

To: PIMA Members
From: Chris Mathis – Mathis Consulting Company
Date: January 8, 2008
Subject: New Roof and Wall Insulation Values in ASHRAE Standard 90.1

Executive Summary

The energy efficiency community and all PIMA members got an early Christmas present on December 18, 2007. On that date the proposed new insulating values for commercial roofs and walls were finally fully approved by ASHRAE and ANSI.

While I have previously reported on these activities, I felt that it would be valuable to restate what this means to PIMA members and to provide you with the exact reference materials you will need to help convey this important change regarding the nation's model commercial building code.

The attached file is the official ASHRAE publication of the approved "addenda" to Standard 90.1-2004, named "as" and "at". The new insulation values are published in "as" and new fenestration tables are published in "at". You will note that the files show the official changes to the Standard in strikeout and underline form (for clarity in documenting the change.) I have also summarized the insulation changes in the tables included at the end of this memo.

These increased roof and wall insulation values apply to all commercial and high-rise residential buildings covered by Standard 90.1. These changes now become a part of the newest edition of the Standard – 90.1-2007.

What Does This Mean? What Can We Say?

The primary meaning of these changes for PIMA members is this:

The minimum prescriptive R-value for above deck roof insulation has gone from R-15 to R-20 in every climate zone from the southernmost tip of Texas to the Canadian border. A 33.3% increase. Everywhere.

Now the real work begins.

We must immediately move to modify all of our architect and specifier training messages to reflect these new minimums. We've already modified the "recommended values" on the PIMA website to be higher than these minimums. We have modified our AIA presentation materials to reflect these new minimums. PIMA members should immediately modify all company-specific energy code training materials to reflect these new minimum values.

We must also remember that these are the prescriptive values. An architect or engineer can choose to take the "performance path" of code compliance and may elect to use other techniques to meet the energy code performance targets. But for those seeking a simple prescriptive recipe, R-20 is now the minimum. Not the best. The minimum.

We are planning to help ASHRAE and the efficiency community tout these new efficiency improvements over the coming months. ASHRAE is now in the process of trying to raise the efficiency bar in its Standard 90.1 to be 30% more efficient than the 2004 version of the Standard. These new insulation levels are just the first in a series of steps toward that goal. Already ASHRAE is working on new envelope, fenestration, lighting and equipment provisions designed to achieve 30% savings by 2010!

Here are some fact-based sound bites that we can immediately share with architects, specifiers, owners, developer and other strategic partners.

1. ASHRAE has set aggressive goals for improved energy conservation in the nation's energy performance standard for commercial buildings – targeting a 30% improvement in efficiency for the 2010 version of the standard.
2. One of its first steps toward achieving this 30% savings was to increase the insulation levels in all walls and roofs for commercial and high-rise residential buildings covered by the Standard.
3. These new values are in the 2007 version of the Standard.
4. Design professionals and specifiers should be aware of these new insulation levels as the new minimum values – regardless of what version of the Standard is referenced in their state.
5. ASHRAE will seek to update the reference from 90.1-2004 to 90.1-2007 into the ICC's 2009 version of the International Energy Conservation Code.
6. Projects where LEED designation (or other Beyond Code certification) is being sought should immediately be re-evaluated against these new higher efficiency minimums to ensure meeting the project's beyond code efficiency objectives. Those projects using the 2004 version of the Standard as their base are now referencing an outdated version of the nation's model energy code for commercial buildings.
7. All green building programs should immediately embrace these new values and establish new targets for energy performance.
8. All computer programs used for building energy simulations should be immediately updated to show these new minimum insulation values for walls and roofs.
9. The prescriptive insulation levels shown in the Standard have been increased across the board – adding an additional R-5 for above-deck commercial roof insulation everywhere except Miami and the north slope of Alaska.
10. There are similar increases in the prescriptive amounts of continuous insulation for mass walls everywhere north of Miami.
11. There are additional amounts of insulation required for all semi-heated spaces (warehouses, manufacturing facilities, etc.)
12. Wall insulation values have also increased in climate Zones 3-8.

Again, I have included abbreviated versions of the new tables in this memo and also attached the official ASHRAE publication of the newly approved changes to Standard 90.1-2007.

If you would like to see ALL of the changes to Standard 90.1 (lighting, equipment, etc.) go to:

<http://www.ashrae.org/technology/page/132>

About two-thirds of the way down you will see all of the approved changes for 2007.

Happy New Year!

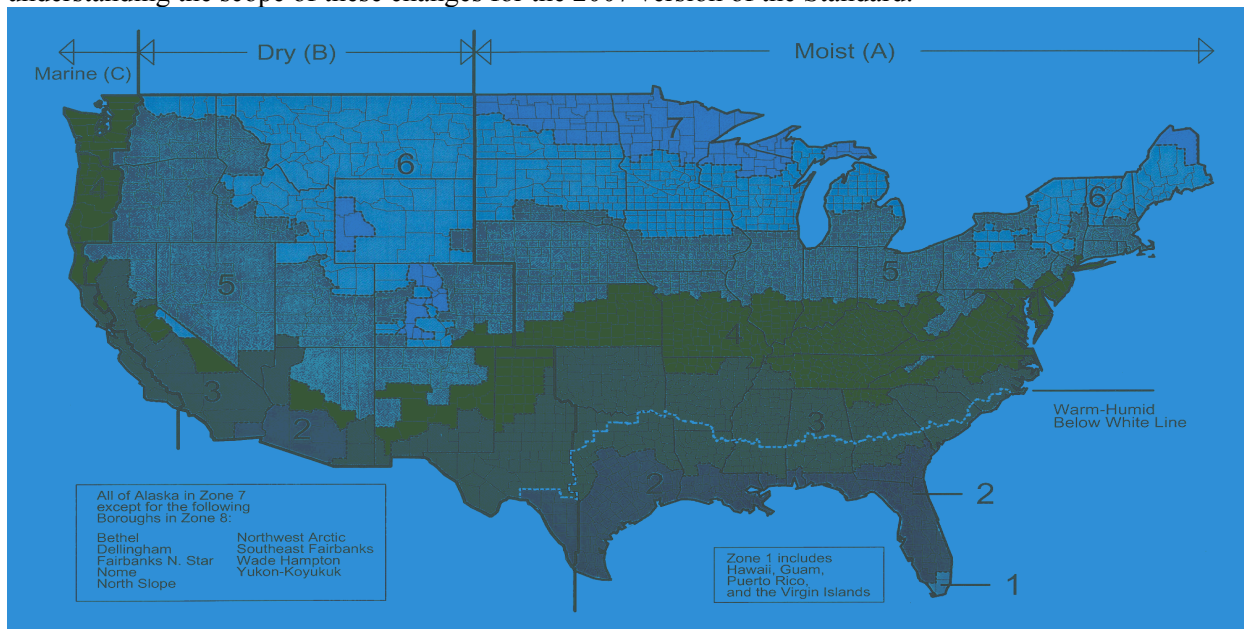
Respectfully submitted,
R. Christopher Mathis

Background and Abbreviated Tables:

ASHRAE Standard 90.1-2004 is the current energy code reference in the International Building Code (IBC) and the International Energy Conservation Code (IECC). As such, this standard defines code minimums for the classes of constructions covered. The ASHRAE Standard addresses building envelope and system requirements for commercial buildings, residential buildings higher than three stories, and semi-conditioned buildings (warehouses, etc.). It is the nation's model standard for establishing the energy performance requirements of these building types.

The energy code has multiple compliance paths – from the simple, prescriptive compliance approach (checklist) to complex building energy simulations (performance-based compliance). The prescriptive changes establish a new efficiency bar for those seeking to use the more complicated energy simulation tools.

The changes are climate zone and building type specific. The map below (from the code) will aid in understanding the scope of these changes for the 2007 version of the Standard.



The tables below show the new prescriptive insulation minimums in Standard 90.1. A few reminders:

1. **New minimum roof and wall R-values are shown in bold red. Every bold red value shown is a change from the previous version of the Standard.**
2. Where there are no specific roof, attic or wall insulation requirements in the Standard the table below shows “NR” for “No Requirement”.
3. R-values listed in the Tables are minimum required R-values.
4. “ci” means “Continuous Insulation required”, such as with insulating sheathing. Other insulation values can mean cavity fills, etc.
5. These tables are abbreviated versions of the entire ASHRAE Standard tables, showing only the approved insulation R-value changes for attics and above-grade walls. There are also proposed changes for below-grade walls and foundations as well.
6. **Metal building roofs and walls are currently under consideration by ASHRAE and new proposals are being heard at the January ASHRAE meetings in two weeks. Values shown here are expected to also change, but are not yet approved.**

**1. Approved Building Envelope Changes For Climate Zone 1 (essentially Miami)
(Abbreviated Version of ASHRAE Table 5.5-1)**

	Opaque Elements	Non-residential 2007	Residential 2007	Semi-heated 2007
Roofs				
	Insulation Entirely Above Deck	R-15ci	R-20ci	R-3.8ci
	Metal Buildings	R-19	R-19	R-6
	Attic and Other	R-30	R-38	R-13
Walls, Above Grade				
	Mass	NR	R-5.7ci	NR
	Metal Buildings	R-13	R-13	R-13
	Steel Framed	R-13	R-13	NR
	Wood Framed and Other	R-13	R-13	NR

**2. Approved Building Envelope Changes For Climate Zone 2 (primarily the Gulf Coast)
(Abbreviated Version of ASHRAE Table 5.5-2)**

	Opaque Elements	Non-residential 2007	Residential 2007	Semi-heated 2007
Roofs				
	Insulation Entirely Above Deck	R-20ci	R-20ci	R-3.8ci
	Metal Buildings	R-19	R-19	R-10
	Attic and Other	R-38	R-38	R-13
Walls, Above Grade				
	Mass	R-5.7ci	R-7.6ci	NR
	Metal Buildings	R-13	R-13	R-13
	Steel Framed	R-13	R-13 + R-7.5ci	R-13
	Wood Framed and Other	R-13	R-13	R-13

**3. Approved Building Envelope Changes For Climate Zone 3 (Southeast, most of CA)
(Abbreviated Version of ASHRAE Table 5.5-3)**

	Opaque Elements	Non-residential 2007	Residential 2007	Semi-heated 2007
Roofs				
	Insulation Entirely Above Deck	R-20ci	R-20ci	R-5ci
	Metal Buildings	R-19	R-19	NC
	Attic and Other	R-38	R-38	R-19
Walls, Above Grade				
	Mass	R-7.6ci	R-9.5ci	NR
	Metal Buildings	R-13	R-13 + R-13	R-13
	Steel Framed	R-13 + R-3.8ci	R-13 + R-7.5ci	R-13
	Wood Framed and Other	R-13	R-13	R-13

**4. Approved Building Envelope Changes For Climate Zone 4 (VA, St. Louis, etc.)
(Abbreviated Version of ASHRAE Table 5.5-4)**

	Opaque Elements	Non-residential 2007	Residential 2007	Semi-heated 2007
Roofs				
	Insulation Entirely Above Deck	R-20ci	R-20ci	R-5ci
	Metal Buildings	R-19	R-13 + R-13	R-10
	Attic and Other	R-38	R-38	R-19
Walls, Above Grade				
	Mass	R-9.5ci	R-11.4ci	NR
	Metal Buildings	R-13 + R-13	R-13 + R-13	R-13
	Steel Framed	R-13 + R-7.5ci	R-13 + R-7.5ci	R-13
	Wood Framed and Other	R-13	R-13 + R-3.8ci	R-13

**5. Approved Building Envelope Changes For Climate Zone 5 (up to Chicago)
(Abbreviated Version of ASHRAE Table 5.5-5)**

	Opaque Elements	Non-residential 2007	Residential 2007	Semi-heated 2007
Roofs				
	Insulation Entirely Above Deck	R-20ci	R-20ci	R-7.6ci
	Metal Buildings	R-13 + R-13	R-13 + R-13	R-13
	Attic and Other	R-38	R-38	R-19
Walls, Above Grade				
	Mass	R-11.4ci	R-13.3ci	R-5.7ci
	Metal Buildings	R-13 + R-13	R-13 + R-13	R-13
	Steel Framed	R-13 + R-7.5ci	R-13 + R-7.5ci	R-13
	Wood Framed and Other	R-13 + R-3.8ci	R-13 + R-7.5ci	R-13

**6. Approved Building Envelope Changes For Climate Zone 6 (Minneapolis, Maine)
(Abbreviated Version of ASHRAE Table 5.5-6)**

	Opaque Elements	Non-residential 2007	Residential 2007	Semi-heated 2007
Roofs				
	Insulation Entirely Above Deck	R-20ci	R-20ci	R-10ci
	Metal Buildings	R-13 + R-19	R-13 + R-19	R-16
	Attic and Other	R-38	R-38	R-30
Walls, Above Grade				
	Mass	R-13.3ci	R-15.2ci	R-5.7ci
	Metal Buildings	R-13 + R-13	R-13 + R-13	R-13
	Steel Framed	R-13 + R-7.5ci	R-13 + R-7.5ci	R-13
	Wood Framed and Other	R-13 + R-7.5ci	R-13 + R-7.5ci	R-13

**7. Approved Building Envelope Changes For Climate Zone 7 (Northern MN, Canada)
(Abbreviated ASHRAE Table 5.5-7)**

	Opaque Elements	Non-residential 2007	Residential 2007	Semi-heated 2007
Roofs				
	Insulation Entirely Above Deck	R-20ci	R-20ci	R-10ci
	Metal Buildings	R-13 + R-19	R-13 + R-19	R-16
	Attic and Other	R-38	R-38	R-30
Walls, Above Grade				
	Mass	R-15.2ci	R-15.2ci	R-7.6ci
	Metal Buildings	R-13 + R-13	R-13 + R-13	R-13
	Steel Framed	R-13 + R-7.5ci	R-13 + R-15.6ci	R-13
	Wood Framed and Other	R-13 + R-7.5ci	R-13 + R-7.5ci	R-13

**8. Approved Building Envelope Changes For Climate Zone 8 (Northern Alaska)
(Abbreviated Version of ASHRAE Table 5.5-8)**

	Opaque Elements	Non-residential 2007	Residential 2007	Semi-heated 2007
Roofs				
	Insulation Entirely Above Deck	R-20ci	R-20ci	R-15ci
	Metal Buildings	R-16 + R-19	R-13 + R-19	R-19
	Attic and Other	R-49	R-49	R-30
Walls, Above Grade				
	Mass	R-15.2ci	R-25ci	R-9.5ci
	Metal Buildings	R-13 + R-13	R-13 + R-16	R-13
	Steel Framed	R-13 + R-7.5ci	R-13 + R-18.8ci	R-13 + R-3.8ci
	Wood Framed and Other	R-13 + R-15.6ci	R-13 + R-15.6ci	R-13