

DF=Dilution factor, which is the volumetric ratio of the dilution air to the raw exhaust sample, calculated as:

$$DF = \frac{WCO_2 - WCO_{2d}}{WCO_{2e} - WCO_{2d}} - 1$$

(c) *Humidity calculations.* (1) The following abbreviations (and units) apply to paragraph (b) of this section:

- BARO=barometric pressure (Pa).
- H=specific humidity, (g H₂O/g of dry air).
- K_H=conversion factor=0.6220 g H₂O/g dry air.
- M_{air}=Molecular weight of air=28.9645.
- M_{H₂O}=Molecular weight of water=18.01534.
- P_{DB}=Saturation vapor pressure of water at the dry bulb temperature (Pa).
- P_{DP}=Saturation vapor pressure of water at the dewpoint temperature (Pa).
- P_v=Partial pressure of water vapor (Pa).
- P_{WB}=Saturation vapor pressure of water at the wet bulb temperature (Pa).
- T_{DB}=Dry bulb temperature (Kelvin).
- T_{WB}=Wet bulb temperature (Kelvin).
- Y=Water-vapor volume concentration.

(2) The specific humidity on a dry basis of the intake air (H) is defined as:
 $H = (K_H) (P_v) / (BARO - P_v)$

(3) The partial pressure of water vapor may be determined using a dew point device. In that case:
 $P_v = P_{DP}$

(4) The percent of relative humidity (RH) is defined as:
 $RH = (P_v / P_{DB}) 100$

(5) The water-vapor volume concentration on a dry basis of the engine intake air (Y) is defined as:
 $Y = ((H) (M_{air}) / (M_{H_2O})) = P_v / (BARO - P_v)$

(d) *NO_x correction factor.* (1) NO_x emission rates (M_{NO_x mode}) shall be adjusted to account for the effects of humidity and temperature by multiplying each emission rate by K_{NO_x}, which is calculated from the following equations:

$$K_{NO_x} = (K) (1 + (0.25 (\log K)^2)^{1/2})$$

$$K = (K_H) (K_T)$$

$$K_H = [C_1 + C_2 (\exp((-0.0143)(10.714)))] / [C_1 + C_2 (\exp((-0.0143)(1000H)))]$$

$$C_1 = -8.7 + 164.5 \exp(-0.0218(A/F)_{wet})$$

$$C_2 = 130.7 + 3941 \exp(-0.0248(A/F)_{wet})$$

Where:
 (A/F)_{wet}=Mass of moist air intake divided by mass of fuel intake.

- K_T=1/[1-0.017(T₃₀-T_A)] for tests conducted at ambient temperatures below 30 °C.
- K_T=1.00 for tests conducted at ambient temperatures at or above 30 °C.
- T₃₀=The measured intake manifold air temperature in the locomotive when operated at 30 °C (or 100 °C, where intake manifold air temperature is not available).
- T_A=The measured intake manifold air temperature in the locomotive as tested (or the ambient temperature (°C), where intake manifold air temperature is not available).

(e) *Other calculations.* Calculations other than those specified in this section may be used with the advance approval of the Administrator.

§ 92.133 Required information.

(a) The required test data shall be grouped into the following two general categories:

(1) *Pre-test data.* These data are general test data that must be recorded for each test. The data are of a more descriptive nature such as identification of the test engine, test site number, etc. As such, these data can be recorded at any time within 24 hours of the test.

(2) *Test data.* These data are physical test data that must be recorded at the time of testing.

(b) When requested, data shall be supplied in the format specified by the Administrator.

(c) *Pre-test data.* The following shall be recorded, and reported to the Administrator for each test conducted for compliance with the provisions of this part:

(1) Engine family identification (including subfamily identification, such as for aftertreatment systems).

(2) Locomotive and engine identification, including model, manufacturer and/or remanufacturer, and identification number.

(3) Locomotive and engine parameters, including fuel type, recommended oil type, exhaust configuration and sizes, base injection (ignition) timing, operating temperature, advance/retard injection (ignition) timing controls, recommended start-up and warm-up procedures, alternator generator efficiency curve.

(4) Locomotive or engine and instrument operator(s).

(5) Number of hours of operation accumulated on the locomotive or engine prior to beginning the testing.

(6) Dates of most recent calibrations required by §§ 92.115-92.122.

(7) All pertinent instrument information such as tuning (as applicable), gain, serial numbers, detector number, calibration curve number, etc. As long as this information is traceable, it may be summarized by system or analyzer identification numbers.

(8) A description of the exhaust duct and sample probes, including dimensions and locations.

(d) Test data. The physical parameters necessary to compute the test results and ensure accuracy of the results shall be recorded for each test conducted for compliance with the provisions of this part. Additional test data may be recorded at the discretion of the manufacturer or remanufacturer. Extreme details of the test measurements such as analyzer chart deflections will generally not be required on a routine basis to be reported to the Administrator for each test, unless a dispute about the accuracy of the data arises. The following types of data shall be required to be reported to the Administrator. The applicable Application Format for Certification will specify the exact requirements which may change slightly from year to year with the addition or deletion of certain items.

(1) Date and time of day.

(2) Test number.

(3) Engine intake air and test cell (or ambient, as applicable) temperature.

(4) For each test point, the temperature of air entering the engine after compression and cooling in the charge air cooler(s). If testing is not performed on a locomotive, the corresponding temperatures when the engine is in op-

eration in a locomotive at ambient conditions represented by the test.

(5) Barometric pressure. (A central laboratory barometer may be used: Provided, that individual test cell barometric pressures are shown to be within ± 0.1 percent of the barometric pressure at the central barometer location.)

(6) Engine intake and test cell dilution air humidity.

(7) Measured horsepower and engine speed for each test mode.

(8) Identification and specifications of test fuel used.

(9) Measured fuel consumption rate at maximum power.

(10) Temperature set point of the heated continuous analysis system components (if applicable).

(11) All measured flow rates, dilution factor, and fraction of exhaust diluted for diluted exhaust measurements (as applicable) for each test mode.

(12) Temperature of the dilute exhaust mixture at the inlet to the respective gas meter(s) or flow instrumentation used for particulate sampling.

(13) The maximum temperature of the dilute exhaust mixture immediately ahead of the particulate filter.

(14) Sample concentrations (background corrected as applicable) for HC, CO, CO₂, and NO_x (and methane, NMHC, alcohols and aldehydes, as applicable) for each test mode. This includes the continuous trace and the steady-state value (or integrated value where required).

(15) The stabilized pre-test weight and post-test weight of each particulate sample and back-up filter or pair of filters.

(16) Brake specific emissions (g/BHP-hr) for HC, CO, NO_x, particulate and, if applicable, CH₃, NMHC, THCE, CH₃OH, CH₃CH₂OH, CH₂O and CH₃CHO for each test mode.

(17) The weighted brake specific emissions for HC, CO, NO_x and particulate (g/BHP-hr) for the total test for the duty-cycle(s) applicable to the locomotive.

(18) The smoke opacity for each test mode. This includes the continuous trace, the peak values and the steady-state value.

§ 92.201

EFFECTIVE DATE NOTE: At 63 FR 19044, Apr. 16, 1998, § 92.133 was added. This section contains information collection and record-keeping requirements and will not become effective until approval has been given by the Office of Management and Budget.

Subpart C—Certification Provisions

§ 92.201 Applicability.

The requirements of this subpart are applicable to manufacturers and remanufacturers of any locomotives and locomotive engines subject to the provisions of subpart A of this part.

§ 92.202 Definitions.

The definitions of subpart A of this part apply to this subpart.

§ 92.203 Application for certification.

(a) For each engine family that complies with all applicable standards and requirements, the manufacturer or remanufacturer must submit to the Administrator a completed application for a certificate of conformity.

(b) The application must be approved and signed by the authorized representative of the manufacturer or remanufacturer.

(c) The application will be updated and corrected by amendment as provided for in § 92.210 to accurately reflect the manufacturer's or remanufacturer's production.

(d) *Required content.* Each application must include the following information:

(1)(i) A description of the basic engine design including, but not limited to, the engine family specifications, the provisions of which are contained in § 92.208;

(ii)(A) For freshly manufactured locomotives, a description of the basic locomotive design;

(B) For freshly manufactured engines for use in remanufactured locomotives, a description of the locomotive designs in which the engines are to be used;

(C) For remanufactured locomotives, a description of the basic locomotive designs to which the remanufacture system will be applied;

(iii) A list of distinguishable configurations to be included in the engine family;

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(2) An explanation of how the emission control system operates, including detailed descriptions of:

(i) All emission control system components;

(ii) Injection or ignition timing for each notch (i.e., degrees before or after top-dead-center), and any functional dependence of such timing on other operational parameters (e.g., engine coolant temperature);

(iii) Each auxiliary emission control device (AECD); and

(iv) All fuel system components to be installed on any production or test locomotive(s) or engine(s);

(3) A description of the test locomotive or engine;

(4) Special or alternate test procedures, if applicable;

(5) A description of the operating cycle and the period of operation necessary to accumulate service hours on the test locomotive or engine and stabilize emission levels;

(6) A description of all adjustable operating parameters (including, but not limited to, injection timing and fuel rate), including the following:

(i) The nominal or recommended setting and the associated production tolerances;

(ii) The intended adjustable range, and the physically adjustable range;

(iii) The limits or stops used to limit adjustable ranges;

(iv) Production tolerances of the limits or stops used to establish each physically adjustable range; and

(v) Information relating to why the physical limits or stops used to establish the physically adjustable range of each parameter, or any other means used to inhibit adjustment, are the most effective means possible of preventing adjustment of parameters to settings outside the manufacturer's or remanufacturer's specified adjustable ranges on in-use engines;

(7) For families participating in the averaging, banking, and trading program, the information specified in subpart D of this part;

(8) Projected U.S. production information for each configuration;

(9) A description of the test equipment and fuel proposed to be used;