TP-523-01
January 30, 2026

U.S. DEPARTMENT OF TRANSPORTATION

NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION

LABORATORY TEST PROCEDURE

FOR

49 CFR Part 523, VEHICLE CLASSIFICATION

ENFORCEMENT
Office of Vehicle Safety Compliance
Mail Code: NEF-200
1200 New Jersey Ave. SE
Washington, DC 20590

TABLE OF CONTENTS

PAGE

PREFACE

In accordance with the Energy Policy and Conservation Act (EPCA) (codified at 49 U.S.C. Chapter 329), the National Highway Traffic Safety Administration (NHTSA) promulgates and administers Corporate Average Fuel Economy (CAFE) standards. NHTSA established requirements in 49 CFR 523 for classifying automobiles as either passenger automobiles or non-passenger automobiles for the purposes of meeting the CAFE standards. There are two pathways for classification as a non-passenger automobile: expanded functionality and off-highway capability. Per 49 CFR 523.5(b), an automobile may be classified as a non-passenger automobile based on off-road capability if it has a gross vehicle weight (GVWR) of more than a 6,000 pounds or a 4-wheel drive and it is capable of off-highway operation through having at least four of the following characteristics calculated when the automobile is at curb weight, on a level surface, with the front wheels parallel to the automobile's longitudinal centerline, and the tires inflated to the manufacturer's recommended pressure—

(i) Approach angle of not less than 28 degrees,
(ii) Breakover angle of not less than 14 degrees,
(iii) Departure angle of not less than 20 degrees,
(iv) Running clearance of not less than 20 centimeters,
(v) Front and rear axle clearances of not less than 18 centimeters each.

Pursuant to EPCA and NHTSA's regulations at 49 CFR Part 537, manufacturers submit information to NHTSA regarding whether they will comply with applicable CAFE standards. Manufacturers are required to submit information about the vehicles in their passenger and non-passenger automobile fleets, including information regarding the criteria that each non-passenger automobile meets. As part of its compliance programs, OVSC conducts verification testing on production vehicles to confirm that manufacturers are meeting NHTSA's requirements. Since there are different CAFE standards for passenger automobile fleets and non-passenger automobile fleets, one aspect of verifying CAFE compliance is verifying whether automobiles are properly classified. This standardized test procedure outlines the methods for physically measuring the attributes of production automobiles, in their as-equipped configurations, to verify whether they meet the criteria for off-highway capability in 49 CFR 523.5(b). If NHTSA finds that a vehicle, that a manufacturer reports as being a non-passenger automobile by meeting the criteria in 49 CFR 523.5(b), fails to meet the criteria, NHTSA may conduct an investigation into whether the vehicle was improperly classified. If a vehicle is found to not meet the criteria for non-passenger automobiles, it will be reclassified as a passenger automobile and the manufacturer's fuel economy standards will be recalculated.

REVISION CONTROL LOG
FOR OVSC LABORATORY
TEST PROCEDURES

TP-523
Vehicle Classification

TEST PROCEDURE		49 CFR Part 523.5		
REV. No.	**DATE**	**AMENDMENT**	**EFFECTIVE DATE**	**DESCRIPTION**
n/a	06/22/1976	41 FR 25015 06/22/1976 Final Rule	06/22/1976	Final Rule (41 FR 25015) delegates authority to NHTSA to establish vehicle classification definitions and vehicle categories.
n/a	03/20/2009	74 FR 14449 03/30/2009 Final Rule	10/01/2011	Modification to part 523.5. The final rule (74 FR 14449) clarified the contrast between non-passenger automobiles and passenger automobiles.
n/a	12/15/2022	87 FR 25710 05/02/2022 Final Rule	12/15/2022	NHTSA (87 FR 25710, page 26025) proposed to issue a test procedure to verify manufacturers are properly classifying non-passenger automobiles, as reported in their pre-model reports.
01	01/30/2026	n/a	01/30/2026	Initial test procedure release for determining off-road capabilities pursuant to 523.5.

1. PURPOSE AND APPLICATION

This document is provided by the National Highway Traffic Safety Administration (NHTSA), Office of Vehicle Safety Compliance (OVSC) for the purpose of presenting procedures for uniform testing, and providing suggestions for the use of specific equipment for contracted testing laboratories. The test procedures are based on the requirements specified in the 49 CFR 523. The OVSC test procedures include requirements that are general in scope to provide flexibility for contracted testing laboratories to perform compliance and verification testing and are not intended to limit or restrain a contractor (contracted testing laboratory) from developing or utilizing any testing techniques or equipment which will assist in procuring the required compliance test data. These test procedures do not constitute an endorsement or recommendation for use of any particular product or testing method.

Prior to conducting compliance or verification testing, contracted laboratories are required to submit a detailed test procedure to the Contracting Officer's Representative (COR) to demonstrate consistency with the OVSC laboratory test procedure and the applicable regulation(s). If a contractor views any part of an OVSC laboratory test procedure to be in conflict with a regulation or observes deficiencies in a laboratory test procedure, the contractor is required to advise the COR and resolve the discrepancy prior to the start of compliance or verification testing or as soon as practicable. The contractor's test procedure must include a step-by-step description of the methodology and detailed check-off sheets. Detailed check-off sheets shall also be provided for the testing instrumentation including a complete listing of the test equipment with make and model numbers. 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 in-house test procedures shall be obtained from the COR before initiating the compliance or verification test program.

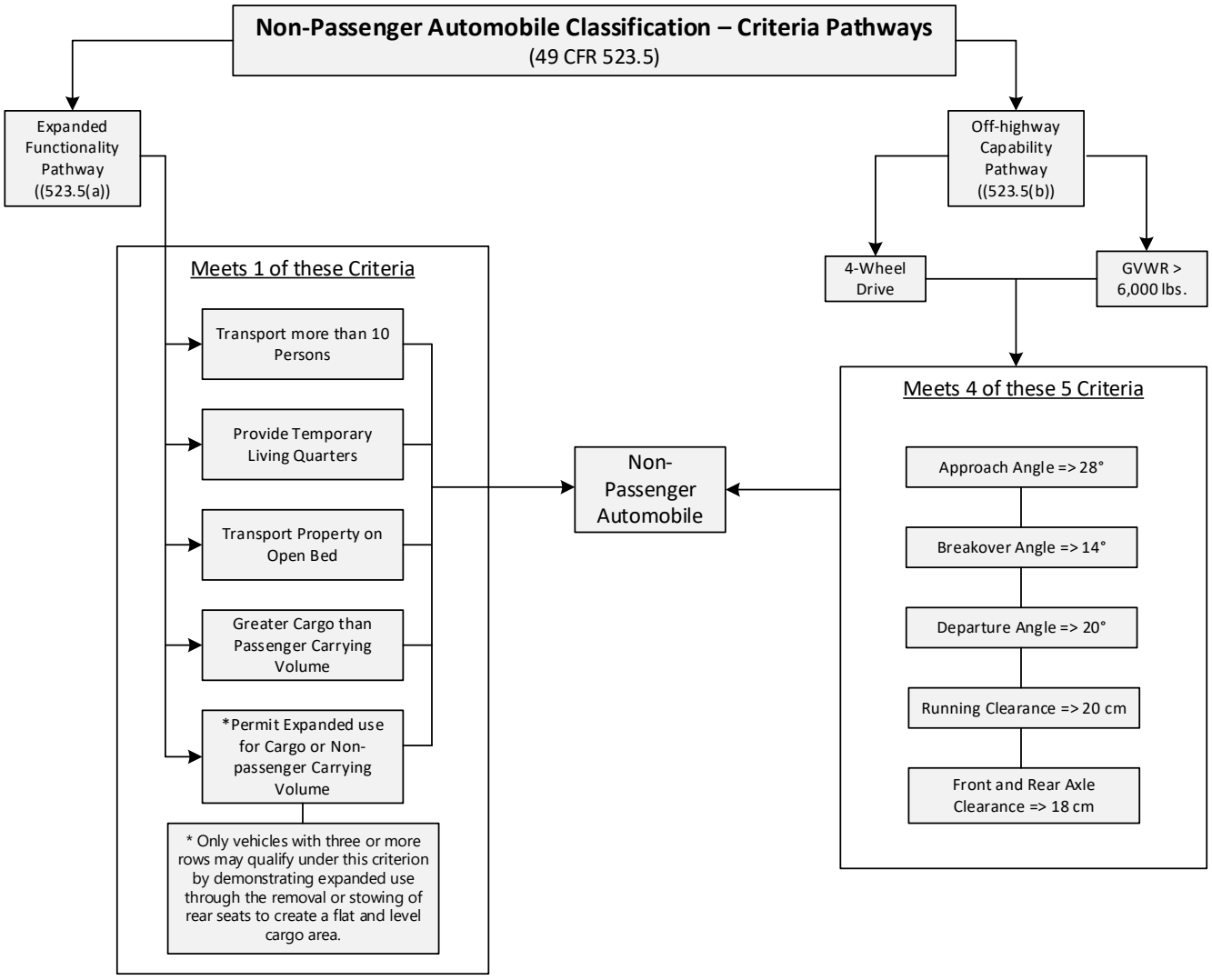
The OVSC Laboratory Test Procedures, prepared for the limited purpose of use by independent laboratories under contract to conduct compliance or verification tests for the OVSC, are not rules, regulations, or NHTSA interpretations regarding the meaning of a regulation(s). **The OVSC Laboratory Test Procedures do not carry the force or effect of the law nor are they intended to bind the public in any way, except that they may be binding on a government contractor consistent with the terms of their contract.** The laboratory test procedures are not intended to limit the requirements of the applicable regulation(s). In some cases, the OVSC laboratory test procedures do not include all the various minimum requirements. Recognizing applicable test tolerances, the laboratory test procedures may specify test conditions that are less severe than the minimum requirements of the FMVSS or regulation. The laboratory test procedures may be modified by the OVSC at any time without notice, and the COR may direct or authorize contractors to deviate from these procedures, as long as the tests are performed in a manner consistent with the standard or regulation 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 or validation tests to those described in the OVSC laboratory test procedures.

2. GENERAL REQUIREMENTS

For an automobile to be properly classifiable as a non-passenger automobile pursuant to 49 CFR Part 523.5, it must meet either have expanded functional characteristics or be capable of off-highway operation (in addition to other requirements), which includes meeting at least four of the following ground clearance criteria. (see Figure 1)

(i) Approach angle of not less than 28 degrees
(ii) Breakover angle of not less than 14 degrees,
(iii) Departure angle of not less than 20 degrees,
(iv) Running clearance of not less than 20 centimeters,
(v) Front and rear axle clearances of not less than 18 centimeters each.

FIGURE 1: Non-Passenger Automobile Classification – Criteria Pathways



This test procedure provides a consistent and repeatable methodology for verifying the manufacturer's classification of the vehicles under the off-highway capability pathway. Under 49 CFR 537, manufacturers are required to submit pre- and mid-model year (PMY and MMY) reports containing early model year production information. As specified in 537.7(c)(5), manufacturers must indicate, for each model type of non-passenger automobile, the criteria the

vehicle meets to qualify under either the expanded functionality criteria specified in 49 CFR 523.5(a) or the off-highway capability criteria specified in 49 CFR 523.5(b). NHTSA uses the data from these reports or will request date from manufacturers to identify vehicles to test in order to verify that non-passenger automobiles are properly classified.

49 CFR 523.5(b) specifies vehicle setup and measurement provisions for classifying vehicles under the off-highway functionality pathway. The criteria are to be calculated with the automobile at curb weight, on a level surface and with the vehicle's front wheels aligned along its longitudinal centerline. The vehicle classification verification testing outlined in this test procedure for determining off-highway capability specifies the use of production vehicles as equipped at the time of first sale, with only manufacturer-offered options installed. Each production vehicle must exceed four out the five attribute values in 49 CFR 523.5. Manufacturers are obligated to exercise reasonable care when certifying vehicle compliance but are not required to follow NHTSA's test procedures.

METRIC SYSTEM OF MEASUREMENT

Section 5164 of the Omnibus Trade and Competitiveness Act (Pub. L. 100-418) establishes that the metric system of measurement is the preferred system of weights and measures for trade and commerce in the United States. Executive Order 12770 directs Federal agencies to comply with the Act by converting regulatory standards to the metric system after September 30, 1992. In a final rule published on March 15, 1990 (60 FR 13639), NHTSA completed the first phase of metrication, converting English measurements in several regulatory standards to the metric system. Since then, metrication has been applied to other regulatory standards (63 FR 28912).

Accordingly, the OVSC laboratory test procedures include revisions to comply with governmental directives in using the metric system. Regulatory standards converted to metric units are required to use metric measurements in the test procedures, whereas standards using English units are allowed to use English measurements or to use English measurements in combination with metric equivalents in parentheses. For any testing equipment that is not available for direct measurement in metric units, the test laboratory shall calculate the exact metric equivalent by means of a conversion factor carried out to at least five significant digits before rounding consistent with the specified metric requirement.

All final test reports are required to include metric measurements for standards using metrication. 49 CFR Part 523.5 specifies requirements in degrees and centimeters, so any measurement values taken in millimeters must be converted accordingly.

The methodology for rounding measurement in the test reports shall be made in accordance with ASTM E29-06b, "Standard Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications."

3. SECURITY

The Contractor shall provide appropriate security measures to protect the OVSC test vehicles and Government Furnished Property (GFP) from unauthorized personnel during the entire 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 Acquisition Management, within two working days after the incident. A letter containing specific details of

the security problem shall be sent to the IPM (with copy to the COR) within 48 hours.

The Contractor shall protect and segregate the data from verification testing before and after each vehicle test. No information concerning the verification testing program shall be released to anyone except the COR, unless specifically authorized by the COR or the COR's Division Chief.

No individuals, other than Contractor personnel directly involved in the verification testing program or OVSC personnel, shall be allowed to witness any vehicle verification test unless specifically authorized by the COR.

4. GOOD HOUSEKEEPING

Contractors shall maintain the entire vehicle 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 test schedule to the COR prior to conducting the first verification test. Tests shall be completed at intervals as required in the contract. If not specified, the first test shall be conducted within 6 weeks after receiving the first delivered unit. Subsequent tests shall be completed in no longer than 1-week intervals unless otherwise specified by the COR.

Scheduling of tests shall be adjusted to permit vehicles to be tested to other NHTSA requirements, such as FMVSSs, as may be required by the OVSC. All verification testing shall be coordinated with the COR in order to allow monitoring by the COR and/or other OVSC personnel if desired. The Contractor shall submit a monthly test status report and a vehicle status report (if applicable) to the COR. The vehicle status report shall be submitted until all vehicles are disposed of. The status report forms are provided in the forms section.

6. TEST DATA DISPOSITION

The Contractor shall make all preliminary verification test data available to the COR within 24 hours after completing all testing. Final test data, including digital printouts and computer-generated plots (if applicable), shall be available to the COR in accordance with the contract schedule or, if not specified, within two working days. Additionally, the Contractor shall analyze the preliminary test results as directed by the COR.

All backup data sheets, strip charts, recordings, plots, technicians' notes, etc., shall be either sent to the COR or destroyed at the conclusion of each delivery order, purchase order, etc.
The Contractor shall protect and segregate the data collected from verification testing.

TEST DATA LOSS

A. INVALID TEST DESCRIPTION

An invalid compliance or verification 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 email or telephone, within 24 hours of the test and send written notice to the COR within 48 hours of the test completion.

C. RETEST NOTIFICATION

The COR 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 COR 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 NHTSA's waiving or not waiving any requirement.

E. TEST VEHICLE

NHTSA shall furnish and pay the cost for only one original vehicle for each test ordered. If a retest is required due to an invalid test or any outcome directly resulting from the Contractor's error, the Contractor shall be responsible for furnishing a new replacement vehicle if necessary. 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 verification test, the Contractor may dispose of it upon notification from the COR 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 COR. The report and other required deliverables for the retest vehicle are required to be submitted to the COR within 3 weeks after completion of the retest. The electronic data and draft final test report shall be submitted within 14 days of the final test. The final test report shall be submitted within 7 days after receiving comments from the COR.

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).

H. NHTSA'S RIGHTS

None of the requirements herein stated shall diminish or modify the rights of NHTSA to determine that any test submitted by the Contractor does not conform precisely to all requirements/specifications of the OVSC Laboratory Test Procedure and Statement of Work

applicable to the test.

7. GOVERNMENT FURNISHED PROPERTY (GFP)

GFP consists of test vehicles and testing equipment. The GFP is authorized by contractual agreement. The Contractor is responsible for the following.

A. ACCEPTANCE OF TEST VEHICLES

The Contractor has the responsibility of accepting each GFP test vehicle whether delivered by a new vehicle dealership or another vehicle transporter. In both instances, the Contractor acts on behalf of the OVSC when signing an acceptance of the GFP test vehicle delivery order. When a GFP vehicle is delivered, the Contractor must verify:

1) All options listed on the "window sticker" are present on the test vehicle.
2) Tires and wheel rims are new and the same as listed.
3) No modifications, additional dealer-installed options, or after-market equipment that would potentially affect the off-highway dimensional characteristics have been installed.
4) There are no dents or other interior or exterior flaws in the vehicle body.
5) The vehicle has been properly prepared and is in running condition.
6) The glove box contains an owner's manual, warranty document, consumer information, and extra set of keys.
7) Proper fuel filler cap is supplied on the test vehicle (if equipped).
8) Spare tire, jack, lug wrench and tool kit (if applicable) are located in the vehicle cargo area.
9) The VIN (vehicle identification number) on the vehicle condition report matches the VIN on the vehicle.
10) The vehicle is equipped as specified by the COR.
11) The Contractor must confirm with the COR any applicable recalls that need to be performed/remedied prior to the start of testing.

A Vehicle Condition form will be supplied to the Contractor by the COR when the test vehicle is transferred from a new vehicle dealership or between test contracts. The upper half of the form is used to describe the vehicle as initially accepted. The lower half of the Vehicle Condition form provides space for a detailed description of the post-test condition. The Contractor must complete a Vehicle Condition form for each vehicle and deliver it to the COR with the Final Test Report or the report will NOT be accepted for payment.

If the test vehicle is delivered by a government contracted transporter, the Contractor should check for damage that may have occurred during transit. GFP vehicle(s) and manufacturer-provided vehicles (if applicable) shall not be driven by the Contractor on public roadways unless authorized by the COR.

B. TESTING EQUIPMENT

Test equipment may be furnished to the contracted laboratory by the OVSC. Otherwise, the contracted laboratory will be responsible for obtaining the test equipment required to execute this test.

C. NOTIFICATION OF COR

The COR must be notified within 24 hours after a vehicle (and/or equipment) has been delivered. In addition, if any discrepancy or damage is found at the time of delivery, a copy of the Vehicle Condition form shall be sent to the COR immediately.

8. CALIBRATION OF TEST INSTRUMENTS

Before the Contractor initiates the verification 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 shall 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 exceeding 12 months for instruments and 12 months for the calibration standards except for static types of measuring devices such as rulers, weights, etc., which shall be calibrated at periodic intervals not to exceed two years. 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 shall 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 at a minimum the following information for all measurement and test equipment:

1) Type of equipment, manufacturer, model number, etc.
2) Measurement range
3) Measurement resolution (detection precision)
4) Measurement accuracy
5) Calibration interval
6) Type of standard used to calibrate the equipment (calibration traceability of the standard must be evident)
7) The actual procedures and forms used to perform the calibrations

E. 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 COR. The calibration system shall need the acceptance of the COR before verification 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. The Contractor may be directed by NHTSA to evaluate its data acquisition system.

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."

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 COR's discretion and shall be performed without additional cost.

9. SUGGESTED TEST EQUIPMENT

A. Handheld laser distance meter with a measuring range of at least 15.24 meters (50 feet), resolution of 1 mm, and an optimized accuracy of ±1 mm (e.g., Fluke 419D or 424D Laser Distance Meter, or equivalent), used on a highly reflective surface (e.g., a light-colored, high-gloss test surface or a thin reflective plastic sheet).

B. Digital level with a measuring range of 0° to 90°, a resolution of 0.1°, and a minimum accuracy of ±0.1° at all measuring angles (e.g., Stabila 48" Digital Level (Model 39548), or equivalent).

C. Digital angle measuring device (inclinometer) with range of 0 - 360°, a resolution of 0.1°, and an accuracy of ±0.1°, (e.g., Digital Protractor Angle Finder (Model PRO 360), or equivalent).

D. 90-degree angle ruler, high-precision/professional grade (for checking alignment of plates).

E. Elevation gauge, or other elevation measuring device, such as a pointer assembly in conjunction with vehicle markings, with a resolution of 1 mm and an accuracy of ±1 mm (for checking vertical vehicle movement). This could be a custom static apparatus (e.g., a pointer stand) capable of working in conjunction with vehicle markings and monitoring vehicle movement during testing, in which case the diameter of the end of the pointer should not exceed 1 mm. The apparatus must be constructed such that it will remain completely stationary during testing. An example of a device meeting this criteria is shown in Figure 14 under Section 10.

F. Tape measure with a measuring length of at least 7,620 mm (300 inches), with 1 mm graduated increments (e.g., Tajima Tool Corp G-Series Shock Resistant Tape Measure, Model No. G-25BW, or equivalent); or caliper device/telescoping measuring arm, such as a tram gauge with minimum measuring length of 4,572 mm (180 inches), with 1 mm graduated increments (e.g., Dent Fix Equipment DF-3TC5A, or equivalent).

G. Portable tire pressure gauge with bleeder valve and an operating pressure of 0-700 kPa (0-100 psi), accuracy of +/- 0.5% of applied pressure, and graduated increments of 1 kPa (0.1 psi) (e.g., Intercomp Digital Air Pressure Gauge, Model 360045, or equivalent).

H. Supplemental jacks (e.g., motorcycle jacks, jack stands, scissors jacks, cylinder jacks, etc.)

I. Carbon Fiber Device (or equivalent): A fabricated device consisting of a rigid, flat carbon-fiber sheet with a nominal thickness of 3/8 in. (9.5 mm), of sufficient size to extend from

tire to tire at either the front or rear of the vehicle. The sheet shall measure approximately 48 in. (L) × 84 in. (W) and shall include structural reinforcements, as necessary, to maintain flatness. Two supplemental jack supports (described above) shall be used to raise and support the plate. Equivalent devices may be constructed from alternative rigid materials, provided they maintain consistent flatness across the entire surface. Structural reinforcements shall be sufficient to prevent any visible warping or bending of the plate during testing. When placed on a perfectly level surface, measurements taken with an inclinometer having an accuracy of ±0.1° shall not indicate a change greater than 0.1° at any location on the sheet surface. The sheet shall be of sufficient size to accommodate the wheelbase and the front and rear overhangs of production automobiles classified as non-passenger automobiles under 49 CFR Part 523. See photographs in Figures 2 and 3 below.

Figure 2

Figure 3

J. Rolling Jack Device (or equivalent): A fabricated device used to measure the vehicle clearances specified in section 13.4: (1) Running Clearance; (2) Axle Clearance; and (3) Breakover Angle. The device is fabricated from a 15” x 9” flat top motorcycle jack stand and a fabricated rolling dolly and attached to a removable control handle, multi-directional wheels, a fabricated jack roof (as a mounting base), fabricated mountable lifting surfaces (angle mounts) of varying heights, fabricated mountable laser holding clamp, and standard 7/8” socket with 42”-48” lightweight socket extension (for jack height adjustment). Measurement devices for running and axle clearances must be capable of vertical measurements from any surface under the vehicle and to the ground. Equivalent devices may be used to measure each vehicle clearance separately. See photographs and diagrams in Figures 4-8 below:

Figure 4

Figure 5

Figure 6

Figure 7

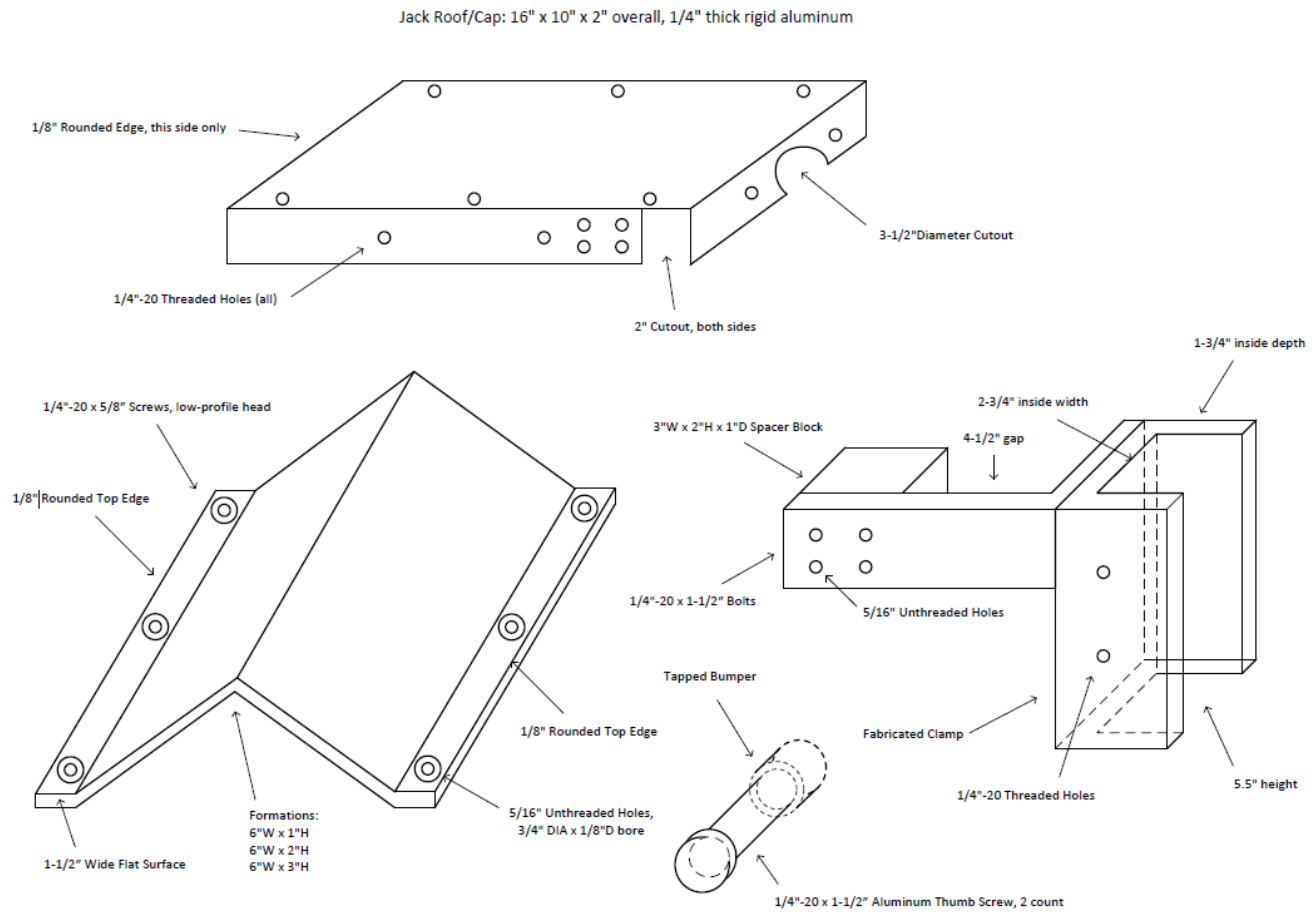


Figure 8

K. Breakover Angle Plate Assembly (or equivalent): A customizable fabricated device consisting of rigid, flat carbon-fiber plates with a nominal thickness of 3/8 in. (9.5 mm), interconnected by square poles of selectable lengths. The assembly shall include aligned pole-positioning sleeves with locking set screws, a hinged cap-plate assembly, two base plates, and one sliding plate. The hinged cap-plate assembly shall consist of two plates hinged together, with recommended individual dimensions of 24 in. (L) × 84 in. (W). The two base plates shall have recommended dimensions of 20 in. (L) × 84 in. (W), and the sliding plate shall have recommended dimensions of 8 in. (L) × 84 in. (W). Structural reinforcements shall be provided, as necessary, to ensure that no visible warping or bending of any plate occurs during testing (see "Carbon Fiber Device" for the method used to verify plate flatness before testing). When the apparatus is laid on a flat surface, the hinged intersection shall not exhibit any visible gap. During testing, limited separation of the hinged plates may occur as the plates are folded along the hinge line; such separation shall be minimal and consistent with the example shown in Figure 13 below. Hinges shall be of high strength and durability and shall be sufficiently low-profile to minimize plate separation. Measurement devices used to determine the breakover angle shall be adjustable

to multiple angles and shall be of sufficient length to contact the inner sides of both the front and rear wheels. All plates used in this device shall remain within the same surface plane when adjusted to different angles. See photographs in Figures 9–13 below.

Figure 9

Figure 10

Figure 11

Figure 12

Figure 13

10. PHOTOGRAPHIC DOCUMENTATION

DIGITAL PHOTOGRAPHS

The Contractor shall take digital photographs of the test procedure execution. Photographs shall be taken in color and contain clear images. A vehicle Model Year and Carline Name, NHTSA number, and photograph description with Test Procedure name shall appear in each photograph and must be legible. Identify the test number using the tent cards. Each photograph filename shall be labeled as to the subject matter. The required resolution for digital photographs is a minimum of 1,600 x 1,200 pixels. Digital photographs are required to be created in color and in a JPG format. Glare from any illuminated or reflective surface should be minimized while taking photographs.

The test reports should include enough photographs to describe the testing in detail and should be organized in a logical succession of consecutive pictures. The photographs should be taken such that they serve as evidence for a description, operation, or dimensional information of the vehicle or test device. The digital photographs should be included in the test report in a logical order detailing the testing. Any instance in which a vehicle is tested to a criteria and fails to meet it must be photographed at various angles to assure complete coverage. Upon request, the photographs should be sent to the COR on a CD or DVD and saved in a "read only" format to ensure that the digital photographs are the exact pictures taken during testing and have not been altered from the original condition.

PHOTOGRAPHIC VIEWS

As a minimum, the following test photographs shall be included in each final vehicle test report submitted by the Contractor:

A. Left and right side of vehicle full views

B. Front and rear of vehicle full views

C. Left side of vehicle three-quarter view

D. Vehicle certification label (including display of VIN)

E. Vehicle (tire) placard

F. Vehicle Monroney Label

G. Tire showing manufacturer (additional photos required if values vary between tires)

H. Tire showing model (additional photos required if values vary between tires)

I. Tire showing size, load, & speed index (additional photos required if values vary between tires)

J. Digital level verifying ground levelness (under front/rear bumper & left/right sills)

K. Digital angle measuring device verifying ground flatness (under front/rear bumpers & left/right sills)

L. Rolling Jack Device with mounted laser distance meter identifying the lowest point of the front and rear axle clearances and showing the measurement (e.g., via the digital display of the mounted laser measuring device) (see section 13.7)

M. Rolling Jack Device with mounted laser distance meter identifying the lowest point of the running clearance and showing the measurement (e.g., via the digital display of the mounted laser measuring device) (see section 13.7)

N. Digital level showing levelness and flatness of approach and departure angle plate resting on the support jacks

O. Digital level and carbon fiber plate showing approach and departure angles on both driver and passenger sides of the plate

P. Full view of wheelbase measurement equipment setup

Q. Tape measure or tram gauge demonstrating the wheelbase measurement

R. Temporary markings of vehicle center line for establishing the breakover angle

S. Rolling Jack Device with breakover angle plates raised to the contact point(s) under the vehicle

T. Measurement of the digital level for breakover angle measurements from the front driver, front passenger, rear driver, and rear passenger sides

U. Vehicle undercarriage front/rear showing underbody protection and axles

V. Elevation gauge or pointer locations (see example locations below - Figure 13: Pointer location (front and rear) for tracking underbody surface compression during running clearance, axle, clearance, and breakover angle measurements; Figure 14: Example of proposed front pointer location (right and left side) for tracking ride height change during approach and departure angle measurements):

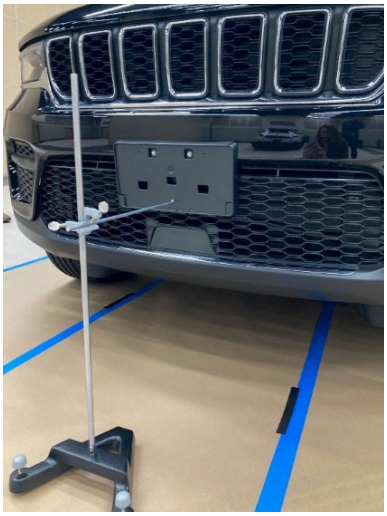


Figure 14

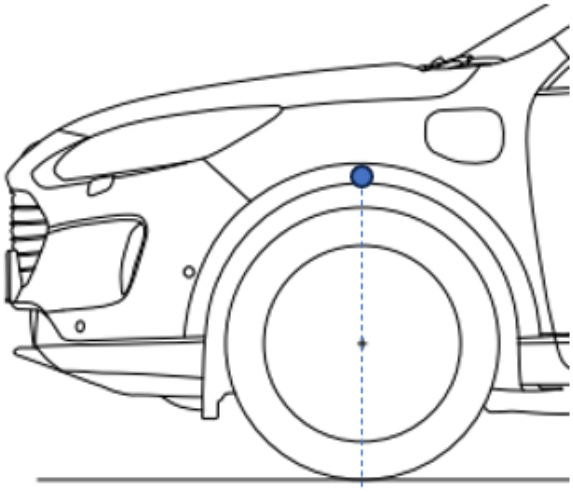


Figure 15

W. Obstructions to axle measurement (if applicable)

X. Vehicle features that are potential causes of a test failure (as required and based on consultation with COR)

11. DEFINITIONS

Approach Angle[1]
The smallest angle, in a plane side view of an automobile, formed by the level surface on which the automobile is standing and a line tangent to the front tire static loaded radius arc and touching the underside of the automobile forward of the front tire.

Axle Clearance[2]
The vertical distance from the level surface on which an automobile is standing to the lowest point on the axle differential of the automobile.

Breakover Angle[3]
Breakover angle means the supplement of the largest angle, in a plane side view of an automobile, that can be formed by two lines tangent to the front and rear static loaded radii arcs and intersecting at a point on the underside of the automobile.

Cargo-carrying Volume[4]
The luggage capacity or cargo volume index, as appropriate, and as those terms are defined in 40 CFR 600.315-08, in the case of automobiles to which either of these terms apply. With respect to automobiles to which neither of these terms apply, “cargo-carrying volume” means the total volume in cubic feet, rounded to the nearest 0.1 cubic feet, of either an automobile's enclosed non-seating space that is intended primarily for carrying cargo and is not accessible from the passenger compartment, or the space intended primarily for carrying cargo bounded in the front by a vertical plane that is perpendicular to the longitudinal centerline of the automobile and passes

1 49 CFR §523.2 Definitions.
2 49 CFR §523.2 Definitions.
3 49 CFR §523.2 Definitions
4 49 CFR §523.2 Definitions

through the rearmost point on the rearmost seat and elsewhere by the automobile's interior surfaces.

Curb Weight[5]
The actual or the manufacturer's estimated weight of the vehicle in operational status with all standard equipment, and weight of fuel at nominal tank capacity, and the weight of optional equipment computed in accordance with 40 CFR 86.1832-01.

Deformable Underbody Component
An automotive component, such as a protective panel, typically made of rubber, plastic, or a composite material, mounted under the vehicle, whose shape can change in response to applied forces—such as from road contact, debris, or air pressure—either temporarily (elastic deformation) or permanently (plastic deformation) without breaking or losing its intended function.

Departure Angle[6]
The smallest angle, in a plane side view of a motor vehicle, formed by the level surface on which the motor vehicle is standing and a line tangent to the rear tire static loaded radius arc and touching the underside of the motor vehicle rearward of the rear tire.

Gross Vehicle Weight Rating (GVWR)[7]
The value specified by the manufacturer as the loaded weight of a single vehicle.

Model Type[8]
Model type means a unique combination of car line, basic engine, and transmission class.

Model Year[9]
The manufacturer's annual production period (as determined by the Administrator of the Environmental Protection Agency), which includes January 1 of such calendar year. If a manufacturer has no annual production period, the term “model year” means the calendar year.

Nominal Suspension Setting
The standard or reference position setting of a vehicle’s suspension system, established by the manufacturer, that represents the intended ride height and geometry under specified loading conditions (typically curb weight or unloaded vehicle weight, on a level surface).

Running Clearance[10]
The distance from the surface on which an automobile is standing to the lowest point on the automobile, excluding unsprung weight.

Standard Equipment[11]
Standard equipment means those features or equipment which are marketed on a vehicle over which the purchaser can exercise no choice.

---

5 40 CFR §86.1803-01 Definitions
6 49 CFR §523.2 Definitions
7 49 CFR §571.3(b) Definitions
8 40 CFR §600.002 Definitions
9 40 CFR §86.1803-01 Definitions
10 49 CFR §523.2 Definitions
11 40 CFR §86.1803-01 Definitions

Static Loaded Radius Arc[12]
A portion of a circle whose center is the center of a standard tire-rim combination of an automobile and whose radius is the distance from that center to the level surface on which the automobile is standing, measured with the automobile at curb weight, the wheel parallel to the vehicle's longitudinal centerline, and the tire inflated to the manufacturer's recommended pressure.

Transmission Class[13]
A group of transmissions having the following common features: Basic transmission type (e.g., automatic, manual, automated manual, semi-automatic, or continuously variable); number of forward gears used in fuel economy testing (e.g., manual four-speed, three-speed automatic, two-speed semi-automatic); drive system (e.g., front wheel drive, rear wheel drive; four wheel drive), type of overdrive, if applicable (e.g., final gear ratio less than 1.00, separate overdrive unit); torque converter type, if applicable (e.g., non-lockup, lockup, variable ratio); and other transmission characteristics that may be determined to be significant by the Administrator.

Unloaded Vehicle Weight (UVW)[14]
The weight of a vehicle with maximum capacity of all fluids necessary for operation of the vehicle, but without cargo, occupants, or accessories that are ordinarily removed from the vehicle when they are not in use.

Unsprung Weight[15] [16]
The components that are connected to and translate with the wheels. (e.g., suspension, wheels, axles, and other components directly connected to the wheels and axles).

Vehicle Configuration[17]
A unique combination of basic engine, engine code, inertia weight class, transmission configuration, and axle ratio.

Vehicle Placard
A label, required under 49 CFR 571.110 (FMVSS No. 110), permanently affixed to the driver's side B-pillar (or an adjacent location if unavailable). It provides key tire size(s), pressure(s), and loading information.

Optional Tire Inflation Pressure Label
An additional label that manufacturers may provide if they specify alternative tire and rim combinations. This optional label lists the recommended cold inflation pressures for those optional tire/rim configurations.

Wheelbase[18]
The longitudinal distance between the front and rear wheel centerlines measured parallel to the

12 49 CFR §523.2 Definitions
13 40 CFR §600.002 Definitions
14 49 CFR §571.3(c) Definitions
15 87 FR 26056 (published on May 2, 2022)
16 For unconventional unsprung components, such as parts of the axle assembly, the COR may need to contact the manufacturer to clarify the extent of possible components to be excluded from clearance measurements.
17 40 CFR §86.1803-01 Definitions
18 40 CFR §86.1803-01 Definitions

ground between the wheels.

Work Truck[19]
A vehicle that is rated at more than 8,500 pounds and less than or equal to 10,000 pounds gross vehicle weight and is not a medium-duty passenger vehicle as defined in 49 U.S.C. 32901(a)(19).

12. TEST VEHICLE IDENTIFICATION AND INSPECTION

A. Inspect test vehicle. Document required test vehicle information.

B. Review all test preparation, vehicle classification criteria, and test instrumentation requirements relating to this verification test. Personnel supervising and/or performing the verification test shall be thoroughly familiar with all of the requirements.

C. Review all applicable contents of the vehicle Owner's Manual or equivalent documentation.

D. Verify COR approval of Contractor's detailed in-house test procedure.

E. Review all test preparation, regulation definitions, specifications, and test instrumentation requirements relating to this verification test. Personnel supervising and/or performing the verification test program shall be thoroughly familiar with the requirements, test conditions, and equipment for the test to be conducted.

F. Contracted laboratories must submit to the COR a list of the NHTSA procured test vehicles received. For each test vehicle, note the make, model, engine, transmission, installed tire size(s), and tire model/manufacturer information.

G. Verify the calibration status of test equipment.

H. Document vehicle installed tire size, manufacturer, tire name and tire identification number (TIN). All tires must be new. The vehicle must be tested with the tires installed on the vehicle at the time of initial vehicle sale. From the vehicle placard or optional tire inflation pressure label, identify the vehicle's designated tire size(s). Notify the COR if any tire installed on the vehicle is different from the manufacturer's designated tire size obtained from the vehicle placard or optional tire inflation pressure label and request further guidance before proceeding. Tire changes should not be required; however, if a tire change is necessary, consult the COR and all identifying tire manufacturing data should be documented with photographs.

I. Document vehicle default and selectable configurations affecting the vehicle clearance dimensions.

13. TEST EXECUTION

Personnel supervising and/or performing the vehicle test program shall be thoroughly familiar with the requirements, test conditions, and equipment for the test to be conducted. Testing will be accomplished as indicated below. Test personnel shall make note of all discrepancies and

19 49 CFR §523.2 Definitions

deviations from the applicable regulation and this laboratory test procedure.

13.1 TEST PREPARATION

A. Make sure that the vehicle is at unloaded vehicle weight (UVW), and check that the vehicle tire air pressure(s) conform with the manufacturer's recommendation(s) on the vehicle (tire) placard[20], adjusting to conform if necessary. Ensure that the room temperature is stabilized to normal conditions before checking the vehicle's tire air pressures. (Note: Since the regulatory requirement is for the vehicle to be at curb weight and not UVW, this difference should be given consideration when evaluating test results. The test laboratory should contact the COR to discuss any changes to the vehicle's weight prior to testing.)

B. Locate and inspect test location. Location shall be clean, uniform (no dips, cracks, etc.), free of equipment obstruction, large enough for testing, and having a consistent and level grade.

C. Ensure that the vehicle is tested in a temperature and humidity-controlled environment within a typical room temperature range of 50ºF to 85ºF (10ºC to 29ºC). The Contractor will check the temperature using normal temperature measuring devices and record the value on the data sheet. Afterward, allow at least 30-minutes of settling time if the previous storage environment varies significantly from the controlled testing environment.

D. If a vehicle's owner's manual identifies certain parameters for off-road usage, the test lab will take reasonable measures to meet those conditions. This applies to both automated (e.g. an off-road mode) and manual modification (e.g. physical parts removal) features. An example of a reasonable measure would include having the vehicle in the 'on/run' mode, as well as in Drive if the OEM states this is necessary for the automated system to adjust to the off-road mode ride height.

E. If a vehicle comes equipped with adjustable suspension packaging, measure the vehicle's 49 CFR 523.5(b)(2) characteristics with its adjustable suspension placed in the position(s) intended for off-road operation under real-world conditions. If no off-road mode button is available, consult the owner's manual for information regarding how to properly set the suspension to an off-road operation mode. The vehicle must be placed in the off-road mode prior to positioning the vehicle. If the vehicle has an adjustable suspension without a setting for off-road, follow the owner's manual or other manufacturer-provided instructions for adjustable suspension settings for off-road operation, or contact the COR.

F. Inspect the test vehicle for installed equipment that may cause testing obstructions adversely impacting vehicle clearance measurements, such as front/rear spoilers, hubcaps, running boards, mud flaps, etc. If the equipment is not indicated on the Monroney label, consult with the COR to determine if the aftermarket equipment should be removed for testing. Remove any equipment the owner's manual recommends removing for off-road capability, if reasonably possible to do so. If equipment cannot be removed for off-road capability despite being recommended by the owner's manual, then contact the COR for a determination of whether the vehicle can still be tested. Follow the guidelines below regarding factory-installed equipment which are not otherwise removed.

G. If the installed equipment or shielding on the vehicle underbody is an obstruction and installed by the vehicle manufacturer, treat this equipment as follows for the purposes of obtaining the

20 See 49 CFR § 571.110 S4.3

49 CFR 523.5(b)(2) measurements:

a. If the equipment is intended to be permanently installed, such as side running boards, rigid mudflaps, non-deformable aerodynamic deflectors, non-deformable shielding, rigid bolts, clamps, etc., include these in the determination of the measurements. Unless the manufacturer provides specifications to demonstrate otherwise, such parts should be assumed to be installed and positioned per the manufacturer's specifications and should not be relocated for the purpose of taking clearance measurements.

b. Any deformable underbody components should only be excluded from measurement if they can bend sufficiently either (1) in the longitudinal direction, or (2) in the vertical direction when subjected to combined longitudinal and vertical forces, while still allowing the vehicle to meet the characteristic requirement in 49 CFR 523.5(b)(2) under loaded and positioned conditions.

   A component should be considered deformable if it can flex without breaking and does not undergo permanent deformation when exposed to the above forces. Such components may be permitted to flex during angle or clearance measurements.

   However, components that would break or become permanently deformed—such as when striking a 200 mm object when measuring running clearance evaluations—must not be excluded from measurement.

H. If the test laboratory is uncertain whether the equipment is non-deformable or deformable, consult with the COR.

a. Verify deformable underbody components in two possible ways, depending on the nature of the surface or object:

1. To verify whether a surface or shield is deformable, use the Rolling Jack Device (excluding any angular mounts or brackets; the contact surface must be flat). Position the jack beneath the surface in question and raise it to a height of 200 mm minus the permitted running clearance tolerance (see Section 13.3).

   If the jack can be raised to this height while in contact with the surface without lifting the vehicle more than 3 mm (vertical movement tolerance) or impacting the ability of the vehicle to operate safely post-test, the surface is considered deformable and the clearance measurement must be taken with the component deformed as closely as possible to its maximum point prior to breakage and without increasing the vehicle height beyond the specified vertical tolerance.

2. To verify aerodynamic deflectors or other components that may move aside to increase clearance when the vehicle is traveling forward or backward, use the same procedure described above. In this case, the verification may require manual assistance to gently bend the object to the side as the jack device is raised beneath it. This applies combined horizontal and vertical forces, similar to those experienced during normal vehicle operation.

   If the jack device can compress the object—whether directly or with light manual assistance—the object is considered deformable and the clearance

measurement must be taken with the component deformed as closely as possible to its maximum point prior to breakage and without increasing the vehicle height beyond the specified vertical tolerance.

3. Do not force any surface or object to the breakage threshold if the jack device cannot reasonably compress it without breakage using the specified methods. If it is not clear whether the object is deformable or would break under compression, consult the COR to obtain further information before proceeding.

I. The method for taking axle clearance measurement may vary according to the specific situation. Use the following guidelines:

a. If no axle or axle differential exists, or if one or both axles are obstructed by structural parts or shielding such that an actual axle clearance measurement cannot be obtained, consult with the COR.

b. If the vehicle has only one axle (front or rear), the single measurement obtained will be compared directly to the clearance criterion in 49 CFR 523.5(b)(2)(v).

c. If at least one axle or differential is present but obstructed by other components, a measurement will be taken from the lowest component below the obstructed axle or axles to confirm that axle clearance is at least that value or greater. Such results will be recorded with the measured value followed by a "+" in the test data sheets. Notify the COR for further instructions.

13.2 CALCULATION AND ROUNDING

A. All rounding done during the calculation of results must be done according to ASTM E29.

B. Outline of ASTM Rounding

a. If the first discarded digit is less than 5, the last digit retained is not changed.

b. If the first discarded digit is greater than 5 or is a 5 followed by at least one digit greater than 0, increase the last retained digit by one unit.

c. If the first discarded digit is exactly 5, not followed by anything greater than 0, the last digit should be rounded up if it is an odd number and unchanged if it is an even number.

C. Measurements shall be rounded off based on ASTM E29 with the following accuracy:

a. Angle measurements shall be rounded off to the nearest 1/10 of a degree.

b. Distance measurements shall be rounded off to the nearest millimeter.

13.3 PROGRAM TOLERANCES

The allowable program tolerances for vehicle measurements vs the manufacturer's reported information in the PMY Report are as follows:

Approach Angle	within + 0.5º of the rounded measured angle
Breakover Angle	within + 0.5º of the rounded measured angle
Departure Angle	within + 0.5º of the rounded measured angle
Running Clearance	within +7 mm of the rounded measured distance
Front and Rear Axle Clearance	within +7 mm of the rounded measured distance

If the measured values are at or above the requirements of 49 CFR 523.5(b)(2), then the Contractor should report the vehicle as having passed the verification test. If the measured values are below the requirements of 49 CFR 523.5(b)(2) such that the vehicle does not meet four out of the five criteria, then the vehicle is potentially improperly classified as non-passenger automobile and the Contractor must report the test failure to the COR.

13.4 RECORDING MANUFACTURER AND VEHICLE INFORMATION

A. Record data from the PMY reports on Data Sheet 3: Manufacturer's Setup Information. If the data from the PMY reports has not been received yet by the OVSC, use the manufacturer's testing setup information for comparing to the measured vehicle clearances verified in this procedure. The information received in the manufacturer's setup information submissions will later be compared to the measurements in the PMY and MMY reports for verifying compliance with 49 CFR Part 537.

B. Record the following information, and that the information recorded matches the test vehicle information:

   a. Verify model year, make, model, body type, engine type/displacement, transmission type (manual/automatic, CVT, number of speeds, etc.), drive system (FWD/RWD/AWD), tire branding, and sizes on the vehicle.

   b. Verify that the vehicle mileage is less than 300 miles.

   c. If the conditions in this section are not met, contact the COR.

13.5 TEST VEHICLE POSITIONING

Follow the steps below for vehicle positioning to verify the vehicle classification:

A. Place the vehicle in an off-road mode or adjustable suspension setting, if the vehicle has such mod or setting, prior to proceeding with the vehicle positioning and settling procedure.

B. Position test vehicle within test area, pulling vehicle forward one car length, holding position for approximately five seconds, then reversing into the testing area ensuring that the steer wheels are pointed straight forward by adjusting the steering wheel such that the vehicle's front tires are pointed in the forward direction parallel to the longitudinal centerline of the vehicle. When exiting the vehicle, ensure that steering direction is not altered by the operator contacting the wheel.

C. Secure test vehicle (for automatic transmission place the transmission in "Park" and set the parking brake. For manual transmission, place the transmission in first gear and set the parking brake).

D. Cycle the vehicle's suspension by "bouncing" the vehicle several times in both the front and rear of the vehicle and allowing the vehicle to settle. Avoid re-entering the vehicle after performing the suspension procedure.

E. If moving the vehicle for testing purposes is not viable, perform only the tire alignment and suspension bouncing parts of the positioning procedure, and notate this limitation in the "notes" section of the data sheet.

F. Allow vehicle suspension to rest for five minutes to allow for it to settle.

13.6 SURFACE MEASUREMENTS

Surface measurements should be taken as follows:

A. Measure test surface angular attributes. The measurements should be carried out utilizing a digital inclinometer to determine surface flatness and a 48-inch digital level or a digital inclinometer placed on top of a 48-inch-long straight edge to determine surface levelness. The straight edge is utilized to ensure that the measurement is indicative of the inclination over a wider area so as to disallow localized defects from skewing the measurements.

B. Measure under the center of the front bumper, left sill, rear bumper, and right sill of the vehicle.

C. All measurements must be less than 0.3 degrees; otherwise, a new test location must be found.

D. Using chalk or painters' tape, mark the vehicle testing surface to repeat the vehicle position for subsequent tests.

13.7 TESTING PROCEDURE

A. Running Clearance

   a. Prepare the Rolling Jack Device for Running Clearance Measurement:

      1. Attach a fabricated jack "roof" to the top of the jack surface using set screws to secure position, and attach a laser device clamp with the laser clamped at a 90-degree angle and pointed towards the ground surface.

      2. Attach a handheld laser device mounted using a laser device clamp.

      3. Adjust the Rolling Jack Device to a height of 200 mm using measurements indicated by the attached laser.

      4. Verify a 90-degree angle of the laser device beam with the level ground surface by using an angle measuring device to confirm the laser device mounting orientation.

   b. Measure Running Clearance with the Rolling Jack Device:

      1. Utilize an attached dolly steering/control handle to move the Rolling Jack Device.

2. Use the Rolling Jack Device to run under the entire undercarriage of the vehicle in search of any obstructions of lower hanging components.

3. The measurement must exclude any unsprung weight as well as any components that are considered in the axle clearance measurement and are considered directly related to the axle system. For example, such exclusions could be dedicated axle housings or shielding, special axle components, axle brackets, or axle bolts.

4. If the Rolling Jack Device stand encounters any obstruction, visually isolate the lowest hanging point in the obstruction region, and use the laser device (ideally mounted to the Rolling Jack Device) to check for the running clearance between the lowest hanging point and the ground.

5. If the Rolling Jack Device does not encounter any obstruction, use the laser device (ideally mounted to the Rolling Jack Device) to measure the lowest visible point of the automobile after isolating the region in which the lowest point occurs. Ensure that the reference surface of the top of the Rolling Jack Device makes contact with the lowest point to enable an accurate measurement of the distance between the contact point and the ground surface. This is accomplished by adjusting the height of the flat top surface of the Rolling Jack Device to match the height of the lowest ground clearance, and then taking a laser measurement associated with the jack height.

6. Raise the Rolling Jack Device until it makes hard physical contact with the vehicle underbody (hard contact is achieved when the contacted object or surface is no longer susceptible to deformation and before any breakage would occur):

    i. Do not continue to raise the apparatus such that the vehicle ride height is altered beyond 3 millimeters (mm).

    ii. Verify that any change in vehicle ride height does not exceed the 3 mm using an elevation measuring device (e.g. elevation gauge).

    iii. Place the elevation measuring device as close as possible to the contact location without obstructing measurement.

    iv. If the vehicle ride height is altered, lower the jack until the vehicle returns to its original height within 3 mm.

    v. If the vehicle will not return to the original height within 3 mm, repeat the vehicle positioning procedure found in the previous section.

    vi. If a deformable underbody component is the lowest point on the vehicle, compress the object or surface until either hard contact is made with vehicle structures or until the 3 mm change in ride height occurs.

7. Record the measurement on the appropriate Datasheet.

B. Axle Clearance

a. Prepare the Rolling Jack Device for Axle Clearance Measurement:

1. Attach a fabricated jack “roof” to the top of the jack surface using set screws to secure position and attach laser device clamp with laser clamped at 90-degree angle and pointed towards the ground surface. (if not already attached)

2. Attach a handheld laser device mounted using a laser device clamp. (if not already attached)

3. Adjust the Rolling Jack Device to a height of 180 mm using measurements indicated by the attached laser.

4. Verify a 90-degree angle of the laser device beam with the level ground surface by using an angle measuring device to confirm the laser device mounting orientation.

c. Measure Axle Clearance with the Rolling Jack Device:

1. Utilize an attached dolly steering/control handle to move the Rolling Jack Device.

2. Use the Rolling Jack Device the Rolling Jack Device to run under the front axle and rear axle differential of the undercarriage of the vehicle in search of any obstructions hanging lower than the test device.

3. The axle clearance measurement must exclude the unsprung weight. (e.g., wheels, semi-sprung control arms).

4. If the Rolling Jack Device stand encounters any obstruction, visually isolate the lowest hanging point in the obstruction region and use the laser device (ideally mounted to the Rolling Jack Device) to check for the axle clearance between the lowest hanging point and ground.

5. If the Rolling Jack Device does not encounter any obstruction, use the laser device (ideally mounted to the Rolling Jack Device) to measure the lowest visible point of the automobile after isolating the region in which the lowest point occurs on the axle. Ensure that the reference surface of the top of the Rolling Jack Device makes contact with the lowest point in order to enable an accurate measurement of the distance between the contact point and the ground surface. This is accomplished by adjusting the height of the flat top surface of the Rolling Jack Device to match the height of the lowest ground clearance, and then taking a laser measurement associated with the jack height.

6. Follow the guidelines in the running clearance section regarding a potential change in ride height and deformable underbody component compression.

7. Record the measurement on the appropriate Datasheet.

   i. If the vehicle has an off-road capability but has no axle differential present to use as a reference point in determining the lowest point on the axle differential of the automobile, any other lowest hanging component of the axle which is unsprung can be used as a reference point in the measurement.

ii. If an axle is not present at the front or rear of the vehicle, do not attempt to take an axle clearance measurement at that location. Only take an axle clearance measurement at locations where an axle is present.

iii. If obstruction caused by the vehicle structures or components makes it impossible to take a measurement of a lowest axle component, then measure to the lowest hanging point of the vehicle structure in the region of the axle, and record this measurement followed by a "+" as the axle clearance entry in the appropriate Datasheet.

iv. Notify the COR if the actual axle clearance measurement cannot be obtained. (See the test preparation section above.)

C. Approach and Departure Angles

a. Measure Approach Angle:

1. Use a 3/8"-thick Carbon Fiber Device and align with the left front and right front tire by slanting it to touch the underside of the automobile.

2. Use supplemental supporting jacks in alignment with the tires on the driver and passenger sides of the vehicle to apply pressure to the underside of the sheet and to hold it in place.

3. Adjust height and/or fine tune the sheet position as required in order to maintain unassisted positioning of the Carbon Fiber Device as described above.

4. If the vehicle has permanent obstructions, such as side running boards, rigid mudflaps, non-deformable aerodynamics deflectors, etc., treat them according to the test preparation section above for the purposes of obtaining measurements.

5. Follow the guidelines in the running clearance section regarding a potential change in ride height and deformable underbody component compression.

6. Do not allow the measurement plate to bend or warp while compressing the deformable underbody component, and only allow the vehicle to rise such that no plate bending occurs.

7. Use a tape measure to verify ground to plate height at each jack location.

8. Use a 48-inch level to verify side-to-side plate levelness and flatness and top to bottom plate flatness:

i. The angle measured from side-to-side should be no greater than 0.1º, consistent with the device measurement accuracy and ideally attempting to achieve a 0º pitch in the measurement plate.

ii. If the measured levelness angle exceeds 0.1º, then adjustment to jack heights is necessary.

iii. There should be no visible gaps between the level and the plate surface when the level is placed horizontally or vertically across the plate.

iv. If necessary, adjust the height and tension of the support jacks, and reduce pressure at contact points until no gaps can be observed.

9. Use a 48-inch digital level, and place the arm length of the device against the thin Carbon Fiber Device and take the reading on both driver and passenger sides of the vehicle for the approach angle and departure angles.

    i. If required to keep the level from touching the ground, place blocks at the bottom of the plate at each rear tire in order to keep the level in contact with the plate only.

10. Average the two measured values, and record one final measurement on the appropriate Datasheet.

b. Measure Departure Angle:

1. Repeat the above steps for measuring approach angle to measure departure angle at the rear tires and underbody of the vehicle.

D. Breakover Angle

a. Measure Breakover Angle:

1. Measure the vehicle wheelbase using the procedure described in the wheelbase measurement section below, or utilize existing measurements already derived from the TP-537 wheelbase measurement procedure, if available.

2. Utilize the Rolling Jack Device, Breakover Angle Plate Assembly, and appropriately selected angle mounts and poles for taking breakover angle measurements.

3. Select the plate support poles:

    i. Poles will be movable through support sleeves attached to each plate piece. Poles must be selected to allow sufficient movement for plate assembly while not exceeding space limitations. The following rough guideline can be used in pole selection:

$$\text{Pole Length} \approx \tfrac{1}{2}\ \text{Wheelbase Length} - 20”$$

    ii. Poles should be available in 28”-60” lengths in gradual increments (4 sets) in order to accommodate the range of possible wheelbase lengths.

4. Select the angle mount:

i. An angle mount will be installed to the top of the Rolling Jack Device roof mount that makes contact with the hinged cap plates and allows for a workable initial angle of the plates. Obstructions on the jack roof should be removed for the lifting process. These include the laser device clamp mount and any protruding set screw ends (i.e. the screws on the long edges). The height of the angle mounts will be used to set an appropriate initial angle of the cap plates. Multiple set heights should be available for these mounts (i.e. 1", 2", and 3"). Use the following general consideration for angle mount selections when the approximate vehicle center running clearance is:

- <6" (~150 mm): not measurable with apparatus, Contractor should record a failure to meet criterion
- 6"-8" (~150 mm-200 mm): use 1" height angle mount
- 9"-10" (~230 mm-255 mm): use 2" height angle mount
- >10" (~255 mm): use 3" height angle mount

5. Assemble the Rolling Jack Device with an appropriately selected angle mount mounted jack roof. Remove any potential obstructions from the jack roof, such as protruding set screws.

6. Assemble the Breakover Angle Plate Assembly:

ii. Using a properly selected length of poles, run each of (4) plate support poles into the (4) sleeves of the ground plates.

iii. Firmly lock the poles into the same position on each sleeve once each pole contacts the stopper device installed on the sleeve.

iv. The extension of the poles from the ground plate sleeves will allow for the sliding plate (if applicable) and the hinge plates to be added to the assembly. (These additional plates have 26" of combined sleeve length, which results in 36" of total sleeve length when combined with the ground plate.)

v. Move the additional plates into position by sliding the pole protrusions first into the optional sliding plate sleeves and then into the hinged cap plate sleeves.

vi. For cases in which the vehicle wheelbase is relatively small (e.g. 100-inches or less), it may be desirable and/or necessary to exclude the sliding plate. This allows for a starting assembly length that will not exceed the available gap between the front and rear tires of the vehicle. However, in some cases, the sliding plate must be installed in order to address plate gaps when dealing with hanging obstructions.

vii. Loosely fasten all plates into assembled position using the set screws located on each sleeve of each plate.

viii. All sleeves should be located on the same side of the plate assembly.

7. Use chalk or other removable/washable marking substance and a measuring tool to mark the longitudinal vehicle center line at ½ of the wheelbase distance (between the wheel spindles) on the outer portion of the vehicle underbody and on the bottom of the vehicle trim on both the right and left sides of the vehicle.

8. Use chalk or equivalent to mark the longitudinal vehicle center line on the level ground surface below the outer of right and left sides of the vehicle.

9. Use the chalk markings as a reference to guide the Rolling Jack Device and the Breakover Angle Plate Assembly into a centered position in reference to the vehicle underbody.

10. Position the Breakover Angle Plate Assembly such that all sleeves rest on the level ground surface

11. Lift and place the Breakover Angle Plate Assembly onto the Rolling Jack Device. Position the angle mount of the Rolling Jack Device at a laterally and longitudinally centered position, using the central gap in the hinges of the hinged cap plates for approximate positional guidance.

12. Alternatively, the hinged cap plate can be rested on the Rolling Jack Device prior to sliding poles into sleeves and prior to adding ground plates to the assembly:

    i. In this case, firmly attach poles to the ground plates first, and then slide poles into position on the hinged cap plate.

    ii. Loosely lock set screws into position on the hinged cap plate following assembly.

13. The hinged center line of the hinged cap plate of the Breakover Plate Assembly should rest directly on the vertex of the angle mount of the Rolling Jack Device without touching the other edges of the angle mount:

    i. If the hinged cap plate contacts the other edges of the angle mount after moving the apparatus into final position under the vehicle, then ensure that the angle mount selection guidelines above were properly followed.

    ii. If necessary, utilize a rubber mallet to gently tap the angle mount into complete alignment with the hinged center line of the hinged cap plate.

14. Roll the Breakover Angle Plate Assembly into a centered position under the vehicle using the Rolling Jack Device:

    i. Utilize the vehicle center line chalk markings as guidance.

    ii. The Breakover Angle Plate Assembly should protrude from either side of the vehicle underbody by approximately the same distance on either side of the vehicle in order to ensure lateral centering.

iii. If the vehicle body width is greater than the width of the Breakover Angle Plate, position the Breakover Angle Plate Assembly in the most centered position possible.

iv. Adjust as necessary and confirm assembly is centered by taking measurements from the edge of the assembly to a common point on either side of the vehicle.

15. Raise the Breakover Angle Plate Assembly:

i. Adjust the height of the Rolling Jack Device by turning the attached crank with a 7/8" with long extension handle, keeping marked vehicle center line in consideration for correct alignment.

ii. Raise the device until the plates makes hard physical contact with the vehicle underbody.

iii. Do not continue to raise the apparatus such that the vehicle ride height is altered by more than 3 mm.

iv. Verify that any change in vehicle ride height does not exceed the 3 mm using elevation measuring devices (e.g. elevation gauges):

- Place the elevation measuring devices at the front and rear center points of the vehicle (e.g. above the centers of the bumpers) so as not to obstruct measurement.

- If the vehicle ride height is altered, lower the jack until the vehicle returns to its original height within 3 mm.

- If the vehicle will not return to the original height within 3 mm, repeat the vehicle positioning procedure found in the previous section.

- If deformable underbody components are obstructing the measurement, follow the same compression process as described in the running clearance measurement section, being careful not to exceed a 3 mm change in vehicle ride height.

    - Deformable coverings or shielding are typically installed on the vehicle underbody and often difficult to remove. Therefore, this compression procedure is likely to be required for most vehicles when acquiring breakover angle measurements.

16. During the positioning of the overall Breakover Angle Plate Assembly, if any of the plates make contact with the vehicle underbody due to hanging obstructions, then the Rolling Jack Device must be lowered until the assembly barely makes hard contact with the vehicle underbody obstruction when properly positioned.

17. Ensure that there are no obstructions within the open space between the plate support poles and each of the plates:

i. Loosen the set screws of the sliding plate, and slide the plate up to the hinged cap plates and back down to the ground plates.

ii. If no obstruction of sliding plate movement occurs, proceed with refining the plate positioning.

iii. If a sliding plate is obstructed by a vehicle underbody protrusion, then lower the Rolling Jack Device until the sliding plate is visibly lower than the lowest vehicle underbody protrusion.

- Position the sliding plate to be directly under the protrusion, and lock the plate into position using the sleeve set screws.

- Raise the Rolling Jack Device until the sliding plate barely makes hard contact with the vehicle underbody, adhering to the same plate raising instructions as described above for the Breakover Angle Plate Assembly.

18. Loosen (if necessary) the hinged cap plate set screws in order to extend the plate assemblies on each side of the vehicle center line, such that the ground plates are in tangent with the static loaded radius arc of each tire while the hinged intersection of the Breakover Angle Plate Assembly remains in alignment with the marked vehicle center line.

19. Use a tape measure to verify that all plates are the same length from the bottom edge of the ground plate to the top edge of the hinge plate. This ensures that the lateral axis of the plates is perpendicular to the longitudinal axis of the vehicle and that each plate edge is extended properly to the static loaded radius arc of each tire.

20. Alternatively, the gaps between ground and hinge plates can be measured as an indicator of alignment.

21. Use a 90-degree angle ruler to verify that all assembled poles are perpendicular with the plate edges.

22. Use a tape measure to check the heights of the breakover angle plates on the driver and passenger sides of the vehicle, ensuring that these plates are as close to the same height from the ground on both sides as the equipment will allow.

    i. If required, utilize supplemental jacks to assist in maintaining equal height on both sides of the vehicle.

23. Use a 48-inch level to verify top to bottom plate flatness:

    i. There should be no visible gap between the level and the plate surface.

    ii. If necessary, adjust the apparatus set screw tension, Rolling Jack Device tension, and pressure at contact points until no gap can be observed.

24. Retighten the set screws of all plate sleeves once the refined positioning is correct.

25. Ensure that you do not further raise the height of the vehicle inadvertently during the process of refining the position of the breakover equipment.

26. Repeat the previously described positioning verifications (pole alignment, height consistency) if the apparatus has to be adjusted for any reason, including after adjusting for obstructions or improving flatness.

27. Obtain Breakover Angle Measurements:

    i. For improved accuracy of the breakover angle measurement, use a digital level to determine the breakover angle formed by the adjoined plates in 4 different locations, and average the values.

    ii. The obtained 4 measurements are taken from the 2 planes formed by the hinged cap plates and the ground plates are as follows:

    - Use a digital level capable of spanning from top of the hinged cap plate to the bottom of the ground plate (e.g., a 48-inch level).

    - Set the digital level upon the entire plane formed between the hinged plates and the ground plates parallel with the plate angle.

    - Measure the angle formed between the level ground surface and the planes, and multiply by a factor of 2 in order to calculate the breakover angle.

    - Measure the angles of the planes at 4 locations: on the front driver, front passenger, rear driver, and rear passenger sides.

28. Round the result of the averaged angle values to the nearest tenth of a degree to determine one final breakover angle measurement, and record the one final breakover angle measurement on the appropriate Datasheet.

E. Wheelbase Measurement

a. Vehicles with identical front and rear wheel size

1. Remove any hubcap or wheel trim obstructing the location of the wheel rim edges that can be easily removed.

2. Using the tape measure or tram gauge on the left side of the vehicle, measure the horizontal distance, parallel to the ground, from the forward most edge of the front wheel rim to the rearward most edge of the rear wheel rim. The measurement should be made to the nearest 1 mm. Record the distance.

   Using the tape measure or tram gauge on the left side of the vehicle, measure the horizontal distance, parallel to the ground, between the rearward most edge of the front wheel rim to the forward most edge of the rear wheel rim. The measurement should be made to the nearest 1 mm. Ensure that while measuring the tape measure is taut and parallel with the ground using the inclinometer. Record the distance.

3. Calculate the left side wheelbase by averaging the measured distances in steps (b) and (c). The calculated wheelbase should be rounded to two decimal places. Record the calculated value onto the data sheet in mm.

4. Repeat steps (b) through (d) for the right side of the vehicle. Record the two measured distances.

5. Calculate the vehicle wheelbase by converting the average of the left and right-side wheelbases in mm from steps (d) and (e) to centimeters rounded to the nearest tenth of a centimeter. Record the calculated value.

b. Vehicles with different front and rear wheel sizes

1. Remove any hubcap or wheel trim obstructing the location of the wheel rim edges that can be easily removed.

2. Using the right-angle rule and the tape measure or tram gauge, measure the horizontal distance, parallel to the ground, between the vertical lines at the forward most location of the front wheel rim to the vertical line at the rearward most location of the rear wheel rim. The measurement should be made to the nearest 1 mm. Record the distance.

3. Using the right-angle rule and the tape measure or tram gauge, measure the horizontal distance, parallel to the ground, between the vertical lines at the rearward most location of the front wheel rim to the vertical line at the forward most location of the rear wheel rim. The measurement should be made to the nearest 1 mm. Record the distance.

4. Calculate the left side wheelbase by averaging the measured distances in steps (b) and (c). The measurement should be rounded to two decimal places. Wheelbase is calculated using two vertical lines at the edges of the rims in order to account for differences in the vertical height of the wheel centers and differences in wheel diameter sizes for vehicles equipped with different tire sizes on each axle. Record the calculated value.

5. Repeat steps (a) through (d) for the right side of the vehicle.

6. Calculate the vehicle wheelbase by averaging of the left and right-side wheelbases from steps (d) and (e). Vehicle wheelbase in mm should be rounded to two decimals places and then converted to centimeters and rounded to the nearest tenth of a centimeter (one decimal place). Record the calculated value.

F. Record all values and round the values according to ASTM E29 to be consistent with PMY/MMY data from manufacturers. Record information on the appropriate Datasheet for use with marking the vehicle centerline.

G. Record the dealership name, contact information, and phone number of the management.

H. If the Contractor misses any of the steps in this section, the test is invalid and the Contractor must re-schedule another vehicle of the same attributes for testing.

13.8 RETESTING REQUIREMENTS AND PROCESS FLOW

A. In order to assure validity of the data, test results obtained are cross-compared with the data provided by the manufacturer in Form 523 and with the minimum required clearances defined by 49 CFR 523.5(b)(2). The conformance verification process takes place in the series of steps explained below:

   a. Conduct Test 1 on the vehicle.

   b. If 4 out of 5 of the measured classification criteria values obtained in Test 1 meet the minimum required clearances defined by 49 CFR 523.5(b)(2), after including the program tolerances outlined in Section 13.3, then the vehicle classification test is in conformance. The Contractor prepares the draft report and sends to OVSC for review. If the vehicle does not meet the criteria, follow Step c through Step d.

   c. Conduct Test 2 on the vehicle.

   d. Compare Test 1 and Test 2 values and check if the values obtained in Test 2 are within tolerance to Test 1 (less than 15% variance). Check if Test 2 results are within the minimum required clearances defined by 49 CFR 523.5(b)(2), after including the program tolerances outlined in Section 13.3. If the test is in conformance, then the Contractor prepares the draft report and sends to OVSC for review. If the vehicle fails to meet the criteria, follow Step e through Step f.

   e. Conduct Test 3 on the vehicle.

   f. Compare Test 1, Test 2 and Test 3 results and check if the values obtained in at least two out of three tests performed are within tolerance to each other (less than 15% variance). Check if the results of any one of the three tests conducted are within the minimum required clearances defined by 49 CFR 523.5(b)(2), after including the program tolerances outlined in Section 13.3.

   g. If Step f results are conforming, then the Contractor prepares the draft report and sends to OVSC for review.

   h. If the Step f results indicate that the vehicle fails to meet the criteria or that Test 1, Test 2, and Test 3 results all do not correlate, the Contractor contacts the COR.

B. Conduct all tests in accordance with Sections 13.1 – 13.7.

C. The results of these tests will be compared with the minimum required clearances defined by 49 CFR 523.5(b)(2), utilizing the program tolerances outlined in Section 13.3. If the vehicle is found to be within tolerances, testing will be concluded.

D. In the event of test results falling outside of the program tolerances, section 13.7 will be repeated with separate results recorded as Test 2 or Test 3 on the same data sheet.

E. Refer to the process flowchart in Figure 16 below.

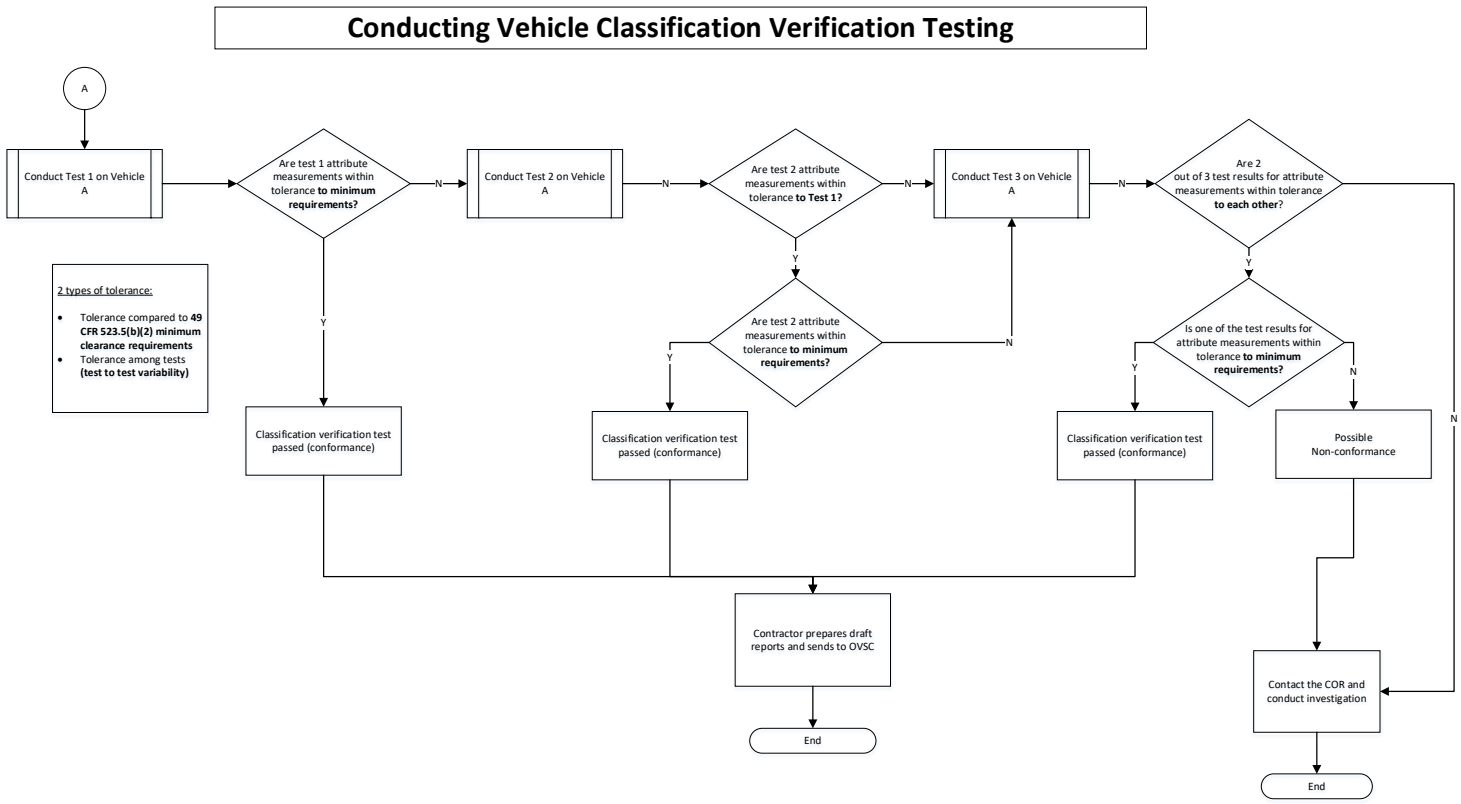


Figure 16

14. POST TEST REQUIREMENTS

A. Verify all data sheets have been completed and all photographs taken.

B. Complete the Vehicle Condition Report form including a word description of the vehicle's post-test condition.

15. REPORTS

15.1. MONTHLY STATUS REPORTS

The Contractor shall submit a monthly Test Status Report and a Vehicle Status Report to the COR. The Vehicle Status Report shall be submitted until all vehicles are disposed of. Samples of the required reports are found in the report forms section.

15.2. APPARENT IMPROPER CLASSIFICATION

Any indication of an improper classification be communicated by telephone to the COR within 24 hours with written notification mailed within 48 hours (Saturdays and Sundays excluded). A Notice of Improper Classification (see report forms section) with a copy of the particular test data sheet(s) and the preliminary data shall be included.

15.3 FINAL TEST REPORTS

15.3.1 COPIES

In the case of a vehicle that is tested and fails to meet the criteria under which it was classified as a non-passenger automobile, electronic copies in both Word and PDF formats of the Final Test Report shall be submitted to the COR for acceptance within three weeks of test completion. The Final Test Report format to be used by all contractors can be found in the "Report Section".

When a vehicle is tested and meets the criteria under which it was classified as a non-passenger automobile, electronic copies in both Word and PDF formats of each Final Test Report shall be submitted to the COR for acceptance within three weeks of test completion. No payment of Contractor's invoices for conducting tests will be made prior to the Final Test Report acceptance by the COR. Contractors are requested to NOT submit invoices before the COR is provided with copies of the Final Test Report.

Contractors are required to submit the first Final Test Report in draft form within one week after the vehicle test is conducted. The Contractor and the COR will then be able to discuss the details of both test conduct and report content early in the vehicle test program.

Contractors are required to PROOFREAD all Final Test Reports before submittal to the COR. 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.

15.3.2 REQUIREMENTS

The Final Test Report and associated documentation (including photographs) are relied upon as the chronicle of the test verification. The Final Test Report will be released to the public domain after review and acceptance by the COR. For these reasons, each final report must be a complete document capable of standing by itself. The Contractor should use DETAILED descriptions of all test validation events. Any events that are not directly associated with the regulation 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 for standardization.

15.3.3 FIRST THREE PAGES

A. FRONT COVER

The information required on the cover is as follows:

(1) Report Number such as 523-ABC-XX-001, where –

523 is the Regulation tested
ABC are the initials for the laboratory
XX is the Fiscal Year of the test program
001 is the Group Number (001 for the 1st test, 002 for the 2nd test, etc.)

(2) Final Report Title and Subtitle such as

CONFORMANCE TESTING FOR 49 CFR 523
Vehicle Classification
* * * * * * * * * * * * * * * *
[Vehicle Manufacturer Name]
[Model Year] [Model Name] [Trim] [Body Style]
NHTSA No. CX0401

(3) Contractor's Name and Address such as

[Contracted Organization Name]
[Street Address]
[City], [State] [9-digit Zip Code]

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
Enforcement
Office of Vehicle Safety Compliance
Mail Code: NEF-200
1200 New Jersey Ave., SE
Washington, DC 20590

B. FIRST PAGE AFTER FRONT COVER

When a contract test laboratory is reporting, a disclaimer statement and an acceptance signature block for the COR 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: _____

Accepted By: _____

Acceptance Date: _____

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

[e.g., 523-ABC-XX-001]

Block 2 — GOVERNMENT ACCESSION NUMBER

Leave blank

Block 3 — RECIPIENT'S CATALOG NUMBER

Leave blank

Block 4 — TITLE AND SUBTITLE

Final Report of 49 CFR Part 523 Vehicle Classification Verification of [Year] [Make] [Model] [Trim] [Body Style], NHTSA No. CX0401

Block 5 — REPORT DATE

[Month] [Day], [Year]

Block 6 — PERFORMING ORGANIZATION CODE

[e.g, ABC]

Block 7 — AUTHOR(S)

[First Name] [Last Name], [Job Title]
[First Name] [Last Name], [Job Title]

Block 8 — PERFORMING ORGANIZATION REPORT NUMBER

[e.g., ABC-DOT-20-XXX-001]

Block 9 — PERFORMING ORGANIZATION NAME AND ADDRESS

[Contracted Organization Name]
[Street Address]
[City], [State] [9-digit Zip Code]

Block 10 — WORK UNIT NUMBER

Leave blank

Block 11 — CONTRACT OR GRANT NUMBER

[e.g., DTNH22-XX-D-12345]

Block 12 — SPONSORING AGENCY NAME AND ADDRESS

United States Department of Transportation
National Highway Traffic Safety Administration
Office of Vehicle Safety Compliance
Mail Code: NVS-220
1200 New Jersey Avenue, SE
Washington, DC 20590

Block 13 — TYPE OF REPORT AND PERIOD COVERED

[Report Type, e.g., Final] Test Report
[Month] [Day] to [Month] [Day], [Year]

Block 14 — SPONSORING AGENCY CODE

NEF-200

Block 15 — SUPPLEMENTARY NOTES

Leave blank

Block 16 — ABSTRACT

Verification Testing was conducted on the subject [Year] [Make] [Model] [Trim] [Body Style] in accordance with the specifications of the Office of Vehicle Safety Compliance Test Procedure No. TP-523-0X to verify that the vehicle meets the criteria in 49 CFR 523.5(b) for non-passenger automobiles, as it was reported by the vehicle manufacturer in a report submitted pursuant to 49 CFR 537 Automotive Fuel Economy Reports. The test failures identified were as follows:

[List here or NONE]

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

Block 17 — KEY WORDS

Verification Testing
Vehicle Classification
49 CFR Part 523

Block 18 — DISTRIBUTION STATEMENT

Copies of this report are available from the following:

National Highway Traffic Safety Administration
Technical Information Services Division, NPO-411
1200 New Jersey Avenue, SE (ROOM E12-100)
Washington, DC 20590

e-mail: tis@nhtsa.dot.gov
FAX: 202-493-2833

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

15.3.4 TABLE OF CONTENTS

Final test report Table of Contents shall include the following:

Section 1 — Purpose of Verification Testing

Section 2 — Test Procedure and Discussion of Results

Section 3 — Test Data

Section 4 — Test Equipment List and Calibration Information

Section 5 — Photographs

Section 6 — Other Documentation

Section 7 — Notice of Improper Classification(if applicable)

Sample Report Layout

<table>
<tr><td>1. Report No.
[e.g., 523-ABC-XX-001]</td><td>2. Government Accession No.
(Leave Blank)</td><td>3. Recipient's Catalog No.
(Leave Blank)</td></tr>
<tr><td colspan="2" rowspan="2">4. Title and Subtitle

Final Report of 49 CFR Part 523 Verification Testing of [Year] [Make] [Model] [Trim] [Body Style], NHTSA No. CX0401</td><td>5. Report Date
[Month] [Day], [Year]</td></tr>
<tr><td>6. Performing Organization Code
[e.g., STF]</td></tr>
<tr><td colspan="2">7. Author(s)

[First Name] [Last Name], [Title]
[First Name] [Last Name], [Title]</td><td>8. Performing Organization Report Number

[e.g, ABC-DOT-20-XXX-001]</td></tr>
<tr><td colspan="2" rowspan="2">9. Performing Organization Name and Address

[Organization Name]
[Street Address]
[City], [State] [Zip Code]</td><td>10. Work Unit No. (TRAIS)
(Leave Blank)</td></tr>
<tr><td>11. Contract or Grant No.

[e.g, DTNH22-XX-D-12345]</td></tr>
<tr><td colspan="2" rowspan="2">12. Sponsoring Agency Name and Address

United States Department of Transportation
National Highway Traffic Safety Administration
Office of Vehicle Safety Compliance,
Mail Code: NEF-200
1200 New Jersey Avenue, SE
Washington, DC 20590</td><td>13. Type of Report and Period Covered

[Type, e.g., Final] Test Report
[Month] [Day] to [Month] [Day], [Year]</td></tr>
<tr><td>14. Sponsoring Agency Code

NEF-200</td></tr>
<tr><td colspan="3">15. Supplementary Notes
(Leave Blank)</td></tr>
<tr><td colspan="3">16. Abstract
Verification Testing was conducted on the subject [Year] [Make] [Model] [Trim] [Body Style] in accordance with the specifications of the OVSC Laboratory Test Procedure No. TP- 523 -0X to verify that the vehicle meets the criteria in 49 CFR 523.5(b) for non-passenger automobiles, as it was reported by the vehicle manufacturer in a report submitted pursuant to 49 CFR 537 Automotive Fuel Economy Reports. The test failures identified were as follows:
[List here or NONE]

NOTE: Above wording must be shown with appropriate changes made for a particular verification test. Any questions should be resolved with the COR.</td></tr>
<tr><td colspan="2">17. Key Words

Verification Testing
Vehicle Classification
49 CFR Part 523</td><td>18. Distribution Statement

National Highway Traffic Safety Administration
Technical Information Services Division
NPO-411, Room E12-100
1200 New Jersey Avenue, S.E.
Washington, DC 20590
Email: tis@nhtsa.dot.gov FAX: 202-493-2833</td></tr>
<tr><td>19. Security Classification (of this report)
UNCLASSIFIED</td><td>21. No. of Pages</td><td>22. Price</td></tr>
<tr><td colspan="3">20. Security Classification (of this page)
UNCLASSIFIED</td></tr>
</table>

16. TEST DATA

49 CFR 523 – TEST DATA SUMMARY

TEST DATE: **[Month] [Day], [Year]** LAB: _____

VEHICLE NHTSA NUMBER: _____ MY/MAKE/MODEL: _____

DATASHEET – 1 of 4 Test Vehicle Manufacturer's Reported Information

Field Data			
MY			
Make			
Model			
Body Type			
VIN			
Stock No.			
Engine Type/Displacement			
Transmission Class			
Drive System			
		Front Axle	Rear Axle
Tire Manufacturer/Model			
Tire Size			
Odometer Reading			
Fuel Level			
Adjusted Tire Pressure to conform (Y/N)			
Ambient Temperature of Test Room			
Label Data			
Monroney Label		Front Axle	Rear Axle
Tire Size			
Manufacturer Certification Label		Front Axle	Rear Axle
Tire Size			
GAWR (kg) *(per Label)			
GVWR (kg) *(per Label)			
Tire Placard	Total	Front	Rear
Seat Capacity			
Tire Size			
Recommended Tire Pressure (kPa)			
Vehicle Capacity Weight (kg)			
Dealer Information			
Dealer Name			
Address			

49 CFR 523 – TEST DATA SUMMARY

TEST DATE: **[Month] [Day], [Year]** LAB: _____

VEHICLE NHTSA NUMBER: _____ MY/MAKE/MODEL: _____

DATASHEET – 2 of 4 Test Data

Attributes			**Test 1**	**Test 2 (if required)**	**Test 3 (if required)**
Approach Angle (degree)	**Passenger side**				
	Driver side				
Average Approach Angle (degrees)					
Departure Angle (degree)	**Passenger side**				
	Driver side				
Average Departure Angle (degrees)					
Breakover Angle (degree)	**Front**	**Passenger side**			
		Driver side			
	Rear	**Passenger side**			
		Driver side			
Average Breakover Angle (degrees)					
Ground Clearance (cm)					
Front Axle Clearance (cm)					
Rear Axle Clearance (cm)					

Wheelbase Calculation	**Test 1**	**Test 2 (if required)**	**Test 3 (if required)**
Left Side OUT-OUT (mm)			
Left Side IN-IN (mm)			
Calculated Left Side Wheelbase (cm)			
Right Side OUT-OUT (mm)			
Right Side IN-IN (mm)			
Calculated Right Side Wheelbase (cm)			
Average Left/Right Wheelbase (cm)			

49 CFR 523 – TEST DATA SUMMARY

TEST DATE: **[Month] [Day], [Year]** LAB: _____

VEHICLE NHTSA NUMBER: _____ MY/MAKE/MODEL: _____

DATASHEET – 3 of 4 Manufacturer's Setup Information (per Form 523, as received from the manufacturer) and Surface Measurements

Surface Measurement (must be less than 0.3 degrees)			
Front Bumper		Rear Bumper	
Left Sill		Right Sill	

Manufacturer's Setup Information (per Form 523)	**Measurements**	**Location Coordinates ((X,Y,Z) in mm)[1]**
Base Tire Size (Front/Rear Axles)		
Approach Angle (degrees)		
Breakover Angle (degrees)		
Departure Angle (degrees)		
Running Clearance (cm)		
Front Axle Clearance (cm)		
Rear Axle Clearance (cm)		
Form 523 values match the test vehicle (Y/N)		

[1] The zero (origin) is at the axial center of the hypothetical front axle, whether present or not. Positive X is pointing to the rear of the vehicle, positive Y is pointing to the right side of the vehicle when facing in the forward direction, and positive Z is pointing up (away from the ground). Record all coordinate distances in millimeters (mm).

Remark: _____

_____

49 CFR 523– TEST DATA SUMMARY

TEST DATE: **[Month] [Day], [Year]** LAB: _____

VEHICLE NHTSA NUMBER: _____ MY/MAKE/MODEL: _____

DATASHEET – 4 of 4 Manufacturer's Reported Information and Test Results

Comparison Chart (less than 15% variance?)	**Y/N**
Does test 1 indicate that criteria are met?	
If No:	
Are tests 1 & 2 comparable?	
Are tests 2 & 3 comparable?	
Are tests 1 & 3 comparable?	
Are test(s) in tolerance with the manufacturer's reported information?	

	Test 1	**Test 2 (if required)**	**Test 3 (if required)**	**Form 523 Values**	**Form 523 Coordinates**
Average Approach Angle (≥ 28°)					
Average Breakover Angle (≥ 20°)					
Average Departure Angle (≥ 14°)					
Running Clearance (≥ 20 cm)					
Front Axle Clearance (≥ 18 cm)					
Rear Axle Clearance (≥ 18 cm)					

Tolerances[1]	
Approach Angle	+ 0.5° of the rounded measured angle
Breakover Angle	+ 0.5° of the rounded measured angle
Departure Angle	+ 0.5° of the rounded measured angle
Running Clearance	+ 7 mm (0.7 cm) of the rounded measured distance
Front and Rear Axle Clearance	+ 7 mm (0.7 cm) of the rounded measured distance

[1] The specified tolerances consider that manufacturers have design and manufacturing tolerances, and they are intended to include these. OVSC will initially apply the default values above in combination with the result of measured vehicles. If the OVSC measured values are at or above OEM-supplied data and the requirements of 49 CFR 523.5(b)(2), then the vehicle is compliant. If the OVSC measured values are below OEM-supplied data even after considering tolerances, then a potential reporting error will be considered based on the amount of the discrepancy. If more than one of the OVSC measured values are below the requirements of 49 CFR 523.5(b)(2) even after considering tolerances, then the vehicle is potentially non-compliant with non-passenger automobile classification criteria. The test may represent a non-conformance subject to further investigation by OVSC. A manufacturer's tolerance data may be requested on a case-by-case basis if a potential non-compliance has been identified, as part of the evaluation of the test results.

Test Conductors: _____ Date: _____

_____ Approved: _____

SECTION 4

TEST EQUIPMENT LIST AND CALIBRATION INFORMATION

EQUIPMENT	DESCRIPTION	MODEL / SERIAL NO	CAL. DATE	NEXT CAL. DATE
AIR PRESSURE GAUGE	ASHCROFT GEN GENERAL PURPOSE DIGITAL GAUGE. MODEL 02L 100 PSI	3093017001		
HAND-HELD LASER DISTANCE METER	FLUKE 424D	5972007		
DIGITAL LEVEL MEASURING DEVICE	STABILA ELECTRONIC LEVEL	36548		
DIGITAL ANGLE MEASURING DEVICE (INCLINOMETER)	ACCU PRO PRO360	1172968		
TAPE MEASURE				
TRAM GUAGE	DENT FIX 184" (4,673MM)	DF-3TC5	N/A	N/A
ELEVATION GAUGES	CUSTOM BUILD	N/A	N/A	N/A
SUPPLEMENTAL JACKS				
BREAKOVER ANGLE PLATES	RIGID 3/8" (9.5 MM)-THICK CARBON FIBER DEVICE (FLAT SHEET)	N/A	N/A	N/A
APPROACH / DEPARTURE PLATES	RIGID 3/8" (9.5 MM)-THICK CARBON FIBER DEVICE (FLAT SHEET)	N/A	N/A	N/A
ROLLING JACK DEVICE	CUSTOM BUILD	N/A	N/A	N/A
BREAKOVER ANGLE PLATE ASSEMBLY	CUSTOM BUILD	N/A	N/A	N/A
90^0 – ANGLE RULER	STANLEY CARPENTER SQUARE		N/A	N/A
RULERS	2000 mm W/ STOPS		N/A	N/A
TREAD EDGE DETERMINATION TOOLS (TEDTS)	30" x 4" x 4" MACHINED I-BEAM WITH A 16" x 1" NOTCH ON BOTTOM FLANGE	N/A	N/A	N/A

17. FORMS

LABORATORY NOTICE OF TEST FAILURE TO OVSC

REGULATION NO.: _____ TEST DATE:_____

LABORATORY:_____

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

LABORATORY PROJECT ENGINEER'S NAME:_____

TEST SPECIMEN DESCRIPTION:_____

VEHICLE NHTSA NO.: _____ VIN:_____

MFR:_____

TEST FAILURE DESCRIPTION: _____

_____

_____

_____

REGULATION REQUIREMENT, PARAGRAPH _____:

_____

_____

_____

NOTIFICATION TO NHTSA (COR): _____

DATE: _____ BY: _____

REMARKS:

MONTHLY TEST STATUS REPORT
49 CFR Part 523
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						

MONTHLY VEHICLE STATUS REPORT
49 CFR Part 523
DATE OF REPORT:

NO.	VEHICLE 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						