

# Noise Control in Buildings Without Exposed Fiberglass

Susan H. Dineen, Lawrence J. Gelin, Steve Wise

Digisonix, Inc. 8401 Murphy Drive Middleton, WI 53562-2543

Fan noise in HVAC ducts has traditionally been attenuated with fibrous internal duct liner or with passive silencers constructed with porous fill material. Because these materials can absorb dust and moisture and provide a breeding ground for microbes, building designers and owners are reducing or eliminating the use of such materials.

With active noise control (ANC) it is possible to cancel low frequency fan noise without using porous or fibrous material. ANC systems use inert components such as microphones and loudspeakers to cancel broadband, ductborne fan noise from air handlers up to 25,000 cfm. They can achieve up to 20dB reduction of noise in the 63, 125, and 250Hz octave bands. Attenuation of up to 10dB in the 31.5 Hz band can also be achieved.

Active noise control was applied to two air handlers in an office building in Canada. Each unit is 9,000 cfm with a top horizontal discharge into a 20" diameter unlined duct. Sound levels as high as NC54 were measured in the office areas. The active systems achieved 5 to 20 dB reduction of the noise between 50 and 250Hz, resulting in an NC38. (Fig.1)

In another installation, active control was applied to attenuate broadband noise as well as a 165Hz tone. (Fig.2) The noise propagated through an unlined supply air duct and then broke out of the 34" x 12" flat oval duct over the noise -sensitive space. (Fig.3) The ambient noise - NC38 - in the room was a problem since the room is

used for consumer research tests which require auditory discrimination. Active cancellation of the ductborne noise reduced the noise levels in the room to NC18. (Fig.3)

Active noise control solutions are also applied in clean rooms for semiconductor manufacturing spaces and pharmaceutical production and packaging facilities. In one installation which has been operating for nearly three years, active noise control was applied to the discharge ducts of four air handling units serving a 350sq.ft clean room for pharmaceutical production. (Fig. 5) The measured sound level in the room was an unacceptable NC68.

Approximately 10 ft. of discharge duct was treated with a 1-inch thick encapsulated fiberglass sheet along the internal perimeter. The encapsulation prevents erosion and moisture absorption while providing attenuation of mid and high frequency noise. Active components, mounted directly to the duct, attenuate low frequency noise. The result is a 10 NC point reduction in the clean room, without the penalty of pressure drop. (Fig.6)

In clean room applications which use a plug, or plenum fan design, much of the sound energy is dissipated within the discharge plenum. However, there often remains a dominant tone at the blade pass frequency, typically between 80Hz and 150Hz. In these applications it is possible to locate the active noise control system at the discharge of the fan and cancel the tone in order to achieve reductions of up to 10 NC points in the clean space.

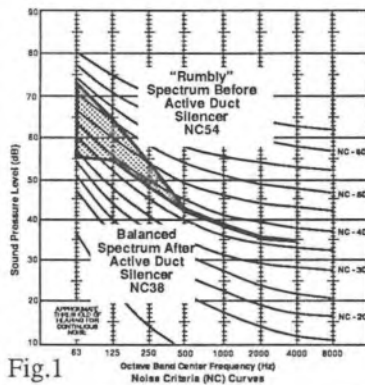


Fig.1

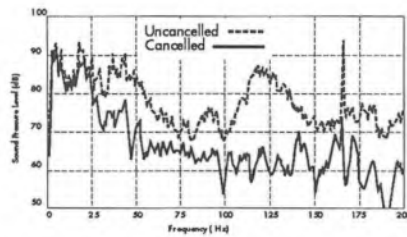


Fig.2

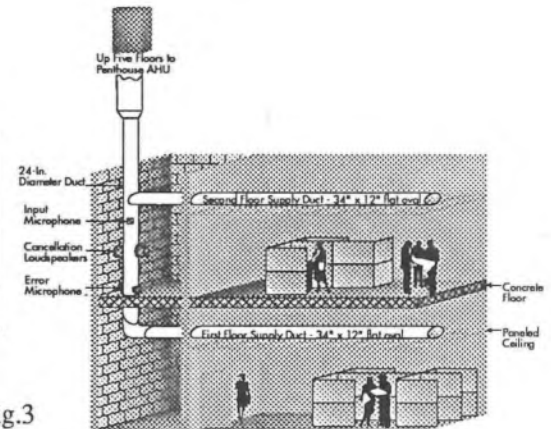


Fig.3

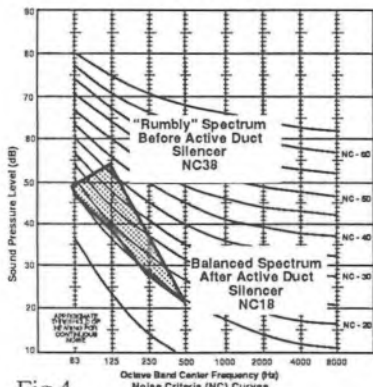


Fig.4

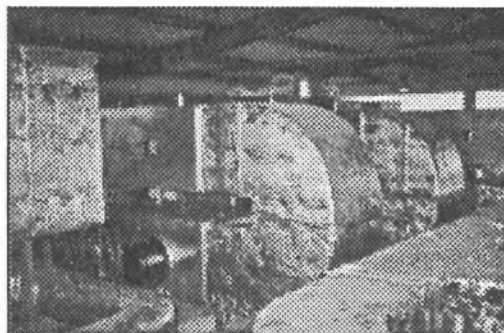


Fig.5

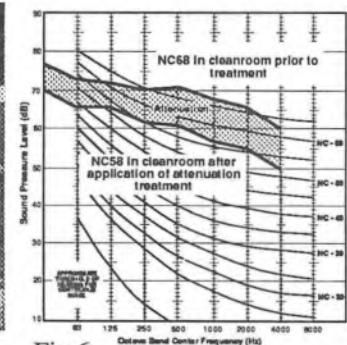


Fig.6