

SYSTEM AIR LEAKAGE TEST STANDARD



**SHEET METAL AND AIR CONDITIONING CONTRACTORS'
NATIONAL ASSOCIATION, INC.**
www.smacna.org

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**SHEET METAL AND AIR CONDITIONING CONTRACTORS'
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FOREWORD

SMACNA has included a procedure for leakage testing of ductwork since January of 1965. The process like many others has evolved after more research and feedback from the industry led to changes in both the pass/fail criteria and the application of testing. The next major leap in the process is this standard. It goes beyond the duct and includes procedures for any item included in a forced air system. As the focus on energy use intensifies so does the focus on leakage. The problem is that many of the claims made are based on models, not real measurements and upon further inspection the models are based on flawed assumptions. This results in buildings not meeting performance expectations because the expectations were flawed to begin with.

This standard addresses leakage testing of the entire forced air system and does so in a practical manner where the pass/fail criteria are based on sound research. The emphasis is on the entire process and team, not just the installing contractor. Systems need to be designed to achieve the desired performance. Designing is more than simply writing ones wishes in the specifications. Manufacturers need to provide useful data free from marketing gimmicks so the advertised performance is relevant to field performance and testing.

This standard is the next step in the evolution of forced air system performance and when applied will improve the performance of a forced air system while balancing the costs of doing so. SMACNA expresses appreciation to all of those whose knowledge and effort led to the development of this new standard.

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SYSTEM AIR LEAKAGE TASK FORCE

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CHAPTER 1

FOR THE SPECIFIER/DESIGNER

1.1 ENERGY IMPACTS OF AIR LEAKAGE

Air leakage from different sections of an HVAC system impacts overall system energy use differently. For example, return leaks draw in unconditioned or partially conditioned air. Supply leaks outside the conditioned space wastes thermal energy. Supply leaks within the conditioned space, while less problematic than leaks outside the conditioned space, reduces design airflow delivery to certain conditioned space(s) resulting in occupant discomfort, thermostat adjustment and increased system run time. Because the location of every air leak and its surroundings would have to be considered to accurately quantify the energy impact of air leakage, it is impractical to associate usable values in terms of energy loss to air duct leakage rates. Therefore, most HVAC system air leakage is parasitic energy loss from ducted air systems and must be minimized using a reasonable, economical approach.

This manual provides methods to reduce overall HVAC system air leakage using cost effective approaches. These methods include the specification of rated or tested low-leakage components and extend through the overall design of the HVAC system.

1.2 HOW MUCH TO TEST

For HVAC systems of adequate assembly and sealing, it is unnecessary to test 100 percent of the system. Testing a representative portion of the system is an informative and cost-effective way to approach air leakage testing. If a representative test results in unacceptable air leakage, then it is simpler to evaluate and determine if the leakage is due to an isolated issue or otherwise indicative of a systemic issue.

Initially, it is recommended that 20 percent by surface area of representative portions will be tested. The selection of the section or sections can be provided by a knowledgeable third party but must be a collaborative effort involving the testing contractor. The testing contractor must have input regarding the boundaries of a test section based on practical limits and jobsite conditions.

Unless otherwise agreed to with the responsible party, all tests need to be witnessed by a qualified independent third party or the designer. The results of these tests would then drive the degree of testing going forward using methods described later in this manual. The contractor may choose to test for leakage during initial installation to ensure the quality required of the components is being met.

To differentiate isolated issues from systemic issues, it's important to understand the distinction between the two. Isolated incidents can include but are not limited to a missing or deficient blank off, a single missed connection, or otherwise a specific, individual, isolated air leak. In these cases, the deficiency is corrected, and the test section is re-tested. If the re-test results in a pass, then leakage is not a concern as the incident was in fact an isolated case.

Systemic issues or issues that affect the overall system, include but are not limited to improper sealing of all, or multiple joints, the use of products not consistent with the specification, improperly installed components, or poor workmanship.

If the failure of the initial test is believed to be caused by systemic issues, an additional portion of the system must be tested. If the additional portion fails, this would likely verify that there are in fact systemic issues causing the leakage of air from the system that need to be rectified and the entire system shall be tested.

For smaller systems, it can be more practical to perform a single test for the entire system. This depends on the capacity of the testing equipment, the size and complexity of the system, and other factors. One disadvantage to doing a single test is trying to isolate leaks. If it is determined that a leakage issue exists, finding the source is the next step. This will require dividing the system into smaller portions, using smoke, or simply walking the system listening for sources of leakage.

Larger systems will likely need to be divided into portions. The size of a given portion is based on the capacity of the equipment being used, the size and complexity of the given system, as well as test parameters including the amount of the allowable leakage.

1.2.1 Deciding Which Portions to Test:

- Do some duct portions serve more sensitive or more important areas than others?
- Areas where initial visual inspections may indicate potential leakage issues
- Higher pressure duct systems
- Exterior portions (outside the building envelope)
- Lower pressure portions, downstream of the VAV boxes

