

Improving the Interior Air Quality at VillaRosso

By Rob Williams, Manager

It should be noted that filtration of air is not an exact science and there are many overlapping ranges of data and somewhat vague standards of measurement involved. The term “Merv” itself, which is an acronym for Minimum Efficiency Reporting Value, uses “minimum” to denote an acceptable value of 75% efficiency for a certain filter performance. This means it is acceptable for a filter of a given M.E.R.V value if it stops 75% of particles of a certain size, not 100%. Further, much of the information out there is from sources that are selling filters and thus the claims of performance and suitability to a particular purpose are not always as reliable as one might hope.

So here are some “FAQ” questions that might be asked after reading the article in the July 2016 newsletter:

How does the MAU work?

The “Makeup Air Unit” on the roof works in unison with 10 exhaust fans in the building that draw air out of every unit through vents in the bathrooms, as well as other locations such as ductwork that serve your dryer vent. Air that is taken away must be replaced somehow or you will eventually be living in a vacuum... so the missing air is *made up* by blowing it back into the building from the roof. The air is pumped in through vents in the hallway, pressurizing that area slightly, causing it to make its way into each unit, mostly through the designed space under your front door. The idea is to keep a fresh air flow that prevents odors from one unit, such as the aroma from cooking or smoking, from spreading to neighboring units.

The MAU is capable of warming the air if it is too cold via heat supplied by the building’s main boiler, and cooling it if the outside temperature is too high by drawing it through a wet surface, much like a swamp cooler. Finally, it passes through a bank of filters to clean the air of dust and various other particulates that happen to be blowing in the wind. The bank of filters is rather large, consisting of an array of 20 – 2” thick pleated filters. The makeup air unit runs 24/7.

How often should I change my filter?

If you ask the person who is selling filters it’s every 3 months. The real answer is when the filter is plugged enough that it is hindering the proper operation of your heating/cooling unit. That could mean 6 months or a year or even more. It depends on how much you run that unit and how dusty/dirty the air is. You could invest in a manometer and measure the pressure differential before and after the filter but that’s an investment of several hundred dollars and who is going to go through all that

trouble anyway. So the answer is check it every so often and when it appears to be too dirty, change it.

What filter should I use?

Since the Merv 13 filters in the MAU should be taking care of the worst (smallest) of the pollution of the incoming air, I think Merv 8 would be sufficient to capture typical household dust from carpeting and upholstery, pet dander, pollen from house plants, etc. If you have asthma or are particularly sensitive to airborne allergens in the environment, you might give a Merv 11 or 13 filter a go to see if you realize an improvement in your comfort level at home.

A little more on filters and VillaRosso

It might surprise you to know that the actual purpose of the filter is to protect the heat exchanger from dirt and dust. The air quality factor wasn't a consideration originally, and is really only bit of an afterthought prompted by today's conscientiousness in thinking green, desire for clean air and healthy environments. Protecting the heat exchanger is important however, as the coils of fine filaments that transfer heat to or from the air can get compacted with nearly impossible to remove muck consisting of cemented household dust. Without a filter it won't take much to completely plug up a heat exchanger and make your unit useless. Once these components become compacted with dirt it is nearly impossible to clean out without major disruption to the home, which could actually involve removing the ceiling. It might even be cheaper to buy a whole new heat pump rather than attempt to clean the coils, which is heartbreaking when you consider it could have been prevented with a filter that represents an investment of only 10-15 dollars.

At VillaRosso, are the filters hard to change?

Yes, unfortunately they can be a pain. Whoever designed this application took the week off when they decided to put them in the way they did. The filter generally is hard to reach, is often behind a myriad of pipes and wires and other miscellaneous stuff making it very difficult to maneuver the filter in place without tearing or cracking the paper frame. Worst yet, small tek screws were used to attach the ductwork to the heat pump with the sharp tips that penetrate the channel that the filter slides in, making it especially difficult to get the filter to slide in completely where it needs to be.

What about a wire frame that can easily bend?

They are easier to install because they flex so readily. The tradeoff is that the fiberglass filter material used with them carry a Merv rating of only about 4.

Where is my heat pump located?

Within the plenum or air space above your main bathroom accessed behind panels in the ceiling.

What filter does the equipment in my unit recommend?

You will often be advised to check what the unit manufacturer recommends when deciding on the air filter efficiency you should use. I checked, and they don't recommend anything. That is to say, they don't make any mention of filter efficiency ratings, only to, "not run your heat pump without a filter." Not much help there.

The heat pumps at Villarosso are manufactured by Mammoth, Inc. The model is the "HydroBank II Water Source Heat Pump." There are 3 sizes used in the units: 750 SCFM, 1083 SCFM, and 1333 SCFM. The filter size is 18" x 25" x 1" (but I haven't verified that with every unit in the building).

Further Reading

From the Environmental Protection Agency of the U.S. Government regarding interior air quality:

https://web.archive.org/web/20130201093821/http://www.epa.gov/iaq/pdfs/residential_air_cleaners.pdf

Wikipedia article expounding on Merv ratings:

https://en.wikipedia.org/wiki/Minimum_efficiency_reporting_value

Chart describing the various Merv ratings from Wikipedia:

MERV	Min. particle size	Typical controlled contaminant ^[2]	Typical Application ^[2]
1–4	> 10.0 µm	Pollen, dust mites, cockroach debris, sanding dust, spray paint dust, textile fibers, carpet fibers	Residential window AC units
5–8 ^[3]	10.0–3.0 µm	Mold, spores, dust mite debris, cat and dog dander, hair spray, fabric protector, dusting aids, pudding mix	Better residential, general commercial, industrial workspaces
9–12	3.0–1.0 µm	Legionella, Humidifier dust, Lead dust, Milled flour, Auto emission particulates, Nebulizer droplets	Superior residential, better commercial, hospital laboratories
13–16	1.0–0.3 µm	Bacteria, droplet nuclei (sneeze), cooking oil, most smoke and insecticide dust, most face powder, most paint pigments	hospital & general surgery
17–20 ^[4]	< 0.3 µm	Virus, carbon dust, sea salt, smoke	Electronics & pharmaceutical manufacturing cleanroom