bpda

# Life Science Building Design Guidelines

## February 28, 2023 DRAFT

## Acknowledgments

Thank you to everyone who has contributed to writing, editing, and reviewing this document.

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Special thanks to Boston Society for Architecture (BSA), especially Jennifer Effron, for helping to organize focus groups with architects experienced in lab development. Thanks also to those who participated in the focus group:

Andrea Love, Payette

Jonathan Chan, BR+A

John Martin, Elkus Manfredi

Charles Klee, Payette

Patrick Duffy, BR+A

Phil Casey, CBT

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Chris Leary, Jacobs

David Silverman, STA

George Takoudes, Goody Clancy

Special thanks to NAIOP, especially Anastasia Nicolaou and Tamara Small, for helping to organize focus groups with life science developers and documenting some of the feedback received. Thanks also to those who participated in the focus group:

Maggie Capelle, Alexandria Real Estate Equities

Sal Zinno, BioMed Realty

Marcus de Castro, Boylston Properties

Tim Stoll, Breakthrough Properties

Doug Manz, HYM Investments

David Surette, IQHQ

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Stephen Faber, Related Beal

Abe Menzin, Samuels & Associates

Gretchen McGuill, The Davis Companies

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Carolyn Desmond, Skanska

## The Boston Planning & Development Agency (BPDA)

The Boston Planning & Development Agency (BPDA) is the planning and economic development agency for the City of Boston. The BPDA plans and guides inclusive growth in our city — creating opportunities for everyone to live, work and connect. Through our future-focused, city-wide lens, we engage communities, implement new solutions, partner for greater impact and track progress.

The information provided in this report is the best available at the time of its publication. All or partial use of this report must be cited.

# Contents

# Introduction

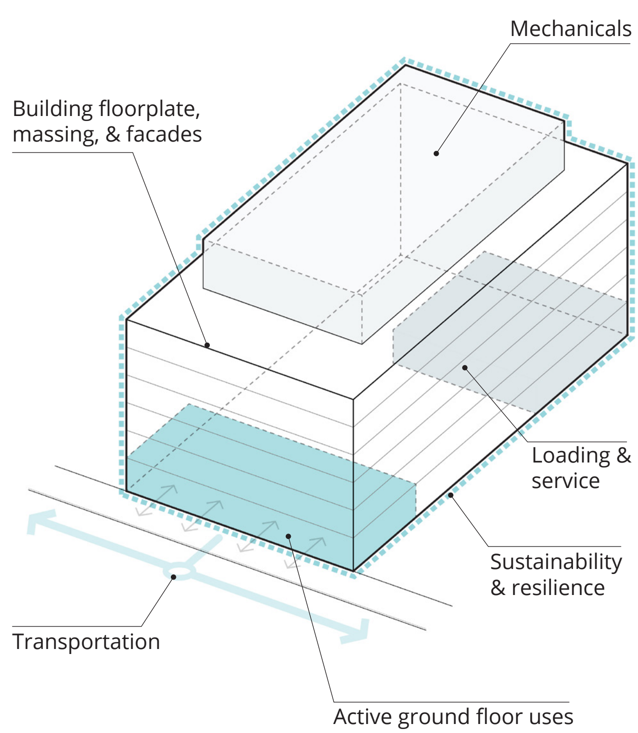
The life science industry is a key driver in Boston's vibrant economy and employment opportunities and provides critical funding for affordable housing, jobs programs, schools, and other public services. As Boston continues its leadership as a global center for life sciences, the Boston Planning & Development Agency (BPDA) welcomes new growth, and in partnership with communities, seeks to shape the impact of life sciences and ensure new development contributes to and fits within Boston's urban fabric and advances citywide goals.

These design guidelines form one part of a larger BPDA effort to support thoughtful, context-sensitive, and flexible growth of the life science industry. These guidelines focus on design challenges unique to life science buildings related to the large floor-plates, higher floor-to-floor heights, and mechanical and operational needs that are typical of many life science uses. These guidelines address how life science buildings can successively and creatively manage the impact of their massing, use, mechanical systems, and unique functional requirements to effectively activate neighborhoods, enhance the public realm, and achieve citywide transportation, resiliency, and sustainability goals.

This document focuses on the following areas of life science building design:

1. **Building Floorplate, Massing, & Facades**
2. **Mechanicals**
3. **Ground Floor: Active Uses, Loading & Service**
4. **Transportation**
5. **Sustainability & Resilience**

Each of these areas are design opportunities that when considered holistically from the beginning of the design and programming process can result in future lab buildings that are more flexible, inclusive, resilient, and responsive to the evolving needs of their tenants and surroundings.



### Note on terminology: Life Sciences

Although there are variations in the definition, the “life sciences” generally refers to organizations and firms dedicated to improving human, animal, and plant life. It includes private, non-profit, and public institutions and organizations specializing in a wide set of interdisciplinary fields, including biopharmaceuticals, biotechnology, medical devices, medical testing laboratories, and other related disciplines. It is distinct, although closely tied, to the healthcare industry, where medical care is directly provided in clinical settings.

For the purposes of these guidelines, “life sciences development” refers to buildings that are used for the development, conduct, or observation of scientific experimentation or research, including but not limited to the medical, chemical, physical, or biological disciplines. Life science buildings have areas that are dedicated to uses which require specialized facilities and/or built accommodations designed for the development, conduct, or observation of scientific experimentation or research – including but not limited to wet laboratory facilities, clean rooms, controlled environment rooms, and facilities with high-frequency ventilation. They often include a mix of laboratory and other uses, including office, storage, and prototype manufacturing, and can include ground-up development of new buildings, as well as conversion of all or a meaningful part of an existing building.

## Purpose and Goals

The purpose of this document is to inform property owners, business owners, developers, and the public about the desired form and character of life science development in the City of Boston.

The design guidelines are led by the following four goals. The BPDA aims to work with developers and the community to help life science development:

- **Achieve a respectful fit** that complements and enhances neighboring buildings and the unique character of each of Boston’s neighborhoods.
- **Support flexibility in building design and use**, including allowing future innovations in life science requirements and conversion to non-life science uses in anticipation of market changes in a fast-moving and innovative industry.
- **Contribute to the urban fabric** of the City of Boston, in ways that activate mixed-use and industrial areas and support the growth and preservation of housing, offices, community facilities, neighborhood retail, and new industry.
- **Contribute to citywide planning goals** including resilience, sustainability, and diversity, equity, and inclusion.

## How to Use These Guidelines

These guidelines are intended for the BPDA, as well as other City agencies, developers, architects, and community members to use in evaluating project design and applications. While they provide guidance on citywide design and performance goals for lab development, they do not supersede neighborhood plans, existing zoning or regulations. Consistency with these guidelines is also separate and distinct from other review processes such as the review process of the Boston Civic Design Commission (BCDC) or Boston Public Improvement Commission (PIC).

## Urban Context Considerations

While these guidelines should be considered citywide, each project will require a unique and flexible approach. Urban design considerations, priorities, and requirements will vary based on location, site adjacencies, and urban context.

These guidelines are especially significant in **mixed-use districts** for example, where projects must be particularly sensitive to existing urban fabric, neighboring uses, building character and scale, activating the ground floor, open space, and established primary and secondary streets.

**Industrial areas** with typically larger blocks may not possess the same degree of preexisting urban fabric or pedestrian activity as mixed-use areas, but special consideration should be made to how the area might grow, opportunities for a creative mix of uses in the project and flexible future-use, and ways to support short-term and long-term public realm and transportation goals.

Projects in **healthcare and academic campuses** often also possess large block sites alongside large scale institutional or healthcare buildings, but guidelines on enhancing the public realm, establishing a pedestrian and human-scale, and adhering to primary and service streets become especially important.

In every context, projects should pay special attention to building adjacencies and their immediate impact on neighboring uses, especially in the design of mechanicals, ventilation, loading, and opportunities to enhance the given neighborhood and public realm.

# Urban Design Guidelines

## 01 Building Massing, Floorplates, & Façades

Breakdown large building massings and sites and organize and shape projects to respect and respond to the surrounding context.

## 02 Mechanicals

Creatively incorporate mechanicals in building design and minimize their impact on the surrounding context and public realm.

## 03 Ground Floor: Active Uses, Loading, & Service

Design to create an inviting, active, and comfortable streetscape sensitive to the surrounding context and avoid conflicts with pedestrians, bicyclists and neighboring uses.

## 04 Transportation

Design features that facilitate transit use and active transportation including biking, running, and walking.

## 05 Sustainability and Resiliency

Ensure projects are resilient and mitigate high energy needs and climate change impact.

# 01 Building Massing, Floorplates, & Façades

## Breakdown large building massings and sites and organize and shape projects to respect and respond to the surrounding context.

1. **Prioritize small floorplates**: Life science buildings with small building floorplates (<30,000 SF) that preserve and respect the scale and character of the surrounding context, are strongly encouraged, especially in mixed-use areas. Buildings with small floor plates will have an expedited review process compared to large floorplate (>30,000 SF) projects.

2. **Design for flexible mixed-use and future use:** To better ensure continued use of the building through different ownership and market cycles, wherever possible consider smaller floorplates with flexible building grids and ceiling heights and adaptable core locations (Figure 2) that can be converted to commercial, residential, or mixed uses in the future.

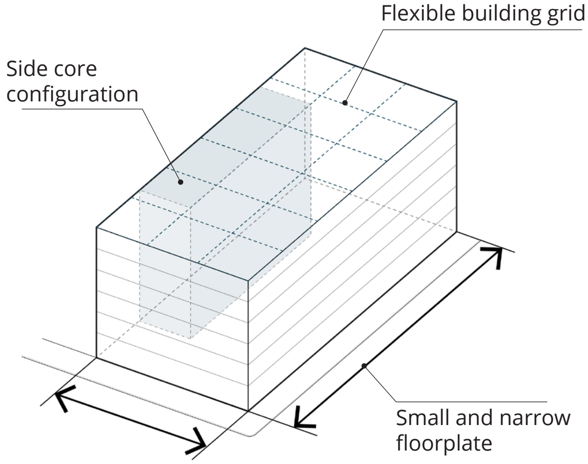



*Figure 2: Designs that optimize the flexibility and future use opportunities of a building are encouraged. A smaller and narrower floorplate, adaptable building grid, and side-core configuration can create efficient and flexible layouts for a mix of uses.*

3. **Mitigate large floorplates**: Floor plates greater than 30,000 sf will require additional design review and must prioritize design strategies, like those included in these guidelines, to mitigate scale, particularly in mixed-use areas.

4. **Breakdown large-blocks:** Where relevant, new development and redevelopment of sites should break up excessively large blocks and increase permeability. The most important feature for longer blocks is the creation of pedestrian and bicycle connections through the site; this may include providing new streets, mid-block alleys, publicly accessible pedestrian paths, courtyards, and plazas that connect with other streets and public or common open spaces. This is particularly

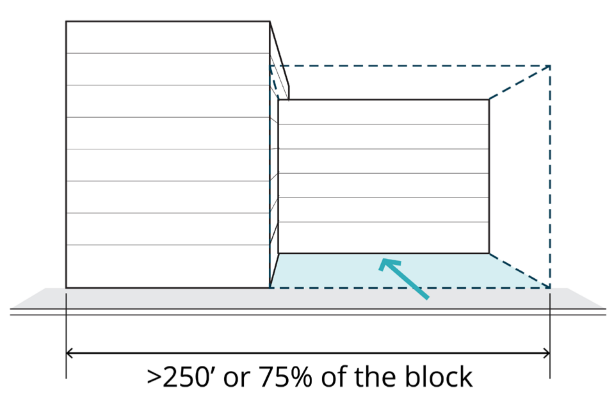
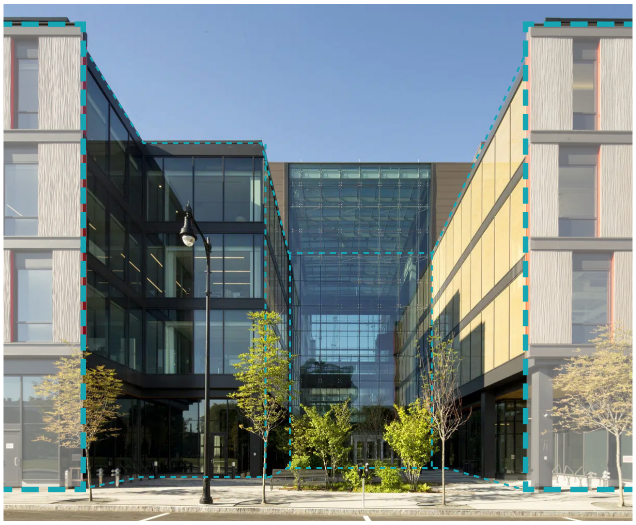



*Figure 3: Buildings with extremely long facades in excess of 250 feet in length or 75% of a block (whichever is smaller) should use more and larger scale physical openings and setbacks*

relevant to multi-building proposals on large parcels or parcel assemblages.

Strategies for addressing these guidelines may include designs that:

- Include additional setback and modulation of massing to reduce building scale and break up the block, particularly where buildings have long lengths along public streets. This is particularly a concern where building length exceeds 250 feet or more than 75 percent of the block (Figure 3).
- Shape the building design to respond to the height and important horizontal datums of adjacent structures.
- Utilize changes in height, façade articulation, material changes, setbacks, and/or similar architectural features to reduce the perceived scale, mass, and height of the building, particularly when the surrounding context is of a smaller scale.
- Vary and articulate the building façades to add scale and reinforce existing façade rhythm along the street where it exists.



*75 Binney Street: The building aimed to have a contextual, site-responsive design, connecting Kendall Square's dense fabric with East Cambridge's residential neighborhoods. The block is broken up by a transparent, five-story entrance atrium setback from the street that includes a café and other public amenities.*

*Rajen Kilachand Center: The project's massing and small floorplate is similar in height and scale to buildings that share the same street edge. The project also added a new pocket park, improving the public realm of the development area. (Photo by Chuck Choi)*

# 02 Mechanicals

## Creatively incorporate mechanicals in building design and minimize their impact on the surrounding context and public realm.

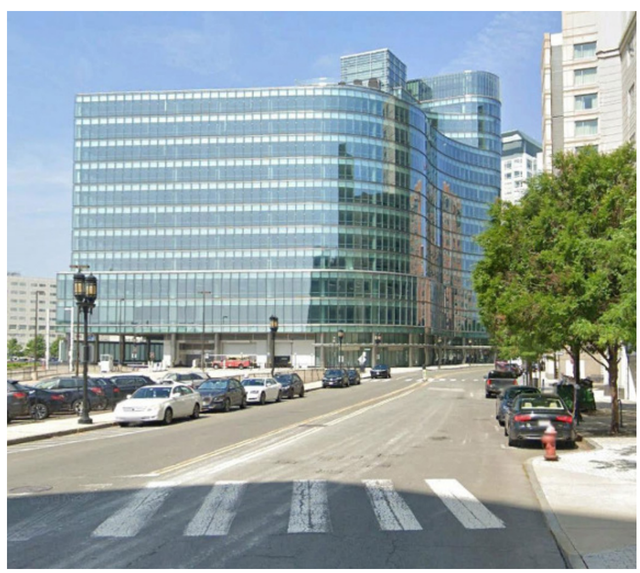
1. **Minimize visual, noise, and shadow impacts to the public realm and adjacent uses.** Size, locate, and arrange rooftop mechanical systems to minimize impacts to the public realm. Screening, setbacks from the roof edge, and distribution of mechanicals should all be used to minimize and mitigate impacts.

2. **Integrate rooftop mechanicals into overall building design.** Rooftop mechanicals and screening are design opportunities. Design approaches should respond to surrounding planning context and the City's sustainability goals. For all of these recommendations, special consideration will be given for projects that utilize creative mechanical solutions or new technology to meet or exceed Article 37 goals. Strategies may include:

    - Architecturally screening mechanicals in such a way that the screening appears as an extrusion of, or a cap to, the building itself.
    - Designing mechanicals to stand out as machinery or as sculptural objects, in which case it needs to be carefully arranged and its appearance from various vantage points should be considered.
    - Include photovoltaic, vegetative cover, or other energy-positive interventions to advance sustainability goals.

3. **Consider the impact of rooftop mechanicals on view corridors:** Special attention should be paid to how mechanicals might impact significant view corridors or locations such as down mixed-use and neighborhood streets or from public open spaces. View studies are encouraged to illustrate how mechanicals will impact views from the street level or significant vantage points.

4. **Utilize interstitial mechanical floors to minimize urban design impacts**: Where appropriate, consider including mechanicals on interstitial floors rather than on the roof to reduce potential impacts to neighbors and neighboring uses.



*Manulife Office-to-Lab Conversion: This office-to-lab conversion added mechanicals into the existing building envelope (in the 14th and 15th floors). Those mechanical systems that needed to be added to the roof were sited and acoustically screened to minimize impacts.*

5. **Follow the height and volume design limits for rooftop mechanicals on large floor plate buildings.** Small floorplate buildings (<30,000 SF) will not be subject to these limits to encourage effective, creative design responses and smaller floorplates. Large floorplate projects will be limited to following design parameters during design review and as part of the entitlements process:

    - Rooftop mechanicals should not exceed a total volume equivalent to 100% roof coverage and 25 feet in height, as illustrated in Figure 4 and Figure 5. The mechanical envelope's shape and height is flexible as long as it does not exceed the limits of this volume. This volumetric limit is meant to help guide the flexible design, placement, and height of rooftop mechanical equipment based on a project's context.
    - Unless to enable smaller floorplate buildings or mitigate impacts to the public realm, rooftop mechanicals should not exceed 40 total feet in height.
    - Mechanical equipment can be integrated into the building volume to minimize impacts.
    - Exhaust related flues and fan sets that extend up above mechanical equipment or screening may exceed this design limit but should be located to minimize impacts to the public realm.
    - These parameters will be evaluated and revised as building technology and energy performance continue to evolve. In all instances, the design guidelines prioritize energy performance and minimizing impact on the public realm as key goals. Solar PV panels and other renewable energy equipment will not be subject to these design limits.

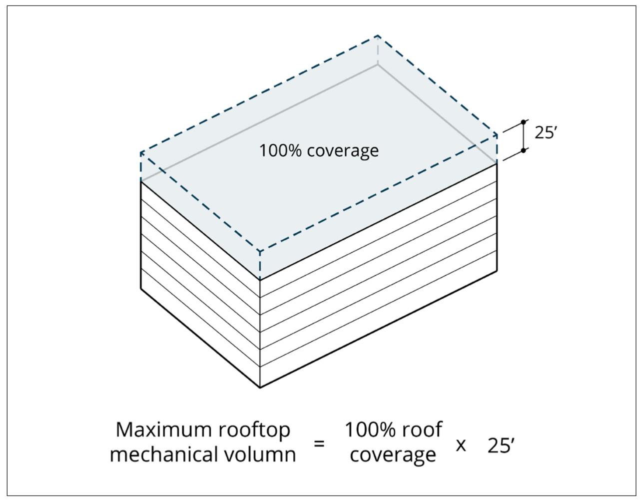



*Figure 4: Rooftop mechanicals should be contained within a envelope limited in volume.*

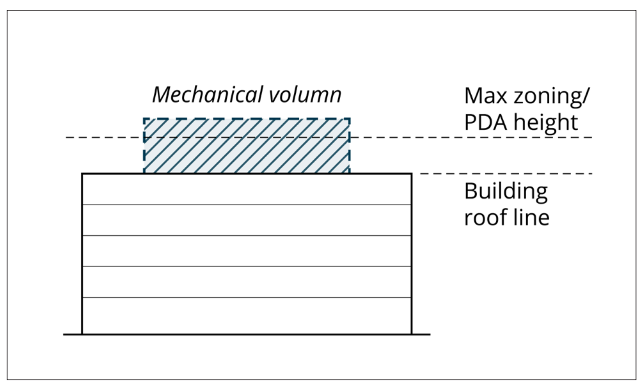



*Figure 5: The volumetric limit to rooftop mechanicals generally applies to mechanical equipment located above the established building height in zoning. However, to encourage the integration of mechanical equipment into the building design, independent penthouse structures are calculated in their totality, and measured from the roof line regardless of the building height in zoning, as illustrated in example above.*

# 03 Ground Floor: Loading, Service, & Active Uses

## Design to create an inviting, active, and comfortable streetscape sensitive to the surrounding context and avoid conflicts with pedestrians, bicyclists and neighboring uses.

1. **Activate the street and public realm with ground floor uses**. Design ground floors to include and feature active ground floor uses to the maximum extent feasible. They should be prioritized on first floors fronting primary streets and open space, particularly in mixed-use areas. Active uses should serve the local community, including those who live and work in the area and/or identified city-wide priorities.

    i. Active and public uses ideal for mixed-use areas include, but are not limited to:
        a. retail (e.g., cafes, restaurants, shops)
        b. creative workspaces
        c. cultural venues
        d. services for the public
        e. community spaces
        f. city services

    ii. In less active contexts, such as industrial areas, some active or mixed uses may not be feasible or contextually appropriate. In these cases, locate semi-active accessory uses such as front offices, reception areas, showroom components, bike storage facilities, or employee amenities such as dining facilities, on primary street frontages.

    iii. Designing for and leasing or selling of space (especially affordable commercial space) to small, locally-owned, and diverse-owned businesses is encouraged

2. **Minimize the impact of loading and service areas on the public realm**. Locate loading and servicing areas on secondary streets or, preferably, alleyways or other locations on private property for loading maneuvers, service, and delivery away from major public streets, open space, and significant promenades.

    i. Location of loading, servicing, and delivery should follow any relevant City guidelines.

    ii. Driveway turnaround and vehicle drop-off facilities along public streets are strongly discouraged to avoid disrupting the continuity of the sidewalk. Ideally, truck maneuvers to access loading bays should be accommodated on-site and should not require trucks to back up on public streets.

3. **Minimize curb cuts** : Curb cuts on public ways shall comply with City of Boston standards.

    i. Those wider than 24 feet require PIC approval.

    ii. Where it is not possible to keep all loading/service internal to the building or where the 24 foot dimension cannot be met, avoid creating loading/servicing areas exceeding 34 feet wide on public ways, particularly in mixed use areas.

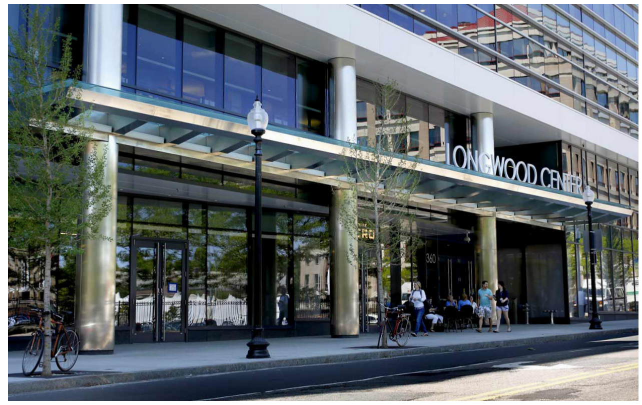
    iii. Loading/servicing/delivery/parking

entrances should be consolidated as much as possible, ideally resulting in no more than one curb cut per block face.

iv. Access drives to loading areas shall be built at the same elevation of the sidewalk to maintain a continuous grade across them for pedestrians.

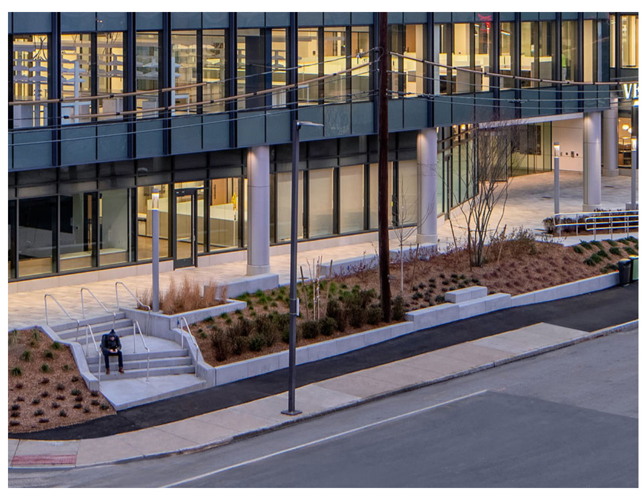
4. **Integrate loading and service bays into the overall building design**. Loading and servicing bays should be designed to:

    i. complement the overall façade composition.
    ii. minimize sound impacts.
    iii. provide proper pedestrian warning systems for vehicles entering and exiting
    iv. fully enclose and screen delivery and service vehicles.
    v. stay closed when loading and servicing bays are not in use.
    vi. allow occupied ground level spaces with windows to occur between loading servicing areas wherever possible to help diminish their impact.




*Dana Farber Cancer Institute ground floor.*


*75 Binney Street: Retail and lobby space help activate the ground floor. The building overhang helps reinforce the human-scale of the pedestrian way and showcase the active ground floor uses.*



*Innovation Square utilizes a landscaped edge to negotiate the change in grade while also providing a setback from the street and enhancing the public realm.*

# 04 Transportation

## Design features that facilitate transit use and active transportation including biking, running, and walking.

1. **Active commutes**: The BPDA encourages all new development to provide support for active transportation including biking, running, and walking.

    iii. Life science developments must adhere to the City's Bike Parking Guidelines, and should consider provision of bike storage and repair station(s); lockers and shower access; and other accommodations within the development. In particular, bicycle facilities should be considered at the inception of the project and considered during the building design.

    iv. Guidelines from Boston's Complete Streets should also be followed. The Complete Streets approach places pedestrians, bicyclists, and transit users on equal footing with motor vehicle users, and embraces innovative designs and technologies to address climate change and promote active healthy communities.

2. **Maximum Parking Ratios**: All life science buildings over 50,000 square feet must adhere to and those under 50,000 square feet are encouraged to follow the Boston Transportation Department (BTD) maximum parking ratio guidelines. These guidelines are site- and use-specific and include a category for Office / Private lab.

3. **Transportation Demand Management (TDM)**: All buildings over 50,000 square feet are required to include TDM strategies to reduce vehicle trips, and submit a TDM plan as part of the transportation development review process. The BTD's TDM point system tool allows developers to choose from a wide variety of strategies to help manage people's travel choices, including strategies to incentivize people to drive less, ride transit and bike more, carpool, and use carshare. It also complements the maximum parking ratios.

4. **Transit use**: Where possible, development should consider linkages and accessibility to public transit in order to reduce reliance on single-person car trips and create job accessibility for a diverse set of potential employees. The BPDA's Research Division has reported that life science workers are more likely than all Suffolk County workers to commute by public transit, biking, walking.[1] This trend can be further supported with transit-oriented and multi-modal design.

[1] See BPDA Research Division Life Science Employment Report, published Aug. 2021, https://www.bostonplans.org/getattachment/7927a2d5-097d-4218-af82-ecd64ad150d4)

# 05 Sustainability and Resiliency

## Ensure projects are resilient and mitigate high energy needs and climate change impact.

1. **Green Building Standards:** Life science development must comply with Article 37 of the Boston Zoning Code, which requires all buildings subject to Article 80 Large Project Review to meet minimum sustainability standards, using the LEED rating systems. LEED helps investors implement management practices to prioritize building efficiency, decrease operational costs, increase asset value, and ensure productivity, comfort, health and wellbeing for occupants. The Article 37 review process utilizes the LEED framework to assess project planning for connectivity, site design, water use, energy & atmosphere impacts, materials, indoor environmental quality, and innovative practices. LEED also provides criteria for building practices that address Boston priorities including reducing urban heat island and lowering the embodied carbon in construction materials.

    v. Article 37 also works in coordination with the Smart Utilities Policy (BSU). The BSU Program is aimed toward developing strategies for more efficient, equitable, sustainable, resilient, and innovative utility services in the City of Boston. Where applicable, projects are required to incorporate five Smart Utilities Technologies (SUTs): Advanced Energy Systems, Telecom Utilidor, Green Infrastructure, Smart Street Lights and Assisted Signal Technology. Projects are encouraged to further consider Renewable Thermal Resources, Wired Score certifiability, and Broadband Equity both on and off-site, especially when located within an Environmental Justice District.

2. **Zero Net Carbon (ZNC) Buildings**: In 2020, the BPDA launched the Zero Net Carbon Building Zoning Initiative to assess and identify strategies to strengthen Article 37 to include zero net carbon standards. Recommendations include establishing building carbon emissions targets that emphasize better building enclosures and efficient, all electric systems, and setting standards for installation of on-site renewable energy systems and procurement of renewable energy sufficient for achieving zero carbon emissions. Implementation is anticipated in 2023 and will be applicable to all new construction (including life science development and conversion).

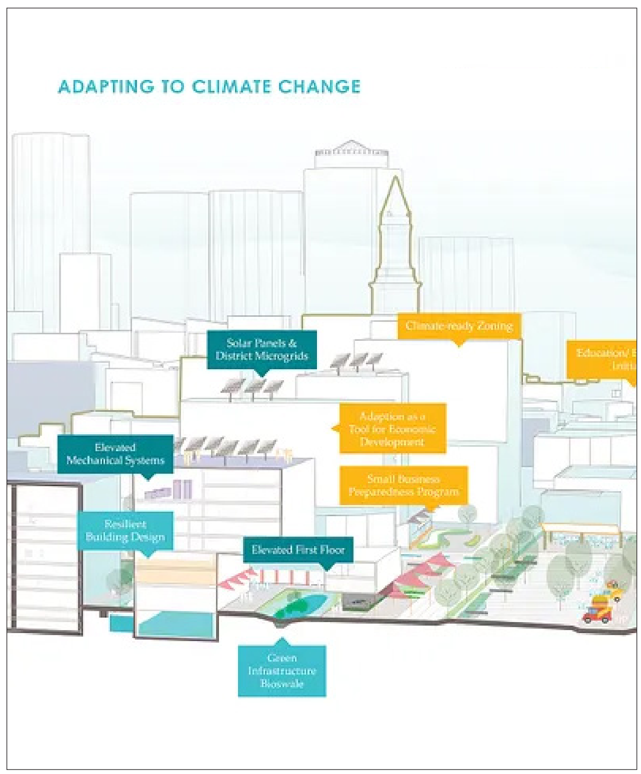
3. **Building Emissions Reduction and Disclosure Ordinance (BERDO)**[2]: Existing buildings, including life science buildings, that are 20,000 square feet or larger are required to comply with Boston's Building Emissions Reduction and Disclosure Ordinance (BERDO). BERDO requires existing buildings to meet declining emissions standards over time, reaching net zero emissions by 2050. Newly constructed projects will be required to annually report building performance per BERDO standards but at a net zero carbon emissions level.

4. **Resilience**: Life science buildings should be designed to prepare for, easily recover from, and adapt to site-relevant climate hazards, including chronic and extreme weather events, heat waves, storm events, and coastal and riverine flooding.

    i. New projects should not exacerbate existing localized heat and flood conditions and should advance design solutions to mitigate these impacts.

    ii. Critical[4] mechanical systems and hazardous materials should be appropriately located and/or designed for the project site to limit disruption to building operations during and after storm events.

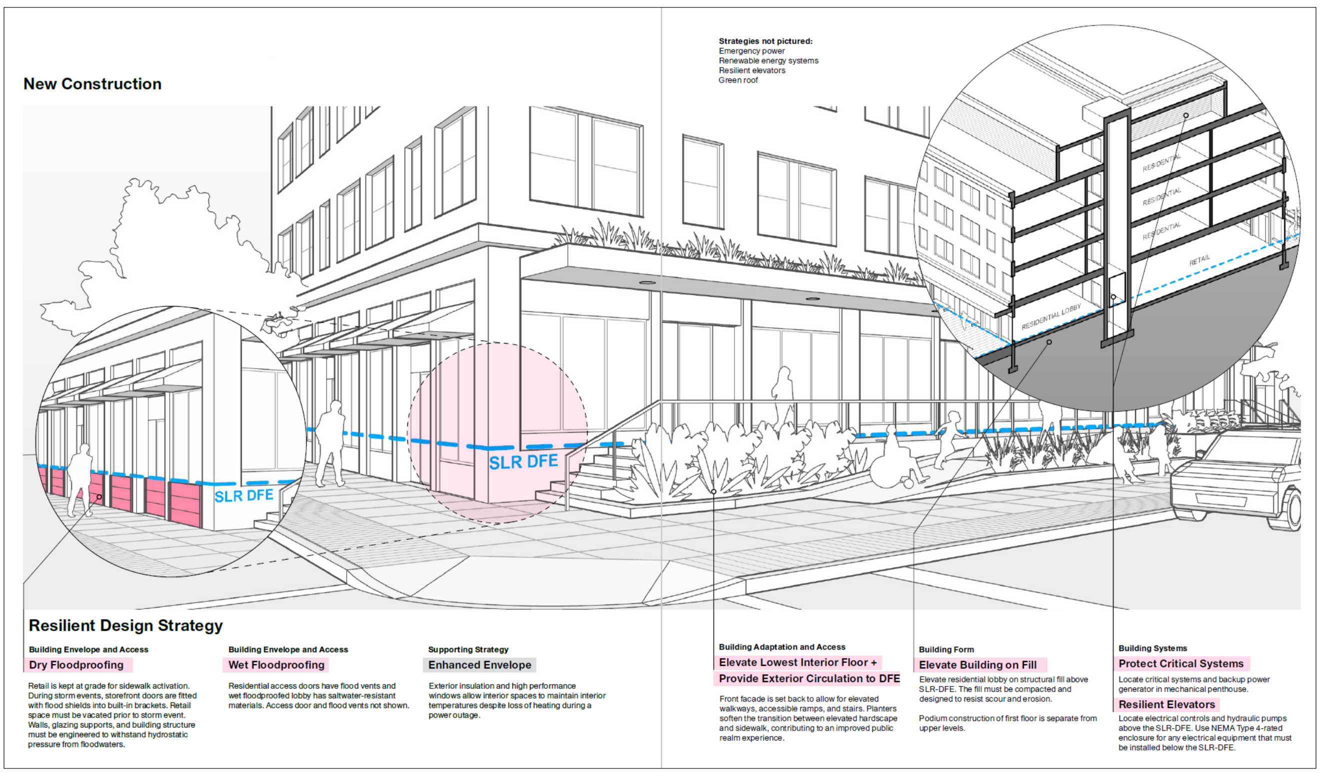
        a. All new development must follow the appropriate existing zoning and guidelines[4], including the Coastal Flood Resilience Overlay District (as codified in Article 25A). Article 25A of the Boston Zoning Code requires that all Article 80 projects located within the Coastal Flood Resilience Overlay District are subject to Resilience Review to demonstrate the ability to adapt to future sea level rise and protect from potential storm events. Projects should utilize the principles outlined in the Flood Resilience Design Guidelines.




*Climate Ready Boston*

[2]Boston Building Emissions Reduction and Disclosure Ordinance (BERDO) (https://www.boston.gov/departments/environment/building-emissions-reduction-and-disclosure)
[3]Note that not all mechanical systems are critical; for example, life support transformers may be considered critical while electric vehicle charging transformers may be non-critical. Note that this does not create nor is it intended to create a new standard or definition of "critical."
[4]Climate Ready Boston resources (https://www.boston.gov/departments/environment/preparing-climate-change#resources)

5. **Zero waste:** Life science buildings should be designed and managed to reduce the consumption and waste of resources. Boston has a Zero Waste Boston initiative to move Boston toward zero waste through planning, policy, and community engagement. Zero waste means reducing, repairing, and reusing materials. While this may be difficult for operating life science buildings to achieve considering their high use of consumables, buildings should be designed thoughtfully for more ways to sort and separate waste, including compost




*Coastal Flood Resilience Design Guidelines*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