DEPARTMENT OF
PLANNING &
ZONING

OFFICE OF
CLIMATE ACTION

City of Alexandria

Design Guide for Achieving Multi-Unit Residential EUI Target

October 2026



Contents

Introduction 1

EUI Target for Multi-Unit Residential Buildings 1

Purpose and Scope of the Guide 1

How to Use the Guide 1

Design Strategies 2

Optimize Building Massing 3

Optimize Window-to-Wall Ratio (WWR) 4

Improve Window Performance Through Glazing 5

Improve Wall and Roof Thermal Performance 6

Reduce Thermal Bridging 7

Use High-Efficiency Heat Pump-Based Heating and Cooling Systems 8

Use High-Efficiency Heat Pump-Based Domestic Hot Water Systems 9

Minimize Corridor Pressurization 10

Minimize Fan, Pump, and HVAC Equipment Energy 11

Integrate High-Performance Roof Design 12

Glossary 13

Introduction

EUI Target for Multi-Unit Residential Buildings

New developments in Alexandria must now conform with the City's 2026 Green Building Plan, which took effect on July 1, 2026. A key component of the Plan is the introduction of Energy Use Intensity (EUI) targets, including a site EUI target of 35 kBtu/ft²/year for multi-unit residential buildings (MURBs). EUI provides a consistent measure of building energy performance representing the amount of energy a building consumes relative to its gross floor area over a year. A lower EUI therefore reflects lower energy consumption, which contributes to reduced energy costs and greenhouse gas emissions.

Purpose and Scope of the Guide

The guide is intended to serve as **a technical resource** for project teams by identifying practical design strategies to support achievement of the EUI target and opportunities to improve building energy performance, and as a decision-support reference for the City when evaluating development applications.

How to Use the Guide

The next section provides **10 design strategies** that can support improved building energy performance. This is not an exhaustive list. No single strategy can achieve the EUI target alone, so design teams should consider them holistically. For each strategy, the section describes recommended best practices and provides good practice benchmarks as reference points for project teams and City staff. Most measures apply to buildings of all heights and reduce energy use in both residences and common areas. Measures particularly suited to low-rise or high-rise buildings are tagged using the icons ● Low/mid-rise ▲ High-rise, respectively.

Project owners should discuss the strategies early in design with mechanical, electrical, and plumbing (MEP) engineers, architects, and sustainability consultants to identify the appropriate combination of measures best suited for the project.

The final section provides a **glossary of 76 key terms** which may be used to establish a base understanding of the concepts outlined in this Guide.

Design Strategies

This section outlines 10 design strategies that can help support achievement of the EUI target. The 10 design strategies outlined in the guide are not requirements. As the strategies are not intended to be exhaustive, project teams may identify and apply other design strategies that contribute to improved building energy performance. Each strategy briefly explains its relationship to building energy use and identifies recommended best practices for consideration.

Because the design strategies interact with one another and with overall building performance, they should be considered holistically as part of the project's overall energy design approach rather than in isolation. The reference values are provided as practical performance benchmarks for evaluating the performance of each strategy relative to current good design practices in the industry.

Optimize Building Massing

Best Practices

Building massing refers to a building's overall shape, form, and size. More compact and strategically configured massing can reduce heat transfer through the building enclosure and support passive design opportunities that reduce heating, cooling, and lighting energy.

Use simple, compact building forms

- Minimize articulations, offsets, corners, and other envelope transitions that increase exterior surface area and create opportunities for heat loss and thermal bridging.
- Simpler, more compact forms can improve both thermal and airtightness performance.

Minimize vertical facade area ratio (VFAR)

- Reduce the envelope-area-to-floor-area ratio to minimize heat transfer through the building enclosure.
- Balance compactness with floorplate depth to avoid increasing lighting energy due to reduced access to daylight.

Use thermal mass strategically

- Where appropriate, use exposed interior thermal mass to moderate indoor temperature fluctuations and reduce peak cooling loads.
- Evaluate natural ventilation opportunities to reduce mechanical cooling energy when outdoor temperature and humidity conditions are favorable.

Consider unit density

- Increasing the number of units served by a given amount of exterior enclosure can reduce envelope area per unit and improve overall energy performance.
- Evaluate potential impacts of increased occupant density and internal heat gains.

CASE STUDY

PROJECT: The Foundry

LOCATION: Alexandria, VA

This 16-story building accommodates 520 rental apartments with a compact, rectangular form that limits exterior envelope area relative to floor area. For a given floor area, less exposed envelope generally reduces heat transfer between indoor and outdoor environments, helping lower heating and cooling energy demand and achieve a lower EUI.



Good Practice Benchmark

- Building vertical façade area ratio (VFAR) < 0.65

Optimize Window-to-Wall Ratio (WWR)

Best Practices

Windows generally have lower thermal resistance than insulated walls. Optimizing the proportion of glazing relative to insulated wall area can limit heat transfer through the building envelope and reduce heating and cooling energy use. Considering window orientation can further improve performance by taking advantage of passive solar gains and daylighting while limiting unwanted heat gain.



CASE STUDY

PROJECT: Girard

LOCATION: Boston, Massachusetts

The project illustrates a balanced approach to multifamily façade design, combining wall area with strategically placed glazing. The design approach supports daylight and views while maintaining a high-performance building envelope and limiting unnecessary heat transfer through glazing.

Limit window to wall ratio

- Use a lower window-to-wall ratio (WWR) where appropriate to reduce conductive heat transfer and unwanted solar heat gain.
- Reducing unnecessary glazing can improve occupant comfort by reducing glare and temperature asymmetry while maintaining daylight and views.

Optimize WWR by orientation

- Avoid applying a uniform WWR across all facades.
- Reduce glazing where daylight, views, and passive solar benefits do not justify the associated conductive and solar loads.
- Pay particular attention to east- and west-facing glazing, where low-angle solar gains can contribute significantly to cooling loads.

Avoid unnecessary low-level glazing

- Where appropriate, raise windowsill heights to approximately 600 mm or more above the floor.
- Limiting low-level glazing can reduce solar gains and radiant discomfort near the floor while maintaining daylight, outward views, and visual connection to the exterior.

Optimize daylighting while controlling solar gain

- Prioritize glazing locations that provide useful daylight rather than increasing glazing area uniformly.
- Optimize floorplate and interior layouts to improve daylight penetration and reduce electric lighting demand.

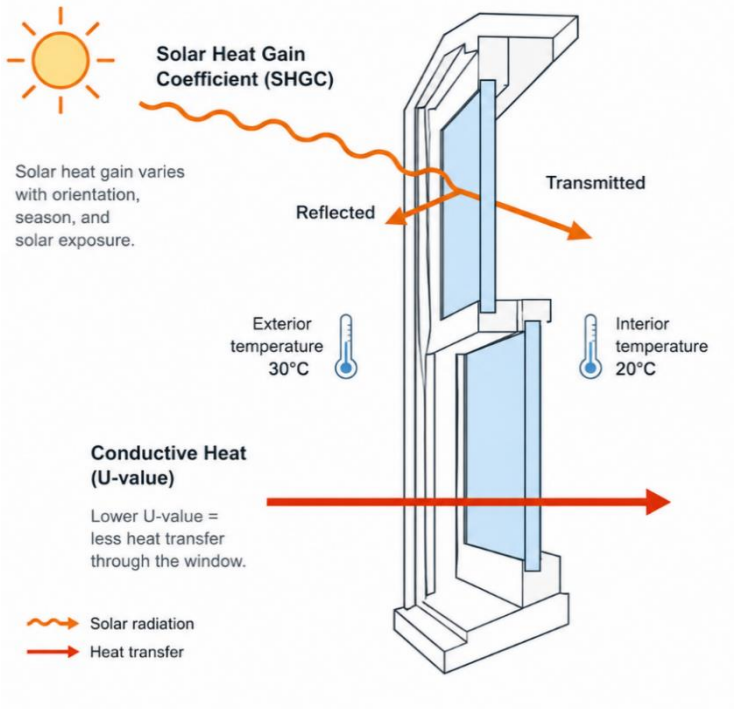
Good Practice Benchmark

- Window to wall ratio < 40%

Improve Window Performance Through Glazing

Best Practices

U-value and Solar Heat Gain Coefficient (SHGC) are key performance metrics for window and glazing selection. Lower U-values indicate reduced heat transfer through the glazing, while lower SHGC values indicate reduced solar heat gain, which together can help reduce heating and cooling energy use.



Specify high-performance, low U-value windows

- Improve glazing and overall window U-values to reduce conductive heat transfer through the enclosure.
- Coordinate window performance with the overall envelope thermal-performance strategy.

Use thermally efficient frames

- Specify low-conductivity, thermally broken window frames.
- Minimize unnecessary mullions and framing elements to reduce heat transfer through the window assembly.

Optimize SHGC by orientation

- Select SHGC to balance beneficial winter solar gains against summer cooling loads.
- Consider lower SHGC values for east- and west-facing glazing, where low-angle solar exposure can contribute substantially to cooling demand.
- Coordinate SHGC with exterior shading and WWR rather than evaluating these measures independently.

Provide exterior solar shading

- Use appropriately designed overhangs, fins, balconies, screens, or other exterior shading to limit unwanted solar gains.
- Design shading by facade orientation. Horizontal shading is generally most effective for higher-angle south solar exposure, while east and west facades require strategies that address lower solar angles.
- Optimize shading to reduce annual cooling energy without unnecessarily increasing winter heating demand.

Good Practice Benchmark

- Window performance
  - U< 0.35 Btu/h·ft²·°F

Improve Wall and Roof Thermal Performance

Best Practices

R-value measures the thermal resistance of a building envelope assembly. Higher R-values indicate better insulating performance, which reduces heat transfer through walls and roofs, lowers heating and cooling energy use, and helps maintain more stable indoor temperatures for occupant comfort.

Increase clear-field thermal resistance

- Increase clear-field wall and roof R-values using appropriate insulation strategies.
- Evaluate clear field, rather than nominal, R-values to account for repeating framing effects.

Prioritize continuous exterior insulation

- Use continuous insulation where practical to reduce thermal bridging through structural and framing elements.
- Coordinate insulation continuity at windows, roofs, foundations, balconies, and other enclosure transitions.

Design scalable wall assemblies

- Select wall systems that can accommodate increased insulation levels without fundamental changes to the enclosure system.
- Use energy modelling to determine the point at which additional insulation provides diminishing EUI benefits relative to other measures.

Control air infiltration

- Provide a continuous air barrier around penetrations, transitions, and interfaces in the building enclosure.
- Select air barrier materials, components, and accessories that resist air flow and are durable for the service life of the building.
- Conduct on-site airtightness testing to verify as-built enclosure performance and identify and address deficiencies.

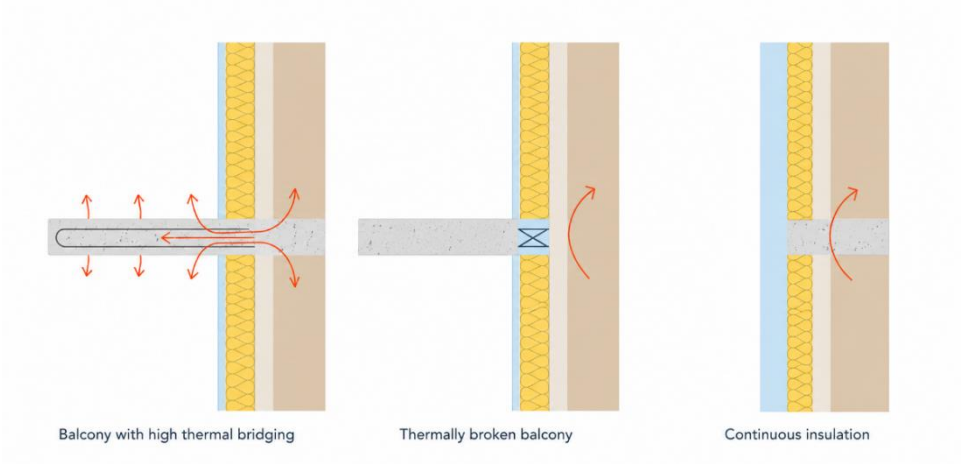
Good Practice Benchmark

- Wall clear-field > R-20
- Roof clear-field > R-30

Reduce Thermal Bridging

Best Practices

A thermal bridge is an area of the building envelope where the insulation layer is interrupted, creating a path for increased heat transfer. Reducing thermal bridging helps limit heat loss in winter, thereby reducing heating energy use.



Maintain continuous insulation

- Minimize interruptions in the thermal-control layer at enclosure interfaces.

Thermally isolate structural penetrations

- Avoid continuous balconies, beams, slabs, canopies, and other structural elements extending from conditioned space to the exterior.
- Where these conditions cannot be avoided, use thermally broken connections or other appropriate thermal-isolation strategies.

Reduce envelope complexity

- Use compact building forms with fewer corners, articulations, transitions, and junctions to reduce geometric and linear thermal bridging.

Optimize enclosure interfaces

- Pay particular attention to window perimeters, slab edges, parapets, roof-to-wall transitions, foundations, balconies, and cladding attachments

Good Practice Benchmark

- Exterior insulation of floor slabs
- Thermally broken balconies

Use High-Efficiency Heat Pump-Based Heating and Cooling Systems

Best Practices

Heat pumps are among the most efficient options for mechanical space conditioning because they transfer heat rather than generate it directly. Selecting high-efficiency heat pumps can significantly reduce the energy required for heating, contributing to a lower building EUI.

- Use **high-efficiency heat pumps** to provide space heating and cooling.
- **Right-size equipment based on calculated building loads** rather than relying on conventional rules of thumb.
- Select equipment based on **expected part-load and seasonal performance**, not only rated efficiency at standard test conditions.
- Minimize reliance on electric resistance backup heating.
- Where applicable, **separate space-conditioning systems from ventilation systems** so each can operate efficiently in response to its respective load.
- **Coordinate heat-pump selection with envelope improvements** so reductions in heating and cooling loads translate into smaller, more efficient equipment.

Good Practice Benchmark

- The heat pump system is sized to meet the lesser of the following requirements:
    - The capacity required to meet the full peak cooling load when operating in cooling mode; or
    - The capacity required to provide 80% of the annual heating load.

Use High-Efficiency Heat Pump-Based Domestic Hot Water Systems

Best Practices

As with space-conditioning systems, heat pump-based domestic hot water systems can significantly reduce the energy required for domestic hot water production compared to conventional systems (electric or gas fired).

- Use **heat pump water heating** where technically appropriate.
- Minimize domestic hot water distribution and recirculation losses through **compact piping layouts and appropriate pipe insulation.**
- **Optimize recirculation controls** to avoid unnecessary continuous pumping and heat loss.
- Consider **drain-water heat recovery** where domestic hot water demand is significant.

Good Practice Benchmark

- Hybrid domestic hot water heater (heat pump, with electric support / top-up)

Minimize Corridor Pressurization

Best Practices

Corridor pressurization uses outdoor air to maintain the desired pressure relationship between corridors and adjacent spaces (residential units). Limiting corridor makeup air to the amount needed reduces the energy required to move, heat, and cool outdoor air.

Minimize unnecessary outdoor airflow

- Avoid excessive corridor pressurization and outdoor air ventilation rates beyond those necessary to meet ventilation, indoor air quality, and pressure-control requirements.
- Minimize outdoor air supplied to corridors, particularly in buildings where ventilation is provided directly to individual suites.

Recover energy from exhaust air

- Use heat or energy recovery where appropriate to reduce the energy required to condition outdoor ventilation air.

Improve compartmentalization

- Reduce uncontrolled air transfer between suites, corridors, shafts, and other spaces through effective air sealing.
- Improved compartmentalization can reduce the amount of conditioned corridor air used primarily to control air movement through the building.

Good Practice Benchmark

- Corridor pressurization (makeup airflow rate) < 20 cfm per door

Minimize Fan, Pump, and HVAC Equipment Energy

Best Practices

High-efficiency equipment reduces the energy required to move air and water and provide heating, cooling, and ventilation, contributing to a lower building energy use intensity. Project teams should evaluate the benefits and challenges of centralized vs unit-level HVAC equipment.

Reduce fan energy

- Design air-distribution systems for low static pressure.
- Minimize unnecessary duct length, fittings, transitions, and pressure losses.
- Select high-efficiency fans and motors and use variable-speed operation where appropriate.

Reduce pumping energy

- Design hydronic systems for low pressure drop.
- Use variable-speed pumps and controls that reduce flow under part-load conditions.
- Avoid unnecessary pumping and excessive design flow rates.

Specify high-efficiency HVAC equipment

- Select equipment that meets or exceeds applicable ASHRAE efficiency requirements.
- Evaluate equipment based on expected annual and part-load performance rather than relying solely on full-load rated efficiency.

Optimize controls

- Use temperature setbacks, deadbands, equipment staging, supply-temperature resets, and other controls to reduce unnecessary energy use.
- Minimize simultaneous heating and cooling.
- Coordinate system operation with actual occupancy and building loads where appropriate.

Good Practice Benchmark

- Equipment efficiency to meet minimum ASHRAE performance requirements

Integrate High-Performance Roof Design

Best Practices

Roofs are exposed to direct sunlight, making them both a source of unwanted heat gain and an opportunity for onsite energy generation. High-performance roof design, including cool and/or green roofs, can reflect or dissipate solar energy, reducing heat transfer to the spaces below and the energy required for cooling. Where feasible, onsite solar PV systems can supply a portion of the building's energy needs, reduce grid demand and, when paired with battery storage, enhance building resilience during power outages. Roof measures are particularly relevant in low or mid-rise buildings due to their larger roof area to floor area ratio.

Cool and green roofs ● Low/mid-rise

- **Use high-reflectance roofing materials.** Select reflective materials and colors, paired with proper insulation, to reduce heat gain and downward heat transfer
- **Consider green roofs.** Incorporate planted materials to reduce roof temperatures through shading and evapotranspiration, while supporting stormwater retention.

On-site renewable energy ● Low/mid-rise ▲ High-rise

- **Install on-site solar PV where feasible.** Assess available roof area, orientation, shading, and generation potential early in the design process.
- **Design the roof to be solar-ready** (Green Building Plan Requirement). Where installation is not immediately feasible, reserve unobstructed roof space, allow for future structural loads, and provide electrical pathways and capacity for future installation.

Good Practice Benchmark

- **Low-sloped roofs** (2:12 or flatter): on-site solar and cool roof with initial solar reflectance index (SRI) 82 or green roof.
- **Steep-sloped roofs:** cool roof with initial SRI 39.

Glossary

ASHRAE

The American Society of Heating, Refrigerating, and Air-Conditioning Engineers, an organization that develops technical standards and guidance for building systems and energy performance. ASHRAE publications include guidance on strategies for reducing energy use in multifamily buildings. ASHRAE has developed Advanced Energy Design Guides for a variety of building types, including multifamily buildings, which may be used as additional resources for evaluating strategies to lower building energy use.

Air Barrier

A continuous layer of materials and sealed connections that limit uncontrolled air movement into and out of a building.

Air Changes per Hour at 50 Pascals (ACH50)

A measure of air leakage that is determined by testing a building or dwelling unit under a pressure difference of 50 pascals. It represents the equivalent number of times the tested air volume would be replaced in one hour under the test conditions. Lower values generally indicate less air leakage.

Air Sealing

The process of sealing gaps, cracks, joints, and penetrations in a building enclosure to reduce uncontrolled air leakage.

Air-Source Heat Pump

A heat pump that transfers heat between indoor spaces and outdoor air to provide heating or cooling.

Airtightness

The ability of a building's exterior enclosure to prevent unwanted air from leaking through gaps, joints, and other openings.

Annual Energy Consumption

The total energy used by a building over one year, typically measured in kWh of electricity, therms of natural gas, or kBtu of total energy.

All-Electric Building

A building that uses electricity rather than onsite combustion of fossil fuels for its building energy services.

Baseline Building

A reference building used to compare a proposed design's energy performance against a defined standard or set of assumptions.

Blower Door Test

A test that uses a calibrated fan to create a pressure difference between a building or dwelling unit and the outdoors to measure air leakage.

Building Commissioning

A systematic process of verifying that building systems are designed, installed, tested, and operated to meet the owner's project requirements.

Building Enclosure (Building Envelope)

The walls, windows, roofs, foundation, and other components that separate a building’s indoor spaces from the outdoor environment. The enclosure helps control heat transfer, air movement, and moisture.

Building Heating or Cooling Load

The rate at which heat must be added to or removed from a building to maintain desired indoor conditions under specified circumstances. Heating and cooling loads are commonly expressed in Btu per hour and are used to size HVAC equipment.

Building Energy Modeling

The use of computer simulations to estimate a building's energy consumption based on its design, enclosure, systems, schedules, occupancy, and operating assumptions.

Building Massing

The overall shape, size, and arrangement of a building’s major forms. More compact building forms generally have less exterior surface area relative to their floor area, which can reduce heat transfer.

Clear-field R-value

The thermal resistance of an uninterrupted portion of an insulated wall or roof, excluding repeating thermal bridges such as studs, joists, or other framing members. The effective R-value of the complete assembly may be lower because of heat transfer through these elements and other thermal bridges.

Compartmentalization

The practice of separating individual dwelling units and other spaces with sealed boundaries to limit unwanted air movement between units, corridors, shafts, and adjacent spaces.

Coefficient of Performance (COP)

The ratio of useful heating or cooling delivered to the energy consumed by a system under specified operating conditions. A higher COP indicates greater efficiency for the stated conditions.

Conditioned Space

Indoor space where heating or cooling is provided to maintain the desired temperature for its occupants.

Continuous Insulation

Insulation that runs continuously across structural framing or other components, minimizing thermal bridges through the building enclosure.

Corridor Pressurization

The practice of maintaining a desired air-pressure relationship between building corridors and adjacent spaces through the management of supply, exhaust, and transfer airflow. Corridor pressure can influence air movement between corridors and dwelling units.

Daylighting

The use of natural light to illuminate indoor spaces, potentially reducing the need for electric lighting.

Dedicated Outdoor Air System (DOAS)

A ventilation system that supplies outdoor air to a building or designated spaces, often treating that air separately from the systems that provide space heating and cooling.

Demand Response

Adjustments to a building's electricity use in response to grid conditions, utility signals, or electricity prices.

Domestic Hot Water

Hot water for everyday building activities, such as showering, bathing, washing dishes, and handwashing.

Electric Resistance Heating

Heating produced by passing electricity through a resistive element. It generally uses more electricity for the same amount of heat delivered by a heat pump.

Embodied Carbon

Greenhouse gas emissions that are associated with the extraction, manufacture, transportation, installation, maintenance, and disposal of building materials and products.

Energy Efficiency

The ability to provide a desired service, such as heating, cooling, or lighting, while using less energy.

Energy Model

A computer-based representation of a building used to estimate energy use and evaluate design alternatives.

Energy Recovery Ventilator (ERV)

A ventilation device that transfers heat and, under appropriate conditions, moisture between outgoing exhaust air and incoming outdoor air to reduce the energy needed to condition ventilation air.

Energy Savings

A reduction in energy consumption compared with a defined baseline, adjusted as appropriate for differences in weather, occupancy, or operating conditions.

Energy Use Intensity (EUI)

A measure of a building's annual energy consumption divided by its gross floor area, typically expressed in kBtu per square foot per year (kBtu/ft²/year). EUI allows comparisons of energy use relative to building size. A lower EUI generally indicates lower energy use per square foot, although comparisons should account for building type, energy uses included, and calculation method.

Exterior Shading

Devices or architectural features outside windows, such as overhangs, fins, and screens, that limit unwanted solar heat gain while potentially preserving daylight and views.

Façade

An exterior face of a building, particularly one that includes walls, windows, and other visible architectural elements.

Glazing

The glass portions of windows and similar building elements that allow daylight and views while also affecting heat transfer and solar heat gain.

Green Roof

A roof partially or fully covered with vegetation and a growing medium, which can help to reduce roof temperatures and retain stormwater.

Heat Pump

A heating and cooling system that transfers heat between indoor and outdoor environments rather than generating heat directly through electric resistance or fuel combustion. Heat pumps can provide heating, cooling, and, in appropriate systems, hot water.

Heat Pump Water Heater (HPWH)

A water heater that uses heat-pump technology to transfer heat from surrounding air or another heat source into water, generally uses less electricity than electric resistance water heating.

Heat Recovery

The process of capturing heating that would otherwise be lost, such as heat from exhaust air or wastewater, and reusing it to reduce the energy needed to heat or cool a building or its water.

Heat Recovery Ventilator (HRV)

A ventilation device that transfers heat between outgoing exhaust air and incoming outdoor air without intentionally transferring moisture.

Heating, Ventilation, and Air Conditioning (HVAC)

The systems used to heat, cool, and circulate air within a building, including associated equipment and controls.

Indoor Air Quality (IAQ)

The condition of indoor air as it relates to occupant health and comfort, including pollutants, moisture, ventilation, and other environmental factors.

Infiltration

Uncontrolled outdoor air entering a building through gaps, cracks, and other openings in the enclosure.

kBtu/ft^2/year

A unit of energy use intensity equal to thousands of British thermal units consumed per square foot of floor area per year. One kBtu equals 1,000 Btu.

Load Flexibility

The ability of a building to shift or adjust energy use over time without compromising essential building services or occupant comfort.

Low-Emissivity (Low-E) Glass

Glass with a thin coating that reduces radiative heat transfer while allowing visible light to pass through. Its effects on solar heat gain depend on the coating and glazing configuration.

Low-EUI Building

A building designed and operated to use relatively little energy per square foot per year. Whether a building qualifies as low-EUI depends on its use, energy accounting boundary, and applicable performance target.

Mechanical, Electrical, and Plumbing (MEP)

The building systems and engineering disciplines that are responsible for heating, cooling, ventilation, electrical power, lighting, water supply, drainage, and related services.

Outdoor Air Ventilation

The intentional introduction of outdoor air into a building to help maintain indoor air quality and meet ventilation requirements.

Overhang

A horizontal architectural projection, often above a window, which can shade glazing from high-angle sunlight.

Part-Load Performance

The efficiency and operating behavior of equipment when it operates below its maximum capacity. Because HVAC equipment frequently operates at partial capacity, part-load performance can significantly affect annual energy consumption.

Passive Solar Gain

Heat from sunlight that enters a building through windows without mechanical heating equipment.

Peak Cooling Load

The maximum rate of heat removal required to maintain indoor temperatures under specified outdoor design conditions.

Peak Heating Load

The maximum rate of heat delivery required to maintain indoor temperatures under specified outdoor design conditions. king Heating Load

Photovoltaic (PV) System

A system of solar panels and associated equipment that converts sunlight into electricity.

Refrigerant Global Warming Potential (GWP)

A measure of the warming effect of a refrigerant released into the atmosphere relative to an equivalent amount of carbon dioxide over a specified period.

R-Value

A measure of resistance to heat transfer through a material or building assembly. Higher R-values indicate better insulating performance.

Seasonal Efficiency

A measure of equipment efficiency across a range of operating conditions over a season, rather than at a single test condition.

Site Energy

The energy consumed at a building, including electricity and fuels delivered to the property, before accounting for the energy used to produce and deliver those fuels.

Source Energy

Energy that accounts for the energy consumed in producing, generating, and delivering energy to a building, including upstream losses.

Solar Heat Gain Coefficient (SHGC)

A measure of how much solar heat passes through a window into a building. Lower SHGC values generally reduce unwanted solar heat gain and demand for cooling.

Solar Orientation

The positioning of a building and its windows relative to the sun's path, which affects daylight, solar heat gain, and energy demand.

Solar-Ready Roof

A roof designed to accommodate future solar panel installation, with appropriate unobstructed space, structural capacity, and electrical provisions.

Solar Reflectance Index (SRI)

A measure of how well a roofing material reflects sunlight and releases absorbed heat compared with reference surfaces. Higher SRI values generally indicate a cooler surface under sunlight.

Spectrally Selective Glazing

Glazing designed to transmit a high proportion of visible light while limiting unwanted solar heat gain.

Thermal Bridge (Thermal Bridging)

A portion of the building enclosure where heat can pass through more readily than through surrounding insulated areas, often because insulation is interrupted by structural elements or connections.

Thermal Envelope

The boundary separating conditioned spaces from unconditioned spaces or the outdoors. It generally includes the insulation and air barrier systems.

Thermally Broken Frame or Connection

A frame or structural connection designed with an insulating separation to reduce heat transfer between the interior and exterior.

Thermal Comfort

The condition in which occupants generally find the indoor thermal environment acceptable, considering factors such as air temperature, radiant temperature, humidity, air movement, clothing, and activity.

Thermal Mass

The material's ability to absorb and store heat and release it over time. Materials with high thermal mass can moderate indoor temperature fluctuations under suitable conditions.

U-Value

A measure of how readily heat passes through a building component, such as a window. Lower U-values indicate less heat transfer and better insulating performance.

Variable Refrigerant Flow (VRF)

An HVAC system that adjusts refrigerant flow to multiple indoor units to meet varying heating and cooling demands in different spaces.

Variable-Speed Equipment

Equipment that adjusts its operating speed to match demand rather than running continuously at one fixed speed.

Vertical Façade Area Ratio (VFAR)

The ratio of a building's total vertical exterior enclosure area to its total interior floor area. A lower VFAR generally means less exterior wall and window area relative to the building's floor area, which can reduce heat transfer.

Whole-Building Energy Use

The combined energy consumption of the building's included systems and uses, such as dwelling units, common areas, parking garages, site lighting, HVAC, interior lighting, and domestic hot water. The scope depends on the reporting boundary.

Window-to-Wall Ratio (WWR)

The proportion of a building's façade's area occupied by windows and other glazing. A lower WWR means less glazing relative to opaque wall area.