

INDOOR AIR QUALITY IS CLASS A

These days, a healthy interior is the expectation. Creating one is possible without a major sacrifice in energy performance.



Indoor Air Quality (IAQ) is increasingly a top priority for the developers of Class A office space and those who operate those buildings. The reason, and the urgency behind the transition to ever-healthier interiors, is obvious. The global airborne COVID-19 pandemic is creating havoc everywhere. In an era where we are accountable for our environmental footprint, we need to understand the nexus of IAQ and energy efficiency.

But even if COVID wasn't an issue, there's a huge, cost-effective and occupant-health benefit to improving IAQ. Studies show that, in terms of the bottom line, it can translate into millions in profits over a 10-year cycle. This windfall, through reduced sick days and greater employee

efficiency, is the hallmark of truly high-performing office space. While IAQ should always be pursued, in the context of the world we live in now, COVID is the key driver behind the heightened interest in healthy interiors.

So, if air quality is a priority for a Class A, 100,000 SF building populated with blue-chip professionals demanding peace of mind vis-à-vis the pandemic, it's important to figure out how to best deliver it and how much energy it will consume. Two common strategies are often analyzed for improving IAQ — high-efficiency particle filtration for HVAC systems, and increasing outside air percentages. Both are effective and can be used



WGI's energy model, used by Sixthdriver Architecture's design for 100,000 SF of Class A office space, was the basis for our analysis | ASHRAE Climate Zone 2A | Austin, TX

in tandem. However, when looking at their bottom-line impact, filtration and outside air are two different things. Those differences must be understood so the best solution is determined for that five-story office block already in the central business district, or the future project that's still under design.

Once the standard for Class A office space, the MERV 8 filter is on its way out. With COVID front and center, both the Centers for Disease Control and Prevention (CDC) and American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) recommend MERV 13, with more filter media than MERV 8 to capture more particulate matter — including COVID. But what are the energy ramifications associated with converting to the higher MERV filter?

If energy performance is an owner's priority, then the question must be answered.

WGI leveraged past studies and internal energy modeling analysis using Trane TRACE 700 software with a blended electricity rate of \$0.06/kWh in ASHRAE Climate Zone 2A. The analysis was modelled on a 100,000 SF building now under design in Austin, TX and measured both filtration and increases in outdoor air.

Using MERV 8 as the baseline, the study recorded energy consumption using MERV 13 and the hospital-grade MERV 16 filters. While MERV 16 is not recommended for commercial use, its inclusion in the study was illuminating because it showed just how energy efficient and cost-effective MERV 13 is.

END USE	BASELINE	MERV 13	MERV 16	OA 50%	OA 100%	OA 50% + MERV 13
Heating	225,747	225,747	225,746	239,063	282,293	238,786
Cooling	1,376,414	1,338,799	1,415,042	1,507,940	1,640,458	1,521,703
Fans	122,038	145,370	194,426	123,833	126,714	147,324
Lighting	546,538	546,538	546,538	546,538	546,538	546,538
Receptacles	46,108	46,108	46,108	46,108	46,108	46,108
Total kBtu/yr	2,316,845	2,352,561	2,427,860	2,463,482	2,642,109	2,500,459
Increase in Fan		19%	59%	1%	4%	21%
Increase in Cooling		1%	3%	10%	19%	11%
Total Increase		2%	5%	6%	14%	8%
Total \$/SF/yr Increase		\$0.01	\$0.02	\$0.02	\$0.05	\$0.03
Total \$/yr		\$628.44	\$1,953.35	\$2,580.13	\$5,723.13	\$3,230.75

The MERV 13 increases total energy by 2%, or \$.01 per year per square foot, equating to \$628. The MERV 16, on the other hand, increases total energy by 5%, or \$.02 per year per square foot, equating to \$1,953 — more than three times the energy cost of MERV 13. This is in addition to an annual energy bill of about \$40,000 to \$45,000 per year.

As the analysis shows, MERV 13 offers great air-quality benefits without driving up energy consumption to unacceptable levels. Regarding MERV 16, the study shows diminishing returns. Not only does it create a pronounced increase in energy consumption, but it also entails the additional costs of resizing the filter box, installing a larger fan, and reconfiguring other related infrastructure.

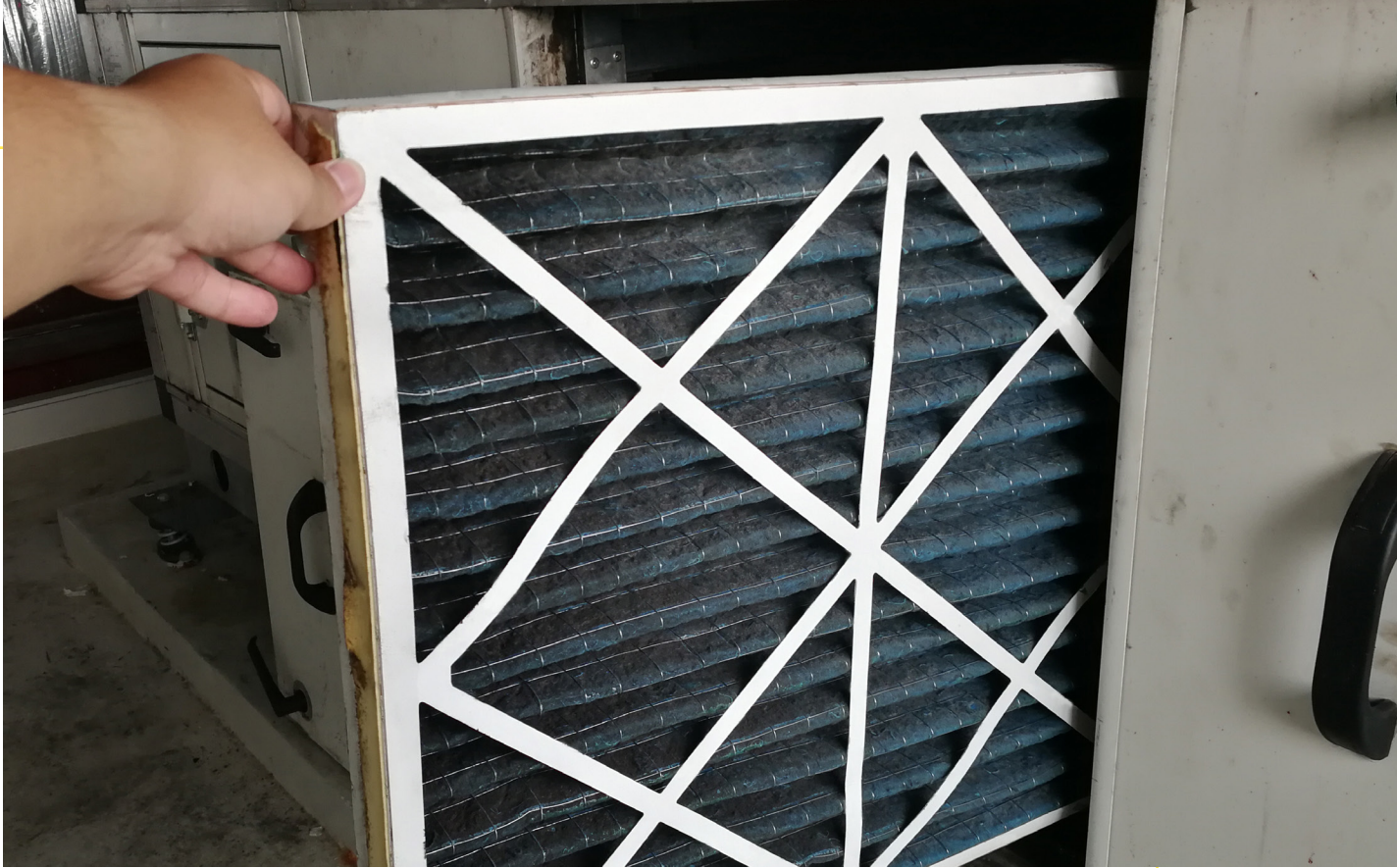
When considering outdoor air, it's important to note it is generally the best air obtained and is key to diluting toxins within a built environment — whether it's an office, a fitness center, or a warehouse. But outside air comes at a cost, particularly in hot, humid areas like the Southeast. Outdoor air must be cooled and dehumidified before it is used, and that process drives energy consumption. In the COVID era, increasing outdoor air is a strategy that should be considered. We assessed the impact of increasing ASHRAE 62.1 minimum outside air requirements by factors of 50% and 100% to understand the magnitudes of energy impact. Increasing it by 50% creates a 6% total increase in energy, or \$2,580 in utilities per year. Increasing outdoor air by 100% creates a 14% total increase in

IMPORTANT TO REMEMBER

When assessing your needs for improved Indoor Air Quality, there are additional design and operations considerations for filters utilized within built-up air-handling units (AHU):

- An increased filter box size from 4" to 12" for MERV 14 and greater
- A higher pressure drop and requirement for fan upsizing
- A larger fan cabinet and rooftop unit (RTU) are needed to accommodate a larger fan and filter box
- Decreased supply airflow due to an increased pressure drop

These considerations are not universal and require consultation with a building engineer or consultant.



energy, or \$5,723 per year in energy costs.

The WGI analysis shows that increasing outdoor air by 100% is not advisable, especially if energy performance is an owner's key priority. An increase of 50% is a more realistic measure, especially during more temperate months. With the use of an economizer, outdoor air is utilized when it's most advantageous to treat it, like during the spring and fall when the cooling-and-dehumidification cost is not prohibitive. The economizer increases the air intake based on the outdoor temperature and can be set to activate at a specified level, like 75 degrees. While most modern units

have economizers, oftentimes they do not work as expected. Your consulting engineer can ensure that this function is working properly and delivering results you want.

The WGI analysis shows that the optimal method is to use both MERV 13 filtration and the 50% increase in outdoor air, amounting to an 8% increase in total energy, or \$3,230 a year. However, these results are skewed higher in a hot-humid climate and do not incorporate economizer operation. Additionally, our findings are limited to this case study's geographic region, and should be reevaluated based on your building's specific climate factors. High-performance

buildings with excellent IAQ contribute to employee health, with downstream benefits like productivity, efficiency, and retention. Studies show that wellness translates to an increase in value per employee each year through increased performance and fewer sick days. For a company with 800 people, this could literally mean millions in profits over a 10-year cycle.

According to Moody's Analytics, a leading financial intelligence firm, the vacancy rate for commercial real estate this year could soar as high

as 19.9%. In 2022, the rate could go even higher. The pandemic pushed people out of their offices and into their homes. Video conferencing technologies, like Zoom, allowed them to stay there. Yet at some point, office blocks across the country will start to fill back up — but before people return, they'll want to know if their workspace is healthy. With MERV 13 filtration, increased outside air, and properly functioning economizers, the needs of the moment can be met without a major sacrifice in energy performance.

LET'S TALK.

For more information about this study or to have a conversation with one of our experts, please contact us:



Joe Miller
Project Manager
Joe.Miller@WGInc.com



Offices Nationwide
866.909.2220
WGInc.com

