

Urban Housing and Crèche / 2011 / Sergison Bates Architects / Geneva, Switzerland / 8 storeys

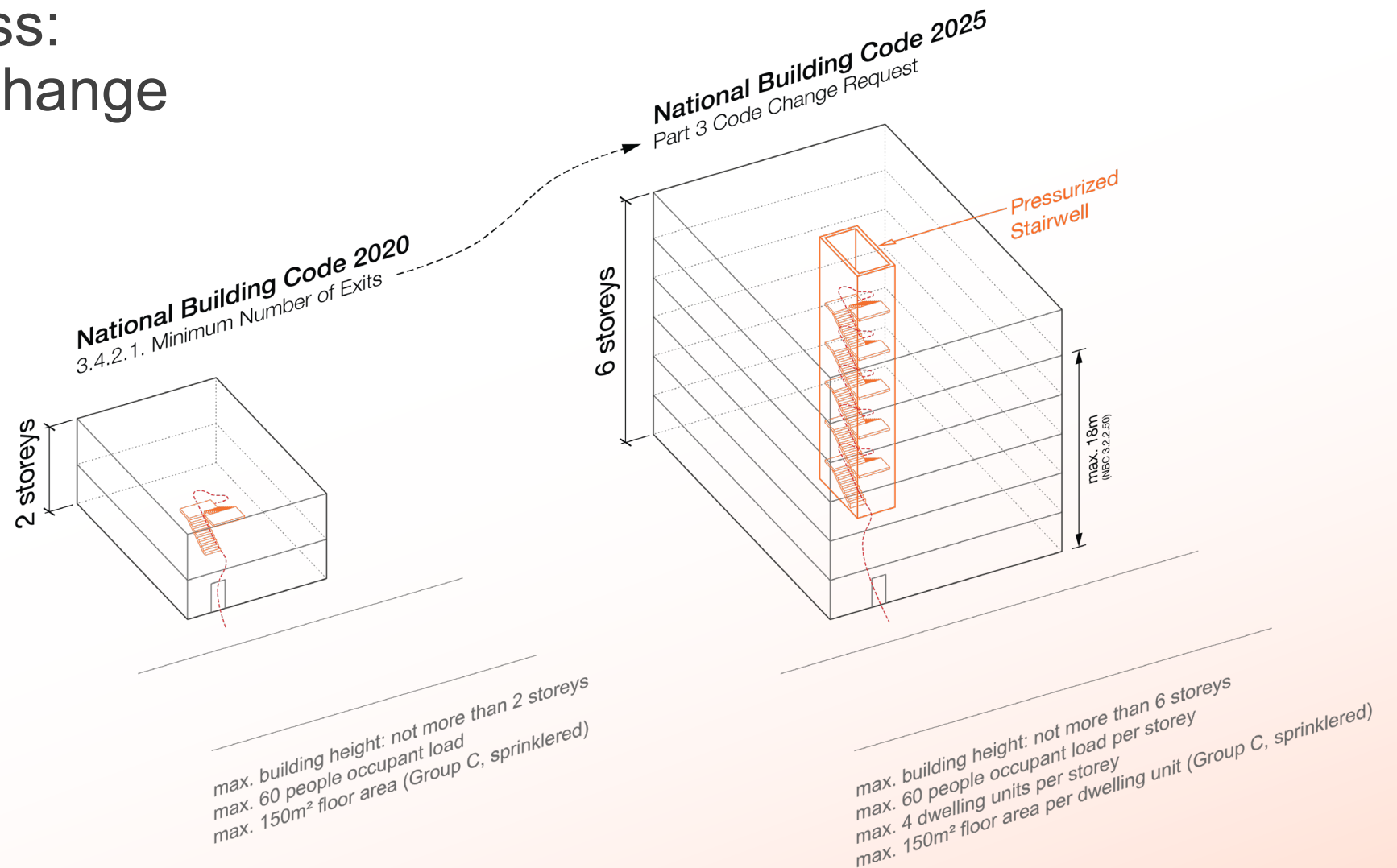
The Second Egress: Building a Code Change

Building Officials' Association of BC
2024 Conference

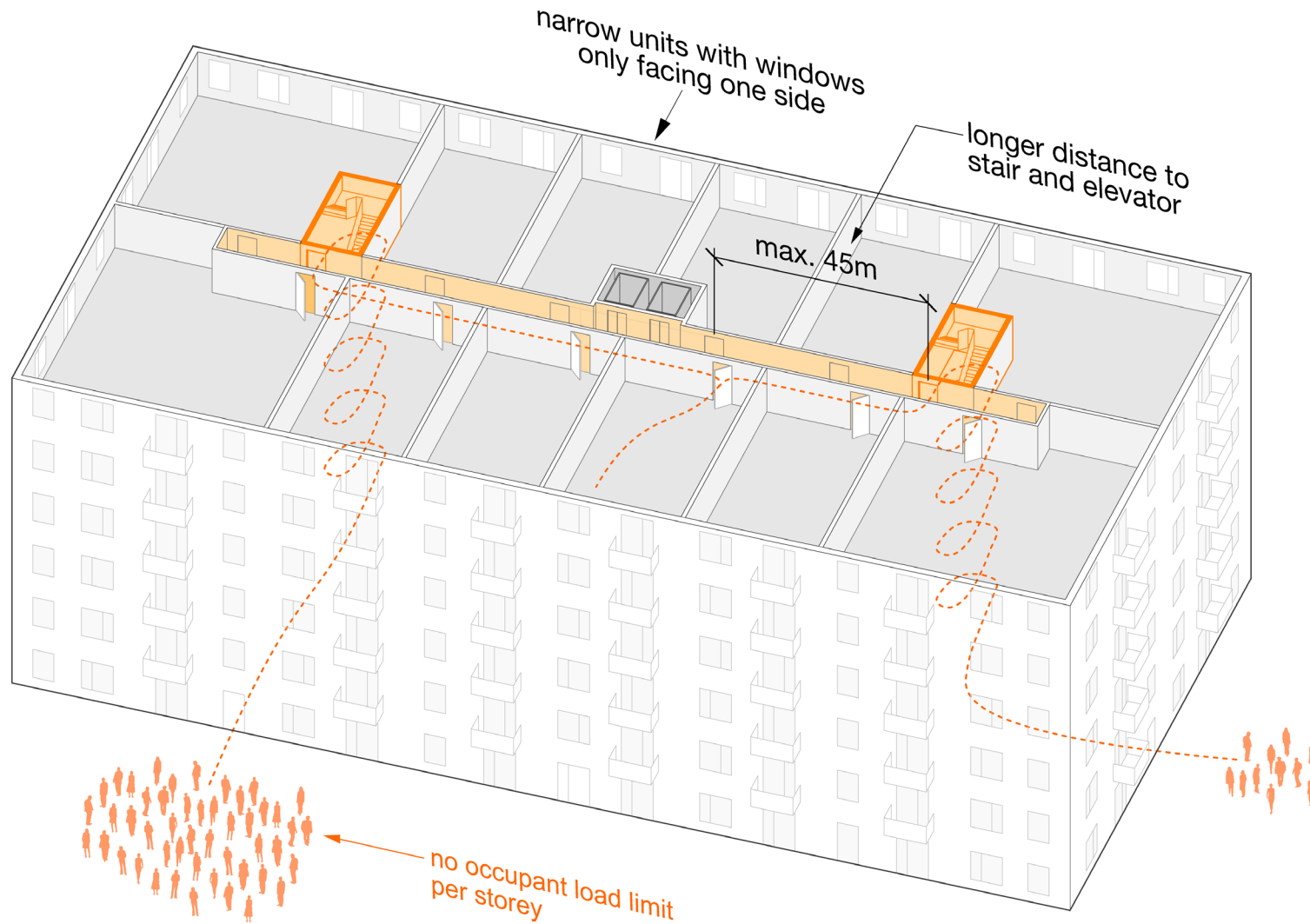
Richmond, BC
May 28, 2024

Conrad Speckert
Intern Architect, BAS, M.Arch

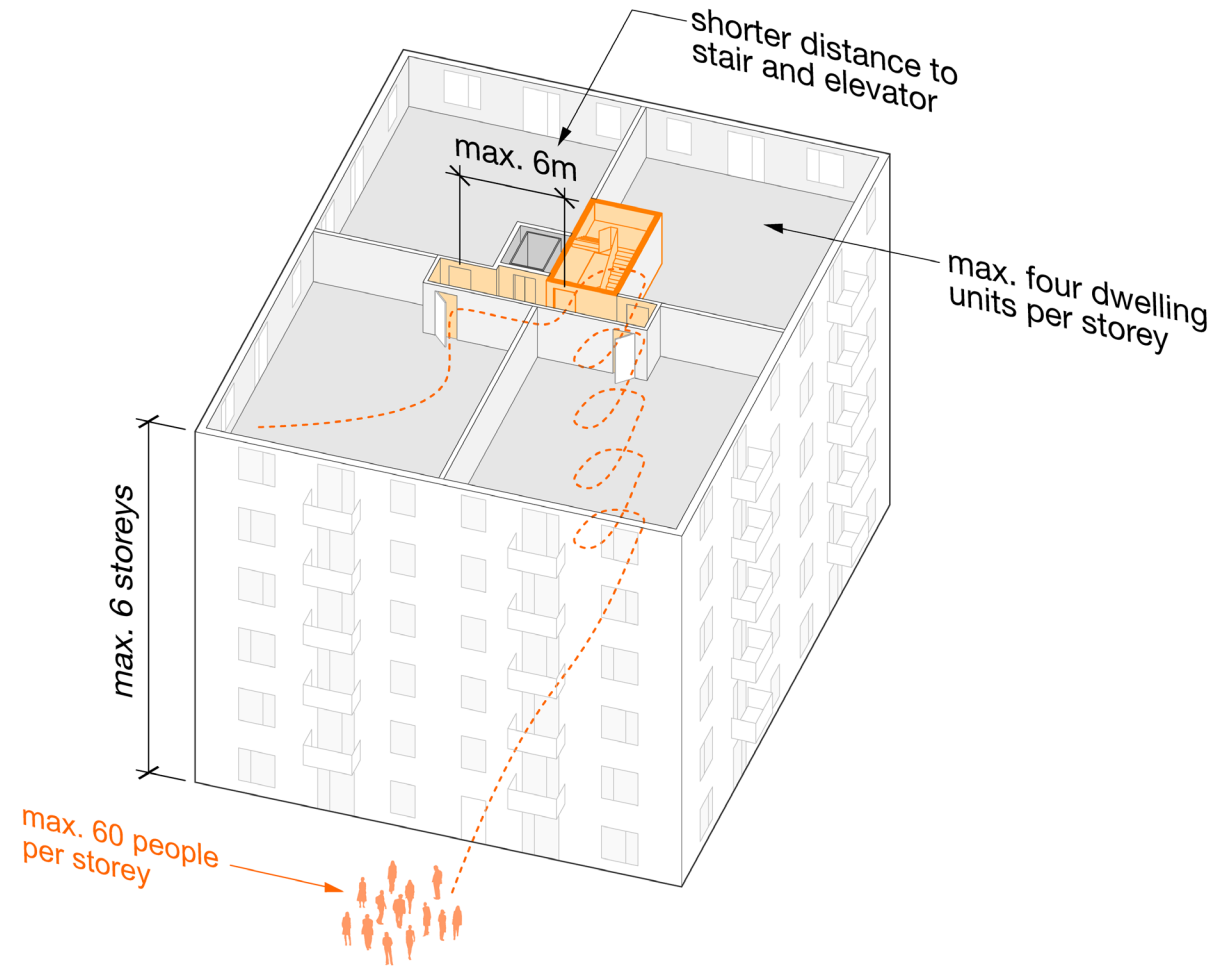
LGA Architectural Partners
Toronto, Canada



What is a typical double-loaded corridor apartment building?



What is a single stair building? (also known as point access block)





Main Streets Initiative Handicapped by Building Codes

Eberhard Zeidler

Eberhard Zeidler is a Principal with Zeidler Roberts Partnership Architects.

It started as an idea whose time had come. Editorials were written about it. The Council embraced it. A competition was mounted to explore its architectural possibilities. The idea was to urbanize our underused main streets with five-storey apartment buildings, which would increase the number of people living in the city and create better use of the existing infrastructure. But today, some five years later, it has produced nothing more than several convoluted bylaws to be passed and woeful editorials about the future of the scheme.

It behooves us to explore the reasons for the fizzle of a great concept, as it may help us to learn for the future or even get this idea realized some day.

I do not think we can blame the failure to build according to the Main Streets concept on the current recession. This plan should have encouraged building in a time of recession, because it deals with small, affordable, and sustainable development, and would use the existing infrastructure economically. Why is it such a good idea to build additional density by going up to five-storey buildings along some main streets in Toronto?

Historically, the main streets of Toronto grew rapidly before the First World War and seemed to be formed by a never-ending line of prototypical structures, mainly two or three storeys in height, with retail along the street enlivened by pedestrians, and one or two-storey apartments or offices above. Much of Queen Street West, Spadina, St. Clair, and Eglinton are still this way, although they were interrupted by some large developments after the Second World War. These new developments were based on modern planning theory, which regarded buildings as isolated sculptures unfolding their individual functions to the optimum, and regarded the street not as a related pedestrian realm but as a two-dimensional vehicular traffic connection.

The life of the street as the realm of the pedestrian was rediscovered through the eyes of Jane Jacobs and others. To prevent further erosion of the street through new development, bylaws were designed to maintain the building stock along the main streets and restrict their height to three storeys. Since there was little economic advantage for individuals to build a new building on these lots without any gain in density, the buildings just stayed. They are, in fact, still the backdrop of some of the most delightful and culturally rich urban life in Toronto. Most exist in a mildly decaying atmosphere but still provide room for urban commercial experiments.

I have watched the death and life of Queen Street East and West over the last 20 years from my office windows. The life that has slowly come back into that street demands respect and careful scrutiny.

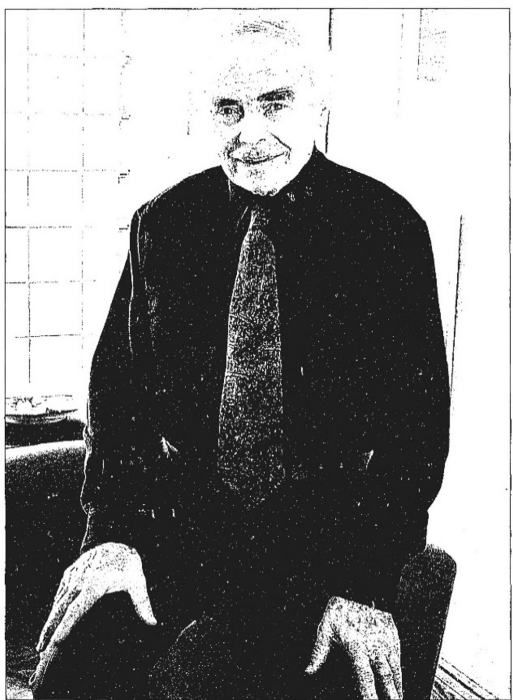
European architects and planners who have visited me over these 20 years have been amazed when they see this urban scene. They admire the lively urban drama on these streets - people crowding them at all times of day and night, even all times of the year (astounding in our climate). However, they are astonished too by the tawdry visual scene they see. In addition to the intrusive hydro poles and broken sidewalks are the collapsing facades of vintage buildings, occasionally broken by crude, modern box interventions or a beautifully restored Victorian facade. In their minds, they compare it unfavorably to the typical European street that was created at the turn of the century - from Haussmann's Paris boulevards to the streets of Berlin or Madrid. They were given their life support not only through retail but also through other activities in these 60- to 70-foot-high buildings, which presented not only a beautiful visual enclosure of the street but also an intricate mix of functions above the street-level commercial activity.



Stairway to a better Toronto



Christopher Hume Details



The problem in Toronto isn't building tall or small. It's building in between.

For years, planners have been trying to encourage the idea of intensifying the city's main streets with five- to six-storey buildings. Ground-floor units would be given to shops and restaurants, the upstairs apartments to residences and offices. It is a simple model, one that has worked brilliantly in Europe from London to Paris to Berlin.

Here, however, the concept has never taken off. Why? According to eminent Toronto architect Eb Zeidler, it has nothing to do with desire and everything to do with fire. Specifically, he argues, the trouble lies with the Ontario Building Code. It requires mid-rise structures to have two exits, one at either end of corridors that run the length of the building.

As Zeidler explains: "This has led to a standard layout in apartment buildings; a central corridor with stairs at either end and apartments lined up on each side. . . . The solution is acceptable on a north-south street where every apartment has an east or west exposure. But if you want to put these buildings along east-west streets, only the south-facing apartments have sun exposure. The ones on the north side would get little sun and, therefore, don't attract buyers."

The European model preferred by Zeidler allows developers to use a single-stair approach. This eliminates the need for hallways and means every unit can enjoy north and south exposures.

By contrast, Toronto has created conditions that favour height while protecting the countless two- to three-storey buildings that proliferate along many of our most important thoroughfares, including Yonge, Queen, College and St. Clair Ave. W.

While these tiny boxes give neighbourhoods much of their appeal, they aren't especially at-

Toronto architect Eb Zeidler says the key to a new urban renewal may lie in changing the Ontario Building Code. Insisting on two stairways limits the kinds of buildings that will be constructed.

tractive or, more important, efficient. Think of the Danforth, a vibrant, urban and hugely popular street with subway service and lots of amenities. How much better if it were defined by the low-rise buildings described by Zeidler?

Certainly, bringing more residents to the Danforth would also enable more people to take advantage of the Bloor subway now woefully underused.

But building code details such as this are not framed with the larger picture in mind. Of course, safety is important. There's no evidence, however, that European apartments are any more dangerous because of the single-stair system. Indeed, Zeidler claims the European method is safer than ours.

Ironically, when the city launched its much-vaunted Main Streets program about a

decade ago, hopes were high. The idea was to increase the population of the city without resorting to the multi-storey towers that neighbourhood groups despise.

The scheme was announced with much fanfare. No less a figure than Jane Jacobs was on hand to lend her approval to the scheme. That wasn't surprising. It's an idea that makes enormous sense.

After that came Toronto's new official plan. Adopted last year, it was explicitly devised to encourage growth on major arteries while keeping it out of single-family neighbourhoods.

So why has nothing happened? "The two-stair plan entrenched in our building codes should be eliminated," Zeidler insists, "to give us the incentive to rebuild our main streets with residential/commercial build-

ings that are in scale with the streets. . . ."

Others, while they agree with Zeidler, also point to the city's parking regulations as an obstacle to low-rise development. They force builders to provide parking spaces according to a formula based on the number of units. The demands tend to be so onerous that small-scale projects are often uneconomical.

Again, the rules were created in isolation of the larger whole. People might choose to live on a street such as the Danforth, for example, because they don't need a car or, therefore, parking.

As Zeidler makes clear, sometimes even the smallest details have major consequences. The fact they are unintended doesn't make them any less harmful.

Christopher Hume can be reached at chume@thestar.ca.

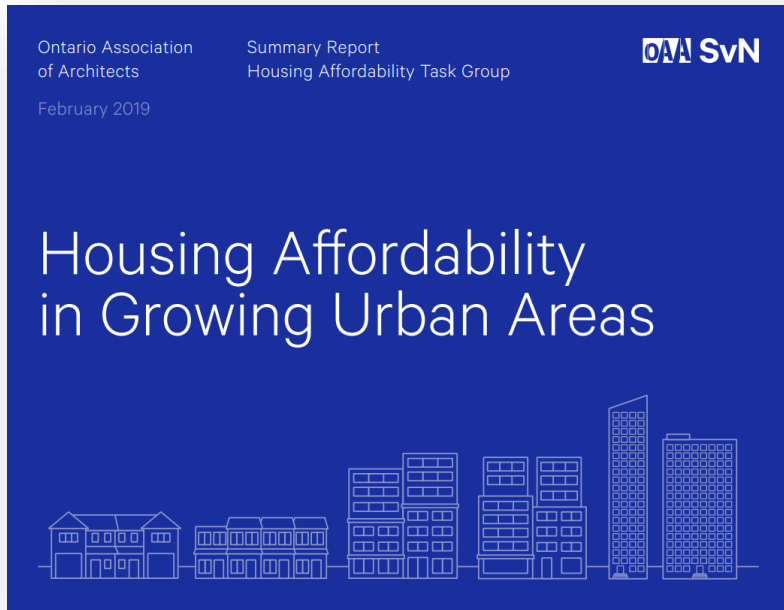




“Many mid-rise buildings on the Avenues could be expected to be located in close proximity to a fire station and should be provided with smoke and heat detectors that have a direct connection to a central fire alarm and to the fire department.

Given these factors and the additional fire suppression mechanism of sprinklers, cost-saving measures such as allowing floors to be served by one exit stair only could be considered.

Such a measure would free up more valuable space for residential and retail uses and improve the efficiency of the buildings. The savings would accrue even if some additional conditions are imposed, such as maximum distances between suite entry door and stairwell; requiring all units to have balconies or other places of refuge; and specifying a maximum building height based on the height that a ladder truck or other rescue vehicles could safely access.”



https://oaa.on.ca/oaa/assets/images/bloaags/text/oaa_hatg_-_feb_11_-_final.pdf

Goal B: Make Housing Financially Attainable

Actions

Reduce Construction Costs

- Increase Zoning permissions in Neighbourhoods and Corridors;
- Reduce development charges and application fees; and
- Promote modular and pre-fabricated housing.

Changes to the Ontario Building Code (OBC)

In addition to revising current municipal land use regulations and Zoning permissions, the Ontario Building Code should be revised to remove regulatory hurdles in order to reduce construction costs. *Example: Create an alternative means of achieving Ontario Building Code compliance to permit a 4-storey building with a single exit. This would require oversight by a Licensed Architect*

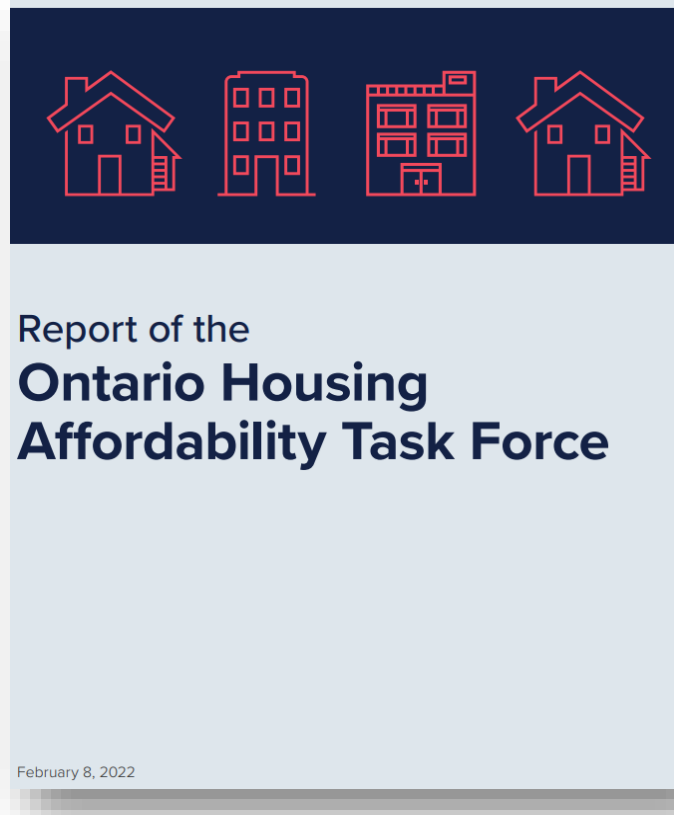
Financial Model Opportunities

The OAA should support the exploration and development of new Financial Models that are supportive of housing affordability.

Results

Taking these actions has the potential to make housing available to citizens with incomes ranging from \$25,000 to \$120,000.

February 2022



3. Limit exclusionary zoning in municipalities through binding provincial action:

a) Allow “as of right” residential housing up to four units and up to four storeys on a single residential lot.

b) Modernize the Building Code and other policies to remove any barriers to affordable construction and to ensure meaningful implementation (e.g., allow single-staircase construction for up to four storeys, allow single egress, etc.).

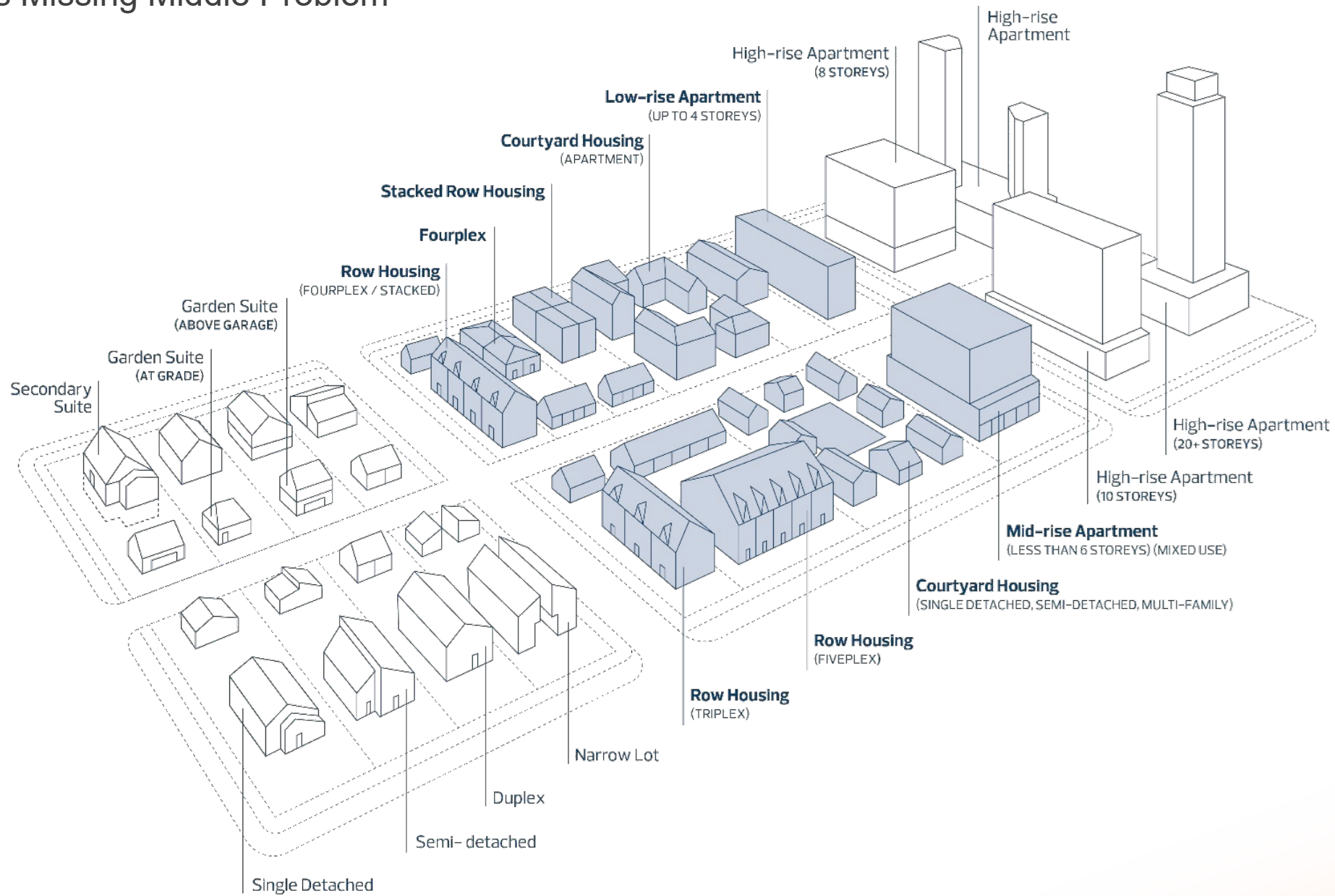
4. Permit “as of right” conversion of underutilized or redundant commercial properties to residential or mixed residential and commercial use.

5. Permit “as of right” secondary suites, garden suites, and laneway houses province-wide.

6. Permit “as of right” multi-tenant housing (renting rooms within a dwelling) province-wide.

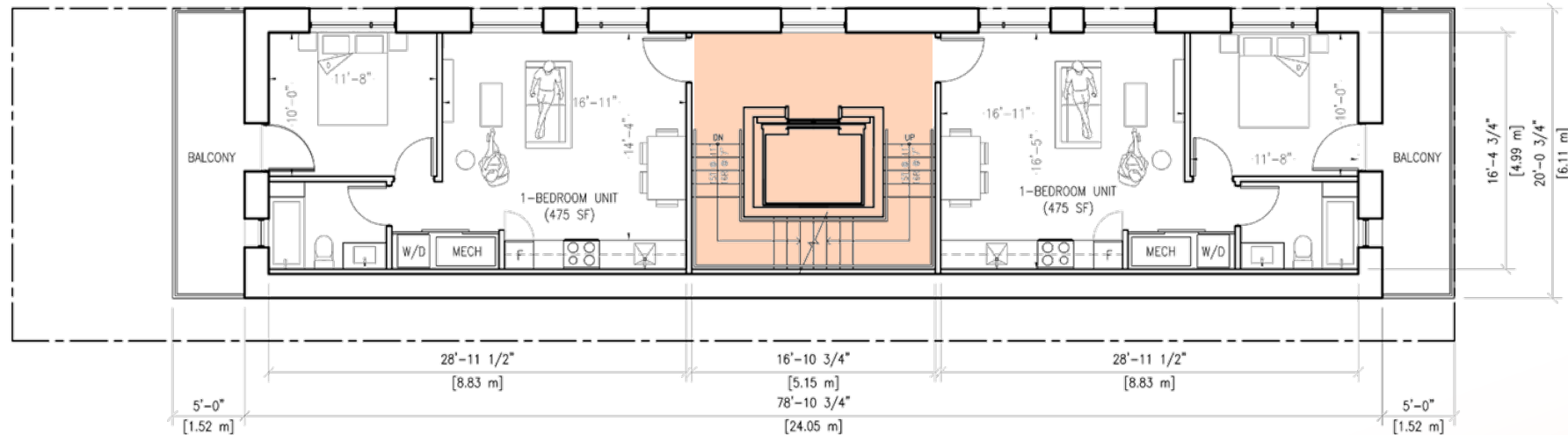
7. Encourage and incentivize municipalities to increase density in areas with excess school capacity to benefit families with children.

Canada's Missing Middle Problem



“On small and narrow lots, a single access/egress stair option as opposed to requiring a second egress for buildings 4-storeys or taller, would allow for more units on small sites and more efficient building designs.”

Fire safety analysis and building code expertise is required to propose and justify an alternative to the requirements in the Ontario Building Code. The Pilot will explore design solutions working within the current regulatory requirements to optimize missing middle projects on small sites. Other necessary City Divisions will be consulted as design options are further developed.”



3.4.2. Number and Location of Exits from Floor Areas

3.4.2.1. Minimum Number of Exits

1) Except as permitted by Sentences (2) to (4), every *floor area* intended for *occupancy* shall be served by at least 2 *exits*.

2) A *floor area* in a *building* not more than 2 *storeys* in *building height*, is permitted to be served by one *exit* provided the total *occupant load* served by the *exit* is not more than 60, and

- a) in a *floor area* that is not *sprinklered* throughout, the *floor area* and the travel distance are not more than the values in Table 3.4.2.1.-A, or
- b) in a *floor area* that is *sprinklered* throughout
 - i) the travel distance is not more than 25 m, and
 - ii) the *floor area* is not more than the value in Table 3.4.2.1.-B.

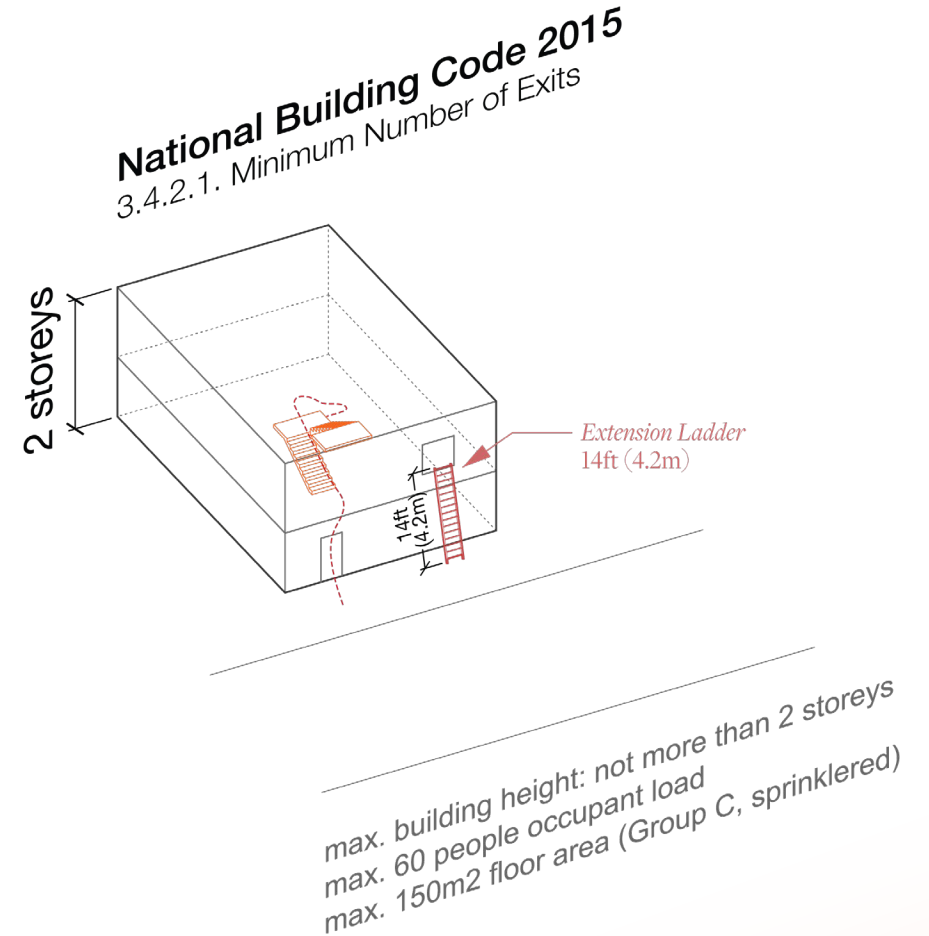
9.9.8. Exits from Floor Areas

9.9.8.2. Number of Required Exits

1) Except as provided in Sentence (2) and Subsection 9.9.9., at least 2 *exits* shall be provided from every *floor area*, spaced so that the travel distance to the nearest *exit* is not more than

- a) 40 m in the case of *business and personal services occupancies*,
- b) 45 m for all *occupancies* where the *floor area* is *sprinklered*, and
- c) 30 m for all other *occupancies*.

2) Except as provided in Subsection 9.9.9., a single *exit* is permitted from each *storey* in *buildings* of 1 and 2 *storeys* in *building height* provided the *floor area* and travel distance requirements conform to those required in Article 9.9.7.4. and the total *occupant load* served by an *exit* facility does not exceed 60 persons.

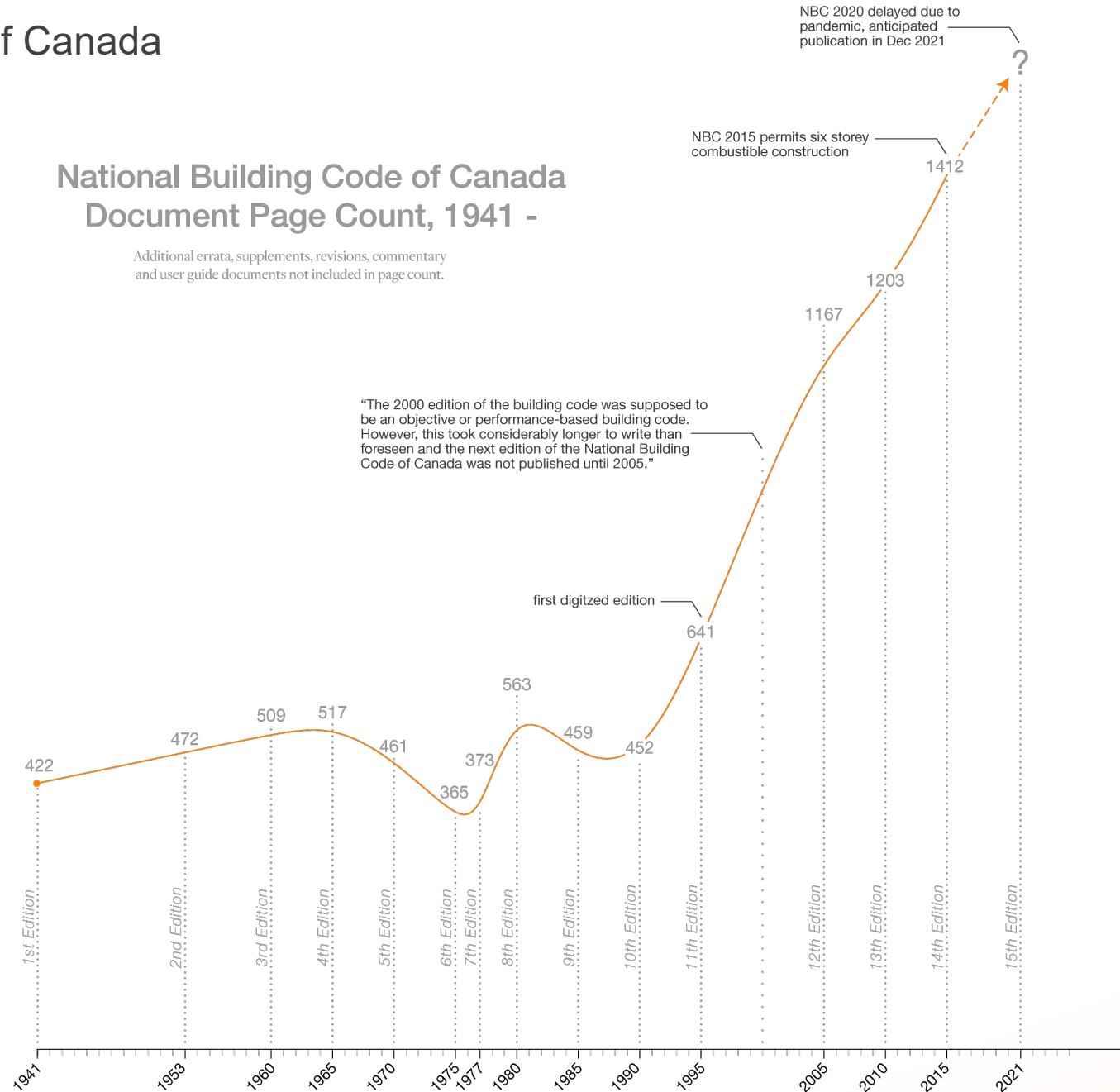


National Building Code of Canada

The first edition of Canada's National Building Code was published in 1941 and was based on the US model codes available at that time.

National Building Code of Canada Document Page Count, 1941 -

Additional errata, supplements, revisions, commentary and user guide documents not included in page count.



NBC 1941

The first edition of the building code allows up to three storeys and 3,000 square feet of non-combustible construction to be served by a single exit.

(c) **From Floor-areas not on the Ground Floor.**—Every such *floor-area* shall have *direct access* to at least two independent *exits*, except that in the following cases one *exit* shall be sufficient:

- ? (i) *Floor-areas* of 3000 square feet or less in buildings of Type 1A, 1B, or 1C Construction not over three *storeys* in *height* whose occupancies are included in Division 3 or 4 of Group C, Commercial and Industrial, or in Group D, Residential, or in Group E, Accessory.
- ? (ii) *Floor-areas* of 3000 square feet or less in buildings of any type of construction not over two *storeys* in *height* whose occupancies are included in Division 3 or 4 of Group C, Commercial and Industrial, or in Group E, Accessory.
- ? (iii) Any *floor-area* wholly contained within a *dwelling unit* located within two *storeys* of the ground when such *dwelling unit* has principal means of access by a private doorway or *stairway* from the *street*.
- ? (iv) *Floor-areas* in apartment houses when each apartment has private access to a second *exit*.
- ? (v) *Floor-areas* of 6000 square feet or less in a building of Type 1A, 1B, or 1C Construction used for any occupancy classified under Division 3 or 4 of Group C, when the building is sprinklered throughout and the maximum distance* from any point on the *floor-area* to an *exit* does not exceed 50 feet; provided, however, that sprinklers shall not be required in office buildings.

NBC 1953

The second edition introduces occupancy load limits for a single exit and restricts the maximum floor area from 3,000 down to 1,000 square feet.

National Building Code of Canada (1953). Revision Slip. June 1958 (Series 2).

3.20.7.3 Number, Location and Width of Exits from Floor Areas

Delete Sections (a) and (b) and replace by:

(a) Exit facilities complying with this section shall be provided for each *floor area* which is contained within exterior walls, or exterior walls and required *fire walls*, and from each *floor area* which is cut off by any means from the remainder of the *storey* on which it is located.

(b) MINIMUM NUMBER OF EXITS

Every *floor area* with an area of 1,000 square feet or more or an *occupancy* in excess of sixty persons shall have at least two separate *exits*.

Every *floor area* which has an *occupancy* classed as hazardous or in which *hazardous substances* are used or stored shall have at least two separate exits.

NBC 1960

The third edition outlines the principles for the design of means of egress, engraining these concepts in future developments of the code.

Principle 1: *Means of egress* are of two kinds, *exit* and *access to exits*.

Exits (such as stair towers) should be designed for the sole purpose of escape. The standards of design within any *exit* enclosure should be adequate to satisfy the extra hazards of escape under the severe conditions imposed by fire. In many cases the standards for *access to exits* must be less stringent than those for *exits* because the access is within a *floor area* and must serve the needs of everyday use and *occupancy* as well as escape. Where *floor areas* are divided into rooms served by corridors, such corridors, even though they are defined as “access”, should be regarded almost as an “exit”.

Principle 2: *Means of egress*, both access and exits, should be designed to increase in width as tributary population feeds into the main stream.

Principle 3: *Means of egress* should be designed so that the escape route is always in a direction away from any possible fire. This means, in theory, that for any position in a *building* which might be occupied, it should be possible to travel in two directions since it is unlikely that both will be cut off at once. Ideally, therefore, corridors should have *exits* at both ends. Practically, it is difficult to achieve this ideal within individual suites and it is less important to achieve it in some circumstances such as where an entire *floor area* is one office or under the control of one person or which is not intended for infirm persons or for sleeping. Under some circumstances, therefore, a reasonable length of dead end may be tolerated but only with the *approval* of the *authority having jurisdiction* and only when no other reasonable solution exists.

Principle 4: Exit safety in multistory *buildings* is almost wholly dependent on the escape routes from any floor being fire separated from the other floors. This not only means that all exit stairs should be in fire-resistive shafts but that the doorways in such shafts should be closed off with fire doors. Even this is almost useless unless such doors are kept closed. Unless these construction practices are adhered to and the discipline of keeping doors closed is maintained, equivalent safety (ultimate safety is never possible) can only be achieved by the most complete sprinkler system and elaborate and expensive alarms.

Principle 5: With *occupancies* which are slow to evacuate such as hospitals and which are contained in multistory *buildings*, the principle is applied of providing temporary safe places of refuge on each floor rather than relying on complete and immediate evacuation. This requires a high standard of fire resistance in the *building* and demands that each floor be divided into two compartments or *floor areas* separated by a *fire wall* with fire doors so that when a fire occurs in one compartment patients can be moved horizontally to the other compartment where, shut off from the fire, the slow evacuation to the street can commence.

NBC 1977

The seventh edition introduces travel distances depending on occupancy to determine if one exit is allowed.

Table 3.4.2.A.

Forming Part of Sentence 3.4.2.1.(2)

<i>Occupancy of Floor Area</i>	<i>Maximum Floor Area, sq ft</i>	<i>Maximum Travel Distance, ft</i>
Group A	1,500	50
Group B	750 ⁽¹⁾	35 ⁽¹⁾
Group C	1,000 ⁽¹⁾⁽²⁾	50 ⁽¹⁾⁽²⁾
Group D	2,000	75
Group E	1,500	50
Group F, Division 2	1,500	35
Group F, Division 3	2,000	50
Column 1	2	3

Notes to Table 3.4.2.A.:

⁽¹⁾ Single *exit* is permitted only when such *exit* is an exterior door at or near ground level.

⁽²⁾ See Sentence 3.3.4.2.(6) for *dwelling units*.

NBC 1980

The eight edition permits one exit for three-storey townhouses with third floor balconies.

This edition also clarifies that dwelling units in buildings up to three storeys don't require corridor fire separation provided they have a second separate exit.

3.3.4.3.(1) Except as provided in Sentences (2) and (3), every *dwelling unit* containing more than 1 *storey* shall have an *exit* door or an egress door opening directly into a *public access to exit* from the uppermost *storey* and from the lowest *storey* of the *dwelling unit* so that the floor level of each such *storey* is served by an *exit* or egress door located not more than 1.5 m above or below the floor level.

(2) A single *exit* is permitted from a *dwelling unit* provided the *exit* is an exterior door at or near ground level and

- (a) it is not necessary to travel up or down more than 1 *storey* to reach the *exit* door, or
- (b) the uppermost floor level opens to a balcony not more than 6 m above adjacent ground level.

(3) An egress door from either the uppermost *storey* or the lowest *storey* in a *dwelling unit*, as required in Sentence (1), need not be provided where the floor level has a door that opens directly into a stairway that

- (a) leads to a *public access to exit*,
- (b) has no direct access to any other floor level in the *dwelling unit*, and
- (c) is separated from the *dwelling unit* by a *fire separation* having a *fire-resistance rating* of at least $\frac{3}{4}$ h.

(4) In buildings of residential occupancy not more than 3 storeys in building height, a doorway from a *dwelling unit* is permitted to open directly into an *exit* stairway provided such *dwelling unit* has a second and separate *means of egress*.

(5) A doorway from a *dwelling unit* may open onto an interior corridor served by a single *exit*, or an exterior balcony served by a single *exit* stairway, or an exterior passageway served by a single *exit* stairway provided each *dwelling unit* has a second and separate *means of egress*.

NBC 1995

The eleventh edition of the code subdivides the table on Criteria for One Exit between sprinklered and non-sprinklered floor areas.

Table 3.4.2.1.A.
Criteria for One Exit (Floor Area Not Sprinklered Throughout)
 Forming Part of Sentence 3.4.2.1.(2)

<i>Occupancy of Floor Area</i>	<i>Maximum Floor Area, m²</i>	<i>Maximum Travel Distance, m</i>
Group A	150	15
Group B	75	10
Group C	100	15
Group D	200	25
Group E	150	15
Group F, Division 2	150	10
Group F, Division 3	200	15

Table 3.4.2.1.B.
Criteria for One Exit (Floor Area Sprinklered Throughout)
 Forming Part of Sentence 3.4.2.1.(2)

<i>Occupancy of Floor Area</i>	<i>Maximum Floor Area, m²</i>
Group A	200
Group B	100
Group C	150
Group D	300
Group E	200
Group F, Division 2	200
Group F, Division 3	300

NBC 2005

The introduction of objective and functional statements to allow for “performance-based design” as alternative code compliance

Division A - Part 2.2 Objectives

OS1 Fire Safety

An objective of this Code is to limit the probability that, as a result of the design or construction of the building, a person in or adjacent to the building will be exposed to an unacceptable risk of injury due to fire.

The risks of injury due to fire addressed in this Code are those caused by—

- OS1.1 - fire or explosion occurring
- OS1.2 - fire or explosion impacting areas beyond its point of origin
- OS1.3 - collapse of physical elements due to a fire or explosion
- OS1.4 - fire safety systems failing to function as expected
- OS1.5 - persons being delayed in or impeded from moving to a safe place during a fire emergency

OS3 Safety in Use

An objective of this Code is to limit the probability that, as a result of the design or construction of the building, a person in or adjacent to the building will be exposed to an unacceptable risk of injury due to hazards. The risks of injury due to hazards addressed in this Code are those caused by—

- OS3.1 - tripping, slipping, falling, contact, drowning or collision
- OS3.2 - contact with hot surfaces or substances
- OS3.3 - contact with energized equipment
- OS3.4 - exposure to hazardous substances
- OS3.5 - exposure to high levels of sound from fire alarm systems
- OS3.6 - persons becoming trapped in confined spaces
- OS3.7 - persons being delayed in or impeded from moving to a safe place during an emergency (see Appendix A)

Division A - Part 3.2 Functional Statements

- F05 To retard the effects of fire on emergency egress facilities.
- F06 To retard the effects of fire on facilities for notification, suppression and emergency response.
- F10 To facilitate the timely movement of persons to a safe place in an emergency.
- F11 To notify persons, in a timely manner, of the need to take action in an emergency.
- F12 To facilitate emergency response.

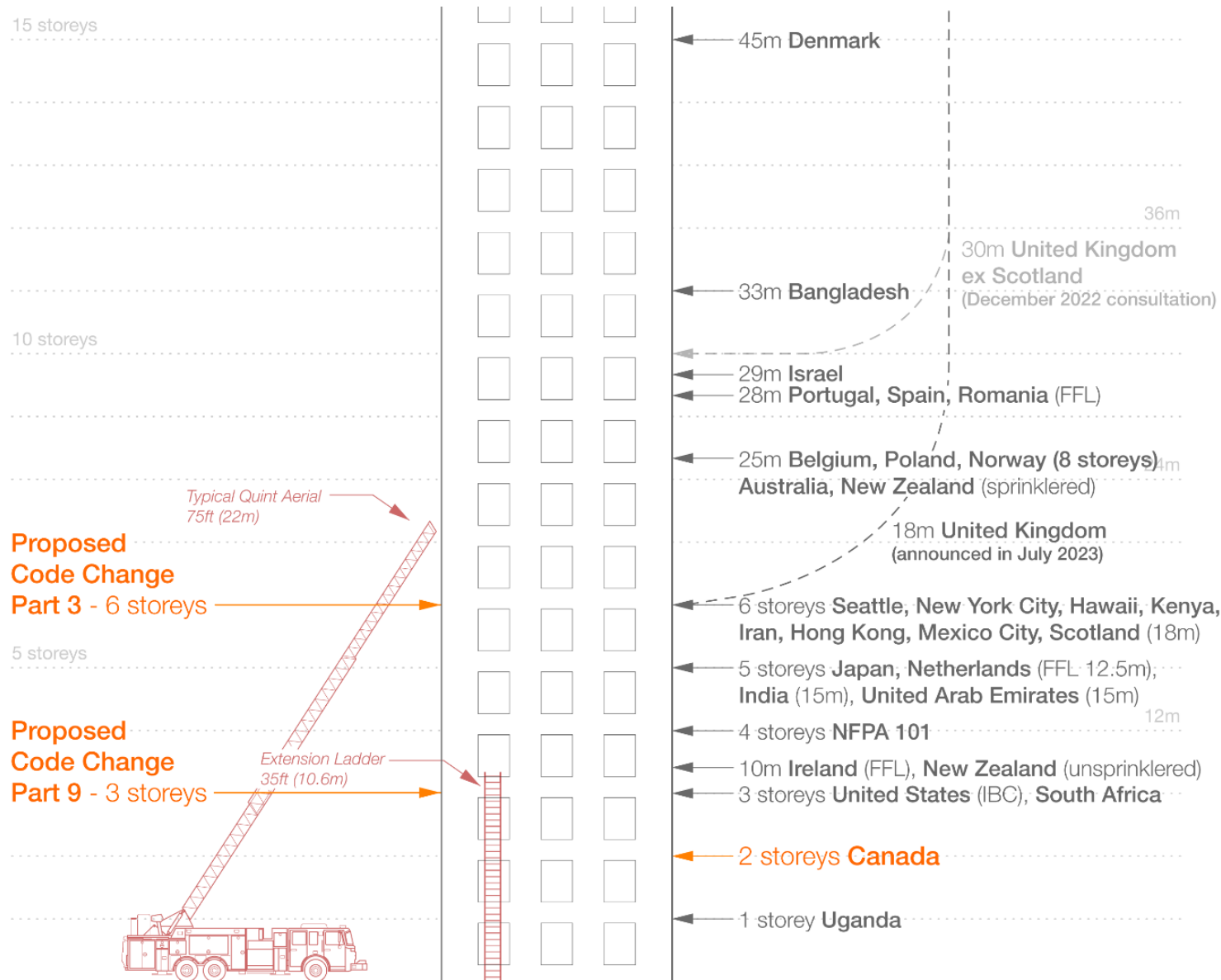
- 1. Construction:** The methods of construction were vastly different and methods of determining fire resistance of structures were in their infancy.
- 2. Compartmentation:** The degree of building compartmentation that was factored into the reviews is not representative of residential construction in today's code.
- 3. Interior Finishes:** Interior finishes were less controlled and flame-spread concepts were in their infancy. Wood was a more predominant ceiling finish, whereas gypsum board is a more common material for walls and ceilings in residences today.
- 4. Evacuation:** Exiting, fire alarm systems, and evacuation plans were less regulated and less effective. Concepts on evacuation relative to building height were based on buildings with open or unprotected stairs and not fire separated stair shafts as required by today's codes.
- 5. Behaviour:** The behaviour of people during a fire had not been studied and was therefore not understood.
- 6. Firefighting:** To the extent that it exists today, fire services did not have breathing apparatus, firefighter's stairs, aerial ladder trucks, addressable fire alarm systems, and floor plans.

Senez Reed Calder Fire Engineering Inc. (2008). "A Historical Perspective on Building Heights and Areas in the British Columbia Building Code." Building and Safety Policy Branch, Office of Housing and Construction Standards, Victoria, BC. pg 23-24.
https://www2.gov.bc.ca/assets/gov/farming-natural-resources-and-industry/construction-industry/building-codes-and-standards/reports/2008_senez_reed_calder_2008_10_17.pdf

Jurisdictional Scan



Jurisdictional Scan



Maximum Prescriptive* Height for Single Staircase Buildings
 multi-unit residential occupancies only (apartment buildings)

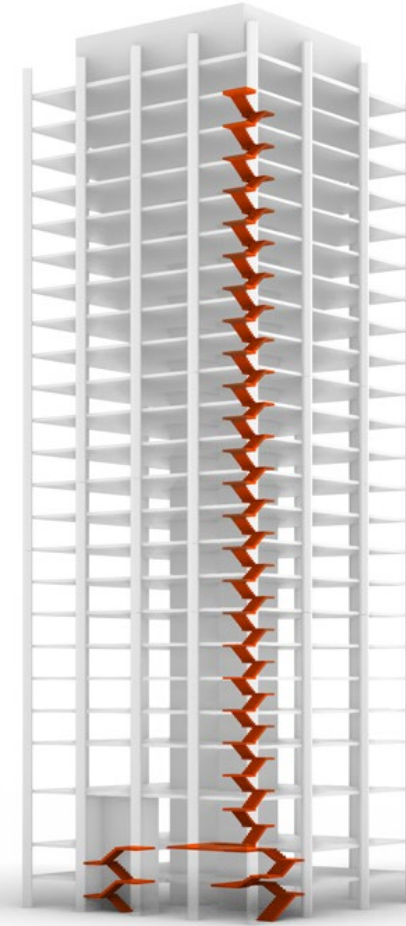
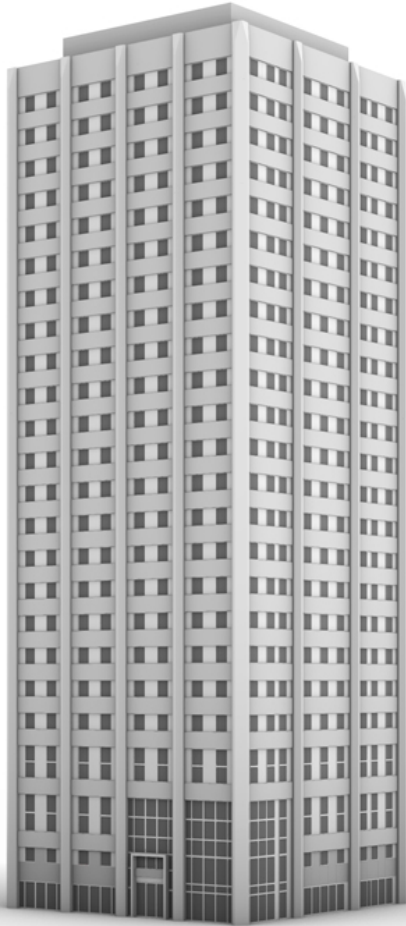
FFL = uppermost finish floor level

Note: the drawing assumes a floor-to-floor height of 3m

*some jurisdictions provide statutory law requirements while other jurisdictions publish guidance and allow alternative solutions subject to performance-based design (updated April 2024)

Grenfell

The UK does not have a vertical restriction for single stair conditions, rather limiting single stair conditions with maximum horizontal travel distances and an occupancy load limit of 60 people per storey.





<https://www.theguardian.com/uk-news/2019/jul/17/delays-to-safety-reforms-risk-a-repeat-of-grenfell-disaster>

Rethink for skyscraper near Grenfell site with single fire escape staircase

The planned 35-storey block is the second tower this month to be adapted after criticism



Artist's impression of the planning application sketch by Unibail-Rodamco-Westfield (URW), which includes the depiction of a tower block which has drawn criticism from Grenfell survivors. Photograph: Unibail-Rodamco-Westfield (URW)/PA

The developer of a residential skyscraper designed with only one fire escape staircase has said it is changing its plans as the London fire brigade (LFB) said it was unhappy with the proposal.

RIBA demands fire regs clarity amid single-stair towers controversy

26 JANUARY 2022 · BY KATE YOUDE

The RIBA has joined fire safety experts in calling for new regulation on staircases in high-rise residential blocks following recent concerns over two proposed single-stair skyscrapers in London



Gavin Tomlinson is chief fire officer at Derbyshire FRS, and chair of the protection and business safety committee at the NFCC

The case for multiple staircases in new high-rise buildings

COMMENT 14.12.22 BY GAVIN TOMLINSON

In the past three years, there have been 154 fires in London where more than 10 people evacuated a high-rise block of flats. It is time to start mandating second staircases, writes *Gavin Tomlinson*

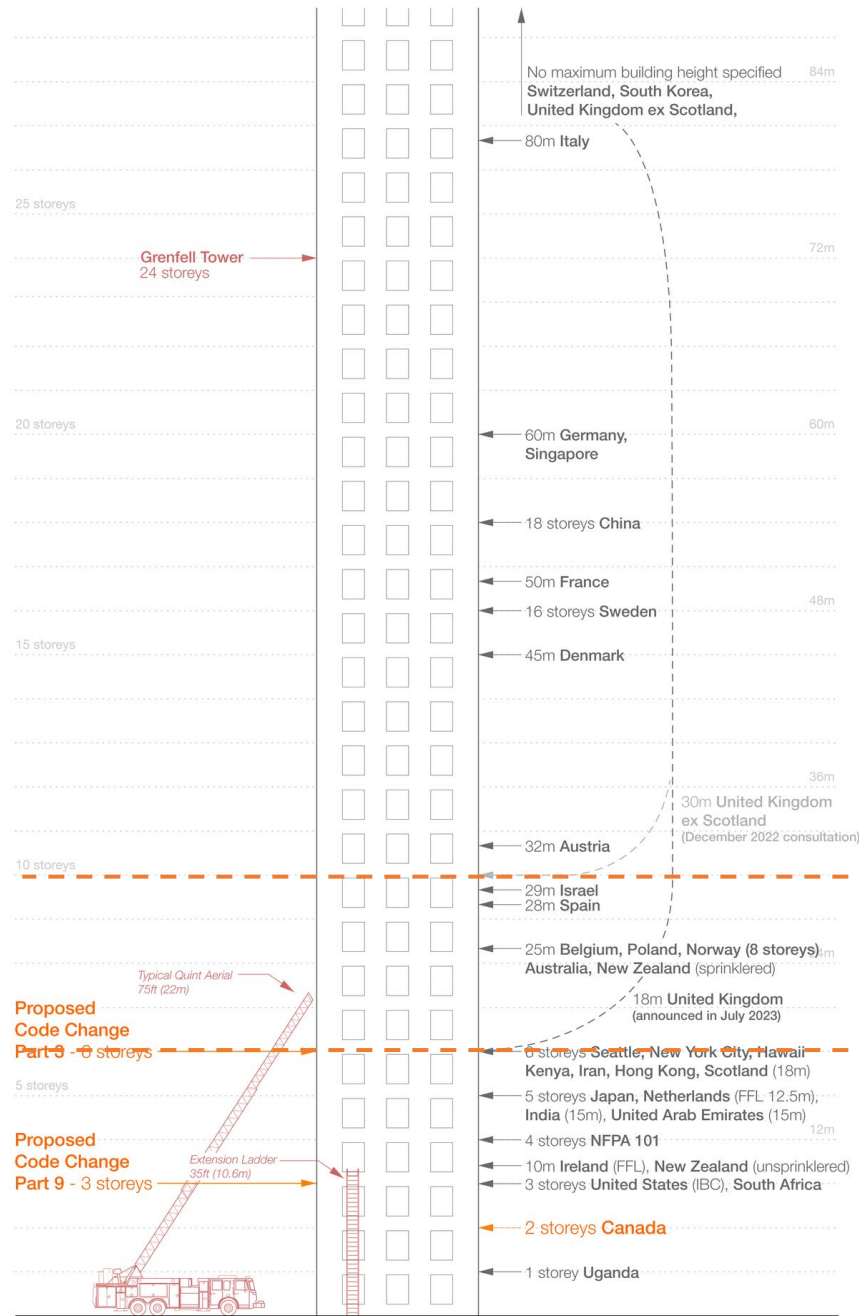
Government warns over single staircase use in high-rise buildings

NEWS 31.08.22 7.00 AM BY JACK SIMPSON

Grenfell

December 2022:
 “recommend a second staircase be provided in residential buildings over 30 metres in height, which would introduce a defined threshold for a second stair for the first time in England.”

July 2023:
 “require two staircases in all new residential high-rises taller than 18m, rather than the 30m threshold previously proposed.”



30m (December 2022 Consultation)

18m (July 2023 Decision)

<https://www.gov.uk/government/consultations/sprinklers-in-care-homes-removal-of-national-classes-and-staircases-in-residential-buildings/sprinklers-in-care-homes-removal-of-national-classes-and-staircases-in-residential-buildings>



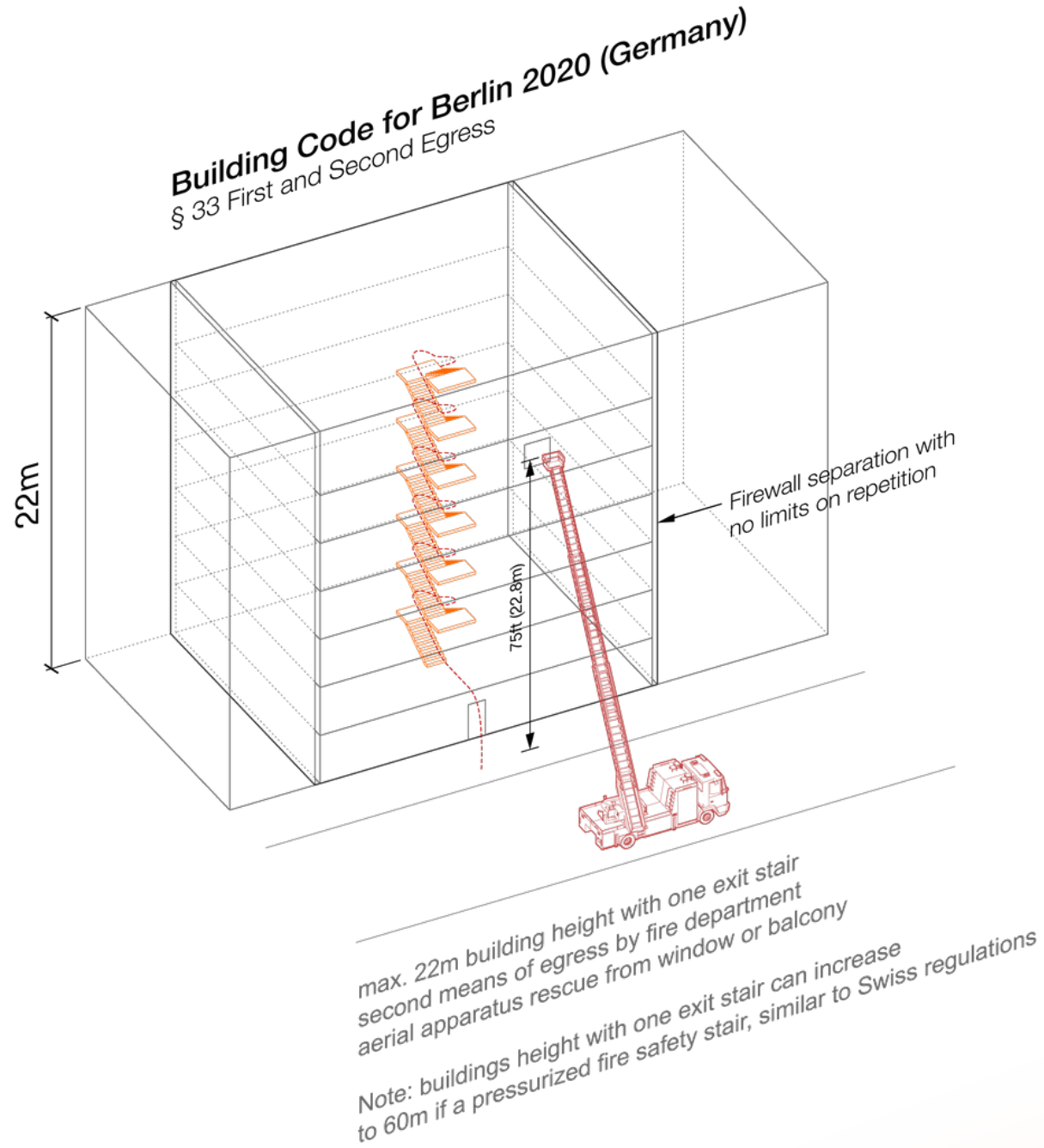
Maximum Height for Single Staircase Buildings
 multi-unit residential occupancy only

Note: the drawing assumes a floor to floor height of 3m

FFL = uppermost finish floor level

Germany

Germany allows for both office and residential buildings of up to 22m in height to be served by a single exit stair, with additional fire safety measures increasing the maximum height to 60m.



Building Code for Berlin (BauO Bln)

Fifth Section

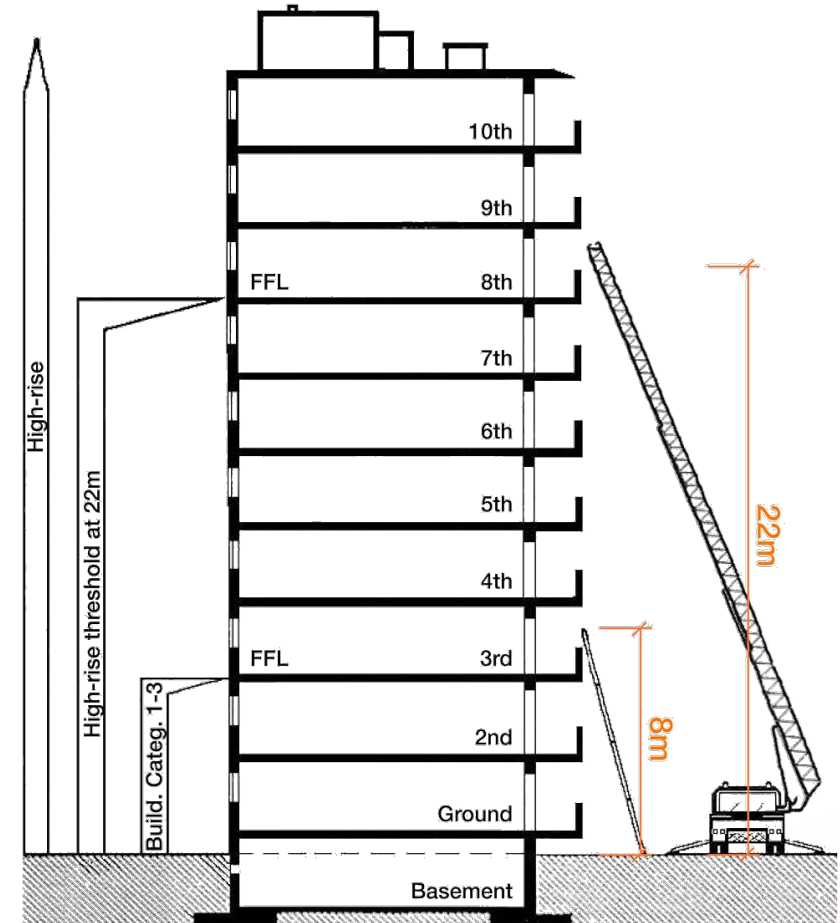
Egress, Openings, Guardrails

§ 33 First and Second Egress

(1) For floor areas with at least one occupancy such as dwelling units, offices or independent commercial spaces, there must be at least two independent means of egress per floor; both escape routes can however pass through the same corridor within the floor area.

(2) For occupied floor areas per Sentence 1, that are not on the ground floor, the first means of egress must be a stair. **The second means of egress can be another stair or a designated area within the occupied floor area that can be reached by the firefighting apparatus of the fire department. A second means of egress is not required if the first means of egress is a fire separated, fire safety stairwell.**

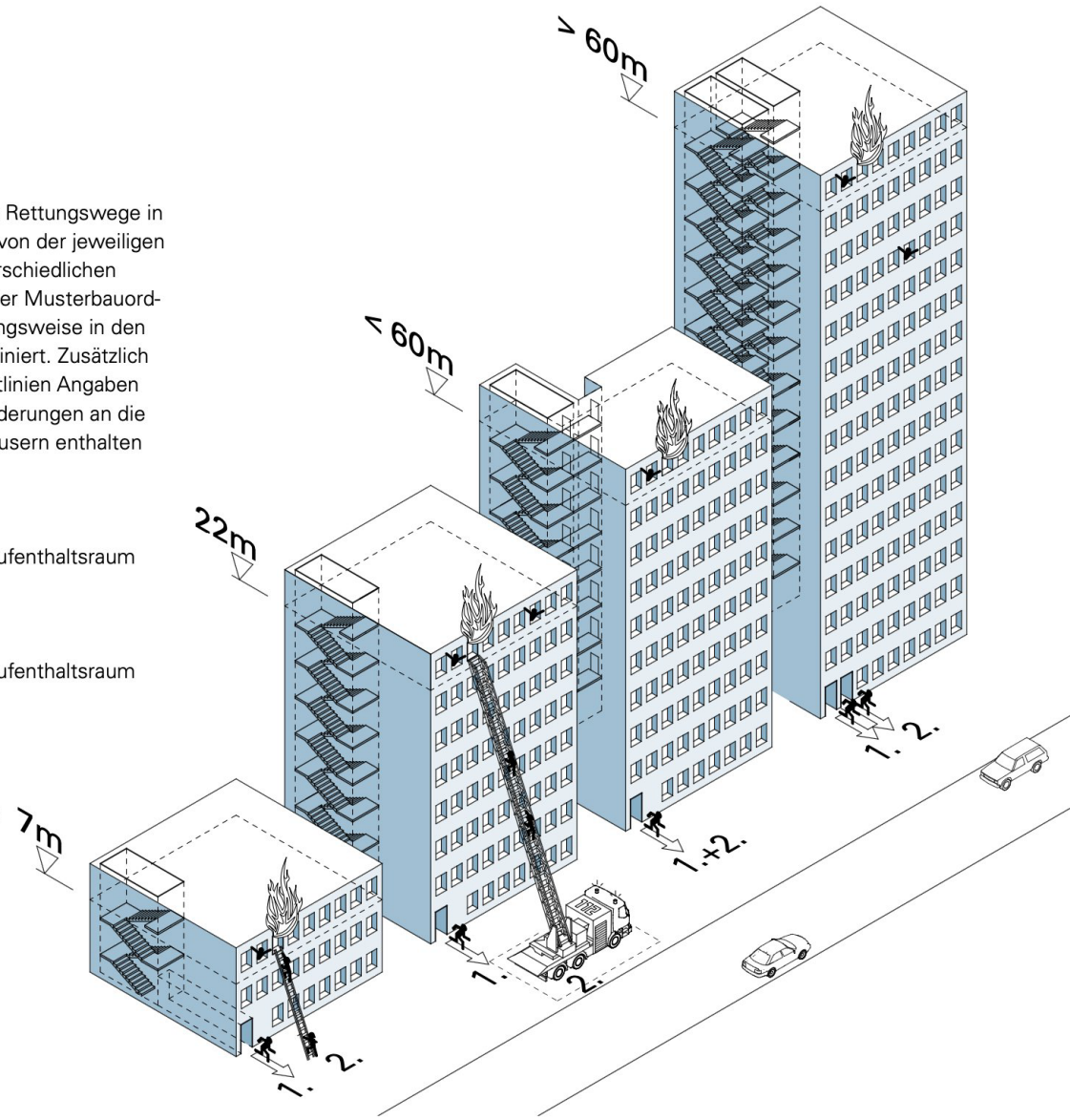
(3) Buildings, for which the second egress requires the fire apparatus of the fire department and in which the sill height of designated windows or landings is more than 8 meters above grade, may only be erected if the local fire department has aerial firefighting apparatus. In the case of special constructions the second egress via fire apparatus is only permitted if there are no concerns regarding occupant rescue.



Rettungswege

Die Anforderungen an die Rettungswege in Gebäuden sind abhängig von der jeweiligen Gebäudeklasse. Die unterschiedlichen Gebäudeklassen sind in der Musterbauordnung (MBO, § 2) beziehungsweise in den Landesbauordnungen definiert. Zusätzlich sind in den Hochhausrichtlinien Angaben zu den besonderen Anforderungen an die Rettungswege in Hochhäusern enthalten (MHHR und andere).

- Höhe: maximal 7 m
Oberkante Fußboden Aufenthaltsraum
Gebäudeklasse 3
- Höhe: maximal 22 m
Oberkante Fußboden Aufenthaltsraum
Gebäudeklasse 5
- Höhe: maximal 60 m
Hochhaus mit einem
Sicherheitstreppehaus
- Höhe: über 60 m
Hochhaus mit
zwei Treppenhäusern,
davon ein Sicherheits-
treppehaus



Rettungswege bei unterschiedlichen Gebäudehöhen (unterschiedliche Gebäudeklassen)

Baugemeinschaft Walden 48

Scharabi Architekten + Anne Raupach (2020)

Landsberger Allee 48, 10249 Friedrichshain

2024 BOABC Conference



Baugemeinschaft Walden 48

Scharabi Architekten + Anne Raupach (2020)
Landsberger Allee 48, 10249 Friedrichshain

Height: 6 storeys incl. mezzanine (18m)

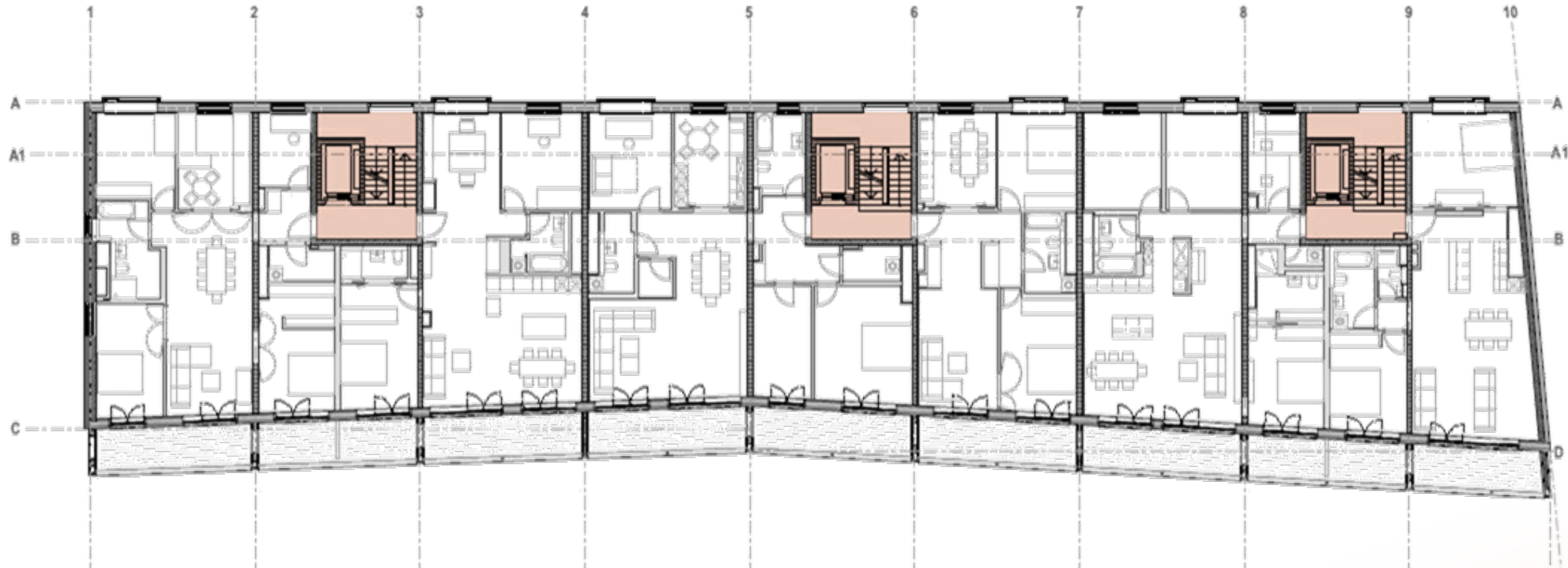
Use: 43 dwelling units

Floor Area: 7,000m²

Construction: Partially Encapsulated Mass Timber

Stair: Concrete Walls, CLT Stair and Elevator Shaft

Sprinklered: No



Baugemeinschaft Walden 48

Scharabi Architekten + Anne Raupach (2020)
Landsberger Allee 48, 10249 Friedrichshain

Height: 6 storeys incl. mezzanine (18m)

Use: 43 dwelling units

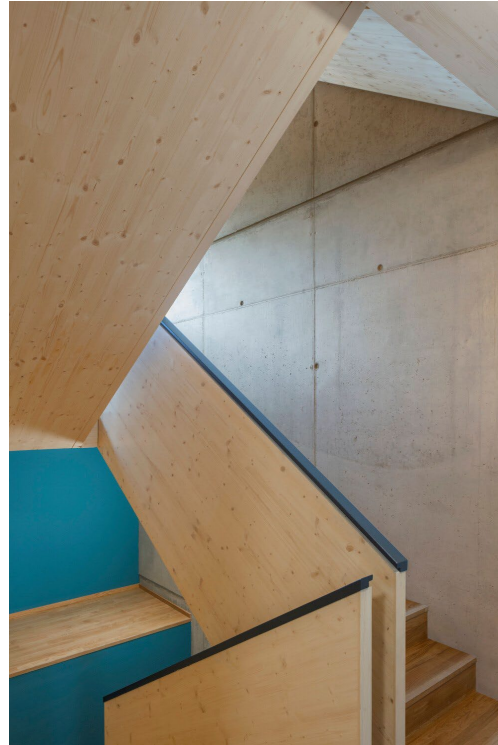
Floor Area: 7,000m²

Construction: Partially Encapsulated Mass Timber

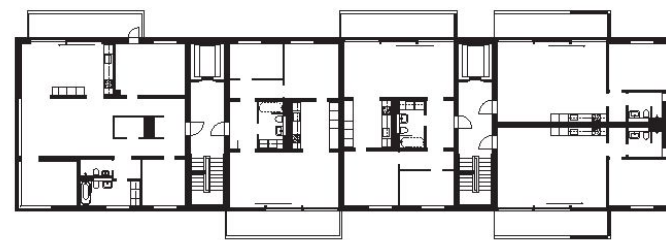
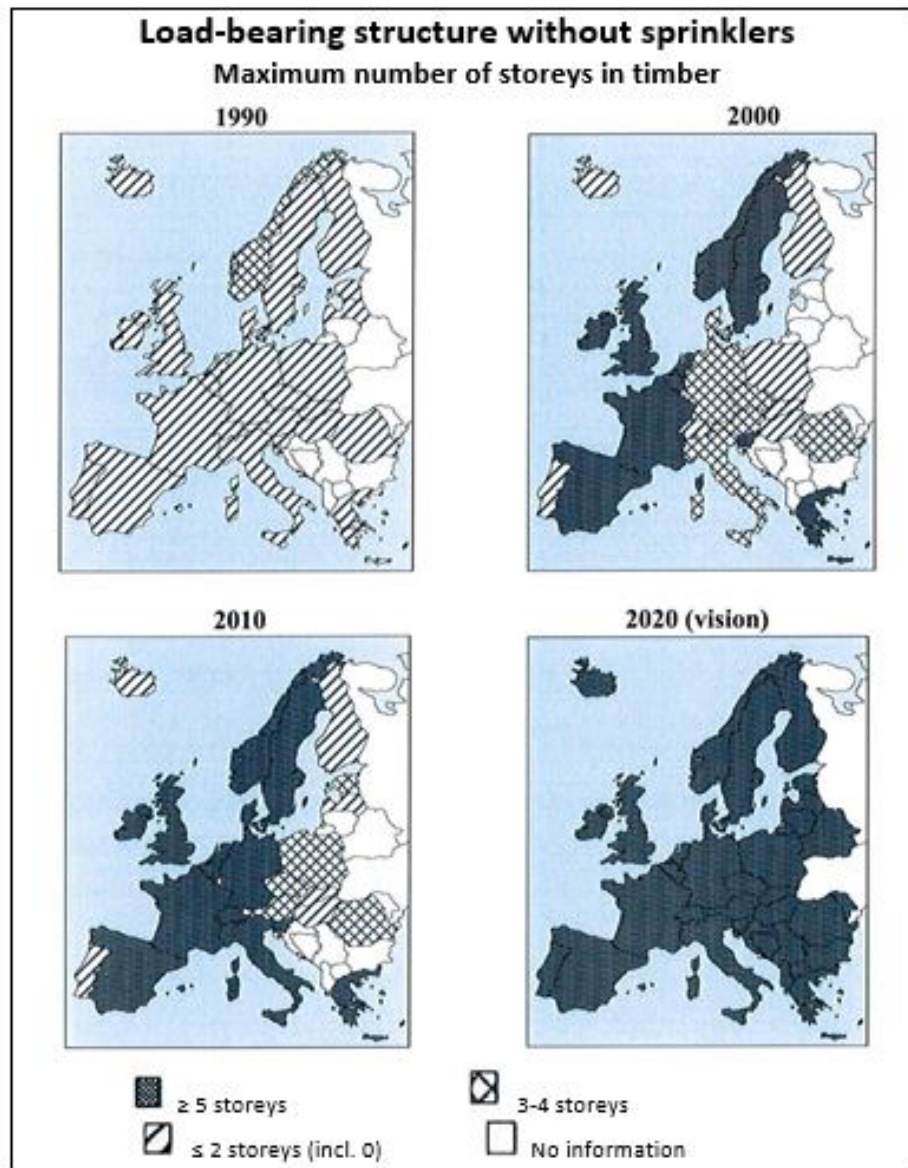
Stair: Concrete Walls, CLT Stair and Elevator Shaft

Sprinklered: No

2024 BOABC Conference



Notes on Combustible Construction

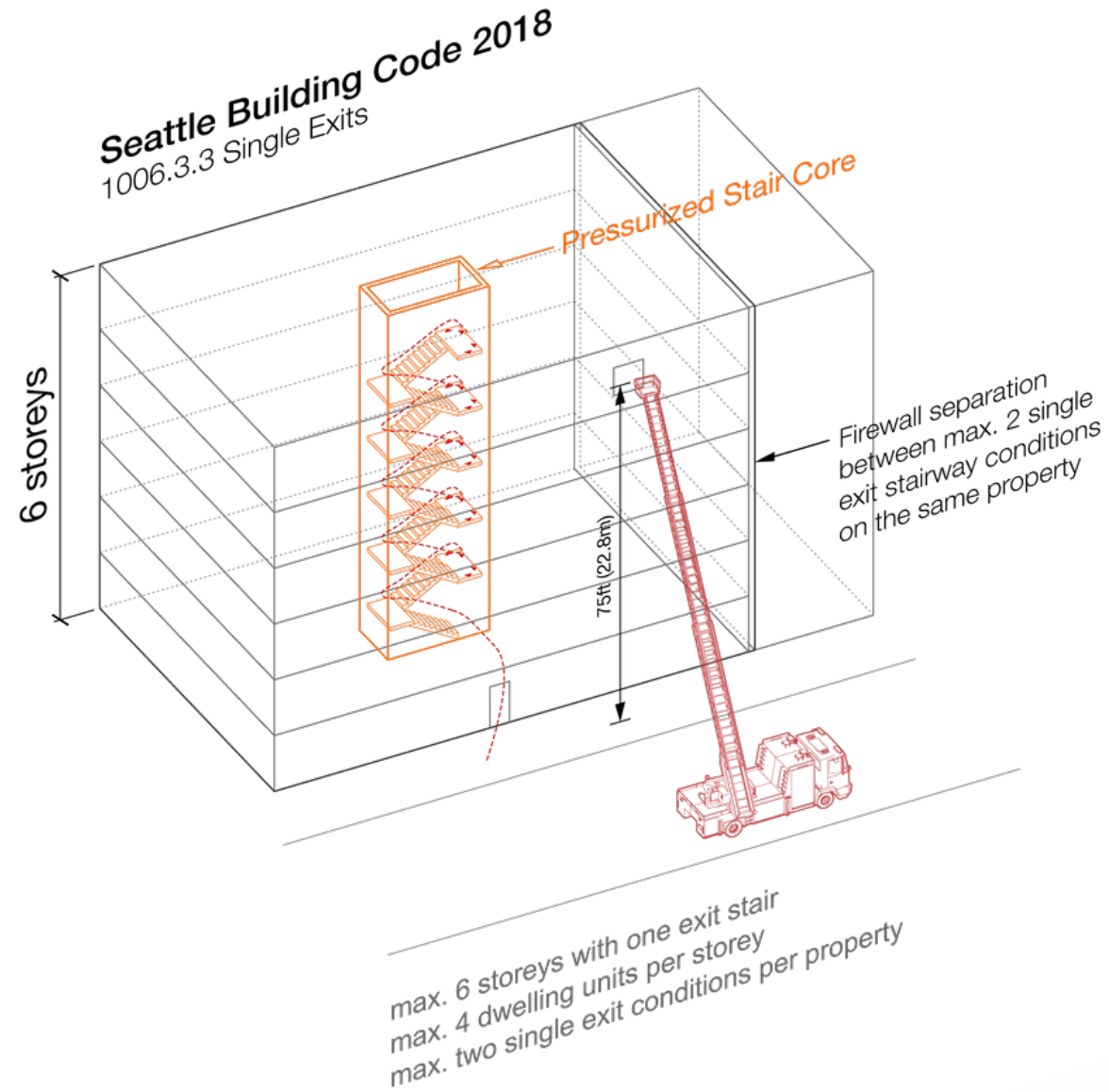


Östman, B. et al. (2017). Fire safety engineering in timber buildings.
<https://www.sciencedirect.com/science/article/abs/pii/S0379711217302977>

Strandparken Building. Sundbyberg, Sweden. 2014.
<https://divisare.com/projects/264352-wingardhs-strandparken-building-b>

Seattle

The Seattle Building Code permits apartment buildings of up to six storeys to be served by a single exit stair.



2018 Seattle Building Code

Chapter 10

1006.3.3. Single Exits

6. Occupied roofs with an occupant load of ten or less are permitted to have a single exit or access to a single exit.
7. Not more than 5 stories of Group R-2 occupancy are permitted to be served by a single exit under the following conditions:
- 7.1. The building has not more than six stories above grade plane.
 - 7.2. The building does not contain a boarding house.
 - 7.3. There shall be no more than four dwelling units on any floor.
 - 7.4. The building shall be of not less than one hour fire-resistive construction and shall also be equipped throughout with an automatic sprinkler system in accordance with Section 903.3.1.1. Residential-type sprinklers shall be used in all habitable spaces in each dwelling unit.
 - 7.5. There shall be no more than two single exit stairway conditions on the same property.
 - 7.6. An exterior stairway or interior exit stairway shall be provided. The interior exit stairway, including any related exit passageway, shall be pressurized in accordance with Section 909.20. Doors in the stairway shall swing into the interior exit stairway regardless of the occupant load served, provided that doors from the interior exit stairway to the building exterior are permitted to swing in the direction of exit travel.
 - 7.7. A corridor shall separate each dwelling unit entry/exit door from the door to an interior exit stairway, including any related exit passageway, on each floor. Dwelling unit doors shall not open directly into an interior exit stairway. Dwelling unit doors are permitted to open directly into an exterior stairway.
 - 7.8. There shall be no more than 20 feet (6096 mm) of travel to the exit stairway from the entry/exit door of any dwelling unit.
 - 7.9. Travel distance measured in accordance with Section 1017 shall not exceed 125 feet.
 - 7.10. The exit shall not terminate in an egress court where the court depth exceeds the court width unless it is possible to exit in either direction to the public way.
 - 7.11. Elevators shall be pressurized in accordance with Section 909.21 or shall open into elevator lobbies that comply with Section 713.14. Where approved by the building official, natural ventilation is permitted to be substituted for pressurization where the ventilation would prevent the accumulation of smoke or toxic gases.
 - 7.12. Other occupancies are permitted in the same building provided they comply with all the requirements of this code. Other occupancies shall not communicate with the Group R occupancy portion of the building or with the single-exit stairway.

Exception: Parking garages and occupied roofs accessory to the Group R occupancy are permitted to communicate with the exit stairway.
 - 7.13. The exit serving the Group R occupancy shall not discharge through any other occupancy, including an accessory parking garage.
 - 7.14. There shall be no openings within 10 feet (3048 mm) of unprotected openings into the stairway other than required exit doors having a one-hour fire-resistance rating.

Capitol Hill Urban Co-Housing

Schemata Workshop (2016)
1720 12th Ave, Seattle, WA 98122, USA

Height: 5 storeys (58 ft / 17m)

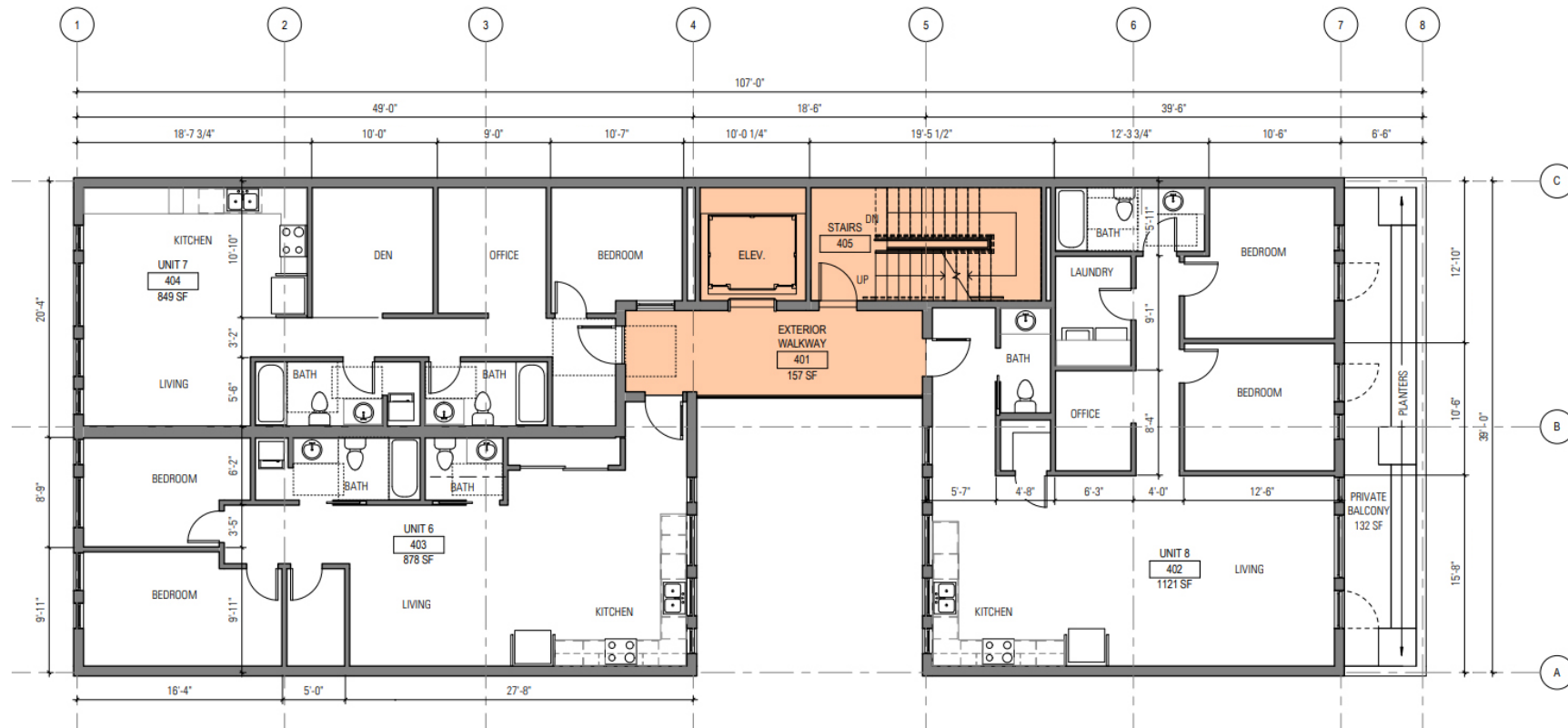
Use: 9 dwelling units, 1 commercial at grade

Floor Area: 17,600 ft² / 1,635 m²

Construction: Type V-A (upper floors) and Type I-A (ground)

Stair: Galvanized Steel

Sprinklered: Yes (NFPA 13, required throughout)



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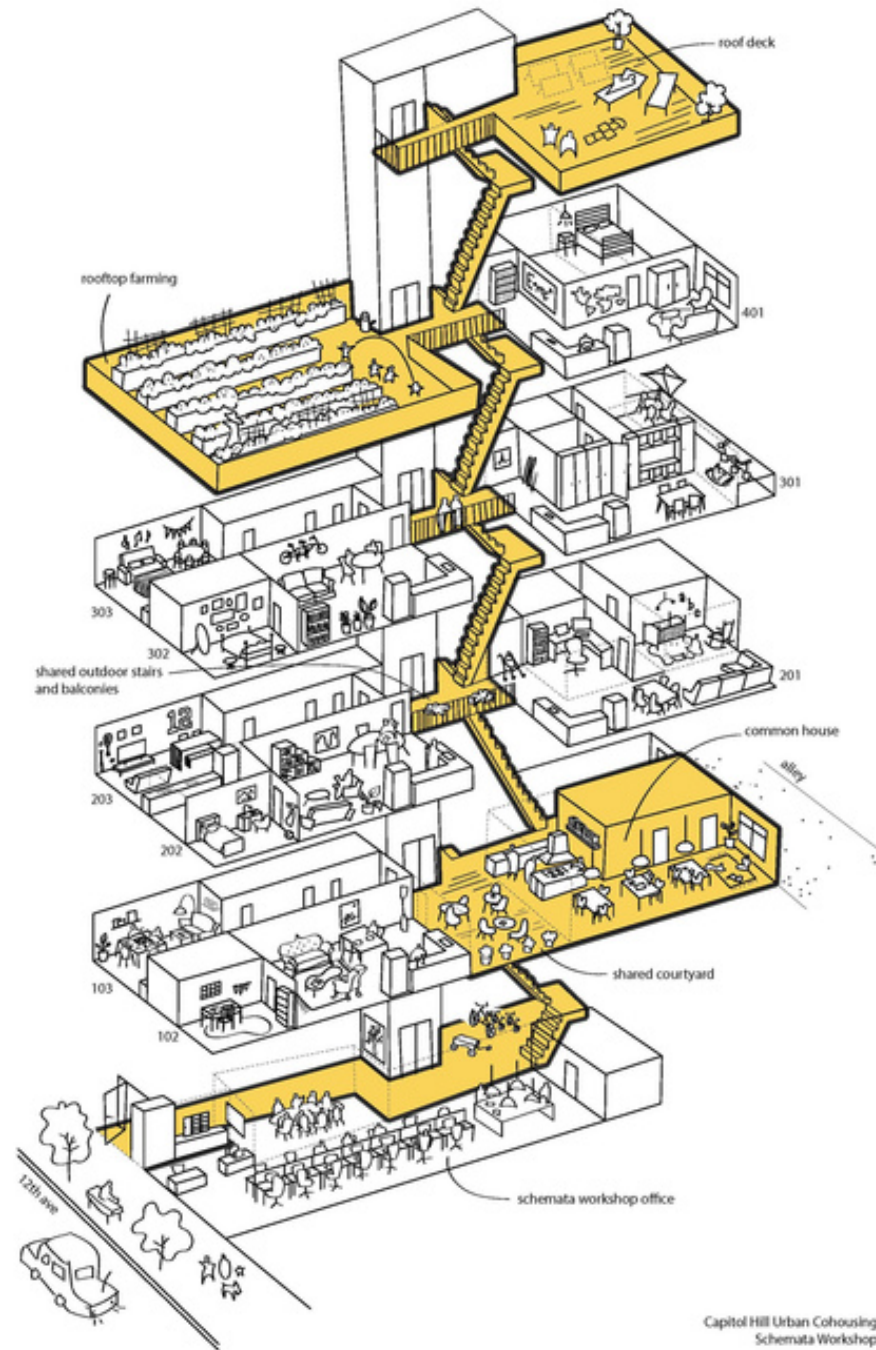
Floor Area: 17,600 ft² / 1,635 m²

Construction: Type V-A (upper floors) and Type I-A (ground)

Stair: Galvanized Steel

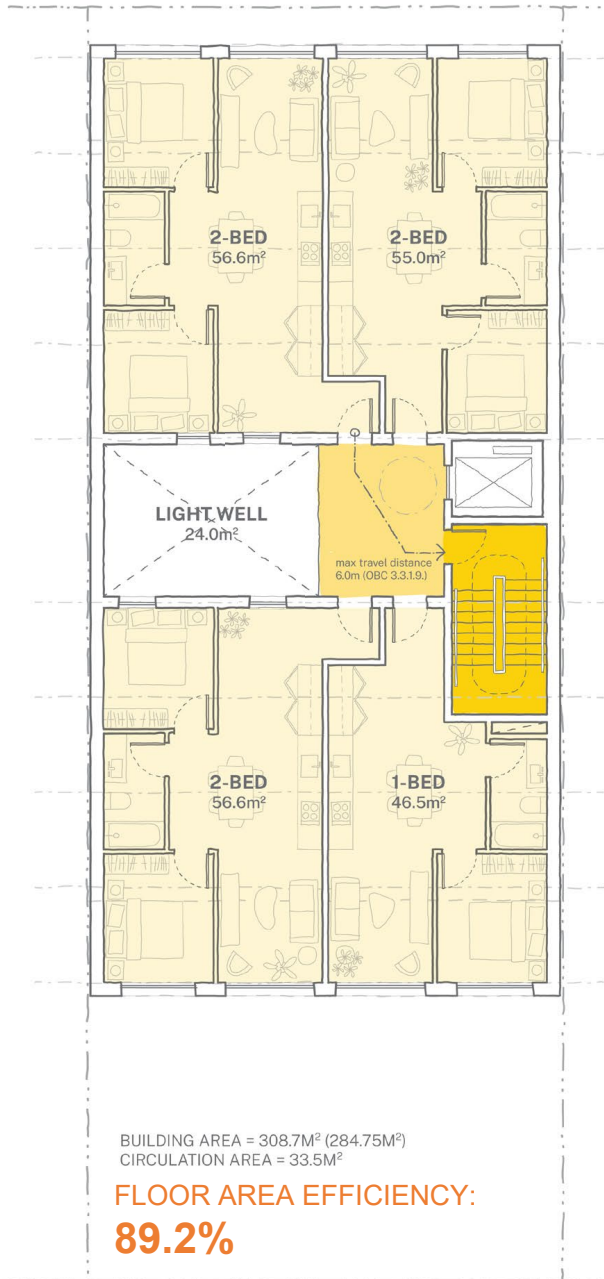
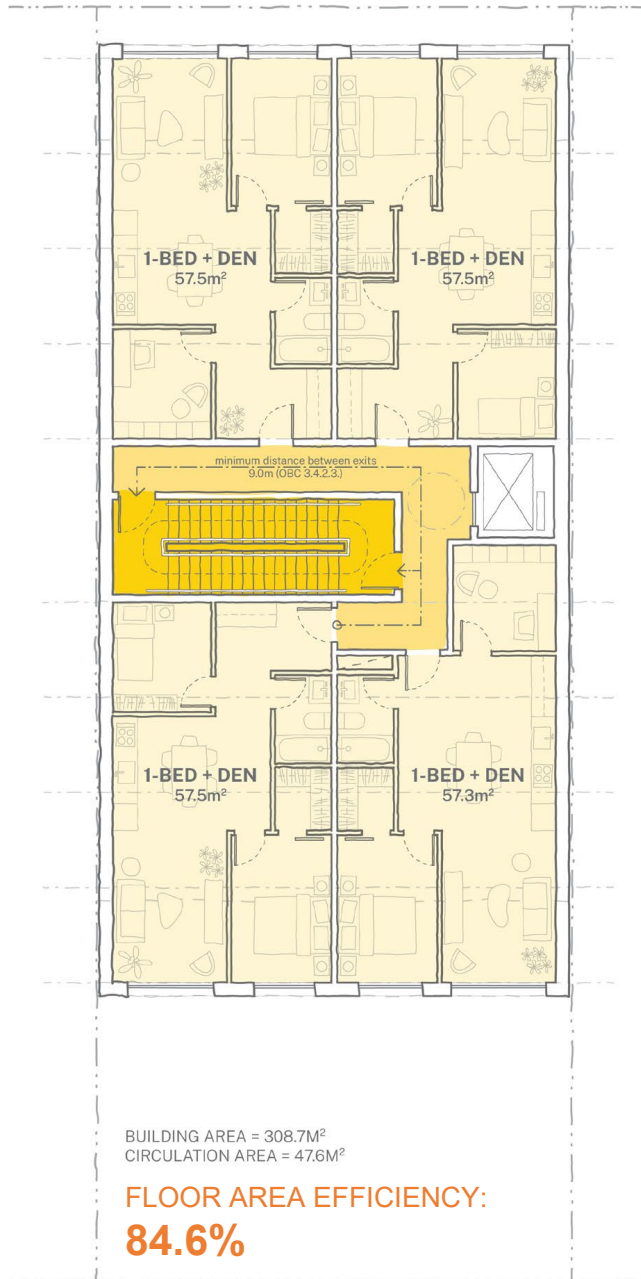
Sprinklered: Yes (NFPA 13, required throughout)





"This sketch really tells the story of the building, a lot of cohousing is quite suburban, and stretched out across a lot of acreage, but here we have a tiny site, and trying to make the most of it, so what is arranged horizontally we're stretching vertically to socially connect the building."

Scissor Stairs Compared



Code Change Request – 6 storeys

Proposed Wording in Part 3 - New Sentence in Section 3.4.2.1.

5) A *floor area* classified as *Group C occupancy* in a *building* not more than *6 storeys* in *building height* is permitted to be served by a single *exit* provided the total *occupant load* on any *storey* served by the *exit* is not more than 60, and

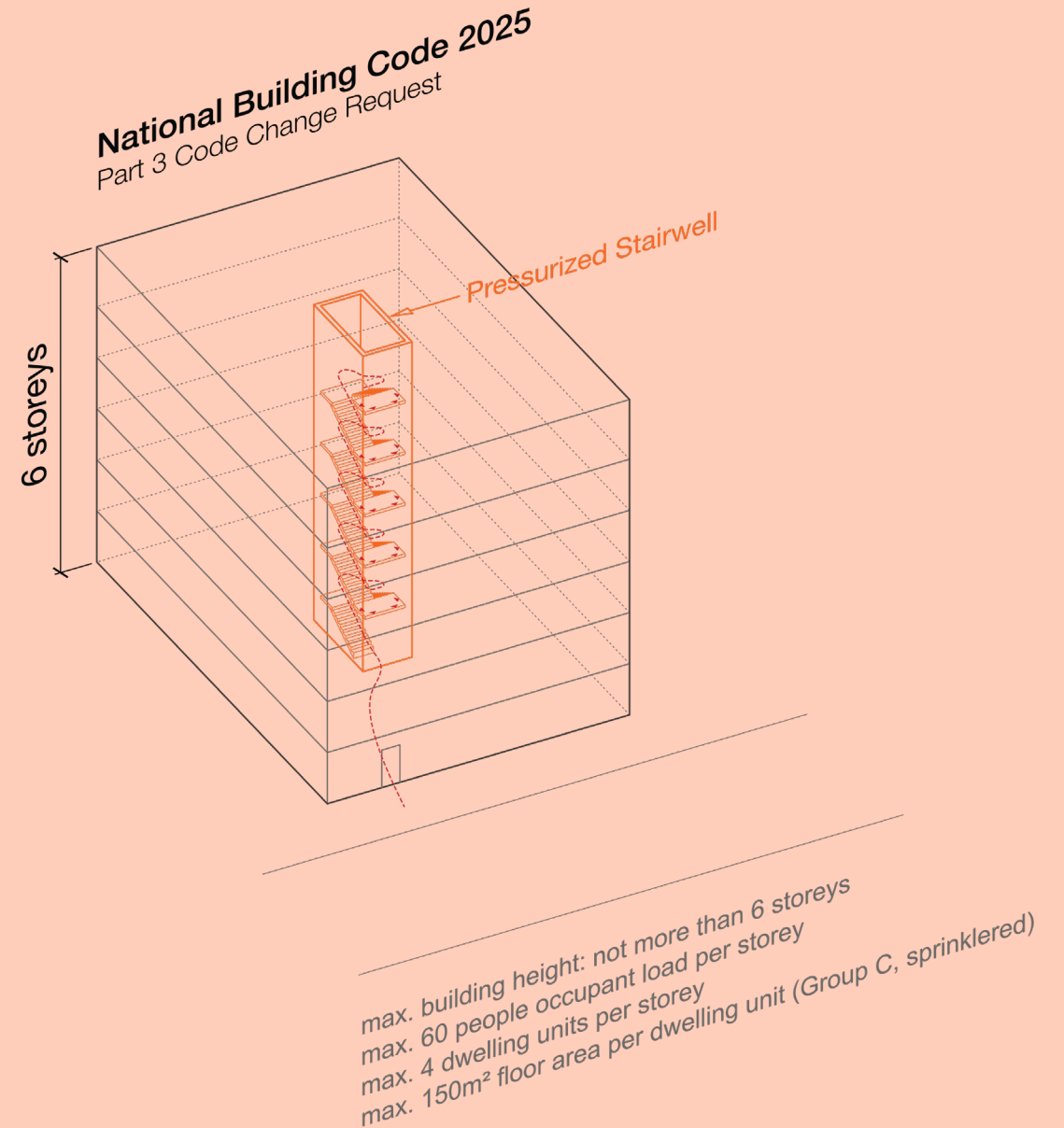
a) there shall be no more than four *dwelling units* on any *storey* served by the *exit* and the *floor area* of each *dwelling unit* does not exceed 150m²,

b) the building is *sprinklered* throughout (NFPA 13),

c) unless an exterior stairway is provided, an interior stairway including any related *exit* passageway or *public corridor* shall be pressurized and designed in accordance with Article 3.2.6.2 to limit the danger to occupants and firefighters from exposure to smoke in a building fire,

d) openings in required *fire separations* shall be protected with a *closure* with a *fire-protection rating* of not less than 45 min and shall be installed in conformance with Chapters 2 to 14 of NFPA 80 “Standard for Fire Doors and Other Opening Protectives”,

e) a fire alarm system is provided without exception (See 3.2.4.1. Determination of Requirement for a Fire Alarm System), and the fire alarm system is designed to notify the fire department that an alarm signal has been initiated (See 3.2.4.7. Signals to Fire Department),



Proposed Wording in Part 3 - New Sentence in Section 3.4.2.1.

5) A floor area classified as Group C occupancy in a building not more than 6 storeys in building height is permitted to be served by a single exit provided the total occupant load on any storey served by the exit is not more than 60, and

a) there shall be no more than four dwelling units on any storey served by the exit and the floor area of each dwelling unit does not exceed 150m²,

b) the building is sprinklered throughout (NFPA 13),

c) unless an exterior stairway is provided, an interior stairway including any related exit passageway or public corridor shall be pressurized and designed in accordance with Article 3.2.6.2 to limit the danger to occupants and firefighters from exposure to smoke in a building fire,

d) openings in required fire separations shall be protected with a closure with a fire-protection rating of not less than 45 min and shall be installed in conformance with Chapters 2 to 14 of NFPA 80 “Standard for Fire Doors and Other Opening Protectives”,

e) a fire alarm system is provided without exception (See 3.2.4.1. Determination of Requirement for a Fire Alarm System), and the fire alarm system is designed to notify the fire department that an alarm signal has been initiated (See 3.2.4.7. Signals to Fire Department),

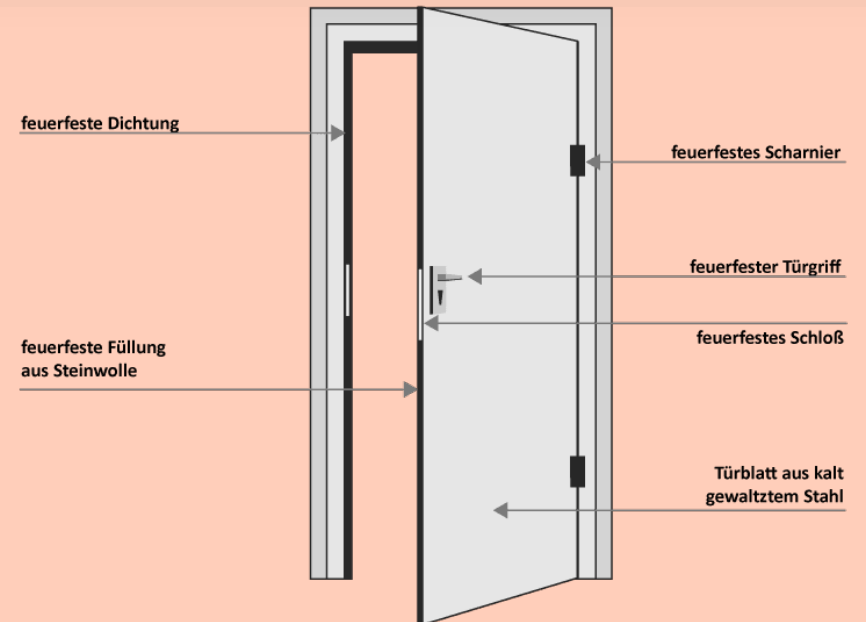
3.1.8.12. Twenty-Minute Closures

1) A door assembly having a fire-protection rating not less than 20 min is permitted to be used as a closure in

- a) a fire separation not required to have a fire-resistance rating more than 1 h, located between
- i) a public corridor and a suite,
 - ii) a corridor and adjacent sleeping rooms, or
 - iii) a corridor and adjacent classrooms, offices and libraries in Group A, Division 2 major occupancies, or
- b) a fire separation not required to have a fire-resistance rating more than 45 min, located in a building not more than 3 storeys in building height.

2) The requirements for noncombustible sills and combustible floor coverings in NFPA 80, “Fire Doors and Other Opening Protectives,” do not apply to a door described in Sentence (1).

3) A door described in Sentence (1) shall have clearances of not more than 6 mm at the bottom and not more than 3 mm at the sides and top.



Proposed Wording in Part 9 - New Sentence in Section 9.9.8.2.

2025 National Building Code of Canada, Volume II, Division B, Part 9

9.9.8 Exits from Floor Areas

9.9.8.2 Number of Required Exits

3) A floor area classified as Group C occupancy in a building not more than 3 storeys in building height is permitted to be served by a single exit provided the total occupant load served by the exit is not more than 60, and

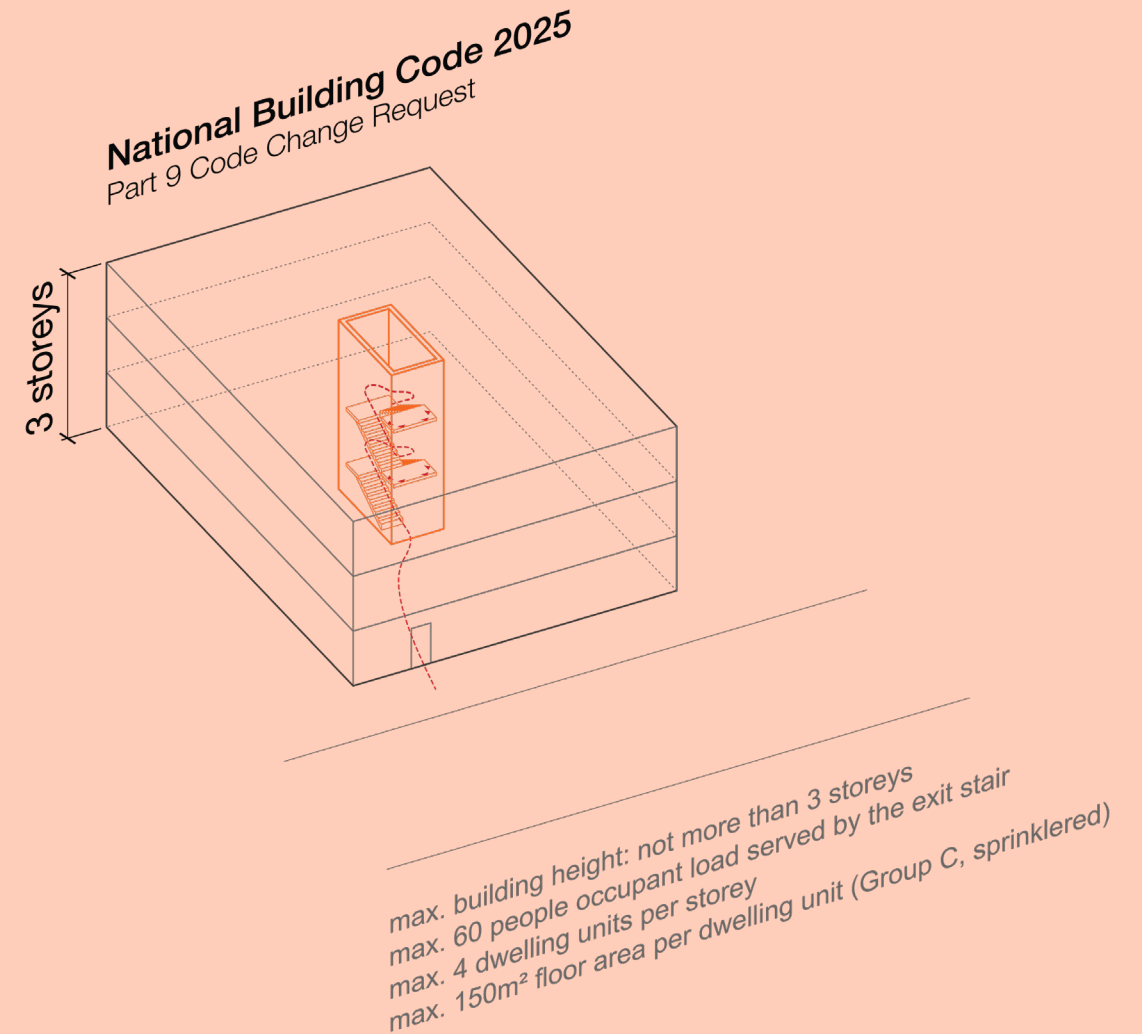
a) there shall be no more than four dwelling units on any storey served by the single exit and the floor area of each dwelling unit does not exceed 150m²,

b) the building is sprinklered throughout (NFPA 13-R, See 9.10.1.3. Items under Part 3 Jurisdiction),

c) openings in required fire separations shall be protected with a closure with a fire-protection rating of not less than 45 min and shall be installed in conformance with Chapters 2 to 14 of NFPA 80 “Standard for Fire Doors and Other Opening Protectives”,

d) a fire alarm system is provided without exception (See 9.10.18.2. Fire Alarm System Required),

e) the floor area classified as Group C occupancy served by a single exit is not intended for use a retirement home.



Proposed Wording in Part 9 - New Sentence in Section 9.9.8.2.

2025 National Building Code of Canada, Volume II, Division B, Part 9
9.9.8 Exits from Floor Areas
9.9.8.2 Number of Required Exits

3) A floor area classified as Group C occupancy in a building not more than 3 storeys in building height is permitted to be served by a single exit provided the total occupant load served by the exit is not more than 60, and

a) there shall be no more than four dwelling units on any storey served by the single exit and the floor area of each dwelling unit does not exceed 150m²,

b) the building is sprinklered throughout (NFPA 13-R, See 9.10.1.3. Items under Part 3 Jurisdiction),

c) openings in required fire separations shall be protected with a closure with a fire-protection rating of not less than 45 min and shall be installed in conformance with Chapters 2 to 14 of NFPA 80 “Standard for Fire Doors and Other Opening Protectives”,

d) a fire alarm system is provided without exception (See 9.10.18.2. Fire Alarm System Required),

e) the floor area classified as Group C occupancy served by a single exit is not intended for use a retirement home.

TABLE 1006.3.3(1) STORIES WITH ONE EXIT OR ACCESS TO ONE EXIT FOR R-2 OCCUPANCIES

STORY	OCCUPANCY	MAXIMUM NUMBER OF DWELLING UNITS	MAXIMUM COMMON PATH OF EGRESS TRAVEL DISTANCE
Basement, first, second or third story above grade plane	R-2 ^{a, b}	4 dwelling units	125 feet
Fourth story above grade plane and higher	NP	NA	NA

For SI: 1 foot = 3048 mm.

NP = Not Permitted.

NA = Not Applicable.

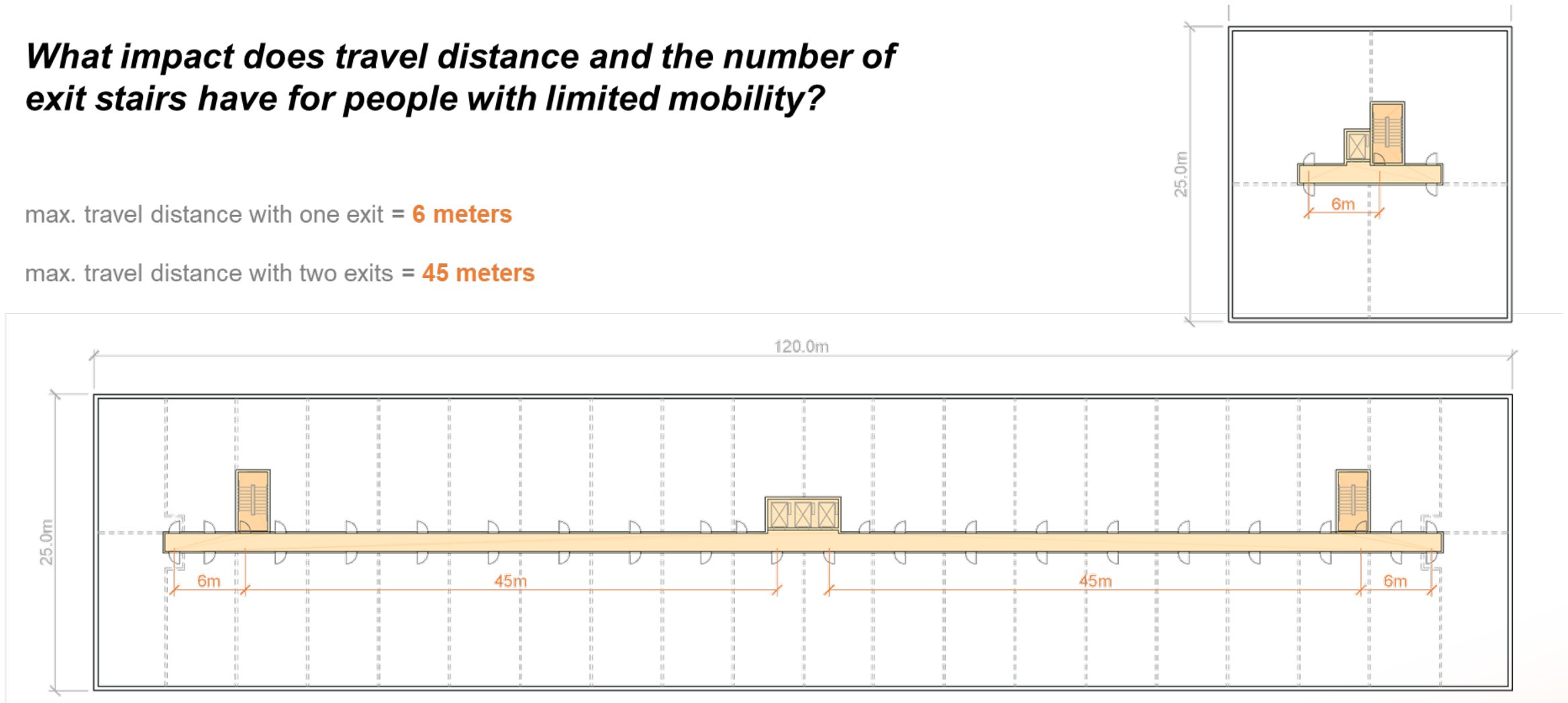
a. Buildings classified as Group R-2 equipped throughout with an *automatic sprinkler system* in accordance with Section 903.3.1.1 or 903.3.1.2 and provided with *emergency escape and rescue openings* in accordance with Section 1030.

b. This table is used for R-2 occupancies consisting of *dwelling units*. For R-2 occupancies consisting of *sleeping units*, use Table 1006.3.3(2).

What impact does travel distance and the number of exit stairs have for people with limited mobility?

max. travel distance with one exit = **6 meters**

max. travel distance with two exits = **45 meters**



Rural Areas: single staircase designs should only be permitted in urban areas served by career fire departments to ensure sufficient response time of emergency responders

Measured Maximum Building Height: in addition to the maximum number of storeys, a maximum building height of 18m (measured as the finish floor level of the uppermost occupied storey) should be specified to align with the trigger level for 3.2.6. High Building Requirements and to prevent unintended design outcomes such as six storeys where each storey has a mezzanine.

Additional Permissions for Mass Timber Construction:

The code change establishes prescriptive conditions with consideration of protected wood-frame construction. It may be appropriate to allow additional building height or more dwelling units per storey for other construction types, such as:

- increasing the maximum building height from 6 to 8 storeys for non-combustible and encapsulated mass timber construction
- increasing the maximum number of dwelling units from 4 to 8 per storey for non-combustible and encapsulated mass timber construction

This incentivizes the construction of more mid-rise housing along main streets and avenues where zoning policy is supportive. It also accommodates structural systems with significantly lower embodied carbon emissions.

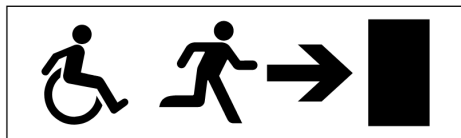


Image Courtesy of R-Hauz.

CSA Standards for Area of Refuge Design:

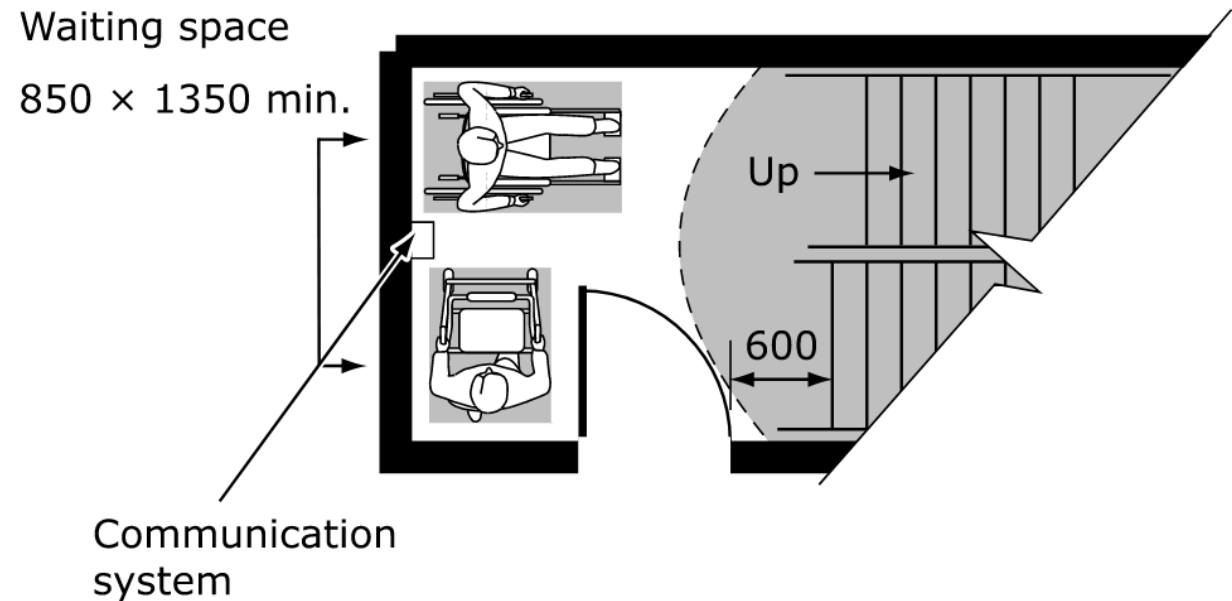
1. Hands-free communication system that is not higher than 1200mm from the floor and connected to an emergency response system
2. Be separated from the building floor area by a fire separation equal to that required for an exit and be smoke-protected from the adjacent floor areas
3. Be served directly by an exit or by a firefighters' elevator
4. Be identified by signage that incorporates symbols show in Figure 37 and identified on all evacuation plans and fire safety documents

Figure 37
Directional evacuation signs
(See Clause 5.7.2.2.)



a) Directional evacuation sign to an area of refuge

Figure 36
Example of area of refuge
(See Clause 5.7.2.1.)



Note: All dimensions are in mm.

October 2022

NRC Staff Analysis

Summary for Standing Committee on Fire Protection — CCR 1815

CCR No.:	1815
Title:	Part 9 – Single egress for multi-unit residential buildings up to 3 storeys
Description:	The code change request suggests that single egress be permitted in Part 9 for Group C occupancy if certain conditions are met to provide additional life safety measures.
Proponent:	Conrad Speckert LGA Architectural Partners
Submitted:	2022-04-18
Code Reference(s):	NBC20 Div.B 9.9.8.2.
Standing Committee(s):	Housing and Small Buildings, Use and Egress

Process

2022-04-21 — Received

2022-04-27 — Sorted

2022-10-12 — Analyzed

NBC 2020 requires two means of egress for all buildings in Part 9 except for the relaxation provided in Sentence 9.9.8.2.(2). The CCR makes the case for extending the relaxation to Part 9 building not more than 3 storeys in building height if certain conditions are met. The proposed conditions required for providing such a relaxation have been identified in the CCR and include additional life safety measures and limits on the occupant load and number of dwelling units per storey served by the single exit.

The proponent maintains that the requirement for two means of egress in NBC needs to be reevaluated in view of the modern fire safety practices and a review of building codes in other jurisdictions. It stresses that the requirement for a second egress is a prohibitive burden for smaller multi-unit residential projects.

A jurisdictional scan providing points of reference to other international codes in support for the relaxation is included in the CCR documentation. The CCR also cites a letter from Ontario Ministry of Municipal Affairs and Housing dated March 31, 2022 requesting CCBFC to prioritize a code change to allow for “a single means of egress in some residential buildings.

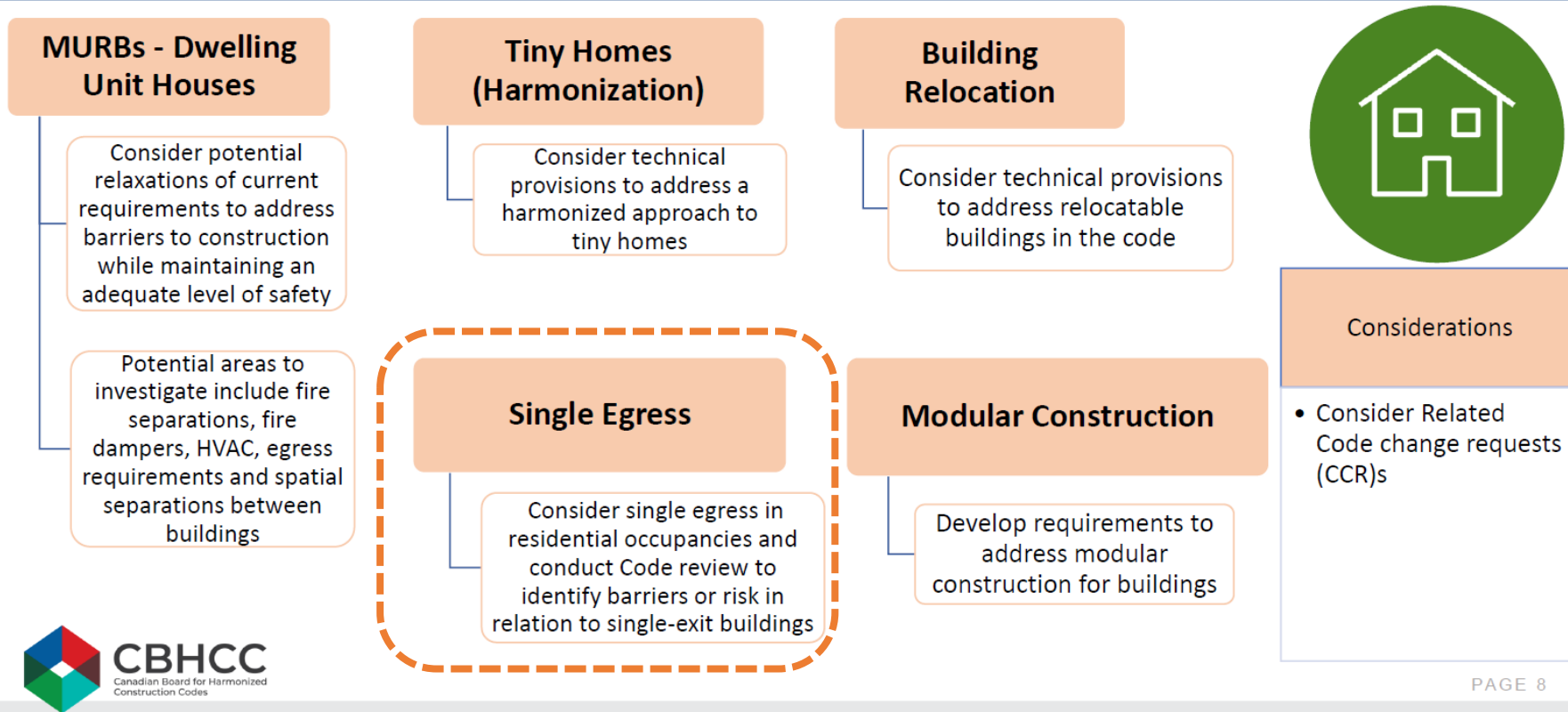
The CCR presents a strong case for reviewing the exit requirements in NBC for Part 9 buildings to determine if a relaxation can be provided to allow a single exit for a sub-set of buildings. At the same time careful analysis is required to determine if the scenarios such as blocked exit or slow movement of persons with impaired abilities pose unacceptable risk. Also, the conditions under which the relaxation is provided in international codes needs to be examined carefully, for example, a quick review of IBC cited as an example indicates that single exits are allowed in R2 occupancy but only in combination with specific requirements for construction, fire protection, refuge area and fire suppression system systems.

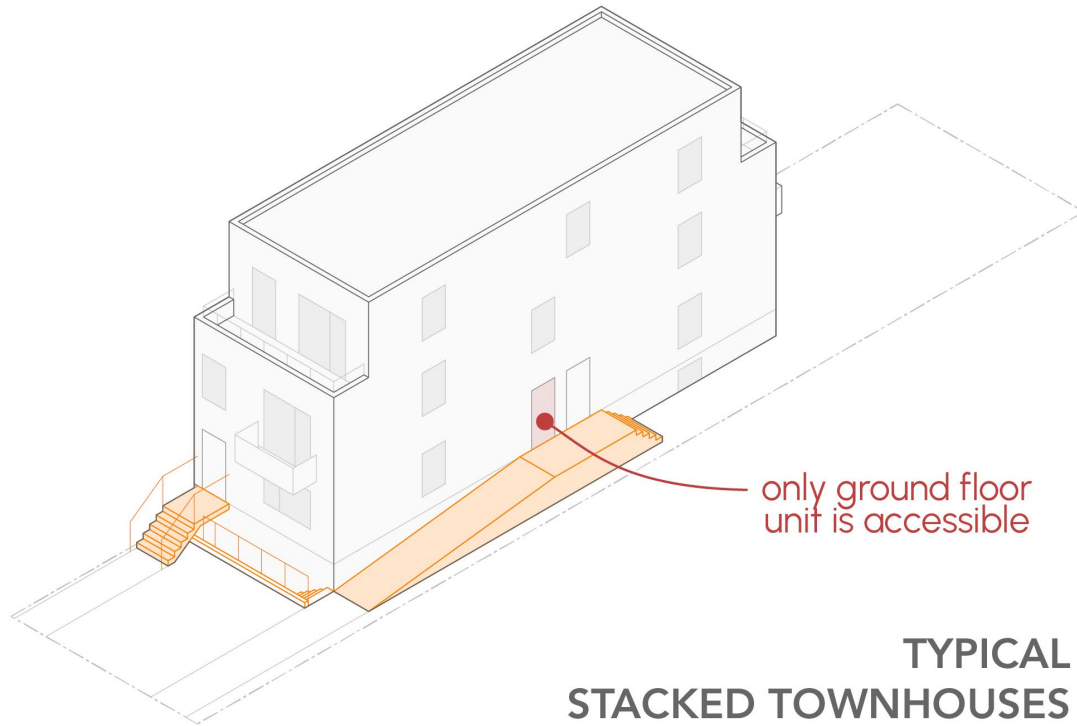
Based on the review of the documentation, staff recommends that the CCR should be considered by SC-UE for further analysis before accepting the CCR and deciding whether to develop a change.

February 2023

Strategic Priorities for the 2025-2030 model code cycle

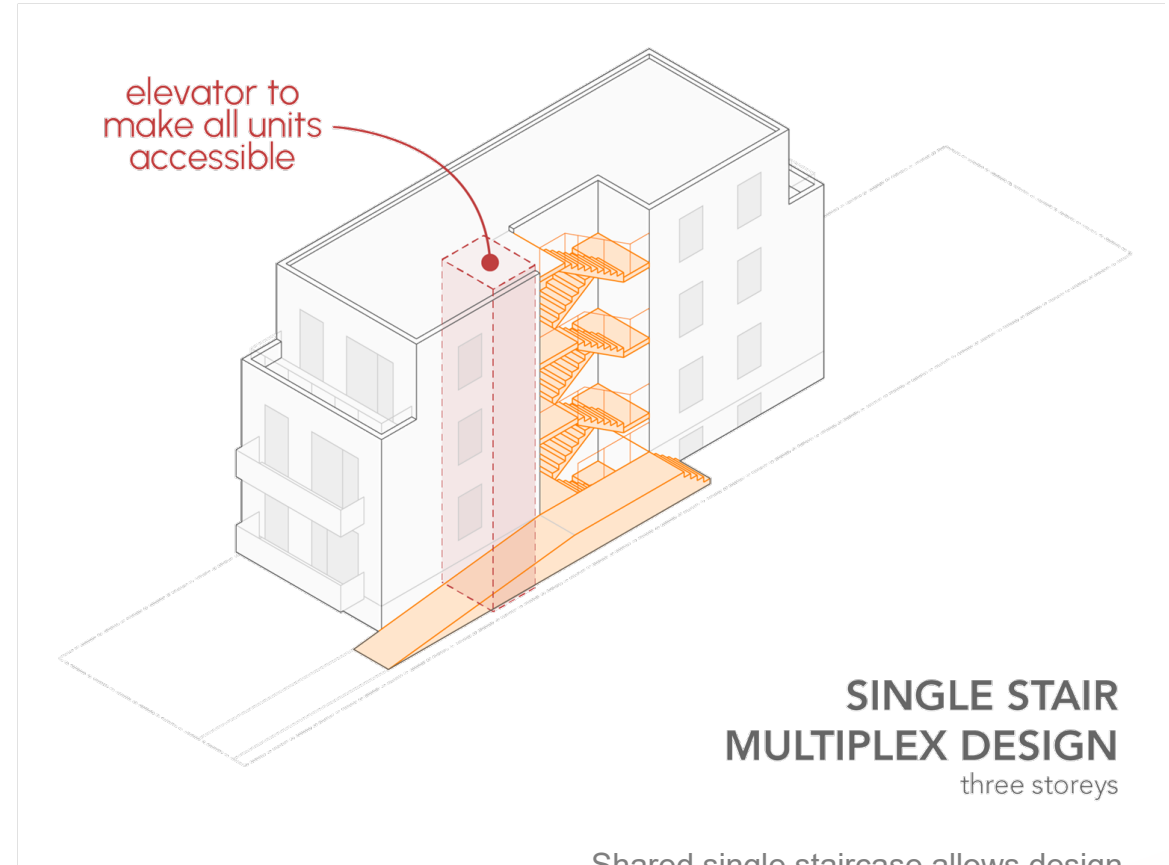
Strategic priority: Housing Supply





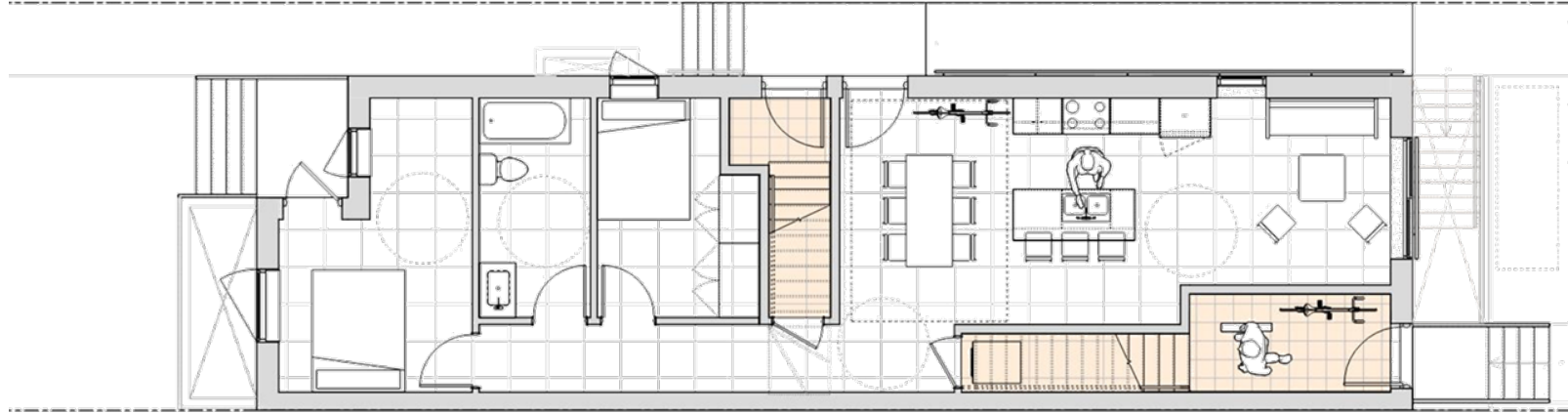
**TYPICAL
STACKED TOWNHOUSES**
three storeys

Only ground floor unit can be designed as accessible in a stacked townhouse configuration because each of the upper units has a separate internal staircase.



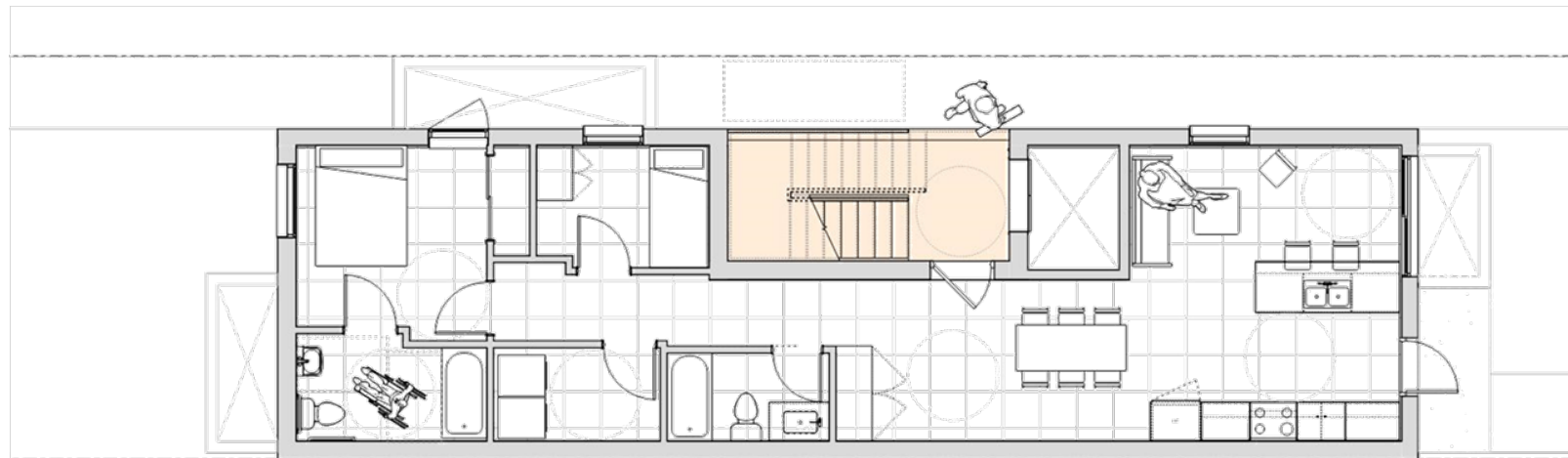
**SINGLE STAIR
MULTIPLEX DESIGN**
three storeys

Shared single staircase allows design flexibility to provide 100% accessible units and share the cost of an elevator for barrier-free access to the upper units.



TYPICAL STACKED TOWNHOUSES

separate entrance to each unit



SINGLE STAIR MULTIPLEX

shared staircase and elevator



Single Stair Alternative Solutions: *Construction Innovation for “Missing Middle” Housing*

The building code in Canada requires two exits for any multi-unit residential building, which is very challenging for "missing middle" housing types.

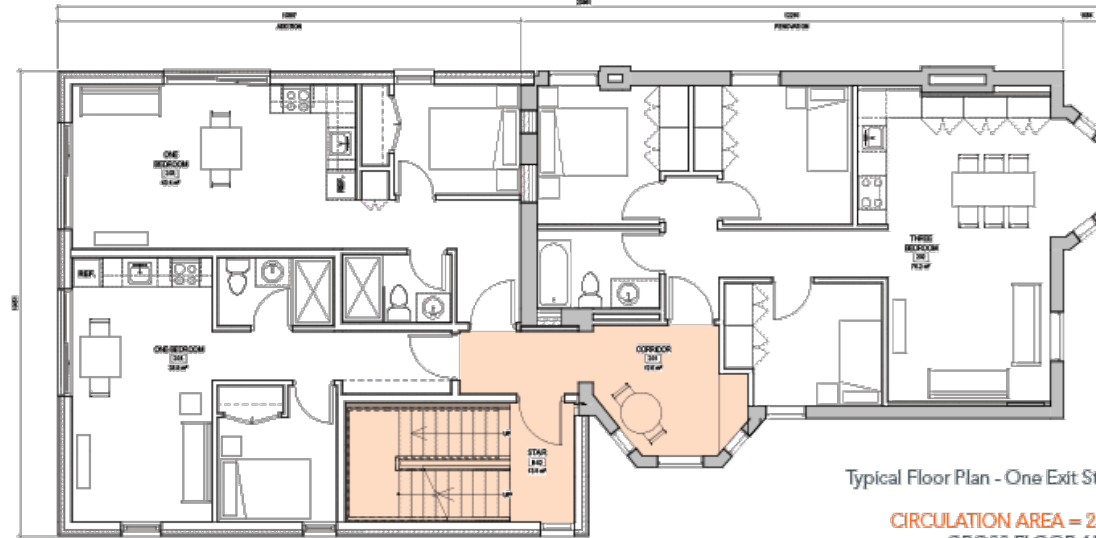
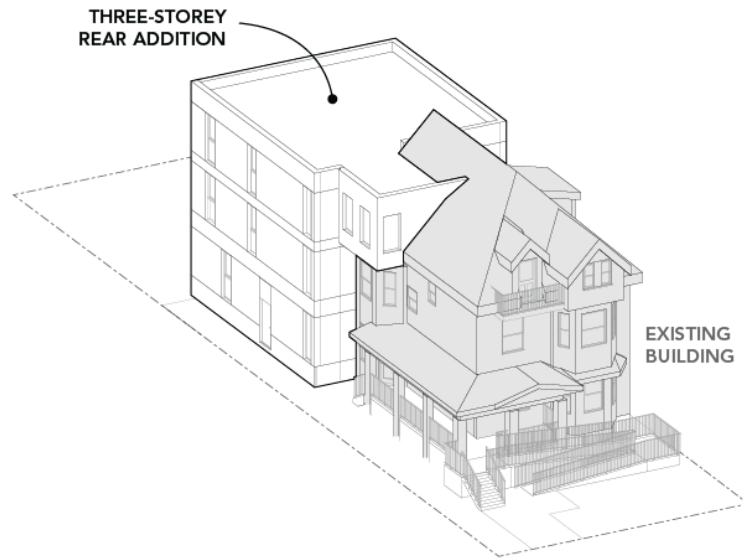
Our solution is to demonstrate that multiplexes and other small multi-unit residential buildings can be constructed with a single exit stair without compromising the high safety standard of our code. This benefits the supply of housing by increasing floor-area efficiency and making the development of smaller infill properties more feasible. It also improves the safety, sustainability, and design flexibility of such buildings. Architects can demonstrate the equivalent performance of a design by providing additional fire-protection measures and submitting an “Alternative Solutions” proposal to the municipal building department.

“SINGLE STAIRCASE ALTERNATIVE SOLUTIONS:

Construction Innovation for Missing Middle Housing” received support and funding from Canada Mortgage and Housing Corporation and the Housing Supply Challenge Building for the Future Round, which supports innovative solutions that remove barriers to increasing housing supply across Canada.

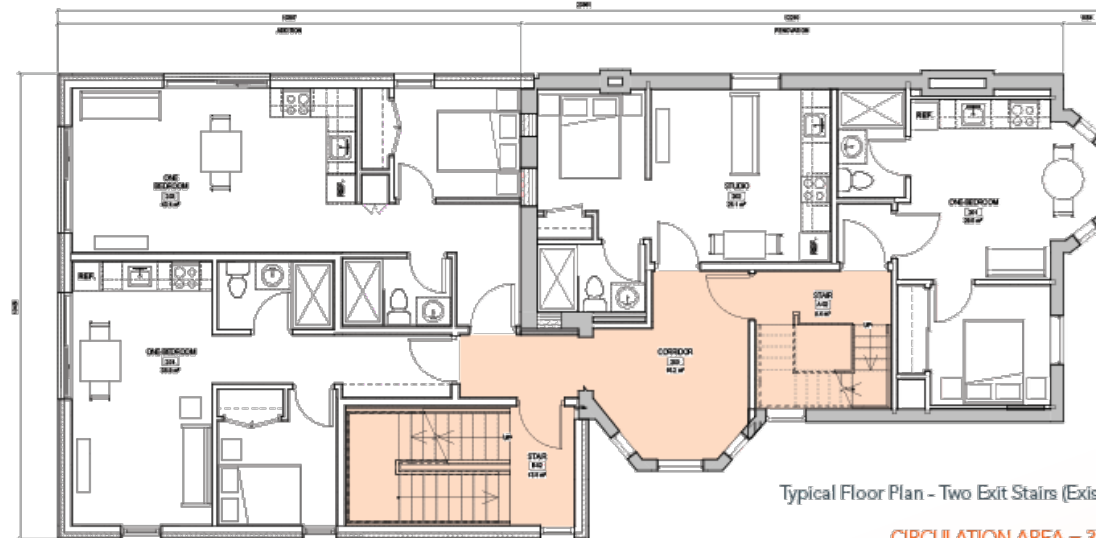


Case Study: Retrofit, Renovation, Addition



Typical Floor Plan - One Exit Stair (New Only)

CIRCULATION AREA = 26.4m² (orange)
GROSS FLOOR AREA = 214.0m²
FLOOR AREA EFFICIENCY = 87.6%



Typical Floor Plan - Two Exit Stairs (Existing and New)

CIRCULATION AREA = 39.4m² (orange)
GROSS FLOOR AREA = 214.0m²
FLOOR AREA EFFICIENCY = 81.5%

Case Study: Small Apartment Building

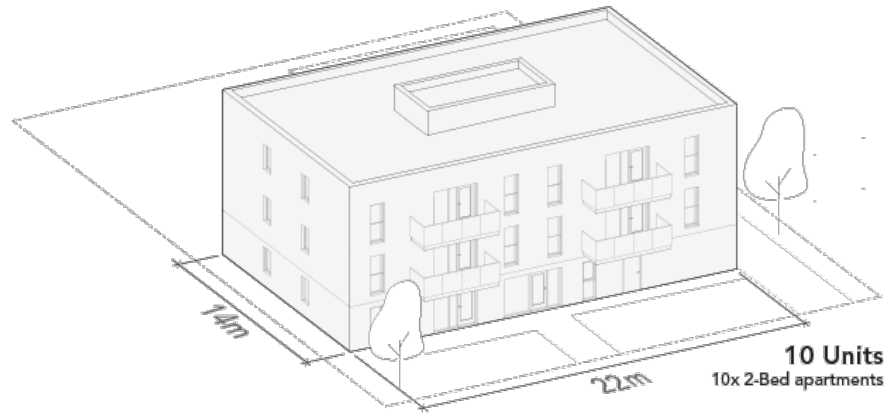


Diagram of Small Apartment Building

+2 units (+4 bedrooms) ↑
single stair design creates more
housing and more accessible
units within the same footprint

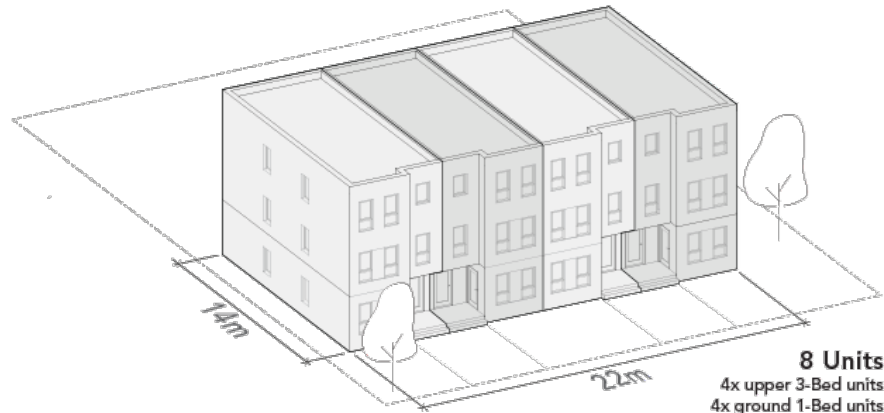
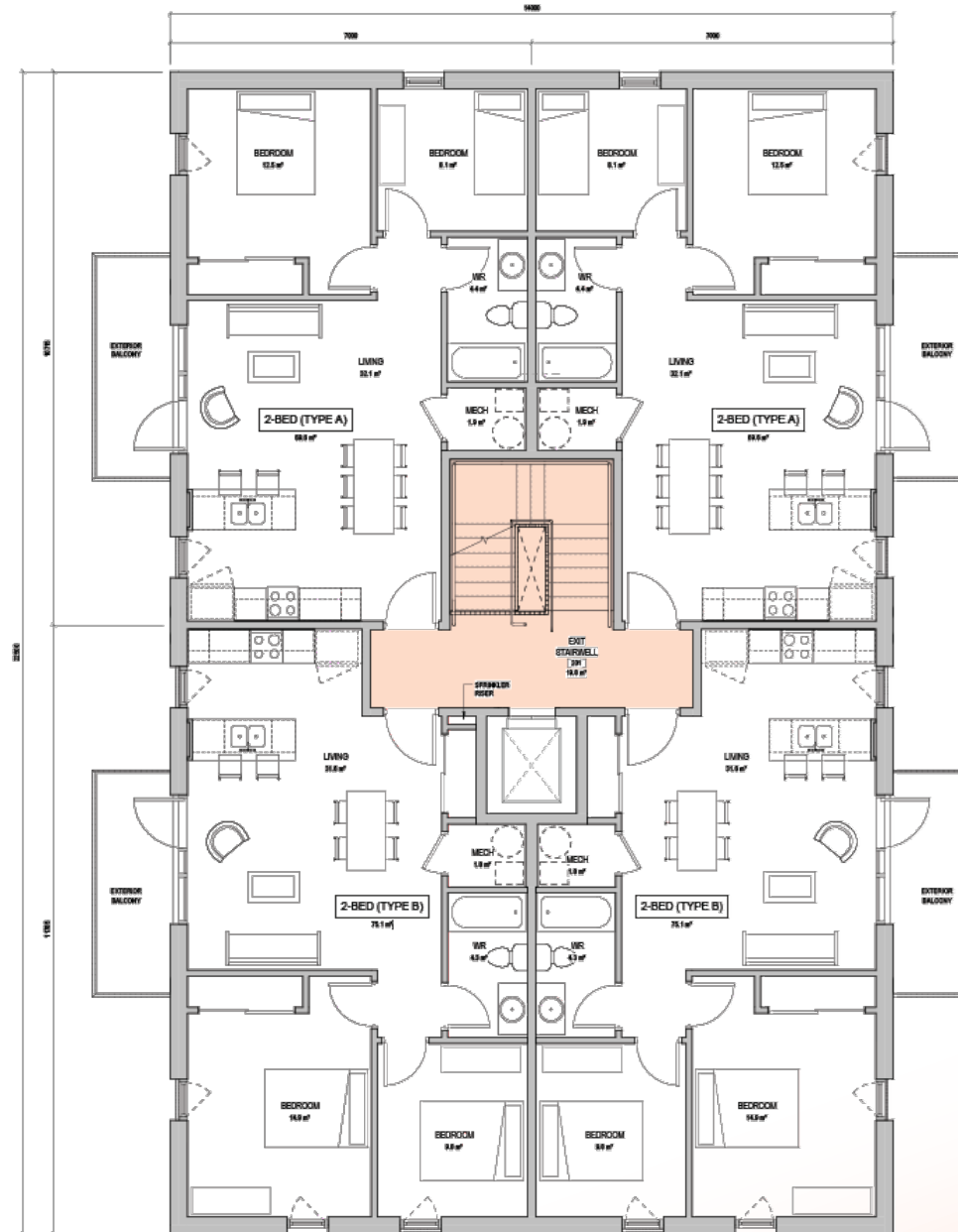
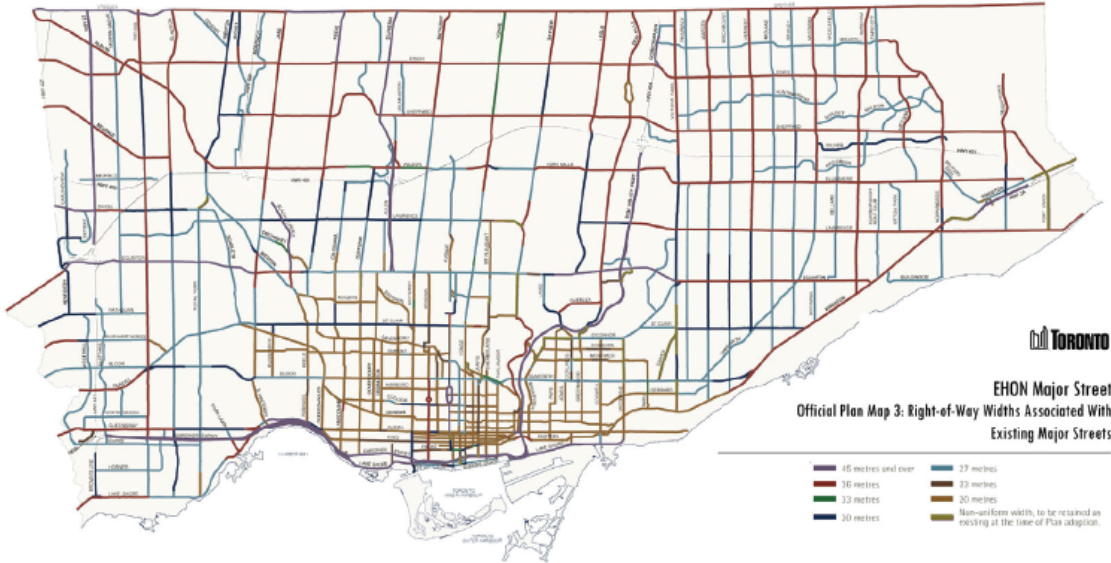


Diagram of Stacked Townhouses



'Order of Magnitude' Impact Analysis

along Major Streets in Toronto



EHON Major Streets
City of Toronto Official Plan Map 3.

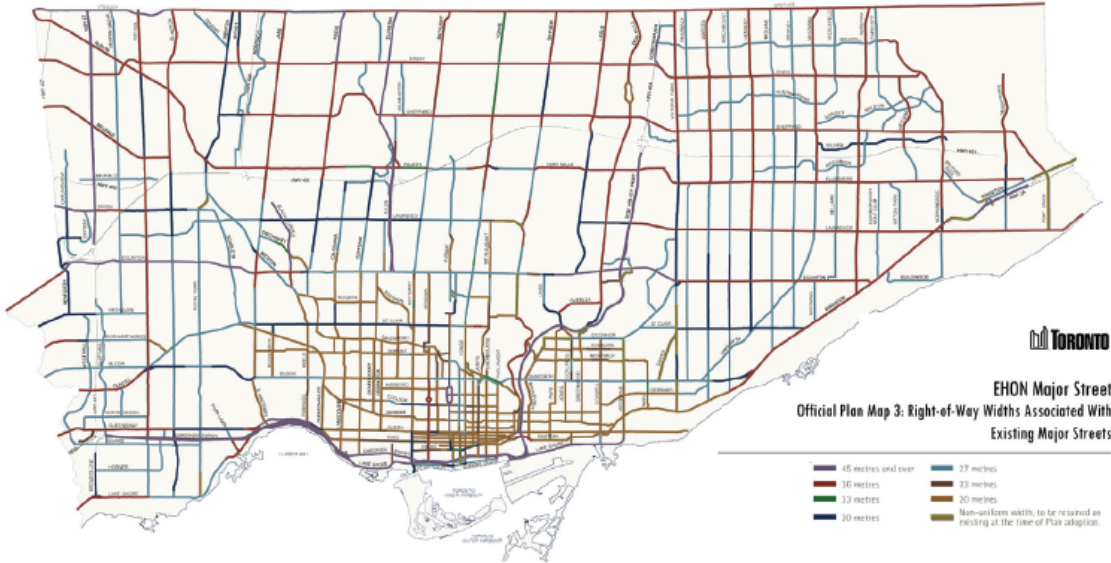
2,435 km
TOTAL LENGTH OF FRONTAGE ALONG MAJOR STREETS IN TORONTO¹

120,000
NUMBER OF ELIGIBLE SITES
assuming buildings on both sides of the street and an average lot width of 50ft - factored at 75% to exclude parks, intersections and other non-uniform conditions.

City of Toronto, EHON - Major Streets Interim Report (Page 9 of 17)

'Order of Magnitude' Impact Analysis

along Major Streets in Toronto



EHON Major Streets
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City of Toronto, EHON - Major Streets Interim Report (Page 9 of 17)

1,200 Midrise Buildings
ASSUMING AN ADOPTION RATE OF 1% OVER THE NEXT 10 YEARS

If 1% of the eligible sites are redeveloped over the next 10 years (0.1% annually), approximately 1,200 midrise buildings could be eligible for the solution in the next decade.

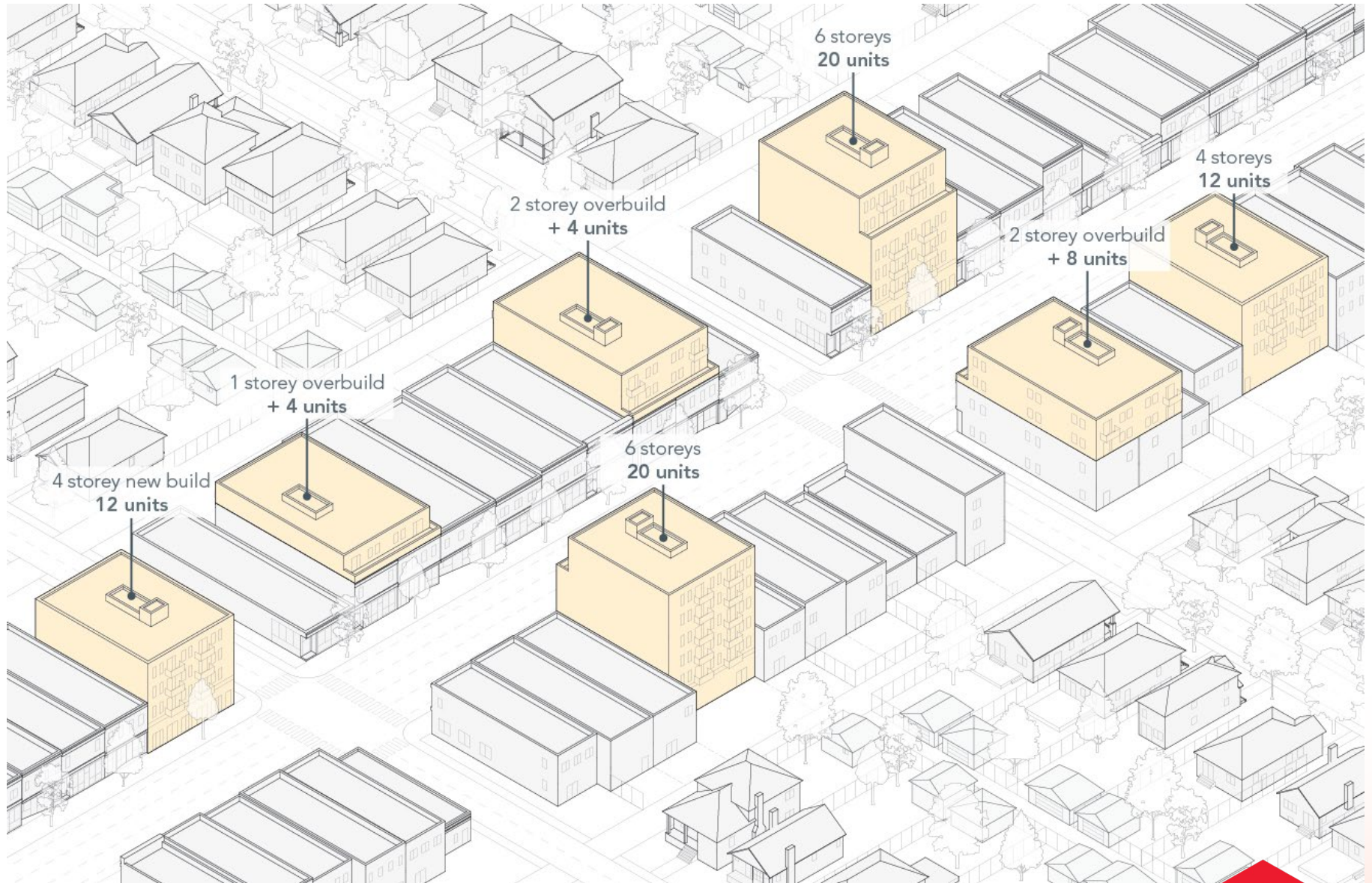
Provincial housing target for Toronto is 285,000 new homes over the next 10 years. If 10% of these are 6-storey mid-rise buildings with an average of 20 dwelling units per building, 1425 mid-rise buildings would be created.

5 Bedrooms (50m²)
SOLUTION IMPACT PER BUILDING

The floor area savings of the solution is equivalent to one bedroom per storey or roughly 10m² per storey. For a 6-storey midrise building with four dwellings per storey and commercial use at grade, the solution creates design flexibility for five more bedrooms.

'Order of Magnitude' Impact Analysis

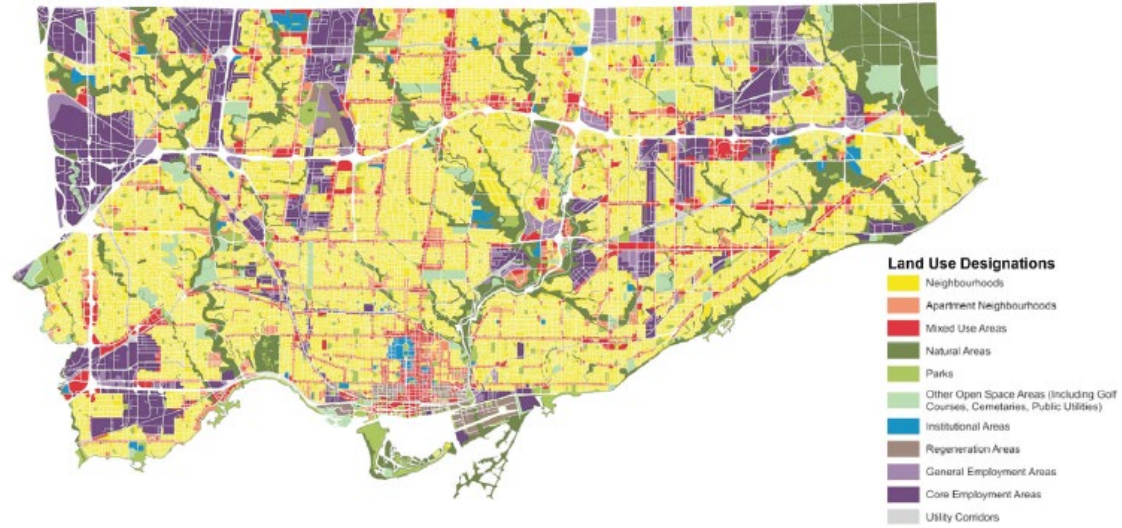
along Major Streets in Toronto



6,000 Bedrooms (60,000m²)
ESTIMATED IMPACT FOR MIDRISE
BUILDINGS ALONG MAJOR STREETS IN
TORONTO OVER THE NEXT 10 YEARS

'Order of Magnitude' Impact Analysis

within Toronto Neighbourhoods



Yellow represents "Neighbourhoods."
City of Toronto Land Use Designations.

270,355

NUMBER OF SINGLE-DETACHED
HOUSES IN TORONTO¹

73,520

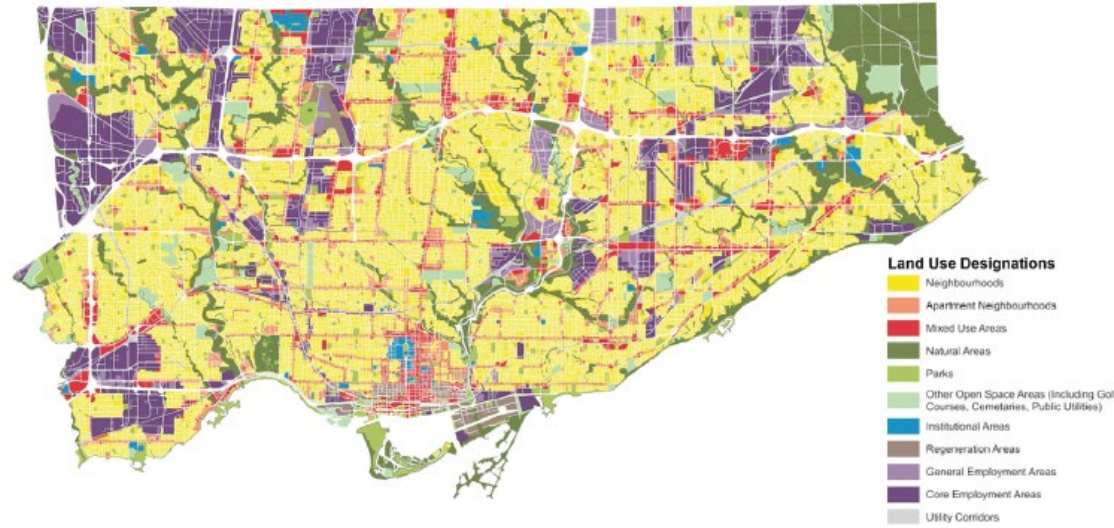
NUMBER OF SEMI-DETACHED
HOUSES IN TORONTO

Statistics Canada. 2022. 2021 Census -
Structural Type of Dwelling by Tenure.

City of Toronto, EHON - Major Streets
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'Order of Magnitude' Impact Analysis

within Toronto Neighbourhoods



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3,400 Multiplexes

ASSUMING AN ADOPTION RATE OF 1%
OVER THE NEXT 10 YEARS

If 1% of eligible sites are redeveloped over the next 10 years (0.1% annually), approximately 3,400 midrise buildings would benefit from the solution.

Provincial housing target for Toronto is 285,000 new homes over the next 10 years. If 10% of these are multiplexes with an average of 4 dwelling units per building, 7125 multiplexes would be created. The adoption rate is likely to be much higher depending on other variables.

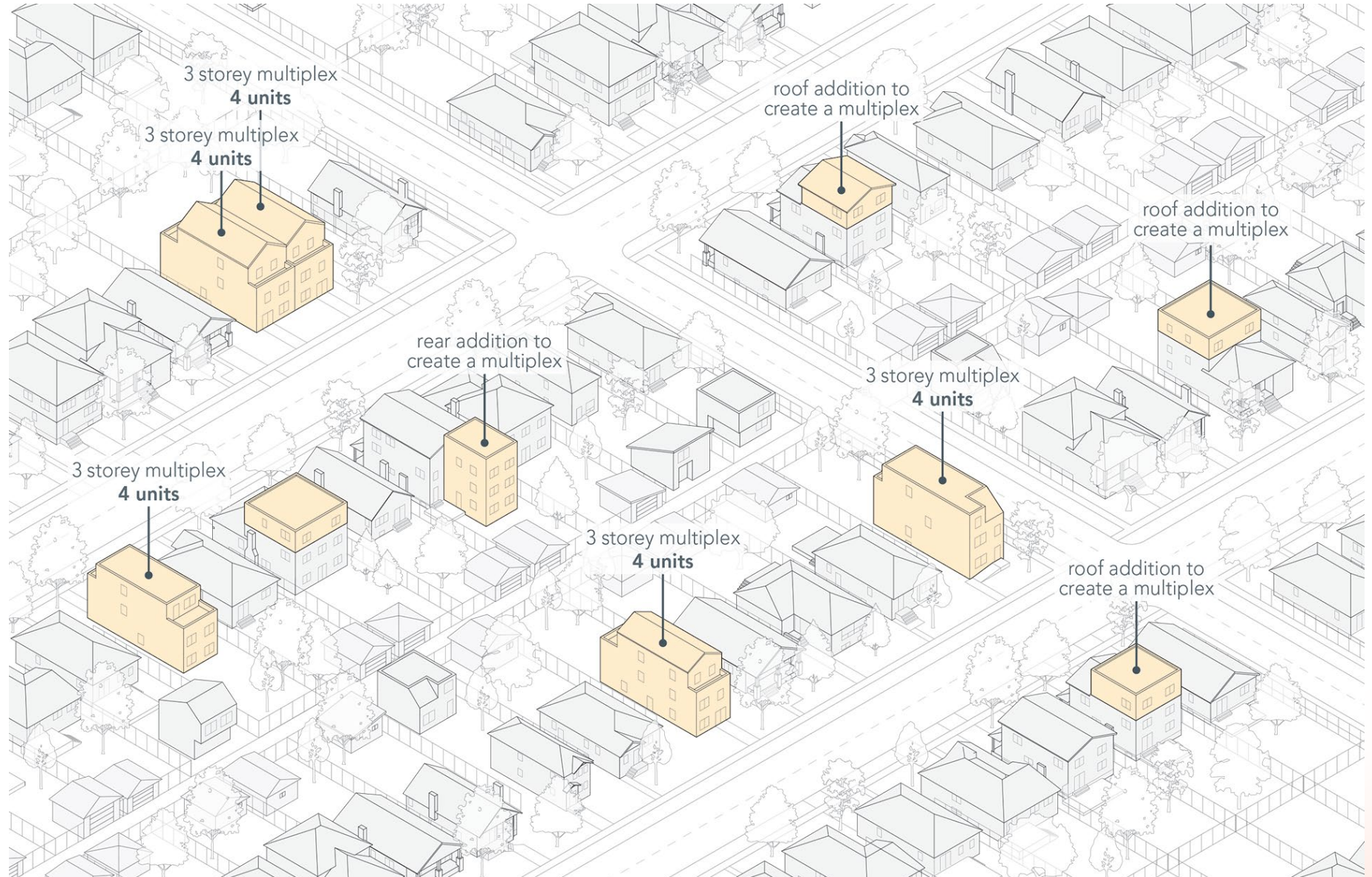
1 Bedroom (10m²)

SOLUTION IMPACT PER BUILDING

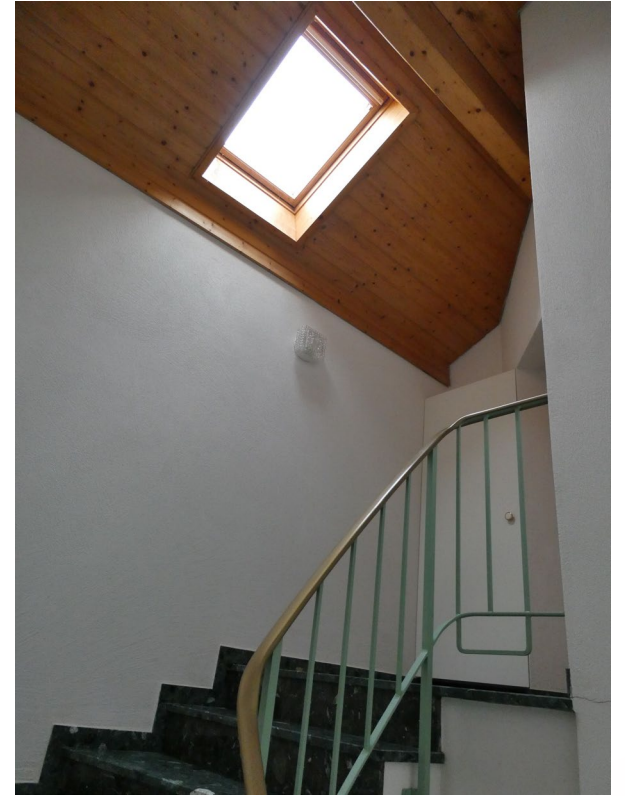
The floor area savings of the solution compared to stacked townhouses is equivalent to one extra bedroom per building or roughly 10m² in total floor area savings. The solution also provides significant design flexibility to create fully-accessible units.

'Order of Magnitude' Impact Analysis

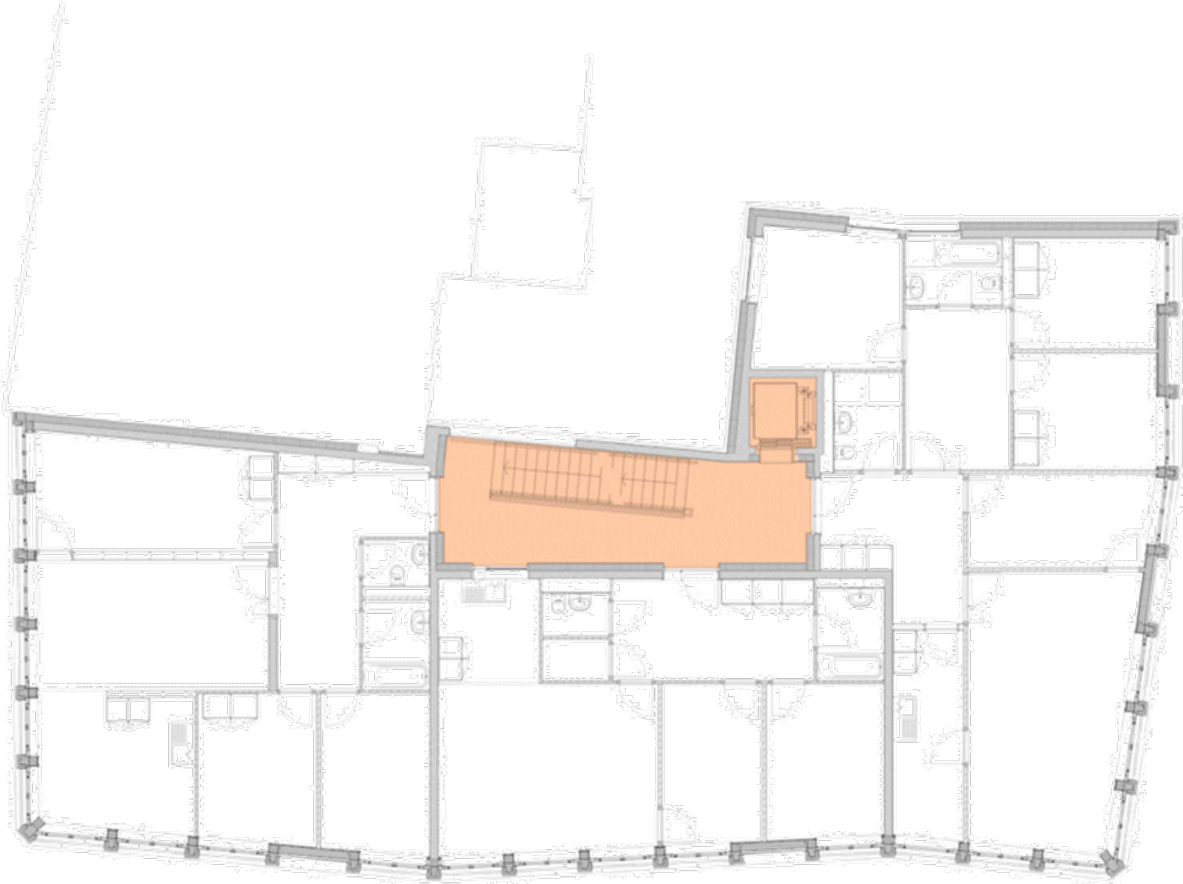
within Toronto Neighbourhoods



3,400 Bedrooms (34,000m²)
ESTIMATED IMPACT FOR MULTIPLEXES
IN TORONTO NEIGHBOURHOODS
OVER THE NEXT 10 YEARS



Thank you!



Urban Housing and Crèche / 2011 / Sergison Bates Architects / Geneva, Switzerland / 8 storeys