Commercial Energy Code Enforcement: We Could be Doing a Whole Lot Better

Energy Codes 2007 - July 26, 2007

Bruce Nelson, P.E.

Minnesota Energy Office

This presentation

- Based on interviews of Minnesota building officials
- Outline
  - Enforcement Today
  - Steps taken to improve enforcement
  - Challenges
  - Case studies
  - Recommendations

A “P.E. stamp” may not be sufficient

- Engineer’s contract may not include site inspection
- Architect is responsible for
  - Air barrier details on the plans
  - Design to mitigate thermal bypasses
- The possibility exists that the building may not conform to the plans

Enforcement Today
Plan Review

- Nearly all building officials said COMcheck is extremely valuable
- Rarely are air barrier or vapor retarder details on plans
- Some applicants still don’t know that energy calculations are required

Enforcement Today
Site Inspection

- Can’t confirm window performance
  - stickers removed
- Poor air barrier details
  - Even though Minn. code requires “continuous air barrier”
- Presumption that equipment on the list of specifications will be installed
  - Not always the case

Roof/Wall Air Barrier

Not sealed

Sealed

Poor Air Barrier Detailing

Results at this City Hall

Improving Enforcement
Plan Review

- Require vapor barrier / air barrier details on drawings
- Examine COMcheck inputs in detail
  - Recalculate area data entries

Improving Enforcement

Site Inspection

- Send inspectors to the field with ½-sized copy of approved plans
- Collaborate with the electrical inspector
  - Air sealed recessed light fixtures
  - Transformer TP-1 requirement
- Take the time to check equipment labels against the spec. sheet
- If design seems questionable, require a performance test (per mechanical code)

Challenges

- Pressure to change equipment
  - Contractor who gets “a real deal” on a piece of equipment that is “just as good”
- Contractors have to fret with each building design’s details
- Code required R-value for ducts outside conditioned space
  - R-6 & R-8 is insufficient for carrying conditioned air

More Challenges

- Manufactured buildings
  - Design may have BIG thermal bypasses
  - No air barrier details in assembly instructions
  - May not even meet code for all areas
- Design/build firms
  - many jobsite changes

Good News

- Many small commercial buildings being done by residential builders
  - Insulation and air barrier consistent with stringent residential code
- Sometimes standard practice for thermal envelope is better than minimal code requirements

Case Studies

- Major HVAC renovation of a technical college
  - Controls not working
  - Main sensor still in plastic shipping bag!
- Primary school wing addition
  - Could not achieve comfort conditions
  - fan was running backward
  - because the fan air-flow arrow was pointing the wrong way!
- Countless others

Recommendations Enforcement

- Better education of designers, contractors & building officials on importance of air barrier
- A “Cookbook” of envelope designs for better practice would be valuable
  - Time saver for contractors
  - For different envelope materials
  - For different climate zones
  - Example: Thermal Bridges Catalog

Code Change Recommendations

- Specifically include a requirement to show vapor retarder / air barrier details on plans
- Need higher R-value for ducts outside conditioned space!

More Difficult Code Change Recommendations

- Windows should have a permanent mark of thermal performance
- Transformer TP-1 requirement should be in the National Electrical Code

Most Difficult Code Change Recommendations

- Performance vs. prescriptive
  - Could we be clever enough to write the code so that it includes a performance requirement in prescriptive language
- Acceptance testing requirement
  - Force industry to come up with test criteria for equipment and systems
  - Minnesota model using parts of ASHRAE Commissioning Guideline

HVAC Acceptance Testing Minnesota model

- ASHRAE Guideline 0-2005 – The Commissioning Process
  - 7.2.9 Develop Test Procedures
  - 7.2.10 Develop Test Data Records
  - 7.2.13 Test Execution
  - 7.2.15 Construction Phase Commissioning Process Report

Recommendations for DOE

- Revise COMcheck to make it harder to fudge the numbers
  - inputs & outputs (now written to text file that can be easily changed)
  - “input form” that gives linear dimensions (in addition to areas) so they are easier to check!
- Work with manufactured building companies
  - Plans and installation instructions consistent with code & best practices

Conclusion

- If we are to achieve the ambitious energy goals we have set
- Must dramatically improve commercial energy code enforcement
- Bruce Nelson
  - Minnesota Department of Commerce, State Energy Office
  - bruce.nelson@state.mn.us
  - (651) 297-2313