

whether the strategies interact in a comparative or additive manner and identify which AECD takes precedence in responding, if applicable.

(10) Explain the extent to which the AECD is included in the applicable test procedures specified in subpart F of this part.

(11) Do the following additional things for AECDS designed to protect engines or vessels:

(i) Identify the engine and/or vessel design limits that make protection necessary and describe any damage that would occur without the AECD.

(ii) Describe how each sensed parameter relates to the protected components' design limits or those operating conditions that cause the need for protection.

(iii) Describe the relationship between the design limits/parameters being protected and the parameters sensed or calculated as surrogates for those design limits/parameters, if applicable.

(iv) Describe how the modulation by the AECD prevents engines and/or vessels from exceeding design limits.

(v) Explain why it is necessary to estimate any parameters instead of measuring them directly and describe how the AECD calculates the estimated value, if applicable.

(vi) Describe how you calibrate the AECD modulation to activate only during conditions related to the stated need to protect components and only as needed to sufficiently protect those components in a way that minimizes the emission impact.

(c) [Reserved]

(d) Describe the engines you selected for testing and the reasons for selecting them.

(e) Describe the test equipment and procedures that you used, including the duty cycle(s) and the corresponding engine applications. Also describe any special or alternate test procedures you used.

(f) Describe how you operated the emission-data engine before testing, including the duty cycle and the number of engine operating hours used to stabilize emission levels. Explain why you selected the method of service accumulation. Describe any scheduled maintenance you did.

(g) List the specifications of the test fuel to show that it falls within the required ranges we specify in 40 CFR part 1065.

(h) Identify the engine family's useful life.

(i) Include the maintenance and warranty instructions you will give to the ultimate purchaser of each new engine (see §§ 1042.120 and 1042.125).

(j) Include the emission-related installation instructions you will

provide if someone else installs your engines in a vessel (see § 1042.130).

(k) Describe your emission control information label (see § 1042.135).

(l) Identify the emission standards and/or FELs to which you are certifying engines in the engine family.

(m) Identify the engine family's deterioration factors and describe how you developed them (see § 1042.245). Present any emission test data you used for this.

(n) State that you operated your emission-data engines as described in the application (including the test procedures, test parameters, and test fuels) to show you meet the requirements of this part.

(o) Present emission data for HC, NO_x, PM, and CO on an emission-data engine to show your engines meet emission standards as specified in § 1042.101. Show emission figures before and after applying adjustment factors for regeneration and deterioration factors for each pollutant and for each engine. If we specify more than one grade of any fuel type (for example, high-sulfur and low-sulfur diesel fuel), you need to submit test data only for one grade, unless the regulations of this part specify otherwise for your engine. Include emission results for each mode if you do discrete-mode testing under § 1042.505. Note that §§ 1042.235 and 1042.245 allows you to submit an application in certain cases without new emission data.

(p) For Category 1 and Category 2 engines, state that all the engines in the engine family comply with the not-to-exceed emission standards we specify in § 1042.101 for all normal operation and use when tested as specified in § 1042.515. Describe any relevant testing, engineering analysis, or other information in sufficient detail to support your statement.

(q) [Reserved]

(r) Report all test results, including those from invalid tests, whether or not they were conducted according to the test procedures of subpart F of this part. If you measure CO₂, report those emission levels. We may ask you to send other information to confirm that your tests were valid under the requirements of this part and 40 CFR part 1065.

(s) Describe all adjustable operating parameters (see § 1042.115(d)), including production tolerances. Include the following in your description of each parameter:

(1) The nominal or recommended setting.

(2) The intended physically adjustable range.

(3) The limits or stops used to establish adjustable ranges.

(4) For Category 1 engines, information showing why the limits, stops, or other means of inhibiting adjustment are effective in preventing adjustment of parameters on in-use engines to settings outside your intended physically adjustable ranges.

(5) For Category 2 engines, propose a range of adjustment for each adjustable parameter, as described in § 1042.115(d). Include information showing why the limits, stops, or other means of inhibiting adjustment are effective in preventing adjustment of parameters on in-use engines to settings outside your proposed adjustable ranges.

(t) Provide the information to read, record, and interpret all the information broadcast by an engine's onboard computers and electronic control units. State that, upon request, you will give us any hardware, software, or tools we would need to do this. If you broadcast a surrogate parameter for torque values, you must provide us what we need to convert these into torque units. You may reference any appropriate publicly released standards that define conventions for these messages and parameters. Format your information consistent with publicly released standards.

(u) Confirm that your emission-related installation instructions specify how to ensure that sampling of exhaust emissions will be possible after engines are installed in vessels and placed in service. Show how to sample exhaust emissions in a way that prevents diluting the exhaust sample with ambient air.

(v) State whether your certification is limited for certain engines. If this is the case, describe how you will prevent use of these engines in applications for which they are not certified. This applies for engines such as the following:

(1) Constant-speed engines.

(2) Variable-pitch.

(3) Recreational engines.

(w) Unconditionally certify that all the engines in the engine family comply with the requirements of this part, other referenced parts of the CFR, and the Clean Air Act.

(x) Include estimates of U.S.-directed production volumes. If these estimates are not consistent with your actual production volumes from previous years, explain why they are different.

(y) Include the information required by other subparts of this part. For example, include the information required by § 1042.725 if you participate in the ABT program.

(z) Include other applicable information, such as information specified in this part or 40 CFR part 1068 related to requests for exemptions.

(aa) Name an agent for service located in the United States. Service on this agent constitutes service on you or any of your officers or employees for any action by EPA or otherwise by the United States related to the requirements of this part.

(bb) For imported engines, identify the following:

(1) The port(s) at which you will import your engines.

(2) The names and addresses of the agents you have authorized to import your engines.

(3) The location of test facilities in the United States where you can test your engines if we select them for testing under a selective enforcement audit, as specified in 40 CFR part 1068, subpart E.

§ 1042.210 Preliminary approval.

If you send us information before you finish the application, we will review it and make any appropriate determinations, especially for questions related to engine family definitions, auxiliary emission control devices, deterioration factors, useful life, testing for service accumulation, maintenance, and compliance with not-to-exceed standards. Decisions made under this section are considered to be preliminary approval, subject to final review and approval. We will generally not reverse a decision where we have given you preliminary approval, unless we find new information supporting a different decision. If you request preliminary approval related to the upcoming model year or the model year after that, we will make best-efforts to make the appropriate determinations as soon as practicable. We will generally not provide preliminary approval related to a future model year more than two years ahead of time.

§ 1042.220 Amending maintenance instructions.

You may amend your emission-related maintenance instructions after you submit your application for certification, as long as the amended instructions remain consistent with the provisions of § 1042.125. You must send the Designated Compliance Officer a written request to amend your application for certification for an engine family if you want to change the emission-related maintenance instructions in a way that could affect emissions. In your request, describe the proposed changes to the maintenance instructions. We will disapprove your

request if we determine that the amended instructions are inconsistent with maintenance you performed on emission-data engines. If operators follow the original maintenance instructions rather than the newly specified maintenance, this does not allow you to disqualify those engines from in-use testing or deny a warranty claim.

(a) If you are decreasing any specified maintenance, you may distribute the new maintenance instructions to your customers 30 days after we receive your request, unless we disapprove your request. We may approve a shorter time or waive this requirement.

(b) If your requested change would not decrease the specified maintenance, you may distribute the new maintenance instructions any time after you send your request. For example, this paragraph (b) would cover adding instructions to increase the frequency of a maintenance step for engines in severe-duty applications.

(c) You do not need to request approval if you are making only minor corrections (such as correcting typographical mistakes), clarifying your maintenance instructions, or changing instructions for maintenance unrelated to emission control.

§ 1042.225 Amending applications for certification.

Before we issue you a certificate of conformity, you may amend your application to include new or modified engine configurations, subject to the provisions of this section. After we have issued your certificate of conformity, you may send us an amended application requesting that we include new or modified engine configurations within the scope of the certificate, subject to the provisions of this section. You must amend your application if any changes occur with respect to any information included in your application.

(a) You must amend your application before you take any of the following actions:

(1) Add an engine configuration to an engine family. In this case, the engine configuration added must be consistent with other engine configurations in the engine family with respect to the criteria listed in § 1042.230.

(2) Change an engine configuration already included in an engine family in a way that may affect emissions, or change any of the components you described in your application for certification. This includes production and design changes that may affect emissions any time during the engine's lifetime.

(3) Modify an FEL for an engine family as described in paragraph (f) of this section.

(b) To amend your application for certification as specified in paragraph (a) of this section, send the Designated Compliance Officer the following information:

(1) Describe in detail the addition or change in the engine model or configuration you intend to make.

(2) Include engineering evaluations or data showing that the amended engine family complies with all applicable requirements. You may do this by showing that the original emission-data engine is still appropriate with respect to showing compliance of the amended family with all applicable requirements.

(3) If the original emission-data engine for the engine family is not appropriate to show compliance for the new or modified engine configuration, include new test data showing that the new or modified engine configuration meets the requirements of this part.

(c) We may ask for more test data or engineering evaluations. You must give us these within 30 days after we request them.

(d) For engine families already covered by a certificate of conformity, we will determine whether the existing certificate of conformity covers your newly added or modified engine. You may ask for a hearing if we deny your request (see § 1042.820).

(e) For engine families already covered by a certificate of conformity, you may start producing the new or modified engine configuration any time after you send us your amended application and before we make a decision under paragraph (d) of this section. However, if we determine that the affected engines do not meet applicable requirements, we will notify you to cease production of the engines and may require you to recall the engines at no expense to the owner. Choosing to produce engines under this paragraph (e) is deemed to be consent to recall all engines that we determine do not meet applicable emission standards or other requirements and to remedy the nonconformity at no expense to the owner. If you do not provide information required under paragraph (c) of this section within 30 days, you must stop producing the new or modified engines.

(f) You may ask us to approve a change to your FEL in certain cases after the start of production. The changed FEL may not apply to engines you have already introduced into U.S. commerce, except as described in this paragraph (f). If we approve a changed FEL after the start of production, you must include

the new FEL on the emission control information label for all engines produced after the change. You may ask us to approve a change to your FEL in the following cases:

(1) You may ask to raise your FEL for your emission family at any time. In your request, you must show that you will still be able to meet the emission standards as specified in subparts B and H of this part. If you amend your application by submitting new test data to include a newly added or modified engine or fuel-system component, as described in paragraph (b)(3) of this section, use the appropriate FELs with corresponding production volumes to calculate your production-weighted average FEL for the model year, as described in subpart H of this part. If you amend your application without submitting new test data, you must use the higher FEL for the entire family to calculate your production-weighted average FEL under subpart H of this part.

(2) You may ask to lower the FEL for your emission family only if you have test data from production engines showing that emissions are below the proposed lower FEL. The lower FEL applies only to engines you produce after we approve the new FEL. Use the appropriate FELs with corresponding production volumes to calculate your production-weighted average FEL for the model year, as described in subpart H of this part.

§ 1042.230 Engine families.

(a) For purposes of certification, divide your product line into families of engines that are expected to have similar emission characteristics throughout the useful life as described in this section. You may not group Category 1 and Category 2 engines in the same family. Your engine family is limited to a single model year.

(b) For Category 1 engines, group engines in the same engine family if they are the same in all the following aspects:

(1) The combustion cycle and fuel (the fuels with which the engine is intended or designed to be operated).

(2) The cooling system (for example, raw-water vs. separate-circuit cooling).

(3) Method of air aspiration.

(4) Method of exhaust aftertreatment (for example, catalytic converter or particulate trap).

(5) Combustion chamber design.

(6) Bore and stroke.

(7) Number of cylinders (for engines with aftertreatment devices only).

(8) Cylinder arrangement (for engines with aftertreatment devices only).

(9) Method of control for engine operation other than governing (*i.e.*, mechanical or electronic).

(10) Application (commercial or recreational).

(11) Numerical level of the emission standards that apply to the engine, except as allowed under paragraphs (f) and (g) of this section.

(c) For Category 2 engines, group engines in the same engine family if they are the same in all the following aspects:

(1) The combustion cycle (*e.g.*, diesel cycle).

(2) The type of engine cooling employed (air-cooled or water-cooled), and procedure(s) employed to maintain engine temperature within desired limits (thermostat, on-off radiator fan(s), radiator shutters, etc.).

(3) The bore and stroke dimensions.

(4) The approximate intake and exhaust event timing and duration (valve or port).

(5) The location of the intake and exhaust valves (or ports).

(6) The size of the intake and exhaust valves (or ports).

(7) The overall injection, or as appropriate ignition, timing characteristics (*i.e.*, the deviation of the timing curves from the optimal fuel economy timing curve must be similar in degree).

(8) The combustion chamber configuration and the surface-to-volume ratio of the combustion chamber when the piston is at top dead center position, using nominal combustion chamber dimensions.

(9) The location of the piston rings on the piston.

(10) The method of air aspiration (turbocharged, supercharged, naturally aspirated, Roots blown).

(11) The turbocharger or supercharger general performance characteristics (*e.g.*, approximate boost pressure, approximate response time, approximate size relative to engine displacement).

(12) The type of air inlet cooler (air-to-air, air-to-liquid, approximate degree to which inlet air is cooled).

(13) The intake manifold induction port size and configuration.

(14) The type of fuel (the fuels with which the engine is intended or designed to be operated) and fuel system configuration.

(15) The configuration of the fuel injectors and approximate injection pressure.

(16) The type of fuel injection system controls (*i.e.*, mechanical or electronic).

(17) The type of smoke control system.

(18) The exhaust manifold port size and configuration.

(19) The type of exhaust aftertreatment system (oxidation catalyst, particulate trap), and characteristics of the aftertreatment system (catalyst loading, converter size vs engine size).

(d) [Reserved]

(e) You may subdivide a group of engines that is identical under paragraph (b) or (c) of this section into different engine families if you show the expected emission characteristics are different during the useful life.

However, for the purpose of applying small volume family provisions of this part, we will consider the otherwise applicable engine family criteria of this section.

(f) You may group engines that are not identical with respect to the things listed in paragraph (b) or (c) of this section in the same engine family, as follows:

(1) In unusual circumstances, you may group such engines in the same engine family if you show that their emission characteristics during the useful life will be similar.

(2) If you are a small-volume engine manufacturer, you may group any Category 1 engines into a single engine family or you may group any Category 2 engines into a single engine family. This also applies if you are a post-manufacture marinizer modifying a base engine that has a valid certificate of conformity for any kind of nonroad or heavy-duty highway engine under this chapter.

(3) The provisions of this paragraph (f) do not exempt any engines from meeting the standards and requirements in subpart B of this part.

(g) If you combine engines that are subject to different emission standards into a single engine family under paragraph (f) of this section, you must certify the engine family to the more stringent set of standards for that model year.

§ 1042.235 Emission testing required for a certificate of conformity.

This section describes the emission testing you must perform to show compliance with the emission standards in § 1042.101(a). See § 1042.205(p) regarding emission testing related to the NTE standards. See §§ 1042.240 and 1042.245 and 40 CFR part 1065, subpart E, regarding service accumulation before emission testing.

(a) Test your emission-data engines using the procedures and equipment specified in subpart F of this part.

(b) Select an emission-data engine from each engine family for testing. For Category 2 or Category 3 engines, you may use a development engine that is

equivalent in design to the engine being certified. Using good engineering judgment, select the engine configuration most likely to exceed an applicable emission standard over the useful life, considering all exhaust emission constituents and the range of installation options available to vessel manufacturers.

(c) We may measure emissions from any of your test engines or other engines from the engine family, as follows:

(1) We may decide to do the testing at your plant or any other facility. If we do this, you must deliver the test engine to a test facility we designate. The test engine you provide must include appropriate manifolds, aftertreatment devices, electronic control units, and other emission-related components not normally attached directly to the engine block. If we do the testing at your plant, you must schedule it as soon as possible and make available the instruments, personnel, and equipment we need.

(2) If we measure emissions from one of your test engines, the results of that testing become the official emission results for the engine. Unless we later invalidate these data, we may decide not to consider your data in determining if your engine family meets applicable requirements.

(3) Before we test one of your engines, we may set its adjustable parameters to any point within the specified adjustable ranges (see § 1042.115(d)).

(4) Before we test one of your engines, we may calibrate it within normal production tolerances for anything we do not consider an adjustable parameter.

(d) You may ask to use emission data from a previous model year instead of doing new tests, but only if all the following are true:

(1) The engine family from the previous model year differs from the current engine family only with respect to model year or other characteristics unrelated to emissions. You may also ask to add a configuration subject to § 1042.225.

(2) The emission-data engine from the previous model year remains the appropriate emission-data engine under paragraph (b) of this section.

(3) The data show that the emission-data engine would meet all the requirements that apply to the engine family covered by the application for certification. For engines originally tested under the provisions of 40 CFR part 94, you may consider those test procedures to be equivalent to the procedures we specify in subpart F of this part.

(e) We may require you to test a second engine of the same or different configuration in addition to the engine

tested under paragraph (b) of this section.

(f) If you use an alternate test procedure under 40 CFR 1065.10 and later testing shows that such testing does not produce results that are equivalent to the procedures specified in subpart F of this part, we may reject data you generated using the alternate procedure.

§ 1042.240 Demonstrating compliance with exhaust emission standards.

(a) For purposes of certification, your engine family is considered in compliance with the emission standards in § 1042.101(a) if all emission-data engines representing that family have test results showing deteriorated emission levels at or below these standards. Note that your FELs are considered to be the applicable emission standards with which you must comply if you participate in the ABT program in subpart H of this part.

(b) Your engine family is deemed not to comply if any emission-data engine representing that family has test results showing a deteriorated emission level above an applicable emission standard for any pollutant.

(c) To compare emission levels from the emission-data engine with the applicable emission standards for Category 1 and Category 2 engines, apply deterioration factors to the measured emission levels for each pollutant. Section 1042.245 specifies how to test your engine to develop deterioration factors that represent the deterioration expected in emissions over your engines' full useful life. Your deterioration factors must take into account any available data from in-use testing with similar engines. Small-volume engine manufacturers and post-manufacture marinizers may use assigned deterioration factors that we establish. Apply deterioration factors as follows:

(1) *Additive deterioration factor for exhaust emissions.* Except as specified in paragraph (c)(2) of this section, use an additive deterioration factor for exhaust emissions. An additive deterioration factor is the difference between exhaust emissions at the end of the useful life and exhaust emissions at the low-hour test point. In these cases, adjust the official emission results for each tested engine at the selected test point by adding the factor to the measured emissions. If the deterioration factor is less than zero, use zero.

Additive deterioration factors must be specified to one more decimal place than the applicable standard.

(2) *Multiplicative deterioration factor for exhaust emissions.* Use a

multiplicative deterioration factor if good engineering judgment calls for the deterioration factor for a pollutant to be the ratio of exhaust emissions at the end of the useful life to exhaust emissions at the low-hour test point. For example, if you use aftertreatment technology that controls emissions of a pollutant proportionally to engine-out emissions, it is often appropriate to use a multiplicative deterioration factor.

Adjust the official emission results for each tested engine at the selected test point by multiplying the measured emissions by the deterioration factor. If the deterioration factor is less than one, use one. A multiplicative deterioration factor may not be appropriate in cases where testing variability is significantly greater than engine-to-engine variability. Multiplicative deterioration factors must be specified to one more significant figure than the applicable standard.

(3) *Deterioration factor for crankcase emissions.* If your engine vents crankcase emissions to the exhaust or to the atmosphere, you must account for crankcase emission deterioration, using good engineering judgment. You may use separate deterioration factors for crankcase emissions of each pollutant (either multiplicative or additive) or include the effects in combined deterioration factors that include exhaust and crankcase emissions together for each pollutant.

(d) Collect emission data using measurements to one more decimal place than the applicable standard. Apply the deterioration factor to the official emission result, as described in paragraph (c) of this section, then round the adjusted figure to the same number of decimal places as the emission standard. Compare the rounded emission levels to the emission standard for each emission-data engine. In the case of NO_x+HC standards, apply the deterioration factor to each pollutant and then add the results before rounding.

§ 1042.245 Deterioration factors.

For Category 1 and Category 2 engines, establish deterioration factors to determine whether your engines will meet emission standards for each pollutant throughout the useful life, as described in §§ 1042.101 and 1042.240. This section describes how to determine deterioration factors, either with an engineering analysis, with pre-existing test data, or with new emission measurements.

(a) You may ask us to approve deterioration factors for an engine family with established technology based on engineering analysis instead of testing. Engines certified to a NO_x+HC

standard or FEL greater than the Tier 2 NO_x+HC standard described in Appendix I of this part are considered to rely on established technology for gaseous emission control, except that this does not include any engines that use exhaust-gas recirculation or aftertreatment. In most cases, technologies used to meet the Tier 1 and Tier 2 emission standards would be considered to be established technology. We must approve your plan to establish a deterioration factor under this paragraph (a) before you submit your application for certification.

(b) You may ask us to approve deterioration factors for an engine family based on emission measurements from similar highway or nonroad engines (including locomotive engines or other marine engines) if you have already given us these data for certifying the other engines in the same or earlier model years. Use good engineering judgment to decide whether the two engines are similar. We must approve your plan to establish a deterioration factor under this paragraph (b) before you submit your application for certification. We will approve your request if you show us that the emission measurements from other engines reasonably represent in-use deterioration for the engine family for which you have not yet determined deterioration factors.

(c) If you are unable to determine deterioration factors for an engine family under paragraph (a) or (b) of this section, first get us to approve a plan for determining deterioration factors based on service accumulation and related testing. Your plan must involve measuring emissions from an emission-data engine at least three times with evenly spaced intervals of service accumulation such that the resulting measurements and calculations will represent the deterioration expected from in-use engines over the full useful life. You may use extrapolation to determine deterioration factors once you have established a trend of changing emissions with age for each pollutant. You may use an engine installed in a vessel to accumulate service hours instead of running the engine only in the laboratory. You may perform maintenance on emission-data engines as described in § 1042.125 and 40 CFR part 1065, subpart E.

(d) Include the following information in your application for certification:

(1) If you use test data from a different engine family, explain why this is appropriate and include all the emission measurements on which you base the deterioration factor.

(2) If you determine your deterioration factors based on engineering analysis, explain why this is appropriate and include a statement that all data, analyses, evaluations, and other information you used are available for our review upon request.

(3) If you do testing to determine deterioration factors, describe the form and extent of service accumulation, including a rationale for selecting the service-accumulation period and the method you use to accumulate hours.

§ 1042.250 Recordkeeping and reporting.

(a) If you produce engines under any provisions of this part that are related to production volumes, send the Designated Compliance Officer a report within 30 days after the end of the model year describing the total number of engines you produced in each engine family. For example, if you use special provisions intended for small-volume engine manufacturers, report your production volumes to show that you do not exceed the applicable limits.

(b) Organize and maintain the following records:

(1) A copy of all applications and any summary information you send us.

(2) Any of the information we specify in § 1042.205 that you were not required to include in your application.

(3) A detailed history of each emission-data engine. For each engine, describe all of the following:

(i) The emission-data engine's construction, including its origin and buildup, steps you took to ensure that it represents production engines, any components you built specially for it, and all the components you include in your application for certification.

(ii) How you accumulated engine operating hours (service accumulation), including the dates and the number of hours accumulated.

(iii) All maintenance, including modifications, parts changes, and other service, and the dates and reasons for the maintenance.

(iv) All your emission tests (valid and invalid), including documentation on routine and standard tests, as specified in part 40 CFR part 1065, and the date and purpose of each test.

(v) All tests to diagnose engine or emission-control performance, giving the date and time of each and the reasons for the test.

(vi) Any other significant events.

(4) Production figures for each engine family divided by assembly plant.

(5) Keep a list of engine identification numbers for all the engines you produce under each certificate of conformity.

(c) Keep data from routine emission tests (such as test cell temperatures and

relative humidity readings) for one year after we issue the associated certificate of conformity. Keep all other information specified in paragraph (a) of this section for eight years after we issue your certificate.

(d) Store these records in any format and on any media, as long as you can promptly send us organized, written records in English if we ask for them. You must keep these records readily available. We may review them at any time.

(e) Send us copies of any engine maintenance instructions or explanations if we ask for them.

§ 1042.255 EPA decisions.

(a) If we determine your application is complete and shows that the engine family meets all the requirements of this part and the Clean Air Act, we will issue a certificate of conformity for your engine family for that model year. We may make the approval subject to additional conditions.

(b) We may deny your application for certification if we determine that your engine family fails to comply with emission standards or other requirements of this part or the Clean Air Act. Our decision may be based on a review of all information available to us. If we deny your application, we will explain why in writing.

(c) In addition, we may deny your application or suspend or revoke your certificate if you do any of the following:

(1) Refuse to comply with any testing or reporting requirements.

(2) Submit false or incomplete information (paragraph (e) of this section applies if this is fraudulent).

(3) Render inaccurate any test data.

(4) Deny us from completing authorized activities (see 40 CFR 1068.20). This includes a failure to provide reasonable assistance.

(5) Produce engines for importation into the United States at a location where local law prohibits us from carrying out authorized activities.

(6) Fail to supply requested information or amend your application to include all engines being produced.

(7) Take any action that otherwise circumvents the intent of the Clean Air Act or this part.

(d) We may void your certificate if you do not keep the records we require or do not give us information as required under this part or the Clean Air Act.

(e) We may void your certificate if we find that you intentionally submitted false or incomplete information.

(f) If we deny your application or suspend, revoke, or void your

certificate, you may ask for a hearing (see § 1042.820).

Subpart D—Testing Production-Line Engines

§ 1042.301 General provisions.

(a) If you produce engines that are subject to the requirements of this part, you must test them as described in this subpart, except as follows:

(1) Small-volume engine manufacturers may omit testing under this subpart.

(2) We may exempt Category 1 engine families with a projected U.S.-directed production volume below 100 engines from routine testing under this subpart. Request this exemption in the application for certification and include your basis for projecting a production volume below 100 units. You must promptly notify us if your actual production exceeds 100 units during the model year. If you exceed the production limit or if there is evidence of a nonconformity, we may require you to test production-line engines under this subpart, or under 40 CFR part 1068, subpart D, even if we have approved an exemption under this paragraph (a)(2).

(3) [Reserved]

(b) We may suspend or revoke your certificate of conformity for certain engine families if your production-line engines do not meet the requirements of this part or you do not fulfill your obligations under this subpart (see §§ 1042.325 and 1042.340).

(c) Other requirements apply to engines that you produce. Other regulatory provisions authorize us to suspend, revoke, or void your certificate of conformity, or order recalls for engines families without regard to whether they have passed these production-line testing requirements. The requirements of this subpart do not affect our ability to do selective enforcement audits, as described in 40 CFR part 1068. Individual engines in families that pass these production-line testing requirements must also conform to all applicable regulations of this part and 40 CFR part 1068.

(d) You may ask to use an alternate program for testing production-line engines. In your request, you must show us that the alternate program gives equal assurance that your products meet the requirements of this part. We may waive some or all of this subpart's requirements if we approve your alternate program.

(e) If you certify an engine family with carryover emission data, as described in § 1042.235(d), and these equivalent engine families consistently pass the

production-line testing requirements over the preceding two-year period, you may ask for a reduced testing rate for further production-line testing for that family. The minimum testing rate is one engine per engine family. If we reduce your testing rate, we may limit our approval to any number of model years. In determining whether to approve your request, we may consider the number of engines that have failed the emission tests.

(f) We may ask you to make a reasonable number of production-line engines available for a reasonable time so we can test or inspect them for compliance with the requirements of this part. See 40 CFR 1068.27.

§ 1042.305 Preparing and testing production-line engines.

This section describes how to prepare and test production-line engines. You must assemble the test engine in a way that represents the assembly procedures for other engines in the engine family. You must ask us to approve any deviations from your normal assembly procedures for other production engines in the engine family.

(a) *Test procedures.* Test your production-line engines using the applicable testing procedures in subpart F of this part to show you meet the duty-cycle emission standards in subpart B of this part. The not-to-exceed standards apply for this testing, but you need not do additional testing to show that production-line engines meet the not-to-exceed standards.

(b) *Modifying a test engine.* Once an engine is selected for testing (see § 1042.310), you may adjust, repair, prepare, or modify it or check its emissions only if one of the following is true:

(1) You document the need for doing so in your procedures for assembling and inspecting all your production engines and make the action routine for all the engines in the engine family.

(2) This subpart otherwise specifically allows your action.

(3) We approve your action in advance.

(c) *Engine malfunction.* If an engine malfunction prevents further emission testing, ask us to approve your decision to either repair the engine or delete it from the test sequence.

(d) *Setting adjustable parameters.* Before any test, we may require you to adjust any adjustable parameter on a Category 1 engine to any setting within its physically adjustable range. We may adjust or require you to adjust any adjustable parameter on a Category 2 engine to any setting within its approved adjustable range.

(1) We may require you to adjust idle speed outside the physically adjustable range as needed, but only until the engine has stabilized emission levels (see paragraph (e) of this section). We may ask you for information needed to establish an alternate minimum idle speed.

(2) We may specify adjustments within the physically adjustable range or the approved adjustable range by considering their effect on emission levels, as well as how likely it is someone will make such an adjustment with in-use engines.

(e) *Stabilizing emission levels.* You may stabilize emission levels (or establish a Green Engine Factor for Category 2 engines) before you test production-line engines, as follows:

(1) You may stabilize emission levels by operating the engine in a way that represents the way production engines will be used, using good engineering judgment, for no more than the greater of two periods:

(i) 300 hours.

(ii) The number of hours you operated your emission-data engine for certifying the engine family (see 40 CFR part 1065, subpart E, or the applicable regulations governing how you should prepare your test engine).

(2) For Category 2 engines, you may ask us to approve a Green Engine Factor for each regulated pollutant for each engine family. Use the Green Engine Factor to adjust measured emission levels to establish a stabilized low-hour emission level.

(f) *Damage during shipment.* If shipping an engine to a remote facility for production-line testing makes necessary an adjustment or repair, you must wait until after the initial emission test to do this work. We may waive this requirement if the test would be impossible or unsafe, or if it would permanently damage the engine. Report to us in your written report under § 1042.345 all adjustments or repairs you make on test engines before each test.

(g) *Retesting after invalid tests.* You may retest an engine if you determine an emission test is invalid under subpart F of this part. Explain in your written report reasons for invalidating any test and the emission results from all tests. If you retest an engine, you may ask us to substitute results of the new tests for the original ones. You must ask us within ten days of testing. We will generally answer within ten days after we receive your information.

§ 1042.310 Engine selection.

(a) Determine minimum sample sizes as follows:

(1) For Category 1 engines, the minimum sample size is one engine or one percent of the projected U.S.-directed production volume for all your Category 1 engine families, whichever is greater.

(2) For Category 2 engines, the minimum sample size is one engine or one percent of the projected U.S.-directed production volume for all your Category 2 engine families, whichever is greater.

(b) Randomly select one engine from each category early in the model year from the engine family with the highest projected U.S.-directed production volume. For further testing to reach the minimum sample size, randomly select a proportional sample from each engine family, with testing distributed evenly over the course of the model year.

(c) For each engine that fails to meet emission standards, test two engines from the same engine family from the next fifteen engines produced or within seven calendar days, which is later. If an engine fails to meet emission standards for any pollutant, count it as a failing engine under this paragraph (c).

(d) Continue testing until one of the following things happens:

(1) You test the number of engines specified in paragraphs (a) and (c) of this section.

(2) The engine family does not comply according to § 1042.315 or you choose to declare that the engine family does not comply with the requirements of this subpart.

(3) You test 30 engines from the engine family.

(e) You may elect to test more randomly chosen engines than we require under this section.

§ 1042.315 Determining compliance.

This section describes the pass-fail criteria for the production-line testing requirements. We apply these criteria on an engine-family basis. See § 1042.320 for the requirements that apply to individual engines that fail a production-line test.

(a) Calculate your test results as follows:

(1) *Initial and final test results.* Calculate the test results for each engine. If you do several tests on an engine, calculate the initial test results, then add them together and divide by the number of tests for the final test results on that engine. Include the Green Engine Factor to determine low-hour emission results, if applicable.

(2) *Final deteriorated test results.* Apply the deterioration factor for the engine family to the final test results (see § 1042.240(c)).

(3) *Round deteriorated test results.* Round the results to the number of

decimal places in the emission standard expressed to one more decimal place.

(b) If a production-line engine fails to meet emission standards and you test two additional engines as described in § 1042.310, calculate the average emission level for each pollutant for the three engines. If the calculated average emission level for any pollutant exceeds the applicable emission standard, the engine family fails the production-line testing requirements of this subpart. Tell us within ten working days if this happens. You may request to amend the application for certification to raise the FEL of the engine family as described in § 1042.225(f).

§ 1042.320 What happens if one of my production-line engines fails to meet emission standards?

(a) If you have a production-line engine with final deteriorated test results exceeding one or more emission standards (see § 1042.315(a)), the certificate of conformity is automatically suspended for that failing engine. You must take the following actions before your certificate of conformity can cover that engine:

(1) Correct the problem and retest the engine to show it complies with all emission standards.

(2) Include in your written report a description of the test results and the remedy for each engine (see § 1042.345).

(b) You may request to amend the application for certification to raise the FEL of the entire engine family at this point (see § 1042.225).

§ 1042.325 What happens if an engine family fails the production-line testing requirements?

(a) We may suspend your certificate of conformity for an engine family if it fails under § 1042.315. The suspension may apply to all facilities producing engines from an engine family, even if you find noncompliant engines only at one facility.

(b) We will tell you in writing if we suspend your certificate in whole or in part. We will not suspend a certificate until at least 15 days after the engine family fails. The suspension is effective when you receive our notice.

(c) Up to 15 days after we suspend the certificate for an engine family, you may ask for a hearing (see § 1042.820). If we agree before a hearing occurs that we used erroneous information in deciding to suspend the certificate, we will reinstate the certificate.

(d) Section 1042.335 specifies steps you must take to remedy the cause of the engine family's production-line failure. All the engines you have produced since the end of the last test

period are presumed noncompliant and should be addressed in your proposed remedy. We may require you to apply the remedy to engines produced earlier if we determine that the cause of the failure is likely to have affected the earlier engines.

(e) You may request to amend the application for certification to raise the FEL of the entire engine family as described in § 1051.225(f). We will approve your request if it is clear that you used good engineering judgment in establishing the original FEL.

§ 1042.330 Selling engines from an engine family with a suspended certificate of conformity.

You may sell engines that you produce after we suspend the engine family's certificate of conformity under § 1042.315 only if one of the following occurs:

(a) You test each engine you produce and show it complies with emission standards that apply.

(b) We conditionally reinstate the certificate for the engine family. We may do so if you agree to recall all the affected engines and remedy any noncompliance at no expense to the owner if later testing shows that the engine family still does not comply.

§ 1042.335 Reinstating suspended certificates.

(a) Send us a written report asking us to reinstate your suspended certificate. In your report, identify the reason for noncompliance, propose a remedy for the engine family, and commit to a date for carrying it out. In your proposed remedy include any quality control measures you propose to keep the problem from happening again.

(b) Give us data from production-line testing that shows the remedied engine family complies with all the emission standards that apply.

§ 1042.340 When may EPA revoke my certificate under this subpart and how may I sell these engines again?

(a) We may revoke your certificate for an engine family in the following cases:

(1) You do not meet the reporting requirements.

(2) Your engine family fails to comply with the requirements of this subpart and your proposed remedy to address a suspended certificate under § 1042.325 is inadequate to solve the problem or requires you to change the engine's design or emission-control system.

(b) To sell engines from an engine family with a revoked certificate of conformity, you must modify the engine family and then show it complies with the requirements of this part.

(1) If we determine your proposed design change may not control emissions for the engine's full useful life, we will tell you within five working days after receiving your report. In this case we will decide whether production-line testing will be enough for us to evaluate the change or whether you need to do more testing.

(2) Unless we require more testing, you may show compliance by testing production-line engines as described in this subpart.

(3) We will issue a new or updated certificate of conformity when you have met these requirements.

§ 1042.345 Reporting.

You must do all the following things unless we ask you to send us less information:

(a) Within 30 calendar days of the end of each quarter in which production-line testing occurs, send us a report with the following information:

(1) Describe any facility used to test production-line engines and state its location.

(2) State the total U.S.-directed production volume and number of tests for each engine family.

(3) Describe how you randomly selected engines.

(4) Describe each test engine, including the engine family's identification and the engine's model year, build date, model number, identification number, and number of hours of operation before testing. Also describe how you developed and applied the Green Engine Factor, if applicable.

(5) Identify how you accumulated hours of operation on the engines and describe the procedure and schedule you used.

(6) Provide the test number; the date, time and duration of testing; test procedure; initial test results before and after rounding; final test results; and final deteriorated test results for all tests. Provide the emission results for all measured pollutants. Include information for both valid and invalid tests and the reason for any invalidation.

(7) Describe completely and justify any nonroutine adjustment, modification, repair, preparation, maintenance, or test for the test engine if you did not report it separately under this subpart. Include the results of any emission measurements, regardless of the procedure or type of engine.

(8) Report on each failed engine as described in § 1042.320.

(9) Identify when the model year ends for each engine family.

(b) We may ask you to add information to your written report so we

can determine whether your new engines conform with the requirements of this subpart.

(c) An authorized representative of your company must sign the following statement: We submit this report under sections 208 and 213 of the Clean Air Act. Our production-line testing conformed completely with the requirements of 40 CFR part 1042. We have not changed production processes or quality-control procedures for test engines in a way that might affect emission controls. All the information in this report is true and accurate to the best of my knowledge. I know of the penalties for violating the Clean Air Act and the regulations. (Authorized Company Representative)

(d) Send electronic reports of production-line testing to the Designated Compliance Officer using an approved information format. If you want to use a different format, send us a written request with justification for a waiver.

(e) We will send copies of your reports to anyone from the public who asks for them. See § 1042.815 for information on how we treat information you consider confidential.

§ 1042.350 Recordkeeping.

(a) Organize and maintain your records as described in this section. We may review your records at any time.

(b) Keep records of your production-line testing for eight years after you complete all the testing required for an engine family in a model year. You may use any appropriate storage formats or media.

(c) Keep a copy of the written reports described in § 1042.345.

(d) Keep the following additional records:

(1) A description of all test equipment for each test cell that you can use to test production-line engines.

(2) The names of supervisors involved in each test.

(3) The name of anyone who authorizes adjusting, repairing, preparing, or modifying a test engine and the names of all supervisors who oversee this work.

(4) If you shipped the engine for testing, the date you shipped it, the associated storage or port facility, and the date the engine arrived at the testing facility.

(5) Any records related to your production-line tests that are not in the written report.

(6) A brief description of any significant events during testing not otherwise described in the written report or in this section.

(7) Any information specified in § 1042.345 that you do not include in your written reports.

(e) If we ask, you must give us projected or actual production figures for an engine family. We may ask you to divide your production figures by maximum engine power, displacement, fuel type, or assembly plant (if you produce engines at more than one plant).

(f) Keep a list of engine identification numbers for all the engines you produce under each certificate of conformity. Give us this list within 30 days if we ask for it.

(g) We may ask you to keep or send other information necessary to implement this subpart.

Subpart E—In-use Testing

§ 1042.401 General Provisions.

We may perform in-use testing of any engine subject to the standards of this part.

Subpart F—Test Procedures

§ 1042.501 How do I run a valid emission test?

(a) Use the equipment and procedures for compression-ignition engines in 40 CFR part 1065 to determine whether Category 1 and Category 2 engines meet the duty-cycle emission standards in § 1042.101(a). Measure the emissions of all regulated pollutants as specified in 40 CFR part 1065. Use the applicable duty cycles specified in § 1042.505.

(b) Section 1042.515 describes the supplemental test procedures for evaluating whether engines meet the not-to-exceed emission standards in § 1042.101(c).

(c) Use the fuels and lubricants specified in 40 CFR part 1065, subpart H, for all the testing we require in this part, except as specified in § 1042.515.

(1) For service accumulation, use the test fuel or any commercially available fuel that is representative of the fuel that in-use engines will use.

(2) For diesel-fueled engines, use the appropriate diesel fuel specified in 40 CFR part 1065, subpart H, for emission testing. Unless we specify otherwise, the appropriate diesel test fuel is the ultra low-sulfur diesel fuel. If we allow you to use a test fuel with higher sulfur levels, identify the test fuel in your application for certification and ensure that the emission control information label is consistent with your selection of the test fuel (see § 1042.135(c)(10)). For Category 2 engines, you may ask to use commercially available diesel fuel similar but not necessarily identical to the applicable fuel specified in 40 CFR part 1065, subpart H.

(3) For Category 1 and Category 2 engines that are expected to use a type of fuel (or mixed fuel) other than diesel fuel (such as natural gas, methanol, or residual fuel), use a commercially available fuel of that type for emission testing. If an engine is designed to operate on different fuels, we may (at our discretion) require testing on each fuel. Propose test fuel specifications that take into account the engine design and the properties of commercially available fuels. Describe these test fuel specifications in the application for certification.

(4) [Reserved]

(d) You may use special or alternate procedures to the extent we allow them under 40 CFR 1065.10.

(e) This subpart is addressed to you as a manufacturer, but it applies equally to anyone who does testing for you, and to us when we perform testing to determine if your engines meet emission standards.

(f) Duty-cycle testing is limited to ambient temperatures of 20 to 30 °C. Atmospheric pressure must be between 91.000 and 103.325 kPa, and must be within ±5% of the value recorded at the time of the last engine map. Testing may be performed with any ambient humidity level. Correct duty-cycle NO_x emissions for humidity as specified in 40 CFR part 1065.

§ 1042.505 Testing engines using discrete-mode or ramped-modal duty cycles.

This section describes how to test engines under steady-state conditions. In some cases, we allow you to choose the appropriate steady-state duty cycle for an engine. In these cases, you must use the duty cycle you select in your application for certification for all testing you perform for that engine family. If we test your engines to confirm that they meet emission standards, we will use the duty cycles you select for your own testing. We may also perform other testing as allowed by the Clean Air Act.

(a) You may perform steady-state testing with either discrete-mode or ramped-modal cycles, as follows:

(1) For discrete-mode testing, sample emissions separately for each mode, then calculate an average emission level for the whole cycle using the weighting factors specified for each mode. Calculate cycle statistics for each mode and compare with the specified values in 40 CFR part 1065 to confirm that the test is valid. Operate the engine and sampling system as follows:

(i) *Engines with NO_x aftertreatment.* For engines that depend on aftertreatment to meet the NO_x emission

standard, operate the engine for 5–6 minutes, then sample emissions for 1–3 minutes in each mode. You may extend the sampling time to improve measurement accuracy of PM emissions, using good engineering judgment. If you have a longer sampling time for PM emissions, calculate and validate cycle statistics separately for the gaseous and PM sampling periods.

(ii) *Engines without NO_x aftertreatment.* For other engines, operate the engine for at least 5 minutes, then sample emissions for at least 1 minute in each mode.

(2) For ramped-modal testing, start sampling at the beginning of the first mode and continue sampling until the end of the last mode. Calculate emissions and cycle statistics the same as for transient testing as specified in 40 CFR part 1065, subpart G.

(b) Measure emissions by testing the engine on a dynamometer with one of the following duty cycles (as specified) to determine whether it meets the emission standards in § 1042.101(a):

(1) *General cycle.* Use the 4-mode duty cycle or the corresponding ramped-modal cycle described in paragraph (a) of Appendix II of this part for commercial propulsion engines with maximum engine power at or above 19 kW that are used with (or intended to be used with) fixed-pitch propellers, and any other engines for which the other duty cycles of this section do not apply.

(2) *Recreational engines.* Use the 5-mode duty cycle or the corresponding ramped-modal cycle described in paragraph (b) of Appendix II of this part for recreational engines with maximum engine power at or above 19 kW.

(3) *Variable-pitch and electrically coupled propellers.* (i) Use the 4-mode duty cycle or the corresponding ramped-modal cycle described in paragraph (c) of Appendix II of this part for constant-speed propulsion engines that are used with (or intended to be used with) variable-pitch propellers or with electrically coupled propellers.

(ii) Use the 8-mode duty cycle or the corresponding ramped-modal cycle described in 40 CFR part 1039, Appendix IV for variable-speed propulsion engines with maximum engine power at or above 19 kW that are used with (or intended to be used with) variable-pitch propellers or with electrically coupled propellers.

(4) *Auxiliary engines.* (i) Use the 5-mode duty cycle or the corresponding ramped-modal cycle described in 40 CFR part 1039, Appendix II, for constant-speed auxiliary engines.

(ii) Use the 8-mode duty cycle or the corresponding ramped-modal cycle

specified in paragraph (b)(3)(ii) of this section for variable-speed auxiliary engines with maximum engine power at or above 19 kW.

(5) *Engines below 19 kW.* Use the 6-mode duty cycle or the corresponding ramped-modal cycle described in 40 CFR part 1039, Appendix III for variable-speed engines with maximum engine power below 19 kW.

(c) During idle mode, operate the engine with the following parameters:

(1) Hold the speed within your specifications.

(2) Set the engine to operate at its minimum fueling rate.

(3) Keep engine torque under 5 percent of maximum test torque.

(d) For full-load operating modes, operate the engine at its maximum fueling rate. However, for constant-speed engines whose design prevents full-load operation for extended periods, you may ask for approval under 40 CFR 1065.10(c) to replace full-load operation with the maximum load for which the engine is designed to operate for extended periods.

(e) See 40 CFR part 1065 for detailed specifications of tolerances and calculations.

§ 1042.515 Test procedures related to not-to-exceed standards.

(a) This section describes the procedures to determine whether your engines meet the not-to-exceed emission standards in § 1042.101(c). These procedures may include any normal engine operation and ambient conditions that the engines may experience in use. Paragraphs (c) through (e) of this section define the limits of what we will consider normal engine operation and ambient conditions.

(b) Measure emissions with one of the following procedures:

(1) Remove the selected engines for testing in a laboratory. You may use an engine dynamometer to simulate normal operation, as described in this section. Use the equipment and procedures specified in 40 CFR part 1065 to conduct laboratory testing.

(2) Test the selected engines while they remain installed in a vessel. Use the equipment and procedures specified in 40 CFR part 1065 subpart J, to conduct field testing. Use fuel meeting the specifications of 40 CFR part 1065, subpart H, or a fuel typical of what you would expect the engine to use in service.

(c) Engine testing may occur under the following ranges of ambient conditions without correcting measured emission levels:

(1) Barometric pressure must be between 91.000 and 103.325 kPa.

(2) Ambient air temperature must be between 13 and 35 °C (or between 13 °C and 30 °C for engines not drawing intake air directly from a space that could be heated by the engine).

(3) Ambient water temperature must be between 5 and 27 °C.

(4) Ambient humidity between 7.1 and 10.7 grams of moisture per kilogram of dry air.

(d) Engine testing may occur at any conditions expected during normal operation but that are outside the conditions described in paragraph (b) of this section, as long as measured values are corrected to be equivalent to the nearest end of the specified range, using good engineering judgment. Correct NO_x emissions for humidity as specified in 40 CFR part 1065, subpart G.

(e) The sampling period may not begin until the engine has reached stable operating temperatures. For example, this would include only engine operation after starting and after the engine thermostat starts modulating the engine's coolant temperature. The sampling period may not include engine starting.

(f) For analyzing data to determine compliance with the NTE standards, refer to § 1042.101(c) and Appendix III of this part 1042 for the NTE standards and the NTE zones, subzones, and any other conditions where emission data may be included or excluded.

§ 1042.520 What testing must I perform to establish deterioration factors?

Sections 1042.240 and 1042.245 describe the required methods for testing to establish deterioration factors for an engine family.

§ 1042.525 How do I adjust emission levels to account for infrequent regenerating aftertreatment devices?

This section describes how to adjust emission results from engines using aftertreatment technology with infrequent regeneration events. See paragraph (e) of this section for how to adjust ramped modal testing. See paragraph (f) of this section for how to adjust discrete-mode testing. For this section, "regeneration" means an intended event during which emission levels change while the system restores aftertreatment performance. For example, exhaust gas temperatures may increase temporarily to remove sulfur from adsorbers or to oxidize accumulated particulate matter in a trap. For this section, "infrequent" refers to regeneration events that are expected to occur on average less than once over the applicable transient duty cycle or ramped-modal cycle, or on

average less than once per typical mode in a discrete-mode test.

(a) *Developing adjustment factors.* Develop an upward adjustment factor and a downward adjustment factor for each pollutant based on measured emission data and observed regeneration frequency. Adjustment factors should generally apply to an entire engine family, but you may develop separate adjustment factors for different engine configurations within an engine family. If you use adjustment factors for certification, you must identify the frequency factor, F, from paragraph (b) of this section in your application for certification and use the adjustment factors in all testing for that engine family. You may use carryover or carry-across data to establish adjustment factors for an engine family, as described in § 1042.235(d), consistent with good engineering judgment. All adjustment factors for regeneration are additive. Determine adjustment factors separately for different test segments. For example, determine separate adjustment factors for different modes of a discrete-mode steady-state test. You may use either of the following different approaches for engines that use aftertreatment with infrequent regeneration events:

(1) You may disregard this section if regeneration does not significantly affect emission levels for an engine family (or configuration) or if it is not practical to identify when regeneration occurs. If you do not use adjustment factors under this section, your engines must meet emission standards for all testing, without regard to regeneration.

(2) If your engines use aftertreatment technology with extremely infrequent regeneration and you are unable to apply the provisions of this section, you may ask us to approve an alternate methodology to account for regeneration events.

(b) *Calculating average adjustment factors.* Calculate the average adjustment factor (EF_A) based on the following equation:

$$EF_A = (F)(EF_H) + (1 - F)(EF_L)$$

Where:

F = The frequency of the regeneration event in terms of the fraction of tests during which the regeneration occurs.

EF_H = Measured emissions from a test segment in which the regeneration occurs.

EF_L = Measured emissions from a test segment in which the regeneration does not occur.

(c) *Applying adjustment factors.* Apply adjustment factors based on whether regeneration occurs during the test run. You must be able to identify

regeneration in a way that is readily apparent during all testing.

(1) If regeneration does not occur during a test segment, add an upward adjustment factor to the measured emission rate. Determine the upward adjustment factor (UAF) using the following equation:

$$UAF = EF_A - EF_L$$

(2) If regeneration occurs or starts to occur during a test segment, subtract a downward adjustment factor from the measured emission rate. Determine the downward adjustment factor (DAF) using the following equation:

$$DAF = EF_H - EF_A$$

(d) *Sample calculation.* If EF_L is 0.10 g/kW-hr, EF_H is 0.50 g/kW-hr, and F is 0.1 (the regeneration occurs once for each ten tests), then:

$$EF_A = (0.1)(0.5 \text{ g/kW-hr}) + (1.0 - 0.1)(0.1 \text{ g/kW-hr}) = 0.14 \text{ g/kW-hr}$$

$$UAF = 0.14 \text{ g/kW-hr} - 0.10 \text{ g/kW-hr} = 0.04 \text{ g/kW-hr}$$

$$DAF = 0.50 \text{ g/kW-hr} - 0.14 \text{ g/kW-hr} = 0.36 \text{ g/kW-hr}$$

(e) Ramped modal testing. Develop a single set of adjustment factors for the entire test. If a regeneration has started but has not been completed when you reach the end of a test, use good engineering judgment to reduce your downward adjustments to be proportional to the emission impact that occurred in the test.

(f) Discrete-mode testing. Develop separate adjustment factors for each test mode. If a regeneration has started but has not been completed when you reach the end of the sampling time for a test mode, extend the sampling period for that mode until the regeneration is completed.

Subpart G—Special Compliance Provisions

§ 1042.601 General compliance provisions for marine engines and vessels.

Engine and vessel manufacturers, as well as owners, operators, and rebuilders of engines and vessels subject to the requirements of this part, and all other persons, must observe the provisions of this part, the requirements and prohibitions in 40 CFR part 1068, and the provisions of the Clean Air Act. The provisions of 40 CFR part 1068 apply for marine compression-ignition engines as specified in that part, except as follows:

(a) Installing a recreational marine engine in a vessel that is not a recreational vessel is a violation of 40 CFR 1068.101(a)(1).

(b) In addition to the provisions listed for the national security exemption in

40 CFR 1068.225(b), your engine is exempt without a request if you produce it for a piece of equipment owned or used by an agency of the federal government responsible for national defense, where the equipment has specialized electronic warfare systems, unique stealth performance requirements, and/or unique combat maneuverability requirements.

(c) For replacement engines, apply the provisions of 40 CFR 1068.240(b)(3) as follows:

(1) Except as specified in paragraph (c)(2) of this section, this paragraph applies instead of the provisions of 40 CFR 1068.101(a)(1) do not apply to a new replacement engine if all of the following are true:

(i) We determine that no engine certified to the requirements of this part is produced by any manufacturer with the appropriate physical or performance characteristics to repower a vessel.

(ii) The replacement engine meets the most stringent standards possible, and at least as stringent as those of the original engine. For example, if at a time in which Tier 3 standards apply, an engine originally certified as a Tier 1 engine is being replaced, the replacement must meet the Tier 2 requirements if we determine that a Tier 2 engine can be used as a replacement; otherwise it must meet the Tier 1 requirements.

(iii) The engine manufacturer must take possession of the original engine or make sure it is destroyed.

(iv) The replacement engine must be clearly labeled to show that it does not comply with the standards and that sale or installation of the engine for any purpose other than as a replacement engine is a violation of federal law and subject to civil penalty.

(2) The provisions of 40 CFR 1068.240(b)(3) for replacement engines apply only if a new engine is needed to replace an engine that has experienced catastrophic failure. If this occurs, the engine manufacturer must keep records for eight years explaining why a certified engine was not available and make these records available upon request. Modifying a vessel to significantly increase its value within six months after installing replacement engines under this paragraph (c)(2) is a violation of 40 CFR 1068.101(a)(1).

(d) Misfueling a marine engine labeled as requiring the use of ultra low-sulfur diesel with higher-sulfur fuel is a violation of 40 CFR 1068.101(b)(1). It is also a violation of 40 CFR 1068.101(b)(1) if an engine installer or vessel manufacturer fails to follow the engine manufacturer's installation instructions

when installing a certified engine in a marine vessel.

(e) The provisions of 40 CFR 1068.120 apply when rebuilding marine engines. The following additional requirements also apply when rebuilding marine engines equipped with exhaust aftertreatment:

(1) Follow all instructions from the engine manufacturer and aftertreatment manufacturer for checking, repairing, and replacing aftertreatment components. For example, you must replace the catalyst if the catalyst assembly is stamped with a build date more than ten years ago and the manufacturer's instructions state that catalysts over ten years old must be replaced when the engine is rebuilt.

(2) Measure pressure drop across the catalyst assembly to ensure that it is neither higher than nor lower than the manufacturer's specifications.

(3) For urea-based SCR systems equipped with exhaust sensors, verify that sensor outputs are within the manufacturer's recommended range and repair or replace any malfunctioning components (sensors, catalysts, or other components).

§ 1042.605 Dressing engines already certified to other standards for nonroad or heavy-duty highway engines for marine use.

(a) *General provisions.* If you are an engine manufacturer (including someone who marinizes a land-based engine), this section allows you to introduce new marine engines into U.S. commerce if they are already certified to the requirements that apply to compression-ignition engines under 40 CFR parts 85 and 86 or 40 CFR part 89, 92, 1033, or 1039 for the appropriate model year. If you comply with all the provisions of this section, we consider the certificate issued under 40 CFR part 86, 89, 92, 1033, or 1039 for each engine to also be a valid certificate of conformity under this part 1042 for its model year, without a separate application for certification under the requirements of this part 1042.

(b) *Boat-builder provisions.* If you are not an engine manufacturer, you may install an engine certified for the appropriate model year under 40 CFR part 86, 89, 92, 1033, or 1039 in a marine vessel as long as you do not make any of the changes described in paragraph (d)(3) of this section and you meet the requirements of paragraph (e) of this section. If you modify the non-marine engine in any of the ways described in paragraph (d)(3) of this section, we will consider you a manufacturer of a new marine engine. Such engine modifications prevent you

from using the provisions of this section.

(c) *Liability.* Engines for which you meet the requirements of this section are exempt from all the requirements and prohibitions of this part, except for those specified in this section. Engines exempted under this section must meet all the applicable requirements from 40 CFR parts 85 and 86 or 40 CFR part 89, 92, 1033, or 1039. This paragraph (c) applies to engine manufacturers, boat builders who use such an engine, and all other persons as if the engine were used in its originally intended application. The prohibited acts of 40 CFR 1068.101(a)(1) apply to these new engines and vessels; however, we consider the certificate issued under 40 CFR part 86, 89, 92, 1033, or 1039 for each engine to also be a valid certificate of conformity under this part 1042 for its model year. If we make a determination that these engines do not conform to the regulations during their useful life, we may require you to recall them under 40 CFR part 85, 89, 92, or 1068.

(d) *Specific criteria and requirements.* If you are an engine manufacturer and meet all the following criteria and requirements regarding your new marine engine, the engine is eligible for an exemption under this section:

(1) You must produce it by marinizing an engine covered by a valid certificate of conformity from one of the following programs:

(i) Heavy-duty highway engines (40 CFR part 86).

(ii) Land-based nonroad diesel engines (40 CFR part 89 or 1039).

(iii) Locomotives (40 CFR part 92 or 1033). To be eligible to be dressed under this section, the engine must be from a locomotive certified to standards that are at least as stringent as either the standards applicable to new marine engines or freshly manufactured locomotives in the model year that the engine is being dressed.

(2) The engine must have the label required under 40 CFR part 86, 89, 92, 1033, or 1039.

(3) You must not make any changes to the certified engine that could reasonably be expected to increase its emissions. For example, if you make any of the following changes to one of these engines, you do not qualify for the engine dressing exemption:

(i) Change any fuel system parameters from the certified configuration, or change, remove, or fail to properly install any other component, element of design, or calibration specified in the engine manufacturer's application for certification. This includes

aftertreatment devices and all related components.

(ii) Replacing an original turbocharger, except that small-volume engine manufacturers may replace an original turbocharger on a recreational engine with one that matches the performance of the original turbocharger.

(iii) Modify or design the marine engine cooling or aftercooling system so that temperatures or heat rejection rates are outside the original engine manufacturer's specified ranges.

(4) You must show that fewer than 10 percent of the engine family's total sales in the United States are used in marine applications. This includes engines used in any application, without regard to which company manufactures the vessel or equipment. Show this as follows:

(i) If you are the original manufacturer of the engine, base this showing on your sales information.

(ii) In all other cases, you must get the original manufacturer of the engine to confirm this based on its sales information.

(e) *Labeling and documentation.* If you are an engine manufacturer or boat builder using this exemption, you must do all of the following:

(1) Make sure the original engine label will remain clearly visible after installation in the vessel.

(2) Add a permanent supplemental label to the engine in a position where it will remain clearly visible after installation in the vessel. In your engine label, do the following:

(i) Include the heading: "Marine Engine Emission Control Information".

(ii) Include your full corporate name and trademark.

(iii) State: "This engine was marinized without affecting its emission controls."

(iv) State the date you finished marinizing the engine (month and year).

(3) Send the Designated Compliance Officer a signed letter by the end of each calendar year (or less often if we tell you) with all the following information:

(i) Identify your full corporate name, address, and telephone number.

(ii) List the engine models for which you expect to use this exemption in the coming year and describe your basis for meeting the sales restrictions of paragraph (d)(4) of this section.

(iii) State: "We prepare each listed engine model for marine application without making any changes that could increase its certified emission levels, as described in 40 CFR 1042.605."

(f) *Failure to comply.* If your engines do not meet the criteria listed in paragraph (d) of this section, they will

be subject to the standards, requirements, and prohibitions of this part 1042 and the certificate issued under 40 CFR part 86, 89, 92, 1033, or 1039 will not be deemed to also be a certificate issued under this part 1042. Introducing these engines into U.S. commerce as marine engines without a valid exemption or certificate of conformity under this part violates the prohibitions in 40 CFR 1068.101(a)(1).

(g) *Data submission.* (1) If you are both the original manufacturer and marinizer of an exempted engine, you must send us emission test data on the appropriate marine duty cycles. You can include the data in your application for certification or in the letter described in paragraph (e)(3) of this section.

(2) If you are the original manufacturer of an exempted engine that is marinized by a post-manufacture marinizer, you may be required to send us emission test data on the appropriate marine duty cycles. If such data are requested you will be allowed a reasonable amount of time to collect the data.

(h) *Participation in averaging, banking and trading.* Engines adapted for marine use under this section may not generate or use emission credits under this part 1042. These engines may generate credits under the ABT provisions in 40 CFR part 86, 89, 92, 1033, or 1039, as applicable. These engines must use emission credits under 40 CFR part 86, 89, 92, 1033, or 1039 as applicable if they are certified to an FEL that exceeds an emission standard.

(i) *Operator requirements.* The requirements specified for vessel manufacturers, owners, and operators in this subpart (including requirements in 40 CFR part 1068) apply to these engines whether they are certified under this part 1042 or another part as allowed by this section.

§ 1042.610 Certifying auxiliary marine engines to land-based standards.

This section applies to auxiliary marine engines that are identical to certified land-based engines. See § 1042.605 for provisions that apply to propulsion marine engines or auxiliary marine engines that are modified for marine applications.

(a) *General provisions.* If you are an engine manufacturer, this section allows you to introduce new marine engines into U.S. commerce if they are already certified to the requirements that apply to compression-ignition engines under 40 CFR part 89 or 1039 for the appropriate model year. If you comply with all the provisions of this section, we consider the certificate issued under 40 CFR part 89 or 1039 for each engine

to also be a valid certificate of conformity under this part 1042 for its model year, without a separate application for certification under the requirements of this part 1042.

(b) *Boat builder provisions.* If you are not an engine manufacturer, you may install an engine certified for land-based applications in a marine vessel as long as you meet all the qualifying criteria and requirements specified in paragraphs (d) and (e) of this section. If you modify the non-marine engine, we will consider you a manufacturer of a new marine engine. Such engine modifications prevent you from using the provisions of this section.

(c) *Liability.* Engines for which you meet the requirements of this section are exempt from all the requirements and prohibitions of this part, except for those specified in this section. Engines exempted under this section must meet all the applicable requirements from 40 CFR part 89 or 1039. This paragraph (c) applies to engine manufacturers, boat builders who use such an engine, and all other persons as if the engine were used in its originally intended application. The prohibited acts of 40 CFR 1068.101(a)(1) apply to these new engines and vessels; however, we consider the certificate issued under 40 CFR part 89 or 1039 for each engine to also be a valid certificate of conformity under this part 1042 for its model year. If we make a determination that these engines do not conform to the regulations during their useful life, we may require you to recall them under 40 CFR part 89 or 1068.

(d) *Qualifying criteria.* If you are an engine manufacturer and meet all the following criteria and requirements regarding your new marine engine, the engine is eligible for an exemption under this section:

(1) The marine engine must be identical in all material respects to a land-based engine covered by a valid certificate of conformity for the appropriate model year showing that it meets emission standards for engines of that power rating under 40 CFR part 89 or 1039.

(2) The engines may not be used as propulsion marine engines.

(3) You must show that the number of auxiliary marine engines from the engine family must be smaller than the number of land-based engines from the engine family sold in the United States, as follows:

(i) If you are the original manufacturer of the engine, base this showing on your sales information.

(ii) In all other cases, you must get the original manufacturer of the engine to

confirm this based on its sales information.

(e) *Specific requirements.* If you are an engine manufacturer or boat builder using this exemption, you must do all of the following:

(1) Make sure the original engine label will remain clearly visible after installation in the vessel. This label or a supplemental label must identify that the original certification is valid for marine auxiliary applications.

(2) Send a signed letter to the Designated Officer by the end of each calendar year (or less often if we tell you) with all the following information:

(i) Identify your full corporate name, address, and telephone number.

(ii) List the engine models you expect to produce under this exemption in the coming year and describe your basis for meeting the sales restrictions of paragraph (d)(3) of this section.

(iii) State: "We produce each listed engine model for marine application without making any changes that could increase its certified emission levels, as described in 40 CFR 1042.610."

(3) If you are the certificate holder, you must describe in your application for certification how you plan to produce engines for both land-based and auxiliary marine applications, including projected sales of auxiliary marine engines to the extent this can be determined. If the projected marine sales are substantial, we may ask for the year-end report of production volumes to include actual auxiliary marine engine sales.

(f) *Failure to comply.* If your engines do not meet the criteria listed in paragraph (d) of this section, they will be subject to the standards, requirements, and prohibitions of this part 1042 and the certificate issued under 40 CFR part 89 or 1039 will not be deemed to also be a certificate issued under this part 1042. Introducing these engines into U.S. commerce as marine engines without a valid exemption or certificate of conformity under this part 1042 violates the prohibitions in 40 CFR 1068.101(a)(1).

(g) *Participation in averaging, banking and trading.* Engines using this exemption may not generate or use emission credits under this part 1042. These engines may generate credits under the ABT provisions in 40 CFR part 89 or 1039, as applicable. These engines must use emission credits under 40 CFR part 89 or 1039 as applicable if they are certified to an FEL that exceeds an emission standard.

(h) *Operator requirements.* The requirements specified for vessel manufacturers, owners, and operators in this subpart (including requirements in

40 CFR part 1068) apply to these engines whether they are certified under this part 1042 or another part as allowed by this section.

§ 1042.620 Engines used solely for competition.

The provisions of this section apply for new engines and vessels built on or after January 1, 2009.

(a) We may grant you an exemption from the standards and requirements of this part for a new engine on the grounds that it is to be used solely for competition. The requirements of this part, other than those in this section, do not apply to engines that we exempt for use solely for competition.

(b) We will exempt engines that we determine will be used solely for competition. The basis of our determination is described in paragraphs (c) and (d) of this section. Exemptions granted under this section are good for only one model year and you must request renewal for each subsequent model year. We will not approve your renewal request if we determine the engine will not be used solely for competition.

(c) Engines meeting all the following criteria are considered to be used solely for competition:

(1) Neither the engine nor any vessels containing the engine may be displayed for sale in any public dealership or otherwise offered for sale to the general public.

(2) Sale of the vessel in which the engine is installed must be limited to professional racing teams, professional racers, or other qualified racers. Keep records documenting this, such as a letter requesting an exempted engine.

(3) The engine and the vessel in which it is installed must have performance characteristics that are substantially superior to noncompetitive models.

(4) The engines are intended for use only as specified in paragraph (e) of this section.

(d) You may ask us to approve an exemption for engines not meeting the applicable criteria listed in paragraph (c) of this section as long as you have clear and convincing evidence that the engines will be used solely for competition.

(e) Engines will not be considered to be used solely for competition if they are ever used for any recreational or other noncompetitive purpose. This means that their use must be limited to competition events sanctioned by the U.S. Coast Guard or another public organization with authorizing permits for participating competitors. Operation for such engines may include only

racing events or trials to qualify for racing events. Authorized attempts to set speed records (and the associated official trials) are also considered racing events. Any use of exempt engines in recreational events, such as poker runs and lobsterboat races, is a violation of 40 CFR 1068.101(b)(4).

(f) You must permanently label engines exempted under this section to clearly indicate that they are to be used only for competition. Failure to properly label an engine will void the exemption for that engine.

(g) If we request it, you must provide us any information we need to determine whether the engines or vessels are used solely for competition. This would include documentation regarding the number of engines and the ultimate purchaser of each engine. Keep these records for five years.

§ 1042.630 Personal-use exemption.

This section applies to individuals who manufacture vessels for personal use. If you and your vessel meet all the conditions of this section, the vessel and its engine are considered to be exempt from the standards and requirements of this part that apply to new engines and new vessels. For example, you may install an engine that was not certified as a marine engine.

(a) The vessel may not be manufactured from a previously certified vessel, nor may it be manufactured from a partially complete vessel that is equivalent to a certified vessel. The vessel must be manufactured primarily from unassembled components, but may incorporate some preassembled components. For example, fully preassembled steering assemblies may be used. You may also power the vessel with an engine that was previously used in a highway or land-based nonroad application.

(b) The vessel may not be sold within five years after the date of final assembly.

(c) No individual may manufacture more than one vessel in any ten-year period under this exemption.

(d) You may not use the vessel in any revenue-generating service or for any other commercial purpose, except that you may use a vessel exempt under this section for commercial fishing that you personally do.

(e) This exemption may not be used to circumvent the requirements of this part or the requirements of the Clean Air Act. For example, this exemption would not cover a case in which a person sells an almost completely assembled vessel to another person, who would then complete the assembly. This would be

considered equivalent to the sale of the complete new vessel. This section also does not allow engine manufacturers to produce new engines that are exempt from emission standards and it does not provide an exemption from the prohibition against tampering with certified engines.

(f) The vessel must be a vessel that is not classed or subject to Coast Guard inspections or surveys.

§ 1042.640 Special provisions for branded engines.

The following provisions apply if you identify the name and trademark of another company instead of your own on your emission control information label, as provided by § 1042.135(c)(2):

(a) You must have a contractual agreement with the other company that obligates that company to take the following steps:

(1) Meet the emission warranty requirements that apply under § 1042.120. This may involve a separate agreement involving reimbursement of warranty-related expenses.

(2) Report all warranty-related information to the certificate holder.

(b) In your application for certification, identify the company whose trademark you will use and describe the arrangements you have made to meet your requirements under this section.

(c) You remain responsible for meeting all the requirements of this chapter, including warranty and defect-reporting provisions.

§ 1042.660 Requirements for vessel manufacturers, owners, and operators.

(a) The provisions of 40 CFR part 94, subpart K, apply to manufacturers, owners, and operators of marine vessels that contain Category 3 engines subject to the provisions of 40 CFR part 94, subpart A.

(b) For vessels equipped with emission controls requiring the use of specific fuels, lubricants, or other fluids, owners and operators must comply with the manufacturer/remanufacturer's specifications for such fluids when operating the vessels. For vessels equipped with SCR systems requiring the use of urea or other reductants, owners and operators must report to us within 30 days any operation of such vessels without the appropriate urea. Failure to comply with the requirements of this paragraph is a violation of 40 CFR 1068.101(a)(2).

Subpart H—Averaging, Banking, and Trading for Certification

§ 1042.701 General provisions.

(a) You may average, bank, and trade (ABT) emission credits for purposes of certification as described in this subpart to show compliance with the standards of this part. Participation in this program is voluntary.

(b) The definitions of subpart I of this part apply to this subpart. The following definitions also apply:

(1) *Actual emission credits* means emission credits you have generated that we have verified by reviewing your final report.

(2) *Averaging set* means a set of engines in which emission credits may be exchanged only with other engines in the same averaging set.

(3) *Broker* means any entity that facilitates a trade of emission credits between a buyer and seller.

(4) *Buyer* means the entity that receives emission credits as a result of a trade.

(5) *Reserved emission credits* means emission credits you have generated that we have not yet verified by reviewing your final report.

(6) *Seller* means the entity that provides emission credits during a trade.

(7) *Standard* means the emission standard that applies under subpart B of this part for engines not participating in the ABT program of this subpart.

(8) *Trade* means to exchange emission credits, either as a buyer or seller.

(c) Emission credits may be exchanged only within an averaging set. Except as specified in paragraph (d) of this section, the following criteria define the applicable averaging sets:

(1) Recreational engines.

(2) Commercial Category 1 engines.

(3) Category 2 engines.

(d) Emission credits generated by recreational or commercial Category 1 engine families may be used for compliance by Category 2 engine families. Such credits must be discounted by 25 percent.

(e) You may not use emission credits generated under this subpart to offset any emissions that exceed an FEL or standard. This applies for all testing, including certification testing, in-use testing, selective enforcement audits, and other production-line testing. However, if emissions from an engine exceed an FEL or standard (for example, during a selective enforcement audit), you may use emission credits to recertify the engine family with a higher FEL that applies only to future production.

(f) Engine families that use emission credits for one or more pollutants may

not generate positive emission credits for another pollutant.

(g) Emission credits may be used in the model year they are generated or in future model years. Emission credits may not be used for past model years.

(h) You may increase or decrease an FEL during the model year by amending your application for certification under § 1042.225.

(i) You may use NO_x+HC credits to show compliance with a NO_x emission standard or use NO_x credits to show compliance with a NO_x+HC emission standard.

§ 1042.705 Generating and calculating emission credits.

The provisions of this section apply separately for calculating emission credits for NO_x, NO_x+HC, or PM.

(a) For each participating family, calculate positive or negative emission credits relative to the otherwise applicable emission standard. Calculate positive emission credits for a family that has an FEL below the standard. Calculate negative emission credits for a family that has an FEL above the standard. Sum your positive and negative credits for the model year before rounding. Round calculated emission credits to the nearest kilogram (kg), using consistent units throughout the following equation:

$$\text{Emission credits (kg)} = (\text{Std} - \text{FEL}) \times (\text{Volume}) \times (\text{Power}) \times (\text{LF}) \times (\text{UL}) \times (10^{-3})$$

Where:

Std = The emission standard, in g/kW-hr.

FEL = The family emission limit for the engine family, in g/kW-hr.

Volume = The number of engines eligible to participate in the averaging, banking, and trading program within the given engine family during the model year, as described in paragraph (c) of this section.

Power = The average value of maximum engine power of all the engine configurations within an engine family, calculated on a production-weighted basis, in kilowatts.

LF = Load factor. Use 0.69 for propulsion marine engines and 0.51 for auxiliary marine engines. We may specify a different load factor if we approve the use of special test procedures for an engine family under 40 CFR 1065.10(c)(2), consistent with good engineering judgment.

UL = The useful life for the given engine family, in hours.

(b) [Reserved]

(c) In your application for certification, base your showing of compliance on projected production volumes for engines whose point of first retail sale is in the United States. As described in § 1042.730, compliance

with the requirements of this subpart is determined at the end of the model year based on actual production volumes for engines whose point of first retail sale is in the United States. Do not include any of the following engines to calculate emission credits:

(1) Engines exempted under subpart G of this part or under 40 CFR part 1068.

(2) Exported engines.

(3) Engines not subject to the requirements of this part, such as those excluded under § 1042.5.

(4) [Reserved]

(5) Any other engines, where we indicate elsewhere in this part 1042 that they are not to be included in the calculations of this subpart.

§ 1042.710 Averaging emission credits.

(a) Averaging is the exchange of emission credits among your engine families.

(b) You may certify one or more engine families to an FEL above the emission standard, subject to the FEL caps and other provisions in subpart B of this part, if you show in your application for certification that your projected balance of all emission-credit transactions in that model year is greater than or equal to zero.

(c) If you certify an engine family to an FEL that exceeds the otherwise applicable standard, you must obtain enough emission credits to offset the engine family's deficit by the due date for the final report required in § 1042.730. The emission credits used to address the deficit may come from your other engine families that generate emission credits in the same model year, from emission credits you have banked, or from emission credits you obtain through trading.

§ 1042.715 Banking emission credits.

(a) Banking is the retention of emission credits by the manufacturer generating the emission credits for use in averaging or trading in future model years.

(b) In your application for certification, designate any emission credits you intend to bank. These emission credits will be considered reserved credits. During the model year and before the due date for the final report, you may redesignate these emission credits for averaging or trading.

(c) You may use banked emission credits from the previous model year for averaging or trading before we verify them, but we may revoke these emission credits if we are unable to verify them after reviewing your reports or auditing your records.

(d) Reserved credits become actual emission credits only when we verify them in reviewing your final report.

§ 1042.720 Trading emission credits.

(a) Trading is the exchange of emission credits between manufacturers. You may use traded emission credits for averaging, banking, or further trading transactions.

(b) You may trade actual emission credits as described in this subpart. You may also trade reserved emission credits, but we may revoke these emission credits based on our review of your records or reports or those of the company with which you traded emission credits. You may trade banked credits to any certifying manufacturer.

(c) If a negative emission credit balance results from a transaction, both the buyer and seller are liable, except in cases we deem to involve fraud. See § 1042.255(e) for cases involving fraud. We may void the certificates of all engine families participating in a trade that results in a manufacturer having a negative balance of emission credits. See § 1042.745.

§ 1042.725 Information required for the application for certification.

(a) You must declare in your application for certification your intent to use the provisions of this subpart for each engine family that will be certified using the ABT program. You must also declare the FELs you select for the engine family for each pollutant for which you are using the ABT program. Your FELs must comply with the specifications of subpart B of this part, including the FEL caps. FELs must be expressed to the same number of decimal places as the emission standards.

(b) Include the following in your application for certification:

(1) A statement that, to the best of your belief, you will not have a negative balance of emission credits for any averaging set when all emission credits are calculated at the end of the year.

(2) Detailed calculations of projected emission credits (positive or negative) based on projected production volumes. If your engine family will generate positive emission credits, state specifically where the emission credits will be applied (for example, to which engine family they will be applied in averaging, whether they will be traded, or whether they will be reserved for banking). If you have projected negative emission credits for an engine family, state the source of positive emission credits to offset the negative emission credits. Describe whether the emission credits are actual or reserved and

whether they will come from averaging, banking, trading, or a combination of these. Identify from which of your engine families or from which manufacturer the emission credits will come.

§ 1042.730 ABT reports.

(a) If any of your engine families are certified using the ABT provisions of this subpart, you must send an end-of-year report within 90 days after the end of the model year and a final report within 270 days after the end of the model year. We may waive the requirement to send the end-of-year report, as long as you send the final report on time.

(b) Your end-of-year and final reports must include the following information for each engine family participating in the ABT program:

(1) Engine-family designation.

(2) The emission standards that would otherwise apply to the engine family.

(3) The FEL for each pollutant. If you changed an FEL during the model year, identify each FEL you used and calculate the positive or negative emission credits under each FEL. Also, describe how the FEL can be identified for each engine you produced. For example, you might keep a list of engine identification numbers that correspond with certain FEL values.

(4) The projected and actual production volumes for the model year with a point of first retail sale in the United States, as described in § 1042.705(c). If you changed an FEL during the model year, identify the actual production volume associated with each FEL.

(5) Maximum engine power for each engine configuration, and the production-weighted average engine power for the engine family.

(6) Useful life.

(7) Calculated positive or negative emission credits for the whole engine family. Identify any emission credits that you traded, as described in paragraph (d)(1) of this section.

(c) Your end-of-year and final reports must include the following additional information:

(1) Show that your net balance of emission credits from all your participating engine families in each averaging set in the applicable model year is not negative.

(2) State whether you will reserve any emission credits for banking.

(3) State that the report's contents are accurate.

(d) If you trade emission credits, you must send us a report within 90 days after the transaction, as follows:

(1) Sellers must include the following information in their report:

(i) The corporate names of the buyer and any brokers.

(ii) A copy of any contracts related to the trade.

(iii) The engine families that generated emission credits for the trade, including the number of emission credits from each family.

(2) Buyers must include the following information in their report:

(i) The corporate names of the seller and any brokers.

(ii) A copy of any contracts related to the trade.

(iii) How you intend to use the emission credits, including the number of emission credits you intend to apply to each engine family (if known).

(e) Send your reports electronically to the Designated Compliance Officer using an approved information format. If you want to use a different format, send us a written request with justification for a waiver.

(f) Correct errors in your end-of-year report or final report as follows:

(1) You may correct any errors in your end-of-year report when you prepare the final report, as long as you send us the final report by the time it is due.

(2) If you or we determine within 270 days after the end of the model year that errors mistakenly decrease your balance of emission credits, you may correct the errors and recalculate the balance of emission credits. You may not make these corrections for errors that are determined more than 270 days after the end of the model year. If you report a negative balance of emission credits, we may disallow corrections under this paragraph (f)(2).

(3) If you or we determine anytime that errors mistakenly increase your balance of emission credits, you must correct the errors and recalculate the balance of emission credits.

§ 1042.735 Recordkeeping.

(a) You must organize and maintain your records as described in this section. We may review your records at any time.

(b) Keep the records required by this section for eight years after the due date for the end-of-year report. You may not use emission credits on any engines if you do not keep all the records required under this section. You must therefore keep these records to continue to bank valid credits. Store these records in any format and on any media, as long as you can promptly send us organized, written records in English if we ask for them. You must keep these records readily available. We may review them at any time.

(c) Keep a copy of the reports we require in §§ 1042.725 and 1042.730.

(d) Keep the following additional records for each engine you produce that generates or uses emission credits under the ABT program:

- (1) Engine family designation.
- (2) Engine identification number.
- (3) FEL and useful life.
- (4) Maximum engine power.
- (5) Build date and assembly plant.
- (6) Purchaser and destination.

(e) We may require you to keep additional records or to send us relevant information not required by this section.

§ 1042.745 Noncompliance.

(a) For each engine family participating in the ABT program, the certificate of conformity is conditional upon full compliance with the provisions of this subpart during and after the model year. You are responsible to establish to our satisfaction that you fully comply with applicable requirements. We may void the certificate of conformity for an engine family if you fail to comply with any provisions of this subpart.

(b) You may certify your engine family to an FEL above an emission standard based on a projection that you will have enough emission credits to offset the deficit for the engine family. However, we may void the certificate of conformity if you cannot show in your final report that you have enough actual emission credits to offset a deficit for any pollutant in an engine family.

(c) We may void the certificate of conformity for an engine family if you fail to keep records, send reports, or give us information we request.

(d) You may ask for a hearing if we void your certificate under this section (see § 1042.820).

Subpart I—Definitions and Other Reference Information

§ 1042.801 Definitions.

The following definitions apply to this part. The definitions apply to all subparts unless we note otherwise. All undefined terms have the meaning the Clean Air Act gives to them. The definitions follow:

Act means the Clean Air Act, as amended, 42 U.S.C. 7401–7671q.

Adjustable parameter means any device, system, or element of design that someone can adjust (including those which are difficult to access) and that, if adjusted, may affect emissions or engine performance during emission testing or normal in-use operation. This includes, but is not limited to, parameters related to injection timing and fueling rate. You may ask us to exclude a parameter that is difficult to access if it cannot be adjusted to affect

emissions without significantly degrading engine performance, or if you otherwise show us that it will not be adjusted in a way that affects emissions during in-use operation.

Aftertreatment means relating to a catalytic converter, particulate filter, or any other system, component, or technology mounted downstream of the exhaust valve (or exhaust port) whose design function is to decrease emissions in the engine exhaust before it is exhausted to the environment. Exhaust-gas recirculation (EGR) and turbochargers are not aftertreatment.

Amphibious vehicle means a vehicle with wheels or tracks that is designed primarily for operation on land and secondarily for operation in water.

Annex VI Technical Code means the “Technical Code on Control of Emission of Nitrogen Oxides from Marine Diesel Engines”, adopted by the International Maritime Organization (incorporated by reference in § 1042.810).

Applicable emission standard or applicable standard means an emission standard to which an engine is subject; or, where an engine has been or is being certified to another standard or FEL, applicable emission standards means the FEL and other standards to which the engine has been or is being certified. This definition does not apply to subpart H of this part.

Auxiliary emission control device means any element of design that senses temperature, motive speed, engine RPM, transmission gear, or any other parameter for the purpose of activating, modulating, delaying, or deactivating the operation of any part of the emission-control system.

Base engine means a land-based engine to be marinized, as configured prior to marinization.

Brake power means the usable power output of the engine, not including power required to fuel, lubricate, or heat the engine, circulate coolant to the engine, or to operate aftertreatment devices.

Calibration means the set of specifications and tolerances specific to a particular design, version, or application of a component or assembly capable of functionally describing its operation over its working range.

Category 1 means relating to a marine engine with specific engine displacement less than 7.0 liters per cylinder.

Category 2 means relating to a marine engine with a specific engine displacement greater than or equal to 7.0 liters per cylinder but less than 30.0 liters per cylinder.

Category 3 means relating to a marine engine with a specific engine

displacement greater than or equal to 30.0 liters per cylinder.

Certification means relating to the process of obtaining a certificate of conformity for an engine family that complies with the emission standards and requirements in this part.

Certified emission level means the highest deteriorated emission level in an engine family for a given pollutant from either transient or steady-state testing.

Clean Air Act means the Clean Air Act, as amended, 42 U.S.C. 7401–7671q.

Commercial means relating to an engine or vessel that is not a recreational marine engine or a recreational vessel.

Compression-ignition means relating to a type of reciprocating, internal-combustion engine that is not a spark-ignition engine.

Constant-speed engine means an engine whose certification is limited to constant-speed operation. Engines whose constant-speed governor function is removed or disabled are no longer constant-speed engines.

Constant-speed operation has the meaning given in 40 CFR 1065.1001.

Crankcase emissions means airborne substances emitted to the atmosphere from any part of the engine crankcase's ventilation or lubrication systems. The crankcase is the housing for the crankshaft and other related internal parts.

Critical emission-related component means any of the following components:

(1) Electronic control units, aftertreatment devices, fuel-metering components, EGR-system components, crankcase-ventilation valves, all components related to charge-air compression and cooling, and all sensors and actuators associated with any of these components.

(2) Any other component whose primary purpose is to reduce emissions.

Designated Compliance Officer means the Manager, Heavy-Duty and Nonroad Engine Group (6403–J), U.S. Environmental Protection Agency, 1200 Pennsylvania Ave., NW., Washington, DC 20460.

Designated Enforcement Officer means the Director, Air Enforcement Division (2242A), U.S. Environmental Protection Agency, 1200 Pennsylvania Ave., NW., Washington, DC 20460.

Deteriorated emission level means the emission level that results from applying the appropriate deterioration factor to the official emission result of the emission-data engine.

Deterioration factor means the relationship between emissions at the end of useful life and emissions at the low-hour test point, expressed in one of the following ways:

(1) For multiplicative deterioration factors, the ratio of emissions at the end of useful life to emissions at the low-hour test point.

(2) For additive deterioration factors, the difference between emissions at the end of useful life and emissions at the low-hour test point.

Diesel fuel has the meaning given in 40 CFR 80.2. This generally includes No. 1 and No. 2 petroleum diesel fuels and biodiesel fuels.

Discrete-mode means relating to the discrete-mode type of steady-state test described in § 1042.505.

Dresser means any entity that modifies a land-based engine for use in a vessel, in compliance with the provisions of § 1042.605. This means that dressers may not modify the engine in a way that would affect emissions.

Emission-control system means any device, system, or element of design that controls or reduces the emissions of regulated pollutants from an engine.

Emission-data engine means an engine that is tested for certification. This includes engines tested to establish deterioration factors.

Emission-related maintenance means maintenance that substantially affects emissions or is likely to substantially affect emission deterioration.

Engine has the meaning given in 40 CFR 1068.30. This includes complete and partially complete engines.

Engine configuration means a unique combination of engine hardware and calibration within an engine family. Engines within a single engine configuration differ only with respect to normal production variability.

Engine family has the meaning given in § 1042.230.

Engine manufacturer means a manufacturer of an engine. See the definition of “manufacturer” in this section.

Engineering analysis means a summary of scientific and/or engineering principles and facts that support a conclusion made by a manufacturer, with respect to compliance with the provisions of this part.

Excluded means relating to an engine that either:

(1) Has been determined not to be a nonroad engine, as specified in 40 CFR 1068.30; or

(2) Is a nonroad engine that, according to § 1042.5, is not subject to this part 1042.

Exempted has the meaning given in 40 CFR 1068.30.

Exhaust-gas recirculation means a technology that reduces emissions by routing exhaust gases that had been exhausted from the combustion

chamber(s) back into the engine to be mixed with incoming air before or during combustion. The use of valve timing to increase the amount of residual exhaust gas in the combustion chamber(s) that is mixed with incoming air before or during combustion is not considered exhaust-gas recirculation for the purposes of this part.

Family emission limit (FEL) means an emission level declared by the manufacturer to serve in place of an otherwise applicable emission standard under the ABT program in subpart H of this part. The family emission limit must be expressed to the same number of decimal places as the emission standard it replaces. The family emission limit serves as the emission standard for the engine family with respect to all required testing.

Foreign vessel means a vessel of foreign registry or a vessel operated under the authority of a country other than the United States.

Fuel system means all components involved in transporting, metering, and mixing the fuel from the fuel tank to the combustion chamber(s), including the fuel tank, fuel tank cap, fuel pump, fuel filters, fuel lines, carburetor or fuel-injection components, and all fuel-system vents.

Fuel type means a general category of fuels such as gasoline, diesel fuel, residual fuel, or natural gas. There can be multiple grades within a single fuel type, such as high-sulfur or low-sulfur diesel fuel.

Good engineering judgment has the meaning given in 40 CFR 1068.30. See 40 CFR 1068.5 for the administrative process we use to evaluate good engineering judgment.

Green Engine Factor means a factor that is applied to emission measurements from a Category 2 engine that has had little or no service accumulation. The Green Engine Factor adjusts emission measurements to be equivalent to emission measurements from an engine that has had approximately 300 hours of use.

High-sulfur diesel fuel means one of the following:

(1) For in-use fuels, *high-sulfur diesel fuel* means a diesel fuel with a maximum sulfur concentration greater than 500 parts per million.

(2) For testing, *high-sulfur diesel fuel* has the meaning given in 40 CFR part 1065.

Hydrocarbon (HC) means the hydrocarbon group on which the emission standards are based for each fuel type, as described in § 1042.101(d).

Identification number means a unique specification (for example, a model number/serial number combination)

that allows someone to distinguish a particular engine from other similar engines.

Low-hour means relating to an engine that has stabilized emissions and represents the undeteriorated emission level. This would generally involve less than 300 hours of operation.

Low-sulfur diesel fuel means one of the following:

(1) For in-use fuels, *low-sulfur diesel fuel* means a diesel fuel market as low-sulfur diesel fuel having a maximum sulfur concentration of 500 parts per million.

(2) For testing, *low-sulfur diesel fuel* has the meaning given in 40 CFR part 1065.

Manufacture means the physical and engineering process of designing, constructing, and assembling an engine or a vessel.

Manufacturer has the meaning given in section 216(1) of the Clean Air Act. In general, this term includes any person who manufactures an engine or vessel for sale in the United States or otherwise introduces a new marine engine into U.S. commerce. This includes importers who import engines or vessels for resale. It also includes post-manufacture marinizers, but not dealers. All manufacturing entities under the control of the same person are considered to be a single manufacturer.

Marine engine means a nonroad engine that is installed or intended to be installed on a marine vessel. This includes a portable auxiliary marine engine only if its fueling, cooling, or exhaust system is an integral part of the vessel. A fueling system is considered integral to the vessel only if one or more essential elements are permanently affixed to the vessel. There are two kinds of marine engines:

(1) Propulsion marine engine means a marine engine that moves a vessel through the water or directs the vessel's movement.

(2) Auxiliary marine engine means a marine engine not used for propulsion.

Marine vessel has the meaning given in 1 U.S.C. 3, except that it does not include amphibious vehicles. The definition in 1 U.S.C. 3 very broadly includes every craft capable of being used as a means of transportation on water.

Maximum engine power has the meaning given in § 1042.140.

Maximum test power means:

(1) For Category 1 engines, the power output observed at the maximum test speed with the maximum fueling rate possible.

(2) For Category 2 engines, 90 percent of the power output observed at the

maximum test speed with the maximum fueling rate possible.

Maximum test speed has the meaning given in 40 CFR 1065.1001.

Maximum test torque has the meaning given in 40 CFR 1065.1001.

Model year means one of the following things:

(1) For freshly manufactured engines (see definition of "new marine engine," paragraph (1)), model year means one of the following:

(i) Calendar year.

(ii) Your annual new model production period if it is different than the calendar year. This must include January 1 of the calendar year for which the model year is named. It may not begin before January 2 of the previous calendar year and it must end by December 31 of the named calendar year.

(2) For an engine that is converted to a marine engine after originally being placed into service as a motor-vehicle engine, a nonroad engine that is not a marine engine, or a stationary engine, model year means the calendar year in which the engine was converted (see definition of "new marine engine," paragraph (2)).

(3) For a marine engine excluded under § 1042.5 that is later converted to operate in an application that is not excluded, model year means the calendar year in which the engine was converted (see definition of "new marine engine," paragraph (3)).

(4) For engines that are not freshly manufactured but are installed in new vessels, model year means the calendar year in which the engine is installed in the new vessel (see definition of "new marine engine," paragraph (4)).

(5) For imported engines:

(i) For imported engines described in paragraph (5)(i) of the definition of "new marine engine," *model year* has the meaning given in paragraphs (1) through (4) of this definition.

(ii) For imported engines described in paragraph (5)(ii) of the definition of new marine engine," model year means the calendar year in which the engine is modified.

(iii) For imported engines described in paragraph (5)(iii) of the definition of "new marine engine," *model year* means the calendar year in which the importation occurs.

(6) For freshly manufactured vessels, *model year* means the calendar year in which the keel is laid or the vessel is at a similar stage of construction. For vessels that become new as a result of substantial modifications, model year means the calendar year in which the modifications physically begin.

Motor vehicle has the meaning given in 40 CFR 85.1703(a).

New marine engine means any of the following things:

(1) A freshly manufactured marine engine for which the ultimate purchaser has never received the equitable or legal title. This kind of engine might commonly be thought of as "brand new." In the case of this paragraph (1), the engine is new from the time it is produced until the ultimate purchaser receives the title or the product is placed into service, whichever comes first.

(2) An engine intended to be installed in a vessel that was originally manufactured as a motor-vehicle engine, a nonroad engine that is not a marine engine, or a stationary engine. In this case, the engine is no longer a motor-vehicle, nonmarine, or stationary engine and becomes a "new marine engine". The engine is no longer new when it is placed into marine service.

(3) A marine engine that has been previously placed into service in an application we exclude under § 1042.5, where that engine is installed in a vessel that is covered by this part 1042. The engine is no longer new when it is placed into marine service covered by this part 1042. For example, this would apply to a marine diesel engine that is no longer used in a foreign vessel.

(4) An engine not covered by paragraphs (1) through (3) of this definition that is intended to be installed in a new vessel. The engine is no longer new when the ultimate purchaser receives a title for the vessel or it is placed into service, whichever comes first. This generally includes installation of used engines in new vessels.

(5) An imported marine engine, subject to the following provisions:

(i) An imported marine engine covered by a certificate of conformity issued under this part that meets the criteria of one or more of paragraphs (1) through (4) of this definition, where the original engine manufacturer holds the certificate, is new as defined by those applicable paragraphs.

(ii) An imported marine engine covered by a certificate of conformity issued under this part, where someone other than the original engine manufacturer holds the certificate (such as when the engine is modified after its initial assembly), becomes new when it is imported. It is no longer new when the ultimate purchaser receives a title for the engine or it is placed into service, whichever comes first.

(iii) An imported marine engine that is not covered by a certificate of conformity issued under this part at the

time of importation is new, but only if it was produced on or after the dates shown in the following table. This addresses uncertified engines and

vessels initially placed into service that someone seeks to import into the United States. Importation of this kind of engine (or vessel containing such an

engine) is generally prohibited by 40 CFR part 1068.

APPLICABILITY OF EMISSION STANDARDS FOR COMPRESSION-IGNITION MARINE ENGINES

Engine category and type	Power (kW)	Per-cylinder displacement (L/cyl)	Initial model year of emission standards
Category 1	P < 19	All	2000
Category 1	19 ≤ P < 37	All	1999
Category 1, Recreational	P ≥ 37	disp. < 0.9	2007
Category 1, Recreational	All	0.9 ≤ disp. < 2.5	2006
Category 1, Recreational	All	disp. ≥ 2.5	2004
Category 1, Commercial	P ≥ 37	disp. < 0.9	2005
Category 1, Commercial	All	disp. ≥ 0.9	2004
Category 2 and 3	All	disp. ≥ 5.0	2004

New vessel means any of the following:

(1) A vessel for which the ultimate purchaser has never received the equitable or legal title. The vessel is no longer new when the ultimate purchaser receives this title or it is placed into service, whichever comes first.

(2) For vessels with no Category 3 engines, a vessel that has been modified such that the value of the modifications exceeds 50 percent of the value of the modified vessel. The value of the modification is the difference in the assessed value of the vessel before the modification and the assessed value of the vessel after the modification. The vessel is no longer new when it is placed into service. Use the following equation to determine if the fractional value of the modification exceeds 50 percent:

$$\text{Percent of value} = \frac{[(\text{Value after modification}) - (\text{Value before modification})] \div 100\%}{(\text{Value after modification})}$$

(3) For vessels with Category 3 engines, a vessel that has undergone a modification that substantially alters the dimensions or carrying capacity of the vessel, changes the type of vessel, or substantially prolongs the vessel's life.

(4) An imported vessel that has already been placed into service, where it has an engine not covered by a certificate of conformity issued under this part at the time of importation that was manufactured after the requirements of this part start to apply (see § 1042.1).

Noncompliant engine means an engine that was originally covered by a certificate of conformity but is not in the certified configuration or otherwise does not comply with the conditions of the certificate.

Nonconforming engine means an engine not covered by a certificate of

conformity that would otherwise be subject to emission standards.

Nonmethane hydrocarbon has the meaning given in 40 CFR 1065.1001. This generally means the difference between the emitted mass of total hydrocarbons and the emitted mass of methane.

Nonroad means relating to nonroad engines, or vessels, or equipment that include nonroad engines.

Nonroad engine has the meaning given in 40 CFR 1068.30. In general, this means all internal-combustion engines except motor vehicle engines, stationary engines, engines used solely for competition, or engines used in aircraft.

Official emission result means the measured emission rate for an emission-data engine on a given duty cycle before the application of any deterioration factor, but after the applicability of regeneration adjustment factors.

Operator demand has the meaning given in 40 CFR 1065.1001.

Owners manual means a document or collection of documents prepared by the engine manufacturer for the owner or operator to describe appropriate engine maintenance, applicable warranties, and any other information related to operating or keeping the engine. The owners manual is typically provided to the ultimate purchaser at the time of sale. The owners manual may be in paper or electronic format.

Oxides of nitrogen has the meaning given in 40 CFR 1065.1001.

Particulate trap means a filtering device that is designed to physically trap particulate matter above a certain size.

Passenger has the meaning given by 46 U.S.C. 2101 (21) and (21a). In the context of commercial vessels, this generally means that a passenger is a person that pays to be on the vessel.

Placed into service means put into initial use for its intended purpose.

Point of first retail sale means the location at which the initial retail sale occurs. This generally means a vessel dealership or manufacturing facility, but may also include an engine seller or distributor in cases where loose engines are sold to the general public for uses such as replacement engines.

Post-manufacture marinizer means an entity that produces a marine engine by modifying a non-marine engine, whether certified or uncertified, complete or partially complete, where the entity is not controlled by the manufacturer of the base engine or by an entity that also controls the manufacturer of the base engine. In addition, vessel manufacturers that substantially modify marine engines are post-manufacture marinizers. For the purpose of this definition, "substantially modify" means changing an engine in a way that could change engine emission characteristics.

Power density has the meaning given in § 1042.140.

Ramped-modal means relating to the ramped-modal type of steady-state test described in § 1042.505.

Rated speed means the maximum full-load governed speed for governed engines and the speed of maximum power for ungoverned engines.

Recreational marine engine means a Category 1 propulsion marine engine that is intended by the manufacturer to be installed on a recreational vessel.

Recreational vessel has the meaning given in 46 U.S.C. 2101 (25), but excludes "passenger vessels" and "small passenger vessels" as defined by 46 U.S.C. 2101 (22) and (35) and excludes vessels used solely for competition. For this part, "recreational vessel" generally means a vessel that is intended by the vessel manufacturer to be operated primarily for pleasure or leased, rented or chartered to another

for the latter's pleasure, excluding the following vessels:

(1) Vessels of less than 100 gross tons that carry more than 6 passengers (as defined in this section).

(2) Vessels of 100 gross tons or more that carry one or more passengers (as defined in this section).

(3) Vessels used solely for competition.

Residual fuel has the meaning given in 40 CFR 80.2. This generally includes all RM grades of marine fuel without regard to whether they are known commercially as residual fuel. For example, fuel marketed as intermediate fuel may be residual fuel.

Revoke has the meaning given in 40 CFR 1068.30. In general this means to terminate the certificate or an exemption for an engine family.

Round has the meaning given in 40 CFR 1065.1001.

Scheduled maintenance means adjusting, repairing, removing, disassembling, cleaning, or replacing components or systems periodically to keep a part or system from failing, malfunctioning, or wearing prematurely. It also may mean actions you expect are necessary to correct an overt indication of failure or malfunction for which periodic maintenance is not appropriate.

Small-volume boat builder means a boat manufacturer with fewer than 500 employees and with annual worldwide production of fewer than 100 boats. For manufacturers owned by a parent company, these limits apply to the combined production and number of employees of the parent company and all its subsidiaries.

Small-volume engine manufacturer means a manufacturer with annual worldwide production of fewer than 1,000 internal combustion engines (marine and nonmarine). For manufacturers owned by a parent company, the limit applies to the production of the parent company and all its subsidiaries.

Spark-ignition means relating to a gasoline-fueled engine or any other type of engine with a spark plug (or other sparking device) and with operating characteristics significantly similar to the theoretical Otto combustion cycle. Spark-ignition engines usually use a throttle to regulate intake air flow to control power during normal operation.

Steady-state has the meaning given in 40 CFR 1065.1001.

Sulfur-sensitive technology means an emission-control technology that experiences a significant drop in emission-control performance or emission-system durability when an engine is operated on low-sulfur fuel (i.e., fuel with a sulfur concentration of 300 to 500 ppm) as compared to when it is operated on ultra low-sulfur fuel (i.e., fuel with a sulfur concentration less than 15 ppm). Exhaust-gas recirculation is not a sulfur-sensitive technology.

Suspend has the meaning given in 40 CFR 1068.30. In general this means to temporarily discontinue the certificate or an exemption for an engine family.

Test engine means an engine in a test sample.

Test sample means the collection of engines selected from the population of an engine family for emission testing. This may include testing for certification, production-line testing, or in-use testing.

Tier 1 means relating to the Tier 1 emission standards, as shown in Appendix I.

Tier 2 means relating to the Tier 2 emission standards, as shown in Appendix I.

Tier 3 means relating to the Tier 3 emission standards, as shown in § 1042.101.

Tier 4 means relating to the Tier 4 emission standards, as shown in § 1042.101.

Total hydrocarbon has the meaning given in 40 CFR 1065.1001. This generally means the combined mass of organic compounds measured by the specified procedure for measuring total hydrocarbon, expressed as a hydrocarbon with a hydrogen-to-carbon mass ratio of 1.85:1.

Total hydrocarbon equivalent has the meaning given in 40 CFR 1065.1001. This generally means the sum of the carbon mass contributions of non-oxygenated hydrocarbons, alcohols and aldehydes, or other organic compounds that are measured separately as contained in a gas sample, expressed as exhaust hydrocarbon from petroleum-fueled locomotives. The hydrogen-to-carbon ratio of the equivalent hydrocarbon is 1.85:1.

Ultimate purchaser means, with respect to any new vessel or new marine engine, the first person who in good faith purchases such new vessel or new marine engine for purposes other than resale.

Ultra low-sulfur diesel fuel means one of the following:

(1) For in-use fuels, *ultra low-sulfur diesel fuel* means a diesel fuel marketed as ultra low-sulfur diesel fuel having a maximum sulfur concentration of 15 parts per million.

(2) For testing, ultra low-sulfur diesel fuel has the meaning given in 40 CFR part 1065.

United States has the meaning given in 40 CFR 1068.30.

Upcoming model year means for an engine family the model year after the one currently in production.

U.S.-directed production volume means the number of engine units, subject to the requirements of this part, produced by a manufacturer for which the manufacturer has a reasonable assurance that sale was or will be made to ultimate purchasers in the United States.

Useful life means the period during which the engine is designed to properly function in terms of reliability and fuel consumption, without being remanufactured, specified as a number of hours of operation or calendar years, whichever comes first. It is the period during which a new engine is required to comply with all applicable emission standards. See § 1042.101(e).

Variable-speed engine means an engine that is not a constant-speed engine.

Vessel means a marine vessel.

Vessel operator means any individual that physically operates or maintains a vessel or exercises managerial control over the operation of the vessel.

Vessel owner means the individual or company that holds legal title to a vessel.

Void has the meaning given in 40 CFR 1068.30. In general this means to invalidate a certificate or an exemption both retroactively and prospectively.

Volatile liquid fuel means any fuel other than diesel or biodiesel that is a liquid at atmospheric pressure and has a Reid Vapor Pressure higher than 2.0 pounds per square inch.

We (us, our) means the Administrator of the Environmental Protection Agency and any authorized representatives.

§ 1042.805 Symbols, acronyms, and abbreviations.

The following symbols, acronyms, and abbreviations apply to this part:

ABT	Averaging, banking, and trading.
AECD	auxiliary-emission control device.
CFR	Code of Federal Regulations.
CO	carbon monoxide.
CO ₂	carbon dioxide.

Cyl	cylinder.
disp.	displacement.
EPA	Environmental Protection Agency.
EGR	exhaust gas recirculation.
EPA	Environmental Protection Agency.
FEL	Family Emission Limit.
G	grams.
HC	hydrocarbon.
Hr	hours.
kPa	kilopascals.
kW	kilowatts.
L	liters.
LTR	Limited Testing Region.
NARA	National Archives and Records Administration.
NMHC	nonmethane hydrocarbons.
NO _x	oxides of nitrogen (NO and NO ₂).
NTE	not-to-exceed.
PM	particulate matter.
RPM	revolutions per minute.
SAE	Society of Automotive Engineers.
SCR	selective catalytic reduction.
THC	total hydrocarbon.
THCE	total hydrocarbon equivalent.
ULSD	ultra low-sulfur diesel fuel.
U.S.C.	United States Code.

§ 1042.810 Reference materials.

Documents listed in this section have been incorporated by reference into this part. The Director of the Federal Register approved the incorporation by reference as prescribed in 5 U.S.C. 552(a) and 1 CFR part 51. Anyone may inspect copies at the U.S. EPA, Air and Radiation Docket and Information Center, 1301 Constitution Ave., NW., Room B102, EPA West Building, Washington, DC 20460 or at the National Archives and Records Administration (NARA). For information on the availability of this material at NARA, call 202-741-6030, or go to: http://www.archives.gov/federal_register/code_of_federal_regulations/ibr_locations.html.

(a) *SAE material.* Table 1 of this section lists material from the Society of Automotive Engineers that we have incorporated by reference. The first column lists the number and name of the material. The second column lists the sections of this part where we reference it. Anyone may purchase copies of these materials from the Society of Automotive Engineers, 400 Commonwealth Drive, Warrendale, PA 15096 or <http://www.sae.org>. Table 1 follows:

TABLE 1 OF § 1042.810—SAE MATERIALS

Document number and name	Part 1042 reference
SAE J1930, Electrical/Electronic Systems Diagnostic Terms, Definitions, Abbreviations, and Acronyms, revised May 1998	1042.135

(b) *IMO material.* Table 2 of this section lists material from the International Maritime Organization that we have incorporated by reference. The first column lists the number and name of the material. The second column lists the section of this part where we reference it. Anyone may purchase copies of these materials from the International Maritime Organization, 4 Albert Embankment, London SE1 7SR, United Kingdom or <http://www.imo.org>. Table 3 follows:

TABLE 2 OF § 1042.810.—IMO MATERIALS

Document number and name	Part 1042 reference
Resolution 2—Technical Code on Control of Emission of Nitrogen Oxides from Marine Diesel Engines, 1997.A	1042.801

§ 1042.815 Confidential information.

(a) Clearly show what you consider confidential by marking, circling, bracketing, stamping, or some other method.

(b) We will store your confidential information as described in 40 CFR part 2. Also, we will disclose it only as

specified in 40 CFR part 2. This applies both to any information you send us and to any information we collect from inspections, audits, or other site visits.

(c) If you send us a second copy without the confidential information, we will assume it contains nothing confidential whenever we need to release information from it.

(d) If you send us information without claiming it is confidential, we may make it available to the public without further notice to you, as described in 40 CFR 2.204.

§ 1042.820 Hearings.

(a) You may request a hearing under certain circumstances, as described elsewhere in this part. To do this, you must file a written request, including a description of your objection and any supporting data, within 30 days after we make a decision.

(b) For a hearing you request under the provisions of this part, we will approve your request if we find that your request raises a substantial factual issue.

(c) If we agree to hold a hearing, we will use the procedures specified in 40 CFR part 1068, subpart G.

§ 1042.825 Reporting and recordkeeping requirements.

Under the Paperwork Reduction Act (44 U.S.C. 3501 *et seq.*), the Office of Management and Budget approves the reporting and recordkeeping specified in the applicable regulations. The following items illustrate the kind of reporting and recordkeeping we require for engines regulated under this part:

(a) We specify the following requirements related to engine certification in this part 1042:

(1) In § 1042.135 we require engine manufacturers to keep certain records related to duplicate labels sent to vessel manufacturers.

(2) In § 1042.145 we state the requirements for interim provisions.

(3) In subpart C of this part we identify a wide range of information required to certify engines.

(4) In §§ 1042.345 and 1042.350 we specify certain records related to production-line testing.

(5) In subpart G of this part we identify several reporting and recordkeeping items for making demonstrations and getting approval related to various special compliance provisions.

(6) In §§ 1042.725, 1042.730, and 1042.735 we specify certain records related to averaging, banking, and trading.

(b) We specify the following requirements related to testing in 40 CFR part 1065:

(1) In 40 CFR 1065.2 we give an overview of principles for reporting information.

(2) In 40 CFR 1065.10 and 1065.12 we specify information needs for establishing various changes to published test procedures.

(3) In 40 CFR 1065.25 we establish basic guidelines for storing test information.

(4) In 40 CFR 1065.695 we identify data that may be appropriate for collecting during testing of in-use engines using portable analyzers.

(c) We specify the following requirements related to the general compliance provisions in 40 CFR part 1068:

(1) In 40 CFR 1068.5 we establish a process for evaluating good engineering judgment related to testing and certification.

(2) In 40 CFR 1068.25 we describe general provisions related to sending and keeping information.

(3) In 40 CFR 1068.27 we require manufacturers to make engines available for our testing or inspection if we make such a request.

(4) In 40 CFR 1068.105 we require vessel manufacturers to keep certain records related to duplicate labels from engine manufacturers.

(5) In 40 CFR 1068.120 we specify recordkeeping related to rebuilding engines.

(6) In 40 CFR part 1068, subpart C, we identify several reporting and recordkeeping items for making demonstrations and getting approval related to various exemptions.

(7) In 40 CFR part 1068, subpart D, we identify several reporting and recordkeeping items for making demonstrations and getting approval related to importing engines.

(8) In 40 CFR 1068.450 and 1068.455 we specify certain records related to testing production-line engines in a selective enforcement audit.

(9) In 40 CFR 1068.501 we specify certain records related to investigating and reporting emission-related defects.

(10) In 40 CFR 1068.525 and 1068.530 we specify certain records related to recalling nonconforming engines.

Appendix I to Part 1042—Summary of Previous Emission Standards

The following standards apply to marine compression-ignition engines produced before the model years specified in § 1042.1:

(a) *Engines below 37 kW.* Tier 1 and Tier 2 standards for engines below 37 kW apply as specified in 40 CFR part 89 and summarized in the following table:

TABLE 1 OF APPENDIX I.—EMISSION STANDARDS FOR ENGINES BELOW 37 kW (G/KW-HR)

Rated power (kW)	Tier	Model year ¹	NMHC + NO _x	CO	PM
kW<8	Tier 1	2000	10.5	8.0	1.0
	Tier 2	2005	7.5	8.0	0.80
8=kW<19	Tier 1	2000	9.5	6.6	0.80
	Tier 2	2005	7.5	6.6	0.80
19=kW<37	Tier 1	1999	9.5	5.5	0.8
	Tier 2	2004	7.5	5.5	0.6

(b) *Engines at or above 37 kW.* Tier 1 and Tier 2 standards for engines at or above 37 kW apply as specified in 40 CFR part 94 and summarized as follows:

(1) *Tier 1 standards.* NO_x emissions from model year 2004 and later engines with displacement of 2.5 or more liters per

cylinder may not exceed the following values:

(i) 17.0 g/kW-hr when maximum test speed is less than 130 rpm.

(ii) 45.0×N^{-0.20} when maximum test speed is at least 130 but less than 2000 rpm, where N is the maximum test speed of the engine in revolutions per minute. Round the

calculated standard to the nearest 0.1 g/kW-hr.

(ii) 9.8 g/kW-hr when maximum test speed is 2000 rpm or more.

(2) *Tier 2 primary standards.* Exhaust emissions may not exceed the values shown in the following table:

TABLE 2 OF APPENDIX I.—PRIMARY TIER 2 EMISSION STANDARDS FOR COMMERCIAL AND RECREATIONAL MARINE ENGINES AT OR ABOVE 37 kW (G/KW-HR)

Engine Size liters/cylinder, rated power	Maximum engine power	Category	Model year	THC+NO _x g/kW-hr	CO g/kW-hr	PM g/kW-hr
disp. < 0.9	power ≅ 37 kW	Category 1	2005	7.5	5.0	0.40
0.9 = disp. < 1.2	All	Category 1	2004	7.2	5.0	0.30
1.2 = disp. < 2.5	All	Category 1	2004	7.2	5.0	0.20
2.5 = disp. < 5.0	All	Category 1	2007	7.2	5.0	0.20
5.0 = disp. < 15.0	All	Category 2	2007	7.8	5.0	0.27
15.0 = disp. < 20.0	power < 3300 kW	Category 2	2007	8.7	5.0	0.50
15.0 = disp. < 20.0	power ≅ 3300 kW	Category 2	2007	9.8	5.0	0.50
20.0 = disp. < 25.0	All	Category 2	2007	9.8	5.0	0.50
25.0 = disp. < 30.0	All	Category 2	2007	11	5	0.5

(3) Tier 2 supplemental standards. Not-to-exceed emission standards apply for Tier 2 engines as specified in 40 CFR 94.8(e).

Appendix II to Part 1042—Steady-State Duty Cycles

(a) Test commercial propulsion engines with maximum engine power at or above 19 kW that are used with (or intended to be used with) fixed-pitch propellers with one of the

cycles specified in this paragraph (a). Use one of these duty cycles also for any other engines for which the other duty cycles of this appendix do not apply.

(1) The following duty cycle applies for discrete-mode testing:

E3 mode number	Engine speed ¹	Percent of maximum test power	Weighting factors
1	Maximum test	100	0.2
2	91%	75	0.5
3	80%	50	0.15
4	63%	25	0.15

¹ Speed terms are defined in 40 CFR part 1065. Percent speed values are relative to maximum test speed.

(2) The following duty cycle applies for ramped-modal testing:

RMC mode	Time in mode (seconds)	Engine speed ^{1 3}	Power (percent) ^{2 3}
1a Steady-state	229	Maximum test speed	100%.
1b Transition	20	Linear transition	Linear transition in torque.
2a Steady-state	166	63%	25%.
2b Transition	20	Linear transition	Linear transition in torque.
3a Steady-state	570	91%	75%.
3b Transition	20	Linear transition	Linear transition in torque.
4a Steady-state	175	80%	50%.

¹ Speed terms are defined in 40 CFR part 1065. Percent speed is relative to maximum test speed.

² The percent power is relative to the maximum test power.

³ Advance from one mode to the next within a 20-second transition phase. During the transition phase, command a linear progression from the torquesetting of the current mode to the torque setting of the next mode, and simultaneously command a similar linear progression for engine speed if there is a change in speed setting.

(b) Test recreational engines that are used with (or intended to be used with) fixed-pitch propellers with maximum engine

power at or above 19 kW with one of the following steady-state duty cycles:

(1) The following duty cycle applies for discrete-mode testing:

E5 mode number	Engine speed ¹	Percent of maximum test power	Weighting factors
1	Maximum test	100	0.08
2	91%	75	0.13
3	80%	50	0.17
4	63%	25	0.32
5	Idle	0	0.3

¹ Speed terms are defined in 40 CFR part 1065. Percent speed values are relative to maximum test speed.

(2) The following duty cycle applies for ramped-modal testing:

RMC mode	Time in mode (seconds)	Engine speed ^{1 3}	Power (percent) ^{2 3}
1a Steady-state	167	Warm Idle	0.
1b Transition	20	Linear transition	Linear transition in torque.
2a Steady-state	85	Maximum test speed	100%.
2b Transition	20	Linear transition	Linear transition in torque.
3a Steady-state	354	63%	25%.
3b Transition	20	Linear transition	Linear transition in torque.
4a Steady-state	141	91%	75%.
4b Transition	20	Linear transition	Linear transition in torque.
5a Steady-state	182	80%	50%.
5b Transition	20	Linear transition	Linear transition in torque.
6 Steady-state	171	Warm Idle	0.

¹ Speed terms are defined in 40 CFR part 1065. Percent speed is relative to maximum test speed.

² The percent power is relative to the maximum test power.

³ Advance from one mode to the next within a 20-second transition phase. During the transition phase, command a linear progression from the torque setting of the current mode to the torque setting of the next mode, and simultaneously command a similar linear progression for engine speed if there is a change in speed setting.

(c) Test any constant-speed/propulsion engines that are used with (or intended to be used with) variable-pitch propellers or with

electrically coupled propellers with one of the following steady-state duty cycles:

(1) The following duty cycle applies for discrete-mode testing:

E2 mode number	Engine speed ¹	Observed torque (percent) ²	Weighting factors
1	Engine Governed	100	0.2
2	Engine Governed	75	0.5
3	Engine Governed	50	0.15
4	Engine Governed	25	0.15

¹ Speed terms are defined in 40 CFR part 1065.

² The percent torque is relative to the maximum test torque as defined in 40 CFR part 1065.

(2) The following duty cycle applies for ramped-modal testing:

RMC mode	Time in mode (seconds)	Engine speed	Torque (percent) ^{1 2}
1a Steady-state	234	Engine Governed	100%.
1b Transition	20	Engine Governed	Linear transition.
2a Steady-state	571	Engine Governed	25%.
2b Transition	20	Engine Governed	Linear transition.
3a Steady-state	165	Engine Governed	75%.
3b Transition	20	Engine Governed	Linear transition.
4a Steady-state	170	Engine Governed	50%.

¹ The percent torque is relative to the maximum test torque as defined in 40 CFR part 1065.

² Advance from one mode to the next within a 20-second transition phase. During the transition phase, command a linear progression from the torque setting of the current mode to the torque setting of the next mode.

Appendix III to Part 1042—Not-to-Exceed Zones

(a) The following Figure 1 illustrates the default NTE zone for commercial marine

engines certified using the duty cycle specified in § 1042.505(b)(1):

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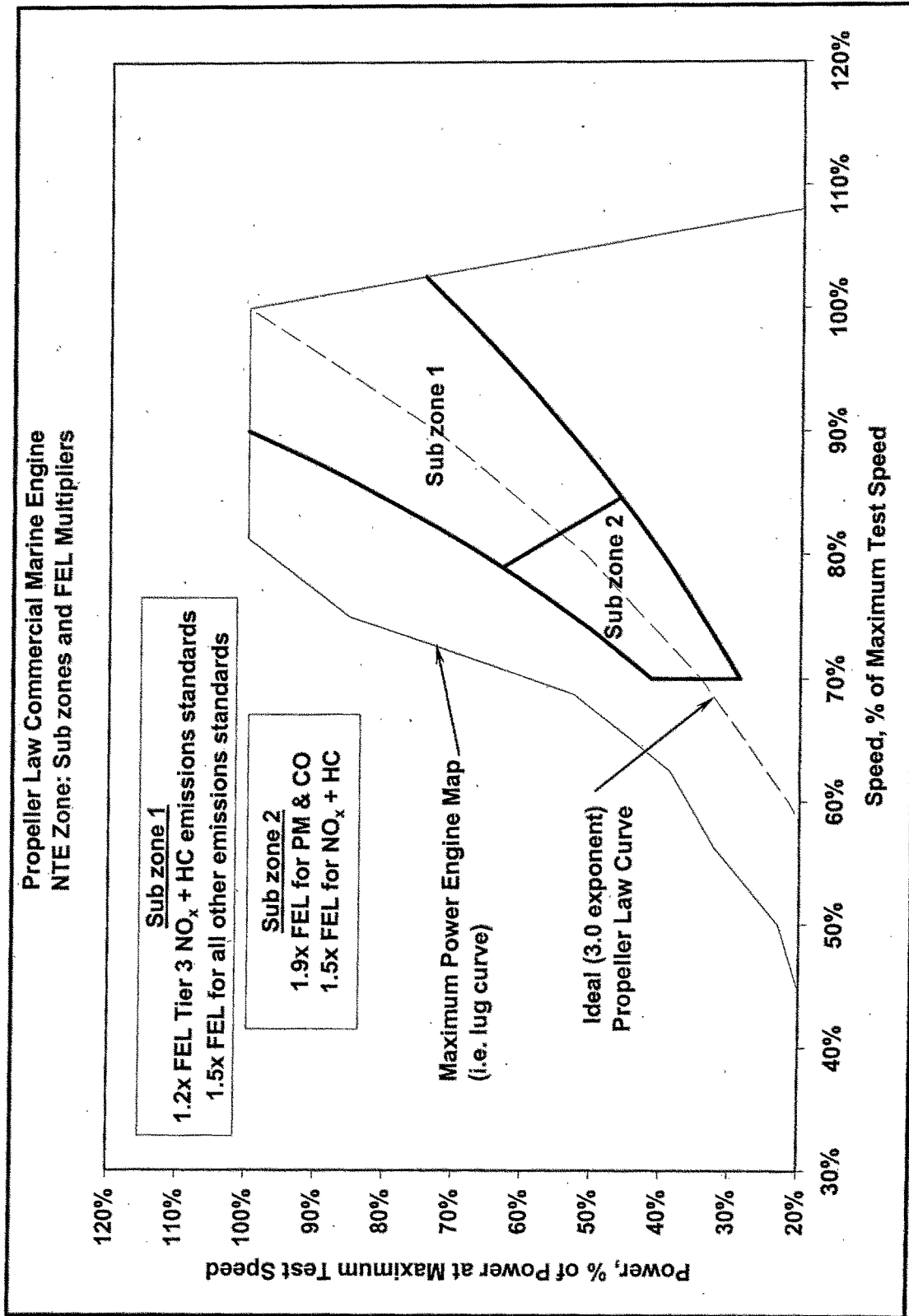


Figure 1 of Appendix III

(1) Subzone 1 is defined as follows, where percent power is equal to the percentage of

the maximum power achieved at Maximum

Test Speed and percent speed is the percentage of Maximum Test Speed:

(i) Percent power $> 0.7 \times (\text{percent speed})^{2.5}$, and

(ii) Percent power $< (\text{percent speed} / 0.9)^{3.5}$, and

(iii) Percent power $> 3.0 \times (100\% - \text{percent speed})$.

(2) Sub zone 2 is defined as follows, where percent power is equal to the percentage of the maximum power achieved at Maximum

Test Speed and percent speed is the percentage of Maximum Test Speed:

(i) Percent power $> 0.7 \times (\text{percent speed})^{2.5}$, and

(ii) Percent power $< (\text{percent speed} / 0.9)^{3.5}$, and

(iii) Percent power $> 3.0 \times (100\% - \text{percent speed})$, and

(iv) Percent power $> 70\%$ of Maximum Test Speed.

(b) The following Figure 2 illustrates the default NTE zone for recreational marine propulsion engines that are used with (or intended to be used with) fixed-pitch propellers:

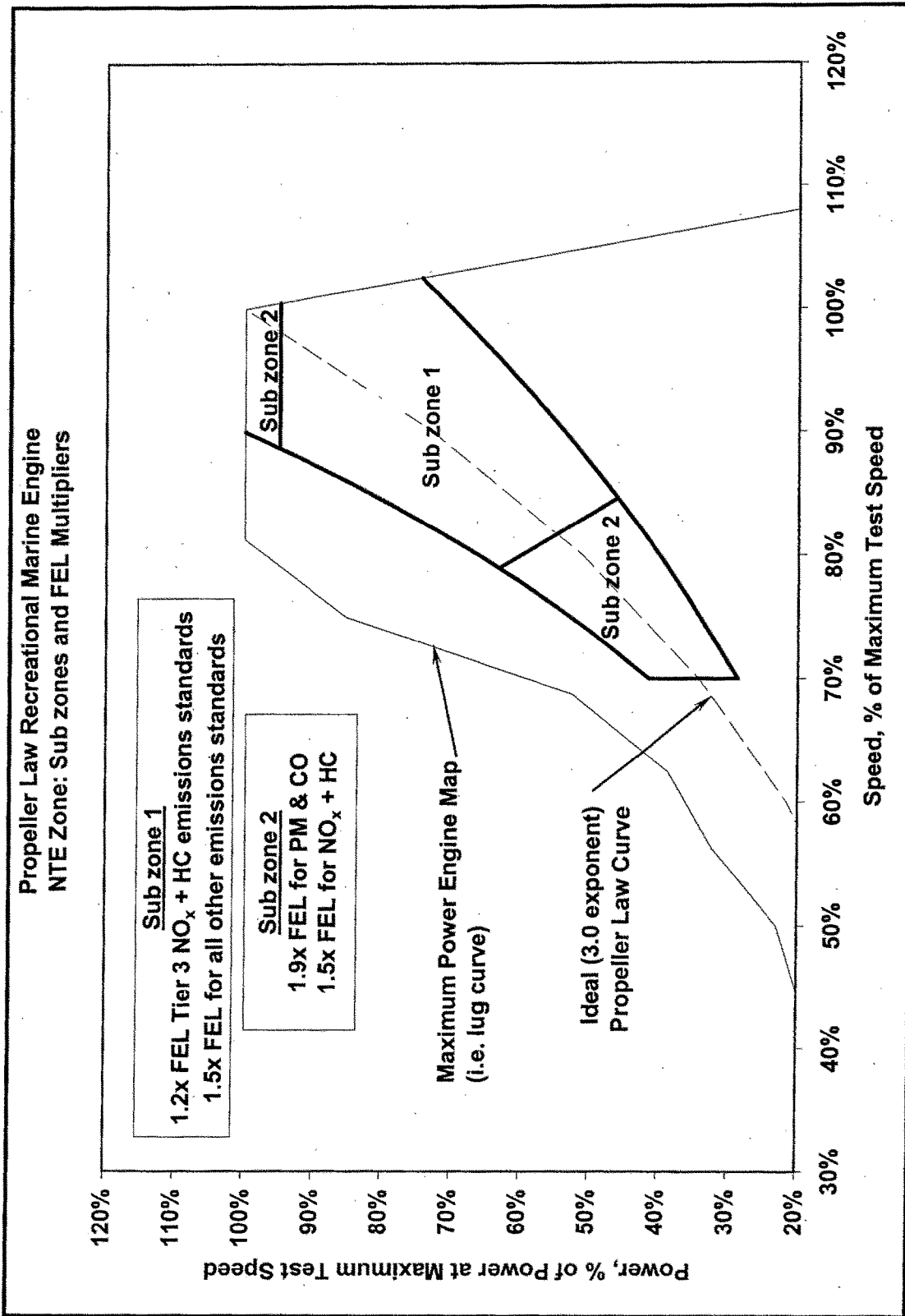


Figure 2 of Appendix III

(1) Sub zone 1 is defined as follows, where the maximum power achieved at Maximum Test Speed and percent speed is the percentage of Maximum Test Speed:

(i) Percent power $> 0.7 \times (\text{percent speed})^{2.5}$, and

(ii) Percent power $< (\text{percent speed} / 0.9)^{3.5}$, and

(iii) Percent power $> 3.0 \times (100\% - \text{percent speed})$.

(iv) Percent power $< 95\%$ of the maximum power at Maximum Test Speed.

(2) Sub zone 2 is defined as follows, where percent power is equal to the percentage of

the maximum power achieved at Maximum Test Speed and percent speed is the percentage of Maximum Test Speed:

(i) Percent power $> 0.7 \times (\text{percent speed})^{2.5}$, and

(ii) Percent power $< (\text{percent speed} / 0.9)^{3.5}$, and

(iii) Percent power $< 3.0 \times (100\% - \text{percent speed})$, and

(iv) Percent speed $> 70\%$ of Maximum Test Speed.

(v) Any power $> 95\%$ of the maximum power at Maximum Test Speed

(c) The following Figure 3 illustrates the default NTE zone for constant speed engines certified using either the duty cycle specified in § 1042.505(b)(3)(I) or in § 1042.505(b)(4)(i):

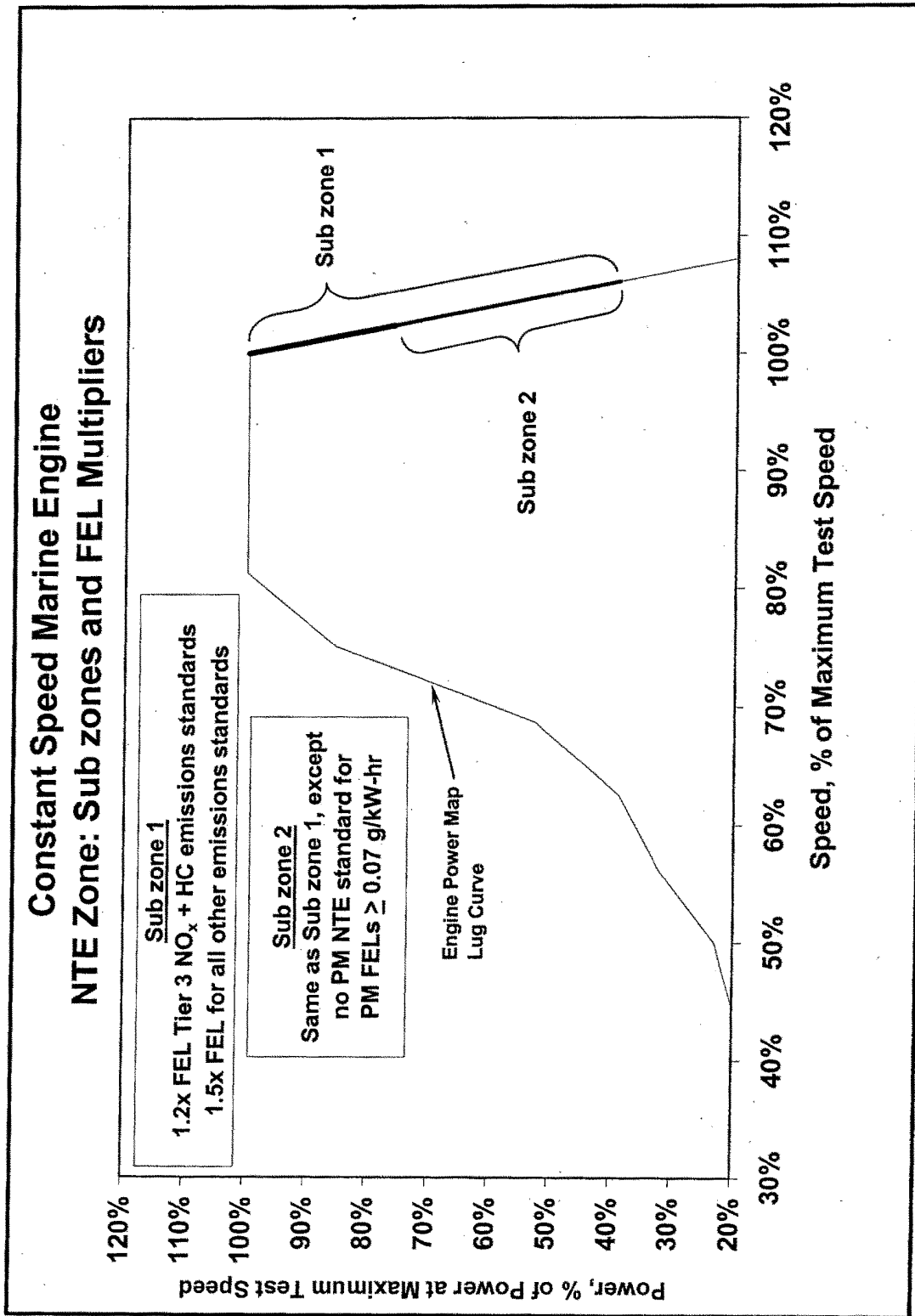


Figure 3 of Appendix III

(1) Subzone 1 is defined in § 1039.101(e).
 (2) Subzone 2 is defined in § 1039.515(b).
 (d) The following Figure 4 illustrates the default NTE zone for variable speed and load

engines certified using either the duty cycle § 1042.505(b)(4)(ii):
 specified in § 1042.505(b)(3)(ii) or in

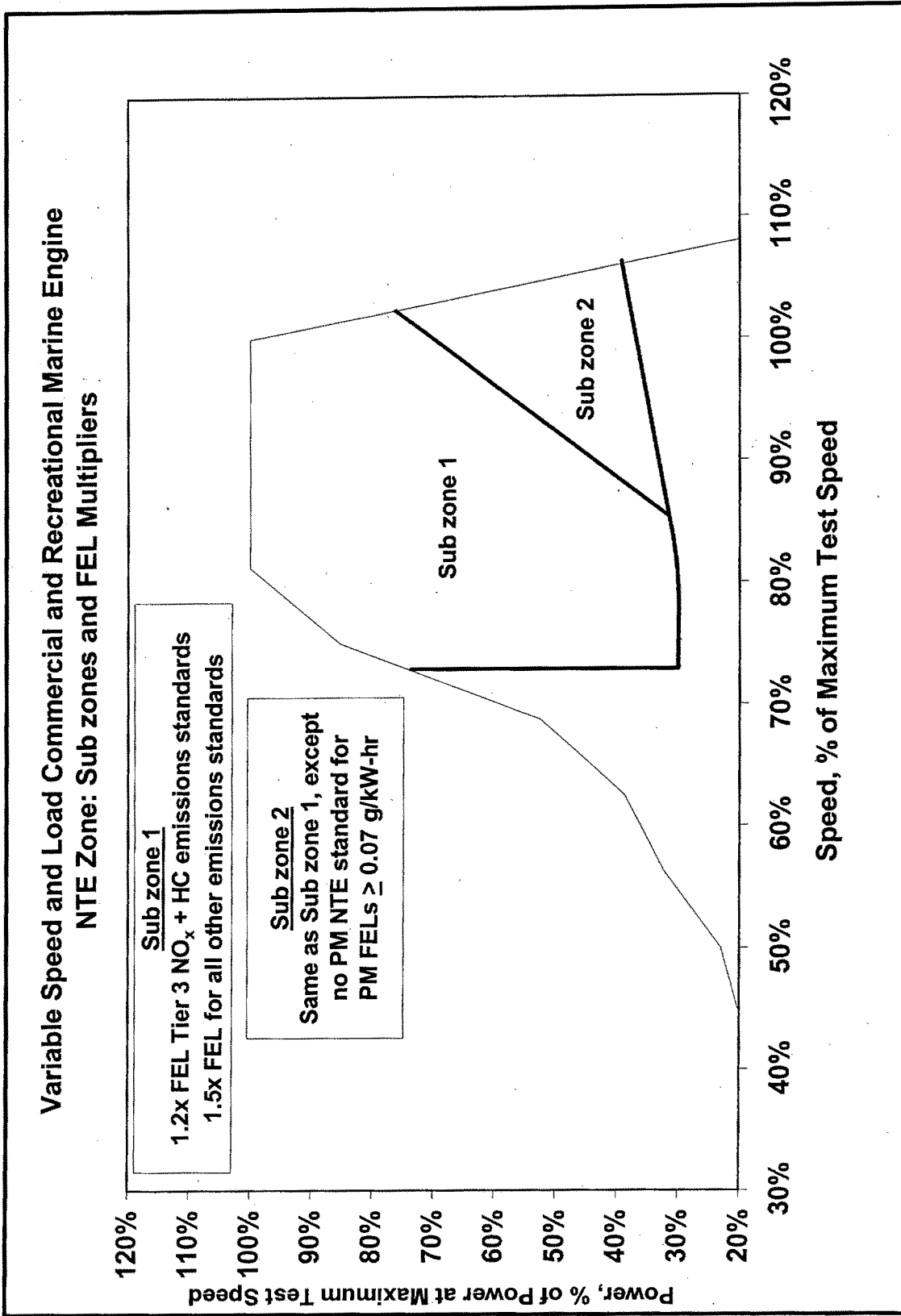


Figure 4 of Appendix III

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- (1) Subzone 1 is defined in § 1039.101(e).
 (2) Subzone 2 is defined in § 1039.515(b).

PART 1065—ENGINE-TESTING PROCEDURES

14. The authority citation for part 1065 continues to read as follows:

Authority: 42 U.S.C. 7401–7671q.

Subpart A—[Amended]

15. Section 1065.1 is revised to read as follows:

§ 1065.1 Applicability.

(a) This part describes the procedures that apply to testing we require for the following engines or for vehicles using the following engines:

(1) Locomotives we regulate under 40 CFR part 1033. For earlier model years, manufacturers may use the test procedures in this part or those specified in 40 CFR part 92 according to § 1065.10.

(2) Model year 2010 and later heavy-duty highway engines we regulate under 40 CFR part 86. For earlier model years, manufacturers may use the test procedures in this part or those specified in 40 CFR part 86, subpart N, according to § 1065.10.

(3) Nonroad diesel engines we regulate under 40 CFR part 1039 and stationary diesel engines that are certified to the standards in 40 CFR part 1039 as specified in 40 CFR part 60, subpart IIII. For earlier model years, manufacturers may use the test procedures in this part or those specified in 40 CFR part 89 according to § 1065.10.

(4) Marine diesel engines we regulate under 40 CFR part 1042. For earlier model years, manufacturers may use the test procedures in this part or those specified in 40 CFR part 94 according to § 1065.10.

(5) Marine spark-ignition engines we regulate under 40 CFR part 1045. For earlier model years, manufacturers may use the test procedures in this part or those specified in 40 CFR part 91 according to § 1065.10.

(6) Large nonroad spark-ignition engines we regulate under 40 CFR part 1048, and stationary engines that are certified to the standards in 40 CFR part 1048 as specified in 40 CFR part 60, subpart JJJJ.

(7) Vehicles we regulate under 40 CFR part 1051 (such as snowmobiles and off-highway motorcycles) based on engine testing. See 40 CFR part 1051, subpart F, for standards and procedures that are based on vehicle testing.

(8) Small nonroad spark-ignition engines we regulate under 40 CFR part

1054 and stationary engines that are certified to the standards in 40 CFR part 1054 as specified in 40 CFR part 60, subpart JJJJ. For earlier model years, manufacturers may use the test procedures in this part or those specified in 40 CFR part 90 according to § 1065.10.

(b) The procedures of this part may apply to other types of engines, as described in this part and in the standard-setting part.

(c) This part is addressed to you as a manufacturer of engines, vehicles, equipment, and vessels, but it applies equally to anyone who does testing for you. For example, if you manufacture engines that must be tested according to this part, this part applies to you. This part is also addressed to any manufacturer or supplier of test equipment, instruments, supplies, or any other goods or services related to the procedures, requirements, recommendations, or options in this part. For example, if you are an instrument manufacturer, this part applies to you.

(d) Paragraph (a) of this section identifies the parts of the CFR that define emission standards and other requirements for particular types of engines. In this part, we refer to each of these other parts generically as the “standard-setting part.” For example, 40 CFR part 1051 is always the standard-setting part for snowmobiles.

(e) Unless we specify otherwise, the terms “procedures” and “test procedures” in this part include all aspects of engine testing, including the equipment specifications, calibrations, calculations, and other protocols and procedural specifications needed to measure emissions.

(f) For vehicles, equipment, or vessels subject to this part and regulated under vehicle-based, equipment-based, or vessel-based standards, use good engineering judgment to interpret the term “engine” in this part to include vehicles, equipment, or vessels, where appropriate.

(g) For additional information regarding these test procedures, visit our Web site at <http://www.epa.gov>, and in particular <http://www.epa.gov/otaq/testingregs.htm>.

16. Section 1065.2 is amended by revising paragraph (c) to read as follows:

§ 1065.2 Submitting information to EPA under this part.

* * * * *

(c) We may void any certificates or approvals associated with a submission of information if we find that you intentionally submitted false, incomplete, or misleading information.

For example, if we find that you intentionally submitted incomplete information to mislead EPA when requesting approval to use alternate test procedures, we may void the certificates for all engines families certified based on emission data collected using the alternate procedures. This would also apply if you ignore data from incomplete tests or from repeat tests with higher emission results.

* * * * *

17. Section 1065.5 is revised to read as follows:

§ 1065.5 Overview of this part 1065 and its relationship to the standard-setting part.

(a) This part specifies procedures that apply generally to testing various categories of engines. See the standard-setting part for directions in applying specific provisions in this part for a particular type of engine. Before using this part’s procedures, read the standard-setting part to answer at least the following questions:

(1) What duty cycles must I use for laboratory testing?

(2) Should I warm up the test engine before measuring emissions, or do I need to measure cold-start emissions during a warm-up segment of the duty cycle?

(3) Which exhaust gases do I need to measure?

(4) Do any unique specifications apply for test fuels?

(5) What maintenance steps may I take before or between tests on an emission-data engine?

(6) Do any unique requirements apply to stabilizing emission levels on a new engine?

(7) Do any unique requirements apply to test limits, such as ambient temperatures or pressures?

(8) Is field testing required or allowed, and are there different emission standards or procedures that apply to field testing?

(9) Are there any emission standards specified at particular engine-operating conditions or ambient conditions?

(10) Do any unique requirements apply for durability testing?

(b) The testing specifications in the standard-setting part may differ from the specifications in this part. In cases where it is not possible to comply with both the standard-setting part and this part, you must comply with the specifications in the standard-setting part. The standard-setting part may also allow you to deviate from the procedures of this part for other reasons.

(c) The following table shows how this part divides testing specifications into subparts:

TABLE 1 OF § 1065.5—DESCRIPTION OF PART 1065 SUBPARTS

This subpart	Describes these specifications or procedures
Subpart A	Applicability and general provisions.
Subpart B	Equipment for testing.
Subpart C	Measurement instruments for testing.
Subpart D	Calibration and performance verifications for measurement systems.
Subpart E	How to prepare engines for testing, including service accumulation.
Subpart F	How to run an emission test over a predetermined duty cycle.
Subpart G	Test procedure calculations.
Subpart H	Fuels, engine fluids, analytical gases, and other calibration standards.
Subpart I	Special procedures related to oxygenated fuels.
Subpart J	How to test with portable emission measurement systems (PEMS).

18. Section 1065.10 is amended by revising paragraphs (c)(1) introductory text and (c)(7) introductory text to read as follows:

§ 1065.10 Other procedures.

* * * * *

(c) * * *

(1) The objective of the procedures in this part is to produce emission measurements equivalent to those that would result from measuring emissions during in-use operation using the same engine configuration as installed in a vehicle, equipment, or vessel. However, in unusual circumstances these procedures may result in measurements that do not represent in-use operation. You must notify us if good engineering judgment indicates that the specified procedures cause unrepresentative emission measurements for your engines. Note that you need not notify us of unrepresentative aspects of the test procedure if measured emissions are equivalent to in-use emissions. This provision does not obligate you to pursue new information regarding the different ways your engine might operate in use, nor does it obligate you to collect any other in-use information to verify whether or not these test procedures are representative of your engine's in-use operation. If you notify

us of unrepresentative procedures under this paragraph (c)(1), we will cooperate with you to establish whether and how the procedures should be appropriately changed to result in more representative measurements. While the provisions of this paragraph (c)(1) allow us to be responsive to issues as they arise, we would generally work toward making these testing changes generally applicable through rulemaking. We will allow reasonable lead time for compliance with any resulting change in procedures. We will consider the following factors in determining the importance of pursuing changes to the procedures:

* * * * *

(7) You may request to use alternate procedures, or procedures that are more accurate or more precise than the allowed procedures. The following provisions apply to requests for alternate procedures:

* * * * *

19. Section 1065.12 is amended by revising paragraphs (a) and (d)(1) to read as follows:

§ 1065.12 Approval of alternate procedures.

(a) To get approval for an alternate procedure under § 1065.10(c), send the Designated Compliance Officer an initial written request describing the alternate procedure and why you believe it is equivalent to the specified procedure. Anyone may request alternate procedure approval. This means that an individual engine manufacturer may request to use an alternate procedure. This also means that an instrument manufacturer may request to have an instrument, equipment, or procedure approved as an alternate procedure to those specified in this part. We may approve your request based on this information alone, or, as described in this section, we may ask you to submit to us in writing supplemental information showing that your alternate procedure is consistently and reliably at least as accurate and repeatable as the specified procedure.

* * * * *

(d) * * *

(1) Theoretical basis. Give a brief technical description explaining why you believe the proposed alternate procedure should result in emission measurements equivalent to those using the specified procedure. You may

include equations, figures, and references. You should consider the full range of parameters that may affect equivalence. For example, for a request to use a different NOx measurement procedure, you should theoretically relate the alternate detection principle to the specified detection principle over the expected concentration ranges for NO, NO2, and interference gases. For a request to use a different PM measurement procedure, you should explain the principles by which the alternate procedure quantifies particulate mass similarly to the specified procedure.

* * * * *

20. Section 1065.15 is amended by revising paragraphs (c)(1) and (e) to read as follows:

§ 1065.15 Overview of procedures for laboratory and field testing.

* * * * *

(c) * * *

(1) Engine operation. Engine operation is specified over a test interval. A test interval is the time over which an engine's total mass of emissions and its total work are determined. Refer to the standard-setting part for the specific test intervals that apply to each engine. Testing may involve measuring emissions and work during the following types of engine operation:

(i) Laboratory testing. Under this type of testing, you determine brake-specific emissions for duty-cycle testing by using an engine dynamometer in a laboratory or other environment. This typically consists of one or more test intervals, each defined by a duty cycle, which is a sequence of modes, speeds, and/or torques that an engine must follow. If the standard-setting part allows it, you may also simulate field testing by running on an engine dynamometer in a laboratory or other environment.

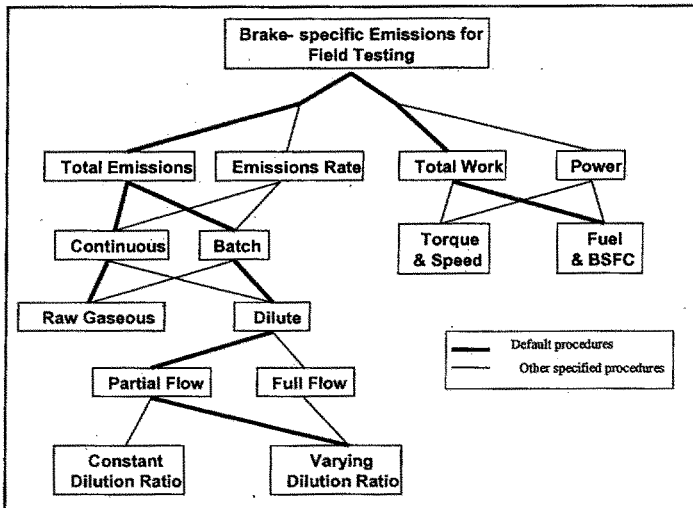
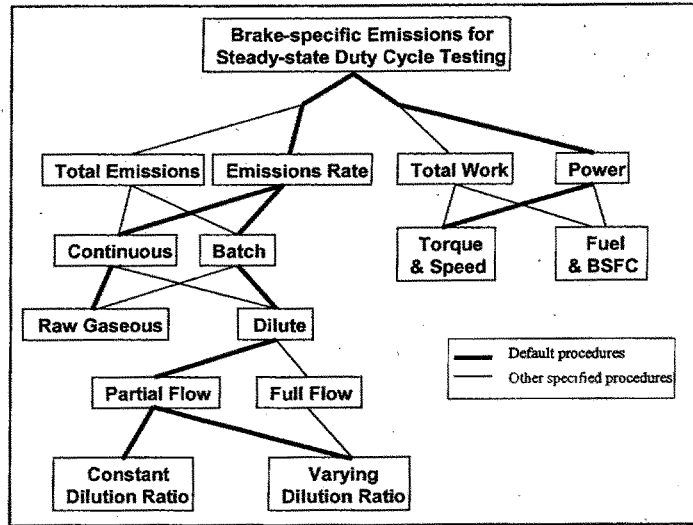
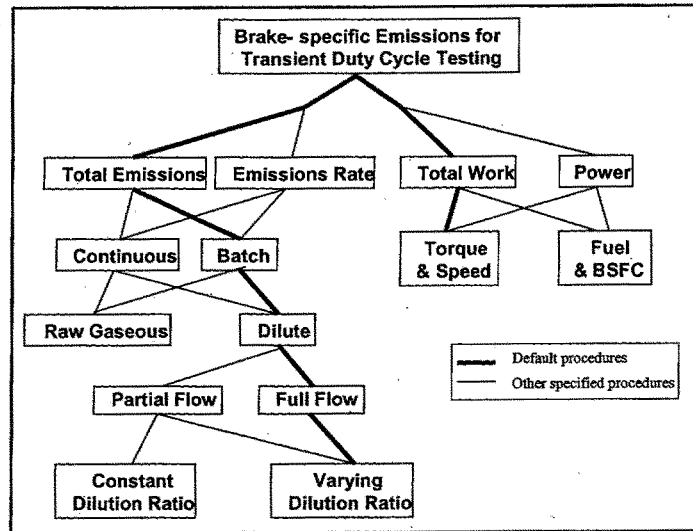
(ii) Field testing. This type of testing consists of normal in-use engine operation while an engine is installed in a vehicle, equipment, or vessel. The standard-setting part specifies how test intervals are defined for field testing.

* * * * *

(e) The following figure illustrates the allowed measurement configurations described in this part 1065:

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Figure 1 of §1065.15—Default test procedures and other specified procedures.



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21. Section 1065.20 is amended by revising paragraphs (f) and (g) to read as follows:

§ 1065.20 Units of measure and overview of calculations.

* * * * *

(f) Interpretation of ranges. Interpret a range as a tolerance unless we explicitly identify it as an accuracy, repeatability, linearity, or noise specification. See § 1065.1001 for the definition of tolerance. In this part, we specify two types of ranges:

(1) Whenever we specify a range by a single value and corresponding limit values above and below that value, target any associated control point to that single value. Examples of this type of range include “±10% of maximum pressure”, or “(30 ± 10) kPa”.

(2) Whenever we specify a range by the interval between two values, you may target any associated control point to any value within that range. An example of this type of range is “(40 to 50) kPa”.

(g) Scaling of specifications with respect to an applicable standard. Because this part 1065 is applicable to a wide range of engines and emission standards, some of the specifications in this part are scaled with respect to an engine’s applicable standard or maximum power. This ensures that the specification will be adequate to determine compliance, but not overly burdensome by requiring unnecessarily high-precision equipment. Many of these specifications are given with respect to a “flow-weighted mean” that is expected at the standard or during testing. Flow-weighted mean is the mean of a quantity after it is weighted proportional to a corresponding flow rate. For example, if a gas concentration is measured continuously from the raw exhaust of an engine, its flow-weighted mean concentration is the sum of the products of each recorded concentration times its respective exhaust flow rate, divided by the sum of the recorded flow rates. As another example, the bag concentration from a CVS system is the same as the flow-weighted mean concentration, because the CVS system itself flow-weights the bag concentration. Refer to § 1065.602 for information needed to estimate and calculate flow-weighted means. Wherever a specification is scaled to a value based upon an applicable standard, interpret the standard to be the family emission limit if the engine is certified under an emission credit program in the standard-setting part.

Subpart B—[Amended]

22. Section 1065.101 is amended by revising paragraph (a) to read as follows:

§ 1065.101 Overview.

(a) This subpart specifies equipment, other than measurement instruments, related to emission testing. The provisions of this subpart apply for all testing in laboratories or other environments where engine speeds and loads are controlled to follow a prescribed duty cycle. See subpart J of this part to determine which of the provisions of this subpart apply for field testing. This equipment includes three broad categories—dynamometers, engine fluid systems (such as fuel and intake-air systems), and emission-sampling hardware.

* * * * *

23. Section 1065.110 is amended by revising paragraphs (a) and (e) to read as follows:

§ 1065.110 Work inputs and outputs, accessory work, and operator demand.

(a) Work. Use good engineering judgment to simulate all engine work inputs and outputs as they typically would operate in use. Account for work inputs and outputs during an emission test by measuring them; or, if they are small, you may show by engineering analysis that disregarding them does not affect your ability to determine the net work output by more than ±0.5% of the net expected work output over the test interval. Use equipment to simulate the specific types of work, as follows:

(1) Shaft work. Use an engine dynamometer that is able to meet the cycle-validation criteria in § 1065.514 over each applicable duty cycle.

(i) You may use eddy-current and water-brake dynamometers for any testing that does not involve engine motoring, which is identified by negative torque commands in a reference duty cycle. See the standard setting part for reference duty cycles that are applicable to your engine.

(ii) You may use alternating-current or direct-current motoring dynamometers for any type of testing.

(iii) You may use one or more dynamometers.

(iv) You may use any device that is already installed on a vehicle, equipment, or vessel to absorb work from the engine’s output shaft(s). Examples of these types of devices include a vessel’s propeller and a locomotive’s generator.

(2) Electrical work. Use one or more of the following to simulate electrical work:

(i) Use storage batteries or capacitors that are of the type and capacity installed in use.

(ii) Use motors, generators, and alternators that are of the type and capacity installed in use.

(iii) Use a resistor load bank to simulate electrical loads.

(3) Pump, compressor, and turbine work. Use pumps, compressors, and turbines that are of the type and capacity installed in use. Use working fluids that are of the same type and thermodynamic state as normal in-use operation.

* * * * *

(e) Operator demand for shaft work.

Operator demand is defined in § 1065.1001. Command the operator demand and the dynamometer(s) to follow a prescribed duty cycle with set points for engine speed and torque at 5 Hz (or more frequently) for transient testing or 1 Hz (or more frequently) for steady-state testing. Refer to the standard-setting part to determine the specifications for your duty cycle(s). Use a mechanical or electronic input to control operator demand such that the engine is able to meet the validation criteria in § 1065.514 over each applicable duty cycle. Record feedback values for engine speed and torque at 5 Hz or more frequently for evaluating performance relative to the cycle validation criteria. Using good engineering judgment, you may improve control of operator demand by altering on-engine speed and torque controls. However, if these changes result in unrepresentative testing, you must notify us and recommend other test procedures under § 1065.10(c)(1).

24. Section 1065.120 is amended by revising paragraph (a) to read as follows:

§ 1065.120 Fuel properties and fuel temperature and pressure.

(a) Use fuels as specified in the standard-setting part, or as specified in subpart H of this part if fuels are not specified in the standard-setting part.

* * * * *

25. Section 1065.122 is amended by revising paragraphs (a) introductory text and (a)(1) to read as follows:

§ 1065.122 Engine cooling and lubrication.

(a) Engine cooling. Cool the engine during testing so its intake-air, oil, coolant, block, and head temperatures are within their expected ranges for normal operation. You may use auxiliary coolers and fans.

(1) For air-cooled engines only, if you use auxiliary fans you must account for work input to the fan(s) according to § 1065.110.

* * * * *

26. Section 1065.125 is revised to read as follows:

§ 1065.125 Engine intake air.

(a) Use the intake-air system installed on the engine or one that represents a typical in-use configuration. This includes the charge-air cooling and exhaust gas recirculation systems.

(b) Measure temperature, humidity, and atmospheric pressure near the entrance to the engine's air filter, or at the inlet to the air intake system for engines that have no air filter. You may use a shared atmospheric pressure meter as long as your equipment for handling intake air maintains ambient pressure where you test the engine within ± 1 kPa of the shared atmospheric pressure. You may use a shared humidity measurement for intake air as long as your equipment for handling intake air maintains dewpoint where you test the engine to within ± 0.5 °C of the shared humidity measurement.

(c) Unless stated otherwise in the standard-setting part, maintain the temperature of intake air to (25 ± 5) °C, as measured upstream of any engine component.

(d) Use an intake-air restriction that represents production engines. Make sure the intake-air restriction is between the manufacturer's specified maximum for a clean filter and the manufacturer's specified maximum allowed. Measure the static differential pressure of the restriction at the location and at the speed and torque set points specified by the manufacturer. If the manufacturer does not specify a location, measure this pressure upstream of any turbocharger or exhaust gas recirculation system connection to the intake air system. If the manufacturer does not specify speed and torque points, measure this pressure while the engine outputs maximum power. As the manufacturer, you are liable for emission compliance for all values up to the maximum restriction you specify for a particular engine. (e) This paragraph (e) includes provisions for simulating charge-air cooling in the laboratory. This approach is described in paragraph (e)(1) of this section. Limits on using this approach are described in paragraphs (e)(2) and (3) of this section.

(1) Use a charge-air cooling system with a total intake-air capacity that represents production engines' in-use installation. Design any laboratory charge-air cooling system to minimize accumulation of condensate. Drain any accumulated condensate before emission testing. Modulate any condensate drain during an emission test as it would normally operate in use. Maintain coolant conditions as follows:

(i) Maintain a coolant temperature of at least 20 °C at the inlet to the charge-air cooler throughout testing.

(ii) At the engine conditions specified by the manufacturer, set the coolant flow rate to achieve an air temperature within ± 5 °C of the value specified by the manufacturer at the charge-air cooler's outlet. Measure the air-outlet temperature at the location specified by the manufacturer. Use this coolant flow rate set point throughout testing. If the engine manufacturer does not specify engine conditions or the corresponding charge-air cooler air outlet temperature, set the coolant flow rate at maximum engine power to achieve a charge-air cooler air outlet temperature that represents in-use operation.

(iii) If the engine manufacturer specifies pressure-drop limits across the charge-air cooling system, ensure that the pressure drop across the charge-air cooling system at engine conditions specified by the manufacturer is within the manufacturer's specified limit(s). Measure the pressure drop at the manufacturer's specified locations.

(2) The objective of this section is to produce emission results that are representative of in-use operation. If good engineering judgment indicates that the specifications in this section would result in unrepresentative testing (such as overcooling of the intake air), you may use more sophisticated setpoints and controls of charge-air pressure drop, coolant temperature, and flowrate to achieve more representative results.

(3) This approach does not apply for field testing. You may not correct measured emission levels from field testing to account for any differences caused by the simulated cooling in the laboratory.

27. Section 1065.130 is revised to read as follows:

§ 1065.130 Engine exhaust.

(a) *General.* Use the exhaust system installed with the engine or one that represents a typical in-use configuration. This includes any applicable aftertreatment devices.

(b) *Aftertreatment configuration.* If you do not use the exhaust system installed with the engine, configure any aftertreatment devices as follows:

(1) Position any aftertreatment device so its distance from the nearest exhaust manifold flange or turbocharger outlet is within the range specified by the engine manufacturer in the application for certification. If this distance is not specified, position aftertreatment devices to represent typical in-use vehicle configurations.

(2) You may use laboratory exhaust tubing upstream of any aftertreatment device that is of diameter(s) typical of in-use configurations. If you use laboratory exhaust tubing upstream of any aftertreatment device, position each aftertreatment device according to paragraph (b)(1) of this section.

(c) *Sampling system connections.*

Connect an engine's exhaust system to any raw sampling location or dilution stage, as follows:

(1) Minimize laboratory exhaust tubing lengths and use a total length of laboratory tubing of no more than 10 m or 50 outside diameters, whichever is greater. If laboratory exhaust tubing consists of several different outside tubing diameters, count the number of diameters of length of each individual diameter, then sum all the diameters to determine the total length of exhaust tubing in diameters. Use the mean outside diameter of any converging or diverging sections of tubing. Use outside hydraulic diameters of any noncircular sections.

(2) You may install short sections of flexible laboratory exhaust tubing at any location in the engine or laboratory exhaust systems. You may use up to a combined total of 2 m or 10 outside diameters of flexible exhaust tubing.

(3) Insulate any laboratory exhaust tubing downstream of the first 25 outside diameters of length.

(4) Use laboratory exhaust tubing materials that are smooth-walled, electrically conductive, and not reactive with exhaust constituents. Stainless steel is an acceptable material.

(5) We recommend that you use laboratory exhaust tubing that has either a wall thickness of less than 2 mm or is air gap-insulated to minimize temperature differences between the wall and the exhaust.

(6) We recommend that you connect multiple exhaust stacks from a single engine into one stack upstream of any emission sampling. To ensure mixing of the multiple exhaust streams before emission sampling, you may configure the exhaust system with turbulence generators, such as orifice plates or fins, to achieve good mixing. We recommend a minimum Reynolds number, $Re\#$, of 4000 for the combined exhaust stream, where $Re\#$ is based on the inside diameter of the single stack. $Re\#$ is defined in § 1065.640.

(d) *In-line instruments.* You may insert instruments into the laboratory exhaust tubing, such as an in-line smoke meter. If you do this, you may leave a length of up to 5 outside diameters of laboratory exhaust tubing uninsulated on each side of each instrument, but you must leave a length of no more than 25

outside diameters of laboratory exhaust tubing uninsulated in total, including any lengths adjacent to in-line instruments.

(e) *Leaks*. Minimize leaks sufficiently to ensure your ability to demonstrate compliance with the applicable standards. We recommend performing a chemical balance of fuel, intake air, and exhaust according to § 1065.655 to verify exhaust system integrity.

(f) *Grounding*. Electrically ground the entire exhaust system.

(g) *Forced cooldown*. You may install a forced cooldown system for an exhaust aftertreatment device according to § 1065.530(a)(1)(i).

(h) *Exhaust restriction*. As the manufacturer, you are liable for emission compliance for all values up to the maximum restriction(s) you specify for a particular engine. Measure and set exhaust restriction(s) at the location(s) and at the speed, torque and aftertreatment set points specified by the manufacturer. If the manufacturer does not specify any location, measure this pressure downstream of any turbocharger or exhaust gas recirculation system connection to the exhaust system. If the manufacturer does not specify speed and torque points, measure this pressure while the engine produces maximum power. Use an exhaust restriction setpoint that represents a typical in-use value, if available.

(1) If a typical in-use value for exhaust restriction is not available for exhaust systems with a fixed restriction, set the exhaust restriction at (80 to 100)% of the maximum exhaust restriction specified by the manufacturer, or if the maximum is 5 kPa or less, the set point must be no less than 1.0 kPa from the maximum. For example, if the maximum back pressure is 4.5 kPa, do not use an exhaust restriction set point that is less than 3.5 kPa.

(2) If a typical value for exhaust restriction is not available for exhaust systems with variable restriction, set the exhaust restriction between the maximum clean and dirty values specified by the manufacturer.

(i) *Open crankcase emissions*. If the standard-setting part requires measuring open crankcase emissions, you may either measure open crankcase emissions separately using a method that we approve in advance, or route open crankcase emissions directly into the exhaust system for emission measurement. If the engine is not already configured to route open crankcase emissions for emission measurement, route open crankcase emissions as follows:

(1) Use laboratory tubing materials that are smooth-walled, electrically conductive, and not reactive with crankcase emissions. Stainless steel is an acceptable material. Minimize tube lengths. We also recommend using heated or thin-walled or air gap-insulated tubing to minimize temperature differences between the wall and the crankcase emission constituents.

(2) Minimize the number of bends in the laboratory crankcase tubing and maximize the radius of any unavoidable bend.

(3) Use laboratory crankcase exhaust tubing that meets the engine manufacturer's specifications for crankcase back pressure.

(4) Connect the crankcase exhaust tubing into the raw exhaust downstream of any aftertreatment system, downstream of any installed exhaust restriction, and sufficiently upstream of any sample probes to ensure complete mixing with the engine's exhaust before sampling. Extend the crankcase exhaust tube into the free stream of exhaust to avoid boundary-layer effects and to promote mixing. You may orient the crankcase exhaust tube's outlet in any direction relative to the raw exhaust flow.

28. Section 1065.140 is revised to read as follows:

§ 1065.140 Dilution for gaseous and PM constituents.

(a) *General*. You may dilute exhaust with ambient air, synthetic air, or nitrogen. Note that the composition of the diluent affects some gaseous emission measurement instruments' response to emissions. We recommend diluting exhaust at a location as close as possible to the location where ambient air dilution would occur in use.

(b) *Dilution-air conditions and background concentrations*. Before a diluent is mixed with exhaust, you may precondition it by increasing or decreasing its temperature or humidity. You may also remove constituents to reduce their background concentrations. The following provisions apply to removing constituents or accounting for background concentrations:

(1) You may measure constituent concentrations in the diluent and compensate for background effects on test results. See § 1065.650 for calculations that compensate for background concentrations.

(2) Either measure these background concentrations the same way you measure diluted exhaust constituents, or measure them in a way that does not affect your ability to demonstrate compliance with the applicable

standards. For example, you may use the following simplifications for background sampling:

(i) You may disregard any proportional sampling requirements.

(ii) You may use unheated gaseous sampling systems.

(iii) You may use unheated PM sampling systems.

(iv) You may use continuous sampling if you use batch sampling for diluted emissions.

(v) You may use batch sampling if you use continuous sampling for diluted emissions.

(3) For removing background PM, we recommend that you filter all dilution air, including primary full-flow dilution air, with high-efficiency particulate air (HEPA) filters that have an initial minimum collection efficiency specification of 99.97% (see § 1065.1001 for procedures related to HEPA-filtration efficiencies). Ensure that HEPA filters are installed properly so that background PM does not leak past the HEPA filters. If you choose to correct for background PM without using HEPA filtration, demonstrate that the background PM in the dilution air contributes less than 50% to the net PM collected on the sample filter. You may correct net PM without restriction if you use HEPA filtration.

(c) *Full-flow dilution; constant-volume sampling (CVS)*. You may dilute the full flow of raw exhaust in a dilution tunnel that maintains a nominally constant volume flow rate, molar flow rate or mass flow rate of diluted exhaust, as follows:

(1) *Construction*. Use a tunnel with inside surfaces of 300 series stainless steel. Electrically ground the entire dilution tunnel. We recommend a thin-walled and insulated dilution tunnel to minimize temperature differences between the wall and the exhaust gases.

(2) *Pressure control*. Maintain static pressure at the location where raw exhaust is introduced into the tunnel within ± 1.2 kPa of atmospheric pressure. You may use a booster blower to control this pressure. If you test an engine using more careful pressure control and you show by engineering analysis or by test data that you require this level of control to demonstrate compliance at the applicable standards, we will maintain the same level of static pressure control when we test that engine.

(3) *Mixing*. Introduce raw exhaust into the tunnel by directing it downstream along the centerline of the tunnel. You may introduce a fraction of dilution air radially from the tunnel's inner surface to minimize exhaust interaction with the tunnel walls. You

may configure the system with turbulence generators such as orifice plates or fins to achieve good mixing. We recommend a minimum Reynolds number, $Re\#$, of 4000 for the diluted exhaust stream, where $Re\#$ is based on the inside diameter of the dilution tunnel. $Re\#$ is defined in § 1065.640.

(4) Flow measurement preconditioning. You may condition the diluted exhaust before measuring its flow rate, as long as this conditioning takes place downstream of any sample probes, as follows:

(i) You may use flow straighteners, pulsation dampeners, or both of these.

(ii) You may use a filter.

(iii) You may use a heat exchanger to control the temperature upstream of any flow meter. Note paragraph (c)(6) of this section regarding aqueous condensation.

(5) Flow measurement. Section 1065.240 describes measurement instruments for diluted exhaust flow.

(6) Aqueous condensation. To ensure that you measure a flow that corresponds to a measured concentration, you may either prevent aqueous condensation between the sample probe location and the flow meter inlet in the dilution tunnel or you may allow aqueous condensation to occur and then measure humidity at the flow meter inlet. Calculations in § 1065.645 and § 1065.650 account for either method of addressing humidity in the diluted exhaust. Note that preventing aqueous condensation involves more than keeping pure water in a vapor phase (see § 1065.1001).

(7) Flow compensation. Maintain nominally constant molar, volumetric or mass flow of diluted exhaust. You may maintain nominally constant flow by either maintaining the temperature and pressure at the flow meter or by directly controlling the flow of diluted exhaust. You may also directly control the flow of proportional samplers to maintain proportional sampling. For an individual test, validate proportional sampling as described in § 1065.545.

(d) *Partial-flow dilution (PFD)*. You may dilute a partial flow of raw or previously diluted exhaust before measuring emissions. Section 1065.240 describes PFD-related flow measurement instruments. PFD may consist of constant or varying dilution ratios as described in paragraphs (d)(2) and (3) of this section. An example of a constant dilution ratio PFD is a "secondary dilution PM" measurement system. An example of a varying dilution ratio PFD is a "bag mini-diluter" or BMD.

(1) *Applicability*. (i) You may use PFD to extract a proportional raw exhaust sample for any batch or continuous PM

emission sampling over any transient duty cycle, any steady-state duty cycle or any ramped-modal cycle (RMC).

(ii) You may use PFD to extract a proportional raw exhaust sample for any batch or continuous gaseous emission sampling over any transient duty cycle, any steady-state duty cycle or any ramped-modal cycle (RMC).

(iii) You may use PFD to extract a proportional raw exhaust sample for any batch or continuous field-testing.

(iv) You may use PFD to extract a proportional diluted exhaust sample from a CVS for any batch or continuous emission sampling.

(v) You may use PFD to extract a constant raw or diluted exhaust sample for any continuous emission sampling.

(vi) You may use PFD to extract a constant raw or diluted exhaust sample for any steady-state emission sampling.

(2) Constant dilution-ratio PFD. Do one of the following for constant dilution-ratio PFD:

(i) Dilute an already proportional flow. For example, you may do this as a way of performing secondary dilution from a CVS tunnel to achieve temperature control for PM sampling.

(ii) Continuously measure constituent concentrations. For example, you might dilute to precondition a sample of raw exhaust to control its temperature, humidity, or constituent concentrations upstream of continuous analyzers. In this case, you must take into account the dilution ratio before multiplying the continuous concentration by the sampled exhaust flow rate.

(iii) Extract a proportional sample from a separate constant dilution ratio PFD system. For example, you might use a variable-flow pump to proportionally fill a gaseous storage medium such as a bag from a PFD system. In this case, the proportional sampling must meet the same specifications as varying dilution ratio PFD in paragraph (d)(3) of this section.

(iv) For each mode of a discrete-mode test (such as a locomotive notch setting or a specific setting for speed and torque), use a constant dilution ratio for any batch or continuous sampling. You may change the dilution ratio between modes, but you must account for this change in dilution ratio in your emission calculations. Also, you may not sample emissions at the same time you are changing the dilution ratio from one constant dilution ratio to another.

(3) Varying dilution-ratio PFD. All the following provisions apply for varying dilution-ratio PFD:

(i) Use a control system with sensors and actuators that can maintain proportional sampling over intervals as short as 200 ms (i.e., 5 Hz control).

(ii) For control input, you may use any sensor output from one or more measurements; for example, intake-air flow, fuel flow, exhaust flow, engine speed, and intake manifold temperature and pressure.

(iii) Account for any emission transit time in the PFD system, as necessary.

(iv) You may use preprogrammed data if they have been determined for the specific test site, duty cycle, and test engine from which you dilute emissions.

(v) We recommend that you run practice cycles to meet the validation criteria in § 1065.545. Note that you must validate every emission test by meeting the validation criteria with the data from that specific test. Data from previously validated practice cycles or other tests may not be used to validate a different emission test.

(vi) You may not use a PFD system that requires preparatory tuning or calibration with a CVS or with the emission results from a CVS. Rather, you must be able to independently calibrate the PFD.

(e) *Dilution air temperature, dilution ratio, residence time, and temperature control*. Dilute PM samples at least once upstream of transfer lines. You may dilute PM samples upstream of a transfer line using full-flow dilution, or partial-flow dilution immediately downstream of a PM probe. Configure dilution systems as follows:

(1) Control dilution air temperature just upstream of the mixing zones to (25 ± 5) °C. We recommend controlling dilution air temperature to within a narrower tolerance of (25 ± 1) °C.

(2) Adjust the dilution system's dilution ratio for your particular engine and duty cycle to achieve a maximum dewpoint of the diluted exhaust of (20 ± 3) °C.

(3) Configure your dilution system to achieve a sample residence time of (1 to 5) seconds from the initial point at which dilution air was first introduced into the exhaust to the sample media. When calculating residence time, use an assumed flow temperature of 25 °C.

(4) Control inside wall temperature to a (42 to 52) °C tolerance, as measured anywhere within 20 cm upstream or downstream of the PM storage media (such as a filter). Measure this temperature with a bare-wire junction thermocouple with wires that are (0.500 ± 0.025) mm diameter, or with another suitable instrument that has equivalent performance. If heat must be rejected from the sample to meet this requirement, reject the heat after the point at which the last dilution air was introduced into the diluted exhaust and

reject as little heat as practical to meet this specification.

29. Section 1065.145 is revised to read as follows:

§ 1065.145 Gaseous and PM probes, transfer lines, and sampling system components.

(a) *Continuous and batch sampling.* Determine the total mass of each constituent with continuous or batch sampling, as described in § 1065.15(c)(2). Both types of sampling systems have probes, transfer lines, and other sampling system components that are described in this section.

(b) *Gaseous and PM sample probes.* A probe is the first fitting in a sampling system. It protrudes into a raw or diluted exhaust stream to extract a sample, such that its inside and outside surfaces are in contact with the exhaust. A sample is transported out of a probe into a transfer line, as described in paragraph (c) of this section. The following provisions apply to sample probes:

(1) *Probe design and construction.* Use sample probes with inside surfaces of 300 series stainless steel or, for raw exhaust sampling, use any nonreactive material capable of withstanding raw exhaust temperatures. Locate sample probes where constituents are mixed to their mean sample concentration. Take into account the mixing of any crankcase emissions that may be routed into the raw exhaust. Locate each probe to minimize interference with the flow to other probes. We recommend that all probes remain free from influences of boundary layers, wakes, and eddies—especially near the outlet of a raw-exhaust tailpipe where unintended dilution might occur. Make sure that purging or back-flushing of a probe does not influence another probe during testing. You may use a single probe to extract a sample of more than one constituent as long as the probe meets all the specifications for each constituent.

(2) *Probe installation on multi-stack engines.* We recommend combining multiple exhaust streams from multi-stack engines before emission sampling as described in § 1065.130(c)(6). If this is impractical, you may install symmetrical probes and transfer lines in each stack. In this case, each stack must be installed such that similar exhaust velocities are expected at each probe location. Use identical probe and transfer line diameters, lengths, and bends for each stack. Minimize the individual transfer line lengths, and manifold the individual transfer lines into a single transfer line to route the combined exhaust sample to analyzers

and/or batch samplers. For PM sampling the manifold design must merge the individual sample streams within 12.5° of the single sample stream's flow. Note that the manifold must meet the same specifications as the transfer line according to paragraph (c) of this section. If you use this probe configuration and you determine your exhaust flow rates with a chemical balance of exhaust gas concentrations and either intake air flow or fuel flow, then show by prior testing that the concentration of O₂ in each stack remains within 5% of the mean O₂ concentration throughout the entire duty cycle.

(3) *Gaseous sample probes.* Use either single-port or multi-port probes for sampling gaseous emissions. You may orient these probes in any direction relative to the raw or diluted exhaust flow. For some probes, you must control sample temperatures, as follows:

(i) For probes that extract NO_x from diluted exhaust, control the probe's wall temperature to prevent aqueous condensation.

(ii) For probes that extract hydrocarbons for NMHC or NMHCE analysis from the diluted exhaust of compression-ignition engines, 2-stroke spark-ignition engines, or 4-stroke spark-ignition engines below 19 kW, maintain a probe wall temperature tolerance of (191 ± 11) °C.

(4) *PM sample probes.* Use PM probes with a single opening at the end. Orient PM probes to face directly upstream. If you shield a PM probe's opening with a PM pre-classifier such as a hat, you may not use the preclassifier we specify in paragraph (e)(1) of this section. We recommend sizing the inside diameter of PM probes to approximate isokinetic sampling at the expected mean flow rate.

(c) *Transfer lines.* You may use transfer lines to transport an extracted sample from a probe to an analyzer, storage medium, or dilution system. Minimize the length of all transfer lines by locating analyzers, storage media, and dilution systems as close to probes as practical. We recommend that you minimize the number of bends in transfer lines and that you maximize the radius of any unavoidable bend. Avoid using 90° elbows, tees, and cross-fittings in transfer lines. Where such connections and fittings are necessary, take steps, using good engineering judgment, to ensure that you meet the temperature tolerances in this paragraph (c). This may involve measuring temperature at various locations within transfer lines and fittings. You may use a single transfer line to transport a sample of more than one constituent, as

long as the transfer line meets all the specifications for each constituent. The following construction and temperature tolerances apply to transfer lines:

(1) *Gaseous samples.* Use transfer lines with inside surfaces of 300 series stainless steel, PTFE, Viton™, or any other material that you demonstrate has better properties for emission sampling. For raw exhaust sampling, use a non-reactive material capable of withstanding raw exhaust temperatures. You may use in-line filters if they do not react with exhaust constituents and if the filter and its housing meet the same temperature requirements as the transfer lines, as follows:

(i) For NO_x transfer lines upstream of either an NO₂-to-NO converter that meets the specifications of § 1065.378 or a chiller that meets the specifications of § 1065.376, maintain a sample temperature that prevents aqueous condensation.

(ii) For THC transfer lines for testing compression-ignition engines, 2-stroke spark-ignition engines, or 4-stroke spark-ignition engines below 19 kW, maintain a wall temperature tolerance throughout the entire line of (191 ± 11) °C. If you sample from raw exhaust, you may connect an unheated, insulated transfer line directly to a probe. Design the length and insulation of the transfer line to cool the highest expected raw exhaust temperature to no lower than 191 °C, as measured at the transfer line's outlet.

(2) *PM samples.* We recommend heated transfer lines or a heated enclosure to minimize temperature differences between transfer lines and exhaust constituents. Use transfer lines that are inert with respect to PM and are electrically conductive on the inside surfaces. We recommend using PM transfer lines made of 300 series stainless steel. Electrically ground the inside surface of PM transfer lines.

(d) *Optional sample-conditioning components for gaseous sampling.* You may use the following sample-conditioning components to prepare gaseous samples for analysis, as long as you do not install or use them in a way that adversely affects your ability to show that your engines comply with all applicable gaseous emission standards.

(1) *NO₂-to-NO converter.* You may use an NO₂-to-NO converter that meets the efficiency-performance check specified in § 1065.378 at any point upstream of a NO_x analyzer, sample bag, or other storage medium.

(2) *Sample dryer.* You may use either type of sample dryer described in this paragraph (d)(2) to decrease the effects of water on gaseous emission measurements. You may not use a

chemical dryer, or use dryers upstream of PM sample filters.

(i) *Osmotic-membrane*. You may use an osmotic-membrane dryer upstream of any gaseous analyzer or storage medium, as long as it meets the temperature specifications in paragraph (c)(1) of this section. Because osmotic-membrane dryers may deteriorate after prolonged exposure to certain exhaust constituents, consult with the membrane manufacturer regarding your application before incorporating an osmotic-membrane dryer. Monitor the dewpoint, T_{dew} , and absolute pressure, p_{total} , downstream of an osmotic-membrane dryer. You may use continuously recorded values of T_{dew} and p_{total} in the amount of water calculations specified in § 1065.645. If you do not continuously record these values, you may use their peak values observed during a test or their alarm setpoints as constant values in the calculations specified in § 1065.645. You may also use a nominal p_{total} , which you may estimate as the dryer's lowest absolute pressure expected during testing.

(ii) *Thermal chiller*. You may use a thermal chiller upstream of some gas analyzers and storage media. You may not use a thermal chiller upstream of a THC measurement system for compression-ignition engines, 2-stroke spark-ignition engines, or 4-stroke spark-ignition engines below 19 kW. If you use a thermal chiller upstream of an NO₂-to-NO converter or in a sampling system without an NO₂-to-NO converter, the chiller must meet the NO₂ loss-performance check specified in § 1065.376. Monitor the dewpoint, T_{dew} , and absolute pressure, p_{total} , downstream of a thermal chiller. You may use continuously recorded values of T_{dew} and p_{total} in the emission calculations specified in § 1065.650. If you do not continuously record these values, you may use the maximum temperature and minimum pressure values observed during a test or the high alarm temperature setpoint and the low alarm pressure setpoint as constant values in the amount of water calculations specified in § 1065.645. You may also use a nominal p_{total} , which you may estimate as the dryer's lowest absolute pressure expected during testing. If it is valid to assume the degree of saturation in the thermal chiller, you may calculate T_{dew} based on the known chiller efficiency and continuous monitoring of chiller temperature, $T_{chiller}$. If you do not continuously record values of $T_{chiller}$, you may use its peak value observed during a test, or its alarm setpoint, as a constant value to determine a constant

amount of water according to § 1065.645. If it is valid to assume that $T_{chiller}$ is equal to T_{dew} , you may use $T_{chiller}$ in lieu of T_{dew} according to § 1065.645. If it is valid to assume a constant temperature offset between $T_{chiller}$ and T_{dew} , due to a known and fixed amount of sample reheat between the chiller outlet and the temperature measurement location, you may factor in this assumed temperature offset value into emission calculations. If we ask for it, you must show by engineering analysis or by data the validity of any assumptions allowed by this paragraph (d)(2)(ii).

(3) *Sample pumps*. You may use sample pumps upstream of an analyzer or storage medium for any gas. Use sample pumps with inside surfaces of 300 series stainless steel, PTFE, or any other material that you demonstrate has better properties for emission sampling. For some sample pumps, you must control temperatures, as follows:

(i) If you use a NO_x sample pump upstream of either an NO₂-to-NO converter that meets § 1065.378 or a chiller that meets § 1065.376, it must be heated to prevent aqueous condensation.

(ii) For testing compression-ignition engines, 2-stroke spark-ignition engines, or 4-stroke compression ignition engines below 19 kW, if you use a THC sample pump upstream of a THC analyzer or storage medium, its inner surfaces must be heated to a tolerance of $(191 \pm 11) ^\circ\text{C}$.

(e) *Optional sample-conditioning components for PM sampling*. You may use the following sample-conditioning components to prepare PM samples for analysis, as long as you do not install or use them in a way that adversely affects your ability to show that your engines comply with the applicable PM emission standards. You may condition PM samples to minimize positive and negative biases to PM results, as follows:

(1) *PM preclassifier*. You may use a PM preclassifier to remove large-diameter particles. The PM preclassifier may be either an inertial impactor or a cyclonic separator. It must be constructed of 300 series stainless steel. The preclassifier must be rated to remove at least 50% of PM at an aerodynamic diameter of 10 μm and no more than 1% of PM at an aerodynamic diameter of 1 μm over the range of flow rates for which you use it. Follow the preclassifier manufacturer's instructions for any periodic servicing that may be necessary to prevent a buildup of PM. Install the preclassifier in the dilution system downstream of the last dilution stage. Configure the preclassifier outlet with a means of bypassing any PM sample media so the preclassifier flow

may be stabilized before starting a test. Locate PM sample media within 75 cm downstream of the preclassifier's exit. You may not use this preclassifier if you use a PM probe that already has a preclassifier. For example, if you use a hat-shaped preclassifier that is located immediately upstream of the probe in such a way that it forces the sample flow to change direction before entering the probe, you may not use any other preclassifier in your PM sampling system.

(2) *Other components*. You may request to use other PM conditioning components upstream of a PM preclassifier, such as components that condition humidity or remove gaseous-phase hydrocarbons from the diluted exhaust stream. You may use such components only if we approve them under § 1065.10.

30. Section 1065.170 is amended by revising the introductory text and paragraphs (a) and (c)(1) to read as follows:

§ 1065.170 Batch sampling for gaseous and PM constituents.

Batch sampling involves collecting and storing emissions for later analysis. Examples of batch sampling include collecting and storing gaseous emissions in a bag or collecting and storing PM on a filter. You may use batch sampling to store emissions that have been diluted at least once in some way, such as with CVS, PFD, or BMD. You may use batch-sampling to store undiluted emissions.

(a) *Sampling methods*. If you extract from a constant-volume flow rate, sample at a constant-volume flow rate. If you extract from a varying flow rate, vary the sample rate in proportion to the varying flow rate. Validate proportional sampling after an emission test as described in § 1065.545. Use storage media that do not significantly change measured emission levels (either up or down). For example, do not use sample bags for storing emissions if the bags are permeable with respect to emissions or if they offgas emissions to the extent that it affects your ability to demonstrate compliance with the applicable gaseous emission standards. As another example, do not use PM filters that irreversibly absorb or adsorb gases to the extent that it affects your ability to demonstrate compliance with the applicable PM emission standard.

* * * * *

(c) * * *

(1) If you use filter-based sampling media to extract and store PM for measurement, your procedure must meet the following specifications:

(i) If you expect that a filter's total surface concentration of PM will exceed

0.473 µg/mm² for a given test interval, you may use filter media with a minimum initial collection efficiency of 98%; otherwise you must use a filter media with a minimum initial collection efficiency of 99.7%. Collection efficiency must be measured as described in ASTM D 2986-95a (incorporated by reference in § 1065.1010), though you may rely on the sample-media manufacturer's measurements reflected in their product ratings to show that you meet this requirement.

(ii) The filter must be circular, with an overall diameter of 46.50 ± 0.6 mm and an exposed diameter of at least 38 mm. See the cassette specifications in paragraph (c)(1)(vii) of this section.

(iii) We highly recommend that you use a pure PTFE filter material that does not have any flow-through support bonded to the back and has an overall thickness of 40 ± 20 µm. An inert polymer ring may be bonded to the periphery of the filter material for support and for sealing between the filter cassette parts. We consider Polymethylpentene (PMP) and PTFE inert materials for a support ring, but other inert materials may be used. See the cassette specifications in paragraph (c)(1)(vii) of this section. We allow the use of PTFE-coated glass fiber filter material, as long as this filter media selection does not affect your ability to demonstrate compliance with the applicable standards, which we base on a pure PTFE filter material. Note that we will use pure PTFE filter material for compliance testing, and we may require you to use pure PTFE filter material for any compliance testing we require, such as for selective enforcement audits.

(iv) You may request to use other filter materials or sizes under the provisions of § 1065.10.

(v) To minimize turbulent deposition and to deposit PM evenly on a filter, use a 12.5° (from center) divergent cone angle to transition from the transfer-line inside diameter to the exposed diameter of the filter face. Use 300 series stainless steel for this transition.

(vi) Maintain sample velocity at the filter face at or below 100 cm/s, where filter face velocity is the measured volumetric flow rate of the sample at the pressure and temperature upstream of the filter face, divided by the filter's exposed area.

(vii) Use a clean cassette designed to the specifications of Figure 1 of § 1065.170 and made of any of the following materials: Delrin™, 300 series stainless steel, polycarbonate, acrylonitrile-butadiene-styrene (ABS) resin, or conductive polypropylene. We recommend that you keep filter

cassettes clean by periodically washing or wiping them with a compatible solvent applied using a lint-free cloth. Depending upon your cassette material, ethanol (C₂H₅OH) might be an acceptable solvent. Your cleaning frequency will depend on your engine's PM and HC emissions.

(viii) If you store filters in cassettes in an automatic PM sampler, cover or seal individual filter cassettes after sampling to prevent communication of semi-volatile matter from one filter to another.

* * * * *

31. Section 1065.190 is amended by revising paragraphs (e) and (g)(6) to read as follows:

§ 1065.190 PM-stabilization and weighing environments for gravimetric analysis.

* * * * *

(e) Verify the following ambient conditions using measurement instruments that meet the specifications in subpart C of this part:

(1) Continuously measure dewpoint and ambient temperature. Use these values to determine if the stabilization and weighing environments have remained within the tolerances specified in paragraph (d) of this section for at least 60 min before weighing filters. We recommend that you provide an interlock that automatically prevents the balance from reporting values if either of the environments have not been within the applicable tolerances for the past 60 min.

(2) Continuously measure atmospheric pressure within the weighing environment. You may use a shared atmospheric pressure meter as long as you can show that your ventilation system for the weighing environment maintains ambient pressure at the balance within ±100 Pa of the shared atmospheric pressure meter. Provide a means to record the most recent atmospheric pressure when you weigh each PM sample. Use this value to calculate the PM buoyancy correction in § 1065.690.

* * * * *

(g) * * *

(6) We recommend that you neutralize PM sample media to within ±2.0 V of neutral. Measure static voltages as follows:

(i) Measure static voltage of PM sample media according to the electrostatic voltmeter manufacturer's instructions.

(ii) Measure static voltage of PM sample media while the media is at least 15 cm away from any grounded surfaces to avoid mirror image charge interference.

32. Section 1065.195 is amended by revising paragraph (c)(4) to read as follows:

§ 1065.195 PM-stabilization environment for in-situ analyzers.

* * * * *

(c) * * *

(4) *Absolute pressure.* Use good engineering judgment to maintain a tolerance of absolute pressure if your PM measurement instrument requires it.

* * * * *

Subpart C—[Amended]

33. Section 1065.201 is amended by revising paragraphs (a), (b), and (d) and adding paragraph (h) to read as follows:

§ 1065.201 Overview and general provisions.

(a) *Scope.* This subpart specifies measurement instruments and associated system requirements related to emission testing in a laboratory or similar environment and in the field. This includes laboratory instruments and portable emission measurement systems (PEMS) for measuring engine parameters, ambient conditions, flow-related parameters, and emission concentrations.

(b) *Instrument types.* You may use any of the specified instruments as described in this subpart to perform emission tests. If you want to use one of these instruments in a way that is not specified in this subpart, or if you want to use a different instrument, you must first get us to approve your alternate procedure under § 1065.10. Where we specify more than one instrument for a particular measurement, we may identify which instrument serves as the reference for comparing with an alternate procedure.

* * * * *

(d) *Redundant systems.* For all measurement instruments described in this subpart, you may use data from multiple instruments to calculate test results for a single test. If you use redundant systems, use good engineering judgment to use multiple measured values in calculations or to disregard individual measurements. Note that you must keep your results from all measurements, as described in § 1065.25. This requirement applies whether or not you actually use the measurements in your calculations.

* * * * *

(h) *Recommended practices.* This subpart identifies a variety of recommended but not required practices for proper measurements. We believe in most cases it is necessary to follow these recommended practices for accurate and

repeatable measurements and we intend to follow them as much as possible for our testing. However, we do not specifically require you to follow these recommended practices to perform a valid test, as long as you meet the required calibrations and verifications of measurement systems specified in subpart D of this part.

34. Section 1065.210 is amended by revising paragraph (a) before the figure to read as follows:

§ 1065.210 Work input and output sensors.

(a) *Application.* Use instruments as specified in this section to measure work inputs and outputs during engine operation. We recommend that you use sensors, transducers, and meters that meet the specifications in Table 1 of § 1065.205. Note that your overall systems for measuring work inputs and outputs must meet the linearity verifications in § 1065.307. We recommend that you measure work inputs and outputs where they cross the system boundary as shown in Figure 1 of § 1065.210. The system boundary is different for air-cooled engines than for liquid-cooled engines. If you choose to measure work before or after a work conversion, relative to the system boundary, use good engineering judgment to estimate any work-conversion losses in a way that avoids overestimation of total work. For example, if it is impractical to instrument the shaft of an exhaust turbine generating electrical work, you may decide to measure its converted electrical work. As another example, you may decide to measure the tractive (*i.e.*, electrical output) power of a locomotive, rather than the brake power of the locomotive engine. In these cases, divide the electrical work by accurate values of electrical generator efficiency ($\eta < 1$), or assume an efficiency of 1 ($\eta = 1$), which would overestimate brake-specific emissions. For the example of using locomotive tractive power with a generator efficiency of 1 ($\eta = 1$), this means using the tractive power as the brake power in emission calculations. Do not underestimate any work conversion efficiencies for any components outside the system boundary that do not return work into the system boundary. And do not overestimate any work conversion efficiencies for components outside the system boundary that do return work

into the system boundary. In all cases, ensure that you are able to accurately demonstrate compliance with the applicable standards.

* * * * *

35. Section 1065.215 is amended by revising paragraph (e) to read as follows:

§ 1065.215 Pressure transducers, temperature sensors, and dewpoint sensors.

* * * * *

(e) *Dewpoint.* For PM-stabilization environments, we recommend chilled-surface hygrometers, which include chilled mirror detectors and chilled surface acoustic wave (SAW) detectors. For other applications, we recommend thin-film capacitance sensors. You may use other dewpoint sensors, such as a wet-bulb/dry-bulb psychrometer, where appropriate.

36. Section 1065.220 is amended by revising paragraph (d) to read as follows:

§ 1065.220 Fuel flow meter.

* * * * *

(d) *Flow conditioning.* For any type of fuel flow meter, condition the flow as needed to prevent wakes, eddies, circulating flows, or flow pulsations from affecting the accuracy or repeatability of the meter. You may accomplish this by using a sufficient length of straight tubing (such as a length equal to at least 10 pipe diameters) or by using specially designed tubing bends, straightening fins, or pneumatic pulsation dampeners to establish a steady and predictable velocity profile upstream of the meter. Condition the flow as needed to prevent any gas bubbles in the fuel from affecting the fuel meter.

37. Section 1065.265 is amended by revising paragraph (c) to read as follows:

§ 1065.265 Nonmethane cutter.

* * * * *

(c) *Configuration.* Configure the nonmethane cutter with a bypass line if it is needed for the verification described in § 1065.365.

* * * * *

38. Section 1065.270 is amended by revising paragraph (c) to read as follows:

§ 1065.270 Chemiluminescent detector.

* * * * *

(c) *NO₂-to-NO converter.* Place upstream of the CLD an internal or

external NO₂-to-NO converter that meets the verification in § 1065.378. Configure the converter with a bypass line if it is needed to facilitate this verification.

* * * * *

39. Section 1065.280 is revised to read as follows:

§ 1065.280 Paramagnetic and magnetopneumatic O₂ detection analyzers.

(a) *Application.* You may use a paramagnetic detection (PMD) or magnetopneumatic detection (MPD) analyzer to measure O₂ concentration in raw or diluted exhaust for batch or continuous sampling. You may use O₂ measurements with intake air or fuel flow measurements to calculate exhaust flow rate according to § 1065.650.

(b) *Component requirements.* We recommend that you use a PMD or MPD analyzer that meets the specifications in Table 1 of § 1065.205. Note that it must meet the linearity verification in § 1065.307. You may use a PMD or MPD that has compensation algorithms that are functions of other gaseous measurements and the engine's known or assumed fuel properties. The target value for any compensation algorithm is 0.0% (that is, no bias high and no bias low), regardless of the uncompensated signal's bias.

40. Section 1065.290 is amended by revising paragraph (c)(1) to read as follows:

§ 1065.290 PM gravimetric balance.

* * * * *

(c) * * *

(1) Use a pan that centers the PM sample media (such as a filter) on the weighing pan. For example, use a pan in the shape of a cross that has upswept tips that center the PM sample media on the pan.

* * * * *

Subpart D—[Amended]

41. Section 1065.303 is revised to read as follows:

§ 1065.303 Summary of required calibration and verifications

The following table summarizes the required and recommended calibrations and verifications described in this subpart and indicates when these have to be performed:

TABLE 1 OF § 1065.303.—SUMMARY OF REQUIRED CALIBRATION AND VERIFICATIONS

Type of calibration or verification	Minimum frequency ^a
§ 1065.305: Accuracy, repeatability and noise ...	Accuracy: Not required, but recommended for initial installation. Repeatability: Not required, but recommended for initial installation. Noise: Not required, but recommended for initial installation.
§ 1065.307: Linearity	Speed: Upon initial installation, within 370 days before testing and after major maintenance. Torque: Upon initial installation, within 370 days before testing and after major maintenance. Electrical power: Upon initial installation, within 370 days before testing and after major maintenance. Clean gas and diluted exhaust flows: Upon initial installation, within 370 days before testing and after major maintenance, unless flow is verified by propane check or by carbon or oxygen balance. Raw exhaust flow: Upon initial installation, within 185 days before testing and after major maintenance, unless flow is verified by propane check or by carbon or oxygen balance. Gas analyzers: Upon initial installation, within 35 days before testing and after major maintenance. PM balance: Upon initial installation, within 370 days before testing and after major maintenance. Stand-alone pressure and temperature: Upon initial installation, within 370 days before testing and after major maintenance.
§ 1065.308: Continuous analyzer system response and recording.	Upon initial installation, after system reconfiguration, and after major maintenance.
§ 1065.309: Continuous analyzer uniform response.	Upon initial installation, after system reconfiguration, and after major maintenance.
§ 1065.310: Torque	Upon initial installation and after major maintenance.
§ 1065.315: Pressure, temperature, dewpoint	Upon initial installation and after major maintenance.
§ 1065.320: Fuel flow	Upon initial installation and after major maintenance.
§ 1065.325: Intake flow	Upon initial installation and after major maintenance.
§ 1065.330: Exhaust flow	Upon initial installation and after major maintenance.
§ 1065.340: Diluted exhaust flow (CVS)	Upon initial installation and after major maintenance.
§ 1065.341: CVS sampler and batch verification	Upon initial installation, within 35 days before testing, and after major maintenance.
§ 1065.345: Vacuum leak	Before each laboratory test according to subpart F of this part and before each field test according to subpart J of this part.
§ 1065.350: CO ₂ NDIR H ₂ O interference	Upon initial installation and after major maintenance.
§ 1065.355: CO NDIR CO ₂ and H ₂ O interference.	Upon initial installation and after major maintenance.
§ 1065.360: FID calibration THC FID optimization, and THC FID verification.	Calibrate all FID analyzers: Upon initial installation and after major maintenance. Optimize and determine CH ₄ response for THC FID analyzers: Upon initial installation and after major maintenance. Verify CH ₄ response for THC FID analyzers: Upon initial installation, within 185 days before testing, and after major maintenance.
§ 1065.362: Raw exhaust FID O ₂ interference ...	For all FID analyzers: Upon initial installation, after major maintenance. For THC FID analyzers: Upon initial installation, after major maintenance, and after FID optimization according to § 1065.360.
§ 1065.365: Nonmethane cutter penetration	Upon initial installation, within 185 days before testing, and after major maintenance.
§ 1065.370: CLD CO ₂ and H ₂ O quench	Upon initial installation and after major maintenance.
§ 1065.372: NDUV HC and H ₂ O interference	Upon initial installation and after major maintenance.
§ 1065.376: Chiller NO ₂ penetration	Upon initial installation and after major maintenance.
§ 1065.378: NO ₂ -to-NO converter conversion	Upon initial installation, within 35 days before testing, and after major maintenance.
§ 1065.390: PM balance and weighing	Independent verification: Upon initial installation, within 370 days before testing, and after major maintenance. Zero, span, and reference sample verifications: Within 12 hours of weighing, and after major maintenance.
§ 1065.395: Inertial PM balance and weighing ...	Independent verification: Upon initial installation, within 370 days before testing, and after major maintenance. Other verifications: Upon initial installation and after major maintenance.

^a Perform calibrations and verifications more frequently, according to measurement system manufacturer instructions and good engineering judgment.

42. Section 1065.305 is amended by revising paragraphs (d)(4) and (d)(8) to read as follows:

§ 1065.305 Verifications for accuracy, repeatability, and noise.

* * * * *

(d) * * *
(4) Use the instrument to quantify a NIST-traceable reference quantity, γ_{ref} . For gas analyzers the reference gas must meet the specifications of § 1065.750.

Select a reference quantity near the mean value expected during testing. For all gas analyzers, use a quantity near the flow-weighted mean concentration expected at the standard or expected during testing, whichever is greater. For a noise verification, use the same zero gas from paragraph (e) of this section as the reference quantity. In all cases, allow time for the instrument to stabilize while it measures the reference

quantity. Stabilization time may include time to purge an instrument and time to account for its response.

* * * * *

(8) Repeat the steps specified in paragraphs (d)(2) through (7) of this section until you have ten arithmetic means ($\bar{y}_1, \bar{y}_2, \bar{y}_i, \dots, \bar{y}_{10}$), ten standard deviations, ($\sigma_1, \sigma_2, \sigma_i, \dots, \sigma_{10}$), and ten errors ($\epsilon_1, \epsilon_2, \epsilon_i, \dots, \epsilon_{10}$).

* * * * *

43. Section 1065.307 is amended by revising paragraphs (b) and (c)(6), adding paragraph (d)(8) and revising Table 1 to read as follows:

§ 1065.307 Linearity verification.

* * * * *

(b) *Performance requirements.* If a measurement system does not meet the applicable linearity criteria in Table 1 of this section, correct the deficiency by recalibrating, servicing, or replacing components as needed. Repeat the linearity verification after correcting the deficiency to ensure that the measurement system meets the linearity criteria. Before you may use a measurement system that does not meet linearity criteria, you must demonstrate to us that the deficiency does not adversely affect your ability to

demonstrate compliance with the applicable standards.

(c) * * *
 (6) For all measured quantities except temperature, use instrument manufacturer recommendations and good engineering judgment to select at least 10 reference values, y_{refi} , that are within the range from zero to the highest values expected during emission testing. We recommend selecting a zero reference signal as one of the reference values of the linearity verification. For temperature linearity verifications, we recommend three to five reference values.

* * * * *
 (13) Use the arithmetic means, \bar{y}_i , and reference values, y_{refi} , to calculate least-squares linear regression parameters and statistical values to compare to the

minimum performance criteria specified in Table 1 of this section. Use the calculations described in § 1065.602. Using good engineering judgment, you may weight the results of individual data pairs (i.e., (y_{refi}, \bar{y}_i)), in the linear regression calculations.

(d) * * *
 (8) *Analog-to-digital conversion of stand-alone temperature signals.* For reference values, select a temperature signal calibrator to simultaneously simulate and measure an analog signal similar to your temperature sensor(s). Analog signals may include voltage, current, resistance, frequency, and pulse signals. Use a calibrator that is independently linearized and cold-junction compensated, as necessary, and is NIST-traceable within $\pm 0.5\%$ uncertainty.

TABLE 1 OF § 1065.307.—MEASUREMENT SYSTEMS THAT REQUIRE LINEARITY VERIFICATIONS

Measurement system	Quantity	Minimum verification frequency ^a	Linearity criteria			
			$ a_0 $ ^b	a_1 ^c	SEE ^b	r^2
Engine speed	f_n	Within 370 days before testing	$\leq 0.05\%$ f_{nmax}	0.98–1.02	$\leq 2\% f_{nmax}$	≥ 0.990
Engine torque	T	Within 370 days before testing	$\leq 1\% \cdot T_{max}$	0.98–1.02	$\leq 2\% T_{max}$	≥ 0.990
Electrical work	W	Within 370 days before testing	$\leq 1\% \cdot T_{max}$	0.98–1.02	$\leq 2\% T_{max}$	≥ 0.990
Fuel flow rate	\dot{m}	Within 370 days before testing ^d	$\leq 1\% \cdot \dot{m}_{max}$	0.98–1.02 ^e	$\leq 2\% \cdot \dot{m}_{max}$	≥ 0.990
Intake-air flow rate	\dot{n}	Within 370 days before testing ^d	$\leq 1\% \cdot \dot{n}_{max}$	0.98–1.02 ^e	$\leq 2\% \cdot \dot{n}_{max}$	≥ 0.990
Dilution air flow rate	\dot{n}	Within 370 days before testing ^d	$\leq 1\% \cdot \dot{n}_{max}$	0.98–1.02	$\leq 2\% \cdot \dot{n}_{max}$	≥ 0.990
Diluted exhaust flow rate	\dot{n}	Within 370 days before testing ^d	$\leq 1\% \cdot \dot{n}_{max}$	0.98–1.02	$\leq 2\% \cdot \dot{n}_{max}$	≥ 0.990
Raw exhaust flow rate	\dot{n}	Within 185 days before testing ^d	$\leq 1\% \cdot \dot{n}_{max}$	0.98–1.02 ^e	$\leq 2\% \cdot \dot{n}_{max}$	≥ 0.990
Batch sampler flow rates	\dot{n}	Within 370 days before testing ^d	$\leq 1\% \cdot \dot{n}_{max}$	0.98–1.02	$\leq 2\% \cdot \dot{n}_{max}$	≥ 0.990
Gas dividers	x	Within 370 days before testing	$\leq 0.5\%$ $\cdot X_{max}$	0.98–1.02	$\leq 2\% \cdot X_{max}$	≥ 0.990
All gas analyzers	x	Within 35 days before testing	$\leq 1\% \cdot X_{max}$	0.99–1.01	$\leq 1\% \cdot X_{max}$	≥ 0.998
PM balance	m	Within 370 days before testing	$\leq 1\% \cdot m_{max}$	0.99–1.01	$\leq 1\% \cdot m_{max}$	≥ 0.998
Stand-alone pressures	p	Within 370 days before testing	$\leq 1\% \cdot p_{max}$	0.99–1.01	$\leq 1\% \cdot p_{max}$	≥ 0.998
Analog-to-digital conversion of stand-alone temperature signals.	$\cdot T$	Within 370 days before testing	$\leq 1\% \cdot T_{max}$	0.99–1.01	$\leq 1\% \cdot T_{max}$	≥ 0.998

^a Perform a linearity verification more frequently if the instrument manufacturer recommends it or based on good engineering judgment.
^b "max." refers to the peak value expected during testing or at the applicable standard over any test interval, whichever is greater.
^c The specified ranges are inclusive. For example, a specified range of 0.98–1.02 for a_1 means $0.98 \leq a_1 \leq 1.02$.
^d These linearity verifications are not required for systems that pass the flow-rate verification for diluted exhaust as described in § 1065.341 (the propane check) or for systems that agree within $\pm 2\%$ based on a chemical balance of carbon or oxygen of the intake air, fuel, and exhaust.
^e a_1 criteria for these quantities must be met only if the absolute value of the quantity is required, as opposed to a signal that is only linearly proportional to the actual value.

44. Section 1065.308 is revised to read as follows:

§ 1065.308 Continuous gas analyzer system-response and updating-recording verification.

(a) *Scope and frequency.* Perform this verification after installing or replacing a gas analyzer that you use for continuous sampling. Also perform this verification if you reconfigure your system in a way that would change system response. For example, perform this verification if you add a significant volume to the transfer lines by increasing their length or adding a filter; or if you change the frequency at which you sample and record gas-analyzer

concentrations. You do not have to perform this verification for gas analyzer systems used only for discrete-mode testing.

(b) *Measurement principles.* This test verifies that the updating and recording frequencies match the overall system response to a rapid change in the value of concentrations at the sample probe. Gas analyzer systems must be optimized such that their overall response to a rapid change in concentration is updated and recorded at an appropriate frequency to prevent loss of information. This test also verifies that continuous gas analyzer systems meet a minimum response time.

(c) *System requirements.* To demonstrate acceptable updating and recording with respect to the system's overall response, use good engineering judgment to select one of the following criteria that your system must meet:

- (1) The product of the mean rise time and the frequency at which the system records an updated concentration must be at least 5, and the product of the mean fall time and the frequency at which the system records an updated concentration must be at least 5. These criteria make no assumption regarding the frequency content of changes in emission concentrations during emission testing; therefore, it is valid for

any testing. In any case the mean rise time and the mean fall time must be no more than 10 seconds.

(2) The frequency at which the system records an updated concentration must be at least 5 Hz. This criteria assumes that the frequency content of significant changes in emission concentrations during emission testing do not exceed 1 Hz. In any case the mean rise time and the mean fall time must be no more than 10 seconds.

(3) You may use other criteria if we approve the criteria in advance.

(4) For PEMS, you do not have to meet this criteria if your PEMS meets the overall PEMS check in § 1065.920.

(d) *Procedure.* Use the following procedure to verify the response of a continuous gas analyzer system:

(1) *Instrument setup.* Follow the analyzer system manufacturer's start-up and operating instructions. Adjust the system as needed to optimize performance.

(2) *Equipment setup.* Using minimal gas transfer line lengths between all connections, connect a zero-air source to one inlet of a fast-acting 3-way valve (2 inlets, 1 outlet). Using a gas divider, equally blend an NO-CO-CO₂-C₃H₈-CH₄, balance N₂ span gas with a span gas of NO₂, balance N₂. Connect the gas divider outlet to the other inlet of the 3-way valve. Connect the valve outlet to an overflow at the gas analyzer system's probe or to an overflow fitting between the probe and transfer line to all the analyzers being verified. Note that you may omit any of these gas constituents if they are not relevant to your analyzers for this verification.

(3) *Data collection.* (i) Switch the valve to flow zero gas.

(ii) Allow for stabilization, accounting for transport delays and the slowest instrument's full response.

(iii) Start recording data at the frequency used during emission testing. Each recorded value must be a unique updated concentration measured by the analyzer; you may not use interpolation to increase the number of recorded values.

(iv) Switch the valve to flow the blended span gases.

(v) Allow for transport delays and the slowest instrument's full response.

(vi) Repeat the steps in paragraphs (d)(3)(i) through (v) of this section to record seven full cycles, ending with zero gas flowing to the analyzers.

(vii) Stop recording.

(e) *Performance evaluation.* (1) If you chose to demonstrate compliance with paragraph (c)(1) of this section, use the data from paragraph (d)(3) of this section to calculate the mean rise time, t_{10-90} , and mean fall time, t_{90-10} , for each

of the analyzers. Multiply these times (in seconds) by their respective recording frequencies in Hertz (1/second). The value for each result must be at least 5. If the value is less than 5, increase the recording frequency or adjust the flows or design of the sampling system to increase the rise time and fall time as needed. You may also configure digital filters to increase rise and fall times. The mean rise time and mean fall time must be no greater than 10 seconds.

(2) If a measurement system fails the criterion in paragraph (e)(1) of this section, ensure that signals from the system are updated and recorded at a frequency of at least 5 Hz. In any case, the mean rise time and mean fall time must be no greater than 10 seconds.

(3) If a measurement system fails the criteria in paragraphs (e)(1) and (2) of this section, you may use the continuous analyzer system only if the deficiency does not adversely affect your ability to show compliance with the applicable standards.

45. Section 1065.309 is revised to read as follows:

§ 1065.309 Continuous gas analyzer uniform response verification.

(a) *Scope and frequency.* Perform this verification if you multiply or divide one continuous gas analyzer's response by another's to quantify a gaseous emission. Note that we consider water vapor a gaseous constituent. You do not have to perform this verification if you multiply one gas analyzer's response to another's to compensate for an interference that never requires a compensation more than 2% of the flow-weighted mean concentration at the applicable standard or during testing, whichever is greatest. You also do not have to perform this verification for batch gas analyzer systems or for continuous analyzer systems that are only used for discrete-mode testing. Perform this verification after initial installation or major maintenance. Also perform this verification if you reconfigure your system in a way that would change system response. For example, perform this verification if you add a significant volume to the transfer lines by increasing their length or by adding a filter; or if you change the frequency at which you sample and record gas-analyzer concentrations.

(b) *Measurement principles.* This procedure verifies the time-alignment and uniform response of continuously combined gas measurements.

(c) *System requirements.* Demonstrate that continuously combined concentration measurements have a uniform rise and fall during a

simultaneous step change in both concentrations. During a system response to a rapid change in multiple gas concentrations, demonstrate that the t_{50} times of all combined analyzers all occur at the same recorded second of data or between the same two recorded seconds of data.

(d) *Procedure.* Use the following procedure to verify the response of a continuous gas analyzer system:

(1) *Instrument setup.* Follow the analyzer system manufacturer's start-up and operating instructions. Adjust the system as needed to optimize performance.

(2) *Equipment setup.* Using a gas divider, equally blend a span gas of NO-CO-CO₂-C₃H₈-CH₄, balance N₂, with a span gas of NO₂, balance N₂. Connect the gas divider outlet to a 100 °C heated line. Connect the other end of this line to a 100 °C heated three-way tee. Next connect a dewpoint generator, set at a dewpoint of 50 °C, to one end of a heated line at 100 °C. Connect the other end of this line to the heated tee and connect a third 100 °C heated line from the tee to an overflow at the inlet of a 100 °C heated fast-acting three-way valve (two inlets, one outlet). Connect a zero-air source, heated to 100 °C, to a separate overflow at the other inlet of the three-way valve. Connect the three-way valve outlet to the gas analyzer system's probe or to an overflow fitting between the probe and transfer line to all the analyzers being verified. Note that you may omit any of these gas constituents if they are not relevant to your analyzers for this verification.

(3) *Data collection.* (i) Switch the valve to flow zero gas.

(ii) Allow for stabilization, accounting for transport delays and the slowest instrument's full response.

(iii) Start recording data at the frequency used during emission testing.

(iv) Switch the valve to flow span gas.

(v) Allow for transport delays and the slowest instrument's full response.

(vi) Repeat the steps in paragraphs (d)(3)(i) through (v) of this section to record seven full cycles, ending with zero gas flowing to the analyzers.

(vii) Stop recording.

(e) *Performance evaluations.* Perform the following evaluations:

(1) Uniform response evaluation. (i) Calculate the mean rise time, t_{10-90} , mean fall time, t_{90-10} for each analyzer.

(ii) Determine the maximum mean rise and fall times for the slowest responding analyzer in each combination of continuous analyzer signals that you use to determine a single emission concentration.

(iii) If the maximum rise time or fall time is greater than one second, verify

that all other gas analyzers combined with it have mean rise and fall times of at least 75% of that analyzer's response. If the slowest analyzer has t_{10-90} and t_{90-10} values less than 1 sec, no dispersion is necessary for any of the analyzers.

(iv) If any analyzer has shorter rise or fall times, disperse that signal so that it better matches the rise and fall times of the slowest signal with which it is combined. We recommend that you perform dispersion using SAE 2001-01-3536 (incorporated by reference in § 1065.1010) as a guide.

(v) Repeat this verification after optimizing your systems to ensure that you dispersed signals correctly. If after repeated attempts at dispersing signals your system still fails this verification, you may use the continuous analyzer system if the deficiency does not adversely affect your ability to show compliance with the applicable standards.

(2) *Time alignment evaluation.* (i) After all signals are adjusted to meet the uniform response evaluation, determine the second at which—or the two seconds between which—each analyzer crossed the midpoint of its response, t_{50} .

(ii) Verify that all combined gas analyzer signals are time-aligned such that all of their t_{50} times occurred at the same second or between the same two seconds in the recorded data.

(iii) If your system fails to meet this criterion, you may change the time

alignment of your system and retest the system completely. If after changing the time alignment of your system, some of the t_{50} times still are not aligned, take corrective action by dispersing analyzer signals that have the shortest rise and fall times.

(iv) If some t_{50} times are still not aligned after repeated attempts at dispersion and time alignment, you may use the continuous analyzer system if the deficiency does not adversely affect your ability to show compliance with the applicable standards.

46. Section 1065.310 is amended by revising paragraph (d) to read as follows:

§ 1065.310 Torque calibration.

* * * * *

(d) *Strain gage or proving ring calibration.* This technique applies force either by hanging weights on a lever arm (these weights and their lever arm length are not used as part of the reference torque determination) or by operating the dynamometer at different torques. Apply at least six force combinations for each applicable torque-measuring range, spacing the force quantities about equally over the range. Oscillate or rotate the dynamometer during calibration to reduce frictional static hysteresis. In this case, the reference torque is determined by multiplying the force output from the reference meter (such as a strain gage or proving ring) by its effective lever-arm

length, which you measure from the point where the force measurement is made to the dynamometer's rotational axis. Make sure you measure this length perpendicular to the reference meter's measurement axis and perpendicular to the dynamometer's rotational axis.

47. Section 1065.340 is amended by revising paragraphs (f)(6)(ii), (f)(9), and (g)(6)(i) and Figure 1 to read as follows:

§ 1065.340 Diluted exhaust flow (CVS) calibration.

* * * * *

(f) * * *

(6) * * *

(ii) The mean dewpoint of the calibration air, \bar{T}_{dew} . See § 1065.640 for permissible assumptions during emission measurements.

* * * * *

(9) Determine C_d and the lowest allowable $\Delta\bar{p}_{CFV}$ according to § 1065.640.

* * * * *

(g) * * *

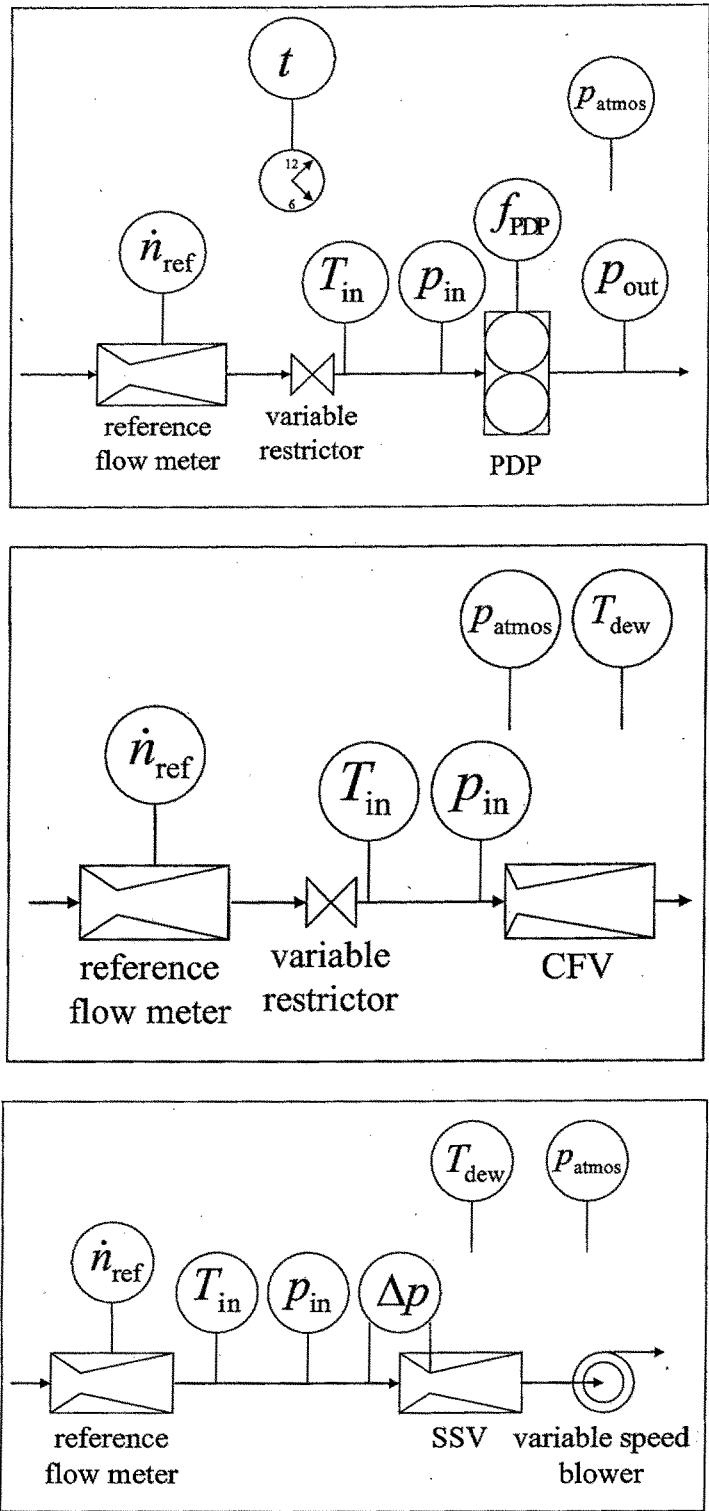
(6) * * *

(i) The mean flow rate of the reference flow meter, \dot{V}_{ref} . This may include several measurements of different quantities, such as reference meter pressures and temperatures, for calculating \dot{V}_{ref} .

* * * * *

BILLING CODE 6560-50-P

Figure 1 of 1065.340 CVS calibration configurations.



BILLING CODE 6560-50-C

48. Section 1065.341 is amended by revising paragraph (g) introductory text to read as follows:

§ 1065.341 CVS and batch sampler verification (propane check).

* * * * *

(g) You may repeat the propane check to verify a batch sampler, such as a PM secondary dilution system.

* * * * *

49. Section 1065.345 is revised to read as follows:

§ 1065.345 Vacuum-side leak verification.

(a) *Scope and frequency.* Upon initial sampling system installation, after major maintenance, and before each test according to subpart F of this part for laboratory tests and according to subpart J of this part for field tests, verify that there are no significant vacuum-side leaks using one of the leak tests described in this section. This verification does not apply to any full-flow portion of a CVS dilution system.

(b) *Measurement principles.* A leak may be detected either by measuring a small amount of flow when there should be zero flow, or by detecting the dilution of a known concentration of span gas when it flows through the vacuum side of a sampling system.

(c) *Low-flow leak test.* Test a sampling system for low-flow leaks as follows:

(1) Seal the probe end of the system by taking one of the following steps:

(i) Cap or plug the end of the sample probe.

(ii) Disconnect the transfer line at the probe and cap or plug the transfer line.

(iii) Close a leak-tight valve in-line between a probe and transfer line.

(2) Operate all vacuum pumps. After stabilizing, verify that the flow through the vacuum-side of the sampling system is less than 0.5% of the system's normal in-use flow rate. You may estimate typical analyzer and bypass flows as an approximation of the system's normal in-use flow rate.

(d) *Dilution-of-span-gas leak test.* You may use any gas analyzer for this test. If you use a FID for this test, correct for any HC contamination in the sampling system according to § 1065.660. To avoid misleading results from this test, we recommend using only analyzers that have a repeatability of 0.5% or better at the span gas concentration used for this test. Perform a vacuum-side leak test as follows:

(1) Prepare a gas analyzer as you would for emission testing.

(2) Supply span gas to the analyzer port and verify that it measures the span gas concentration within its expected measurement accuracy and repeatability.

(3) Route overflow span gas to one of the following locations in the sampling system:

(i) The end of the sample probe.

(ii) Disconnect the transfer line at the probe connection, and overflow the span gas at the open end of the transfer line.

(iii) A three-way valve installed in-line between a probe and its transfer line, such as a system overflow zero and span port.

(4) Verify that the measured overflow span gas concentration is within $\pm 0.5\%$ of the span gas concentration. A measured value lower than expected indicates a leak, but a value higher than expected may indicate a problem with the span gas or the analyzer itself. A measured value higher than expected does not indicate a leak.

(e) *Vacuum-decay leak test.* To perform this test you must apply a vacuum to the vacuum-side volume of your sampling system and then observe the leak rate of your system as a decay in the applied vacuum. To perform this test you must know the vacuum-side volume of your sampling system to within $\pm 10\%$ of its true volume. For this test you must also use measurement instruments that meet the specifications of subpart C of this part and of this subpart D. Perform a vacuum-decay leak test as follows:

(1) Seal the probe end of the system as close to the probe opening as possible by taking one of the following steps:

(i) Cap or plug the end of the sample probe.

(ii) Disconnect the transfer line at the probe and cap or plug the transfer line.

(iii) Close a leak-tight valve in-line between a probe and transfer line.

(2) Operate all vacuum pumps. Draw a vacuum that is representative of normal operating conditions. In the case of sample bags, we recommend that you repeat your normal sample bag pump-down procedure twice to minimize any trapped volumes.

(3) Turn off the sample pumps and seal the system. Measure and record the absolute pressure of the trapped gas, the time, and optionally the system absolute temperature. Wait at least 60 sec and again record the pressure, time, and optionally temperature. You may have to adjust your wait time by trial and error to accurately quantify a change in pressure over a time interval.

(4) Calculate the leak flow rate based on an assumed value of zero for pumped-down bag volumes and based on known values for the sample system volume, the initial and final pressures, optional temperatures, and elapsed time. Verify that the vacuum-decay leak

flow rate is less than 0.5% of the system's normal in-use flow rate.

50. Section 1065.350 is amended by revising paragraphs (c) and (d) to read as follows:

§ 1065.350 H₂O interference verification for CO₂ NDIR analyzers.

* * * * *

(c) *System requirements.* A CO₂ NDIR analyzer must have an H₂O interference that is within (0 ± 400) $\mu\text{mol/mol}$, though we strongly recommend a lower interference that is within (0 ± 200) $\mu\text{mol/mol}$.

(d) *Procedure.* Perform the interference verification as follows:

(1) Start, operate, zero, and span the CO₂ NDIR analyzer as you would before an emission test.

(2) Create a humidified test gas by bubbling zero air that meets the specifications in § 1065.750 through distilled water in a sealed vessel at (25 ± 10) °C.

(3) Downstream of the vessel, maintain the humidified test gas temperature at least 5 °C above its dewpoint. We recommend using a heated transfer line.

(4) Introduce the humidified test gas upstream of any sample dryer, if one is used during testing.

(5) Allow time for the analyzer response to stabilize. Stabilization time may include time to purge the transfer line and to account for analyzer response.

(6) While the analyzer measures the sample's concentration, record 30 seconds of sampled data. Calculate the arithmetic mean of this data. The analyzer meets the interference verification if this value is within (0 ± 400) $\mu\text{mol/mol}$.

* * * * *

51. Section 1065.355 is amended by revising paragraphs (d) and (e)(1) to read as follows:

§ 1065.355 H₂O and CO₂ interference verification for CO NDIR analyzers.

* * * * *

(d) *Procedure.* Perform the interference verification as follows:

(1) Start, operate, zero, and span the CO NDIR analyzer as you would before an emission test.

(2) Create a humidified CO₂ test gas by bubbling a CO₂ span gas through distilled water in a sealed vessel at (25 ± 10) °C.

(3) Downstream of the vessel, maintain the humidified gas temperature at least 5 °C above its dewpoint. We recommend using a heated transfer line.

(4) Introduce the humidified CO₂ test gas upstream of any sample dryer, if one is used during testing.

(5) Measure the humidified CO₂ test gas dewpoint and pressure as close as possible to the inlet of the analyzer, or to the inlet of the sample dryer, if one is used.

(6) Allow time for the analyzer response to stabilize. Stabilization time may include time to purge the transfer line and to account for analyzer response.

(7) While the analyzer measures the sample's concentration, record its output for 30 seconds. Calculate the arithmetic mean of this data.

(8) Scale the CO₂ interference by multiplying this mean value (from paragraph (d)(7) of this section) by the ratio of expected CO₂ to span gas CO₂ concentration. In other words, estimate the flow-weighted mean dry concentration of CO₂ expected during testing, and then divide this value by the concentration of CO₂ in the span gas used for this verification. Then multiply this ratio by the mean value recorded during this verification (from paragraph (d)(7) of this section).

(9) Scale the H₂O interference by estimating the flow-weighted mean concentration of H₂O expected during testing, then divide this value by the concentration of H₂O in the span gas used for this verification. Then multiply this ratio by the CO₂-scaled result of paragraph (d)(8) of this section.

(10) The analyzer meets the interference verification if the result of paragraph (d)(9) of this section is within $\pm 2\%$ of the flow-weighted mean concentration of CO expected at the standard.

(e) * * *

(1) You may omit this verification if you can show by engineering analysis that for your CO sampling system and your emission calculations procedures, the combined CO₂ and H₂O interference for your CO NDIR analyzer always affects your brake-specific CO emission results within $\pm 0.5\%$ of the applicable CO standard.

* * * * *

52. Section 1065.360 is revised to read as follows:

§ 1065.360 FID optimization and verification.

(a) *Scope and frequency.* For all FID analyzers, calibrate the FID upon initial installation. Repeat the calibration as needed using good engineering judgment. For a FID that measures THC, perform the following steps:

(1) Optimize the response to various hydrocarbons after initial analyzer installation and after major maintenance as described in paragraph (c) of this section.

(2) Determine the methane (CH₄) response factor after initial analyzer installation and after major maintenance as described in paragraph (d) of this section.

(3) Verify the methane (CH₄) response within 185 days before testing as described in paragraph (e) of this section.

(b) *Calibration.* Use good engineering judgment to develop a calibration procedure, such as one based on the FID-analyzer manufacturer's instructions and recommended frequency for calibrating the FID. Alternately, you may remove system components for off-site calibration. For a FID that measures THC, calibrate using C₃H₈ calibration gases that meet the specifications of § 1065.750. For a FID that measures CH₄, calibrate using CH₄ calibration gases that meet the specifications of § 1065.750. We recommend FID analyzer zero and span gases that contain approximately the flow-weighted mean concentration of O₂ expected during testing. If you use a FID to measure methane (CH₄) downstream of a nonmethane cutter, you may calibrate that FID using CH₄ calibration gases with the cutter. Regardless of the calibration gas composition, calibrate on a carbon number basis of one (C₁). For example, if you use a C₃H₈ span gas of concentration 200 $\mu\text{mol/mol}$, span the FID to respond with a value of 600 $\mu\text{mol/mol}$. As another example, if you use a CH₄ span gas with a concentration of 200 $\mu\text{mol/mol}$, span the FID to respond with a value of 200 $\mu\text{mol/mol}$.

(c) *THC FID response optimization.* This procedure is only for FID analyzers that measure THC. Use good engineering judgment for initial instrument start-up and basic operating adjustment using FID fuel and zero air. Heated FIDs must be within their required operating temperature ranges. Optimize FID response at the most common analyzer range expected during emission testing. Optimization involves adjusting flows and pressures of FID fuel, burner air, and sample to minimize response variations to various hydrocarbon species in the exhaust. Use good engineering judgment to trade off peak FID response to propane calibration gases to achieve minimal response variations to different hydrocarbon species. For an example of trading off response to propane for relative responses to other hydrocarbon species, see SAE 770141 (incorporated by reference in § 1065.1010). Determine the optimum flow rates for FID fuel, burner air, and sample and record them for future reference.

(d) *THC FID CH₄ response factor determination.* This procedure is only

for FID analyzers that measure THC. Since FID analyzers generally have a different response to CH₄ versus C₃H₈, determine each THC FID analyzer's CH₄ response factor, RF_{CH₄}, after FID optimization. Use the most recent RF_{CH₄} measured according to this section in the calculations for HC determination described in § 1065.660 to compensate for CH₄ response. Determine RF_{CH₄} as follows, noting that you do not determine RF_{CH₄} for FIDs that are calibrated and spanned using CH₄ with a nonmethane cutter:

(1) Select a C₃H₈ span gas concentration that you use to span your analyzers before emission testing. Use only span gases that meet the specifications of § 1065.750. Record the C₃H₈ concentration of the gas.

(2) Select a CH₄ span gas concentration that you use to span your analyzers before emission testing. Use only span gases that meet the specifications of § 1065.750. Record the CH₄ concentration of the gas.

(3) Start and operate the FID analyzer according to the manufacturer's instructions.

(4) Confirm that the FID analyzer has been calibrated using C₃H₈. Calibrate on a carbon number basis of one (C₁). For example, if you use a C₃H₈ span gas of concentration 200 $\mu\text{mol/mol}$, span the FID to respond with a value of 600 $\mu\text{mol/mol}$.

(5) Zero the FID with a zero gas that you use for emission testing.

(6) Span the FID with the C₃H₈ span gas that you selected under paragraph (d)(1) of this section.

(7) Introduce at the sample port of the FID analyzer, the CH₄ span gas that you selected under paragraph (d)(2) of this section.

(8) Allow time for the analyzer response to stabilize. Stabilization time may include time to purge the analyzer and to account for its response.

(9) While the analyzer measures the CH₄ concentration, record 30 seconds of sampled data. Calculate the arithmetic mean of these values.

(10) Divide the mean measured concentration by the recorded span concentration of the CH₄ calibration gas. The result is the FID analyzer's response factor for CH₄, RF_{CH₄}.

(e) *THC FID methane (CH₄) response verification.* This procedure is only for FID analyzers that measure THC. If the value of RF_{CH₄} from paragraph (d) of this section is within $\pm 5.0\%$ of its most recent previously determined value, the THC FID passes the methane response verification. For example, if the most recent previous value for RF_{CH₄} was 1.05 and it changed by ± 0.05 to become 1.10 or it changed by -0.05 to become

1.00, either case would be acceptable because $\pm 4.8\%$ is less than $\pm 5.0\%$.

Verify RF_{CH_4} as follows:

(1) First verify that the pressures and flow rates of FID fuel, burner air, and sample are each within $\pm 0.5\%$ of their most recent previously recorded values, as described in paragraph (c) of this section. You may adjust these flow rates as necessary. Then determine the RF_{CH_4} as described in paragraph (d) of this section and verify that it is within the tolerance specified in this paragraph (e).

(2) If RF_{CH_4} is not within the tolerance specified in this paragraph (e), re-optimize the FID response as described in paragraph (c) of this section.

(3) Determine a new RF_{CH_4} as described in paragraph (d) of this section. Use this new value of RF_{CH_4} in the calculations for HC determination, as described in § 1065.660.

53. Section 1065.362 is amended by revising paragraph (d) to read as follows:

§ 1065.362 Non-stoichiometric raw exhaust FID O₂ interference verification.

* * * * *

(d) *Procedure.* Determine FID O₂ interference as follows, noting that you may use one or more gas dividers to create the reference gas concentrations that are required to perform this verification:

(1) Select two span reference gases that contain a C₃H₈ concentration that you use to span your analyzers before emission testing. Use only span gases that meet the specifications of § 1065.750. You may use CH₄ span reference gases for FIDs calibrated on CH₄ with a nonmethane cutter. Select the two balance gas concentrations such that the concentrations of O₂ and N₂ represent the minimum and maximum O₂ concentrations expected during testing.

(2) Confirm that the FID analyzer meets all the specifications of § 1065.360.

(3) Start and operate the FID analyzer as you would before an emission test. Regardless of the FID burner's air source during testing, use zero air as the FID burner's air source for this verification.

(4) Zero the FID analyzer using the zero gas used during emission testing.

(5) Span the FID analyzer using a span gas that you use during emission testing.

(6) Check the zero response of the FID analyzer using the zero gas used during emission testing. If the mean zero response of 30 seconds of sampled data is within $\pm 0.5\%$ of the span reference value used in paragraph (d)(5) of this section, then proceed to the next step; otherwise restart the procedure at paragraph (d)(4) of this section.

(7) Check the analyzer response using the span gas that has the minimum concentration of O₂ expected during testing. Record the mean response of 30 seconds of stabilized sample data as X_{O_2minHC} .

(8) Check the zero response of the FID analyzer using the zero gas used during emission testing. If the mean zero response of 30 seconds of stabilized sample data is within $\pm 0.5\%$ of the span reference value used in paragraph (d)(5) of this section, then proceed to the next step; otherwise restart the procedure at paragraph (d)(4) of this section.

(9) Check the analyzer response using the span gas that has the maximum concentration of O₂ expected during testing. Record the mean response of 30 seconds of stabilized sample data as X_{O_2maxHC} .

(10) Check the zero response of the FID analyzer using the zero gas used during emission testing. If the mean zero response of 30 seconds of stabilized sample data is within $\pm 0.5\%$ of the span reference value used in paragraph (d)(5) of this section, then proceed to the next step; otherwise restart the procedure at paragraph (d)(4) of this section.

(11) Calculate the percent difference between X_{O_2maxHC} and its reference gas concentration. Calculate the percent difference between X_{O_2minHC} and its reference gas concentration. Determine the maximum percent difference of the two. This is the O₂ interference.

(12) If the O₂ interference is within $\pm 1.5\%$, the FID passes the O₂ interference verification; otherwise perform one or more of the following to address the deficiency:

(i) Repeat the verification to determine if a mistake was made during the procedure.

(ii) Select zero and span gases for emission testing that contain higher or lower O₂ concentrations and repeat the verification.

(iii) Adjust FID burner air, fuel, and sample flow rates. Note that if you adjust these flow rates on a THC FID to meet the O₂ interference verification, you must re-verify RF_{CH_4} according to § 1065.360. Repeat the O₂ interference verification after adjustment and RF_{CH_4} verification.

(iv) Repair or replace the FID and repeat the O₂ interference verification.

(v) Demonstrate that the deficiency does not adversely affect your ability to demonstrate compliance with the applicable emission standards.

54. Section 1065.365 is revised to read as follows:

§ 1065.365 Nonmethane cutter penetration fractions.

(a) *Scope and frequency.* If you use a FID analyzer and a nonmethane cutter

(NMC) to measure methane (CH₄), determine the nonmethane cutter's penetration fractions of methane, PF_{CH_4} , and ethane, $PF_{C_2H_6}$. As detailed in this section, these penetration fractions may be determined as a combination of NMC penetration fractions and FID analyzer response factors, depending on your particular NMC and FID analyzer configuration. Perform this verification after installing the nonmethane cutter. Repeat this verification within 185 days of testing to verify that the catalytic activity of the cutter has not deteriorated. Note that because nonmethane cutters can deteriorate rapidly and without warning if they are operated outside of certain ranges of gas concentrations and outside of certain temperature ranges, good engineering judgment may dictate that you determine a nonmethane cutter's penetration fractions more frequently.

(b) *Measurement principles.* A nonmethane cutter is a heated catalyst that removes nonmethane hydrocarbons from an exhaust sample stream before the FID analyzer measures the remaining hydrocarbon concentration. An ideal nonmethane cutter would have a methane penetration fraction, PF_{CH_4} , of 1.000, and the penetration fraction for all other nonmethane hydrocarbons would be 0.000, as represented by $PF_{C_2H_6}$. The emission calculations in § 1065.660 use the measured values from this verification to account for less than ideal NMC performance.

(c) *System requirements.* We do not limit NMC penetration fractions to a certain range. However, we recommend that you optimize a nonmethane cutter by adjusting its temperature to achieve a $PF_{CH_4} > 0.85$ and a $PF_{C_2H_6} < 0.02$, as determined by paragraphs (d), (e), or (f) of this section, as applicable. If we use a nonmethane cutter for testing, it will meet this recommendation. If adjusting NMC temperature does not result in achieving both of these specifications simultaneously, we recommend that you replace the catalyst material. Use the most recently determined penetration values from this section to calculate HC emissions according to § 1065.660 and § 1065.665 as applicable.

(d) *Procedure for a FID calibrated with the NMC.* If your FID arrangement is such that a FID is always calibrated to measure CH₄ with the NMC, then span that FID with the NMC cutter using a CH₄ span gas, set the product of that FID's CH₄ response factor and CH₄ penetration fraction, $RF_{CH_4} \cdot PF_{CH_4}$, equal to 1.0 for all emission calculations, and determine its ethane (C₂H₆) penetration fraction, $PF_{C_2H_6}$ as follows:

(1) Select a CH₄ gas mixture and a C₂H₆ analytical gas mixture and ensure that both mixtures meet the specifications of § 1065.750. Select a CH₄ concentration that you would use for spanning the FID during emission testing and select a C₂H₆ concentration that is typical of the peak NMHC concentration expected at the hydrocarbon standard or equal to THC analyzer's span value.

(2) Start, operate, and optimize the nonmethane cutter according to the manufacturer's instructions, including any temperature optimization.

(3) Confirm that the FID analyzer meets all the specifications of § 1065.360.

(4) Start and operate the FID analyzer according to the manufacturer's instructions.

(5) Zero and span the FID with the cutter and use CH₄ span gas to span the FID with the cutter. Note that you must span the FID on a C₁ basis. For example, if your span gas has a CH₄ reference value of 100 μmol/mol, the correct FID response to that span gas is 100 μmol/mol because there is one carbon atom per CH₄ molecule.

(6) Introduce the C₂H₆ analytical gas mixture upstream of the nonmethane cutter.

(7) Allow time for the analyzer response to stabilize. Stabilization time may include time to purge the nonmethane cutter and to account for the analyzer's response.

(8) While the analyzer measures a stable concentration, record 30 seconds of sampled data. Calculate the arithmetic mean of these data points.

(9) Divide the mean by the reference value of C₂H₆, converted to a C₁ basis. The result is the C₂H₆ penetration fraction, PF_{C₂H₆}. Use this penetration fraction and the product of the CH₄ response factor and CH₄ penetration fraction, RF_{CH₄} · PF_{CH₄}, set to 1.0 in emission calculations according to § 1065.660 or § 1065.665, as applicable.

(e) *Procedure for a FID calibrated with propane, bypassing the NMC.* If you use a FID with an NMC that is calibrated with propane, C₃H₈, by bypassing the NMC, determine penetration fractions as follows:

(1) Select CH₄ and C₂H₆ analytical gas mixtures that meet the specifications of § 1065.750 with the CH₄ concentration typical of its peak concentration expected at the hydrocarbon standard and the C₂H₆ concentration typical of the peak total hydrocarbon (THC) concentration expected at the hydrocarbon standard or the THC analyzer span value.

(2) Start and operate the nonmethane cutter according to the manufacturer's

instructions, including any temperature optimization.

(3) Confirm that the FID analyzer meets all the specifications of § 1065.360.

(4) Start and operate the FID analyzer according to the manufacturer's instructions.

(5) Zero and span the FID as you would during emission testing. Span the FID by bypassing the cutter and by using C₃H₈ span gas to span the FID. Note that you must span the FID on a C₁ basis. For example, if your span gas has a propane reference value of 100 μmol/mol, the correct FID response to that span gas is 300 μmol/mol because there are three carbon atoms per C₃H₈ molecule.

(6) Introduce the C₂H₆ analytical gas mixture upstream of the nonmethane cutter.

(7) Allow time for the analyzer response to stabilize. Stabilization time may include time to purge the nonmethane cutter and to account for the analyzer's response.

(8) While the analyzer measures a stable concentration, record 30 seconds of sampled data. Calculate the arithmetic mean of these data points.

(9) Reroute the flow path to bypass the nonmethane cutter, introduce the C₂H₆ analytical gas mixture to the bypass, and repeat the steps in paragraphs (e)(7) through (8) of this section.

(10) Divide the mean C₂H₆ concentration measured through the nonmethane cutter by the mean concentration measured after bypassing the nonmethane cutter. The result is the C₂H₆ penetration fraction, PF_{C₂H₆}. Use this penetration fraction according to § 1065.660 or § 1065.665, as applicable.

(11) Repeat the steps in paragraphs (e)(6) through (10) of this section, but with the CH₄ analytical gas mixture instead of C₂H₆. The result will be the CH₄ penetration fraction, PF_{CH₄}. Use this penetration fraction according to § 1065.660 or § 1065.665, as applicable.

(f) *Procedure for a FID calibrated with methane, bypassing the NMC.* If you use a FID with an NMC that is calibrated with methane, CH₄, by bypassing the NMC, determine penetration fractions as follows:

(1) Select CH₄ and C₂H₆ analytical gas mixtures that meet the specifications of § 1065.750, with the CH₄ concentration typical of its peak concentration expected at the hydrocarbon standard and the C₂H₆ concentration typical of the peak total hydrocarbon (THC) concentration expected at the hydrocarbon standard or the THC analyzer span value.

(2) Start and operate the nonmethane cutter according to the manufacturer's instructions, including any temperature optimization.

(3) Confirm that the FID analyzer meets all the specifications of § 1065.360.

(4) Start and operate the FID analyzer according to the manufacturer's instructions.

(5) Zero and span the FID as you would during emission testing. Span the FID with CH₄ span gas by bypassing the cutter. Note that you must span the FID on a C₁ basis. For example, if your span gas has a methane reference value of 100 μmol/mol, the correct FID response to that span gas is 100 μmol/mol because there is one carbon atom per CH₄ molecule.

(6) Introduce the C₂H₆ analytical gas mixture upstream of the nonmethane cutter.

(7) Allow time for the analyzer response to stabilize. Stabilization time may include time to purge the nonmethane cutter and to account for the analyzer's response.

(8) While the analyzer measures a stable concentration, record 30 seconds of sampled data. Calculate the arithmetic mean of these data points.

(9) Reroute the flow path to bypass the nonmethane cutter, introduce the C₂H₆ analytical gas mixture to the bypass, and repeat the steps in paragraphs (e)(7) and (8) of this section.

(10) Divide the mean C₂H₆ concentration measured through the nonmethane cutter by the mean concentration measured after bypassing the nonmethane cutter. The result is the C₂H₆ penetration fraction, PF_{C₂H₆}. Use this penetration fraction according to § 1065.660 or § 1065.665, as applicable.

(11) Repeat the steps in paragraphs (e)(6) through (10) of this section, but with the CH₄ analytical gas mixture instead of C₂H₆. The result will be the CH₄ penetration fraction, PF_{CH₄}. Use this penetration fraction according to § 1065.660 or § 1065.665, as applicable.

55. Section 1065.370 is amended by revising paragraphs (e) and (g)(1) to read as follows:

§ 1065.370 CLD CO₂ and H₂O quench verification.

* * * * *

(e) *H₂O quench verification procedure.* Use the following method to determine H₂O quench, or use good engineering judgment to develop a different protocol:

(1) Use PTFE tubing to make necessary connections.

(2) If the CLD has an operating mode in which it detects NO-only, as opposed to total NO_x, operate the CLD in the NO-only operating mode.