March 2007

Hart&Cooley
install confidence

Filter Grille Performance and Filter Limitations

TT-36

by Dave Fetters

Air circulation and conditioning usually incorporate some form of filtration of airborne particulate matter. There are many types of filtering mechanisms and methods, but I want to limit my remarks to the specific products we sell that allow air filtration. In our business, this air filtering is accomplished with a *filter grille*. The vast majority of our filter grilles are designed to use the readily available, 1-inch thick, cardboard-edged, disposable, fiberglass filters. Although we manufacture filter grilles that will accept thicker filters, relatively few are sold. Even though hog hair, foam, and other types of media filters may do a better job of filtration than the fiberglass, the universally available and inexpensive fiberglass filter is the most popular choice.

These throwaway, one-inch panel filters are relatively inefficient and are effective with comparatively large particulate matter at low airflow rates than other types of media and filtration methods. More important to the installer, most efficiency and pressure drop ratings are developed at only 300 feet-per-minute airflow velocity through the filter. The maximum airflow recommended is usually around 500 feet per minute, as published in the literature for these types of filters.

Given the popularity of these types of filters, care must be given in selecting a filter grille size to accommodate the desired total CFM, while keeping in mind the filter limitations of velocity. Our recommendation for a maximum design face velocity is 400 feet per minute (FPM). To size a filter grille, look at the engineering data for that model. In the column less than 400 FPM, find a CFM number that is equal to or slightly higher than what is desired or required. The size corresponding to that rating is what should be used.

(continued on reverse side)

A rough but safe rule of thumb to use in the absence of available engineering data is to multiply the gross filter grille area in square inches by 2 CFM for each square inch. This will keep the face velocity below 400 FPM. For instance, if one thinks a 20 x 20 grille might be adequate, 20 x 20 = 400 gross square inches. Multiply this by 2 CFM per square inch and the result is a CFM of 800.

Exceeding the filter's capability will lower filtration efficiency by allowing some dirt to pass through and may dislodge particulate matter already captured if the face velocity becomes excessive. In addition, noise could become an issue with stamped-face filter grilles if velocities exceed about 500 FPM.

T-bar filter grilles that are 2 x 2 in size are going to accept a nominal 20 x 20 filter. So, the rule-of-thumb CFM capacity will also be around 800 in order to maintain a 400 FPM face velocity. We build RHF45 filter grilles from as small as 6 x 6 to 48 x 48. This is a rigid filter grille with mullions and blade spacers at appropriate widths for added support. If one wanted to "push the envelope" for performance, this filter grille would handle higher velocities without fin or face vibration, which would occur with a stamped-faced filter grille like our 659 or 673. Obviously, the filter media would have to be up to the task as well.

Our testing of a filter grille with and without a clean fiberglass filter has indicated that a clean filter reduces the performance data we publish by only about 3% to 5%.

Obviously, as a filter collects dirt, its resistance to flow increases and drives up the system pressure loss. For this reason, it is vitally important for a homeowner to establish a regular maintenance cycle to change out filters, so they do not affect the system performance.

RHF45
Aluminum Filter Grille

659
Steel Return Air Filter Grille

673
Steel Return Air Filter Grille

Hart&Cooley
install confidence

Hart & Cooley, Inc.
500 East Eighth Street
Holland, MI 49423
info@hartcool.com
www.hartandcooley.com

800.433.6341 *toll-free*
616.392.7855 *phone*
800.223.8461 *toll-free fax*
616.392.7971 *fax*