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III and Class IV engine families, and the 2010 model year for Class V engine families, these engines must meet the applicable Phase 2 standards.

(8) Notwithstanding the standards shown in Table 3 of this section, the HC+NO<sub>x</sub> (NMHC+NO<sub>x</sub>) standard for Phase 2 Class II side valve engine families with annual production of 1000 or less shall be 24.0 g/kW-hr (22.0 g/kW-hr) for model years 2010 and later. Engines produced subject to this provision may not exceed this standard and are excluded from the averaging, banking and trading program and any related credit calculations.

(b) Exhaust emissions will be measured using the procedures set forth in subpart E of this part.

[60 FR 34598, July 3, 1995, as amended at 61 FR 58300, Nov. 13, 1996; 62 FR 42643, Aug. 7, 1997; 64 FR 15236, Mar. 30, 1999; 65 FR 24305, Apr. 25, 2000; 67 FR 68340, Nov. 8, 2002]

**§ 90.104 Compliance with emission standards.**

Paragraphs (a) through (c) of this section apply to Phase 1 engines only. Paragraphs (d) through (h) of this section apply only to Phase 2 engines.

(a) If all test engines representing an engine family have emissions less than or equal to each emission standard in a given engine displacement class, that family complies with that class of emission standards.

(b) If any test engine representing an engine family has emissions greater than any one emission standard in a given engine displacement class, that family will be deemed not in compliance with that class of emission standards.

(c) If catalysts are used in an engine family, the engine manufacturer must affirm that catalyst durability has been confirmed on the basis of the evaluation procedure that is specified in subpart E of this part.

(d) The exhaust emission standards (FELs, where applicable) for Phase 2

engines set forth in this part apply to the emissions of the engines for their full useful lives as determined pursuant to § 90.105.

(e) For all Phase 2 engines, if all test engines representing an engine family have emissions, when properly tested according to procedures in this part, less than or equal to each Phase 2 emission standard (FEL, where applicable) in a given engine class and given model year, when multiplicatively adjusted by the deterioration factor determined in this section, that family complies with that class of emission standards for purposes of certification. If any test engine representing an engine family has emissions adjusted multiplicatively by the deterioration factor determined in this section, greater than any one emission standard (FEL, where applicable) for a given displacement class, that family does not comply with that class of emission standards.

(f) Each engine manufacturer must comply with all provisions of the averaging, banking and trading program outlined in subpart C of this part for each engine family participating in that program.

(g)(1) Small volume engine manufacturers and small volume engine families may, at their option, take deterioration factors for HC+NO<sub>x</sub> (NMHC+NO<sub>x</sub>) and CO from Table 1 or Table 2 of this paragraph (g), or they may calculate deterioration factors for HC+NO<sub>x</sub> (NMHC+NO<sub>x</sub>) and CO according to the process described in paragraph (h) of this section. For technologies that are not addressed in Table 1 or Table 2 of this paragraph (g), the manufacturer may ask the Administrator to assign a deterioration factor prior to the time of certification. The provisions of this paragraph (g) do not apply to Class I-A and Class I-B engines.

(2) Table 1 follows:

TABLE 1: NONHANDHELD ENGINE HC+NO<sub>x</sub> (NMHC+NO<sub>x</sub>) AND CO ASSIGNED DETERIORATION FACTORS FOR SMALL VOLUME MANUFACTURERS AND SMALL VOLUME ENGINE FAMILIES

Engine class	Side valve engines		Overhead valve engines		Engines with aftertreatment
	HC+NO <sub>x</sub> (NMHC+NO <sub>x</sub> )	CO	HC+NO <sub>x</sub> (NMHC+NO <sub>x</sub> )	CO	
Class I .....	2.1	1.1	1.5	1.1	Dfs must be calculated using the formula in §90.104(g)(4).
Class II .....	1.6	1.1	1.4	1.1	

(3) Table 2 follows:

TABLE 2—HANDHELD ENGINE HC+NO<sub>x</sub> AND CO ASSIGNED DETERIORATION FACTORS FOR SMALL VOLUME MANUFACTURERS AND SMALL VOLUME ENGINE FAMILIES

Engine class	Two-stroke engines <sup>1</sup>		Four-stroke engines		Engines with aftertreatment
	HC+NO <sub>x</sub>	CO	HC+NO <sub>x</sub>	CO	
Class III .....	1.1	1.1	1.5	1.1	Dfs must be calculated using the formula in §90.104(g)(4).
Class IV .....	1.1	1.1	1.5	1.1	
Class V .....	1.1	1.1	1.5	1.1	

<sup>1</sup> Two-stroke technologies to which these assigned deterioration factors apply include conventional two-strokes, compression wave designs, and stratified scavenging designs.

(4) Formula for calculating deterioration factors for engines with aftertreatment:

$$DF = [(NE * EDF) - (CC * F)] / (NE - CC)$$

Where:

- DF = deterioration factor.
- NE = new engine emission levels prior to the catalyst (g/kW-hr)
- EDF = deterioration factor for engines without catalyst as shown in Table 1 or Table 2 of this paragraph (g)
- CC = amount converted at 0 hours in g/kW-hr.
- F = 0.8 for HC (NMHC), 0.0 for NO<sub>x</sub>, and 0.8 for CO for all classes of engines.

(h)(1) Manufacturers shall obtain an assigned df or calculate a df, as appropriate, for each regulated pollutant for all Phase 2 engine families. Such dfs shall be used for certification, production line testing, and Selective Enforcement Auditing.

(2) For engines not using assigned dfs from Table 1 or Table 2 of paragraph (g) of this section, dfs shall be determined as follows:

(i) On at least one test engine representing the configuration chosen to be the most likely to exceed HC+NO<sub>x</sub> (NMHC+NO<sub>x</sub>) emission standards, (FELs where applicable), and constructed to be representative of production engines pursuant to §90.117, con-

duct full Federal test procedure emission testing pursuant to the regulations of subpart E of this part at the number of hours representing stabilized emissions pursuant to §90.118. If more than one engine is tested, average the results and round to the same number of decimal places contained in the applicable standard, expressed to one additional significant figure;

(ii) Conduct such emission testing again following aging the engine. The aging procedure should be designed to allow the manufacturer to appropriately predict the in-use emission deterioration expected over the useful life of the engine, taking into account the type of wear and other deterioration mechanisms expected under typical consumer use which could affect emissions performance. If more than one engine is tested, average the results and round to the same number of decimal places contained in the applicable standard, expressed to one additional significant figure;

(iii) Divide the full useful life emissions (average emissions, if applicable) for each regulated pollutant by the stabilized emissions (average emissions, if applicable) and round to two significant figures. The resulting number

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shall be the df, unless it is less than 1.0, in which case the df shall be 1.0.

(iv) At the manufacturer's option additional emission test points can be scheduled between the stabilized emission test point and the full useful life test period. If intermediate tests are scheduled, the test points must be evenly spaced over the full useful life period (plus or minus 2 hours) and one such test point shall be at one-half of full useful life (plus or minus 2 hours). For each pollutant HC+NO<sub>x</sub> (NMHC+NO<sub>x</sub>) and CO, a line must be fitted to the data points treating the initial test as occurring at hour zero, and using the method of least-squares. The deterioration factor is the calculated emissions durability period divided by the calculated emissions at zero hours.

(3) EPA may reject a df if it has evidence that the df is not appropriate for that family within 30 days of receipt from the manufacturer. The manufacturer must retain actual emission test data to support its choice of df and furnish that data to the Administrator upon request. Manufacturers may request approval by the Administrator of alternate procedures for determining deterioration. Any submitted df not rejected by EPA within 30 days shall be deemed to have been approved.

(4) Calculated deterioration factors may cover families and model years in addition to the one upon which they were generated if the manufacturer submits a justification acceptable to the Administrator in advance of certification that the affected engine families can be reasonably expected to have similar emission deterioration characteristics.

(5) Engine families that undergo running changes need not generate a new df if the manufacturer submits a justification acceptable to the Administrator concurrent with the running change that the affected engine families can be reasonably expected to have similar emission deterioration characteristics.

[60 FR 34598, July 3, 1995, as amended by 64 FR 15237, Mar. 30, 1999; 65 FR 24306, Apr. 25, 2000]

**§ 90.105 Useful life periods for Phase 2 engines.**

(a) Manufacturers shall declare the applicable useful life category for each engine family at the time of certification as described in this section. Such category shall be the category which most closely approximates the expected useful lives of the equipment into which the engines are anticipated to be installed as determined by the engine manufacturer. Manufacturers shall retain data appropriate to support their choice of useful life category for each engine family. Such data shall be furnished to the Administrator upon request.

(1) For nonhandheld engines: Manufacturers shall select a useful life category from Table 1 of this section at the time of certification. Engines with gross power output greater than 19 kW that have an engine displacement less than or equal to one liter that optionally certify under this part as allowed in § 90.1(a), must certify to a useful life period of 1,000 hours.

(2) Table 1 follows:

TABLE 1: USEFUL LIFE CATEGORIES FOR NONHANDHELD ENGINES [HOURS]

Class I .....	125	250	500
Class II .....	250	500	1000
Class I-A .....	50	125	300
Class I-B .....	125	250	500

(3) For handheld engines: Manufacturers shall select a useful life category from Table 2 of this paragraph (a) at the time of certification.

(4) Table 2 follows:

TABLE 2: USEFUL LIFE CATEGORIES FOR HANDHELD ENGINES (HOURS)

Class III .....	50	125	300
Class IV .....	50	125	300
Class V .....	50	125	300

(5) Data to support a manufacturer's choice of useful life category, for a given engine family, may include but are not limited to:

(i) Surveys of the life spans of the equipment in which the subject engines are installed;

(ii) Engineering evaluations of field aged engines to ascertain when engine performance deteriorates to the point