



City of Austin Residential Energy Code

John Umphress
March 2016





Current Code

- Austin is currently under the 2012 IECC with local amendments aimed at a 10 – 15% improvement in efficiency
- Differences between published code and Austin's:
 - Opaque wall R/U
 - Lighting
 - Testing
 - Radiant barrier
- Austin allows limited envelope/mechanical tradeoff under Section 405



Net ZECH Task Force

- 2007 report set us on the path
- Developed the 2006 Austin Energy Code
- Made recommendations for subsequent code cycles
- Most of those recommendations have been incorporated into the code
- Anticipated improvements in space conditioning, water heating, appliance efficiency
- Worth noting – code has been built on the foundation of Austin Energy Green Building





2006 Austin Energy Code

Code Year	Measures
2006	Comprehensive Testing – Sampling allowed
	75% high efficacy lighting
	Roof radiant barrier or reflective roof
	R8 duct insulation
	MERV 6 AHU filter
	Water heater timers (electric)
	HVAC sizing





2009 Austin Energy Code

Code Year	Measures
2009	R15/R13+2 Opaque wall
	.30 SHGC/.51U fenestration
	Envelope metric changed
	Air barriers, attic bulkhead
	90% high efficacy lighting
	DWH piping insulation
	DWH circulation systems
	Sampling retained for MF





2012 Austin Energy Code

Code Year	Measures
2012	.25 SHGC/.40U fenestration
	Limited tradeoff of fenestration U and SEER
	HVAC system - 4 cfm/100sf CFA
	Envelope - 5ACH ₅₀
	Mechanical ventilation required
	Increase in Fed. efficiency minimums for space conditioning and water heating (4-15)



Comparison of Residential Requirements

Measure or Requirement	2012 Austin E Code	2015 IECC	2015 Austin E Code
Framed wall insulation	R15 or 13+2	R13	R19, 15+2, 13+3
Attic/roof insulation	R38	R38	R38
Floor insulation	R13	R13	R13
Fenestration U-factor	0.4	0.4	0.35
Window SHGC	0.25	0.25	0.25
Skylight SHGC	0.6	0.65	0.6
U-factor alternative	Yes	Yes	Yes
Allows higher fenestration U via averaging	Yes	Yes	Yes
Envelope leakage testing	5 ACH@50pa	5 ACH@50pa	5 ACH@50pa
Duct leakage testing	4cfm/100sqft CFA	4cfm/100sqft CFA	4cfm/100sqft CFA
Supply airflow verification	Yes	No	Yes
Pressure differential - bedrooms	Yes	No	Yes
Static pressure	Yes	No	Yes
Timers - Electric water heaters	Yes	No	Yes
Roof radiant barrier	Yes	No	Yes
High efficacy lighting	90%	75%	100%
Internet connected thermostat	No	No	Yes
Envelope-mechanical efficiency tradeoff - Sec. 405	Yes	No	Yes
Energy Rating Index (ERI) - Sec. 406	na	52	59





Envelope Performance

2012 Prescriptive Requirements

CLIMATE ZONE	FENESTRATION U-FACTOR ^b	SKYLIGHT U-FACTOR ^b	GLAZED FENESTRATION SHGC	CEILING R-VALUE	WOOD FRAME WALL R-VALUE	MASS WALL R-VALUE	FLOOR R-VALUE
2	.40	.60	0.25	38 ^d	15 or 13+2 ^{e,f,g}	4/6	13

2015 Prescriptive Requirements

CLIMATE ZONE	FENESTRATION U-FACTOR ^b	SKYLIGHT U-FACTOR ^b	GLAZED FENESTRATION SHGC	CEILING R-VALUE	WOOD FRAME WALL R-VALUE	MASS WALL R-VALUE	FLOOR R-VALUE
2	.35	.60	0.25	38 ^d	19, 15+2 or 13+5 ^{e,f,g}	4/6	13

- Many builders are at or beyond 2015 prescriptive requirements
- Can tradeoff to the 2012 prescriptive with modest increase in HVAC efficiency via performance approach
- Houses with more than 15% glazing to CFA will need to increase performance of windows and/or HVAC
- 2012 prescriptive requirements retained for existing construction





Water Heating

- Retain prohibition on electric where gas service is adjacent
- Some exceptions allowed
- Timers still required to shift demand
- Encourage higher efficiency units via Green Building



Energy Rating Index (ERI)

- New for the 2015 IECC – advanced by HERS raters, builders who wanted some means of trading off envelope and HVAC/water heating performance
- 2015 IECC set ERI at 52 for Climate Zone 2 – score of 59 was offered by LBA but rejected by ICC
- House Bill 1736 set ERI of 65 for CZ2, stepping down to 59 in 2022 – cities can adopt lower ERI
- San Antonio adopted a 59 in their 2015 code
- Still not an accurate method of determining ERI
- Small houses have difficulty achieving 65





For a 1200sqft 3 bedroom house . . .

- Added construction costs of approximately \$350
- Reduction in annual utility bills of between \$37 and \$72 depending on fuel type
- Reduction in peak demand of between .4 and .5 kW



City of Austin Commercial Energy Code

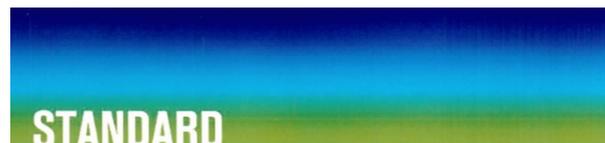
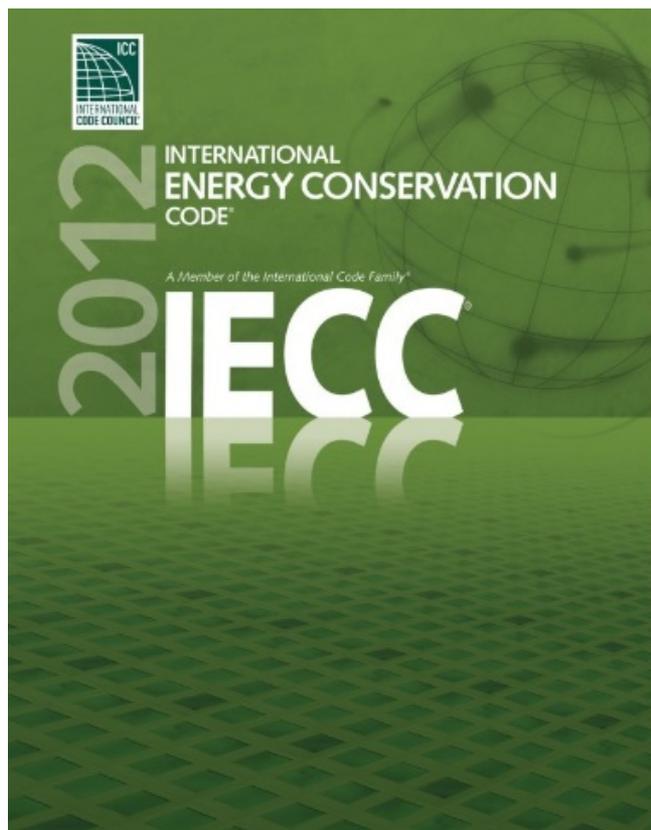
Michael Husted
March, 2016





Energy Code

- 1. Residential Section**
(single family and MF 4 stories and less)
- 2. Commercial Section**
(everything not included in the Residential Section)
 - a. International Energy Conservation Code (IECC)**
 - b. ASHRAE 90.1**



ANSI/ASHRAE/IES Standard 90.1-2010
 (Supersedes ANSI/ASHRAE/IESNA Standard 90.1-2007)
 Includes ANSI/ASHRAE/IES Addenda Listed in Appendix F

Energy Standard for Buildings Except Low-Rise Residential Buildings

I-P Edition

See Appendix F for approval dates by the ASHRAE Standards Committee, the ASHRAE Board of Directors, the IES Board of Directors, and the American National Standards Institute.

This standard is under continuous maintenance by a Standing Standard Project Committee (SSPC) for which the Standards Committee has established a documented program for regular publication of addenda or revisions, including procedures for timely, documented, consensus action on requests for change to any part of the standard. The change submittal form, instructions, and deadlines may be obtained in electronic form from the ASHRAE Web site (www.ashrae.org) or in paper form from the Manager of Standards. The latest edition of an ASHRAE Standard may be purchased from the ASHRAE Web site (www.ashrae.org) or from ASHRAE Customer Service, 1791 Tullie Circle, NE, Atlanta, GA 30329-2305. E-mail: orders@ashrae.org. Fax: 404-321-5478. Telephone: 404-636-8400 (worldwide), or toll free 1-800-527-4723 (for orders in US and Canada). For reprint permission, go to www.ashrae.org/permissions.

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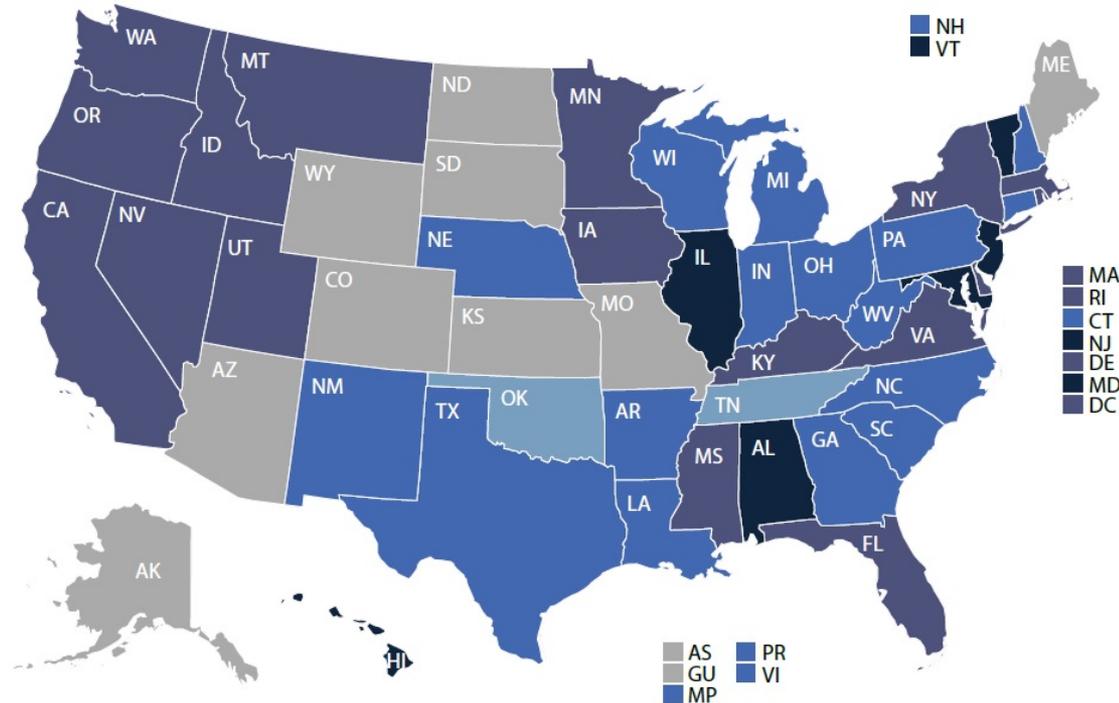


Illuminating
ENGINEERING SOCIETY



(Year) IECC = ASHRAE 90.1- (Two years prior)

COMMERCIAL



- Meets or exceeds ASHRAE Standard 90.1-2013 or equivalent (6)
- Meets or exceeds ASHRAE Standard 90.1-2010 or equivalent (18)
- Meets or exceeds ASHRAE Standard 90.1-2007 or equivalent (19)
- Meets or exceeds ASHRAE Standard 90.1-2004 or equivalent (2)
- No statewide code or predates ASHRAE Standard 90.1-2004 (11)

2015 IECC (black) becomes new TX State code, effective Nov. 1, 2016

Source: Building Codes Assistance Project



Current Commercial Energy Code

Why do we need an Energy Code?

Austin Climate Protection Plan (20070215-023) adopted

Feb, 2007

2009 Austin Generation Resource Planning Task Force created	Jun, 2009
2009 report from Austin Generation Task Force delivered	Nov, 2009
AE Res, Gen, and Climate Protection Plan to 2020 delivered	Apr, 2010
2010 Generation Plan amended to add more solar	Oct, 2013
Direction to develop climate resiliency strategies	Nov, 2013
2014 Austin Generation Resource Planning Task Force appointed	Apr, 2014

Update to the ACPP, community net-zero by 2050

Apr, 2014

Report from Austin Generation Task Force delivered	Jul, 2014
Austin to become leading city in the nation in GHG reductions	Aug, 2014
Direction to evaluate recommendations of the AGTF	Aug, 2014
Generation plan update to 2025 delivered	Dec, 2014

Adoption of Austin Community Climate Plan

Jun, 2015

Establishment of Joint Sustainability Committee	Aug, 2015
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Proposed Commercial Energy Code

Table ES.1. Summary of Cost-effectiveness Analysis

Prototype		Climate Zone and Location				
		2A Houston	3A Memphis	3B El Paso	4A Baltimore	5A Chicago
Life Cycle Cost Net Savings						
Small Office	Total	\$21,600	\$15,200	\$10,800	\$2,900	\$5,000
	\$/ft ²	\$3.93	\$2.76	\$1.96	\$0.53	\$0.91
Large Office	Total	\$740,000	\$1,650,000	\$2,540,000	\$300,000	\$1,340,000
	\$/ft ²	\$1.48	\$3.31	\$5.09	\$0.60	\$2.69
Standalone Retail	Total	\$84,000	\$81,400	\$53,800	\$67,000	\$79,000
	\$/ft ²	\$3.40	\$3.30	\$2.18	\$2.71	\$3.20
Primary School	Total	\$246,000	\$116,000	\$398,000	\$70,000	\$54,000
	\$/ft ²	\$3.33	\$1.57	\$5.38	\$0.95	\$0.73
Small Hotel	Total	\$96,410	\$76,000	\$78,000	\$62,600	\$57,000
	\$/ft ²	\$2.23	\$1.76	\$1.81	\$1.45	\$1.32
Mid-rise Apartment	Total	\$59,600	\$22,600	\$23,800	\$29,200	\$28,500
	\$/ft ²	\$1.77	\$0.67	\$0.71	\$0.87	\$0.84
Simple Payback (years)						
Small Office	Immediate	Immediate	Immediate	22.0	17.0	
Large Office	6.8	Immediate	Immediate	5.1	Immediate	
Standalone Retail	Immediate	Immediate	Immediate	Immediate	Immediate	
Primary School	5.5	9.5	0.6	14.3	15.6	
Small Hotel	3.9	4.1	4.0	7.2	8.7	
Mid-rise Apartment	1.9	11.7	11.4	7.2	9.7	
Scalar Ratio, Limit = 21.85						
Small Office	(4.9)	(2.8)	(6.3)	20.0	15.1	
Large Office	5.6	(44.7)	(53.7)	3.0	(86.8)	
Standalone Retail	(1.9)	(1.6)	(2.0)	4.2	3.8	
Primary School	5.1	11.1	(1.2)	15.3	16.7	
Small Hotel	3.8	4.5	4.4	7.5	8.9	
Mid-rise Apartment	2.2	11.3	11.1	7.0	9.5	

Source: PNNL Report: National Cost Effectiveness of ANSI/ASHRAE/IES Standard 90.1-2013



Amendments geared to consistency:

- **Roofing (using aged values)**
- **Windows and Subchapter E**



Local amendments advancing the energy code:

- **Overhead Door Shut-Off Devices**
- **Air Filtration**
- **Water Heater Timers**
- **Insulation Encapsulation**
- **Commissioning**



New amendments also advancing the energy code:

- **Demand response**
- **Appendix G for code compliance**
- **Solar ready**



Amendments to delete or improve language:

- **Automatic receptacle control**
- **Exterior lighting control**
- **Projection factor adjustment**



Solar Ready

John Umphress & Michael Husted
March, 2016



Objective:

To advance renewable energy generation through the reduction of physical barriers that might otherwise impede solar installations.

- Requires modest amount of clear roof area with good solar orientation
- Requires planning of plumbing vents, attic vents, other obstructions
- Rewards simple (affordable) roof designs
- Prewiring is not required
- Many homes currently comply





Requirements:

- Continuous, defined rooftop areas for solar arrays.
- Listing of roof structural design loads
- Wall space for inverters and metering equipment
- Reserved space in the electrical distribution system

Exceptions:

- Insufficient rooftop area
- Pitched roofs
- Small additions
- Roofs in the Downtown Network