



Designation: E1058 – 02

Standard Practice for the Toxic Contamination of the Environment in the Operator Enclosure of Self-Propelled Agriculture Vehicles¹

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1. Scope

1.1 This practice may be used to determine the level of specific harmful airborne contaminants within a vehicle operator enclosure under standardized test conditions. The air exchange rate, air pressure relative to ambient conditions, air temperature, and relative humidity maintained within the enclosure during the test are also determined. Operator-introduced contaminants are not addressed by this practice.

1.2 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 SAE Standards:

SAE Air Cleaner Test Code (for Fine Dust)²

SAE J1012 Recommended Practice Agricultural Equipment Enclosure Pressurization System Test Procedure²

2.2 NIOSH Standards:

NIOSH 2549 Method for Xylene (Aromatic Hydrocarbons)³

NIOSH 2539 Method for Formaldehyde (Aldehydes)³

NIOSH S340 Method for Carbon Monoxide³

NIOSH Method for Malathion (Organic Phosphates)³

NIOSH Manual of Analytical Methods³

2.3 OSHA Standard:

OSHA Instruction CPL 2-2.20, Standard Methods for Sampling Air Contaminants⁴

SKC Guide to NIOSH/OSHA Air Sampling Standards⁵

3. Terminology

3.1 Definitions:

3.1.1 *aerosols, n*—small droplets of a liquid or particles of solid matter suspended in air, for example, a mist, fog, or smoke.

3.1.2 *air exchange rate, n*—the rate at which the air in a specific space is removed or replaced, or both.

3.1.3 *breathing zone, n*—the zone surrounding and immediately in front of operator's face. Assumed to be directly above front edge of operator's seat and 1.2 m above floor of enclosure.

3.1.4 *closed operator enclosure, n*—a structure for enclosing or enveloping the operator that is sufficiently air-tight to permit modification of the environment within.

3.1.5 *contaminant, n*—an undesirable component in any material or system.

3.1.6 *differential air pressure, n*—difference in the pressure exerted by air at a specific location relative to another selected location.

3.1.7 *dynamic test, n*—a test conducted while the test subject is undergoing specified motion.

3.1.8 *forced air ventilation, n*—air ventilation which is created or aided by a forced movement of air as by a fan or blower.

3.1.9 *gaseous, adj*—existing in the state of a molecular gas (< 0.001 μm particle size); containing no liquid droplets or solid particles.

3.1.10 *mists, n*—cloud-like aggregation of liquid droplets having a diameter of < 20 μm which are temporarily suspended in air.

3.1.11 *operator-introduced contaminant, n*—substance which is introduced by or as a result of actions of the operator (that is, as carried on operator's hands or clothing).

3.1.12 *primary filter (also particulate filter or fresh-air filter), n*—a device used for filtering suspended mists and particulate matter out of intake air.

⁵ Available from SKC, Inc., 863 Valley View Rd., Eighty Four, PA 15330-9614.

¹ These test methods are under the jurisdiction of ASTM Committee E35 on Pesticides and are the direct responsibility of Subcommittee E35.26 on Safety to Man.

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² Available from Society of Automotive Engineers, 400 Commonwealth Dr., Warrendale, PA 15096.

³ Available from National Institute of Occupational Safety and Health, 4676 Columbia Parkway, Cincinnati, OH 45226.

⁴ Available from Occupational Safety and Health Administration, 219 S. Dearborn, Chicago, IL.

3.1.13 *rated air flow, n*—rate of flow of air in or through a system specified for designed performance.

3.1.14 *recirculating filter, n*—filter used for filtering the air which is recirculated within the operator enclosure (see *secondary filter*).

3.1.15 *secondary filter, n*—filter located in a system where air in the enclosure is refiltered after passing through the primary filter (usually for recirculated air) (see *recirculating filter*).

3.1.16 *self-propelled agricultural vehicle, n*—an agricultural vehicle that has the capability of providing its own motive power.

3.1.17 *seat index point (SIP), n*—reference point relative to the operator's seat as determined by a SIP measurement device.

3.1.18 *static test, n*—a test performed while the test subject is stationary, in a fixed position.

3.1.19 *technical material, n*—the chemically active ingredient of a chemical solution or formulation.

3.1.20 *test media, n*—the materials being used to test the performance of a system.

3.1.21 *threshold limit value (TLV), n*—time-weighted concentration of a material to which most workers can be exposed for 8 h per day over long periods of time without experiencing adverse effects.

3.1.22 *ultra-low volume (ULV), n*—0.45 to 4.5 L per hectare.

4. Summary of Practice

4.1 *Static (Laboratory) Test*—This test involves having the stationary vehicle housed in a sealed and insulated chamber. Air containing standard dust or chemical test media is passed through the chamber at various speeds, temperatures, and humidities, while the vehicle engine and air-filtering or air-conditioning system are operating. Automatic —samplers are positioned inside and outside the operator enclosure to sample the air during the test interval. Analysis of these samples for the test contaminants provides a basis for determining the efficiency of the air-filtering or air-conditioning system for the operator enclosure.

4.2 *Dynamic (Field) Test*—This test involves monitoring the operator enclosure during normal field operations of the vehicle. Air sampling inside and outside the operator enclosure is carried out in a fashion similar to that used in the static test method. Analysis of the test parameters, vehicle speed and direction, ambient atmospheric conditions, operator enclosure environment, properties of the materials involved, sample analytical results, etc., provides a basis for determining the efficiency of the air-filtering or air-conditioning system for the operator enclosure.

5. Significance and Use

5.1 There are concerns about the potential for excessive exposure of the operators of self-propelled agricultural vehicles to toxic agricultural chemicals when transporting or applying these materials, or both. A need exists for suitable procedures for determining the amount of toxic chemical contaminants in the vehicle operator environment when official testing is required.

5.2 The purpose of this practice is to provide a practical, reliable, and reproducible procedure for testing the performance of operator enclosure ventilating or air conditioning systems, or both, relative to the maintenance of safe environmental conditions with regard to toxic material contamination within the enclosure under static (laboratory) or dynamic (field) conditions, or both.

STATIC (LABORATORY) TEST

6. Test Facilities and Apparatus

6.1 *Test Chamber:* For the static test, construct a test chamber as specified as follows:

6.1.1 *Dimensions*—The test chamber shall be large enough to contain the vehicle to be tested with a minimum of 1.0 m clearance on all sides and top of the vehicle being tested.

6.1.2 *Construction*—Insulate and seal the test chamber sufficiently to adequately maintain the physical conditions specified for the tests to be conducted. (While not essential, a turntable is recommended so that vehicle being tested can be quickly repositioned for different tests.)

6.1.3 *Chamber Pressure*—Provide the test chamber with a means for maintaining air pressure specified for the tests to be conducted.

6.1.4 *Heating and Cooling System*, adequate to maintain steady state temperature within the test chamber from 5 to 40 ± 3°C for the duration of each test.

6.1.5 *Humidity Control*—Provide a means which can maintain the relative humidity within the test chamber that is specified for the test being conducted, ranging from 20 to 90% relative humidity ± 5%.

6.1.6 *Air Circulation System*—Equip the test chamber with an air circulation system capable of maintaining uniform air flow within the chamber at the speed and direction specified for the test. The air flow should be from 2 to 18 ± 2 km/h measured 0.5 m above the center of the top of the operator enclosure being tested.

6.1.7 *Vehicle Engine*—Duct the engine air supply into the test chamber. Duct the exhaust gases separately out of the test chamber.

6.1.8 *Test Media Introduction and Removal:*

6.1.8.1 *Introduction*—Provide a means for introducing the test media into the air circulation system and maintaining the concentration throughout the air in the system that is specified for the test being conducted.

6.1.8.2 *Removal*—Provide a means for filtering out or removing test media, or both, from the air in the air circulating system of the test chamber and test vehicle and from the surfaces within the test chamber and of the test vehicle, when tests with a specific test media are completed. Follow chemical manufacturers' decontamination procedures as indicated on the labels of chemicals being used.

6.2 *Instrumentation:*

6.2.1 *Air Flow Meters.*⁶

6.2.2 *Air Pressure Measuring Devices*— Two calibrated barometers (aneroid or mercury type), one for inside the

⁶ ALNOR Hood/HVAC Mode/Velometer, or equivalent, available from Fisher Scientific Co.