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Duct Leakage Testing is a Must

A recent survey of the building construction industry by the Building Commissioning Association (BCA) on the issue of duct leakage resulted in some

startling statistics. Seventy-five percent of the approximately 300 respondents felt that duct leakage contributes substantially to energy loss in commercial buildings. And, 74% of the respondents also believed most of the buildings in the U.S. have significant duct leakage (greater than 15%). Duct leakage can significantly increase the energy consumption of a building, leading to increased energy bills for the owner. It increases energy costs and can result in occupant discomfort and lower productivity. This combination can transform a building intended to be a high performing building into a building that is not. So, what can be done to combat duct leakage? Test early and test often.

As a commissioning provider for high performing buildings, we observe many instances of duct leakage in both new and existing buildings. The top factors for duct leakage issues are inadequate sealing of duct joints and access doors or panels, which are related to quality of duct installation workmanship, and over-pressurization of the air distribution system resulting in duct seam separation, which is related to HVAC system control. Many owners do not include commissioning, which can identify performance



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issues such as lack of testing requirements in the design specifications and building performance issues that occur during the design, construction, and operational phases of a project.

Where new building codes (2010 and later) have been adopted, some duct leakage testing requirements exist. However, many states have yet to adopt the newer codes. While these new codes are beginning to require duct leakage testing, they only require 25% of the high- and medium-pressure duct be tested. As a result, duct leakage testing appears to be hit or miss when it comes to newly



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constructed buildings. Though a project designer can specify the required sealing level for each duct type, the only way to verify the effectiveness of the duct sealing is by duct leak testing.

It is important that design professionals specify duct leakage testing and have the commissioning provider observe duct leak testing of high- and medium-pressure ductwork in accordance with SMACNA's *HVAC Air Duct Leakage Test Manual*. It is also important that the commissioning provider evaluate the building's controls.

Allowable duct leakage rates specified are around 10%. However, for high performing buildings, designers may elect to reduce the allowable leakage amount in an effort to further reduce the energy consumption of the air moving systems. By specifying SMACNA duct leakage testing for medium- and high-pressure air duct systems integrated with commissioning in their projects, design professionals can be confident that their building will meet the high performing requirements of the owner.

The survey by the BCA also noted that a majority of respondents felt duct leakage is most prevalent in existing buildings. This should come as no surprise to individuals in the building industry. Many of the existing buildings that are prime candidates for services such as energy audits or retro-commissioning were built 15 or more years ago. Even if duct leakage testing was performed when the buildings were constructed, the sealant materials can be either near the end of their useful life or have begun to deteriorate, which leads to increased duct leakage.

Typical building maintenance programs do not include observations and maintenance of the duct sealants, and even if they did it would be nearly impossible for all seams and joints to be evaluated, let alone resealed from the exterior. What is the answer? Very cost-effective products that can be applied to the interior of the air distribution system that can seal most air loss paths. Maintaining a sealed air distribution system should be included in a building's operation and maintenance (O&M) budgets, similar to sealants for the building enclosure. This is a simple way for building owners to keep their buildings' energy consumption low.

If owners elect to have energy audit or retro-commissioning services performed on their building, they should require that these professionals evaluate the leakage of the existing ductwork. This can provide the owner with a low-cost energy measure that can potentially have a very low payback period.

It is clear to the building industry that duct leakage is an issue. For buildings looking to be labeled as high performing buildings, it can be a significant issue. Therefore, it is imperative that engineers require duct leak testing and that commissioning providers ensure duct leakage is minimized. The simplest way to stop or significantly reduce duct leakage is to require testing and verification of the air distribution and exhaust systems' installation and HVAC control function through the design and commissioning process.

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