The HVAC Factor: Paths To Improved Indoor Air Quality (IAQ)

For facility management, here's the 4-1-1 on MERV ratings and supplemental filtration strategies.

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In Chicago's Loop, developer The John Buck Company set out to provide a high-quality space for tenants at 151 N. Franklin, a 35-story skyscraper. ESD Global recommended installing a MERV 13 filter for one LEED point and UV coils to further improve indoor air quality. In June 2019, 151 N. Franklin became the first WELL v1 Core & Shell Gold certification (high-rise) in the U.S. for superior IAQ.

In the past, indoor air quality (IAQ) was a concern largely for those who suffered from allergies. Today, virtually everyone—including building occupants and operators—has taken note of the impact of IAQ, and many are currently taking steps to create a healthy environment. Researchers have led this interest by quantifying the impact of IAQ on productivity, presenteeism, and absenteeism.

- Better IAQ can lead to employee productivity improvements of 8-11%.[1]
- 52% of all Millennials say living and working in a healthy environment influences their personal health.[2]
- Employees who are satisfied with their workplace are 16% more productive, 18% more likely to stay, and 30% more attracted to the company over competitors.[3]

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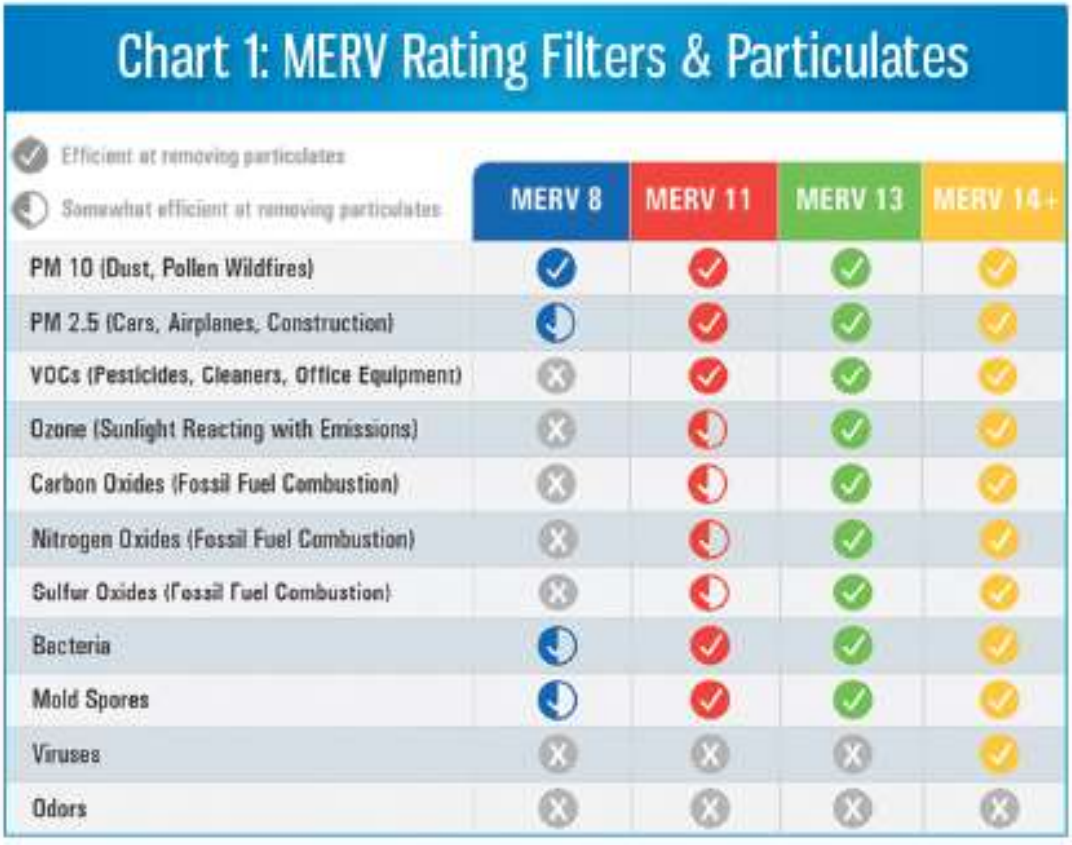
MERV Ratings: What Do These Mean?

The first step in improving IAQ is to check out the building's MERV rating on its filter on the mechanical equipment. Minimum Efficiency Reporting Value (MERV) rates the overall effectiveness of the air filter, with higher value MERV ratings leading to better filtration and fewer dust particles and other airborne contaminants.

Thanks to the U.S. Department of Energy (DOE) and sustainable building certifications like LEED from the U.S. Green Building Council that encourage MERV 13 filters, there has been a growth in the adoption of higher MERV ratings as well as technological advances in supplemental filtration. Below is a chart that lists MERV rating filters:



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Many facilities are grandfathered in with a MERV 8 filter based on the limitations of their duct static pressure drop. So, what if you and your building are “married to a MERV 8”? In these cases, consider the following options (and see Chart 2):

1. A stand-alone HEPA and/or carbon filter to remove contaminants and unpleasant odors (microwaved fish, anyone?). We recommend a wall-mounted model at the breathing level closest to the source (ex. main supply air grille, janitor’s closet, loading dock, kitchen) for best results.

2. UV (ultraviolet) lighting at the mechanical systems cooling coils can remove bacteria, mold spores, and viruses. While this is a more costly option, it will improve the air quality of the entire building vs. a single space with a standalone filter.

3. Ionization technology at the main supply air distribution can remove many issues from dust to odors for as little as 1.5 watts of power consumption per linear foot. Ionization bars deliver oxygen molecules into the air to neutralize contaminants. Each bar installed can treat up to 20,000 CFM.

4. HVAC Load Reduction (HLR) technology can selectively remove gas contaminants from the indoor air via a self-cleaning sorbent cartridge. This innovative approach reduces the energy consumption in HVAC systems by up to 50% at peak loads by reusing indoor air.

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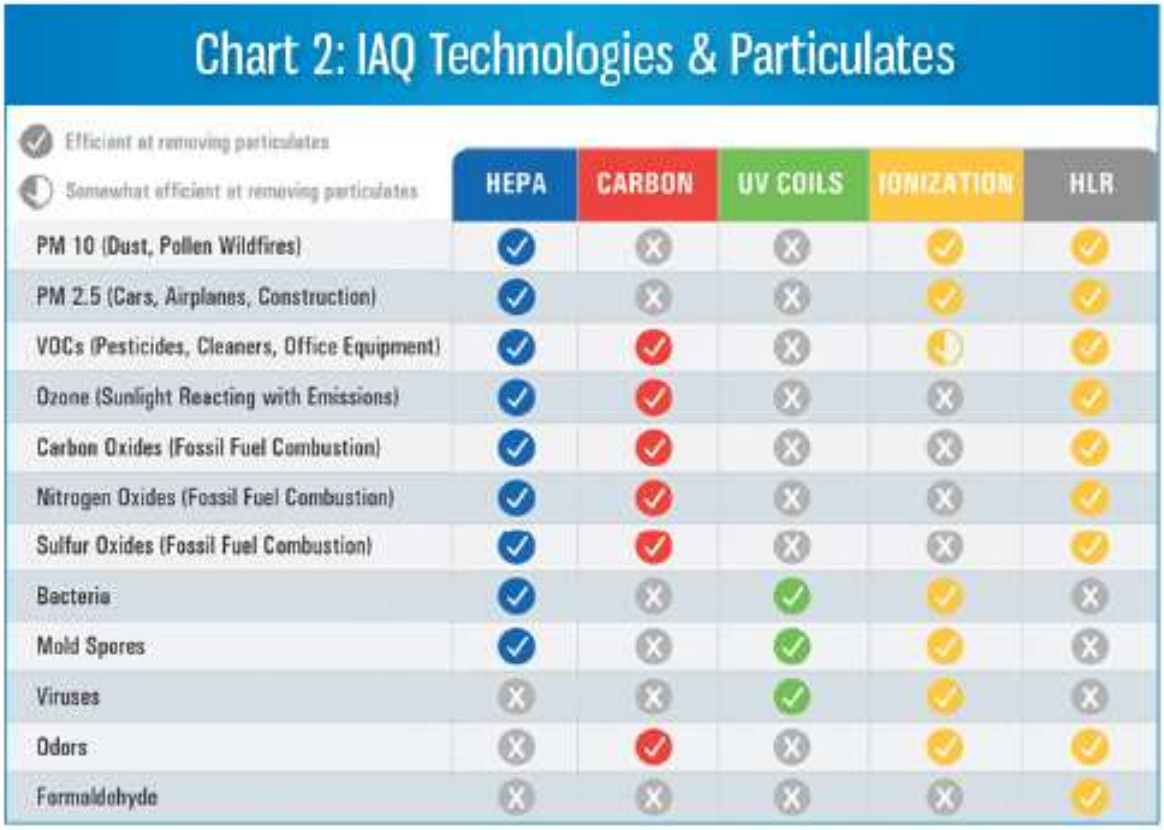

Chart 2: IAQ Technologies & Particulates

✓ Efficient at removing particulates

◐ Somewhat efficient at removing particulates

	HEPA	CARBON	UV COILS	IONIZATION	HLR
PM 10 (Dust, Pollen Wildfires)	✓	✗	✗	✓	✓
PM 2.5 (Cars, Airplanes, Construction)	✓	✗	✗	✓	✓
VOCs (Pesticides, Cleaners, Office Equipment)	✓	✓	✗	◐	✓
Ozone (Sunlight Reacting with Emissions)	✓	✓	✗	✗	✓
Carbon Oxides (Fossil Fuel Combustion)	✓	✓	✗	✗	✓
Nitrogen Oxides (Fossil Fuel Combustion)	✓	✓	✗	✗	✓
Sulfur Oxides (Fossil Fuel Combustion)	✓	✓	✗	✗	✓
Bacteria	✓	✗	✓	✓	✗
Mold Spores	✓	✗	✓	✓	✗
Viruses	✗	✗	✓	✓	✗
Odors	✗	✓	✗	✓	✓
Formaldehyde	✗	✗	✗	✗	✓

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Outdoor Air Pollutants and IAQ

IAQ is not government regulated. Instead, local building codes (ASHRAE 62 and ASHRAE 55) establish minimum IAQ requirements. The following six criteria pollutants are caused by numerous widespread emissions, commonly found in outdoor air that put public health at risk. Researchers have documented the following complications from each of the six for building inhabitants which building owners and operators can address via the tables provided within this article.

1. Particulate matter 2.5 & 10 (premature mortality, lung cancer, heart disease)
2. Ozone (inflamed airways, coughing, difficulty breathing)
3. Carbon oxides (headache, dizziness, restlessness)
4. Volatile organic compounds (VOCs) (headaches, loss of coordination, damage to nervous system)
5. Nitrogen Oxides (nausea, headache, difficulty breathing)
6. Sulfur Oxides (painful deep breaths, throat irritation, difficulty breathing)

Note: Refer to Chart 1 for MERV ratings that filter the six criteria pollutants.

Meeting IAQ Goals

Both existing and new filtration systems can help facility management teams meet their IAQ goals. As the general population has increased its focus on IAQ, even purchasing their own personal IAQ sensors (now available on Amazon!) and the impact of climate change on outdoor air quality increases, building occupants will come to demand it. Understanding MERV ratings and other IAQ improvement options will help continually raise the bar.

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References

[1] Health, Wellbeing & Productivity in Offices. The next chapter for green building, 2015. World Green Building Council
[2] The Consumer Health Mindset – Unpack the Experience. Unleash the Possibilities, (pp. 12-20), 2014. Aon Hewitt.
[3] Future Workplace Wellness Study. View Inc. 2019 Survey Report.

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