



Evaporative Emission System Guideline 20, Dust Intrusion

1 Scope

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. The purpose of this specification is to evaluate the amount of dust intrusion into the evaporative emission system (particularly the carbon canister and fresh air vent solenoid) by simulating trailing dust driving behind another vehicle on a dirt/gravel road or off-road surface.

1.2 Foreword. Not applicable.

1.3 Applicability. This procedure can be used for development or validation and is applicable to passenger cars, vans, and light and medium-duty trucks.

2 References

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

2.1 External Standards/Specifications.

NIOSH TC-21C-XXX

2.2 GM Standards/Specifications.

None

2.3 Additional References.

CG2536 Dust Intrusion Evaluation Template

GM Part Number 22062562

SAE Paper 930018

3 Resources

3.1 Facilities. A dust course capable of producing a dust cloud behind the lead vehicle.

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 Electrical vacuum pump capable of producing 60 L/minute (127 ft³/h) continuous flow or two Delphi 12 V vacuum pumps (GM Part Number 22062562) (this pump is used on GM diesel applications for vacuum supply to power brakes).

3.2.2 National Institute for Occupational Safety and Health (NIOSH) approved dust respirator (3M 8710, Wilson 1410, AO 1070 or equivalent). These respirators are approved for nuisance particulate and particulate capable of causing lung ailments. Approved respirators are identified in NIOSH TC-21C-XXX. Regional equivalents to NIOSH respirators may be used.

3.2.3 A lead vehicle to generate dust clouds is required for tests to determine dust-related failure modes of a single test vehicle. A dual-wheel pickup is recommended for the lead vehicle. Any vehicle used as a lead vehicle must have a light bar to aid in visibility.

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3.2.4 Mechanical airflow meter with range of 0 to 60 L/minute (127 ft³/h).

3.2.5 Service tool (currently TECH II) capable of measuring/reading the engine air flow rate.

3.2.6 Weight scale up to 5000 g.

3.3 Test Vehicle/Test Piece.

3.3.1 Test Vehicle. Test vehicle selected should be worst case application to represent vehicle family. Selection should be based on the following parameters that can affect test results:

- Largest engine option to maximize purge air flow.
- Transmission/axle with highest rpm at 56 km/h (35 mph) to maximize purge air flow.
- Lowest ride height to maximize dust concentration.
- Widest tires to maximize dust concentration.
- Body parts (air dam, fascias, body panels, splash shields, bumpers, and grille).
- Trailer and trailer hitches can impact airflow at rear of vehicle.

Consider all models within a platform with above items that are different.

3.3.2 Test Materials/Components. Two (2) filters capable of filtering down to five (5) micron particles to be used as dust traps. Typically fuel filters with threaded fittings are used. Fuel filters with quick disconnect fittings have high restriction and low flow.

3.4 Test Time. The following is an estimate on the amount of time (man-hours) needed to perform this procedure.

Consider prep and other downtime, actual test, and analysis of data in capturing a total calendar time.

Calendar time: 3 days

Test hours: 24 hours

Coordination hours: 24 hours

3.5 Test Required Information. Not applicable.

3.6 Personnel/Skills. Only trained and certified personnel should be used. Drivers should be familiar with driving in light dust cloud generated by lead vehicle. If possible, the same drivers should be used for all tests.

4 Procedure

4.1 Preparation.

4.1.1 Onboard Refueling Vapor Recovery (ORVR) Vehicles. This section may be used for non-ORVR vehicles based on regional discretion.

4.1.1.1 Evaporative Emission System Flow. An accurate projection of the lifetime dust input into the vehicle system requires that the dust sample be collected at a purge flow rate equal to the average purge flow rate over the vehicle life. Fifty-six (56) km/h (35 mph) has been picked as the average speed for dust generation (peak is between 48 km/h and 64 km/h (30 mph and 40 mph)). Measure and record the purge flow rate (with a low restriction flow meter) at the fresh air inlet to a new (green) canister at a steady speed of 56 km/h (35 mph) on level dry pavement. The purge solenoid shall be forced to 100% duty cycle using a service tool (currently TECH II) during the purge flow measurement. (The canister purge system is part of the closed loop fuel control system that is controlled by the engine fuel system computer. Fuel vapors can cause the purge solenoid flow to be very low.) It is important to use a new (green) carbon canister that has no fuel vapor because the vapor loading of the canister affects the pressure restriction.

4.1.1.1.1 Evaporative Emission System Flow – Hybrid Vehicle. Measure purge flow rate at the fresh air inlet to a new (green) canister at speeds of 0 km/h (idle), 16 km/h (10 mph), 32 km/h (20 mph), 48 km/h (30 mph), 64 km/h (40 mph), 80 km/h (50 mph), 96 km/h (60 mph), and 112 km/h (70 mph) using the same method described in 4.1.1.1.

4.1.1.2 Engine Air Flow. Record engine airflow (in grams per second) while driving (Air Conditioning (A/C) set to Maximum or recirculation) at steady speeds on a level road at 0 km/h (idle), 16 km/h (10 mph), 32 km/h (20 mph), 48 km/h (30 mph), 64 km/h (40 mph), 80 km/h (50 mph), 96 km/h (60 mph), and 112 km/h

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