

§ 89.412

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sampling only) by the bag sample technique outlined in paragraph (c) of this section.

(e) *Hydrocarbon hangup.* If HC hangup is indicated, the following sequence may be performed:

- (1) Fill a clean sample bag with background air.
- (2) Zero and span the HFID at the analyzer ports.
- (3) Analyze the background air sample bag through the analyzer ports.
- (4) Analyze the background air through the entire sample probe system.
- (5) If the difference between the readings obtained greater than or equal to 2 percent of full scale deflection, clean the sample probe and the sample line.
- (6) Reassemble the sample system, heat to specified temperature, and repeat the procedure in paragraphs (e)(1) through (e)(6) of this section.

[59 FR 31335, June 17, 1994. Redesignated and amended at 63 FR 56996, 57016, Oct. 23, 1998]

§ 89.412 Raw gaseous exhaust sampling and analytical system description.

(a) *Schematic drawing.* An example of a sampling and analytical system which may be used for testing under this subpart is shown in Figure 1 in appendix B to subpart D. All components or parts of components that are wetted by the sample or corrosive calibration gases shall be either chemically cleaned stainless steel or inert material, for example, polytetrafluoroethylene resin. The use of "gauge savers" or "protectors" with nonreactive diaphragms to reduce dead volumes is permitted.

(b) *Sample probe.* (1) The sample probe shall be a straight, closed-end, stainless steel, multi-hole probe. The inside diameter shall not be greater than the inside diameter of the sample line plus 0.03 cm. The wall thickness of the probe shall not be greater than 0.10 cm. The fitting that attaches the probe to the exhaust pipe shall be as small as practical in order to minimize heat loss from the probe.

(2) The probe shall have a minimum of three holes. The spacing of the radial planes for each hole in the probe must be such that they cover approximately equal cross-sectional areas of

the exhaust duct. See Figure 1 in appendix A to this subpart. The angular spacing of the holes must be approximately equal. The angular spacing of any two holes in one plane may not be $180^\circ \pm 20^\circ$ (that is, section view C-C of Figure 1 in appendix A to this subpart). The holes should be sized such that each has approximately the same flow. If only three holes are used, they may not all be in the same radial plane.

(3) The probe shall extend radially across the exhaust duct. The probe must pass through the approximate center and must extend across at least 80 percent of the diameter of the duct.

(c) *Sample transfer line.* (1) The maximum inside diameter of the sample line shall not exceed 1.32 cm.

(2) If valve V2 is used, the sample probe must connect directly to valve V2. The location of optional valve V2 may not be greater than 1.22 m from the exhaust duct.

(3) The location of optional valve V16 may not be greater than 61 cm from the sample pump.

(d) *Venting.* All vents, including analyzer vents, bypass flow, and pressure relief vents of regulators, should be vented in such a manner to avoid endangering personnel in the immediate area.

(e) Any variation from the specifications in this subpart including performance specifications and emission detection methods may be used only with prior approval by the Administrator.

(f) Additional components, such as instruments, valves, solenoids, pumps, switches, and so forth, may be employed to provide additional information and coordinate the functions of the component systems.

(g) The following requirements must be incorporated in each system used for raw testing under this subpart.

(1) [Reserved]

(2) The sample transport system from the engine exhaust pipe to the HC analyzer and the NO_x analyzer must be heated as indicated in Figure 1 in appendix B of subpart D.

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