

(iii) If a heat exchanger is used, the gas mixture temperature, measured at a point immediately ahead of the critical flow venturi, shall be within $\pm 20^{\circ}\text{F}$ (11°C) of the designed operating temperature at the start of the test. The gas mixture temperature variation from its value at the start of the test shall be limited to $\pm 20^{\circ}\text{F}$ (11°C) during the entire test. The temperature measuring system shall have an accuracy and precision of $\pm 2^{\circ}\text{F}$ (1.1°C).

(iv) The cyclonic separator is optional.

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(c) *Component description—*

methanol-fueled vehicles. The components necessary for methanol-fueled vehicle exhaust sampling shall meet the following requirements:

(1) The PDP-CVS, Figure B94-5, shall contain a proportional particulate sampling system, and shall conform to all of the requirements listed for the exhaust gas PDP-CVS (§ 86.109), with one exception: a flow rate of sufficient volume is required to maintain the diluted exhaust stream, from which the particulate sample flow is taken, at a temperature of 125°F (52°C) or less.

(2) The CFV-CVS sample system, Figure B94-6, shall contain a proportional particulate sampling system, and shall conform to all of the requirements listed for the exhaust gas CFV sample system (§ 86.109), except for the following:

(i) A flow rate of sufficient volume is required to maintain the diluted exhaust stream, from which the particulate sample flow is taken, at a temperature of 125°F (52°C) or less.

(ii) If a constant volume particulate sample is collected, a heat exchanger is required.

(iii) If a heat exchanger is used, the gas mixture temperature, measured at a point immediately ahead of the critical flow venturi, shall be within $\pm 20^{\circ}\text{F}$ (11°C) of the designed operating temperature at the start of the test. The gas mixture temperature variation from its value at the start of the test shall be limited to $\pm 20^{\circ}\text{F}$ (11°C) during the entire test. The temperature measuring system shall have an accuracy and precision of $\pm 2^{\circ}\text{F}$ (1.1°C).

(iv) The cyclonic separator is optional.

(3) The EFC-CFV-CVS sample system shall conform to all of the requirements listed for the exhaust gas EFC sample system (§ 86.109) with three exceptions:

(i) A flow rate of sufficient volume is required to maintain the diluted exhaust stream, from which the particulate sample flow is taken, at a temperature of 125°F (52°C) or less.

(ii) A proportional particulate sample shall be collected using an electronic flow controller that meets the performance criteria listed in § 86.109 for methanol and formaldehyde EFC systems.

(iii) The cyclonic separator is optional.

(4) Losses of methanol due to condensation of water in the duct connecting the vehicle tail pipe to the dilution tunnel must be eliminated. This may be accomplished by:

(i) The use of a duct of unrestricted length maintained at a temperature above the maximum dew point of the exhaust, but below 250°F (121°C), through heating and cooling as required; or

(ii) The use of a short duct (up to 12 feet long) constructed of smooth wall pipe with a minimum of flexible sections maintained at a temperature above the maximum dew point of the exhaust, but below 250°F (121°C), prior to the test and during breaks in testing (insulation may remain in place and/or heating may occur during testing provided maximum temperature is not exceeded); or

(iii) Using smooth wall duct less than five feet long with no required heating. A maximum of two short flexible connectors are allowed under this option; or

(iv) Omitting the duct and performing the exhaust gas dilution function at the vehicle tailpipe exit.

(5) The vehicle exhaust shall be directed downstream at the point where it is introduced into the dilution tunnel.

(6) The dilution air shall be between 68°F (20°C) and 86°F (30°C) during the test (unless the requirements of § 86.109-94(b)(4) are also met).

(7) The dilution tunnel shall be:

(i) Sized to permit development of turbulent flow (Reynold's No. $>>4000$) and complete mixing of the exhaust and dilution air between the mixing orifice and the particulate sample probe. It is recommended that uniform mixing be demonstrated by the user.

(ii) At least 8.0 inches (20.3 cm) in diameter.

(iii) Constructed of electrically conductive material which does not react with the exhaust components.

(iv) Grounded.

(8) The temperature of the diluted exhaust stream inside of the dilution tunnel shall be sufficient to prevent water condensation. However, the sample zone dilute exhaust temperature shall not exceed 125°F (52°C) at any time during the test.

(9) The particulate sample probe shall be:

(i) Installed facing upstream at a point where the dilution air and exhaust are

well mixed (i.e., near the tunnel centerline, approximately 10 tunnel diameters downstream from the point where the exhaust enters the dilution tunnel).

(ii) Sufficiently distant (radially) from the THC probe so as to be free from the influence of any wakes or eddies produced by the THC probe.

(iii) 0.5 inch (1.27 cm) minimum inside diameter.

(iv) The distance from the sampling tip to the filter holder shall be at least five probe diameters (for filters located inside the tunnel), but not more than 40.0 inches (102 cm) for filters located outside of the dilution tunnel.

(v) Free from sharp bends.

(vi) Configured so that a clean particulate filter (including back up filter) can be selected simultaneously with the selection of an empty gaseous emissions bag.

(10) The flow rate through the particulate probe shall be maintained to a constant value within ± 5 percent of the set flow rate.

(11) The particulate sample pump shall be located sufficiently distant from the dilution tunnel so that the inlet gas temperature is maintained at a constant temperature ($\pm 5.0^{\circ}\text{F}$ (2.8°C)).

(12) The gas meters or flow instrumentation shall be located sufficiently distant from the tunnel so that the inlet gas temperature remains constant ($\pm 5.0^{\circ}\text{F}$ (2.8°C)).

(13) The hydrocarbon probe shall be:

(i) Installed facing upstream at a point where the dilution air and exhaust are well mixed (i.e., approximately ten tunnel diameters downstream from the point where the exhaust enters the dilution tunnel).

(ii) Sufficiently distant (radially) from the particulate probe so as to be free from the influence of any wakes or eddies produced by the particulate probe.

(iii) Heated and insulated over the entire length to maintain a wall temperature more than 5°F (3°C) above the maximum dew point of the sample, but below 250°F (121°C).

(iv) 0.19 in. (0.48 cm) minimum inside diameter.

(14) It is intended that the THC probe be free from cold spots (i.e., free from cold spots where the probe wall temperature is less than 5°F (3°C) above the maximum dew point of the sample.) This will be determined by a temperature sensor located on a section of the probe wall outside of the dilution tunnel. The temperature sensor shall be insulated from any heating elements on the probe. The sensor shall have an accuracy and precision of $\pm 2^{\circ}\text{F}$ (1.1°C).