Whole Building Energy Performance and Energy Codes

Presented to

2006 RESNET Building Performance Conference

1 March 2006

by

Z. Todd Taylor

Pacific Northwest National Laboratory

—OR—

A Code Guy's Random Thoughts on Performance Compliance Paths

➢ How codes fit into DOE's Zero Energy Buildings (ZEB) initiative

➢ Commitment to the large 'N'

➢ Main interest is the disinterested

➢ "Code" entails…

- The text (IECC, energy chapter of IRC, etc.)
- A code jurisdiction
- One or more local officials
- Possibly multiple compliance aids

➢ Performance Analysis

- (Everyone here knows what that is)

➢ Performance Path

- Generally involves one or more performance analyses
- Rules defined by the "code"

- ➢ IECC—International Energy Conservation Code
  - • A national "model code"
  - • Maintained by the International Code Council (ICC)
  - • Has prescriptive, UA-tradeoff, and performance paths
- ➢ IRC—International Residential Code
  - • We're only (mostly) interested in the energy chapter
  - • Has no performance path (but does allow use of the IECC)
- ➢ "I-Codes"—any of the ICC's codes

- Why the performance path doesn't get used
- Why the performance path does get used
- Common misconceptions about the performance path
- Why is the performance path important?
- Problems with advancing efficiency via the performance path
- Final thoughts and suggestions / discussion

Why Performance Doesn't Get Used More

- ➤ The Code Official doesn't care
  - "How much better" is irrelevant (code compliance is a **binary** metric)
  - Most officials view energy as a small, even nuisance, issue
- ➤ The rank-and-file builder sees little value-add
  - "How much better" buys nothing at the code office
  - Unless another program is involved (e.g., E-star), "how much better" buys nothing in terms of marketing

The code offers neither incentive nor infrastructure to promote performance analysis

Why the Performance Path *Does* Get Used

➢ The builder is already on board with an external, above-code program

➢ To take advantage of "flexibility"

- To find a cheaper overall solution (but simpler paths usually work just as well)

- To use innovative materials/techniques (but most of these uses are already covered in the first category)

Why the Performance Path *Does* Get Used

➤ The building is in California or Florida

➤ To reduce the efficiency of the home

- Hydronic credit (15%) is a freebie in the Northeast

- Overhangs are a freebie in Florida

- About half of all homes have advantageous solar orientation and can reduce insulation/efficiency as a result

- The other half would require *more* insulation/efficiency so they avoid the performance path

The code's incentives can be perverse

Common Misconceptions about Performance Compliance

➢ MYTH: Performance compliance encourages more efficient homes

➢ TRUTH: More efficient homes encourage performance compliance

Common Misconceptions about Performance Compliance

➤ MYTH: Making passive solar features "valuable" in the performance path encourages the use of those features

➤ TRUTH: It's a rare passive solar design that will *need* any performance analysis to comply with the code

   What passive design manual tells you to trade away your insulation and good windows?

Successful Performance Path Examples

➢ E.g., California and Florida

- Large populations/infrastructures to oversee "complex" compliance system

- Single entity (state) controls the code

- Lots of very large builders

- Code itself makes prescriptive path arduous (because it's based on worst-case assumptions)

- Can make use of "drug dealer" marketing tactics—making new technologies free this year, mandatory later

Most U.S. jurisdictions don't fit that pattern

Successful Performance Path Examples

➢ E.g., California and Florida

- Can make use of "drug dealer" marketing tactics—making new technologies free this year, mandatory later (I-Codes not sufficiently controlled for this)

The I-Codes don't fit that pattern

➤ It's NOT…

➤ Performance *analysis* is, though

"The code is not above-code"

Common Misconceptions about Performance Compliance

➢ MYTH: The code should "lead the way" by making the performance path primary/mandatory/preferred/etc.

➢ TRUTH: The code can rarely lead the way on anything

- Needs to reference something externally proven
- There are exceptions (e.g., SHGC)

➢ Prescriptive code directions

- Most components have plateaued (LCC-wise)
- Most components, maxed out, would save *relatively* small amounts (against DOE's ZEB strategy)

➢ Code scope is limited both legally and practically

- E.g., HVAC equipment subject to NAECA
- E.g., many appliances not sold with home
- E.g., code officials have limited time and expertise

Outside help is needed (e.g., even in CA)

16

The Importance of Performance *Analysis* Outside of the Code

➢ Code is legalistic and rigid
- Optimal design requires imagination and engineering
  Code worries with minimal design, not optimal design

➢ Code is limited in scope
- Optimal design requires a "systems" viewpoint

➢ Code is controlled by…
    …nobody

Better RESNET than ICC

The Importance of Performance *Analysis* Outside of the Code

➤ Code provides no avenue for added value to the builder—hence, little incentive to use performance path for anything other than counter-productive purposes

➤ Baseline code frequently requires too much of the builder's attention, leaving little patience/interest in pursuing something better

(Trying to get the code to lead the way can be counter-productive)

Significant advances <u>must</u> be driven from outside the code

➢ Build linkages with beyond-code programs

- Eliminate barriers to new technologies/techniques
- Accommodate the tools (e.g., HERS)

➢ Let the code lean on industry standards (e.g., HERS), not vice versa

➢ Keep improving the code's simple path

- Eliminates the easiest bypasses
- Lops off the lower tail
- Bumps "better than the cheap guy" closer to a real efficiency interest