

**Compendium of Methods
for the Determination of
Inorganic Compounds
in Ambient Air**

Compendium Method IO-2.4

**CALCULATIONS
FOR
STANDARD VOLUME**

**Center for Environmental Research Information
Office of Research and Development
U.S. Environmental Protection Agency
Cincinnati, OH 45268**

June 1999

Method IO-2.4

Acknowledgments

This Method is a part of *Compendium of Methods for the Determination of Inorganic Compounds in Ambient Air* (EPA/625/R-96/010a), which was prepared under Contract No. 68-C3-0315, WA No. 2-10, by Midwest Research Institute (MRI), as a subcontractor to Eastern Research Group, Inc. (ERG), and under the sponsorship of the U.S. Environmental Protection Agency (EPA). Justice A. Manning, John O. Burckle, Scott Hedges, Center for Environmental Research Information (CERI), and Frank F. McElroy, National Exposure Research Laboratory (NERL), all in the EPA's Office of Research and Development, were responsible for overseeing the preparation of this method. Other support was provided by the following members of the Compendia Workgroup:

- James L. Cheney, U.S. Army Corps of Engineers, Omaha, NE
- Michael F. Davis, U.S. EPA, Region 7, KC, KS
- Joseph B. Elkins Jr., U.S. EPA, OAQPS, RTP, NC
- Robert G. Lewis, U.S. EPA, NERL, RTP, NC
- Justice A. Manning, U.S. EPA, ORD, Cincinnati, OH
- William A. McClenny, U.S. EPA, NERL, RTP, NC
- Frank F. McElroy, U.S. EPA, NERL, RTP, NC
- William T. "Jerry" Winberry, Jr., EnviroTech Solutions, Cary, NC

This Method is the result of the efforts of many individuals. Gratitude goes to each person involved in the preparation and review of this methodology.

Author(s)

- William T. "Jerry" Winberry, Jr., EnviroTech Solutions, Cary, NC

Peer Reviewers

- David Brant, National Research Center for Coal and Energy, Morgantown, WV
- John Glass, SC Department of Health and Environmental Control, Columbia, SC
- Jim Cheney, U.S. Army Corps of Engineers, Omaha, NE
- Lauren Drees, U.S. EPA, NRMRL, Cincinnati, OH

DISCLAIMER

This Compendium has been subjected to the Agency's peer and administrative review, and it has been approved for publication as an EPA document. Mention of trade names or commercial products does not constitute endorsement or recommendation for use.

Method IO-2.4
Calculating Standard Volume

TABLE OF CONTENTS

	<u>Page</u>
1. Introduction	2.4-1
2. Calculation of Volume to STP	2.4-1
3. Federal Register Citation	2.4-1

[This page intentionally left blank.]

Chapter IO-2 INTEGRATED SAMPLING OF SPM IN AMBIENT AIR

Method IO-2.4 CALCULATING STANDARD VOLUME

1. Introduction

1.1 Most atmospheric sampling techniques use a sampling train whereby air containing the pollutant of interest enters the train and passes through a sample collection device.

1.2 The weight of the pollutant collected is compared to the volume of air drawn through the train to extrapolate the concentration of the pollutant in the ambient air. The concentration is usually expressed in terms of $\mu\text{g}/\text{m}^3$, corrected to EPA's standard temperature and pressure (STP).

2. Calculation of Volume to STP

2.1 To compare gas sampling data collected by various agencies and organizations from around the country, EPA has specified that all gas volumes must be corrected to a set of predetermined standard conditions. For atmospheric or ambient sampling, these conditions are 25EC or 298K and 760 mm Hg.

2.2 The equation used to correct sample volumes (V_s) to EPA standard volume (V_{std}) conditions is:

$$\begin{aligned}V_{\text{std}} &= (V_s)(P_{\text{atm}}/P_{\text{std}})(T_{\text{std}}/T_{\text{atm}}) \\V_{\text{std}} &= (V_s)(P_{\text{atm}}/760 \text{ mm Hg})(298 \text{ K}/T_{\text{atm}}) \\V_{\text{std}} &= (V_s)(0.39)(P_{\text{atm}}/T_{\text{atm}})\end{aligned}$$

where:

V_{std} = volume of gas sampled, corrected to EPA's standard pressure (760 mm Hg) and standard temperature (25EC), m^3 .

V_s = volume of gas sampled at atmospheric pressure (P_{atm}) and temperature (T_{atm}), m^3 .

T_{std} = EPA standard temperature (25EC), $273 + 25 = 298 \text{ K}$.

P_{std} = EPA standard pressure, 760 mmHg.

T_{atm} = average atmospheric temperature during sampling (EC), $273 + 25 = 298\text{K}$.

P_{atm} = average atmospheric pressure during sampling, mmHg.

0.39 = $298 \text{ K}/760 \text{ mm Hg}$.

3. Federal Register Citation

3.1 The full text of EPA's specifications for correcting volumes to STP can be found in 40 CFR, Part 50, Appendix B.

3.2 All sample volumes must be corrected to STP.

[This page intentionally left blank.]