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**EMISSION MEASUREMENT TECHNICAL INFORMATION CENTER  
GUIDELINE DOCUMENT**

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**DETERMINATION OF THE PRESENCE OF STRATIFICATION OF GASEOUS POLLUTANT AND  
DILUENT EMISSIONS FOR CONTINUOUS EMISSION MONITOR OR REFERENCE METHOD  
RELATIVE ACCURACY LOCATIONS**

**INTRODUCTION**

The CEMS locations in duct work close to the ground are usually the most accessible for maintenance and repair purposes, but often provide very difficult situations in terms of representative sampling. Because duct work is minimized for efficiency of space and cost, few duct locations provide a well-mixed condition desirable for CEMS installation. Frequently, by-passed gas is mixed with cleaned or scrubbed gas for reheating purposes, and the result is significant stratification of emissions within the duct work. Stratification can also occur due to poor scrubber operation, especially through plugging of gas passageways and liquid-slurry spray nozzles. This latter type of stratification is most difficult to measure and is often temporally variable. Stratification may cause a pollutant or diluent monitor to fail the relative accuracy test because the reference method may sample be collected at another nonstratified location.

**DISCUSSION**

If stratification is suspected, the following procedure to locate a point or path of average emissions for monitor location selection is suggested. For rectangular ducts, locate at least nine sample points in the cross section such that sample points are the centroids of similarly-shaped, equal area divisions of the cross section. Measure the pollutant concentration and, if applicable, the diluent concentration at each point using appropriate reference methods or other appropriate instrument methods that give responses relative to pollutant concentrations. Then calculate the mean value for all sample points, and select a point, points, or path that provides a value equivalent to the mean. The sample location should be within the inner 50 percent area of the cross section. For circular ducts, conduct a 12-point traverse (i.e., six points on each of the two perpendicular diameters) locating the sample points as described in 40 CFR 60, Appendix A, Method 1. Perform the measurements and calculations as described above, and determine a point, points, or path that provides a value equivalent to the mean. The sample location should be within the inner 50 percent area of the cross section.

If stratification is expected at the reference method location for relative accuracy testing, perform the measurements as described above, and determine if the mean pollutant concentration is more than 10% different from any single point. If so, the cross section is considered to be stratified, and the tester may not use the alternative traverse point locations as described in 40 CFR Part 60, Appendix B, Performance

Specification 2, section 3.2 (... 0.4, 1.2, and 2.0 meters from the stack or duct wall.) but must use the three traverse points at 16.7, 50.0, and 83.3 percent of the entire measurement line.

**REFERENCES**

1. Gaseous Continuous Emission Monitoring Systems - Performance Specification Guidelines for SO<sub>2</sub>, CO<sub>2</sub>, O<sub>2</sub>, and TRS, EPA-450/3-82-026, October 1982, page 9.
2. APTI Course 474, Continuous Emissions Monitoring Systems, Student Manual, 450/2-91-006a, May 1992, Revised Draft, pages 52-54.
3. Transportable Continuous Emission Monitoring System Operational Protocol: Instrumental Monitoring of SO<sub>2</sub>, NO<sub>x</sub>, CO, O<sub>2</sub>, Effluent Concentrations, July 1982, page 2.