solution package

Building Envelope

A guide to building envelope solutions that improve comfort, marketability, and energy efficiency.

The BE-Ex solution packages are a suite of six documents compiled from the *Anatomy of an Energy Efficient Building* exhibit on view at Building Energy Exchange's downtown resource center, or virtually at **be-exchange.org/anatomy**

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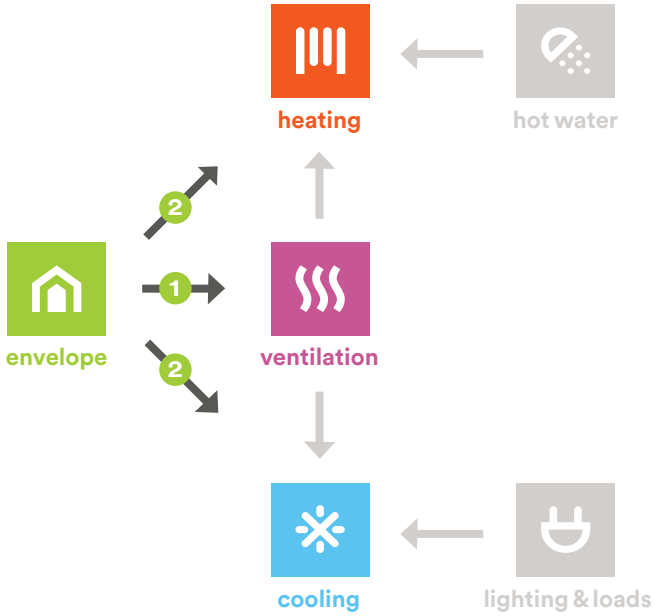
system interaction

The performance of mechanical building systems is contingent on the integrity of the building envelope. Building envelope upgrade decisions should be made in the context of how they might impact the operation and performance of mechanical systems.



1

envelope → ventilation

Envelope upgrades must be paired with balanced fresh air ventilation to ensure indoor air quality and health benefits.

2

envelope → heating & cooling

Improvements to the building envelope will reduce the need for heating and cooling, saving energy and minimizing operating costs.

operations & maintenance

Investing in operations and maintenance best practices ensures that building systems run optimally, enabling proper performance in existing equipment and maximizing return on investment in new systems. Best practices for building envelopes include:

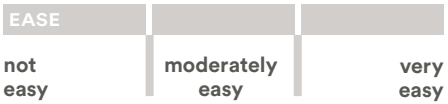
- Weatherstrip windows and door frames, replace gaskets, and air seal around air conditioners, vents, shaft openings, piping penetrations, and cracks along walls and joints.
- Routinely inspect building for air and heat leakage using infrared cameras to identify thermal bridges and smoke blowers to locate air leaks.
- Inspect each envelope component from both the exterior and interior of the building.
- Establish a winter maintenance policy for window and through-wall air conditioners.
- Apply reflective, light-colored paint to the building's roof.

envelope efficiency measures

Building envelope improvements include creating an airtight barrier to reduce infiltration through gaps and holes in exterior walls and roofs, upgrading doors and windows to higher performance models, ensuring continuous and sufficient insulation at walls and roofs, and minimizing thermal bridging.

Key

EASE OF IMPLEMENTATION



Ease of Implementation reflects technical and financial feasibility.

Measures marked "not easy" are typically expensive, complex, highly disruptive, or pay back slowly, while "very easy" measures tend to be in-expensive, quick, and straightforward.

PROJECT IMPACT

Project Impact reflects potential to reduce energy and emissions and to improve system performance.

"Low impact" measures typically yield minor savings and incremental improvements, while "high impact" measures achieve major savings and comprehensive improvements.

ADDED BENEFITS

operations & maintenance
Keeps building performing optimally when completed on a routine basis

health & comfort
Enhances indoor environmental quality and advances occupant wellbeing

marketability
Improves aesthetics and upgrades occupant spaces, increasing appeal to potential tenants

future-ready
Puts building on path for long-term emissions reduction and legislative compliance

RATING SYSTEM METHODOLOGY

Ratings and benefits of energy conservation measures were assigned based on NYC energy audit data and analysis by industry experts. Actual results will vary by building type, use, and baseline conditions.

Stop Drafts and Air Leakage

Airseal Window & Door Frames

Apply caulk and weather-stripping materials like rubber, foam, or vinyl to seal frames.

Seasonally Maintain Room ACs

Remove and store or cover and weatherize AC units after each cooling season to minimize air leakage.

Stop Drafts and Air Leakage, cont.

Identify & Seal Additional Air Leaks

Use blower door or smoke tests to find leaks. Common culprits include piping penetrations, recessed lighting, outlets, and laundry vents.

Airseal Room ACs

Use a trim kit, weatherstripping, and caulk to create a snug fit around window and through-wall ACs.

envelope efficiency measures

Stop Drafts and Air Leakage, cont.

Air Seal Vertical Shafts

Cover elevator and stairwell vents (partially or fully, per NYC code) to reduce heat loss, especially in tall buildings.

Install Continuous Air Barrier

Best started in design phase of new construction/gut rehab. Options are also available for retrofits. Ensure continuity via careful detailing.

Control Temperature and Moisture Levels

Optimize Wall Insulation

Best started in design phase. Install insulation to meet code and modeled building needs. Ensure continuity via careful detailing.

Optimize Floor Slab insulation

Best started in design phase. Optimize floor slab insulation in conditioned spaces.

Control Temperatures and Moisture Levels, cont.

Optimize Roof Insulation

Install insulation to meet code and modeled building needs. Coordinate with other roof measures, like solar and green roofs.

Mitigate Thermal Bridges

Install thermal break materials to minimize transfer of heat and moisture.

Maximize Thermal Comfort

Consider Interior Window Treatments

Install thermal shades or blinds to insulate windows and prevent solar heat gain. Add daylight controls to maximize benefits.

Consider High Performance Window Coatings

Apply insulating, reflective and/or smart coatings to increase thermal performance of existing windows.

envelope efficiency measures

Maximize Thermal Comfort, cont.

Install High Performance Exterior Doors

Install well-insulated, thermally broken doors and frames with with robust gasketing.

Consider Exterior Shade Structures

Consider adding shade structures that minimize summer heat gain, particularly in new construction projects.

Install High Performance Windows

Install well insulated, thermally broken glazing and frames with robust gasketing.

Evaluate Sustainable Roof Options

Install Solar Photovolatic (PV) Panels

Required for many buildings by NYC law. Solar PV can offset energy use, especially during peak sunlight hours or when paired with batteries.

Install Green (Vegetative) Roof

Required for many buildings by NYC law. Green roofs improve insulation while decreasing stormwater runoff.

Apply Cool Roof Coating

Required for many buildings by NYC law. Apply a light-colored relfective coating to reduce unwanted heat gain.

Further Reading

The BE-Ex solution packages cover the following building systems:

- Heating
- Cooling
- Ventilation
- Domestic Hot Water
- Lighting & Plug Loads
- Envelope

To access the suite of solution packages, visit:
be-exchange.org/anatomy-solutions

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