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Standard Test Method for Durability Testing of Duct Sealants[1]

This standard is issued under the fixed designation E2342; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

INTRODUCTION

Duct leakage has been identified as a major source of energy loss in residential buildings. Most duct leakage occurs at the connections to registers, plenums or branches in the duct system. At each of these connections a method of sealing the duct system is required. Typical sealing methods include tapes or mastics applied around the joints in the system. Field examinations of duct systems have typically shown that these seals tend to fail over extended periods of time.

The proposed method evaluates the durability of duct sealants by blowing heated air into test sections, combined with a pressure difference between the test sections and their surroundings. The temperatures and pressures were chosen to expose the test sections to typical conditions that are found in residential duct systems. The duct leakage site geometry represents a leakage site commonly found in duct systems. The test sections are constructed from standard duct fittings.

1. Scope

1.1 This test method describes an accelerated aging test for evaluating the durability of duct sealants by exposure to temperatures and static pressures characteristic of residential duct systems.

1.2 This test method is intended to produce a relative measure of the durability of duct sealants. This standard does not measure durability under specific conditions of weather and building operation that might be experienced by an individual building and duct system. Instead it evaluates the sealant method under fixed conditions that do not include the manifold effects of installation practice.

1.3 This test method only addresses sealants not mechanical strength of the connections.

1.4 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.* For specific hazard statements see Section 7.

2. Referenced Documents

2.1 *ASTM Standards:*[2]

E632 Practice for Developing Accelerated Tests to Aid Prediction of the Service Life of Building Components and Materials

3. Terminology

3.1 Practice E632 defines much of the terminology used in this standard.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *air-leakage rate*—the volume of air movement per unit time across the duct wall.

3.2.2 *duct sealant*—a method and/or material for sealing leaks in forced air thermal distribution duct systems.

4. Summary of Test Method

4.1 To evaluate sealant durability this test method uses a standardized joint configuration with controlled temperature and pressure differences. These temperatures and pressures are chosen to represent conditions found in residential duct systems. The test apparatus applies temperature and pressure conditions, and measures how well the sealant performs over time.

5. Significance and Use

5.1 Residential duct systems are often field designed and assembled. There are many joints, often of dissimilar materials that require both mechanical connection and air sealing. Without this sealing, duct systems would be extremely leaky and hence inefficient. While some duct sealants are rated on their properties at the time of manufacture or during storage, none of these ratings adequately addresses the in-service lifetime. This test method has been developed to address this durability issue.

[1] This test method is under the jurisdiction of ASTM Committee E06 on Performance of Buildings and is the direct responsibility of Subcommittee E06.41 on Air Leakage and Ventilation Performance.

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[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

5.2 This standard applies to products which list duct sealing as one of their uses. This includes duct tape (cloth, metal foil or plastic backed), mastics and sprayed/aerosol sealants. It does not apply to caulks or plaster patches that are not intended to be permanent duct sealing methods.

5.3 The standard duct leak site is a collar to plenum connection for round duct that is 10 to 20 cm (4 to 8 in.) in diameter. This perpendicular connection was chosen because almost all residential duct systems have this type of connection and in field observations of duct systems, it is often this type of connection that has sealant failure.

6. Apparatus

6.1 The following is a general description of the required apparatus. Any arrangement of equipment using the same principles and capable of performing the test procedure within the allowable tolerances is permitted.

6.2 *Major Components*—There are two major components required to perform the testing: a test section leakage measurement device (Fig. 1) and a durability test apparatus (Fig. 2).

6.2.1 *Test Section Leakage Measuring Device*—A device for measuring the leakage of individual test sections. This device shall consist of a fan to blow air into the test section, a flow measurement device for measuring the flow rate in the test section, a pressure measuring device for measuring the pressure difference between the inside and outside of the test section, and a cap to seal the end of the test section. See Fig. 2. For these test section leakage measurements, the air flow measuring device shall have an accuracy of ±0.085 m^3/h (0.05 cfm) or ±1 % of the measured flow, whichever is greater.

6.2.2 *Durability Test Apparatus*—A device for blowing hot air through one or more test sections. This device is comprised of the following components.

6.2.2.1 *Air-Moving Equipment*—A fan that is capable of moving air through the test sections. The fan must be selected to provide the required flow rates and pressure differences. In addition, the fan must be selected to be capable of operating at the hot conditions existing in the test apparatus.

6.2.2.2 *Pressure-Measuring Devices*—Manometers or pressure indicators to measure pressure difference with an accuracy of ±0.2 Pa (0.0008 in. of water) or ±1 % of the measured pressure, whichever is greater.

6.2.2.3 *Temperature-Measuring Devices*—Instruments to measure temperature with an accuracy of ±1°C (2°F). The test section surface temperatures shall be measured using surface mount temperature sensors with heat transfer paste between the sensor and the test section.

6.3 *Test Section*—Sheet metal duct system components combined to create a plenum to collar connection. The test section consists of a flange and a collar with fingers to fold in

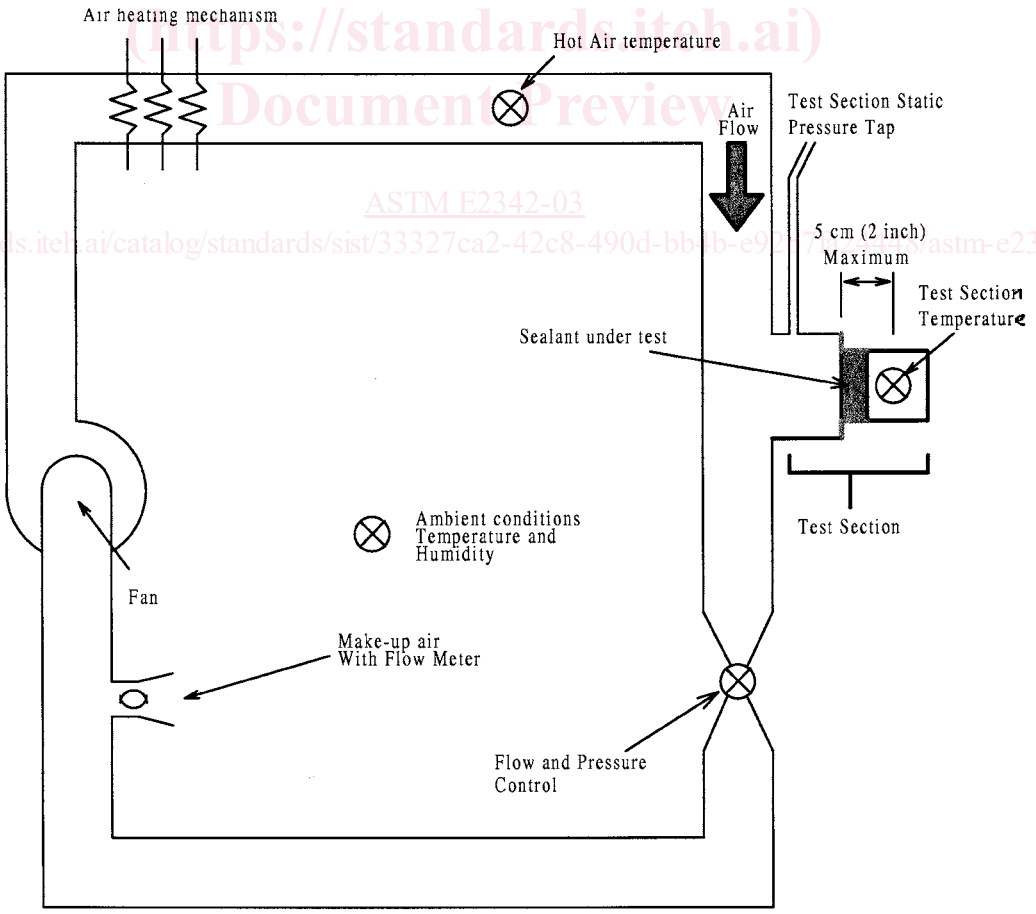

FIG. 1 Schematic of Durability Apparatus