

Effects of Negative Air Duct Cleaning on Flex Ducting

Abstract:

In this paper, we investigate the pressure and airflow tolerances of flex ducting as it pertains to air duct cleaning.

Background:

Flex ducting is a type of ductwork that consists of a flexible inner core covered by a helical wire and an outer layer of insulation. It is widely used in residential and commercial HVAC systems because of its low cost, ease of installation, and adaptability to different layouts. Most HVAC ducting in residential and commercial structures since the 1980s consists of flex ducting.

Air duct cleaning is a process of removing dust, debris and other contaminants from the ductwork system. One of the most common methods is negative air duct cleaning, which involves generating negative pressure in the duct system by attaching a powerful vacuum, typically to a central juncture to which all main/trunk and branch ducts are connected. Mechanical agitation removes dust and debris from the inner walls of the ductwork, where airflow generated by the negative air machine then pulls it out of the system.

However, negative air duct cleaning can cause problems for flex ducting. According to the manufacturers of flex ducting, the flex ducting utilized in both residential and commercial HVAC applications is not designed to withstand negative pressures exceeding 1 inch of water column (IWC).

The negative air pressures generated by negative air duct cleaning equipment exceed these pressure limits significantly, compromising the structural integrity of the ducting. Some consequences of this damage are:

- The flex ducts can collapse or tear due to excessive negative pressure.
- The helical wire can break or detach from the inner core due to excessive tension or torsion.
- The insulation layer can compress or peel off due to excessive friction or abrasion.
- The joints and connections can leak or disconnect due to excessive stress or strain.
- Even minor adhesive failure caused by negative pressure can lead to humidity migration into the interior of the duct, creating an environment conducive to microbial (ie: mold) growth.

Methods

According to the leading manufacturers of negative air duct cleaning equipment, portable machines generate an average of 5 IWC negative pressure, and truck-mounted machines generate 20 IWC negative pressure and higher.

Conclusion:

The negative pressure applied by negative air duct cleaning equipment, both portable and truck-mounted, significantly exceeds the tolerable limit for HVAC flex ducting, as specified by the manufacturers of HVAC flex ducting.

This damage can reduce the performance, efficiency, and lifespan of flex ducting and compromise indoor air quality and comfort, as well as safety of the occupants. To avoid these problems, it is advisable to use alternative methods of air duct cleaning that do not create excessive negative pressure in the duct system.

Product	Diameter (ID)	Pressure Rating	Positive	Negative	Velocity (FPM)
Thermaflex® KP Insulated Duct	4"-20"	IWC	10 (4"-16" ID) 6 (18"-20" ID)	1/2 (4"-20" ID)	5000
Thermaflex® SL-D Air Connector	3"-14"	IWC	10 (3"-14" ID)	1 (3"-14" ID)	5000
QuietFlex® Manufactured Housing Flex Duct	6"-18"	IWC	10	1/2	6000
JPL® MH-25 Insulated Flex Duct	4"-16"	IWC	6 (6"-12" ID) 4 (14"-16" ID)	1 (6"-10" ID) 1/2 (12"-16" ID)	5000
H&C Flex™ Residential Flex Duct it	3"-20"	IWC	10	1/2	4000
ATCO Flex Duct	3"-22"	IWC	6 (3"-12" ID) 4 (14"-22" ID)	3/4	5000

Sources:

<https://atcoflex.com/wp-content/uploads/2022/05/ATCO-078-Double-ply-polyester-core.-Grey-Jacket-R8.0.pdf>
<https://thermaflex.net/products/flex-vent-kp-flexible-duct/> <https://thermaflex.net/products/thermaflex-s-ld-air-connector/> https://www.quietflex.com/s/QF-MobileHome_specsheet_2019.pdf
<https://jplflex.com/mh-25/>
<https://hcflexduct.com/technical/>

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