Best Practice Guidelines

Filtration for Wildfire Smoke

NAFA®
National Air
Filtration
Association

WWW.NAFAHQ.ORG

NAFA®
National Air
Filtration
Association

Table of Contents

National Air Filtration Association (NAFA) Headquarters
7780 Elmwood Ave, Ste 130
Middleton, WI 53562
www.nafahq.org

Copyright © National Air Filtration Association 2026
Revised 5.4.2026. All rights reserved.

Filtration for Wildfire Smoke Events

NAFA guidelines provide advice on achieving the cleanest air possible based on the design limits of existing HVAC equipment and with consideration of the impact on energy and the environment. Our guidelines are created and updated to collect and supplement existing information. However, we go beyond the "bare minimum," publishing best practices based on the experience and expertise of our membership, as well as current mandates and research provided by governmental and scientific communities.

For a more complete explanation of principles and techniques found in this guideline, visit www.nafahq.org to purchase the *NAFA Guide to Air Filtration*. If you have any questions or comments about this publication, please contact NAFA Headquarters.

A special thank you to the following member contributors:

Lead Author

Keith Jordan, CAFS, NCT
Colorado Air Filter LLC

Committee Chair

James Parris, CAFS
Freudenberg Filtration Technologies Inc.

Contributors

Glen Bergman, CAFS
G & B Environmental, Inc.

Josh Brandl, CAFS
The Filter Shop

Randy Brannen, CAFS, NCT II
Quality Filters, Inc.

Michael Corbat, CAFS
Rensa Filtration

Nitim Mohan, CAFS, NCT
Tristate Filter & HVAC Supplies, Inc.

Hunter Most, CAFS
AAF Flanders

Patrick Rosenthal, CAFS, NCT
TEX-AIR Filters

About Us

Our Mission:
The National Air Filtration Association (NAFA) mission is to be the global source for expertise, education & best practices in air filtration.

What can NAFA membership do for you?
NAFA brings together air filter and component manufacturers, sales and service companies, and HVAC and indoor air quality companies. By becoming a member, you can:

- Meet with industry thought leaders
- Strengthen your network
- Share best practices
- Receive up to date industry information
- Access professional development, certification and education

Be a part of something bigger
As a NAFA member, you are a part of a support system that shares the common goals of supporting industry growth and creating healthier communities. Following the coronavirus pandemic, we are more aware than ever of the important role that our members play in a well society. We know that our work is important to maintaining healthy, happy communities.

Benefits of Membership

As a member of NAFA, you'll have access to a host of benefits that offer networking, learning, and advertising opportunities. Here are just a few of our most popular benefits:

- Annual conferences and webinars
- Professional development programs (CAFS and NCT Level I & II certification)
- Air Media magazine
- Best practices guidelines
- Clean Air Award recognition program
- Library of resources, manuals, seminars, and training.
- NAFA advertising and sponsorship programs
- Exposure through NAFA social media and a listing on the NAFA website
- NAFA volunteer and leadership opportunities

...and more!

Click here to become a member today!

CAFS & NCT Certifications

Educate your team

Attract new customers

Be known as a leader in your industry

Now more than ever, customers seek professionals with the credentials for quality assurance and knowledge to ensure that their complex needs will be met. Addressing this concern, NAFA offers two certification programs to increase the level of education and professionalism in the industry.

The NAFA Certified Air Filter Specialist (CAFS) program

CAFS is the first education and certification program offering an extensive examination on the principles, methods and applications of air filtration. It differentiates professionals who have demonstrated a high level of professionalism and a thorough, up-to-date understanding of air filtration technology. The CAFS exam is pass/fail, and is based on the NAFA Guide to Air Filtration.

NAFA Certified Technician (NCT) Program

This open-book exam is based on the NAFA Installation, Operation, and Maintenance of Air Filtration Systems manual. This program was designed to increase the knowledge of technicians, facility managers, and building owners.

Both certifications are renewable on an annual basis pending successful completion of continued education requirements. While the exams are open to members and nonmembers alike, test fees are dramatically reduced for members. To find out more about the cost, study aids, test dates/locations, and requirements, visit the weblinks below.

CAFS information page

NCT information page

Minimum MERV Requirements

In reference to the NAFA Best Practice Guidelines, MERV recommendations refer to the baseline filtration efficiency levels that HVAC air filters should meet to achieve effective indoor air quality and protect building occupants, equipment, and systems. MERV (Minimum Efficiency Reporting Value) is a standardized rating determined by ANSI/ASHRAE Standard 52.2 that quantifies a filter's ability to capture airborne particles of varying sizes.

The recommendations set forth by the NAFA Best Practice Guidelines are produced by intense research into industry-wide best practices from accredited organizations such as (but not limited to) ASHRAE, ANSI, EPA, ISO, and Industry Experts. The Guidelines Committee research, compiles, and analyzes this data, along with their own Industry Experiences to produce a comprehensive document.

NAFA's objective is to go beyond minimum standards set by other organizations. For example, In many commercial and institutional settings, NAFA's best practice recommendations typically call for a MERV 13 air filter to effectively remove fine particulate matter (PM2.5) that can impact occupant health and harm sensitive equipment performance. Lower MERV rated filters (e.g., MERV 8) may be acceptable for pre-filtration stages, or less demanding environments, but NAFA's best practices strive to elevate performance above these basic minimums.

By specifying appropriate MERV requirements tailored to system design and environmental conditions, NAFA guidelines help industry professionals make informed decisions that improve indoor air quality, increase occupant wellbeing, and support HVAC system operation and longevity.

MERV Statement: Version 1, May 2026

Purpose, Scope and Background

1 PURPOSE

The purpose of this guideline is to establish best practices for protecting indoor air quality and HVAC system performance during periods of wildfire smoke. It addresses the control of fine particulate matter ($PM_{2.5}$) and associated gases that infiltrate buildings during smoke events, providing clear measures to reduce occupant exposure and maintain system integrity.

2 SCOPE

This guideline applies to commercial, institutional, and multi-unit residential buildings, as well as health care facilities, schools, museums, libraries, and other specialized occupancies. It covers both new construction and retrofit strategies, along with operational and maintenance measures during smoke events. The recommendations do not apply to smoke generated internally from structure fires, combustion appliances, or industrial processes.

3 BACKGROUND

Wildfire smoke is a complex mixture of particulate matter, gases, and volatile organic compounds. The fine particulate fraction ($PM_{2.5}$) is the most significant from a health perspective because it can penetrate deep into the lungs, triggering respiratory and cardiovascular effects, and in some cases impacting cognitive function. During severe wildfire events, outdoor $PM_{2.5}$ levels can exceed 300 $\mu g/m^3$ - far higher than the U.S. EPA's 24-hour National Ambient Air Quality Standard of 35 $\mu g/m^3$. Without mitigation, indoor concentrations can quickly rise to unhealthy levels even in buildings with mechanical ventilation.

Smoke enters buildings through outdoor air intakes, openings in the building envelope, natural ventilation systems, and leakage driven by wind or pressure differences. Once inside, $PM_{2.5}$ can linger in the air and settle on surfaces, contributing to ongoing exposure. The goal during smoke events is to keep indoor concentrations as low as reasonably achievable (ALARA), with a target of no more than 20% of concurrent outdoor levels when possible.

NAFA Best Practices Recommendations

Maintaining acceptable indoor air quality during wildfire smoke events requires an integrated approach combining high-performance filtration, building pressurization, and operational controls. The recommendations below are based on ASHRAE Guideline 44-2024, adapted into NAFA's best practice framework.

1

Filter Selection and Efficiency

Filtration is the most effective long-term defense against wildfire smoke particulates once they enter the mechanical ventilation system. NAFA recommends a minimum final filter efficiency of MERV 13 (ePM_1 ≥50%) for both outdoor air and recirculated air streams. Higher efficiencies—MERV 14 to 16 or HEPA—are preferred for facilities housing sensitive populations such as hospitals, elder care, schools, and buildings with high occupant density.

Two-stage filtration should be implemented wherever possible. A MERV 8 prefilter upstream of the higher-efficiency final filter will remove larger particles, protecting the final filter from premature loading and reducing resistance increases over time. This staged approach extends service life, improves performance consistency, and minimizes operational disruptions during extended smoke events.

2

Filter Installation and Bypass Prevention

The benefit of high-efficiency filtration is only realized when the filter bank is fully sealed. Filters must be installed with proper gasketing, rigid framing, and mechanical fasteners to eliminate air bypass. Even small gaps can allow smoke-laden air to circumvent the media, reducing effective system efficiency and allowing $PM_{2.5}$ to circulate indoors. Filter racks, housings, and door seals should be inspected before the start of smoke season, with repairs made as needed.

3

Monitoring and Control Systems

Continuous measurement of indoor and outdoor $PM_{2.5}$ is an essential best practice during smoke season. Readings should be recorded in real time and archived for analysis. Portable, research-grade sensors can be deployed if a permanent system is not available. Differential pressure gauges across filter banks provide a simple, reliable means of tracking filter loading, enabling timely replacement based on actual performance rather than fixed schedules.

Where possible, integrate these measurements into a building automation system (BAS). This allows operators to activate a programmed "smoke mode" in response to poor outdoor air quality. A smoke mode should disable economizers, reduce outdoor air intake to the minimum required for ventilation safety, and maintain positive building pressure to prevent infiltration.

NAFA Best Practices Recommendations

4

Building Pressurization and Envelope Integrity
Maintaining positive indoor pressure between +5 and +17 Pascals (0.02–0.07 in. w.g.) relative to outdoors reduces smoke infiltration through cracks, joints, and other openings in the building envelope. Facilities staff should perform seasonal inspections to seal penetrations around utility entries, windows, doors, and roof/wall interfaces. Airlock vestibules, well-sealed revolving doors, and operational air curtains can further limit smoke entry in high-traffic buildings.

5

Supplemental Air Cleaning
Not all HVAC systems can accommodate high-MERV filtration due to fan capacity or configuration. In these cases, portable air cleaners (PACs) or fan-powered filtration units should be deployed, particularly in high-occupancy spaces or areas serving at-risk populations. PACs should be equipped with MERV 13–HEPA filtration and be sized to deliver at least five clean air changes per hour (eACH) for the space. Units should be positioned to promote uniform air mixing and away from obstructions.

6

Operational Adjustments During Smoke Events
Operators should proactively monitor local and regional smoke forecasts, including AirNow.gov and state air quality alerts, and prepare to implement mitigation measures before conditions deteriorate. When outdoor air quality index (AQI) levels enter the "unhealthy" range ($PM_{2.5}$ >55 µg/m³), outdoor air intake should be minimized, nonessential exhaust systems should be shut down, and internal air recirculation should be maximized through the filtration system.

Critical spaces—such as data centers, medical facilities, and laboratories—may require even tighter control, including the use of dedicated outdoor air units (DOAS) with high-efficiency filtration and gas-phase media to remove both particulates and combustion gases.

7

Special Occupancy Considerations
Health care facilities should maintain pressurization regimes in critical areas and protect vulnerable patient spaces with HEPA filtration. Schools should prioritize clean air delivery in classrooms, gymnasiums, and nurse's offices, with Portable Air Cleaner deployment if HVAC upgrades are not feasible. Museums, archives, and libraries require high-efficiency filtration for particulates and consideration of gas-phase filtration for nitrogen dioxide, ozone, and other combustion by-products to protect sensitive collections.

8

Summary of Recommendations:

- Install a minimum MERV 13 final filter
- Use two-stage filtration with MERV 8 prefilter to protect high-efficiency media.
- Ensure complete sealing of filter banks to eliminate bypass.
- Continuously monitor $PM_{2.5}$ and track filter pressure drop.
- Maintain positive building pressure and seal envelope penetrations.
- Deploy Portable Air Cleaners in critical areas when HVAC upgrades are not feasible.
- Adjust operations during smoke events to minimize outdoor air intake and maximize filtered recirculation.

Installation, Operation & Maintenance

Proper installation and maintenance are critical to achieving the intended filtration performance during wildfire smoke events. Filters should be installed according to manufacturer instructions, ensuring correct fit, sealing, and orientation. Holding frames must be sized and designed for the intended MERV rating and airflow, with gaskets and fasteners to prevent bypass.

Preventive maintenance should include monthly inspections during smoke season. Filters must be replaced when the pressure drop reaches the manufacturer's recommended final value or when performance declines. Coils, fans, dampers, and ductwork should be kept clean to maintain airflow and efficiency.

Baseline pressure drop readings should be recorded with new filters and compared during service intervals to determine loading. Indoor and outdoor $PM_{2.5}$ measurements should be taken before, during, and after smoke events to verify the effectiveness of mitigation measures and adjust procedures as needed.

Used filters should be treated as potentially contaminated and disposed of according to local, state, and federal regulations.

Operation & Maintenance Summary:

- Inspect and replace filters as needed based on pressure drop and performance.
- Keep HVAC components clean to maintain airflow.
- Monitor and log $PM_{2.5}$ and pressure drop data.
- Dispose of used filters in compliance with regulations.

Installation, Operation & Maintenance

Summary

Wildfire smoke presents a significant challenge to maintaining healthy indoor air. Protecting building occupants and HVAC systems requires a combination of high-efficiency filtration, proactive pressurization, careful control of outdoor air, and diligent maintenance. NAFA's best practice approach is to install MERV 13 or higher filters, minimize unfiltered outdoor air during smoke events, monitor system performance, and apply the ALARA principle to indoor $PM_{2.5}$.

When consistently implemented, these measures can reduce occupant exposure, safeguard equipment, and enhance building resilience during smoke season.13 or higher filters, minimize unfiltered outdoor air during smoke events, monitor system performance, and apply the ALARA principle to indoor $PM_{2.5}$.

When consistently implemented, these measures can reduce occupant exposure, safeguard equipment, and enhance building resilience during smoke season.

You care about your residents and employees.
You care about the environment and your community.
You care about the fiscal health of your institution.
Indoor air quality matters.

COSTS OF POOR AIR QUALITY
Lost productivity
Decreased Health
Increased absenteeism
Increased Equipment Maintenance/Replacement
Increased Energy

BENEFITS OF IMPROVED AIR QUALITY
Reduced absenteeism
Increased productivity
Improved health, wellness and satisfaction

KEY RECOMMENDATIONS FOR YOUR HVAC SYSTEM

- Run the HVAC whenever the space is occupied.
- Direct the clean/cleaned air into the breathing zone in each occupied space.
- Return air vents should pull air from the room and not directly from the clean air inlet.
- Maintain temperature and humidity design set points.
- Set the HVAC system to bring in as much outside ventilation air as possible.

KEY RECOMMENDATIONS FOR FILTER MAINTENANCE

- To achieve the recommended MERV 13-equivalent or better levels of performance (which removes ≥85%of 1-3 µm particles), a combination of filters/air cleaners can be used.
- Use only air cleaners for which evidence of effectiveness and safety is clear.
- When upgrading filters, carefully monitor to ensure your current system can handle the upgrade (e.g. pressure drop).
- Upgrading both pre-filters and filters may cause unacceptable pressure drop. It may not be necessary to upgrade both.
- Consider using the AHAM Clean Air Delivery Rate (CADR) for sizing air-cleaners for your space
- Confirm filters are sealed in their frames, preferably with gaskets to prevent filter bypass.
- Personnel changing filters should wear PPE. Dispose of spent filters immediately and in a safe manner.

DID YOU KNOW?

Studies with SARS CoV-1 have shown that toilet flushing can generate airborne droplets and aerosols that could contribute to transmission of pathogens. Remember to:

- Keep toilet room doors closed, even when not in use.
- Encourage putting the toilet seat lid down, if there is one, before flushing.
- Keep bathroom fans running continuously and vent separately, where possible.

Glossary

ALARA – As Low As Reasonably Achievable

BAS – Building Automation System

HEPA – High-Efficiency Particulate Air MERV – Minimum Efficiency Reporting Value PAC – Portable Air Cleaner

$PM_{2.5}$ – Particulate matter with aerodynamic diameter ≤2.5 microns

Bibliography

ASHRAE Guideline 44-2024, *Protecting Building Occupants from Smoke During Wildfire and Prescribed Burn Events*.

ANSI/ASHRAE Standard 52.2, *Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size*.

NAFA *Installation, Operation, and Maintenance of Air Filtration Systems.*

NAFA Guide to Air Filtration.

U.S. Environmental Protection Agency, *Wildfire Smoke: A Guide for Public Health Officials. NAFA, Installation, Operation and Maintenance of Air Filtration Systems.*

Copyright & Usage

As a global source for expertise, education & best practices in air filtration, we provide these guidelines with one important goal in mind: **To support best practices and ensure the cleanest air possible for our employees, our customers, and our community.** While the information provided is the property of NAFA and is protected by copyright and intellectual property laws, we strongly encourage the use and dissemination of this information - in print or electronically - to those within our industry.

These guidelines were created through the hard work and care of experts in the industry... your peers. By reading these guidelines you agree not to reproduce, broadcast, or otherwise distribute the information within these guidelines for commercial purposes without the prior written consent of NAFA. If such permissions are granted, you also agree to include in any printed/electronic uses the phrase, "Used with permission of The National Air Filtration Association®."

Disclaimer
The information contained in this guideline is intended for reference purposes only. NAFA has used its best efforts to assure the accuracy of information and industry practices. NAFA encourages the user to work with a NAFA Certified Air Filter Specialist (CAFS), to ensure that these guidelines address user specific equipment and facility needs. Issues regarding health information, including COVID- 19, may be superseded by new developments in the field of industrial hygiene or by new information revealed by experts in science/ medicine. Users are therefore advised to regard these recommendations as general guidelines and to determine whether new information is available.

Send questions to: nafa@nafahq.org