CITY OF VANCOUVER

COUNCIL REPORT

Report Date: February 14, 2025
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Meeting Date: February 26, 2025
Submit comments to Council

TO: Standing Committee on Policy and Strategic Priorities

FROM: Chief Building Official

SUBJECT: Potential to Update the Vancouver Building Bylaw to Enable Single Egress Stairs

Recommendation

A. THAT Council decline to adopt of the Provincial "Single Egress Stair" provisions enacted as Revision 3 to the 2024 BC Building Code, on account that the proposed features are not well suited to the Vancouver context.

FURTHER THAT Council direct the Chief Building Official, in consultation with the Fire Chief, to further investigate and report back with recommendations to safely densify sites across the City, through the adoption of space-efficient egress in small residential buildings.

Alternative Consideration

B. THAT as an alternative to Recommendation A above, Council direct the Chief Building Official, in consultation with the Fire Chief, to report back with proposed alterations to Building By-law to adopt, with modifications, the Provincial Single Egress Stair provisions including additional mitigations as may be warranted in the Vancouver context.

Purpose and Executive Summary

The Provincial government recently introduced revisions to the BC Building Code that provide a voluntary (opt-in) set of requirements that permit residential buildings of up to six storeys to be constructed with a single egress stair (SES).

This report explores the potential for realizing stated benefits of the SES requirements, as well as the increased risks where a second exit stair is non-existent. The benefits of the SES model depend on the specifics of each building design, and many of the technical risk mitigating features required to implement the BC Building Code changes impact the ability to realize these benefits. This is likely to lead to longer term maintenance requirements being passed on to the end owners.

The SES design also increases life safety risk to the residents by removing alternatives for emergency response and evacuation. This is contrary to the risk management principles fundamental to Canadian building codes and will lead to difficulty maintaining the required fire protection systems in a timely manner for the lifetime of these buildings.

Staff has convened a group of experts and have thus far determined that there are possible alternative ways to safely densify smaller residential lots without having to remove the second exit stairs or by providing additional design parameters that will reduce the risk of a single stair, while meeting the stated goals of the SES provisions.

Council Authority/Previous Decisions

On October 9, 2024, Council made a motion to direct staff to investigate voluntary (opt-in) provisions introduced into the BC Building Code that allow for residential buildings with single egress stairs. Council requested that staff investigate *"… the potential to and required changes […] to permit single egress stairs in low & mid-rise buildings in buildings up to six (6) stories to enable larger layouts and more multi-bedroom apartment options for families and people who need them*", and to generally consult with experts from industry and the Fire Service with respect to "*the identification or potential inclusion of supporting life safety and firefighting measures*".

The Building By-law is enacted under the authority provided by the Vancouver Charter and provides Council with the authority to regulate the construction of buildings, including structures of every kind, excavations, and everything so attached to a structure as to constitute it real property.

On October 31 2023, Council released the Vibrant Vancouver: City Council's Strategic Priorities for 2023 to 2026, containing nine strategic objectives, almost all of which may be influenced by the Building By-law, including "*2. **Housing** - We work with senior governments and other partners to address the local housing crisis, with the goal of ensuring that appropriate housing options are available for everyone in Vancouver*", to which the new voluntary requirements for single egress stairs may be relevant.

City Manager's Comments

The lack of available data to quantify the relative risk of single-egress stair construction represents a significant constraint on evaluation of the two alternative decisions for Council as set out above. Irrespective of any determination reached by Council at this time, the City Manager suggests that the imperative to enable affordable construction of medium-density housing forms warrants continued effort to quantify that relative risk.

Context and Background

Current Vancouver Building By-law Requirements

The provisions of the current Vancouver Building By-law generally require each floor area of a building that is greater than 2 storeys to be served by at least two exits. This provides building residents, visitors and first responders (such as police and paramedics) with both a choice of emergency evacuation routes, and a backup evacuation route if the first one is compromised. This also allows firefighters, once arriving on scene, to use one of the stairs for firefighting operations and the other stair for evacuation. This requirement has been consistent with Canadian model construction codes for many years, and consistent with the risk management concept that redundancy[1] provides a significant fire and life safety benefit.

Single Egress Stair Provisions

The Province of BC introduced non-mandatory (opt-in) provisions to support small residential buildings designed with a single egress stair. These regulations address smaller dedicated residential buildings between 3 to 6 storeys in height, with no more than 24 occupants per floor. Representatives of the fire service in BC have stated their concerns were not taken into consideration in the very short consultation period and had requested that the SES provisions be paused until the National Building Code has completed its study.

Key benefits cited by many proponents of SES designs are:

- Greater Urbanization Potential: SES designs could unlock the potential for greater densification of single-family lots that might otherwise require expensive land assembly.
- Cost Savings: The costs associated with a second stair are viewed as being a large and unnecessary cost.
- Reduce Service Impacts: Equivalent density can be provided on a smaller footprint to increase the availability of permeable ground for water absorption.

Concern related to the single egress stair design have been raised by the fire chiefs and other fire and life safety professionals across North America, noting that life safety may be compromised unreasonably due to:

- A lack of an alternative for egress if the sole exit is compromised.
- Congestion in the single stair due to concurrent firefighting operations and occupant egress.
- The inability of first responders to access a fire floor without putting occupants at risk due to toxic smoke from the fire floor.

Single Egress Stair (SES) Designs

The provincial single egress stair requirements recognize there are fire and life safety risk implications for design with one stair, and require additional features to help offset these risks, including:

- Increased sprinkler design requirements.
- Stair construction is to be non-combustible or limited to non-combustible finishes (FSR/SDC 25/50).
- Wider stairs (1500 mm).
- Hold open devices for doors for each dwelling unit tied to the fire alarm system.

[1] **Federation of Canadian Municipalities and National Research Council** (2006)**,** "National Guide to Sustainable Municipal Infrastructure" - Chapter 10", https://fcm.ca/sites/default/files/documents/resources/guide/infraguide-managing-risk-mamp.pdf

- Mechanical pressurization of the stairway, or construction of a vestibule on each floor for buildings over 4 storeys.
- Emergency power for the pressurization fan and fire protection of their electrical cables.

Approaches in Other Jurisdictions

There are other jurisdictions around the world which do allow single egress stair designs exceeding 2 storeys. Yet, research by the National Fire Protection Association and others have pointed to differences in data collection, regional design and construction materials choices, and other factors that can lead to different conclusions when interpretating the available data. Even when comparing with the often referenced City of Seattle, there are local differences; it is notable that the Seattle fire department does not support broader expansion of the single egress stair provisions and has identified the crucial nature of a rapid, fire department response, and that substantive fire fighting capabilities, more than almost every other fire departments in North America have, including Vancouver, are needed to make SES work[2].

Discussion

This report provides information for Council's consideration if the BC SES regulations should be adopted as part of the next edition of the Vancouver Building By-law. Staff have conducted research and heard from proponents, building designers, firefighters, and experts in accessibility, building fire and life safety to develop this summary of the potential benefits and implications of adopting the BC SES.

Staff recognize there are potential benefits offered by single egress stair designs. These are not necessarily unique to single egress stair designs, and other more space efficient egress designs with two stairs for small residential buildings might also achieve the same benefits. Staff are therefore providing a recommendation as well as an alternative for Council's consideration:

- **Recommendation** that Council decline to adopt the BC SES regulations as written, and to direct staff to explore alternative options for safely increasing densification by means of the adoption of space efficient egress for small residential buildings.
- **Alternative Consideration**: that Council direct staff to report back to Council with proposed alterations to the BC SES provisions, including additional mitigations as may be warranted in the Vancouver context.

Development Benefits

The fundamental argument for SES housing benefits are highly dependent upon the specific design. The improved flexibility of suite design is frequently stated as a benefit, largely due to the elimination of area taken by one stair and reduced public amenity areas, which allows the freed-up floor space to increase and improve living spaces. Estimates by some studies suggest that there may be space efficiency gains of up to 10% of the floor area for smaller 4 storey buildings. Space efficiency gains are less for higher buildings (approximately 5% of floor area for 6 storeys). However, the actual accrued benefit is based on the design specifics, and the actual usable floor area recovery may be significantly smaller due to several other requirements.

[2] **National Fire Protection Association**, "Single Stair, Many Questions", August 6, 2024

Environmental and Building Service Benefits

There are various potential environmental benefits from SES buildings including:

- Maintenance of permeable surfaces.
- Potential Increased daylighting and cross-ventilation.

SES building designs could potentially include a larger number of units than is permitted by multiplex designs. It has been identified that SES designs could limit density-driven building service demands by maintaining the current amount of permeable surface on lots previously zoned for detached single dwellings through this vertical densification. To be effective in this capacity, proponents have noted that zoning and development changes will be required to support this vertical densification, and the housing market would need to accept designs without or with reduced parking.

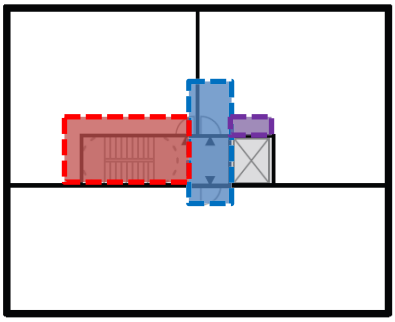
In addition, proponents have identified that the removal or at least reduction of common space dedication on each floor would reduce interior restrictions on suite design, and permit increased exterior perimeter of suites in an SES design. This may in turn provide better cross-ventilation opportunities for the residential suites, which can potentially reduce energy usage for cooling during the summer and taking advantage of increased solar heat gain during the winter months. Increased windows may also improve daylighting of the suite leading to an increase in the attractiveness and livability of the residential suites.

These are important and desirable benefits but are not unique to the SES design. Other more space efficient exit system design can achieve the same benefit without having to compromise life safety with the removal of the second stairway, and possibly without the additional costs of the current SES provisions.

Regulatory Requirements for Single Egress Stairs Buildings

The BC SES regulations require additional design features to harden the single exit stair against the possibility of failure, reduce the impacts of fire and smoke, and reduce the impacts on fire fighting response and occupant egress. Depending upon the size of the building, and the specific design, these features are likely to significantly reduce the expected benefit of the SES designs. Exit stair and landings and additional vestibules may also be required, significantly reducing the expected recovered floor area. Additionally, there may be further need for space to accommodate smoke control measures such as vestibules, emergency power, and shafts further eroding the anticipated space recovery.

In a study from Boston[3] a comparison of a hypothetical 3 dwelling unit, double loaded floor plate and a similar SES design and showed a 10% improvement in efficiency. However, this SES design is not consistent with the Vancouver (or even the BC) context, since the BC SES provisions require the exit stair and landings to be roughly 1/3 wider to accommodate simultaneous fire response and evacuation. Additionally, the building code prohibits direct access from a suite into an exit stair. This means that a corridor serving the residential suites cannot be eliminated.



[3] Boston Indicators, Joint Center for Housing Studies of Harvard University (2024), “Legalizing Mid-Rise Single-Stair Housing in Massachusetts”

The new SES provisions for buildings of 5 to 6 storeys may also require a vestibule between the stair and corridor, thereby further eroding the anticipated space recovery. Space may also be lost to shafts providing ventilation for pressurization of the single stair, or as services space to accommodate an emergency power supply, further reducing floor area gains (the image on the right provides an illustrative overlay of the BC SES needs versus the Boston study).

In the Appendix to the BC Building Code, it is recognized that the SES provisions must be carefully evaluated for its applicability. The accompanying note to the BC SES requirements identifies that, "*These solutions are not appropriate for use if any of the stated expectations cannot be met.*", and that "*…These solutions can be used when there is a high level of confidence that the expected capacities and capabilities will exist for the lifecycle of the building.*"

To date, it is our understanding that no other local jurisdiction in British Columbia has implemented the new single egress stair provisions in the BC Building Code.

Housing Affordability and Delivery

Some proponents have claimed the SES model has potential for reducing costs and faster housing delivery. The technical risk mitigation features proposed by the province are likely to lead to substantially increased costs for other building systems negating most if not all cost savings (see Appendix A).

Recent staff experience with proposals for single egress in buildings have generally confirmed the high cost of the risk mitigating features, and designers have typically responded by identifying a desire to waive these features or implement alternative solutions[4] to avoid these features. This approach increases cost, time, and administrative burden, for both the owner and City, and will likely result in a negative impact on housing delivery by increasing permit review times, construction costs, and inspections.

Further to above, the SES features include life safety features such as a fire alarm, mechanical pressurization and door hold open devices, which have long term testing, maintenance, and repair costs. Developers may be accepting of features with long term maintenance costs, where as the end owners may have other economic pressures which could lead to the deferral or omission of required maintenance essential for the proper operation of these safety features. The impact of these long term and high costs associated with the BC SES requirements do not appear to have been deeply studied in the economic assessments to date.

Vancouver continues to experience the challenge of maintaining fire protection systems in a multi-unit building while being able to have the residents housed in safe and liveable conditions, especially for the older, mobility challenged, and vulnerable citizens. If a building owner fails to maintain the SES life safety systems in a timely manner even as legal action is being undertaken by the City, mandating residents to vacate their homes while enforcement action is being taken or repair is being done will be an extreme option and a last resort. In the meantime, residents will be exposed to an increased risk to their life safety with only one way out. This only way out will be further compromised and made unusable if firefighter must use the same stairway to run hose and stage firefighting operations.

[4] **Alternative Solutions** are a method of achieving code compliance with specific code requirements, through alternate features by providing a technical demonstration of equivalent or better performance as permitted by Division A, Clause 1.2.1.1.(1)(b).

Emergency Response Implications

A single stair could result in both evacuation and emergency services response occurring simultaneously within the single stair which could result in delays to emergency response, evacuation, or both.

In the case of fire response, firefighters set up and stage for a fire attack from within the safe confines of a protected stairway. Hoses need to be connected to the standpipes in the stair, which means that the doors between the stair and the fire floor must be held open, allowing smoke to spill into the exit stairway which could lead to the single stair becoming untenable. There is no alternative stair to allow for evacuation of the residents who are slow to respond or who have mobility challenges. The SES provisions attempted to mitigate the potential of fire and smoke spread into the stairway by requiring pressurization of the stairs,or constructing vestibules on each floor. However, the SES provisions did not take into account the necessity of opening exit stair doors to extend hose onto the fire floor, thereby negating the effects of both the pressurization and the vestibule.

It has been noted that the single stair egress provisions only apply to buildings with limited occupant load, and it is expected that occupants will have evacuated. Fire is not a remote risk, and it is also well documented there are numerous cases where occupants have delayed evacuation for various reasons which could subsequently impact their ability to egress safety. A report for the University of the Fraser Valley, has identified that "*Smoke affected primary egress routes for more than 42% of residential apartment fires, including the corridor (23.5%), stairwell (18.7% and elevator (0.4%).)*"[5].

Alternatives for Space Efficient Egress in Small Residential Buildings

As part of this report, Staff have generally explored alternatives or modifications to facilitate space efficient egress alternatives. Scissor stairs or exterior single egress stairs have been identified as potential alternatives, and a list of other considered options are provided in **Appendix B**. Should **Recommendation A** be adopted by Council, staff propose to further develop alternative regulations to implement space efficient egress for small residential building with further assistance of subject matter experts.

Subject Matter Expert Consultation

In general, the experts have acknowledged that the issue is complex and should not be rushed, and that the BC SES provisions may not be well suited to development with a heavy emphasis on wood frame construction or on smaller lots with limited street access. Alternative means to achieve the fundamental goals of more space efficient egress design may be more appropriate.

Cost vs. Benefit and Risk Assessment

Much of the arguments for and against single egress stair arrangements are with respect to tangible but hard to quantify outcomes. Staff recommend that Council carefully consider the principal purpose of the exit stair, and whether the potential benefits provided by the BC SES regulations merit the potential increased life safety risk.

[5] Garris (2024), "*Evaluating Stakeholder Concerns About Proposed Single Egress Stairs - Residential Buildings in Canada, and What the Data Tells Us.*", pg.10.

Financial Implications

There are no financial implications associated with this report's recommendations.

Legal Implications

There are no legal implications associated with this report's recommendations.

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APPENDIX A
Commentary on the Achievability of the Design Benefits and the Safety and Implementation Concerns related to Single Egress Designs

Fire Fighting Concerns

Concern	Comments
Congestion during response and evacuation	o The need for evacuation to occur concurrently with fire response in the same stair creates severe space constraints, even with the wider stair required by the BCBC. o Bi-directional travel and persons requiring additional support to egress may further complicate both response and evacuation
Lack of redundancy	o All activities must take place in the exit stair, as the sole "Safe space". o Firefighter operations require opening the door and keep it open on the fire floor (hoses), which could then jeopardize evacuation for all other floors (there being no other stair that can be used for evacuation)
Reliance on adequate maintenance and repair	o Additional safety system are required to replace the 2nd stair, which are more complicated require more maintenance
Reliance on occupants to take immediate action and not to delay	o Occupants may not react the way anticipated by BCBC, and frequently delay, which then impacts Fire response.
Insufficient fire fighting capacity to mount an effective response	o BCBC relies on an unclear assumed "good" fire response. o Based on Seattle's experience a large and fast fire fighting response (say 30 persons to) even to small buildings is necessary to address SES concerns.

Anticipated SES Design Benefits

Anticipated Benefit	Comments
They can fill in for more "missing middle" type housing	o No clear evidence for this as development is driven by market forces (i.e. developers sell based on the price of comparable units across the city). Large units are simply less affordable. o It has also been noted that the reduced common space and tight lots for SES buildings leads to fewer amenities which may correlate with the reduced cost for similar units. o Increases from SES are generally limited to small lots only, which limits the overall potential for increased housing choice.
There would be more choice for multi-bedroom suites	o Additional area and removal of corridor requirements could lead to wider suites and improve design for greater livability. o Designs for multi-bedrooms would in many cases effectively preclude increases in the number of suites due to the fixed area available on most of the intended lots. o Area requirements for the risk mitigating features of the BCBC would largely negate the anticipated potential space saving.

Small lots can have higher density and do not need land assembly.	o Research in this area suggest savings of only a couple hundred square feet, not enough to add a unit. o Minimal space increases coupled with the suggested additional suite space are unlikely to add meaningful density increase or number of housing units. o Review of this form of housing suggest that higher density is achieved by larger traditional double loaded designs.
Energy efficiency will be better with the ability to provide cross ventilation where suites are in a corner of the building.	o The larger potential wall area does provided additional opportunities for openable windows, however, this can also be achieved by simply due to larger suite sizes, and might not be a consequence of single egress stair design. o Increase cross ventilation provides only limited benefit in extreme heat events. o Windows on flanking property lines may not be permitted if you are seeking to maximize lot coverage, unless you are prepared to implement less space efficient layouts.
Housing cost will be lowered by saving floor area required of a 2nd stair	o Additional safety features such as elevators, emergency power, self-closers, etc. add substantial upfront cost. o BCBC compliant design includes many fire/life safety features that place a long term maintenance cost on the end owners.
Better aesthetics/livability	o Units are not permitted to open directly into the exit stairs to prevent the interconnection of floors, which prevents the open design envisioned by proponents from being achieved. o The attractive usable space envisioned cannot contain
Feasibility in other jurisdictions	o Does not necessarily fully consider local context, data context, and other factors[6,7,8,9,10]. o Construction material and design choices are different which can material affect occupant risk.

[6] Garis (2024), "Evaluating Stakeholder Concerns About Proposed Single Egress Stairs
Residential Buildings in Canada, and What the Data Tells Us", pg.17 – with reference to the "knowing-doing gap", and "wear-off effect" with respect to local fire safety training and practice, and Joyner (2015) "*Bridging the knowing/doing gap to create high engagement work cultures"; and* Compton & Chein (2008) "*Factors related to knowledge retention after crisis intervention team training for police officers*".

[7] National Fire Protection Association (2024), "One Stair, Two Perspectives: Single Exit Stair Symposium, pg. 18. *"…there is an intersection of social risks (e.g., aging, decreased mobility) all using the same stairwell, and other risks like new lightweight, combustible construction, elevation concerns with this type of approach, and the presence of new hazards (e.g., lithium-ion batteries).*" Pg. 27. "*Other factors that need to be considered are the impact of changing demographics with more people aging in place and families relying on that to care for the elderly.*"

[8] National Fire Protection Association (2024), "One Stair, Two Perspectives: Single Exit Stair Symposium, pg. 23 "Analysis of the data shows that it is not directly comparable between countries. Countries use their own definition of what a fire and fire death is and often only report fires without specifying the type of fire (structure, outdoors, vehicle, etc.). What is counted and reported as a fire death in one country may not be counted the same way in another."

[9] Almejmaj Meacham (2021), *The Effects of Culture-Specific Walking Speed and Pre-Movement Data on Egress Modeling in Shopping Malls- A Comparative Analysis*, pg. 8, "*There are various risks associated with the increased use of egress analysis and applying input parameters across culturally without examining the local cultural norms and how they might affect the estimated model results*"

[10] Garis Desautels (2024), Learning from fire death data: Ten years of coroner data reveals the factors behind escalated Indigenous fire risk in Canada, "…*National Indigenous Fire Safety Council (NIFSC) released a [study] delving into the circumstances surrounding fire deaths in Canada from 2011 to 2020 […], the study not only reinforces earlier research showing that fire-related deaths and injuries are significantly higher for Indigenous than non-Indigenous people but sheds new light on the contributing factors. The study data suggests that Indigenous people are four times more likely than non-Indigenous people to die in a fire in Canada,*"

Concerns related to the implementation the single stair egress requirements

Permit times longer	o This adds complexity to the design and further administrative overhead inconsistent with the goal of providing more and faster housing. o First enquiries have all sought to avoid including the risk mitigation features required by the new BC code changes, and propose a variety of alternative solutions, each of which would add to processing times and design costs.
Additional Design cost	o Even compliant designs would require additional system requiring design at additional cost. o Also requires additional registered professionals to support these processes.
Greater maintenance costs	o The additional risk mitigation features require additional features which add complexity and maintenance requirements, which lead to additional maintenance costs to support more frequent work and/or engaging of trained personnel.
Seismic and non-fire emergency risks to evacuation	o Potential loss of means to egress due to seismic event, or other non-fire emergency is increased.
Risk increase from loss of redundancy	o The long term risk to occupant is amplified during periods of maintenance or outage since redundant safety features have been eliminated. o
Insurance cost could be higher	o This is unclear in the short term, It will take many years to fully understand the insurance implications. o Insurance companies are unlikely to view the reduction of egress options (and the ability of occupants to take measure to ensure their own safety) favourably which could leave owner on the hook for insurance costs.

Approaches in Other Jurisdictions

Proponents for single egress stairs have pointed towards other jurisdictions around the world where single egress stair designs exceeding 2 storeys are permitted. More work is necessary to confirm that such comparisons take into consideration the whole context and identify local considerations. Research by the National Fire Protection Association and other have pointed to differences in data collection, regional design and construction materials choices, and other factors can lead to different conclusions when interpretating the available data[11,12].

[11] National Fire Protection Association (2024), One Stair, Two Perspectives: Single Exit Stair Symposium, pg. 23 "Analysis of the data shows that it is not directly comparable between countries. Countries use their own definition of what a fire and fire death is and often only report fires without specifying the type of fire (structure, outdoors, vehicle, etc.). What is counted and reported as a fire death in one country may not be counted the same way in another."

[12] Almejmaj Meacham (2021), *The Effects of Culture-Specific Walking Speed and Pre-Movement Data on Egress Modeling in Shopping Malls- A Comparative Analysis*, pg. 8, "*There are various risks associated with the increased use of egress analysis and applying input parameters across culturally without examining the local cultural norms and how they might affect the estimated model results*"

The City of Seattle has adopted SES provisions and is frequently referenced by proponents. However, it is notable that the Seattle fire department does not support broader expansion of the single egress stair provisions and has identified the crucial nature of a rapid, fire department response, and that substantive fire fighting capabilities, more than almost all other fire departments in North America have, including Vancouver, are needed to make SES work[13].

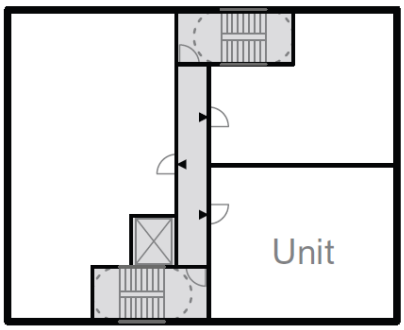
Development Context

Some proponents have indicated that SES may be effective for redeveloping smaller lots for rental use by potentially eliminating expensive and time-consuming land assembly and rezoning processes that are currently needed to redevelop properties zoned for single detached housing. In such a case, the construction of a SES building will remain constrained by the small lot size so that the actual floor area gains remain small (10-15 m^2) so the recoverable floor area is most likely to be used to expanding existing suites into multi-room housing options - this is therefore a solution that could improve choice of housing and likely not quantity of housing.

Regulatory Requirements for Single Egress Stairs Buildings

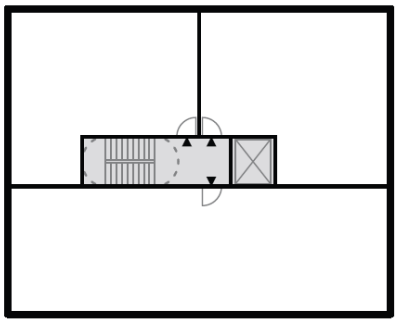
The BC SES regulations require additional design features to harden the single exit stair against the possibility of failure, reduce the impacts of fire and smoke, and reduce the impacts on fire fighting response and occupant egress. Depending upon the size of the building, and the specific design, these features are likely to significantly reduce the expected benefit of the SES designs.

In a study from Boston[14] a comparison of a hypothetical 3 Unit, 2,880 gross SF Floor Plate arrangement was carried out. The findings of this study is fairly typical of other similar studies[15] of various prototypical SES floor layouts.



This study found a Small Double-Loaded Plan (left image) to be about 82% Space Efficient.

By comparison, an alternate small Single-Stair Plan (right image) was found to be 92% efficient.



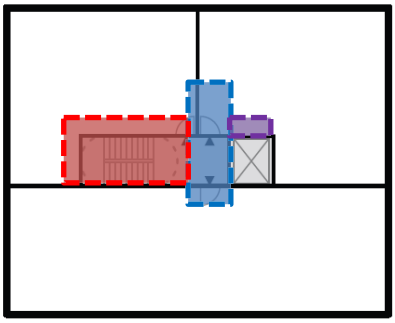
While impressive, this it is not consistent with the Vancouver (or even the BC) context, since the BC SES provisions require the exit stair and landings to be at least 1500 mm wide versus the normal 1100 mm wide stair (or 900 mm in smaller buildings) to accommodate the potential for simultaneous fire response and evacuation.

[13] **National Fire Protection Association**, "Single Stair, Many Questions", August 6, 2024

[14] Boston Indicators, Joint Center for Housing Studies of Harvard University (2024), "Legalizing Mid-Rise Single-Stair Housing in Massachusetts"

[15] Similar studies have generally reported potential space recovery between 5% to 10% depending on the assumed suite types and layouts, and include the report by Public Architecture, and LGA Architectural Partners.

Additionally, the building code prohibits direct access from a suite into an exit stair. This means that a corridor serving the residential suites cannot be eliminated. Furthermore, the new SES requirements for buildings of 5 to 6 storey may also require a vestibule with a minimum length of 2,400 mm between the stair and corridor, thereby further eroding the anticipated space recovery. Space may also be lost to shafts providing ventilation for pressurization of the single stair, or as services space to accommodate an emergency power supply, further reducing floor area gains.



In the Appendix to the BC Building Code, it is recognized that the SES provisions must be carefully evaluated for its applicability:

"*Note A-3.2.10. informs industry, specifically building owners, managers, designers, authorities having jurisdiction and their fire departments, of the expectations accompanying the development of these technical solutions. These solutions are not appropriate for use if any of the stated expectations cannot be met. A further expectation is that if there is an unacceptable risk or concern about capacity and capability to meet the stated expectations that these solutions would not be applied. These solutions can be used when there is a high level of confidence that the expected capacities and capabilities will exist for the lifecycle of the building.*"

Housing Affordability and Delivery

Some proponents have claimed the SES model has potential for reducing costs and faster housing delivery. Some studies have suggested general cost reductions of around $200k from eliminating one exit stair based on experiences in some jurisdictions. However, this does not necessarily consider the broader context. The technical risk mitigation features proposed by the province are likely to lead to substantially increased costs for other building systems.

Technical Risk Reduction Feature	**Impact**	**Increased Cost Estimate (order of magnitude)**
Stair enhancement	Noncombustible construction/finishes Wider stair adds property and construction costs	$100k
Sprinklers Enhancements	Design to NFPA 13 standard and balcony sprinklers if over 4 storeys	$20k
Fire alarm Enhancements	Door hold open devices, Circuit integrity	$20k
Emergency Power	EM generator/Battery system; fire-rated cabling	$100k
Smoke Control Measures (5 & 6 storey)	Stair pressurization or vestibule	$100-200k (method dependent)
Housing Design	Housing to be designed to multi-family home standard (Part 9 -> Part 3 of Code) if over 3 storeys	$100k

Recent staff experience with proposals for single egress in buildings have generally confirmed the high cost of the technical risk mitigating features, and designers have typically responded by

identifying a desire to waive or implement alternative solutions[16] to avoid these measures. This approach increases cost, time, and administrative burden, for both the owner and City, and will likely result in a negative impact on housing delivery by increasing permit review times, construction costs, and inspections.

Further to above, the SES features include life safety features such as a fire alarm, mechanical pressurization, door hold open devices, etc. which have long term testing and maintenance requirements. Developers may be accepting of features with long term maintenance costs, where as the end owners may have other economic pressures which could lead to the deferral or omission of required maintenance essential for the proper operation of these safety features. The impact of these long term and high costs associated with the BC SES requirements do not appear to have been deeply studied in the economic assessments to date.

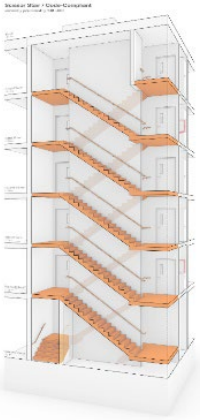
Vancouver continues to experience the challenge of maintaining fire protection systems in a multi-unit building while being able to have the residents housed in safe and liveable conditions, especially for the older, mobility challenged, and vulnerable citizens. If a building owner fails to maintain the SES life safety systems in a timely manner even as legal action is being undertaken by the City, mandating residents to vacate their homes while enforcement action is being taken or repair is being done will be an extreme option and a last resort. In the meantime, residents will be exposed to an increased risk to their life safety with only one way out. This only way out will be further compromised and made unusable if firefighter must use the same stairway to run hose and stage firefighting operations.

Alternatives for Space Efficient Egress in Small Residential Buildings

As part of this report, Staff have generally explored alternatives or modifications to facilitate space efficient egress alternatives. Scissor stairs or exterior single egress stairs have been identified as potential alternatives, and a list of other considered options are provided in **Appendix B**. Should **Recommendation A** be adopted by Council, staff proposed to further develop alternative regulations to implement space efficient egress for small residential building with further assistance of subject matter experts.

Scissor Stairs

Staff have generally explored renewed consideration of scissor stairs as a more efficient alternative design generally consistent with current Canadian model code expectations for two means of egress. This includes two intertwined stairs arranged in a zigzag pattern for greater efficiency. This allows the stairs to share space in a stair tower (see adjoining image), while retaining the benefits of a second means of egress.

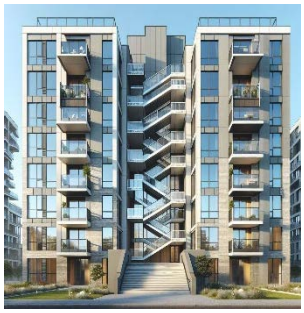


Vancouver has previously limited the application of scissor stair in wood and steel framed buildings, over concerns of construction and seismic risk. Additional passive or simple design features could be introduced to further reduce the overall risk, and further investigation of the minimum separation requirement for the second exit could be considered if further efficiencies can be achieved.

[16] **Alternative Solutions** are a method of achieving code compliance with specific code requirements, through alternate features by providing a technical demonstration of equivalent or better performance as permitted by Division A, Clause 1.2.1.1.(1)(b).

Exterior Stairs

One of the principal concerns of single egress stair designs is the potential for the stair to become smoke logged. Externalizing the single egress stair could significantly reduce the probability that occupant or firefighters would be exposed to untenable conditions as the smoke and heat would be immediately dispersed in the open air. Staff suggest further exploration in this area, and consideration of the potential for supporting suites opening directly into exterior exit stairs, can create further efficiencies without unduly reducing fire and life safety.



Subject Matter Expert Consultation

Representatives from Industry and the Fire Services were consulted to verify staff understanding of the new BC Building Code requirements, and to understand the both the perceived advantages and potential consequences of implementing a single egress stair design.

In general, the experts have acknowledged that the issue is complex and should not be rushed, and that the BC SES provisions come with cost heavy features, the burden of long term maintenance commitments, and which may not be well suited to local heavy emphasis on wood frame construction and smaller lots with limited street access. . Alternative means to achieve the fundamental goals of more space efficient egress design may be appropriate.

Cost vs. Benefit and Risk Assessment

Much of the arguments for and against single egress stair arrangements are with respect to tangible but hard to quantify outcomes. Staff recommend that Council carefully consider the principal purpose of the exit stair, and whether the potential benefits provided by the BC SES regulations merit the potentially increased fire and life safety risk.

Staff have generally assessed the potential life safety risk as being significant, since the consequence of injury due to lack of access to exit or compromised exit is quite significant.

APPENDIX B
Commentary on Proposed Alternative Space Efficient Egress

Possible solutions	Additional Comments/Questions
Require mass timber floors instead of light wood framed floor assemblies.	o Should include supporting structure as well? o Could help with embodied carbon by reducing concrete use.
Require limited backup water supply for sprinklers using a bladder pressure tank (13D system).	o Reliability of unlisted systems under 13D might need consideration. o Still a space allotment, o Are there height limitations or other consideration for such a system?
Require the single stair to be minimum 1650 mm wide, same as for B-3 (care) occupancies where it is necessary to move residents with mobility issues down the stairs.	o Is there an accessibility implication to not providing an intermediary handrail under the BCBC? o Is this adequate room to move persons with mobility challenges over and around fire service response?
Require a second elevator to enable evacuating residents with mobility issues.	o High cost item. o Would improve daily use, and reduce the impact of outages and maintenance. o Elevators can also be used for evacuation if designed appropriately, and suitable training.
Support exterior single stairs with exterior exit passageway between each suite and the enclosed exit stair. The exterior exit passageway shall be at least 50% open to the outdoors on the exterior side.	o Does this have implications for building envelope design or energy use? o Can it be designed to reduce implications for slips trips and fall in inclement weather? o Design cost implications for building systems such as sprinkler, fire alarm system, etc. o Are there specific design needs or risk implications?
Enable use of scissor stairs in light wood buildings over 4 storeys. Waive minimum distance requirement between the two exit doors from each floor that opens into the scissor stairs for residential buildings up to 6 storeys in height.	o Does the space usage seem equivalent to BCBC Subsection 3.2.10. provisions? o Potentially positive space implications for all buildings.

APPENDIX C
Fire Incident Statistics

Vancouver Fire Data 2016 to 2024

Fires	2016	2017	2018	2019	2020	2021	2022	2023	2024
Total fire incidents	1,797	1,983	2,251	2,350	2,856	3,426	3,610	4,308	3,991
Total structure fires	795	801	786	860	875	996	1,047	1,225	1,114
Residential Fires	405	354	395	685	708	826	784	965	908
Industrial Fires	0	3	4	11	9	7	8	8	5
Assembly Fires	15	19	21	60	50	43	50	60	72
Mercantile Fires	12	13	12	26	27	34	39	35	34
Business Fires	12	12	19	26	30	33	38	31	21
Institutional Fires	14	9	11	13	13	4	12	12	15
Storage Fires	2	2	5	19	19	21	22	24	18
Other structure type	335	389	319	20	19	28	94	90	41
Vehicle fires	86	110	108	105	103	109	134	132	103
Outdoor fires	904	1,060	1,329	1,353	1,853	2,300	2,387	2,935	2,738
Person fires	0	1	4	10	12	7	22	15	16
Unknown type of fire incident	12	11	24	22	13	14	20	1	20

Deaths and Injuries	2016	2017	2018	2019	2020	2021	2022	2023	2024
Total Injuries or Casualties	68	64	76	73	68	65	75	82	98
Smoke inhalation	20	21	34	30	19	15	25	24	44
Burns	20	25	19	31	38	38	38	39	35
Struck by object or person	2	5	3	1	1	2	0	1	2
Injury caused by falls	4	1	4	3	3	4	3	4	5
Injury caused by explosives	0	0	1	1	0	1	2	0	1
Injury caused by electrical	1	1	1	1	0	0	1	0	1
Unknown	21	11	14	6	7	5	6	14	10

Source Data: Vancouver Fire and Rescue Services (Feb 05, 2025)