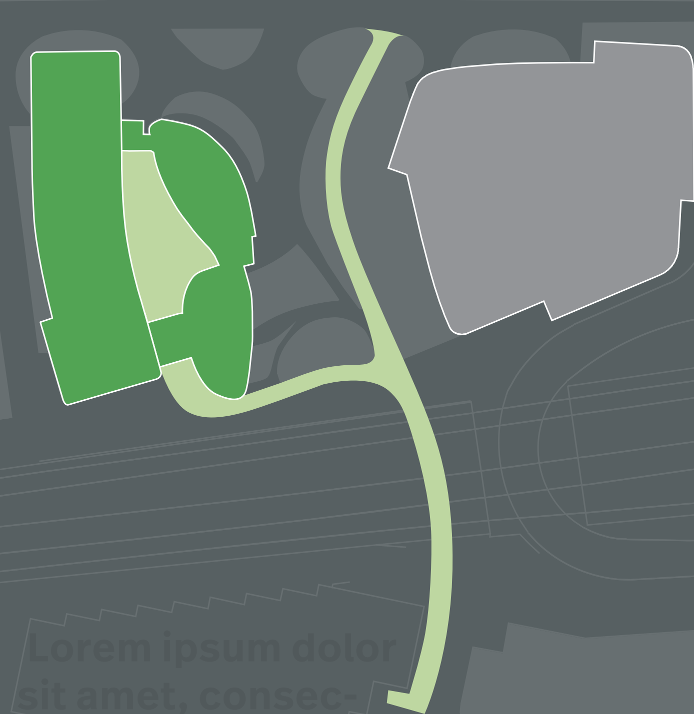
ISEC Sustainability



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Northeastern University is deeply committed to maintaining its status as a leader in sustainable practices. The ISEC reflects the University's commitment to sustainability in every way.

The Building

Flow and movement define the form language of the building. Dynamic movement systems permeate the project, expand the campus, and bridge two Boston neighborhoods. The expressive architectural form is intrinsically linked to high-performance architecture through parametric design and energy modeling. An integrated and collaborative approach to sustainability was ingrained in the project from the planning stages throughout the design process, impacting everything from the programmatic organization of the building to the design of the building enclosure. This cutting-edge facility defines a new academic and social hub for students, advancing the University's research mission.

The Site

Constructed on an urban brownfield site in a former rail yard, the ISEC represents the completion of the first phase of the newly planned 660,000 square foot academic precinct.

Located between the Ruggles and Mass Ave Orange Line MBTA stops, this urban campus is highly accessible to public transportation. The new pedestrian bridge will flow directly into the core campus and provide a north/south link to Huntington Avenue and the Fens area of the Emerald Necklace. A restored section of the Southwest Corridor Park connects the building with a 4.7-mile linear park that links the South End, Back Bay, Fenway, Roxbury, and Jamaica Plain neighborhoods with biking, jogging, and walking paths. The building adds no parking in its urban location and incorporates interior parking for 136 bicycles with additional exterior bike parking.

Most errands can be done on foot — Best access to public transportation — Biking is convenient for most trips

Comfort and Daylight

The performance-driven design process–coupled with automated systems such as daylighting controls and window shades–prioritizes occupant comfort in a building that is tuned to its environment. Computational Fluid Dynamics modeling ensured the triple-glazed façade provides a comfortable interior temperature on the coldest days without supplemental heating.

Daylighting studies explored the performance of the atrium skylights, adjusting their orientation to minimize interior glare and maximize their daylighting potential. Workspaces are defined by their connection to both the exterior and the atrium, orienting students and researchers within the building and campus.

Daylit atrium maximizes use of natural lighting — Daylight sensors maintain even light levels — High-efficiency lighting reduces lighting power density

Water Conservation

Within the landscape, a series of depressed spaces, or bioswales, create a new urban marsh, a historic reference to the nearby Fens. The bioswales in the plaza are designed to collect, filter, and infiltrate storm water runoff from the impervious areas of the plaza and streetscape. This is achieved through a series of plants and soils that can withstand moisture levels ranging from flooded to dry. The primary benefits of these bioswales are the improved quality and reduced volume of site runoff, thereby reducing burden on the municipal system. The bioswales can also be used for snow storage in the winter and be slowly infiltrated.

Bioswales reduce discharge to storm drains — Native plantings reduce the need for irrigation — Biodiversity contributes to a resilient ecosystem — Infiltration gallery returns runoff to aquifer

The building achieves a significant reduction in water use over baseline standard with the use of low-flow plumbing and fixtures. The flush fixtures are primarily fed from harvested rainwater. Based on the tank size installed, the system is designed to collect 99% of the rainwater that falls on the roof and offset approximately 57% of the flushing demand of the building.

Low-flow fixtures reduce potable water demand — Rainwater collection offsets flushing demand — High-efficiency cooling towers reduce water demand

Energy

Passive Before Active

Early stage energy modeling targeted solar heat gain as the primary driver of peak cooling loads. Parametric models allowed the team to perform iterative simulations to optimize the profile, form and performance of the exterior shading system. These results were translated directly in the building energy model, allowing equipment to be correctly sized to the required performance and loads.

This approach to enclosure design prioritized investment in passive elements that contribute to lower energy use and cost savings. High-performance triple-glazing allows for the elimination of a perimeter heating system. Clever detailing and thermal modeling in a collaborative design assist process enabled the team to minimize thermal breaks despite extensive integrated catwalk systems.

Solar sunshade / fins lower solar heat gain — Solar wall pre-heats air in cold weather — Chilled beams with VAV efficiently cool the building — Heat recovery chillers & boilers efficiently heat and cool spaces

Energy Flow & Zoning

A cascade air system significantly reduces the outside air needed for the building, taking advantage of the central atrium volume. Air is supplied to perimeter offices and drawn from offices through the atrium acting as a mixing chamber before it is fed to the lab air handler and delivered to the research spaces. Air is supplied to the write-up zone and drawn into the labs, ensuring negative pressure for safety and allowing air to be recirculated through the spaces.

Glazed walls allow unobstructed views through the research spaces while separating the high and low energy use zones, reducing the volume of ventilated research space to reduce the building energy usage. The thermal envelope and innovative supply strategy result in a highly controlled laboratory space that minimizes variable solar and thermal loads and the energy profile of the building.

High-efficiency fume hoods safely reduce airflow rate — Displacement ventilation is used in auditorium underfloor mass — Occupancy airflow control reduces air exchange rates

LEED GOLD 2016 — Leadership in Energy & Environmental Design

91 kbtu/sf
per year in energy use intensity

78%
energy savings over typical lab

50%
energy savings over code

78%
peak solar heat gain reduction

62%
cumulative reduction in solar radiation

83%
daylight autonomy in atrium

27%
reduction in lighting power density

69%
storm water retained onsite

57%
water use reduction for flush and flow fixtures

86%
construction waste diverted from landfill

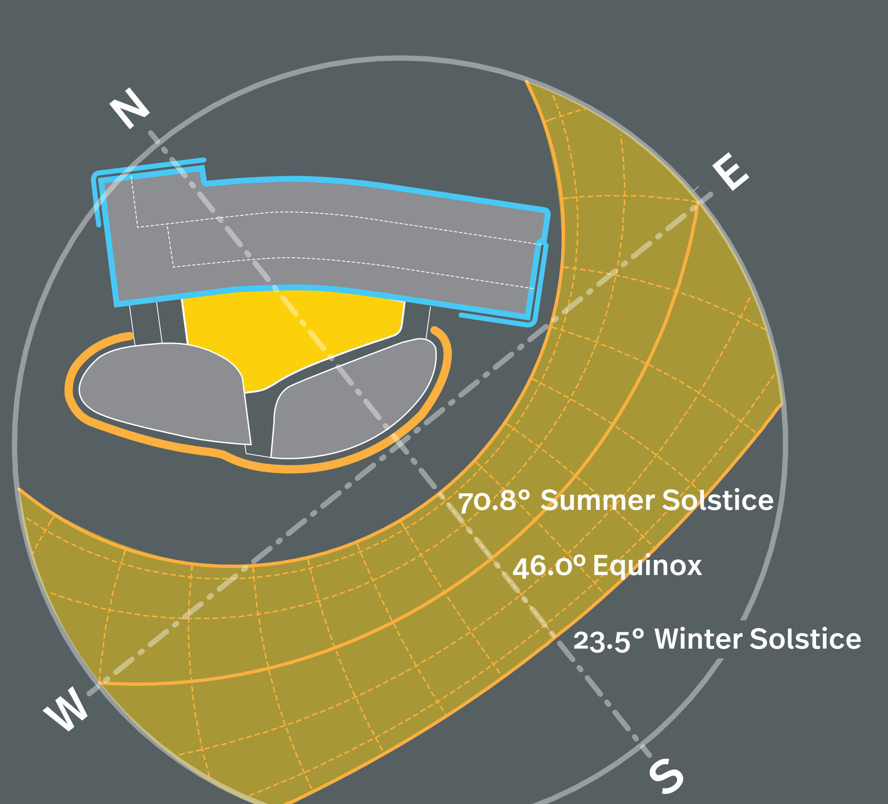
Location S.1 - Interior Wall Graphic Summary Display - Revised Layout
3" = 1'-0"

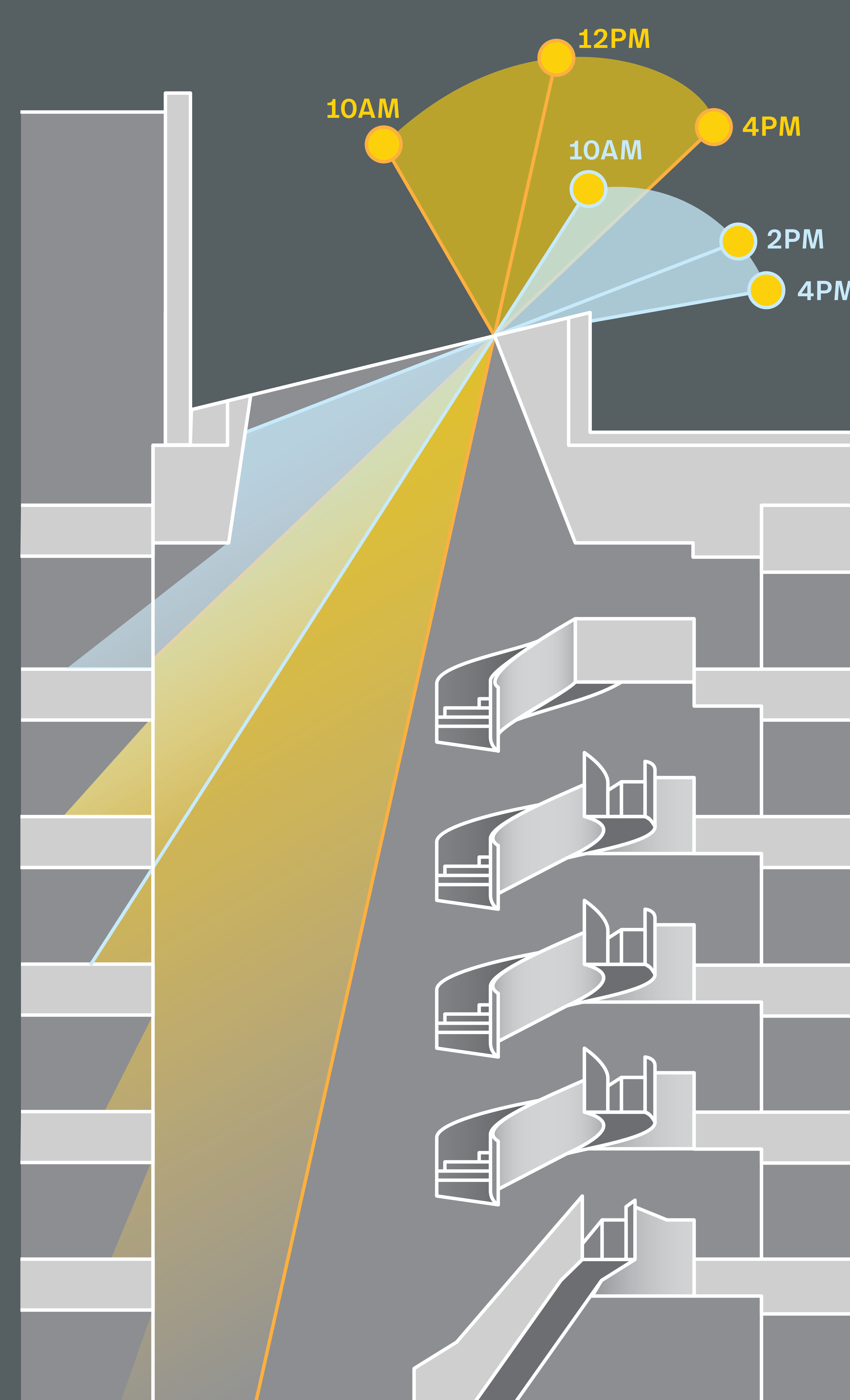
June 25, 2019

Comfort & Daylight

Atrium skylights are designed to maximize daylight and minimize interior glare.

83% **daylight autonomy in atrium**





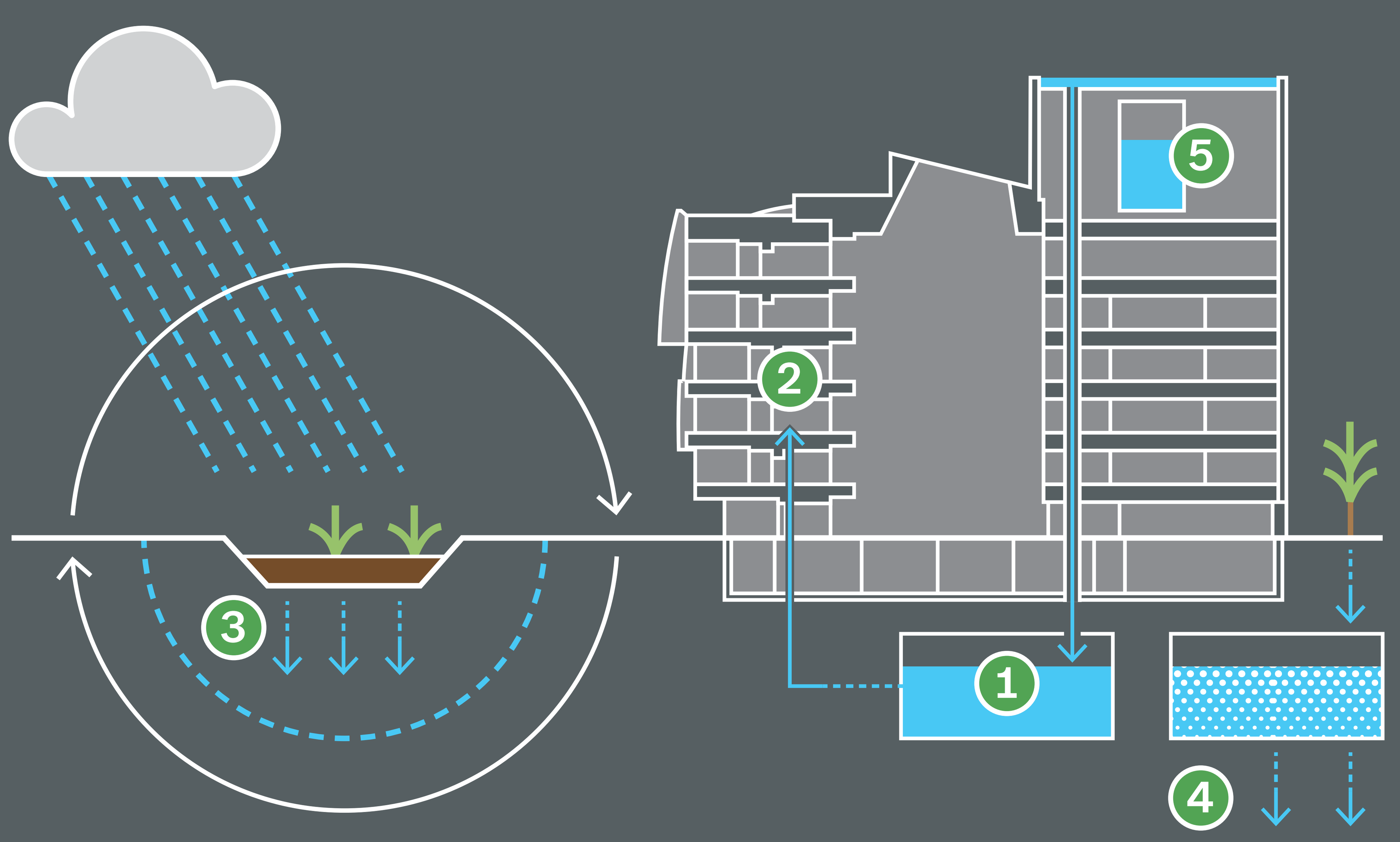
Summer solstice   Winter solstice

Daylit Atrium

Daylight Sensors

High-Efficiency Lighting

ISEC Water Conservation

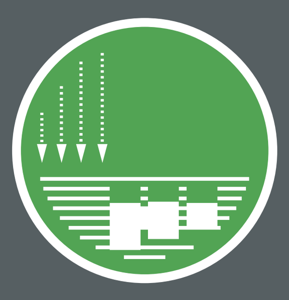


1. Rainwater from the roof collects in a cistern underground
2. Cistern-supplied water offsets flushing demand inside the building
3. Bioswales collect surface rainwater to form an urban marsh
4. Water returns to the local aquifer through an infiltration gallery
5. High-efficiency chillers and cooling towers reduce water demand for cooling

69%

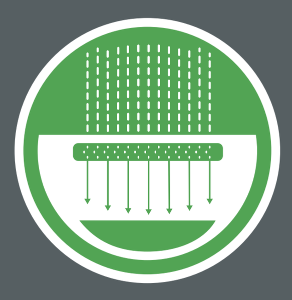
storm water retained on site

New urban marshes, or bioswales, collect storm water and allow slow infiltration into the landscape, reducing discharge to storm drains. A high-efficiency system minimizes water needed to cool the building.



Rainwater Collection

Bioswale

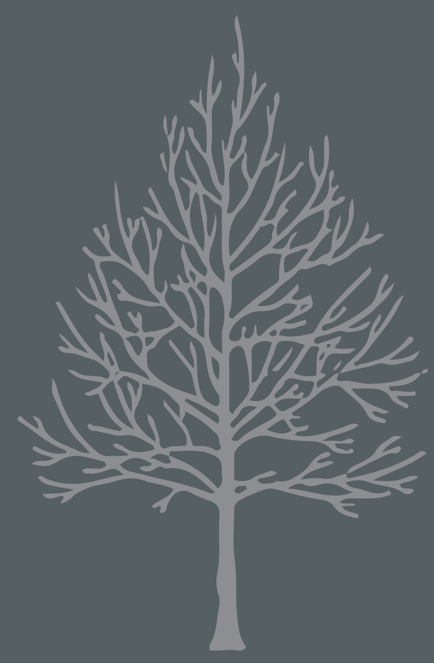


Infiltration Gallery

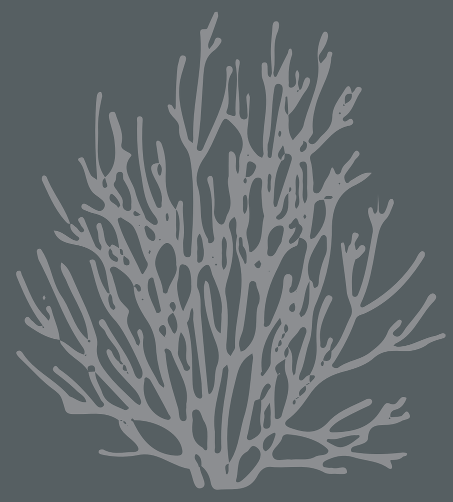
Low Flow Fixtures

High Efficiency Cooling Towers

ISEC Urban Ecology



Liquidambar styraciflua
Moraine Sweetgum



Cornus sericea
Arctic Fire Dogwood

Matteuccia struthiopteris
Ostrich Fern

Asclepias tuberosa
Orange Milkweed

Echinacea palladia
Pale Purple Coneflower

Papaver orientale
“Beauty of Livermere” Poppy

Eryngium zabelii
“Big Blue” Sea Holly

Various indigenous and drought resistant plantings contribute to a resilient ecosystem and reduce the need for irrigation.
The bioswale plant community includes trees and herbaceous plants that can withstand moisture levels ranging from flooded to dry.

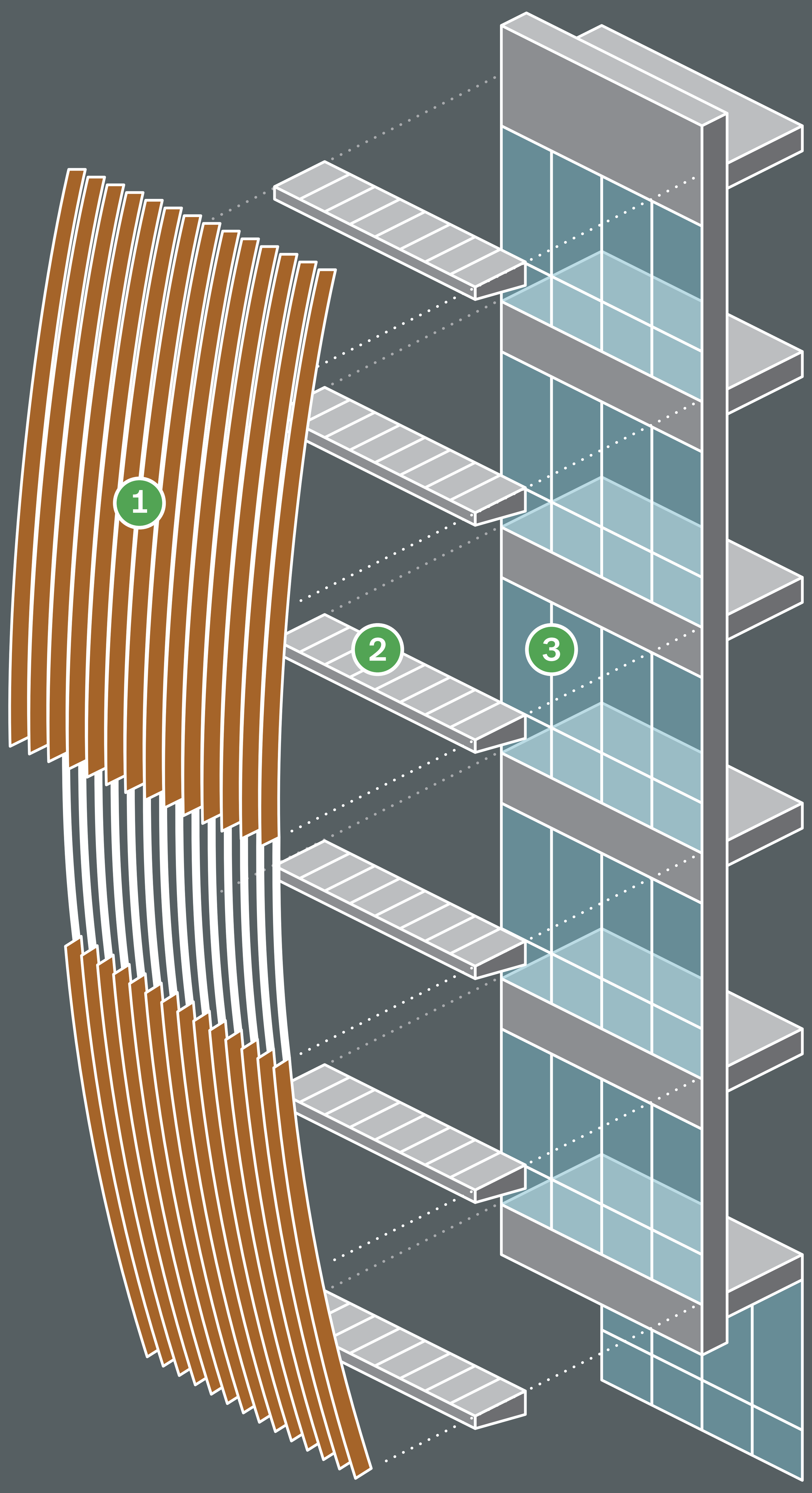
Rainwater Collection

Bioswale

Native Plantings

Biodiversity

ISEC Passive Before Active



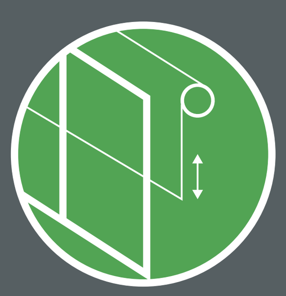
1. Curved Solar Sunshade Fins
2. Solar Sunshade Catwalk
3. High Performance Glazing

Unique shading elements on the facade and high performance triple glazing lower overall energy use and increase cost savings by reducing solar gain.

78%
peak solar heat gain reduction

Solar Sunshade / Fins

Daylight Sensors



Automated Shades

Chilled Beams

Location E.1 - Exterior Pylon - Passive before Active - Revised Layout
Full Size

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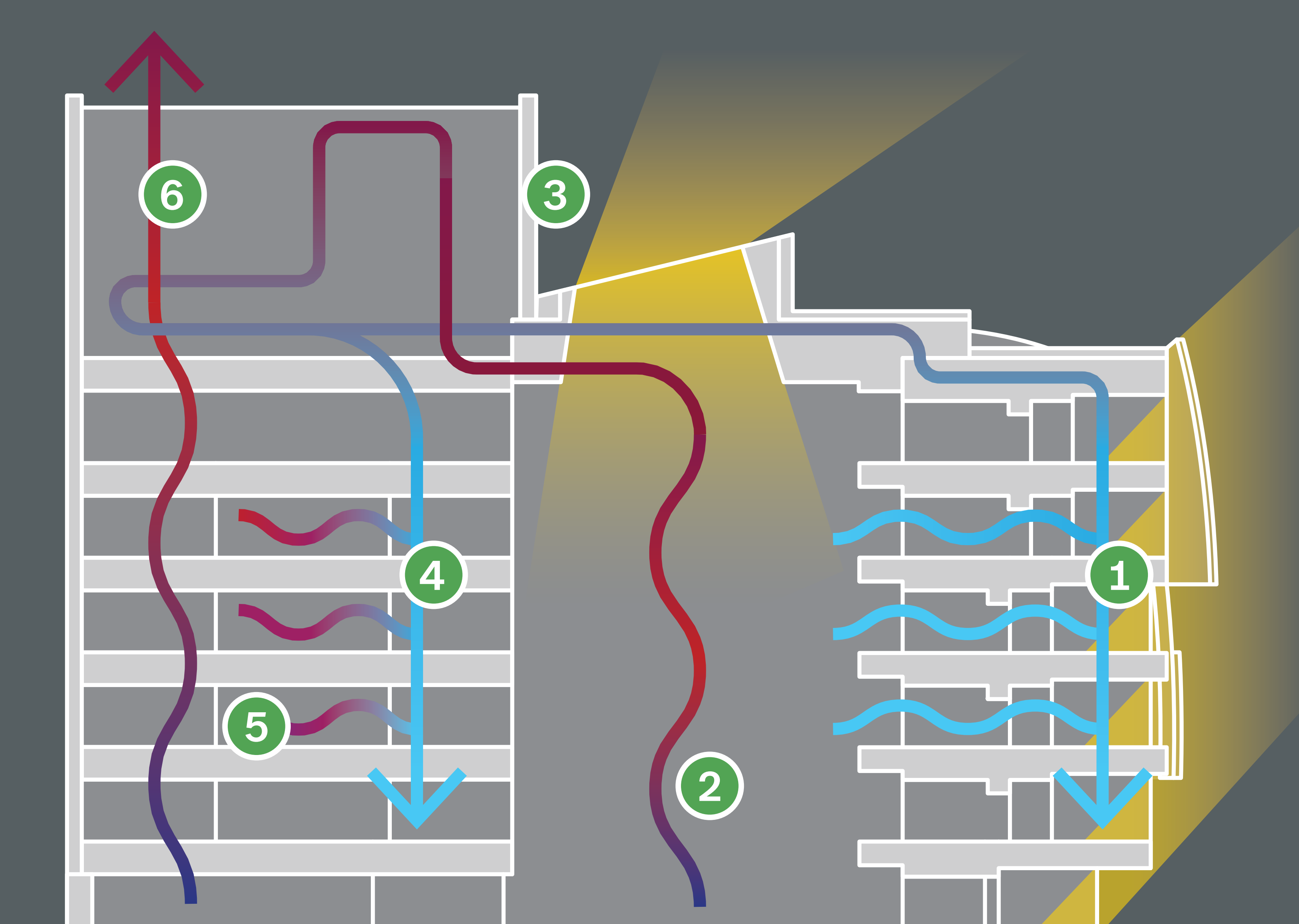
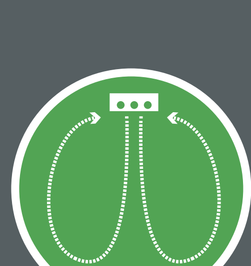
Energy Flow



1. Air is supplied to perimeter offices
2. Atrium acts as a mixing chamber
3. Solar wall tempered air mixes with atrium air
4. Lab air handler delivers air to write up zones
5. Air is drawn into high-energy labs
6. Heat is captured efficiently as air leaves building

50%
energy savings over code

The building's cascade air system circulates through open and enclosed spaces, reducing the outside air needed for cooling.



Chilled Beams

Displacement Ventilation

Solar Wall

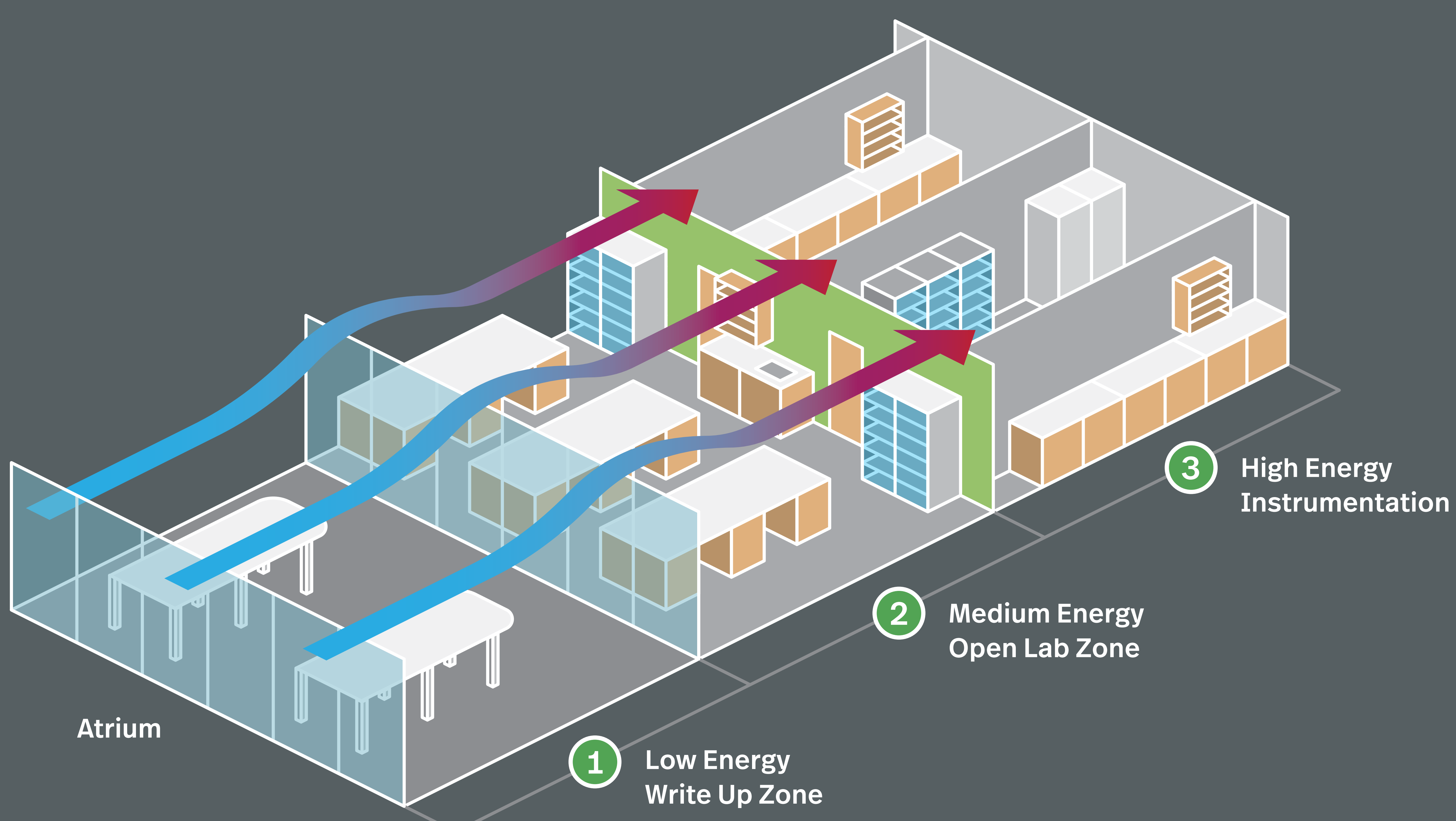
High Efficiency Fume Hoods

High Efficiency Heat Recovery

Location 1.1 - Interior Pylon - Energy Flow - Revised Layout
Full Size

June 25, 2019

Energy Zoning

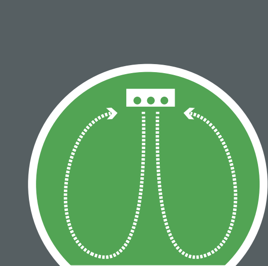


78%

energy savings over typical lab

Floor-to-ceiling interior glazed walls separate energy intensive research space from write-up areas requiring less energy, while still fostering a collaborative research culture.

Occupancy Airflow Control



Chilled Beams

High Efficiency Fume Hoods