

Spiral Duct: How shape and connection technology contribute to high-performance HVAC systems

In addition to improving the energy efficiency of HVAC systems; spiral ductwork cuts installed costs, and adds aesthetic appeal.

High performance has reached buzzword status in the HVAC industry. With energy costs soaring, designers and specifiers are searching for ways to maximize energy efficiency in buildings. The search naturally leads to consideration of HVAC systems, which account for around 40 percent of the energy usage in a typical building. Besides reducing costs, boosting the energy efficiency of HVAC systems helps building owners and operators meet the latest sustainability requirements such as those spelled out in LEED or ASHRAE 90.1.



Of course, one way to meet sustainability objectives is to specify more efficient HVAC equipment. So when designing an HVAC system, engineers often focus on the more costly mechanical components such as chillers and air handlers. But there's another part of the system that has a major impact on performance and efficiency: the ductwork. That's why today's HVAC system design and engineering professionals are carefully considering their ductwork options.

One choice that has much to offer in both new construction and renovation of commercial buildings is spiral ductwork. Advantages of spiral ductwork include efficient air movement and minimal leakage when compared with traditional rectangular design. For this reason, spiral can help reduce the energy needs of HVAC systems. Additionally spiral duct is also relatively inexpensive to install and provides an aesthetic asset once in place.

SHAPE IMPROVES AIRFLOW

In buildings, spiral ductwork can be a major asset to an HVAC system, which requires power to drive the fan or blower unit that moves air through the ductwork to various locations in the building. If the system fails to deliver the proper airflows, building occupants will turn

temperature settings up or down more than should be necessary to meet their comfort needs, which in turn boosts energy use and costs.

Such problems can be lessened by using spiral duct, which produces equal internal pressure and allows even and efficient airflows. Studies have shown that round duct produces less airflow resistance than rectangular duct. With the seam entirely on the outside of the pipe, spiral duct also has a smooth interior that minimizes friction losses.

Another key airflow issue concerns pressure. Air leaving an air handler under high pressure drops to lower pressures as it travels through straight ducts, bends and diffuses to its destination. In typical spiral duct systems, this pressure drop is less than the one experienced by air flowing through rectangular ductwork. By decreasing the drop in air pressure and increasing airflow efficiency, spiral duct allows the use of smaller, less powerful and less expensive air-moving units.

MINIMIZED AIR LEAKAGE

In addition to airflow, air-duct leakage is a major concern of building designers and owners. When ducts leak, HVAC systems require larger and more expensive fans to produce the required airflow. Duct leaks also make fans and other HVAC equipment work harder to maintain the desired building temperatures, increasing energy usage and reducing system efficiency. Often, engineers will specify

HVAC systems with larger and more expensive fans to produce the required airflow, simply to compensate for duct leakage. A spiral duct system offers leakage rates of less than 1% of the total system CFM while rectangular systems are often over 5% of the system CFM. This reduction in leakage will improve indoor air quality and comfort for building occupants.

For these reasons, building designers and specifiers strive to produce airtight HVAC systems. By choosing spiral duct, they can meet or exceed the highest industry air-leakage standards. With fewer duct connections in a typical spiral system, and improved connections methods such as gasketed fittings or duct flange systems, air leakage is virtually eliminated. By minimizing air leakage, these systems reduce the fan energy required to move air downstream through the duct.

EASIER AND LESS EXPENSIVE INSTALL

Besides its performance-related features, spiral ductwork offers other advantages that make it a good choice for HVAC systems. Consider, for example, the positive impact it can have on the installation process. Strong and rigid due to its multiple metal thickness lockseam construction, spiral duct needs fewer supporting components such as stiffeners and hangers, cutting both product and labor costs. Spiral duct also requires fewer tools to install—a drill and some screws; in comparison, rectangular duct

requires slips and drives, corners, cleats, nuts and bolts, gasket, hammers, snips, as well as field cuts and caulk. The strength of spiral duct also allows it to be made of lighter-gauge, less costly metals than would otherwise be required. As a result, spiral duct can be significantly lighter than rectangular duct, reducing load on the structure and allowing installation quickly and with fewer employees.

In addition, spiral duct normally comes in 10-foot lengths as opposed to five-foot lengths for rectangular duct, reducing the number of connections needed by half to create a duct system and thereby reducing installation time, labor and equipment.

AESTHETIC ADVANTAGES

Many of today's modern work environments provide an open format free of walls and ceilings. Spiral duct is an aesthetic answer to these environments. In addition, gasketed or flanged spiral allows for a quick and clean installation compare to rectangular duct that is often caulked or brushed with a duct sealant. This enhances the attractiveness of exposed spiral duct, which is in favor with designers and architects as it gives buildings a contemporary look.

Today, spiral ductwork is frequently found in modern commercial buildings with open-air designs. These include restaurants, sports facilities, malls, stores and warehouses. In addition, spiral duct is often the choice for public and institutional buildings such as churches, community centers, hospitals and schools.

CONCLUSION

Over the last half-century, spiral ductwork has taken a commanding market-share lead in Western Europe, which has long been saddled with relatively high energy costs. Though not nearly as common in the U.S., spiral duct is consistently gaining popularity among designers and specifiers struggling to keep up with the latest trends and requirements complicating the job of building construction. Current conditions have increased the need for innovative, high-performance HVAC systems that reduce energy use and costs. Spiral ductwork can give users a significant performance, installation and aesthetic edge.

MAKING SPIRAL DUCT:

Spiral duct is manufactured from a variety of metals, including galvanized, stainless steel, aluminum, polyvinyl coated, and paint grip. Spiral duct machines wind a continuous sheet of strip metal, about six inches wide, locking the edges together and forming it into a continuous spiral tube. The four-ply spiral lockseam serves as a continuous reinforcing rib, boosting the pipe's crushing resistance to more than twice that of longitudinal lockseam or welded pipe. The stronger, more rigid construction also allows long lengths of spiral duct to be made in a wide range of diameters, from three to 96 inches and manufactured in lengths from one to 20 feet.



Common methods of sealing spiral ductwork include: standard slip-fit connections which require the application of joint sealant, flanged connections with an applied gasket, or factory-applied gaskets which effectively seal spiral duct connections without the use of sealants.