No More Easy Refills: The Move from Prescriptions to Performance Codes

October 13, 2016

Roger Hedrick, BEMP, LEED AP
Principal Engineer
NORESCO

HISTORY: ORIGIN OF TITLE 24 AND STANDARD 90.1

› 1973: The Oil Crisis

› 1974: Gov. Ronald Reagan signs the Warren-Alquist Act into law
  • Establishes an Energy Commission to be an independent agency for load forecasting
  • Establishes cost-effectiveness requirements for efficiency standards

› 1975: ASHRAE Standard 90

› 1978: First California building energy efficiency code
THE PROBLEM

- Energy standards’ intent – ensure use of energy efficient building components
  - Insulation levels
  - HVAC systems
  - Lighting systems

- Based on positive economics over the life cycle
  - Why?

- Only addresses building components
  - Excludes geometry
  - Excludes occupant behavior
  - Excludes process loads
  - Excludes operation and maintenance

- Performance approach – gives designers greater flexibility
  - Goal was performance equivalent to prescriptive approach

THE PROBLEM

- Prescriptive requirements have reached their limit

- Prescriptive requirements cannot effectively achieve net zero energy buildings

- Renewable energy required to further reduce energy
  - Outside scope of traditional codes

- Performance approach only addresses a subset of building features
OPTIONS?

- Continue on current path
  - More and more effort for smaller and smaller gains
- Require performance approach
- Revise the prescriptive approach
- Come up with something completely different

GET RID OF PRESCRIPTIVE APPROACH

PROS
- Allows setting energy targets as desired
- Allows design team to innovate and optimize
- Simplifies the code

CONS
- Problematic for additions and, especially, alterations
- Overkill for small or simple buildings
Performance Approach Problems

- Must develop baseline for comparison
- For any feature of the baseline that is set “equal to proposed,” no credit available for improved design.
  - Geometry and (in Title 24) orientation
  - Window to Wall Ratio (up to 40%)
  - Occupancy
  - Plug loads and process loads
  - Schedules
- But, how to set baselines?

Performance Approach Problems

- Performance approach - comparison to a baseline
- “Baseline” really means “Target”
- How can we set targets that allow buildings to get credit for “equal to proposed” characteristics?
- Set an EUI based on the building type and location
- But, now we have fairness issues
  - Two businesses may have inherently different internal loads
  - Different occupant density standards
REVISE THE PRESCRIPTIVE APPROACH

- Traditional prescriptive requirements apply to all buildings
- Identify measures that are cost effective, but not necessarily appropriate for all buildings
  - PV systems – X kW per Y square foot of roof
- Provide alternates that can be used instead
  - Increased HVAC efficiency (avoids Federal preemption)
  - Decreased lighting power
  - Et cetera

REVISE THE PRESCRIPTIVE APPROACH

- Difficult to balance tradeoff options
  - Will energy savings of increased HVAC efficiency approximate energy from PV system?
  - Does it matter?
- Not effective for achieving specific energy goals, such as net zero
  - Prescriptive renewable requirements will overshoot or undershoot net zero, usually by a large margin
- Still problematic for alterations
  - Scope may not include HVAC or lighting, so options become infeasible
RECOMMENDATIONS – PRESCRIPTIVE APPROACH

› Some sort of prescriptive compliance option is needed

› Limit when it can be used
  • Alterations – defined scope
  • Defined small projects

› Set aggressive requirements

› Options for tradeoffs
  • May not be necessary based on the limited alterations scope above
  • Small projects – easier, but not easy
## Recommendations – Performance Approach

- **Require use of performance approach**
  - All new buildings (except for defined small buildings)
  - All additions
  - All alterations beyond a certain scope

- **Simplify modeling, such as automatic baseline generation**
  - Makes application to smaller buildings more reasonable

- **Set aggressive energy targets**
  - Will drive use of renewables

- **Decrease energy targets to zero over time**

## Recommendations – Performance Approach

- **Identify and minimize “equal to proposed”**

- **Fixed baseline** — may need to be set arbitrarily
  - Window to wall ratio
  - Geometry

- **Set energy targets based on building type**
  - “Baseline” implies a reasonable design – “Target” is just a yardstick
  - Drives energy model to meet that target, but not necessarily the building
Recommendations - Net Zero

- A net zero requirement simplifies many of the problems
- Focus on actual energy use
- How?

Questions?

Contact:
Roger Hedrick, Principal Engineer
rhedrick@noresco.com

© NORESCO, LLC,
All rights reserved,
2016