



# FLORIDA SOLAR ENERGY CENTER

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A Research Institute of the University of Central Florida

## *Florida Building Energy Code Updates & 'Beyond Code' Advanced Building Energy Performance Standards*

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- ❖ Updated residential and commercial energy code compliance tools
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# *Florida Energy Code 2004*

- ❖ Chapter 13 of the Florida Building Code 2004, with supplement issued in 2006
- ❖ Sub-chapter 13-4: Commercial Buildings
- ❖ Chapter 11 or Sub-chapter 13-6: Residential Buildings
- ❖ Methods of Compliance:
  - Method A – Whole Building Performance Method
  - Method B – Building Envelope Trade-off Method
  - Method C – Buildings Prescriptive Envelope Method



# *Florida Energy Code 2007*

- ❖ Commercial code based on ASHRAE 90.1 2004
- ❖ Residential code overhauled completely – changed from multiplier method to normalized building loads and based on IECC 2006
  - Compliance calculated using an hourly annual simulation with the DOE-2 engine
- ❖ Ready for release, but shelved due to request from Governor for greater efficiency



## FL Energy Code 2007 changes: Highlights

CATEGORY	FLORIDA ENERGY CODE 2004	FLORIDA ENERGY CODE 2007
<b>Based on</b>	ASHRAE Standard 90.1 2001	ASHRAE Standard 90.1 2004
<b>Weather</b>	16 ASHRAE Climate zones (TMY2 weather data)	8 ASHRAE Climate zones (Zones 1, 2A,B cover Florida, TMY3 weather data)
<b>Envelope</b>	<p>Minimum prescriptive requirements based on ASHRAE 90.1 2001 (for eg.: Tampa)</p> <ul style="list-style-type: none"> <li>▪ metal building roof: <b>U-0.065</b></li> <li>▪ metal building wall: <b>U-0.113</b></li> <li>▪ steel-joint floor: <b>U-0.35</b></li> <li>▪ vertical fenestration (40-50% WWR): <b>U-1.22 / U-1.27 (fixed/operable), SHGC – 0.19 / SHGC – 0.47 (all / north)</b></li> </ul>	<p>Minimum prescriptive requirements based on ASHRAE 90.1 2004 (for eg.: Tampa)</p> <ul style="list-style-type: none"> <li>▪ metal building roof: <b>U-0.065</b></li> <li>▪ metal building wall: <b>U-0.113</b></li> <li>▪ steel-joint floor: <b>4-0.052</b></li> <li>▪ vertical fenestration (40-50% WWR): <b>U-1.22 / U-1.27 (fixed/operable), SHGC – 0.17 / SHGC – 0.44 (all / north)</b></li> </ul>
<b>HVAC System Components</b>	<ul style="list-style-type: none"> <li>▪ Air Conditioning System (Air Cooled, Single / Split, &lt; 65,000 Btu/h): <b>10 SEER</b></li> <li>▪ Heat Pump (Cooling mode, Single / Split, &lt; 65,000 Btu/h): <b>10 SEER</b></li> <li>▪ Heat Pump (Heating mode, Single / Split, &lt; 65,000 Btu/h): <b>6.8 / 6.6 HSPF</b></li> </ul>	<ul style="list-style-type: none"> <li>▪ Air Conditioning System (Air Cooled, Single / Split, &lt; 65,000 Btu/h): <b>13 SEER</b></li> <li>▪ Heat Pump (Cooling mode, Single / Split, &lt; 65,000 Btu/h): <b>13 SEER</b></li> <li>▪ Heat Pump (Heating mode, Single / Split, &lt; 65,000 Btu/h): <b>7.7 HSPF</b></li> <li>▪ Single packaged vertical A/C, Heat Pump (SPVAC, SPVHP). Cooling mode: <b>8.6 EER</b></li> <li>▪ SPVHP, heating mode: <b>2.7 COP</b></li> </ul>



## FL Energy Code 2007 changes: Highlights

CATEGORY	FLORIDA ENERGY CODE 2004	FLORIDA ENERGY CODE 2007
<b>Chillers</b>	<ul style="list-style-type: none"> <li>▪Centrifugal Chillers &lt; 150 tons: <b>COP<sub>std</sub> = 5.0, IPLV<sub>std</sub> = 5.25</b></li> <li>▪Centrifugal Chillers &gt;= 150 tons and &lt; 300 tons: <b>COP<sub>std</sub> = 5.55, IPLV<sub>std</sub> = 5.5</b></li> <li>▪Centrifugal Chillers &gt;= 300 tons: <b>COP<sub>std</sub> = 6.1, IPLV<sub>std</sub> = 6.40</b></li> </ul>	<ul style="list-style-type: none"> <li>▪Centrifugal Chillers &lt; 150 tons: <b>COP<sub>std</sub> = 5.0, IPLV<sub>std</sub> = 5.25</b></li> <li>▪Centrifugal Chillers &gt;= 150 tons and &lt; 300 tons: <b>COP<sub>std</sub> = 5.55, IPLV<sub>std</sub> = 5.5</b></li> <li>▪Centrifugal Chillers &gt;= 300 tons: <b>COP<sub>std</sub> = 6.1, IPLV<sub>std</sub> = 6.40</b></li> </ul>
<b>Air Distribution System</b>	<ul style="list-style-type: none"> <li>▪Minimum insulation levels as per 90.1 2001 (for example, building exterior: <b>R-8</b>)</li> </ul>	<ul style="list-style-type: none"> <li>▪Minimum insulation levels as per 90.1 2004 (for example, building exterior, supply / return duct: <b>R-6 / R-4.2</b>). New categories added</li> </ul>
<b>Lighting</b>	<ul style="list-style-type: none"> <li>▪Internal lighting: as per ASHRAE 90.1 2001</li> <li>▪External lighting: as per ASHRAE 90.1 2001</li> </ul>	<ul style="list-style-type: none"> <li>▪Internal lighting: as per ASHRAE 90.1 2004, some LPD's changed</li> <li>▪External lighting: as per ASHRAE 90.1 2001, significant new additions</li> </ul>



## *Proposed Florida Energy Code 2008*

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- ❖ The following was proposed for commercial:
  - Method A - compliance based on 85% baseline energy use as compared to the Florida commercial energy code 2007 baseline building
  - Method B - calculated using prescriptive multipliers
  - Method C - will not be applicable anymore
- ❖ The following is proposed for residential:
  - Method A - compliance based on 85% criterion
  - Method B - calculated using prescriptive multipliers
  - Method C - not applicable anymore



## *Proposed Commercial Code: Method B*

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Roof Absorptance	0.22
Roof U-value	0.027
Wall Absorptance	0.3
Wall R-value	13
Floor R-value	19
Window U-value	0.45
Window SHGC, North, 0-40% WWR Ratio	0.61
Window SHGC, North, 40-50% WWR Ratio	0.44
Window SHGC, All, 0-50% WWR Ratio	0.25
Overhang PF	0.5



## *Proposed Residential Code: Method B*

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- Windows: Max. U-0.65, SHGC 0.35, 16% GFA
- Walls: Frame R-13, Block R-6 interior insulation
- Ceilings: R-30
- Floors: R-13 raised floor; R-0 slab-on-grade
- Equipment efficiency: code minimums by equipment and fuel type
- Duct either in conditioned space or tested to be leak-free
- Programmable thermostat installed.



## *Advanced Building Performance Simulation Standards*

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- ❖ Buildings account for 40% of the nations energy use (72% electricity, 55% natural gas)\*
- ❖ Tremendous potential for cost savings using simulation tools and techniques
- ❖ Why do energy modeling and simulation?
  - Cost effective process that allows for informed decisions
  - Careful consideration of many possible component and system interactions

\* <http://eere.pnl.gov/building-technologies/>



# *Advanced Building Performance Simulation Standards*

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## ❖ Commercial Buildings:

- Florida Energy Code Compliance
- ASHRAE 90.1 Energy Code Compliance (2001, 2004)
- ASHRAE 90.1 Appendix G Performance Rating Method (2004, 2007)
  - Federal Commercial Tax Deductions (2006)
  - LEED (New Construction) 2.2

## ❖ Residential Buildings:

- Florida Energy Code Compliance
- HERS Rating (1999, 2006)
- LEED for Homes
- Federal Tax Rebates



## *Commercial Buildings: ASHRAE Standard 90.1*

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- ❖ Energy Standards for Buildings except Low Rise Residential Buildings from the American Society for Heating Refrigeration and Air Conditioning
- ❖ Latest edition: 2007
- ❖ 3 methods for energy code compliance, viz.
  - Prescriptive Compliance
  - Envelope Trade-off
  - Energy Cost Budget Method
- ❖ ECBM – Proposed vs Reference (Baseline) building models
- ❖ Appendix G – Performance Rating Method
  - $\% \text{ improvement} = (\text{Baseline performance} - \text{Proposed Performance}) / \text{Baseline Performance}$



## ASHRAE APPENDIX G – MODELING GUIDELINES

COMPONENT	PROPOSED BUILDING	REFERENCE BUILDING
<b>Design Model</b>	<ul style="list-style-type: none"> <li>▪ Simulation model consistent with design document</li> <li>▪ Include all end use load components</li> <li>▪ All conditioned spaces SHOULD be BOTH heated and cooled</li> <li>▪ Features yet-to-be-designed have to be similar to the baseline</li> <li>▪ Spaces that cannot be classified should default to ‘office‘</li> </ul>	<ul style="list-style-type: none"> <li>▪ Same number of floors and identical area as proposed design</li> </ul>
<b>Additions &amp; Alterations</b>	<p>Can exclude part of the existing building when:</p> <ul style="list-style-type: none"> <li>▪ Excluded parts are served by different HVAC systems</li> <li>▪ Design space temperatures and set points and schedules are same for both</li> </ul>	<ul style="list-style-type: none"> <li>▪ Same as proposed</li> </ul>
<b>Space Use Classification</b>	<ul style="list-style-type: none"> <li>▪ Mixed use buildings allowed</li> </ul>	<ul style="list-style-type: none"> <li>▪ Same as proposed</li> </ul>
<b>Schedules</b>	<ul style="list-style-type: none"> <li>▪ HVAC fan schedules – run continuously when occupied, cycle on – off when unoccupied, except:               <ul style="list-style-type: none"> <li>○ Heating or cooling in proposed absent, then fans cycle on-off for all hours</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>▪ Same as proposed, except:               <ul style="list-style-type: none"> <li>○ Modeling of non-standard efficiency measures (like natural ventilation, demand controlled ventilation, reduced service water heating loads)</li> </ul> </li> </ul>



## ASHRAE APPENDIX G – MODELING GUIDELINES

COMPONENT	PROPOSED BUILDING	REFERENCE BUILDING
<b>Building Envelope</b>	<p>All components should be modeled.            Exceptions:</p> <ul style="list-style-type: none"> <li>▪ All un-insulated assemblies to be modeled separately (projection balconies, concrete floor beams etc)</li> <li>▪ Exterior surfaces whose azimuth and tilt differ by less than 45° can be modeled as a single surface</li> <li>▪ Reflectance of 0.3 for exterior roofs.                Exception: use 0.45 if reflectance &gt; 0.7 and emittance &gt; 0.75</li> <li>▪ Manual shading cannot be modeled, only automatic and permanent shading devices can</li> </ul>	<ul style="list-style-type: none"> <li>▪ Same total gross area for walls, roofs, floors, doors, exposed slabs</li> <li>▪ Baseline building to be rotated in 4 orientations and results averaged</li> <li>▪ No shading allowed</li> <li>▪ Opaque assemblies should be lightweight and have:               <ul style="list-style-type: none"> <li>○ Roofs – insulation entirely above deck</li> <li>○ Above-grade walls – steel framed</li> <li>○ Floors – steel-joint</li> </ul> </li> <li>▪ Vertical fenestration limited to 40% of gross wall area (above-grade) and distributed uniformly</li> <li>▪ Skylights limited to 5% of gross roof area</li> <li>▪ Roof reflectivity limited to 0.30</li> </ul>
<b>Lighting</b>	<ul style="list-style-type: none"> <li>▪ Lighting as exists or as designed</li> <li>▪ If not designed, then use Building Area method to determine lighting</li> <li>▪ Include all lighting (including task)</li> <li>▪ Daylighting credit through schedule adjustment requires separate daylighting analysis</li> <li>▪ Automatic controls credit as per specifications</li> </ul>	<ul style="list-style-type: none"> <li>▪ Lighting power density and schedules as per mandatory requirements</li> <li>▪ No automatic controls need to be modeled</li> </ul>



## ASHRAE APPENDIX G – MODELING GUIDELINES

COMPONENT	PROPOSED BUILDING	REFERENCE BUILDING
<b>Thermal Blocks</b>	<ul style="list-style-type: none"> <li>▪ HVAC zones designed – each zone to be modeled as single thermal block. Exception:               <ul style="list-style-type: none"> <li>○ Space use classification is similar</li> <li>○ Orientation does not vary by more than 45° for all exterior zones</li> <li>○ Zones served by same or similar HVAC system</li> </ul> </li> <li>▪ HVAC zones not designed – thermal blocks based on similar internal loads. Separate thermal blocks for:               <ul style="list-style-type: none"> <li>○ Interior and perimeter zones</li> <li>○ Orientation difference of 45° or more</li> <li>○ Ground contact or ambient conditions exposure and zones with exterior roof assemblies</li> </ul> </li> <li>▪ Multifamily – One thermal block per living unit (can be combined if orientation is the same)</li> </ul>	<ul style="list-style-type: none"> <li>▪ Same as proposed</li> </ul>
<b>HVAC System</b>	<ul style="list-style-type: none"> <li>▪ HVAC system efficiencies should be similar to actual equipment used or as per rating</li> <li>▪ If no heating or cooling system used, then a heating or cooling system as required by the baseline should be used</li> </ul>	<ul style="list-style-type: none"> <li>▪ HVAC system should reflect the system map as specified</li> </ul>



## ASHRAE APPENDIX G - MODELING GUIDELINES

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<b>COMPONENT</b>	<b>PROPOSED BUILDING</b>	<b>REFERENCE BUILDING</b>
<b>Service Hot Water</b>	<ul style="list-style-type: none"><li>▪ Consistent with design documents</li><li>▪ When not specified, should be as per baseline with the same loads</li></ul>	<ul style="list-style-type: none"><li>▪ Same energy source as proposed</li><li>▪ If no system specified, electric resistance water heater should be used</li><li>▪ For combined space and service water systems in the proposed, separate systems should be used in the baseline</li></ul>
<b>Receptacle and other loads</b>	<ul style="list-style-type: none"><li>▪ All receptacle and process loads should be included in the proposed design model</li></ul>	<ul style="list-style-type: none"><li>▪ Same as proposed</li></ul>



# ASHRAE APPENDIX G – SYSTEM MAP

**TABLE G3.1.1A** *Baseline HVAC System Types*

Building Type	Fossil Fuel, Fossil/Electric Hybrid, & Purchased Heat	Electric and Other
Residential	System 1 – PTAC	System 2 - PTHP
Nonresidential & 3 Floors or Less & <75,000 ft <sup>2</sup>	System 3 – PSZ-AC	System 4 – PSZ-HP
Nonresidential & 4 or 5 Floors & <75,000 ft <sup>2</sup> or 5 Floors or Less & 75,000 ft <sup>2</sup> to 150,000 ft <sup>2</sup>	System 5 - Packaged VAV w/ Reheat	System 6 - Packaged VAV w/PFP Boxes
Nonresidential & More than 5 Floors or >150,000 ft <sup>2</sup>	System 7 - VAV w/Reheat	System 8 - VAV w/PFP Boxes

**Notes:**

Residential building types include dormitory, hotel, motel, and multifamily. Residential space types include guest rooms, living quarters, private living space, and sleeping quarters.

Other building and space types are considered nonresidential.

Where no heating system is to be provided or no heating energy source is specified, use the “Electric and Other” heating source classification.

Where attributes make a building eligible for more than one *baseline* system type, use the predominant condition to determine the system type for the entire building.

**TABLE G3.1.1B** *Baseline System Descriptions*

System No.	System Type	Fan Control	Cooling Type	Heating Type
1. PTAC	Packaged terminal air conditioner	Constant Volume	Direct Expansion	Hot Water Fossil Fuel Boiler
2. PTHP	Packaged terminal heat pump	Constant Volume	Direct Expansion	Electric Heat Pump
3. PSZ-AC	Packaged rooftop air conditioner	Constant Volume	Direct Expansion	Fossil Fuel Furnace
4. PSZ-HP	Packaged rooftop heat pump	Constant Volume	Direct Expansion	Electric Heat Pump
5. Packaged VAV w/ Reheat	Packaged rooftop variable air volume with reheat	VAV	Direct Expansion	Hot Water Fossil Fuel Boiler
6. Packaged VAV w/PFP Boxes	Packaged rooftop variable air volume with reheat	VAV	Direct Expansion	Electric Resistance
7. VAV w/Reheat	Packaged rooftop variable air volume with reheat	VAV	Chilled Water	Hot Water Fossil Fuel Boiler
8. VAV w/PFP Boxes	Variable air volume with reheat	VAV	Chilled Water	Electric Resistance



# ASHRAE APPENDIX G - MODELING GUIDELINES

## Fan Power Limitation

**TABLE G3.1.2.9 Baseline Fan Brake Horsepower**

Supply Air Volume	Baseline Fan Motor Brake Horsepower	
	Constant Volume Systems 1 – 4	Variable Volume Systems 5 – 8
<20,000 cfm	$17.25 + (\text{cfm} - 20000) \times 0.0008625$	$24 + (\text{cfm} - 20000) \times 0.0012$
$\geq 20,000$ cfm	$17.25 + (\text{cfm} - 20000) \times 0.000825$	$24 + (\text{cfm} - 20000) \times 0.001125$

## Automatic Lighting Controls Credit

**TABLE G3.2 Power Adjustment Percentages for Automatic Lighting Controls**

Automatic Control Device(s)	Non-24-hr and $\leq 5,000\text{ft}^2$	All Other
(1) Programmable timing control	10%	0%
(2) Occupancy sensor	15%	10%
(3) Occupancy sensor and programmable timing control	15%	10%

Note: The 5,000 ft<sup>2</sup> condition pertains to the total conditioned floor area of the building.



## *Commercial Buildings: LEED 2.2 (New Construction)*

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- ❖ Standards administered by the US Green Building Council (USGBC)
- ❖ LEED® – Leadership in Energy & Environmental Design:
  - “encourages and accelerates global adoption of sustainable green building and development practices through the creation and implementation of universally understood and accepted tools and performance criteria” – USGBC
- ❖ LEED for New Construction version 2.2



## *LEED (NC) 2.2*

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- ❖ Seeks to measure and rate all the following:
  - Sustainable sites (SS Credits)
  - Water Efficiency (WE Credits)
  - **Energy & Atmosphere (EA Credits)**
  - Materials and Resources (MR Credits)
  - Indoor Environmental Quality (EQ Credits)
  - Innovation & Design Process (ID Credits)
- ❖ EA Credit 1: Optimize Energy Performance



## *LEED (NC) 2.2 - EA Credit 1*

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- ❖ Intent: “Achieve increasing level of energy performance above the baseline to reduce environmental and economic impacts associated with excessive energy use” - USGBC
- ❖ 1-10 EA Credit 1 points available. A minimum of 2 points mandatory for registrations after June 26, 2007
- ❖ Methods:
  - Option 1: Whole Building Performance Simulation (1-10 Points)
  - Option 2: Prescriptive Compliance Path - ASHRAE Advanced Design Guides for Small Office Buildings (4 Points)
  - Option 3: Prescriptive Compliance Path - Advanced Buildings Core Performance Guides (2-5 Points)



## *LEED NC 2.2 EA Credit 1: Option 1*

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### ❖ Requirements:

- Must comply with the mandatory provisions in ASHRAE 90.1 2004
- Must include all the energy cost within and associated with the building project
- Must be compared against a baseline building that complies with Appendix G to Standard 90.1 2004
- Default process energy cost is 25% of total energy cost for baseline building. Process energy defined to include all office and general miscellaneous equipment, computers, elevators, kitchen cooking and refrigeration, laundry washing and drying etc.
- Additional requirements as per Appendix G – UNMET HOURS



## *LEED 2.2 EA Credit 1: Points Table*

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<b>New Construction</b>	<b>Existing Buildings</b>	<b>Points</b>
10.50%	3.50%	1
14%	7%	2
17.50%	10.50%	3
21%	14%	4
24.50%	17.50%	5
28%	21%	6
31.50%	24.50%	7
35%	28%	8
38.50%	31.50%	9
42%	35%	10



# LEED NC 2009

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- ❖ Intent: “Achieve increasing level of energy performance above the baseline to reduce environmental and economic impacts associated with excessive energy use” – USGBC
- ❖ **1-19** EA Credit 1 points available. No mandatory points requirement
- ❖ Methods:
  - Option 1: Whole Building Performance Simulation (1-19 Points)
  - Option 2: Prescriptive Compliance Path - ASHRAE Advanced Design Guides for Small Office Buildings (4 Points)
  - Option 3: Prescriptive Compliance Path - Advanced Buildings Core Performance Guides (2-5 Points)



# *LEED NC 2009 EA Credit 1: Option 1*

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## ❖ Requirements:

- Must comply with the mandatory provisions in ASHRAE 90.1 2007
- Must comply with EA Prerequisite 2 (10% improvement)
- Must include all the energy cost within and associated with the building project
- Must be compared against a baseline building that complies with Appendix G to Standard 90.1 2007
- Default process energy cost is 25% of total energy cost for baseline building. Process energy defined to include all office and general miscellaneous equipment, computers, elevators, kitchen cooking and refrigeration, laundry washing and drying etc.
- Additional requirements as per Appendix G - UNMET HOURS



## LEED 2009 EA Credit 1: Points Table

New Construction	Existing Buildings	Points
12%	8%	1
14%	10%	2
16%	12%	3
18%	14%	4
20%	16%	5
22%	18%	6
24%	20%	7
26%	22%	8
28%	24%	9
30%	26%	10
32%	28%	11

New Construction	Existing Buildings	Points
34%	30%	12
36%	32%	13
38%	34%	14
40%	36%	15
42%	38%	16
44%	40%	17
46%	42%	18
48%	44%	19



## *Federal Tax Deductions - Commercial Buildings*

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- ❖ Energy Policy Act (EPACT) 2005 – IRC Section 179D: Energy Efficient Commercial Buildings Deduction
- ❖ Tax DEDUCTION - not CREDIT
- ❖ Reduce total Energy & Cost by 50% in comparison to baseline building modeled using ASHRAE 90.1 2004 Appendix G Performance Rating Criteria
- ❖ Maximum deduction of \$1.80/sq. foot (50% reduction – total building energy and power cost)
- ❖ Partial Deduction of \$0.60/sq. foot (16 $\frac{2}{3}$ <sup>rd</sup>% reduction – lighting or systems or envelope)
- ❖ Interim lighting rule (25% to 40% reduction – deduction scales accordingly)
- ❖ Qualified Software – ASHRAE Standard 140
- ❖ Listing at:  
[www.eere.energy.gov/buildings/info/qualified\\_software](http://www.eere.energy.gov/buildings/info/qualified_software)



# Tax Deduction Modeling Requirements

## IRS Notice 2006-52 – Energy Policy Act 2005

		<b>FULL DEDUCTION</b>	<b>PARTIAL LIGHTING</b>	<b>PARTIAL HVAC &amp; SHW</b>	<b>PARTIAL ENVELOPE</b>
<b>ENVELOPE</b>	<b>Reference</b>	ASHRAE 90.1 2001 reference minimum	Reference Lighting	Reference HVAC & SHW	ASHRAE 90.1 2001 envelope compliance
	<b>Proposed</b>	Taxpayer's building	Taxpayer's building (min ASHRAE 90.1 2001 compliance)**	Taxpayer's building (min ASHRAE 90.1 2001 compliance) **	Taxpayer's building
<b>HVAC &amp; SHW</b>	<b>Reference</b>	ASHRAE 90.1 2001 reference minimum	Reference Lighting	ASHRAE 90.1 2001 HVAC & SHW compliance	Reference Envelope
	<b>Proposed</b>	Taxpayer's building	Taxpayer's building (min ASHRAE 90.1 2001 compliance) **	Taxpayer's building	Taxpayer's building (min ASHRAE 90.1 2001 compliance) **
<b>LIGHTING</b>	<b>Reference</b>	ASHRAE 90.1 2001 reference minimum	ASHRAE 90.1 2001 lighting compliance	Reference HVAC & SHW	Reference Envelope
	<b>Proposed</b>	Taxpayer's building	Taxpayer's building	Taxpayer's building (min ASHRAE 90.1 2001 compliance) **	Taxpayer's building (min ASHRAE 90.1 2001 compliance) **

\*\* ASHRAE 90.1 2001 requirements for corresponding components



## *Residential Buildings: Beyond Code*

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- ❖ Annual simulation, reference house IECC 2004
  - Federal Tax **Credits** for energy efficient homes
    - Envelope: 10% increase in efficiency
    - Systems: 50% increase in efficiency (no hot water)
    - Tax credit goes to home builder
    - Amount is \$2000 per home
- ❖ Home Energy Rating System (HERS) Index
  - LEED for Homes
    - Prescriptive compliance option
    - Whole building performance simulation (HERS 2006 index)
  - DOE Building Challenge
    - HERS index of 70 or lower (85 and lower qualifies for EnergyStar)



## *Commercial & Residential Compliance Tools*

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Short demo of updated Code  
Compliance tools..



*Thank you!*

*Questions?*