

**PAPER TITLE**

Performance of Duct Leakage Test Methods – When to Use Which and Why

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**OTHER AUTHORS****ABSTRACT**

Duct leakage has been recognized for years as a major source of energy loss as well as a mechanism for pollutant transfer in buildings. As a result, substantial effort has gone into developing test methods for field measurement of duct leakage, primarily in residential buildings although the results are also applicable to many non-residential structures. Several of these methods have been incorporated into ASTM Standard E1554. Additionally, numerous standards and programs in the United States have duct airtightness testing requirements, including ASHRAE Standard 62.2, ASHRAE Standard 152, the U.S. Department of Energy's low-income weatherization assistance program (WAP), the Building Performance Institute (BPI), ACCA Standards 5QI and 12EH, and Energy Star.

Three of these test methods are the pressure pan test, the duct pressurization test, and the Delta-Q test. Each of these test methods has advantages and disadvantages. As such, which method to use depends greatly on the application.

The pressure pan test evaluates the relative leakiness of ducts and produces results in terms of pressure, not flow. Therefore it is not appropriate for applications where estimates of actual leakage flow rates are required, but is instead intended for applications where the primary goal is to assess where within a duct system major defects are located so that these defects can be quickly targeted. The fan pressurization test provides a leakage estimate but at artificial conditions. It is therefore appropriate where a specific level of duct airtightness is required and to identify those systems that do not achieve the specified level. The Delta-Q test provides leakage estimates at actual operating conditions but is sensitive to wind. It is therefore most appropriate for situations where a good estimate of energy penalty is desired, but is less suitable for demonstrating compliance with tight specifications due to the measurement uncertainty.

The pressure pan and Delta-Q tests also only provide results for leakage to outside the thermal boundary of the building. This is appropriate for energy assessments but does not address all concerns related to contaminant transport. The fan pressurization test can be done with or without a blower door operating concurrently, allowing it to produce results for leakage to outside only (if the blower door is operating) or combined leakage to inside and outside which can give a better indication of the potential for the duct system to contribute to indoor environmental quality problems.

This paper presents field-based evaluation results for each of these three test methods. Results come from several different studies in residential buildings in which multiple methods were performed at each home, allowing for comparisons between methods. The results demonstrate the benefits and drawbacks of each of the methods and provide insight into appropriate use. Specific recommendations for when to use each method are also featured.