

NFPA 1989, 2008 Edition

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The 2008 Edition of NFPA 1989 Standard on Breathing Air Quality for Fire and Emergency Services Respiratory Protection is available for free viewing or purchase at www.nfpa.org. We highly recommend that you purchase the document to familiarize yourself with the changes and to determine if the service company and/or laboratory you are using are in compliance with this standard. The following is a brief summary. It is not intended to cover the complete document, nor replace the reader's responsibility in reading and interpreting the original document. Some sections which are repetitive are not included. Feel free to email Trace Analytics any questions you may have. We will do our best to get a definitive answer for you. Send questions or comments to: ruby@airchecklab.com.

When a section number is followed by an asterisk (*) it indicates explanatory material from NFPA 1989 Annex. *Text in italics are common questions with answers provided by Trace Analytics, Inc.*

Chapter 1 ADMINISTRATION

The scope of the document is to provide minimum requirements for breathing air quality for emergency services organizations. It specifies the requirements for the air quality component of the respiratory protection program required by NFPA 1500, Standard on Fire Department Occupational Safety and Health Program.

Chapter 2 REFERENCED PUBLICATIONS

See original document.

Chapter 3 DEFINITIONS

See original document.

Chapter 4 ACCREDITATION

This chapter mandates the use of a laboratory that is accredited in accordance with ISO 17025. It also mandates that the accrediting agency be independent, that it ensures the laboratory has facilities and equipment to conduct proper tests, written procedures for calibration of all instruments/devices for measurement which includes colorimetric detector tubes, proper control, and follows good laboratory practice. Trace Analytics is in compliance with these requirements.

Chapter 5 AIR QUALITY REQUIREMENTS

5.1	Regular Periodic Testing	Notes
	Quarterly tests submitted to accredited laboratory	*A.5.1.1 Recommends info to be submitted to lab with sample
5.1.2	Obtain sample any time contamination suspected from compressor, stored air, or SCBA cylinder	
5.1.3	Accredited lab to perform tests per 5.3, see Q&A below	Trace Analytics, Inc. meets or exceeds requirements
	Retain records for minimum of 5 years	*A.5.1.4 Can be kept electronically if feasible

Q 5.1.3, 5.2.2 states laboratory will test according to air quality levels in section 5.3. Is this correct?

A Correct section is 5.6. An erratum has been submitted to NFPA committee.

5.2	Special Testing & Procedures for Maintenance Conditions	Notes
5.2.1	When air contamination could occur, samples shall be taken after any event such as alterations, maintenance, repairs, or relocation of system or system part.	
	Take sample before purification filters are replaced (no more than 1 week prior to change)	*A.5.2.1.1 Purpose of taking a sample before a filter change is to verify that air quality was acceptable during the period between the last test and prior to the filter change.
5.2.1.2	Sample after any event noted in 5.2.1 and 5.2.1.1, passing test results shall be received before returning compressor to service	See Q&A below
5.2.1.3	Samples submitted to accredited lab meeting Chapter 4 requirements	Trace Analytics, Inc. meets or exceeds requirements

Q 5.2.1.2 states that I have to wait to use my compressed air until I receive air test results. Does this apply to routine maintenance? I never had to wait before.

A When contamination is possible waiting for test results is prudent. Trace has submitted a request for clarification.



5.3*	Special Testing and Procedures for Synthetic Breathing Air	Notes
5.3.1	The organization shall document whether air is from normal atmospheric or manufactured synthetic air.	See Annex A.5.3 below
5.3.2	In addition to quarterly testing, samples from each and every cylinder shall be tested for oxygen content. Supplier's certificate of analysis is insufficient.	
5.3.3	Testing shall occur upon delivery of cylinders by supplier or when organization blends its own synthetic breathing air. Testing shall take place before any SCBA cylinders are filled.	
5.3.4	Oxygen content shall be between 19.5% and 23.5% by volume	
5.3.5	Cylinders failing to meet oxygen requirements will be rejected	
5.3.6	The organization shall have air tested for oxygen content by accredited laboratory	

*A.5.3 Synthetic breathing air is usually very clean and free of contaminants. However, procedures for mixing or blending of synthetic air can be subject to mechanical failure and human error. Deaths have occurred from “lots” of cylinders that were tested by the supplier. The requirement for testing of each cylinder is to prevent these types of failures.

5.4*	Special Testing and Procedures for Contaminated Compressed Breathing Air	Notes
5.4.1	When a sample fails to meet air quality limits in 5.6, the organization shall remove the breathing air system from service, determine cause of failure and take corrective action.	
5.4.2	The breathing air system shall not be returned to service until a sample submitted to an accredited laboratory determines results are in compliance.	

5.5	Air Samples	Notes
5.5.1*	Quarterly air samples shall be taken directly at point of transfer which is any connection where air cylinders or receivers are routinely filled	*A.5.5.1 Purpose of taking “before and after” samples is to verify that the compressor is producing safe air since last quarterly test
5.5.2	Two samples shall be taken when purification filters are changed; one before, one after filter change. Samples shall be taken from the compressor downstream of filtration and bypassing stored air	
5.5.3*	Fill hose shall be bled for minimum of one minute	*A.5.5.3 Allowing air to flow for 1 min. will purge line of room air and contaminants. (Trace notes: If hose length is extremely long as in the case of hose on a reel, air should be bled sufficiently to assure that air being sampled is from current operation of compressor.)
5.5.4	Samples can be taken at remote fill hose or designated sampling port if unable to sample through containment fill station	
5.5.5	Before using synthetic breathing air, oxygen content shall be tested and found to be within acceptable range	
	The organization shall have oxygen content tested from each delivered cylinder. The supplier's certificate of analysis is unacceptable	
	If the organization blends its own synthetic breathing air, oxygen content in each mixing container shall be tested. This is in addition to routine quarterly tests	

Q I'm confused about where to take a sample?

A A request for Formal Interpretation of Section 5.5.1 has been submitted to the NFPA committee. However, it is Trace Analytics' understanding that the intent of the committee is for samples to be taken from the compressor and not from cascade/storage cylinders. **Routine quarterly samples** are taken from the compressor downstream of the purification bypassing storage. **When a purification filter is changed**; two samples are taken from the compressor: one before change, one after. This is to assure that air was contamination free since the last air test. This eliminates the need for sampling stored air. If contamination is determined prior to the filter change; corrective action such as replacing the air in storage cylinders/scbas with safe, clean air should be taken before putting back into service.



5.6*	Breathing Air Quality	Maximum Allowable Limit	Notes
5.6.1	Oxygen	19.5 – 23.5%	
	Carbon Monoxide	5.0 ppm/v	Reduced from 10 ppm
	Carbon Dioxide	1000 ppm/v	
5.6.4	Condensed Oil & Particulate	2.0 mg/m ³	Reduced from 5 mg/m ³
	Water	24 ppm	
5.6.6	Volatile Organic Compounds	25 ppm	Excludes methane
	Odor	Not pronounced or unusual	
5.6.8	Nitrogen	75-81%	New requirement

Chapter 6 TEST METHODS

This chapter establishes requirements for the laboratory such as calibration standards, instrument/device/detector tube calibration frequency, minimum accuracy and detection limits. Trace Analytics' analytical methods comply or exceed the established limits.

6.0	Test Methods	Minimum Accuracy	Min. Detection Limit	Notes
6.1	Oxygen	± 0.5%		
6.2	Carbon Monoxide	± 0.5 ppm at 5 ppm	0.5 ppm	
6.3	Carbon Dioxide	± 50 ppm at 1000 ppm	100 ppm	
6.4	Condensed Oil & Particulate	± 0.1 mg/m ³ at 1.0 mg/m ³	0.1 mg/m ³	Min. 500 liter air sample
6.5	Water	± 8 ppm at 24 ppm	3 ppm	
6.6	Volatile Organic Compounds	± 1 ppm at 25 ppm	1 ppm	
6.7	Odor			
6.8	Nitrogen	± 0.5 %		

Additional requirements for condensed oil and particulate include a minimum of 500 liters of air to be passed through a pre-weighed filter that must perform according to ASTM D 2986-Smoke Test, and provides procedures for desiccating or heating of filters.

Chapter 7 COMPRESSED BREATHING AIR SYSTEMS

7.1	Installation (of compressor)	Notes
	Installed, operated, and maintained per mfg's instructions	Equipped with calibration system
	Locate compressor intake to minimize contamination	
	Post sign identifying air intake location	
	Purification cartridges shall be installed in correct sequence and according to manufacturer's instructions	
	System shall not be installed to permit air to bypass air purifying components	

7.2	Compressors (Monitor)	Applies to oil-lubricated compressors Requirements	Notes
	Carbon Monoxide	Tamper-proof, Audible & Visual, Auto Shut-down at 5ppm, Limit of Detection 1.0 ppm & Resolution 1.0 ppm	Equipped with calibration system
	High Temperature	Tamper-proof, Audible & Visual, Auto Shut-down per Mfg's instructions	
	Low Oil Level / Low Oil Pressure or both	Tamper-proof, Audible & Visual, Auto Shut-down per Mfg's instructions	
	Applies to all monitors	All alarms shall be investigated and action taken before filling scba or cascade cylinders	

Q 7.2 Are the monitors required in Section 7.2 only for new breathing air systems installed after 12/30/07. Do older systems need to be upgraded?

A This section does not distinguish between new or existing breathing air systems. Governing bodies will be responsible for determining this distinction. NFPA 1500 Standard on Fire Department Occupational Safety and Health Program 2007 Edition states that the fire department will adopt and maintain a respiratory protection program that addresses the assurance of air quality (7.9.1) and that it will meet requirements specified in NFPA 1989 (7.1). NFPA 1500 2007 Edition was written prior to the current edition of NFPA 1989 and so therefore references the previous edition of NFPA 1989.





7.3	Maintenance	Notes
	Run compressor 30 min. weekly, min. 2 drain cycles	To prevent moisture build-up & provide proper lubrication
	Replace filters per mfg's instructions	
	Annually replace air stored in steel cylinders	To prevent contamination
	Maintain positive pressure in empty cylinders	To prevent contamination

7.4	Records to be maintained	Notes
7.4.1	Compressor installation, maintenance, filter changes, operation, trouble reports, corrective actions	
7.4.2	All air quality test reports	
7.4.3	All fills for SCBA, storage cylinders and receivers (not attached to compressor)	
	Records to include fill date, ID of person performing fill, cylinder serial number, air source ID, final cylinder pressure, and latest hydrostatic test date	A.7.4.3.1 Sample form provided
7.3.4	Retain records for 5 years minimum	Can be kept electronically if feasible

Trace Analytics, Inc. makes no claims to the content, completeness, or adequacy of information provided. Trace Analytics has made every effort to verify information and clarify statements with the NFPA committee to assure that information is accurate to the best of its ability. In any situation where the source document differs from this summary, the source document takes precedence.

As additional information, clarification, questions or comments become available; updates to this document will be available on Trace's website – www.AirCheckLab.com

