

Using Air Filtration in Water Loss Restoration

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By Kevin Fisher



The Need

Because today's customers are more concerned with indoor air quality, air filtration is often used for customer – and employee – safety and peace of mind. Air filtration devices (AFDs) are needed in water restoration work whenever the job involves:

- contaminated water,
- contaminated structure,
- high levels of particulates being added to the air, or
- strong air movement.

Typically, at least one of these conditions exists in every drying environment.

Air filtration is a must whenever there are building occupants who might be at higher risk for discomfort or illness from an elevated level of particles in the air (e.g. very young, elderly, or those with respiratory problems or a compromised immune system). When walls or other cavities are known to contain particles, drying systems should include AFDs.

The Basics

AFDs – often called negative air machines, air scrubbers, HEPA units or air filters – offer several stages of filtration, including:

- **Pre-filters** – Designed to catch large particles, replaced daily or at least with each job. Often available in two stages for varying particle size.
- **Carbon filter** – Designed to absorb organic vapors, thereby reducing odor. Often optional.
- **Primary filter** – Often made of HEPA (high efficiency particulate air) media. Designed to capture 99.97 % of particles down to 0.3 microns in size.

AFDs also include basic operational parts such as blowers, switches, etc. Some units come equipped with devices that indicate when the filter is clogged.

Determining How Many AFDs to Place

Determining the amount of air filtration needed is simple. The factors involved are:

- Cubic feet (ft³) of air to be filtered
- Air exchanges necessary (will range from 4-6, depending upon conditions)

- Math (multiply the cubic feet by 4-6, then divide by 60; this will provide a range of CFM needed to effectively filter air in the affected area)

This formula can be expressed as:

$$\text{ft}^3 \times \text{AEH} / 60 = \text{CFM Necessary}$$

Where:

- ft^3 = Cubic feet in the affected area
- AEH = Air exchanges necessary (4 to 6)
- 60 = Minutes in an hour, to convert AEH to CFM

For example, if a structure has an affected area of 1600 square feet, with 8-foot ceilings, and it was determined that 4 air exchanges were needed, at least 853 CFM of air filtration should be installed. If 500 CFM units were available, two units would be needed in this scenario.

Installation

It is important to place AFDs evenly throughout the structure in order to capture the maximum number of particles. AFDs are most effective when installed as multiple units with lower airflow – as opposed to fewer units with higher airflow– to greatly increase the capture zone in the affected area. If this is not possible, or only one AFD is needed, it must be placed in a central location. AFDs can also be placed in the air stream of the structure's HVAC system or in the air stream of the air movers to increase their capture zone. An AFD has a significant amount of airflow and can be used to replace an airmover in some cases.

Changing Filters

Pre-filters and HEPA filters should be changed whenever airflow is diminished or as specified by the manufacturer. When changing the pre-filters of AFDs at the loss site, the following is done to prevent spread of contaminants:

1. Keep the AFD running during the entire process and wear appropriate personal protection equipment (PPE).
2. Place the containment bag near the filter that will be changed.
3. As the filter is removed, place it in the bag and seal immediately.
4. Replace the filter with a clean one immediately, to prevent the HEPA filter from filling with large particles.

HEPA filters are generally changed away from the loss site. Manufacturer recommendations should be followed when changing the HEPA filter. Be sure to wear appropriate PPE and prevent cross contamination of the area.

CADR vs. HEPA

Before installing units to manage particulates, it is important to understand the way in which air filtration devices are rated. Air filtration devices must be capable of removing particulate at a rate greater than the rate at which it is being added to the air, ensuring control of airborne particles. While a HEPA filter may be *rated* to remove 99.97% of particulate down to 0.3 microns in size, an AFD depends on many other factors to properly remove particles. The filter, blower, gaskets and housings must be tested together to truly show the rate of particle removal.

When the filter is installed and the blower is turned on, CFM will decrease and filter efficiency will also be affected. The result can be a performance much lower than expected. For example: Filters tested to deliver HEPA at 200 CFM will not deliver the same efficiency at 1,000 CFM. Also, blowers rated to deliver 1,000 CFM will not do so when they are restricted by a HEPA filter.

So, when evaluating an air filtration system's potential effectiveness, the components must be tested *after complete assembly*. This testing should focus on the efficiency of the filter and the actual CFM delivered by the machine.

CADR (Clean Air Delivery Rate) is an AHAM testing standard, similar to those used for dehumidification water removal. CADR testing requires that the air filtration device be tested with all components assembled. The actual CFM and filtration efficiency are measured, and after the CFM and filtration are known, the following formula is used to establish the CADR rating:

$$\text{CFM} \times \text{filtration efficiency} = \text{CADR}$$

This rating is critical to the needs of the restorer. When trying to capture particulates, both airflow and filtration are necessary.

- An AFD that removes 100% of particulate, but that has no airflow, will remove no particulate. Using the CADR formula, the unit would have 0 CADR.
- And, an AFD with 2,000 CFM but no filtration will remove no particulate. This unit also would have a 0 CADR.

In other words, effective air filtration devices remove a high amount of particulate at a high CFM. For example, a unit that delivered 500 CFM and 99.97% efficiency would deliver a 500 CADR (500 CFM x 99.97%). Effective air filtration devices have a high CADR.

Conclusion

In today's environment of heightened awareness of health issues and indoor air quality, AFDs are an effective way to protect employees and customers. Using the right amount of air filtration provides a cleaner environment in water losses, which reduces liability. And reduced liability helps the business owner sleep better at night, one of the biggest payoffs of all.



Kevin Fisher
kevinf@dri-eaz.com

has been involved in cleaning and restoration since 1999. Prior to joining Dri-Eaz, he worked for a large restoration company and has consulted on a wide variety of restoration jobs. He has developed training programs for employees, managers and owners of several restoration firms.

Kevin has a degree in Curriculum Development and Psychology. Before developing an interest in restoration, Kevin spent nine years teaching science at the secondary and college level. This combination of experience and education has proven beneficial both in teaching water damage courses and in providing technical assistance to restorers.

As an IICRC approved instructor, Kevin teaches the Dri-Eaz Water Restoration Training (WRT) and the Applied Structural Drying Course (ASD). He is an IICRC Master Restorer, a Water Loss Specialist and has served as a company representative to the IICRC certification board.