

**Environmental Protection Agency**

**§ 80.49**

**§ 80.49 Fuels to be used in augmenting the complex emission model through vehicle testing.**

(a) Seven fuels (hereinafter called the "addition fuels") shall be tested for the purpose of augmenting the complex emission model with a parameter not currently included in the complex emission model. The properties of the addition fuels are specified in paragraphs (a)(1) and (2) of this section. The addition fuels shall be specified with at

least the same level of detail and precision as in paragraph (a)(5)(i) of this section, and this information must be included in the petition submitted to the Administrator requesting augmentation of the complex emission model.

(1) The seven addition fuels to be tested when augmenting the complex model specified at §80.45 with a new fuel parameter shall have the properties specified as follows:

PROPERTIES OF FUELS TO BE TESTED WHEN AUGMENTING THE MODEL WITH A NEW FUEL PARAMETER

Fuel property	Fuels						
	1	2	3	4	5	6	7
Sulfur, ppm .....	150	150	150	35	35	500	500
Benzene, vol % .....	1.0	1.0	1.0	0.5	0.5	1.3	1.3
RVP, psi .....	7.5	7.5	7.5	6.5	6.5	8.1	8.1
E200, % .....	50	50	50	62	62	37	37
E300, % .....	85	85	85	92	92	79	79
Aromatics, vol % .....	27	27	27	20	20	45	45
Olefins, vol % .....	9.0	9.0	9.0	2.0	2.0	18	18
Oxygen, wt % .....	2.1	2.1	2.1	2.7	2.7	1.5	1.5
Octane, (R+M)/2 .....	87	87	87	87	87	87	87
New Parameter <sup>1</sup> .....	C	(C+B)/2	B	C	B	C	B

<sup>1</sup>C = Candidate level, B = Baseline level.

(i) For the purposes of vehicle testing, the "baseline" level of the parameter shall refer to the level of the parameter in Clean Air Act baseline gasoline. The "candidate" level of the parameter shall refer to the most extreme value of the parameter, relative to baseline levels, for which the augmentation shall be valid.

(ii) If the fuel parameter for which the fuel supplier is petitioning EPA to augment the complex emission model (hereinafter defined as the "candidate parameter") is not specified for Clean Air Act summer baseline fuel, then the baseline level for the candidate parameter shall be set at the levels found in typical gasoline. This level and the justification for this level shall be included in the petitioner's submittal to EPA prior to initiating the test program, and EPA must approve this level prior to the start of the program.

(iii) If the candidate parameter is not specified for Clean Air Act summer baseline fuel, and is not present in typical gasoline, its baseline level shall be zero.

(2) The addition fuels shall contain detergent control additives in accord-

ance with section 211(l) of the Clean Air Act Amendments of 1990 and the associated EPA requirements for such additives.

(3) The addition fuels shall be specified with at least the same level of detail and precision as in paragraph (a)(5)(i) of this section, and this information shall be included in the petition submitted to the Administrator requesting augmentation of the complex emission model.

(i) Paraffin levels in Fuels 1 and 2 shall be altered from the paraffin level in Fuel 3 to compensate for the addition or removal of the candidate parameter, if necessary. Paraffin levels in Fuel 4 shall be altered from the paraffin level in Fuel 5 to compensate for the addition or removal of the candidate parameter, if necessary. Paraffin levels in Fuel 6 shall be altered from the paraffin level in Fuel 7 to compensate for the addition or removal of the candidate parameter, if necessary.

(ii) Other properties of Fuels 4 and 6 shall not vary from the levels for Fuels

§ 80.49

40 CFR Ch. I (7-1-07 Edition)

5 and 7, respectively, unless such variations are the naturally-occurring result of the changes described in paragraphs (a)(1) and (2) of this section. Other properties of Fuels 1 and 2 shall not vary from the levels for Fuel 3, unless such variations are the naturally-occurring result of the changes described in paragraphs (a)(1) and (2) of this section.

(iii) The addition fuels shall be specified with at least the same level of detail and precision as defined in paragraph (a)(5)(i) of this section, and this information must be included in the petition submitted to the Administrator requesting augmentation of the complex emission model.

(4) The properties of the addition fuels shall be within the blending tolerances defined in this paragraph (a)(4) relative to the values specified in paragraphs (a)(1) and (2) of this section. Fuels that do not meet these tolerances shall require the approval of the Administrator to be used in vehicle testing to augment the complex emission model:

Fuel parameter	Blending tolerance
Sulfur content .....	±25 ppm.
Benzene content .....	±0.2 vol %.
RVP .....	±0.2 psi.
E200 level .....	±2 %.
E300 level .....	±4 %.
Oxygenate content .....	±1.0 vol %.
Aromatics content .....	±2.7 vol %.
Olefins content .....	±2.5 vol %.
Saturates content .....	±2.0 vol %.
Octane .....	±0.5.
Detergent control additives ....	±10% of the level required by EPA's detergents rule.
Candidate parameter .....	To be determined as part of the augmentation process.

(5) The composition and properties of the addition fuels shall be determined by averaging a series of independent tests of the properties and compositional factors defined in paragraph (a)(5)(i) of this section as well as any additional properties or compositional factors for which emission benefits are claimed.

(i) The number of independent tests to be conducted shall be sufficiently large to reduce the measurement uncertainty for each parameter to a sufficiently small value. At a minimum the 95% confidence limits (as calculated using a standard t-test) for each parameter must be within the following

range of the mean measured value of each parameter:

Fuel parameter	Measurement uncertainty
API gravity .....	±0.2°API
Sulfur content .....	±10 ppm
Benzene content ....	±0.02 vol %
RVP .....	±0.05 psi
Octane .....	±0.2 (R+M/2)
E200 level .....	±2%
E300 level .....	±2%
Oxygenate content	±0.2 vol %
Aromatics content ..	±0.5 vol %
Olefins content .....	±0.3 vol %
Saturates content ...	±1.0 vol %
Detergent control Additives.	±2% of the level required by EPA's detergents rule.

(ii) The 95% confidence limits for measurements of fuel parameters for which emission reduction benefits are claimed and for which tolerances are not defined in paragraph (a)(5)(i) of this section must be within ±5% of the mean measured value.

(iii) Each test must be conducted in the same laboratory in accordance with the procedures outlined at § 80.46.

(b) Three fuels (hereinafter called "extension fuels") shall be tested for purpose of extending the valid range of the complex emission model for a parameter currently included in the complex emission model. The properties of the extension fuels are specified in paragraphs (b)(2) through (4) of this section. The extension fuels shall be specified with at least the same level of detail and precision as in paragraph (a)(5)(i) of this section, and this information must be included in the petition submitted to the Administrator requesting augmentation of the complex emission model. Each set of three extension fuels shall be used only to extend the range of a single complex model parameter.

(1) The "extension level" shall refer to the level to which the parameter being tested is to be extended. The three fuels to be tested when extending the range of fuel parameters already included in the complex model or a prior augmentation to the complex model shall be referred to as "extension fuels."

(2) The composition and properties of the extension fuels shall be as described in paragraphs (b)(2) (i) and (ii) of this section.

**Environmental Protection Agency**

**§ 80.49**

(i) The extension fuels shall have the following levels of the parameter being extended:

**LEVEL OF EXISTING COMPLEX MODEL  
PARAMETERS BEING EXTENDED**

Fuel property being extended	Extension fuel No. 1	Extension fuel No. 2	Extension fuel No. 3
Sulfur, ppm .....	Extension level	80	450
Benzene, vol % .....	Extension level	0.5	1.5
RVP, psi .....	Extension level	6.7	8.0
E200, % .....	Extension level	38	61
E300, % .....	Extension level	78	92
Aromatics, vol % .....	Extension level	20	45
Olefins, vol % .....	Extension level	3.0	18
Oxygen, wt % .....	Extension level	1.7	2.7
Octane, R+M/2 .....	87	87	87

(ii) The levels of parameters other than the one being extended shall be given by the following table for all three extension fuels:

**LEVELS FOR FUEL PARAMETERS OTHER THAN  
THOSE BEING EXTENDED**

Fuel property	Extension fuel No. 1	Extension fuel No. 2	Extension fuel No. 3
Sulfur, ppm .....	150	150	150
Benzene, vol % .....	1.0	1.0	1.0
RVP, psi .....	7.5	7.5	7.5
E200, % .....	50	50	50
E300, % .....	85	85	85
Aromatics, vol % .....	25	25	25
Olefins, vol % .....	9.0	9.0	9.0
Oxygen, wt % .....	2.0	2.0	2.0
Octane, R+M/2 .....	87	87	87

(3) If the Complex Model for any pollutant includes one or more interactive terms involving the parameter being extended, then two additional extension fuels shall be required to be tested for each such interactive term. These additional extension fuels shall have the following properties:

(i) The parameter being tested shall be present at its extension level.

(ii) The interacting parameter shall be present at the levels specified in paragraph (b)(2)(i) of this section for extension Fuels 2 and 3.

(iii) All other parameters shall be present at the levels specified in paragraph (b)(2)(ii) of this section.

(4) All extension fuels shall contain detergent control additives in accordance with Section 211(l) of the Clean Air Act Amendments of 1990 and the associated EPA requirements for such additives.

(c) The addition fuels defined in paragraph (a) of this section and the extension

fuels defined in paragraph (b) of this section shall meet the following requirements for blending and measurement precision:

(1) The properties of the test and extension fuels shall be within the blending tolerances defined in this paragraph (c) relative to the values specified in paragraphs (a) and (b) of this section. Fuels that do not meet the following tolerances shall require the approval of the Administrator to be used in vehicle testing to augment the complex emission model:

Fuel parameter	Blending tolerance
Sulfur content .....	±25 ppm.
Benzene content .....	±0.2 vol %.
RVP .....	±0.2 psi.
E200 level .....	±2 %.
E300 level .....	±4 %.
Oxygenate content .....	±1.5 vol %.
Aromatics content .....	±2.7 vol %.
Olefins content .....	±2.5 vol %.
Saturates content .....	±2.0 vol %.
Octane .....	±0.5.
Candidate parameter .....	To be determined as part of the augmentation process.

(2) The extension and addition fuels shall be specified with at least the same level of detail and precision as defined in paragraph (c)(2)(i) of this section, and this information must be included in the petition submitted to the Administrator requesting augmentation of the complex emission model.

(i) The composition and properties of the addition and extension fuels shall be determined by averaging a series of independent tests of the properties and compositional factors defined in paragraph (c)(2)(ii) of this section as well as any additional properties or compositional factors for which emission benefits are claimed.

(ii) The number of independent tests to be conducted shall be sufficiently large to reduce the measurement uncertainty for each parameter to a sufficiently small value. At a minimum the 95% confidence limits (as calculated using a standard t-test) for each parameter must be within the following range of the mean measured value of each parameter:

Fuel parameter	Measurement uncertainty
API gravity .....	±0.2 °API.
Sulfur content .....	±5 ppm.
Benzene content .....	±0.05 vol %.

§ 80.50

Fuel parameter	Measurement uncertainty
RVP .....	±0.08 psi.
Octane .....	±0.1 (R+M/2).
E200 level .....	±2 %.
E300 level .....	±2 %.
Oxygenate content .....	±0.2 vol %.
Aromatics content .....	±0.5 vol %.
Olefins content .....	±0.3 vol %.
Saturates content .....	±1.0 vol.%
Octane .....	±0.2.
Candidate parameter .....	To be determined as part of the augmentation process.

(iii) Petitioners shall obtain approval from EPA for the 95% confidence limits for measurements of fuel parameters for which emission reduction benefits are claimed and for which tolerances are not defined in paragraph (c)(2)(i) of this section.

(iv) Each test must be conducted in the same laboratory in accordance with the procedures outlined at §80.46.

(v) The complex emission model described at §80.45 shall be used to adjust the emission performance of the addition and extension fuels to compensate for differences in fuel compositions that are incorporated in the complex model, as described at §80.48. Compensating adjustments for naturally-resulting variations in fuel parameters shall also be made using the complex model. The adjustment process is described in paragraph (d) of this section.

(d) The complex emission model described at §80.45 shall be used to adjust the emission performance of addition and extension fuels to compensate for differences in fuel parameters other than the parameter being tested. Compensating adjustments for naturally-resulting variations in fuel parameters shall also be made using the complex model. These adjustments shall be calculated as follows:

(1) Determine the exhaust emissions performance of the actual addition or extension fuels relative to the exhaust emissions performance of Clean Air Act baseline fuel using the complex model. For addition fuels, set the level of the parameter being tested at baseline levels for purposes of emissions performance evaluation using the complex model. For extension fuel #1, set the level of the parameter being extended at the level specified in extension fuel #2. Also determine the exhaust emissions performance of the addition fuels specified in paragraph

40 CFR Ch. I (7-1-07 Edition)

(a)(1) of this section with the level of the parameter being tested set at baseline levels.

(2) Calculate adjustment factors for each addition fuel as follows:

(i) Adjustment factors shall be calculated using the formula:

$$A = \frac{[1 + (P(\text{actual})/100)]}{[1 + (P(\text{nominal})/100)]}$$

where

A = the adjustment factor

P(actual) = the performance of the actual fuel used in testing according to the complex model

P(nominal) = the performance that would have been achieved by the test fuel defined in paragraph (a)(1) of this section according to the complex model (as described in paragraph (d)(1) of this section).

(ii) Adjustment factors shall be calculated for each pollutant and for each emitter class.

(3) Multiply the measured emissions from each vehicle by the corresponding adjustment factor for the appropriate addition or extension fuel, pollutant, and emitter class. Use the resulting adjusted emissions to conduct all modeling and emission effect estimation activities described in §80.48.

(e) All fuels included in vehicle testing programs shall have an octane number of 87.5, as measured by the (R+M)/2 method following the ASTM D4814 procedures, to within the measurement and blending tolerances specified in paragraph (c) of this section.

(f) A single batch of each addition or extension fuel shall be used throughout the duration of the testing program.

[59 FR 7813, Feb. 16, 1994, as amended at 59 FR 36962, July 20, 1994; 71 FR 74567, Dec. 15, 2005]

**§ 80.50 General test procedure requirements for augmentation of the emission models.**

(a) The following test procedure must be followed when testing to augment the complex emission model described at §80.45.

(1) VOC, NO<sub>x</sub>, CO, and CO<sub>2</sub> emissions must be measured for all fuel-vehicle combinations tested.

(2) Toxics emissions must be measured when testing the extension fuels per the requirements of §80.49(b) or