Body Dust Intrusion

1 Scope

Note: Nothing in the specification supersedes applicable laws and regulations unless specific exemption has been obtained.

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

1.1 Purpose. To measure dust intrusion into a vehicle using a controlled environmental dust chamber with severe dust conditions.

1.2 Foreword. This dust intrusion test was developed to provide a repeatable method of measuring airborne dust intrusion into vehicle bodies. This analysis is rated using the GMW14264 subjective scale & actual pictures of performance examples. Refer to the trace elements pictures to evaluate. *This test can be used as a development or validation test.*

1.3 Applicability. Passenger cars, vans, and light duty trucks.

2 References

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

2.1 External Standards/Specifications.

None

2.2 GM Standards/Specifications.

GMW3067 GMW14264

3 Resources

3.1 Facilities. The Environmental Dust Chamber, Building 7, Vehicle Sealing Lab at the General Motors Milford Proving Grounds, Milford, Michigan or equivalent.

3.2 Equipment.

3.2.1 Dust Precipitators. Dust collection device. See Desert Proving Grounds drawing #81-01-C, dated 6/6/90.

Note: Caution should be exercised to avoid making contact with the test probe, due to the possibility of electrical shock.

3.2.2 Measurement Device. Scientific balance, capable of ± 0.005 (g) grams accuracy.

3.2.3 Safety Protection. A NIOSH approved particulate, full face, dual cartridge respirator with HEPA filters, is required when entering the chamber environment following a test sequence for inspection, while cleaning chamber and vehicle surfaces and during system re-supply and filter maintenance activities.

Note: Approved noise reduction ear muffs are required when entering the dust chamber during operation.

3.2.4 Verify calibration of above equipment and record necessary information on Dust Instrument Calibration Sheet (See Appendix A). See subjective book for traceable elements.

3.2.5 GM approved sealants as designated in the Service Technology manuals for sealing leak areas that are not to design intent.

3.3 Test Vehicle/Test Piece. Not applicable.

3.4 Test Time.

Calendar time:	2 days
Test hours:	4 hours
Coordination hours	6 hours

3.5 Test Required Information. Results of the Static Air Leakage test and related root cause/repair work.

3.6 Personnel/Skills. Personnel with sufficient skills, capable of reviewing Product Assembly Documents, Working Drawings, etc. to document, root cause and repair leaks to design intent conditions.

4 Procedure

Note: GENERAL INFORMATION. Consult the vehicle technical specifications for requirements.

4.1 Preparation.

4.1.1 The test vehicle must be cleaned and thoroughly dried before being placed in the environmental dust chamber.

The test vehicle must be washed and placed in the garage the day before testing. This allows for a clean and dry vehicle to be placed in the chamber. Dry vehicle is a requirement before placement in the chamber.

A window template must be installed following the procedure for Static Air Leakage. See Full Vehicle Static Air Leakage test procedure GMW3067.

4.1.2 Vehicle Inspection. Check vehicle drain holes, doors and deck lid seals, rear compartment grommets, pressure relief valve flaps, etc., for proper design and installation.

4.1.3 Static Leakage Test. Prior to dust testing, vehicle is required to undergo a static air leakage test using procedure, GMW3067 Full Vehicle Static Air Leakage. The results of this test will determine if the air leakage rate is according to the design specifications. If the vehicle does not meet the design specifications, specific leak pathways should be evaluated and sealed to design intent before proceeding with the dust test.

Note: Window template used in the static air evaluation should be retained on vehicle for use in the static dust chamber.

4.1.4 Precipitator placement. Secure precipitators at the locations specified below. Ideally, the precipitator tubes should be positioned at the longitudinal centerline of the vehicle and at a height of 300 mm (12 inches) from the base of the sampler. However, tubes may be repositioned (lateral and vertical) to fit different vehicle/seat designs per test engineer direction. Refer to attached Precipitator Placement photos for examples.

Note: Caution should be taken to ensure that the airflow is not restricted at the inlet/outlet of the precipitator.

4.1.4.1 Passenger vehicles with front and rear seats only, including small and mid sport utility vehicles (SUV's). Secure precipitator in the center of the rear/second seat area with precipitator tube facing forward. Secure a 2nd sampler in the center of the luggage compartment, or rear stowage area with tube facing forward.

4.1.4.2 Passenger vehicles with fold down seats. Completely fold-down the rear seats and place the precipitator on the back of the seat, facing forward. Also, secure a precipitator in the center of the luggage compartment (rear stowage compartment), tube facing forward.

4.1.4.3 Passenger vehicles with armrest access to the rear stowage compartment. Fold-down the armrest and slip the precipitator base below the armrest. The precipitator should be facing cross-car, with the tip of the tube at centerline. Also, secure a precipitator in the center of the luggage compartment, with the tube facing forward.

4.1.4.4 Passenger vehicles with front seats only (i.e., pick-up trucks and performance cars). Place the precipitator on the passenger seat, and secure it with the collection tube as close as possible to the centerline of the vehicle, cross-car. Face the precipitator towards the pressure relief valve (PRV).

4.1.4.5 Passenger vehicles low profile trunks. Place the interior precipitator as discussed in the appropriate paragraphs 4.1.4.1 to 4.1.4.4. Place the trunk precipitator in the depression of the rear stowage compartment as close as possible to centerline, with the precipitator facing the PRV.

4.1.4.6 Extended cab pick-up trucks with rear jump seats. Place the precipitator on the front passenger seat, facing cross-car with the collection tube as close as possible to the centerline of the vehicle. Place the second precipitator in the back seat area on a crate to raise it to seat height and point tube forward.

Note: Precipitator must be restrained.

4.1.4.7 Vans and large sport utility vehicles (including cargo vans). Locate a precipitator in the 2nd and 3rd seats at centerline.

Note: Must restrain precipitator.

Also place a precipitator in the center of the rear compartment with the tube facing forward. For Cargo vans, no seats, place precipitators on the floor relative to where the seats would be.

Note: Must restrain precipitator

4.1.4.8 Extended cab pick-ups with full rear seats. Place a precipitator on the front passenger seat facing cross-car with the collection tube as close as possible to the centerline of the vehicle. Place a 2nd precipitator in the backseat at centerline, with the tube facing forward in the vehicle.

4.1.5 Precipitator power. Install the power supply leads to each dust precipitator.

4.1.6 Clean tubes. Remove and clean all sampling tubes and probes to insure that tubes are free of dust and contaminants.

4.1.7 Install tubes. Re-install tubes in electrostatic dust sampler. Take care to ensure that the electrode is in position and tube is fully inserted.

4.1.8 Window position. All windows are to be in the closed position including sunroofs. The only

exception is the Body Leak Tester (BLT) Template Window.

4.1.9 HVAC controls. The test vehicle HVAC controls are to set as follows:

a. Non-air conditioned vehicles: Set the HVAC mode selector to the ***off*** position. If an ***off*** position is not available, set selector to ***vent*** position.

b. Air Conditioned vehicles: Set the HVAC mode selector to the ***off*** position. If there isn't an ***off*** position, place selector in the ***defrost*** position, with the temperature selector in the coldest position.

c. On all vehicles: Set the fan speed to ***off***. If an ***off*** fan position is not available, set the fan to the lowest speed. If the vehicle has manual front cowl vents, make sure they are closed and sealed properly.

d. Body Air Inlet is to be sealed by use of tape as in the static air leakage evaluation.

4.2 Conditions.

4.2.1 Environmental Conditions. Not Applicable.

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

4.2.3 Door and window sealing. If power leads are to be routed to the battery, ensure that the door or window sealing is not disturbed.

4.2.4 Special Circumstances. For vehicles with access from the passenger compartment to the rear stowage compartment (i.e., fold-down seats, pass-through, etc.), the vehicle should be tested with the access in the open position. For 60/40 seats, both sides should be down. For vehicles with security covers, these should be left open

4.3 Instructions.

4.3.1 Turning the dust chamber on. Using the master power switch on the control panel, turn the chamber on. Using the circuit box on the chamber, turn the air dryer on. Returning to the control panel, using the touch screen, press F5 to start the booth. This will initiate the chamber warm up period which includes the setting of the environmental conditions. This period takes approximately 15 minutes.

4.3.2 Entering the dust chamber. Locate Vehicle to be placed in the dust chamber, to the center of the chamber fore and aft and side to side.

4.3.3 Line Connections. Connect hoses from wall inputs to window template for 15.24 cm (6 inch) and 12.7 mm (½ inch) lines for Body Leak Tester (BLT) hookup. Turn on BLT unit to warm up.

4.3.4 Precipitators On and BLT Set. Turn on the dust samplers and ensure that they are operating at a reading of 1200 $\pm$ 50 volts. Make sure all doors are closed properly and sealed. Set the already warmed up BLT to 1.27 cm (.5 inches) of water evacuation 125 pa. Using the switches on the side of the chamber, turn the interior fans on.

4.3.5 Automated test sequence. Using the touch screen on the control panel, press F6, Cycle, and then start. The chamber will run through the 8 minute test cycle, at the end of the 8 minute cycle, turn off the BLT and the interior fans. The chamber will automatically process a 15 minute evacuation period at the end of the 8 minute test period to reclaim dust from the chamber.

Note: Do not enter the chamber until the evacuation period is complete.

4.3.6 Caution. A NIOSH approved dust respirator (see paragraph 3.2.3) must be worn when entering the chamber after the completion of testing and during any cleaning of the vehicle and chamber to prevent possible or fatal lung ailments. These respirators are approved for nuisance particulates and particulates capable of causing lung ailments.

4.3.7 Test completion. Chamber ventilation system should remain on during chamber and vehicle cleaning. Use the central vacuum system to clean all excess dust from the outside of the vehicle and any excess dust material present in the chamber After the Evacuation of the chamber and the external cleaning of the test vehicle is complete, the dust chamber door can be opened, the test vehicle removed to an evaluation area and interior vehicle clean-up and inspection can begin. Remove vehicle from the chamber to evaluation designated evaluation area.

4.3.8 Post-test tube removal. Remove the sampling tubes and wipe dust from exterior surface of tube with a clean rag.

Take care to hold tubes in a horizontal position to avoid losing material. Do not bump tubes against a foreign surface prior to weighing them.

4.3.9 Post-test tube mass. Obtain a mass of each sampling tube using a scientific balance. This must be done within 30 minutes after completion of tests. Record the mass on the Dust Chamber Data Sheet. (See appendix A). Calculate the difference between the post-test and pre-test mass to obtain the accumulated dust mass. Record on data sheet.

(See appendix A). A mathematics correction (simple ratio) must be made on the test results.

4.3.10 Post-test vehicle inspection. Inspect the vehicle for areas of dust entry and record observations on GMUTS Vehicle Dust Intrusion Worksheet. (See appendix A). Record any exterior areas that have dust accumulated, these might include the door openings, rocker sections, trunk gutter, rear fascia, and fuel filler area. Assign a GMUTS rating to each leak location. Use the Subjective Dust Evaluation Photos to rate each location. Perform a root cause analysis for each leak location and record on worksheet. (See appendix A).

4.3.11 Caution. A NIOSH approved dust respirator (see paragraph 3.2.3) must be worn when **cleaning vehicle** after testing to prevent the possible risk of serious or fatal lung ailments. These respirators are approved for nuisance particulates and particulates capable of causing lung ailments. Cleaning the test vehicles must be at designated locations. It is also suggested that hearing protection be worn while using the high-pressure air to clean vehicle. Hearing Protection, Padded Ear Muffs must be worn when entering the Dust Chamber during operation or during cleanup.

Note: Safety glasses and a dust mask must be worn while cleaning.

4.4 Data Presentation. Record pertinent test results on the supplied data sheets.

5 Data

5.1 Calculations.

5.1.1 Data is to be recorded on the Appendix A Data sheets, which are in an MS Excel spreadsheet format.

5.1.2 Data documentation sheets are named and described in section 7.1 Glossary.

5.2 Interpretation of Results.

5.2.1 The requesting engineer is responsible for the final interpretation of test results.

5.3 Test Documentation.

5.3.1 Test documentation is to be completed in accordance with appropriate standard work instructions.

6 Safety

This procedure may involve hazardous materials, operations, and equipment. This method does not propose to address all the safety problems associated with its use. It is the responsibility of the user of the method to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.

7 Notes

7.1 Glossary.

Dust Chamber Data Test Sheet: used to record the results of the dust collected in the dust precipitators.

Dust Instrumentation Calibration Sheet: used to record calibration results performed on the Precipitators.

GMUTS Vehicle Dust Intrusion Worksheet: used to record subjective observations of leaks and related information taken as a result of the test activities.

7.2 Acronyms, Abbreviations, and Symbols.

BLT Body Leak Tester

CTS Component Technical Specifications

GMUTS General Motors Uniform Testing Specification

HVAC Heating, Ventilating, and Air Conditioning

NIOSH National Institute of Occupational Safety and Health

PRV Pressure Relief Valve

VTS Vehicle Technical Specifications

8 Coding System

This standard shall be referenced in other documents, drawings, VTS, CTS, etc. as follows:

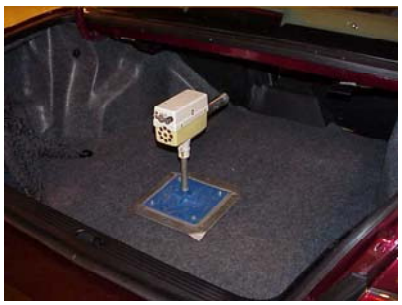
Test to GMW14527

9 Release and Revisions

9.1 Release. This standard originated in January 2006, replacing GMUTS R-15-57 (also known as MTL 8177) and GME R-1-12.. It was first approved by the Global Vehicle Sealing Team (GMNA, GME, LAAM, AP) in March 2006. It was first published in March 2006.

Appendix A

Precipitator Placement



Paragraph 4.1.4.1
Sedan
Stationary Rear Seat and Rear Stowage Compartment

Paragraph 4.1.4.1
SUV
Second Row Seating (only) and Rear Compartment Area

Paragraph 4.1.4.2
Passenger Vehicle Fold Down Seat and Rear Stowage Compartment

Paragraph 4.1.4.3
Passenger Vehicle Armrest Access to Rear Stowage Compartment

Paragraph 4.1.4.4
Front Seat Only
Front Seat and Rear Stowage Compartment

Paragraph 4.1.4.5 Passenger Vehicle with Low Profile Rear Stowage Compartment

Paragraph 4.1.4.6 Extended Cab Truck with Rear Jump Seat

Paragraph 4.1.4.7 Van and Large SUV All Secondary Seats and Rear Compartment Area (3 configurations shown)

Paragraph 4.1.4.8 Extended Cab Truck with Full Rear Seat

GMW14527 Vehicle Dust Intrusion

Dust Chamber Data Test Sheet

TEST NUMBER
TEST VEHICLE NUMBER:
VEHICLE TEST DESCRIPTION:
VEHICLE TEST CONDITION:

Date Printed: **2:46 PM**

DATE/Technician	PRE-TEST MASS (g)	POST-TEST MASS (g)	REAR SEAT (g)	PRE-TEST MASS (g)	POST-TEST MASS (g)	REAR COMPARTMENT (g)
mm/dd/yy AAA	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
VTS Requirement(At or Below)			TBD			TBD
Difference to Requirement			0.000			0.000

Note: Positive number in 'Difference to Requirment' cell indicates that requirement was not met.

Technician _____ Date: _____

GM

GMW14527 Vehicle Dust Intrusion

GMUTS Vehicle Dust Intrusion Worksheet

Vehicle Number: Technician/Date:

Item	Leak Location	Root Cause	GMUTS RATING
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			
17			
18			
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21			
22			
23			
24			
25			
26			
27			
28			

GMW14527 Vehicle Dust Intrusion

Dust Instrument Calibration sheet

Precipitator and Scale calibrations are done by Instrumentation Group Annually

Instrument	Equipment#	Calibration Date	Next Calibration Date	Voltage	Fan cfm	Fan Amp	Std. Height	Comments
Precipitator #1								
Precipitator #2								
Precipitator #3								
Precipitator #4								
Precipitator #5								
Precipitator #6								
Precipitator #7								
Precipitator #8								
Precipitator #9								
Precipitator #10								
Precipitator #11								
Precipitator #12								
Tube Scale								

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