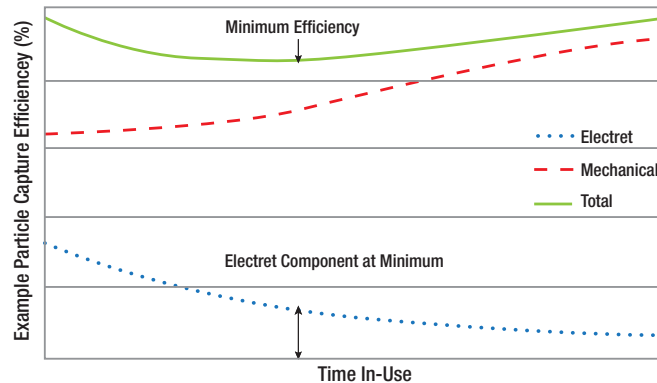


### Advances in Electrostatically Charged HVAC Filter Technology

HVAC air filters are critical to the efficient operation of the air handling system of any building. They contribute to the protection of the equipment within the air handling system and provide an important component to an Indoor Air Quality management program. HVAC filters may also contribute substantially to the energy required to move air within a building as a result of the pressure drop across the filter bank. The greater the ability of a filter to load with debris without substantial increase in pressure drop, the greater the possible energy savings. The choice of a filter is in large part based upon these three fundamental attributes: efficiency, initial pressure drop, and filter loading.

3M™ Commercial HVAC Filters are highly engineered to provide the optimum balance of these attributes for commercial and industrial air handling systems. To provide the most value for the building owner and operator, 3M Commercial HVAC Filters are precisely designed to help minimize the total energy utilization at each efficiency level. A key component of 3M Commercial HVAC Filters is a highly refined electrostatically charged media (electret media). Electret based (or “enhanced”) filters have the potential basis for a filter having very low initial pressure drop compared to filters utilizing uncharged media of the same filter design and efficiency. 3M has designed a product with very low initial pressure drop and low rate of pressure drop increase as it loads in-use based on a combination of innovate media and product attributes.

It is well known that the efficiency of electret based filters, including 3M’s, will reduce over time to some extent in HVAC and other environments. The in-use efficiency reduction is a direct result of the initial loading of the media with particulates in the environment. At the same time, as particles are captured the effective media fiber area is increasing, thereby, increasing the mechanical capture efficiency. The balance in electret and mechanical efficiency mechanisms and how they vary over time is shown generically in the following graph.



The particle capture efficiency of filters utilized in the HVAC industry is characterized by the Minimum Efficiency Reporting Value (MERV), as defined in the ASHRAE 52.2-2007 standard. When originally adopted in 1999, it was recognized by the standard committee that the filter conditioning protocol required to obtain a MERV value did not predict the full drop in efficiency of electret media in actual use in many HVAC environments. ASHRAE has recently adopted an improved method that more accurately predicts the drop in efficiency of electret media in commercial and industrial environments. This improved filter conditioning protocol is included in 52.2-2007 as Appendix J, having a designation of MERV-A.

3M™ Commercial HVAC Filters are specifically designed to provide predictable particle capture efficiency per Appendix J. Importantly, 3M has successfully developed products that retain a significant electret component at the efficiency minimum determined by Appendix J. The impact of the two conditioning protocols contained within ASHRAE 52.2-2007 when applied to the 3M Commercial HVAC MERV-A13 Filters are shown in the following table. In addition, the efficiency of a clean and discharged (i.e., electrostatic charge removed) filter is included for reference.

3M™ Commercial HVAC Filter A13		Average Efficiencies per ASHRAE 52.2-2007 @ 492 fpm		
Particle Size Range (micron)	Clean Filter	Standard Filter Conditioning	Conditioning per Appendix J	X-Ray Discharged
E1: 0.3 - 1.0	92%	84	64%	53%
E2: 1.0 - 3.0	98%	97	90%	81%
E3: 3.0 - 10.0	100%	100	99%	98%
		MERV-14	MERV-A13	

As anticipated the efficiency is reduced by both conditioning protocols, with the efficiency drop being most pronounced for the smaller particles in the E1 and E2 ranges. This result is anticipated as the electrostatic force is relatively greater for small particles. The resulting efficiency reporting value obtained is MERV-14 and MERV-A13 for the standard and Appendix J conditioning protocols, respectively. For a MERV-A13 filter E1 is not taken into consideration and the minimum E2 efficiency is 90%. The drop in E2 efficiency from a clean filter to standard conditioned filter is only 1%, while the drop from a clean filter to a conditioned filter per Appendix J is 7%, and 16% to a fully discharged filter. In other words, the electret charge contributes a full 9% to the total E2 efficiency at the Appendix J conditioned minimum.

In conclusion, the 3M Commercial HVAC products have been designed specifically for building air handling environments where predictable particle capture efficiency, low pressure drop and potential energy savings are paramount. Low filter pressure drop is attained through an innovative combination of filter materials and processes, resulting in a highly charged stable electret media. 3M has clearly developed a “long life electret” filter as validated by the rigorous conditioning protocol defined in ASHRAE 52.2-2007 Appendix J. The 9% efficiency retained from the electret charge at the conditioned minimum is extremely important from a potential energy savings standpoint.

**IMPORTANT NOTICE:** The information in this literature is based on tests 3M Purification Inc. believes are reliable. It is not and should not be relied on as a product or technical specification. We do not guarantee the accuracy of this information. You are responsible for determining whether products described in this literature are fit for a particular purpose and suitable for your application. Because there are many factors within your knowledge and control that might affect the use and performance of these products, you must evaluate these products to determine whether they are fit for a particular purpose, are suitable for your application, and meet your performance expectations. 3M PURIFICATION INC. IS NOT LIABLE FOR ANY LOSS OR DAMAGES, WHETHER DIRECT, INDIRECT, SPECIAL, INCIDENTAL, OR CONSEQUENTIAL ARISING OUT OF THE USE OF OR INABILITY TO USE ANY OF THESE PRODUCTS.

**CAUTION:** USED FILTERS MAY CONTAIN CONTAMINANTS FROM OPERATION OF THE HVAC SYSTEM. FOR PROPER HANDLING OF USED FILTERS, CONSULT APPLICABLE HEALTH AND SAFETY STANDARDS OR CONTACT AN INDUSTRIAL HYGIENIST. TO REDUCE RISK OF ILLNESS OR INJURY, ALWAYS USE APPROPRIATE RESPIRATORY PROTECTION AND PROTECTIVE CLOTHING WHEN REMOVING OR HANDLING USED FILTERS. DISPOSE OF USED FILTERS ONLY IN ACCORDANCE WITH FEDERAL, STATE AND LOCAL LAWS AND REGULATIONS.

**IMPORTANT USE RESTRICTIONS:** DO NOT EXPOSE THIS FILTER DIRECTLY TO UV RADIATION FROM A UV PURIFICATION SYSTEM. EXCESSIVE UV EXPOSURE MAY LEAD TO A REDUCTION IN THE MECHANICAL INTEGRITY AND PERFORMANCE OF THE FILTER. THIS FILTER MUST NOT BE USED FOR THE FOLLOWING UNAUTHORIZED USES: A) ASBESTOS, LEAD OR MOLD REMEDIATION; B) BIOTERRORISM PROTECTION; C) APPLICATIONS IN BUILDING THAT REQUIRE OR ARE UNDERGOING AIR HANDLING SYSTEM REMEDIATION OF HAZARDOUS SUBSTANCES; OR D) PROTECTIVE ENVIRONMENTS PER AIA GUIDELINES.

**LIMITED WARRANTY:** 3M Purification Inc. warrants that these products will be free of defects in material and manufacture when shipped. This is the exclusive remedy for any defects in these products. This warranty does not apply to damage or defects resulting from improper use, storage or maintenance of these products.

**LIMITATION OF LIABILITY:** User must determine whether these products are fit for a particular purpose, suitable for user's application and meet user's performance expectations. 3M Purification Inc. IS NOT LIABLE FOR ANY LOSS OR DAMAGE, WHETHER DIRECT, INDIRECT, SPECIAL, INCIDENTAL OR CONSEQUENTIAL, ARISING OUT OF THE SALE, USE OF, OR INABILITY TO USE ANY OF THESE PRODUCTS REGARDLESS OF LEGAL THEORY.

**Your Local Distributor:**



**3M Purification Inc.**  
 400 Research Parkway  
 Meriden, CT 06450  
 U.S.A.  
 (800) 648-3550  
 (651) 789-7381  
[www.3Mpurification.com/airfilters](http://www.3Mpurification.com/airfilters)

3M is a trademark of 3M Company.  
 © 2014 3M Company. All rights reserved.  
 Please recycle. Printed in U.S.A.  
 70020269505  
 REV 0214