

# Above Code/New Technologies



**RESNET/ENERGY STAR & Code**  
**~ Field Experience**

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## RESNET/ENERGY STAR & Code

- Code basis of the Home Energy Rating System
  - HERS as a code compliance tool
- HERS basis of ENERGY STAR Homes
  - ENERGY STAR Homes as a code compliance tool
- Regulatory drivers for above-code standards
- Real world application
  - When code and ENERGY STAR collide
  - Performance, comfort and quality

## SECTION 404 SIMULATED PERFORMANCE ALTERNATIVE (Performance)

**404.1 Scope.** This section establishes criteria for compliance using simulated energy performance analysis. Such analysis shall include heating, cooling, and service water heating energy only.

**404.2 Mandatory requirements.** Compliance with this Section requires that the criteria of Sections 401, 402.4, 402.5, 402.6 and 403 be met.

**404.3 Performance-based compliance.** Compliance based on simulated energy performance requires that a proposed residence (proposed design) be shown to have an annual energy cost that is less than or equal to the annual energy cost of the standard reference design. Energy prices shall be taken from a source approved by the code official, such as the Department of Energy, Energy Information Administration's *State Energy Price and Expenditure Report*. Code officials shall be permitted to require time-of-use pricing in energy cost calculations.

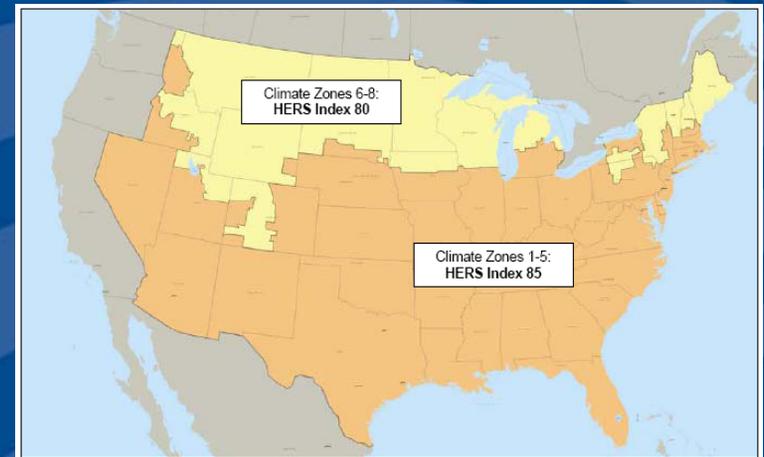
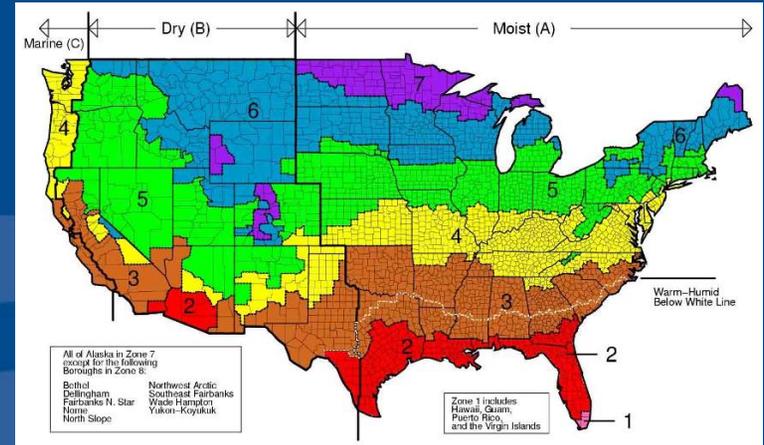
**Exception:** Jurisdictions that require site energy (1kWh = 3,413 Btu) rather than energy cost as the metric of comparison.

# The Code Basis of HERS

- Section 404 also requires...
  - “Documentation verifying that the methods and accuracy of the compliance software tool...provided to the code official.”
  - The report shall contain certain minimum information and a certificate.
  - The software tool shall meet certain minimum requirements.
- RESNET has adopted a software tool verification procedure (Publication No. 07-003, March 2007)

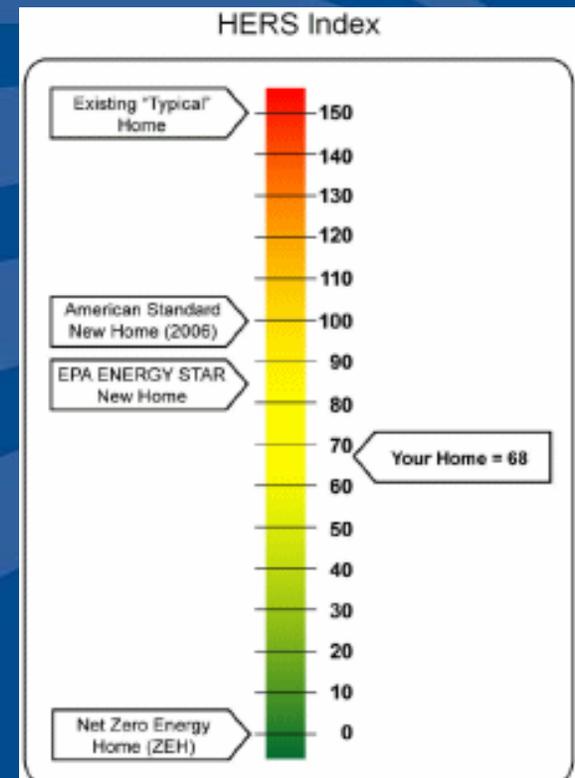
# The HERS Basis of ENERGY STAR

- IECC 2004
- DOE climate zones
- HERS Index
- ENERGY STAR climate zones



# The HERS Index

- HERS reference home at 100 points (IECC 2004)
  - Each 1 point = 1% energy usage (not 5%)
  - The lower the score the more efficient the home is
- Hence...
  - Zero energy home = 0
  - Energy Star Home = 85
    - 15% more energy efficient than 100 point reference home
  - Reference home = 100
  - Inefficient home > 100



# Regulatory Drivers

- State/utility “market transformation” programs (may involve technical support &/or incentives)
  - NJ, NY, TX, CA, WI, FL, New England...
- Publicly funded affordable development criteria
  - NJHMFA, PHFA...
- Local codes/ordinances
  - ENERGY STAR
  - Green...

# Real World Application

## New Jersey example:

- ENERGY STAR documentation accepted for energy code compliance submission

3. COMPLIANCE WITH NJ ENERGY STAR HOMES: This program is sponsored by New Jersey utility companies. The program provides incentives for projects that exceed the Energy Subcode. A letter of enrollment (typically the “builder’s acknowledgement” letter) from the utility company (or its consultant) should be submitted with the permit application if the applicant is choosing this compliance option. Inspections for this program are handled by the utility company or its consultant. Upon application for a new home’s Certificate of Occupancy, the Home Energy Rating Scale certificate or equivalent (i.e., passing final inspection report) should be submitted.

- CO may be dependent on ENERGY STAR verification

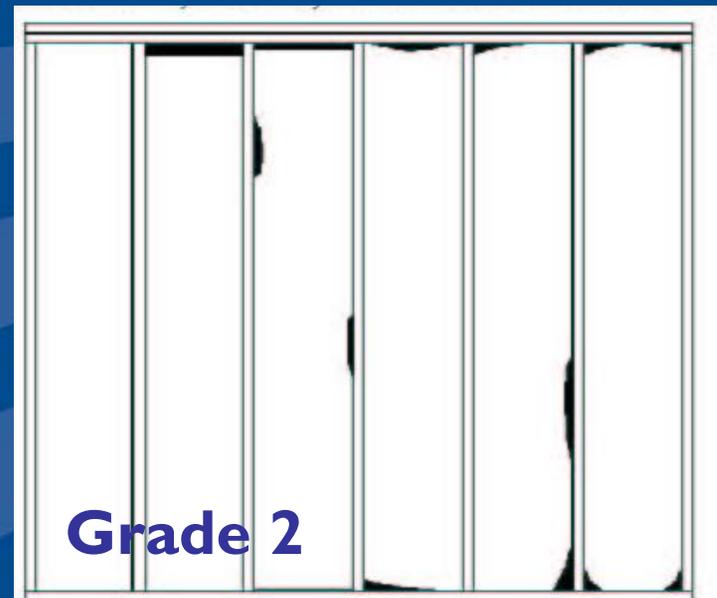
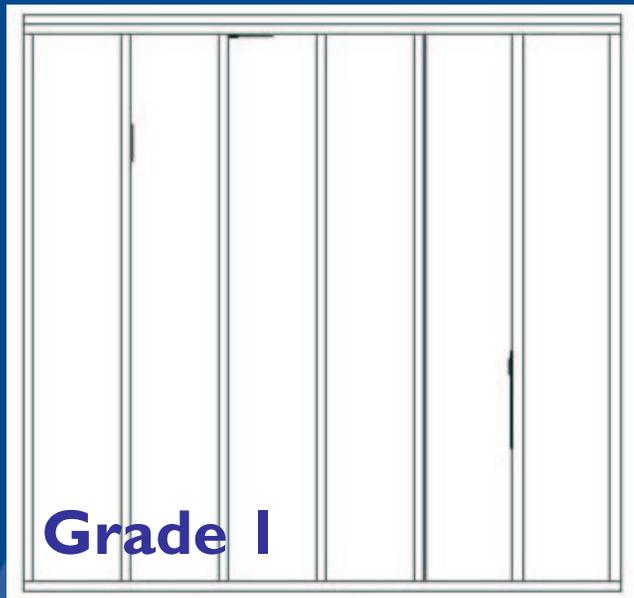
# Real World Application

## New Jersey example:

- ENERGY STAR verification may substitute for building department insulation inspection

**Insulation** – With the exception of those homes that are enrolled in the NJ Energy Star Homes Program (where compliance is verified by a third party), inspectors should verify that the insulation levels installed in all buildings match the insulation levels used in the calculations, found in the *REScheck* or *COMcheck* printout, or shown in the Prescriptive Package table, as applicable. Lastly, other Energy Subcode requirements, such as piping and ductwork insulation, are still applicable.

- **HERS 2006:** More rigorous insulation installation standard “but” flexibility of a performance standard



Grade 1 gets credit for a higher insulation level than Grade 2.

- **ESH 2006:** Maximum duct leakage to outside (6 CFM/100 square feet)
- More rigorous Thermal Bypass Checklist augments performance (and prescriptive) standards



**ENERGY STAR Qualified Homes Thermal Bypass Inspection Checklist**

Address: \_\_\_\_\_ City: \_\_\_\_\_ State: \_\_\_\_\_

Inspection Guidelines	Inspector	Rater/Verifier
1. Thermal Bypass Insulation is installed in full contact with the air barrier to provide continuous alignment and alignment of the insulation with the air barrier.		<input type="checkbox"/>
2. Tub at Floor/Wall Exterior walls have been enclosed on all six sides.		<input type="checkbox"/>
3. Tub at Floor/Wall Exterior walls have been fully insulated.		<input type="checkbox"/>
4. Staircase Floor Above Staircase All barrier is installed at any exposed edges of insulation.		<input type="checkbox"/>
5. Staircase Floor Above Staircase Insulation is installed to maintain permanent contact with the underside of the sub-floor decking.		<input type="checkbox"/>
6. Staircase Floor Above Staircase Conditioned top and bottom plates are installed with an air barrier on the attic side of decking. Insulation is installed to maintain permanent contact with the underside of the sub-floor decking.		<input type="checkbox"/>
7. Staircase Floor Above Staircase Insulation is in complete alignment with exterior wall frame and the attic side air barrier.		<input type="checkbox"/>
8. Attic Access Panel / Drop-Down Stair Attic access panel or stair is fully gasketed for an airtight fit.		<input type="checkbox"/>
9. Attic Access Panel / Drop-Down Stair Attic access panel or stair is covered with insulation that is adhered and fits snugly in the framed opening.		<input type="checkbox"/>
10. Attic Access Panel / Drop-Down Stair Attic barrier spans cantilever and any exposed edges of insulation.		<input type="checkbox"/>
11. Cantilevered Floor Floor framing is completely filled with insulation or insulation is installed to maintain permanent contact with the exterior decking.		<input type="checkbox"/>
12. Duct Shaft Openings for unconditioned spaces are sealed with solid blocking and any remaining gaps are sealed with caulk or foam.		<input type="checkbox"/>
13. Duct Shaft Openings around ducts are fully sealed with framing and any remaining gaps are sealed with caulk or foam.		<input type="checkbox"/>
14. Duct Shaft Clearance between ducts and combustible materials (e.g., OSB) are fully sealed with UL-approved metal collars.		<input type="checkbox"/>
15. Piping Shaft / Penetrations Openings are fully sealed with framing and any gaps are fully sealed with caulk or foam.		<input type="checkbox"/>
16. Piping Shaft / Penetrations Attic barrier is fully aligned with insulated framing, as framed shafts before envelope is caulk, foam, or tape.		<input type="checkbox"/>
17. Dropped Ceiling / Soffit Attic barrier is fully aligned with caulk, foam, or tape.		<input type="checkbox"/>
18. Fireplace Wall Attic barrier is fully aligned with insulated framing and any gaps are fully sealed with caulk or foam.		<input type="checkbox"/>
19. Staircase Framing at Exterior Wall / Attic Airtight IC-rated recessed light fixtures are sealed to prevent air leakage.		<input type="checkbox"/>
20. Recessed Lighting Attic barrier is installed at the intersection of the porch roof and exterior wall.		<input type="checkbox"/>
21. Porch Roof An airtight corner is provided that is gasketed or sealed to the opening from either the side wall or ceiling side of the fan.		<input type="checkbox"/>
22. Whole-House Fan Penetration at Attic Attic barrier is installed to seal the gap between a gopher shaft used (e.g., screen wall) the side wall or ceiling side of the fan.		<input type="checkbox"/>
23. Common Walls Between Dwelling Units Attic barrier is installed to seal the gap between units in duplex and townhouse construction and the structural framing between units.		<input type="checkbox"/>

Home Energy Rating Provider: \_\_\_\_\_ Builder Company: \_\_\_\_\_  
 Home Energy Rater Company: \_\_\_\_\_ Builder Employee Signature: \_\_\_\_\_  
 Home Energy Rater Signature: \_\_\_\_\_ Inspection Code: \_\_\_\_\_  
 Inspection Date: \_\_\_\_\_ Re-inspection Date: \_\_\_\_\_



# Performance, Comfort & Quality

- Can't be codified or legislated
- ENERGY STAR Homes now addresses more issues, but...not HVAC design or installation
- Satisfaction is subjective

# What Can You Do When...

- HVAC systems are not sized properly
- Distribution is not following any intentional plan
- Not sealed or insulated properly
- Made to fit on site – not integrated with house design
- Different crews responsible for installation of system and ducts
- Judged by how fast and how cheap not how well
- No measure of performance



## But You Can Still Have...

- HVAC systems are not sized properly
- Distribution is not following any intentional plan
- Not sealed or insulated properly
- Made to fit on site – not integrated with house design
- Different crews responsible for installation of system and ducts
- Judged by how fast and how cheap not how well
- No measure of performance

# Verify, Verify, Verify

- Visually inspect the the first of each model at the rough mechanical phase
  - to coordinate trades and structure.
  - Modify design as necessary
  - Verify installation and quality of workmanship in accordance with design

# Measuring Performance

- Static pressure drop across coil and filter
- True-Flow® measure of actual system airflow at return trunk
- Flow hood measurements at registers and grilles
- Compare with system air flow & design air flow



# Advanced Diagnostics

- If there's a problem:
  - Temp rise & drop
  - Room air temps (ASHRAE standards)
  - Mean radiant temp diagnostics (more on this)
  - Infrared
  - Pressure boundaries (ZPT)
  - And then there is the drywall saw...

# More on Performance, Comfort & Quality

Actual Temperature  
ASHRAE Comfort Zone  
Mean Radiant Temperature

