ADDENDA

ANSI/ASHRAE/IES Addendum l to
ANSI/ASHRAE/IES Standard 90.1-2013

Energy Standard for Buildings Except Low-Rise Residential Buildings

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FOREWORD

The scope of this addendum is to address the following:

1. *Verification of delivered envelope performance is an essential next step in improving the standard.*
2. *Critical areas of envelope performance could be easily inspected and verified within the context and scope of the standard.*
3. *While some types of longer-term performance verification were desirable, there is some concern that verification activities postoccupancy were outside the current scope of the standard.*
4. *While* all *areas of envelope performance governed by the standard are important, compliance with air leakage control provisions of the standard were seen as critical and should be more robustly addressed.*

Actions in this proposal:

1. *Part 1 seeks to update the mandatory inspection provisions defined in Section 4.*
2. *Part 2 provides new language to more robustly address critical envelope inspections and verification of assemblies and materials.*
3. *Part 3 adds new reference standards that support the proposed new text.*

Justification for Part 1

This list of items to be inspected is incomplete and does not convey all of the requirements of the standard (for envelope, mechanical, lighting, or other sections.) As such, this incomplete list leads to confusion over what inspections the standard actually requires and what is to be verified in each section of the standard. The list of items to be verified should more appropriately be in each section of the standard and in the User's Manual checklists.

Added under Section 4.2.4 are provisions for the building official to determine when a qualified commissioning agent or third-party inspection service can provide services, when they are to report, and to whom the agency is to submit a report. This is designed to address the administrative requirements for current provisions on commissioning and for future provisions on commissioning and third-party inspections.

Justification for Part 2

The proposal also adds provisions concerning a verification process and includes a new section focusing on this topic. While inspection and verification may be implied by the standard's provisions, there are certain key elements of envelope performance that should be supported by appropriate levels of required inspection, testing and verification. These include all envelope areas currently governed under the standard, which include opaque envelope, fenestration, and air barrier components. While all *areas of envelope performance governed by the standard are important, compliance with air leakage control provisions of the standard were seen as critical and should be more robustly addressed as shown in this proposal.*

Added to the inspection requirement are inspection provisions for features now addressed in the standard. These focus on the aspects of fenestration and daylighting.

Justification for Part 3

This proposal also adds whole-building testing to the air barrier provisions for all buildings governed under this standard. This recommendation builds on the recent findings and reported results from hundreds of commercial building air leakage tests, demonstrating the value of tests in determining and achieving the levels of air leakage control defined by the standard. Two new normative standards, ASTM E779 and ASTM 1827, are recommended to be included in the standard as verification tools for determining compliance.

This proposal also seeks to comply with the planned organizational structure for each section according to the following conceptual framework for numbering with a new subsection on inspection and verification:

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X.1—General
X.2—Compliance Paths
X.3—Simple Buildings or Systems
X.4—Mandatory Requirements
X.5—Compliance Path #1
X.6—Compliance Path #2
X.7—Submittals
X.8— Products
X.9—Inspection and verification

This proposal will increase the cost of construction. The verification options proposed are intended to ensure that intended envelope energy performance will be delivered to the building owner for the lifetime of those assemblies. Data provided showed that the costs of these various approaches to envelope performance verification more than justify the potential increases in first cost. Additionally, the costs of these procedures will reduce over time as builders become more familiar with envelope performance verification techniques and their construction practices improve due to the feedback provided by these techniques.

[This addendum makes proposed changes to the current standard. These changes are indicated in the text by underlining (for additions) and ~~strikethrough~~ (for deletions) except where the reviewer instructions specifically describe some other means of showing the changes. Only these changes to the current standard are open for review and comment at this time. Additional material is provided for context only and is not open for comment except as it relates to the proposed changes.]

Addendum l to 90.1-2013

Modify Section 4.2 as follows (I-P and SI):

4.2.4 Inspections. All building construction, additions, or alteration~~s~~ work subject to the provisions of this standard shall ~~be subject to inspection by the building official, and all such work shall~~ remain accessible and exposed for inspection purposes until approved in accordance with the procedures specified by the building official. ~~Items for inspection include at least the following~~.

~~a. wall insulation after the insulation and vapor retarder are in place but before concealment~~
~~b. roof/ceiling insulation after roof/insulation is in place but before concealment~~
~~c. slab/foundation wall after slab/foundation insulation is in place but before concealment~~
~~d. fenestration after all glazing materials are in place~~
~~e. *continuous air barrier* after installation but before concealment~~
~~f. mechanical systems and equipment and insulation after installation but before concealment~~
~~g. electrical equipment and systems after installation but before concealment~~

4.2.5 Verification and Commissioning Reporting. Where reporting is required, the building official or other approved agencies shall report to the contractor their findings of conformance and nonconformance for correction.

4.2.5.1 Nonconformance. If the nonconforming work is found not to be corrected within a predetermined time as agreed upon by the contractor, the nonconforming work shall be reported in writing to the building official and design professional. At a time agreed upon by the building official or other approved agencies, a final report shall be submitted to the building official and the contractor that outlines the inspection findings and documents the correction of nonconforming work.

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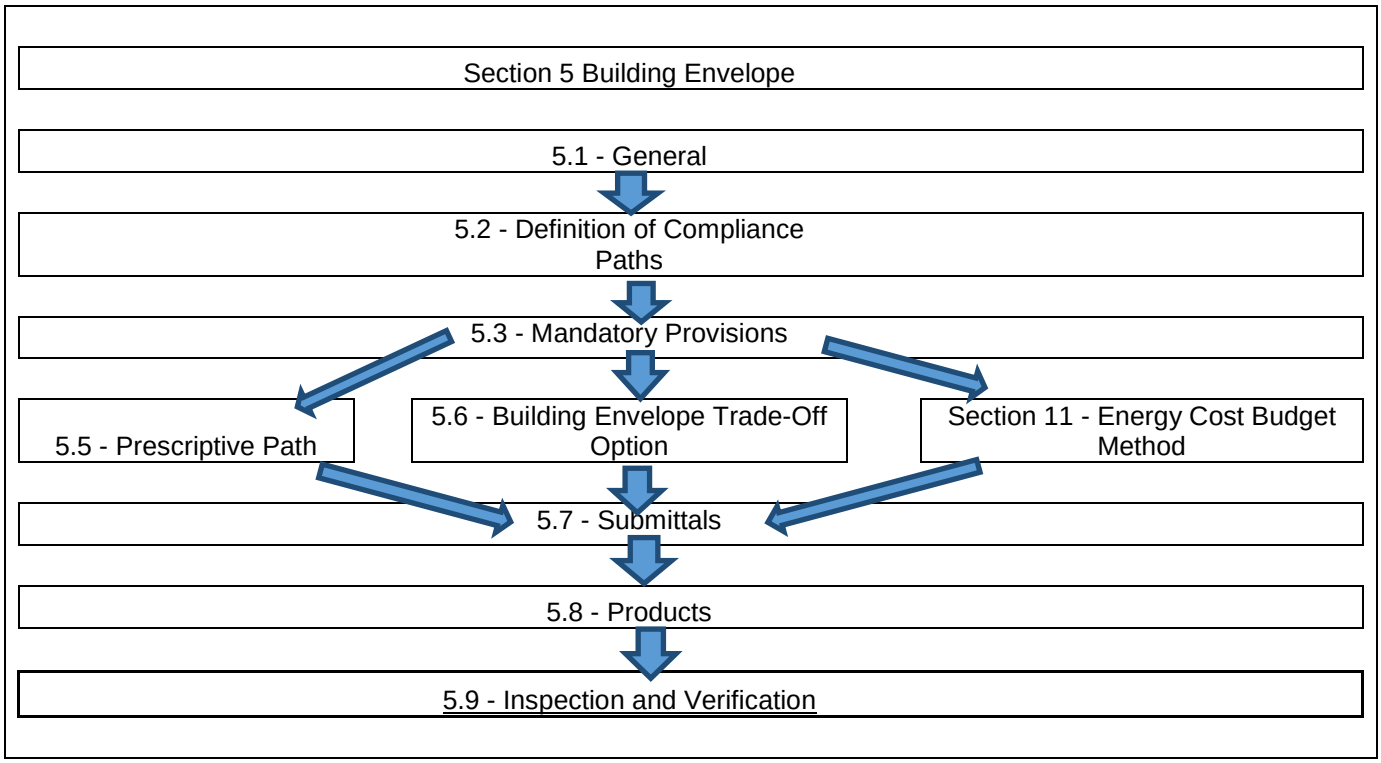
Modify the graphic at the start of Section 5 as follows (I-P and SI):



Modify Section 5.2 as follows (I-P and SI):

5.2 Compliance Paths

5.2.1 Compliance. For the appropriate climate, space-conditioning category, and class of construction, the building envelope shall comply with Section 5.1, "General"; Section 5.4, "Mandatory Provisions"; Section 5.7, "Submittals"; ~~and~~ Section 5.8, "Product Information and Installation Requirements"; and Section 5.9, "Inspection and Verification"; and either

a. Section 5.5, "Prescriptive Building Envelope Option", provided that the fenestration area does not exceed the maximum allowed by Section 5.5.4.2, or
b. Section 5.6, "Building Envelope Trade-Off Option".

Modify Section 5.4.3.1.3 as follows (I-P and SI):

5.4.3.1.3 Testing, Acceptable Materials, and Assemblies. The building shall comply with whole-building pressurization testing in accordance with Section 5.4.3.1.3(a); or with the ~~C~~*continuous air barrier* requirements in ~~materials and assemblies for the *opaque building envelope* shall comply with one of the following requirements:~~ Section 5.4.3.1.3(b) or Section 5.4.3.1.3(c).

a. Whole-building pressurization testing shall be conducted in accordance with ASTM E779 or ASTM E1827 by an independent third party. The measured air leakage rate of the *building envelope* shall not exceed 0.40 cfm/ft^2 (2.0 L/s·m^2) under a pressure differential of 0.3 in. of water (75 Pa), with this air leakage rate normalized by the sum of the above- and below-grade *building envelope* areas of the *conditioned* and *semiheated space*.

Exceptions:

1. For buildings having over 50,000 ft^2 (5000 m^2) of gross conditioned floor area, air leakage testing shall be permitted to be conducted on less than the whole building provided the following portions of the building are tested and their measured air leakage is area-weighted by the surface areas of the building envelope:

   a. The entire floor area of all stories that have any spaces directly under a roof

   b. The entire floor area of all stories that have a building entrance or loading dock

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c. Representative above-grade sections of the building totaling at least 25% of the wall area enclosing the remaining conditioned space; floor area tested per (a) and (b) shall not be included in the 25%.

2. Where the measured air leakage rate exceeds 0.40 cfm/ft^2 (2.0 L/s·m^2) but does not exceed 0.60 cfm/ft^2 (3.0 L/s·m^2), a diagnostic evaluation, such as a smoke tracer or infrared imaging shall be conducted while the building is pressurized, and any leaks noted shall be sealed if such sealing can be made without destruction of existing building components. In addition, a visual inspection of the air barrier shall be conducted, and any leaks noted shall be sealed if such sealing can be made without destruction of existing building components. An additional report identifying the corrective actions taken to seal leaks shall be submitted to the code official and the building owner and shall be deemed to satisfy the requirements of this section.

~~a~~b. Materials that have an air permeance not exceeding…

~~b~~c. Assemblies of materials and components…

Add the following new Section 5.9 as follows (I-P and SI):

5.9 Inspection and Verification

5.9.1 Inspections. In addition to the requirements of Section 4.2.4, envelope components and assemblies shall be inspected in accordance with Sections 5.9.1.1 through 5.9.1.4.

5.9.1.1 Inspection of Fenestration and Door Requirements. Fenestration and doors shall be inspected to ensure compliance with the requirements of Sections 5.4.3.2, 5.8.2.1, 5.8.2.2, and 5.8.2.3. Where testing is required to demonstrate compliance with the air leakage requirements, it shall be conducted by an independent third party. Operation of the door and closer or operating mechanism shall be inspected for conformance with the manufacturer's instructions, and that the seals or gaskets are installed and in accordance with the manufacturer's instructions.

5.9.1.2 Inspection of Loading Dock Weatherseals. Where there is a loading dock, weatherseals shall be inspected for proper installation and to ensure that the seals are in good condition.

5.9.1.3 Inspection of Opaque Envelope Air Tightness Requirements. Opaque roof, above- and below-grade walls, and floors, shall be subject to the following inspections during construction:

a. Use of compliant materials and assemblies as indicated in 5.4.3.1.3.
b. Integration with adjoining *fenestration* and *continuous air barrier* elements

5.9.1.4 Fenestration Inspections. Fenestration shall be subject to the following inspections during construction:

a. Skylights size and location in relation to the designed primary and secondary lighted areas below
b. Rooftop monitors size and location in relation to the designed primary and secondary lighted areas below
c. Dynamic glazing compliance with SHGC and U-factor in accordance with Sections 5.5.4.4.1 and 5.5.4.4.2, and testing of the operation for conformance with the manufacturer's instructions
d. Permanent fenestration projection(s) installation and performance in accordance with Section 5.5.4.4.1 and the construction documents

5.9.2 Verification

5.9.2.1 Building Envelope Performance Verification. The performance of the building envelope shall be verified in accordance with this section and Section 4.2.5.

5.9.2.2 Air Leakage Verification. Air leakage verification shall be determined in accordance with one of the following methods:

a. An air barrier design and installation verification program shall be implemented and shall include the following elements:
   1. A design review shall be conducted to assess compliance with the requirements in Sections 5.4.3.1.1, 5.4.3.1.2, and the applicable portions of 5.4.3.1.3.
   2. Periodic field inspection of *continuous air barrier* components and assemblies shall be conducted during construction while the air barrier is still accessible for inspection and repair to verify compliance with the requirements of Sections 5.4.3.1.1, 5.4.3.1.2, and the applicable portions of Section 5.4.3.1.3.
   3. Reporting shall be in compliance with Section 4.2.5.
b. A whole-building air leakage verification program shall be implemented and shall include the following elements:

   1. Whole-building pressurization testing shall be done in accordance with Section 5.4.3.1.3(a) and the use of any exceptions shall be documented.
   2. Reporting shall be in compliance with Section 4.2.5.

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Update the organization title and add the following normative standards to Chapter 12:

~~American Society for Testing and Materials~~
ASTM International
100 Barr Harbor Dr., West Conshohocken, PA 19428-2959

Reference	**Title**
ASTM E1827-2011	Standard Test Methods for Determining Airtightness of Buildings Using an Orifice Blower Door

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ASHRAE is concerned with the impact of its members' activities on both the indoor and outdoor environment. ASHRAE's members will strive to minimize any possible deleterious effect on the indoor and outdoor environment of the systems and components in their responsibility while maximizing the beneficial effects these systems provide, consistent with accepted Standards and the practical state of the art.

ASHRAE's short-range goal is to ensure that the systems and components within its scope do not impact the indoor and outdoor environment to a greater extent than specified by the Standards and Guidelines as established by itself and other responsible bodies.

As an ongoing goal, ASHRAE will, through its Standards Committee and extensive Technical Committee structure, continue to generate up-to-date Standards and Guidelines where appropriate and adopt, recommend, and promote those new and revised Standards developed by other responsible organizations.

Through its *Handbook*, appropriate chapters will contain up-to-date Standards and design considerations as the material is systematically revised.

ASHRAE will take the lead with respect to dissemination of environmental information of its primary interest and will seek out and disseminate information from other responsible organizations that is pertinent, as guides to updating Standards and Guidelines.

The effects of the design and selection of equipment and systems will be considered within the scope of the system's intended use and expected misuse. The disposal of hazardous materials, if any, will also be considered.

ASHRAE's primary concern for environmental impact will be at the site where equipment within ASHRAE's scope operates. However, energy source selection and the possible environmental impact due to the energy source and energy transportation will be considered where possible. Recommendations concerning energy source selection should be made by its members.

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8/16