

(2) If a 7- or 9-point gas divider is used, the gas divider shall conform to the accuracy requirements specified in § 92.112, and shall be used according to the following procedure:

(i) Span the full analyzer range using a top range calibration gas meeting the calibration gas accuracy requirements of § 92.112.

(ii) Generate a calibration curve according to, and meeting the applicable requirements of §§ 92.118 through 92.122.

(iii) Select a calibration gas (a span gas may be used for calibrating the CO<sub>2</sub> analyzer) with a concentration between the two lowest non-zero gas divider increments. This gas must be "named" to an accuracy of ±1.0 percent (±2.0 percent for CO<sub>2</sub> span gas) of NIST gas standards, or other standards approved by the Administrator.

(iv) Using the calibration curve fitted to the points generated in paragraphs (b)(2)(i) and (ii) of this section, check the concentration of the gas selected in paragraph (b)(2)(iii) of this section. The concentration derived from the curve shall be within ±2.3 percent (±2.8 percent for CO<sub>2</sub> span gas) of the gas' original named concentration.

(v) Provided the requirements of paragraph (b)(2)(iv) of this section are met, use the gas divider with the gas selected in paragraph (b)(2)(iii) of this section and determine the remainder of the calibration points. Fit a calibration curve per §§ 92.118 through 92.122 for the entire analyzer range.

**§ 92.128 Particulate handling and weighing.**

(a) At least 1 hour before the test, place each filter in a closed (to eliminate dust contamination) but unsealed (to permit humidity exchange) petri dish and place in a weighing chamber meeting the specifications of § 92.110(a) of this section for stabilization.

(b) At the end of the stabilization period, weigh each filter on the microbalance. This reading is the tare weight and must be recorded.

(c) The filter shall then be stored in a covered petri dish or a sealed filter holder until needed for testing. If the filters are transported to a remote test location, the filter pairs, stored in individual petri dishes, should be transported in sealed plastic bags to prevent

contamination. At the conclusion of a test run, the filters should be removed from the filter holder, and placed face to face in a covered but unsealed petri dish, with the primary filter placed face up in the dish. The filters shall be weighed as a pair. If the filters need to be transported from a remote test site, back to the weighing chamber, the petri dishes should be placed in a sealed plastic bag to prevent contamination. Care should be taken in transporting the used filters such that they are not exposed to excessive, sustained direct sunlight, or excessive handling.

(d) After the emissions test, and after the sample and back-up filters have been returned to the weighing room after being used, they must be conditioned for at least 1 hour but not more than 80 hours and then weighed. This reading is the gross weight of the filter and must be recorded.

(e) The net weight of each filter is its gross weight minus its tare weight. Should the sample on the filter contact the petri dish or any other surface, the test is void and must be rerun.

(f) The particulate filter weight (Pf) is the sum of the net weight of the primary filter plus the net weight of the backup filter.

(g) The following optional weighting procedure is permitted:

(1) At the end of the stabilization period, weigh both the primary and backup filters as a pair. This reading is the tare weight and must be recorded.

(2) After the emissions test, in removing the filters from the filter holder, the back-up filter is inverted on top of the primary filter. They must then be conditioned in the weighing chamber for at least 1 hour but not more than 80 hours. The filters are then weighed as a pair. This reading is the gross weight of the filters (Pf) and must be recorded.

(3) Paragraphs (a), (c), and (e) of this section apply to this option, except that the word "filter" is replaced by "filters".

**§ 92.129 Exhaust sample analysis.**

(a) The analyzer response may be read by automatic data collection (ADC) equipment such as computers, data loggers, etc. If ADC equipment is used the following is required:

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(1) The response complies with §92.130.

(2) The response required in paragraph (a)(1) of this section may be stored on long-term computer storage devices such as computer tapes, storage discs, or they may be printed in a listing for storage. In either case a chart recorder is not required and records from a chart recorder, if they exist, need not be stored.

(3) If the data from ADC equipment is used as permanent records, the ADC equipment and the analyzer values as interpreted by the ADC equipment are subject to the calibration specifications in §§92.118 through 92.122, as if the ADC equipment were part of the analyzer.

(b) Data records from any one or a combination of analyzers may be stored as chart recorder records.

(c) Software zero and span.

(1) The use of "software" zero and span is permitted. The process of software zero and span refers to the technique of initially adjusting the analyzer zero and span responses to the calibration curve values, but for subsequent zero and span checks the analyzer response is simply recorded without adjusting the analyzer gain. The observed analyzer response recorded from the subsequent check is mathematically corrected back to the calibration curve values for zero and span. The same mathematical correction is then applied to the analyzer's response to a sample of exhaust gas in order to compute the true sample concentration.

(2) The maximum amount of software zero and span mathematical correction is  $\pm 10$  percent of full scale chart deflection.

(3) Software zero and span may be used to switch between ranges without adjusting the gain of the analyzer.

(4) The software zero and span technique may not be used to mask analyzer drift. The observed chart deflection before and after a given time period or event shall be used for computing the drift. Software zero and span may be used after the drift has been computed to mathematically adjust any span drift so that the "after" span check may be transformed into

the "before" span check for the next mode.

(d) For sample analysis perform the following sequence:

(1) Warm-up and stabilize the analyzers; clean and/or replace filter elements, conditioning columns (if used), etc., as necessary.

(2) Leak check portions of the sampling system that operate at negative gauge pressures when sampling, and allow heated sample lines, filters, pumps, etc., to stabilize at operating temperature.

(3) Optional: Perform a hang-up check for the HFID sampling system:

(i) Zero the analyzer using zero air introduced at the analyzer port.

(ii) Flow zero air through the overflow sampling system, where an overflow system is used. Check the analyzer response.

(iii) If the overflow zero response exceeds the analyzer zero response by 2 percent or more of the HFID full-scale deflection, hang-up is indicated and corrective action must be taken.

(iv) The complete system hang-up check specified in paragraph (f) of this section is recommended as a periodic check.

(4) Obtain a stable zero reading.

(5) Zero and span each range to be used on each analyzer used prior to the beginning of the test sequence. The span gases shall have a concentration between 75 and 100 percent of full scale chart deflection. The flow rates and system pressures shall be approximately the same as those encountered during sampling. The HFID analyzer shall be zeroed and spanned through the overflow sampling system, where an overflow system is used.

(6) Re-check zero response. If this zero response differs from the zero response recorded in paragraph (d)(5) of this section by more than 1 percent of full scale, then paragraphs (d)(4), (5), and (6) of this section should be repeated.

(7) If a chart recorder is used, identify and record the most recent zero and span response as the pre-analysis values.

(8) If ADC equipment is used, electronically record the most recent zero and span response as the pre-analysis values.

(9) Measure (or collect a sample of) the emissions continuously during each mode of the test cycle. Indicate the start of the test, the range(s) used, and the end of the test on the recording medium (chart paper or ADC equipment). Maintain approximately the same flow rates and system pressures used in paragraph (d)(5) of this section.

(10)(i) Collect background HC, CO, CO<sub>2</sub>, and NO<sub>x</sub> in a sample bag (optional).

(ii) Measure the concentration of CO<sub>2</sub> in the dilution air and the diluted exhaust for particulate measurements.

(11) Perform a post-analysis zero and span check for each range used at the conditions specified in paragraph (d)(5) of this section. Record these responses as the post-analysis values.

(12) Neither the zero drift nor the span drift between the pre-analysis and post-analysis checks on any range used may exceed 3 percent for HC, or 2 percent for NO<sub>x</sub>, CO, and CO<sub>2</sub>, of full scale chart deflection, or the test is void. (If the HC drift is greater than 3 percent of full-scale chart deflection, hydrocarbon hang-up is likely.)

(13) Determine HC background levels (if necessary) by introducing the background sample into the overflow sample system.

(14) Determine background levels of NO<sub>x</sub>, CO, or CO<sub>2</sub> (if necessary).

(e) HC hang-up. If HC hang-up 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 is 2 percent or more of the HFID full scale deflection:

(i) Clean the sample probe and the sample line;

(ii) Reassemble the sample system;

(iii) Heat to specified temperature; and

(iv) Repeat the procedure in this paragraph (e).

#### § 92.130 Determination of steady-state concentrations.

(a)(1) For HC and NO<sub>x</sub> emissions, a steady-state concentration measurement, measured after 300 seconds (or 840 seconds for notch 8) of testing shall be used instead of an integrated concentration for the calculations in § 92.132 if the concentration response meets either of the criteria of paragraph (b) of this section and the criterion of paragraph (c) of this section.

(2) For CO and CO<sub>2</sub> emissions, a steady-state concentration measurement, measured after 300 seconds (or 840 seconds for notch 8) of testing shall be used. The provisions of paragraphs (b) through (f) of this section do not apply for CO and CO<sub>2</sub> emissions.

(b) (1) The steady-state concentration is considered representative of the entire measurement period if the time-weighted concentration is not more than 10 percent higher than the steady-state concentration. The time-weighted concentration is determined by integrating the concentration response (with respect to time in seconds) over the first 360 seconds (or 900 seconds for notch 8) of measurement, and dividing the area by 360 seconds (or 900 seconds for notch 8).

(2) A steady-state concentration is considered representative of the entire measurement period if the estimated peak area is not more than 10 percent of the product of the steady-state concentration and 360 seconds (or 900 seconds for notch 8). The estimated peak area is calculated as follows, and as shown in Figure B130-1 of this section):

(i) Draw the peak baseline as a straight horizontal line intersecting the steady-state response.

(ii) Measure the peak height from the baseline with the same units as the steady-state concentration; this value is *h*.

(iii) Bisect the peak height by drawing a straight horizontal line halfway between the top of the peak and the baseline.

(iv) Draw a straight line from the top of the peak to the baseline such that it intersects the response curve at the same point at which the line described in paragraph (b)(2)(iii) of this section intersects the response curve.