

Controlling Terminal Box Noise in Healthcare HVAC Systems

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Terminal boxes are devices in HVAC systems that are located close to rooms and control airflow to those rooms. Terminal boxes in HVAC systems create noise when they throttle airflow to reduce pressure and airflow from medium-pressure distribution ductwork to low-pressure ductwork serving individual healthcare spaces.

The noise is mostly due to turbulence, although fan-powered terminal boxes also have noise from induction fans. Controlling this noise in healthcare spaces can be difficult because of the restrictions on ductwork.

Traditionally, there have been four noise control methods to reduce ductborne noise transmission from terminal boxes to supply diffusers downstream: fibrous duct lining, integral attenuation sections, flexible duct, and duct silencers. Fibrous duct lining is prohibited in many healthcare spaces. This lining is also a key component in integral attenuation sections, which are basically sections of lined duct.

Keep in mind that when a terminal box needs to be "hospital grade," the attenuation section is typically lined with a film facing that effectively eliminates the acoustical performance of the attenuation section. Eliminating these options leaves flexible duct and duct silencers as the only remaining noise control measures from our traditional toolbox. I recommend the wire-helix variety of flexible duct.

For Noise Criteria (NC) 35 background noise goals, which occur in most areas of healthcare facilities, only modest attenuation is required. Either 5 feet of flexible duct at the runout to each diffuser or a 3-foot medium pressure drop silencer on the room side of the terminal box should provide sufficient control of terminal box noise.

The duct silencer should be a film-lined baffled silencer to satisfy air quality concerns while providing acoustical performance. (Note that a baffled silencer can still perform well when faced with film facing, while a lined duct cannot.) The silencer should be sized to have no more than 0.08 inches of pressure drop and should be at least one or two duct diameters from the terminal box and any duct fittings to avoid excess pressure drop and self generated noise.

For NC-30 background noise goals, which occur in conference rooms and other listening spaces, a duct silencer will be required. This silencer should be sized to have no more than 0.06 inches of pressure drop and should be at least one or two duct diameters from the terminal boxes and any duct fittings.

Some terminal box manufacturers are now providing a film-faced baffled attenuator and a terminal box packaged together as a single unit, which can save on labor and material costs. The noise data for these units should be studied to see if they provide similar attenuation to the options mentioned above.

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