NEW JERSEY AIR TEST METHOD 1 – DETERMINATION OF PARTICULATE MATTER FROM STATIONARY SOURCES

General Applicability and Principle

Particulate matter determination requires isokinetic sampling of the exhaust stack flue gases and particulate matter is determined gravimetrically after the removal of uncombined water. The measured emission weight will be the combined weight of all particles collected and analyzed in accordance with these sampling and analytical procedures.

Required Test Data

The following test data shall be determined and reported for each run.

1) Average dry gas meter temperature (degrees Fahrenheit).
2) Average stack temperature (degrees Fahrenheit).
3) The root mean square value of differential pressures (inches of water) of all traverse points in the stack during each test run.
4) Average differential pressure (inches of water) across the orifice meter during each test run.
5) Diameter of the stack cross-sectional area at sampling location.
6) Weight (grams) of total solid particles collected during each test run.
7) Moisture content by volume in stack gas during each test run, determined by EPA Method 5 moisture procedures.
8) Volume of gas (cubic feet) sampled during each test run.
9) Source gas emission rate (SCFM).
10) Molecular weight of the stack gas, determined by EPA Method 3 or 3A.
11) Emission rate for each test run in the following units:
    _____

Source Specific Method Application

A minimum sample catch of 50 mg is targeted to calculate the minimum sample times. An absolute minimum of 3 mg catch is required, but any expected catch of less than 50 mg will require the use of EPA Alternative Method 005 to process the samples. Sampling times should be as close to the compliance basis (at a minimum equal to the compliance basis) as possible, while still obtaining a representative sample catch. The following equations will calculate the sample catch and the sample time.

LB/HR (from Permit allowable) = _____
DSCFM (from Permit information) = _____
Vsamp (variable to change to increase catch) = _____cf

gr/DSCF = (LB/HR)*7000/(60*DSCFM) = _____
mg = (gr/DSCF)/7000*Vsamp*453.59*1000 = _____

Sample rate (min. of 30 cf/hr) = _____cf/hr
Sample time (hr) = Vsamp/Sample rate = _____

Based on these calculations, a sample time of _____ minutes/run will be performed.

Sampling Train Components

The sampling train will consist of the following:

1) A tapered-edge **sampling nozzle** constructed of stainless steel and a **glass-lined probe**.
2) **Pitot tube** with a known coefficient.
3) A **heating system** that includes **in-line thermocouples** to measure the gas stream temperature across the particulate filter. The temperature will **not exceed 225 degrees Fahrenheit** and will only be sufficiently hot to prevent condensation of water on the filter.
4) A **glass fiber filter** in a **glass holder**.
5) **Four Greenburg-Smith impingers**, the first two containing 100 ml of distilled water, the third impinger empty and the fourth containing a known quantity of silica gel, all submerged in an ice bath which will ensure that they will be kept below 68 degrees Fahrenheit. The first, third and fourth impingers will be modified Greenburg-Smith and the second will be a Greenburg-Smith impinger with a standard tip, as described in Section 6.1.1.8 of EPA Method 5.
6) A **leak-free pump** with flow control adjusters and a vacuum gauge.
7) A **dry gas meter** accurate within two percent and temperature sensors to indicate the gas inlet and outlet temperatures
8) An **orifice meter** with an inclined manometer (leveled and zeroed prior to use)
9) A **thermocouple** equipped with a temperature sensor attached to the probe adjacent to the nozzle to indicate the stack gas temperature.

All glassware will be interconnected with glass fittings having ball joints. All components will meet the specifications of the Method.

Preparation for Sampling

All internal surfaces of the nozzles, probes, impingers, connecting glassware and hoses will be cleaned and dried prior to sampling. The open ends of all sampling components will be covered to prevent contamination. A tared filter (dried at 220-230 degrees Fahrenheit, cooled in a desiccator to room temperature and weighed to the nearest 0.1mg) will be placed in the glass filter holder.

A fourth impinger will be charged with 200-300 grams of silica gel and sealed against contamination. The first and second impingers of the sampling train will be charged with 100 ml of distilled, deionized water and connected to the remaining impingers. The third impinger will be empty. The impingers will be placed in the sampling train and surrounded with crushed ice.

The entire sampling system will then be transported to the sampling site for assembly and leak check. The leak check procedure consists of assembling the sample system, starting the sampling pump and blocking the nozzle inlet. The pump is then adjusted to pull a minimum of 15 inches of mercury vacuum. When the vacuum reading stabilizes, the dry gas meter is observed for one minute to determine the sample system leak rate. If the leak rate is less than 0.02 cubic feet per minute, sampling proceeds. When the heating system reaches the proper temperature, sampling will begin.

Sampling

When the probe and filter are up to temperature, the probe will be inserted into the stack at the first traverse point with the nozzle pointed into the gas stream. The dry gas meter initial volume will be recorded and the vacuum pump will be immediately started and the flow adjusted to isokinetic conditions. For each run, the data required on Figure 5-3 of EPA Method 5 will be recorded using that or a similar data sheet. Readings indicated by Figure 5-3 will be taken at each sample point during each time increment and additional readings when significant changes necessitate additional adjustments in flow rate. Each sampling test will consist of **three separate and valid** test runs, unless otherwise specified by the Department.

Leak checks will be performed when sampling is completed at the end of each test. The dry gas meter volume will be recorded and the sample system will be leak checked. A run will be considered valid if the leak rate upon completion of the run is less than 0.02 cubic feet per minute, the final isokinetic sampling rate is between 90 and 110 percent and the filter temperature was maintained consistent with the method.

Sample Recovery Procedures

Following the completion of each test run the sampling train will be transported to a recovery area onsite. The recovery site will be clean and protected from the wind. The sample recovery will be as follows:

1) Container 1 - Disassemble the filter housing and transfer the filter to its original glass petri dish. Seal the petri dish with Teflon tape and label it with the appropriate sample information.
2) Container 2 - The front half of the train; nozzle, probe, and front-half filter housing are rinsed and nylon bristle brushed with acetone into an amber glass container with a Teflon-lined cap. This procedure will be performed three times or more until no visible particulate remains, after which the container is sealed and labeled. The liquid level will be marked on the container to ensure no leakage occurred during transport.
3) The contents of the first three impingers are measured for volume and discarded.
4) Container 3 – Note the color of the silica gel to determine whether it has been completely spent and make a notation of its condition. The silica gel is returned to its original container and weighed to obtain a final weight.
5) Container 4 – 100 ml of acetone will taken directly from the wash bottle being used for sample recovery into a separate glass sample container and labeled “Acetone Blank”.
6) All containers are checked to ensure proper sealing, labeling, and that all liquid levels are marked. All samples are logged onto a chain-of-custody record.

Analysis

The filter will be dried at the average temperature maintained during the corresponding run and desiccated for 24 hours. The filter will be weighed to a constant weight and the final weight will be recorded to the nearest 0.1 mg. The probe and nozzle washings will be transferred to a clean, tared glass weighing dish. The dish will be evaporated at ambient temperature and pressure, then desiccated for 24 hours and weighed to the nearest 0.1 mg.

A 100 ml sample of acetone will be collected as a field blank. The blank will be evaporated at ambient temperature and pressure, then desiccated for 24 hours and weighed to the nearest 0.1 mg. The maximum blank acetone correction will be $\leq$0.001% residue (by weight). This equates to a maximum blank correction of 0.0079 mg/ml of acetone rinse (0.01 mg/g acetone).

Calculations

All calculations will be carried out in accordance with the method, with all final results reported at one significant figure beyond the allowable.

QA/QC Procedure

All pitot tubes, dry gas meters, orifice meters, and thermocouples that are used in this stack test program will be properly calibrated prior to testing. Calibration records will be made available to the on-site DEP observers and submitted to the Department in the final test report.

Chain-of-custody documentation for all samples will be implemented at the completion of sampling and documented until the samples are received by the laboratory for analysis and submitted to the Department.

Proposed Deviations from this BTS Template or the Method

(Insert any proposed deviations here).