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LAND SEA AIR SPACE

TECHNICAL REPORT J381

WINDSHIELD DEFROSTING SYSTEMS TEST PROCEDURE — TRUCKS, BUSES, AND MULTIPURPOSE VEHICLES — SAE J381

SAE Recommended Practice

Report of Body Engineering Committee and Automotive Safety Committee approved February 1968.

1. Scope—This SAE Recommended Practice establishes uniform test procedures for the defrosting systems of enclosed cab trucks, buses, and multipurpose vehicles. It is limited to tests that can be conducted on uniform test equipment in commercially available laboratory facilities. Current engineering practice prescribes that for laboratory evaluation of defroster systems an ice coating of known thickness be applied to the windshield to provide more uniform and repeatable test results, even though under actual conditions such a coating would necessarily be scraped off before driving. The test condition, therefore, represents a more severe condition than the actual condition, where the defroster system must merely be capable of maintaining a cleared viewing area.

Because of the special nature of the operation of most of these vehicles (where vehicles are generally warmed up before or garaged in preparation for road operations) and since defrosting under steady state, over-the-road operation is the main concern, test conditions have been adopted which eliminate the engine warmup phase of vehicle operation.

This recommended practice will be reviewed and revised as technological progress in vehicle defroster test procedure requires.

2. Definitions

2.1 Defrost—Melt frost on inside or test coating on the outside surface of the glass with the defroster system.

2.2 Windshield Defroster System—Means intended to defrost the windshield.

2.3 Defrosted Area—That area of the windshield composed of dry cleared surface and melted or partially melted (wet) test coating, and excluding that area of the windshield covered with dry test coating.

2.4 Coolant—Liquid used for heat transfer composed of 50% glycol and 50% water by volume.

3. Defrosting Test

3.1 Test Equipment

(a) Cold chamber sufficiently large to contain the basic vehicle or basic vehicle body or partial body with provision for circulating cold air. If the road load test condition option is selected, a chassis dynamometer is required.

(b) Means for recording the boundaries of the windshield areas defrosted. (A wax pencil is commonly used for outlining defrosted areas.)

(c) Engine tachometer.

(d) Stopwatch or other timing device.

(e) Thermometers or other temperature measuring devices.

(f) Thottle control device (if desired).

(g) Spray gun for applying water to windshield (Binks Model 62 spray gun, with fluid nozzle 66 and air nozzle 66SD, 66SF, or equivalent equipment).

(h) Device for measuring quantity of water applied to windshield.

(i) Auxiliary power supply for blower motor.

(j) Anemometer.

(k) Independent coolant supply to provide controlled coolant flow to the heater-defroster system when an engine is not used for the coolant source.

3.2 Test Conditions—Either the engine in the test vehicle or an independent coolant supply may be used to provide coolant flow to the heater-defroster system under test.

(a) Cold chamber temperature —0 ±5 F (—18 ±3 C).

(b) Engine Load and Speed (when applicable)

Gasoline engines—1500 ±50 rpm in neutral gear or any load not to exceed 25 mph (40 km/hr) road load.

Diesel engines—Governed or rated speed either in neutral gear or at any load not to exceed 25 mph (40 km/hr) road load.

Load on the chassis dynamometer shall not exceed that calculated as follows:

The sum of one half the "rolling resistance horsepower" plus the "air resistance horsepower" as established according to the procedure specified in SAE J688, using Tables 3-6. A value equal to the minimum of the rated gvw applicable to that defrosting system under test shall be used for the total gross vehicle weight and all calculated values will be for a speed of 25 mph (40 km/hr) and an altitude of 1000 ft (0.30 km).

A sample calculation is provided in Fig. 1.

Truck model CN900
Minimum gvw rating—27,000 lb

Area factor from Table 4 of SAE J688—0.145
Velocity factor from Table 5 of SAE J688—31.3
Altitude factor from Table 6 of SAE J688—0.97
Rolling factor from Table 3 of SAE J688—0.657

Air resistance hp = Area factor × Velocity factor × Altitude factor
= 0.145 × 31.3 × 0.97
= 4.4

1/2 Rolling resistance hp = 1/2 (Rolling factor × Gross weight in 1000 lb)
= 1/2 (0.657 × 27)
= 8.9

Road load = 4.4 + 8.9 = 13.3 hp

FIG. 1—SAMPLE CALCULATION FOR ROAD LOAD

At road load, the vehicle shall be run in that transmission gear which will permit running the engine at its governed or rated speed at the closest possible speed to 25 mph but not to exceed 25 mph (40 km/hr).

(c) Heater-Defroster System Coolant Flow

With engine—That flow resulting from engine operation as prescribed in paragraph 3.2 (b).

With independent coolant supply—Flow of coolant to be either 40 + 0 — 5 lb/minute (18 + 0 — 2.25 kgm/minute) or the flow that would be produced by the engine at 1500 rpm for the gasoline type and at governed speed for the diesel type, both for a closed engine thermostat condition.

(d) Heater-Defroster System Coolant Temperatures

With engine—To be at 150 F (65.5 C) at the start of the test, or at the level off temperature of the coolant if below 150 F (65.5 C). Coolant temperature after the start of the test is to be a function of the engine control temperature characteristics at the test conditions.

With independent coolant supply—To be maintained at 150 F +5 —0 F (65.5 C +3 C —0 C) for the entire test period.

(e) Air Velocity—The maximum wind velocity shall not exceed 1 mph (1.6 km/hr).

(f) Soak Time—4 hr. NOTE: If instrumentation is available to assure that the windshield and cab are stabilized at test temperature, a shorter soak time may be used.

(g) Number of Vehicle Occupants during Test—Two maximum.

(h) Windshield Wipers—Wiper blades and arms are to be off the windshield glazing surface during ice application. Windshield wipers may be used during the test.

(i) Defroster and/or Heater System Air—On full, blower(s) on high speed.

(j) Test Voltage—To be 15% over nominal system rating at the blower motor (for example, 13.8 on 12 V system) or the supply end of motor dropping resistor.

(k) Temperature Control—Maximum position.

(l) All engine, heater, and defroster units shall be standard production parts or equivalent, adjusted to specified limits.

(m) Engine hood, doors, windows, and controllable vents shall be