

## Proposed Change to Air Barrier & Testing Requirement, Energy Code C402.4

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The IECC rules for air barrier compliance in Section C402.4.1.2 do not actually require pressure testing of the air barrier. Instead, testing is just one option, the main options being simply the use of approved air barrier materials and assemblies.

My memory of the TAG meeting when this issue was discussed (January 5<sup>th</sup>, 2012) is that we thought that the rule required commercial buildings to have air barriers and be pressure-tested. Our current 2009 code requires testing for all buildings over 5 stories tall, and I believe our intention was to extend this requirement to low-rise buildings as well, as has already been done in the Seattle Energy Code. Since the vast majority of floor area constructed in the state is in low-rise buildings, the rule really has little impact with the 5-story threshold.

Testing is especially important to make the air barrier rules effective, because the materials and tested assemblies themselves do not cause the problem of building air leakage. Air leakage is typically found around the joints between different materials – door frames, roof edges, foundations, and similar transitions. It is often not clear which trade is responsible for the air tightness of the building envelope at such transitions or at mechanical penetrations through the wall. Blower door testing can identify such gaps in the continuity of the air barrier, ensuring that the building envelope delivered to the owner is performing as designed.

In Seattle, all buildings permitted under the 2009 energy code must perform blower door testing, although they have not been required to pass, and thus far all have passed the test standard. Many additional firms have now begun to offer blower door testing services, making the costs increasingly competitive. Compared with all other available technologies for conserving energy in real-world applications, tested air barriers easily provide the best “bang for the buck,” and should be mandated in this code. (Note that it is quite common for a building to lose 30% of its conditioned air through such leakage, dramatically increasing energy consumption during both cold and warm weather.)

The text of C402.4, the air leakage standard, is reproduced below for your convenience. The main proposed code change is subtle – look for it in Section C402.4.1.2. Instead of giving a choice between using air barrier materials or testing the air barrier with a blower door, the revised code language would require both, as our 2009 code already does for buildings over 5 stories tall. To maintain consistency, an exception has also been struck from Section C402.4.1.1.

**C402.4 Air leakage (Mandatory).** The thermal envelope of buildings shall comply with Sections C402.4.1 through C402.4.8.

**C402.4.1 Air barriers.** A continuous air barrier shall be provided throughout the building thermal envelope. The air barriers shall be permitted to be located on the inside or outside of the building envelope, located within the assemblies composing the envelope, or any combination thereof. The air barrier shall comply with Sections C402.4.1.1 and C402.4.1.2.

**Exception:** Air barriers are not required in buildings located in Climate Zones 1, 2 and 3.

**C402.4.1.1 Air barrier construction.** The *continuous air barrier* shall be constructed to comply with the following:

1. The air barrier shall be continuous for all assemblies that are the thermal envelope of the building and across the joints and assemblies.
2. Air barrier joints and seams shall be sealed, including sealing transitions in places and changes in materials. Air barrier penetrations shall be sealed in accordance with Section C402.4.2. The joints and seals shall be securely installed in or on the joint for its entire length so as not to dislodge, loosen or otherwise impair its ability to resist positive and negative pressure from wind, stack effect and mechanical ventilation.
3. Recessed lighting fixtures shall comply with Section C404.2.8. Where similar objects are installed which penetrate the air barrier, provisions shall be made to maintain the integrity of the air barrier.

~~Exception: Buildings that comply with Section C402.4.1.2.3 are not required to comply with Items 1 and 3.~~

**C402.4.1.2 Air barrier compliance options.** A continuous air barrier for the opaque building envelope shall comply with Sections C402.4.1.2.1, C402.4.1.2.2, ~~or and~~ C402.4.1.2.3.

**C402.4.1.2.1 Materials.** Materials with an air permeability no greater than 0.004 cfm/ft<sup>2</sup> (0.02 L/s · m<sup>2</sup>) under a pressure differential of 0.3 inches water gauge (w.g.) (75 Pa) when tested in accordance with ASTM E 2178 shall comply with this section. Materials in Items 1 through 15 shall be deemed to comply with this section provided joints are sealed and materials are installed as air barriers in accordance with the manufacturer's instructions.

1. Plywood with a thickness of not less than 3/8 inch (10 mm).
2. Oriented strand board having a thickness of not less than 3/8 inch (10 mm).
3. Extruded polystyrene insulation board having a thickness of not less than 1/2 inch (12 mm).
4. Foil-back polyisocyanurate insulation board having a thickness of not less than 1/2 inch (12 mm).
5. Closed cell spray foam a minimum density of 1.5 pcf (2.4 kg/m<sup>3</sup>) having a thickness of not less than 1 1/2 inches (36 mm).
6. Open cell spray foam with a density between 0.4 and 1.5 pcf (0.6 and 2.4 kg/m<sup>3</sup>) and having a thickness of not less than 4.5
7. inches (113 mm).
8. Exterior or interior gypsum board having a thickness of not less than 1/2 inch (12 mm).
9. Cement board having a thickness of not less than 1/2 inch (12 mm).
10. Built up roofing membrane.
11. Modified bituminous roof membrane.
12. Fully adhered single-ply roof membrane.
13. A Portland cement/sand parge, or gypsum plaster having a thickness of not less than 5/8 inch (16 mm).
14. Cast-in-place and precast concrete.
15. Fully grouted concrete block masonry.
16. Sheet steel or aluminum.

**C402.4.1.2.2 Assemblies.** Assemblies of materials and components with an average air leakage not to exceed 0.04 cfm/ft<sup>2</sup> (0.2 L/s · m<sup>2</sup>) under a pressure differential of 0.3 inches of water gauge (w.g.) (75 Pa) when tested in accordance with ASTM E 2357, ASTM E 1677 or ASTM E 283 shall comply with this section. Assemblies listed in Items 1 and 2 shall be deemed to comply provided joints are sealed and requirements of Section C402.4.1.1 are met.

1. Concrete masonry walls coated with one application either of block filler and two applications of a paint or sealer coating;
2. A Portland cement/sand parge, stucco or plaster minimum 1/2 inch (12 mm) in thickness.

**C402.4.1.2.3 Building test.** The completed building shall be tested and the air leakage rate of the *building envelope* shall not exceed 0.40 cfm/ft<sup>2</sup> at a pressure differential of 0.3 inches water gauge (2.0 L/s · m<sup>2</sup> at 75 Pa) in accordance with ASTM E 779 or an equivalent method approved by the code official.