

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

LABORATORY TEST PROCEDURE

FOR

REGULATION PART 581

Bumper Standard



SAFETY ASSURANCE
Office of Vehicle Safety Compliance
Room 6115, NSA-30
400 Seventh Street, SW
Washington, DC 20590

OVSC LABORATORY TEST PROCEDURE NO. 581
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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. 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

Regulation Part 581 (P581) was issued under the authority of Title I of the Motor Vehicle Information and Cost Savings Act. P581 specifies the following requirements for low speed vehicle impacts:

- A. Prohibits damage to the vehicle surfaces
- B. Incorporates the safety requirements contained in the former Federal Motor Vehicle Standard (FMVSS) No. 215
- C. Limits damage to passenger vehicle bumpers on vehicles manufactured on or after September 1, 1979
- D. Limits the impact force levels for pendulum impacts to reduce the frequency of override and under ride.

3. SECURITY

The contractor shall provide appropriate security measures to protect the OVSC test vehicles 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 from unauthorized personnel during the entire compliance-testing program. Any security problems, which arise, shall be reported by telephone to the Industrial Property Manager (IPM), Office of Contracts and Procurement, NHTSA, within 2 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 passenger car 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 supervisors.

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

4. GOOD HOUSEKEEPING

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

5. TEST SCHEDULING AND MONITORING

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

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

6. TEST DATA DISPOSITION

The contractor shall make all vehicle preliminary compliance test data available to the COTR at the test site immediately after the test. Final test data, including digital printouts and computer generated plots (if applicable), shall be furnished to the COTR within 5 working days. Additionally, the contractor shall analyze the preliminary test results as directed by the COTR.

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

7. GOVERNMENT FURNISHED PROPERTY (GFP)

ACCEPTANCE OF VEHICLE

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

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

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

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

NOTIFICATION OF COTR

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

REPORT OF VEHICLE CONDITION AT THE COMPLETION OF TESTING

CONTRACT NO.: DTNH22 - _____ DATE: _____

FROM: _____

TO: _____

The following vehicle has been subjected to compliance testing for FMVSS No. _____

The vehicle was inspected upon arrival at the laboratory for the test and found to contain all of the equipment listed below. All variances have been reported within 2 working days of vehicle arrival, by letter, to the NHTSA Industrial Property Manager (NAD-30), with a copy to the OVSC COTR. The vehicle is again inspected, after the above test has been conducted, and all changes are noted below. The final condition of the vehicle is also noted in detail.

MODEL YEAR/MAKE/MODEL/BODY STYLE: _____

NHTSA NO.: _____ BODY COLOR: _____ VIN: _____

ODOMETER READINGS: ARRIVAL - _____ miles DATE - _____

COMPLETION - _____ miles DATE - _____

PURCHASE PRICE: \$ _____ DEALER'S NAME: _____

ENGINE DATA: _____ Cylinders _____ Liters _____ Cubic Inches

TRANSMISSION DATA: _____ Automatic _____ Manual _____ No. of Speeds

FINAL DRIVE DATA: _____ Rear Drive _____ Front Drive _____ 4 Wheel Drive

TIRE DATA: Size - _____ Mfr. - _____

CHECK APPROPRIATE BOXES FOR VEHICLE EQUIPMENT:

<input type="checkbox"/>	Air Conditioning	<input type="checkbox"/>	Traction Control	<input type="checkbox"/>	Clock
<input type="checkbox"/>	Tinted Glass	<input type="checkbox"/>	All Wheel Drive	<input type="checkbox"/>	Roof Rack
<input type="checkbox"/>	Power Steering	<input type="checkbox"/>	Speed Control	<input type="checkbox"/>	Console
<input type="checkbox"/>	Power Windows	<input type="checkbox"/>	Rear Window Defroster	<input type="checkbox"/>	Driver Air Bag
<input type="checkbox"/>	Power Door Locks	<input type="checkbox"/>	Sun Roof or T-Top	<input type="checkbox"/>	Passenger Air Bag
<input type="checkbox"/>	Power Seat(s)	<input type="checkbox"/>	Tachometer	<input type="checkbox"/>	Front Disc Brakes
<input type="checkbox"/>	Power Brakes	<input type="checkbox"/>	Tilt Steering Wheel	<input type="checkbox"/>	Rear Disc Brakes
<input type="checkbox"/>	Antilock Brake System	<input type="checkbox"/>	AM/FM/Cassette Radio	<input type="checkbox"/>	Other-

LIST OTHER PERTINENT OPTIONAL EQUIPMENT ON NEXT PAGE (REMARKS SECTION)

REPORT OF VEHICLE CONDITION AT THE COMPLETION OF TESTING....Continued

REMARKS:

Equipment that is no longer on the test vehicle as noted on previous page:

Explanation for equipment removal:

Test Vehicle Condition:

RECORDED BY: _____

DATE: _____

APPROVED BY: _____

8. CALIBRATION OF TEST INSTRUMENTS

Before the contractor initiates the safety compliance test program, a test instrumentation calibration system will be implemented and maintained in accordance with established calibration practices. Guidelines for setting up and maintaining such a calibration systems are described in MIL-C-45662A, "Calibration System Requirements". The calibration system shall be set up and maintained as follows:

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

9. PHOTOGRAPHIC DOCUMENTATION

Photos, if required, shall be glossy black and white, 8 x 10 inches, and properly focused for clear images. A placard identifying the test vehicle model, vehicle NHTSA number and test date shall appear in each photograph and must be legible. Each photograph shall be labeled as to the subject matter such as "P581 Bumper Testing".

As a minimum the following photographs shall be included in EACH vehicle final test report:

- A. Vehicle's certification label
- B. Vehicle's tire information label or placard
- C. Full front view of test vehicle
- D. Full rear view of test vehicle
- E. 3/4 left front and left rear views of test vehicle
- F. 3/4 right rear and right front views of test vehicle
- G. Test vehicle's bumper impact energy absorption systems.

Obtain sufficient photographs of the following views, which will be developed in the event of a test failure.

- H. Test vehicle under hood views including engine mounts, fuel, cooling, exhaust, braking, and steering system components
- I. Test vehicle underbody views including fuel supply and return lines, vapor lines, cooling, exhaust propulsion, braking steering and suspension systems
- J. Views that show the vehicle's bumper face bar and adjacent body panels, filler panels and decorative moldings.

10. DEFINITIONS

BUMPER FACE BAR

Any component of the bumper system that contacts the impact ridge of the pendulum test device.

EFFECTIVE IMPACTING PENDULUM MASS

Equal to the mass of the block plus one-third (1/3) the mass of the support arms if the arms are of uniform cross section.

EXTERIOR VEHICLE SURFACE

Portions of a component, which are readily visible, which usually have a decorative coating or finish, applied, and which are intended to enhance vehicle appearance. Exceptions are the bumper face bar, and components and associated fasteners that directly attach the bumper face bar to the chassis frame.

FILLER PANEL

Component located between the top of the bumper face bar and the body panels that conceals and protects the components that structurally attach the bumper face bar to the chassis frame.

FIXED COLLISION BARRIER

Flat, vertical, unyielding surface with the following characteristics:

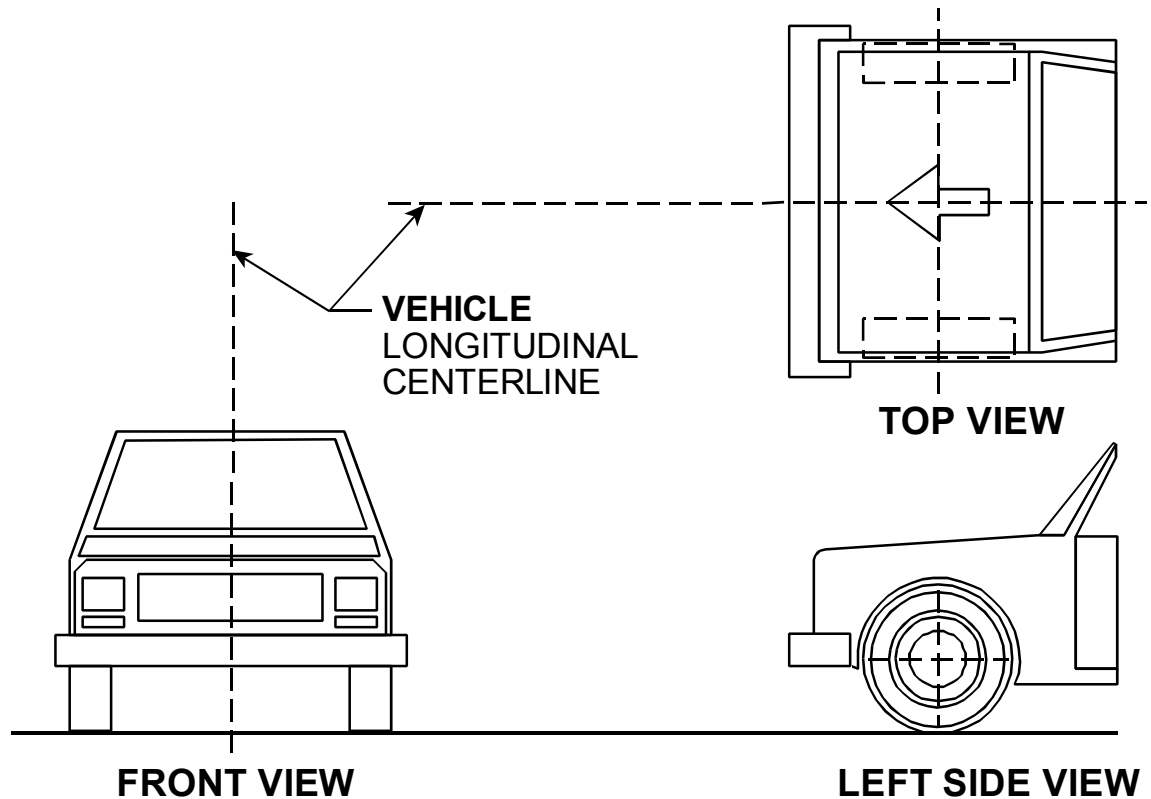
- A. Surface is sufficiently large that when struck by a tested vehicle, no portion of the vehicle projects or passes beyond the surface.
- B. Approach is a horizontal surface that is large enough for the vehicle to attain a stable attitude during its approach to the barrier, and that does not restrict vehicle motion during impact.
- C. When struck by a vehicle, the surface and its supporting structure absorb no significant portion of the vehicle's Kinetic Energy ($KE = 1/2mv^2$), so that a performance requirement described in terms of impact with a fixed collision barrier must be met no matter how small an amount of energy is absorbed by the barrier.

10. DEFINITIONS....Continued

LONGITUDINAL or LONGITUDINALLY

Parallel to the longitudinal centerline of the test vehicle.

TEST VEHICLE LONGITUDINAL CENTERLINE LOCATION



OPTICAL AXIS

Line formed by the intersection of a vertical plane parallel to the longitudinal axis of the vehicle through the filament center and a horizontal plane through the filament center.

OPTICAL CENTER

- A. For a Direct Optics Lamp, means the point of intersection of the optical axis with the normal external surface of the lens.
- B. For a Parabolic Reflector Lamp, means the point of intersection of the axis of the Parabola with the normal external surface of the lens.

10. DEFINITIONS....Continued

PENDULUM TEST DEVICE (PTD)

Test device with the following characteristics:

- A. Impacting block shall have one side contoured as specified in Figures 1 and 2. The impact ridge made of AISI steel with a minimum hardness of 30 Rockwell C.
- B. PTD shall be constructed in such a way as to maintain Plane A vertical within $\pm 0.25^\circ$ and the impact line horizontal within $\pm 0.25^\circ$ from release until the onset of rebound.
- C. Planes A and B shall be instrumented to measure the longitudinal contact force during impact tests. Capabilities shall exist for recording contact loads to at least 2500 lbs. on each contact plane. Accelerometers shall be mounted on the contact planes to compensate for inertial induced errors. A general arrangement for a representative force measurement system is presented in Figure 3. A system accuracy of ± 80 lbs. shall be demonstrated prior to the initiation of testing.
- D. Arc described by any point on the impact line shall be constant, with a minimum radius of 11 feet, and lie in a plane perpendicular to Plane A of the PTD.
- E. Test area is a flat, level, rigid concrete surface large enough to allow proper positioning of the test vehicle, and that does not restrict vehicle motion during impact.
- F. Height of the impact line from the test surface must be adjustable over the range of 15.5" to 20.5".

10. DEFINITIONS...Continued

BUMPER IMPACT BLOCK TEST DEVICE

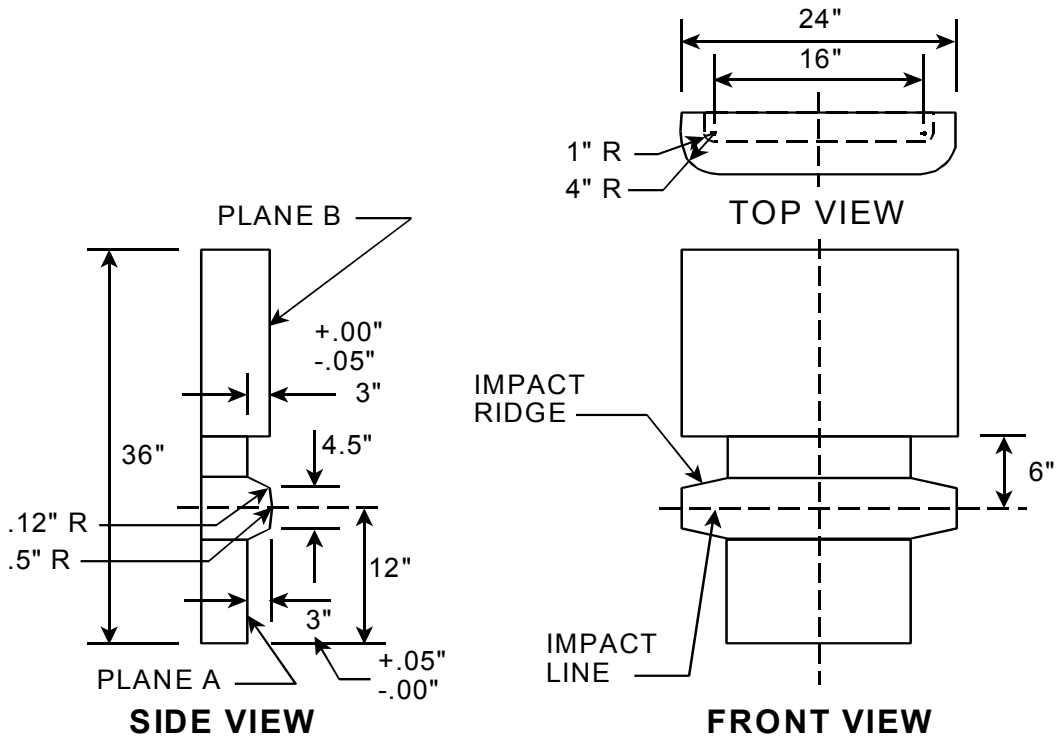


FIGURE 1

BUMPER IMPACT BLOCK TEST DEVICE

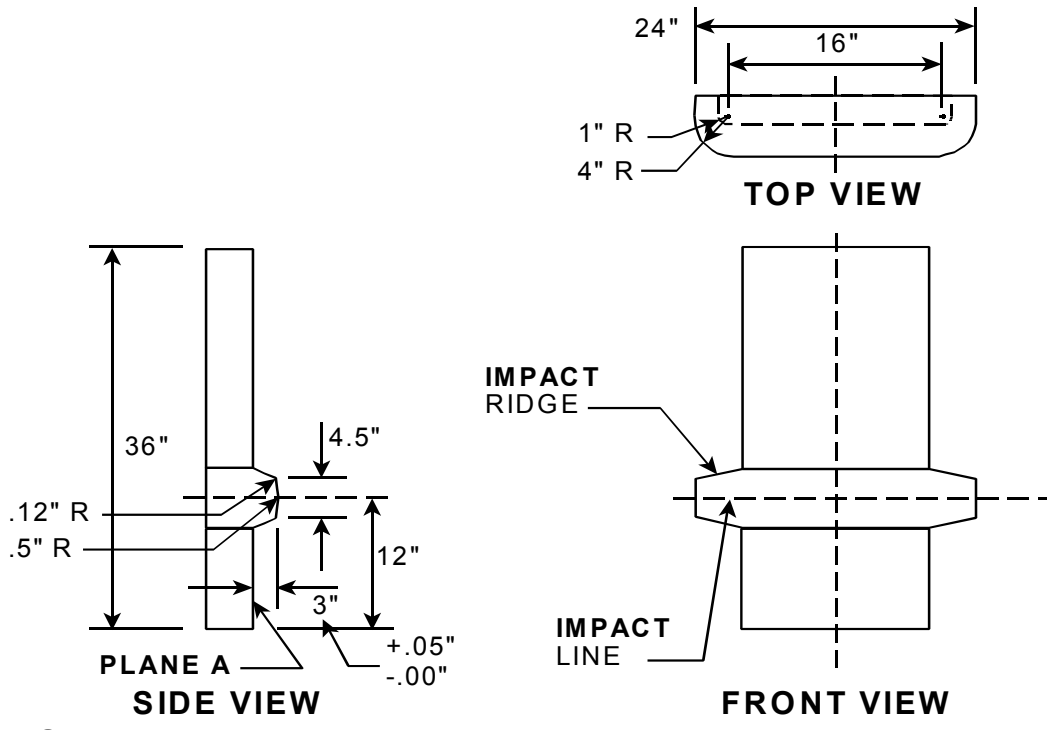


FIGURE 2

10. DEFINITIONS...Continued

BUMPER IMPACT FORCE MEASUREMENT SYSTEM

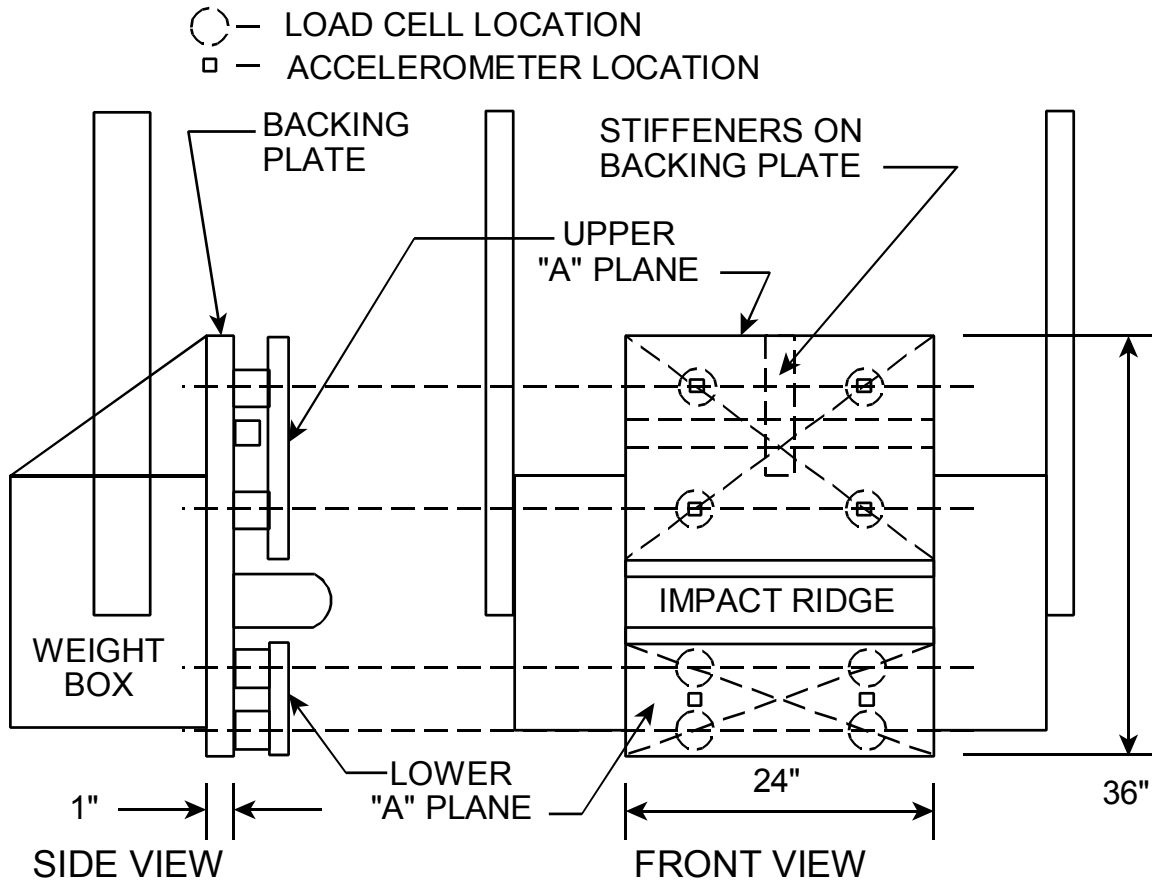


FIGURE 3

- G. Effective impacting mass of the test device shall be equal to the measured Unloaded Vehicle Weight (UVW) of the test vehicle less 40 to 90 lbs.
- H. Center of percussion of the test device shall be located on the impact line. The pendulum shall be tested as described in section 11, "Compliance Test Execution."
- I. Pendulum device shall have a suitable pullback and quick release mechanism so that there is no delay in the free fall of the pendulum.

REFLEX REFLECTOR

Optical device that reflects light emitted from an approaching vehicle back to the driver of that vehicle.

STONE SHIELD

Component located between the bottom of the bumper face bar and the body panels that conceals and protects the components that structurally attach the bumper face bar to the chassis frame.

10. DEFINITIONS...Continued

UNLOADED VEHICLE WEIGHT (UVW)

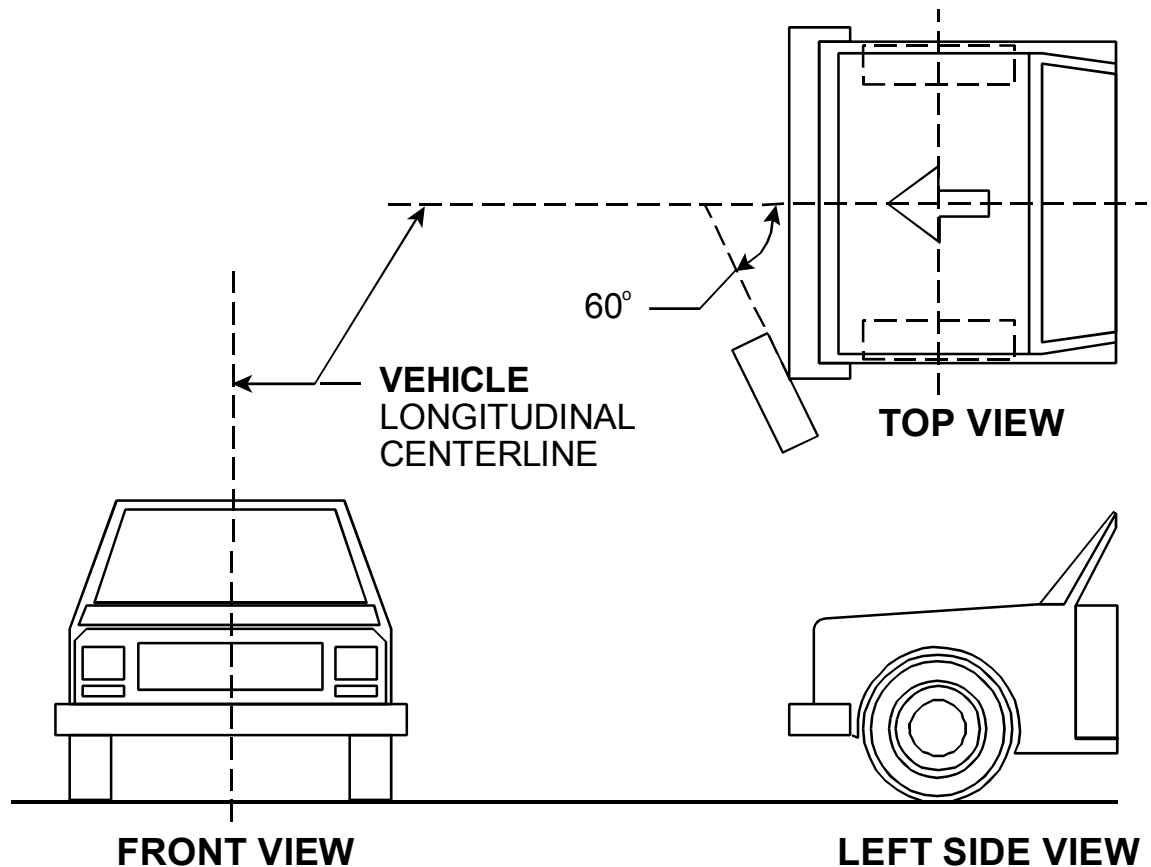
Weight of a vehicle with maximum capacity of all fluids necessary for operation of the vehicle, but without cargo or occupants.

VEHICLE CORNER

Initial contact point on the vehicle, established by contact between the vehicle and the impact ridge of the pendulum test device under the following conditions:

- A. Impact line of the test device is at the specified impact height
- B. Vehicle longitudinal centerline forms an angle of 60° with Plane A of the test device.

TEST VEHICLE CORNER INITIAL CONTACT POINT



11. PRETEST REQUIREMENTS

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

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

TEST DATA LOSS

A compliance test is not to be conducted unless all of the various test conditions specified in the applicable OVSC Laboratory TP have been met. Failure of a contractor to obtain the required test data and to maintain acceptable limits on test parameters in the manner outlined in the applicable OVSC Laboratory TP shall require a retest at the expense of the contractor. The retest costs will include the cost of the replacement vehicle or item of motor vehicle equipment and the service costs for conducting the retest. The original Government Furnished Property (GFP) will become the property of the contractor after the retest has been successfully conducted.

12. COMPLIANCE TEST EXECUTION

REQUIREMENTS

Each vehicle shall meet the following damage criteria when impacted in accordance with these procedures.

LAMPS - VISIBILITY

Each lamp or reflective device except license plate lamps shall be free of cracks and shall comply with applicable visibility requirements of S4.3.1.1 of FMVSS No. 108. The following SAE Standards give the specifications for each lighting device requiring compliance with the applicable visibility requirements of S4.3.1.1 of S108:

LAMP ASSEMBLY	SAE STANDARD	EFFECTIVE DATE	REQMT
Tail	J585e	Sep 1977	(1)
Stop	J586c	Aug 1970	(1)
Turn Signal	J588e	Sep 1970	(2)
Backup	J593c	Feb 1968	(3)
Side Marker	J592e	Jul 1972	(4)
Parking	J222	Dec 1970	(4)

The following list contains excerpts from the above referenced SAE Standards that are relevant to the requirements of this Laboratory Procedure:

- A. Visibility of the lamp shall not be obstructed by any part of the vehicle throughout the photometric test angles for the lamp. Signals from lamps on both sides of the vehicle shall be visible through a horizontal angle from 45° to the left to 45° to the right. Where more than one lamp or optical area is lighted on each side of the car, only one such area on each side need comply. To be considered visible, the lamp must provide an unobstructed projected illuminated area of outer lens surface, excluding reflex, at least 2 in² in extent, measured at 45° to the longitudinal axis of the vehicle.
- B. Visibility of the front signal to the front, and the rear signal to the rear, shall not be obstructed by any part of the vehicle throughout the photometric test angles for the lamps. In addition, lamps mounted on the left side of the vehicle shall be visible through a horizontal angle of 45° to the left, and lamps mounted on the right side of the vehicle shall be visible through a horizontal angle of 45° to the right. To be considered visible,

12. COMPLIANCE TEST EXECUTION....Continued

the lamp must provide an unobstructed effective projected illuminated area of outer lens surface, excluding reflex, at least 2 in² in extent measured at 45° to the longitudinal axis of the vehicle.

When there is more than one lamp on each side at the front or rear, only one lamp on each side, front or rear, need comply with the 45° requirement.

- C. Backup lamps shall be mounted on the rear so that the center of the lens of at least one lamp is visible from any eye point elevation from at least 6 feet to 2 feet above the horizontal plane on which the vehicle is standing; and from any position in the rear, rearward of a vertical plane perpendicular to the longitudinal axis of the vehicle, 3 feet to the rear of the vehicle and extending 3 feet beyond each side of the vehicle.

Visibility of the lamp shall not be obstructed by any part of the vehicle throughout the photometric test angles for the lamp. Refer to appropriate SAE Standard for maximum horizontal photometric angles.

LAMPS - HEADLAMP AIM

The aim of each headlamp shall be adjustable to within the beam aim inspection limits specified in Table 2 of SAE Recommended Practice J599b, Jul 1970, measured with a mechanical aim conforming to the requirements of SAE Standard J602a, Jul 1970.

TEST VEHICLE'S OPERATIONAL CAPABILITY

- A. Hood, trunk, and doors shall operate in the normal manner.
- B. Fuel and cooling systems shall have no leaks or constricted fluid passage and all sealing devices and caps shall operate in the normal manner.
- C. Exhaust system shall have no leaks or constrictions.
- D. Propulsion, suspension, steering, and braking systems shall remain in adjustment and shall operate in the normal manner.
- E. Pressure vessel used to absorb impact energy in an exterior protection system by the accumulation of gas pressure or hydraulic pressure shall not suffer loss of gas or fluid accompanied by separation of fragments from the vessel.

12. COMPLIANCE TEST EXECUTION....Continued

- F. Vehicle shall not touch the test device, except on the impact ridge shown in Figures 4 and 5, with a force that exceeds 2000 pounds on the combined surfaces of Planes A and B of the test device.

BUMPER IMPACT BLOCK TEST DEVICE

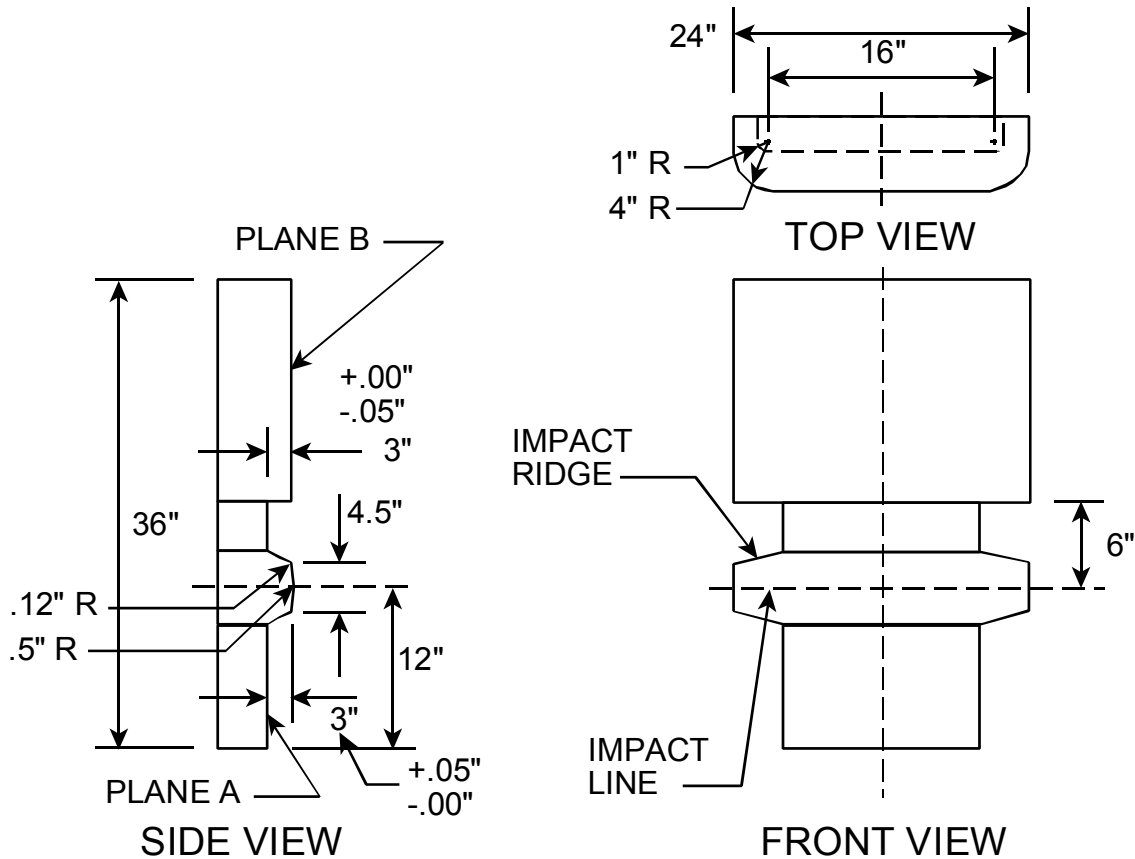


FIGURE 4

- G. The exterior surfaces shall have no separations of surface materials, paints, polymeric coatings, or other covering materials from the surface to which they are bonded, and no permanent deviations from their original contours 30 minutes after completion of each pendulum and barrier impact, except where such damage occurs to the bumper face bar and the components and associated fasteners that directly attach the bumper face bar to the chassis frame.

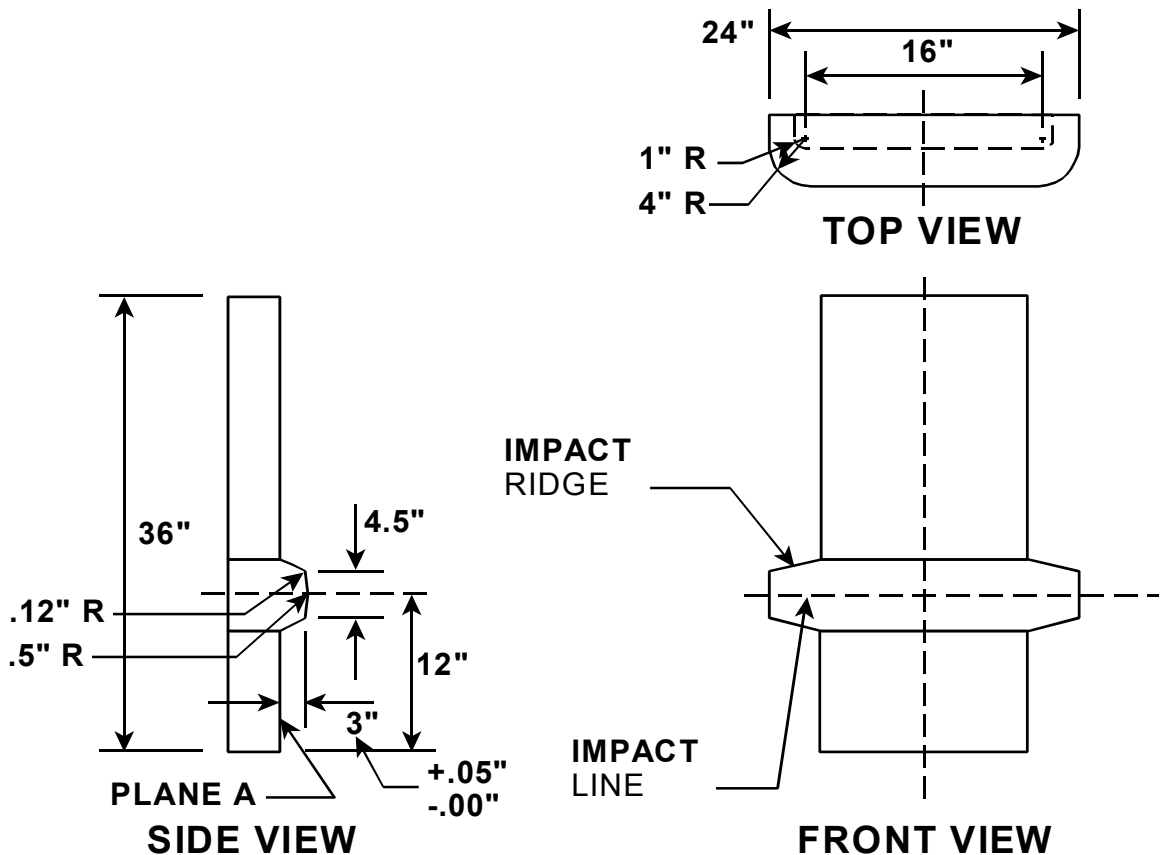
- H. There shall be no breakage or release of fasteners or joints.

TEST EQUIPMENT

A list of the minimum test equipment needed to evaluate the minimum performance requirements follows:

- A. Fixed collision barrier in accordance with the requirements given in DEFINITIONS.

12. COMPLIANCE TEST EXECUTION....Continued

BUMPER IMPACT BLOCK TEST DEVICE**FIGURE 5**

- B. Straight, level, paved surface with a straight guide system anchored to the roadway and positioned to guide the test vehicle perpendicularly into the lateral center of the barrier face.
- C. Photographic pit extending perpendicular to the barrier face and having sufficient length so that at least 1/2 of vehicle underbody can be photographically viewed and recorded throughout the impact.
- D. Two (2) certification timing traps positioned so that the vehicle velocity can be measured within 1 foot of the barrier face. The traps shall have the capability to measure vehicle impact velocity within 2 to 3 mph to an accuracy of ± 0.02 mph. The velocity measurement from both timing traps shall be permanently recorded by photographic means immediately following an impact test.
- E. High speed 16 mm cameras operating at a minimum film speed of 500 fps, placed in the following positions:
 - (1) Barrier overhead camera aligned directly on the center of the vehicle course and having a field of view large enough to include the impacted 1/2 of the vehicle length throughout the impact.

12. COMPLIANCE TEST EXECUTION....Continued

- (2) Pit camera(s) that will provide clear records of any fluid loss and will show the fuel, cooling, braking, propulsion, steering, exhaust, and energy absorption system components. A hand held camera will be utilized for recording any fluid loss immediately following impact.
 - (3) Barrier side view camera positioned on the right side of the vehicle path in as close proximity as possible to the vehicle and perpendicular to the vehicle path. The camera shall be at approximately the same height as the leading edge of the vehicle surface to be impacted and have a field of view including as much of the impacted surface as possible.
 - (4) Barrier side view camera positioned on the left side of the vehicle path and perpendicular to the vehicle path of travel, having a field of view large enough to include the impacted 2/3 of the vehicle length, including the passenger compartment, throughout the impact.
 - (5) Pulse generators with a minimum frequency of 100 pps for marking the edges of the 16mm film to permit correlation of film data from instant of impact on all cameras and time reference for film analysis.
 - (6) A strobe light will be placed in the field of view of each camera which will mark "Time Zero" when the most forward (or most rearward) part of the vehicle contacts the barrier unless the strobe is in the camera. Light from the strobe should not cover more than 3 frames of high speed film.
- F. A stationary test vehicle towing system having automatic or manual control of test vehicle impact speed. The set point or target speed accuracy of the impact shall be 2.3 ± 0.1 mph.
- G. Each test vehicle will be equipped with an onboard abort system attached to the vehicle brakes. Any secondary offboard type abort system attached to the vehicle shall not exert any loads on the test vehicle during impact. An offboard abort system must be approved by the COTR.
- H. A lateral guidance system and appropriate vehicle attachments to ensure that the vehicle is traveling perpendicular to the barrier face at impact. This system should ensure stable guidance and not affect the vehicle collapse or rebound in any manner. **NOTE:** Guidance system to be approved by the COTR prior to test.
- I. Mechanical headlamp aiming and alignment equipment conforming to the requirements of SAE J602a, Jul 1970.
- J. The following equipment is needed to verify the visibility requirement.

12. COMPLIANCE TEST EXECUTION....Continued

- (1) Camera and tripod. Camera with capacity for exposing 4" x 5" film negative
- (2) Illuminated dimensional reference in the form of either a linear scale (6" rule), or a simple geometric object of precisely known area.
- (3) Planimeter
- (4) Target stands having adjustable vertical and horizontal reference points that are suitable for establishing the visibility angles of each respective lighting device. See Figures 6, 7 and 8 which follow.

TURN SIGNAL LAMP TEST SETUP

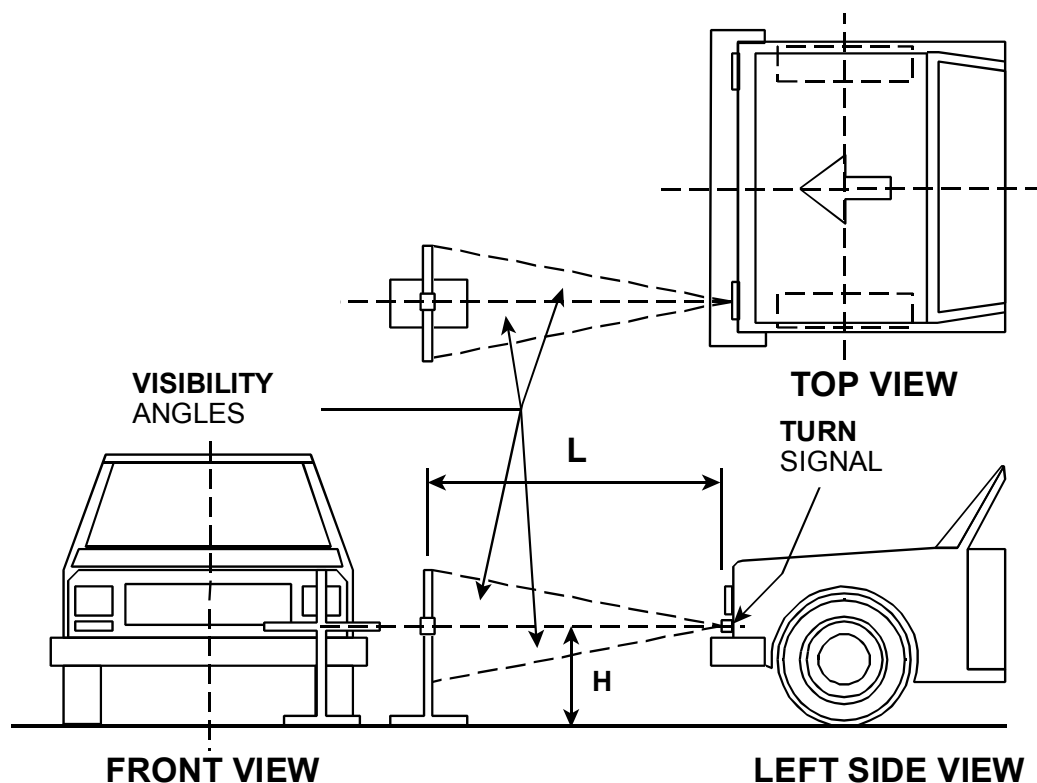


FIGURE 6

The following equipment is needed to perform the photographic procedure to establish visible vehicle damage to filler panels or stone shields.

Camera & Film:

Standard 4" x 5" view camera Focal length of 127 mm
 Maximum aperture - f/4.7 Coated lenses
 Shutter speeds - 1 second to 1/400th of a second
 Film Type: 52 Pola-Pan 4" x 5" film for Polaroid prints
 Photoelectric exposure meter
 Kodak Gray Card

12. COMPLIANCE TEST EXECUTION...Continued

BACKUP LAMP TEST SETUP

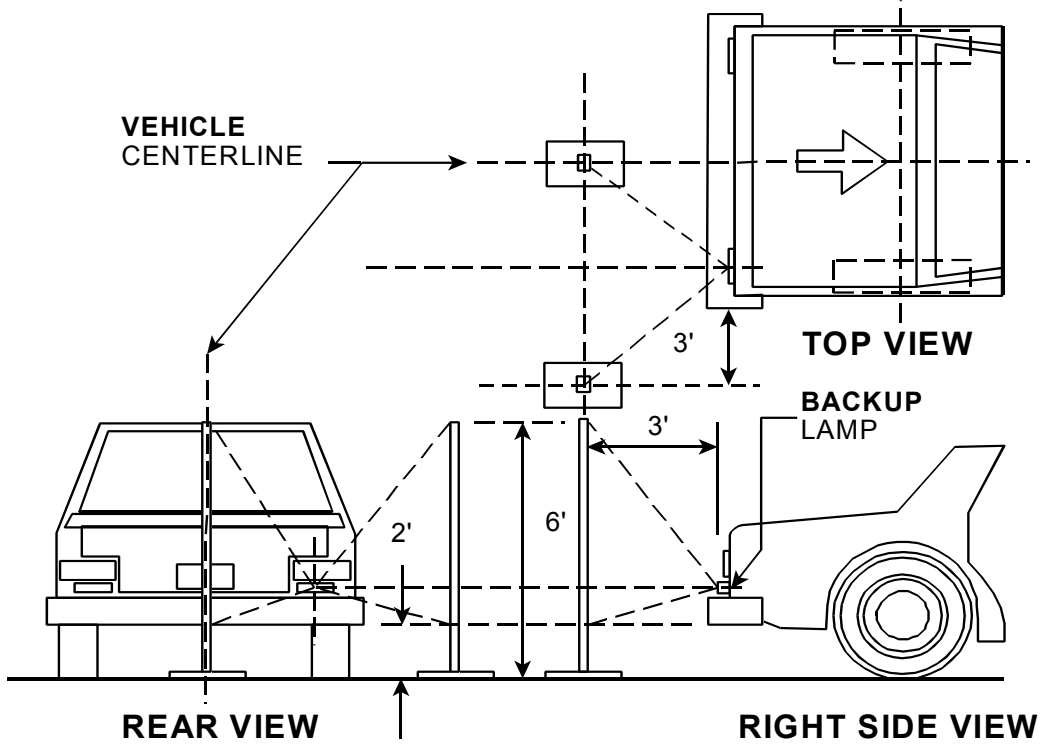


FIGURE 7

LIGHTING DEVICE TEST SETUP

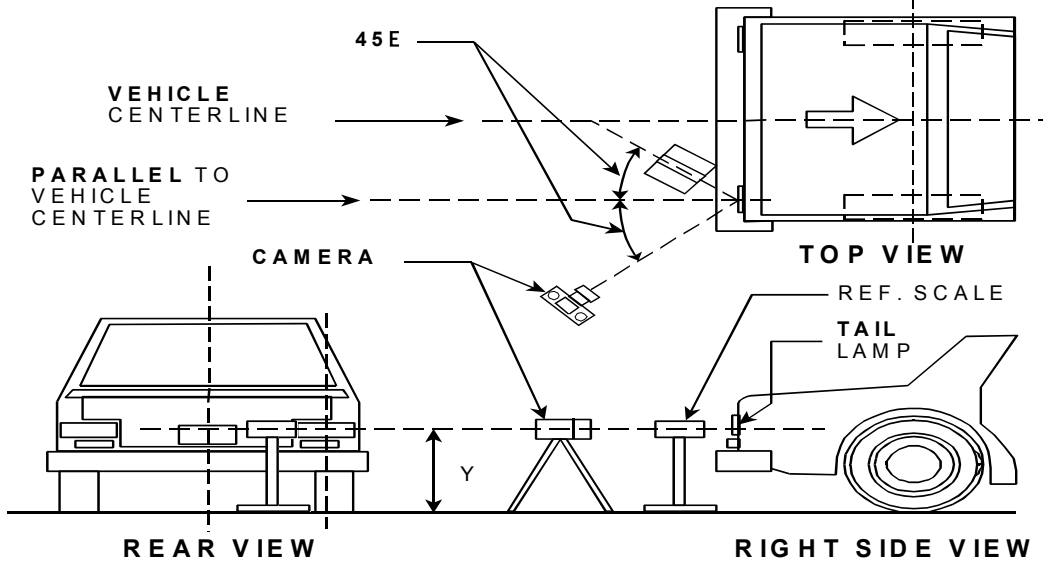


FIGURE 8

12. COMPLIANCE TEST EXECUTION....Continued

Illumination:

2 photoflood lamps (1000 watts) for main light

1 photoflood lamp (1000 watts) for fill-in light

4 tripods suitable to support camera and illumination devices

K. Front and rear suspension alignment measurement equipment

Additional equipment items necessary to conduct the pendulum impact tests are as follows:

L. Pendulum Test Device (PTD) in accordance with the requirement given in DEFINITIONS.

NOTE: The precise geometry requirements for the impact faces throughout the pendulum arc establish the PTD design as a pendulum with rigid pivot arms. Special care must be taken in the construction of the test device to make these pivot arms as light as possible, thus placing the bulk of the pendulum mass near the impact line and insuring proper location of the center of percussion. Adjustments to the impacting mass of the pendulum should be made with firmly attached weights placed in such a way as to keep the center of percussion properly located. Static torsional stiffness of the pendulum must be at least 110,000 foot pounds per radian. The static torsional stiffness must be verified before testing begins. A typical configuration which meets these requirements is shown in Figure 9.

M. Steel scale - minimum length of 20" and accuracy of ± 0.05 "

N. Electronic timer with accuracy of ± 0.010 seconds

O. Two (2) certification timing traps positioned so that the pendulum velocity can be measured within 1 foot of impact. The traps shall have the capability to measure pendulum velocity in the range of 2 to 3 mph to an accuracy of ± 0.02 mph for longitudinal impacts and in the range of 1 to 2 mph to an accuracy of ± 0.02 mph for corner impacts. The velocity measurement from both timing traps shall be permanently recorded by photographic procedures.

P. High speed 16 mm cameras operating at a minimum film speed of 500 fps, placed in the following positions:

(1) Pendulum overhead camera aligned directly on the center of the vehicle course and having a field of view large enough to include the impacted 1/3 of the test vehicle length throughout the impact.

12. COMPLIANCE TEST EXECUTION....Continued

TYPICAL PENDULUM TEST DEVICE

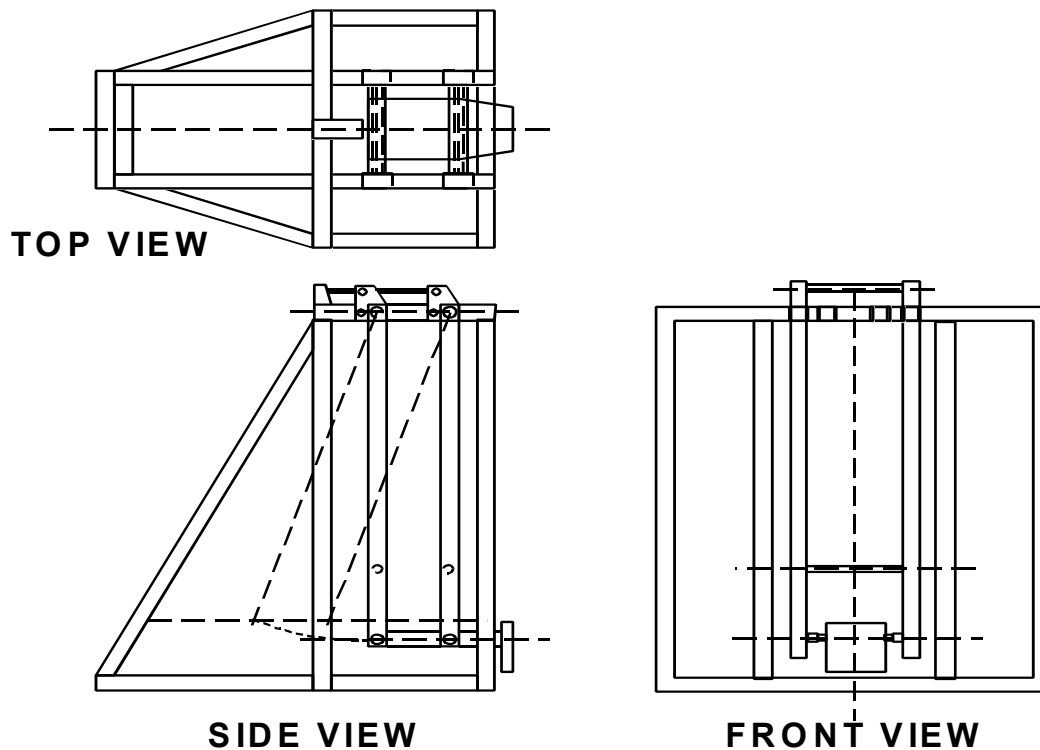


FIGURE 9

- (2) Pendulum side view camera positioned in as close proximity as possible to the vehicle on the side of the vehicle being impacted. The camera shall be at approximately the same height as the pendulum impact line, perpendicular to the plane of the pendulum arc, and have a field of view including as much of the impacted surface as possible.
 - (3) Pendulum side view camera positioned on the opposite side of the vehicle being impacted and having a field of view large enough to include the impacted 1/2 of the test vehicle length throughout the impact.
- Q. A hand held real time 16 mm camera (24 fps) to record vehicle motions during and after impact and for recording any fluid loss immediately following impact.
 - R. A switch that activates point of impact strobe lights visible in all high speed cameras. The switch will NOT be contacted by the impact ridge, Plane A or Plane B.
 - S. A tether system, if used, shall be attached to components of the vehicle undercarriage not directly related to the bumpers or bumper support structures for the purpose of limiting vehicle motion after impact and pendulum rebound. The tether system shall not exert any loads on the test vehicle during impact and shall restrain vehicle travel to one vehicle length after impact. A tether system must be approved by the COTR.

12. COMPLIANCE TEST EXECUTION....Continued

- T. All movie film will be edited into a single continuous reel. The introductory titles will show the laboratory name and location, vehicle NHTSA number, camera speed and timing pulse frequency. All impacts will be shown in sequence and each impact will be preceded by an identification showing impact number, date and vehicle NHTSA number.
- U. Plane A and Plane B shown in Figures 1 and 2 shall be instrumented to measure the longitudinal contact force on these planes during pendulum impact tests. Prestress errors induced by mounting load cells to the pendulum test device should be monitored and compensated for, if required. Capabilities for recording contact load time histories to 2500 lbs. on each plane shall be available, and overall measurement accuracy of ± 10 lbs. shall be demonstrated.
- V. The contact planes shall include accelerometers to compensate the measured force data for inertia errors. These accelerometers should be physically located as close as possible to the centroidal axis of the individual load cell, and the overall accuracy of the compensated force signal must be demonstrated through an approved test technique.
- W. Suitable instrumentation shall be provided to amplify, balance, and scale, the outputs from each of the load cells and accelerometer sensors. The signal conditioning electronics shall incorporate provisions for data channel calibration prior to an impact test.
- X. Suitable recording capability shall be provided to record each of the sensor output signals. It is noted that the contact force data will be processed through a SAE J211 Class 60 filter, and appropriate data channel bandwidth should be provided in the signal conditioning electronics and the recorder instrument.
- Y. Either analog circuitry or computer data reduction capability shall be provided to compensate the measured load cell data for inertia error and to provide filtering to SAE J211 Class 60 data. Output data shall consist of filtered scaled time histories of the total force on the upper plane, the lower plane, and both during the impact test. "Time Zero" (initial time of pendulum/vehicle contact) shall be defined in the output data plots.

Since different mass upper planes are required, a convenient method to account for these mass variations shall be provided in the compensation technique. Regardless of which compensation technique is used, it must be thoroughly documented and approved by the COTR prior to use.

12. COMPLIANCE TEST EXECUTION....Continued

- Z. A standard mercury thermometer to measure ambient temperature.

INSPECTION

The vehicle's exterior lamps and reflective devices, the fuel, cooling, exhaust, propulsion, suspension, steering, braking, and energy absorption systems shall be subjected to a visual and manual inspection to ascertain that each system is complete and functional per the manufacturer's recommendations. Any damage, deformation, misadjustment or other condition that could influence the test results or the purpose of the test program shall be recorded. Record headlight aim, the front suspension alignment, and the rear suspension alignment on vehicles with adjustable rear suspension, so that any change may be noted. The vehicle shall be subjected to a road test, including braking stops, to insure that all vehicle systems are in proper operating condition. Particular attention should be directed to note the condition of the bumper face bar, bumper/vehicle filler panels, and body parts in close proximity to the bumper face bar. Any damage including small body surface paint scratches and chips, minor dents and other visually observable characteristics should be noted in the test log book and pointed out to the COTR prior to the initiation of actual impact tests. Approval from the COTR must be obtained prior to test initiation if any observable external body surface damage is noted on the vehicle.

PROCEDURE

PREPARATION

- A. If vehicle is equipped with a trailer hitch, IT MUST BE REMOVED.
- B. If the license plate supporter bracket is a dealer installed kit provided by the manufacturer, it must be removed.
- C. Obtain and record unloaded weight of vehicle with maximum capacity of fuel, oil and coolant. Weight measurement accuracy must be within ± 40 lbs. per vehicle. Vehicle shall be tested at UVW.
- D. Check and record vehicle unloaded attitude on a level surface (tire inflation pressure of all tires, including spare, must conform to the vehicle manufacturer's recommended pressure for the unloaded vehicle). Measure from floor to a permanent scribe mark on fender well on a vertical line through each axle centerline and at all four corners of vehicle. Check that spare tire and jack are stowed and secured per the manufacturer's specifications.
- E. Stripe the test vehicle as follows, using a striping tape having contrasting markings (such as yellow and black) at 1" intervals:
- (1) One stripe along the entire vehicle longitudinal centerline

12. COMPLIANCE TEST EXECUTION....Continued

- (2) One horizontal stripe along each side of the vehicle
- (3) Striping or gridlines on the front and rear impacted surfaces and on the adjoining body panels, in the field of the broadside cameras, for determining relative motions of these components during impact.

NOTE: Striping should not be placed in an area that may be contacted by the impact ridge of the PTD.

- F. Place 1 foot photographic reference points on the side of the test vehicle in the field of view of the broadside cameras and on the top of the vehicle in the field of view of the overhead camera.
- G. Attach placards large enough to be legible to the test vehicle denoting the model year, make, model and body style (such as 90 Ford Escort 4DHB), impact number, and vehicle NHTSA number in view of each camera.
- H. Position the front seat(s) to the longitudinal midposition. If there is no adjustment position at the midpoint, move the seat(s) rearward to the first adjustment aft of the midpoint. Adjust seat to the lowest position if vertically adjustable. Place adjustable seatbacks in the nominal design position. Consult the owners manual for details.
- I. Position adjustable headrest to the highest vertical location and affix photographic targets in view of the broadside cameras.
- J. Position the front movable side windows in their fully open position and all other windows in the fully closed position.
- K. Assure all vehicle doors are unlocked.
- L. REMOVE ALL REMOVABLE SHIPPING TIEDOWN PLATES ATTACHED TO THE FRONT OR REAR VEHICLE SURFACES.

PENDULUM IMPACTS

Pretest Procedure

- A. Activate the contact plane electronic equipment and determine that each load cell and each accelerometer is operating free from preload errors and that the data recording and analysis equipment is operating properly.
- B. Enter appropriate setting to identify the proper mass of the upper plane into the compensating circuitry.

12. COMPLIANCE TEST EXECUTION....Continued

C. Prior to performance of the pendulum test, and after each change in configuration of the PTD, perform the following:

- (1) Adjust the effective impacting mass of the PTD equal between - 40 and - 90 lbs. of the UVW weight of the test vehicle.
- (2) With the impact line of the PTD set at the specified impact height, conducting the following operation to ascertain if the center of percussion is located on the impact line:

Pull the test device back to a suitable small angle less than 10° and release, allowing it to oscillate freely. Using an electronic timer, measure the time necessary for the test device to complete 10 full cycles (both over and back), and compare this experimental time with the time calculated from the following equation:

$$t = 20 \left(\sqrt{\frac{I}{g}} \right)$$

Where:

- I = length of the pendulum arc, from pivot point(s) to impact line (inches) and accurate to ± 0.125"
- g = local gravitational acceleration (in./sec.²) accurate to ± 0.10%

Adjust the placement of weight on the test device until the experimental time is within 0.75% of the calculated time. Record both experimental time and calculated time on the appropriate test data sheet.

D. Prior to each pendulum impact, perform the following:

- (1) Ascertain the correct position of release of the PTD in order to obtain the desired impact speed.
- (2) Position trap timers and electronic readout equipment. Activate system to insure stable operating temperature. Check out operation of all timing trap equipment.
- (3) With the PTD hanging at the lowest point of its arc, measure the height of the impact line from the test surface and record the measurement on the appropriate Data Sheet.
- (4) With the PTD at the lowest point of its arc, position the test vehicle so that it touches, but does not move the PTD according to the following requirements:

12. COMPLIANCE TEST EXECUTION....Continued

- (A) For longitudinal impacts, the vehicle longitudinal centerline must be perpendicular to Plane A of the test device within $\pm 2^\circ$.
- (B) For longitudinal impacts at a height of 20" (+ 0", - 0.1") the midpoint of the impact line with respect to the test vehicle shall be displaced a minimum of 12" laterally from its position in any prior impact.
- (C) For longitudinal impacts at a height between 16.1" and 19.9", the impact line of the PTD shall be displaced vertically a minimum of 2" from its position in any prior impact, unless the midpoint of the impact line with respect to the test vehicle is displaced laterally a minimum of 12" from its position in any prior impact.
- (D) For longitudinal impacts, the outer edges of the impact face of the PTD shall be located inboard of the test vehicle corners.
- (E) For longitudinal impacts, the exact location of the initial impact and subsequent impacts is left to the discretion of the testing agency (within the constraints given above and subject to approval by the COTR)
- (F) For corner impacts, the vehicle longitudinal centerline must form an angle of $60^\circ \pm 2^\circ$ with Plane A of the PTD.
- (G) For corner impacts, align the vehicle so that a vehicle corner touches, but does not move, the lateral center of the PTD.

Record the lateral location of the midpoint of the impact ridge on the data sheet.

- (5) Place a stadia pole on each side of the vehicle directly in line with one of the 1 foot photographic reference points, as viewed through the broadside cameras. This will provide an additional means of determining the instant of impact. Aim, load, focus and check operation of all cameras. Record the position of each camera.
- (6) Move the PTD to its release position and perform the following checks and operations:
 - (A) Attach tether (if used) to test vehicle
 - (B) Place transmission in neutral

12. COMPLIANCE TEST EXECUTION....Continued

- (C) Disengage parking brake
- (D) Latch doors, hood and trunk
- (E) Check glove compartment door (latched, but not locked)

Sequence

Each applicable vehicle will be subjected to the following impacts by the PTD:

- A. Two (2) longitudinal impacts on the vehicle front surface at 2.3 ± 0.1 mph using the PTD shown in Figure 2 with its impact line at any height between 16.1" and 19.9".
- B. Two (2) longitudinal impacts to the vehicle rear surface at 2.3 ± 0.1 mph using the PTD shown in Figure 2 with its impact line at any height between 16.1" and 19.9".
- C. One or more of the above impacts may be conducted at a height between 19.9" and 20" using the PTD shown in Figure 1.
- D. One (1) corner impact each to 2 diagonally opposite front and rear corners of the vehicle at 1.3 ± 0.1 mph using the PTD shown in Figure 1 with its impact line at a height of 20", + 0.00", - 0.10".
- E. One (1) corner impact each to the 2 vehicle corners not tested in Item C at 1.3 ± 0.1 mph using the PTD shown in Figure 2 with its impact line at any height between 16.1" and 19.9".

The sequence of the above impacts is left to the discretion of the testing agency (subject to approval by the COTR) but any 2 successive impacts to either the front or rear of the vehicle must be performed at intervals of NOT LESS THAN 30 minutes.

Impact Test

- A. Timing traps and cameras
- B. Activate all data acquisition and recording equipment
- C. Alert all concerned personnel at the test site
- D. Upon signal of engineer in charge, release pendulum and record impact number, time of day and impact speed

12. COMPLIANCE TEST EXECUTION....Continued

NOTE: OVSC procedures requires an impact velocity of 2.3 ± 0.1 mph for longitudinal impacts and 1.3 ± 0.1 mph for corner impacts.

Post Test Evaluation

- A. Photograph the impacted area of the test vehicle immediately after each impact. The photographs shall be suitably identified with the number of the impact.
- B. Photographic Procedure for Evaluating Damage to Shielding Panels:

The photographic procedure specified for P581 compliance testing will be used as an aid in determining whether damage to shielding panels (filler panels and stone shields) is "normally observable" for the purpose of compliance with the standard. Upon completion of each pendulum impact during which damage is suspect, photographs will be taken of the shielding panel area in accordance with the procedure that is described below. Damage that is visible to the unaided eye in a good quality photographic print of the questionable area will be considered "normally observable" and, therefore, a test failure.

SIDE VIEW PHOTO PROCEDURE

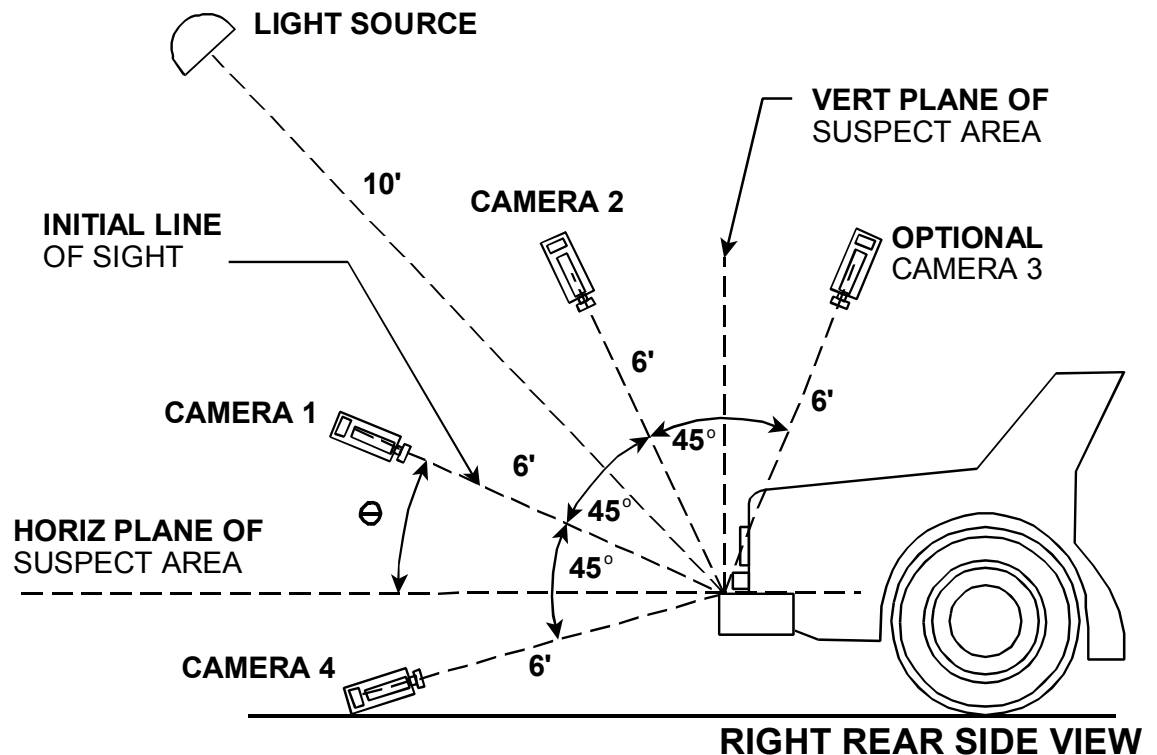


FIGURE 10

12. COMPLIANCE TEST EXECUTION....Continued

PLAN VIEW PHOTO PROCEDURE

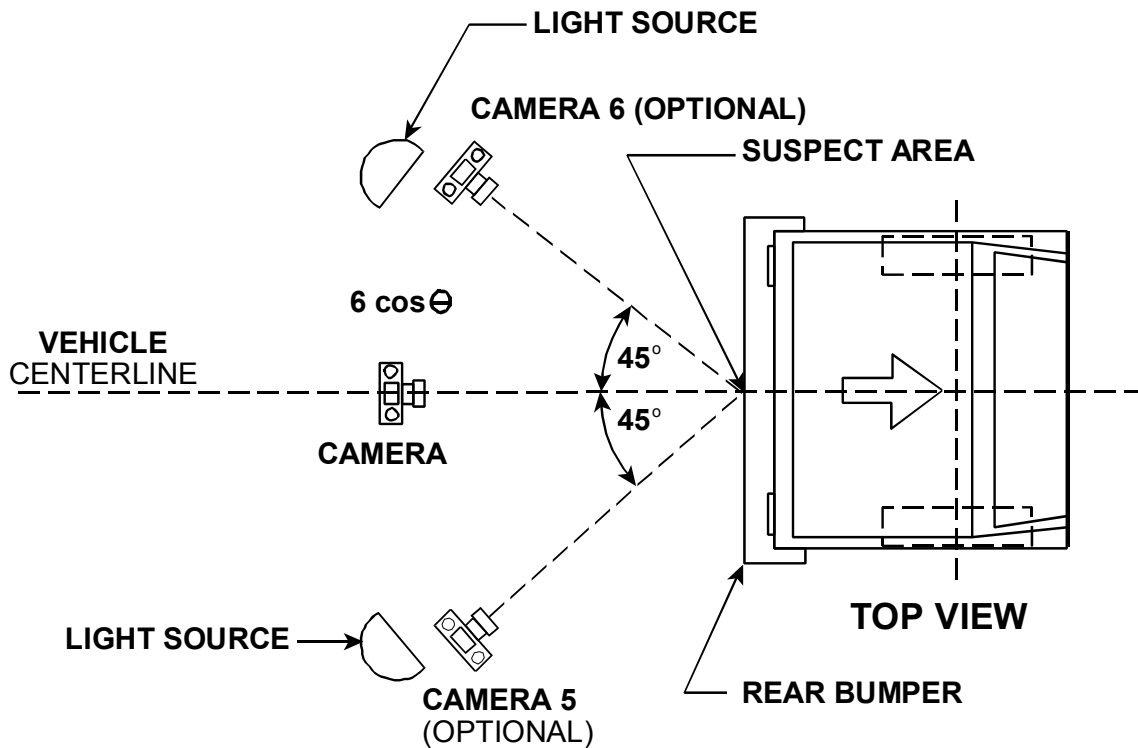


FIGURE 11

The photographs will be taken indoors using the following illumination procedures:

- (1) Illuminate the area to be photographed with crosslighting using 2 photoflood lamps (1000 watts) for main light, and 1 photoflood lamp (1000 watts) for fill-in light.
- (2) Position the photoflood lamps so that the light rays strike the subject area at a 45° angle from a distance of 10 feet from the area being photographed.

Position the camera at a distance of 6 feet from the center of the suspect area and utilizes ground glass focusing to properly focus the camera for that distance. Photographs are taken both at 90° and 45° angles relative to the suspect area.

With a General Electric, Dejur or Weston photoelectric exposure meter to determine the exposure requirements, take light readings by measuring the intensity of reflected light from a Kodak Gray Card placed upon the area to be photographed. The meter is placed near enough to the gray

12. COMPLIANCE TEST EXECUTION....Continued

card to indicate the average reflected light (at least within a distance equal to the width of the subject being photographed). The light reading obtained is set opposite the film speed which is indicated on the meter so that the f/stop or the aperture settings and shutter speeds coincide. The correct camera setting is read directly from the meter.

A 4" x 5" black and white photographic contact print from the Polaroid film is produced. Examine the complete contact print with the unaided eye and determine result in accordance with criterion stated for a test failure.

- (3) At least 30 minutes after each pendulum impact, determine whether the exterior surfaces, except for the bumper face bar, have separation of surface materials, paint, polymeric coatings, or other materials from the surface to which they are bonded, and or permanent deviations from their original contours.
- (4) The vehicle shall not touch the pendulum test device, except on the impact ridge shown in Figures 1 and 2, with a force that exceeds 2000 lbs. on the combined surfaces of planes A and B of the test device. Record contact plane load data through an SAE J211 Class 60 filter, and determine if the combined load on planes A and B is less than 2000 lbs. during the impact. Place the actual loads on Plane A, Plane B, and the total in Data Sheet 3.

BARRIER IMPACTS

Pretest Procedure

- A. Install soft (nonrigid) guide attachments to the test vehicle, utilizing bolts, holes, or other existing attaching points which have been provided during original manufacture, when possible. These attachments must be approved by the COTR prior to installation.
- B. Install and check operation of the brake abort system.
- C. Immediately before each test, calibrate tow vehicle null meter or other propulsion method target speed indicating instrument.
- D. Position trap timers and electronic readout equipment. Activate system to insure stable operating temperature. Check out operation of all timing trap equipment.
- E. With the vehicle attached to the guide shoe and rail, move it to the barrier face and conduct the following operation while in contact with the barrier:

12. COMPLIANCE TEST EXECUTION....Continued

Place a stadia pole beside vehicle directly in line with one of the 1 foot photographic reference points, as viewed through the broadside camera. This will provide an additional means of determining the instant of impact. Aim, load, focus, and check operation of all cameras.

Record each camera's position.

- F. Place the vehicle at its starting position and perform the following check and operations:
- (1) Attach tow cable to test vehicle
 - (2) Place transmission in neutral
 - (3) Disengage parking brake
 - (4) Close doors, hood and trunk
 - (5) Check glove compartment door (latched, but not locked)

Impact Test

- A. Start engine and allow to warm up and run at its normal hot idle speed (off fast idle cam)
- B. Arm timing traps, cameras, and brake abort systems
- C. Alert all concerned personnel at the test site
- D. Upon signal of engineer in charge, tow vehicle into the barrier and record impact speed **NOTE:** OVSC TP requires an impact velocity of 2.3 ± 0.1 mph for barrier impacts.
- E. Allow the test vehicle engine to idle for at least five minutes after impact and check for proper operation, leaks, etc. If the engine stalls, restart and note on the test data sheet.

Test Evaluation

Inspect the following items and/or systems and provide complete details, including photographs, of any damage, fluid or exhaust gas, constrictions or abnormal conditions that have resulted from the impacts and may impair the safe operation of that vehicle component or system.

12. COMPLIANCE TEST EXECUTION....Continued

- A. Determine if any suspect damage on filler panels and stone shields is "normally observable." "Normally observable" damage is not permitted after the completion of barrier impact.
- B. Determine if the exterior surfaces, except for the bumper face bar, have separation of surface materials, paint, polymeric coatings, or other materials from the surface to which they are bonded, or permanent deviations from their original contours at least 30 minutes after each barrier impact.
- C. Determine if each lamp or reflective device, except license plate lamps, is free of cracks and complies with the applicable visibility requirements. Visibility angles and/or projected illuminated areas of each lighting or signaling device shall be measured and recorded on the appropriate data sheet.

Tail, stop, turn signal and side marker lamp visibility angles shall be checked with a test setup similar to that shown in Figure 12. The horizontal and vertical (H-V) centerline of the signaling lamp shall coincide with H-V intersection of the test fixture arms. The height of the test fixture H-V axis (dimension H) must be equal to the height of the horizontal centerline of the signaling lamp being tested. The projection distance of the visibility angles along the longitudinal axis of the signaling lamp (dimension L) shall be at least 6 feet. Strings shall be fastened at the geometric center of the lamp and stretched to points of attachments to the test fixture that correspond to the required visibility angles being checked.

TURN SIGNAL LAMP TEST SETUP

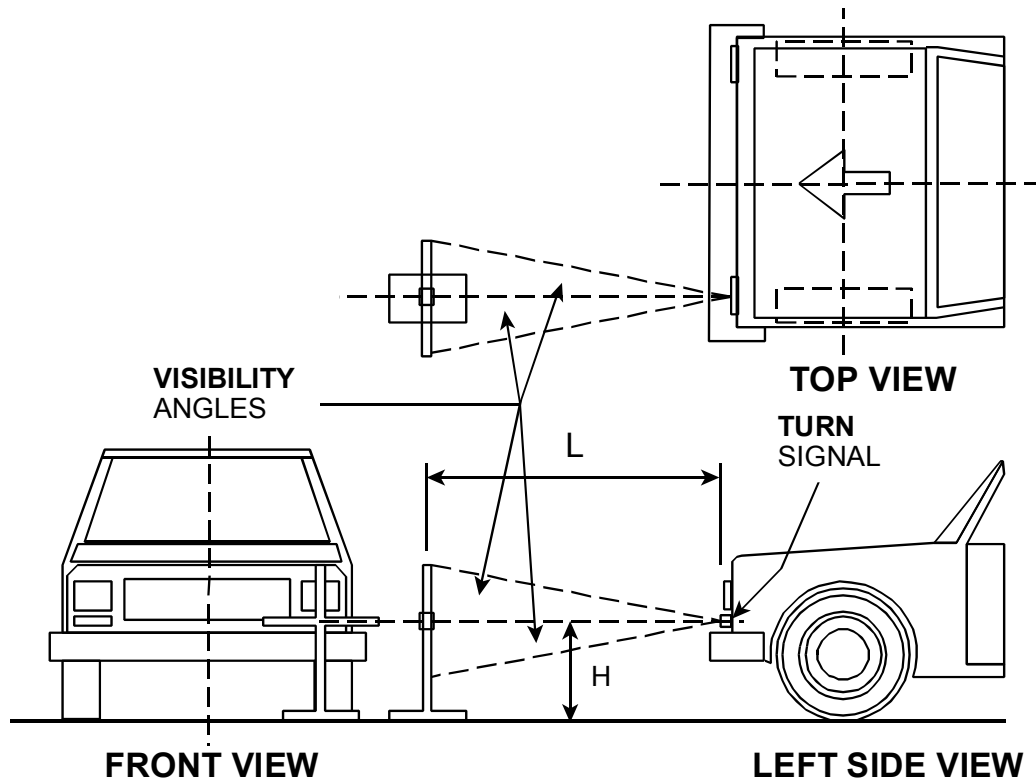


FIGURE 12

12. COMPLIANCE TEST EXECUTION....Continued

Projected illuminated areas of tail, stop and turn signal lamps shall be measured with a test setup similar to that shown in Figure 14. Illuminated areas shall be measured by photographing the lighted test lamp together with a dimensional reference using a tripod mounted camera positioned at the same height (Y) as the test lamp and at a 45° angle to the longitudinal centerline of the lamp. The distance from the camera to the lamp should be sufficient to provide the maximum possible image of the test lamp in the camera field of view. The projected area of the test lamp shall be measured by tracing the illuminated area showing on a 4" x 5" (minimum photographic print using a planimeter.

The projected illuminated area of the lamp measured on the photograph shall be recorded and the appropriate corrected or true area shall be computed according to the relationship given below.

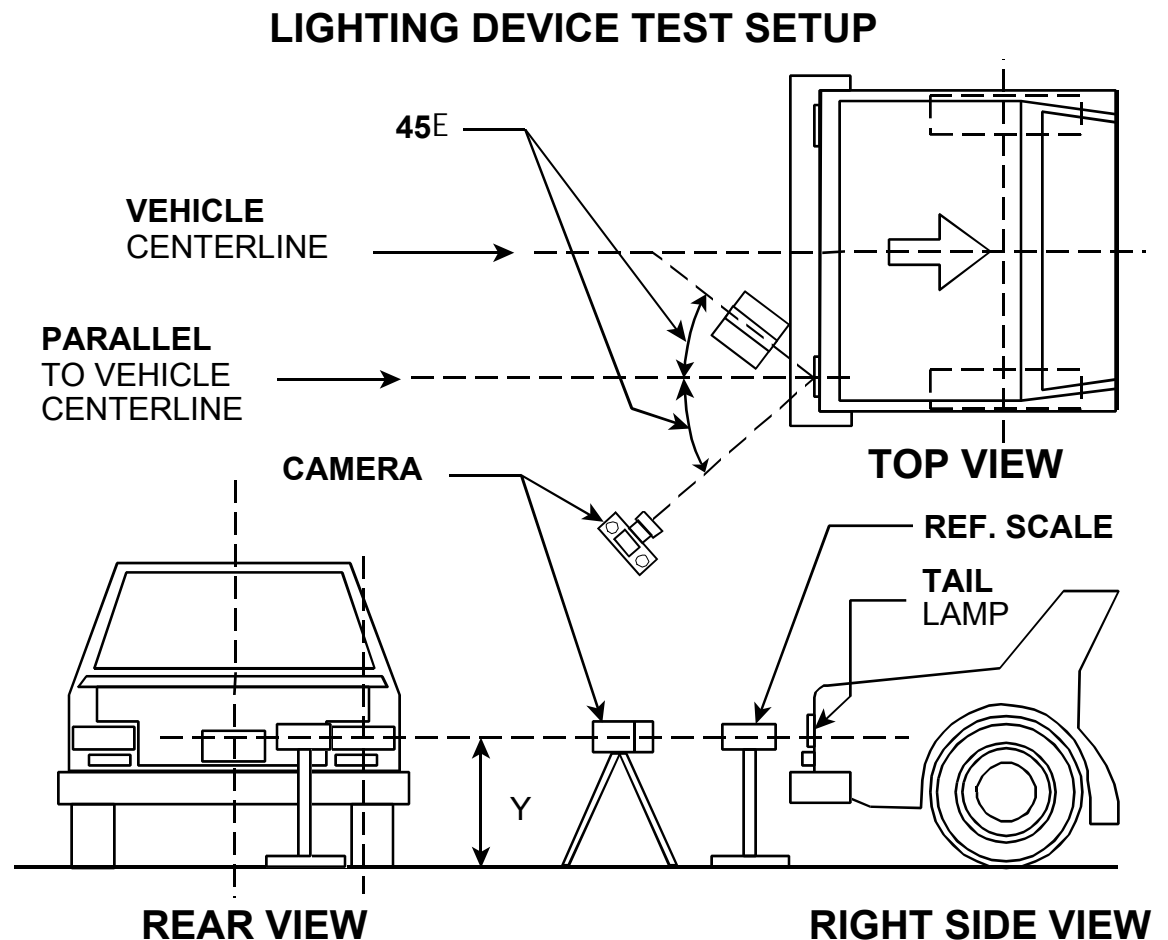


FIGURE 14

12. COMPLIANCE TEST EXECUTION....Continued

- (1) If the dimensional reference used to scale the photograph is a linear scale (e.g., a 6" scale, etc), the following expression shall be used to compute the true area value:

$$A_t = A_m [L_t / L_m]^2, \text{ where -}$$

A_t = True area in²

A_m = Measured area of lamp

L_t = True length of reference scale in inches

L_m = Measured length of reference scale on photograph in inches

- (2) If the dimensional reference used to scale the photograph is a simple plane surface of precisely known area (e.g., a square or rectangle, etc.), the following expression shall be used to compute the true area value:

$$A_t = A_m [A_1 / A_2], \text{ where -}$$

A_t = True area in in²

A_m = Measured area of lamp

A_1 = True area of reference surface in in²

A_2 = Measured area of reference surface on photograph in in²

The measured and true values of projected illuminated area for each respective signaling lamp shall be recorded in the spaces provided in Data Sheet 6, Post Impact Visibility Test Summary Sheet.

The aim of each headlamp shall be measured and recorded on the appropriate test data sheet and be adjustable to within the beam aim inspection limits in Table 2 of SAE Recommended Practice J599b, Jul 1970, measured with a mechanical timer conforming to the requirements of SAE Standard J602a, Jul 1970.

- D. Determine if vehicle's hood, trunk, and doors shall operate in the normal manner. The unlatching and opening efforts for each shall be recorded on the appropriate data sheet.
- E. Determine if the vehicle's fuel, cooling, braking and exhaust systems shall have no leaks or constricted passages and all sealing devices and caps shall operate in the normal manner.
- F. The alignment of the vehicle front suspension system and rear suspension system (on vehicles with adjustable rear suspensions) shall be measured and recorded on the appropriate data sheet.

12. COMPLIANCE TEST EXECUTION....Continued

- G. The striping tape and 1 foot photographic markings must be removed and the vehicle surface cleaned of all adhesive, as soon as possible following completion of all tests.

- H. The vehicle shall be subjected to a road test, including braking stops to insure that the propulsion, suspension, steering, and braking systems operate in a normal manner.

13. POST TEST REQUIREMENTS

INTERPRETATIONS AND CLARIFICATION

- A. The term "cooling system" does not include the air conditioning system.
- B. If components such as pollution control vapor canisters and other components used to reduce fuel emission contain fuel or fuel vapor, they are considered to be part of the fuel system.
- C. Designed exhaust system drain ports and flow restrictions do not constitute leaks or constrictions.
- D. During the perpendicular impact tests, the outboard edge of the test device is to be inboard of a line parallel to the vehicle longitudinal centerline and a parallel line passing through the corner impact contact point.
- E. Lamp bulb replacement after impact testing is permitted, if necessary, to check lamp operation.
- F. Movement of the automatic transmission shift lever from Neutral to Drive position during a test impact does not constitute a test failure as long as the movement does not impair the subsequent operation of the transmission or other parts of the propulsion system. However, this occurrence must be noted in the report.
- G. Vehicles must comply with the requirements of P581 both when equipped with the bumper system which is standard for that vehicle model and when equipped with approved optional bumper equipment such as guards or rub strips whether factory or dealer installed.
- H. Any component of the bumper system which can be contacted by the impact ridge of the PTD in any permissible pendulum stroke is considered bumper face bar, whether or not it was actually contacted in a particular test sequence.
- I. Components which do not perform a load bearing function are not necessarily components of the bumper system (and potentially bumper face bar) solely as the result of this incidental mounting on or near a load bearing structure of the bumper system. Components must be examined on a case-by-case basis to determine whether they constitute components of the bumper system.
- J. Bumper system components that can contact the impact ridge of the PTD and thus be considered "bumper face bar" include the following:
 - (1) Bumper and cuffs
 - (2) Bumper guards

13. POST TEST REQUIREMENTS....Continued

- (3) "Nerf strips"
- (4) Shielding panels

The same would be true of other cosmetic components directly associated with the bumper system's function such as manufacturing cutout patches and tape strips - the primary function of which is to hide protrusions, fasteners, or other unsightly aspects of the bumper construction.

- K. Illumination devices, e.g., fog lamps and directional signals, are not associated with the bumper system's function and could not qualify as components of the bumper system, even if contacted by the PTD or barrier. However, they are subject to the damage limitations.
- L. Still other components could be considered components of the bumper system, depending on their application in a particular vehicle design. For example, a grille, which would generally be associated with the vehicle body, could perform a protective function as a component of a bumper system in a soft-face configuration, and could qualify as a component of the bumper system.
- M. A load bearing component in the bumper system that lies under a covering of rubber, plastic, or another material and is not visible when the bumper is mounted on the vehicle would not qualify as an "exterior surface".
- N. The many shielding panel designs that do not contact the impact ridge must be categorized as "exterior surfaces" subject to the damage criteria of 581.5 (C) (10), i.e., no separation of materials from the surface to which bonded and no permanent deviation from original contours.
- O. While both barrier and PTD impacts can cause some chipping or flaking of chrome or soft-face material, such damage is insignificant (41 FR 9346; March 4, 1976). This reasoning also governs minor damage to the tape strips, such as wrinkling or buckling, as long as the strips are contactable by the impact ridge or barrier face and thus qualify as bumper face bar. This interpretation would apply equally whether the damage happened to fall at the area of impact or elsewhere on the face bar.
- P. Vehicle equipped with an automatic leveling system that operates only with the ignition switch on, may not be PTD tested with the ignition on.

14. REPORTS

14.1 MONTHLY STATUS REPORTS

The contractor shall submit a monthly Test Status Report and a Vehicle or Equipment Status Report to the COTR. The Vehicle or Equipment 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 FORMS section.

14.2 APPARENT TEST FAILURE

Any indication of a test failure shall be communicated by telephone to the COTR within 24 hours with written notification mailed within 48 hours (Saturdays and Sundays excluded). A Notice of Test Failure (see FORMS section) 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 a failure, a post test calibration check of some 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.

14.3 FINAL TEST REPORT

14.3.1 COPIES

In the case of a test failure, 7 copies of the Final Test Report shall be submitted to the COTR for acceptance within 3 weeks of test completion. The Final Test Report format to be used by all contractors can be found in the REPORTS section.

Where there has been no indication of a test failure, 3 copies of each Final Test Report shall be submitted to the COTR within 3 weeks of test completion. Payment of contractor's invoices for completed compliance tests may be withheld until the Final Test Report is accepted by the COTR. Contractors are requested to NOT submit invoices before the COTR is provided copies of the Final Test Report.

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.

14. REPORTS...Continued

14.3.2 REQUIREMENTS

The Final Test Report, associated documentation (including photographs) are 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 document capable of standing by itself.

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 first three pages of the final test report are provided below for the purpose of standardization.

14.3.3 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 581-CTL-9X-001 where
 - 581 is the FMVSS or REGULATION PART tested
 - CTL are the initials for the laboratory
 - 9X is the Fiscal Year of the test program (or 0X after year 1999)
 - 001 is 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 REGULATION PART 581
 - Bumper Standard
 - *****
 - Name of Passenger Car Manufacturer
 - Car Model Year, Make, Model & Body Style
 - NHTSA No. for Test Vehicle

- (3) Contractor's Name and Address such as
 - COMPLIANCE TESTING LABORATORIES, INC.
 - 4335 West Dearborn Street
 - Detroit, Michigan 48090

14. REPORTS....Continued

NOTE: DOT SYMBOL WILL BE PLACED BETWEEN ITEMS (3) AND (4)

- (4) Date of Final Report Completion
- (5) The words "FINAL REPORT"
- (6) The sponsoring agency's name and address as follows

U.S. DEPARTMENT OF TRANSPORTATION
National Highway Traffic Safety Administration
Safety Assurance
Office of Vehicle Safety Compliance
400 Seventh Street, SW
Room 6115 (NSA-30)
Washington, DC 20590

14. REPORTS...Continued**B. FIRST PAGE AFTER FRONT COVER --**

A disclaimer statement and an acceptance signature block for the COTR shall be provided as follows

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Prepared By: _____

Approved By: _____

Approval Date: _____

FINAL REPORT ACCEPTABLE BY OVSC:

Accepted By: _____

Accepted Date: _____

14. 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 NUMBER

581-CTL-9X-001

Block 2 -- GOVERNMENT ACCESSION NUMBER

Leave Blank

Block 3 -- RECIPIENT'S CATALOG NUMBER

Leave Blank

Block 4 -- TITLE AND SUBTITLE

Final Report of Reg Part 581 Compliance Testing of 199X Ace Super
2-door Coupe, NHTSA No. CX0401

Block 5 -- REPORT DATE

March 1, 199X (or 200X after year 1999)

Block 6 -- PERFORMING ORGANIZATION CODE

CTL

Block 7 -- AUTHOR(S)

John Smith, Project Manager
Bill Doe, Project Engineer

Block 8 -- PERFORMING ORGANIZATION REPORT NUMBER

CTL-DOT-XXX-001

Block 9 -- PERFORMING ORGANIZATION NAME AND ADDRESS

Compliance Testing Laboratories, Inc.
4335 West Dearborn Street
Detroit, MI 48090

14. REPORTS....Continued

Block 10 -- WORK UNIT NUMBER

Leave Blank

Block 11 -- CONTRACT OR GRANT NUMBER

DTNH22-XX-X-XXXXX

Block 12 -- SPONSORING AGENCY NAME AND ADDRESS

US Department of Transportation
National Highway Traffic Safety Administration
Safety Assurance
Office of Vehicle Safety Compliance (NSA-30)
400 Seventh Street, SW, Room 6115
Washington, DC 20590

Block 13 -- TYPE OF REPORT AND PERIOD COVERED

Final Test Report
Feb 15 to Mar 15, 199X (or 200X after year 1999)

Block 14 -- SPONSORING AGENCY CODE

NSA-30

Block 15 -- SUPPLEMENTARY NOTES

Leave Blank

Block 16 -- ABSTRACT

Compliance tests were conducted on the subject 199X Ace Super 2-door coupe in accordance with the specifications of the Office of Vehicle Safety Compliance Test Procedure No. TP-581-XX for the determination of REG PART 581 compliance. Test failures identified were as follows:

None

NOTE: Above wording must be shown with appropriate changes made for a particular compliance test. Any questions should be resolved with the COTR.

14. REPORTS....Continued

Block 17 -- KEY WORDS

Compliance Testing
Safety Engineering
REGULATION PART 581

Block 18 -- DISTRIBUTION STATEMENT

Copies of this report are available from - -

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Block 19 -- SECURITY CLASSIFICATION OF REPORT

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Unclassified

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Add appropriate number

Block 22 -- PRICE

Leave Blank

14. REPORTS....Continued

14.3.4 TABLE OF CONTENTS

Final test report Table of Contents shall include the following:

Section 1 — Purpose of Compliance Test

Section 2 — Compliance Test Data Summary

Section 3 — Compliance Test Data

Section 4 — Noncompliance Data (if applicable)

Section 5 — Photographs

15. DATA SHEETS

DATA SHEET 1
RESULTS OF NEW VEHICLE INSPECTION

MODEL YR/MAKE/MODEL/BODY: _____

NHTSA NO.: _____ ; VIN: _____

BUILD DATE: _____ ; TEST DATE: _____

TEST LABORATORY: _____ ; AMBIENT TEMP. : _____

OBSERVERS: _____

No.	INSPECTION ITEM	PREIMPACT		POST IMPACT	
		YES	NO	YES	NO
01	Does hood pop-up to secondary latch position when primary hood latch is released?				
02	When secondary latch is released, can hood be raised?				
03	Can hood be closed to primary latch position?				
04	Does radiator cap operate in the normal manner?				
05	Does radiator overflow reservoir cap operate in the normal manner?				
06	Is the radiator coolant at the full level?				
07	Do all doors operate in the normal manner?				
08	Do all door locks operate in the normal manner?				
09	Do the trunk lid and trunk latch operate in the normal manner?				

REMARKS:

15. DATA SHEETS....Continued

No.	INSPECTION ITEM	PREIMPACT		POST IMPACT	
		YES	NO	YES	NO
10	Can fuel filler cap be removed and reinstalled?				
11	Is cooling system free of leaks as indicated by wet areas or drop formations with the engine off and the engine idling?				
12	Is the cooling system free of constrictions?				
13	Is the fuel system free of leaks as indicated by wet areas or drop formations with the engine off and the engine idling?				
14	Is the exhaust system free of leaks and constrictions?				
15	Does the vehicle leveling system operate in the normal manner?				
16	Are all exterior vehicle surfaces free of scratches, nicks and separations in their decorative coatings or finishes?				
17	Are the shielding panels free of "normally observable" deviations or separations?				
18	Is the vehicle free of any separations or releases of fasteners or joints?				
19	When driving the vehicle, do the propulsion, suspension, steering and braking systems operate in the normal manner?				
20	Are all exterior lamps in satisfactory condition?				
21	Are all reflective devices in normal condition?				

REMARKS:

15. DATA SHEETS....Continued

HEADLAMP ALIGNMENT

LOCATION	VERTICAL	HORIZONTAL
Left Outer		
Left Inner		
Right Outer		
Right Inner		

SUSPENSION ALIGNMENT

Toe-InFRONT: _____ ; REAR: _____
Camber LF: _____ RF: _____ LR: _____ RR: _____
CasterLF: _____ RF: _____

REMARKS:

RECORDED BY: _____ DATE _____

APPROVED BY: _____

15. DATA SHEETS....Continued

DATA SHEET 2
RESULTS OF PREIMPACT INSPECTION AND PREPARATION

MOD YR/MAKE/MODEL/BODY: _____

NHTSA NO.: _____ ; VIN: _____

BUILD DATE: _____ ; TEST DATE: _____

TEST LABORATORY: _____ ; AMBIENT TEMP. : _____

OBSERVERS: _____

Vehicle Gross Unloaded Weight: _____ lbs.

Gross Vehicle Weight Rating (GVWR): _____ lbs.

Vehicle Unloaded Weight At Each Wheel (in pounds) –

LF: _____ RF: _____ LR: _____ RR: _____

Cold Tire Inflation Pressure (in psi) –

LF _____ RF: _____ LR: _____ RR: _____

Description of Impact Energy Absorbing System –

FRONT: _____

REAR: _____

Vehicle Attitude:

Before Test - -

RF: _____ LF: _____ RR: _____ LR: _____

After Pendulum Impacts - -

RF: _____ LF: _____ RR: _____ LR: _____

After Barrier Impacts - -

RF: _____ LF: _____ RR: _____ LR: _____

15. DATA SHEETS....Continued

REMARKS:

RECORDED BY: _____

DATE: _____

APPROVED BY: _____

15. DATA SHEETS...Continued

DATA SHEET 3
PENDULUM IMPACT TEST SUMMARY SHEET

MOD YR/MAKE/MODEL/BODY: _____

NHTSA NO.: _____ ; VIN: _____

BUILD DATE: _____ ; TEST DATE: _____

TEST LABORATORY: _____ ; AMBIENT TEMP. : _____

OBSERVERS: _____

Total Pendulum Weight = _____ lbs.

Calculated Time For 20 Cycles = _____ ; Actual Time For 20 Cycles = _____

IMPACT NUMBER*	TIME	IMPACT LINE HT.	IMPACT LINE MIDPOINT LOCATION	IMPACT SPEED		
				TRAP 1	TRAP 2	AVERAGE
LONGITUDINAL FRONT IMPACTS						
A						
B						
LONGITUDINAL REAR IMPACTS						
C						
D						
FRONT CORNER IMPACTS						
E						
F						
REAR CORNER IMPACTS						
G						
H						

* Test Sequence Number From 1 to 8

15. DATA SHEETS....Continued

Inspection and Vehicle Operation indicates there is Damage, Leak or Constriction to the following:

	YES	NO		YES	NO
Exterior Lamps			Fuel System		
Reflective Devices			Cooling System		
Impact Energy Absorbing System			Exhaust System		
Steering System			Braking System		
Suspension System			Propulsion System		
Exterior Surfaces					

LONGITUDINAL IMPACTS AT 2.5 MPH - -

TEST	PLANE CONTACT LOAD (pounds)		
	UPPER	LOWER	TOTAL
A			
B			
C			
D			

CORNER IMPACTS AT 1.5 MPH - -

TEST	PLANE CONTACT LOAD (pounds)		
	UPPER	LOWER	TOTAL
E			
F			
G			
H			

15. DATA SHEETS....Continued

REMARKS:

RECORDED BY: _____

DATE: _____

APPROVED BY: _____

15. DATA SHEETS...Continued

DATA SHEET 4
BARRIER IMPACT TEST SUMMARY SHEET

MOD YR/MAKE/MODEL/BODY: _____

NHTSA NO.: _____; VIN: _____

BUILD DATE: _____; TEST DATE: _____

TEST LABORATORY: _____; AMBIENT TEMP.: _____

OBSERVERS: _____

TEST	IMPACT SPEED REQUIREMENT	ACTUAL IMPACT SPEED		
		TRAP 1	TRAP 2	AVERAGE
Forward Impact	2.4 ± 0.06 mph			
Rear Impact	2.4 ± 0.06 mph			

Engine Operation for 5 minutes after impact without stalling - - _____ YES _____ NO

Inspection and Vehicle Operation indicates there is Damage, Leak or Constriction to the following: (If YES, indicate after which impact number)

	YES	NO		YES	NO
Exterior Lamps			Fuel System		
Reflective Devices			Cooling System		
Impact Energy Absorbing System			Exhaust System		
Steering System			Braking System		
Suspension System			Propulsion System		
Exterior Surfaces					

15. DATA SHEETS...Continued

DATA SHEET 5
POST IMPACT TEST SUMMARY SHEET

MOD YR/MAKE/MODEL/BODY: _____

NHTSA NO.: _____ ; VIN: _____

BUILD DATE: _____ ; TEST DATE: _____

TEST LABORATORY: _____ ; AMBIENT TEMP.: _____

OBSERVERS: _____

HEADLAMP ALIGNMENT

LOCATION	VERTICAL	HORIZONTAL	LAMP ADJUSTMENT TO PROPER ALIGNMENT	
			YES	NO
Left Outer				
Left Inner				
Right Outer				
Right Inner				

SUSPENSION ALIGNMENT

Toe-InFRONT: _____ ; REAR: _____

Camber LF _____ RF: _____ LR: _____ RR: _____

CasterLF: _____ RF: _____

IS LARGE/UNUSUAL OPERATING EFFORT/FORCE REQUIRED?

Hood _____ Trunk _____

Doors RF: _____ LF: _____

RR: _____ LR: _____

Other:

15. DATA SHEETS....Continued

REMARKS:

RECORDED BY: _____

DATE: _____

APPROVED BY: _____

15. DATA SHEETS....Continued

DATA SHEET 6
POST IMPACT VISIBILITY TEST SUMMARY SHEET

MOD YR/MAKE/MODEL/BODY: _____

NHTSA NO.: _____; VIN: _____

BUILD DATE: _____; TEST DATE: _____

TEST LABORATORY: _____; AMBIENT TEMP.: _____

OBSERVERS: _____

DO VISIBILITY ANGLES COMPLY WITH APPLICABLE SAE STANDARD?

		YES	NO
Tail Lamp	Left		
	Right		
Stop Lamp	Left		
	Right		
Turn Signal Lamp	Left Front		
	Right Front		
	Left Rear		
	Right Rear		
Backup Lamp	Left		
	Right		

REMARKS:

15. DATA SHEETS....Continued

MEASURED AND TRUE ILLUMINATED AREA (Square Inches)

		MEASURED AREA	TRUE AREA
Tail Lamp	Left		
	Right		
Stop Lamp	Left		
	Right		
Turn Signal Lamp	Left Front		
	Right Front		
	Left Rear		
	Right Rear		
Backup Lamp	Left		
	Right		

REMARKS:

RECORDED BY: _____

DATE: _____

APPROVED BY: _____

15. DATA SHEETS...Continued

DATA SHEET 7
SUPPLEMENTAL POST IMPACT TEST DATA SHEET

MOD YR/MAKE/MODEL/BODY: _____

NHTSA NO.: _____; VIN: _____

BUILD DATE: _____ TEST DATE: _____

TEST LABORATORY: _____; AMBIENT TEMP.: _____

OBSERVERS: _____

Provide detailed description of any damage, leaks or malfunction that was noted on Data Sheet 3. Also describe any other damage, malfunction or significant change(s) that resulted from the impact tests:

Identify below the test number(s) during which the damage or malfunction described above occurred if visually obvious after the test.

REMARKS:

RECORDED BY: _____

DATE: _____

APPROVED BY: _____

16. FORMS

LABORATORY NOTICE OF TEST FAILURE TO OVSC

REGULATION PART 581

TEST DATE: _____

LABORATORY: _____

CONTRACT NO. DTNH22-_____

DELV. ORDER NO.: _____

LABORATORY PROJECT ENGINEER'S NAME: _____

TEST VEHICLE MAKE/MODEL/BODY STYLE: _____

VEHICLE NHTSA NO.: _____; VIN: _____

VEHICLE MODEL YEAR: _____; BUILD DATE: _____

TEST FAILURE DESCRIPTION: _____

P581 REQUIREMENT, PARAGRAPH ____ : _____

NOTIFICATION TO NHTSA (COTR) : _____

DATE: _____ BY: _____

REMARKS:

16. FORMS...Continued

MONTHLY TEST STATUS REPORT
REGULATION PART 581
DATE OF REPORT: _____

NO.	VEHICLE NHTSA NO., MAKE & MODEL	COMPLIANCE TEST DATE	PASS/ FAIL	DATE REPORT SUBMITTED	DATE INVOICE SUBMITTED	INVOICE PAYMENT DATE
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						

16. FORMS...Continued

MONTHLY VEHICLE STATUS REPORT
REGULATION PART 581
DATE OF REPORT: _____

NO.	VEH. NHTSA NO., MAKE & MODEL	DATE OF DELIVERY	ODOMETER READING	TEST COMPLETE DATE	VEHICLE SHIPMENT DATE	ODOMETER READING
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						