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Title 40: Protection of Environment

[PART 1048—CONTROL OF EMISSIONS FROM NEW, LARGE NONROAD SPARK-IGNITION ENGINES](#)

[Subpart B—Emission Standards and Related Requirements](#)

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§ 1048.101 What exhaust emission standards must my engines meet?

The exhaust emission standards of this section apply by model year. You may 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) *Emission standards for transient testing.* Starting in the 2007 model year, transient exhaust emissions from your engines may not exceed the Tier 2 emission standards, as follows:

(1) Measure emissions using the applicable transient test procedures described in subpart F of this part.

(2) 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 following engines are not subject to the transient standards in this paragraph (a):

(i) High-load engines.

(ii) Engines with maximum engine power above 560 kW.

(iii) Engines with maximum test speed above 3400 rpm.

(iv) Constant-speed engines and severe-duty engines.

(3) You may optionally certify your engines according to the following formula instead of the standards in paragraph (a)(1) of this section: $(\text{HC} + \text{NO}_x) \times \text{CO}^{0.784} \leq 8.57$. 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)(3):

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
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(b) *Standards for steady-state testing.* Except as we allow in paragraph (d) of this section, steady-state exhaust emissions from your engines may not exceed emission standards, as follows:

(1) Measure emissions using the applicable steady-state test procedures described in subpart F of this part:

(2) 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

(3) Starting in the 2007 model year, steady-state exhaust emissions from your engines may not exceed the numerical emission standards in paragraph (a) of this section. See paragraph (d) of this section for alternate standards that apply for certain engines.

(c) *Standards for field testing.* Starting in 2007, exhaust emissions may not exceed field-testing standards, as follows:

(1) Measure emissions using the field-testing procedures in subpart F of this part:

(2) 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 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.

(3) 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: $(\text{HC}+\text{NO}_x) \times \text{CO}^{0.791} \leq 16.78$. 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 operate 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.* The exhaust emission standards in this section apply for engines using each type of fuel specified in 40 CFR part 1065, subpart H, on which the engines in the engine family are designed to operate, except for engines certified under §1048.625. For engines certified under §1048.625, the standards of this section apply to emissions measured using the specified test fuel. 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) Natural gas-fueled engines: NMHC emissions.
 - (2) Alcohol-fueled engines: THCE emissions.
 - (3) Other engines: THC emissions.
- (f) *Small engines.* Certain engines with total displacement at or below 1000 cc may comply with the requirements of 40 CFR part 90 or 1054 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. For severe-duty engines, the minimum useful life is 1,500 hours of operation or seven years, whichever comes first. For all other engines, 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 in your application for certification that we approve a shorter useful life for an engine family. We may approve a shorter useful life, in hours of engine operation but not in years, if we determine that these engines will rarely operate longer than the shorter useful life. If engines identical to those in the engine family have already been produced and are in use, your demonstration must include documentation from such in-use engines. In other cases, your demonstration must include an engineering analysis of information equivalent to such in-use data, such as data from research engines or similar engine models that are already in production. Your demonstration must also include any overhaul interval that you recommend, any mechanical warranty that you offer for the engine or its components, and any relevant customer design specifications. Your demonstration may include any other relevant information. 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 duty-cycle emission standards in this subpart apply to all testing performed according to the procedures in §§1048.505 and 1048.510, including certification, production-line, and in-use testing. The field-testing standards apply for all testing performed according to the procedures of subpart F of this part.

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