and Diesel heavy-duty engines. It applies to 1979 and later model years.

§ 86.302–79 Definitions.

The definitions in §§ 86.077–2, 86.078–2, and 86.079–2 apply to this subpart.

§ 86.303–79 Abbreviations.

The abbreviations in § 86.078–3 apply to this subpart.

§ 86.304–79 Section numbering; construction.

(a) The model year of initial applicability is indicated by the section number. The two digits following the hyphen designate the first model year for which a section is effective. A section remains effective until superseded.

Example: Section 86.311–79 applies to the 1979 and subsequent model years until superseded. If a § 86.311–81 is promulgated it would take effect beginning with the 1981 model year; § 86.311–79 would apply to model years 1979 and 1980.

(b) A section reference without a model year suffix refers to the section applicable for the appropriate model year.

(c) Unless indicated, all provisions in this subpart apply to both gasoline-fueled and Diesel heavy-duty engines.

§ 86.305–79 Introduction; structure of subpart.

(a) This subpart describes the equipment required and the procedures to follow in order to perform exhaust emission tests on gasoline-fueled and Diesel heavy-duty engines. Subpart A sets forth the testing requirements and test intervals necessary to comply with EPA certification procedures.

(b) Four topics are addressed in this subpart. Sections 86.306 through 86.318 set forth specifications and equipment requirements; §§ 86.319 through 86.333 discuss calibration methods and frequency; test procedures and data requirements are listed (in approximately chronological order) in §§ 86.334 through 86.343; and calculation formulas are found in §§ 86.344 and 86.345. Alternative procedures and calculations are set forth in §§ 86.346 and 86.347.

§ 86.306–79 Equipment required and specifications; overview.

(a) This subpart contains procedures for both gasoline-fueled and Diesel engine gaseous emission tests. Generally, the equipment required is identical for both types of engines. Equipment required and specifications are found in §§ 86.307 through 86.318.

(b) Some analyzer specifications refer to calibration checks found in §§ 86.320 through 86.332.

§ 86.307–82 Fuel specifications.

(a) *Gasoline.* (1) Gasoline having the following specifications will be used by the Administrator in exhaust emission testing. Gasoline having the following specifications or substantially equivalent specifications approved by the Administrator shall be used by the manufacturer in exhaust testing, except that the lead and octane specifications do not apply.

Item designation	ASTM	Leaded	Unleaded
Octane, research, minimum	D2699	100	96
PB (organic), grams/U.S. gallon		[1] 1.4	0.00–0.05
Distillation Range:			
IBP, °F	D86	75–95	75–95
10 pct point, °F	D86	120–135	120–135
50 pct point, °F	D86	200–230	200–230
90 pct point, °F	D86	300–325	300–325
EP, °F (maximum)	D86	415	415
Sulfur, weight percent, maximum	D1266	0.10	0.10
Phosphorus, grams/U.S. gallon, maximum		0.01	0.005
RVP pounds per square inch	D323	8.0–9.2	8.0–9.2
Hydrocarbon composition:			
Olefins, percent, maximum	D1319	10	10
Aromatics, percent maximum	D1319	35	35
Saturates	D1319	([2])	([2])

[1] Minimum. [2] Remainder.

(2) Gasoline representative of commercial gasoline which will be generally available through retail outlets shall be used in service accumulation. For leaded fuel the minimum lead content shall be equal to the average lead content found in regular leaded gasoline in the fuel survey prescribed by the Administrator. Where the Administrator determines that engines represented by a test engine will be operated using gasoline of different lead content from that prescribed in this paragraph, he may consent in writing to use of a gasoline with a different lead content. The octane rating of the gasoline used shall be no higher than 4.0 research octane numbers above the minimum recommended by the manufacturer and have a minimum sensitivity of 7.5 octane numbers for unleaded fuel and 7.0 octane numbers for leaded fuel, where sensitivity is defined as research octane number minus motor octane number.

(b) *Diesel Fuel.* (1) The diesel fuels employed for testing shall be clean and bright, with pour and cloud points adequate for operability. The diesel fuel may contain nonmetallic additives as follows: Cetane improver, metal deactivator, antioxident, dehazer, antirust pour depressant, dye, and dispersant.

(2) Diesel fuel meeting the following specifications, or substantially equivalent specifications approved by the Administrator, shall be used in exhaust emissions testing. The grade of diesel fuel recommended by the engine manufacturer commercially designated as ''Type 1–D'' or ''Type 2–D'', shall be used.

Item	ASTM test method No.	Type 1–D	Type 2–D
Cetane Number	D613, D86	48–54	42–50
Distillation range:			
IBP, °F		330–390	340–400
10 percent point, °F		370–430	400–460
50 percent point, °F		410–480	470–540
90 percent point, °F		460–520	550–610
EP, °F		500–560	580–660
Gravity, °AP1	D287	40–44	33–37
Total sulfur, percent	D129 or D2622	0.05–0.02	0.2–0.5
Hydrocarbon composition	D1319		
Aromatics, percent (minimum		[1] 8	[1] 27
Paraffins, naphthenes, olefins		([2])	([2])
Flashpoint, °F (minimum)	D93	120	130
Viscosity, centistokes	D445	1.6–2.0	2.0–3.2

[1] Minimum.
[2] Remainder.

(3) Diesel fuel meeting the following specifications, or substantially equivalent specifications approved by the Administrator, shall be used in service accumulation. The grade of diesel fuel recommended by the engine manufacturer, commercially designated as ''Type 1–D'' or ''Type 2–D'', shall be used.

Item	ASTM test method No.	Type 1–D	Type 2–D
Cetane (minimum)	D613	42–56	38–58
Distillation range 90 pct point, °F	D86	440–530	540–630
Gravity, °AP1	D287	39–45	30–42
Total sulfur, percent	D129 or D2622	0.05	0.2
Flashpoint, °F (minimum)	D96	120	130
Viscosity, centistokes	D445	1.2–2.2	1.5–4.5

[1] Minimum.

(4) Other petroleum distillate fuels may be used for testing and service accumulation provided:

(i) They are commercially available;

(ii) Information, acceptable to the Administrator, is provided to show that only the designated fuel would be used in customer service;

(iii) Use of a fuel listed under paragraphs (b) (2) and (3) of this section would have a detrimental effect on emissions or durability; and

(iv) Written approval from the Administrator of the fuel specifications was provided prior to the start of testing.

(5) The specification range of the fuels to be used under paragraphs (b)(2), (3), and (4) of this section shall be reported in accordance with § 86.082–21(b)(3).

(c) Fuels not meeting the specifications set forth in this section may be used only with the advance approval of the Administrator.

[46 FR 50494, Oct. 13, 1981, and 47 FR 49807, Nov. 2, 1982]

§ 86.308–79 Gas specifications.

(a) *Analyzer gases.* (1) Calibration gases for the CO and CO_2 analyzers shall have zero grade nitrogen as a diluent. Combined CO and CO_2 span gases are permitted. Zero grade nitrogen shall be the diluent for CO and CO_2 span gases.

(2) Calibration or span gases for the hydrocarbon analyzer shall be propane with zero-grade nitrogen as a diluent when testing gasoline-fueled engines. For Diesel engine tests the diluent shall be zero-grade air.

(3) Calibration or span gases for the NO_X analyzer shall be NO named as NO_X with a maximum NO_2 concentration of 5 percent of the nominal value. Zero-grade nitrogen shall be the diluent.

(4) Zero-grade gases for hydrocarbon analyzers shall be nitrogen when testing gasoline-fueled engines and air when testing Diesel engines.

(5) Zero-grade gases for the carbon monoxide, carbon dioxide and oxides of nitrogen analyzers shall be either zero-grade air or zero-grade nitrogen.

(6) The allowable zero grade gas (air or nitrogen) impurity concentrations shall not exceed 2 ppmC hydrocarbon, 10 ppm carbon monoxide, 400 ppm carbon dioxide and 1 ppm nitric oxide.

(7) ''Zero-grade air'' includes artificial ''air'' consisting of a blend of nitrogen and oxygen with oxygen concentrations between 18 and 21 mole percent.

(b) *Calibration gas.* Calibration gas values are to be derived from NBS ''Standard Reference Materials'' (SRM's) or other gas standards approved by the Administrator. The uncertainty of the assigned calibration gas values shall not exceed 2.0 percent of the assigned value. The uncertainty is defined as the sum of the precision errors (at the 90 percent confidence level) and the bias errors. Precision and bias errors apply to both the equipment and the derivation procedures.

(c) *Span gas.* Span gas values are to be derived from NBS ''Standard Reference Materials'' (SRM's) or other gas standards approved by the Administrator. The uncertainty of the assigned calibration gas values shall not exceed 3.0 percent of the assigned value. The uncertainty is defined as the sum of the precision errors (at the 90 percent confidence level) and the bias errors. Precision and bias errors apply to both the equipment and the derivation procedures.

(d) *Hydrocarbon analyzer fuel*—(1) *The fuel shall contain 40 ±2 percent hydrogen.* The balance shall be helium. The mixture shall contain less than 2 ppmC hydrocarbon.

(2) *Alternate pure hydrogen fuel.* Some HFID's are designed to operate on pure hydrogen. Generally the HFID fuel is incompatible with good relative hydrocarbon response.

(i) For Diesel engines this fuel is not recommended. However, this fuel may be used if the engine manufacturer demonstrates, on each basic combustion system (i.e., 4 cycle DI, 2 cycle DI, 4 cycle pre-cup, etc.) that an HFID using this fuel produces comparable results to an HFID using 40% H_2/60% He fuel. These data must be submitted to and approved by the Administrator prior to testing. Pure H_2 fuel, that may be allowed for testing, must contain at least 99.0 percent hydrogen and contain less than 2 ppmC hydrocarbon.

(ii) For gasoline-fueled engines, pure hydrogen fuel for the HFID is not allowed.

(e) *Hydrocarbon analyzer burner air.* The concentration of oxygen must be within 1 mole percent of the oxygen concentration of the burner air used in the latest oxygen interference check ($\%O_2$ I). If the difference in oxygen concentration is greater than 1 mole percent, then the oxygen interference must be checked and the analyzer adjusted if necessary, to meet the $\%O_2$ I