



ENERGY SYSTEMS LABORATORY

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To: Stakeholders in Residential Energy Code Compliance
From: Energy Systems Laboratory, Bahman Yazdani, Associate Director
Re: Compliance Options for Insulating Ducts in Unconditioned Attics
For Projects Permitted On or After Jan. 23, 2006

The Energy Systems Laboratory has been requested by a stakeholder group which consists of building officials, residential builders, air conditioning contractors, product suppliers, and home energy raters to provide guidance on how new Federal standards for residential air conditioners and heat pumps under the National Appliance Energy Conservation Act (NAECA) may impact allowable trade-offs involving equipment efficiency and duct insulation in attics, especially during a transition period during which time new lines of higher efficiency equipment may not be readily available.

NAECA provides that Federal standards for certain products preempt standards for those same products in state and local codes under certain conditions. The new NAECA standards for residential central air conditioners and heat pumps will become effective January 23, 2006. Details of the new standards are available in the Federal Register FR/Vol. 69, No. 158, Aug. 17, '2004, and in a December 20, 2005 notice clarifying the preemption issue on the Department of Energy's website for Building Codes & Standards
http://www.energycodes.gov/residential_ac_hp.stm.

Products manufactured to the older standards existing prior to January 23, 2006 may be sold and installed after this date. To the extent that NAECA preempts a standard in a state or locally adopted building code, it does not affect previously permitted projects. Please consult your local building official for all issues of code interpretation and procedures for local administration and enforcement.

This guidance focuses on compliance with energy code requirements in Texas for insulating the air conditioning ducts in unconditioned attics and on alternative methods of achieving equal or better energy performance, assuming all other code requirements have been satisfied prior to addressing equipment efficiency and duct insulation levels. Options shown in the following table are briefly described below.

Prior to Jan. 23, 2006	On/After Jan. 23, 2006
SEER 10/R-8, R-4	SEER 13/R-8, R-4
SEER 12/R-6, R-6	SEER 14/R-6, R-6
IECC Chapter 4 Systems Analysis, SEER 10	Energy Star (see below)
IRC Chapter 11, where applicable, SEER 10 or higher , prescriptive requirements	SEER 13/R-6, R-6/ and improved windows
	IECC Chapter 4 Systems Analysis, SEER 13
	SEER 10 or higher (mfd. before 1/23/06) /R-8, R-4 (no trade-offs)
	IRC Chapter 11, where applicable, SEER 10 or higher (mfd. before 1/23/06) or SEER 13, prescriptive requirements.

The codes being referenced are the International Residential Code (IRC) and International Energy Conservation Code (IECC) 2000 editions as modified by the 2001 Supplement published in March 2001 . Unless the IRC is expressly noted, these options relate to the 2001 IECC.

SEER 13/R-8, R-4:

For air conditioners, SEER 13 (and HSPF 7.7, if applicable) with R-8 insulation on supply ducts and R-4 on return ducts meet energy code requirements.

SEER 14/R-6, R-6:

A SEER 14/R-6 Trade-Off (and HSPF 7.7 for heat pumps, if applicable) will be allowed as an alternative compliance approach, with the following restrictions, based on analysis of the energy impact by the ESL.

A) For Gas or Electric Heating Systems:

- 1) For heating-degree-days (HDDs) less than 3,000 HDDs, the SEER14/R6 Trade-Off.
- 2) For heating-degree-days (HDDs) greater than or equal to 3,000 HDDs, the SEER14/R6 Trade-Off may be used if the heating system, other than electric resistance heating, has an AFUE rating greater than or equal to 80%.

Note: The SEER14/R-6 Trade-Off may not be used if the primary heating system uses electric resistance heating.

B) For Heat Pump Heating Systems:

- 1) For heating-degree-days (HDDs) less than 3,000 HDDs, the SEER14/R-6 Trade-Off may be used if the heat pump has an HSPF rating greater than or equal to 7.7.
- 2) For heating-degree-days (HDDs) greater than or equal to 3,000 HDDs, the SEER14/R-6 Trade-Off may be used if the heat pump has an HSPF rating greater than or equal to 7.9.

Energy Star:

The Energy Systems Laboratory does not make compliance determinations concerning the Environmental Protection Agency's (EPA) Energy Star Program. Texas Health & Safety Code Section 388.003(i) provides that the EPA's Energy Star Program certification of energy code compliance equivalence is considered evidence of compliance under Texas law.

SEER 13/R-6, R-6 and improved windows:

R-6 insulation on both supply and return may be used in combination with a SEER 13 air conditioner and windows that exceed the base code prescriptive requirements by achieving labeled U-factors and solar heat gain coefficients (SHGC) at or below those in the following table.

Climate Zone	HDD	Maximum U-factor			Max. SHGC	Min. Duct Insul. Supply	Min. Duct Insul. Return
		WWR ≤15%	WWR ≤20%	WWR ≤25%			
2	500-999	0.81	0.68	0.59	0.32	R-6	R-6
3	1,000-1,499	0.68	0.63	0.50	0.32	R-6	R-6
4	1,500-1,999	0.68	0.54	0.47	0.32	R-6	R-6
5	2,000-2,499	0.59	0.47	0.45	0.40	R-6	R-6
6	2,500-2,999	0.54	0.45	0.41	0.40	R-6	R-6
7	3,000-3,499	0.49	0.41	0.40	0.40	R-6	R-6
8	3,500-3-999	0.45	0.38	0.37	NR	R-6	R-6
9	4,000-4,499	0.41	0.33	0.33	NR	R-6	R-6

IECC Chapter 4 Systems Analysis:

Any "proposed design" (no prescriptive limits on components) may demonstrate compliance by a systems analysis that meets the criteria in Chapter 4 of the 2000 IECC with 2001 Supplement. The inputs for the "standard design" should include a SEER 13 air conditioner, and meet all other prescriptive requirements of the IECC. If a heat pump is used, the HSPF in the standard design must be 7.7. The analysis shall state in its output report: "this home meets the annual energy consumption requirements of Chapter 4 of the 2001 International Energy Conservation Code based on _____ Heating Degree Days."

SEER 10 or higher (manufactured before 1/23/06)/R-8, R-4:

SEER 10 or higher air conditioners and HSPF 6.8 or higher heat pumps which meet the NAECA standards in effect at the time of manufacture may continue to be used in prescriptive compliance approaches. Pursuant to the DOE notice of December 20, 2005 no Trade-Offs are allowed with this option.

IRC Chapter 11, where applicable, SEER 10 or higher (mfd. before 1/23/06) or SEER 13, with prescriptive duct insulation requirements.

Meeting the requirements of the 2000 International Residential Code with the 2001 supplement, Chapter 11, for buildings with glazing area that does not exceed 15 percent of the gross area of exterior wall, provides compliance using a SEER 13/HSPF 7.7 or higher or SEER 10 or higher (manufactured before 1-23-2006).

"All portions of the air distribution system shall be installed in accordance with Section M1601 and be insulated to an installed R-5 when system components are located within the building but outside of conditioned space, and R-8 when located outside of the building. When located within a building envelope assembly, at least R-8 shall be applied between the duct and that portion of the assembly furthest from conditioned space."

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