What is a MERV?

- MERV is a rating system used to evaluate the efficiency of an air filter based on how effective it is at catching particles of varying sizes. Basically, the higher the MERV rating, the higher the air filtration capabilities of a particular filter
- Ratings range from 1-20. 1 iw the lowest level of filtration and 20 is the highest.
- The higher the MERV rating the better the filter is at trapping specific types of particles.
- Filters that are MERV 16 - 20 are usually only found in hospitals, cleanrooms, and nuclear power plants.
- The higher the MERV rating the more it filters out (see chart).

Is there a downside to a higher MERV rating?

1. Higher MERV rating can cause air flow issues. This means the HVAC system will not be able to push air through as easily; there will be more resistance because the air must pass through the filter.
2. More resistance can cause bigger pressure drops which can lead to other problems like reduced air flow.
3. Reduced air flow can lead to:
   - HVAC not cooling or heating efficiently
   - AC coil may get too cold and freeze up - which can ultimately damage the compressor.
   - Low air flow can affect the furnace, making it more hot, which can cause it to crack.

TABLE 3: MERV PARAMETERS

Standard 52.2 Minimum Efficiency Reporting Value (MERV)	Composite Average Particle Size Efficiency, % In Size Range, µm			Average Arrestance, %
	Range 1 (0.3-1.0)	Range 2 (1.0-3.0)	Range 3 (3.0-10.0)	
1	n/a	n/a	E3 < 20	$A_{avg} < 65$
2	n/a	n/a	E3 < 20	$65 \le A_{avg} < 70$
3	n/a	n/a	E3 < 20	$70 \le A_{avg} < 75$
4	n/a	n/a	E3 < 20	$75 \le A_{avg}$
5	n/a	n/a	$20 \le E3$	n/a
6	n/a	n/a	$35 \le E3$	n/a
7	n/a	n/a	$50 \le E3$	n/a
8	n/a	$20 \le E_2$	$70 \le E3$	n/a
9	n/a	$35 \le E_2$	$75 \le E3$	n/a
10	n/a	$50 \le E_2$	$80 \le E3$	n/a
11	$20 \le E_1$	$65 \le E_2$	$85 \le E3$	n/a
12	$35 \le E_1$	$80 \le E_2$	$90 \le E3$	n/a
13	$50 \le E_1$	$85 \le E_2$	$90 \le E3$	n/a
14	$75 \le E_1$	$90 \le E_2$	$95 \le E3$	n/a
15	$85 \le E_1$	$90 \le E_2$	$95 \le E3$	n/a
16	$95 \le E_1$	$95 \le E_2$	$95 \le E3$	n/a

To summarize, a high-MERV filter can:

- Add resistance to the air flow
- Increase the pressure in the duct system
- Increase the energy use of the system
- Reduce the air flow
- Cause comfort problems
- Freeze the air conditioner coil
- Damage the compressor
- Crack the heat exchanger
- Potentially increase carbon monoxide in the space
- Dehumidify better

https://www.energyvanguard.com/blog/unintended-consequences-high-merv-filters

What is pressure drop? In simple terms, pressure drop is basically air resistance. The air filter is a literal barrier between your HVAC system and your vents, and that slows the ability of air to get pulled through vents to the actual system. How much the HVAC's air flow is slowed by a filter is equivalent to its pressure drop.

Pressure drop varies based on the filter. Filters that are more tightly woven (the higher the MERV rating the more tightly woven the filter) will make it harder for air to pass through. This creates a decrease in air flow and a higher pressure drop. As long there is an air filter installed in the air return, there's no way to avoid pressure drop.

MERV Rating Chart					
MERV #	**APPLICATION**	**CONTROLS THESE CONTAMINANTS**			**PARTICLE SIZE**
MERV 1 **MERV 2** **MERV 3** **MERV 4**	• Pre-Filter In Commercial Bldg • Residential Furnaces • Window Air-Conditioning Units	Pollen Dust mites		Sanding dust Textile/carpet fibers	Filters down to 10.0 micron particle size
MERV 5 **MERV 6** **MERV 7** **MERV 8**	• Pre-filters or Final Filters • Commercial Buildings • Better Residential Buildings • Industrial Workplaces • Paint Booth Inlets	Pollen Dust mites Sanding dust	Dust lint Cement dust	Textile/carpet fibers Mold/spores	Filters down to 3.0–10.0 micron particle size
MERV 9 **MERV 10** **MERV 11** **MERV 12**	• Pre-Filters or Final Filters • Hospital Laboratories • Better Commercial Buildings • Superior Residential Buildings	Pollen Dust mites Sanding dust Textile/carpet fibers	Mold/spores Dust lint Coal dust Nebulizer dust	Cement dust Legionella Lead dust Humidifier dust	Filters down to 1.0–3.0 micron particle size
MERV 13 **MERV 14** **MERV 15** **MERV 16**	• ·Final Filters • ·General Surgery • ·Superior Commercial Bldgs • ·Hospital Inpatient Care • ·Smoking Lounges	Pollen Dust mites Sanding dust Textile/carpet fibers Mold/spores Dust lint Cement dust	Sneeze nuclei Insecticide dust Copier toner Pet dander Face powder Legionella Lead dust	Humidifier dust Coal dust Nebulizer dust Bacteria Tobacco smoke Auto fumes	Filters down to 0.3–1.0 micron particle size
MERV 17 **MERV 18** **MERV 19** **MERV 20**	• Final Filter • Clean Rooms • Radioactive Materials • Carcinogenic Materials • Orthopedic Surgery Room · Pharmaceutical Manufacturing Facilities	Pollen Dust mites Sanding dust Textile/carpet fibers Mold/spores Dust lint Cement dust Legionella	Lead dust Humidifier dust Coal dust Nebulizer dust Bacteria Sea salt Combustion smoke Radon progeny Odor	Tobacco smoke Auto fumes Sneeze nuclei Insecticide dust Copier toner Pet dander Face powder Virus carriers Carbon dust	Filters down to less than 0.30 micron particle size

Planning for Pandemic Response. During pandemics, the following modifications to HVAC operations may help decrease exposures to airborne pathogens, according to ASHRAE.

- **Increase Outdoor Air Ventilation.** Outdoor air dampers control the flow of fresh air into a building and are normally integrated into a building's air-handling system. Open outdoor air dampers to 100%.
- **Improve air filtration.** High MERV ratings may be difficult to attain in some systems because they can lead to pressure drop, which can potentially reduce airflow and diminish the system's ability to maintain humidity and temperature set points. Change filters often – every 1-3 months.
- **Keep HVAC Systems Running.** Leave HVAC systems running as long as possible in emergency situations, up to 24/7 if possible. No matter what level of filtration your system has, it can only remove particles when the fan is running.
- **Control the Humidity.** According to ASHRAE, the ideal relative humidity for preventing aerosol transmission of respiratory viruses is between 40% and 60%.