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(2) Include your full corporate name and trademark.

(3) State the engine displacement (in liters) and maximum brake power.

(4) State: "THIS ENGINE IS EXCLUDED FROM THE REQUIREMENTS OF 40 CFR PART 1048 AS A "STATIONARY ENGINE." INSTALLING OR USING THIS ENGINE IN ANY OTHER APPLICATION MAY BE A VIOLATION OF FEDERAL LAW SUBJECT TO CIVIL PENALTY."

Subpart B—Emission Standards and Related Requirements

§ 1048.101 What exhaust emission standards must my engines meet?

Apply the exhaust emission standards in this section by model year. You may choose to certify engines earlier than we require. The Tier 1 standards apply only to steady-state testing, as described in paragraph (b) of this section. The Tier 2 standards apply to steady-state, transient, and field testing, as described in paragraphs (a), (b), and (c) of this section.

(a) *Standards for transient testing.* Starting in the 2007 model year, Tier 2 exhaust emission standards apply for transient measurement of emissions with the duty-cycle test procedures in subpart F of this part:

(1) The Tier 2 HC+NO_x standard is 2.7 g/kW-hr and the Tier 2 CO standard is 4.4 g/kW-hr. For severe-duty engines, the Tier 2 HC+NO_x standard is 2.7 g/kW-hr and the Tier 2 CO standard is 130.0 g/kW-hr. The standards in this

paragraph (a) do not apply for transient testing of high-load engines.

(2) You may optionally certify your engines according to the following formula instead of the standards in paragraph (a)(1) of this section: $(HC+NO_x) \times CO^{0.784} \leq 8.57$. The HC+NO_x and CO emission levels you select to satisfy this formula, rounded to the nearest 0.1 g/kW-hr, become the emission standards that apply for those engines. You may not select an HC+NO_x emission standard higher than 2.7 g/kW-hr or a CO emission standard higher than 20.6 g/kW-hr. The following table illustrates a range of possible values under this paragraph (a)(2):

TABLE 1 OF § 1048.101—EXAMPLES OF POSSIBLE TIER 2 DUTY-CYCLE EMISSION STANDARDS

HC+NO _x (g/kW-hr)	CO (g/kW-hr)
2.7	4.4
2.2	5.6
1.7	7.9
1.3	11.1
1.0	15.5
0.8	20.6

(b) *Standards for steady-state testing.* Except as we allow in paragraph (d) of this section, the following exhaust emission standards apply for steady-state measurement of emissions with the duty-cycle test procedures in subpart F of this part:

(1) The following table shows the Tier 1 exhaust emission standards that apply to engines from 2004 through 2006 model years:

TABLE 2 OF § 1048.101—TIER 1 EMISSION STANDARDS (G/KW-HR)

Testing	General emission standards		Alternate emission standards for severe-duty engines	
	HC+NO _x	CO	HC+NO _x	CO
Certification and production-line testing	4.0	50.0	4.0	130.0
In-use testing	5.4	50.0	5.4	130.0

(2) Starting in the 2007 model year, engines must meet the Tier 2 exhaust emission standards in paragraph (a) of this section for both steady-state and transient testing. See paragraph (d) of this section for alternate standards that apply for certain engines.

(c) *Standards for field testing.* Starting in 2007, the following Tier 2 exhaust emission standards apply for emission measurements with the field-testing procedures in subpart F of this part:

(1) The HC+NO_x standard is 3.8 g/kW-hr and the CO standard is 6.5 g/kW-hr. For severe-duty engines, the HC+NO_x

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standard is 3.8 g/kW-hr and the CO standard is 200.0 g/kW-hr. For natural gas-fueled engines, you are not required to measure nonmethane hydrocarbon emissions or total hydrocarbon emissions for testing to show that the engine meets the emission standards of this paragraph (c); that is, you may assume HC emissions are equal to zero.

(2) You may apply the following formula to determine alternate emission standards that apply to your engines instead of the standards in paragraph (c)(1) of this section: $(HC+NO_x) \times CO^{0.791} \leq 16.78$. HC+NO_x emission levels may not exceed 3.8 g/kW-hr and CO emission levels may not exceed 31.0 g/kW-hr. The following table illustrates a range of possible values under this paragraph (c)(2):

TABLE 3 OF § 1048.101—EXAMPLES OF POSSIBLE TIER 2 FIELD-TESTING EMISSION STANDARDS

HC+NO _x (g/kW-hr)	CO (g/kW-hr)
3.8	6.5
3.1	8.5
2.4	11.7
1.8	16.8
1.4	23.1
1.1	31.0

(d) *Engine protection.* For engines that require enrichment at high loads to protect the engine, you may ask to meet alternate Tier 2 standards of 2.7 g/kW-hr for HC+NO_x and 31.0 g/kW-hr for CO instead of the emission standards described in paragraph (b)(2) of this section for steady-state testing. If we approve your request, you must still meet the transient testing standards in paragraph (a) of this section and the field-testing standards in paragraph (c) of this section. To qualify for this allowance, you must do all the following things:

- (1) Show that enrichment is necessary to protect the engine from damage.
- (2) Show that you limit enrichment to operating modes that require additional cooling to protect the engine from damage.
- (3) Show in your application for certification that enrichment will rarely occur in use in the equipment in which your engines are installed. For example, an engine that is expected to oper-

ate 5 percent of the time in use with enrichment would clearly not qualify.

(4) Include in your installation instructions any steps necessary for someone installing your engines to prevent enrichment during normal operation (see § 1048.130).

(e) *Fuel types.* Apply the exhaust emission standards in this section for engines using each type of fuel specified in 40 CFR part 1065, subpart C, for which they are designed to operate. You must meet the numerical emission standards for hydrocarbons in this section based on the following types of hydrocarbon emissions for engines powered by the following fuels:

- (1) Gasoline- and LPG-fueled engines: THC emissions.
- (2) Natural gas-fueled engines: NMHC emissions.
- (3) Alcohol-fueled engines: THCE emissions.

(f) *Small engines.* Certain engines with total displacement at or below 1000 cc may comply with the requirements of 40 CFR part 90 instead of complying with the requirements of this part, as described in § 1048.615.

(g) *Useful life.* Your engines must meet the exhaust emission standards in paragraphs (a) through (c) of this section over their full useful life (§ 1048.240 describes how to use deterioration factors to show this). The minimum useful life is 5,000 hours of operation or seven years, whichever comes first.

(1) Specify a longer useful life in hours for an engine family under either of two conditions:

- (i) If you design, advertise, or market your engine to operate longer than the minimum useful life (your recommended hours until rebuild may indicate a longer design life).
- (ii) If your basic mechanical warranty is longer than the minimum useful life.

(2) You may request a shorter useful life for an engine family if you have documentation from in-use engines showing that these engines will rarely operate longer than the alternate useful life. The useful life value may not be shorter than any of the following:

- (i) 1,000 hours of operation.
- (ii) Your recommended overhaul interval.

(iii) Your mechanical warranty for the engine.

(h) *Applicability for testing.* The standards in this subpart apply to all testing, including production-line and in-use testing, as described in subparts D and E of this part.

§ 1048.105 What evaporative emissions standards and requirements apply?

(a) Starting in the 2007 model year, engines that run on a volatile liquid fuel (such as gasoline), must meet the following evaporative emissions standards and requirements:

(1) Evaporative hydrocarbon emissions may not exceed 0.2 grams per gallon of fuel tank capacity when measured with the test procedures for evaporative emissions in subpart F of this part.

(2) For nonmetallic fuel lines, you must specify and use products that meet the Category 1 specifications in SAE J2260 (incorporated by reference in § 1048.810).

(3) Liquid fuel in the fuel tank may not reach boiling during continuous engine operation in the final installation at an ambient temperature of 30 °C. Note that gasoline with a Reid vapor pressure of 62 kPa (9 psi) begins to boil at about 53 °C.

(b) Note that § 1048.245 allows you to use design-based certification instead of generating new emission data.

(c) If other companies install your engines in their equipment, give them any appropriate instructions, as described in § 1048.130.

§ 1048.110 How must my engines diagnose malfunctions?

(a) *Equip your engines with a diagnostic system.* Starting in the 2007 model year, equip each engine with a diagnostic system that will detect significant malfunctions in its emission-control system using one of the following protocols:

(1) If your emission-control strategy depends on maintaining air-fuel ratios at stoichiometry, an acceptable diagnostic design would identify malfunction whenever the air-fuel ratio does not cross stoichiometry for one minute of intended closed-loop operation. You may use other diagnostic strategies if we approve them in advance.

(2) If the protocol described in paragraph (a)(1) of this section does not apply to your engine, you must use an alternative approach that we approve in advance. Your alternative approach must generally detect when the emission-control system is not functioning properly.

(b) *Use a malfunction-indicator light (MIL).* The MIL must be readily visible to the operator; it may be any color except red. When the MIL goes on, it must display “Check Engine,” “Service Engine Soon,” or a similar message that we approve. You may use sound in addition to the light signal. The MIL must go on under each of these circumstances:

(1) When a malfunction occurs, as described in paragraph (a) of this section.

(2) When the diagnostic system cannot send signals to meet the requirement of paragraph (b)(1) of this section.

(3) When the engine’s ignition is in the “key-on” position before starting or cranking. The MIL should go out after engine starting if the system detects no malfunction.

(c) *Control when the MIL can go out.* If the MIL goes on to show a malfunction, it must remain on during all later engine operation until servicing corrects the malfunction. If the engine is not serviced, but the malfunction does not recur for three consecutive engine starts during which the malfunctioning system is evaluated and found to be working properly, the MIL may stay off during later engine operation.

(d) *Store trouble codes in computer memory.* Record and store in computer memory any diagnostic trouble codes showing a malfunction that should illuminate the MIL. The stored codes must identify the malfunctioning system or component as uniquely as possible. Make these codes available through the data link connector as described in paragraph (g) of this section. You may store codes for conditions that do not turn on the MIL. The system must store a separate code to show when the diagnostic system is disabled (from malfunction or tampering).

(e) *Make data, access codes, and devices accessible.* Make all required data accessible to us without any access codes or devices that only you can supply.