Total Suspended Particulate QA Plan (2.4)

July 1, 2003

Revision Number 9

2.4 PROCEDURES FOR AMBIENT AIR MONITORING FOR TOTAL SUSPENDED PARTICULATE (40CFR50 - APPENDIX B)

Revision 9 is a complete document. There are no current revisions prior to 9.

2.4 TOTAL SUSPENDED PARTICULATE (TSP) USING VOLUMETRIC FLOW CONTROLLERS

2.4.0.1 The Electronic Calibration Branch shall procure air monitoring equipment and appurtenances for the Division of Air Quality and maintain an inventory of spare parts and supplies. Spare parts and assistance should be requested on the AQ-109.

2.4.1 MAINTENANCE AND CALIBRATION

2.4.1.1 ROOTSMETER - STANDARD

(1) Maintenance, Check and service annually

(2) Calibration, Refer to Section 2.3.2.1 Rootsmeter

2.4.1.2 ORIFICE CALIBRATION UNIT / AUDIT DEVICE

(1) Maintenance, Inspect annually during calibration

(2) Calibration, Refer to Section 2.3.2.2 Orifice Calibration Unit and Reference Flow Device

2.4.1.3 TSP HIGH VOLUME SAMPLERS (HI VOL)

2.4.1.3.1 High Volume Samplers with a mass flow controller are no longer in use.

2.4.1.3.2 High Volume Samplers with a volumetric flow controller The volumetric flow controlled samplers are mass flow controller samplers that were modified with a kit that used the PM10 motor and a volumetric flow controller (VFC). **EACH VFC UNIT** is identified by a number (it has its own corresponding “Look-up” chart specific to that VFC). In volumetric flow controllers, the air through a choked-flow venturi attains sonic velocity and is unaffected by motor speed in excess of the critical speed, exit pressure,

filter funnel stagnation pressure and temperature. Thus, the volumetric flow is without moving parts and has **no** means for adjusting the controlled flow rate. The sampler calibration, using the Orifice Calibration Unit [utilizing the PM10 slope(m) and intercept(b)], verifies the accuracy of the critical venturi by comparing the known orifice calibration unit flow rate against a factory calibration flow rate listed on the "Look-up" chart. The flow rates should agree within $\pm$ 4.0 %. The actual flow rate of the sampler during operation must be 40 ft^3/min (1.13 M^3/min) $\pm$10 % (36-44 ft^3/min). The VFC is designed for a proper operating flow rate over a broad range of temperature and pressure conditions.

Figure 2.4.1.3.2

2.4.1.3.3. Maintenance for TSP samplers consists of the inspection, the repair of physical damage, and the periodic replacement of seals, motor brushes, motors, and switches. The equipment must be inspected frequently for damage or wear (frayed / cut cord; loose, cracked, or leaking seals). Seals should be replaced when identified through inspections, or at a

minimum, every three (3) years. Any defective parts must be repaired or replaced before a final calibration is performed. **Always perform an ending calibration prior to changing motors or brushes if the motor is operational. Note:** the motors used for the TSP are the same motors used in the PM-10. A preferred method of brush replacement is to install and burn in the brushes on an extra motor at the office/shop (see procedure 2.4.1.3.3.1). Then replace the motor in the field after the ending calibration. Once the motor is installed, a beginning calibration must be performed. Calibrations may be affected by low voltage, below 115v. Line voltage must be checked periodically at the site.

2.4.1.3.3.1 BRUSH REPLACEMENT PROCEDURE

The brushes/motor must be replaced after approximately 384 hours of operation or no longer than 91 days. The brushes may be replaced sooner if an inspection or performance warrants. A small work area and the following items are needed for brush replacement:

Brush set	Soft cloth	Short handled phillips screwdriver
Crocus cloth	AC Power	Common screwdriver, jeweler size
		Solvent, (isopropyl alcohol)

(a) Disconnect the sampler from electricity

(b) Loosen the two (2) plastic pronged knobs in the upper rear corners of the shelter and tilt the VFC to permit access/removal of the motor assembly.

(c) Remove the four(4) knobs that attach the motor housing to the bottom of the VFC. Slide out the motor assembly.

(d) Place the motor assembly, brush end up, on the work surface.

(e) Examine the brush assembly. Note the arrangement and clamping method and how the brush is attached to the connector. Also notice the position locator on the bottom of the brush. Compare the new brush to the one in the motor to verify the same type of brush.

(f) At one brush, remove the 2 clamp screws. Remove the clamp. Grasp the outer end of the brush assembly and lift up slightly allowing the brush to push itself away from the commutator.

(g) While holding the brush assembly in this position, dislodge the connector (push away from the brush assembly) using a jeweler's common screwdriver. Allow the brush assembly to move away from the commutator slightly, which will give the connector clearance from the commutator. Exercise care moving the connector as the wire may break.

(h) After the brush assembly has been removed, examine the commutator. (Use your finger or a ratchet to rotate the armature from the air input end. Never use a tool at the commutator to rotate the armature.) If it is scored, it should be lightly polished with a crocus cloth. If pitted, use a pumice stone to smooth the commutator. If the commutator is smooth but blackened, clean with a cloth dipped in cleaning solvent and air dry.

(i) Place the new brush assembly in the same position as item g. Install the connector by pushing it into the brush at the point at which it was originally removed. Check to see that the wires to the brushes do not touch the metal of the motor frame.

(j) Reseat the brush against the commutator. When the brush is properly oriented, replace the clamp and partially tighten the screws. Move the brush to insure that it is properly seated. Tighten the screws.

(k) Follow the preceding instructions to remove and replace the second brush assembly.

(l) Reconnect the wire nuts that attach the power cord to the motor at the sampler.

(m) Slide the motor assembly into the housing and replace the four (4) knobs.

(n) Return the VFC to the operating position. Replace the two (2) black plastic pronged knobs up inside the upper rear corners of the sampler housing.

(o) Brush burn-in or seating should be accomplished at the office. If seating has been accomplished, connect the power cord to the sampler power outlet. Brush seating at the office, follow this procedure :

1. Attach the ECB supplied Y-cord (**1/2** power) to the "burn-in" motor, a second motor (preferably another burn-in motor), and a standard wall outlet (115vAC) power source.

2. Run the motor at **1/2** power for thirty minutes and allow it to cool. **Remove the Y-cord.**

3. Plug into a power supply (115vAC), run for thirty minutes at full power (no Y-cord), and allow the motor to cool. The brush seating is complete.

2.4.1.3.3.2 Calibration

Calibration is required upon installation, before and after maintenance, when moved to new location, and after every 384 hours/16 sample runs. **Do not to exceed 91 days between calibrations.**

2.4.1.3.3.2.1 Calibration Procedure

The volumetric flow-controlled sampler will be calibrated at one point near the design flowrate of (40 acfm). Periodic calibrations every 3 months (less than 91 days) are required to establish accuracy and consistency.

Calibration equipment:

Orifice Transfer Standard (traceable to NIST).

2 Manometers (4+4" H_2O to 0.1 inch) and (12+12" H_2O to 0.1 inch)/or

electronic manometers verified by ECB

Thermometer [certified in °Centigrade, converted to °Kelvin]

Barometer, certified, read to nearest mm Hg, TSP filter

(a) Upon arrival at the site allow equilibration of an NIST certified thermometer, record the ambient temperature (T_a) and ambient pressure (P_a) on the TSP calibration e logbook.

(b) Install the calibration orifice and a TSP filter on the sampler. Turn on the sampler and check for leaks by blocking <u>all</u> open ports. **WARNING**: DO

NOT CONNECT THE MANOMETER TO THE CALIBRATION ORIFICE (ΔH) UNTIL THIS LEAK TEST IS COMPLETED. Do not run the leak check more than 30 seconds. Listen for any whistling sound that may indicate faulty gaskets or cross threading. Ensure that the filter screen is properly aligned with the top loading adapter. If not, adjust the screen forward and backward until the gasket seals the top of the filter screen correctly. If the unit still leaks, retighten or realign and retest until leaks are found.

(c) Zero the manometers being used.

Water manometers are adjusted to zero by:

1. Insuring the vents for each side are open (turned counterclockwise)
2. Loosening the retaining device and sliding the scale so that both sides of the U-tube are zeroed at the bottom of the water meniscus, retighten the retaining device.

Electronic Manometers:

1. Turn on (push the **on** button)
2. Zero (rotate the screw, without being attached to the sampler)

Figure 2.4.1.3.3.2.1

(d) Connect one side of the large manometer to the stagnation port pressure tap located on the side of the sampler housing (ΔP_f), see figure 2.4.1.3.3.2, and leave the other side open to the atmosphere. (The quick connect located on the station housing closes automatically when the manometer is disconnected.) Connect the orifice to the small manometer. Insure the electronic manometer is “on” before connecting to any port. **CAUTION: If**

the electronic manometer is "OFF" when connected, damage to the diaphragm may result.)

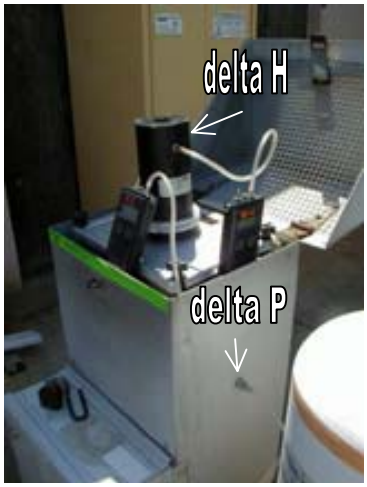

Figure 2.4.1.3.3.2

(e) Turn on the sampler motor. Insure it is allowed to warm up for 5 minutes.

(f) While waiting, record on the calibration data sheet: date, location, operator, sampler motor number, VFC S/N, orifice S/N and the orifice PM-10 calibration slope and intercept.

(g) After 5 minutes, record the funnel pressure (ΔP_f) and the orifice pressure (ΔH).

(h) Convert the ΔP_f (inches H_2O) to mm Hg using this formula:

mm Hg = 1.87 x inches H_2O, Record on calibration form.

(i) Calculate the VFC pressure ratio **P_o/P_a** :

$$P_o/P_a = \frac{(P_a - P_f)}{P_a}$$

where P_a = ambient pressure, and P_f = VFC pressure (both in mm Hg)

(j) Determine the calibration orifice flow rate, Q_a (ACFM):

$$Q_a = \frac{((\Delta H \times 25.4 \times T_a/P_a)^{1/2}) - b}{m}$$ **Note: $(x)^{1/2}$ = Square root x = $\sqrt{x}$**

Where T_a = ambient temperature °Kelvin = °Centigrade + 273

P_a = ambient pressure in mm Hg

m and **b** are the slope and intercept for the orifice.

(k) Determine the expected flow rate for the funnel, Q_f . Go to the Look-up table for the VFC and use the temperature in °F = ((°C x9/5) + 32°) and the pressure ratio P_o/P_a to determine the VFC expected flow rate. Interpolation may be required for the actual temperature.

(l) Determine the percent difference:

$$\text{Percent difference} = \frac{Q_f - Q_a}{Q_a} \times 100$$

The Percent difference between the Orifice flow rate (Q_a) & the expected look up flow rate (Q_f) must agree within ± 4%. If the percent difference is ≤4%, the calibration is considered validated.

(m) **If the % difference is > 4%, troubleshoot the calculations & the**

sampler:

Recheck the orifice transfer constants and calculations of the calibration procedure. Check for manometer reading errors and incorrect temperature or pressure data. Make sure the serial numbers for the hardware and the lookup table match. Recheck the system for leaks. Inspect the VFC for debris or corrosion in the throat. If necessary, clean with soap and water. If still not within ±4 %, check that the line voltage is ≥ 110 v AC. Inspect the blower motor, check for adequate brushes and gaskets. If necessary, change existing motor and brushes and recalibrate.

(n) If all efforts to calibrate fail, return the VFC and motor to the Electronics and Calibration Branch (ECB) for replacement.

2.4.1.4 ELAPSED TIME INDICATOR (ETI)

Verify at least annually. (Section 2.3.2.4). The ETI accuracy is important since the final calculated pollutant concentrations are dependant on the sample time. The ETI must be accurate within ±2 minutes in 24 hours.

2.4.1.5 ANALYTICAL BALANCE

(1) The balance must be serviced annually. Record servicing in the logbook and obtain a certificate from the servicing company.

(2) Perform a one point check with standard weight before each use. Record the actual and the measured weights in the lab logbook.

(3) Perform a full scale check quarterly. (See 2.3.3.2.2.b) with “S” class weights. Record these balance checks in the lab logbook.

2.4.1.6 AUDIT DEVICE

Calibrate annually. Refer to Section 2.3.2.3 for procedures. The audit device and the calibration device are identical. If a sampler is calibrated using a specific device, the audit is accomplished using any other device except the one used for calibration.

2.4.1.7 BAROMETER

Certified semi-annually by ECB.

2.4.1.8 THERMOMETER

Certified semi-annually by ECB.

2.4.2 MONITORING PROCEDURES

2.4.2.1 PREPARATION FOR FIELD

2.4.2.1.1 Before carrying the filters into the field complete the AQ-41 to reflect sampling station and projected date of sampling. If the sampler is involved in an enforcement case, the “chain of custody” procedure must be utilized. All individuals handling the filter from initial weighing at the lab, to the operator, and locations of storage must be documented on this form to include the time the filter is in the sampler.
This chain continues through final weighing and storage at the lab. All field signatures utilize the AQ-41 for documentation. The complete AQ 41 chain of custody procedure is located in appendix M of the Air Quality Monitoring Quality Assurance Plan.

2.4.2.1.2 Place the clean filters from the lab and AQ-41's in regional locked containers.

2.4.2.2 SAMPLE COLLECTION (REMOVING EXPOSED FILTER)

2.4.2.2.1 Connect the pressure reading device to the pressure tap on the outside of the TSP housing (ΔP_f). The recorder is not calibrated; it is used to measure changes in flow and indicate problems only.

2.4.2.2.2 Move the 7-day timer switch to the "on" position and allow high volume sampler to operate for 5 full minutes. At the end of the 5 minute warm-up period and after the air flow rate has stabilized, read the manometer to the nearest one tenth scale division. Record the pressure reading. Convert the ΔP_f (inches H_2O) to mm Hg using this formula: mm Hg = 1.87 x inches H_2O. Use this value to calculate the final stagnation pressure P_{ff} (36-44 acfm) according to the Look-up table. (see step 2.4.1.3.3.2 item # g,h). If the reading is not in the acceptable range, perform the recalibration maintenance in 2.4.1.3.3 and calibrate under section 2.4.1.3.3. If the readings are still not in the acceptable range, replace the motor and recalibrate. If this fails, return the VFC unit to the ECB for recertification/maintenance. Obtain a replacement if available.

2.4.2.2.3 Move the 7-day timer switch to the "off" position, read the elapsed time indicator to the nearest 0.1 minute and then record on the AQ-41 data sheet. The total sample time must be 1380 to 1500 min. If not 1380 to 1500 min, the sample is invalidated. Readjust / troubleshoot the sampler timer if total sample time is not between 1380-1500 min. Some of the newer TSP samplers have timers that are in hours instead of minutes. Actual time sampled must be 23 to 25 hours.

2.4.2.2.4 Check the recorder readings for flow. It is not calibrated. The chart recorder is used to indicate if there were major flow changes (± 4 CFM) and to verify that the sampler ran uninterrupted. If interrupted, check the monitoring system to identify the cause.

2.4.2.2.5 Remove the used filter as follows:

(a) Lift the shelter top and examine filter; note any unusual filter conditions or

(b) Remove the filter retainer device: i.e. loosen or remove the wing nuts or screws holding the face plate in place. Carefully remove the face plate. Again check for any border fuzziness or air leakage and note on AQ-41.

(c) Remove the filter carefully by touching the outer edges (not the corners).

(d) Note any unusual condition which may affect the samples, date and initial the AQ-41.

(e) Fold the filter so that the particulate-coated surfaces are in contact and that the resulting folded filter is 8" x 5". Place the folded filter into a zip lock bag and then into the folded corresponding AQ-41. Remove the labeled recorder chart and place the recorder chart in the folded corresponding AQ-41.

(f) Note any unusual condition which may affect samples, date, and initial AQ-41. Place the filter, chart, and AQ-41 in the manila envelope, then lock the shipping container after placing each sample in the container.

(g) Return the shipping container to the regional office after completing the sampling route. Filters and associated paperwork must be reviewed by the Regional Chemist/Auditor. The filters should then be shipped every two weeks to the Lab. Do not delay either the pick-up from the sampler or the shipment to Lab. The regional office should not have any filters that are more than 2 weeks old since having been sampled.

2.4.2.2.6 Record the appropriate T_s and P_s, seasonal average temperature and pressure, on the AQ-41.

2.4.2.2.7 Calculate the average stagnation pressure (P_{fa}) in mm Hg as:

$$P_{fa} = \frac{\text{initial stag. Pressure}(P_{fi}) + \text{final stag. Pressure}(P_{ff})}{2}$$

2.4.2.2.8 Calculate the Pressure Ratio P_o/P_s as:

$$P_o/P_s = \frac{P_s - P_{fa}}{P_s}$$

where: P_s = seasonal geographic average barometric pressure (mm Hg)

P_{fa} = average stagnation pressure (mm Hg)

2.4.2.2.9 Determine Q_s, flow rate as a function of seasonal temperature and P_o/P_s in the look-up table for that specific volumetric flow device. Compare the Q_s with the design specification of the sampler, 36-44 cfm. If Q_s is not between 36-44 cfm, check the temperature used is °F and not °C. Also check the manometer reading is correct with no leaks in the system. Perform a calibration without adjusting or changing any hardware. If the calibration is good, the stagnation pressure should be re-accomplished. If the calibration is not good, perform the failed calibration maintenance (2.4.1.3.3.2.1 m), and recalibrate.

2.4.2.2.10 Determine the average standard flow rate (Q_{STD}):
First, determine an initial flow rate Q_S immediately after the filter is installed as described above. Another final flowrate Q_S must be determined before removing the filter after sampling. Write in the initial and final flowrate on the AQ 41. Average the initial and final flow rate = Q_{Savg}. This must be converted to Q_{STD} in the following manner:

$$Q_{STD} = 0.392 \times Q_{Savg} \times (P_S/T_S)$$

0.392 = standard temperature (298K) / standard pressure (760)
Q_{Savg} = flowrate at seasonal average conditions

P_S/T_S = the seasonal pressure / seasonal temperature

Record the calculated Q_{STD} in the "Avg CFM" block on the AQ-41.

2.4.2.2.11 Determine the standard volume sampled in cubic meters (m^3)

$$V_{STD} = Q_{STD} \times t_{minutes} \times 0.0283$$

V_{STD} = air sampled in cubic meters
$T_{minutes}$ = sampling time in minutes

2.4.2.2.12 After completion of the AQ-41's include all information in 2.4.2.4.1b:

(a) fold the recorder chart in half (printed side in)

(b) position the folded recorder chart so that the fold lies along edge of the line printed on the AQ-41

(c) staple the chart to the white copy only,

(d) forward all samples & forms to the auditor for his review (2.4.5.2.4).

2.4.2.2.13 After receipt from the operator, place the folded filters and AQ-41's in a plastic bag, place the plastic bag in the top of the sample shipping container, lock and seal the container, and attach a shipping label.

2.4.2.2.14 Carry the shipping container to the courier pick-up. Initial and date the sample station logbook.

2.4.2.3 FILTER INSTALLATION

2.4.2.3.1 Inspect inside of shelter top and wipe clean, if necessary.

2.4.2.3.2 Inspect the filter face plate gasket for imperfections. If there are any, replace face plate gasket.

2.4.2.3.3 Wipe the face plate gasket and the top of the filter adapter with a soft cloth. Inspect the filter screen for holes and excessive bowing, replace if required.

2.4.2.3.4.1 Center the new filter in position (numbered-side down) so when the face plate gasket is in place, an air tight seal can be formed with the outer edges of the filter. The filter should be aligned so that edges of the filter form a parallel ½" border.

2.4.2.3.4.2 Carefully install the face plate without disturbing the filter and tighten the opposite wing nuts or screws evenly. Under tightening or excessive tightening must be avoided to prevent air leakage or filter and face plate gasket damage.

2.4.2.3.6 Read the elapsed time indicator and record on the AQ-41.

2.4.2.3.7 Move the timer switch to the "on" position and allow the air flow rate to stabilize for 5 full minutes, while completing the next 3 steps.

2.4.2.3.8 Lift sampler assembly and return to the operating position. Close the shelter top.

2.4.2.3.9 Reset the 7-day timer for the next sampling period. (Routine sampling, every 6th day; emergency or enforcement as specified).

2.4.2.3.10 Label the back of the recorder chart by station number and date of sample and place the recorder chart on the recorder.

2.4.2.3.11 Insure the manometer is on and then connected to the stagnation port. At the end of the 5 minute warm-up period and after the air flow rate has stabilized, read the manometer to the nearest one tenth scale division. Record the pressure reading. Convert the ΔP_f (inches H_2O) to mm Hg using this formula: mm Hg = 1.87 x inches H_2O. Use this value to calculate the initial stagnation pressure P_{fi} (36-44 acfm) according to the Look-up table. (see step 2.4.1.3.3.2 item # g,h). If the reading is not in the acceptable range, perform the recalibration maintenance in 2.4.1.3.3 and calibrate under section 2.4.1.3.3. If the readings are still not in the acceptable range, replace the motor and recalibrate. If this fails, return the VFC unit to the ECB for recertification / maintenance. Obtain a replacement if available.

2.4.2.3.12.1 Position the timer switch to "off", reconnect the recorder (if necessary), close and lock the sampler shelter.

2.4.2.4 DOCUMENTATION

2.4.2.4.1 Listed below are the data which must be completed on the AQ-4I:

(a) Filter installation
- (1) Operator who starts the sampler
- (2) Sample date
- (3) Verify that filter number and initial weight are recorded.
- (4) Station number
- (5) Sampler number
- (6) Starting time or ETI reading
- (7) Initial flow rate
- (8) Date and initials
- (9) Summary of any unusual conditions that may affect results (construction activity, land clearing, weather

(b) Filter / Sample removal:
- (1) Operator who removes sample
- (2) Stop time and elapsed time

(3) Final flow rate calculation (attach flow rate chart)
(4) Date and initials
(5) Summary of existing conditions that may affect results, including reasons for invalid samples.

(c) Received at the lab
(1) Person who receives sample in laboratory
(2) Date and initials

2.4.2.4.2 Electronic sample station logbook section must be completed as follows:

(a) Filter number
(b) Sampler number
(c) Sample date
(d) Initial and final flow rates
(e) Start and stop times and elapsed time
(f) Operator initials
(g) Flow rate range determinations
(h) Flow rate audits
(I) Flow rate calibration results
(j) Date samples shipped and initials

2.4.3 LABORATORY PROCEDURES

2.4.3.0 Temperature and humidity of pre and post weighed filters is controlled by the PM 2.5 weighing lab at 21°C ± 2 C° and 38% RH ± 5% RH.

2.4.3.1 SELECTION OF NEW FILTERS

(a) Visually inspect each filter for imperfections (i.e., pin holes, lumps, loose particles) by holding before a light table. Remove particles with a small brush. Discard other imperfect filters.

(b) Enter the filter numbers and description of any filters that are discarded in the initial weights Excel file.

(c) Select 25 filters for enforcement samples. Initiate a “chain of custody” form on each of these filters at this point. These filters are prepared for specific enforcement cases to be determined by the regions. The region will request enforcement filters. Once the level of filters falls below 10 filters another 25 filters will be prepared.

2.4.3.2 PREPARATION OF NEW FILTERS

(a) If filters have not been numbered, number each filter on the smooth side in the lower right-hand corner with a mechanical numbering device, using a minimum of force so as not to damage filter.

(b) Equilibrate filters in a conditioning lab for a minimum of 24 hours, but preferably 48 hours prior to weighing. The lab conditions for the preceeding 24 hours must be stable at the above temperature and relative humidity ± 2 C° and ± 5% RH

(c) Perform a zero balance check.

(d) Perform a performance balance check by weighing a standard weight (3 to 5 Grams) at the beginning and end of the weighing session. If the measured weight differs from the actual weight by more than 0.5 mg, then corrective action must be taken and reported immediately to the supervisor.

(e) Zero (tare) the balance pan at the beginning and after every five (5) weighings. If the adjustments are other than minimal; stop weighing filters and notify the group supervisor immediately, so that the problem can be identified and corrected. A notation of all problems or suspicions should be made in the lab logbook. After correction of the balance problem, reweigh any filters which are thought to be suspect

(f) If the balance checks indicate satisfactory performance, carefully weigh 1 filter on the weighing pan so as not to fold or crease the filter. Weigh the filter to the nearest 0.1 mg and record the filter weight and the filter number in the initial weights section of the Excel file. Also record the filter weight on the pre numbered AQ-41.

(g) Weigh the remaining filters according to Steps a through f.

(h) Perform a reweighing check by placing 1 filter of each lot of 10. Reweigh these filters and record results on the AQ-41 and in the initial weight logbook. If the first and second weighing differ by more than ±2.8 mg, then all filters in that lot are reweighed.

(I) Place the pre-weighed filters upon the corresponding data sheets (AQ-41) and stack on each other and store. On the appropriate shipping date, place the required number of filters and corresponding AQ-41's in each field office shipping container, lock the container and ship to each regional office.

2.4.3.3 SAMPLE PREPARATION AND ANALYSIS

2.4.3.3.1 Once the container is received in the laboratory, check the seal, break the seal, and unlock the container. Note: Storage time should be limited since volatile organic particulates will evaporate.

(a) The analyst receiving the samples must enter the general condition of samples received on the AQ 41. The analyst must also sign and date the "Chain-of-Custody" section of the AQ 41 and initiate the lab "Chain-of-Custody" form for enforcement filters only.

(b) Assign the proper lab numbers to each sample by entering the lab number on the AQ-41. In the PM Log Excel file, record lab number, the date, the filter number, and the sampling site.

2.4.3.3.2 Check the exposed filter for unusual conditions or interferences. If the filter is torn after sampling (torn edges are clean and white), note "Torn Filter" on the AQ-41. Review AQ-41 and void sample under the following conditions:

(a) The container seal is broken prior to receipt.

(b) Sampling time is less than 23 hours or more than 25 hours.

(c) Flow rate readings are below 36 ft^3 /min or above 44 ft^3/min.

(d) Filter shows significant damage or interference. (e.g., holes or cracks in filter made prior to sampling; leaves; feathers or other objects on filter; piece of filter missing, wet filter, etc). Any foreign matter which might affect the weight of the filter should be identified if possible and noted along with the results as to whether it was removed or not; in case of doubt check with supervisor.

(e) Process routine ambient samples that have insects on them as follows:

(1) For samples with <20 insects, report result with qualifier "<20 insects, not removed."

(2) For samples with 20 insects, the supervisor is to make a

decision whether to void the filter, remove the insects before analysis, or analyze as is. Results are to be qualified in one of the following ways:

(a) >20 insects, voided
(b) >20 insects removed
(c) >20 insects, not removed

(3) Analyze the Special Samples that have insects on them and qualify results as follows:

(a) <20 insects, not removed
(b) >20 insects, not removed.

2.4.3.3.3 The analyst receiving the samples must date and initial the AQ-41.

(1) Maintain the chain of custody (AQ 41) with the sample.

(2) The laboratory clerk must enter the lab number on the Lab Excel file as returned.

(3) Initiate a Lab Chain of Custody for enforcement filters.

2.4.3.3.4 If there is any loose particulate in the zip-lock bag, brush the loose particulate on to the filter. Zip-lock bags are not reused.

2.4.3.3.5 Carefully place the folded exposed filters in the lab to equilibrate for 24 hours minimum.

2.4.3.3.6 Perform a balance check immediately prior to weighing filter.

(a) Zero balance check

(b) Perform a performance balance check by weighing a standard weight (3 to 5 grams) at the beginning and end of the weighing session. If the measured weight differs from the actual weight by more than 0.5 mg, then corrective action must be taken and reported immediately to the supervisor.

2.4.3.3.7 If the balance check indicated satisfactory performance prepare to weigh the remainder of the filters.

(a) Make a final weight Excel file. Record the date, lab number, filter number, initial weight and total volume sampled in the file for each filter to be weighed.

(b) Zero (tare) the balance pan at the beginning and after every five (5) weighings. If the adjustments are other than minimal; stop weighing filters and notify the group supervisor immediately, so that the problem can be identified and corrected. A notation of all problems or suspicions should be made in the log. After correction of the balance problem, reweigh any filters which are thought to be suspect.

2.4.3.3.8 Place the exposed, equilibrated filter on the weighing pan. Weigh the filter to the nearest 0.l mg and record the filter final weight in the particulate log. Also record the filter weight and analysis date on the pre numbered AQ-41.

2.4.3.3.9 Perform a re weigh check by reweighing l filter of each lot of 10. Another analyst should reweigh these filters and record results on the AQ-41 and in the particulate log. If the first and second weighing differ by more than ±5.0 mg, then all of the filters in that lot are reweighed.

2.4.3.3.10 Store weighed filters, unless further analysis is required. AQ-41 / chain of custody must document filter being in storage. In keeping with our other record retention requirements, total suspended particulate filters must be

kept for three years. Dispose of used filters that have been retained for three years. These older filters are of no use for analytical purposes.

2.4.3.3.11 Calculate total particulate in grams by subtracting the initial weight from the final weight and record in the particulate log and on the AQ-41.

2.4.3.3.12 Initial AQ-41 and submit the data to the other technician to be checked.

2.4.3.3.13 The other technician will check all entries, calculations, and initial the AQ-41. Submit the AQ-41 to DMSS or hold for completion of microscopic analysis as required if above 150 ug/m^3.

2.4.3.4.1 DOCUMENTATION

2.4.3.4.1 Record sample data on AQ-41 forms and in the particulate log.

2.4.3.4.2 Record duplicate initial and final weights and date performed on AQ-41 forms. Also, record standard weight balance check results in the logbook.

2.4.4 DATA HANDLING PROCEDURES

2.4.4.1 DATA PREPARATION

2.4.4.1.1. Keep a copy of all AQ-41 data sheets received from the Lab. Account for all sites and samples. Missing data (scheduled) must be explained. Samples which are to be voided are still to be documented on the AQ-41.

2.4.4.1.2 Screen each form for accuracy, completeness and unusual conditions. Initial and date the "Hq process" and "Date" blocks on the AQ-41.

2.4.4.1.3 Enter the raw data into the data system. The system will calculate the mass concentration of suspended particulates:

$$\textbf{T.S.P.} = \frac{(W_F - W_I)\ 10^6}{(V_{STD})}$$

T.S.P. = mass concentration of total suspended particulates, $\mu g/m^3$

W_I = initial weight of filter, g

W_F = final weight of filter, g

10^6 = conversion of g to μg

V_{STD} = air volume sampled corrected to standard conditions and cubic meters (m^3)

2.4.4.1.4 Perform a data processing check (2.4.5.4.3) on the completed AQ-41 data sheets on a 1 out of 10 basis.

(a) Recalculate total suspended particulate from AQ-41 raw data and record in logbook.

(b) If a check result varies ± 3% from original calculations, recalculate all samples of that lot.

2.4.4.1.5 Once the data are accepted as mathematically correct, the maximum and minimum concentration of the data shall be examined. If any values are less than 20 $\mu g/m^3$ or greater than 150 $\mu g/m^3$, the data technician shall forward those forms to the Hq particulate chemist for further investigation.

NOTE: Any calculations greater than 150$\mu g/m^3$ will be sent to the HQ particulate chemist for evaluation and signature on the “Hq Review” block.

2.4.4.1.6 Data reported below the minimum detectable limits (mdl) are questionable,

but are to be reported using a constant of ½ mdl, for TSP, this mdl is 1$\mu g/m^3$. The report value for TSP is 0.5 $\mu g/m^3$. It should be noted that if more than 25% of the measurements for a site are below the mdl the EPA will not compute the annual statistics for that pollutant.

2.4.4.2 DATA SUBMITTAL by DMSS

2.4.4.2.1 After receipt of the AQ-41 file all AQ-41's by site number.

2.4.4.2.2 Create the AQS files when the monthly data has been entered and edited as described above.

2.4.4.2.3 Transfer the AQS submittal files from the ESC System Software to EPA for inclusion in AQS.

2.4.4.2.4 Review the quarterly data reports from AQS, make changes as needed. When the data in AQS is complete and correct, prepare the quarterly data submittal letter for the signature of the Chief, Ambient Monitoring Section.

2.4.4.2.5 The Chief will submit to EPA the letter certifying the air quality data for that reporting quarter and indicate the date of the last AIRS "Notify" to update.

2.4.4.2.6 Review the Data Assessment Report using AQS.

2.4.4.2.7 When the Data Assessment Report is complete and accurate, prepare a submittal letter for the signature of the Chief, Ambient Monitoring Section.

2.4.4.2.8 The Chief will submit the Data Assessment Report and the certification letter to EPA.

2.4.4.2.9 The quarterly data and data assessments must be submitted within to EPA within 120 days from the end of the quarter.

2.4.5 QUALITY ASSURANCE PROCEDURES

The Quality Assurance program involves running audits to determine statistically the accuracy and reliability of the total set of data. The AQ 98 will be used by the HQ for calculation precision values. The AQ 99 will be utilized by the regional offices for audits.

2.4.5.1 PROCEDURES FOR THE OPERATOR

The major part of the operator's role in the quality assurance program is the carrying out of his/her duties in accordance with these operating procedures and performing the following duties.

2.4.5.1.1 Operation of Collocated, Precision Sampler (TSP)

(a) The location of the collocated sampler(s) will be determined by the Hq.

(b) Place the precision sampler adjacent (greater than 2 meters and less than 4 meters) to the field sampler previously designated.

(c) Operate the precision sampler in accordance with Section 2.4 of this plan simultaneously with the field sampler.

(d) Samples from the field sampler and the precision sampler are not interchangeable. However, results from the precision sampler can be substituted in the event of failure of the primary sampler.

(e) Identify all precision sampler sample data forms (AQ-41) with County - FIPS Area - Site No. - A.

(f) Install, collect, and process samples as you would any other sample.

2.4.5.1.2 Flow Checks - This single point check is conducted in the field at each site during the first and third month of each calendar quarter. See Section

2.4.5.2.1 for specifics.

2.4.5.1.3 Audits - This single point check is conducted in the field at each site during the second month of each calendar quarter. It is to be performed in the first 14 days of the second month and reported on the AQ 99 to the particulate manager at the beginning of the third month of the quarter. See Section 2.4.5.2.1 for specifics.

2.4.5.1.3.1 Interagency Testing, NPAP

(a) Upon receipt of the reference flow device (RFD) and instructions from the particulate manager, an interlaboratory test shall begin.

(b) All scheduled samplers should be checked.

(c) The instructions provided by EPA must be followed completely to ensure uniformity throughout the tests.

(d) Results of each check must be noted in the sample station e-logbook and reported to the particulate manager within two working days of receipt of the RFD.

(e) The RFD should be carefully packaged and shipped or carried to the next field office or EPA as listed.

2.4.5.2 PROCEDURES FOR THE AUDITOR

2.4.5.2.0 The Auditor responsibility rests with each Region's Environmental Chemist II. However some of the duties may be delegated to an operator. This Auditor/operator should be an operator who performs the following duties on those samplers that are **not** his / her primary responsibility. Calibrations, flow checks, and audits are the exact same procedure for TSP samplers. When the procedure is accomplished determines the name of the procedure.

2.4.5.2.1 Calibrations are performed in conjunction with motor/brush changes in the sampler. This should happen in the first month of the quarter. There is a calibration/flow check performed immediately before the motor/brush change (if scheduled and the motor has not failed) and a cal/flow check immediately after the motor brush change. For quality assurance the cal/flow check after the motor/brush change is the monthly flow check. A flow check should be accomplished in the third month of the calendar quarter using any available transfer standard/orifice. Calibrations are required every 3 months (less than 91 days between motor/brush changes) to establish accuracy and consistency.

2.4.5.2.2 Accuracy Audit - An Accuracy Audit is the calibration/flow check procedure using a different orifice than the one used to for the quarterly TSP sampler calibration. The single point accuracy audit/calibration is conducted in the field at each site. It should be accomplished in the first two weeks of the second month of the quarter. The following is the calibration/audit procedure. It will be calculated using both current ambient and seasonal averaged data.

2.4.5.2.2.1 Accuracy Audit Procedure

The volumetric flow-controlled sampler will be calibrated at one point near the design flowrate of (40 acfm).

Calibration equipment:
Orifice Transfer Standard (traceable to a rootsmeter).
2 Manometers (4+4" H_2O to 0.1 inch) and (12+12" H_2O to 0.1 inch)
/or electronic manometers verified by ECB
Thermometer [certified in degrees Centigrade converted to °K]

Barometer, certified, read to nearest mm Hg

TSP filter

(a) Upon arrival at the site allow equilibration of a certified thermometer, record the ambient temperature (T_a) and ambient pressure (P_a) on the TSP calibration logsheet.

(b) Install the calibration orifice and a TSP filter on the sampler. Turn on the sampler and check for leaks by blocking all open ports. **WARNING**: DO NOT CONNECT THE MANOMETER TO THE CALIBRATION ORIFICE (ΔH) UNTIL THIS LEAK TEST IS COMPLETED. Do not run the leak check more than 30 seconds. Listen for any whistling sound that may indicate faulty gaskets or cross threading. Ensure that the filter screen is properly aligned with the top loading adapter. If not, adjust the screen forward and backward until the gasket seals the top of the filter screen correctly. If the unit still leaks, retighten or realign and retest until leaks are found.

(c) Zero the manometers being used (motor off).

Water manometers are adjusted to zero by:

1. insuring the vents for each side are open (turned counterclockwise)
2. loosening the retaining device and sliding the scale so that both sides of the U-tube are zeroed at the bottom of the water meniscus, retighten the retaining device

Electronic Manometers:

1. Turn on (push the **on** button)
2. Zero (turn the **zero** screw, without being attached to the sampler)

(d) Connect one side of the large manometer to the stagnation port pressure tap located on the side of the sampler housing (ΔP_f), see figure 2.4.1.3.3.2, and leave the other side open to the atmosphere. (The quick connect

located on the station housing closes automatically when the manometer is disconnected.) Connect the orifice to the small manometer. Insure the electronic manometer is “on” before connecting to any port. **CAUTION: If the electronic manometer is "OFF" when connected, damage to the diaphragm may result.**)

(e) Turn on the sampler motor. Insure it is allowed to warm up for 5 minutes.

(f) While waiting, record on the calibration data sheet: date, location, operator, sampler motor number, VFC S/N, orifice S/N and the orifice PM-10 calibration slope and intercept.

Figure 2.4.1.3.3.2

(g) After 5 minutes, record the funnel pressure (ΔP_f) and the orifice pressure (ΔH).

(h) Convert the ΔP_f (inches H_2O) to mm Hg using this formula:

mm Hg = 1.87 x inches H_2O, Record on calibration form.

(i) Calculate the VFC pressure ratio P_o/P_a :

$$P_o/P_a = \frac{(P_a - P_f)}{P_a}$$

where P_a = ambient pressure, and P_f = funnel pressure (both in mm Hg)

(j) Determine the calibration orifice flow rate, $\mathbf{Q_a}$ (ACFM):

$$Q_a = \frac{((\Delta H \times 25.4 \times T_a/P_a)^{1/2}) - b}{m}$$

Note: $(x)^{1/2}$ = Square root x = $\sqrt{x}$

Where $\mathbf{T_a}$ = ambient temperature °Kelvin = °Centigrade + 273

$\mathbf{P_a}$ = ambient pressure in mm Hg

m and **b** are the slope and intercept for the orifice.

(k) Determine the expected flow rate for the funnel, $\mathbf{Q_f}$. Go to the Look-up table for the VFC and use the temperature in °F = ((°C x 9/5) + 32) and the pressure ratio P_o/P_a to determine the VFC expected flow rate. Interpolation may be required for the actual temperature.

(l) Determine the percent difference:

$$\text{Percent difference} = \frac{Q_f - Q_a}{Q_a} \times 100$$

The audit (Calibration) calculation using ambient temperature / barometric pressure checks the validity of the calibration conducted with another calibration orifice. For Audit calculations using current ambient data, the percent difference between the Orifice flow rate (Q_a) &

the expected look up flow rate (Q_f) must agree ± **4%. Record in the sampler log only.**

The calculation using seasonal average temperature and barometric pressure will validate the run data using the seasonal averages. **For** Audit calculations using the seasonal average data, the Percent difference between the Orifice flow rate (Q_a) & the expected look up flow rate(Q_f) must agree ± **6%. Record in the sampler log and AQ- 99.**

(m) **If the Calibration % difference is > 4%,**
Troubleshoot the calculations & the sampler:
Recheck the orifice transfer constants and calculations of the calibration procedure. Check for manometer reading errors and incorrect temperature or pressure data. Make sure the serial numbers for the hardware and the lookup tables match. Recheck the system for leaks. Inspect the VFC for debris or corrosion in the throat. If necessary clean with soap and water. If still not within ± 4 % Check that line voltage is $\geq$ 110 v AC. Inspect for blower motor, check for adequate brushes and gaskets. If necessary, change existing motor and brushes and recalibrate.

(n) If all efforts to calibrate fail, return the VFC and motor to the Electronics and Calibration Branch for replacement.

(o) **If the Audit % difference is > 6%,** but the calibration is ok, check for temperatures and barometer value extremes from the seasonal. Extreme values are considered greater than 40mm Hg or 20°C. If seasonal values are considered extreme and the calibration is good, the audit passes. However, if seasonal values are less than

extreme, recheck hardware as in item m above**.**

2.4.5.2.3 AUDIT SCHEDULING

Audits should be scheduled and performed during the first two weeks of the second month of the calendar quarter. Increase the auditing rates if defects are detected, until the defects can be demonstrated corrected. The audit result (AQ 99) should be sent to the particulate chemist not later than the first week of the third month of the quarter.

(a) Collocated Precision Sampler (Hi Vol)

No special auditing schedule is required for the audit sampler, since it operates simultaneously with the field sampler. Audit with primary sampler.

2.4.5.2.4. AUDITOR REVIEW

(a) Collocated Precision Sampler (Hi Vol)

(1) Review, initial and date the additional AQ-41's for the collocated sampler. It is suggested that the auditor occasionally question the operator to be sure that the audit sampler and samples are not receiving preferential treatment.

(2) If an Audit Evaluation form is received from Q.C. for a collocated sampler, the auditor will assure that any necessary corrective action be taken.

(c) Audit (Calibration) (Hi Vol)

(1) The field work for the single point checks may be performed

by the operator during the quarter.

(2) DMSS will obtain the actual and measured audit flow rates from AQ-99. DMSS will calculate the individual percent difference (d_2) for each station for each audit value as follows:

$$d_2 = \frac{(Q_o - Q_a) \times 100}{Q_a}$$

Q_o = the observed flow rate (□40 scfm)

Q_a = the actual flow rate in CFM determined for that orifice.

(3) Obtain the single point check d_2 from the AQ-99. If more than one audit is run, calculate each d_2 and use this value as a separate audit (i.e., separate site) using the above equation.

2.4.5.2.5 AUDIT EVALUATION AND ACTION

After each audit, DMSS must evaluate the d-values.

(a) Calibration Check (Hi Vol)

(1) If d_2 is greater than 4.7 in magnitude ($d_2 > 4.7$), then ;
(a) increase the auditing rate to two times/quarter
(b) perform special checks to identify trouble areas
(c) take necessary action to reduce error level

(2) If d_2 is greater than 7 in magnitude ($d_2 \geq 7$) then terminate operation of the sampler until the cause has been determined and corrected.

(b) Documentation **When a defect is detected, enter the following**

information in the sampler e-log.

(1) the date the evaluation was made
(2) results of the evaluation
(3) any increase in audit level
(4) type of corrective and preventative action taken
(5) the results of the audits following the corrective action
(6) the date acceptable data collection was resumed

2.4.5.2.6 DATA VERIFICATION

(a) All sample forms must be initialed by the regional chemist.

(b) Before initialing, check form for completeness and correctness.

(c) Screen the sample and form for representativeness
(1) Is the sample representative of the area?
(2) Was there an unusual situation noted by the operator?
(3) Instrument averaging time 24 hrs ± 1 hr.

NOTE: Samples having abnormalities must be flagged by a check at the top of the AQ-41 in the "Data Validation" block.

2.4.5.3. PROCEDURES FOR THE LABORATORY

2.4.5.3.1. Presampling: Several checks need to be performed in preparation of filters. Record each check in the proper lab logbook.

(a) Filters weighed by lab
(1) Visual inspection of filters check (See 2.4.3.1)

(2) Balance checks (See 2.4.3.2. c &d)

(3) Filter reweighing check. (See 2.4.3.2. h)

2.4.5.3.2 SAMPLE ANALYSIS

(a) Balance performance checks. Perform both a zero balance check and a weight check. Record each check in the proper lab logbook.

(b) Filter reweighing check. (See 2.4.3.3.9)

2.4.5.3.3. DOCUMENTATION

(a) Record specific details about visual inspection of filters, balance checks, and reweighing checks in the lab logbook and other appropriate forms as necessary. The details shall include, but not be limited to the following:

(1) Visual inspection of filters
- (a) Date of check
- (b) Analyst
- (c) Number of filter lot
- (d) Number of filters rejected

(2) Zero balance check and performance balance check
- (a) Date of check
- (b) Analyst
- (c) Standard weight
- (d) Measured weight
- (e) Action taken to correct discrepancy

(3) Reweighing check

(a) Date
(b) Analyst or Analysts
(c) Filter number
(d) First measured weight
(e) Second measured weight
(f) Action taken

(4) In addition to documenting the reweighing check as set forth above, the results should also be used to produce a quality control chart for both initial and final weight reweighing checks as described in Appendix Section A. Enter warning limits, control limits and specification limits on each chart.

(5) All forms and copies of the control charts shall be submitted to the particulate chemist when requested.

2.4.5.4 PROCEDURES FOR THE HEADQUARTER'S STAFF

2.4.5.4.0 The Particulate Chemist

(a) The Particulate Chemist shall evaluate and retain all quality assurance data indicated by this manual including all Audit Evaluation forms.

(b) A check that regional auditors have set up and implemented auditing schedules must be made by the Particulate Chemist.

2.4.5.4.1. Collocated Precision Sampler - Data Technician

(a) After obtaining both the field sampler AQ-41 and the audit sampler AQ-41 for a site, review the data for completeness and accuracy and

correct any errors.

(b) Calculate the final concentrations of suspended particulate (SP) for each AQ-41.

(c) Calculate the percent differences (d_{1j}) for each pair of SP values(SP_{FJ}) as follows:

$$d_{1j} = \frac{Sp_{aj} - Sp_{fj}}{\left\lceil \frac{Sp_{aj} + Sp_{fj}}{2} \right\rceil} \times 100$$

where:
SP_{fj} = Conc. from field sample
Sp_{aj} = Conc. from precision sample

(d) Record each SP_{fj} , Sp_{aj} , and d_{1j} in the Data Qualification forms. If any d_{1j} is greater than ± 25%, prepare an Audit Evaluation Form for the Particulate Chemist to send to the responsible regional office.

2.4.5.4.2 DATA VALIDATION - DATA TECHNICIANS

(a) Keep a record of all AQ-41 data sheets received so that for each sampling date all sites and samples are accounted for. Samples, which are voided, are also maintained.

(b) Screen each form for accuracy, completeness and unusual conditions. Initial and date the "Data Edit" and "Date" blocks.

(c) After the completion of the routine sample calculations (2.4.4.1), perform the data process check (2.4.5.4.3) below.

(d) Once the data are accepted as mathematically correct, the

maximum and minimum concentration of the data shall be examined. If any values are less than 20 $\mu g/m^3$ or greater than 150 $\mu g/m^3$, the data technician shall forward those forms to the Particulate Chemist for further investigation.

(e) Data reported below the minimum detectable limits (mdl) are questionable, but are to be reported using a constant of 1/2 mdl for the pollutant. The report value for particulate is 0.5 $\mu g/m^3$.

(f) Notify the AQS contact to submit the data to AQS when all calculations have been completed and all data processing checks have been passed.

(g) After the data are electronically submitted to AQS, DMSS will check the AQS printout to verify that every expected sample is complete and accurate.

(h) File the AQ-41 forms in the data file.

(i) Prepare and forward the AQS data submittal letter showing the date of the last AIRS NOTIFY for the quarter for the signature of the Chief, Ambient Monitoring Section.

2.4.5.4.3 Data Processing Check

(a) A Data Technician will randomly choose one (1) sample out of a lot of 10. All final concentrations will be recalculated from raw data. (See 2.4.4.1). The original particulate concentration must be obtained from the AQ-41.

(b) Calculate the percent difference as follows:

$$d_{4j} = \frac{SP_{oj} - SP_{cj}}{Sp_{cj}} \times 100$$

where:

d_{4j} = percent difference between calculations for the jth check of the quarter

SP_{oj} = originally calculated value for total suspended particulate to be used in the jth check of the quarter

Sp_{cj} = check calculation obtained though (a) above

(c) Record the d_{4j} in the Data Process Check Logbook.

(d) Evaluate the d_{4j} values. If all d_{4j} values for a station for the quarter are $-3 \leq d_{4j} \leq +3$, then all SP_{oj} are accepted as good. If one of the d_{4j} values exceeds these limits, then the entire set of that type of sampling data for that date shall be recalculated.

2.4.5.4.4 Determination of Probability Limits

The following calculations are now routinely calculated automatically by the EPA software. Manual calculations are not usually performed.

(a) Pooled Precision Difference - Collocated Samplers

(1) Obtain the PDQARF and CMQAR forms from the QAC at the end of each calendar quarter. Obtain the d_{1j} values for each collocated sampler site.

(2) Average all d_{1j} for a site as follows:

-

$$d_1 = \frac{d_{11} + d_{12} + d_{13} + \ldots d_{1j}}{j}$$

j = no. of collocated samples at a site per quarter

=

(3) Quarterly, calculate the agency pooled % difference (d_1) as follows:

= - - -

$$d_1 = \frac{N_1 d_1 + N_2 d_2 + \ldots + N_k d_k}{N_1 + N_2 + \ldots + N_k}$$

d_{1n} = the average percent difference for each site, n

k = the number of sites

N = the number of collocated pairs at each site

=

(4) Record the d_1 on the CMQAS.

(b) Pooled Accuracy Difference - Calibration Check

(1) Obtain the CMQAR forms from the QAC at the end of each calendar quarter. Obtain the d_2 values for the entire agency. Complete the ADQARF forms according to 40 CFR 58 instructions.

-

(2) Calculate the agency average percent difference (D_2) as follows:

-

$$D_2 = \frac{\Sigma d_2}{n}$$

n = number of audits reporting a d_2

-

(3) Record the D_2 on the CMQAS

2.4.5.4.5 Interagency Testing

(a) The State of North Carolina will participate in the EPA interagency flow rate studies.

(b) The interlaboratory flow rate study is conducted by EPA. Instructions are provided by the EPA and these instructions may vary from test to test, therefore, no specific procedures will be included in this part.

(c) The State of North Carolina will participate in all interagency particulate studies when possible. In addition to reporting the results to EPA's Quality Assurance Branch, an inter agency evaluation will be made of the results and corrective actions will be taken when necessary.

(d) Interagency Testing General Procedure

(1) Upon receipt of the reference flow device (RFD) and instructions from EPA an interlaboratory test shall begin.

(a) The Particulate Chemist shall develop a list of the field offices to receive the RFD.

(b) The Particulate Chemist shall ship the RFD and instructions to the first field office on the list.

(c) Upon receipt of the results from each field office, the results will be reviewed and prepared for submittal to EPA. An evaluation will be made of the results and corrective action taken. The Particulate Chemist shall initiate any corrective actions.