Subject

“What everyone needs to know about ASHRAE 90.1”

J. Christopher Larry, P.E., C.E.P., C.E.M, C.I.P.E.

Thursday, January 20, 2005

Joint ASHRAE – AEE Meeting

Cleveland, Ohio

Introduction

J. Christopher Larry

P.E., C.E.P., C.E.M, C.I.P.E.

Senior Energy Engineer - Performance Solutions

Siemens Building Technologies

Past President Pittsburgh Chapter of ASHRAE.

President of AEE (Association of Energy Engineers) of Western PA.

ASHRAE Vice-Chair Technology, Energy and Governmental Activities (CTTC).

AEE “Energy Engineer of the Year” in 2000.

Agenda

- **Announcements**
- **Goals and Objectives**
- **Background (History)**
- **What is included and required (by chapter)**
- **Using it for Energy Efficiency**
  - **“Rules of Thumb”**
- **Enforcement**
- **Questions**

ASHRAE Standard 90.1-1999/2001

ASHRAE's Newest

Commercial Building Standard

Energy Efficient Standard for Buildings

Announcements

- ASHRAE Show – Feb. 7-9, 2005
  - Orlando, Florida
- AEE Globalcon 2005 – March 23-34, 2005
  - Atlantic City, New Jersey
- ASHRAE Satellite Broadcast – Mold
  - April 13, 2005
- AEE CEM Training & Exam – Spring 2005
  - Pittsburgh, PA
- Ohio Energy Conference – Feb. 17-18, 2005
  - Columbus, Ohio

Standard 90.1 - 1999/2001

- Developed jointly by the American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) and the Illuminating Engineering Society of North America (IESNA)
- Developed under American National Standards Institute (ANSI) consensus guidelines
- “Standard” vs. “Code”

Standard 90.1 - 1999/2001

- Developed with participation from many building and construction organizations including:
  - American Institute of Architects (AIA)
  - Building Owners and Managers Association (BOMA)
  - North American Insulation Manufacturer's Association (NAIMA)
  - Air-Conditioning and Refrigeration Institute (ARI)
  - Gas Appliance Manufacturers Association (GAMA)

Standard 90.1 - 2001

- The US DOE has found ASHRAE Standard 90.1-2001 does save energy and states are currently required to adopt a **code** that meets or exceed the provisions of Standard 90.1-2001 as their commercial building **code** by July 15, 2004.

Standard 90.1 - Past

- ASHRAE Standard 90.1 has been the basis of all versions of the national Model Energy Codes, the International Energy Conservation Code, the Federal commercial standards, and most state codes.
- PA & OH have updated their energy **codes** to reference 90.1.

Standard 90.1 – Present

- Standard 90.1-2001 is the reference standard for the 2001 IECC
- Standard 90.1-2001 will be the reference standard for NFPA 5000 and the 2003 IECC
- Standard 90.1-1999 and 2001's Energy Cost Budget method is the basis for LEED certification

Mandatory, Enforceable Language

- Standard 90.1-1999 is a code-intended standard. As such, it is written in unambiguous language intended to allow a code official to say “that complies” or “that doesn’t”
- There are no “shoulds”, “coulds” or “shall consider” phrases – just lots of “shalls”

Based on Consistent Economic Criteria

- While previous ASHRAE standards were based on professional judgment combined with analysis of energy and cost impacts, Standard 90.1-1999 is the first to attempt to use consistent economic criteria as the basis for requirements.

Technical Basis of Standard 90.1

- Economic analysis tempered with professional judgment
- First costs based on incremental costs of improved performance
- Annual savings based on incremental energy savings

Renovations and Retrofits

- Previous ASHRAE Standards were more or less silent on the concept. All standards were designed for “new construction” but what does that mean?
- ASHRAE worked with BOMA on Chapter 4 to develop detailed rules for how Standard 90.1-1999 should be applied to renovations and retrofits.

Chapter 6 (HVAC)

- Offers a simplified approach for small (less than 25,000 ft2), short (less than two stories) buildings with single zone HVAC
- 2,500 ft2 per zone maximum.
- This section is inspiring the development of “small” or “simple” building sections in each chapter of Standard 90.1

Chapter 6 (HVAC for Not-So-Simple Buildings) I

- Requires load calculations
- Regulates equipment efficiency

Chapter 6 (HVAC for Not-So-Simple Buildings) II

- Regulates HVAC system construction and insulation
  - Duct and plenum insulation, piping insulation
  - Duct and plenum leakage
- Requires that construction documents and manuals be provided to the owner
- Requires system balancing in all buildings and commissioning in large buildings

Controls

- Requires controls
  - Zone thermostatic, off-hour, ventilation system, humidifier preheat, humidification and dehumidification, freeze protection and snow/ice melting systems, ventilation controls for high-occupancy areas
  - heat pump auxiliary heat and valves on all.
  - Variable flow-multiple boiler/chillers-Isolation valves & variable flow.

Controls

- Requires controls
  - Temperature and humidity-reset able and programmable.
  - No barometric- Motorized dampers
  - Automatic shutoff valves on humidifiers
  - Sensors for freeze protection and snow/ice melting systems
  - DCV ventilation controls for high-occupancy areas (>3,000 cfm OA & >100 people/1,000 sf)

Chapter 6 (HVAC for Not-So-Simple Buildings) III

- Requires economizers (with lots of exceptions)
- Regulates simultaneous heating and cooling
  - "No reheating – with limitations"
- Regulates air system design and control
- Regulates hydronic system design and control
- Regulates heat rejection equipment
- Regulates exhaust hoods

Chapter 6 (HVAC for Not-So-Simple Buildings) IV

- All fans >/= 7.5 HP should have VSDs.
- All pumps >/= 10 HP should have VSDs.
- Requires energy recovery (with exceptions) >5,000 cfm & 70% OA
- DCV ventilation controls for high-occupancy areas (>3,000 cfm OA & >100 people/1,000 sf)
- Good guide to retrofits…..

Chapter 7 (Service Water Heating)

- Requires load calculations
- Regulates equipment efficiency
- Requires SWH piping insulation
- Requires SWH temperature controls
- Requires pool heater shut-off controls, pool covers, and pool heater/pump shut-off controls
- Requires heat traps & flue dampers

Chapter 9 (Lighting) I

- Requires interior lighting controls
- Requires tandem wiring of ballasts
- Regulates exit signs
- Defines installed interior lighting power
- Defines luminaire wattage
- Regulates exterior lighting efficacy
- 2,500 sf/zone-occupant sensor, override, security interlock.

Chapter 9 (Lighting) II

- Provides two options for regulating interior lighting power
  - Building Area Method
  - Space-By-Space Method
- Provides additional interior lighting power allowances for specific situations

Training Resources

- Our state ASHRAE chapters
- ASHRAE's website – www.ashrae.org
  - Interpretations, addenda, mailing lists, videos
- DOE's code website – www.energycodes.gov
  - Presentations, status of states, code comparisons, simplified compliance materials (maps, guides, software), videos

Software & Documentation

- EnvStd – exterior insulation calculator
- Forms:
  - Building envelope compliance documentation
  - HVAC simplified, mandatory & prescriptive
  - Service water heating
  - Lighting
  - Energy cost budget (ECB) compliance
- Code check software

Energy Efficiency & Tax Incentives

- H.R. 3953 – "Cool & Efficient Buildings Act" reduce depreciation of energy efficient equipment (>39 years).
- Senate Bill 2311 – Tax deductions ($/sf) if building is less than 50% of Ashrae 90.1.
- Pending.

Standard & Manuals

- By attending this meeting you can order 90.1 manuals for:
  - $38 for standard
  - $44 for user's manual

Questions?

- I have a copy of the standard and guidebook.
- Your ASHRAE chapter representatives have been specifically trained by ASHRAE to answer questions related to Standard 90.1