

## ***Supplemental Information***

1. **Comparisons of energy conservation savings** between the 2009 Albuquerque Energy Conservation Code (09-AECC) and the 2009 International Energy Conservation Code (09-IECC that was recently adopted by the State of NM.)
  - a. See **Attachment A** with comparisons between the two codes in major categories.

The 09-AECC was a revision of the 07-AECC that was challenged in court due to HVAC requirements which violated national standards. The Energy Conservation efficiencies in the 07-AECC were modeled by a third-party, private-sector company. In the 09-AECC, the HVAC requirements were rolled back to base 06-IECC standards, and the energy efficiencies were supposedly made up primarily in the envelope (more insulation) and in the lighting standards (10% lower than the 06-IECC).

**NOTE: No third-party, private sector modeling was done on the 09-AECC. Hence, there is no third-party verification that the 09-AECC achieves a 30% improvement over base 06-IECC.**

**Talking Point:** It is the consensus of engineers, contractors and architects who reviewed the attached comparisons, that 09-AECC and 09-IECC are comparable in terms of energy conservation savings for commercial buildings.

**In addition**, by adopting the most recent version of the IECC (09-IECC) rather than continuing to use the 09-AECC (which is based on the outdated 06-IECC), contractors, engineers, and owners are allowed to take advantage of the increases in efficiency, updates, clarifications, and lessons learned since the 2006 IECC was published.

### **Examples:**

- 09-IECC has higher energy saving requirements in terms of **Air Conditioner Efficiency** (i.e. a 13 SEER as opposed to a 10 SEER).
- 09-AECC has higher requirements in terms of some types of insulation, but not significantly higher (i.e. **Roof Insulation:** R-25 insulation in the 09-AECC vs. R-20 in the 09-IECC).
- 09-AECC has more stringent requirements in terms of **Interior Lighting Power Allowances** (10% less than 06-IECC for all buildings types, all sizes). However, it should be noted that this blanket requirement has caused problems in terms of specific needs for certain types of buildings such as medical facilities and areas needing security video coverage. The result is that supplemental task lighting is often added which negates some of the energy savings.
- In terms of **Gas Furnace Efficiency** and **Water Heater Efficiency**, the two codes are the same.
- For **metal framed construction** the 09-AECC requires a wall construction with R19 batt insulation with 5" continuous insulation on the exterior. The 2009 IECC allows a wall construction of R13 batt with 7.5" of continuous insulation, resulting in a wall insulation system that is comparable in terms of energy conservation savings.

**COMPARATIVE ANALYSIS OF 2009 ALBUQUERQUE ENERGY CONSERVATION  
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**BUILDING ENVELOPE - PRESCRIPTIVE**

**Wall Insulation**

2009 Albuquerque Energy Conservation Code:

- R-21 (wood studs)
- R-19 + R-5 c.i. (steel studs)
- R-12.5 c.i. (Mass Wall)

2009 International Energy Conservation Code:

- R-13 (wood studs)
- R-13 + R-7.5 c.i. (steel studs)
- R-9.5 c.i. (Mass Wall)

**Roof Insulation**

2009 Albuquerque Energy Conservation Code:

- R-38 (insulation in attic)
- R-25 (insulation entirely above roof deck)

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- R-20 (insulation entirely above roof deck)

**Roof Reflectance**

2009 Albuquerque Energy Conservation Code:

- 0.65 (low slope roofs, initial reflectance)
- 0.25 (steep slope roofs, initial reflectance)

2009 International Energy Conservation Code:

- No requirement

**Vertical Glazing – Thermal Transmittance**

2009 Albuquerque Energy Conservation Code:

- Maximum U-factor = 0.42

2009 International Energy Conservation Code:

- Maximum U-factor = 0.50

**Vertical Glazing – Solar Heat Gain Coefficient (SHGC)**

2009 Albuquerque Energy Conservation Code:

- Maximum SHGC = 0.38

2009 International Energy Conservation Code:

- No requirement if  $PF > 0.25$
- Maximum SHGC = 0.40 if  $PF < 0.25$

### **Vertical Glazing – Projection Factor (PF)**

2009 Albuquerque Energy Conservation Code:

- Minimum PF = 0.5 (S, E, & W orientations)

2009 International Energy Conservation Code:

- No requirement

### **Reflectance of Interior Surface**

2009 Albuquerque Energy Conservation Code:

- Minimum ceiling reflectance = 70%
- Minimum ceiling reflectance – exposed ducts/structure = 80%
- Minimum wall reflectance – above 7 ft. = 70%
- Minimum wall reflectance – below 7 ft. = 50%

2009 International Energy Conservation Code:

- No requirement

## **MECHANICAL SYSTEMS AND WATER HEATING - PRESCRIPTIVE**

### **Gas Furnace Efficiency**

2009 Albuquerque Energy Conservation Code:

- No amended requirement (defaults to 2006 International Energy Conservation Code)
- Electric-resistance heating systems prohibited (with exceptions)
- (2006 International Energy Conservation Code:  
78% AFUE < 225,000 Btu/h < 225,000 Btu/h (defaults to NAECA)
- National Appliance Energy Conservation Act (NAECA):  
80% AFUE < 225,000 Btu/h

2009 International Energy Conservation Code:

- 78% AFUE < 225,000 Btu/h
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### **Air Conditioner Efficiency**

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- 2006 International Energy Conservation Code:  
10 SEER < 65,000 Btu/h (defaults to NAECA)

2009 International Energy Conservation Code:

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**Water Heater Efficiency**

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**ELECTRICAL LIGHTING - PRESCRIPTIVE**

**Interior Lighting Power Allowances**

2009 Albuquerque Energy Conservation Code:

- 10% less than 2006 International Energy Conservation Code (all building types, all sizes)

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**Occupancy Sensor Controls**

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- Required in most rooms of all building types and sizes

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- No similar requirement

**Daylight Harvesting**

2009 Albuquerque Energy Conservation Code:

- Required in factories and warehouses > 8,000 sf. -5% of gross roof area

2009 International Energy Conservation Code:

- No requirement

**TOTAL BUILDING PERFORMANCE**

**2009 Albuquerque Energy Conservation Code**

- Required improvement over baseline: 30% **(No energy conservation modeling done to support this percentage.)**
- Baseline: 2006 International Energy Conservation Code

**2. Comparison of construction costs between the 09-AECC and the 09-IECC for two model buildings.**

- a. See **Attachment B** with breakdown of costs for each of the codes for two model buildings.

Local contractors, engineers and architects created a construction cost comparison on 2 hypothetical commercial buildings, using both the 09-AECC and the 09-IECC. Even though the energy conservation savings are comparable between the two codes, the cost comparison reveals significant differences in costs to build to the 2 codes.

A 25,000 square-foot warehouse, costs **\$91,180.54 more to build on the 09-AECC** than on the 09-IECC. A 25,000 square-foot office building costs **\$160,727.94 more to build on the 09-AECC** than the 09-IECC. This has significant implications for job creation and competitiveness with surrounding municipalities.

A 25,000 square-foot warehouse or factory, using a Concrete Tilt or a CMU (Mass Wall)

**Total Increased Cost** of the 09-AECC over the 09-IECC: **\$91,180.54**  
**Per Square Foot Increase** **\$ 3.65**

A 25,000 square-foot office building, steel framed

**Total Increase Cost** of the 09-AECC over the 09-IECC: **\$160,727.94**  
**Per Square Foot Increase** **\$ 6.43**

These costs are compounded when looked at in terms of a typical 10-year lease agreement in which a standard 2 cent increase, per square foot, is added for each year of the agreement. If the AECC-09 costs are used as the baseline, the following **additional costs** would accrue to the business leasee:

Year	Lease Annually PSF \$	Lease Annually Total \$
1	0.64	\$16,073
2	0.66	\$16,555
3	0.68	\$17,052
4	0.70	\$17,563
5	0.72	\$18,090
6	0.75	\$18,633
7	0.77	\$19,192
8	0.79	\$19,768
9	0.81	\$20,361
10	0.84	\$20,971
<b>Ten Year Sum</b>		<b>\$184,257</b>

### 3. Problems inherent in the 09-AECC.

The development of the International Codes is an intensive, in-depth process that includes thousands of professionals from a variety of disciplines including civil, mechanical, and electrical engineers, architects, contractors and manufacturers.

In the 09-AECC, the City of Albuquerque attempted to increase energy conservation savings by adding requirements to the 2006 International Energy Conservation Code, but without going through this extensive vetting process by outside professionals and without performing any third-party modeling of the enhanced requirements.

The resulting code contains significant problems, both in terms of costs, availability of product, and other unintended consequences. The following examples illustrate a few of these problems.

#### **Vertical Glazing – Projection Factor (PF)**

In essence, this mandate requires that a window be recessed into the building or a canopy placed above it, based on  $\frac{1}{2}$  the vertical size of the window. So, as in retail buildings, in which an average window is 9 feet tall, the window would have to be recessed into the wall  $4\frac{1}{2}$  feet or a  $4\frac{1}{2}$  foot permanent canopy be placed above the window.

This adds significantly to the cost in both new construction and in remodels, and is a design problem for typical southwestern construction, as well as limiting other design solutions in achieving energy savings.

In terms of most building types with tall windows typical for good day-lighting, this could result in overhangs over 3' deep over all windows, which is a cost issue, structural issue, and aesthetic issue.

#### **Electrical Lighting – Prescriptive**

*Table 505.6.2:*

The requirements are that parking lot lighting densities be 0.13 W/SF. This is not acceptable for any parking lot where there are requirements for video surveillance or other measures to control crime. For example, a lighting level of at least 1 foot-candle is required for video surveillance and it is common to design for 4 to 5 times that amount to actually achieve an overall average lighting level. Some retail facilities may require lighting levels as high as 15 – 40 foot-candles, which is estimated to approximately equate to lighting densities of about 0.5 – 2.0 W/SF.

Using watts / square foot is a very poor method for measurement of lighting for parking areas. This method could cause parking lots to have real bright spots and real dark spots. This causes visual problems with the human eye. Uniformity ratio is as important as foot candles (FC) when evaluating parking/roadway lighting.

Illuminating Engineering Society of North America (IESNA) recommended lighting levels in a high activity general parking and pedestrian area is .9 FC on the pavement with a 4:1 uniformity ratio. Two 140 watt LED light fixtures spaced 10 feet apart will produce .9 FC at a 4:1 uniformity ratio for an area of 1100 square feet. This equals .25 watts/square feet almost double the .13 Watts/square foot required by the 09-AECC. Meeting

the Albuquerque Code requirements would provide lighting at almost double the recommended uniformity ration or half of the recommended foot candles.

*Table 505.5.2:*

Most of the 09-AECC lighting requirements are too low. For instance, in the Code chart, schools are .9 watts per square foot which only gets about 30 foot-candles to a desk top surface, using the most efficient light fixtures and lamps on the market today. Children do not carry task lights to school, and learning will be impaired. The Society of Illumination Engineers advises 75 foot-candles in schools.

In addition, the 09-AECC code requires that hospitals have a lighting density of 1.1 watts/square foot. It is difficult to comply with other applicable health care recommendations, codes and standards for medical lighting, such as the North American Illuminating Engineering Society, and still comply with the 09-AECC requirements. Other lighting requirements for manufacturing areas are equally limiting, as well.

### **Reflectance of Interior Surfaces**

The concept is that you use less energy for lighting if the colors are more reflective but the application can not only be difficult or even impossible to document but can also be extremely limiting as to what materials can and can't be used.

Many products are installed using varied techniques. It is almost impossible to calculate a specific reflectivity on hand-applied stains or materials that vary in luster or intensity as part of an artistic application.

Some plan reviewers are requiring data on light reflectance of interior materials such as carpets but the information is not available from manufacturers. In the 09-AECC, flooring shall have a minimum reflectance of 20%. Flooring specifications do not provide LRV information and also some consideration should be taken to prevent glare.

These surface reflectance requirements virtually prohibit feature walls or walls with darker colors such as navy blue, burgundy or forest green. They also prohibit dark or black-colored ceilings. Exposed structure is often painted black to avoid the cost of putting in a ceiling. The light fixtures are mounted lower and provide down light. This design can comply with the mandated energy savings but would not be allowed by this prescriptive requirement.

In short, Reflectance has nothing to do with energy saving (watts / sq ft). It is a visual design element and visual comfort issue. Many materials such as flooring, wall coverings, etc. do not have published data for reflectance.

#### **4. Competiveness with surrounding cities and surrounding states.**

Albuquerque is one of the only cities in New Mexico that is not enforcing a base national code for energy conservation. The 09-AECC is not only more expensive in terms of construction of commercial buildings, but is also more problematic in terms of idiosyncratic mandates that are not scientifically supported, hinder the use of alternative energy-saving options, and require materials or equipment that are often hard or impossible to obtain.

Increased construction costs mandated by the 09-AECC makes Albuquerque uncompetitive with surrounding cities or even with unincorporated portions of Bernalillo County. In addition, the 09-AECC creates design problems for national and international companies that build to national standards and have accommodated their standard building design to abide by those standards. Due to corporate policies, they are often unable or unwilling to compromise those designs for one community. Retail stores, including grocery and drug stores, as well as chain restaurants are examples. Due to the downturn in the construction/development industry, we have not seen the true negative effect of this code on our economy and the creation of jobs.

Finally, in terms of the Southwest, the 09-AECC makes Albuquerque uncompetitive with surrounding states and cities. As of May 2011, only Utah, Austin, Phoenix, and the Transportation Department of Colorado had even passed the base 2009 International Energy Conservation Code. None of them added enhanced regulations. We expect other states to eventually adopt the base 09-IECC, but at this point, here is a snapshot of our competitors:

**AZ** -- State has officially adopted the 2006 IECC, but some of the small towns are still on the 2003 version. Tempe and Tucson are on the 2006.

**CO** -- State Transportation is on the 2009, but most of the municipalities are on the 2006, including Golden, Greeley, Littleton & Denver. Colorado Springs is on the 2003 IECC.

**TX** -- State Transportation is on the 2006, with Carrollton, Dallas & Irving complying. Houston & Lubbock are on the 2000 version of the IECC.

**UT** -- Entire state is on the 2009 IECC (base version, no additions).

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