

## §79.57 Emission generation.

This section specifies the equipment and procedures that must be used in generating the emissions which are to be subjected to the characterization procedures and/or the biological tests specified in §§79.52(b) and 79.53 of these regulations. When applicable, they may also be required in conjunction with testing under §§79.54 and 79.58(c). Additional requirements concerning emission generation, delivery, dilution, quality control, and safety practices are outlined in §79.61.

(a) Vehicle and engine selection criteria. (1) All vehicles and engines used to generate emissions for testing a fuel or additive/fuel mixture must be new (i.e., never before titled) and placed into the program with less than 500 miles on the odometer or 12 hours on the engine chronometer. The vehicles and engines shall be unaltered from the specifications of the original equipment manufacturer.

(2) The vehicle/engine type, vehicle/engine class, and vehicle/engine subclass designated to generate emissions for a given fuel or additive shall be the same type, class, and subclass which, over the previous three years, has consumed the most gallons of fuel in the fuel family applicable to the given fuel or additive. No distinction shall be made between light-duty vehicles and light-duty trucks for purposes of this classification.

(3) Within this vehicle/engine type, class, and subclass, the specific vehicles and engines acceptable for emission generation are those that represent the most common fuel metering system and the most common of the most important emission control system devices or characteristics with respect to emission reduction performance for the model year in which testing begins. These vehicles will be determined through a survey of the previous model year's vehicle/engine sales within the given subclass. These characteristics shall include, but need not be limited to, aftertreatment device(s), fuel aspiration, air injection, exhaust gas recirculation, and feedback type.

(4) Within the applicable subclass, the five highest selling vehicle/engine models that contain the most common such equipment and characteristics shall be determined. Any of these five models of the current model year (at the time testing begins) may be selected for emission generation.

(i) If one or more of the five models is not available for the current model year, the choice of model for emission generation shall be limited to those remaining among the five.

(ii) If fewer than five models of the given vehicle/engine type are available for the current model year, all such models shall be eligible.

(5) When the fuel or fuel additive undergoing testing is not commonly used or intended to be used in the vehicle/engine types prescribed by this selection procedure, or when rebuilding or alteration is required to obtain a suitable vehicle/engine for emission generation, the manufacturer may submit a request to EPA for a modification in test procedure requirements. Any such request must include objective test results which support the claim that a more appropriate vehicle/engine type is needed as well as a suggested substitute vehicle/engine type. The vehicle/engine selection in this case shall be approved by EPA prior to the start of testing.

(6) Once a particular model has been chosen on which to test a fuel or additive product, all mileage accumulation and generation of emissions for characterization and biological testing of such product shall be conducted on that same model.

(i) If the initial test vehicle/engine fails or must be replaced for any reason, emission generation shall continue with a second vehicle/engine which is identical to, or resembles to the greatest extent possible, the initial test vehicle/engine. If more than one replacement vehicle/engine is necessary, all such vehicles/engines shall be identical, or resemble to the greatest extent possible, the initial test vehicle/engine.

(ii) Manufacturers are encouraged to obtain, at the start of a test program, more than one emission generation vehicle/engine of the identical model, to ensure the availability of back-up emission generator(s). All backup vehicles/engines must be conditioned and must have their emissions fully characterized, as done for the initial test vehicle/engine, prior to their use as emission generators for biological testing. Alternating between such vehicles/engines regularly during the course of testing is permissible and advisable, particularly to allow regular maintenance on such vehicles/engines during prolonged health effects testing.

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(b) Vehicle/engine operation and maintenance. (1) For the purpose of generating combustion emissions from a fuel or additive/base fuel mixture for which the relevant class is light duty, either a light-duty vehicle shall be operated on a chassis dynamometer or a light-duty engine shall be operated on an engine dynamometer. When the relevant class is heavy duty, the emissions shall be generated on a heavy-duty engine operated on an engine dynamometer. In both cases, the vehicle or engine model shall be selected as described in paragraph (a) of this section and shall have all applicable fuel and emission control systems intact.

(2) Except as provided in §79.51(h)(2)(iii), the fuel or additive/base fuel mixture being tested shall be used at all times during operation of the test vehicle or engine. No other fuels or additives shall be used in the test vehicle or engine once mileage accumulation has begun until emission generation for emission characterization and biological testing purposes is completed.

(i) A vehicle or engine may be used to generate emissions for the testing of more than one fuel or additive, provided that all such fuels and additives belong to the same fuel family pursuant to §79.56(e)(i), and that, once a vehicle or engine has been used to generate emissions for an atypical fuel or additive (pursuant to §79.56(e)(2)(iii)), it shall not be used in the testing of any other fuel or additive. Paragraphs (a) (2) and (3) of this section shall apply only to the first fuel or additive tested.

(ii) Prior to being used to generate emissions for testing an additional fuel or additive, a vehicle or engine which has previously been used for testing a different fuel or additive shall undergo an effective intermediate preconditioning cycle to remove the previously used fuel and its emissions from the vehicle's fuel and exhaust systems and from the combustion emission and evaporative emission control systems, if any.

(iii) Such preconditioning shall include, at a minimum, the following steps:

(A) The canister (if any) shall be removed from the vehicle and purged with 300 °F nitrogen at 20 liters per minute until the incremental weight loss of the canister is less than 1 gram in 30 minutes. This typically takes 3-4 hours and removes 100 to 120 grams of adsorbed gasoline vapors.

(B) The fuel tank shall be drained and filled to capacity with the new test fuel or additive/fuel mixture.

(C) The vehicle or engine shall be operated until at least 95% of the fuel tank capacity is consumed.

(D) The purged canister shall be returned to the vehicle.

(E) The fuel tank shall be drained and filled to 40% capacity with test fuel.

(F) Two-hour fuel tank heat builds from 72-120 °F shall be performed repeatedly as necessary to achieve canister breakthrough. The fuel tank must be drained and filled prior to each heat build.

(3) Scheduled and unscheduled vehicle/engine maintenance. (i) During emission generation, vehicles and engines must be maintained in good condition by following the recommendations of the original equipment manufacturer (OEM) for scheduled service and parts replacement, with repairs performed only as necessary. Modifications, adjustments, and maintenance procedures contrary to procedures found in 40 CFR part 86 for the maintenance of test vehicles/engines or performed solely for the purpose of emissions improvement are not allowed.

(ii) If unscheduled maintenance becomes necessary, the vehicle or engine must be repaired to OEM specifications, using OEM or OEM-approved parts. In addition, the tester is required to measure the basic emissions pursuant to §79.52(b)(2)(i) after the unscheduled maintenance and before resuming testing to ensure that the post-maintenance emissions shall be within 20 percent of pre-maintenance emissions levels. If the basic emissions cannot be brought within 20 percent of their previous levels, then the manufacturer shall restart the emissions characterization and health testing of its products combustion emissions using a new vehicle/engine.

(c) Mileage accumulation. (1) A vehicle/engine break-in period is required prior to generating emissions for characterization and/or biological testing under this subpart. The required mileage accumulation may be accomplished on a test track, on the street, on a dynamometer, or using any other conventionally accepted method.

(2) Vehicles to be used in the evaluation of baseline and non-baseline fuels and fuel additives shall accumulate 4,000 miles prior to emission testing. Engines to be used in the evaluation of baseline

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and non-baseline fuels and fuel additives shall accumulate 125 hours of operation on an engine dynamometer prior to emission testing.

(3) When the test formulation is classified as an atypical fuel or fuel additive formulation (pursuant to definitions in §79.56(e)(4)(iii)), the following additional mileage accumulation requirements apply:

(i) The test vehicle/engine must be operated for a minimum of 4,000 vehicle miles or 125 hours of engine operation.

(ii) Thereafter, at intervals determined by the tester, all emission fractions (i.e., vapor, semi-volatile, and particulate) shall be sampled and analyzed for the presence and amount of the atypical element(s) and/or other atypical constituents. Pursuant to paragraph (d) of this section, the sampled emissions must be generated in the absence of an intact aftertreatment device. Immediately before the samples are taken, a brief warmup period (at least ten miles or the engine equivalent) is required.

(iii) Mileage accumulation shall continue until either 50 percent or more of the mass of each atypical element (or other atypical constituent) entering the engine can be measured in the exhaust emissions (all fractions combined), or the vehicle/engine has accumulated mileage (or hours) equivalent to 40 percent of the average useful life of the applicable vehicle/engine class (pursuant to regulations in 40 CFR part 86). For example, the maximum mileage required for light-duty vehicles is 40 percent of 100,000 miles (i.e., 40,000 miles), while the maximum time of operation for heavy-duty engines is the equivalent of 40 percent of 290,000 miles (i.e., the equivalent in engine hours of 116,000 miles).

(iv) When either condition in paragraph (c)(3)(iii) of this section has been reached, additional emission characterization and biological testing of the emissions may begin.

(d) Use of exhaust aftertreatment devices. (1) If the selected test vehicle/engine, as certified by EPA, does not come equipped with an emissions aftertreatment device (such as a catalyst or particulate trap), such device shall not be used in the context of this program.

(2) Except as provided in paragraph (d)(3) of this section for certain specialized additives, the following provisions apply when the test vehicle/engine, as certified by EPA, comes equipped with an emissions aftertreatment device.

(i) For mileage accumulation:

(A) When the test formulation does not contain any atypical elements (pursuant to definitions in §79.56(e)(4)(iii)), an intact aftertreatment device must be used during mileage accumulation.

(B) When the test formulation does contain atypical elements, then the manufacturer may choose to accumulate the required mileage using a vehicle/engine equipped with either an intact aftertreatment device or with a non-functional aftertreatment device (e.g., a blank catalyst without its catalytic wash coat). In either case, sampling and analysis of emissions for measurement of the mass of the atypical element(s) (as described in §79.57(c)(3)) must be done on emissions generated with a non-functional (blank) aftertreatment device.

(1) If the manufacturer chooses to accumulate mileage without a functional aftertreatment device, and if the manufacturer wishes to do this outside of a laboratory/test track setting, then a memorandum of exemption for product testing must be obtained by applying to the Director of the Field Operations and Support Division (see §79.59(a)(1)).

(2) [Reserved]

(ii) For Tier 1 (§79.52), the total set of requirements for the characterization of combustion emissions (§79.52(b)) must be completed two times, once using emissions generated with the aftertreatment device intact and a second time with the aftertreatment device rendered nonfunctional or replaced with a non-functional aftertreatment device as described in paragraph (d)(2)(i)(B) of this section.

(iii) For Tier 2 (§79.53), the standard requirements for biological testing of combustion emissions shall be conducted using emissions generated with a non-functioning aftertreatment device as described in paragraph (d)(2)(i)(B) of this section.

(iv) For alternative Tier 2 requirements (§79.58(c)) or Tier 3 requirements (§79.54) which may be prescribed by EPA, the use of functional or nonfunctional aftertreatment devices shall be specified by EPA as part of the test guidelines.

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(v) In the case where an intact aftertreatment device is not in place, all other manufacturer-specified combustion characteristics (e.g., back pressure, residence time, and mixing characteristics) of the altered vehicle/engine shall be retained to the greatest extent possible.

(3) Notwithstanding paragraphs (d)(1) and (d)(2) of this section, when the subject of testing is a fuel additive specifically intended to enhance the effectiveness of exhaust aftertreatment devices, the related aftertreatment device may be used on the emission generation vehicle/engine during all mileage accumulation and testing.

(e) Generation of combustion emissions—(1) Generating combustion emissions for emission characterization. (i) Combustion emissions shall be generated according to the exhaust emission portion of the Federal Test Procedure (FTP) for the certification of new motor vehicles, found in 40 CFR part 86, subpart B for light-duty vehicles/engines, and subparts D, M and N for heavy-duty vehicles/engines. The Urban Dynamometer Driving Schedule (UDDS), pursuant to 40 CFR part 86, appendix I(a), shall apply to light-duty vehicles/engines and the Engine Dynamometer Driving Schedule (EDS), pursuant to 40 CFR part 86, appendix I(f)(2), shall apply to heavy-duty vehicles/engines. The motoring portion of the heavy-duty test cycle may be eliminated, at the manufacturer's option, for the generation of emissions.

(A) For light-duty engines operated on an engine dynamometer, the tester shall determine the speed-torque equivalencies ("trace") for its test engine from valid FTP testing performed on a chassis dynamometer, using a test vehicle with an engine identical to that being tested. The test engine must then be operated under these speed and torque specifications to simulate the FTP cycle.

(B) Special procedures not included in the FTP may be necessary in order to characterize emissions from fuels and fuel additives containing atypical elements or to collect some types of emissions (e.g., particulate emissions from light-duty vehicles/engines, semi-volatile emissions from both light-duty and heavy-duty vehicles/engines). Such alterations to the FTP are acceptable.

(C) For Tier 2 testing, the engines shall operate on repeated bags 2 and 3 of the UDDS or back to back repeats of the heavy-duty transient cycle of the EDS.

(ii) Pursuant to §79.52(b)(1)(i) and §79.57(d)(2)(ii), emission generation and characterization must be repeated three times when the selected vehicle/engine is normally operated without an emissions aftertreatment device and six times when the selected vehicle/engine is normally operated with an emissions aftertreatment device. In the latter case, the emission generation and characterization process shall be repeated three times with the intact aftertreatment device in place and three times with a non-functioning (blank) aftertreatment device in place.

(iii) From both light-duty and heavy-duty vehicles/engines, samples of vapor phase, semi-volatile phase, and particulate phase emissions shall be collected, except that semi-volatile phase, and particulate emissions need not be sampled for fuels and additives in the methane and propane families (pursuant to §79.56(e)(1)(v) and (vi)). The number and type of samples to be collected and separately analyzed during one emission generation/characterization process are as follows:

(A) In the case of combustion emissions generated from light-duty vehicles/engines, the samples consist of three bags of vapor emissions (one from each segment of the light-duty exhaust emission cycle) plus one sample of particulate-phase emissions and one sample of semi-volatile-phase emissions (collected over all segments of the exhaust emission cycle). If the mass of particulate emissions or semi-volatile emissions obtained during one driving cycle is not sufficient for characterization, up to three driving cycles may be performed and the extracted fractions combined prior to chemical analysis. Particulate-phase emissions shall not be combined with semi-volatile-phase emissions. The test laboratory should focus on the characterization of the limit of detection for particulates and semi-volatile emissions.

(B) In the case of combustion emissions generated from heavy-duty engines, the samples consist of one sample of each emission phase (vapor, particulate, and semi-volatile) collected over the entire cold-start cycle and a second sample of each such phase collected over the entire hot-start cycle (see 40 CFR 86.334 through 86.342).

(iv) Emission collection and storage. (A) Vapor phase emissions shall be collected and stored in Tedlar bags for subsequent chemical analysis. Storage conditions are specified in §79.52(b)(2).

(B) Particulate phase emissions shall be collected on a particulate filter (or more than one, if required) using methods described in 40 CFR 86.1301 through 86.1344. These methods, ordinarily applied only to heavy-duty emissions, are to be adapted and used for collection of particulates

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from light-duty vehicles/engines, as well. The particulate matter may be stored on the filter in a sealed container, or the soluble organic fraction may be extracted and stored in a separate sealed container. Both the particulate and the extract shall be shielded from ultraviolet light and stored at  $-20^{\circ}\text{C}$  or less. Particulate emissions shall be tested no later than six months from the date they were generated.

(C) Semi-volatile emissions shall be collected immediately downstream from the particulate collection filters using porous polymer resin beds, or their equivalent, designed for their capture. The soluble organic fraction of semi-volatile emissions shall be extracted immediately and tested within six months of being generated. The extract shall be stored in a sealed container which is shielded from ultraviolet light and stored at  $-20^{\circ}\text{C}$  or less.

(D) Particulate and semi-volatile phase emission collection, handling and extraction methods shall not alter the composition of the collected material, to the extent possible.

(v) Additional requirements for combustion emission sampling, storage, and characterization are specified in §79.52(b).

(2) Generating whole combustion emissions for biological testing. (i) Biological tests requiring whole combustion emissions shall be conducted using emissions generated from the test vehicle or engine operated in accordance with general FTP requirements.

(ii) Light-duty test vehicles/engines shall be repeatedly operated over the Urban Dynamometer Driving Schedule (UDDS) (or equivalent engine dynamometer trace, per paragraph (e)(1)(i)(A) of this section) and heavy-duty test engines shall be repeatedly operated over the Engine Dynamometer Schedule (EDS) (see 40 CFR part 86, appendix I).

(A) The tolerances of the driving cycle shall be two times those of the Federal Test Procedure and must be met 95 percent of the time.

(B) The UDDS or EDS shall be repeated as many times as required for the biological test session.

(C) Light-duty dynamometers shall be calibrated prior to the start of a biological test (40 CFR 86.118-78), verified weekly (40 CFR 86.118-78), and recalibrated as required. Heavy-duty dynamometers shall be calibrated and checked prior to the start of a biological test (40 CFR 86.1318-84), recalibrated every two weeks (40 CFR 86.1318-84(a)) and checked as stated in 40 CFR 86.1318-84(b) and (c).

(D) The fuel reservoir for the test vehicle/engine shall be large enough to operate the test vehicle/engine throughout the daily biological exposure period, avoiding the need for refueling during testing.

(iii) An apparatus to integrate the large concentration swings typical of transient-cycle exhaust is to be used between the source of emissions and the exposure chamber containing the animal test cages(s). The purpose of such apparatus is to decrease the variability of the biological exposure atmosphere and achieve the necessary concentration of CO or NOX, whichever is limiting.

(A) A large mixing chamber is suggested for this purpose. The mixing chamber would be charged from the CVS at a constant rate determined by the exposure chamber purge rate. Flow to the exposure chamber would begin at the conclusion of the initial transient cycle with the associated mixing chamber charge.

(B) A potential alternative apparatus is a mini-diluter (see, for example, AIGER/CRADA, February, 1994 in §79.57(g)).

(C) [Reserved]

(iv) Emission dilution. (A) Dilution air can be pre-dried to lower the relative humidity, thus permitting a lower dilution rate and a higher concentration of hydrocarbons to be achieved without condensation of water vapor.

(B) These procedures include requirements that the mean exposure concentration in the inhalation test chamber on 90 percent or more of the exposure days shall be controlled as follows:

(1) If the species being controlled is hydrocarbon or particulate, the mean exposure concentration must be within 15 percent of the target concentration for the single species being controlled.

(2) For other species, the mean exposure concentration must be within 10 percent of the target concentration for the single species being controlled.

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(3) For all species, daily monitoring of CO, CO<sub>2</sub>, NO<sub>x</sub>, SO<sub>x</sub>, and total hydrocarbons in the exposure chamber shall be required. Analysis of the particle size distribution shall also be performed to establish the stability and consistency of particle size distribution in the test exposure.

(C) After the initial exhaust dilution to preserve the character of the exhaust, the exhaust stream can be further diluted in the mixing chamber (and/or after leaving the chamber) to achieve the desired biological exposure concentrations.

(v) Verification procedures. (A) The entire system used to dilute and transport whole combustion emissions (i.e., from exhaust pipe to outlet in the biological testing chamber) shall be verified before any animal exposures begin, and verified at least weekly during testing. (See procedures at 40 CFR 86.119-90 for light-duty vehicles and §86.1319-90 for heavy-duty engines.) Verification testing shall be accomplished by introducing a known sample at the end of the vehicle/engine exhaust pipe into the dilution system and measuring the amount exiting the system. For example, an injected hydrocarbon sample could be detected with a gas chromatograph (GC) and flame ionization detector (FID) to determine the recovery factor.

(B) [Reserved]

(vi) Emission exposure quality control. (A) The tester shall incorporate the additional quality assurance and safety procedures outlined in §79.61(d) to control variability of emissions during the generation of exposure emissions during health effect testing.

(B) These procedures include requirements that the mean exposure concentration in the inhalation test chamber on 90 percent or more of the exposure days shall be controlled as follows:

(1) If the species being controlled is hydrocarbon or particulate, the mean exposure concentration must be within 15 percent of the target concentration for the single species being controlled.

(2) For other species, the mean exposure concentration must be within 10 percent of the target concentration for the single species being controlled.

(3) For all species, daily monitoring of CO, CO<sub>2</sub>, NO<sub>x</sub>, SO<sub>x</sub>, and total hydrocarbons in the exposure chamber shall be required. Analysis of the particle size distribution shall also be performed to establish the stability and consistency of particle size distribution in the test exposure.

(C) The testing facility shall allow an audit of its premises, the qualifications, e.g., curriculum vitae, of its staff assigned to testing, and the specimens and records of the testing for registration purposes (as specified in §79.60).

(vii) To allow for customary laboratory scheduling and unforeseen problems affecting the combustion emission generation or dilution equipment, biological exposures may be interrupted on limited occasions, as specified in §79.61(d)(5). Interruptions exceeding these limitations shall cause the affected test(s) to be void. Testers shall be aware of concerns for backup vehicles/engines cited in paragraph (a)(7)(ii) of this section.

(3) Generating particulate and semi-volatile emissions for biological testing. (i) Salmonella mutagenicity testing, pursuant to §79.68, shall be conducted on extracts of the particulate and semi-volatile emission phases separately. These emissions shall be generated by operating the test vehicle/engine over the appropriate FTP driving schedule (see paragraph (e)(2)(ii) of this section) and collected and analyzed according to methods described in 40 CFR 86.1301 through 1344 (further information on this subject may be found in Perez, et al. CRC Report No. 551, 1987 listed in §79.57(g)).

(A) Particulate emissions shall be collected on particulate filters and extracted from the collection equipment for use in biological tests. The number of repetitions of the applicable driving schedule required to collect sufficient quantities of the particulate emissions will vary, depending on the characteristics of the engine, the test fuel, and the requirements of the biological test protocol. The particulate sample may be collected on one or more filters, as necessary.

(B) Semi-volatile emissions shall be collected immediately downstream from the particulate collection filters using porous polymer resin beds, or their equivalent, designed for their capture. Semi-volatile phase emissions shall be collected on one apparatus. The time spent collecting sufficient quantities of the test substances in emissions samples will vary, depending on the emission characteristics of the engine and fuel or additive/base fuel mixture and on the requirements of the biological test protocol.

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- (ii) The extraction method shall be determined by the specifications of the biological test for which the emissions are used.
- (iii) Particulate and semi-volatile emission storage requirements are as specified in §79.57(e)(1)(iv).
- (iv) Particulate and semi-volatile phase emission collection, handling and extraction methods shall not alter the composition of the collected material, to the extent possible.
- (v) Particulate emissions shall not be combined with semi-volatile phase emissions.
- (f) Generation of evaporative emissions for characterization and biological testing. (1) Except as provided in paragraph (f)(5) of this section, an evaporative emissions generator shall be used to volatilize samples of a fuel or additive/base fuel mixture for evaporative emissions characterization and biological testing. Emissions shall be collected and sampled using equipment and methods appropriate for use with the compounds being characterized and the requirements of the emission characterization analysis. In the case of potentially explosive test substance concentrations, care must be taken to avoid generating explosive atmospheres. The tester is referred to §79.61(d)(8) for considerations involving explosivity.
- (2) Evaporative Emissions Generator (EEG) Description. An EEG is a fuel tank or vessel to which heat is applied causing a portion of the fuel to evaporate at a desired rate. The manufacturer has flexibility in designing an EEG for testing a particular fuel or fuel additive. The sample used to generate emissions in the EEG shall be renewed at least daily.
- (i) The evaporation chamber shall be made from materials compatible with the fuels and additives being tested and shall be equipped with a drain.
- (ii) The chamber shall be filled to 40 ±5 percent of its interior volume with the fuel or additive/base fuel mixture being tested, with the remainder of the volume containing air.
- (iii) The concentration of the evaporated fuel or additive/base fuel mixture in the vapor space of the evaporation chamber during the time emissions are being withdrawn for testing shall not vary by more than 10 percent from the equilibrium concentration in the vapor space of emissions generated from the fresh fuel or additive/base fuel mixture in the chamber.
- (A) During the course of a day's emission generation period, the level of fuel in the EEG shall be maintained to within 7 percent of its height at the start of the daily exposure period.
- (B) The fuel used in the EEG shall be drained at the end of each daily exposure. The EEG shall be refilled with a fresh supply of the test formulation before the start of each daily exposure.
- (C) The vapor space of the evaporation chamber shall be well mixed throughout the time emissions are being withdrawn for testing.
- (iv) The size of the evaporation chamber shall be determined by the rate at which evaporative emissions shall be needed in the test animal exposure chambers and the rate at which the fuel or the additive/base fuel mixture evaporates. The rate of evaporative emissions may be adjusted by altering the size of the EEG or by using one or more additional EEG(s). Emission rate modifications shall not be adjusted by temperature control or pressure control.
- (v) The temperature of the fuel or additive/base fuel mixture in the evaporation chamber shall be 130 °F ±5 °F. The vapors shall maintain this temperature up to the point in the system where the vapors are diluted.
- (vi) The pressure in the vapor space of the evaporation chamber and the dilution and sampling apparatus shall stay within 10 percent of ambient atmospheric pressure.
- (vii) There shall be no controls or equipment on the evaporation chamber system that change the concentration or composition of the vapors generated for testing.
- (viii) Manufacturers shall perform verification testing of evaporative emissions in a manner analogous to the verification testing performed for combustion emissions.
- (3) For biological testing, vapor shall be withdrawn from the EEG at a constant rate, diluted with air as required for the particular study, and conducted immediately to the biological testing chamber(s) in a manner similar to the method used in §79.57(e), excluding the mixing chamber therein. The rate of emission generation shall be high enough to supply the biological exposure chamber with sufficient emissions to allow for a minimum of fifteen air changes per exposure chamber per hour. To allow for customary laboratory scheduling and for unforeseen problems with the evaporative

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emission generation or dilution equipment, biological exposures may be interrupted on limited occasions, as specified in §79.61(d)(5). Interruptions exceeding these limitations shall cause the affected test(s) to be void.

(4) For characterization of evaporative emissions, samples of equilibrated emissions to the vapor space of the EEG shall be withdrawn into Tedlar bags, then stored and analyzed as specified in §79.52(b).

(5) A manufacturer (or group of manufacturers) may submit to EPA a request for approval of an alternative method of generating evaporative emissions for use in emission characterization and biological tests required under this subpart.

(i) To be approved by EPA, the request must fully explain the rationale for the proposed method as well as the technical procedures, quality control, and safety precautions to be used, and must demonstrate that the proposed method will meet the following criteria:

(A) The emission mixture generated by the proposed procedures must be reasonably similar to the equilibrium composition of the vapor which occurs in the vehicle fuel tank head space when the subject fuel or additive/base fuel mixture is in use and near-maximum in-use temperatures are encountered.

(B) The emissions mixture generated by the proposed method must be sufficiently concentrated to provide adequate exposure levels in the context of the required toxicologic tests.

(C) The proposed method must include procedures to ensure that the emissions delivered to the biologic exposure chambers will provide a reasonably constant exposure atmosphere over time.

(ii) If EPA approves the request, EPA will place in the public record a copy of the request, together with all supporting procedural descriptions and justifications, and will notify the public of its availability by publishing a notice in the Federal Register.

(g) References. For additional background information on the emission generation procedures outlined in this paragraph (g), the following references may be consulted. Additional references can be found in §79.61(f).

(1) AIGER/CRADA (American Industry/Government Emissions Research Cooperative Research and Development Agreement, "Specifications for Advanced Emissions Test Instrumentation" AIGER PD-94-1, Revision 5.0, February, 1994

(2) Black, F. and R. Snow, "Constant Volume Sampling System Water Condensation" SAE #940970 in "Testing and Instrumentation" SP-1039, Society of Automotive Engineers, Feb. 28-Mar. 3, 1994.

(3) Perez, J.M., Jass, R.E., Leddy, D.G., eds. "Chemical Methods for the Measurement of Unregulated Diesel Emissions (CRC-APRAC Project No. CAPI-1-64), Coordinating Research Council, CRC Report No. 551, August, 1987.

(4) Phalen, R.F., "Inhalation Studies: Foundations and Techniques", CRC Press, Inc., Boca Raton, Florida, 1984.

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