

Reducing the Effects of Wildfire Smoke in the Built Environment

Presentation to B.C. Lung Association
by BGE Indoor Air Quality Solutions

June 16, 2022



Q:

Is it possible to keep all wildfire smoke out of a building?

- **What are some examples of smoke proofed buildings.**
- **How can you implement it and is it scalable?**

Answer:

The technology does exist to reduce, or eliminate, wildfire smoke from a building or space and we have been doing this for many years in specific controlled environments.

Controlled Environments

Submarines



The torpedo room of the U.S.S. Growler, a submarine that is docked in New York City as part of the Intrepid Museum. Photograph by AlexCorv / Alamy



Space Station



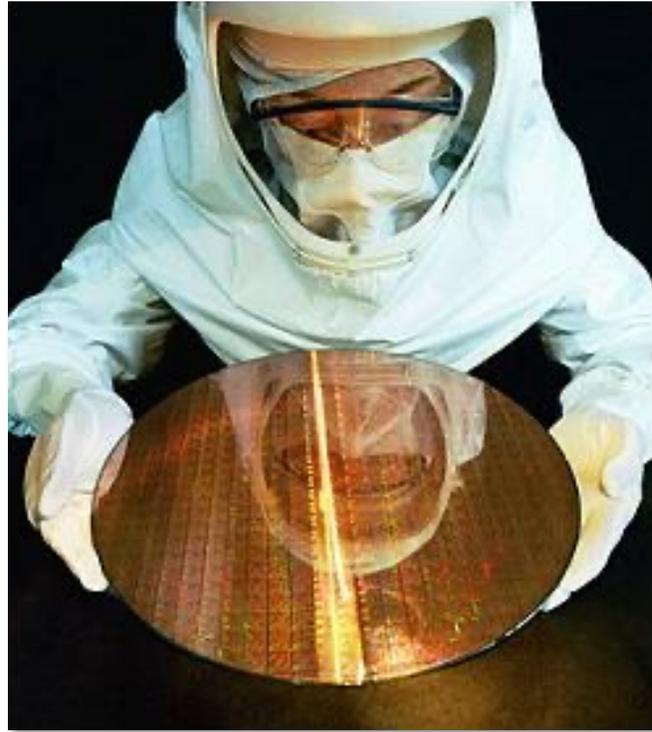
Controlled Environments

Research Laboratories



Controlled Environments

Microelectronic Cleanrooms



Controlled Environments

Control rooms on Industrial sites



Controlled Environments

Operating Room Suites



How Wildfire Smoke Enters Buildings

Wildfire smoke enters a building in 3 ways:

1. Natural ventilation
2. Infiltration
3. Mechanical ventilation

The one thing we as a group can control is the quality of the air being supplied via the mechanical route...

And it is measurable

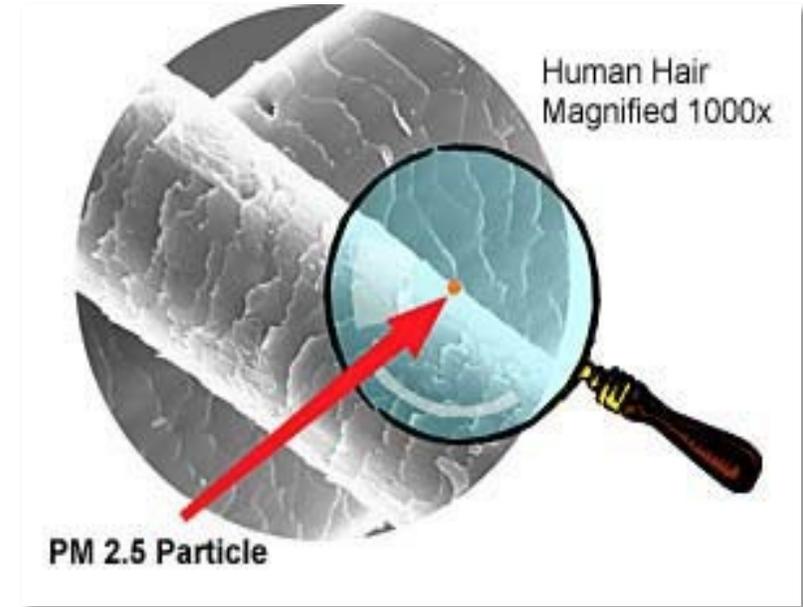
Two Main Contaminants of Concern

Solids (Particulate) – 0.003 to 100 microns

- Smoke
- Soot
- Dust

Gases – 0.0003 to 0.0007 microns

- Sulfur Dioxide
- Carbon Dioxide
- Carbon Monoxide



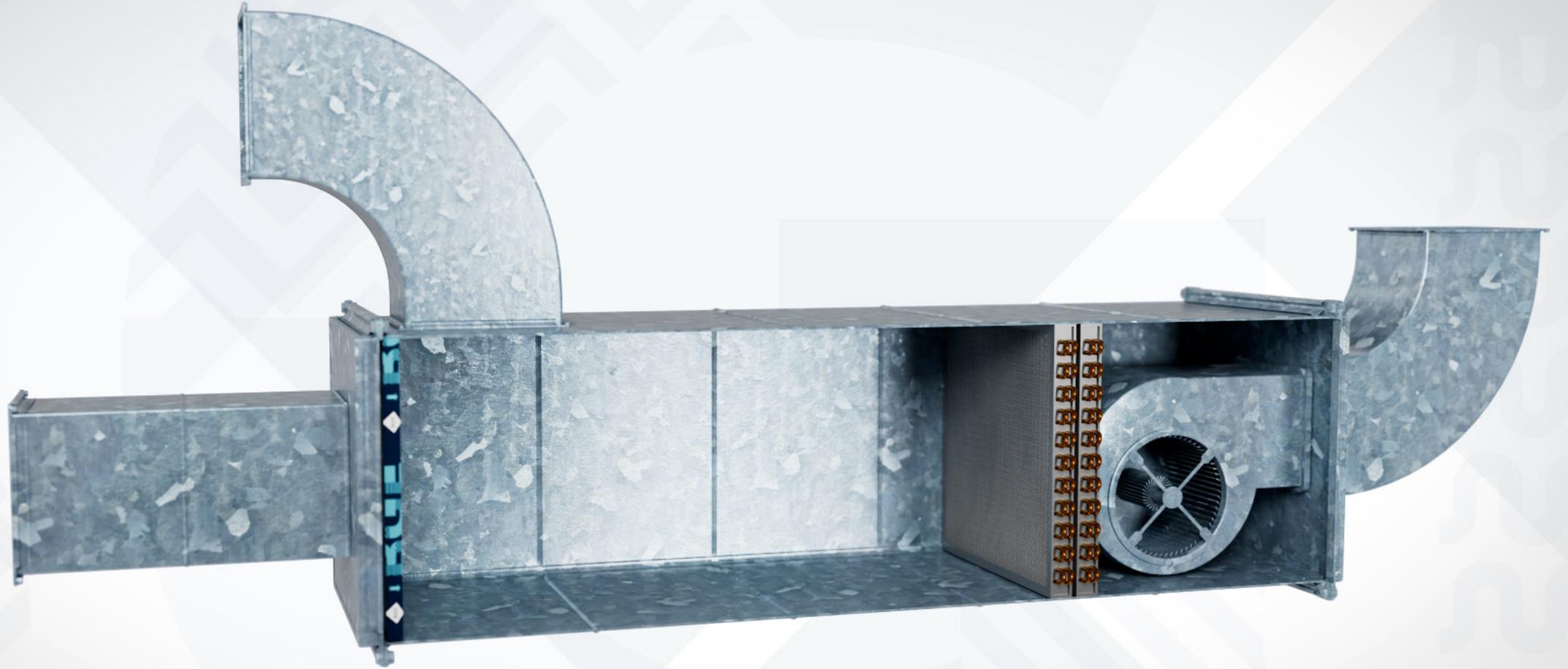
2 Distinct Modes of Removal/Control

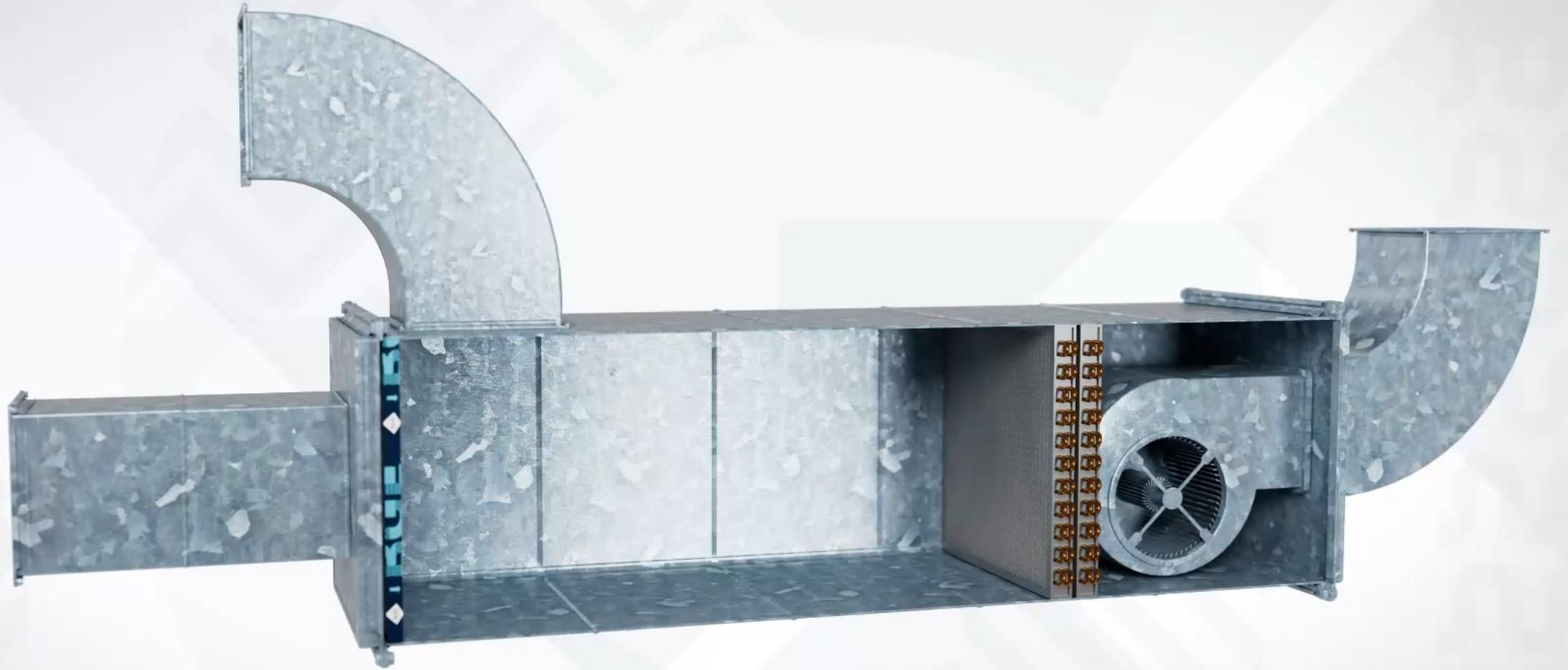
- Mechanical Air filters

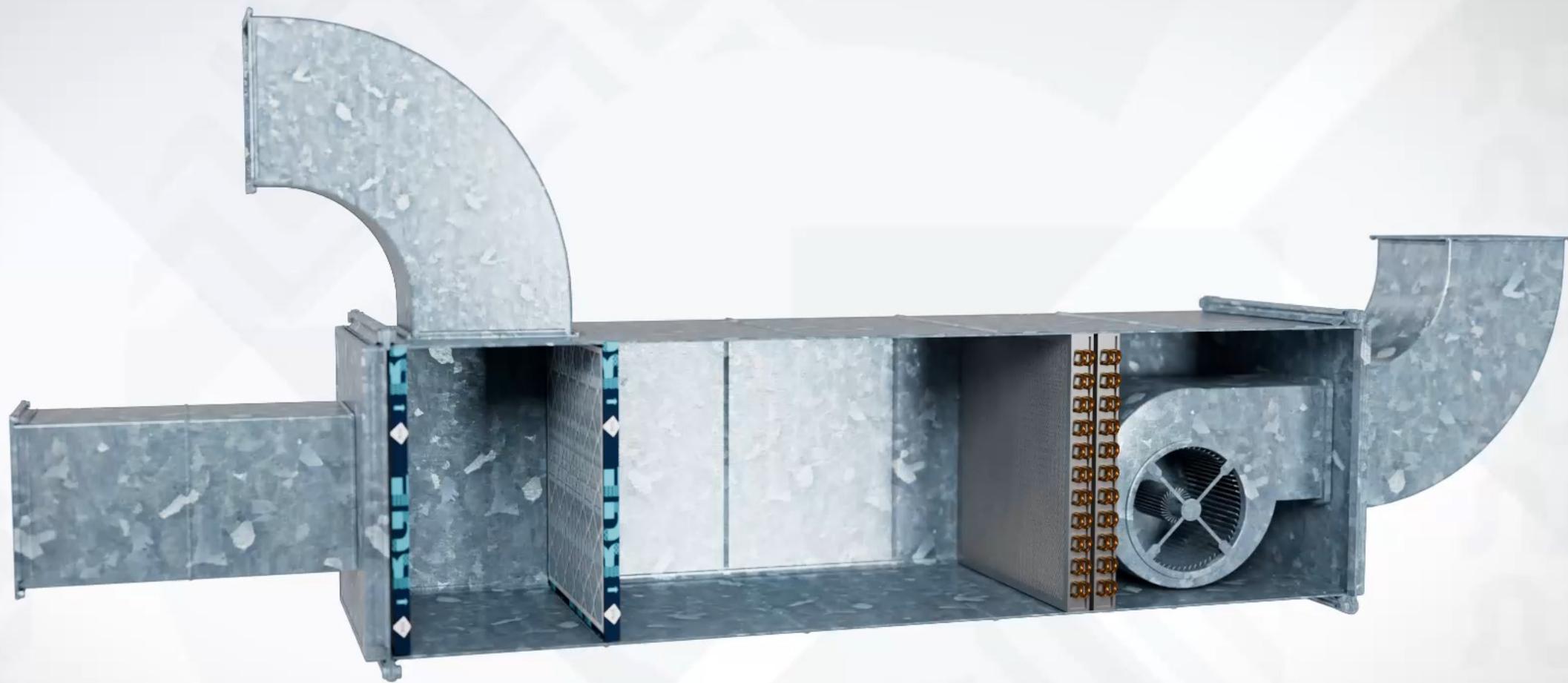


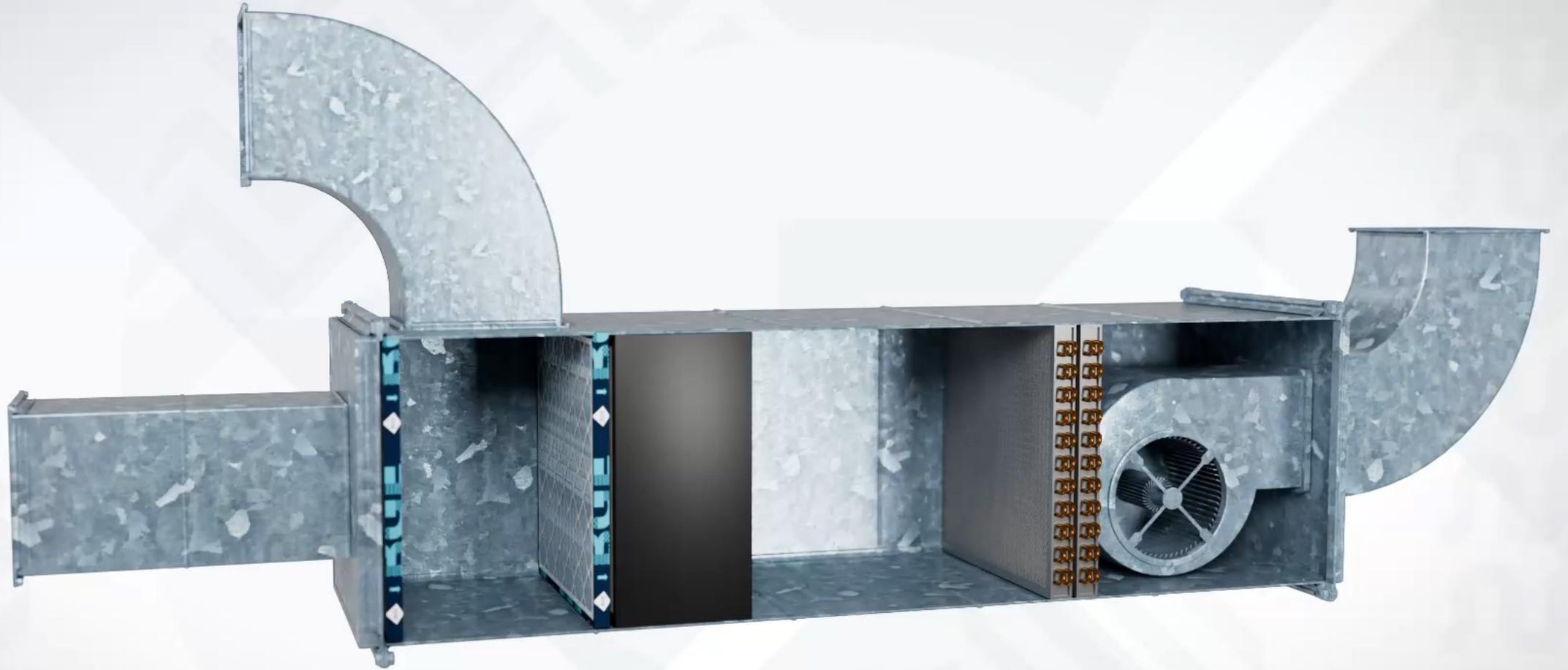
- Gas phase/odour control

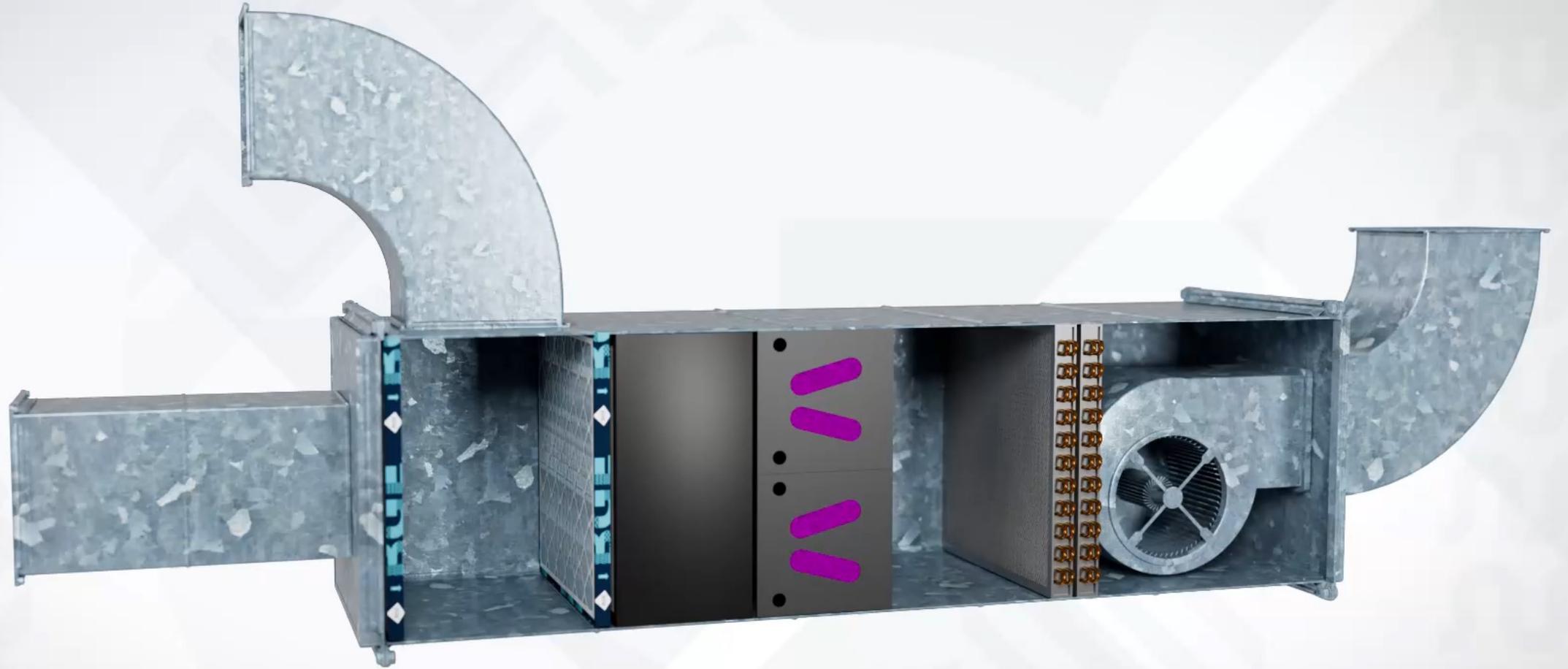


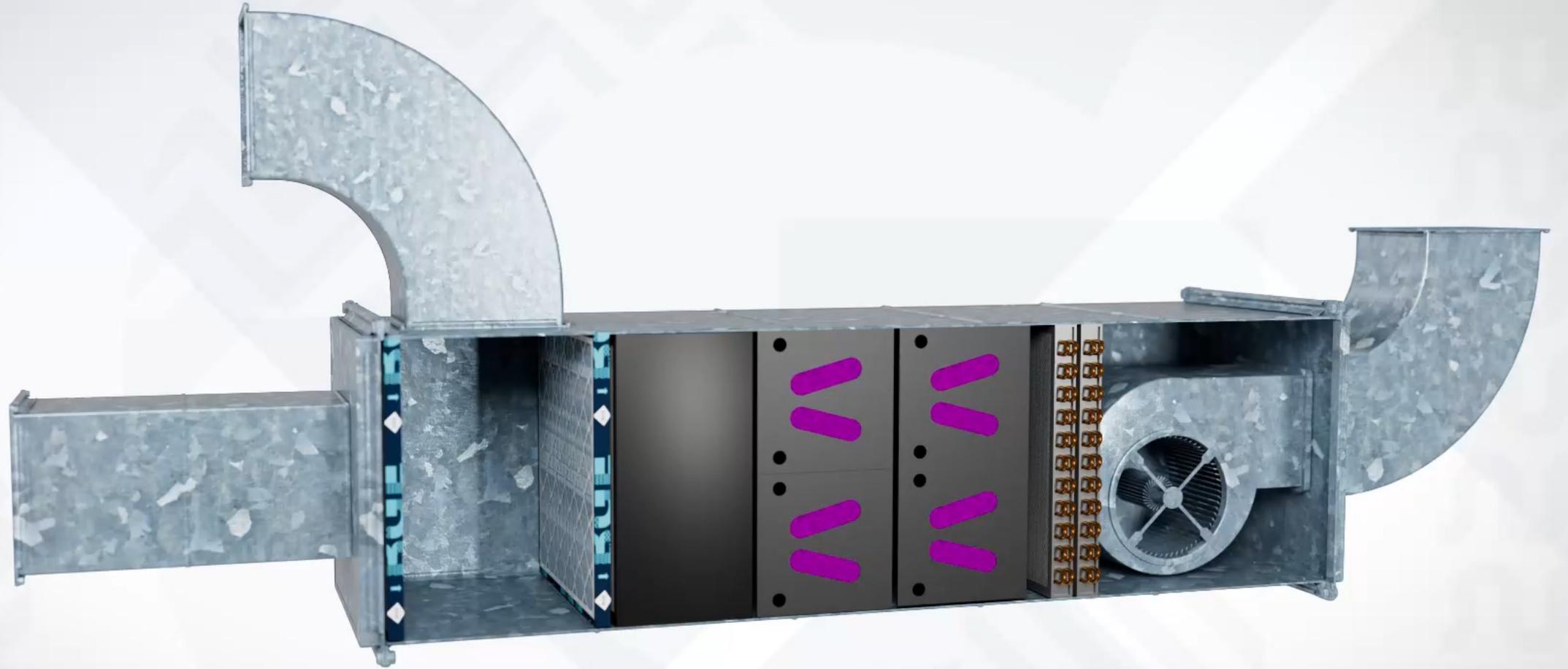


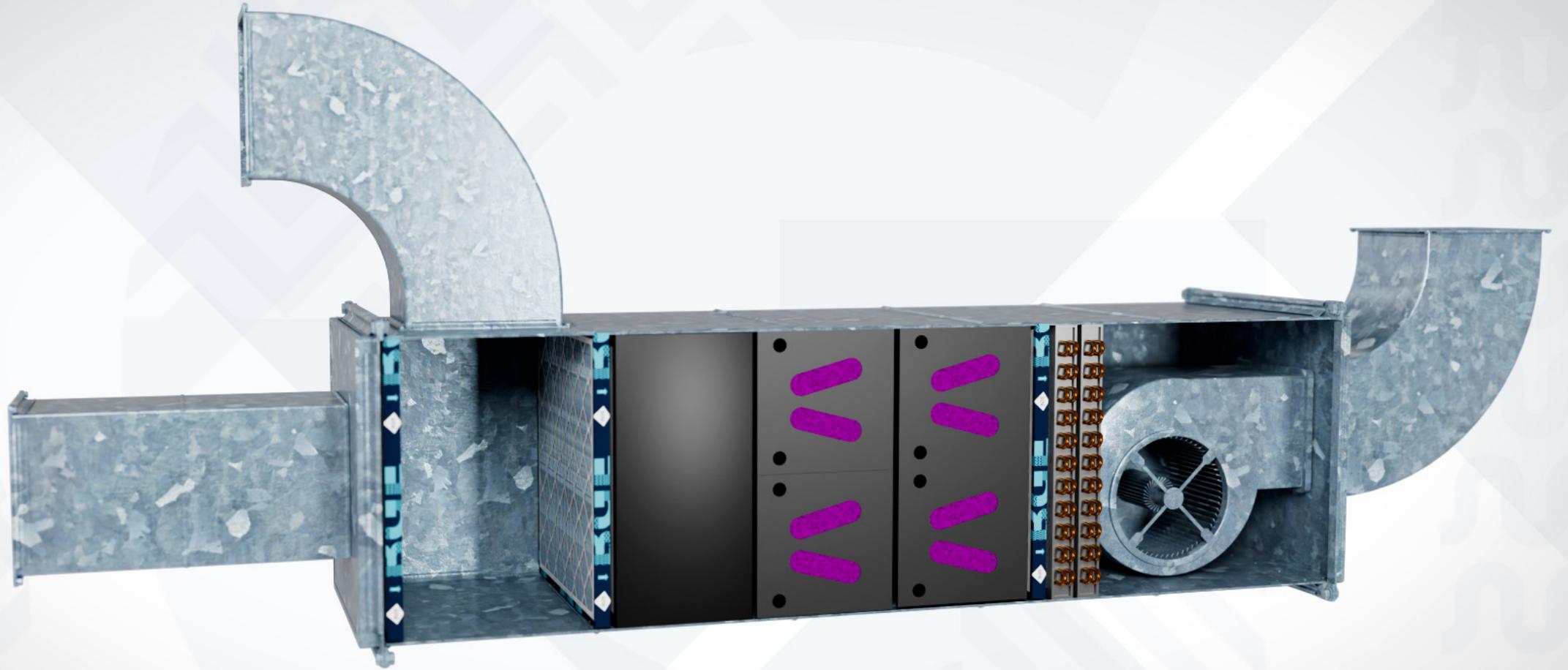












Q:

How can you implement this, and is it scalable?

A:

For the majority of buildings it is difficult, to near impossible, to keep wildfire smoke out with the existing HVAC mechanical equipment.

HVAC System Realities

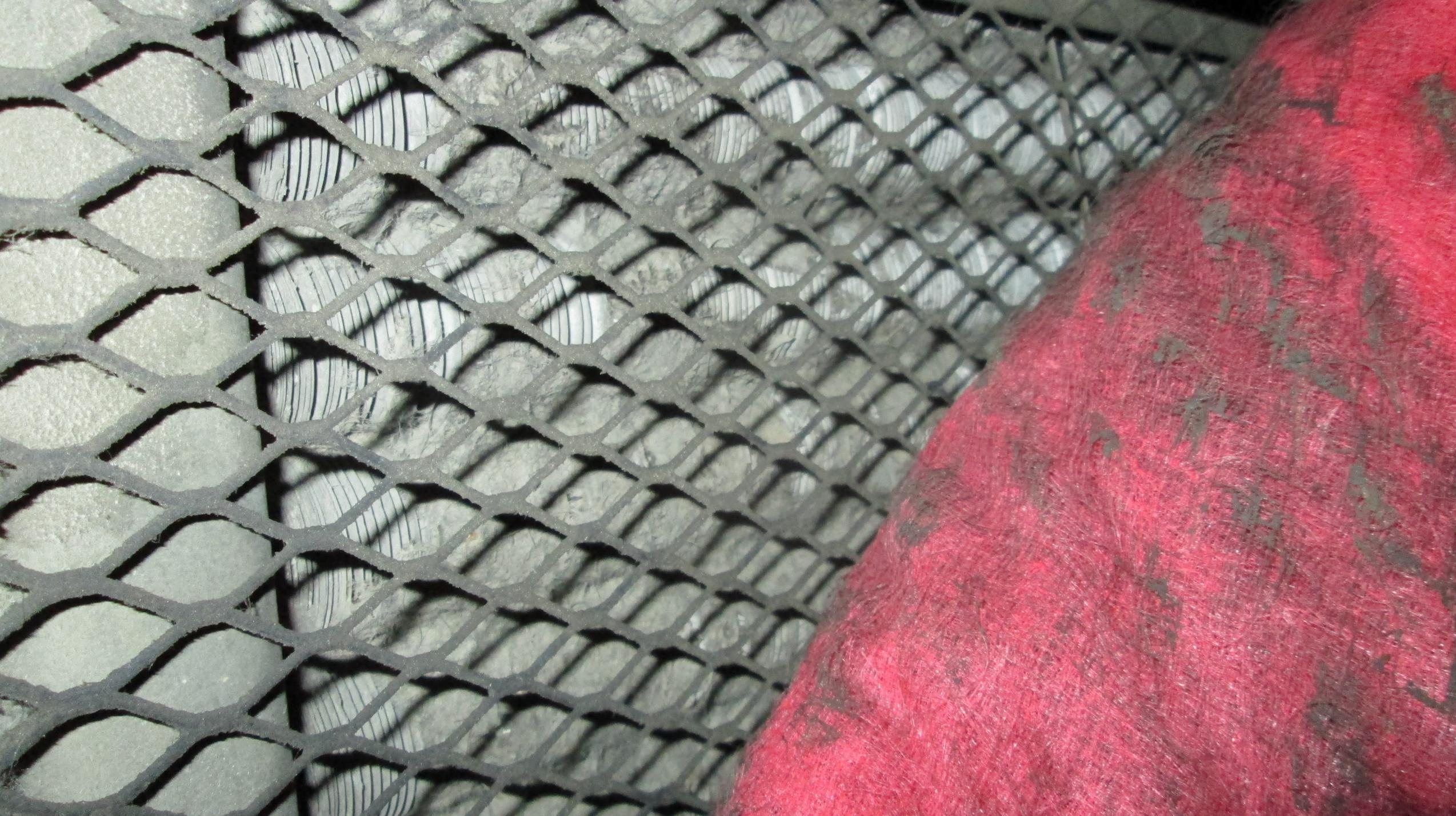
HVAC mechanical systems are generally designed for:

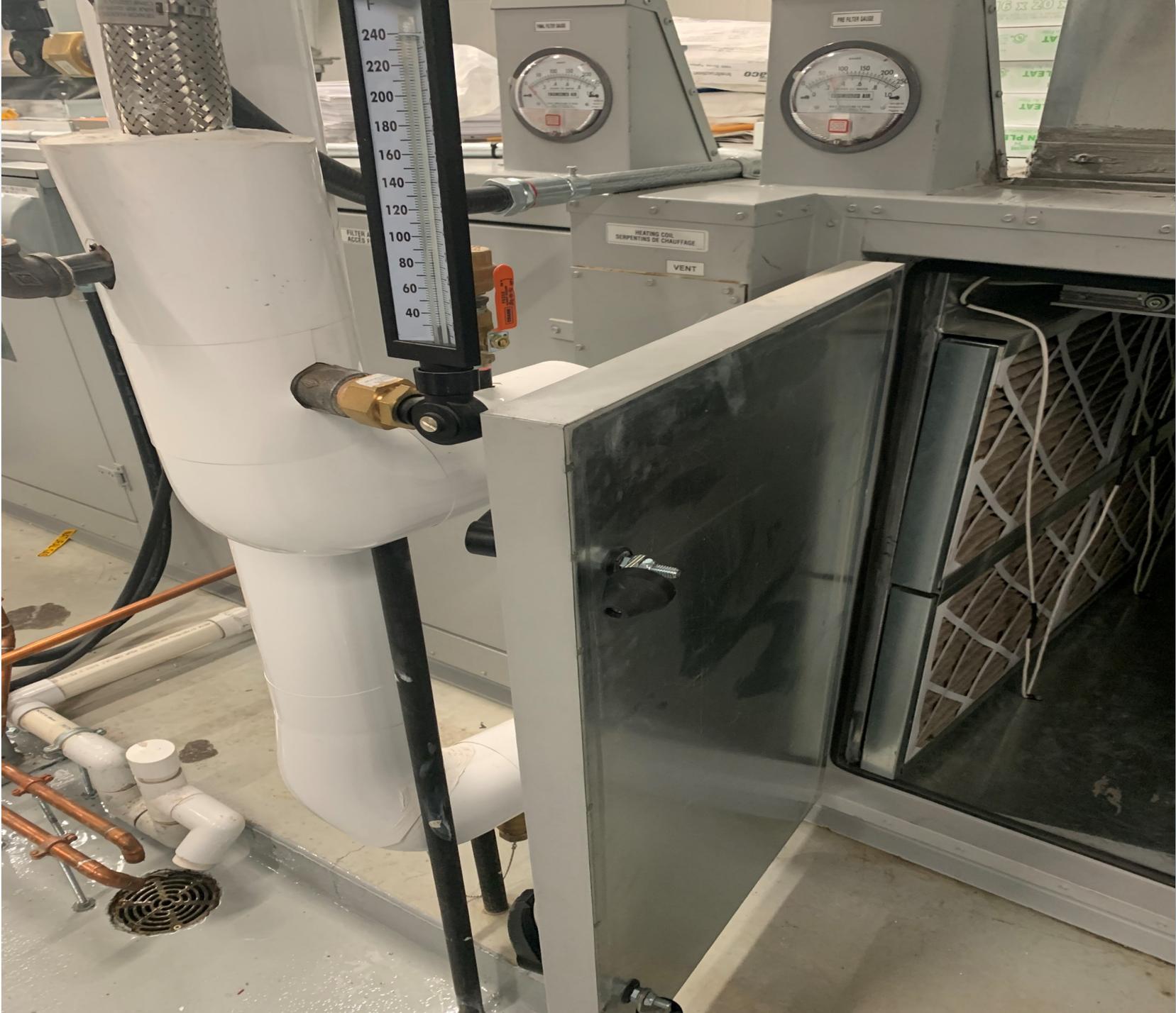
- Thermal comfort
- Equipment protection
- Energy conservation
- Product and processes protection

Not for the health, safety, and well being of building occupants











Indoor Air Quality Solutions





Quality Solutions



Q:

What do you need to consider to minimize smoke infiltration into a building?

Operational Strategies

- Operate the HVAC system to create a positive building pressure
- Verify HVAC system design intent: Are you getting the designed ventilation to maintain the positive pressure?
- Continuous operation
- A thorough review and inspection of the existing filter hardware and sealing mechanisms by a third party, such as a NAFA Certified Air Filtration Specialist (CAFS), trained on system performance not just filter performance.
- Air quality monitoring including Pm 2.5
- Supplemental air cleaning technologies

Filter System Performance Begins With An Aircheck

1. Is the filter bank rigid?
2. Are the frame channels clean?
3. Are gaskets intact?
4. Are proper type and quantity of fasteners or sealing mechanisms installed and working properly?
5. Have all leaks between plenum and frames been sealed?
6. Is all the air going through the filter?

“If it doesn't fit, it doesn't filter.”

- Darrel Sutton, Founder of BGE



- Air takes the path of least resistance.
- The more efficient the filter, the more the air will want to bypass.
- Fit is every bit as important as filter efficiency...

The goal of every filter
installation needs to be
system performance, not
just filter performance



Indoor Air Quality Solutions

Q:

1. How should the building code be changed to reduce indoor smoke in the future?
2. Are there other options?

System design and future planning

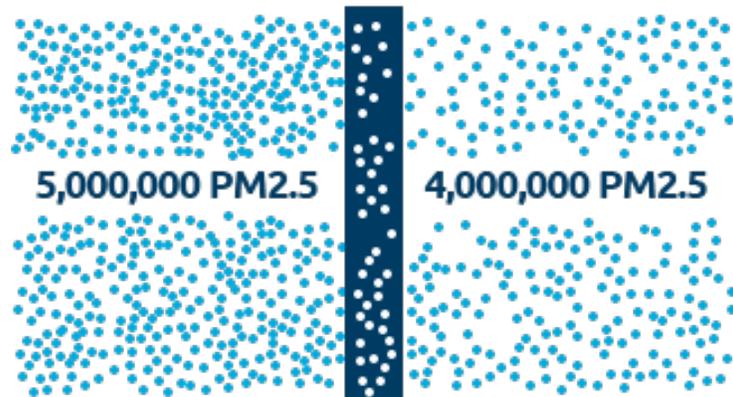
Upgrading/retrofitting your filtration system results in an immediate improvement in air quality because of the immediate reduction in particulate load entering the occupied space.

This can be accomplished 2 ways:

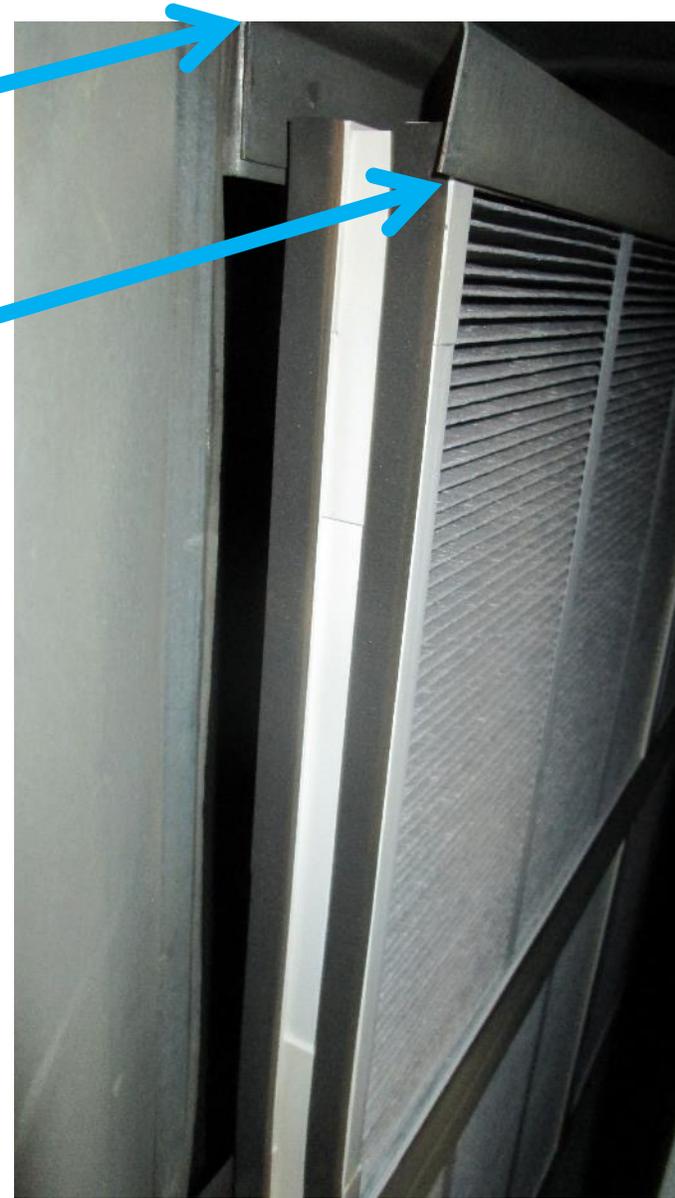
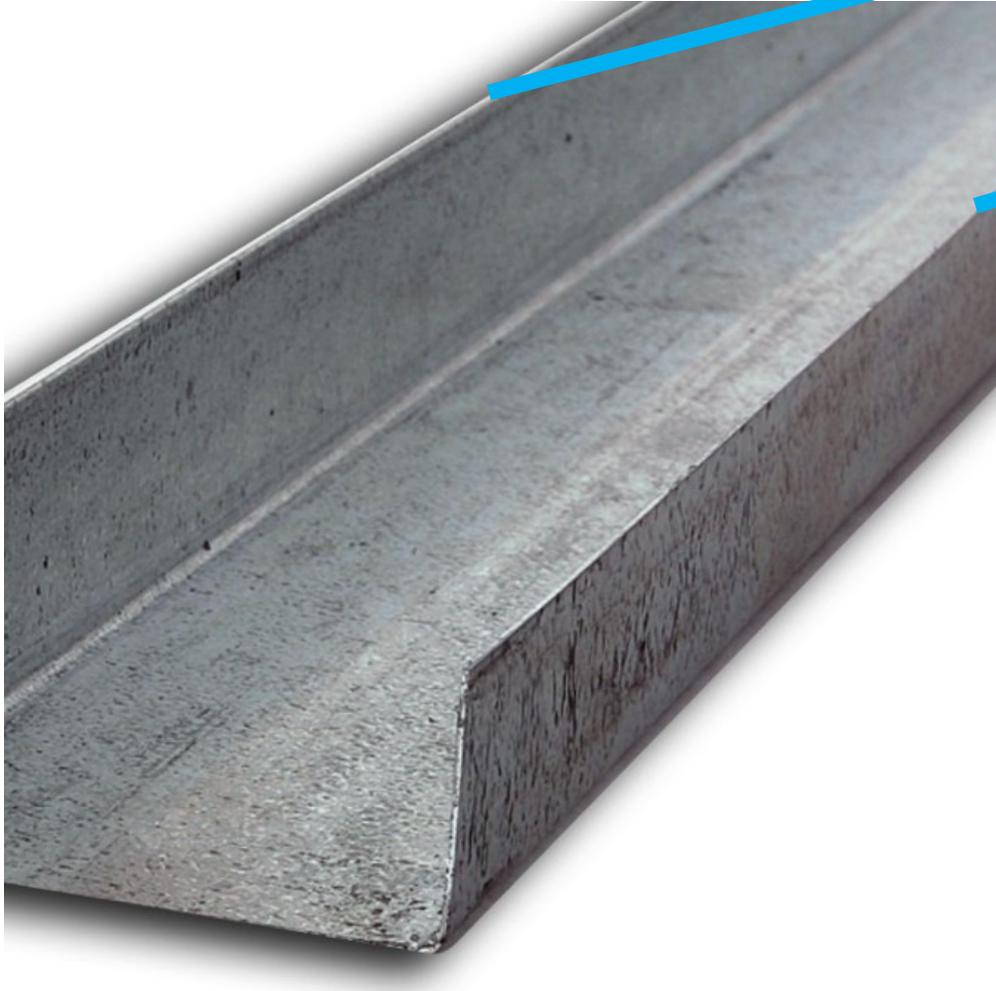
1. Upgrading to a more efficient filter
2. Improving System integrity

Concentration of Wildfire Smoke (Respirable Particulates PM2.5)

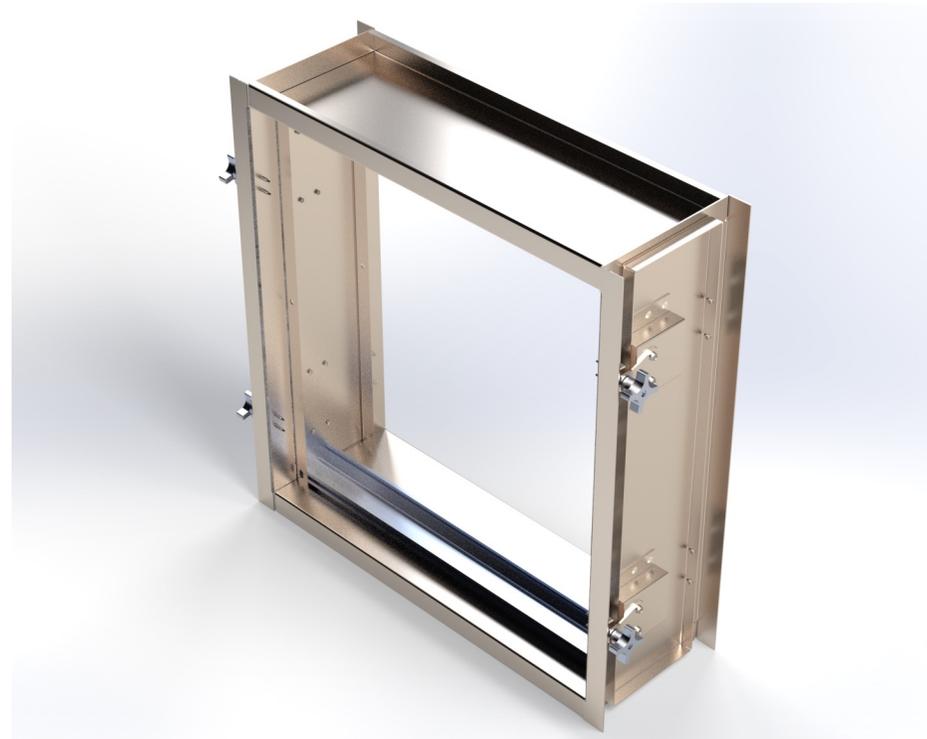
MERV 8 = 20% Captured

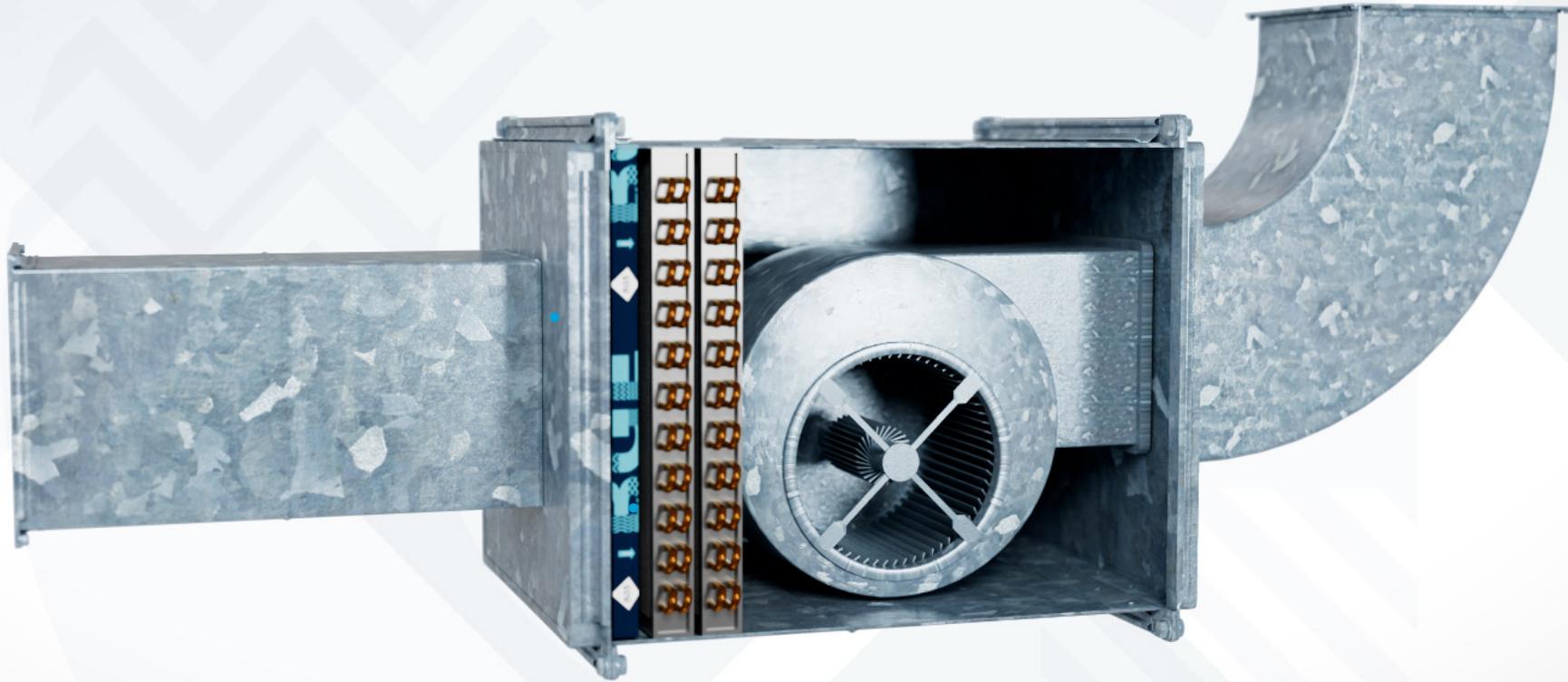


U Channel

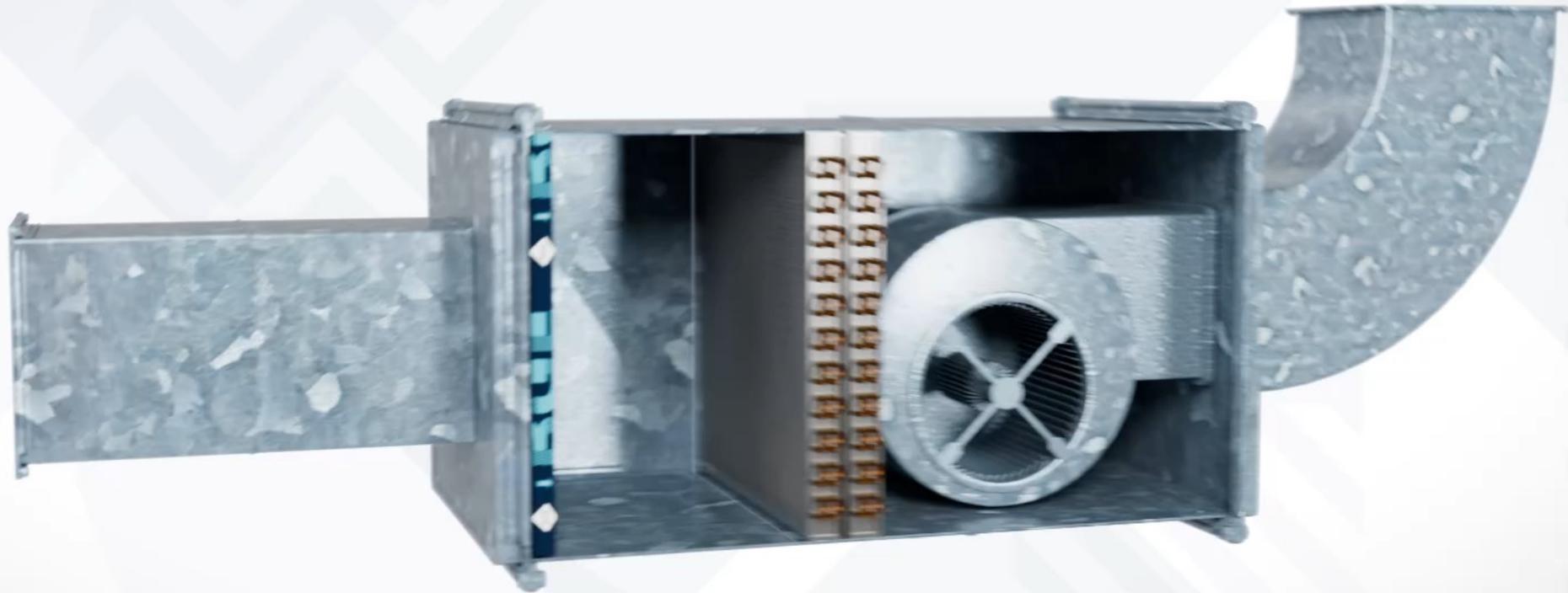


Filter Hardware





Wildfire Smoke Mode



Pandemic Mode



Extraordinary Event Mode



Final Comments

- An **unprecedented** amount of money, and tax incentives, are being allocated for the replacement and upgrading of aged HVAC equipment.
- Health and wellness has replaced energy as the most significant building metric.
- Design for **increased ventilation and filtration capacity**.
- We have a unique opportunity to participate in this growth but also a responsibility to ensure the **filtration and ventilation is designed, installed, and maintained** to withstand any future extraordinary events.
- It would be a shame if we replaced the old equipment with just shiny newer versions without thought for increased ventilation and filtration capacity.

Thank You



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When clean air matters

