

Gary Turner @DtaGuy

This spreadsheet calculates the operating point where the filter pressure drop vs flow curve crosses the fan pressure drop vs flow curve, for combinations of filters and pc fans in parallel in an unrestricted container. It assumes all filters and fans operate at the same pressure drop. It may NOT provide reliable Clear Air Delivery Rates, since Particle Size Efficiencies are measured at much higher velocities.

		MPR 1900 MERV 13		MPR 2200 MERV 13		MPR 2800 MERV 14		Total CFM Filters	
		ΔP (in H ₂ O)	CFM Filters	ΔP (in H ₂ O)	CFM Filters	ΔP (in H ₂ O)	CFM Filters		
Operating Point		0.0221	60.28	540	58.55	0	45.32	0	540
		μm							
Unreliable CADR by size based on published eff at 2.5 m/s = 492 FPS		0.3-1.0		335	0	0	335	0	335
		1.0-3.0		470	0	0	470	0	470
		3.0-10		513	0	0	513	0	513

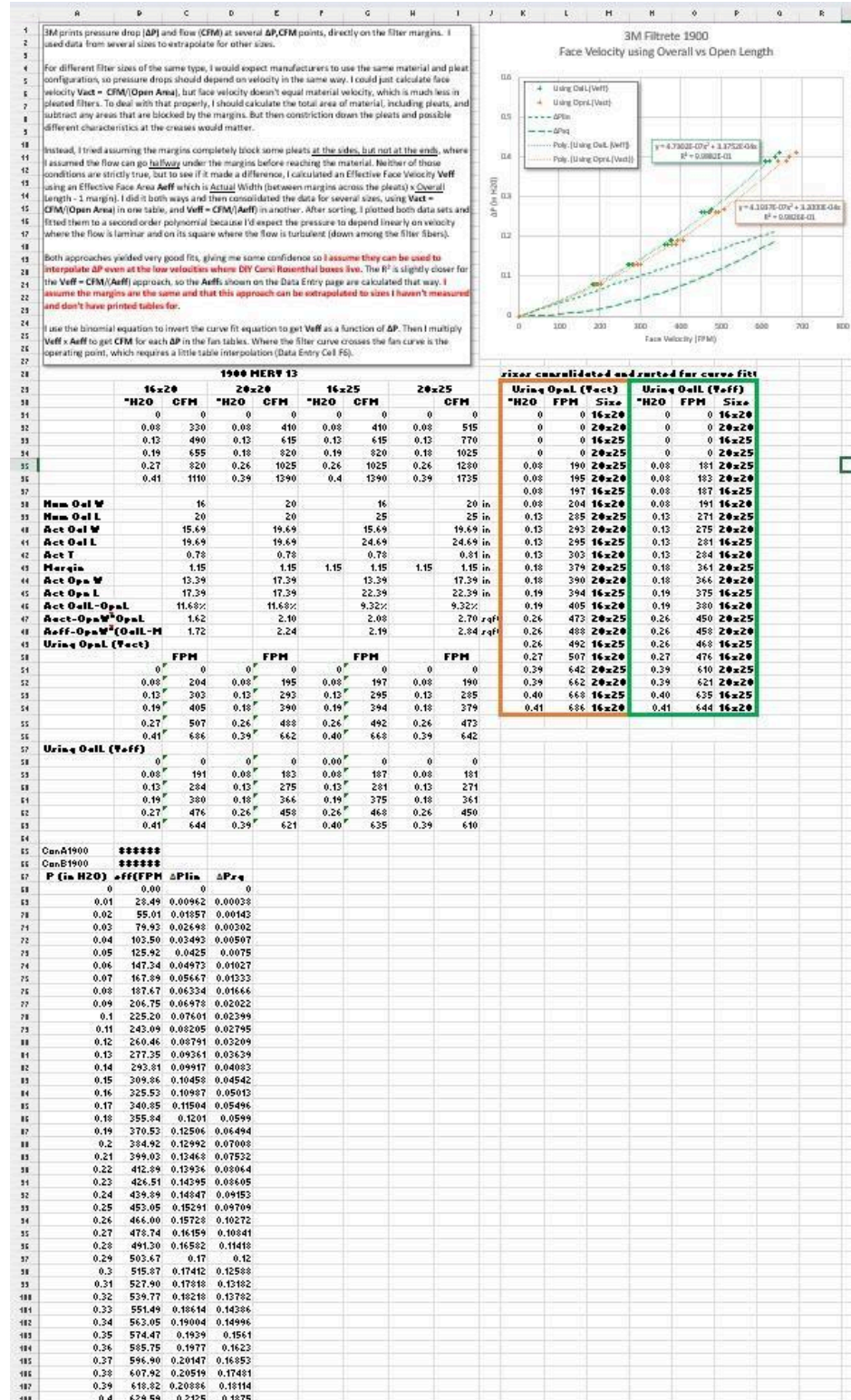
Enter number of filters of each size and type in the light blue fields.

3M Filtrete 1" Filters (not all types available in all sizes)						MPR 1900 MERV 13		MPR 2200 MERV 13		MPR 2800 MERV 14	
Nominal Dim (in)			Actual Dim (in)			# of Filters	Aeff (ft ²)	# of Filters	Aeff (ft ²)	# of Filters	Aeff (ft ²)
Width	Length	Thick	Width	Length	Thick						
10	20	1	9.81	19.81	0.78	0.00	0.00	0.00	0.00	0.00	0.00
12	12	1	11.81	11.81	0.78	0.00	0.00	0.00	0.00	0.00	0.00
12	20	1	11.81	19.81	0.78	0.00	0.00	0.00	0.00	0.00	0.00
20	12	1	11.69	23.69	0.78	0.00	0.00	0.00	0.00	0.00	0.00
14	14	1	13.81	13.81	0.78	0.00	0.00	0.00	0.00	0.00	0.00
14	20	1	13.81	19.81	0.78	0.00	0.00	0.00	0.00	0.00	0.00
14	24	1	13.81	23.81	0.78	0.00	0.00	0.00	0.00	0.00	0.00
24	14	1	13.81	24.81	0.78	0.00	0.00	0.00	0.00	0.00	0.00
14	30	1	13.81	29.81	0.78	0.00	0.00	0.00	0.00	0.00	0.00
15	20	1	14.69	19.6	0.78	0.00	0.00	0.00	0.00	0.00	0.00
16	16	1	15.81	15.81	0.78	0.00	0.00	0.00	0.00	0.00	0.00
16	20	1	15.69	19.69	0.78	0.00	0.00	0.00	0.00	0.00	0.00
16	24	1	15.69	23.69	0.78	0.00	0.00	0.00	0.00	0.00	0.00
16	25	1	15.69	24.69	0.78	0.00	0.00	0.00	0.00	0.00	0.00
16	30	1	15.69	29.69	0.78	0.00	0.00	0.00	0.00	0.00	0.00
17	23	1	17.19	23.19	0.78	0.00	0.00	0.00	0.00	0.00	0.00
18	18	1	17.81	17.81	0.78	0.00	0.00	0.00	0.00	0.00	0.00
18	24	1	17.81	23.81	0.78	0.00	0.00	0.00	0.00	0.00	0.00
18	30	1	17.69	29.69	0.78	0.00	0.00	0.00	0.00	0.00	0.00
20	20	1	19.69	19.69	0.78	0.00	0.00	0.00	0.00	0.00	0.00
20	24	1	19.81	23.81	0.78	0.00	0.00	0.00	0.00	0.00	0.00
20	25	1	19.69	24.69	0.78	0.00	0.00	0.00	0.00	0.00	0.00
20	30	1	19.81	29.81	0.78	0.00	0.00	0.00	0.00	0.00	0.00
23	23	1	23.19	23.19	0.78	0.00	0.00	0.00	0.00	0.00	0.00
24	24	1	23.81	23.81	0.78	0.00	0.00	0.00	0.00	0.00	0.00
24	30	1	23.81	29.81	0.78	0.00	0.00	0.00	0.00	0.00	0.00
25	25	1	24.69	24.69	0.78	0.00	0.00	0.00	0.00	0.00	0.00
						4	8.96	0	0.00	0	0.00

Enter number of fans of each type in the light green fields.

||
||
||

Tech types, please look at 2nd sheet (1900 Fltr Anlyss) to see what I did & what needs fixing. @CorsiAQ
@JimRosenthal4 @robwiss @joeyfox85 @DavidElfstrom @cleanairkits @CRBoxKits @CleanAirStars
@RFantinato @open_erv @haussamen @sameo416 @syntagmatic @PlasticFull @leanhealth 2/



I'm really looking for comments and suggestions. If I made mistakes, I want to know about them. 3/

Here's the link to the spreadsheet:

https://docs.google.com/spreadsheets/d/1TimHhIs5TSM8BELDjP1XcJ4rcDIEuHNN/edit?usp=drive_link&ouid=105204247863838203368&rtpof=true&sd=true 4/

And here's a link to the doc:

https://docs.google.com/document/d/121IXFVSWSFib2CG6Q_EDxLLuMK2-P2yd/edit?usp=drive_link&ouid=105204247863838203368&rtpof=true&sd=true 5/

I've only included filters for which I have pressure vs. CFM data at several points. I fit that data in a physics-friendly way and interpolate to low pressures where DIY CR boxes live. I'd like to include more filters, so please send me data if you have it. 6/

For filters, I need actual dimensions, including margin sizes and number of pleats to calculate a V_{eff} as explained on the 1900 Fltr Anlyss sheet. A picture would help. 7/

Likewise, I've only included fans for which I have pressure vs CFM data. I'd like to include more fans, so please send me data if you have it. Even an image of a fan curve would help. 8/

The spreadsheet assumes the fans are well enough spaced that they don't interact and the box has no restrictions in or out (grills), so the pressure drop across all the filters is the same and equal to the pressure drop across all the fans (but opposite sign, of course). 9/

I've included CADR calculations, but they're iffy since, as @JimRosenthal4 explained here <https://www.texairfilters.com/what-is-a-merv-air-filter-testing-explained/> the data were proly taken at 495 FPS, and may not apply at these slow velocities. 10/

But even with caveats and restrictions, it does allow mixing of filter sizes and types, as well as fan types. It should even work for a dropped ceiling approach with multiple filters and fans on 2'x4' tiles sharing a single plenum, as suggested here <https://twitter.com/JimRosenthal4/status/1720475070190039302>. F/