

Envelope Leakage Testing

Code Change Proposal

R402.4.1 Building thermal envelope. The *building thermal envelope* shall comply with Sections R402.4.4.4 and R402.4.1.2. The sealing methods between dissimilar materials shall allow for differential expansion and contraction.

R402.4.1.1 Installation. The components of the *building thermal envelope* as listed in Table R402.4.1.1 shall be installed in accordance with the manufacturer's instructions and the criteria listed in Table R402.4.1.1, as applicable to the method of construction. Where required by the *code official*, an *approved* third party shall inspect all components and verify compliance.

R402.4.1.2 Testing. The building or dwelling unit shall be tested and verified as having an air leakage rate not exceeding five air changes per hour in Climate Zones 1 and 2, and three air changes per hour in Climate Zones 3 through 8. Testing shall be conducted in accordance with ~~ASTM E 779 or ASTM E 1827~~ BSR/RESNET/ICC 380-2016 and reported at a pressure of 0.2 inch w.g. (50 Pascals). Where required by the *code official*, testing shall be conducted by an *approved* third party. A written report of the results of the test shall be signed by the party conducting the test and provided to the *code official*. Testing shall be performed at any time after creation of all penetrations of the *building thermal envelope*.

During Testing:

- ~~1. Exterior windows and doors, fireplace and stove doors shall be closed, but not sealed, beyond the intended weather stripping or other infiltration control measures.~~
- ~~2. Dampers including exhaust, intake, makeup air, backdraft and flue dampers shall be closed, but not sealed beyond intended infiltration control measures.~~
- ~~3. Interior doors, if installed at the time of the test, shall be open.~~
- ~~4. Exterior doors for continuous ventilation systems and heat recovery ventilators shall be closed and sealed.~~
- ~~5. Heating and cooling systems, if installed at the time of the test, shall be fully open.~~
- ~~6. Supply and return registers, if installed at the time of the test, shall be fully open.~~

RESNET	Residential Energy Services Network, Inc. P.O. Box 4561 Oceanside, CA 92052-4561
Standard reference number	Title
ANSI/RESNET/ICC 380-2015	Standard for Testing Airtightness of Building Enclosures, Airtightness of Heating and Cooling Air Distribution Systems, and Airflow of Mechanical Ventilation Systems

Reason Statement

BSR/RESNET/ICC 380-2016 provides needed guidance for performing envelope air leakage, duct leakage and air flow testing. Building off of existing standards (e.g. ASTM E779-10) the standard allows for multiple test procedures to provide flexibility for the testing industry. Standard 380 also covers testing for single-family and 3-story and less multi-family projects and will be referenced as the protocol for testing for the rating industry. The E 779 standard requires multi-point testing under both pressurized and depressurized conditions. BSR/RESNET/ICC 380-2016 allows E 779 tests but expands the test methodology to allow single point tests under only one pressurization/depressurization condition and includes correction factors to account for test bias and uncertainty. Thus, 380 can be a substantially less expensive protocol than E 779.

The standard provides a consistent, uniform methodology for evaluating the airtightness of building envelopes and heating and cooling air ducts. The test procedures can be used as building diagnostics, in quality assurance and control, for determining compliance with codes and standards and to determine input to energy simulations and ratings. The standard provides a step-by-step approach to testing for building envelop leakage with the goal of standardizing how testing should be performed in the field.

Standard 380 provides guidelines for calculating common air leakage testing metrics e.g. CFM50, ACH50, NLA, SLA and ELA. Referencing a standard with this type of flexibility allows the testing metric to change in the code without the need to change the reference standard (e.g. changing from ACH50 to SLA).

Why Use BSR/RESNET/ICC 380-2016 in Place of ASTM Standard E779-10. ASTM Standard E779-10 requires multi-point testing at a range of 10 to 60 Pa in 5 to 10 Pa increments using both pressurization AND depressurization of the building and the reporting requirements include: fan pressurization measurements (inside-outside zero flow building pressure differences), inside and outside temperatures (at start and end of test), the product of the absolute value of the indoor/outdoor air temperature difference multiplied by the building height, tabular list of all air leakage measurements and calculations (time, building pressure difference, air density, nominal airflow, fan airflow rate, air leakage rate, deviations from standard procedure, wind speed and direction and whether it is estimated or measured on site (if measured on site, the height above ground at which the wind speed was measured), and the calculation details (leakage coefficient, pressure exponent, effective leakage area for pressurization and depressurization and combined results, whether a reference pressure other than 4 Pa was used, and an estimate of confidence limits). This is a test method more suitable for research testing than code enforcement, so we adopted BSR/RESNET/ICC 380-2016 with references to specific calculation procedures found in ASTM Standard E779-10.

RESNET/ICC Standard 380 has been developed to provide a consensus national standard for consistent measurement of several air-flow related residential building metrics. It builds off of existing American National Standards to provide standard procedures essential to the evaluation of the energy performance of residential buildings energy.

Additional Cost: None. The code change proposal may lead to a decrease in first cost for testing versus following the E 779 reference standards.