ENERGY to care

Greater efficiency supports patient care.

Check and Repair Thermal Envelope

All ECM content was independently developed and reviewed to be vendor, product and service provider-neutral.

Description

Improve energy efficiency and reduce the risk of compromised indoor air quality by regularly inspecting the building thermal envelope for gaps, cracks and faulty or missing insulation and addressing any problems found.

Project Talking Points

- Openings in the thermal envelope waste energy and introduce health and safety risks by:
  - Allowing heating and cooling to escape, wasting energy.
  - Allowing unfiltered air into the building.
  - Compromising pressure relationships of affected rooms.
  - Providing pathways for pests to enter the building.
  - Allowing mold and mildew growth in concealed, moist areas.
- Diagnostic tools such as thermal imaging cameras can help identify weak components of the thermal boundary. Combining a thermal imaging camera with the use of a blower door can help identify even the smallest weakness in the envelope.

Triple Bottom Line Benefits

- **Cost benefits:** Sealing leaks can provide significant energy savings, which result in cost savings.

- **Environmental benefits:** Reducing energy use always reduces emissions.

Social Benefits: Depending on the improvements made to the envelope, thermal comfort may be improved, enhancing patient and staff experience. **Purchasing Considerations**

Consider the return on investment for selecting different insulation types. Initial cost may be higher for certain types, but the payoff in energy and occupant comfort may outweigh the upfront capital.

How-To

ENERGY to care

Greater efficiency supports patient care.

1. Create a team including the commissioning agent, building engineer, infection control and building maintenance personnel.

2. Develop a thermal envelope inspection work plan, schedule and documentation deliverables. Assign roles and responsibilities to appropriate team members.

3. Visually inspect the current state of the building thermal envelope. At a minimum, document deterioration, evidence of moisture penetration and/or evidence of pests in the following:
    - Roof assemblies
    - Vapor barriers
    - Diffusion retarders
    - Air barrier systems
    - Rain-screen layers
    - Flashing
    - Cladding and siding
    - Windows
    - Curtain-wall assemblies
    - Doors (entrance, exit, deck and roof access doors)
    - Thermal bridges
    - Utility penetrations

4. In locations where the thermal envelope appears to have been breached, conduct testing for air leakage using blower door and/or infrared methods.

5. Seal cracks and leaks to prevent excessive air infiltration/exfiltration, heat gains/losses and moisture penetration.

6. Install insulation in strategic locations to reduce unwanted thermal gains or losses.

7. Coordinate envelope inspections with performance improvement measures.

8. Consider installing sunscreens on exterior windows or curtain walls where solar heat frequently increases the temperature of specific areas.

Resources

ENERGY to care

Greater efficiency supports patient care.

- The American Society for Healthcare Engineering (ASHE) courses:
  - Industrial Insulation III: Inspection and Maintenance
  - Industrial Insulation II: Design Data Calculations
- California Commissioning Collaborative: California Commissioning Guide: Existing Buildings
- California Commissioning Collaborative: Existing Building Commissioning Toolkit
- LEED for Existing Buildings: Operations + Maintenance
  - Energy and Atmosphere Prerequisite 1: Energy Efficiency Best Management Practices, Planning, Documentation and Opportunity Assessment
  - Energy and Atmosphere Prerequisite 2: Minimum Energy Performance
  - Energy and Atmosphere Credit 1: Optimize Energy Efficiency Performance
  - Energy and Atmosphere Credit 2.1: Existing Building Commissioning, Investigation and Analysis
  - Energy and Atmosphere Credit 2.1: Existing Building Commissioning, Implementation
  - Energy and Atmosphere Credit 3.1: Performance Measurement, Building Automation System (BAS)
  - Energy and Atmosphere Credit 5: Measurement and Verification
- LEED for Healthcare: New Construction and Major Renovations
  - Energy and Atmosphere Prerequisite 1: Fundamental Commissioning of Building Energy Systems
  - Energy and Atmosphere Prerequisite 2: Minimum Energy Efficiency Performance
  - Energy and Atmosphere Credit 1: Optimize Energy Efficiency Performance
  - Energy and Atmosphere Credit 3: Enhanced Commissioning
  - Energy and Atmosphere Credit 5: Measurement and Verification
- National Institute of Building Sciences: HVAC Integration of the Building Envelope
- Schneider Electric: Energy University Courses
- U.S. Department of Energy:
  - Building Envelope Critical to High-Performance Hospitals
  - Commissioning Existing Hospital Buildings Aids Peak Energy Performance
  - Energy Smart Hospitals: Retrofitting Existing Facilities
  - Hospitals Realize Fast Paybacks from Retrofits and O&M Solutions

ASHE Optimizing health care facilities

AHA Data & Insights

U.S. Environmental Protection Agency (EPA) and ENERGY STAR®: Energy Star Building Upgrade Manual

Regulations, Codes and Standards, Policies

- ASHE: Health Facility Commissioning Guidelines
- American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE): Guideline 0-2005: The Commissioning Process

Commissioning Connections

The ASHE Health Facility Commissioning Guidelines and accompanying Health Facility Commissioning Handbook are good information sources for undertaking this performance improvement measure.

- 3.13 Facilitate Pressure Testing.
- 3.13.1 Code Requirements. Current codes require controlled pressure relationships between critical health care spaces such as operating rooms, procedure rooms, airborne infection isolation (AII) Rooms and between protective environments (PE) rooms and adjacent spaces.
- 3.13.4 Steps for Testing the Building Envelope. Controlling building pressure is also critical to efficient and comfortable building operation. To ensure the building envelope is properly sealed, the commissioning process should include building pressure testing. The recommended pressure testing process for the building envelope includes these steps:
    - Close all doors and opening to the building.
    - Verify that all exhaust fans are operating at the proper airflow.
    - Increase the air-handling unit outdoor airflow until the building pressure relationship is positive 0.01 in. w.g. The building pressure relationship should be determined using a properly installed building pressure transmitter that measures the average differential pressure at the ground-level entrances to the building.
    - Record the outdoor airflows, building pressure and outdoor air temperature.
    - If the outdoor airflow is excessive, the contractor [during construction] should identify and seal envelop leaks.
    - The testing and sealing process is then repeated until the amount of outdoor airflow is acceptable.
- 3.14 Review Record Drawings. The health facility commissioning authority (HFCxA) should review the record drawings with operations and maintenance

(O&M) personnel. The HFCxA should identify know discrepancies between these documents and as-installed conditions for resolution.

ECM Synergies

- Establish baseline for current energy consumption.
- Practice preventive maintenance of major HVAC equipment.
  Retro-commission HVAC controls.

ECM Descriptors

EnergyLevel**:** Beginner

Category List:

- Building and maintenance
- Commissioning
- Envelope

ECM Attributes:

- Repair or optimize existing systems

Improvement Type

- Commission/retro-commission
- Retrofit/renovations
- New buildings
- O&M

Department:

- Engineering/facilities management