BC HOUSING

Considerations and recommendations for housing in response to a COVID-19, Pandemic World

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Image source: Pexels

Acknowledgments

Lead Authors:

Virendra Kallianpur, Practice Leader, Perkins and Will

Sheryl Peters, Provincial Director, Redevelopment, BC Housing

James Forsyth, Regional Director, BC Housing

Wilma Leung, Senior Manager, Technical Research & Education, BC Housing

Sadia Afrin, Acting Senior Manager, Construction Services, Development and Asset Strategies, BC Housing

Contributors:

David Dove, Principal, Perkins and Will

Larry Adams, Principal, NSDA Architects

Maryam Ahmadi, Intermediate Urban Designer, Perkins and Will

Karolina Hanula, Intern Architect, NSDA Architects

Courtney Stewart, Redevelopment, BC Housing

Sara Sarvari, Student Intern, BC Housing

Layouts and Graphics:

Maryam Ahmadi, Intermediate Urban Designer, Perkins and Will

Collaborators

Dane Jansen, Principal, DYS Architecture

Peter Osuchowski, President, TD Systems

George Simpson, Director Facilities, RainCity Housing and Support Society

Jim Aalders, Vice President – HDR Architecture

Madeleine Hebert, Researcher, Happy City

Ryan Bragg, Principal, Perkins and Will

Adrian Watson, Principal, Perkins and Will

Kathy Wardle, Associate Principal, Perkins and Will

Rufina Wu, Senior Associate

Kaz Bremner, Senior Architect, Perkins and Will

Horace Lai, Senior Architect, Perkins and Will

Alysia Baldwin, Intermediate Architect, Perkins and Will

This report is a result of a study led by BC Housing & Perkins and Will in collaboration with experts through workshops and discussions.

Contents

Introduction

Image source: Pexels

1. 1. Introduction

The emergence of the novel coronavirus has prompted national and global measures to contain the spread of the virus. As people tend to spend the majority of their time indoors, examining the built environment is essential to understand how we can minimize the spread of the virus within buildings.

These recommendations can be applied to any housing project: existing, projects in development, and future projects.

As illustrated in the Barton and Grant Health Map in Figure *1-1* below, the built environment is identified as having a great degree of importance in determining the health and wellbeing of our neighbourhoods.

Forecasting our 'new normal' for housing design and how we approach design is ongoing. Although we can not say exactly what the future will look like, we can examine current trends, tactics, and ideas. This guide offers prudent and reasonably attainable recommendations to combat the challenges posed by the COVID-19 pandemic.

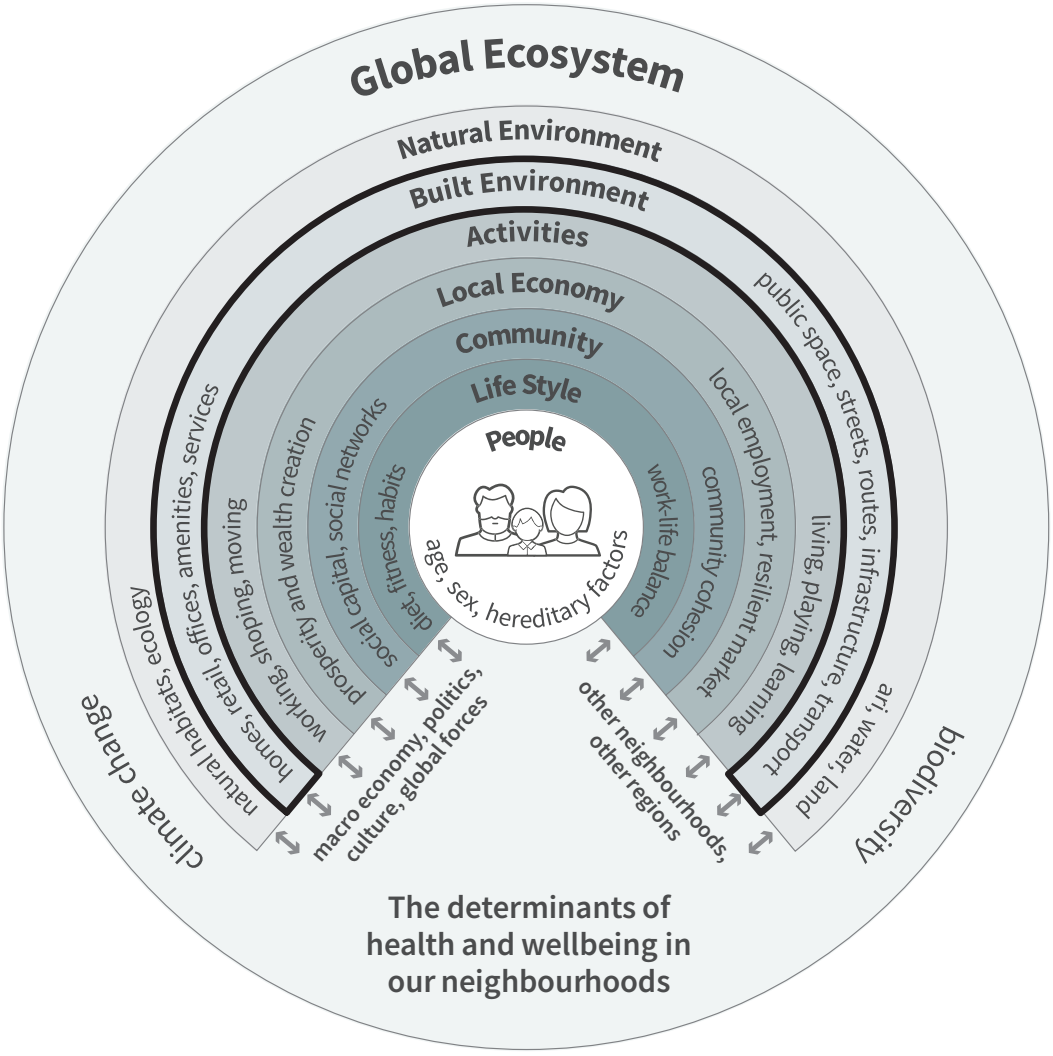


Figure 1-1. The determinants of health and wellbeing in our neighbourhoods - Barton and Grant (2006) Health Map, The Journal for the Royal Society for the Promotion of Health

1.1.2. Encouraging Health and Wellbeing Through Built Form

As shown in *Figure 1-2* below, a robust design framework that strengthens social networks and promotes healthy choices is a relatively resource-efficient method of improving public health for the greatest number of residents.

Better resource allocation for housing and built environments that fulfill the physical, mental, and social needs of different groups, will foster community prosperity and wellbeing.

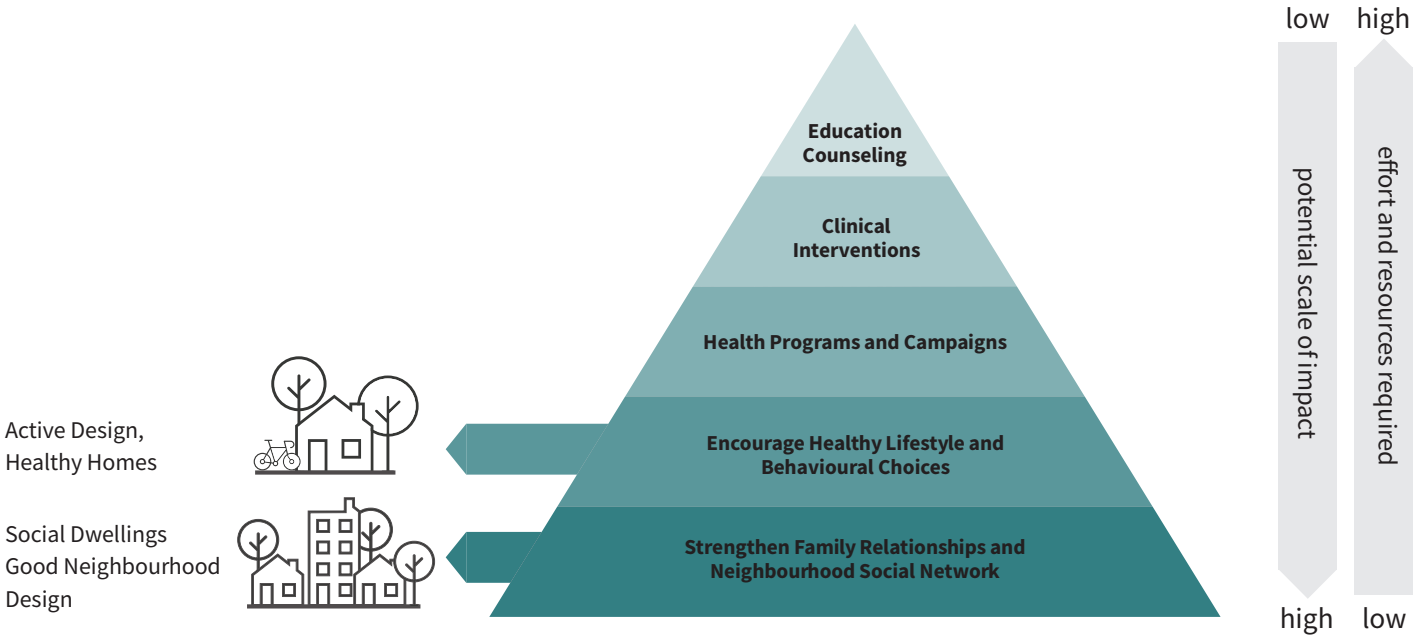


Figure 1-2. Impact of Built environment on Improving Public Health Pyramid - UK Green Building Council Health and Wellbeing in Homes Report 2016

1.2. Forces at Play

COVID-19 as a catalyst for change and re-calibration

1.2.1. Increasing Role of Homes

According to Statistics Canada, between the years of 1991 and 2017, the median living area of condominium apartments in British Columbia and Vancouver shrunk by 17% and 20% respectively.

During the COVID-19 pandemic, homes became containers for almost all activities, from virtual schooling to working from home to indoor entertainment. With these increased demands, the role of the homes has changed. Innovative

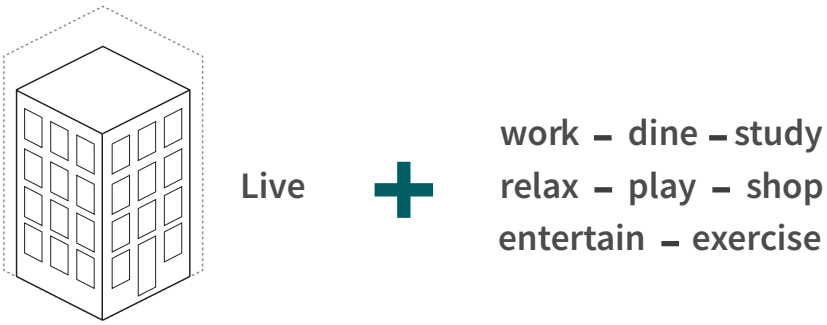


Figure 1-3. Role of homes during pandemic

and adaptable design solutions need to be implemented to incorporate the expanded daily life requirements within the built environment (*Figure 1-3).*

1.2.2. Change in Mobility Patterns

While communities were in lock down mode during the peak period of COVID-19 in British Columbia, mobility patterns witnessed a dramatic change. Based on a June 2020 Google report (*Figure 1-4*), despite an increase in local store and park visits, there has been a sharp decline in movement through public transit systems and around transit nodes. This was precipitated by the drop in flows to and from workplaces, retail, and recreation facilities in spite of a rise in mobility around housing.

This shift in mobility patterns reveals the importance of access to essential community resources and natural refuge as a principle factor in better health and wellbeing.

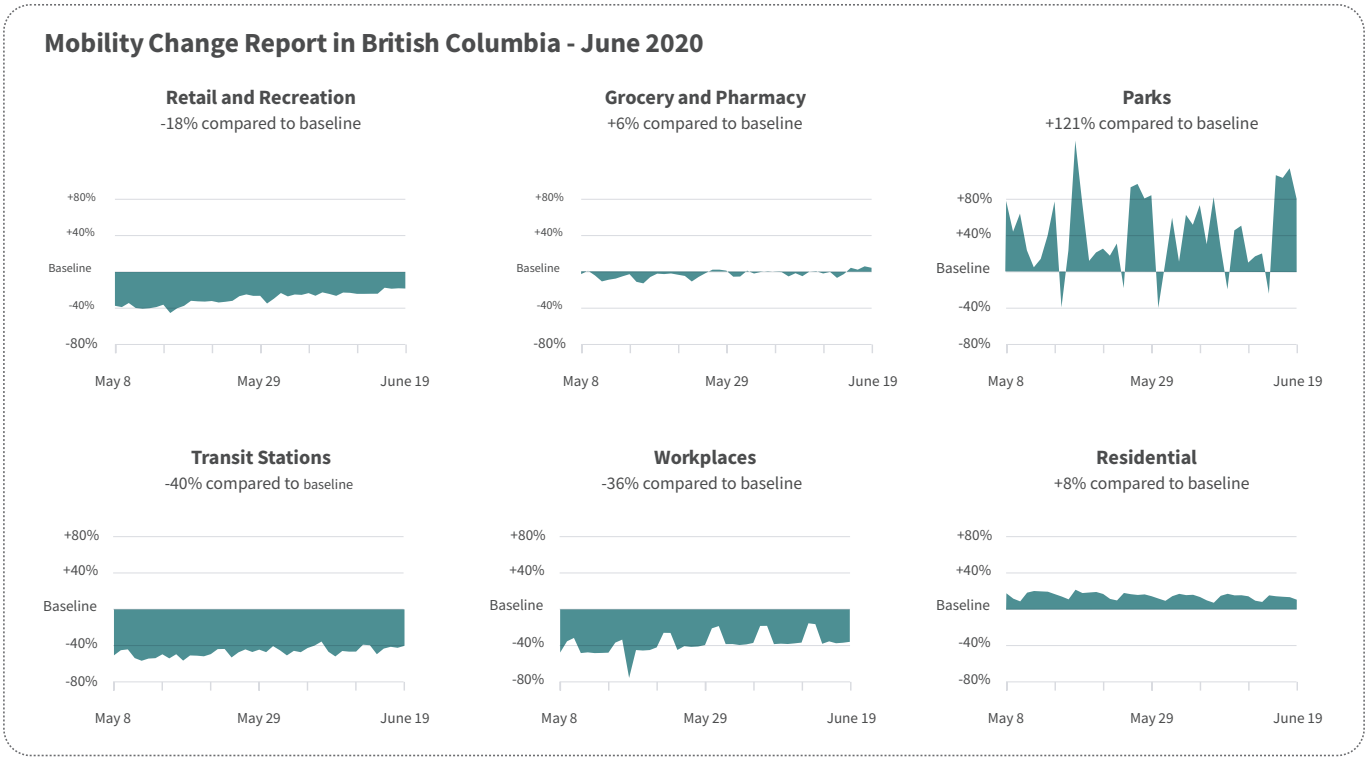
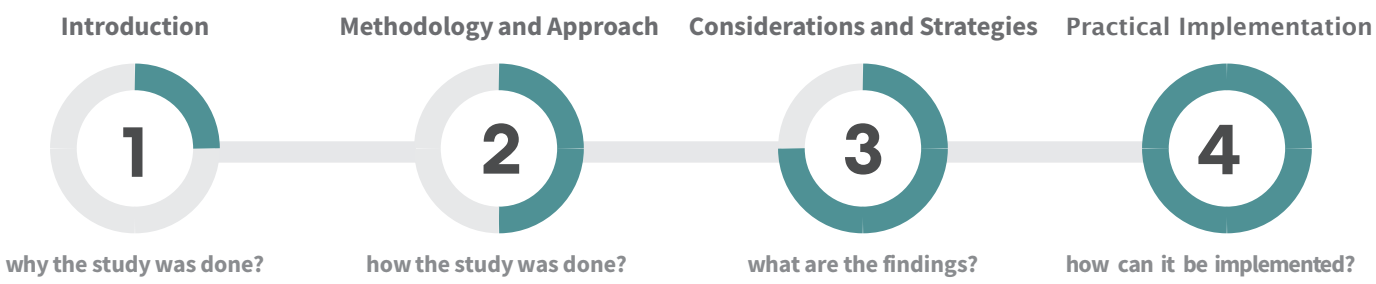


Figure 1-4. Mobility Changes in British Columbia from Google COVID-19 Community Mobility Report

1.3. Structure of the Report



Methodology and Approach

Image source: Pexels

In an effort to address the housing challenges during the pandemic, and build a collective intelligence on this emerging field, an integrated methodology was adopted including literature review, collaborative workshops, and iterative design idea explorations. The collected information was gathered into a cohesive report which will remain a living document. It will continue to grow, improve and evolve with additional knowledge about the viral disease, building science and technology responses, and our understanding of how to mitigate infection and contamination risks improves.

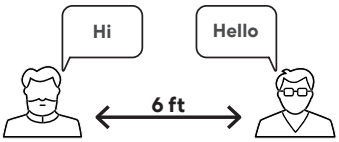
2.1. Trends and Observations

Behavioural tendencies that might reshape our post pandemic world

As people learn to live with the new reality and the ripple effects of COVID-19, there are some emerging behavioural themes and trends. These help to inform designers, developers, facility managers, operators, and decision makers when employing new strategies to improve interaction with the built environment.

a. Physical distancing

In order to stem the spread of the coronavirus, physical interactions around the world have been restricted enormously.



b. Virtual as the new reality

As people stay physically apart, they are discovering new connections and nurturing relationships virtually.

c. Higher regard for health, self-care, and mental wellbeing

As people cope with the challenge of staying healthy and bound at home, they are focusing more on taking care of their own physical and psychological needs.

d. Shift to value and essentials

With many people experiencing negative impact on their financial stability as well as a shift in their daily routines, expenditures are being directed towards essentials.

e. Online shopping, on demand delivery

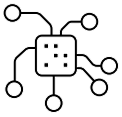
As people spend more time home, digital and contactless services - including curb side pickups and deliveries - are highly favoured. Much like centralized mail boxes, secure delivery points in multi-unit housing complexes for personal packages should be considered

f. Increase preference for local businesses

With reduction in trips across cities along with the value, availability, and quality of products, local businesses are revisited at a higher rate in neighbourhoods.

g. Importance of and reliance on technology

Technological and digital platforms allow many services and businesses to remain active during lockdown and ensure people could distance more effectively.



2.2. Workshops

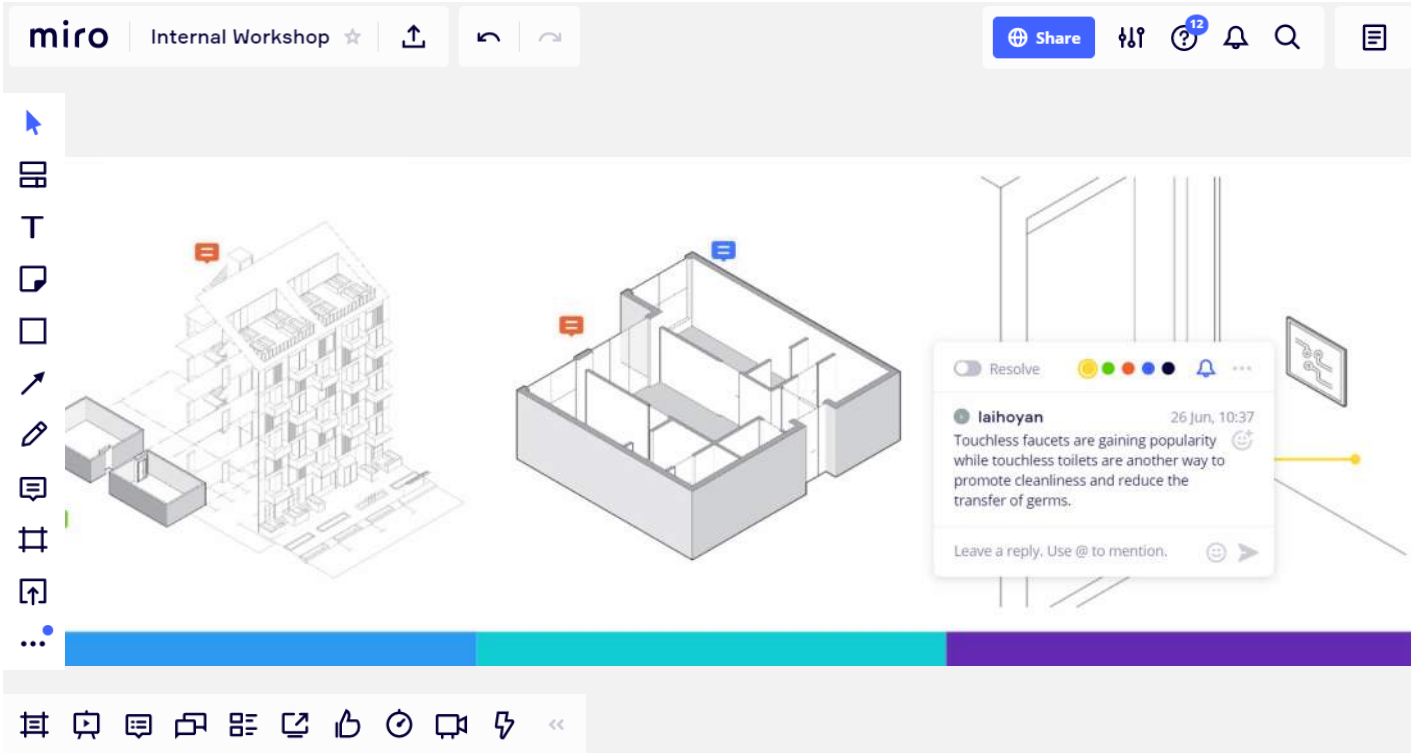


Figure 2-1. Miro was used as the virtual platform for the Workshops

The creation of this document is a prime example of how the pandemic has not limited our ability to work and interact, but rather has changed the way in which we do so. In lieu of a physical workshop, a virtual workshop was facilitated using Miro, an on-line virtual platform.

Two workshops were organized to discuss and build the collective knowledge on the considerations and recommendations for housing in pandemic and post pandemic era. The first virtual workshop drew upon the cross-national and international expertise within Perkins and Will. Participants were given time to explore the virtual workshop boards to absorb, comment, and discuss. The recommendations varied from small space considerations during the pandemic to perceptions about the future of density in large cities.

One of the outcomes of this workshop was an understanding of how the pandemic is now requiring designers and community builders to recalibrate their approach towards space and neighbourhood creation. With many amenities shut down for a long period of time, a major reconsideration for space programming and allocation is inevitable. Housing has to become agile and flexible enough to accommodate the activities required do to maintain health and wellbeing - both personally and professionally. Social connectivity to the community could be addressed by rethinking the building envelope and common spaces.

Additionally, observations reinforced trending paradigms of sustainable design: housing has to minimize its carbon footprint, maximizing solar exposure of individual units, promote rainwater collection, and provide natural ventilation.

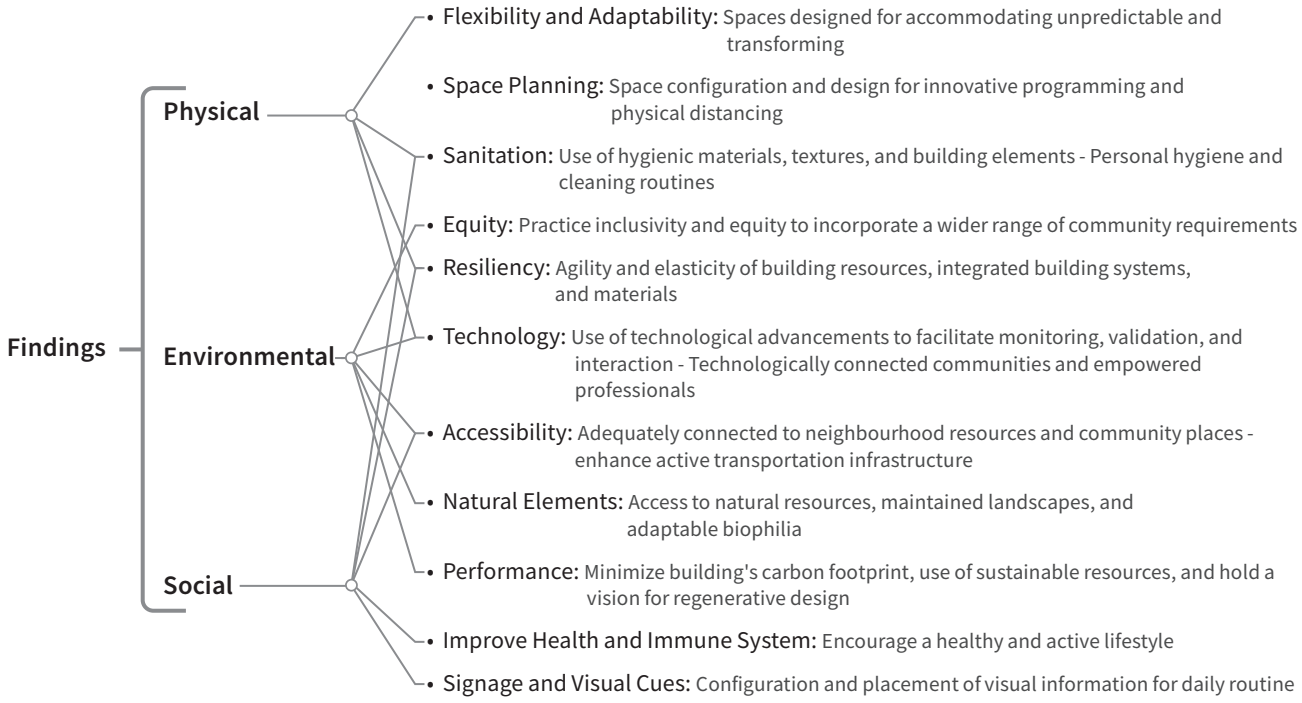


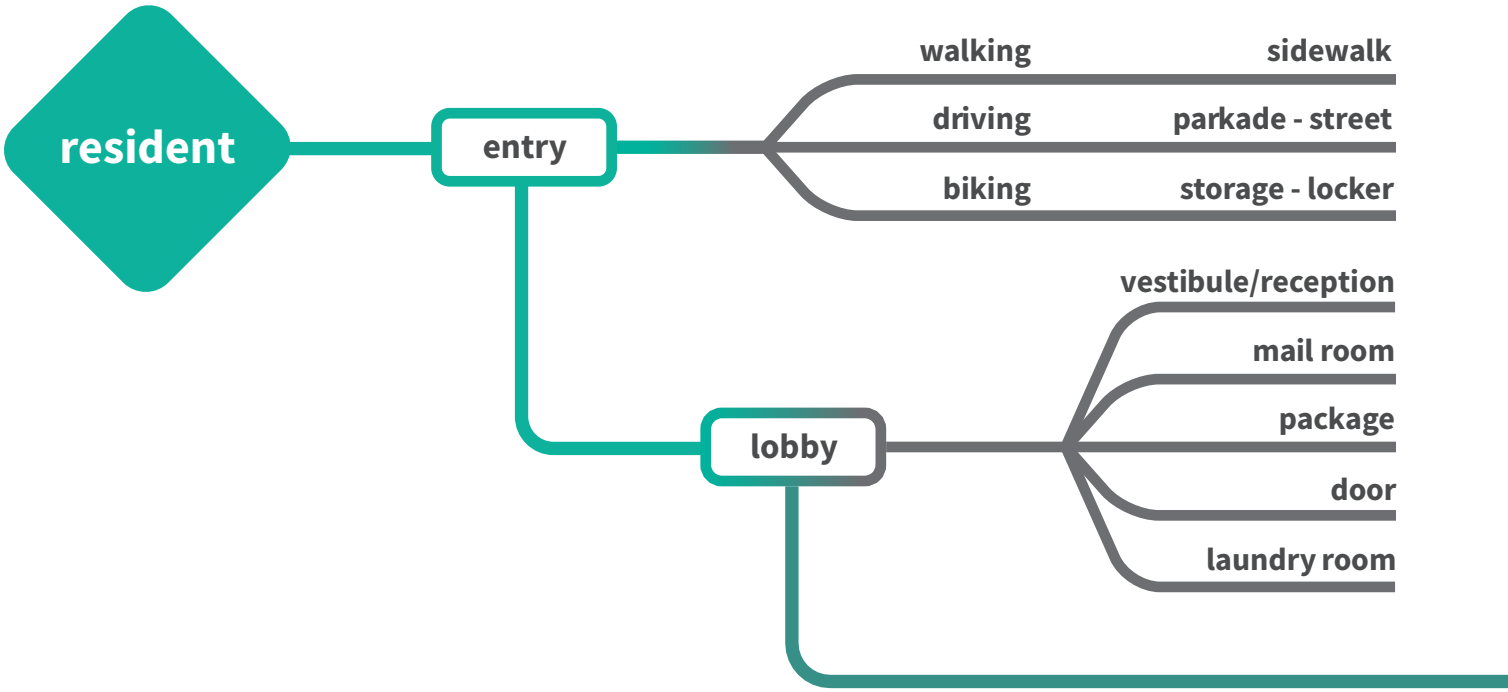
Figure 2-2. Summary of findings discussed in the Workshop 2

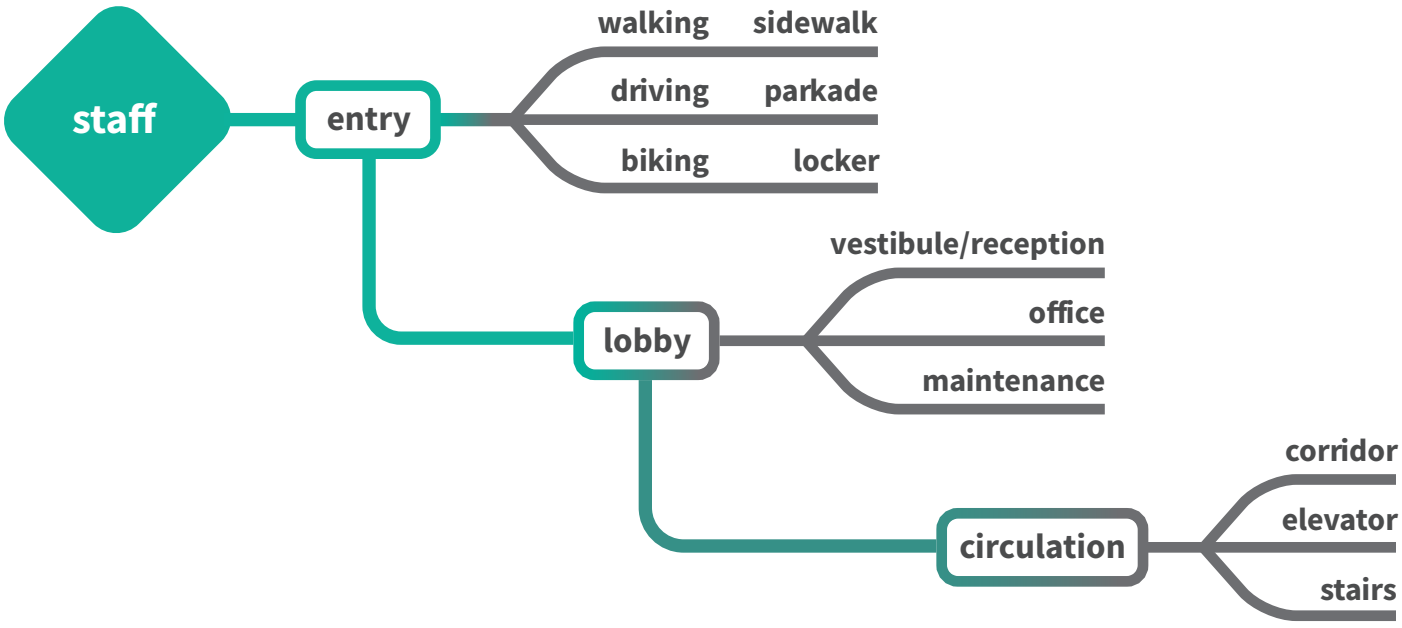
A second virtual workshop was held to gather input from a multi-disciplinary group ranging from mechanical consultants to non-profit housing operators to social programming experts.

Flexibility emerged as one of the most important aspects in the design of housing during - and potentially - post pandemic. Flexibility in planning and operational decisions to the programming of interior spaces was discussed. These inputs have been incorporated in the relevant sections of the report.

2.3. Sequence Flows Through Spaces

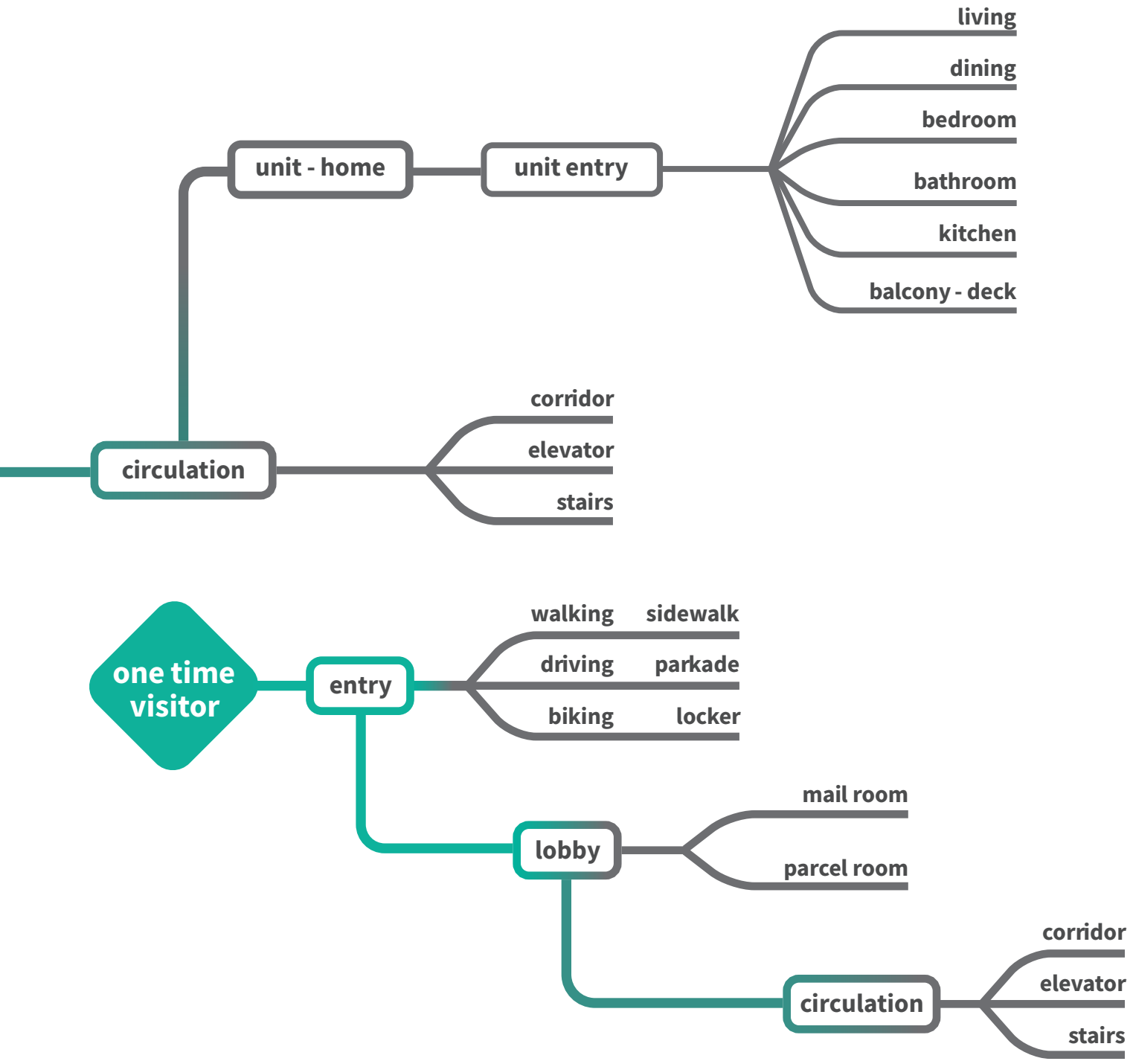
Arrival sequence and circulation for various user groups





staff category:

operators - support providers - health providers - facility maintenance staff



one-time visitor category:
guest visitor - food delivery - parcel delivery

2.4. Interconnectivity

In order to develop strategies and guidelines in a comprehensive manner, it is crucial to identify the factors that impact the built environment. Recognizing that many of these are interconnected and interdependent, a systems-thinking approach was adopted to develop a robust framework.

Four distinct criteria were used to reconcile the various factors to determine the applicability of the recommended intervention:

1. Time and Cost

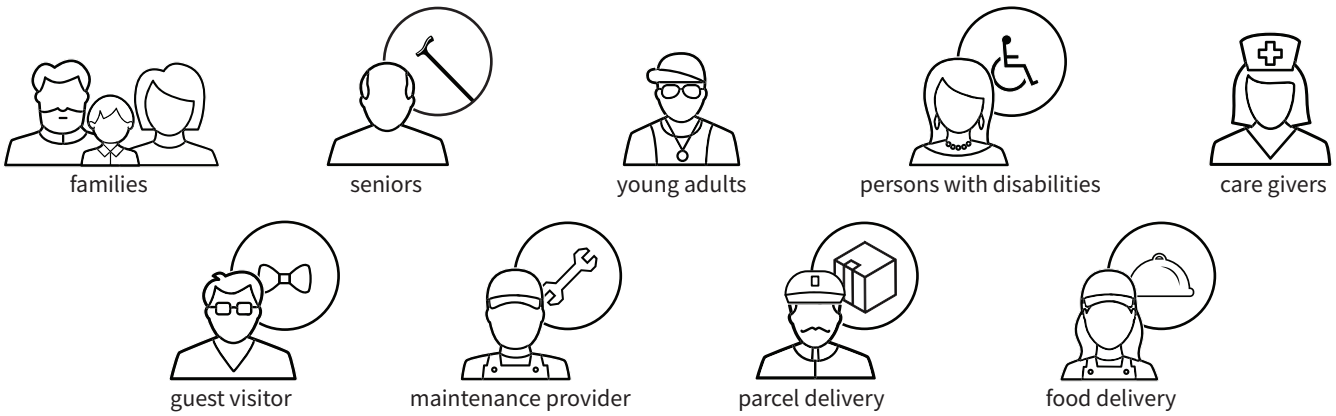
Time and Cost evaluates the temporal and financial efficiency of applied strategies

2. Project Status

Project Status explores the applicability of strategies on existing, current, and future projects.

3. User Profile

User Profile accounts for the spectrum of users interacting with the building from residents to single time visitors.



4. Scale

Scale examines the design strategy and/or user experience against different scales of building components.

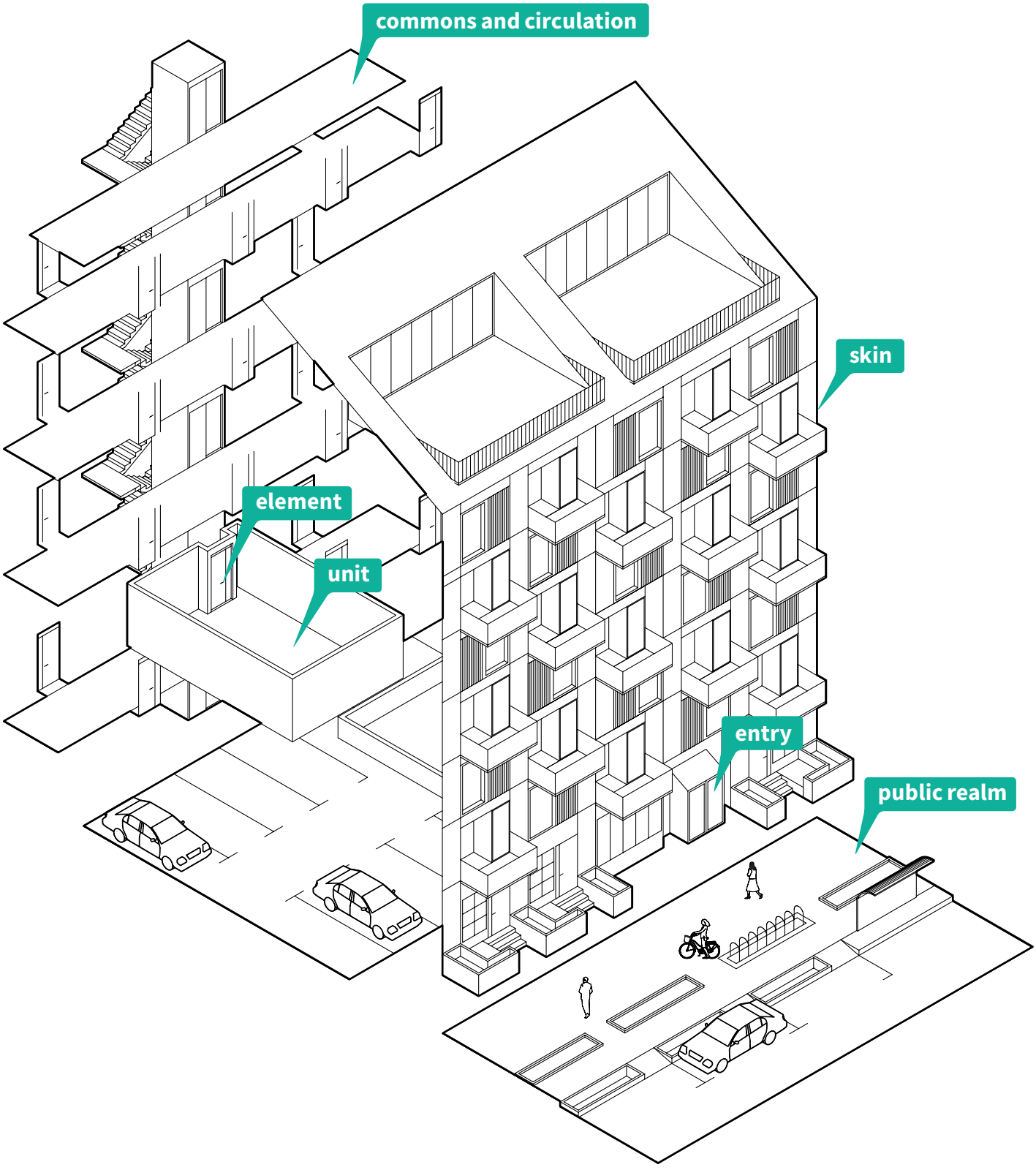


Figure 2-4. Building scales that inform design decisions

Consideration and Strategies

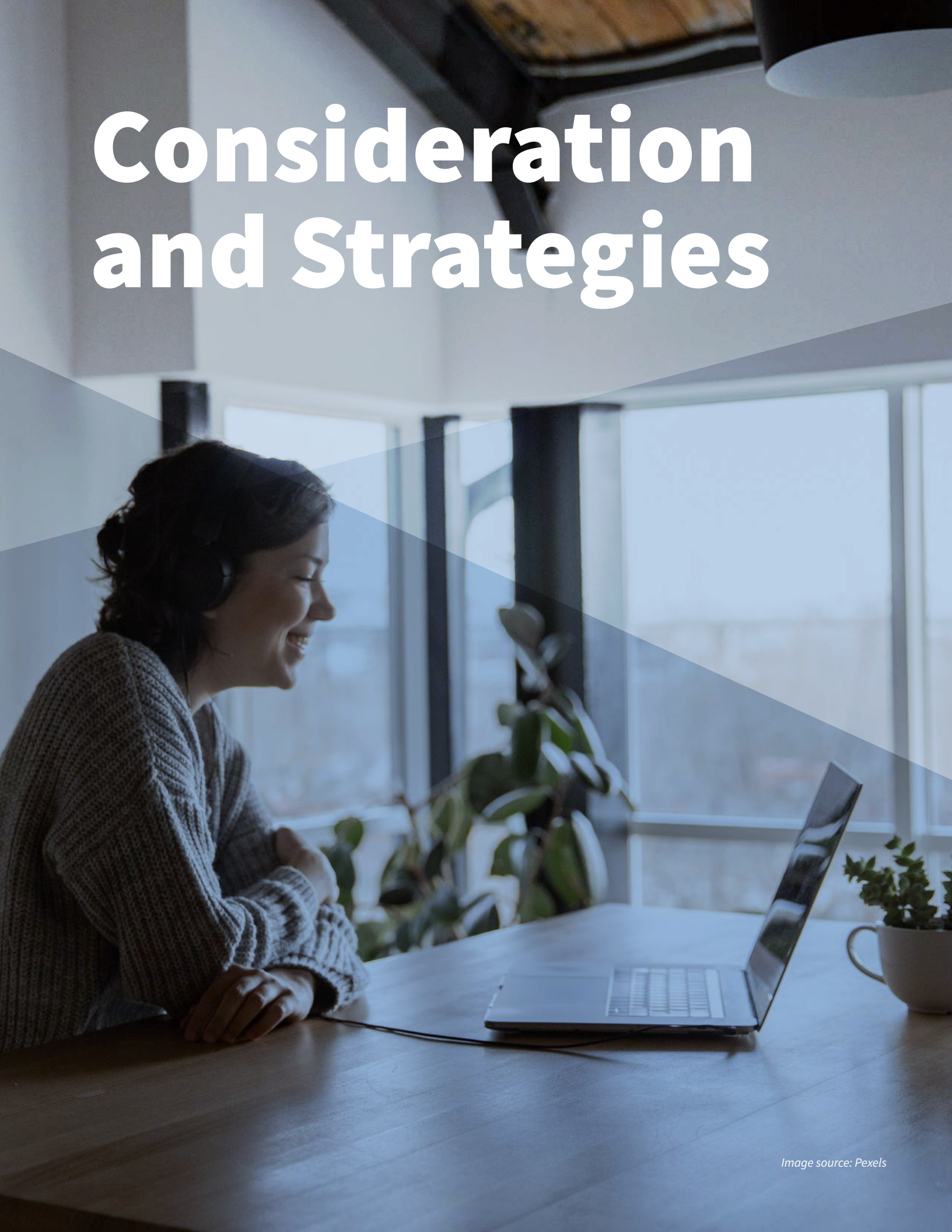


Image source: Pexels

3.1. Considerations

In order to maintain livability and the health of residents during the pandemic, as well as to minimize the social and environmental tensions following the new normal, it is important to reflect on areas of improvement and collective effort:

3.1.1. Strengthen the sense of community and alleviate the isolation following social distancing:

a. Re-evaluate internal configurations

Facilitate safe community interactions by reevaluating dimensions, space configurations, and typologies.

examples: external circulation, open corridors, amenities, activate rooftop spaces

reclaim rooftop

widen corridors

b. Promote wellbeing

Administer a healthy environment that supports physical and mental wellbeing.

examples: visually connect semi private spaces, balconies, and spaces for safe exercise

social balconies

exercise spaces

c. Invigorate communal spaces

Cultivate a sense of belonging and neighbourliness by providing communal spaces that require community upkeep and care.

examples: co-working spaces, outdoor worship spaces, outdoor dining tables, and amenities

communal spaces

co-working spaces

3.1.2. Improve connectivity between public realm and private spaces:

a. Advocate connectivity

Endorse public private connectedness while ensuring the security and privacy of homes.

examples: presence of balconies on the facade, and raised ground floor oriented units with stoops and decks

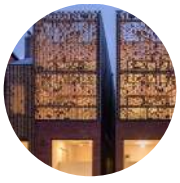
raised entries

present balconies

b. Foster access to natural elements

Enhance access to nature, sunlight, and natural ventilation as facilitators for health and well being.

examples: increased dimension of fenestration, incorporate natural landscaping and deck elements



natural ventilation

biophilia

c. Improve movement alternatives

Minimize crowding by creating alternative pathways connecting public realm to homes.

examples: multiple entry ways, support variety of modes accessing the site at different grades and points

various entries

multi modal access

3.1.3. Promote agile and resilient housing typologies to support the emerging needs of residents:

a. Re-evaluate housing models

Advocate for housing models that empower micro- cultures and small group support.

examples: housing clusters with ample social spaces for safe gatherings

social spaces

housing clusters

a. Re-introduce courtyard housing

Revisit successful models of courtyard housing that allow for cross ventilation and community spaces.

examples: community spaces in the heart of the house, semi private gathering spaces

courtyard typology

courtyard typology

3.1.4. Rethink thresholds/transitional spaces to develop a safe and desirable experience to and from homes:

a. Refine space integration

Enhance the integration of public, semi public, semi private, and private spaces.

examples: create a robust sequence for user's experience moving from one space to another

movement sequence

user experience

b. Promote health and safety

Increase the health and safety of residents by applying strategies that minimizes physical contact and allows for sanitation at entry points.

examples: intentional entry spaces, touchless doors, and hand washing stations at entry doors

easy fixes

mud rooms

c. Enhance visibility

Increase visibility at entry points to avoid accidental physical contact.

examples: use of glazing for lobbies and waiting areas

glazings and transparent materials

3.1.5. Enhance flexibility of homes to accommodate the changing needs of the residents:

a. Advocate flexibility

Allocate flexible spaces for activities such as working from home and homeschooling.

b. Holistic interior design

Encourage integrated design of interior spaces and furniture that allows for agility and adaptability of homes.

c. Support privacy

Maintain sufficient private space so as to address the need of all residents.

examples: moving walls and furnitures to adapt to use

flexible spaces

flexible interiors

examples: adequate use of built in furniture vs movable pieces, and modularity

open plan

modularity

examples: acoustic separation between spaces

transparent partitions

immaterial separators

3.1.6. Improve the design and placement of elements to minimizes the risk of transmission:

a. Support healthy materials

Encourage use of materials and textures that are easier to manage and sterilize.

examples: use of stainless steel and glazed materials for easy sanitation

material and texture

material and texture

b. Advance digital connections

Employ bulletin boards and accessible social media platforms to maintain the interaction of residents.

examples: bulletin boards, virtual gatherings, social media

community bulletin

social media

c. Reduce touch surface

Increase the use of touchless shared elements as well as provide sanitation stations for regular cleaning

examples: touchless door handles, touchless light switches

touchless elements

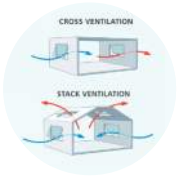
sanitation stations

3.1.7. Cleanse and improve indoor air quality to inhibit contaminated airborne particles:

a. Increase ventilation and air flow

Raise the indoor air quality by distributing fresh air in the ventilation system and flushing out the contaminated particles.

examples: use of natural ventilation systems, low draft HVAC systems



natural ventilation

building air flush

b. Temperature and humidity control

Control thermal and moisture quality of the indoor air to contain the spread of the infectious virus

examples: monitoring and validation data collection, automated thermostat

HVAC monitoring systems

automated thermostat

c. Filtration and disinfection

Utilize high performance air filters and disinfectants to reduce the risk of recirculating contaminated air

examples: high performance filters in HVAC canals

high performance HVAC filters

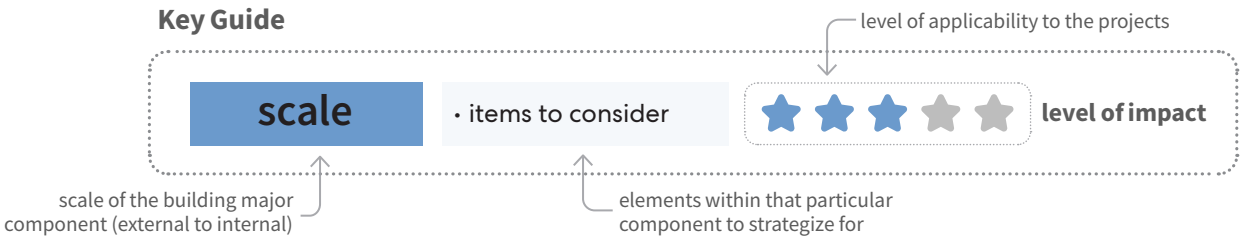
HVAC disinfectant

3.2. Big Ideas

This effort, comprised of literature review, workshops and studies led to the formulation of six concepts, that could structure housing strategies for post pandemic design guidelines. The strategies that are presented later in this chapter, exemplify one or several of these concepts.

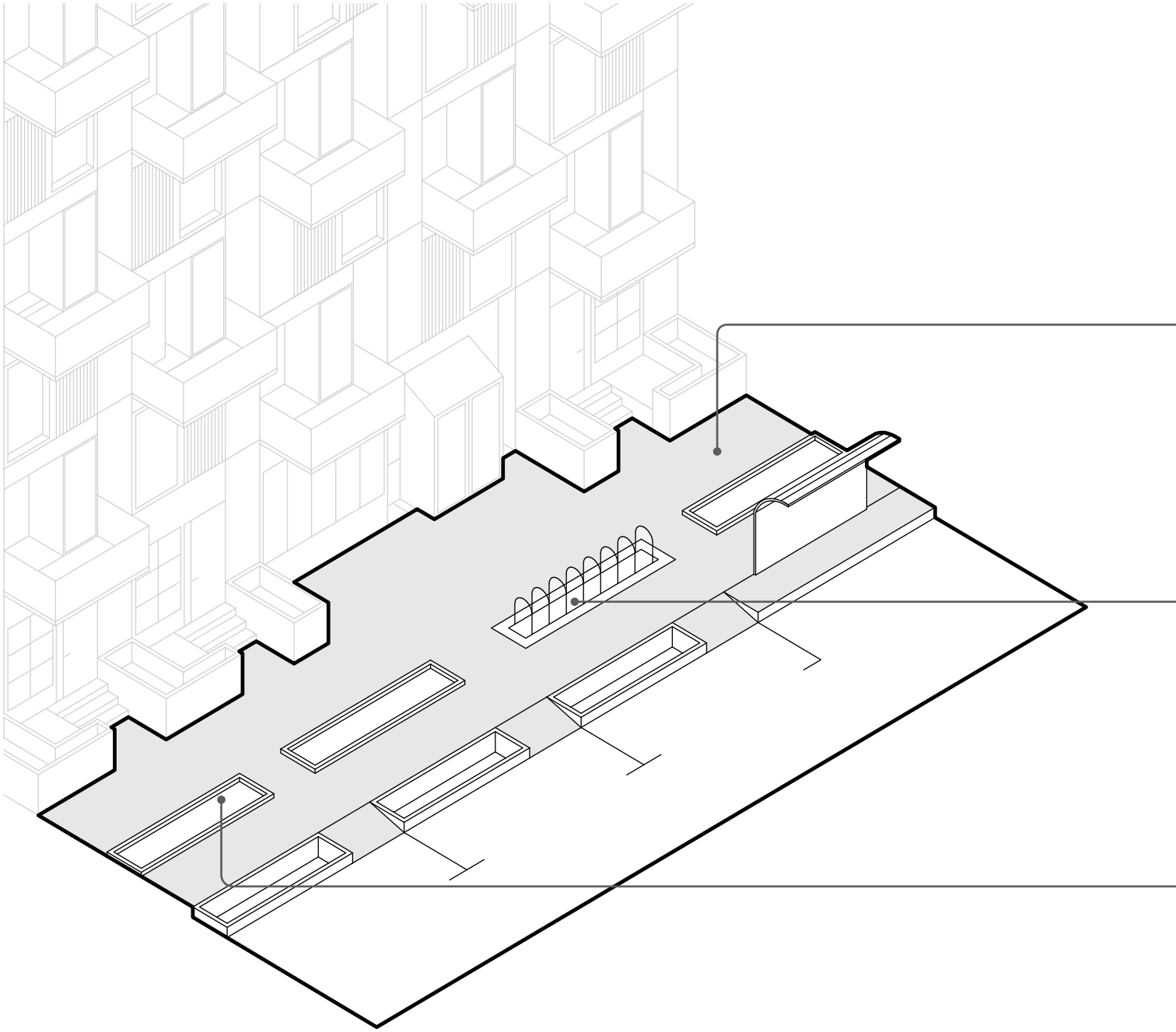
3.3. Strategies

To approach the strategies in a consistent manner, the big ideas are broken down into the following building scales and are compared against the type of project they are applicable to.

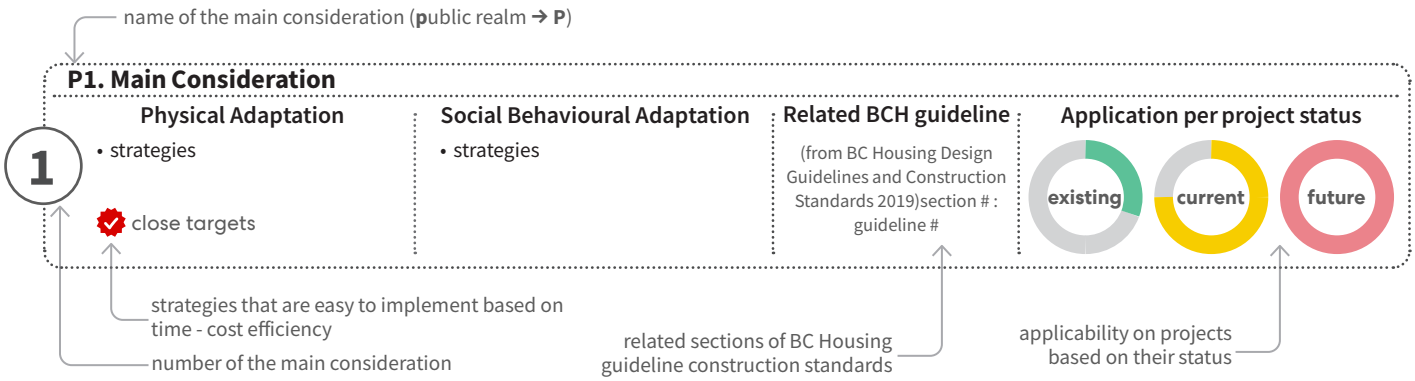


public realm	• side walk • green separators/planters • active transportation infrastructure • on street parking access • public transit station • materiality/texture	future current existing
skin	• balconies • fenestration • glazing • natural elements • exterior vertical/horizontal circulation	future current existing
entry	• street access entry • parking entry • active transportation entry • on-ground town-home entry • glazing • washing/sanitation stations	future current existing
commons	• lobbies and corridors • elevators and stairs • courtyard - front/back yards • mail/delivery rooms • laundry room • roof top • storage • pool/gym • smoking area • co-working spaces • outdoor dining/pavilion • play room/playground	future current existing
systems	• ventilation • water/sewer system • garbage/recycling disposal • irrigation	future current existing
unit	• unit layout • flexible/adaptable strategies • private spaces • care spaces • vestibule/genkan • furniture choice/placement	future current existing
element	• public elements • entry spaces' elements • texture and materiality • community/social technology	future current existing

3.4. Public Realm [P]



Key Guide



P1. Sidewalk

Physical Adaptation

1

- width / dimension
- foliage density
- sunlight exposure
- pausing / resting spots
- building entry pathways

Social Behavioural Adaptation

- movement direction / pattern
- physical distancing signage

Related BCH guideline

- S1: 10-2, 7-3
- S3: 2-3
- S4: D3

Application per project status

existing | current | future

P2. Active Transportation Station

Physical Adaptation

2

- dimension / no. of stalls
- safety and visibility
- accessibility
- room for physical distancing

Social Behavioural Adaptation

- proper locking etiquette
- litter prevention
- theft prevention

Related BCH guideline

- S1: 2-1, 4-3, 4-5,
- S3: 3-4, 3-20
- S5: 1-1

Application per project status

existing | current | future

P3. Foliage Separator

Physical Adaptation

3

- width / dimension
- location along and across sidewalk
- foliage type and density
- visual permeability
- soil bioretention

Social Behaviour Adaptation

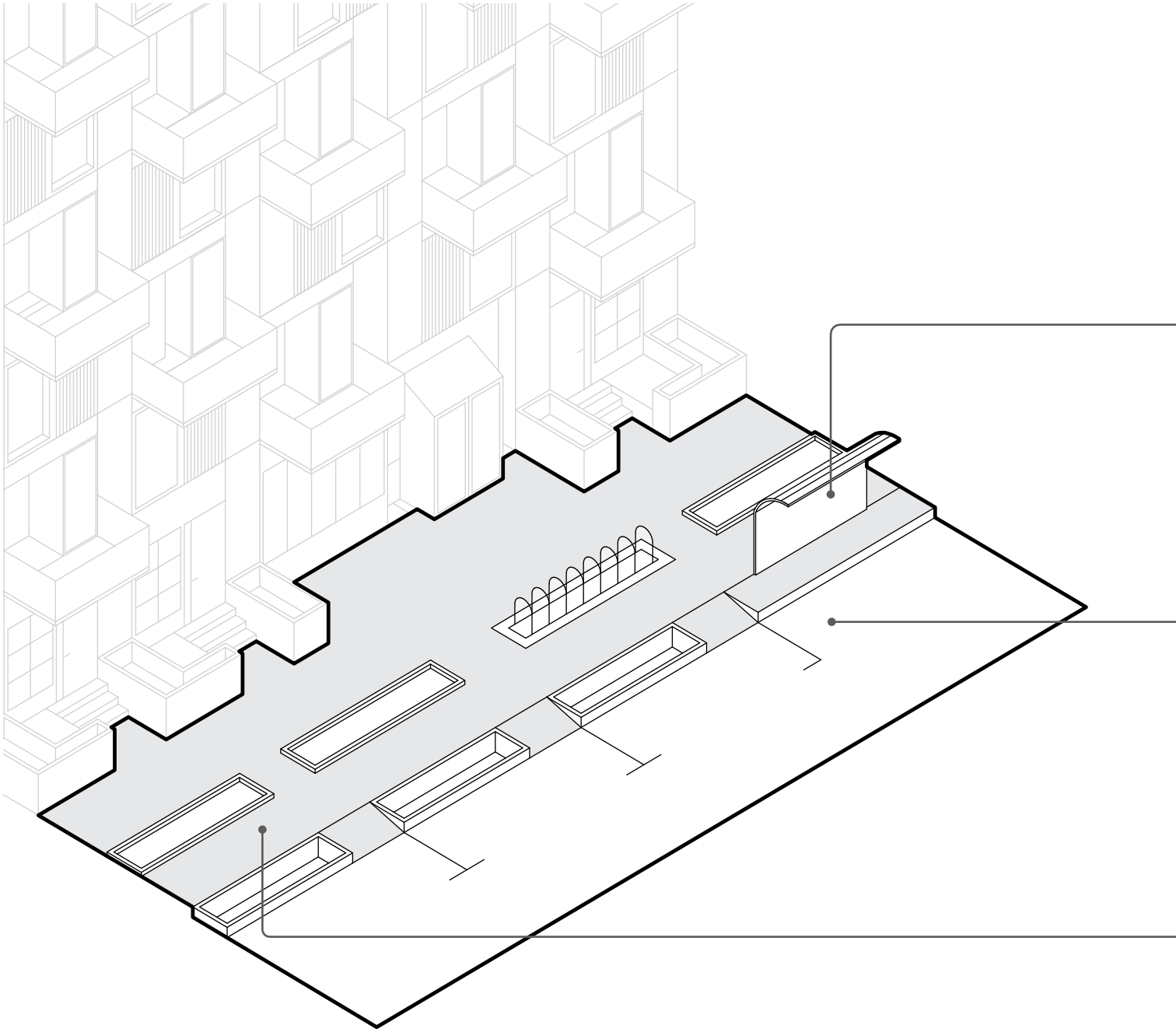
- signage placement on soil
- litter prevention

Related BCH guideline

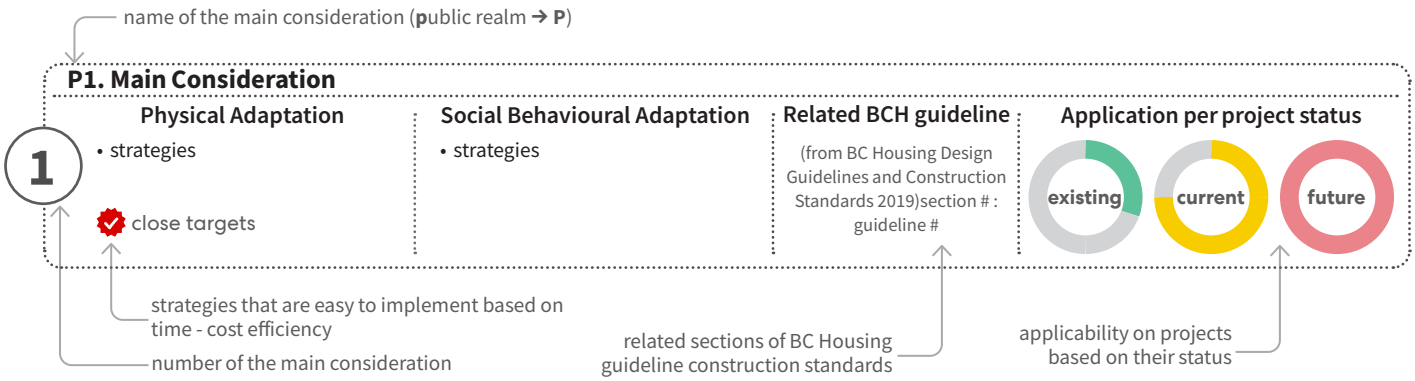
- S1: 2
- S2: 8

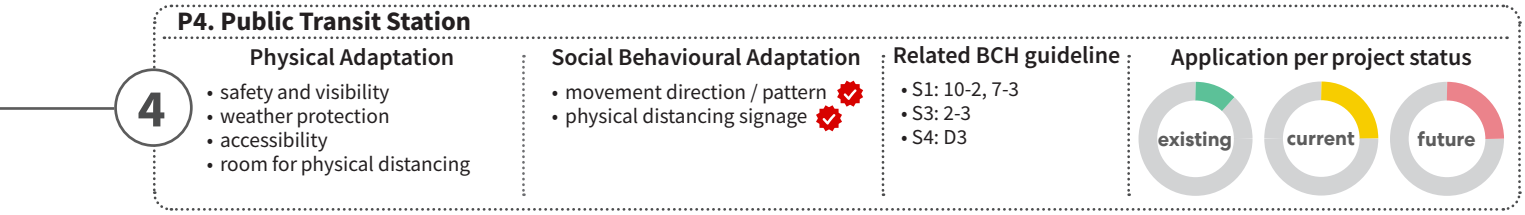
Application per project status

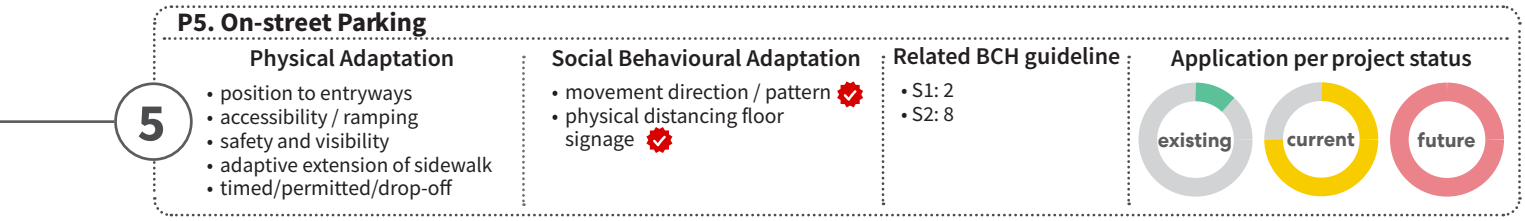
existing | current | future

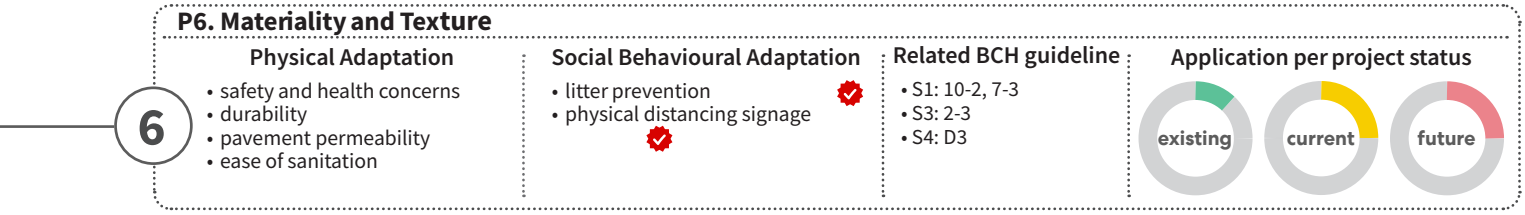


Key Guide

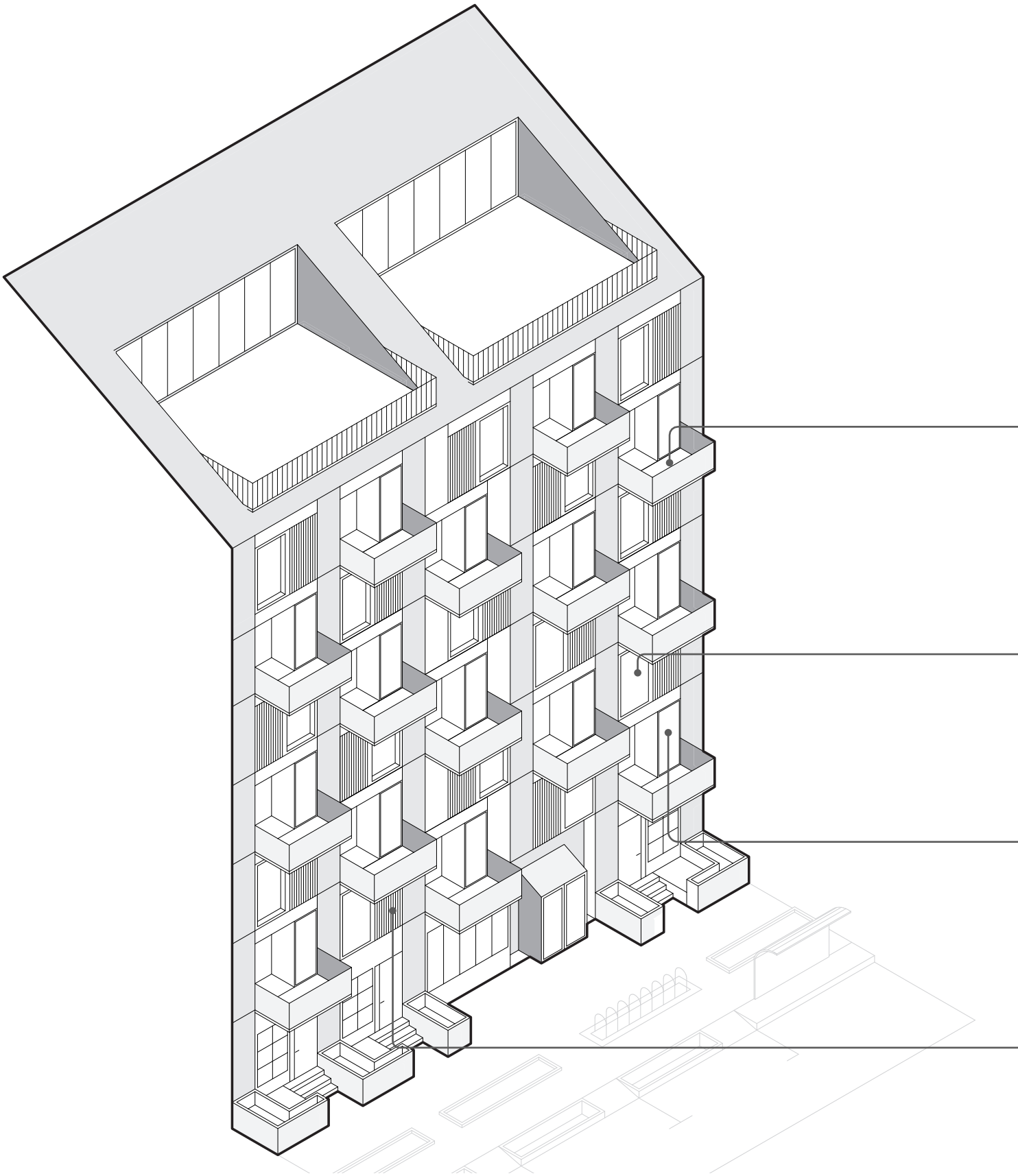

name of the main consideration (public realm → P)
P1. Main Consideration
Physical Adaptation
Social Behavioural Adaptation
Related BCH guideline
Application per project status
1
• strategies
• strategies
(from BC Housing Design Guidelines and Construction Standards 2019)section # : guideline #
existing
current
future
close targets
strategies that are easy to implement based on time - cost efficiency
number of the main consideration
related sections of BC Housing guideline construction standards
applicability on projects based on their status


P4. Public Transit Station
Physical Adaptation
Social Behavioural Adaptation
Related BCH guideline
Application per project status
4
• safety and visibility
• weather protection
• accessibility
• room for physical distancing
• movement direction / pattern
• physical distancing signage
• S1: 10-2, 7-3
• S3: 2-3
• S4: D3
existing
current
future

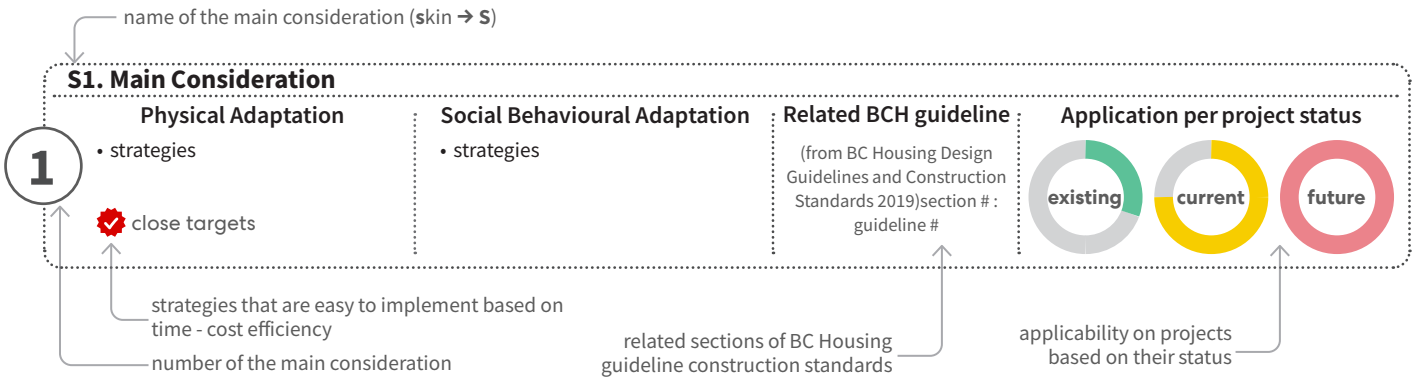

P5. On-street Parking
Physical Adaptation
Social Behavioural Adaptation
Related BCH guideline
Application per project status
5
• position to entryways
• accessibility / ramping
• safety and visibility
• adaptive extension of sidewalk
• timed/permitted/drop-off
• movement direction / pattern
• physical distancing floor signage
• S1: 2
• S2: 8
existing
current
future


P6. Materiality and Texture
Physical Adaptation
Social Behavioural Adaptation
Related BCH guideline
Application per project status
6
• safety and health concerns
• durability
• pavement permeability
• ease of sanitation
• litter prevention
• physical distancing signage
• S1: 10-2, 7-3
• S3: 2-3
• S4: D3
existing
current
future

3.5. Skin [S]



Key Guide



S1. Balcony

Physical Adaptation	Social Behavioural Adaptation	Related BCH guideline	Application per project status
• width / dimension • enclosed deck / flex spaces • distribution among all units • orientation • placement / relationship to other balconies • presence of natural elements • private / shared deck	• community presence • litter prevention • social integration	• S1: 3-2, 7-3 • S2: 3-2 • S4: D7	existing / current / future

S2. Glazing

Physical Adaptation	Social Behavioural Adaptation	Related BCH guideline	Application per project status
• size / dimension • thermal/acoustic insulation • operable openings • glare	• community presence • social integration	• S1: 4-2, 4-3, 4,4, 7-3, 9-1 • S2: 3-2, 4-6 • S3: 3-2, • S4: D1, D8, D23	existing / current / future

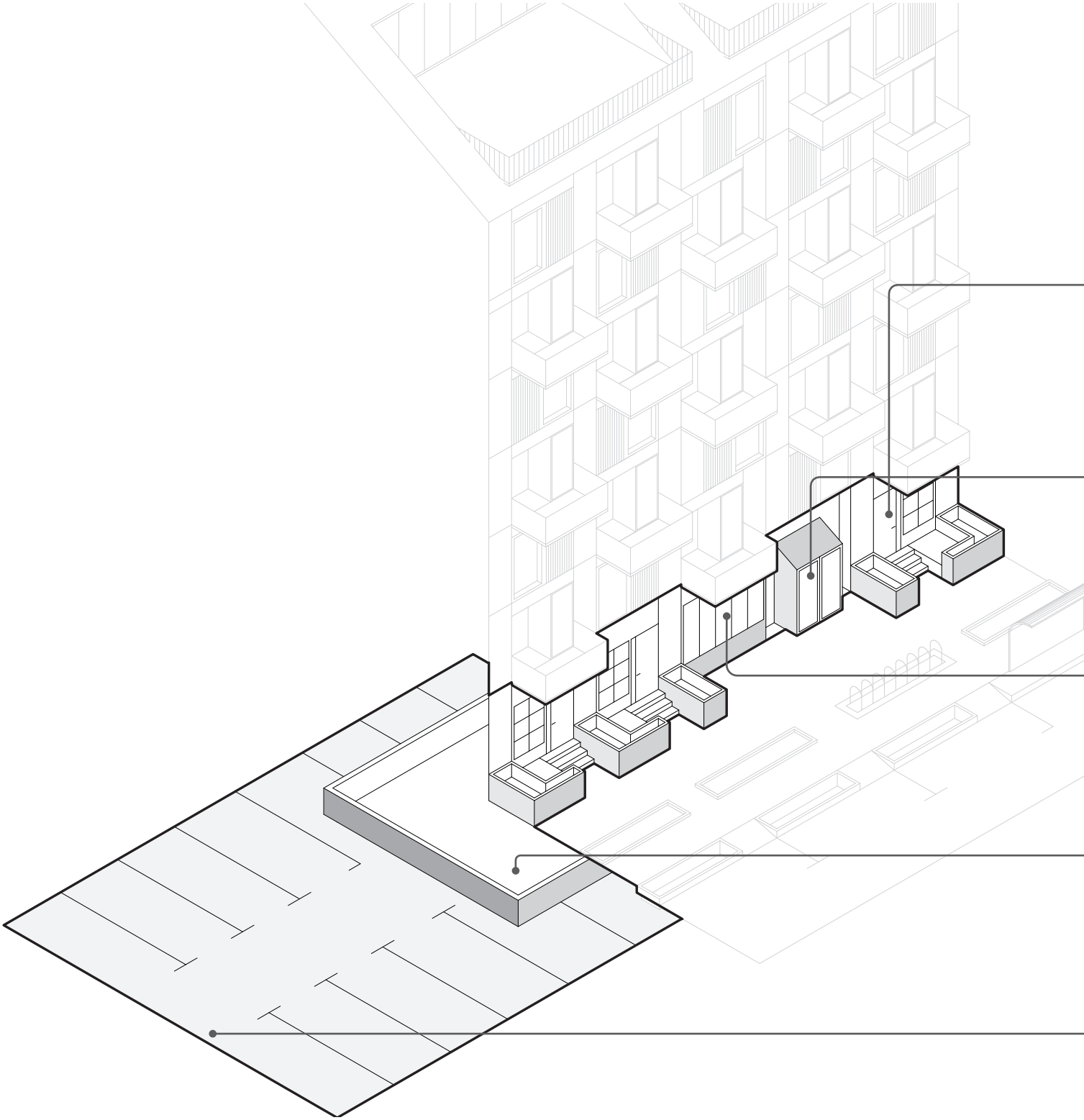
S3. Fenestration

Physical Adaptation	Social Behavioural Adaptation	Related BCH guideline	Application per project status
• size / dimension • placement / relationship to other openings • orientation / views out • sunlight penetration • natural ventilation	• social interaction	• S1: 3-1, 4-2, 5-2, 7-4, 8-2, 9-1 • S3: 2-2, 3, • S4: D1, D6, D7, D8, D26	existing / current / future

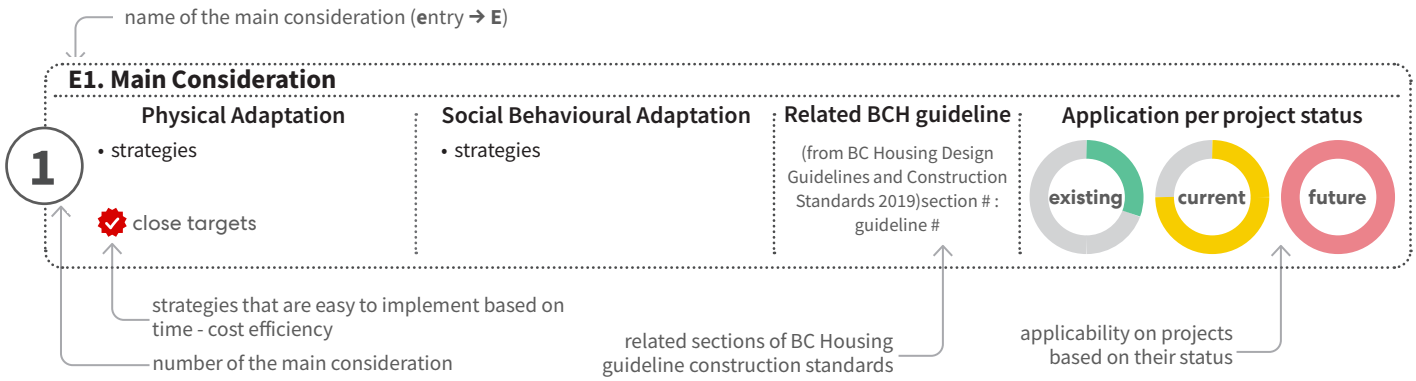
S4. Natural Elements

Physical Adaptation	Social Behavioural Adaptation	Related BCH guideline	Application per project status
• size / dimension • placement / relationship to other natural elements • integrated vs add-in • flora species and type • maintenance	• maintenance habits • sustainability awareness / community training	• S1: 3 • S2: 1, 2, 3, 4-1, 4-6, 7, 8-2 • S4: D32	existing / current / future

3.6. Entry [E]



Key Guide



E1. At Grade Townhome Entry

Physical Adaptation
1
- distance from / buffer with sidewalk
- elevation from grade
- accessibility
- safety and visibility

Social Behavioural Adaptation
- litter prevention ✓

Related BCH guideline
- S1: 3-1, 4-2, 5-2, 7-4, 8-2, 9-1
- S3: 2-2, 3,
- S4: D1, D6, D7, D8, D26

Application per project status
existing | current | future

E2. Street Access Entry

Physical Adaptation
2
- multiple and separate entry points
- wayfinding
- safety and visibility
- accessibility
- ease of sanitation
- no-touch entry elements ✓

Social Behavioural Adaptation
- physical distancing signage ✓
- movement direction / yield to people exiting ✓
- minimum surface touch / contact

Related BCH guideline
- S1: 3-1, 4-2, 5-2, 7-4, 8-2, 9-1
- S3: 2-2, 3,
- S4: D1, D6, D7, D8, D26

Application per project status
existing | current | future

E3. Glazing

Physical Adaptation
3
- width / dimension
- safety and visibility
- minimum accidental encounter
- thermal and acoustic insulation
- glare

Social Behavioural Adaptation
- minimum surface touch / contact
- visual visibility for movement / yield to people exiting ✓

Related BCH guideline
- S1: 4-2, 4-3, 4,4, 7-3, 9-1
- S2: 3-2, 4-6
- S3: 3-2,
- S4: D1, D8, D23

Application per project status
existing | current | future

E4. Wash/Sanitation Station

Physical Adaptation
4
- maintenance
- ease of sanitation
- accessibility and abundance ✓
- pet washing / safety shoes cleaning station

Social Behavioural Adaptation
- physical distancing signage ✓
- maintenance etiquette ✓

Related BCH guideline
- S1: 3
- S2: 1, 2, 3, 4-1, 4-6, 7, 8-2
- S4: D32

Application per project status
existing | current | future

E5. Parking Entry

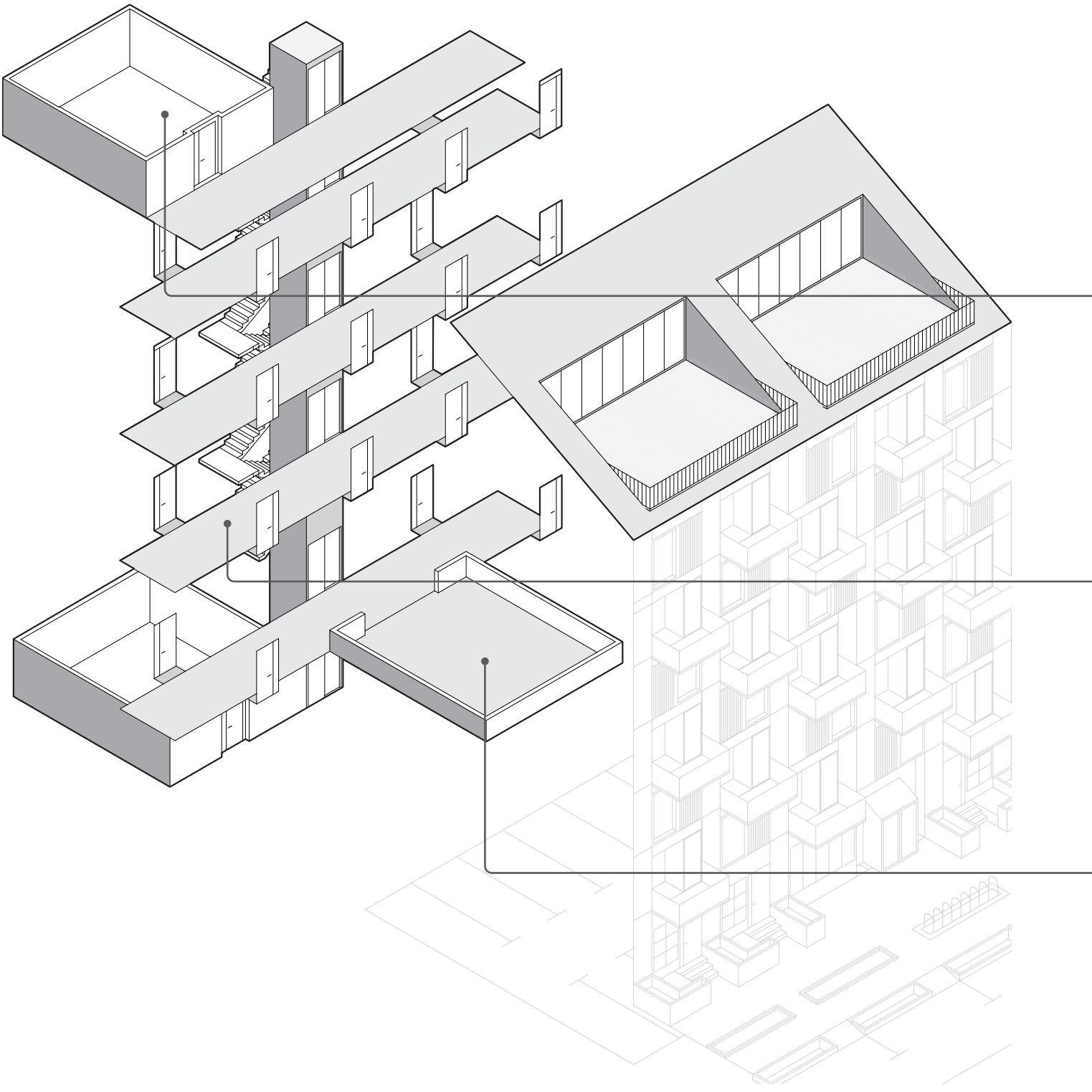
Physical Adaptation
5
- wayfinding
- safety and visibility ✓
- accessibility
- ease of sanitation
- minimum physical contact
- no-touch entry elements

Social Behavioural Adaptation
- physical distancing signage ✓
- movement direction / yield to people exiting ✓
- minimum surface touch / contact

Related BCH guideline
- S1: 3-1, 4-2, 5-2, 7-4, 8-2, 9-1
- S3: 2-2, 3,
- S4: D1, D6, D7, D8, D26

Application per project status
existing | current | future

3.7. Commons and Circulation [C]



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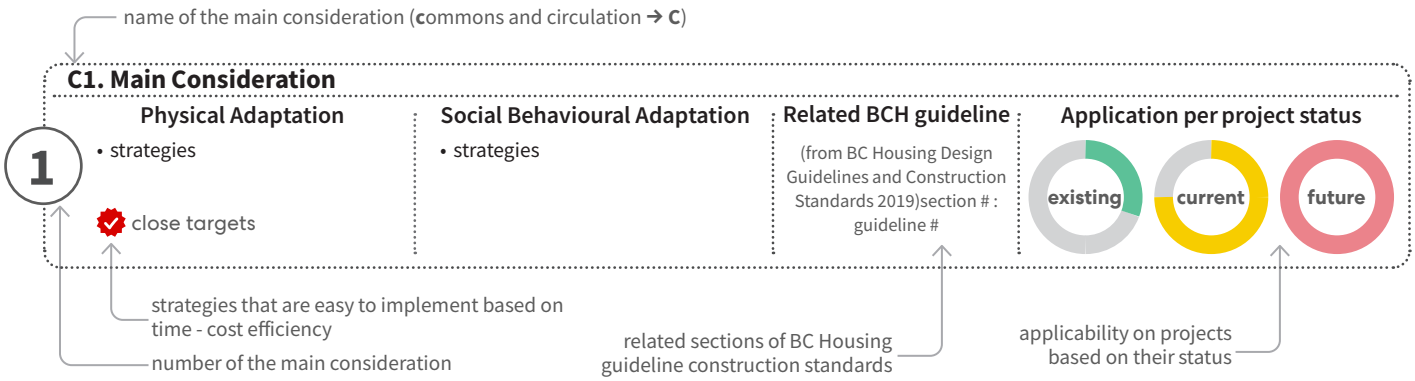


C1. Amenities

1

Physical Adaptation	Social Behavioural Adaptation	Related BCH guideline	Application per project status
• extra width / dimension for safe social interaction • no-touch infrared switches • sunlight penetration • natural ventilation	• acoustic comfort considerations • physical distancing signage ✓ • litter prevention ✓ • safe social encounter	• S1: 3-1, 3-2, 4-1, 4-2, 4-5, 7-3, 9-2, 9-3, 10-2, 10-4 • S2: 2, 4-5, • S4: D6, D8, D9, D13, D23, D27	existing / current / future

C2. Corridor

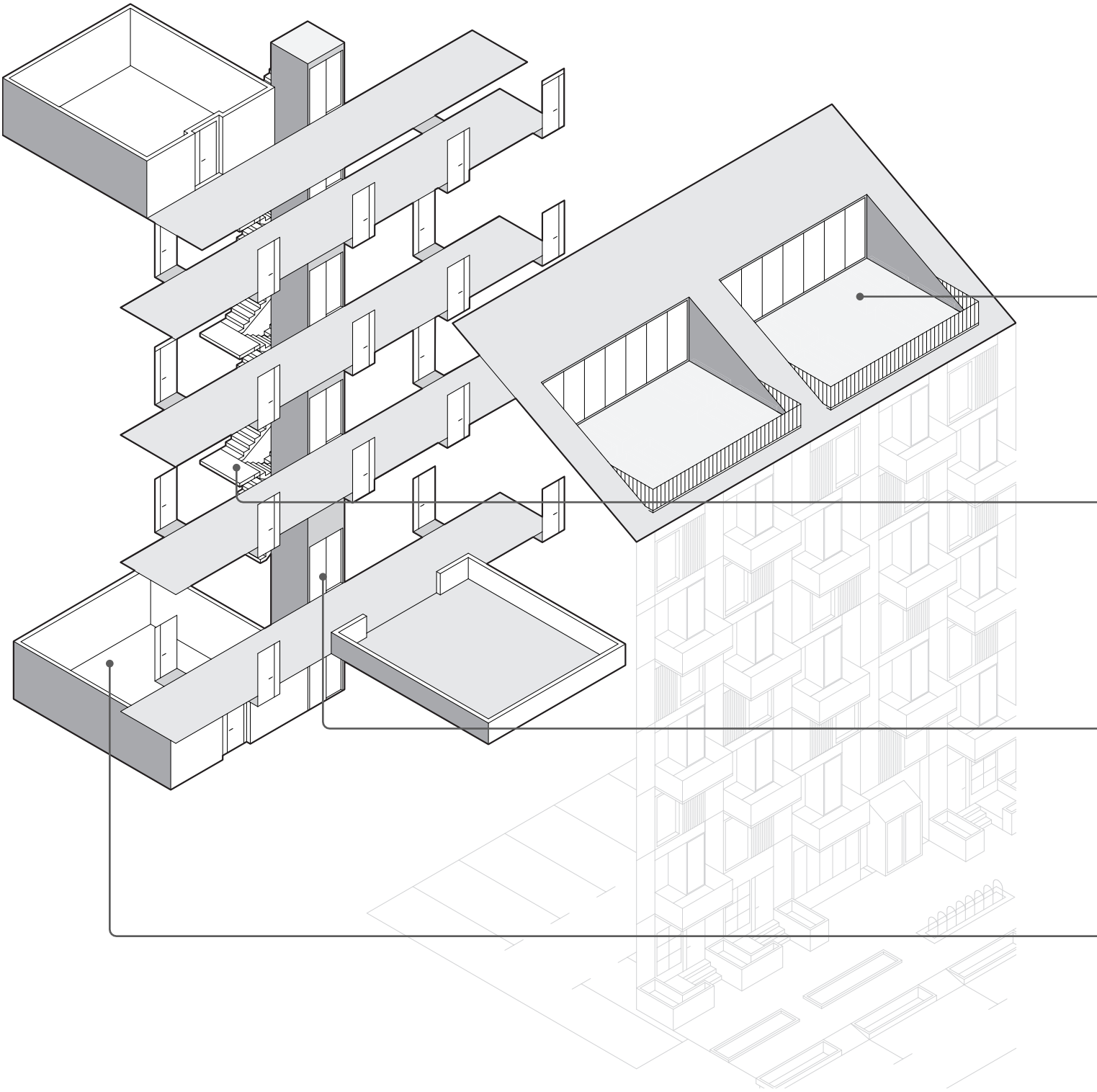
2

Physical Adaptation	Social Behavioural Adaptation	Related BCH guideline	Application per project status
• extra width / dimension for safe social interaction • number of homes connected via one corridor • sufficient circulation space • exposed corridors / natural ventilation and daylight • visibility and wayfinding • no-touch infrared switches • thermal/acoustic insulation	• acoustic comfort considerations • physical distancing signage ✓ • litter prevention ✓ • safe social encounter ✓	• S1: 3-2, 4-3, 4,4, 7-3, 7-2,7-3, 8-3, 9-2, 9-4 • S2: 3-2 • S3: 3-20 • S4: D8, D9, D19, D23	existing / current / future

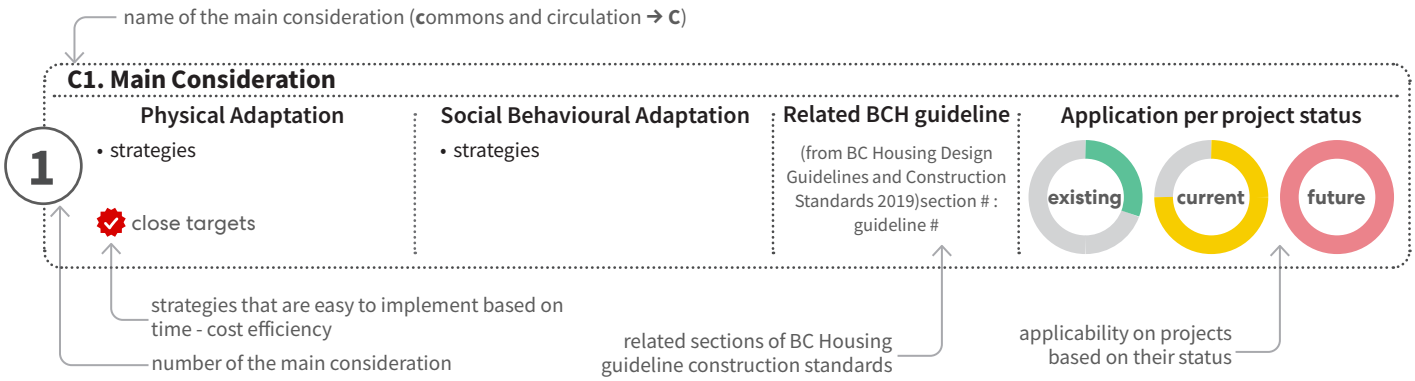
C3. Lobby

3

Physical Adaptation	Social Behavioural Adaptation	Related BCH guideline	Application per project status
• extra width / dimension for safe social encounter • materiality and texture • no-touch infrared switches • ease of sanitation • sunlight penetration • natural ventilation	• physical distancing signage ✓ • litter prevention ✓ • safe social encounter • sanitation routine ✓	• S1: 3-2, 4-2, 4-3, 4-4, 4-5, 7-3, 9-2 • S3: 2-4 • S4: D1, D6, D9, D14, D26	existing / current / future



Key Guide



C4. Rooftop

Physical Adaptation
- size / dimension
- safety and visibility
- biophilia / habitat restoration / food growth
- social programming for safe interactions

Social Behavioural Adaptation
- physical distancing signage
- litter prevention
- safe social encounter
- sanitation routine

Related BCH guideline
- S1: 3-1, 3-2, 4-2, 5, 6, 8
- S2: 2, 4-5,
- S4: D8, D9, D10, D23, D26

Application per project status

4 | existing | current | future

C5. Staircase

Physical Adaptation
- width / dimension
- exposed staircase / natural ventilation and daylight
- no-touch infrared switches
- materiality and texture
- additional programming for staircases

Social Behavioural Adaptation
- minimum surface touch / contact
- acoustic comfort considerations
- physical distancing signage
- litter prevention
- safe social encounter
- sanitation routine

Related BCH guideline
- S1: 3-2, 4-3, 4,4, 4-5, 7-2, 7-3, 7-4, 7-5, 9-3, 10-4
- S3: 3-14, 3-19
- S4: D6, D8, D9, D10, D26, D27

Application per project status

5 | existing | current | future

C6. Elevator

Physical Adaptation
- materiality and texture
- no-touch infrared switches
- ease of sanitation

Social Behavioural Adaptation
- physical distancing floor signage
- minimum surface touch / contact
- multiple sanitation routine
- maximum capacity signage
- wear mask culture

Related BCH guideline
- S1: 3-1, 3-2, 4-2, 5, 6, 8
- S2: 2, 4-5,
- S4: D8, D9, D10, D23, D26

Application per project status

6 | existing | current | future

C7. Laundry Room - Garbage and Recycling Rooms

Physical Adaptation
- washing station / sink
- materiality and texture
- no-touch infrared switches
- ease of sanitation
- proper ventilation

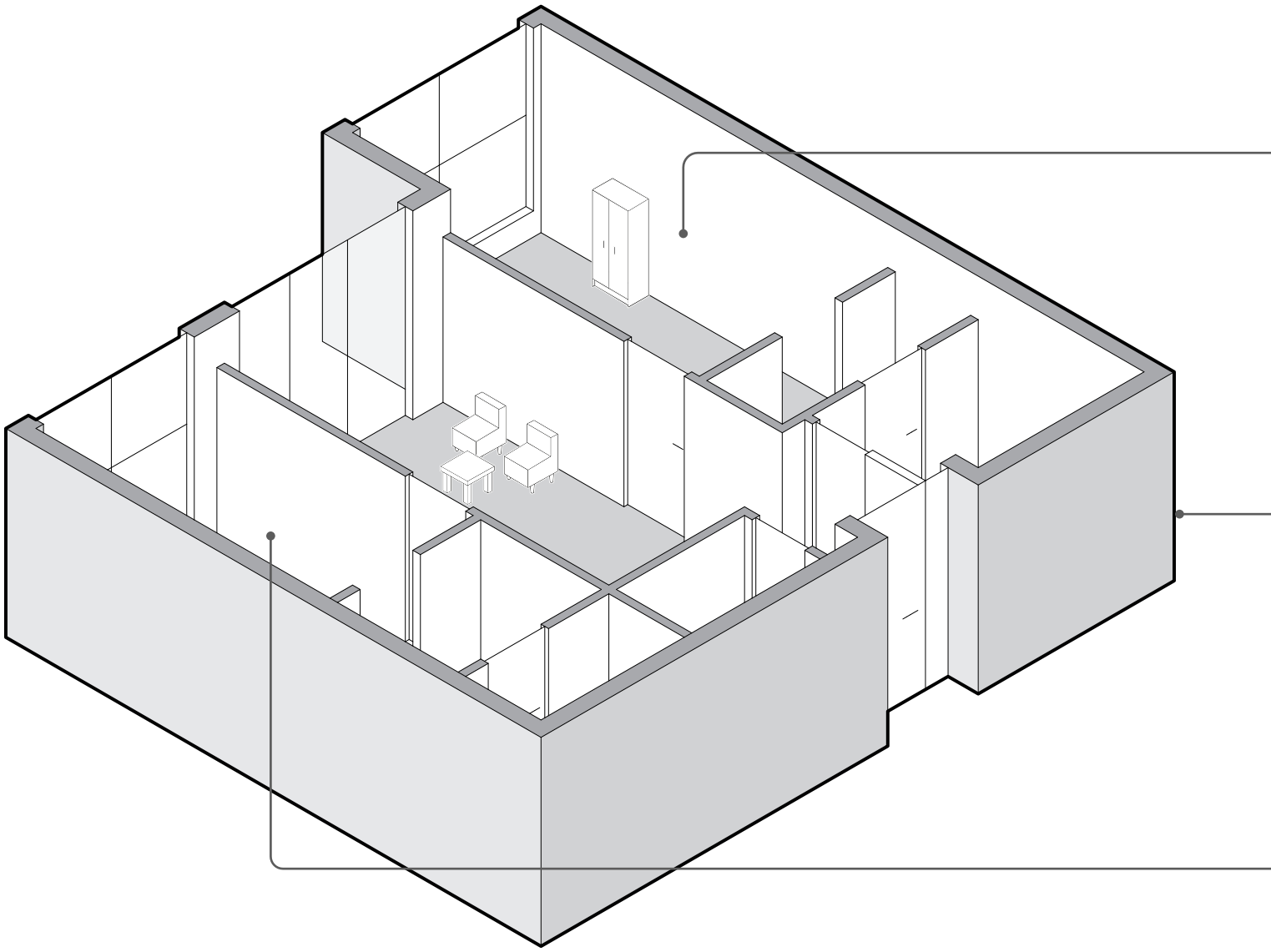
Social Behavioural Adaptation
- physical distancing signage
- litter prevention
- safe social encounter
- sanitation routine

Related BCH guideline
- S1: 3-2, 4-2, 4-5, 7-2, 7-3, 9-2
- S3: 3-4, 3-19
- S4: D8, D9, D11, D22, D27

Application per project status

7 | existing | current | future

3.8. Unit [U]



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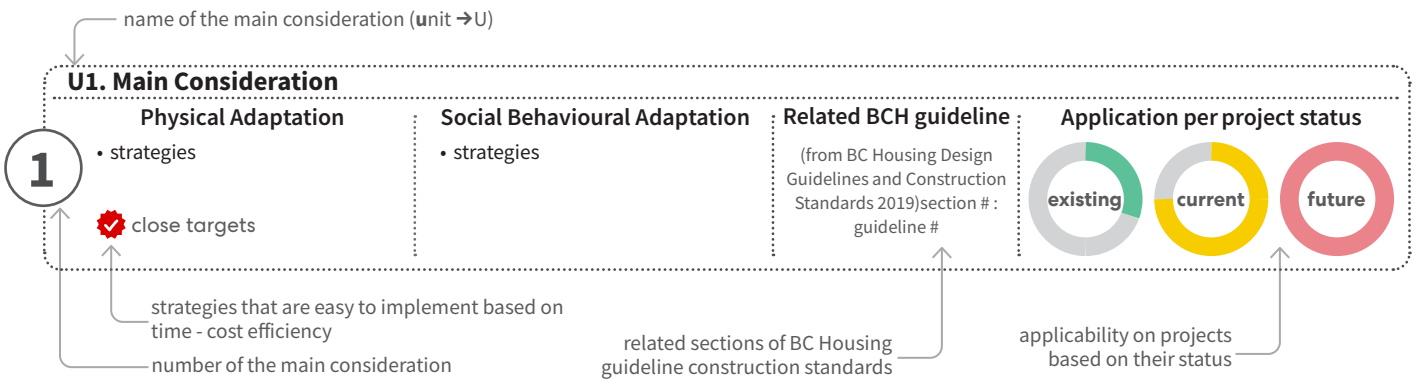


U1. Private Spaces

1

Physical Adaptation
- size / dimension
- acoustic / visual isolation
- sunlight penetration
- thermal comfort
- access to service spaces (kitchen)

Social Behavioural Adaptation
- acoustic comfort considerations

Related BCH guideline
- S1: 3-1, 3-2, 4-2, 5, 6, 8
- S2: 2, 4-5,
- S4: D8, D9, D10, D23, D26

Application per project status

existing | current | future

U2. Unit Layout

2

Physical Adaptation
- size / dimension
- legibility and efficiency of plan and circulation
- flex spaces - transition between day and night
- sunlight penetration
- natural ventilation
- thermal / acoustic comfort
- additional use for circulation spaces
- access to deck / balcony

Social Behavioural Adaptation
- acoustic comfort considerations
- work from home etiquette
- home schooling etiquette

Related BCH guideline
- S1: 4-2, 4-3, 4,4, 7-3, 9-1
- S2: 3-2, 4-6
- S3: 3-2,
- S4: D1, D8, D23

Application per project status

existing | current | future

U3. Care Spaces

3

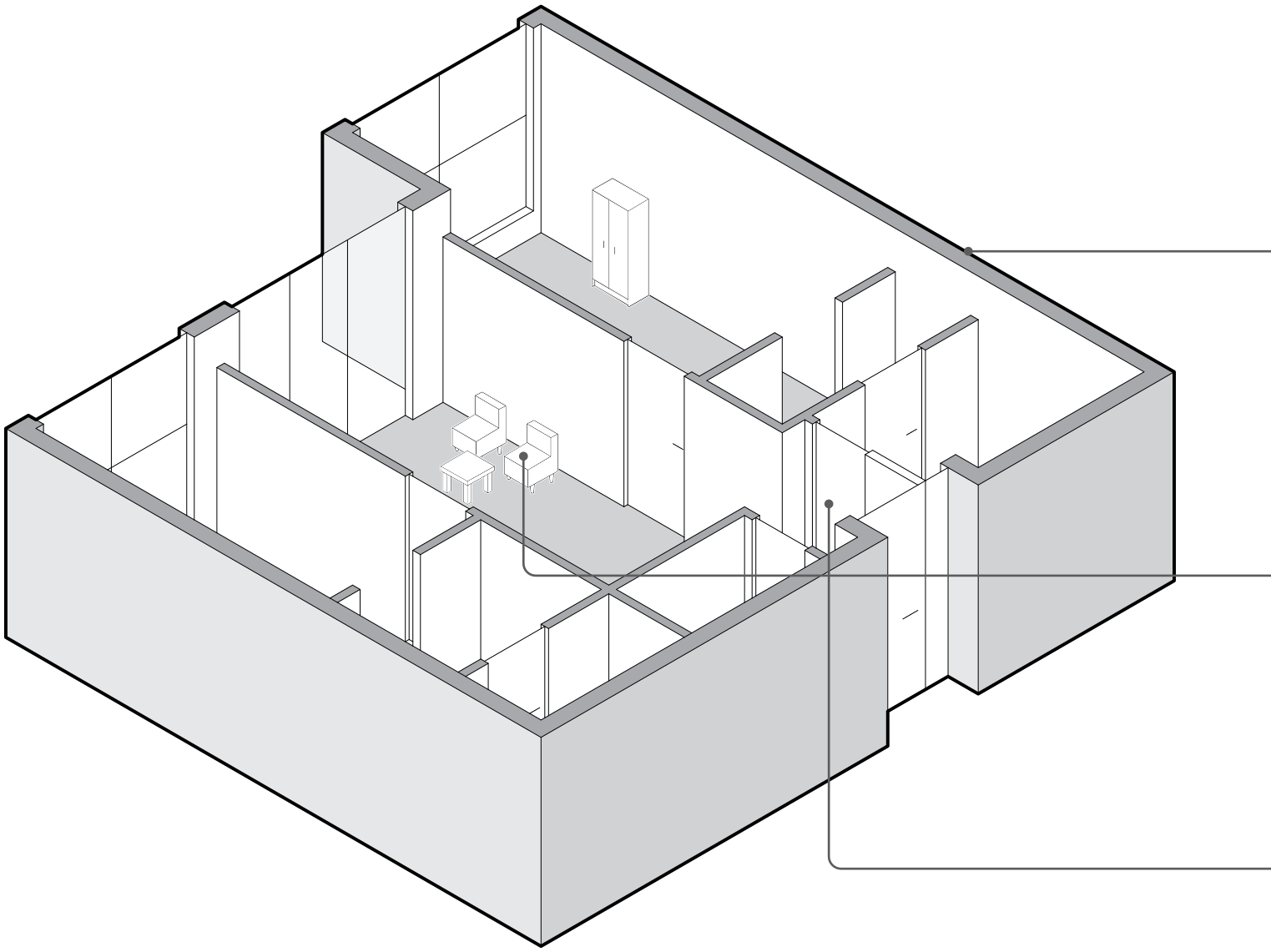
Physical Adaptation
- size / dimension
- access to service spaces (kitchen - bathroom)
- natural ventilation
- sunlight penetration
- materiality and texture

Social Behavioural Adaptation
- sanitation routine
- acoustic comfort considerations

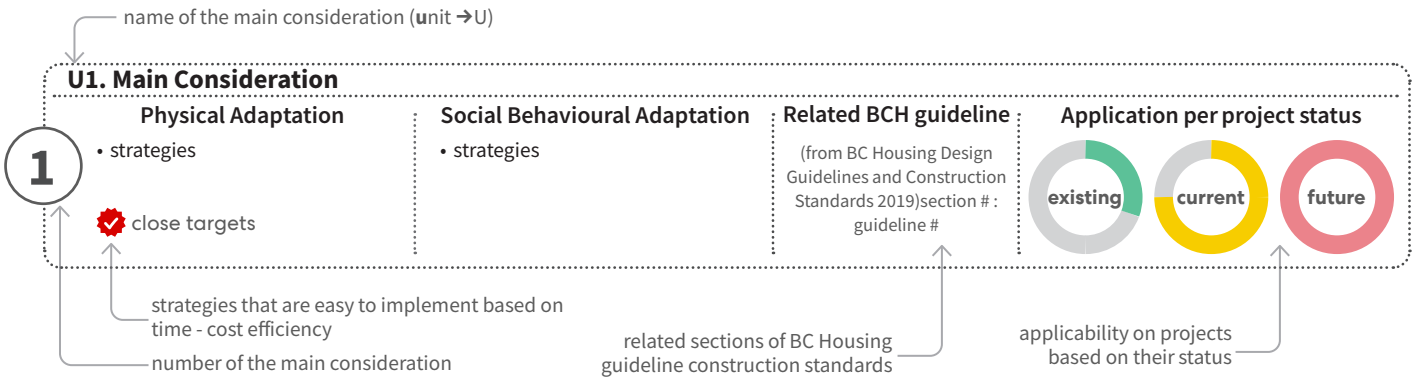
Related BCH guideline
- S1: 3-1, 3-2, 4-2, 5, 6, 8
- S2: 2, 4-5,
- S4: D8, D9, D10, D23, D26

Application per project status

existing | current | future



Key Guide



U4. Flexibility and Adaptability

Physical Adaptation

4

- integrated and added interior elements
- structural modularity
- materiality and texture
- portable walls - half walls
- open plan concepts
- rethink bathroom space efficiency

Social Behavioural Adaptation

- flexible living space utilization

Related BCH guideline

- S1: 3-1, 3-2, 4-2, 5, 6, 8
- S2: 2, 4-5,
- S4: D8, D9, D10, D23, D26

Application per project status

existing | current | future

U5. Furniture Choice and Placement

Physical Adaptation

5

- comfort
- materiality / texture
- interior space dividers
- safety
- durability

Social Behavioural Adaptation

- sanitation routine
- sustainable materials

Related BCH guideline

- S1: 3-1, 3-2, 4-2, 5, 6, 8
- S2: 2, 4-5,
- S4: D8, D9, D10, D23, D26

Application per project status

existing | current | future

U6. Mudroom and Ganken

Physical Adaptation

6

- size / dimension
- storage space
- washing / sanitation space
- materiality and texture
- space adjacencies

Social Behavioural Adaptation

- minimum surface touch / contact
- sanitation and decontamination routine upon arrival

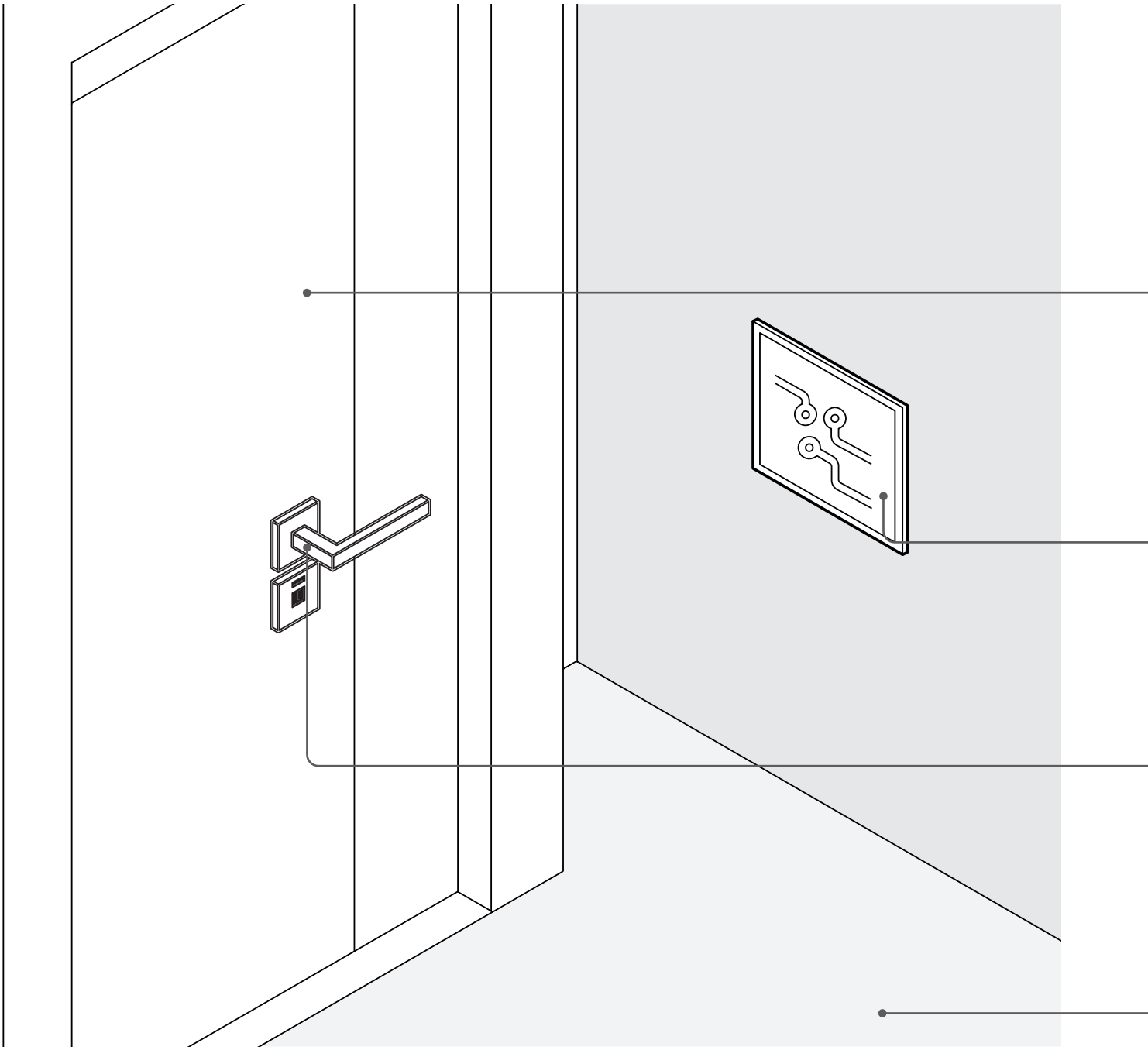
Related BCH guideline

- S1: 3-1, 3-2, 4-2, 5, 6, 8
- S2: 2, 4-5,
- S4: D8, D9, D10, D23, D26

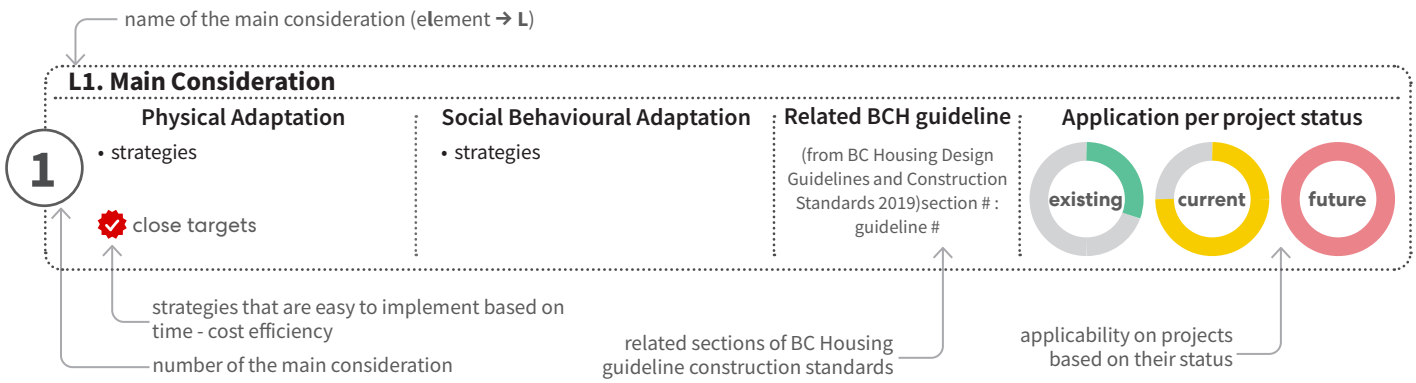
Application per project status

existing | current | future

3.9. Element [L]



Key Guide



L1. Publicly Used Elements

Physical Adaptation
- size / dimension
- location and placement
- materiality and texture
- no-touch infrared switches
- ease of sanitation after multiple uses
- durability

Social Behavioural Adaptation
- minimum surface contact
- sanitation routine

Related BCH guideline
- S1: 3-2, 7-3
- S2: 3-2
- S4: D7

Application per project status

L2. Community and Social Technology

Physical Adaptation
- size / dimension
- location and placement
- accessibility for all
- ease of sanitation after multiple use
- high tech alternatives and fixture

Social Behavioural Adaptation
- minimum surface contact
- virtual social integration

Related BCH guideline
- S1: 3-2, 7-3
- S2: 3-2
- S4: D7

Application per project status

L3. Entryways Elements

Physical Adaptation
- size / dimension
- materiality and texture
- ease of sanitation after multiple use
- accessibility for all user groups
- contactless alternatives

Social Behavioural Adaptation
- minimum surface contact
- sanitation routine

Related BCH guideline
- S1: 3-2, 7-3
- S2: 3-2
- S4: D7

Application per project status

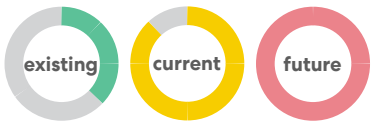
L4. Texture and Materiality

Physical Adaptation
- sustainability of materials
- thermal and acoustic comfort
- ease of sanitation
- durability
- anti microbial carpets and fibers
- non hazardous materials
- seamless / non-porous surfaces

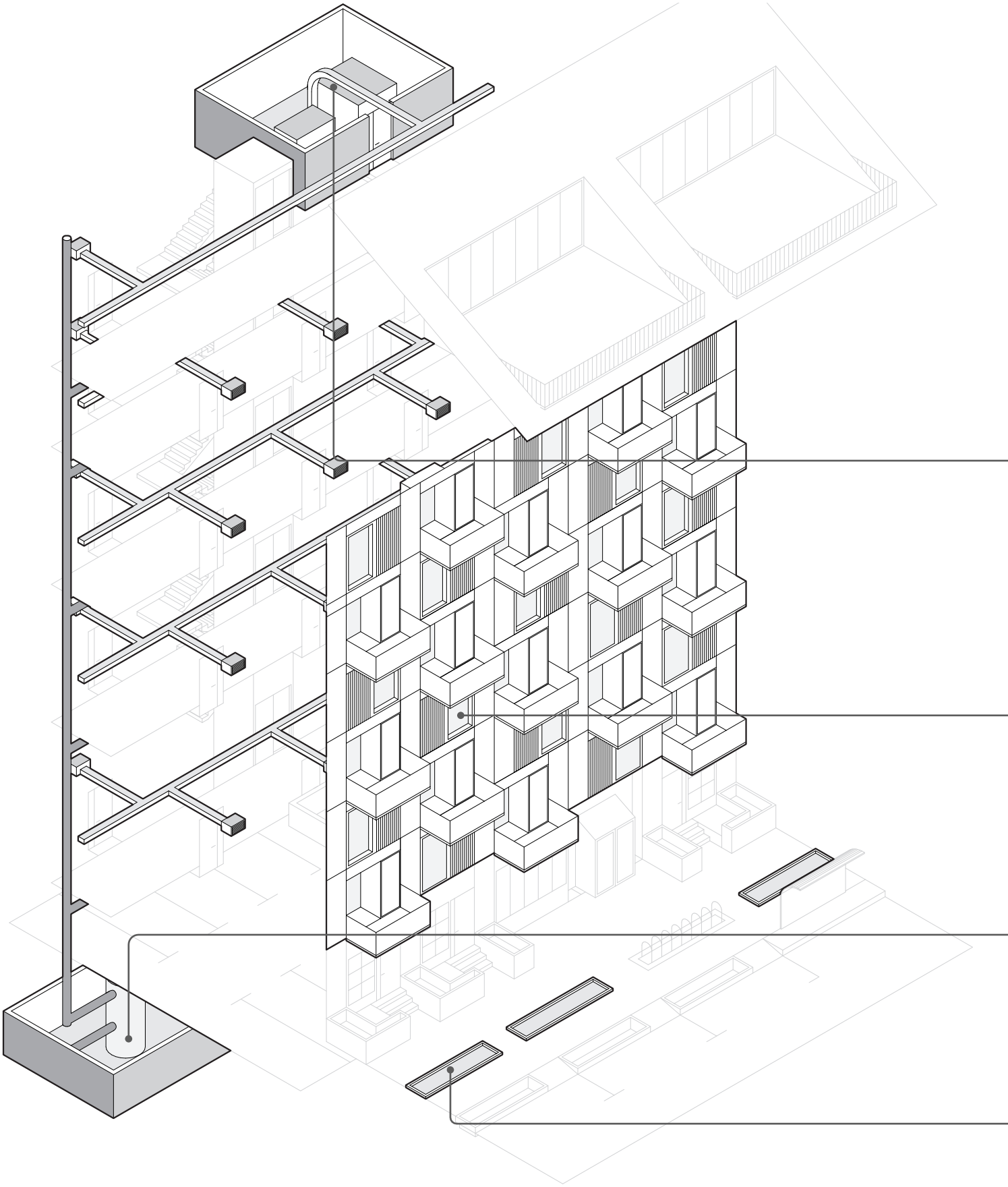
Social Behavioural Adaptation
- minimum surface contact
- maintenance routine

Related BCH guideline
- S1: 3-2, 7-3
- S2: 3-2
- S4: D7

Application per project status



3.10. Mechanical [M]



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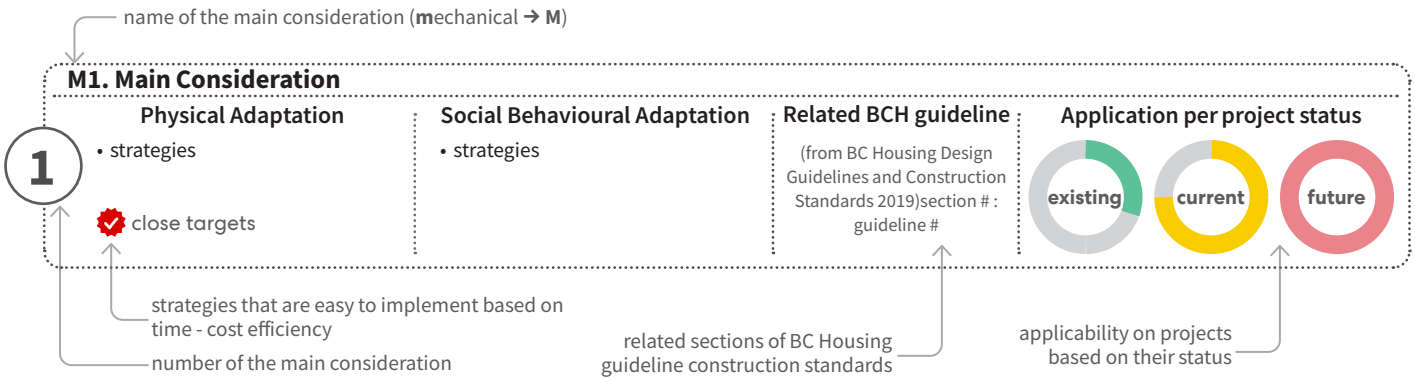


M1. Heating, Ventilation and Air Conditioning (HVAC)

1

Physical Adaptation	Social Behavioural Adaptation	Related BCH guideline	Application per project status
• flushing of building • washroom exhaust ventilation • air distribution optimization • disinfectant in air supply ducts, AC units and air purifiers ✓ • temperature and humidity control dashboard • increase outside air and control cross contamination • acoustic insulation for HVAC • energy recovery risk management • HVAC unit cabinet adjacencies • IAQ sensor network to monitor adequate ventilation, for both CO2 and relative humidity	• air duct maintenance and cleaning routine ✓ • timely filter change • longer hours of operation for HVAC system to dilute the virus concentration ✓ • real time monitoring and validation • periodic maintenance ✓	• S1: 9-3 • S2: 3-2, 4-1, • S4: D1, D13, D21, D22, D23 • Appendix C	existing / current / future

M2. Natural Ventilation

2

Physical Adaptation	Social Behavioural Adaptation	Related BCH guideline	Application per project status
• fenestration size / dimension • placement of openings for promoted cross ventilation • disinfectant ultraviolet lights for air purifiers ✓ • air flow temperature control • in-suite HRVs to avoid cross contamination	• sanitation routines ✓ • systems inspection ✓ • residents training ✓	• S1: 5-4, 7-4, 9-3 • S2: 3-1, 3-2	existing / current / future

M3. Domestic Water and Sewerage System

3

Physical Adaptation	Social Behavioural Adaptation	Related BCH guideline	Application per project status
• flush water system • disinfectant water additives • water temperature thermostat • sewage energy recovery risk management • fixture / hardware sanitation ✓ • contactless water fixtures in common areas ✓ • hand washing station near building entry	• sanitation routine for fixtures and drainage pipes ✓ • periodic plumbing inspection ✓ • physical distanced maintenance • flush with lid down ✓ • run all taps for 5 secs twice a day ✓ that stops p-traps from drying out • residents training ✓	• S1: 3-1, 4-3, 4-5, 6-1, 6-2, 8-2, 8-3, 9-3 • S2: 6-1, 6-2, 8-1, 8-2 • S4: D1, D7, D9, D10, D11, D12, D13, D21, D22, D23,	existing / current / future

M4. Irrigation and Rainwater Collection Systems

4

Physical Adaptation	Social Behavioural Adaptation	Related BCH guideline	Application per project status
• materiality and texture • gray water recovery plan • water conservation measures • real time monitoring and validation systems	• maintenance routine • sustainability awareness / community training	• S1: 10-1, 10-2 • S2: 8-2 • S4: D1, D22	existing / current / future

3.11. Summary

The pandemic has catalyzed our reevaluation of housing and its impact on the health and wellbeing of communities. It has advanced our efforts to improve resource utilization, sustainability, social integration, and physical engagement.

There are many strategies to tackle housing issues in a pandemic and post pandemic world - from social and behavioural adaptations to physical and technological building upgrades.

Plotted graphically below we show how strategies can be implemented depending on the timing needs (x-axis) and project status (y-axis) in context.

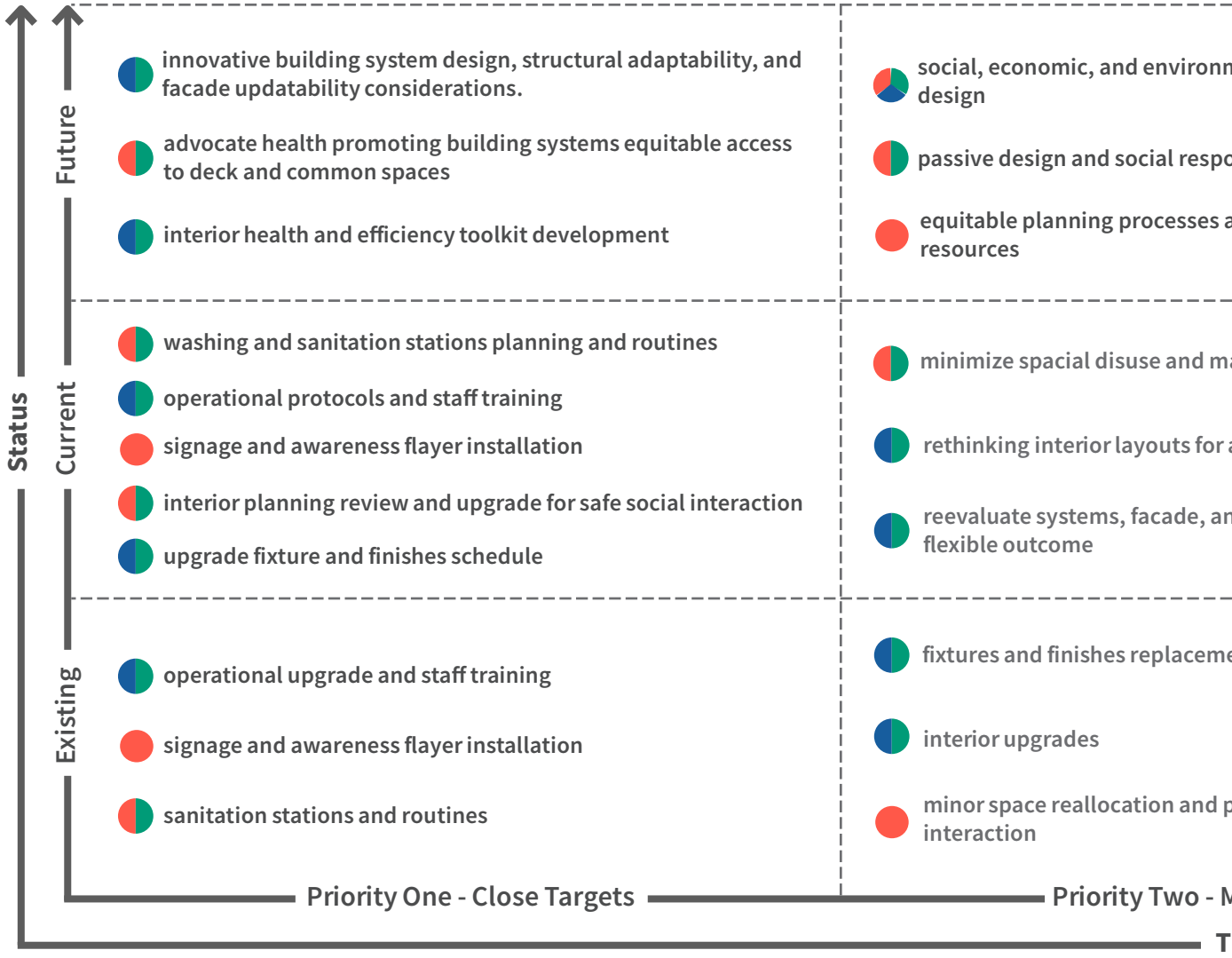
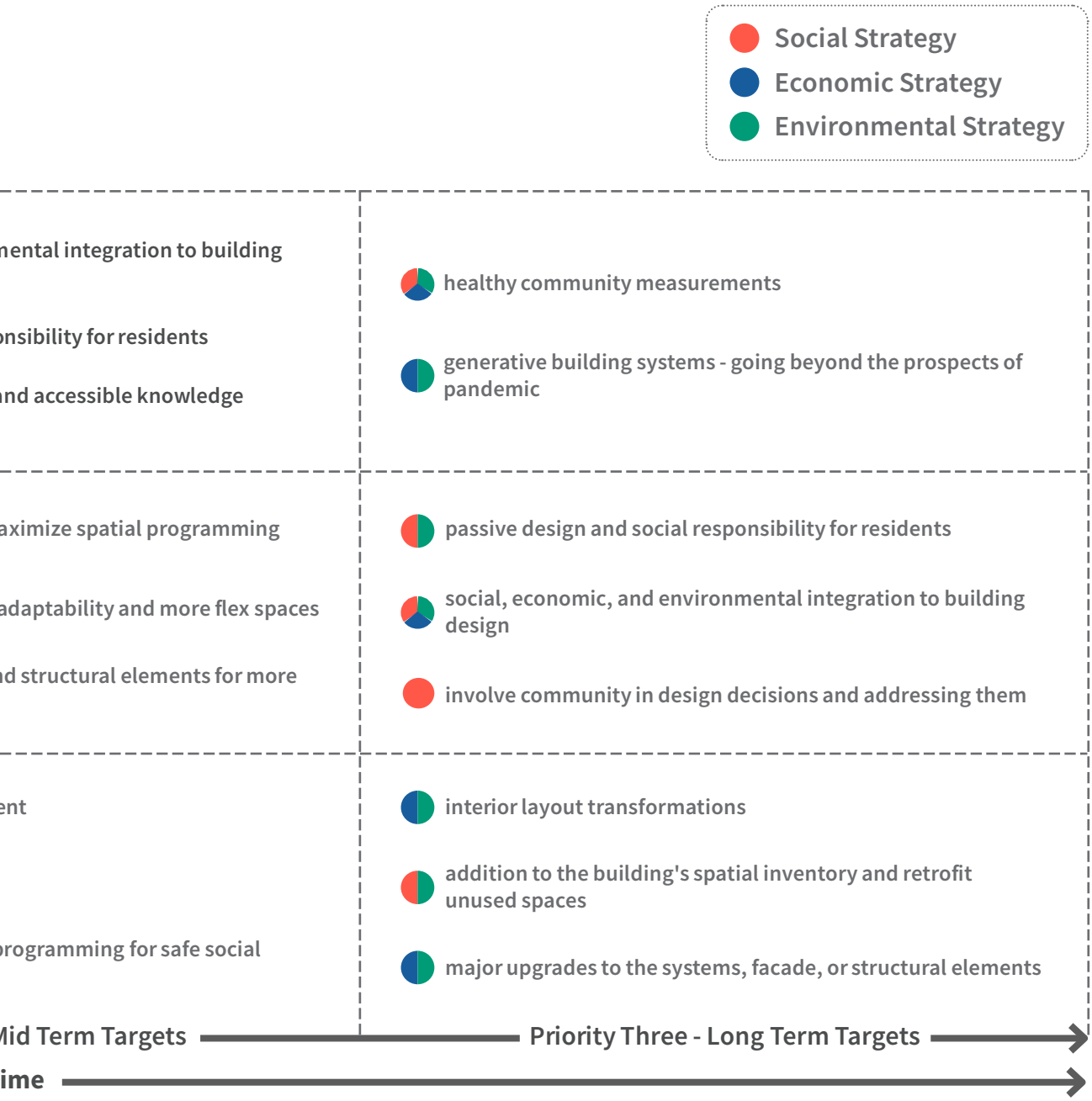


Figure 3-1. Strategy implementation matrix



based on building status and guideline priority

Design Consideration Case Studies

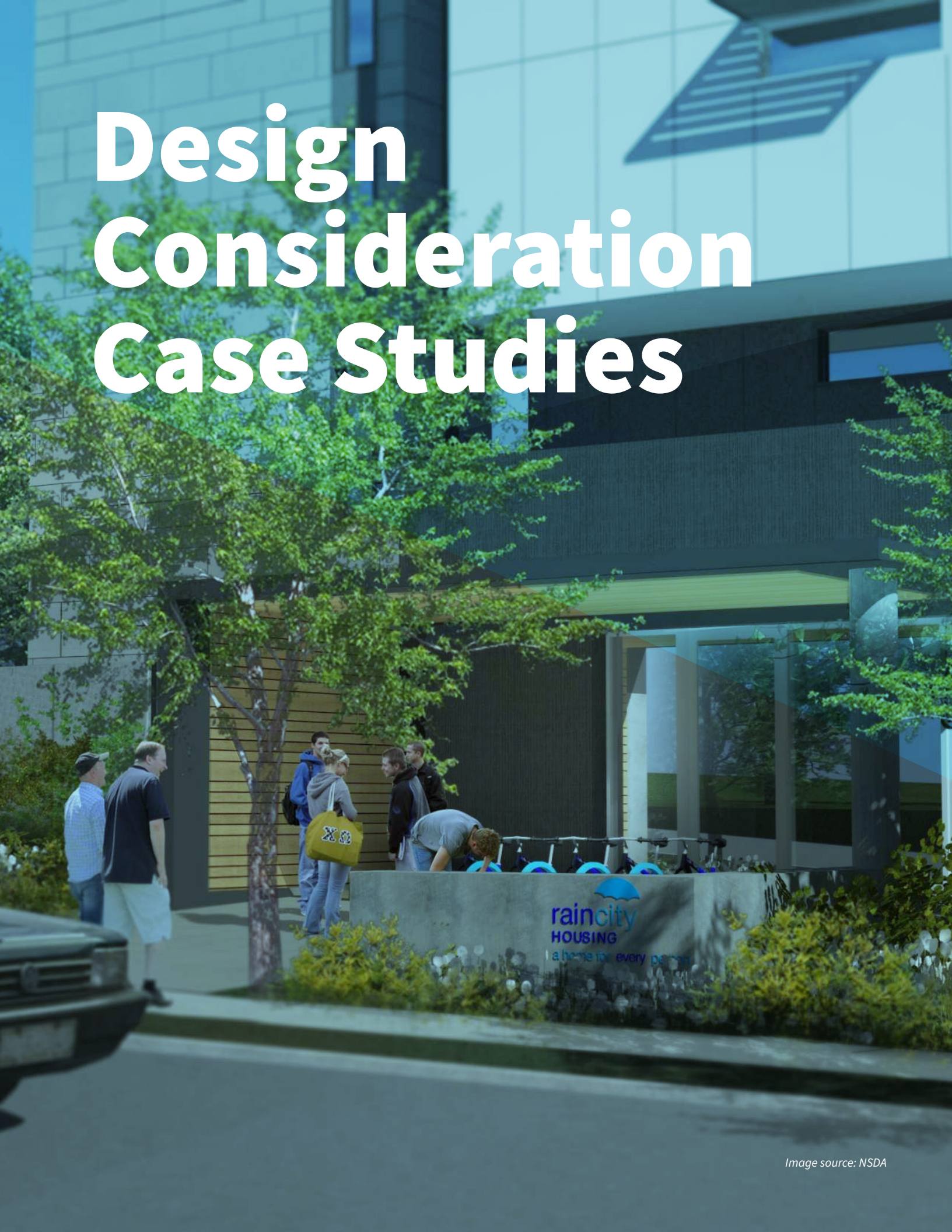


Image source: NSDA

The basis of the design guidelines are applicable across the BC Housing building typology spectrum (Figure 4-1). In this section, these guidelines are explored on two BC Housing projects from design, mechanical, and cost perspectives.

BC Housing Building Tenure Types

- Home - ownership
- Private Market Rentals
- Rent Assistance in Private Market
- Independent Social Housing
- Transitional and Supportive Assisted Living
- Emergency Shelter and Housing for Homeless

BC Housing Building Typologies

- Town Homes
- Group Homes
- Duplexes
- Mid-rises
- High-rises
- Modular Housing

Figure 4-1. BC Housing Building Tenure Type (left) and Building Typology (right) categories

The proposed operational and design strategies help diminish the spread of the virus in these buildings. Operational strategies are to be implemented by the building's staff once construction is complete, so these measures are relatively inexpensive. The design strategies are to be implemented during the development and construction of the project and so are more expensive. Design strategies can be graded as follows:

1. Low cost: strategies with expenses within 1% of the construction costs
2. Medium cost: strategies with expenses within 2% to 3% of the construction costs
3. High cost: strategies with expenses within 3% to 5% of the construction costs

The images below show the two model buildings we reference in this chapter. Both projects are designed by an architectural firm in collaboration with BC Housing.

Model Building No. 1

Model Building No. 2

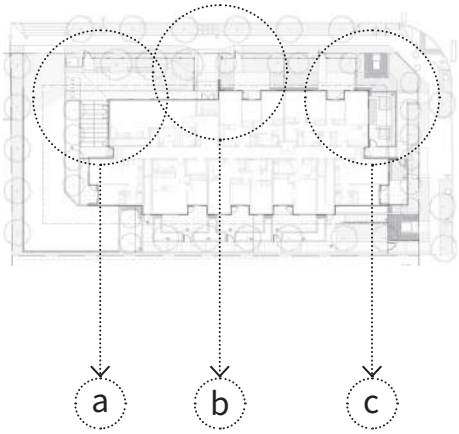
Figure 4-2. Model Buildings Renderings

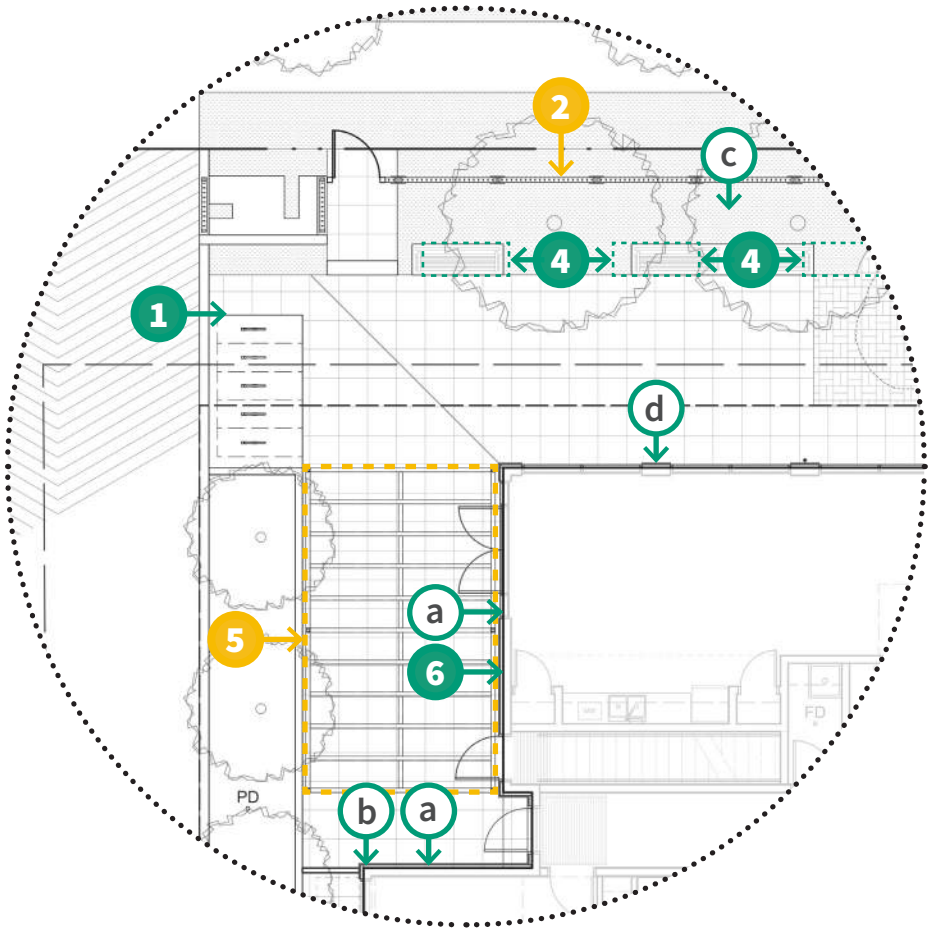
4.1. Model Building No. 1: Affordable Housing

4.1.1. Outdoor Amenity Areas

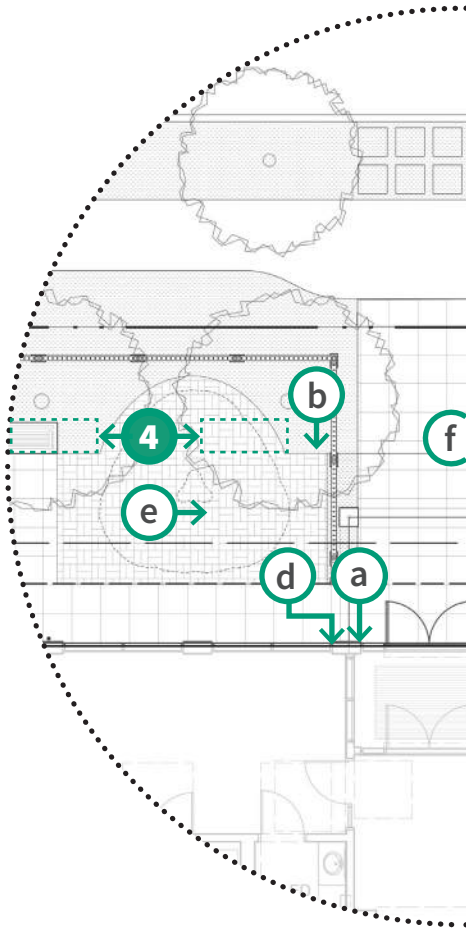
The list below outlines design approaches used in the Model Building No. 1 outdoor amenity areas. It is followed by a proposed set of operational and design tactics to mitigate the risk and spread of infectious diseases such as COVID-19:

- Provided permeable paver and ample vegetation in outdoor areas.
- Provided hose bibs at the North and South amenity areas for the cleaning and sanitation of common areas.
- Provided concrete planters with dense foliage to create green separators between private yards and public walkways at the south of the building.
- Provided Class B Bicycle Racks to encourage alternative transportation and physical activity among residents and visitors.
- Provided additional hose bib at East amenity areas for the cleaning and sanitation of common areas.





Zoomed in Plan a



Zoomed

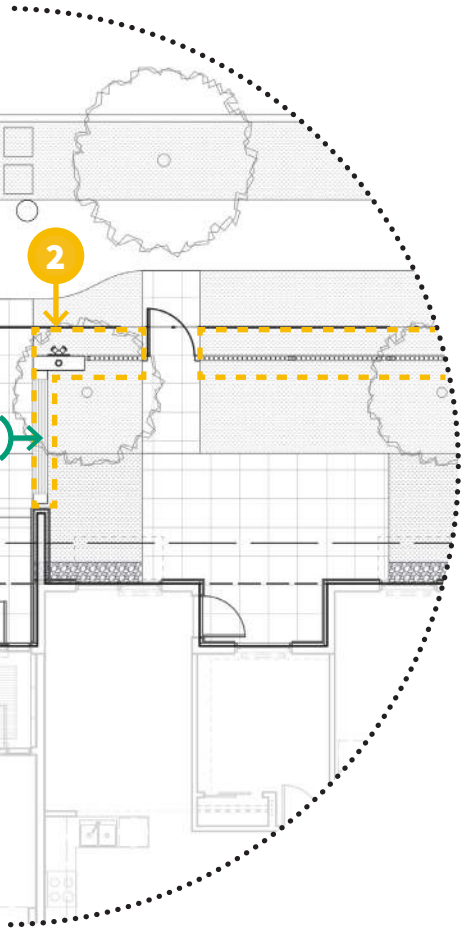
Proposed Operational Strategies for Outdoor Amenity Areas

- (a) Provide sanitizer dispensers in all common areas to reduce transmission of viruses and bacteria through surface contact.
- (b) Provide garbage cans in common areas as a litter prevention strategy.
- (c) Post signage on soil promoting physical distancing in common areas.
- (d) Post signage on building promoting COVID-19 health precautions.
- (e) Post signage in children's play area encouraging physical distancing to reduce transmission of viruses and bacteria through surface contact.
- (f) Post signage on shared seating overlooking Unit 101 to reduce transmission between public walkway and private outdoor spaces.

Proposed Design Strategies for Outdoor Amenity Areas

Low Cost Medium Cost High Cost

1. Install an additional Class B bicycle racks to promote alternative transportation.
2. Replace aluminum fences north of the building with concrete planters to increase foliage density and green separators. This will increase privacy and reduce the transmission of viruses and bacteria between the public areas and private patios/yards.
3. Moved outdoor dining tables to provide adequate clearance for physical distancing.
4. Space benches minimum two meters apart to promote physical distancing, safe individual rest, and small group social interactions.
5. Redesign trellis to provide weather protection over the West outdoor amenity space to allow residents to use it rain or shine.
6. Provide electrical outlets in West amenity area to allow for an outdoor work area/virtual chat opportunities.



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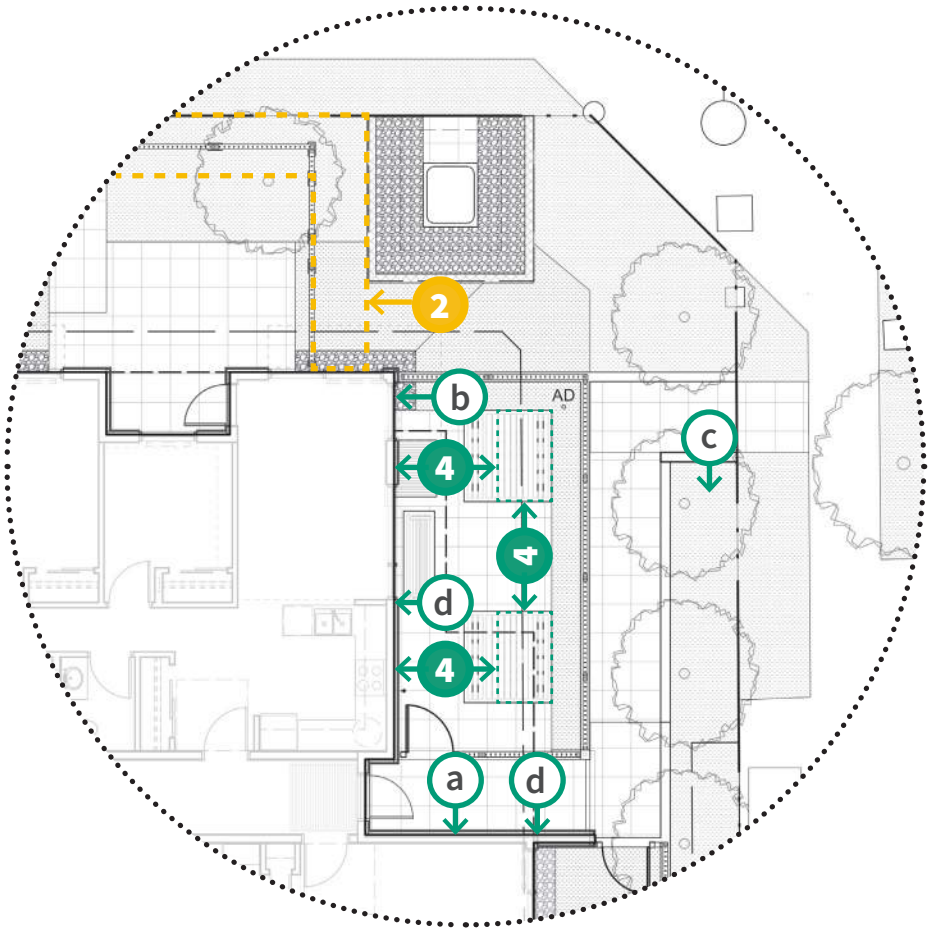
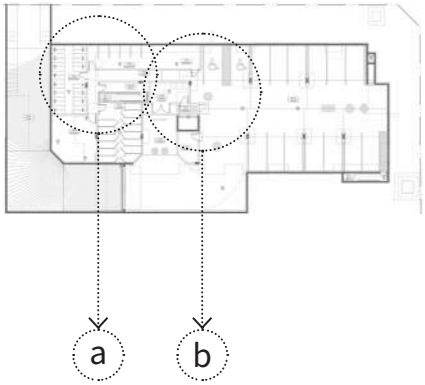


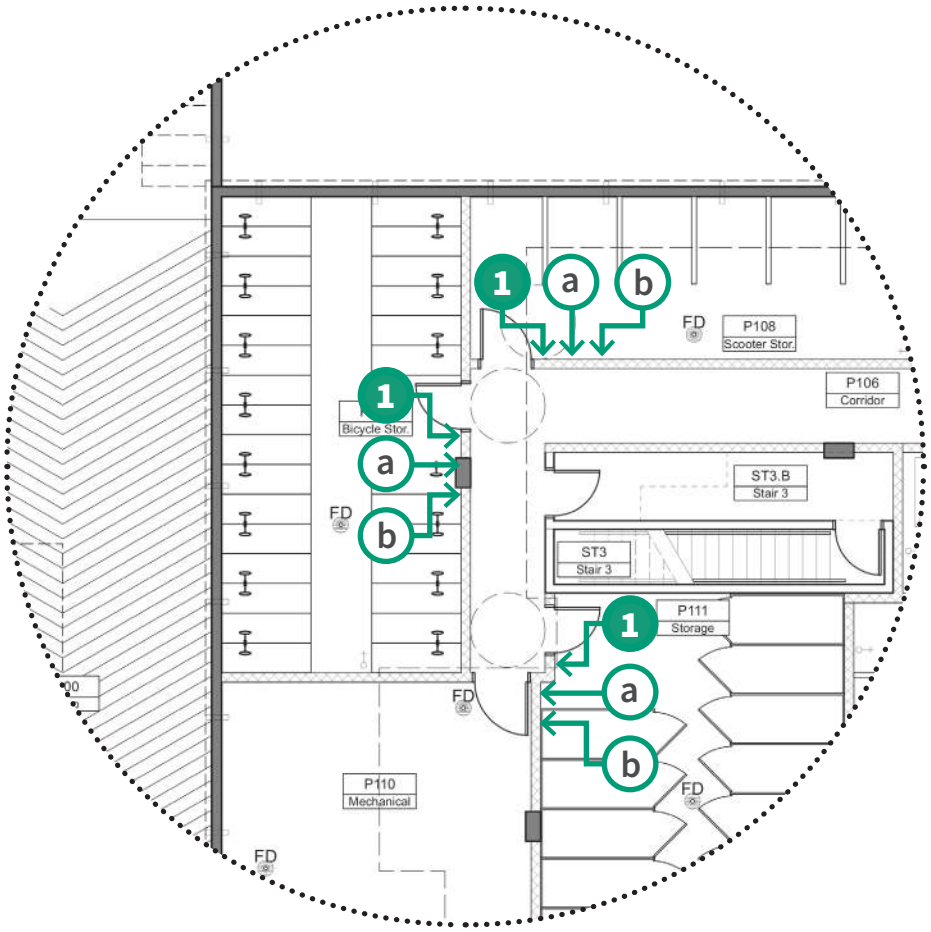
Zoomed in Plan c

4.1.2. Parking Level

The list below outlines design approaches used in the Model Building No. 1 parking level. It is followed by a proposed set of operational and design tactics to mitigate the risk and spread of infectious diseases such as COVID-19:

- Provided bicycle storage, scooter storage and storage rooms for residents to use.
- Provided a car wash stall for increased sanitation of vehicles.
- Provided automatic door openers and card readers for P105 Vestibule, P103 Garbage, P106 Scooter Storage and P109 Bicycle Storage.





Zoomed in Plan a

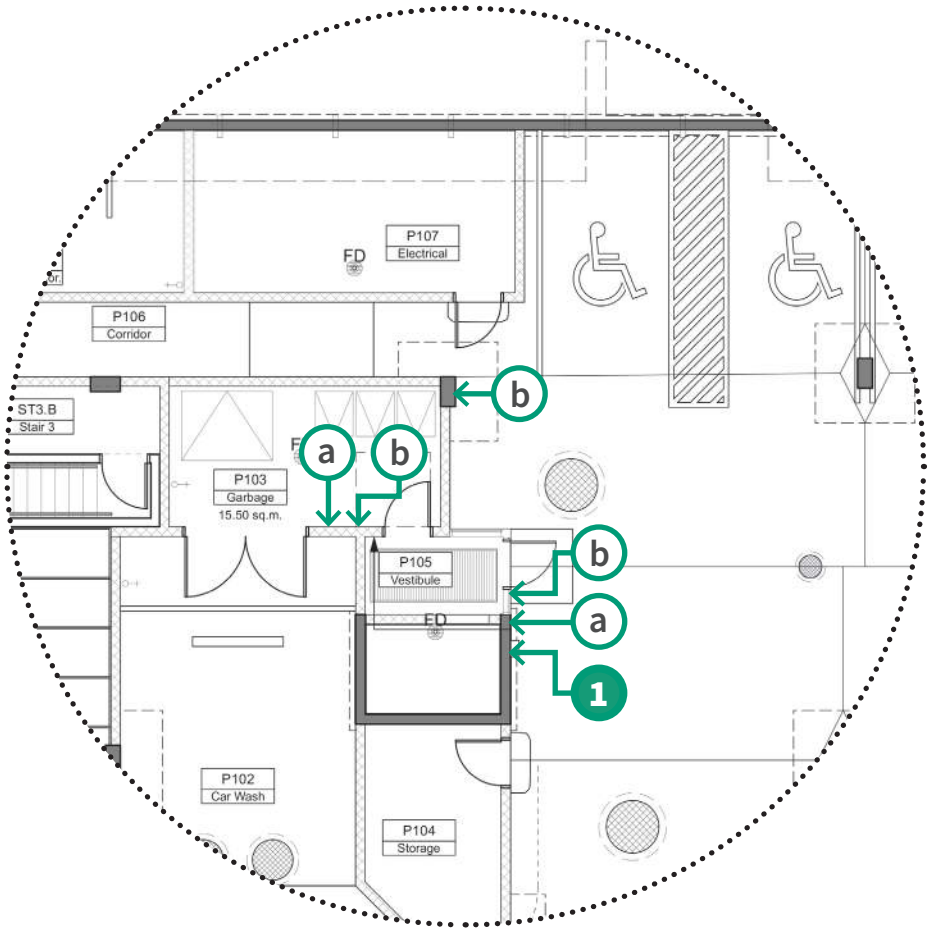
Proposed Operational Strategies for Parking Level

- (a) Provide sanitizer dispensers at all common areas to reduce transmission of viruses and bacteria through surface contact.
- (b) Place signage on building promoting COVID-19 health precautions.

Proposed Design Strategies for Parking Level

Low Cost | Medium Cost | High Cost

- (1) Install automatic door openers and card readers for P103 Garbage and P111 Storage.



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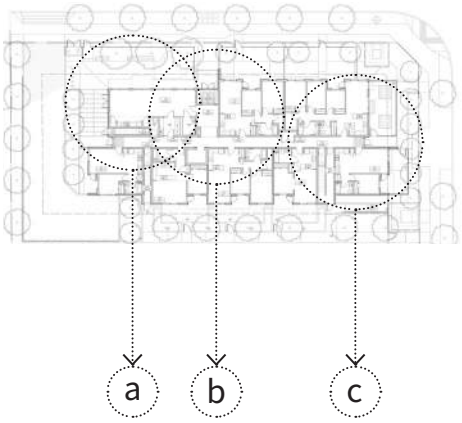
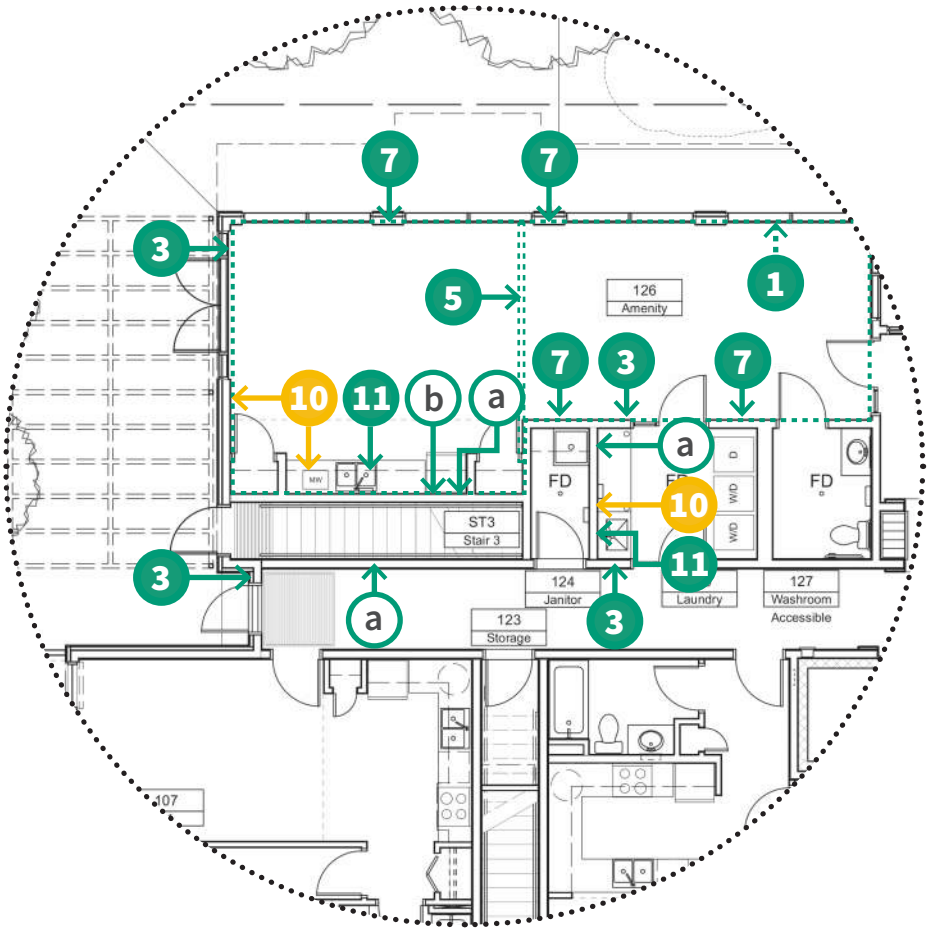
4.1.3. Main Floor Common Areas

The list below outlines design approaches used in the Model Building No. 1 main floor common areas. It is followed by a proposed set of operational and design tactics to mitigate the risk and spread of infectious diseases such as COVID-19:

- Provided operable windows to all common areas to increase natural ventilation in amenity areas.
- Provided store-front glazing in amenity rooms to allow access to natural light and visibility.
- Provided automatic door openers for 128 Vestibule and 129 Lobby to reduce the transmission of virus and bacteria through surface contact.





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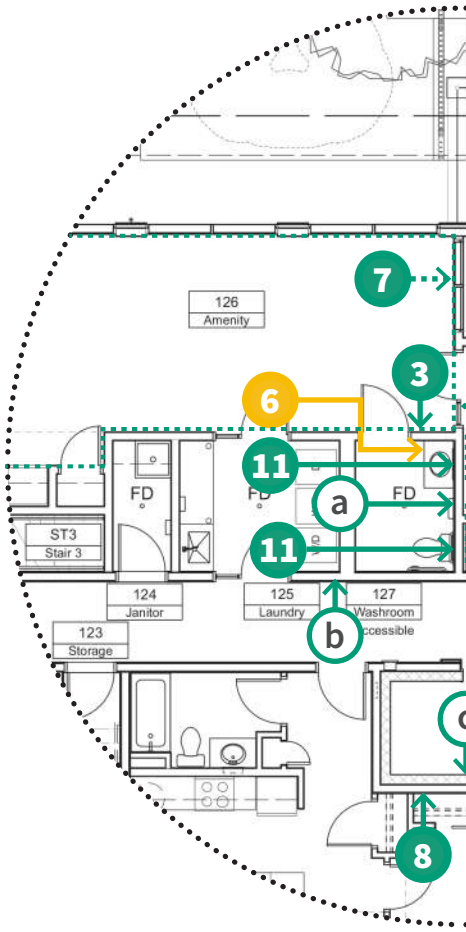

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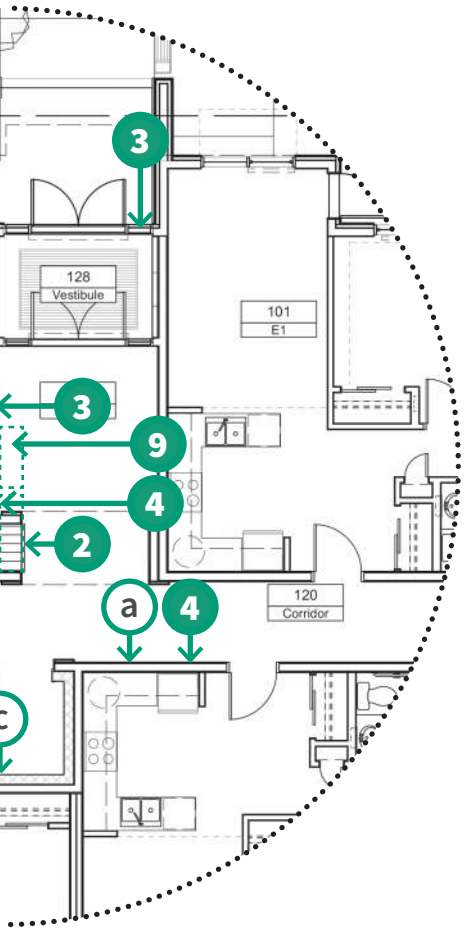
Proposed Operational Strategies for Main Floor Common Areas

- **a** Provide sanitizer dispensers throughout common areas to reduce transmission of viruses and bacteria through surface contact.
- **b** Post directional signage through corridors to reduce physical interaction between residents.
- **c** Post signage advising maximum elevator occupancy be limited to one party or three persons to reduce transmission of viruses and bacteria through surface contact.

Proposed Design Strategies for Main Floor Common Areas

Low Cost · Medium Cost · High Cost

1. Upgrade light switches to touchless infrared sensors throughout common areas to reduce transmission of viruses and bacteria through surface contact.
2. Expand mailboxes for additional parcel storage to accommodate increased online shopping trends caused by quarantine and isolation.
3. Install automatic door openers for 126 Amenity, 125 Laundry and 127 Washroom, as well as east and west entrances to 120 Corridor.
4. Post bulletins and signage highlighting pandemic health notices, building policies, and virtual social connections (social media groups, building updates, etc.).
5. Subdivide 126 Amenity with a retractable partition wall to provide flexible uses for multiple small parties.
6. Apply wipeable coatings where applicable on bathroom fixtures and wall finishes.
7. Provide common Wifi and numerous multi-port outlets in shared amenity areas to promote co-working opportunities.
8. Upgrade elevator to increase the vertical feet per second speed of elevator to reduce wait times for residents.
9. Provide a hand washing and drying station in 129 Lobby with touchless fixtures operated by infrared sensors.
10. Specify wipeable and durable finishes and materials in common areas to facilitate increased sanitation needs.
11. Install touchless fixtures in common areas (sinks, soap dispensers, paper towel dispensers, toilets) operated by infrared sensors to reduce transmission of viruses and bacteria through surface contact.



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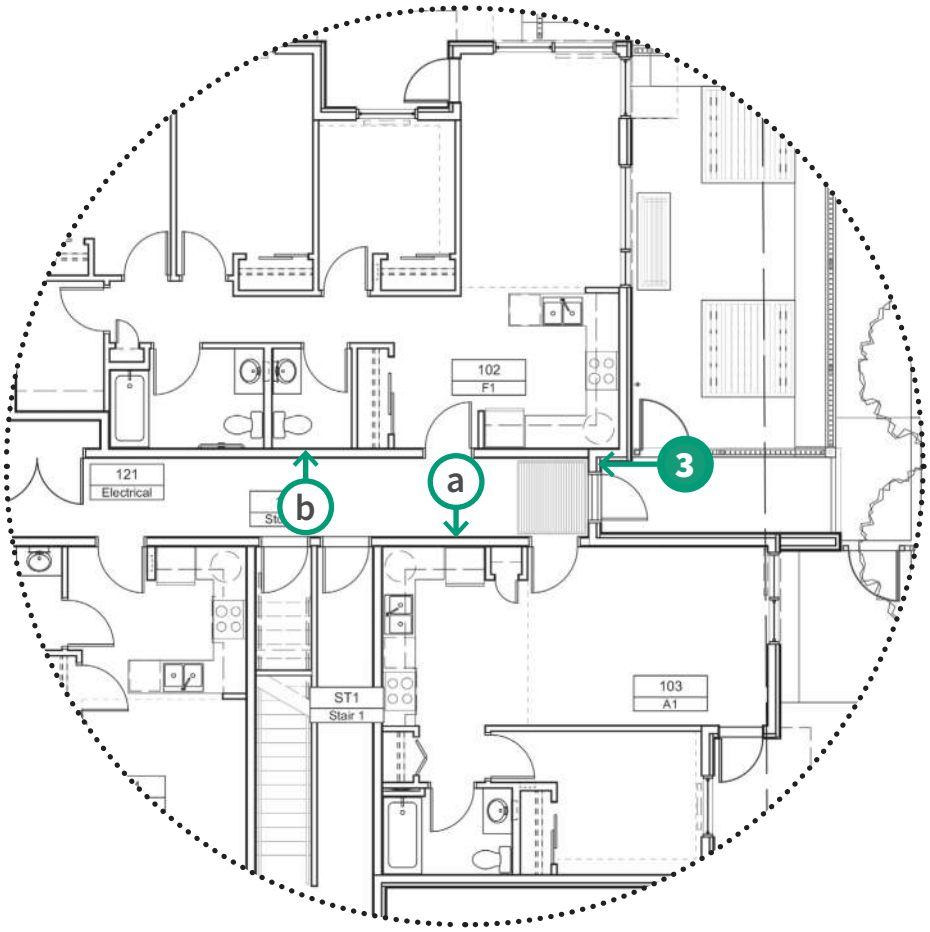

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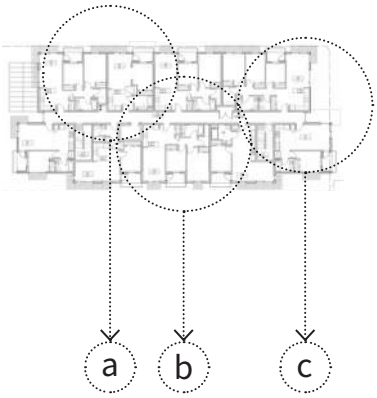
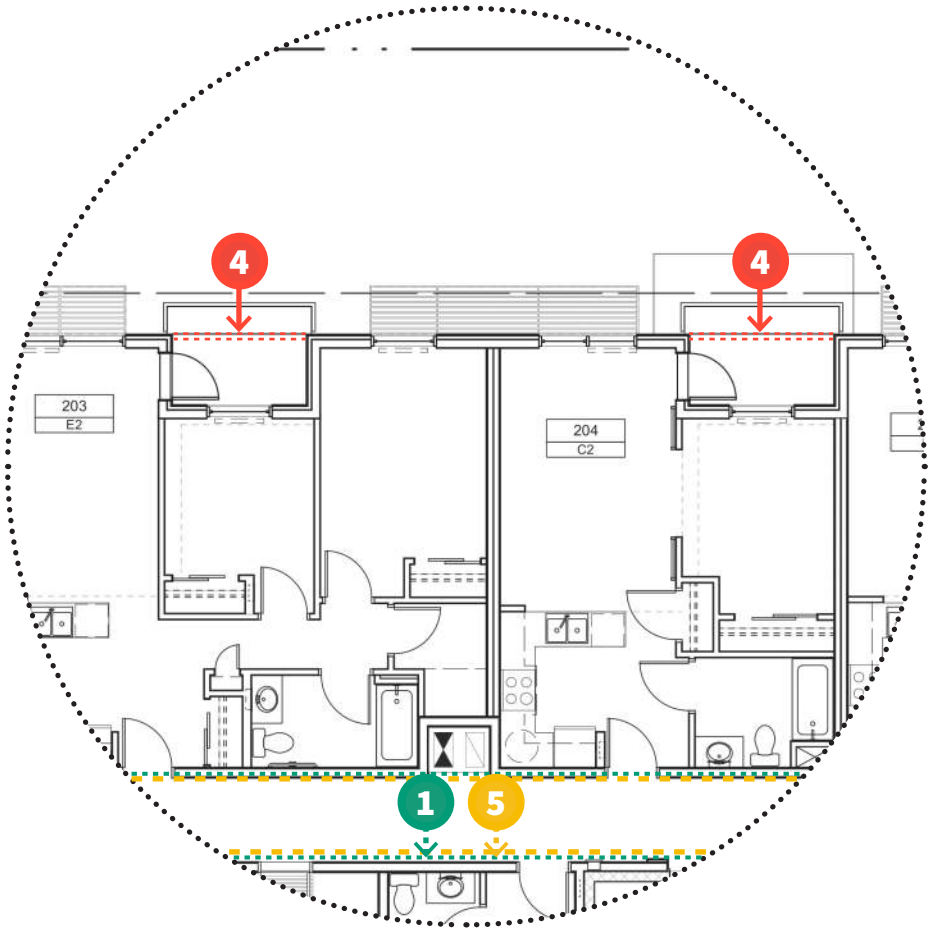
4.1.4. Second and Third Floor Common Areas

The list below outlines design approaches used in the Model Building No. 1 second and third floor common areas. It is followed by a proposed set of operational and design tactics to mitigate the risk and spread of infectious diseases such as COVID-19:

- Provided operable windows to all common areas to increase natural ventilation of amenity areas.
- Provided store-front glazing in amenity rooms for natural light and visibility of residents
- Provided automatic door openers for 128 Vestibule and 129 Lobby to reduce the transmission of virus and bacteria through surface contact.





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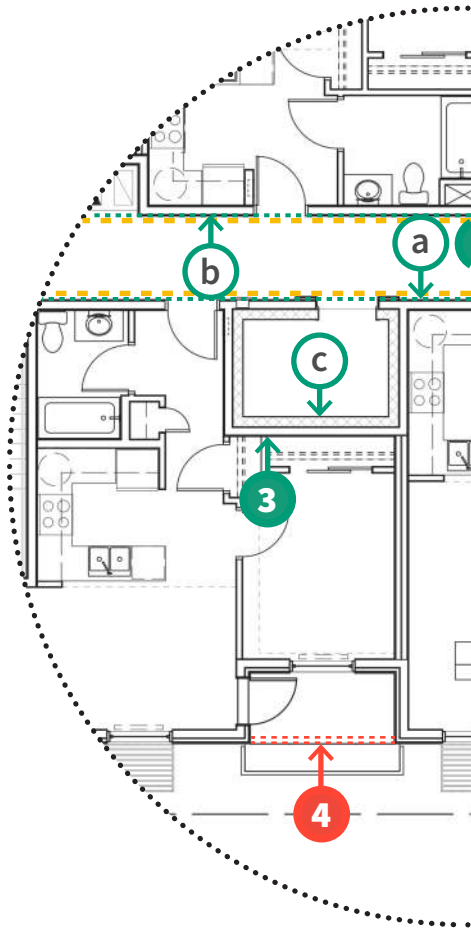

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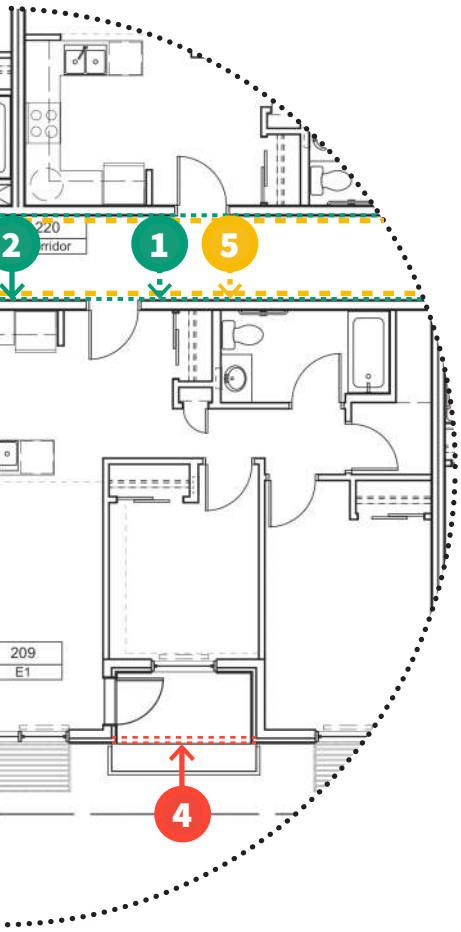
Proposed Operational Strategies for Second and Third Floor Common Areas

- (a) Provide sanitizer dispensers throughout common areas to reduce transmission of viruses and bacteria through surface contact.
- (b) Post directional signage on floors of corridors to reduce physical interaction between residents.
- (c) Post signage limiting elevator maximum occupancy to one party or three persons to reduce transmission of viruses and bacteria between residents.

Proposed Design Strategies for Second and Third Floor Common Areas

Low Cost · Medium Cost · High Cost

1. Upgrade light switches to touchless infrared sensor operation throughout common areas to reduce transmission of viruses and bacteria through surface contact.
2. Post bulletins and signage for pandemic health notices, building policies, and virtual social connections (social media groups, building updates, etc.).
3. Upgrade elevator to increase the vertical feet per second speed to reduce wait times for residents.
4. Provide retractable balcony glass enclosures (e.g., Lumon) to create flexible outdoor areas for residents to use as needed.
5. Specify wipeable and durable finishes and materials in common areas to facilitate increased sanitation needs.



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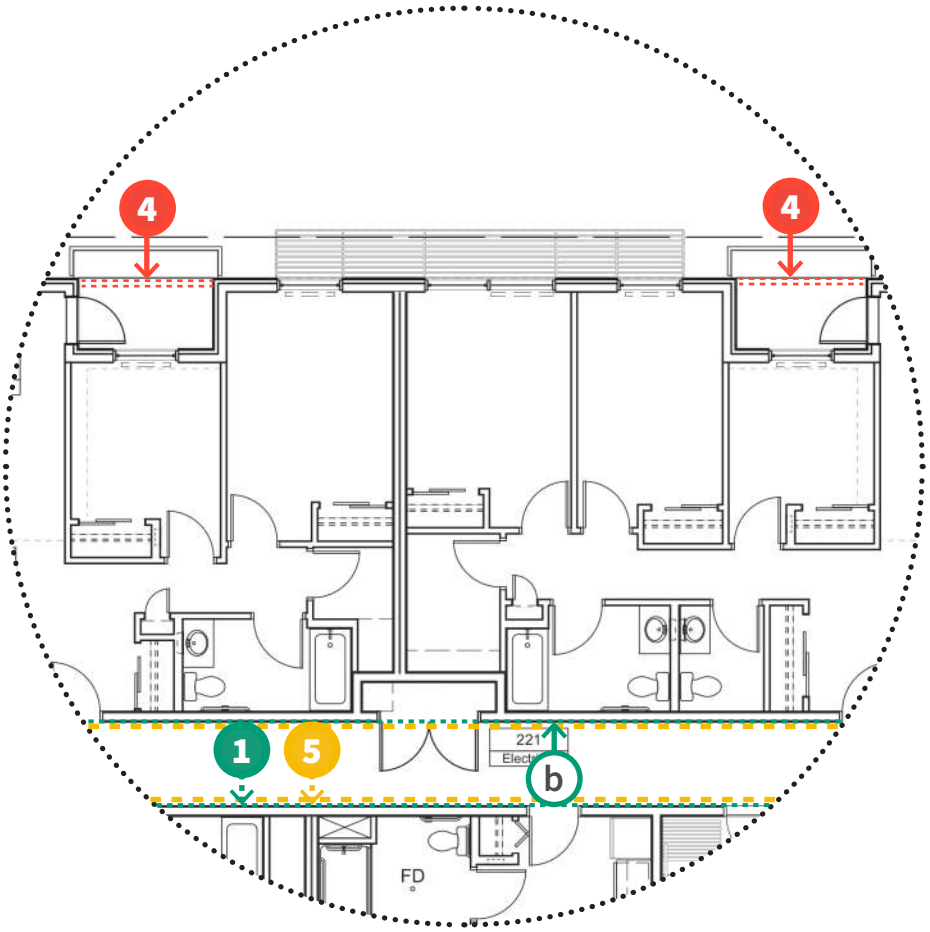

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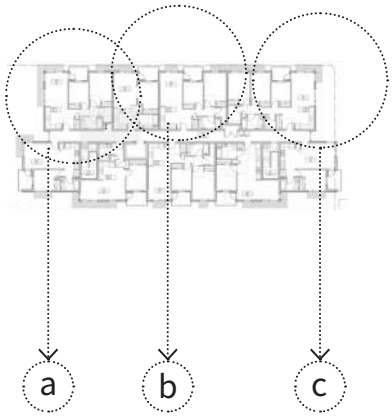
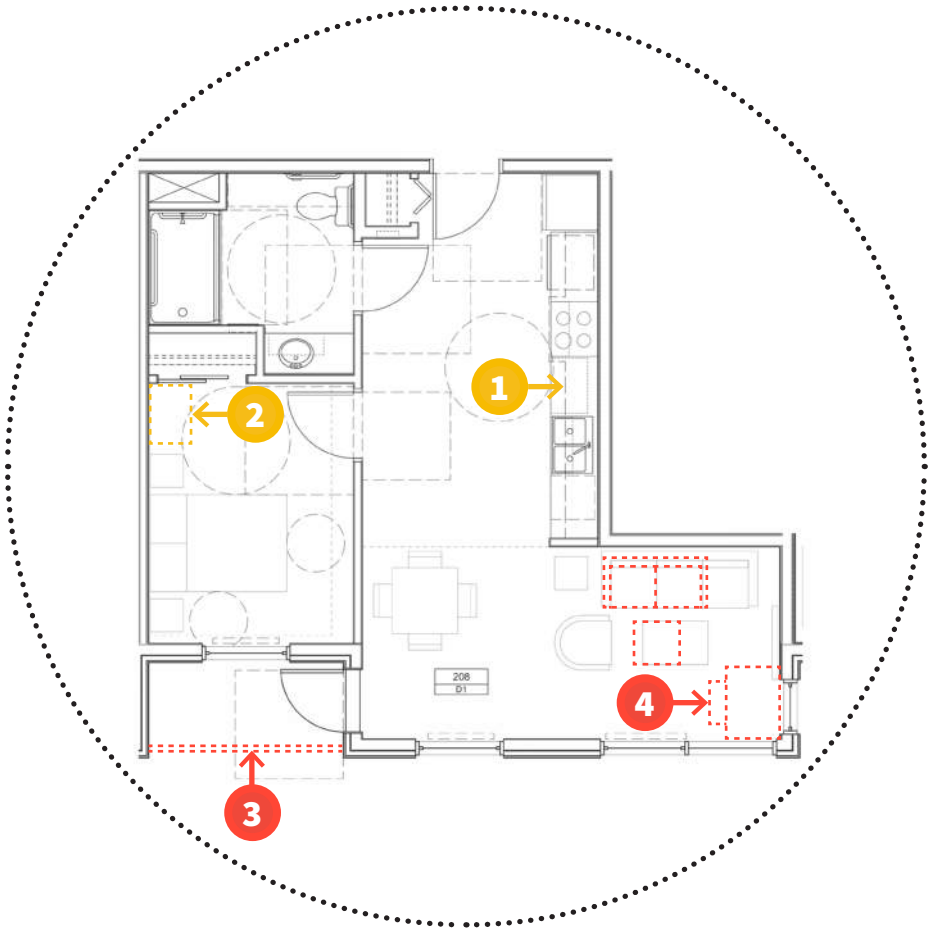
4.1.5. Units

The list below outlines design approaches used in the Model Building No. 1 units. It is followed by a proposed set of design tactics to mitigate the risk and spread of infectious diseases such as COVID-19:

- Provided large vinyl windows in the living room and bedrooms of each unit for increased sunlight penetration.
- Provided operable vinyl windows in the living room and bedrooms of each unit to increase opportunities for natural ventilation.
- Provided balconies and decks so that residents had access to flexible outdoor spaces.
- Provided open plan concept between living room, kitchen and dining areas in order for tenants to adapt and arrange spaces according to their specific needs (dining, living, office, work out areas).
- Provided easy-to-clean surfaces, including luxury vinyl tile flooring throughout the suites and vinyl safety flooring with flash coving in bathrooms.





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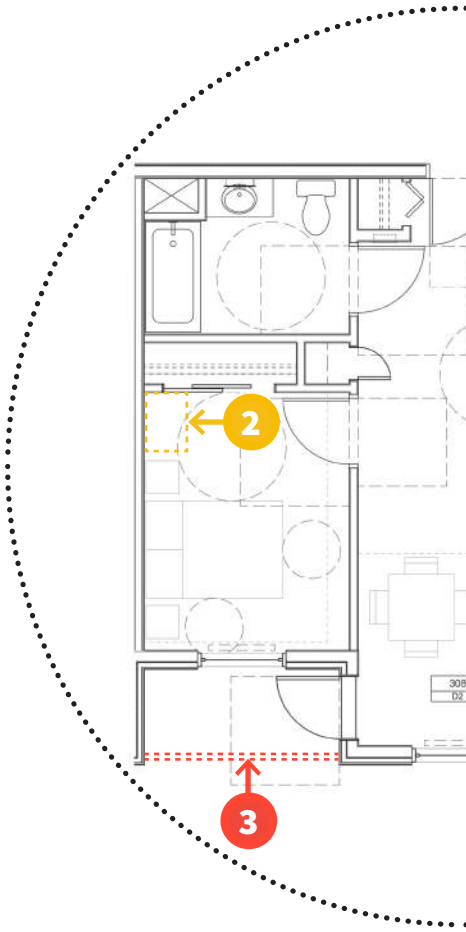

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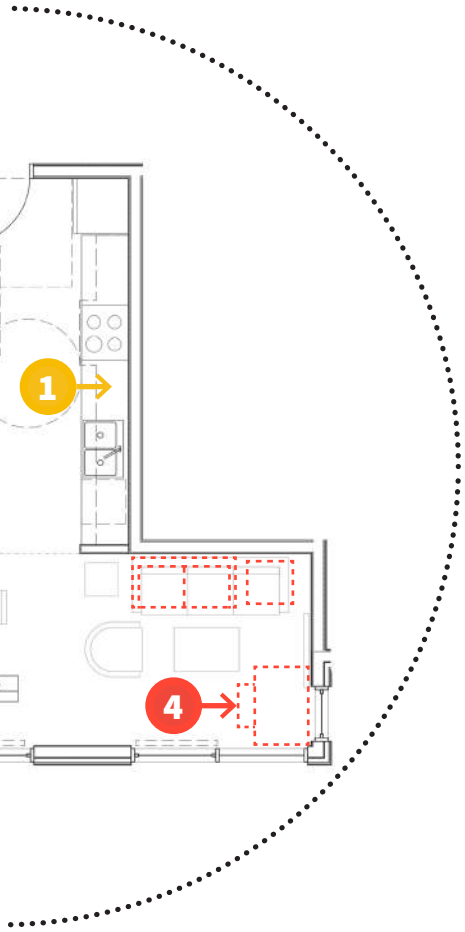
Proposed Design Strategies for Units

Low Cost Medium Cost High Cost

1. Increase durability of countertop and wall finishes to allow for increased sanitation.
2. Provide foldable desks and additional multi-port outlets to accommodate students and employees working from home.
3. Specify antibacterial metals for door hardware to reduce transmission of viruses and bacteria through surface contact.
4. Adapt storage rooms as multi-use office areas, and offer storage space in P1 level.



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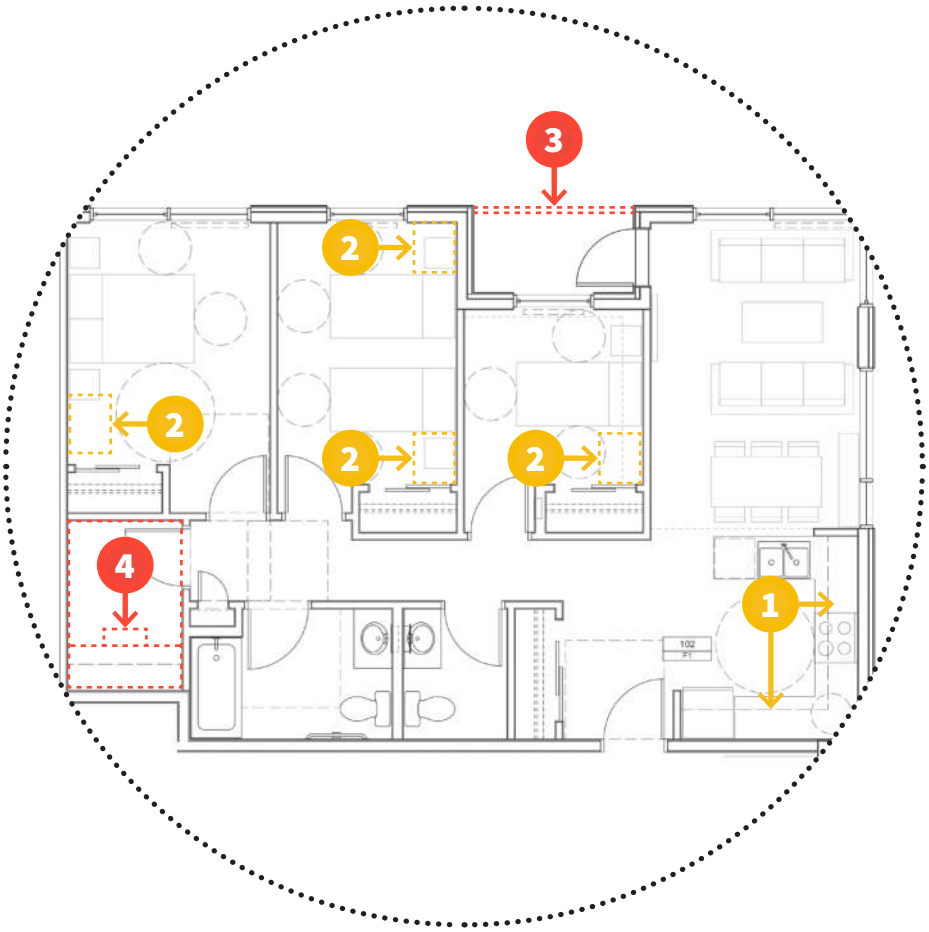

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4.1.6. HVAC Systems

The list below outlines design approaches used in the Model Building No. 1 HVAC systems. It is followed by a proposed set of design tactics to mitigate the risk and spread of infectious diseases such as COVID-19:

- Provided ventilation and partial cooling from central, roof-mounted energy recovery ventilator (ERV) to all shelter bedrooms an transitional suites.
- Provided central, roof-mounted ERV-1 for ventilation of all amenity, program and supportive areas.
- Prevented recirculation of ventilation air as supply air streams are separated from exhaust air streams.
- Ensured outdoor air is taken from the roof level so there is no possible contamination of ventilation supply air.

Proposed Design Strategies for HVAC Systems

Low Cost | Medium Cost | High Cost

1. Upgrade central ventilation systems be to MERV-13 filters.
2. Provide a divider in the amenity room including separate air supply and exhaust grilles to avoid air transfer between two sections of this space.
3. Provide two separate DX wall mounted fan coil units.
4. Ensure plumbing fixtures are easy to disinfect and clean.
5. Ensure plumbing fixtures in common areas are operated by touchless, infra-red sensors.

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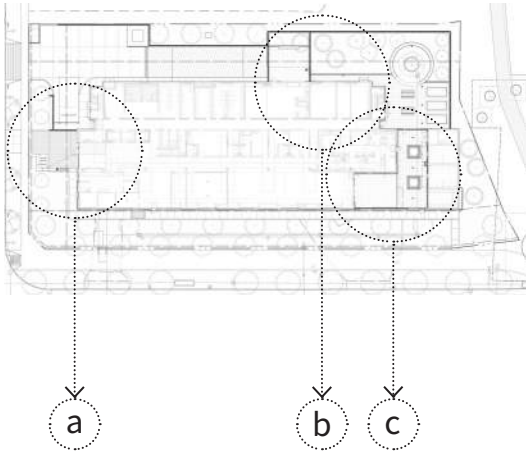
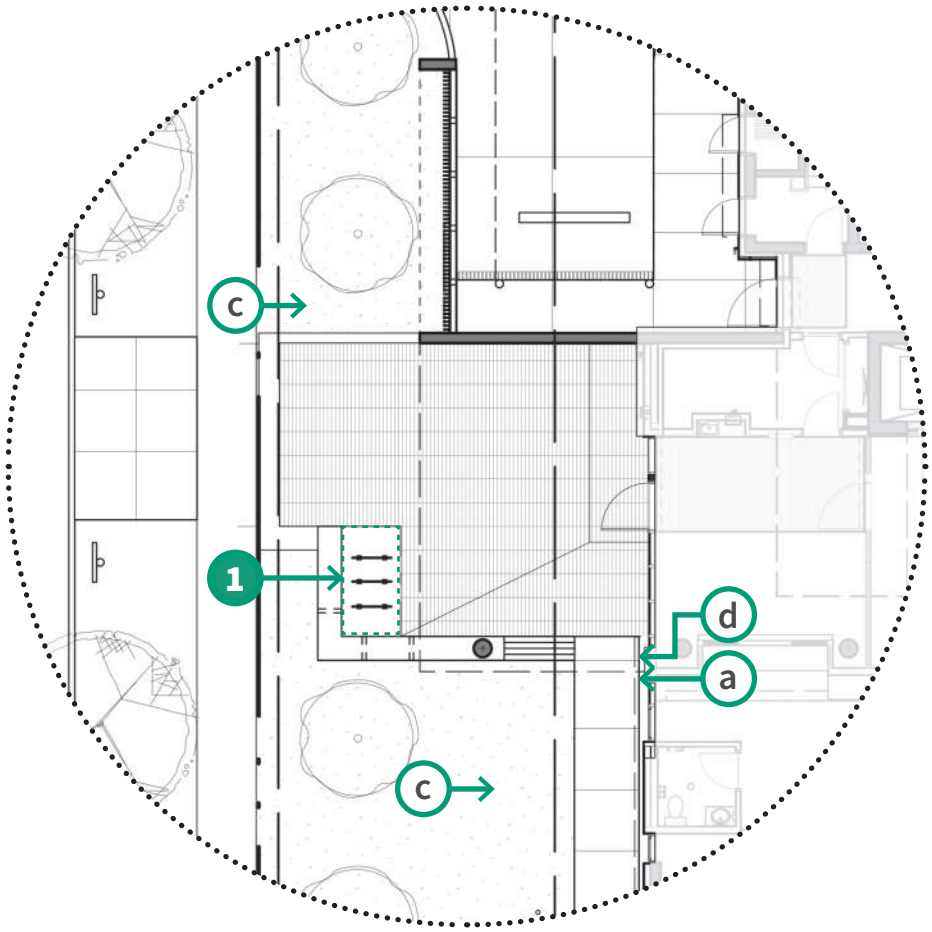
4.2. Model Building No. 2: Supportive Housing

4.2.1. Outdoor Amenity Areas

The list below outlines design approaches used in the Model Building No. 2 outdoor amenity areas. It is followed by a proposed set of operational and design tactics to mitigate the risk and spread of infectious diseases such as COVID-19:

- Provided permeable paver and ample vegetation in outdoor areas.
- Provided hose bibs at East amenity areas for cleaning and sanitation of pets and common areas.
- Provided planters with dense foliage to create green separators between bench and property lines.
- Provided Class B Bicycle Racks to encourage alternative transportation and physical activity among occupants.
- Provided covered patio space in the South-East amenity area.





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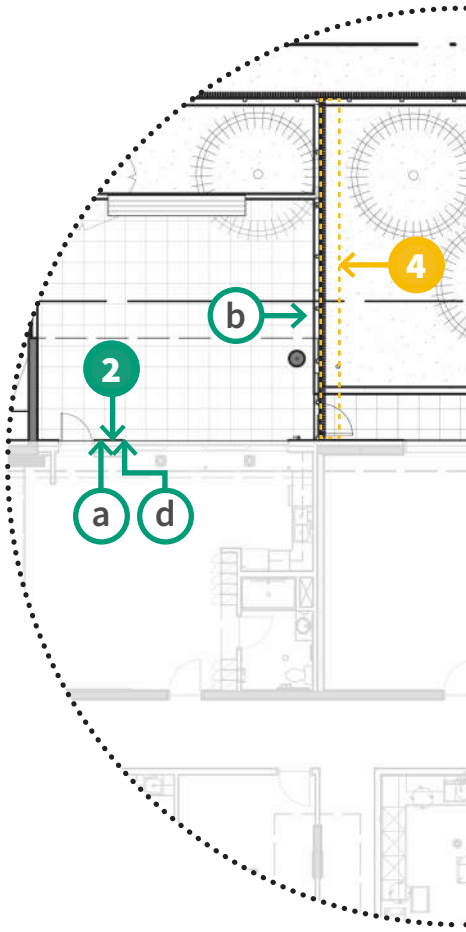

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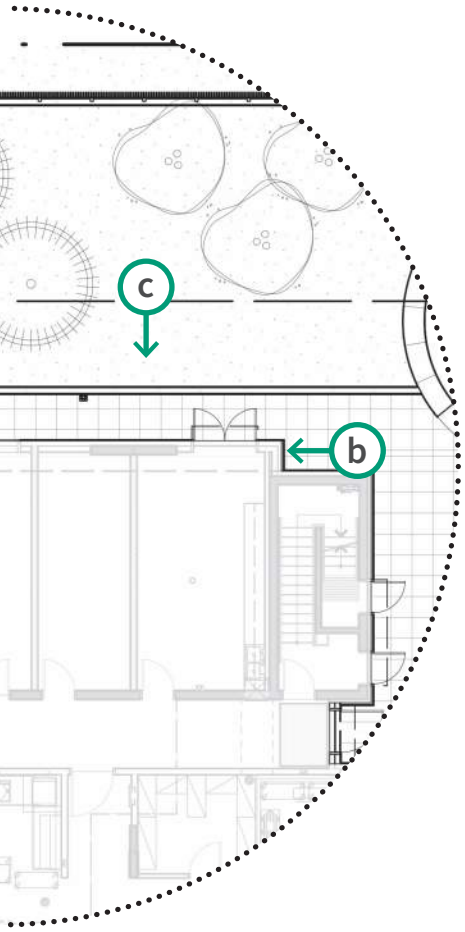
Proposed Operational Strategies for Outdoor Amenity Areas

- (a) Provide sanitizer dispensers in all common areas to reduce transmission of viruses and bacteria through surface contact.
- (b) Provide garbage cans in common areas as a litter prevention strategy.
- (c) Post signage on soil promoting COVID-19 health precautions.
- (d) Post signage on building promoting COVID-19 health precautions.

Proposed Design Strategies for Outdoor Amenity Areas

Low Cost · Medium Cost · High Cost

1. Provide additional Class B bicycle racks to promote alternative transportation.
2. Provide electrical outlets in North and East amenity areas for outdoor work and virtual chat opportunities.
3. Space benches a minimum of two meters apart to promote physical distancing, safe individual rest or small group social interactions.
4. Aluminum fences at north of the building be replaced by concrete planters to increase foliage density and green separators. This will increase privacy and reduce the spread of transmission of viruses an bacteria between the public areas and private patios/yards.



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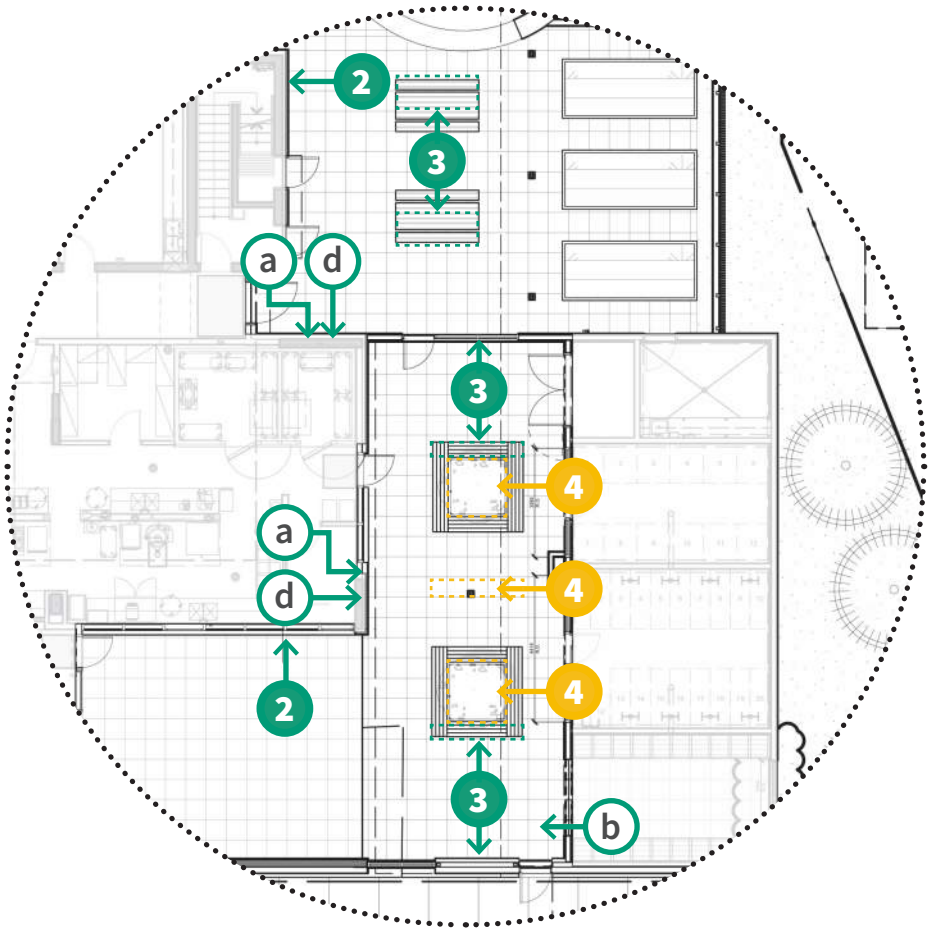

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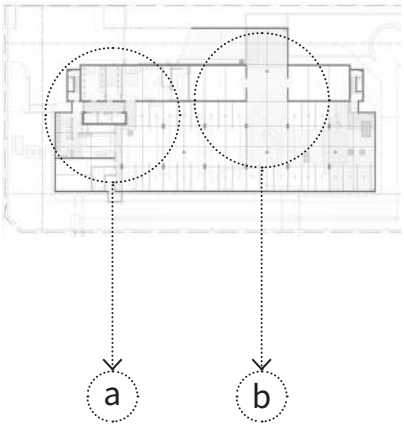
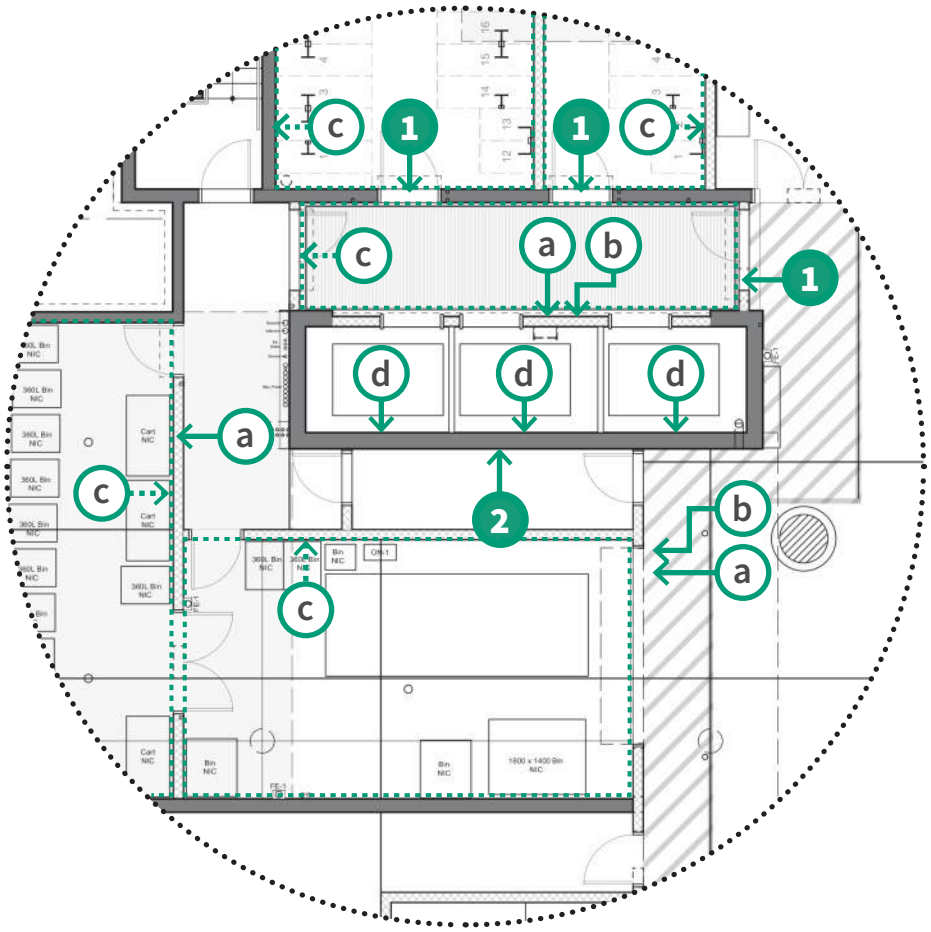
4.2.2. Parking Level

The list below outlines design approaches used in the Model Building No. 2 parking level. It is followed by a proposed set of operational and design tactics to mitigate the risk and spread of infectious diseases such as COVID-19:

- Provided bicycle storage and storage rooms for occupants to use.





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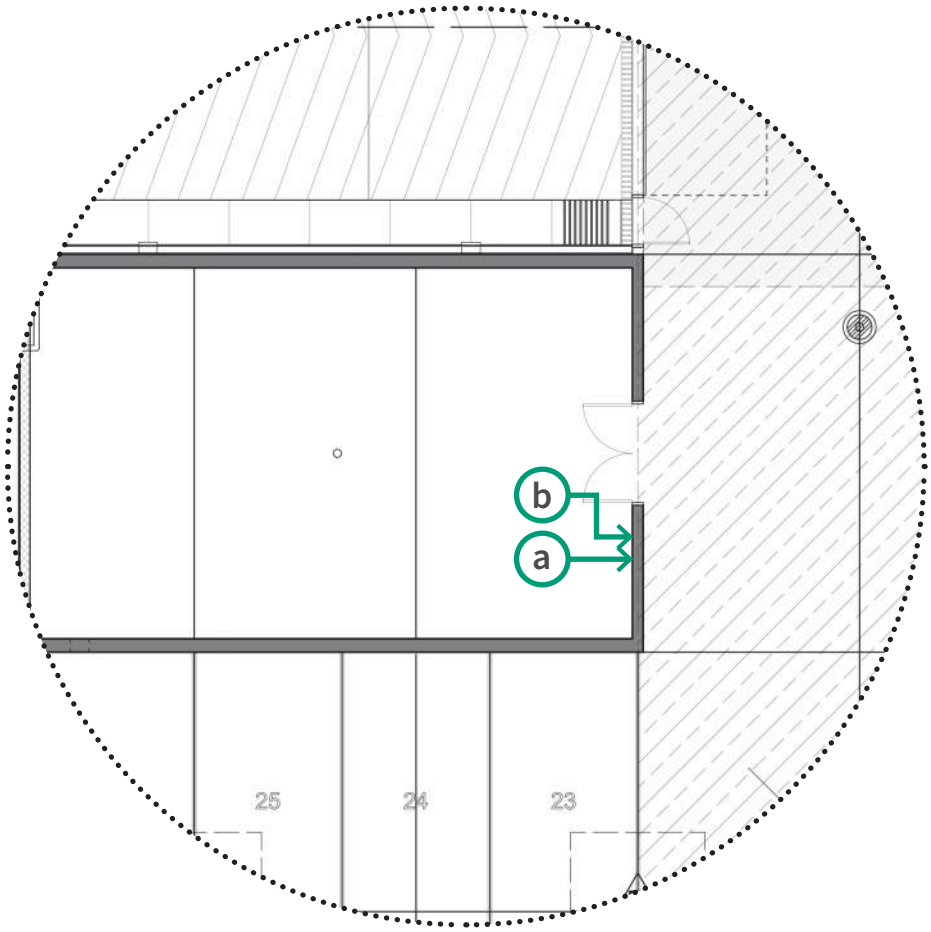
Proposed Operational Strategies for Parking Level

- (a) Provide sanitizer dispensers at all common areas to reduce transmission of viruses and bacteria through surface contact.
- (b) Post COVID-19 signage in all common areas and rooms.
- (c) Post signage regarding maximum room occupancy limitations in common rooms.
- (d) Post signage limiting maximum elevator occupancy to one party or three persons to reduce transmission of viruses and bacteria between residents.

Proposed Design Strategies for Parking Level

Low Cost | Medium Cost | High Cost

- (1) Provide automatic door openers for access to 001 Lobby, 002 Bicycle Storage (Staff), 003 Bicycle Storage (Shelter).
- (2) Upgrade elevator to increase the vertical feet per second speed of elevator to reduce wait times for residents.

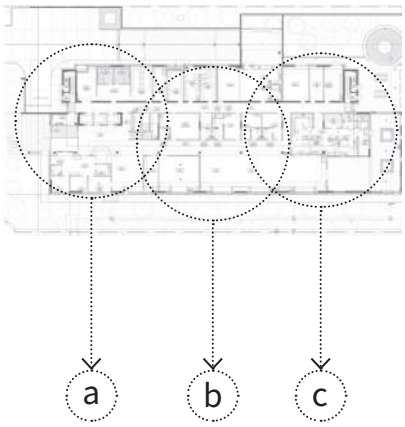


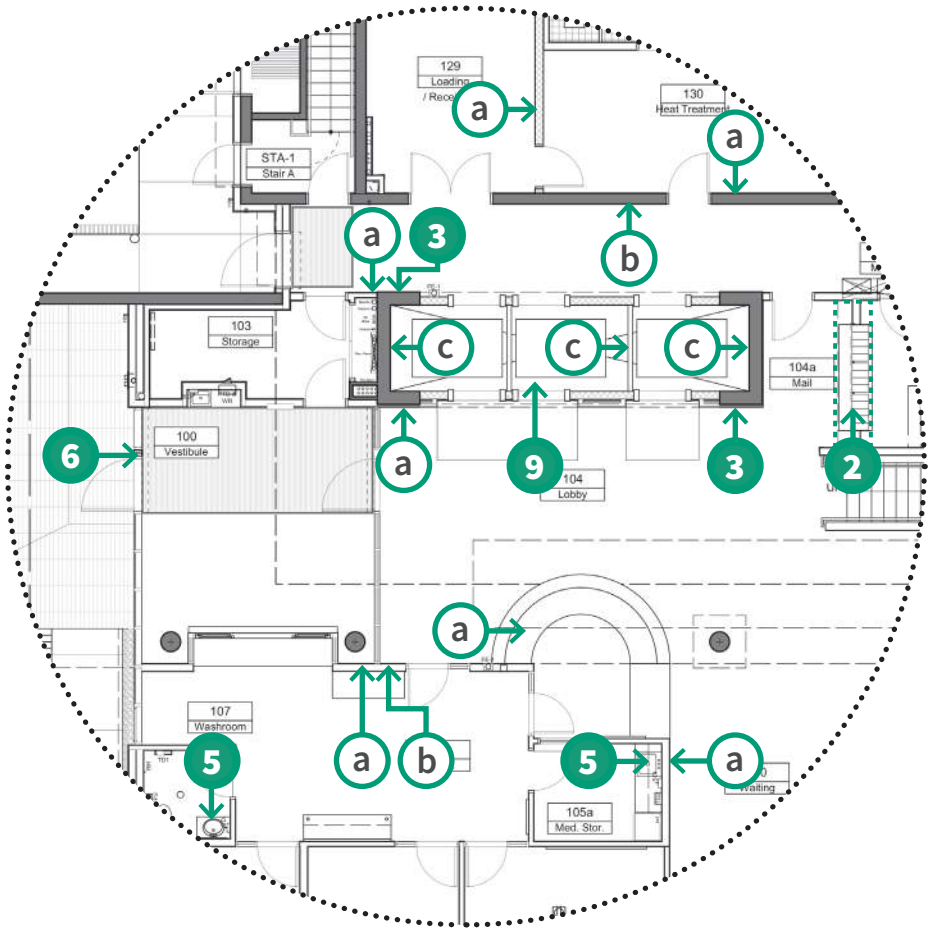
Zoomed in Plan b

4.2.3. Main Floor Common Areas

The list below outlines design approaches used in the Model Building No. 2 main floor common areas. It is followed by a proposed set of operational and design tactics to mitigate the risk and spread of infectious diseases such as COVID-19:

- Provided operable windows to all common areas to increase natural ventilation of amenity areas.
- Provided ample glazing in amenity rooms to allow access to natural light for residents and visibility of occupants.
- Provided numerous multi-use rooms for adaptability of functions.
- Provided numerous single occupancy washrooms for use of staff and clients to avoid transmission of viruses and bacteria between occupants.
- Provided 135 Training Rm subdivided by retractable partition wall to provide flexible uses for multiple small parties.
- Provided handwash station in 115 Kitchen.





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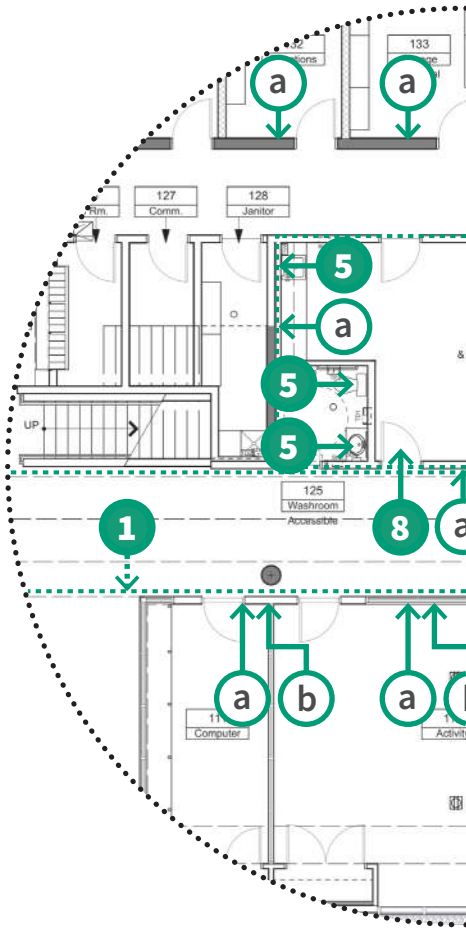

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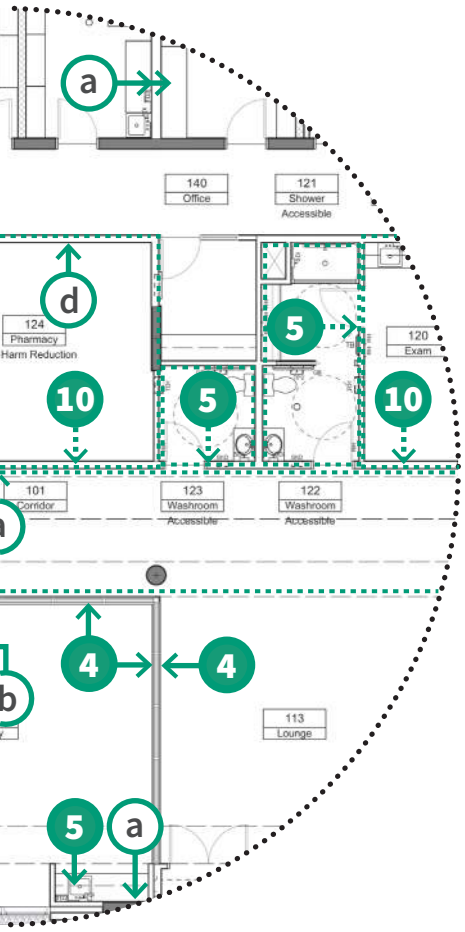
Proposed Operational Strategies for Main Floor Common Areas

- **a** Provide sanitizer dispensers throughout common areas to reduce transmission of viruses and bacteria through surface contact.
- **b** Provide directional signage on floors of corridors to reduce physical interaction between occupants.
- **c** Post signage limiting maximum elevator occupancy to one party or three persons to reduce transmission of viruses and bacteria between occupants.
- **d** Post signage on wall regarding directional travel and yielding etiquette.

Proposed Design Strategies for Main Floor Common Areas

Low Cost · Medium Cost · High Cost

1. Upgrade light switches to touchless infrared sensor operation throughout common areas to reduce transmission of viruses and bacteria through surface contact.
2. Expand mailboxes to accommodate additional parcel storage related to increased online shopping trends caused by quarantine and isolation.
3. Post bulletins and signage for pandemic health notices, building policies, and virtual social connections (social media groups, building updates, etc.).
4. Provide common Wifi and numerous multi-port outlets in shared amenity areas to promote co-working opportunities in common areas.
5. Specify fixtures in common areas (sinks, soap dispensers, paper towel dispensers, toilets) with touchless infrared sensor operation to reduce transmission of viruses and bacteria through surface contact.
6. Provide automatic door openers for East and West entrances.
7. Specify wipeable coatings and materials for fixtures, appliances and wall finishes.
8. Specify antibacterial metals for door hardware to reduce transmission of viruses and bacteria through surface contact.
9. Upgrade elevator to increase the vertical feet per second speed of elevator to reduce wait times for residents.
10. Specify wipeable and durable finishes and materials in common areas to facilitate increased sanitation needs



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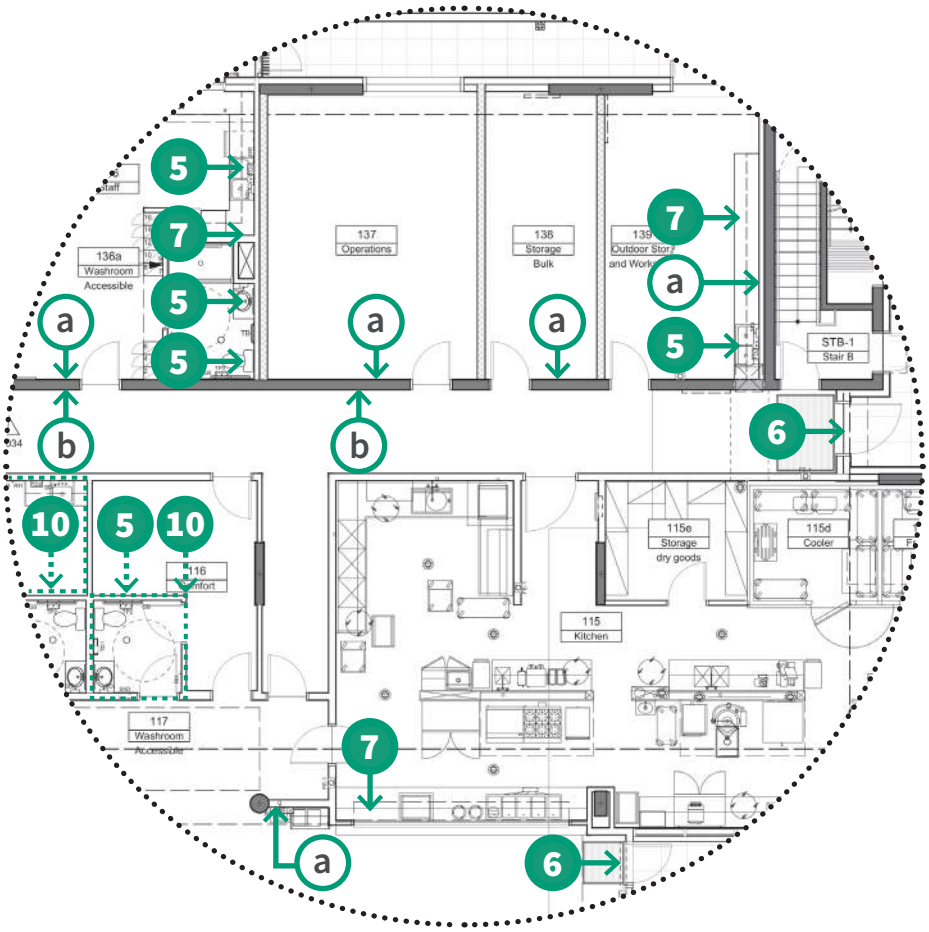

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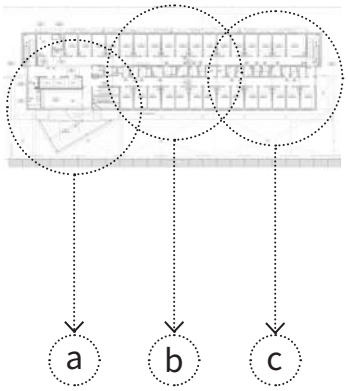
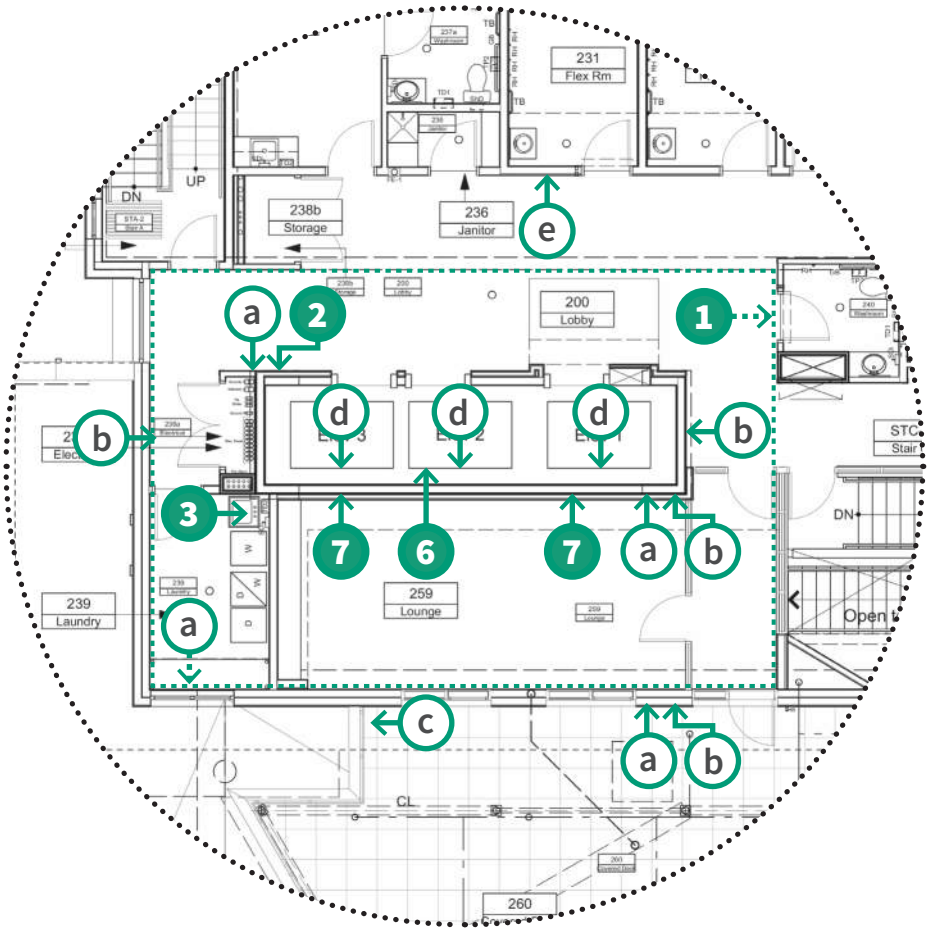
4.2.4. Second Floor Common Areas

The list below outlines design approaches used in the Model Building No. 2 second floor common areas. It is followed by a proposed set of operational and design tactics to mitigate the risk and spread of infectious diseases such as COVID-19:

- Provided operable windows to all common areas to increase natural ventilation of amenity areas.
- Provided store-front glazing in amenity rooms to allow access to natural light for residents and visibility of residents.
- Provided automatic door openers for 128 Vestibule and 129 Lobby to reduce the transmission of virus and bacteria through surface contact.





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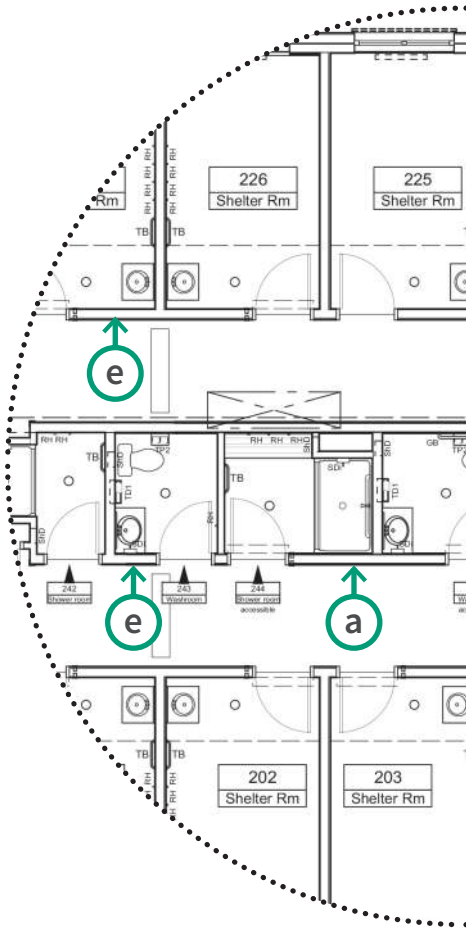

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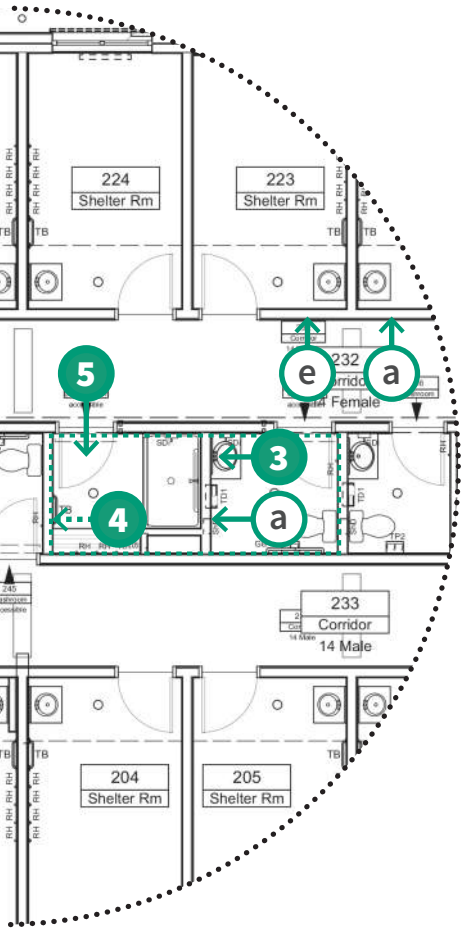
Proposed Operational Strategies for Second Floor Common Areas

- **a** Provide sanitizer dispensers throughout common areas to reduce transmission of viruses and bacteria through surface contact.
- **b** Provide directional signage on floors of corridors to reduce physical interaction between occupants.
- **c** Provide garbage cans in common areas as a litter prevention strategy.
- **d** Post signage limiting maximum elevator occupancy to one party or three persons to reduce transmission of viruses and bacteria between occupants.
- **e** Post signage on wall regarding directional travel and yielding etiquette.

Proposed Design Strategies for Second Floor Common Areas

Low Cost Medium Cost High Cost

- **1** Upgrade light switches to touchless infrared sensor operation throughout common areas to reduce transmission of viruses and bacteria through surface contact.
- **2** Post bulletins and signage for pandemic health notices, building policies, and virtual social connections (social media groups, building updates, etc.).
- **3** Specify fixtures in common areas (sinks, soap dispensers, paper towel dispensers, toilets) with touchless infrared sensor operation to reduce transmission of viruses and bacteria through surface contact.
- **4** Specify wipeable coatings and materials for fixtures, appliances and wall finishes.
- **5** Specify antibacterial metals for door hardware to reduce transmission of viruses and bacteria through surface contact.
- **6** Upgrade elevator to increase the vertical feet per second speed of elevator to reduce wait times for residents.
- **7** Provide numerous multi-port outlets in shared amenity areas to promote co-working opportunities in common areas.



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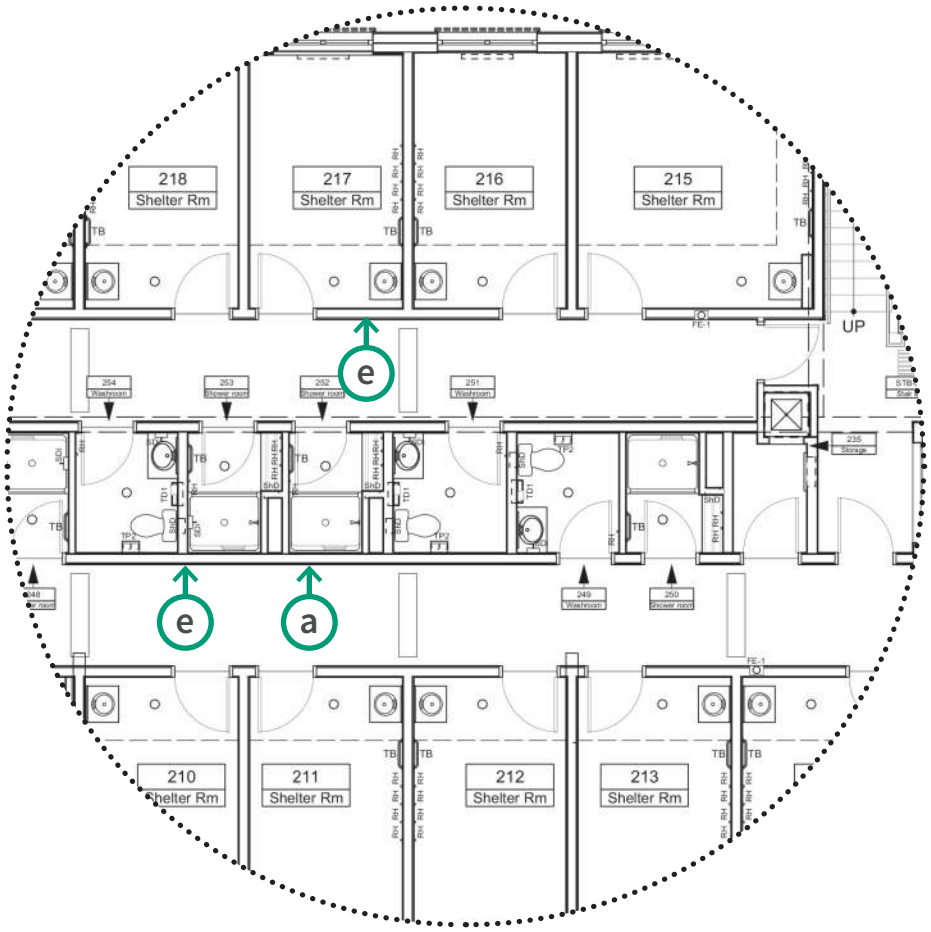

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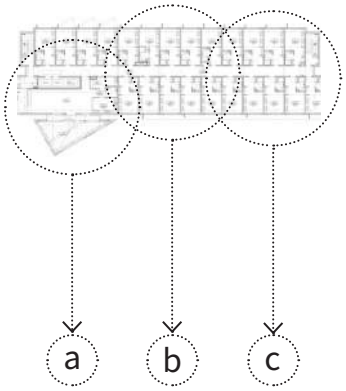
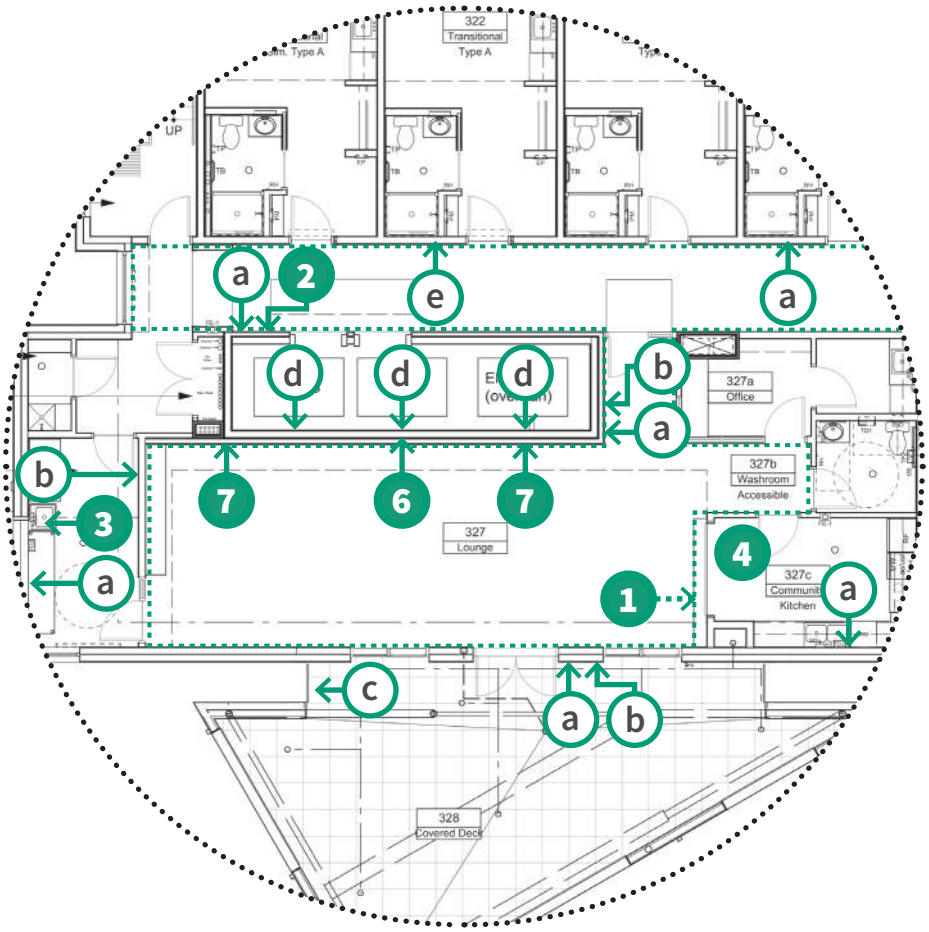
4.2.5. Third Floor Common Areas

The list below outlines design approaches used in the Model Building No. 2 third floor common areas. It is followed by a proposed set of operational and design tactics to mitigate the risk and spread of infectious diseases such as COVID-19:

- Provided operable windows to all common areas to increase natural ventilation of amenity areas.
- Provided store-front glazing in amenity rooms to allow access to natural light for residents and visibility of residents.
- Provided automatic door openers for 128 Vestibule and 129 Lobby to reduce the transmission of virus and bacteria through surface contact.





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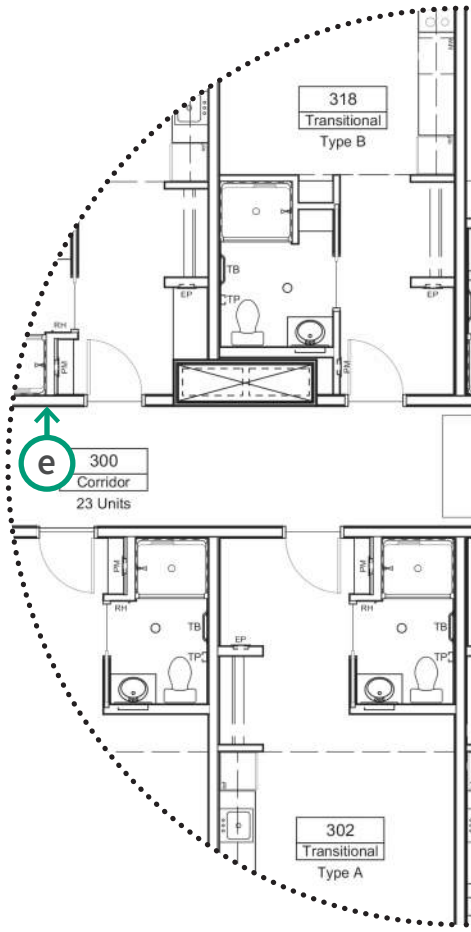

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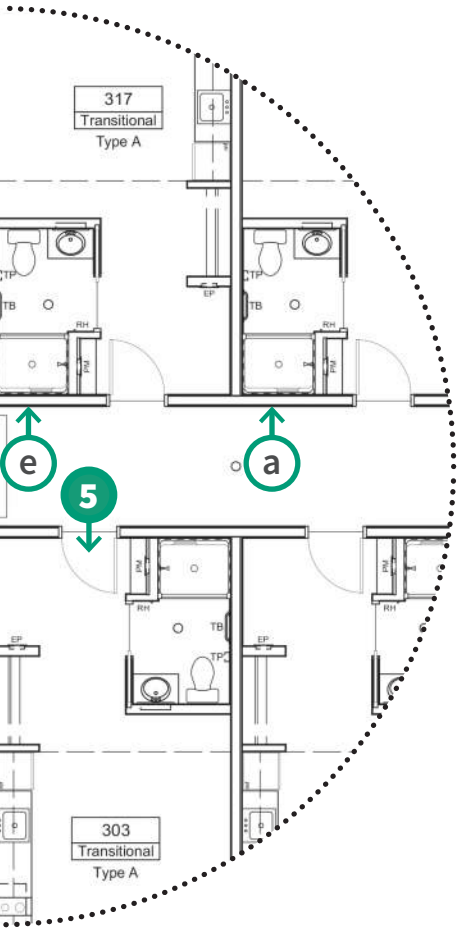
Proposed Operational Strategies for Third Floor Common Areas

- **a** Provide sanitizer dispensers throughout common areas to reduce transmission of viruses and bacteria through surface contact.
- **b** Provide directional signage on floors of corridors to reduce physical interaction between occupants.
- **c** Provide garbage cans in common areas as a litter prevention strategy.
- **d** Post signage limiting maximum elevator occupancy to one party or three persons to reduce transmission of viruses and bacteria between occupants.
- **e** Post signage on wall regarding directional travel and yielding etiquette.

Proposed Design Strategies for Third Floor Common Areas

Low Cost Medium Cost High Cost

1. Upgrade light switches to touchless infrared sensor operation throughout common areas to reduce transmission of viruses and bacteria through surface contact.
2. Post bulletins and signage for pandemic health notices, building policies, and virtual social connections (social media groups, building updates, etc.).
3. Specify fixtures in common areas (sinks, soap dispensers, paper towel dispensers, toilets) with touchless infrared sensor operation to reduce transmission of viruses and bacteria through surface contact.
4. Specify wipeable coatings and materials for fixtures, appliances and wall finishes.
5. Specify antibacterial metals for door hardware to reduce transmission of viruses and bacteria through surface contact.
6. Upgrade elevator to increase the vertical feet per second speed of elevator to reduce wait times for residents.
7. Provide numerous multi-port outlets in shared amenity areas to promote co-working opportunities in common areas.



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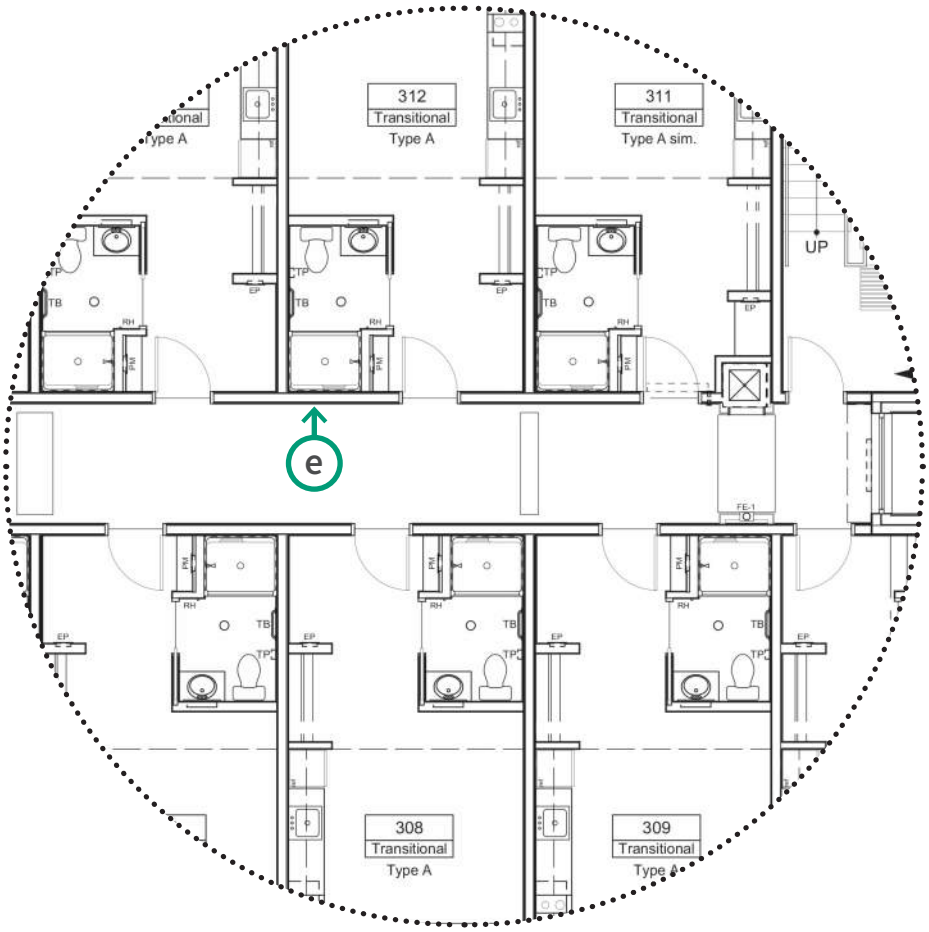

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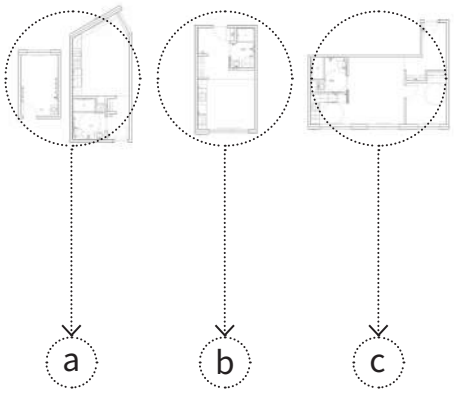
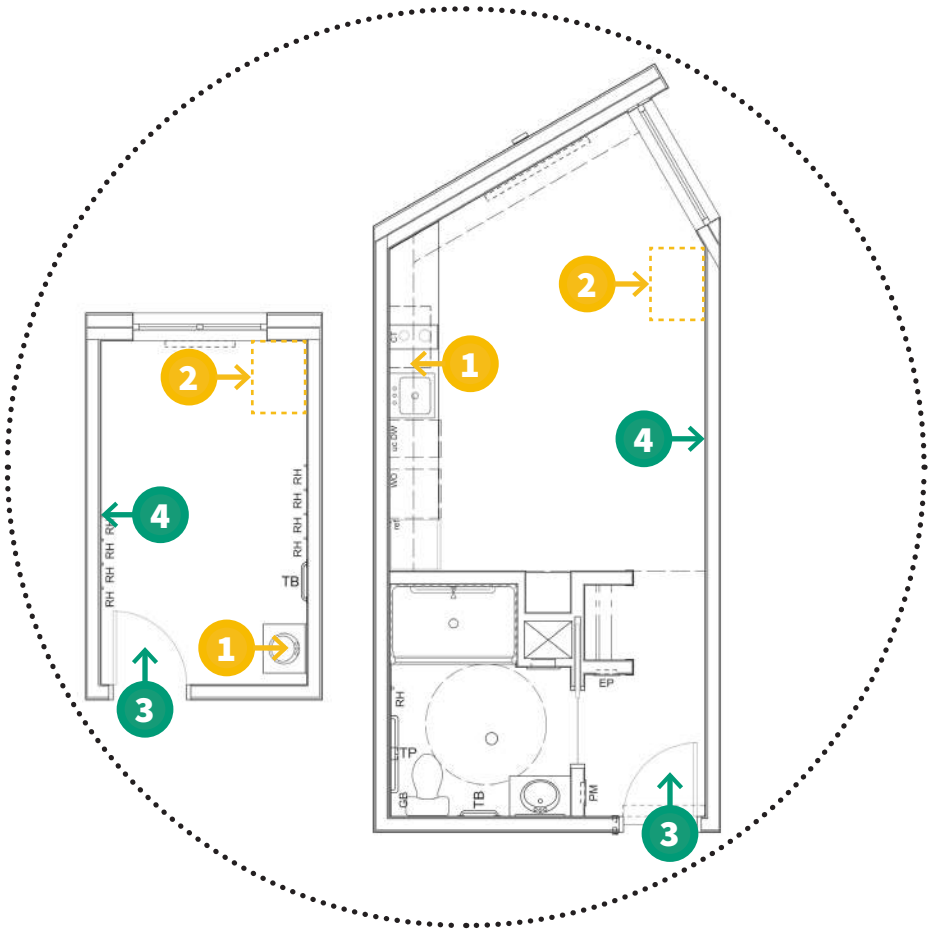
4.2.6. Units

The list below outlines design approaches used in the Model Building No. 2 units. It is followed by a proposed set of operational and design tactics to mitigate the risk and spread of infectious diseases such as COVID-19:

- Provided large windows in the living room and bedrooms of each unit for increased sunlight penetration in units.
- Provided operable windows in the living room and bedrooms of each unit to increase opportunities for natural ventilation.
- Provided open plan concept in order for occupants to adapt and arrange spaces according to their specific needs.
- Provided easy to clean surfaces, including flooring and shower inserts in the bathrooms.
- Provided close proximity of sink to unit entry, in order to facilitate increased hand washing.





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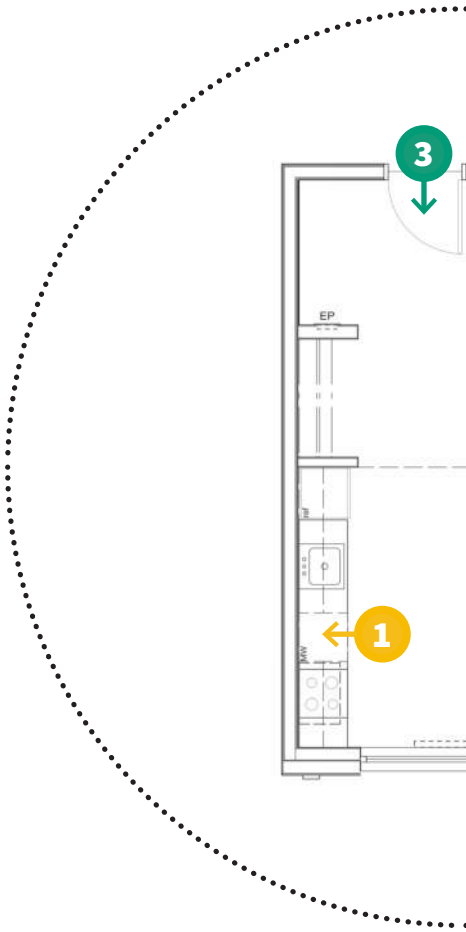

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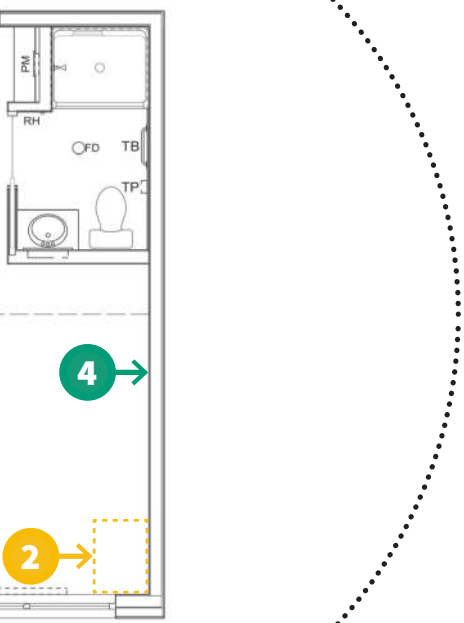
Proposed Design Strategies for Units

Low Cost · Medium Cost · High Cost

1. Increase durability of countertop and wall finishes to allow for increased sanitation.
2. Provide foldable desks and additional multi-port outlets to accommodate students and employees working from home.
3. Specify antibacterial metals for door hardware to reduce transmission of viruses and bacteria through surface contact.
4. Specify wipeable coatings and materials for fixtures, appliances and wall finishes.



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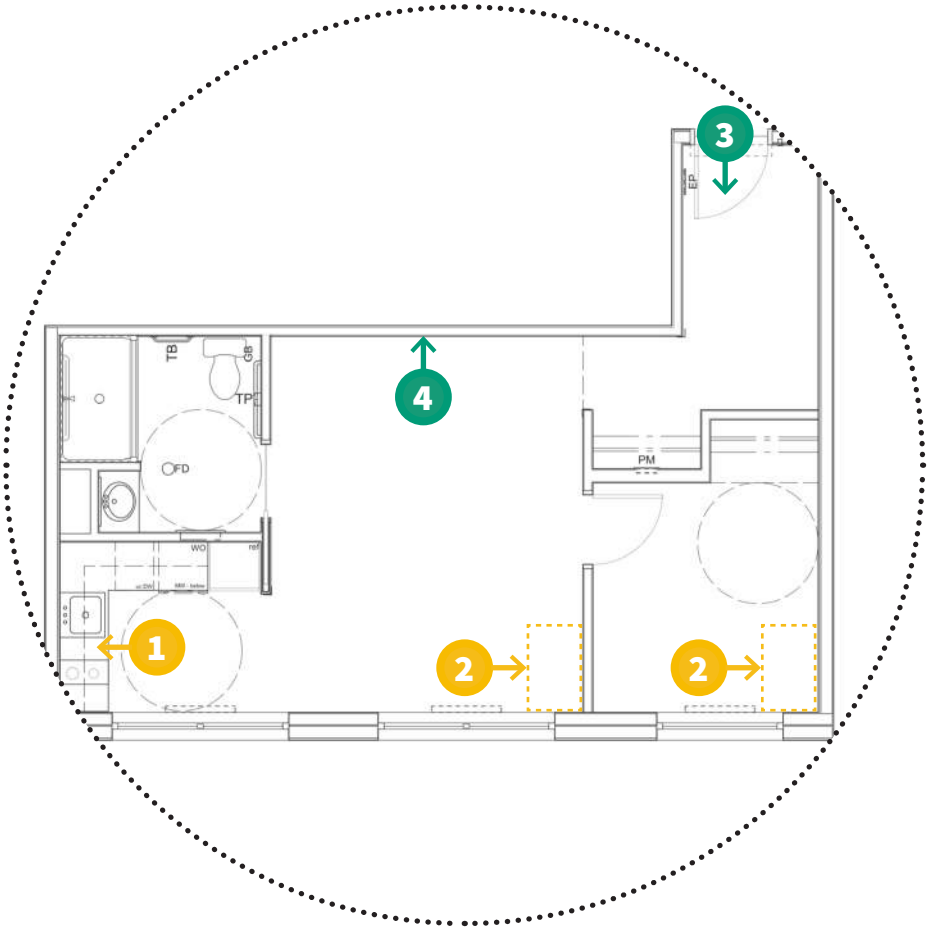

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4.2.7. HVAC Systems

The list below outlines design approaches used in the Model Building No. 2 HVAC System. It is followed by a proposed set of operational and design tactics to mitigate the risk and spread of infectious diseases such as COVID-19:

- Provided ventilation and partial cooling from central, roof-mounted energy recovery ventilator (ERV) to all shelter bedrooms an transitional suites.
- Provided central, roof-mounted energy recovery ventilator (ERV)-1 for ventilation of all amenity, program and supportive areas.
- Ensured there is no recirculation of ventilation air as supply air streams are separated from exhaust air streams.
- Ensured outdoor air is taken from the roof level ensuring that there is no possible contamination of ventilation supply air

Proposed Design Strategies for HVAC Systems

Low Cost | Medium Cost | High Cost

1. Proposed central ventilation systems be upgraded to MERV-13 filters
2. Proposed providing a divider in the amenity room should also include adding separate ventilation air supply and exhaust grilles to avoid air transfer between two sections of this space
3. Proposed two separate DX wall mounted fan coil units.
4. Proposed plumbing fixtures should be easy to disinfect and clean
5. Proposed plumbing fixtures in common areas be operated by touchless, infra-red sensors

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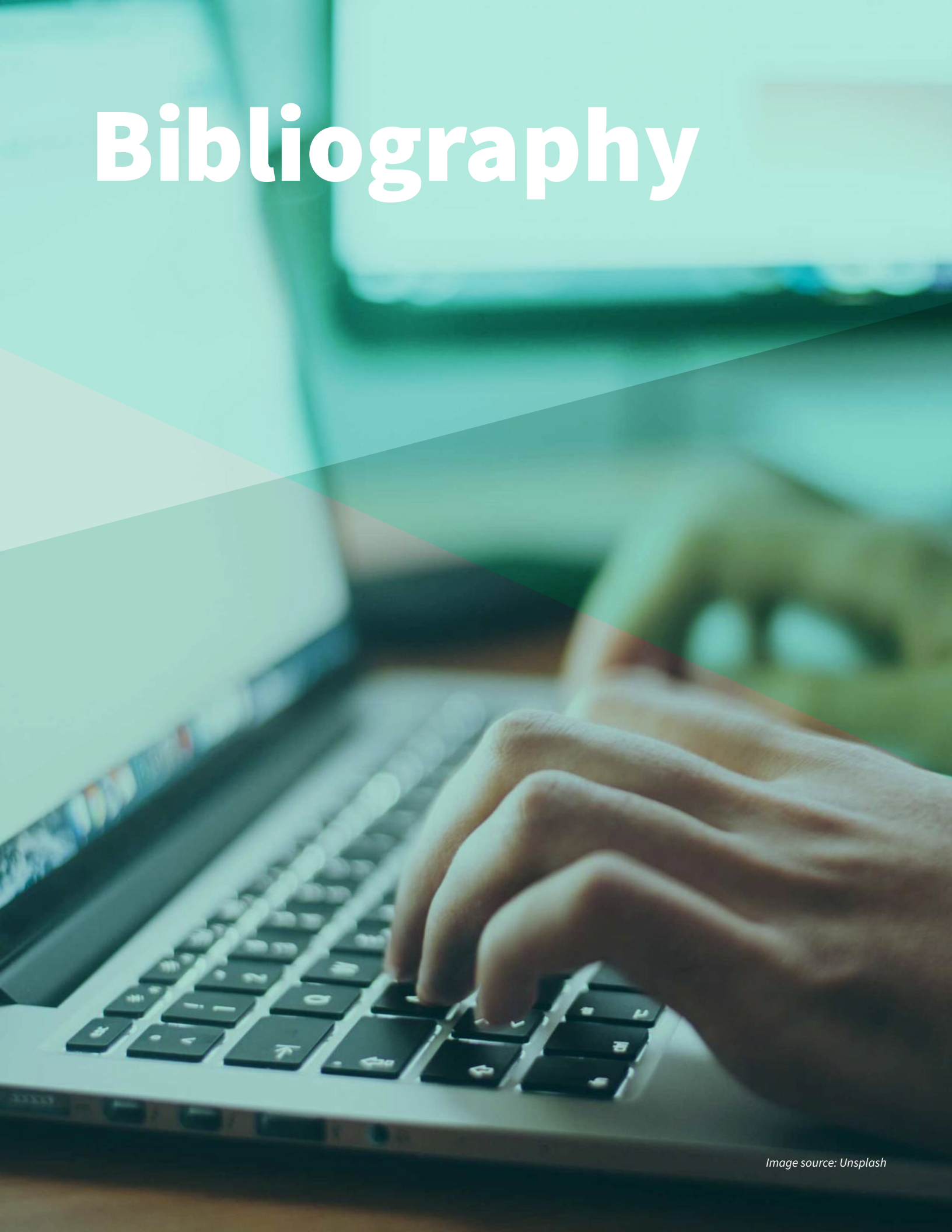

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