Major Texas Energy Code Changes (CZ3)
TexEnergy Solutions
August 30th, 2016
Goals for today

- To give an overview of the Energy Code changes coming to Texas per Texas State Law.
- Will focus on IRC and Residential provisions of IECC
Givens

  - Municipalities will make their own revisions but what and how is currently unknown
- Residential requirements of the 2015 IECC changed very little from 2012 IECC.
Givens

- Adoption of 2015 IRC / 2015 IECC & 2015 IMC (in combination) will require mechanical outside air ventilation systems be provided in all new homes.
- Requirements of the outside air dictated by mechanical code not energy code.
IECC Pathways

Currently (2009 IECC)
- Prescriptive
- Performance
- ENERGY STAR

As of Sept. 1 2016 (2015 IECC)
- Prescriptive
- Performance
- Energy Rating Index
- ENERGY STAR
IECC Pathways

Currently (2009 IECC)
- Prescriptive
- Performance
- ENERGY STAR

As of Sept. 1 2016 (2015 IECC)
- Prescriptive
- Performance
- Energy Rating Index
- ENERGY STAR
Prescriptive Path
Overview

- Mechanical outside air
- More stringent envelope R-values
- Mandatory Blower Door test (3ACH target)
- Tighter windows
- Mandatory Duct Leakage with tighter duct systems (4 CFM per 100 Sq.Ft. of enclosure)
- Tighter air-handlers/furnaces
- Hot water pipe insulation
- Minimum 75% high-efficacy lighting
# Prescriptive Path

## Envelope – Insulation

Table R402.1.2

### 2009 IECC (CZ 3)

- **Ceiling** – R30
- **Wall (wood)** – R13
- **Wall (mass)** – R5 cont or R8 cavity
- **Floor** – R19
- **Wall (basement & crawlspace)** – R5 cont or R13 cavity

### 2015 IECC (CZ 3)

- **Ceiling** – R38
- **Wall (wood)** – R20 or R13+5 cont
- **Wall (mass)** – R8 cont or R13 cavity
- **Floor** – R19
- **Wall (basement & crawlspace)** – R5 cont or R13 cavity
Prescriptive Path
Envelope – Insulation
Table R402.1.2

Wall Insulation – (CZ3)
- R20 – larger slab or less CFA
- R13+5 – larger brick ledge
- Insulated Headers
  - R3 per inch
- Cavities within corners
  - R3 per inch
Prescriptive Path
Envelope – Insulation

R-20 wall

R13+5 wall
Prescriptive Path
Envelope – Fenestration
Table R402.1.2

<table>
<thead>
<tr>
<th></th>
<th>2009 IECC (CZ 3)</th>
<th>2015 IECC (CZ 3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Windows</td>
<td>U = 0.50</td>
<td>U = 0.35</td>
</tr>
<tr>
<td>Skylight</td>
<td>U = 0.65</td>
<td>U = 0.55</td>
</tr>
<tr>
<td>Both</td>
<td>SHGC = 0.30</td>
<td>SHGC = 0.25</td>
</tr>
</tbody>
</table>

2009 IECC
(CZ 3)

Windows – U = 0.50
Skylight – U = 0.65
Both – SHGC = 0.30

2015 IECC
(CZ 3)

Windows – U = 0.35
Skylight – U = 0.55
Both – SHGC = 0.25
Prescriptive Path
Envelope – Fenestration

### ENERGY STAR Qualification Criteria for Residential Windows, Doors, and Skylights

#### Windows

<table>
<thead>
<tr>
<th>Climate Zone</th>
<th>U-Factor $^1$</th>
<th>SHGC $^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Northern</td>
<td>$\leq 0.27$</td>
<td>Any</td>
</tr>
<tr>
<td></td>
<td>$= 0.28$</td>
<td>$\geq 0.32$</td>
</tr>
<tr>
<td></td>
<td>$= 0.29$</td>
<td>$\geq 0.37$</td>
</tr>
<tr>
<td></td>
<td>$= 0.30$</td>
<td>$\geq 0.42$</td>
</tr>
<tr>
<td>North-Central</td>
<td>$\leq 0.30$</td>
<td>$\leq 0.40$</td>
</tr>
<tr>
<td>South-Central</td>
<td>$\leq 0.30$</td>
<td>$\leq 0.25$</td>
</tr>
<tr>
<td>Southern</td>
<td>$\leq 0.40$</td>
<td>$\leq 0.25$</td>
</tr>
</tbody>
</table>

Air Leakage $\leq 0.3$ cfm/ft$^2$

#### Doors

<table>
<thead>
<tr>
<th>Glazing Level</th>
<th>U-Factor $^1$</th>
<th>SHGC $^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Opaque</td>
<td>$\leq 0.17$</td>
<td>No Rating</td>
</tr>
<tr>
<td>$\leq \frac{1}{4}$-Lite</td>
<td>$\leq 0.25$</td>
<td>$\leq 0.25$</td>
</tr>
<tr>
<td>$&gt; \frac{1}{4}$-Lite</td>
<td>$\leq 0.30$</td>
<td></td>
</tr>
</tbody>
</table>

Air Leakage for Sliding Doors $\leq 0.3$ cfm/ft$^2$
Air Leakage for Swinging Doors $\leq 0.5$ cfm/ft$^2$

#### Skylights

<table>
<thead>
<tr>
<th>Climate Zone</th>
<th>U-Factor $^1$</th>
<th>SHGC $^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Northern</td>
<td>$\leq 0.50$</td>
<td>Any</td>
</tr>
<tr>
<td>North-Central</td>
<td>$\leq 0.53$</td>
<td>$\leq 0.35$</td>
</tr>
<tr>
<td>South-Central</td>
<td>$\leq 0.53$</td>
<td>$\leq 0.28$</td>
</tr>
<tr>
<td>Southern</td>
<td>$\leq 0.60$</td>
<td>$\leq 0.28$</td>
</tr>
</tbody>
</table>

Air Leakage $\leq 0.3$ cfm/ft$^2$

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$^1$ Bluf/sf°F
$^2$ Solar Heat Gain Coefficient

*The effective date for the Northern Zone prescriptive and equivalent energy performance criteria for windows is January 1, 2016.*

Note: A complete list of ENERGY STAR Climate Zones by state and county or, where applicable, zip code is available at [https://www.energystar.gov/index.cfm?refaction=webdoors星光气候].
Prescriptive Path
Envelope – Infiltration
R402.4

2009 IECC
(CZ 3-8)
Air-sealing Inspection (Mandatory)
Blower Door test – 7 ACH (Optional)

2015 IECC
(CZ 3-8)
Air-sealing Inspection (Mandatory)
Blower Door test – 3 ACH (Mandatory)
# Prescriptive Path Envelope – Air Sealing

2009 IECC Table 402.4.2

<table>
<thead>
<tr>
<th>COMPONENT</th>
<th>CRITERIA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air barrier and thermal barrier</td>
<td>Exterior thermal envelope insulation for framed walls is installed in substantial contact and continuous alignment with building envelope air barrier. Breaks or joints in the air barrier are filled or repaired. Air-permeable insulation is not used as a sealing material. Air-permeable insulation is inside of an air barrier.</td>
</tr>
<tr>
<td>Ceiling/attic</td>
<td>Air barrier in any dropped ceiling/soffit is substantially aligned with insulation and any gaps are sealed. Attic access (except unvented attic), knee wall door, or drop down stair is sealed.</td>
</tr>
<tr>
<td>Walls</td>
<td>Corners and headers are insulated. Junction of foundation and sill plate is sealed.</td>
</tr>
<tr>
<td>Windows and doors</td>
<td>Space between window/door jambs and framing is sealed.</td>
</tr>
<tr>
<td>Rim joists</td>
<td>Rim joists are insulated and include an air barrier.</td>
</tr>
<tr>
<td>Floors (including above-garage and cantilevered floors)</td>
<td>Insulation is installed to maintain permanent contact with underside of subfloor decking. Air barrier is installed at any exposed edge of insulation.</td>
</tr>
<tr>
<td>Crawl space walls</td>
<td>Insulation is permanently attached to walls. Exposed earth in unventilated crawl spaces is covered with Class I vapor retarder with overlapping joints taped.</td>
</tr>
<tr>
<td>Shafts, penetrations</td>
<td>Duct shafts, utility penetrations, knee walls and flue shafts opening to exterior or unconditioned space are sealed.</td>
</tr>
<tr>
<td>Narrow cavities</td>
<td>Batt insulation in narrow cavities are cut to fit, or narrow cavities are filled by sprayed/blown insulation.</td>
</tr>
<tr>
<td>Garage separation</td>
<td>Air sealing is provided between the garage and conditioned spaces.</td>
</tr>
<tr>
<td>Recessed lighting</td>
<td>Recessed light fixtures are air tight, IC rated, and sealed to drywall. Exception—fixtures in conditioned space.</td>
</tr>
<tr>
<td>Plumbing and wiring</td>
<td>Insulation is placed between outside and pipes. Batt insulation is cut to fit around wiring and plumbing, or sprayed/blown insulation extends behind piping and wiring.</td>
</tr>
<tr>
<td>Shower/tub on exterior wall</td>
<td>Showers and tubs on exterior walls have insulation and an air barrier separating them from the exterior wall.</td>
</tr>
<tr>
<td>Electrical/phone box on exterior walls</td>
<td>Air barrier extends behind boxes or air sealed-type boxes are installed.</td>
</tr>
<tr>
<td>Common wall</td>
<td>Air barrier is installed in common wall between dwelling units.</td>
</tr>
<tr>
<td>HVAC register boots</td>
<td>HVAC register boots that penetrate building envelope are sealed to subfloor or drywall.</td>
</tr>
<tr>
<td>Fireplace</td>
<td>Fireplace walls include an air barrier.</td>
</tr>
</tbody>
</table>
**Prescriptive Path**

**Envelope – Air Sealing**

**2015 IECC Table R402.4.1.1**

**TABLE R402.4.1.1 AIR BARRIER AND INSULATION INSTALLATION**

<table>
<thead>
<tr>
<th>COMPONENT</th>
<th>AIR BARRIER CRITERIA</th>
<th>INSULATION INSTALLATION CRITERIA</th>
</tr>
</thead>
<tbody>
<tr>
<td>General requirements</td>
<td>A continuous air barrier shall be installed in the building envelope.</td>
<td>Air-permeable insulation shall not be used as a sealing material.</td>
</tr>
<tr>
<td>Ceilings</td>
<td>The air barrier in any dropped ceiling/soffit shall be aligned with the insulation and any gaps in the air barrier shall be sealed. Access openings, drop down stairs or knee wall doors to unconditioned attic spaces shall be sealed.</td>
<td></td>
</tr>
<tr>
<td>Walls</td>
<td>The junction of the foundation sill plate shall be sealed.</td>
<td>The insulation in any dropped ceiling/soffit shall be aligned with the air barrier.</td>
</tr>
<tr>
<td>Windows, skylights and doors</td>
<td>The space between window捎or jams and framing, and skylights and framing shall be sealed.</td>
<td></td>
</tr>
<tr>
<td>Plate air barrier</td>
<td>The air barrier shall be installed at any exposed edge of insulation.</td>
<td></td>
</tr>
<tr>
<td>Crawls space walls</td>
<td>Exposed earth in unvented crawl spaces shall be covered with a Class I vapor retarder and overlapping joints taped. If provided instead of floor insulation, insulation shall be permanently attached to the crawlspace walls.</td>
<td></td>
</tr>
<tr>
<td>Shades penetrations</td>
<td>Dust shafts, utility penetrations, and fuse shafts opening to exterior or unconditioned space shall be sealed.</td>
<td></td>
</tr>
<tr>
<td>Narrow cavities</td>
<td>Trims in narrow cavities shall be cut to fit, or narrow cavities shall be filled by insulation that on installation readily conforms to the available cavity space.</td>
<td></td>
</tr>
<tr>
<td>Garage separation</td>
<td>Air sealing shall be provided between the garage and conditioned spaces.</td>
<td></td>
</tr>
<tr>
<td>Recessed lighting</td>
<td>Recessed light fixtures installed in the building thermal envelope shall be sealed to the drywall. Recessed light fixtures installed in the building thermal envelope shall be air tight and IC rated.</td>
<td></td>
</tr>
<tr>
<td>Plumbing and wiring</td>
<td>All insulation shall be cut to fit around wiring and plumbing in exterior walls, or insulation that on installation readily conforms to available space shall extend behind piping and wiring.</td>
<td></td>
</tr>
<tr>
<td>Shower/tub on exterior wall</td>
<td>The air barrier installed at exterior walls adjacent to showers and tubs shall separate them from the showers and tubs. Exterior walls adjacent to showers and tubs shall be insulated.</td>
<td></td>
</tr>
<tr>
<td>Electrical penetrations on exterior walls</td>
<td>The air barrier shall be installed behind electrical or communication boxes or air-sealed boxes shall be installed.</td>
<td></td>
</tr>
<tr>
<td>HVAC register boots</td>
<td>HVAC register boots that penetrate building thermal envelope shall be sealed to the subfloor or drywall. HVAC register boots shall only be sealed in a manner that is recommended by the manufacturer. Caulking or other adhesive sealants shall not be used to fill voids between fire sprinkler cover plates and walls or ceilings.</td>
<td></td>
</tr>
</tbody>
</table>
Prescriptive Path
Envelope – Air Sealing

- Additional air-sealing options
Prescriptive Path
Envelope – Air Sealing

- Sealed kneewall
Prescriptive Path
Envelope – Air Sealing Overview

- Air sealing measures listed in Code are substantially the same
- Major changes include
  - Kneewalls shall be sealed
  - Skylights sealed to framing

- Additional air-sealing beyond the prescriptive list in Code will be required to meet the 3 ACH target
<table>
<thead>
<tr>
<th>Prescriptive Path</th>
<th>Envelope - Other</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>2009 IECC</strong></td>
<td></td>
</tr>
<tr>
<td>Sunrooms – no requirements in CZ 3</td>
<td></td>
</tr>
<tr>
<td>Dynamic Glazing – not covered</td>
<td></td>
</tr>
<tr>
<td>Wood-burning fireplaces shall have gasketed doors and outdoor combustion air</td>
<td></td>
</tr>
<tr>
<td>Fenestration air leakage – no requirement</td>
<td></td>
</tr>
<tr>
<td>Rooms containing fuel-burning fireplaces – no requirement</td>
<td></td>
</tr>
<tr>
<td><strong>2015 IECC</strong></td>
<td></td>
</tr>
<tr>
<td>Sunrooms - must be thermally isolated (R402.2.13)</td>
<td></td>
</tr>
<tr>
<td>Dynamic Glazing (R402.3.2)</td>
<td></td>
</tr>
<tr>
<td>Wood-burning fireplaces - shall have tight-fitting flue dampers or doors, and outdoor combustion air (R402.4.2)</td>
<td></td>
</tr>
<tr>
<td>Fenestration Air Leakage – new infiltration limit rating requirement (R402.4.3)</td>
<td></td>
</tr>
<tr>
<td>Rooms containing fuel-burning appliances – must be sealed and isolated (R402.4.4)</td>
<td></td>
</tr>
</tbody>
</table>
Prescriptive Path
Envelope - Other

Dynamic glazing

Window air-leakage
Prescriptive Path Systems – Duct Leakage

2009 IECC (CZ 3)
- Rough-in Test – Total Leakage Test
  6 CFM per 100 SF of enclosure
- Postconstruction Test – Leakage to Outside Test
  8 CFM per 100 SF of enclosure
- Postconstruction Test – Total Leakage Test
  12 CFM per 100 SF of enclosure

2015 IECC (CZ 3)
- Rough-in Test – Total Leakage Test
  4 CFM per 100 SF of enclosure
- Postconstruction Test – Total Leakage Test
  4 CFM per 100 SF of enclosure
- Postconstruction Test – Leakage to Outside Test not allowed
Prescriptive Path Systems – Duct Leakage

R403.3.4

- 4 CFM per 100 ft
### Prescriptive Path Systems - Mechanical

**2009 IECC** *(CZ 3)*

- Sealed air handlers – Not required
- Building cavities shall not be used as supply ducts
- Mechanical ventilation fans – No efficacy requirement
- Mechanical ventilation fans – No requirement
- Heating and cooling equipment sized in accordance with M1401.3 of the IRC

**2015 IECC** *(CZ 3)*

- Sealed air handlers - 2% leakage when tested by manufacturer *(R403.2.1)*
- Building cavities shall not be used as ducts or plenums *(R403.3.5)*
- Mechanical ventilation fans shall meet the efficacy requirements of Table R403.6.1
- Mechanical ventilation fans that are integral to the HVAC equipment shall be powered by an ECM motor *(R403.6.1)*
- Heating and cooling equipment sized in accordance with ACCA Manual J & S *(R403.7)*
Prescriptive Path Systems - Mechanical

- Building cavities shall not be used as ducts or plenums (R403.3.5)
Prescriptive Path Systems - Mechanical

- Mechanical ventilation fans shall meet the efficacy requirements of Table R403.6.1

<table>
<thead>
<tr>
<th>FAN LOCATION</th>
<th>AIR FLOW RATE MINIMUM (CFM)</th>
<th>MINIMUM EFFICACY (CFM/WATT)</th>
<th>AIR FLOW RATE MAXIMUM (CFM)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Range hoods</td>
<td>Any</td>
<td>2.8 cfm/watt</td>
<td>Any</td>
</tr>
<tr>
<td>In-line fan</td>
<td>Any</td>
<td>2.8 cfm/watt</td>
<td>Any</td>
</tr>
<tr>
<td>Bathroom, utility room</td>
<td>10</td>
<td>1.4 cfm/watt</td>
<td>&lt; 90</td>
</tr>
<tr>
<td>Bathroom, utility room</td>
<td>90</td>
<td>2.8 cfm/watt</td>
<td>Any</td>
</tr>
</tbody>
</table>
Prescriptive Path
Systems - Mechanical

- Mechanical ventilation fans that are integral to the HVAC equipment shall be powered by an ECM motor (R403.6.1)
Prescriptive Path
Systems - Other

2009 IECC
(CZ 3)

- Hot water pipe insulation – Not Required

- Lighting – 50% high-efficacy (R404.11)

2015 IECC
(CZ 3)

- Hot water pipe insulation – R-3 pipe insulation on:
  • ¾” piping (inside envelope)
  • Piping outside conditioned space
  • Piping to a distribution manifold
  • Piping located under the slab
  • Buried in piping
  • (R403.5.3)

- Lighting – 75% high-efficacy (R404.11)
Prescriptive Path
Mandatories (no change from 2009)

- 2015 IECC Envelope (with UA trade-offs) (R402.1)
- Wall vapor retarded per R702.7 of the 2015 IRC (R402.1.1)
- Eave baffles (R402.2.3)
- Insulated access hatches and doors (R402.2.4)
- Sunroom Isolation (R402.2.13)
- Envelope Air Leakage at 3 ACH (R402.4.1)
- Wood-burning fireplaces shall have tight-fitting flue dampers or doors and outdoor combustion air (R402.4.2)
- Windows, skylights and sliding doors shall have air infiltration rate of no more than 0.3 cfm per square foot and swinging doors no more than 0.5 cfm per square foot (R402.4.3)
- Fuel burning appliances shall be located outside of isolated from inside the thermal envelope (R402.4.4)
- IC-rated recessed lighted sealed to envelope (R402.4.5)
Prescriptive Path
Mandatories (cont.)

- Programmable thermostat (with heat pump supplement heat as applicable) (R403.1.1 & .2)
- R-8 ductwork outside conditioned space (R403.3.1)
- Airhandlers have manufacture’s designation for air leakage of no more than 2% (R403.3.2.1)
- Duct leakage testing (4 CFM per 100 Sq.Ft. of enclosure) (R403.3.3)
- Building cavities shall not be used as ducts or plenums (R403.3.5)
- Mechanical system piping insulation shall be insulated to R-3 (R403.4)
- Manual J and S calculations (R403.7)
Prescriptive Path
Mandatories (cont.)

- Heated water recirculation systems (R403.5.1)
- Hot water pipe insulation – R-3 pipe insulation (R403.5.3)
  - ¾” piping
  - Piping outside conditioned space
  - Piping to a distribution manifold
  - Piping located under the slab
  - Buried in piping
- Residential pools and spas (R403.10.4)
- 75% high-efficacy lighting (R404.1)
Prescriptive Path
Mandatories (cont.)

- Outdoor intakes and exhausts shall have automatic or gravity dampers that close when the ventilation is not operating (R403.6)
- Mechanical ventilation fans shall meet the efficacy requirements of Table R403.6.1
- Mechanical ventilation system fans that are integral to the HVAC equipment shall be powered by ECM motors (R406.6.1)
Required Documents – Prescriptive
IECC Pathways

Currently (2009 IECC)
- Prescriptive
- Performance
- ENERGY STAR

As of Sept. 1 2016 (2015 IECC)
- Prescriptive
- Performance
- Energy Rating Index
- ENERGY STAR
Performance Path Overview

This single family residential project was found to be in compliance with the performance measures described in IECC 2009 using the v. 3.14.3 calculation tool developed by the Energy Systems Laboratory, a division of the Texas A&M Engineering Experiment Station.

2009 IECC Energy Cost Compliance

This home MEETS the annual energy cost requirements of Section 405 of the 2009 International Energy Conservation Code based on a climate zone of 3a. In fact, this home surpasses the requirements by 9.8%.

In accordance with IECC, building inputs, such as setpoints, infiltration rates, and window shading may have been changed prior to calculating annual energy cost. Furthermore, the standard reference design HVAC system efficiencies are set equal to those in the design home as specified in the 2009 IECC. These standards are subject to change, and software updates should be obtained periodically to ensure the compliance calculations reflect current federal minimum standards.
Performance Path Overview

- Mechanical outside air
- More stringent envelope R-values (with small trade-offs allowed)
- Mandatory Blower Door test (3 ACH)
- Tighter windows
- Mandatory Duct Leakage with tighter duct systems (target determined by model)
- Tighter air-handlers/furnaces
- More high-efficacy lighting (% determined by model)

- Negligible trade-offs for using more efficient HVAC or Water-heating equipment
Performance Path
Mandatories

- 2015 IECC Envelope (with UA trade-offs)
- Envelope Air Leakage at 3 ACH (R402.4.1)
- Wood-burning fireplaces shall have tight-fitting flue dampers or doors and outdoor combustion air (R402.4.2)
- Windows, skylights and sliding doors shall have air infiltration rate of no more than 0.3 cfm per square foot and swinging doors no more than 0.5 cfm per square foot (R402.4.3)
- Fuel burning appliances shall be located outside of isolated from inside the thermal envelope (R402.4.4)
- IC-rated recessed lighted sealed to envelope (R402.4.5)
Performance Path
Mandatories (cont.)

- Programmable thermostat (with heat pump supplement heat as applicable) (R403.1.1 & .2)
- Air-handlers have manufacture’s designation for air leakage of no more than 2% (R403.3.2.1)
- Duct leakage testing (target determined by model) (R403.3.3)
- Building cavities shall not be used as ducts or plenums (R403.3.5)
- Mechanical system piping insulation shall be insulated to R-3 (R403.4)
- Manual J and S calculations (R403.7)
Performance Path
Mandatories (cont.)

- Heated water recirculation systems (R403.5.1)
- Residential pools and spas (R403.10.4)
- Minimum 75% high-efficacy lighting (R404.1)
Required Documents - Performance

Affidavit and performance testing results and...
IECC Pathways

Currently (2009 IECC)
- Prescriptive
- Performance
- ENERGY STAR

As of Sept. 1 2016 (2015 IECC)
- Prescriptive
- Performance
- Energy Rating Index
- ENERGY STAR
ERI Path
Overview

- New compliance path for the IECC
- ERI = HERS Index
  - (Additional options will be on the market by Sept 2016)
- Per 2015 IECC as written
  - ERI = 51 in CZ 3
- ERI score starts at 65 (but ratchets down)
  - 2016 – 65
  - 2019 – 63
  - 2022 – 59
- Minimum 2009 IECC Envelope
- All Code Mandatories still apply
- Allows trade-offs on equipment efficiency that otherwise are not allowed in the Prescriptive or Performance Paths
- The bigger the house, the better this works!
ERI Path
Mandatories

- 2009 IECC Envelope (without UA trade-offs)
- Envelope Air Leakage at 3 ACH (R402.4.1)
- Wood-burning fireplaces shall have tight-fitting flue dampers or doors and outdoor combustion air (R402.4.2)
- Windows, skylights and sliding doors shall have air infiltration rate of no more than 0.3 cfm per square foot and swinging doors no more than 0.5 cfm per square foot (R402.4.3)
- Fuel burning appliances shall be located outside of isolated from inside the thermal envelope (R402.4.4)
- IC-rated recessed lighted sealed to envelope (R402.4.5)
ERI Path
Mandatories (cont.)

- Programmable thermostat (with heat pump supplement heat as applicable) (R403.1.1 & .2)
- Airhandlers have manufacture’s designation for air leakage of no more than 2% (R403.3.2.1)
- Mandatory Duct Leakage with tighter duct systems (target determined by my model)
- Building cavities shall not be used as ducts or plenums (R403.3.5)
- Mechanical system piping insulation shall be insulated to R-3 (R403.4)
- Hot water Pipe Insulation (R403.5.3)
- Manual J and S calculations (R403.7)
ERI Path
Mandatories (cont.)

- Heated water recirculation systems (R403.5.1)
- Hot water pipe insulation – R-3 pipe insulation (R403.5.3)
  - ¾” piping
  - Piping outside conditioned space
  - Piping to a distribution manifold
  - Piping located under the slab
  - Buried in piping
- Residential pools and spas (R403.10.4)
- Minimum 75% high-efficacy lighting (R404.1)
ERI Path
Mandatories (cont.)

- Outdoor intakes and exhausts shall have automatic or gravity dampers that close when the ventilation is not operating R403.6)
- Mechanical ventilation fans shall meet the efficacy requirements of Table R403.6.1

<table>
<thead>
<tr>
<th>FAN LOCATION</th>
<th>AIR FLOW RATE MINIMUM (CFM)</th>
<th>MINIMUM EFFICACY (CFM/WATT)</th>
<th>AIR FLOW RATE MAXIMUM (CFM)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Range hoods</td>
<td>Any</td>
<td>2.8 cfm/watt</td>
<td>Any</td>
</tr>
<tr>
<td>In-line fan</td>
<td>Any</td>
<td>2.8 cfm/watt</td>
<td>Any</td>
</tr>
<tr>
<td>Bathroom, utility room</td>
<td>10</td>
<td>1.4 cfm/watt</td>
<td>&lt; 90</td>
</tr>
<tr>
<td>Bathroom, utility room</td>
<td>90</td>
<td>2.8 cfm/watt</td>
<td>Any</td>
</tr>
</tbody>
</table>

- Mechanical ventilation system fans that are integral to the HVAC equipment shall be powered by ECM motors (R406.6.1)
ERI Path Impacts

- Using AHU with ECM motor is not a significant measure to lower ERI
  - Inline fan (reduction by 2-5 points)
Required Documents - ERI

At Permit

For CO

Building Summary

General Building Information
- Area of Conditioned Space: 2,077
- Roof Area: 2,077
- Heating System: Forced Air
- Insulation: Yes
- Number of Bathrooms: 2
- Number of Bedrooms: 3
- Foundation Type: Slab
- Frame Type: 2x6 frame
- Interior Insulation: No

Slab Floor Information
- Slab Floor Uninsulated
  - Slab: 125.7
  - Perimeter: 0.5
- Slab Insulation Grade: Insulated
  - Slab insulation: 2.0
- Slab Insulation R-value: 11.0
- Insulation R-value: 0.0

Above-Grade Wall
- Wall: 125.7
- Insulation: Yes
  - Insulation R-value: 0.0

2015 IECC ENERGY RATING INDEX REPORT

Annual Energy Consumption
- HERS Index: 53
- Annual Energy Consumption: 53

2015 Energy Star
- HERS Index: 53
- Energy Star: Yes
- Energy Star Score: 80
- Energy Star Rating: 1.0

Target Index: 51
- HERS Index: 53
- Target Index: 51
- Target HERS Index: 51
- Target Energy Star: 80
- Target Energy Star Score: 80
- Target Energy Star Rating: 1.0

Mandatory Requirements
- HERS Target: Pass
- Energy Saving: (Interests 99,8, in HERS)
- Dual Zoning: Pass
- Automatic Shading (DSSC 2013)
- Air Leakage: (Air Sealed 2.0, 3.0)
- Window Ventilation Efficiency: Pass
- Emissions Data
- Provider Data and Seal

This information does not constitute any warranty of energy cost savings.
ENERGY STAR Path
Overview

- ENERGY STAR for Homes 3.0
  - Rev. 08 will be in effect
- Compliance based on HERS score (similar to ERI)
  - Required HERS score is not a 52 or 65 for all homes but varies for every home based on its specific design and location.
- ESv3 checklists and EPA/RESNET oversight do apply.

- In Sept. 2017, ENERGY STAR will move to ESv3.1
ENERGY STAR Path Overview

- **ESv3 Rev 08 Changes**
  - Prescriptive Path removed
    - (no one was using it)
  - Water Management Checklist responsibility moved from Rater to Builder
ENERGY STAR Path Overview

- ESv3 Rev 08 Changes - HVAC
  - HVAC Designer must now use per County design temperatures specified by ENERGY STAR
    - [www.energystar.gov/hvacdesigntemps](http://www.energystar.gov/hvacdesigntemps)
  - Rules for HVAC “group design” codified
  - HVAC Sizing limits clarified
    - %s for allowable oversizing increased but “next nominal size” allowance removed
  - HVAC paperwork split into Design and Commissioning Checklists
    - HVAC Design Paperwork should to be reviewed by Rater prior to construction
    - HVAC Commissioning Paperwork can be turned in after closing (reduces paperwork holdups)
ENERGY STAR Path Overview

- **ESv3 Rev 08 Changes - HVAC**
  - HVAC Contractor **required** to submit HVAC Design Checklist to Rater
  - HVAC is still required to produce items below but Rater can elect to **not** collect them
    - HVAC Commissioning Checklist
    - Full load calculations
    - AHRI matchups
    - Separate ventilation calculations
    - Balancing Report
Required Documents - Energy Star

For Permit

For CO

ENERGY STAR v3.0 Home Report

This home MEETS or EXCEEDS the energy efficiency requirements.

Pollution Prevented

Energy Cost Savings $/yr

The energy savings and pollution prevented are calculated by comparing the stated home to the ENERGY STAR v3.0 national median.
Changes to the HERS Index
Overview
Impacts ENERGY STAR and ERI

- Implementing July 1, 2016
  - Aligning back-end calculations with 2015 IECC ERI rules
  - Credit given for Water Efficient Fixtures and Layouts
  - Ventilation calculations rules clarified

- Implementing in 2017-18
  - New Quality Assurance structure
Changes to the HERS Index
Overview
Impacts ENERGY STAR and ERI

- Alignment with the 2015 IECC ERI rules
  - Typically will raise HERS scores by 0 to 6 points

- Credit for Water Efficient Fixtures and Layouts
  - Typically will lower HERS scores by 0 to 1 point

- Ventilation calculations rules being clarified
  - Could raise HERS scores depending on Rater and ventilation type 0-3 points
  - Systems using AHU as Mechanical Outdoor Air strategy will see biggest increases
Changes to the HERS Index
Overview
Impacts ENERGY STAR and ERI

- New Quality Assurance structure in 2017-2018
  - Goal is to increase consistency in HERS Index between Raters and Areas
  - Could increase cost of Ratings
Additional Paths

- Alternative pathways along with ENERGY STAR could be available by Sept. 2016
Sampling – What is it?

- Pre-analysis of building plans meeting the intended qualifications

&

- Subsequent random testing and inspections

*as defined by RESNET
Is Sampling allowed? It Depends...

- Not for: prescriptive, performance, and ERI compliance pathways
  - All performance tests and each measure shall be inspected by the code official or approved 3rd party (R104.2, R104.4)
  - Performance compliance report: batch sampling to determine compliance shall be prohibited (R405.4.2)
- Energy Star - “Raters who operate under a Sampling Provider are permitted to verify the Minimum Rated Features of the home and to verify any Checklist Item designated “Rater Verified” using the RESNET-approved sampling protocol
Questions
Resources

- Free online version of 2015 IRC
  - [http://codes.iccsafe.org/I-Codes.html](http://codes.iccsafe.org/I-Codes.html)
- DOE Builder America Solution Center
  - [https://basc.pnnl.gov/](https://basc.pnnl.gov/)
- ENERGY STAR for Homes
  - [www.energystar.gov](http://www.energystar.gov)
- Green Built Texas
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