SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT

CHAPTER X

NON-STANDARD METHODS AND TECHNIQUES

OFFICE OF OPERATIONS
TECHNICAL SERVICES DIVISION
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CHAPTER X

NON-STANDARD METHODS AND TECHNIQUES

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1. Flow Measurement at Locations not Meeting Method 1.1 Requirements

1.1 Introduction

It is the policy of the District to test all sources at locations that provide uniform, parallel flow characteristics. Sampling at locations not meeting Method 1.1 criteria can be performed to obtain qualitative-type results only. A test is considered qualitative if its range of accuracy cannot be determined. If the cost of upgrading facilities to meet Method 1.1 criteria is very high, or time is a major factor, a qualitative test may be appropriate. The District will conduct a qualitative-type test to indicate the likelihood of a rule violation or the approximate emission rate of a source.

If the results of a qualitative test indicate the possibility of a rule violation, the facility is required to upgrade its sampling locations to meet Method 1.1 requirements.

1.2 Cyclonic Flow

Cyclonic flow is the most difficult and most often encountered problem in existing sources. Method 1.1 gives explicit instructions for determining when unacceptable flow conditions exist. The District uses an alignment approach as an alternative method for a qualitative test when unacceptable cyclonic flow conditions exist. This approach involves turning the Pitot tube and particulate sampling nozzles so that they face directly into the tangential flow. The angle of the tangential flow from the vertical is first measured at all sample points by turning the Pitot tube 90° to the flow until the differential pressure gauge reads zero. The angle is measured at each point and sampling is conducted 90° to that angle.

The sample time at each point should be adjusted for the cosine of the angle of flow to the vertical. The vertical component of the flow is used to calculate flow rate out the exhaust system. The uncorrected flow is used to calculate isokinetic sampling rate. No particulate sample should be taken at any negative velocity points. The negative volumetric flow rate should be calculated based on the negative axial component. The net volumetric flow rate must be used to calculate the mass emission rate.

This method does not correct for the pitch angle misalignment. Refer to the Section 1.4 on Alternative Site Selection Method for use of a three dimensional Pitot tube to determine the flow pattern at each sampling point.

1.3 Pressurized Baghouse

Another site-related problem is encountered in testing pressurized baghouses that are not vented through an exhaust stack. The District will allow the use of the sampling procedures outlined in EPA Method 5D. The applicability and analysis of Methods 5.1, 5.2, or 5.3 must be followed. The District does not condone using this method from the inside of a baghouse for safety reasons.

1.4 Alternative Site Selection Method

1.4.1 Applicability

An alternative measurement site allows testing at locations that are less than ideal. The District recognizes that there will be some error introduced in sampling at locations that are not ideal but the error will be acceptable if the method is used properly and flow does not exceed specified limits.

This alternative applies to sources where measurement locations are less than 2 equivalent stack diameters downstream or less than 1/2 diameter upstream from a flow disturbance. The alternative should be limited to stacks or ducts larger than 24 in. in diameter where blockage and wall effects are minimal.

A directional flow sensing probe is used to measure pitch and yaw angles of the gas flow at 40 or more traverse points. The resultant angles are calculated and compared with acceptable criteria for mean and standard deviation.

Both the pitch and yaw angles are measured from a line passing through the traverse point and parallel to the stack axis. The pitch angle is the angle of the gas flow component in the plane that includes the traverse line and is parallel to the stack axis. The yaw angle is the angle of the gas flow component in the plane perpendicular to the traverse line at the traverse point and is measured from the line passing through the traverse point and parallel to the stack axis.

1.4.2 Apparatus

a. Directional Probe

Use any directional probe, such as United Sensor Type DA Three-Dimensional Directional Probe, capable of measuring both the pitch and yaw angles of gas flows. (Mention of trade name or specific products does not constitute endorsement by the SCAQMD.) Assign an identification number to the directional probe and permanently mark it on the body of the probe. Also provide a system for cleaning the pressure holes of the probes by "back-purging" with pressurized air, since the holes are susceptible to plugging when used in particulate or moisture laden gas streams.

b. Differential Pressure Gauges

Use inclined manometers, U-tube manometers, or other differential pressure gauges e.g. magnehelic gauges, that meet the specifications described in Method 2.1.

If the differential pressure gauge produces both negative and positive pressure readings, then both readings must be calibrated at a minimum of three points as specified in Chapter III.

1.4.3 Traverse Points

Use a minimum of 40 traverse points for circular ducts and 42 points for rectangular ducts for the gas flow angle determinations. Follow Table 1 or 2 of Method 1.1 for the location and layout of the traverse points. If the measurement location is determined to be acceptable according to the criteria in this alternative procedure, use the same traverse point number and locations for sampling and velocity measurements.

1.4.4 Measurement Procedure

Prepare the directional probe and differential pressure gauges as recommended by the manufacturer. Capillary tubing or surge tanks may be used to dampen pressure fluctuations. A pretest leak check should be conducted by applying pressure or suction on the impact opening until a reading of at least 7.6 cm

(3 in.) H_2O registers on the differential pressure gauge; then plug the impact opening. The pressure of a leak-free system should remain stable for at least 15 seconds.

Level and zero the manometers. Since the manometer level and zero may drift because of vibrations and temperature changes, periodically check the level and zero during the traverse.

Position the probe at the appropriate locations in the gas stream and rotate it until zero deflection is indicated for the yaw angle pressure gauge. Determine and record the yaw angle. Record the pressure gauge readings for the pitch angle and determine the pitch angle from the calibration curve. Repeat this procedure for each traverse point. If the stack gases are not clean, "back-purge" the pressure lines and impact openings prior to measurements at each traverse point.

Perform a post-test leak check as described above for the pretest leak check. If the criteria for a leak-free system are not met, repair the equipment and repeat the flow angle measurements.

1.4.5 Calculations

Calculate the resultant angle at each traverse point, the average resultant angle, and the standard deviation using the following equations. Complete the calculations and record results to at least one significant figure more than the acquired data. Round the values after the final calculations.

The measurement location is acceptable if the average resultant angle is $\leq 20^{o}$ and the standard deviation is $\leq 10^{o}$.

Resultant Angle at Each Traverse Point

$$R_i = \text{Arc cosine } [(\text{cosine } Y_i)\ (\text{cosine } P_i)]$$

where:

R_i = Resultant angle at traverse point i, degree

Y_i = Yaw angle at traverse point i, degree

P_i = Pitch angle at traverse point i, degree

Average Resultant Angle

$$\bar{R} = \frac{\Sigma R_i}{n}$$

where:

$\bar{R}$ = Average resultant angle, degree

n = Total number of traverse points

Standard Deviation

$$S_d = \sqrt{\frac{\sum_{i=1}^{n} (R_i - R)^2}{(n-1)}}$$

where:

S_d = Standard deviation, degree

1.4.6 Calibration

Use a flow system as described in Chapter III. In addition, the flow system shall have the capacity to generate two test section velocities; one between 365 and 730 m/min (1200 and 2400 ft/min) and one between 730 and 1100 m/min (2400 and 3600 ft/min).

1.4.7 Entry Ports

Cut two entry ports in the test section. The axes through the entry ports should be perpendicular to each other and intersect in the centroid of the test section. The ports should be elongated slots parallel to the axis of the test section and long enough to allow measurement of pitch angles while maintaining the Pitot head position at the test section centroid. To facilitate alignment of the directional probe during calibration, the test section should be constructed of Plexiglas or other transparent material. Make all calibration measurements at the same point in the test section, preferably at the centroid of the test section.

1.4.8 Gas Flow Angle

The gas flow must be parallel to the central axis of the test section. Follow the procedure in Section 2.4 of Method 1.1 for cyclonic flow determination to measure the gas flow angles at the centroid of the test section from two test ports located 90° apart. The gas flow angle measured in each port must be within 2° of 0°. Straightening vanes should be installed, if necessary, to meet this criterion.

1.4.9 Pitch Angle Calibration

Perform a calibration traverse according to the manufacturer's recommended protocol in 5° increments for angles from -60° to $+60^{\circ}$ (or maximum angle encountered) at one velocity in each of the two ranges specified above. Average the pressure ratio values obtained for each angle in the two flow ranges. Plot a calibration curve with the average values of the pressure ratio (or other suitable measurement factor as recommended by the manufacturer) versus the pitch angle. Draw a smooth line through the data points. Plot the data values for each traverse point. Determine the differences between the measured data values and the angle from the calibration curve at the same pressure ratio. The difference at each comparison must be within 2° for angles between 0° and 40° and within 3° for angles between 40° and 60°.

1.4.10 Yaw Angle Calibration

Mark the three-dimensional probe to allow the determination of the yaw position of the probe. This is usually a line extending the length of the probe and aligned with the impact opening. To determine the accuracy of measurements of the yaw angle, only the zero or null position must be calibrated according to the following procedure.

Place the directional probe in the test section and rotate the probe until the zero position is found. With a protractor or similar device, measure the angle indicated by the yaw angle indicator on the three-dimensional probe. This should be within 2° of 0°. Repeat this measurement for any other points along the length of the Pitot where yaw angle measurements could be read in order to account for variations in the Pitot markings used to indicate Pitot head positions.

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2. Determination of Velocity Using Flue Factor Method

2.1 Introduction

It is standard procedure to measure velocity head and temperature at each traverse point during sampling by strapping a Pitot tube and thermocouple to the probe. At some sources this may be impractical because of physical limitations, e.g. small port holes, quartz probe, or high temperatures. One alternative is to use the flue factor method for monitoring flow rate during sampling to obtain an average velocity.

Flue factor is the ratio between the average stack gas velocity to an average reference point gas velocity. This factor also can be used to proportion and integrate stack flow rate over time when traverse sampling is not required.

2.2 Procedure

Use Methods 1.1 and 2.1 to conduct a velocity traverse prior to actual sampling. Make three complete traverses to calculate a reliable average stack gas velocity. From these velocity data select a reference point in the stack, usually a point having the average velocity or the center point of the stack. Monitor the velocity during sampling through a different port at the same plane. Record the velocity head readings at this reference point as they are taken during sampling. Note any fluctuation in the flow rate and adjust the sampling rates based on previous velocity readings to maintain isokinetic conditions.

2.3 Calculations

Calculate the true average stack gas velocity using the equation:

$$u_s = u_{rs} F_f$$

where:

u_s = Average stack gas velocity during sampling, ft/sec

u_{rs} = Average reference point gas velocity during sampling, ft/sec

F_f = Flue factor

F_f, flue factor, is calculated using the equation:

$$F_f = \frac{u_t}{u_r}$$

where:

u_t = Average stack gas velocity during velocity traverse, ft/sec

u_r = Average reference point gas velocity during velocity traverse, ft/sec

The instantaneous stack gas velocity at any point can be calculated using this same procedure by substituting the individual point average velocity obtained during traversing for u_t to obtain a flue factor for that point.

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3. Sampling High-Temperature Sources

3.1 Introduction

Source testers must sample certain high-temperature sources where use of standard commercial sampling equipment is not suitable. Sources such as incinerators, flares, and uncontrolled furnaces can emit effluents well in excess of 1200°F. Tests of sources above 400°F require probe and filter assemblies that can withstand the high temperature without affecting the quality of the source tests. Careful preparation is required for sampling high-temperature sources to provide reliable results and safe conditions for the test team.

3.2 Problems

Certain hazards and problems are inherent in high-temperature sampling.

3.2.1 Personnel and Equipment

High temperature gloves must always be used. A good insulation blanket around the stack will stop the radiant heat from directly impinging on the test crew and the sampling equipment. The sampling equipment should be kept away from the stack as far as possible. Direct radiant heat may affect the thermocouple readings. Air circulating fans, plenty of drinking water, and salt tablets should be available at the workplace.

3.2.2 Thermal Expansion

Thermal expansion commonly occurs because the probe/nozzle/filter assembly is usually prepared at ambient temperature. As the assembly is heated the different thermal expansions of the components come into effect. Joints may loosen, and cause leaks. Different coefficients of expansion between glass liners and stainless steel sheaths can cause breakage or a complete unseating of the glass.

A piece of glass equipment with one portion exposed to high temperature within the stack and low temperature outside the stack can become stressed and break. Even within the stack, heating of the upstream side faster than the downstream side can cause stress, warping, and breakage.

3.2.3 Decomposition of Materials

In-stack filters cannot be used above about 500°F. Teflon and Viton cannot be used to seal joints above 450°F. Use of asbestos or ceramic string as a gasket material may be a solution, but it does not have the resilience to fill the gap when the glass probe liner and metal sheath expand at different rates. Asbestos also has a lack of cohesion. Stray fibers may enter the train and contaminate the particulate sample. Even with these drawbacks, asbestos is a good substitute for Teflon O-rings if it is used carefully.

Leaks occurring around the nozzle-probe liner interface draw air from around the probe liner. If the liner is covered with a material containing volatiles, the volatiles may be evolved due to the high temperature and drawn into the sample. To prevent this contamination, either modify the probe sheath so this does not occur (by drilling holes in it, putting it under vacuum, or maintaining a leak free interface) or condition the liner so no volatiles will be evolved during testing.

3.2.4 Corrosion

Because of the problems with glass at high temperatures it is often desirable to use metals. The major problem with metals is corrosion from stack gases.

Stainless steel will oxidize, soften, and corrode at high temperature and should not be used above 700°F. Inconel should not be used above 1100°F. If metal probes are used above these limits, perform an analysis for metals in the sample collected. Discard the sample if probe metals are more than 2 percent of the sample.

3.3 Solutions

Because standard probes are unsuitable for sampling at temperatures above 700°F, two basic approaches can be undertaken: devise a cooling system that will allow the use of standard stainless steel and glass probe assemblies, or fabricate a probe assembly using materials that will be able to withstand high temperatures.

3.3.1 Cooling System

Cooling of the probe can be accomplished by constructing a jacket around the probe and circulating a liquid or gas coolant. Ambient air, water, or steam may be used a as coolant. Normally a gaseous coolant is vented into the stack and a liquid coolant is recirculated.

Cooled probes are durable and not severely limited in length. Cooling of the sample gases ensures that the filter temperature can be maintained within operating limits.

A Pitot tube, thermocouple, and sample gas line can be included inside the cooling jacket for simultaneous velocity and temperature readings, and sampling for gaseous constituents.

A cooled probe requires bulky support systems and other accessories, such as pumps and connecting lines for coolant recirculation. These systems are expensive and requires maintenance. Malfunction of a cooling system will cause abandonment of the test. When liquid coolants are used, pop-off valves must be installed to avoid formation of vapor pockets which may cause rupture of the jacket. Alignment of the probe is also important. Placement of the coolant vents must be done carefully so that the coolant vapor does not dilute the sample entering the nozzle or bias the velocity and temperature readings. Even with a cooling system, the nozzle tip may soften and distort at high temperatures. The system should be designed for nozzles with great mass and to allow heat flow back to the coolant.

There are other inherent problems introduced by cooled probes. Due to the conduction of heat from the nozzle, the temperature of the nozzle will be at lower than the temperature of the effluent gases around the nozzle. This will cause gases in and around the nozzle to contract and thus affect isokinetics. Another potential problem is condensation in the probe if it is cooled well below the stack temperature. This complicates cleanup and recovery of the sample and accelerates corrosion.

3.3.2 High-temperature Materials

As an alternative to a complicated cooling system, probes constructed of quartz or glazed porcelain material may be used. For high-temperature stacks the District has successfully used quartz probes. These probes are unsheathed and of a one-piece "L" shaped construction.

The greatest problem is breakage and extremely careful handling is required.

Probe lengths greater than 5 feet are impractical. Pitot tubes and thermocouples must be attached carefully. This may mean that separate velocity and temperature readings must be taken at the sample points prior to particulate sampling. If so, during the actual sampling, velocity readings should be taken at a reference point to monitor flow rate changes and for maintaining isokineticity.

Since one-piece construction dictates a fixed nozzle for a given probe, several probes with different nozzle sizes should be available at the test site. The probes should be at least one foot longer than necessary for the traverse of the duct. This will leave part of the probe exposed to ambient condition for cooling.

It is advisable to start sampling at the innermost sample point. Care must be taken so that the filter or sample lines are not exposed to too much radiant heat. The most significant advantage of a quartz probe is that the effluent usually will not react with the probe under most sampling conditions, although high temperature furnaces with fluoride emissions can corrode quartz. One-piece quartz probes have other advantages such as fewer leak problems and easy cleanup.

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4. Sampling at Multiple Locations

4.1 Introduction

When a test requires sampling at more than one location, simultaneous sampling at all locations is desirable. When the emissions are variable over time, simultaneous sampling is required. Testing a control device for efficiency also requires simultaneous testing unless it can be proven by taking additional samples that emissions are not variable.

Application of rules on particulate emissions is a problem when multiple sources or multiple control devices are involved. The District has two rules for controlling particulate emissions. Rule 404 limits total particulate concentration times in the exhaust gases and Rule 405 limits solid particulate mass emission rates. The

District uses the following guidelines in applying these two rules to systems with multiple basic or control devices.

4.2 Rule 404 Applied to a Control System

Two or more parallel control devices under one Permit to Operate are considered as one control system. The allowed emission concentration is based on the total flow rate to the atmosphere from all the control devices. However, the allowed concentration is applied individually to each control device. If a process has several control devices controlling emissions from different sections, the flows from the control devices are not added to find the allowed concentration. For example, baghouses controlling the charging well and furnace emissions on an aluminum reverberatory furnace are evaluated separately.

4.3 Rule 405 Applied to Individual Process Units Under Separate Permit

If more than one process unit is vented to one control device or system, the allowed mass emission rate from that device is the sum of the allowed from each process unit. For example, if two small furnaces are each allowed emissions of 10 lb/hr based on their individual process weights, the allowed emissions from the control device will be 20 lb/hr.

Emissions from control devices are not normally prorated among the basic process units. There are exceptions in Regulation IX where specific process units have specific allowed concentrations.

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5. Measurement of Flow Rates of Low Velocities

5.1 Introduction

The measurement of the mass emission rate of any pollutant from a source involves an accurate determination of the volumetric flow rate of the gaseous effluent. The product of the average velocity and the cross-sectional area of the stack at the location of measurement will give the gas flow rate. Method 2.1 describes the Pitot tube procedure for direct measurement of average gas velocity. The S-type Pitot tube in combination with a pressure differential measuring device, usually an inclined manometer or magnehelic gauge, has become a standard for stack samplers.

In some cases, the source testers will encounter very low stack gas velocities, where the velocity head does not register sufficiently on these gauges. The accuracy in this low range is questionable when Method 2.1 is used. In fact, the S-type Pitot tube coefficient changes at velocities below approximately 600 ft/min.

When velocities below 600 ft/min are expected, source testers may use one of the alternative measurement techniques described below.

5.2 Alternative Velocity Measurement Methods

Gas velocity measurement methods can be classified according to their principle of operation. Numerous devices are available for making each of the following measurements. Some are used only with low temperature air, some cannot be calibrated, and some can be used only for survey-type work.

5.2.1 Pressure Drop

When a constriction is placed in a duct carrying a stream of gas, there will be an increase in velocity and a corresponding drop in static pressure. The rate of flow through the constriction can be calculated from the pressure drop, the cross-sectional area at the constriction, the density of the fluid, and a flow coefficient. This coefficient is defined as the ratio of actual flow to the theoretical flow and allows for stream contraction and frictional effects.

For incompressible fluids, the flow rate is given by the following equation:

$$Q = CA\left[\frac{2g}{\nu}\Delta P\right]^{1/2}$$

where:

Q = Volumetric flow rate, in.^{3}/sec

C = Flow coefficient of the measuring device, dimensionless

A = Cross-sectional area of this constriction, in.^{2}

g = Acceleration due to gravity, 386 in./sec^2

ν = Fluid density, lb/in.^{3}

ΔP = Pressure drop across the constriction, lb/in.^{2}

In most cases, v = 1.

Three types of constriction meters can be used for gas flow measurements. These meters give a total volumetric flow rate. When these meters are used, all the gases must pass through the meter. This can result in back pressure that will preclude their use.

5.2.1.1 Venturi Meter

A typical Venturi meter consists of a conical converging section, a cylindrical throat, and a diverging section. Recommended proportions are: entrance cone angle of $21 \pm 2^{\circ}$, exit cone angle of 5 to 15°, and throat length equal to throat diameter. Static pressure taps are located upstream of the convergence and at the throat.

Venturi meters offer high accuracy and relatively low head loss. They are highly resistant to abrasion from entrained particulate matter, but impractical for use in large diameter ducts.

5.2.1.2 Orifice Meter

An orifice meter is a plate with a small knife-edged circular opening at its center. It is placed across a duct where flow is to be measured. The pressure taps are located on either side of the plate.

The orifice meter is inexpensive and easily adapted. However, it causes a considerable head loss and is susceptible to abrasion and corrosion that can alter its performance characteristics.

5.2.1.3 Laminar Flow Element

A typical element consists of a bundle of 3/4 in. diameter by 15 in. steel tubes brazed into a duct. The pressure drop across the element is measured. Flow is related to this pressure drop by the following equation:

$$Q = K \frac{\mu_o}{\mu} \Delta P$$

where:

Q = Flow rate. ft^3/sec

K = Calibration factor of the element, $ft^5/lb\text{-}sec$

μ_o = Dynamic viscosity of gas at calibration condition, $lb\text{-}sec/ft^2$

μ = Dynamic viscosity of gas at measurement condition, $lb\text{-}sec/ft^2$

ΔP = Pressure drop, lb/ft^2

5.2.2 Heat Transfer Rate

The rate of heat transfer from a stationary heat source to a gas stream is dependent on the velocity of the stream. Instruments that employ this principle are limited to relatively low temperature gas streams.

5.2.2.1 Hot-Wire Anemometers

Hot-wire anemometers determine gas velocity either from the temperature change in a resistance wire or by the amount the passing gases are heated. Two temperature sensing elements are used in the second type. The upstream one is heated and the downstream one is unheated. This involves an accurate measurement of the flue gas temperatures.

Since hot-wire anemometers lose accuracy when coated with particulate, they are not suitable for particulate-laden gas streams. Shielded hot-wire anemometers can return to calibration when the shield is cleaned.

5.2.2.2 Thermistor Anemometers

In principle, the thermistor anemometer is identical to the hot-wire anemometer, but it uses thermistors instead of resistance wires as heating and sensing elements. Gases pass into a small opening and are heated by the first thermistor and the temperature increase is measured by the second thermistor. Thermistor anemometers are sensitive to velocities of less than 20 ft/min. They are quite useful for low-flow clean gas streams. The greatest drawback with thermistor anemometers is that they lose accuracy when coated with particulate.

5.2.2.3 Hot-Film Anemometers

Hot-film anemometers consists of a platinum film sensing element deposited on a glass substrate. Compared with the hot-wire, it is less susceptible to fouling by particulate matter. It has greater mechanical strength and can be used for gases at high velocities and high temperatures, and can give a higher signal-to-noise ratio.

5.2.3 Mechanical Displacement

These devices operate on the principle of mechanical displacement caused by the impact pressure of a moving gas. This displacement is proportional to the gas velocity.

5.2.3.1 Rotating Vane Anemometer

The rotating vane anemometer consists of a series of radially-mounted diagonal vanes which rotate when a gas stream passes through them. The vanes are geared to a dial that measures total revolutions and that is calibrated for total feet of gas passing through the vanes. The dial reading divided by the elapsed time gives the average velocity. This device generally is used to measure indraft air through large openings and cannot be used for wet, dirty, corrosive, or hot gas streams.

5.2.3.2 Swing Vane Anemometer

In this device, the gas stream impinges upon a metal strip-vane connected to a meter. The amount of deflection of the strip is proportional to the impact pressure. The impact pressure is related to the gas velocity. A direct reading for velocity is provided. This anemometer cannot be used in dirty or hot gas streams.

5.2.3.3 Drag Body Meter

The drag force on a body placed in a gas stream can be an accurate measurement of the flow rate. A fixed body is mounted on a support having a strain gauge in order to measure the drag force. These instruments are not effective for a flow rate below 150 ft/min.

5.2.4 Tracer Material

This technique involves an introduction of a readily identifiable tracer material into a gas stream at a known distance upstream of a detection device, and measurement of the amount of time required for the tracer material to traverse that distance. Several tracers have been used successfully.

5.2.4.1 Balloons

Balloons are introduced into a duct and then spotted downstream. They cannot be used in a hot gas stream and errors are introduced due to their inertial properties.

5.2.4.2 Colored Smoke

Colored smoke or powder is injected into the gas stream and the time required for the smoke to exit the stack is measured. This method can be used where the effluent does not have any effect on the powder.

5.2.4.3 Chemicals

A chemical which will react with one of the constituents of the gas stream to form a visible cloud is injected and a time lapse measurement taken. For example, ammonium hydroxide will react with sulfur dioxide to form white aerosol. Hydrochloric acid along with ammonium hydroxide may be introduced in the gas streams. Presence of high moisture in cold weather will obscure the white cloud produced.

5.2.4.4 Radioactive Materials

Radioisotopes, detected with a Geiger counter, can be used for flow measurement. This technique involves complicated and expensive instruments and extensive safety precautions.

5.2.5 Dilution Method

A dilution technique is useful when velocity measurement with Pitot tubes or other devices is not possible, as when highly turbulent flow exists. A tracer gas which is not one of the constituents of the gas stream is introduced into the flue gas at a known concentration and rate. The concentration of the tracer gas is measured at a point downstream where complete mixing has taken place. The volumetric flow can be calculated using the following equation:

$$Q_s = Q_1 \left(\frac{C_a}{C_b} - 1\right)$$

where:

Q_s = Gas flow rate, scfm

Q_1 = Tracer gas injection rate, scfm

C_a = Concentration of injected tracer gas, ppm

C_b = Concentration of tracer gas at sampling point, ppm

Ethane, methane, propane, and sulfur hexafluoride have been used with success and the downstream concentration can be monitored by instrumentation. Grab sampling of the gas for analysis in the laboratory may be utilized. Radioactive materials also may be used.

5.2.6 Computational Methods

Material balances are frequently used to determine gas flow rates when direct measurements are not possible. In many cases, mass balance calculation methods are used as a check on the direct measurements. These methods assume that the inlet and outlet mass flow rates of any element are equal. Since mass flow rate is the product of concentration and volume flow rate, for any element A we can use the equation:

$$Q = \frac{W_A}{C_A}$$

where:

Q = Stack gas flow rate, scfm

W_A = Weight of element A introduced into the process, lb/min

C_A = Concentration of element A in the stack gases, lb/scf

When using this method confirm that the stack gases are thoroughly mixed at the point where the sample is extracted for analysis to determine the concentration of the desired element. This computational method is most widely used in combustion processes and also can be used where the element has undergone a chemical change.

The fuel analysis, stack gas analysis, and fuel burning rate can be used to calculate the flow rate of gases from the stack. With correct data, balances involving carbon, hydrogen, sulfur, oxygen, or other constituents can be made. Conversely, fuel rates can be calculated from stack gas flow rates and the respective chemical analyses.

Volume balances also may be used to calculate gas flow rate, if the flow rates at other stations in the same system are known. Determination of moisture content of the gas will be necessary if changes occur due to the addition or removal of water vapor in the gas volume.

5.3 Source Modification to Achieve Increased Velocity

The velocity of a gas stream confined in a duct is inversely proportional to the cross-sectional area of the duct. An increase in velocity can be achieved by a reduction in cross-sectional area. A temporary or permanent extension of the duct can be constructed. The original duct is tapered to an appropriately smaller cross section using Method 2.1.

The extent of reduction in the cross-sectional area will depend on the original velocity of the gas stream. An increase to above 600 ft/min should be achieved. However, diameters less than 12 inches introduce other problems. Constricting flow increases system back pressure, though at low initial flow rates the increase in back pressure will also be low.

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6. Batch or Intermittent Processes

Non-continuous type processes pose special problems. Most District rules require testing to be performed over a specific time period (typically one hour) or one cycle. If a cycle is longer than one hour and the rule specifies a one-hour sample, sampling should be conducted for the one-hour portion of the cycle that would give the highest emissions, e.g. during soot blowing of a boiler. Processes that have cycle lengths less than approximately 15 minutes are considered as continuous operations and tested for one hour over several cycles, e.g. concrete batching.

For cyclic operations greater than one-half hour, testing should be discontinued during idle periods and conducted during enough complete cycles to give an adequate sample volume.

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7. Error-Bias Corrections

Errors occur in all sampling. Small systematic or random errors are accepted as determining the precision of the results. Where errors are large but the maximum bias can be determined, the results may be useful as a qualitative-type test but cannot be used for quantitative results. EPA has set policies concerning two common errors and these policies have been adopted by the District.

7.1 Leakage Rates Exceeding Acceptable Limits

The following procedures were developed by EPA to correct for sample trains with leaks greater than an allowable rate. The correction will give the results a high bias. The correction should not be used if it is greater than approximately 10 percent, or if more than one component change is necessary.

If the leakage rate is found to be no greater than 0.00057 m^3/min., (0.02 ft^3/min.) or 4 percent of the average sampling rate (whichever is less), the results are acceptable, and no correction need be applied to the total volume of dry gas metered.

If, however, a higher leakage rate is obtained, the tester shall either record the leakage rate and correct the sample volume or shall void the sampling run.

Two specific cases are as follows:

- No component changes made during sampling run.

  Replace V_m (dry standard sample volume) with the expression:

  $$[V_m-(L_p-L_a)\ \theta]$$

- One or more component changes made during the sampling run.

Replace V_m with the expression:

$$[V_m - (L_p - L_a)\ \theta_1 - \sum_{i=2}^{n} (L_i - L_a)\theta_i - (L_p - L_a)\theta_p]$$

where:

L_a = Maximum acceptable leakage rate for either a pretest leak check or a leak check following a component change; equal to 0.0057 m^3/min (0.02 ft^3/min) or 4 percent of the average sampling rate, whichever is less

L_p = Leakage rate observed during the post-test leak check, m^3/min (ft^3/min)

L_i = Individual leakage rate observed during the leak check conducted prior to the "i^{th}" component change (i = 1, 2, 3..n), m^3/min (ft^3/min)

V_m = Volume of gas sample measured by the dry gas meter, corrected to standard conditions, dcm (dscf)

θ = Total sampling time, min

θ_1 = Sampling time interval, from the beginning of a run until the first component change, min

θ_i = Sampling time interval, between two successive component changes, beginning with the interval between the first and second changes, min

θ_p = Sampling time interval, from the final (n^{th}) component change until the end of the sampling run, min

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8. Non-Isokinetic Sampling

The sampling rate used in extracting a particulate matter sample is important because non-isokinetic conditions can cause sample concentrations to be positively or negatively biased due to the inertial effects of the particulate matter. Hence, the calculation of percent isokinetic (I) is a useful tool for validating particulate test results. Methods 5.1, 5.2, and 5.3 state: "If 90 percent $\leq$ I $\leq$ 110 percent, the results are acceptable. If the results are low in comparison to the standard and I is beyond the acceptable range, or, if I is less than 90 percent, the Administrator may opt to accept the results."

The procedure outlined below provides more detail on the use of percent isokinetic to accept or reject test results when the sampling rate is beyond the acceptable range. The basic approach of the procedure is to account for the inertial effects of particulate matter and to make a maximum adjustment on the measured particulate matter concentration. After comparison with the emission standard, the measured particulate matter concentration is categorized as (1) clearly meeting or exceeding the emission standard, or (2) marginal. In the former category, the test report is accepted; in the latter, a retest should be conducted isokinetically.

8.1 Procedure

Check or calculate the percent isokinetic (I) and the particulate matter concentration (C_S) according to the procedure outlined in Method 5.1, 5.2 and 5.3. Note that C_S must be calculated using the volume of effluent gas actually sampled (in units of dry standard cubic feet, corrected for leakage). Calculate the emission rate (E), i.e. convert C_S to the units of the standard. For this procedure, it is assumed that all inputs for calculating E are correct and other specifications of Methods 5.1, 5.2, and 5.3 are met.

Compare E to the standard. Accept or reject C_S using the criteria outlined below. A summary is given in Table X-1.

- Case 1

  I is between 90 and 110 percent.

  The concentration C_S must be considered to be acceptable. A variation of ± 10 percent from 100 percent isokinetic is permitted by Methods 5.1, 5.2, and 5.3.

- Case 2

  I is less than 90 percent.

  If E meets the standard, C_S should be accepted, since C_S can either be correct (if all particulate matter is less than about 5 micrometers in diameter) or it can be biased high (if particulate matter larger than 5 micrometer is present) relative to the true concentration; one has the assurance that C_S is yielding an E which is definitely below the standard.

- Case 3

I is above 110 percent.

If E is above the standard, multiply C_S by the factor (I/100) and recalculate E. If, on the one hand, this adjusted E is still lower than the standard, the adjusted C_S should be accepted; a maximum adjustment which accounts for the inertial effects of particulate matter has been made and E still meets the standard. On the other hand, if the adjusted E exceeds the standard, a retest should be done.

Table X-1

Summary of Procedure for Acceptance of Results Based on Percent Isokinetic

Case	I	Category	Decision
1	90-110	-	Accept
2	<90	E $\leq$ Em. Std.	Accept
		C_s (I/100)E_{adj} >Em. Std.	Accept
		C_s (I/100)E_{adj} $\leq$Em. Std.	Retest
3	>110	E >Em. Std	Accept
		C_s (I/100)E_{adj} $\leq$Em. Std.	Accept
		Cs (I/100)E_{adj} >Em. Std.	Retest

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9. Pulsating Flow

Pulsating flow can cause significant errors in velocity measurements and isokinetic sampling. The District uses the following technique to test the pulsating flow systems of an internal combustion engine (ICE).

ICE testing for velocity and particulate matter can be extremely difficult and inaccurate because of severe pulsation. Since pulsations from the engine can be dampened by a muffler or surge tank, testing should be performed downstream of those devices.

If velocity readings at each traverse point vary more than ± 20 percent use a manometer with long Pitot lines, surge chambers, or capillaries to dampen out pulsations. Take at least 5 velocity readings at each point. If readings cannot be dampened below ± 20 percent at individual points carbon balance technique should be used to calculate the average exhaust flow rate. Measure the fuel rate to ± 5 percent.

For particulate sampling, use a sample location downstream of any surge chamber or muffler. It should be a minimum of 8 stack diameters downstream and 2 stack diameters upstream of any flow disturbance. Locate at least 8 sample points using Method 1.1 and set the isokinetic sample rate at each point using the average stack flow rate calculated from the carbon balance. Measure fuel rate and exhaust O_2 and CO_2 within ± 5 percent during particulate sampling to ensure that the average particulate sample rate is ± 10 percent of isokinetic.

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10. Confidentiality of Production and Emission Data

The District has issued a guideline to implement the California Public Records Act by outlining the procedures to be followed in making records available to the public (see Appendix). In brief, the guideline states that all air pollution emission data are available to the public, but that certain production data and data used to calculate emission data may remain confidential if they can be shown to be trade secrets.

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11. Determination of Process Weight

Chapter II mentions that emission limits are often expressed as process rates. For instance, Rule 405 limits the emission rate of solid particulate matter based on process weight per hour. The process weight calculation is very important in determining compliance with this rule.

District rules define process weight as the total weight of all materials introduced into any specific process which may discharge contaminants into the atmosphere. Process weight includes solid fuel charged, but does not include liquid and gaseous fuels and air (except in the desert portion of Riverside County).

There are many details to consider in calculating the process weight for batch or intermittent processes or where many material streams are introduced or recirculated. Process weight is calculated according to the following guidelines:

- Process weight and allowed loss are both considered as average rates during the time required for the process. Any time the process is not in normal operation is excluded in calculating process weight and proportioning the allowed loss. The following example illustrates this principle for operations conducted for less than one hour:

  A process is charged with 500 pounds of material, which is processed to completion in 30 minutes. The process is then idle for 30 minutes.

  In accordance with Rule 405, the process weight is 500 pounds per half-hour, or 1000 pounds per hour. The maximum number of pounds of contaminants which may be discharged into the atmosphere in any one hour is found from the table in Rule 405 to be 2.52 pounds.

  Since the process required less than one hour, the sample collected represents only the emission for that fraction of an hour. Therefore, the weight of the sample should be compared with the emission allowed in the table of Rule 405 for one hour, adjusted to the fraction of an hour of actual operation. In the example of 30 minutes of operation, the prorated allowable emission is:

$\frac{30}{60}$ x 2.52, or 1.26 pounds per half-hour cycle.

Do not prorate below 0.99 lb/hr; it is not allowed by Rule 405.

- Recycled material is considered in calculating process weight each time it is recycled in the process. For example, sand in an abrasive blasting cabinet is considered to be introduced into the process each time it passes through the blast nozzle.

- Values of process weight and allowed loss may be interpolated between values in the table in Rule 405. The table may not be extrapolated. Therefore, for any process weight of 220 pounds per hour or less, the allowed loss is 0.99 pounds per hour.

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12. Dilution Air

District rules limit the concentrations of contaminants that can be emitted to the atmosphere. Some rules correct the concentration to a standard excess air reference such as 3 percent O_2. Where no correction for excess air is made it is possible to circumvent a concentration limit by using more excess air than would be associated with good engineering practice.

There are instances when it is good engineering practice to dilute an exhaust stream. Cooling air often is added to prevent excessive stress or corrosion to exhaust systems. Excess air can be used to prevent the condensation of moisture in an exhaust stream. Effective air pollution control hood systems draw in excess air to ensure capture of contaminants. The District has adopted Rule 408 to prevent circumvention of rules that limit emission concentrations.

If it has been determined that dilution air in excess of good engineering practice has been introduced into an exhaust system, take the following steps when applying a concentration limit that does not correct for excess air:

- If the concentration to the atmosphere exceeds a concentration limit report it as such.

- If the concentration to the atmosphere does not exceed a concentration limit, correct for the dilution air. If the corrected concentration does not exceed the limit, report the uncorrected concentration and show compliance with the concentration limit. If the corrected concentration exceeds the limit, report a violation of Rule 408 but report the uncorrected concentration actually emitted to the atmosphere.

- A dilution correction may be made by adjusting to the same O_2 or CO_2 value of the gas stream before dilution. Another approach is to subtract out the diluting volume added to the system, and adjust concentrations to the reduced volume.

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13. Determination of Gaseous Constituent Stratification

13.1 Introduction

Gas stratification is the uneven distribution of the gaseous constituents in a duct or stack. It may exist at the outlet of a control device, at the point where two or more dissimilar gas streams combine, or at the point where air inleakage occurs.

For the purpose of the District, gas stratification (to be referred to as stratification from here on) is a condition defined as the presence of a difference, in excess of 10 percent, between the concentration of a gaseous constituent at any two points in the same cross sectional plane.

Samples taken at locations where stratification exists may not provide results that are representative of the entire effluent stream. In some cases, it is necessary to conduct a test to verify and/or quantify the existence of stratification. This method determines the acceptability of a sampling location for providing representative gaseous emissions measurement.

Stratification can be measured for either pollutant gases (e.g. CO, SO_2, NO_x) or diluent gases (e.g. O_2, CO_2) in units of concentration. Alternatively, for fuel burning equipment stratification may be reported in units of the applicable standard (lbs of pollutant per million Btu of heat input).

13.2 Principle

Stratification testing is performed by making a series of measurements at traverse points across the stack or duct. Ideally, simultaneous measurements at all the traverse points should be done. However, this approach is not usually feasible because of the extensive manpower and equipment required to make simultaneous measurements. To ensure that the stratification determination is not affected by temporal changes in the effluent concentration, a sampling method is used which employs a probe system to sample alternately at a traverse point and a fixed reference point.

CAUTION: Allow sufficient time between readings to flush out the sampling system. Generally three times the system response time is long enough to achieve complete flush out.

Stratification testing should be done under a steady-state operation so that the effluent concentration is not affected by process fluctuations. If the test is performed on sources operating under batch process conditions, the test should be conducted only during the periods of steady operation of the process.

13.3 Apparatus

The equipment necessary to conduct a stratification test is an extractive continuous monitoring system consisting of sample acquisition and conditioning systems, analyzers, strip chart recorder, and an automatic data processor (optional). Refer to method 100.1 for detail description, calibration, and sampling procedure.

13.4 Procedure

To eliminate the effects of temporal variations in effluent concentrations, all measurements must be normalized to a specific point in time before the percent difference at each traverse point is calculated. First the probe is placed at a fixed reference point, generally at the stack centroid, during the sampling period. This probe monitors the temporal change of the effluent concentrations. The probe is then placed at a specified traverse point. The location of traverse points are determined by the procedure in the next section.

The monitoring system alternates between sampling at the reference point and at a traverse point throughout the testing period, sampling for at least 3 minutes at each point. The system is calibrated immediately before and after the stratification test following Method 100.1.

13.5 Selection and Location of Traverse Points

Select a minimum of eight points for stacks with a cross sectional area less than 1.5 m^2 (16.1

ft^2) and eight plus one additional point for each 0.2 m^2 (2.2 ft^2) increase in cross sectional area for stacks of 1.5 m^2 to 10.0 m^2 (16.1 to 107.6 ft^2) in cross sectional area. Select 48 points for stacks greater that 10.0 m^2 (107.6 ft^2) in cross sectional area. For circular stacks the number of traverse points must be a multiple of 4. For rectangular stacks the number of traverse points must be determined from Table 1.1-1 in Method 1.1.

For circular stacks the location of traverse points must be determined following Table 1.1-2 of Method 1.1.

For rectangular stacks location of traverse points must be determined following Section 2.3.2 of Method 1.1.

13.6 Calculations

This calculation is based on an assumption that the concentration at any traverse point is proportional to the concentration at the reference point, or

$$T_X = K_X R_X \qquad \text{Equation 1}$$

where:

T_x = Concentration at traverse point x

K_x = Proportionality constant for point x (time in variant)

R_x = Concentration at reference point

x = 1, 2, 3, ...

This relation may be rewritten as

$$K_x = \frac{T_x}{R_x} \qquad \text{Equation 2}$$

Since T_x and R_x are not measured simultaneously, the average value of R_x ($\bar{R}_x$) measured before and after T_x is used as an estimate for R_x. It is assumed that all changes in concentration occur in such a manner that this assumption is a good approximation.

So the average reference point concentration at a time when the traverse point concentration is being measured is set equal to the average of the reference point concentrations measured before and after the traverse point concentration measurement.

$$\bar{R}_x = \frac{R_{xa} + R_{xb}}{2} \qquad \text{Equation 3}$$

where:

$\bar{R}_x$ = Average concentration at reference point

R_{xa} = Concentration at reference point before measurement at traverse point x

R_{xb} = Concentration at reference point after measurement at traverse point x

Consequently, equation 2 may be written as

$$K_x = \frac{T_x}{\bar{R}_x} \qquad \text{Equation 4}$$

To compare a traverse point measurement to another on a consistent basis, (i.e. eliminate the effect of concentration changes with time), all traverse point measurements must be normalized to a reference time t.

$$T_{xn} = T_x \left[\frac{R_t}{\bar{R}_x}\right] = \left[\frac{T_x}{\bar{R}_x}\right] R_t$$

$$T_{xn} = K_x R_t \qquad \text{Equation 5}$$

where:

T_{xn} = Normalized value of concentration at traverse point x

K_x = Proportionality constant defined in Equation 1

R_t = Concentration at reference point at reference time t (first reference point reading)

If there is a change in effluent flow rate on any process parameters during the test period it will cause changes in the nature of stratification. Consequently, K_x will change causing inaccuracy in quantification of stratification.

Calculate the maximum difference of concentration values by using the following equation.

$$\text{Stratification} = \frac{T_{xn}\ (\text{Max}) - T_{xn}\ (\text{Min})}{T_{xn}\ (\text{Average})} \times 100$$

where:

T_{xn} (Max) = Maximum normalized value of concentration

T_{xm} (Min) = Minimum normalized value of concentration

T_{xn} (Average) = Average normalized value of concentration

If the value is greater than 10 percent the sampling location is not acceptable for measurement of concentration of gaseous constituents present in the effluent. If the change in concentrations at the reference point is large when measured before and after a traverse point measurement the assumption of average of concentrations becomes critical and will result in error. This error becomes more pronounced when the measurement time period approaches one-half the time period of a cyclic concentration change.

Record the data in a form similar to Figure X-1.

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT

Stratification Data Sheet

Test No.__________ Date__________

Name of Company____

Sampling Location____

Sample Point	Reference Probe			Traverse Probe			Avg. Ref. Probe			Temporal Change			Normalized Trav.		
	SO_2 (ppm)	NO_x (ppm)	CO_2/O_2 (%)	SO_2 (ppm)	NO_x (ppm)	CO_2/O_2 (%)	SO_2 (ppm)	NO_x (ppm)	CO_2/O_2 (%)	SO_2 (%)	NO_x (%)	CO_2/O_2 (%)	SO_2 (ppm)	NO_x (ppm)	CO_2/O_2 (%)
▨				▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨
	▨	▨	▨												
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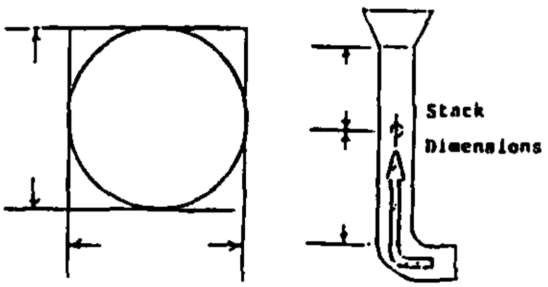

Recorded By______________________

Figure X-1
Stratification Data Sheet

APPENDIX

Guideline for Implementation of the California Public Records Act

The purpose of this guideline is to implement the California Public Records Act, commencing at Section 6250 of the Government Code, and other applicable statutes and case law by setting forth the procedures to be followed when making records available to the public. (Authorized by Government Code Section 6253).

I. Definitions

A. "District" means the South Coast Air Quality Management District or any employee authorized to act on its behalf.

B. "Person" includes any natural person, corporation, partnership, firm, or association.

C. "Public Record" includes any writing containing information relating to the conduct of the public's business prepared, owned, used, or retained by the District, regardless of physical form or characteristics.

D. "Writing" means handwriting, typewriting, printing, photostating, photographing, and every other means of recording upon any form of communication or representation, including letters, words, pictures, sounds, or symbols, or a combination thereof, and all papers, maps, magnetic or paper tapes, photographic films and prints, magnetic of punched cards, discs, drums, and other documents.

E. "Production Data" means information concerning quantity or quality of material or service used to produce an article or trade or a service having commercial value, as well as information concerning the quantity or quality produced.

F. "Emission Data" are measured or calculated concentrations or weights of air contaminants emitted into the ambient air. Data used to calculate emission data are not emission data.

II. Air Pollution Data Which is Available to the Public

A. Data Available

1. All air monitoring data, including data compiled from stationary sources (Government Code Section 6254.7 (b).

2. All information, analyses, plans, or specifications that disclose the nature, extent, quantity, or degree of air contaminants or other pollution which any article, machine, equipment, or other contrivance will produce, which any air pollution control district or any other state or local agency or district requires any applicant to provide before such applicant builds, erects, alters, replaces, operates, sells, rents, or uses such article, machine, equipment, or other contrivance, unless the information may disclose a "trade secret" as defined in Government Code Section 6254.7 (d).

3. All air pollution emission data, including those emission data which constitute trade secrets as defined in Government Code Section 6254.7 (d). Data used to calculate emission data

are not emission data for the purposes of this subdivision and data which constitute trade secrets and which are used to calculate emission data are not public records and are not available.

B. Procedure:

Trade secrets, with the exception of emission data as defined in Government Code Section 6254.7 (e), are not public records under the above statutory categories. Trade secrets are defined as follows:

"...'Trade secrets', as used in [Section 6254.7], may include, but are not limited to, any formula, plan, patterns, process, tool, mechanism, compound, procedure, production data, or compilation of information which is not patented, which is known only to certain individuals within a commercial concern who are using it to fabricate, produce, or compound an article of trade or a service having commercial value, and which gives its user an opportunity to obtain a business advantage over competitors who do not know or use it."

If the District receives a request to inspect any record which falls into the categories listed above in Part II.A., 2 or 3 (other than air pollution emission data as defined in Government Code Section 6254.7 (e)), and is identified to a particular source, such as information submitted by an applicant for a permit, the District shall not immediately release such data; but rather, shall adhere to the following procedures which are calculated to enable the District to either release the information requested or to inform the party requesting the information why said data cannot be released with 30 days of the request.

The District shall, instead of releasing the data referred to in the previous paragraph, promptly notify the person who submitted the information that a request has been received to inspect the record, and shall inquire as to whether that person claims the statutory trade secret privilege as set forth in Government Code Section 6254.7 (d). This notice shall include a request for a complete justification and statement of the grounds on which that person claims the trade secret privilege, if the privilege is claimed.

The notice shall be sent by certified or registered mail, return receipt requested.

If no such notification is received by the District, within 15 days, after receipt of the above notice, the District shall release the information in accordance with the request, subject to other limitations and procedures as prescribed herein.

If the District receives, in writing, within 15 days after receipt of the above notice, a claim of the trade secret privilege, together with the required justification, the District shall make a review of the justification. The District shall evaluate the justification and any other information at its disposal and shall determine if the justification supports the claim that the material is in fact a trade secret, under the above quoted statutory language.

If the District determines that the claim is bona fide and that the material is a trade secret, it shall notify the person seeking the information that the data sought involves a trade secret and therefore cannot be released. The person seeking the information shall be promptly advised that the justification is available for his inspection. If a person who seeks information believes that the trade secret privilege has been improperly invoked he may present rebuttal evidence and the District may reconsider. Such person shall also be advised of his right to bring appropriate legal action to compel disclosure.

If the District determines that the claim of trade secret is not meritorious or is inadequately supported by the evidence, it shall promptly notify the person who submitted the information that the justification is inadequate and that, unless further justification is received, the information shall be released, as requested within 10 days, after receipt of such notice. Such person shall also be advised of his right to bring appropriate legal action to prevent disclosure.

III. Other Records Which are not Public:

A. Preliminary drafts, notes, or interagency or intra-agency memoranda which are not retained by the District in the ordinary course of business, provided that the public interest in withholding such records clearly outweighs the public interest in disclosure. (Government Code Section 6254 (a)).

B. Records pertaining to pending litigation to which the District is a party, or to claims made pursuant to Division 3.6 (commencing with Section 810) of Title 1 of the Government Code, until such litigation or claims has been finally adjudicated or otherwise settled. (Government Code Section 6254 (b)).

C. Personnel, medical, or similar files, the disclosure of which would constitute and unwarranted invasion of personal privacy. (Government Code Section 6254 (c)).

D. Geological and geophysical data, plant production data and similar information relating to utility systems development, or market or crop reports, which are obtained in confidence from any person. (Government Code Section 6254 (e)).

E. Records of complaints to or investigations conducted by, or for the District for law enforcement or permit purposes. (Government Code Section 6254 (f)).

F. Test questions, scoring keys, and other examination data related to employment or academic examination. (Government Code Section 6254 (g)).

G. The contents of real estate appraisals, engineering or feasibility estimates and evaluations made for or by the state or local agency relative to the acquisition of property, or to prospective public supply and construction contracts, until such time as all of the property has been acquired or all of the contract agreement obtained, provided, however, the law of eminent domain shall not be affected by this provision. (Government Code Section 6254 (h)).

H. Library and museum materials made or acquired and presented solely for reference or exhibition purposes. (Government Code Section 6254 (j)).

I. Records the disclosure of which is exempted or prohibited pursuant to provisions of federal or state law, including, but not limited to, provisions of the Evidence Code relating to privilege.

J. Confidential communications between the District and its attorneys. (Evidence Code Section 954).

K. Records of documents prepared by attorneys of the District, including County Counsel and various prosecutors, or prepared by others for the purpose of eventual transmittal to the District's attorneys.

L. Records which relate to Grand Jury testimony.

M. Documents which are privileged under Section 1040 of the Evidence Code which provides:

"1040" Privilege for Official Information

> "(a) As used in this section, 'official information' means information acquired in confidence by a public employee in the course of his duty and not open, or officially disclosed, to the public prior to the time the claim of privilege is made.

"(b) A public entity has a privilege to refuse to disclose official information, and to prevent another from disclosing such information, if the privilege is claimed by a person authorized by the public entity to do so and:

"(1) Disclosure is forbidden by an act of the Congress of the United States or a statute of this state; or

"(2) Disclosure of the information is against the public interest because there is a necessity for preserving the confidentiality of the information that outweighs the necessity for disclosure in the interest of justice; but no privilege may be claimed under this paragraph if any person authorized to do so has consented that the information be disclosed in the proceeding. In determining whether disclosure of the information is

> against the public interest, the interest of the public entity as a party in the outcome of the proceeding may not be considered."

IV. Inspection:

It is the policy of the District that all records open for public inspection shall be available with the least possible delay and expense to the requesting party.

Public records are open to inspection at all times during the office hours of the District and every citizen has a right to inspect any public record as defined herein.

A request to inspect public records in the custody of the District must describe the records with sufficient specificity to enable the District to identify the information sought. The District may require that the request to inspect be in writing.

V. Copies:

Any person may receive or make a copy of an identifiable public record or copy thereof. Upon request an exact copy shall be provided by the

District, unless impracticable to do so. Computer and similar data shall be provided in a form determined by the District. Requests for copies shall be made in writing on a form provided by the district and must describe the records with sufficient specificity to enable the District to identify the information sought.

VI. Fees:

Except as otherwise provided in Rule 44, a request for a copy shall be accompanied by payment of the fee computed in accordance with the schedule established by the Los Angeles County Auditor.

A request to inspect records which requires more than nominal (30 minutes) retrieval time, will be subject to a reasonable fee based upon a time charge at a rate established by the Los Angeles County Auditor.