



# Exploring the Fabric Duct Alternative

**You can reduce installation time and improve traditional airflow patterns compared to metal ductwork by using fabric duct in certain commercial applications**

BY CARY PINKALLA

**F**or the past decade, the use of fabric air dispersion has grown steadily in North America as architects, consulting engineers and hvac contractors learn of this alternative to metal ductwork. While many contractors might be skeptical of installing fabric duct at first, those initial reservations usually are eased when the product's benefits are understood.

Ten years ago fabric duct was used mainly in food processing and low-end industrial applications for makeup air. The improvement in fabric aesthetics, endurance and diffusion performance has brought fabric duct specification to a new level.

Today, architects, engineers and contractors are using it in gymnasiums, offices, clean rooms, indoor pools, churches and other applications. In general, the two criteria are an open-ceiling architecture and high attention to interior design.

While it was popular in Europe as far as 35 years ago, fabric duct has only recently come to the forefront of

American air distribution design. Five years ago few North American architects were aware of fabric duct. The fact that a majority of North American architects have seen it, read about it or used it has resulted in an increase of projects by an estimated 500 percent in the past five years.

## Fabric duct advantages

Today's fabric duct is made of a variety of high-end polyester blends that are designed to meet stringent building codes and UL requirements. Plus, the range of fabrics used today has become much more diverse than 10 years ago. For example, some fabrics are manufactured to breathe, thus eliminating the risk of condensation.

Other fabrics are not breathable and can deliver air up to 90 feet with a terminal velocity of 150 feet per minute. Because of the varied uses and applications that fabric is used in today, there is more emphasis on fabric selection and air delivery methods than in the past.

Fabric duct diameters typically range in size from 8 to 72 inches, with the majority of installations staying within the 18- to 36-inch diameter range. The material cost of a fabric duct system is comparable to single-wall spiral metal duct in the 18- to 36-inch range. The cost differences can vary slightly depending on the fabric, suspension and air delivery system selected. When diameters are greater than 36 inches, the material cost of the fabric duct system is almost always less than metal systems.

In applications using sizes less than 18 inches in diameter, fabric can be more expensive than metal. When condensation is an issue, the material cost of a fabric duct system can range from 25-75 percent less than metal, based on diameter and the type of metal selected.

While the material cost savings for fabric are not always obvious, the cost to install fabric duct is less than metal because it takes less time. It takes anywhere from 20 to 80 percent less installation time to hang fabric than a comparably sized metal system.

The wide range of savings is based on the type of suspension system selected, the weight differences between fabric and metal, mounting heights and the ease of handling fabric that is light and flexible. Since labor is a big cost component of hanging metal, the savings for a fabric ventilation system can be significant.

Fabric duct often requires less maintenance than its metal counterpart, resulting in additional savings. In models where the fabric breathes (allowing approximately 10 percent of the total air flow to penetrate the fabric) surface dust buildup is greatly reduced if not eliminated.

In humid environments, moisture can accumulate and prematurely age the appearance of metal duct. Fabric duct does not encourage condensation. You can clean the duct by disassembling via zippers and either laundering in a washing machine or dry cleaning, eliminating the need for possibly more expensive duct-cleaning services.

Metal systems will accumulate dust and contaminate the upper outside surface areas, which in a public space will require routine maintenance to remove. Air porous fabrics repel dust and prevent airborne particulates from settling on the duct surface. Another costly expense to maintaining the outside of metal duct is that it may require repainting, which can cause business interruption and cost as much as the initial investment in the metal duct system.

As for the inside of the duct, metal usually requires using a duct cleaning service. Fabric duct cleaning can be less expensive and done more frequently than metal duct because a building's maintenance department can do the job as described above.

Plus, facilities tend to keep their air distribution delivery system cleaner when it's an easy and inexpensive task. For example, a school gymnasium with several hundred feet of fabric duct hanging 25 feet high can be disassembled in half a day, laundered and reassembled in another half day resulting in minimal downtime to the facility or hvac system.



**Fabric duct's light weight requires fewer workers to install compared to metal ductwork.**

## Specialized systems

It is much easier and more cost-effective to have a fabric duct system delivered to the jobsite already color selected or dyed to match the intended space than to paint a metal duct system after it is installed. Most manufacturers of fabric duct systems offer a variety of standard colors, and some offer custom dyeing and the silk-screening of company logos and slogans.

Because metal ductwork was never intended for use in open spaces, the look and feel is industrial. Fabric, on the other hand, has an inherent soft and warm presence that blends better into the architecture and interior design of the space.

Colors available typically include red, blue, white or black. However, custom colors can be applied to match interior design schemes or corporate colors. Unlike metal duct, fabric duct arrives at the site pre-colored and needs no on-site painting or anti-moisture coatings. School or corporate logos can be silk screened on the fabric as well.

Manufacturers also have expanded into many specialized air dispersion varieties. For example, the D-shape incorporates a special hanging system that lies flat against the ceiling with surface mounting. This is perfect for offices and/or applications with low clearance. One manufacturer offers the V-shape, which fits into a 90-degree space created by the junction of the ceiling and wall.

Most manufacturers make a static-free version of fabric duct for installation in electronic control rooms to

avoid static buildup and discharge. They also make antimicrobial-treated fabric that controls the growth and transmission of bacteria, fungi and molds, and is especially suited for the food-processing industry. Like metal ductwork, fabric duct also has standard



**Adapter rings fit around metal collars for transitions between fabric and metal duct.**

90-degree and 45-degree elbow fittings along with Ts and adaptor rings that fit around metal collars for transitions from metal to fabric.

Fabric duct can be considered a “green” product by helping to improve IAQ. It can prevent the generation or introduction of pollutants – especially biological contaminants – into an occupied space. Using fabric duct also can save valuable metal resources and thus add resource-efficiency benefits to a project.

Fabric has been found to absorb sound and transmit less mechanical equipment noise than metal ductwork. For diffusing air, fabric can be less noisy than metal, provided that the fabric duct is properly designed. Air usually is diffused more evenly and continuously along fabric duct than a metal stem that positions registers every five or 10 feet apart.

## Some limitations

Fabric duct disperses air either through different grades of factory-engineered orifices, through the fabric itself, through linear diffusers that run the length of the duct or by a combination of these methods. Because some fabric duct is breathable, it isn't suitable for use in enclosed ceilings, behind walls, above dropped ceilings or as return air duct. Fabric duct is used strictly as a supply-side air distributor in open-ceiling architecture.

One aesthetic disadvantage is the fact that fabric duct deflates during off-cycling of the hvac system.

When deflated, fabric duct hung from a single rail or cable system looks like a decorative banner. With a dual-rail hanging system, a deflated duct holds its round appearance when viewed from below.

Deflation is becoming less an issue as more modern hvac designs are specifying continuous ventilation in occupied spaces to maintain higher IAQ standards. When fabric duct is used with variable air volume (VAV) boxes, the fabric duct can be designed to provide a pleasing appearance even at 50-percent of the maximum air volume.



**The aluminum H-track system allows fabric duct to be hung from exposed steel-truss roof structures.**

Additionally, fabric duct might not be the correct specification in applications where caustic chemicals can come in contact with the fabric or where there is restrictive ceiling



**Cable strung over a ceiling joist is one method of supporting fabric duct.**

heights, a limitation that might apply to metal ducts too.

## Installing the system

Before installation, manufacturers can deliver the factory-engineered fabric duct to the job site or hvac contractor's headquarters. A large installation can involve dozens of lengths. Since all jobs are factory-engineered, the pieces



**Wire cable and small duct clips make hanging fabric duct similar to hanging a shower curtain.**

arrive on site numbered as to where they should be installed.

Sections can vary by length depending on the diameter of the duct. Smaller size lengths can range from

20 to 40 feet long, while larger diameters have shorter lengths for better handling ability.

While putting up a 30-foot section of 24-inch-round spiral metal duct would necessitate a large installation crew, a similar length of fabric duct requires only two handlers because the fabric is approximately 90 percent lighter. On smaller projects, a contractor can save money by using ladders instead of scaffolding.

Tools to use for installation are no different than those needed for hanging metal duct: power drills, anchors for all types of materials, screwdrivers and pliers. Fabric duct needs no on-site cutting and typically is zippered together with factory-sewn industrial zippers.

But don't throw away those tin snips. Metal plenums and metal duct (in enclosed ceilings) may still be needed to deliver the air from the air handler to the room(s) where fabric duct is placed.

Support systems are similar among all major fabric duct manufacturers and consist of either a cable system or an H-track system. The majority of projects that utilize fabric duct as their air distribution system consist of exposed steel truss roof structures (roof girder, purlin, rafter or beam). These structures can support the duct system.



**Company or school logos can be printed onto fabric duct, and duct color can be custom matched to a business' corporate colors.**

Cable systems consist of aircraft-grade steel cable and turnbuckles for tightening. Typically, a cable system is anchored from wall-to-wall with conventional anchors found at any hardware store.

Long cable runs most likely will need support(s) in the middle sections. This is accomplished no differently than supporting piping or other types of ductwork. Threaded rod anchored to ceiling joists is the most common hanging method.

## Going for the best fit

Recent innovations have included the popular Gripple fitting that contractors use for hanging electrical conduit, lighting fixtures, piping, sheet metal duct, sprinkler systems and other utility supplies that require leveling and on-site adjustments. The Gripple system is a faster method than C-clamps and threaded rod.

An installer takes a small length of aircraft cable and loops it over the bottom of the ceiling joist and under the fabric duct cable system. Both ends of the cable are easily strung through the fitting, which can be tightened when the proper length is achieved (once it levels the sagging of the main fabric duct cable system run). The locking grip on the fitting easily can be reversed, thus freeing the cable for readjustment or disassembly.

Once the cable system has been suspended, hanging the fabric duct is no different than stringing a shower curtain onto a rod. The top of the duct comes with small clips that the cable is strung through. For larger diameters of 38-inches or more, a two-row cable system is recommended for aesthetics, but is not mandatory. With two cable systems holding the duct at the 10 o'clock and 2

o'clock positions, potential sagging is eliminated and enhances the aesthetics of the duct run.

An alternative to the cable suspension system is the aluminum H-track system. This is not anchored into walls, but relies totally on support from the ceiling structure above. Once again the previously mentioned Gripple system supports the H-track from a ceiling support. Each vertical support cable has a special hub that slides through the top of the H.

A snap tab that's connected to the fabric has a hub as well that slides through the bottom of the H. Some manufacturers offer a locking

nut for the top hub that prevents it from sliding in the H-track once it has been set in position. Like the cable system, a two-run H-track will eliminate possible sagging on larger diameter runs. The H-track also comes in a surface-mount style for low-clearance situations.

## Help is available

Usually it takes only a few hours for a technician to become proficient at hanging either the cable or H-track systems. In addition, most major fabric duct manufacturers offer factory consultation for installation.

By the time a fabric duct project reaches the installation contractor, the specifying, engineering and selection of size, airflow, color and shape have been determined by the architect or consulting engineer. The industry's top fabric duct manufacturers have representatives that either help with system design or act as liaisons with factory engineers who provide the technical engineering assistance.

On design/build projects where a contractor is required to specify size and airflow characteristics, the manufacturer's representative is a vital part of the engineering team.

Incidentally, fabric duct is good for hvac contractors who find themselves sub-contracting the sheet metal portion of a design/build project. Instead of sub-contracting, a contractor can install the ductwork with in-house workers and make additional profits on a project. ♦

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