ADDENDA

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

Energy Standard for Buildings Except Low-Rise Residential Buildings

Approved by the ASHRAE Standards Committee on August 24, 2016; by the ASHRAE Tech Counil on August 29, 2016; by the IES Board of Directors on September 26, 2016; and by the American National Standards Institute on August 30, 2016.

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FOREWORD

Addendum cb updates the duct insulation requirements in Standard 90.1 that have been in effect since the 2001 edition of the standard. The SSPC 90.1 Mechanical subcommittee (MSC) reviewed duct insulation criteria in related energy codes and standards, including the 2015 International Energy Conservation Code, the International Green Construction Code, ASHRAE Standard 189.1-2014, and California's 2013 Title 24. The MSC observed that the Standard 90.1-2013 criteria were the most complex of these codes and standards (with seven columns of duct locations), while the trend in recent years has been to simplify the duct locations into just two: exterior and unconditioned space.

In addition, the MSC observed that the Standard 90.1 duct insulation requirements were considerably less stringent than the other energy codes and standards, even though higher levels of duct insulation have been found to be cost-effective in studies supporting changes to the 2015 IECC and Title 24. Most recently, a Pacific Northwest National Laboratory (PNNL) study determined it was cost effective for the 2015 IECC to require R-12 insulation on exterior ducts in climate zones (CZ) 5 through 8 (Hart 2012[1]) using both ASHRAE's scalar factor method as well as a DOE net present value analysis. The MSC further updated and reviewed common duct insulation materials and installation costs to confirm the PNNL economic analysis. That review is reflected in the new Table 6.8.2 of this addendum, which incorporates many of the duct insulation requirements in the 2015 IECC.

The MSC also reevaluated previous simplification efforts and concluded that insulation requirements for exterior and unconditioned duct locations are overly stringent for indirectly conditioned spaces within the building thermal envelope. Therefore the MSC retained the indirectly conditioned duct location, (which also includes return air plenums with or without exposed roofs above) and moved from no requirement to a minimum value of R-1.9, a common design practice insulation value to control condensation from ductwork. As a common practice, the MSC expects little or no incremental cost for compliance with this requirement. The MSC also determined that the duct insulation requirements for "heating only" in CZ 0 through 1 should be "none" due to minimal heating hours. Similarly, the requirements in CZ 7 through 8 for "cooling only" were relaxed because of minimal cooling hours and milder outdoor temperatures.

The new Table 6.8.2 also replaces two separate tables for cooling-only and heating-only ductwork (Table 6.8.2-1) and for combined heating and cooling ductwork (Table 6.8.2-2) with a single table to address all ductwork and locations. The MSC also found that the new requirements can provide demonstrated energy and energy cost savings. For example, the analysis for CZ 5 shows that improved insulation to R-12 from R-8 can reduce annual costs of duct energy loss (in the range of $3.00 to $4.00 per square foot [$32 to $43 per square metre]) by $1.00 per square foot ($11 per square metre) or more, using incremental duct insulation costs of $0.70 per square foot ($7 per square metre) of duct surface area.

[1] Hart, R., 2012. Supporting analysis for proposed changes to the commercial provisions of the 2012 IECC: Increase Duct and Plenum Insulation. Pacific Northwest National Laboratory. December, 2012.

Note: In this addendum, changes to the current standard are indicated in the text by underlining (for additions) and strikethrough (for deletions) unless the instructions specifically mention some other means of indicating the changes.

Addendum cb to 90.1-2013

Revise the standard as follows (I-P):

6.4.4.1.2 Duct and Plenum Insulation. All supply and return ducts and plenums installed as part of an HVAC air distribution system shall be thermally insulated in accordance with Table~~s~~ 6.8.2~~ 1 and 6.8.2-2~~.

Delete Tables 6.8.2-1 and 6.8.2-2 and replace them with the new Table 6.8.2 as shown below.

~~**TABLE 6.8.2-1 Minimum Duct Insulation R-Value,a**~~
~~**Cooling- and Heating-Only Supply Ducts and Return Ducts**~~

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~~**TABLE 6.8.2-2 Minimum Duct Insulation R-Value,a**~~
~~**Combined Heating and Cooling Supply Ducts and Return Ducts**~~

TABLE 6.8.2 Minimum Duct Insulation R-Value[a]

Climate Zone	Duct Location		
	Exterior[b]	Unconditioned Space and Buried Ducts	Indirectly Conditioned Space[c,d]
Supply and Return Ducts for Heating and Cooling			
0 to 4	R-8	R-6	R-1.9
5 to 8	R-12	R-6	R-1.9
Supply and Return Ducts for Heating Only			
0 to 1	none	none	none
2 to 4	R-6	R-6	R-1.9
5 to 8	R-12	R-6	R-1.9
Supply and Return Ducts for Cooling Only			
0 to 6	R-8	R-6	R-1.9
7 to 8	R-1.9	R-1.9	R-1.9

a. Insulation R-values, measured in (h·ft^2·°F)/Btu , are for the insulation as installed and do not include film resistance. The required minimum thicknesses do not consider water vapor transmission and possible surface condensation. Where portions of the building envelope are used as a plenum, insulation shall be as required by the most restrictive condition of Section 6.4.4.2 or Section 5, depending on whether the plenum is located in the roof, wall, or floor. Insulation resistance measured on a horizontal plane in accordance with ASTM C518 at a mean temperature of 75°F at the installed thickness.
[b]Includes attics above insulated ceilings, parking garages and crawl spaces.
[c] Includes return air plenums with or without exposed roofs above.
[d] Return ducts in this duct location do not require insulation.

Revise the standard as follows (SI):

6.4.4.1.2 Duct and Plenum Insulation. All supply and return ducts and plenums installed as part of an HVAC air distribution system shall be thermally insulated in accordance with Table~~s~~ 6.8.2~~-1 and 6.8.2-2~~.

Delete Tables 6.8.2-1 and 6.8.2-2 and replace with new Table 6.8.2 as shown below.

~~**TABLE 6.8.2-1 Minimum Duct Insulation R-Value,a**~~
~~**Cooling- and Heating-Only Supply Ducts and Return Ducts**~~

~~**TABLE 6.8.2-2 Minimum Duct Insulation R-Value,a**~~
~~**Combined Heating and Cooling Supply Ducts and Return Ducts**~~

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TABLE 6.8.2 Minimum Duct Insulation R-Value[a]

Climate Zone	Duct Location		
	Exterior[b]	Unconditioned Space and Buried Ducts	Indirectly Conditioned Space[c,d]
Supply and Return Ducts for Heating and Cooling			
0 to 4	R-1.41	R-1.06	R-0.34
5 to 8	R-2.12	R-1.06	R-0.34
Supply and Return Ducts for Heating Only			
0 to 1	none	none	none
2 to 4	R-1.06	R-1.06	R-0.34
5 to 8	R-2.12	R-1.06	R-0.34
Supply and Return Ducts for Cooling Only			
0 to 6	R-1.41	R-1.06	R-0.34
7 to 8	R-0.34	R-0.34	R-0.34

a Insulation R-values, measured in $(m^2 \cdot K)/W$, are for the insulation as installed and do not include film resistance. The required minimum thicknesses do not consider water vapor transmission and possible surface condensation. Where portions of the building envelope are used as a plenum, insulation shall be as required by the most restrictive condition of Section 6.4.4.2 or Section 5, depending on whether the plenum is located in the roof, wall, or floor. Insulation resistance measured on a horizontal plane in accordance with ASTM C518 at a mean temperature of 23.9°C at the installed thickness.

[b]Includes attics above insulated ceilings, parking garages and crawl spaces.

[c] Includes return air plenums with or without exposed roofs above.

[d]Return ducts in this duct location do not require insulation.

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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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7/16