



Exhaust System Dynamic Clearance

1 Introduction

Note: Nothing in this standard supercedes applicable laws and regulations.

Note: In the event of conflict between the English and domestic language, the English language shall take precedence.

1.1 Purpose. To identify exhaust system dynamic clearance.

1.2 Applicability. All passenger cars and trucks.

1.3 Remarks. Measurement of the movements of the engine and exhaust system relative to underhood, underbody and fascia components, particularly at critical points.

2 References

Note: Only the latest approved standards are applicable unless otherwise specified.

2.1 External Standards/Specifications.

None

2.2 GM Standards/Specifications.

None

3 Resources

3.1 Facilities. GM or equivalent proving ground with a suitable vehicle durability course, skid pad, gradient between 20% and 30%, Belgian Blocks and staggered/parallel washboard road surfaces.

3.1.1 Calibration. The test facilities and equipment shall be in good working order and shall have a valid calibration label.

3.1.2 Alternatives. Alternative test facilities and equipment may also be used. However, all measuring variables as specified in this standard shall be determined correctly with respect to their physical definition.

3.2 Equipment.

3.2.1 Electronic, optical or mechanical travel sensors.

3.2.2 Soft clay or plasticine, not hardened or liquefied.

3.2.3 Scale, outside calipers and depth caliper gage.

3.2.4 Paint spray can.

3.2.5 Photographic and/or video equipment, for documentation purposes.

3.3 Test Vehicle/Test Piece. In order to achieve greater engine movements, tests shall be performed using vehicles with manual transmission, which enables direct acceleration, and with a kilometer reading of > 10 000 km, which would increase play as components have settled in, when possible.

3.4 Test Time.

Calendar time: 1 day

Test hours: 8 hours

Coordination hours: 2 hours

3.5 Test Required Information. Not applicable.

3.6 Personnel/Skills. One (1) qualified engineer or technician trained in the use of data acquisition equipment and the required road courses at the proving grounds. General experience and knowledge of the vehicle exhaust system and prior experience in setting up and running this procedure is preferred.

4 Procedure

4.1 Preparation.

4.1.1 Vehicle.

4.1.1.1 Release Status. Check the following parts to the state of release and vehicle position:

- Air induction system, heater hose, scoop.
- Radiator, blower, shroud.
- Engine and transmission mounts, check for cracks.
- Throttle controls.
- Underbody components near exhaust system.
- Underhood components near exhaust system.
- Body fascia near exhaust tailpipe.
- Exhaust system.

Test according to the availability of parts for non-series vehicles.

4.1.1.2 Modifications. If assemblies are expected to come into contact with each other during the tests using worn engine and transmission mounts, then consideration shall be given to a temporary repositioning or alteration of new parts, so as to enable the maximum engine movements to take place unhindered.

4.1.2 Travel Sensors. Record the movements in the area of the engine and transmission mounts as well as points of critical clearance simultaneously, as far as possible, using electronic, optical or mechanical positioning sensors which enable all three (3) directions to be recorded. Record the clearances between components before and after test. Use photographs and/or video as needed to document critical clearance conditions.

4.1.3 Resources.

4.1.3.1 Clay or Plasticine. Clay or plasticine may be used to determine minimum clearance between the components creating an impression in the clay or plasticine. However, this method only records the maximum movements.

4.1.3.2 Paint Coat. Opposite component faces of moving parts may be painted. This method only provides visible evidence of contact.

4.1.3.3 Photographs and Video. Photographs and video may be used to document critical clearance conditions. Video offers the advantage of time based clearance visualization.

4.2 Conditions.

4.2.1 Environmental Conditions. Not applicable.

4.2.2 Test Conditions. Deviations from the requirements of this standard shall have been agreed upon. Such requirements shall be specified on component drawings, test certificates, reports, etc.

4.3 Instructions.

4.3.1 General. The following safety related components shall be checked for each drive condition:

- a. Brake system, ensuring depression, sealed oil system.
- b. Steering, locking, stiff steering.
- c. Cooling system, air and water tightness.
- d. Gas regulation, unintentional increased engine speed, return to idle speed, and distortion of the power transmission elements.

4.3.1.1 Checks shall be performed to see which components restrict the engine movements, see 4.1.1.2.

4.3.2 Procedure. The following drive tests shall be performed and the measured values determined before and after each driving condition, recorded separately:

- Engine suspensions according to the state of release.