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Small/Medium-Sized Commercial Building Re-tuning Training

Introduction

A PRESCRIPTIVE APPROACH TO RE-TUNING SMALL/ MEDIUM-SIZED COMMERCIAL BUILDINGS

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Small/Medium-Sized Building Re-tuning Training: Introduction

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- The purpose of this training is to train students/technicians on how to make small/medium-sized buildings more efficient leading to energy savings and reduced operating cost
- The knowledge and skills learned through the training will be highly valued by organizations and companies seeking to improve the performance of small/medium-sized buildings
- It will also prepare the participating students/technicians for hands-on field training
- It will also provide an opportunity for students/technicians to ask questions and get clarification on any aspect of the re-tuning process

Small/Medium-Sized Building Re-tuning Training: Intended Audience

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- Onsite employees (custodial staff) responsible for day-to-day building operations,
- Offsite contractors (retro-commissioning agents, service providers or control vendors) hired to improve a building's energy efficiency, and
- People interested in entering this field, including college students and military veterans

Small/Medium-Sized Building Re-tuning: Definition

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- Building re-tuning is a systematic process to identify and correct no/low cost operational problems that lead to energy waste
- Because small/medium-sized buildings will mostly have packaged units for heating and cooling with simple air distribution, and are controlled by a zone thermostat, many of the recommendations for efficiency improvements will be prescriptive
- Some of the topics covered in this building re-tuning training are often covered in training associated with energy auditing and retro-commissioning for small/medium-sized commercial buildings

Small/Medium-Sized Building Re-tuning Training: Approach

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- It will use a four step approach
  - **Initial data collection phase**: Collection of information about the building
  - **Investigation phase**: Building walk-down to identify and characterize the building operations
  - **Implementation phase**: Application of prescriptive re-tuning measures
  - **Documentation phase**: Reporting of measures implemented and calculation of energy savings

Small/Medium-Sized Building Re-tuning Training: Major Focus Areas

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- Building Envelope
- Heating, Ventilation and Air-Conditioning Systems and Controls
  - Packaged air conditioners and heat pumps
  - Gas furnaces
- Lighting and Lighting Controls
- Hot Water
- Office Equipment
- Indoor Environmental Conditions
- Air distribution system
- Meter Profile

Small/Medium-Sized Commercial Building: Definitions and Approach

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- Small-sized Buildings:
  - 25,000 square feet (sf) or less
  - No building automation system
- Medium-sized Buildings:
  - Greater than 25,000 and generally less than 100,000 sf
  - No building automation system

- A prescriptive approach to identify and correct no-cost or low-cost building operational problems that lead to energy waste
- May include identifying other opportunities for improving energy efficiency that require investment

Small-Sized Commercial Building Characteristics

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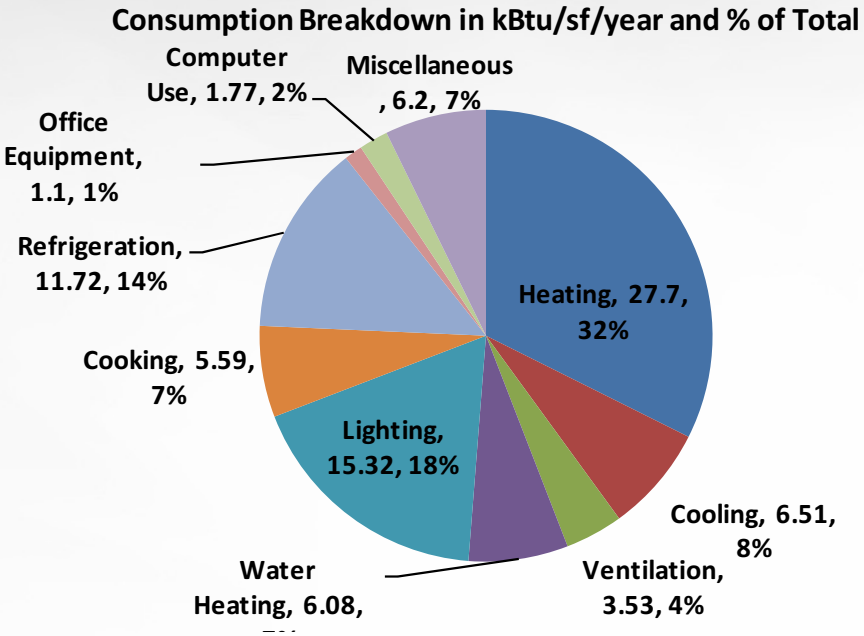
- Buildings less than 25,000 sf
  - Percent of total number of commercial buildings – 54%
  - Percent of total commercial building square footage – 22%
  - Percent of total commercial building energy use – 21%
- Even a 10% reduction in HVAC and lighting energy consumption will lead to 6 kBtu/sf/year or 150 mBtu/yr for a small commercial building



Source: 2003 CBECS

Medium-Sized Commercial Building Characteristics

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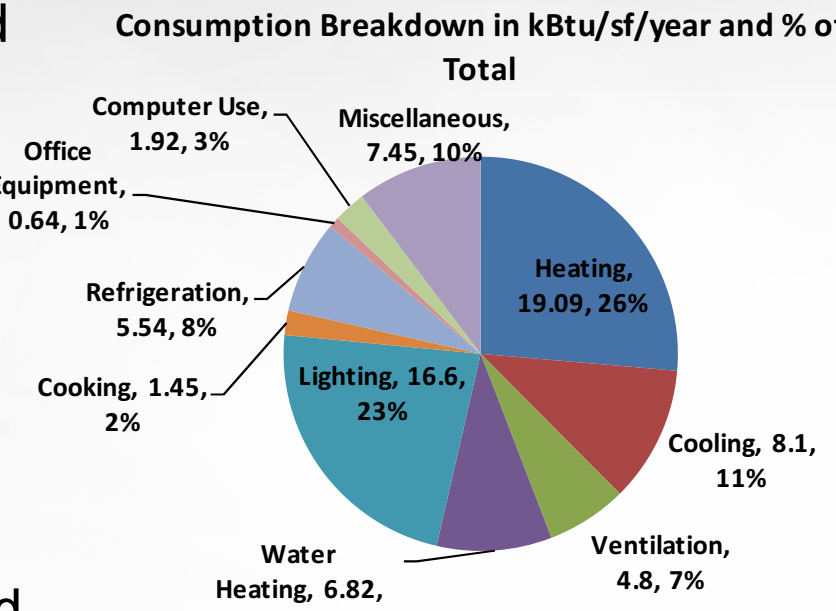
- Buildings greater than 25,000 sf and up to 50,000 sf
  - Percent of total number of commercial buildings – 3%
  - Percent of total commercial building square footage – 6%
  - Percent of total commercial building energy use – 5%
- Even a 10% reduction in HVAC and lighting energy consumption will lead to 5.5 kBtu/sf/year or 275 mBtu/yr for a medium commercial building that is 50,000 sf in size



Source: 2003 CBECS

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Small/Medium-Sized Commercial Building Re-tuning: Building Personality

Small/Medium-Sized Building Re-tuning: Basic Energy Management Principles

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- If you don't need it, turn it off
- If you don't need it at full power, turn it down
- Make "smart" energy decisions when adjusting systems to the real building needs
- Learn and know your building's personality
- Save energy without negatively impacting the comfort of the occupants

Small/Medium-Sized Commercial Building Re-tuning Training: Understanding Building Personality

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- Buildings start as children
  - Designed (parents)
    - By engineers with best guess information
    - For some weather conditions
    - Inside load conditions
    - For a specific number of occupants
    - For a specific solar gain and orientation
  - Built with (childhood years)
    - Low bid
    - Tight schedules
    - Limited inspections
    - Minimum or no commissioning

Building Personality (cont.)

- Buildings grow to be teenagers … usage, constant change (teenage years)
  - Weather impacts
  - Staff changes
  - Changes in internal loads, e.g., computer, printers, etc.
  - Equipment malfunctions that are not repaired
  - Design flaws that are not repaired
  - Cubical and wall reconfigurations without moving diffusers, thermostats or light switches
  - Poor maintenance on equipment
    - Working Dampers, Air Balance
    - Controls
    - Clean Filters, Clean Coils and Refrigerant Charge

Building Personality (cont.)

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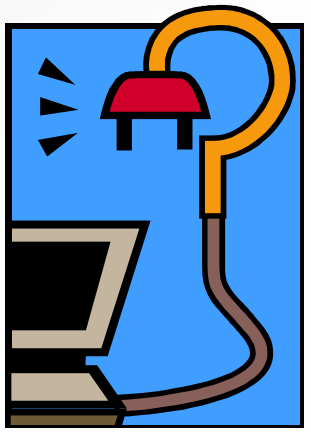
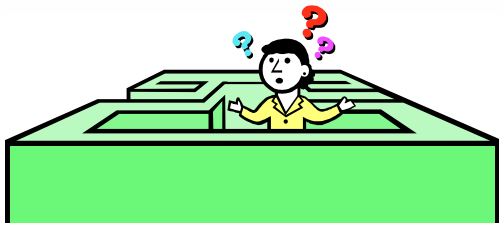
- Buildings grow to be adults … current conditions (adulthood)
  - High energy costs
  - High complaints
  - Small zones driving large systems
  - Poor operations based on complaint response instead of the bigger picture
  - Continuance of poor maintenance

Building Personality (cont.)

- Like children, you need to get to know your building
- When is the building truly occupied and how it reacts to occupancy changes
- What is its personality
  - How does it act or respond to changing internal conditions?
  - How does it respond to weather changes?
  - What is its balance point (a point where no heating or cooling is required to maintain comfort in the building)?





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Small/Medium-Sized Commercial Building Re-tuning Steps

Small/Medium-Sized Commercial Building Re-tuning Steps

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- Collection of information about the building: This is the **Initial phase** of building re-tuning
- Building walk-down to identify and characterize the building operations: This is the **Investigation phase** of building re-tuning
- Application of prescriptive re-tuning measures: This is the **Implementation phase** of building re-tuning
- Reporting of measures implemented and calculating of energy saving: This is the **Documentation phase** of building re-tuning.