

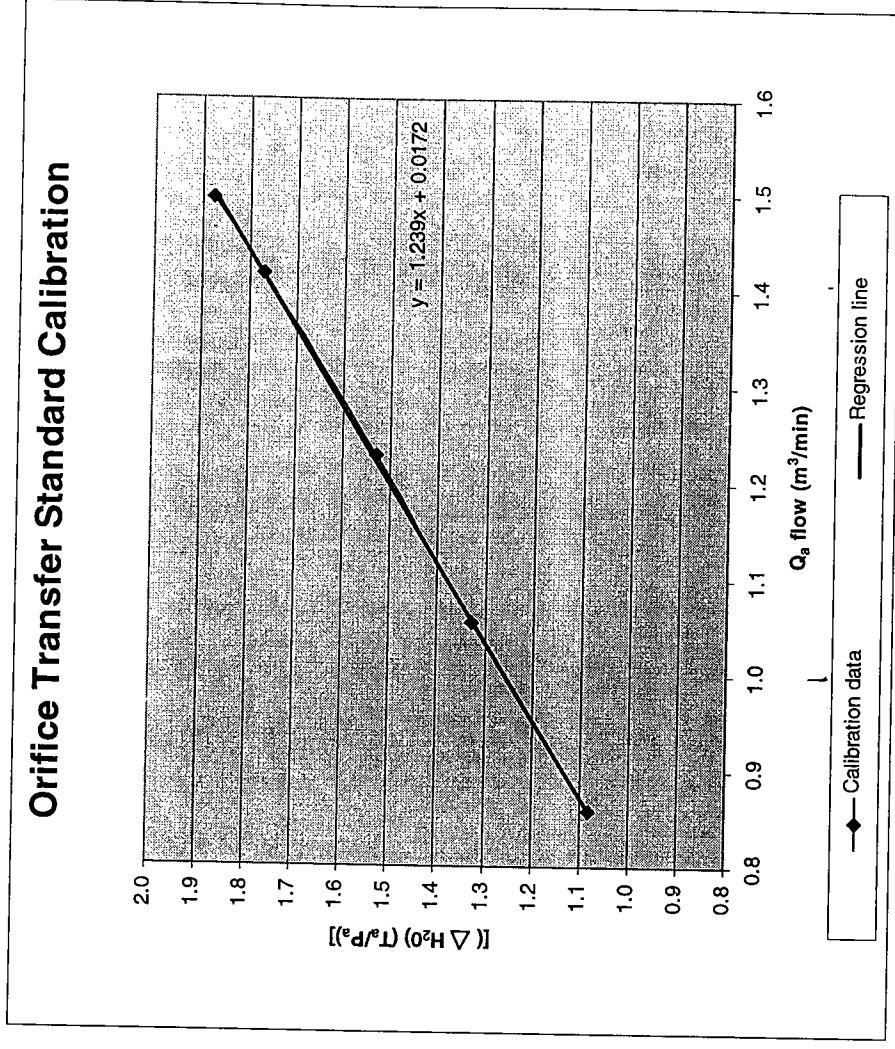
# Orifice Calibration Procedure

(continued)

- Repeat for at least four additional flow rates.
- Compute  $[(\Delta H_2O) (T_a/P_a)]^{1/2}$  for each flow rate.
- Draw orifice transfer standard calibration curve.
- Calculate the slope (m), intercept (b), and correlation coefficient (r) of the linear least-squares regression.

# Orifice Calibration Procedure (continued)

- Plot regression line on same graph as calibration data
- Readable to 0.02 m<sup>3</sup>/min
- Within 2% of line



# Orifice Calibration Procedure

(continued)

- For future use of the orifice standard, calculate  $Q_a$ .

$$Q_a \text{ (orifice)} = \{ (\Delta H_{2O}) (T_a / P_a)^{1/2} - b \} \{1/m\}$$

# Orifice Calibration Procedure

(continued)

Where:

$Q_a$  (orifice) = actual volumetric flow rate as indicated by the orifice transfer standard, m<sup>3</sup>/min

$\Delta H_2O$  = pressure drop across the orifice, mm (or in.) H<sub>2</sub>O

$T_a$  = ambient temperature during use, K ( $K = ^\circ C + 273$ )

$P_a$  = ambient barometric pressure during use, mm Hg  
(or kPa)

$b$  = intercept of the orifice calibration relationship

$m$  = slope of the orifice calibration relationship

# **Orifice Transfer Standard Calibration Frequency**

- **Upon receipt**
- **At least annually**
- **When nicks or dents are visible**

# **Basic Calibration Procedure for MFC Sampler**

- **Overview**
- **Calibration Equipment**
- **Multipoint Flow Rate Calibration Procedure**
- **Calibration Calculations**

# Overview

- **Flow rates are determined by an orifice transfer standard.**
- **Recommended exit orifice plenum pressure is measured with a 25 cm water or oil manometer.**
- **Each sampler should have its own dedicated manometer.**

# **Calibration Equipment**

- **Orifice transfer standard traceable to NIST**
- **An oil or water manometer with a 0 to 400 mm (0 to 16 in) range, scale division of 2 mm (0.1 in)**
- **A sampler oil and water manometer with a 0 to 200 mm (0 to 8 in) range, scale division of 2 mm (0.1 in) for measurement of sampler exit orifice plenum pressure**



# **Calibration Equipment**

**(continued)**

- **Thermometer range of 0 to 50°C to the nearest 0.1°C traceable to NIST**
- **Portable aneroid barometer range of 500 to 800 mm Hg, sensitivity to nearest 1 mm Hg, referenced within 5 mm Hg of a barometer of known accuracy annually**
- **Miscellaneous handtools, calibration data sheets, and duct tape**

# **Multipoint Flow Rate Calibration Procedure**

- **Set up calibration system.**
- **Disconnect motor from flow controller.**
- **Install orifice transfer standard.**
- **Check all gaskets and replace as needed.**
- **Select first calibration flow rate, install appropriate resistance plate or adjust the variable orifice valve.**
- **Conduct leak test.**

# **Multipoint Flow Rate Calibration**

## **Procedure**

**(continued)**

- **Eliminate any leaks before proceeding.**
- **Inspect connecting tubing.**
- **Adjust manometer's sliding scales.**
- **Connect orifice transfer standard manometer to the orifice transfer standard.**
- **Connect sampler's exit orifice manometer to the exit orifice plenum port.**