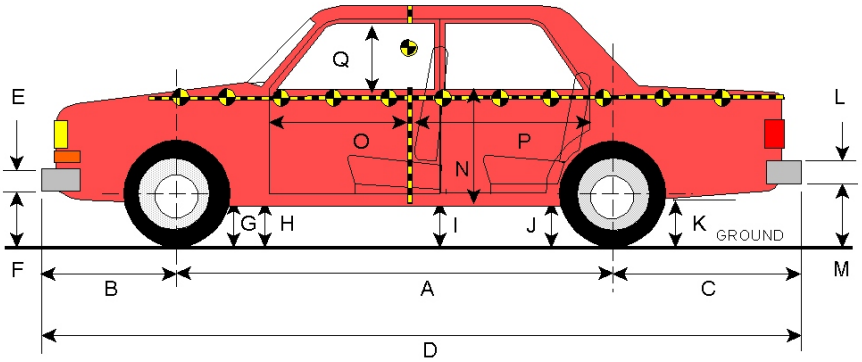
AIR BAG DEPLOYMENT STATUS
Curtain_____ (Yes/No) Thorax/Torso (Yes/No) _____ Frontal ____ (Yes/No)
Other_____ (Yes/No)

Actual Impact Point
Actual Impact Point = _____ mm [rearward or forward] of nominal impact ref. line
as measured horizontally.

14. DATA SHEETS….Continued

DATA SHEET No. 9
VEHICLE PROFILE MEASUREMENTS

TEST VEHICLE: _____ ; NHTSA NO.: _____

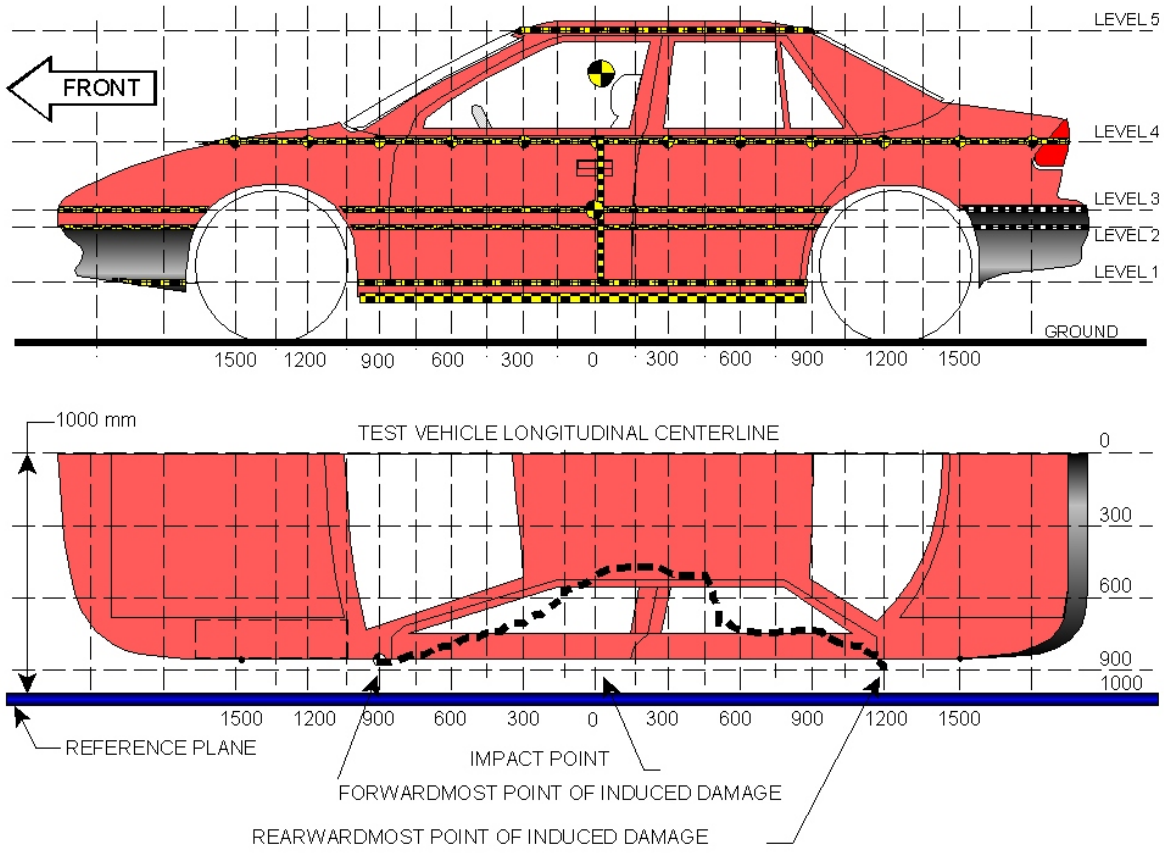


IMPACT SIDE
VIEW

	PRETEST (As Tested)	POST TEST	Δ CHANGE
A			
B			
C			
D			
E			
F			
G			
H			
I			
J			
J			
K			
L			
M			
N			
O			
P			
Q			

14. TEST DATA....Continued

DATA SHEET No. 10
VEHICLE EXTERIOR CRUSH MEASUREMENTS



NOTE: All measurements are in millimeters (mm)

LEVEL 5 @ Window Top	_____ mm
LEVEL 4 @ Window Sill	_____ mm
LEVEL 3 @ Mid Door	_____ mm
LEVEL 2 @ Occupant H-Point	_____ mm
LEVEL 1 @ Sill Top Height	_____ mm

14. TEST DATA....Continued

TEST VEHICLE: _____ ; NHTSA NO.: _____

DATA SHEET No. 10
VEHICLE EXTERIOR CRUSH MEASUREMENTS

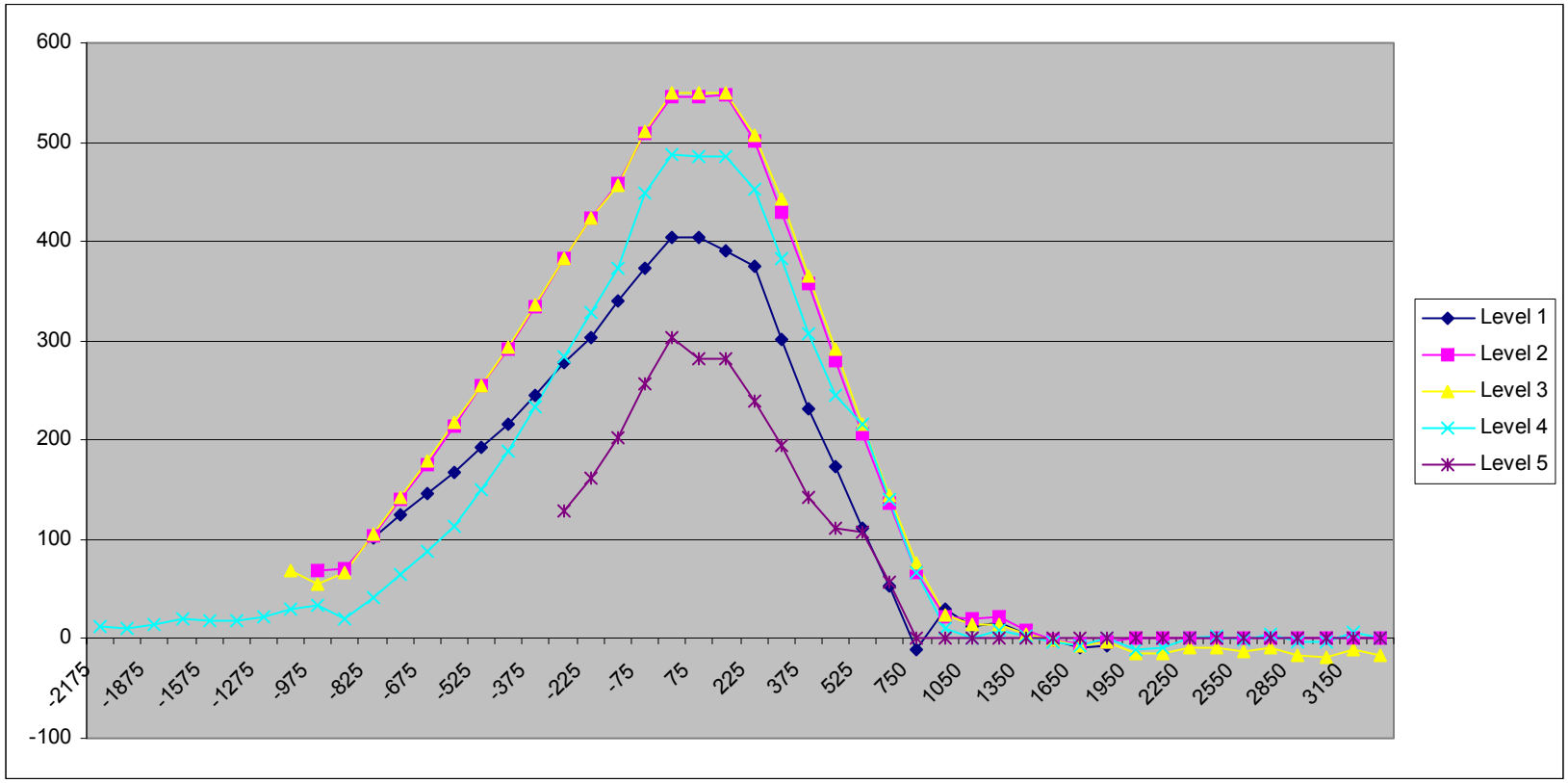
Location	Height		-900	-750	-600	-450	-300	0	150	300	450	600	750	900	1050	1200
Level 1 Side Sill		Pre														
		Post														
		Crush														
Level 2 H-Point		Pre														
		Post														
		Crush														
Level 3 Mid - Door		Pre														
		Post														
		Crush														
Level 4 Window Sill		Pre														
		Post														
		Crush														
Level 5 Window Top		Pre														
		Post														
		Crush														

Location	Height		1350	1500	1650	1800	1950	2100	2250	2400	2550	2700	2850
Level 1 Side Sill		Pre											
		Post											
		Crush											
Level 2 H-Point		Pre											
		Post											
		Crush											
Level 3 Mid - Door		Pre											
		Post											
		Crush											
Level 4 Window Sill		Pre											
		Post											
		Crush											
Level 5 Window Top		Pre											
		Post											
		Crush											

14. TEST DATA....Continued

TEST VEHICLE: _____ ; NHTSA NO.: _____

DATA SHEET No. 10
VEHICLE EXTERIOR CRUSH MEASUREMENTS



Maximum Static Crush (mm) Level 1 ____ Level 2 ____ Level 3____ Level 4____ Level 5 ____

15. LABORATORY NOTICE OF TEST FAILURE FORM

This form may be used to report a test failure.

LABORATORY NOTICE OF TEST FAILURE

FMVSS: 214, SIDE IMPACT PROTECTION TEST DATE:_____

LABORATORY:_____

CONTRACT NO.: _____; DELV. ORDER NO.:_____

LAB. PROJECT ENGINEER'S NAME:_____

VEH. MY/MAKE/MODEL:_____

VEH. BODY STYLE: _____; BUILD DATE:_____

VEH. NHTSA NO.: _____; VIN:_____

DUMMY #: _____ ;

TEST FAILURE DESCRIPTION:_____

_____

_____

S214 REQUIREMENT, PARAGRAPH §_____

NOTIFICATION TO NHTSA (COTR):_____

DATE: _____ BY: _____

REMARKS:

Appendix A

SIDIIs Calibration Test Procedure

(TBD)

[Intentionally Blank]

Pending agency's resolution of dummy rule petitions for reconsideration

Appendix B

ES-2re Calibration Test Procedure

(TBD)

[Intentionally Blank]

Pending agency's resolution of dummy rule petitions for reconsideration

Appendix C

Positioning Dummies in the Test Vehicle

ES-2re 50th Percentile Male Dummy in the Driver or Front Outboard Seating Position

A. UPPER TORSO

(1) The plane of symmetry of the dummy coincides with the vertical median plane of the specified seating position.

(2) Bend the upper torso forward and lay against the seat back. Set the shoulders of the dummy fully rearward.

B. PELVIS

(1) Position the pelvis of the dummy such that a lateral line passing through the dummy H-points is perpendicular to the longitudinal center plane of the seat. The line through the dummy H-points is horizontal with a maximum inclination of ± 2 degrees. The dummy may be equipped with tilt sensors in the thorax and the pelvis. These instruments can help to obtain the desired position.

(2) The correct position of the dummy pelvis may be checked relative to the H-point of the H-point Manikin by using the M3 holes in the H-point back plates at each side of the ES-2re pelvis. The M3 holes are indicated with "Hm". The "Hm" position should be in a circle with a radius of 10 mm (0.39 inches) round the H-point of the H-point Manikin

C. ARMS

Driver’s Seat and Front Outboard Seat - place the dummy’s upper arms such that the angle between the projection of the arm centerline on the mid-sagittal plane of the dummy and the torso reference line is 40°± 5°.

ES-2re 50TH Percentile Male Dummy in the Driver or Front Outboard Seating Position

D. LEGS, THIGHS and FEET

(1) Driver's Seat

Without inducing pelvis or torso movement, place the right foot of the dummy on the un-pressed accelerator pedal with the heel resting as far forward as possible on the floor pan. Set the left foot perpendicular to the lower leg with the heel resting on the floor pan in the same lateral line as the right heel. Set the knees of the dummy such that their outside surfaces are 150 ± 10 mm (5.9 ± 0.4 inches) from the plane of symmetry of the dummy. If possible within these constraints, place the thighs of the dummy in contact with the seat cushion.

(2) Front Outboard Seat

Without inducing pelvis or torso movement, place the heels of the dummy as far forward as possible on the floor pan without compressing the seat cushion more than the compression due to the weight of the leg. Set the knees of the dummy such that their outside surfaces are 150 ± 10 mm (5.9 ± 0.4 inches) from the plane of symmetry of the dummy.

SID-IIs 5th Percentile Female in the Driver's Seat

Adjust the dummy's neck bracket to align the zero degree index marks.

(1) Fully recline the seat back, if adjustable. Install the dummy into the driver's seat, such that when the legs are positioned 120 degrees to the thighs, the calves of the legs are not touching the seat cushion

(2) Bucket seats. Center the dummy on the seat cushion so that its mid-sagittal plane is vertical and passes within ± 10 mm (± 0.4 in) of the SgRP.

(3) Bench seats. Position the mid-sagittal plane of the dummy vertical and parallel to the vehicle's longitudinal centerline and aligned within ± 10 mm (± 0.4 in) of the center of the steering wheel rim.

(4) Hold the dummy's thighs down and push rearward on the upper torso to maximize the dummy's pelvic angle.

(5) Place the legs at 120 degrees to the thighs. Set the initial transverse distance between the longitudinal centerlines at the front of the dummy's knees at 160 to 170 mm (6.3 to 6.7 in), with the thighs and legs of the dummy in vertical planes. Push rearward on the dummy's knees to force the pelvis into the seat so there is no gap between the pelvis and the seat back or until contact occurs between the back of the dummy's calves and the front of the seat cushion.

(6) Gently rock the upper torso relative to the lower torso laterally in a side to side motion three times through a ± 5 degree arc (approximately 51 mm (2 in) side to side).

(7) If needed, extend the legs slightly so that the feet are not in contact with the floor pan. Let the thighs rest on the seat cushion to the extent permitted by the foot movement. Keeping the leg and the thigh in a vertical plane, place the foot in the vertical longitudinal plane that passes through the centerline of the accelerator pedal. Rotate the left thigh outboard about the hip until the center of the knee is the same distance from the mid-sagittal plane of the dummy as the right knee ± 5 mm (± 0.2 in). Using only the control that moves the seat fore and aft, attempt to return the seat to the full forward position. If either of the dummy's legs first contacts the steering wheel, then adjust the steering wheel, if adjustable, upward until contact with the steering wheel is avoided. If the steering wheel is not adjustable, separate the knees enough to avoid steering wheel contact. Proceed with moving the seat forward until either the leg contacts the vehicle interior or the seat reaches the full forward position.

(The right foot may contact and depress the accelerator and/or change the angle of the foot with respect to the leg during seat movement.) If necessary to avoid contact with the vehicle's brake or clutch pedal, rotate the test dummy's left foot about the leg. If there is still interference, rotate the left thigh outboard about the hip the minimum distance necessary to avoid pedal interference. If a dummy leg contacts the vehicle interior before the full forward position is attained, position the seat at the next detent where there is no contact. If the seat is a power seat, move the seat fore and aft to avoid contact while assuring that there is a maximum of 5 mm (0.2 in) distance between the vehicle interior and the point on the dummy that would first contact the vehicle interior. If the steering wheel was moved, return it to the mid-position. If the steering wheel contacts the dummy's leg(s) prior to attaining this position, adjust it to the next higher detent, or if infinitely adjustable, until there is 5 mm (0.2 in) clearance between the wheel and the dummy's leg(s).

(8) For vehicles without adjustable seat backs, adjust the lower neck bracket to level the head as much as possible. For vehicles with adjustable seat backs, while holding the thighs in place, rotate the seat back forward until the transverse instrumentation platform of the head is level to within ± 0.5 degree, making sure that the pelvis does not interfere with the seat bight. Inspect the abdomen to ensure that it is properly installed. If the torso contacts the steering wheel, adjust the steering wheel in the following order until there is no contact: telescoping adjustment, lowering adjustment, raising adjustment. If the vehicle has no adjustments or contact with the steering wheel cannot be eliminated by adjustment, position the seat at the next detent where there is no contact with the steering wheel. If the seat is a power seat, position the seat to avoid contact while assuring that there is a maximum of 5 mm (0.2 in) distance between the steering wheel and the point of contact on the dummy.

(9) If it is not possible to achieve the head level within ± 0.5 degrees, minimize the angle.

(10) Measure and set the dummy's pelvic angle using the pelvic angle gage. The angle shall be set to 20.0 degrees ± 2.5 degrees. If this is not possible, adjust the pelvic angle as close to 20.0 degrees as possible while keeping the transverse instrumentation platform of the head as level as possible.

SID-IIs 5th Percentile Female in the Driver's Seat

(11) If the dummy is contacting the vehicle interior after these adjustments, move the seat rearward until there is a maximum of 5 mm (0.2 in) between the contact point of the dummy and the interior of the vehicle or if it has a manual seat adjustment, to the next rearward detent position. If after these adjustments, the dummy contact point is more than 5 mm (0.2 in) from the vehicle interior and the seat is still not in its forwardmost position, move the seat forward until the contact point is 5 mm (0.2 in) or less from the vehicle interior, or if it has a manual seat adjustment, move the seat to the closest detent position without making contact, or until the seat reaches its forwardmost position, whichever occurs first.

Driver foot positioning.

(1) If the vehicle has an adjustable accelerator pedal, adjust it to the full forward position. If the heel of the right foot can contact the floor pan, follow the positioning procedure in (i). If not, follow the positioning procedure in (ii).

(i) Rest the right foot of the test dummy on the undepressed accelerator pedal with the rearmost point of the heel on the floor pan in the plane of the pedal. If the foot cannot be placed on the accelerator pedal, set it initially perpendicular to the leg and then place it as far forward as possible in the direction of the pedal centerline with the rearmost point of the heel resting on the floor pan. If the vehicle has an adjustable accelerator pedal and the right foot is not touching the accelerator pedal when positioned as above, move the pedal rearward until it touches the right foot. If the accelerator pedal in the full rearward position still does not touch the foot, leave the pedal in that position.

(ii) Extend the foot and lower leg by decreasing the knee flexion angle until any part of the foot contacts the undepressed accelerator pedal or the highest part of the foot is at the same height as the highest part of the pedal. If the vehicle has an adjustable accelerator pedal and the right foot is not touching the accelerator pedal when positioned as above, move the pedal rearward until it touches the right foot.

SID-IIs 5th Percentile Female in the Driver's Seat

(2) If the ball of the foot does not contact the pedal, increase the ankle plantar flexion angle such that the toe of the foot contacts or is as close as possible to contact with the undepressed accelerator pedal.

(3) If, in its final position, the heel is off of the vehicle floor, a spacer block must be used under the heel to support the final foot position. The surface of the block in contact with the heel has an inclination of 30 degrees, measured from the horizontal, with the highest surface towards the rear of the vehicle.

(4) Place the left foot on the toe-board with the rearmost point of the heel resting on the floor pan as close as possible to the point of intersection of the planes described by the toe-board and floor pan, and not on or in contact with the vehicle's brake pedal, clutch pedal, wheel-well projection or foot rest.

(5) If the left foot cannot be positioned on the toe board, place the foot perpendicular to the lower leg centerline as far forward as possible with the heel resting on the floor pan.

(6) If the left foot does not contact the floor pan, place the foot parallel to the floor and place the leg perpendicular to the thigh as possible. If necessary to avoiding contact with the vehicle's brake pedal, clutch pedal, wheel-well, or foot rest, use the three foot position adjustments listed in (i)-(iii). The adjustment options are listed in priority order, with each subsequent option incorporating the previous. In making each adjustment, move the foot the minimum distance necessary to avoid contact. If it is not possible to avoid all prohibited foot contact, priority is given to avoiding brake or clutch pedal contact:.

- (i) Rotate (abduction/adduction) the test dummy's left foot about the lower leg;
- (ii) Planar flex the foot
- (iii) Rotate the left leg outboard about the hip.

SID-IIs 5th Percentile Female in the Driver's Seat

Driver arm positioning.

Place the dummy's upper arm such that the angle between the projection of the arm centerline on the mid-sagittal plane of the dummy and the torso reference line is 40° ± 5°. The torso reference line is defined as the thoracic spine centerline. The shoulder-arm joint allows for discrete arm positions at 0, ± 40, ± 90, ± 140, and 180 degree settings where positive is forward of the spine.

SID-IIs 5th Percentile Female in the Front Outboard Seat

Torso/head/seat back angle positioning

(1) With the seat at the mid-height in the full-forward position determined in Section 11-N use only the control that primarily moves the seat fore and aft to place the seat in the rearmost position, without adjusting independent height controls. If the seat cushion reference angle automatically changes as the seat is moved from the full forward position, maintain, as closely as possible, the seat cushion reference line angle determined in Section 11-M for the final forward position when measuring the pelvic angle. The seat cushion reference line angle position may be achieved through the use of any seat or seat cushion adjustments other than that which primarily moves the seat or seat cushion fore-aft.

(2) Fully recline the seat back, if adjustable. Place the dummy into the passenger's seat, such that when the legs are positioned 120 degrees to the thighs, the calves of the legs are not touching the seat cushion.

(3) Bucket seats - Place the dummy on the seat cushion so that its mid-sagittal plane is vertical and passes through the SgRP within ± 10 mm (± 0.4 in).

(4) Bench seats - Position the mid-sagittal plane of the dummy vertical and parallel to the vehicle's longitudinal centerline and the same distance from the vehicle's longitudinal centerline, within ±10 mm (± 0.4 in) as the mid-sagittal plane of the driver dummy.

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SID-IIs 5th Percentile Female in the Front Outboard Seat

(5) Hold the dummy's thighs down and push rearward on the upper torso to maximize the dummy's pelvic angle.

(6) Place the legs at 120 degrees to the thighs. Set the initial transverse distance between the longitudinal centerlines at the front of the dummy's knees at 160 to 170 mm (6.3 to 6.7 in.), with the thighs and legs of the dummy in vertical planes. Push rearward on the dummy's knees to force the pelvis into the seat so there is no gap between the pelvis and the seat back or until contact occurs between the back of the dummy's calves and the front of the seat cushion.

(7) Gently rock the upper torso relative to the lower torso laterally in a side to side motion three times through a ± 5 degree arc (approximately 51 mm (2 in.) side to side).

(8) If needed, extend the legs slightly so that the feet are not in contact with the floor pan. Let the thighs rest on the seat cushion to the extent permitted by the foot movement. With the feet perpendicular to the legs, place the heels on the floor pan. If a heel will not contact the floor pan, place it as close to the floor pan as possible. Using only the control that primarily moves the seat fore and aft, attempt to return the seat to the full forward position. If a dummy leg contacts the vehicle interior before the full forward position is attained, position the seat at the next detent where there is no contact. If the seats are power seats, position the seat to avoid contact while assuring that there is a maximum of 5 mm (0.2 in.) distance between the vehicle interior and the point on the dummy that would first contact the vehicle interior.

(9) For vehicles without adjustable seat backs, adjust the lower neck bracket to level the head as much as possible. For vehicles with adjustable seat backs, while holding the thighs in place, rotate the seat back forward until the transverse instrumentation platform of the head is level to within ± 0.5 degree, making sure that the pelvis does not interfere with the seat bight. Inspect the abdomen to ensure that it is properly installed.

(10) If it is not possible to achieve the head level within ± 0.5 degrees, minimize the angle.

SID-IIs 5th Percentile Female in the Front Outboard Seat

(11) Measure and set the dummy's pelvic angle using the pelvic angle gage. The angle shall be set to 20.0 degrees ± 2.5 degrees. If this is not possible, adjust the pelvic angle as close to 20.0 degrees as possible while keeping the transverse instrumentation platform of the head as level as possible.

(12) If the dummy is contacting the vehicle interior after these adjustments, move the seat rearward until there is a maximum of 5 mm (0.2 in.) between the contact point of the dummy and the interior of the vehicle or if it has a manual seat adjustment, to the next rearward detent position. If after these adjustments, the dummy contact point is more than 5 mm (0.2 in.) from the vehicle interior and the seat is still not in its forwardmost position, move the seat forward until the contact point is 5 mm (0.2 in.) or less from the vehicle interior, or if it has a manual seat adjustment, move the seat to the closest detent position without making contact, or until the seat reaches its forwardmost position, whichever occurs first.

Foot positioning

(1) Place the front passenger's feet flat on the toe board.

(2) If the feet cannot be placed flat on the toe board, set them perpendicular to the leg center lines and place them as far forward as possible with the heels resting on the floor pan.

(3) Place the rear seat passenger's feet flat on the floor pan and beneath the front seat as far as possible without front seat interference.

Arm positioning

Place the dummy's upper arm such that the angle between the projection of the arm centerline on the mid-sagittal plane of the dummy and the torso reference line is 40° ± 5°. The torso reference line is defined as the thoracic spine centerline. The shoulder-arm joint allows for discrete arm positions at 0, ± 40, ± 90, ± 140, and 180 degree settings where positive is forward of the spine.