Urban Design for Rapid Transit

Skytrain Stations for People

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The City of Vancouver has positioned itself to become the “Greenest City” in the World by the year 2020. Through its Greenest City Action Plan, 10 goals and 15 measurable targets have been identified to guide its push to become more sustainable. While substantial progress has been made in many fronts, there are still significant challenges and there remains a lot of work to be done to catch up with more sustainable cities around the globe.

One of these problem areas is in Transportation, where half of all trips made within the city are still by cars, producing more than 35% of the city’s total greenhouse gas emissions. The city must take steps to shift travel to more sustainable modes, for example the Skytrain rapid transit system.

Successful transit relies on 6 qualities, collectively known as the 6Ds of transit-oriented communities. Among these 6Ds is Design, which states that transit stations and the communities around them must be designed with the needs of people in mind. However, urban design is a complex and subjective field, and there are many differing takes on what “good” urban design is.

In order to evaluate and enhance the urban design around our rapid transit stations, we turn to Jan Gehl, a Danish urban
designer whose book, *Cities for People*, describes how to create public spaces that offer protection, comfort, and delight to all. Adapting his 12 quality criteria to Vancouver’s rapid transit context provides us with a framework by which to assess the strengths and weaknesses of existing and future transit station urban design.

By studying three test cases in the City of Vancouver, namely Waterfront station, Main Street-Science World station, and Commercial-Broadway station, we can see that the urban design framework can help us identify areas of strength and weakness. The framework also offers guidance on how to remedy these issues using design.

The major issues encountered in the three test cases related to Protection for passengers. For example, ground floor quality was inconsistent and occasionally poor, even immediately adjacent to some stations. Furthermore, passive surveillance was weak especially in the early and late hours of train operation, where station-area businesses were likely to be closed. Rain protection was adequate for train platforms, but was lacking for key bus stops.

In order to address these issues, I suggest simple design interventions such as traffic calming, and more stringent
implementation of existing zoning regulations regarding street-fronting activities. An emphasis on activity-generating uses should be maintained for all major walking routes to the stations. However, design solutions alone may not be able to solve all the problems, without consideration of the other 5Ds such as density and diversity of use.

In summary, Jan Gehl’s 12 quality criteria and the adapted urban design framework offer us a useful tool to analyse the quality of urban design in various situations, such as around rapid transit stations. Crafting the urban environment using the framework can help produce places and spaces that are appealing and interesting to people. At the same time, attention must be paid to the other 5Ds, among other criteria, in order for transit systems to be successful.
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by

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1 Context
A lively, safe, sustainable, and healthy city is one that is concerned with the most basic of urban qualities – the human experience. Cities are about people and public life, and must provide good conditions for people to walk, stand, sit, watch, listen, and talk. For too long this human dimension of city planning and design has been overlooked, but in recent decades many cities around the world have rediscovered the vital importance of designing around human needs, and in doing so have breathed life into formerly desolate public spaces. The City of Vancouver, in British Columbia, is one of the leaders in this movement in urban design.

Robson Square in Downtown Vancouver is a good example of high-quality urban design, coupled with frequent activities that make the space lively. In summer, one block of Robson Street is closed to traffic and turned into an impromptu public square, with interactive public art.

[Image credit: Vancouver Public Space Network]

There are, however, gaps that remain unaddressed. One of these gaps is in the design of rapid transit stations, and the neighbourhoods that surround them. These too must be safe,
comfortable, and inviting places for everyone to enjoy; Too of-
ten they are not, and this is a threat not only to safety, but also
liveliness, sustainability, and public health. That is the cost of
neglecting the human scale.

How then should we design transit stations and their neigh-
bourhoods to best meet human needs? The short answer is
that they must offer protection, comfort, and delight.

Bad urban design directly across the street from
Waterfront Station - the blank and lifeless face
of this parking garage make this sidewalk an
unpleasant place to walk, particularly at night
when lighting is inadequate and the streets are
empty of life.

[author’s photo]

The longer answer is that we have yet to fully realise the po-
tential of our transit stations and station neighbourhoods as
successful public places. This project is an attempt to fill in
those gaps that exist, and to help chart a path to making rapid
transit a safe, comfortable, and delightful option for all Van-
couverites.
1.2 Vancouver - the Greenest City

The City of Vancouver’s Greenest City Action Plan (GCAP) was passed by Council in 2011. The GCAP outlines a road map for Vancouver to become the “greenest city in the world” by the year 2020, and beyond.

Among the GCAP’s 10 goals and 15 targets is the goal to “make walking, cycling and public transit preferred transportation options”, within which a target was set for half of all trips to be made on foot, by bike, or on transit. This target for sustainable transport was achieved as of April 2015.

However, is 50% enough? Another plan, Transportation 2040, was approved by council in October 2012, and it set out a goal for two thirds of all trips to be made by walking, cycling, or transit. How should the City work towards this goal?
The Greenest City Action Plan, most recently updated in 2015.

[image credit: City of Vancouver]

Trends in transportation. Vancouver residents are walking and cycling more, but transit use seems to have stopped growing. This is a challenge that Vancouver must overcome.

[graph by author, data from City of Vancouver]
1.3 the 6Ds of Successful Transit

If we want to encourage more transit use, there are clear steps that must be taken. Research on successful transit systems around the world has taught us that the built environment – housing, offices, shops, and streets – around transit needs to fulfil the 6 “D”s of transit-oriented development. According to Translink’s publication, “Transit Oriented Communities Design Guidelines – Creating more livable places around transit in Metro Vancouver”, the 6 Ds are:

**Destinations**: Locate most new development along reasonably direct corridors, locate highest densities of development and the most important destinations at the intersection of frequent transit corridors.

**Distance**: Shorten travel distances between places, making it possible for people to quickly and conveniently walk or cycle to where they want to go, and to easily connect with transit.

**Density**: Concentrate most growth and development within a short walk of frequent transit stops/stations. A higher density of homes, jobs, and other activities creates a market for transit.
**Diversity:** A vibrant mix of land uses helps to create complete, walkable neighbourhoods around transit, and ensures that the neighbourhood is active throughout the day.

Shinjuku Station in Japan, perhaps the busiest transit station in the World. Just beyond its entrances you can find an astonishing array of shopping centres, small shops, services, restaurants, gigantic office buildings, and even apartments. The sheer diversity of uses around the station cater to more than three and a half million people who use the station daily.

[Image credit: allabouttravelling.com]

**Demand Management:** Promote walking, cycling, and transit use over driving. Encourage drivers to switch by increasing travel options, pricing parking appropriately, providing information, allocating more road space to transit, cycling and pedestrian uses.
and lastly, **Design**: Carefully design the community with the needs of people in mind. People of all ages and abilities should be able to access and enjoy a comfortable, safe, delightful, and inviting public realm.

Evidence from around the World shows that designing communities in this way not only helps promote transit use, but also achieves health and safety outcomes, and makes city living more sustainable and safe as well.

Among the 6 Ds, one can argue that planners and academics have well-developed guidelines for Destinations, Distance, Density, and Diversity. Demand management, on the other hand, typically falls under the purview of City Transportation Engineers. The last factor, Design, is the hardest to quantify and evaluate, mainly because of the complex interactions between human psychology and the environment around us - it is also the most interesting, and thus a prime candidate for in-depth study.

In this project, we will focus on Design criteria for creating better rapid transit stations and enhancing the neighbourhoods around them.
1.4 Zooming in on Design

How do you design a transit station, and the community around it, to meet human needs? How do we make the public realm safe, comfortable and inviting? These are questions that urban designers have been grappling with for a long time, and so we turn to prominent thinkers in urban design for answers.

Allan Jacobs, author of the book “Great Streets” and the former Director of the San Francisco Department of City Planning, wrote in his paper “Towards an urban design manifesto,” that we must create “an urban fabric for an urban life.” He listed five physical characteristics: livable streets and neighbourhoods (reasonable, though not excessive, safety, cleanliness, security); some minimum density of residential development as well as intensity of land use; integration of activities – living, working, shopping – in some reasonable proximity to each other; a manmade environment, particularly buildings, that defines public space (as opposed to buildings that sit in space); many separate, distinct buildings with complex arrangements and relationships (as opposed to a few large buildings).
In his book “Walkable City”, urbanist and author Jeff Speck describes a “General theory of walkability”. According to Speck, a walk has to satisfy four main conditions: it must be useful, safe, comfortable, and interesting. Useful means that most aspects of daily life are located close at hand and organised in a way that walking serves them well. Safe means that the street has been designed to give pedestrians a fighting chance against being hit by automobiles, they must not only be safe but feel safe, which is even tougher to satisfy. Comfortable means that buildings and landscape shape urban streets into ‘outdoor living rooms’, in contrast to wide-open spaces. Interesting means that sidewalks are lined by unique buildings with friendly faces and that signs of humanity abound.
Another urbanist, well-known for his studies of life in public spaces, is Danish architect Jan Gehl. In his book “Cities for people”⁸, he describes how cities can be lively, safe, sustainable, and healthy, by respecting and designing for the human scale. According to Gehl, “The battle for city quality is on the small scale” - at the 5km/h scale that pedestrians experience. Cities must provide good conditions for people to walk, stand, sit, watch, listen, and talk, and these become fundamental criteria for good urban design.

Danish Architect and keen observer of city life, Jan Gehl
[image credit: La Razon newspaper]
1.5 The 12 Quality Criteria for People-Centered Places

In “Cities for People”, Jan Gehl sets out 12 “quality criteria”, all of which must be met in order for a city space to be successful. While the criteria were designed for all types of city space, they can also be applied to particular situations such as rapid transit stations and their neighbourhoods. Making rapid transit stations appealing and inviting to all should help encourage the use of both transit as well as public space.

Of the 12 criteria, Jan Gehl writes: “It is crucial to first ensure reasonable protection against risk, physical injury, insecurity, and unpleasant sensory experiences (in particular, the negative effects of climate). The next step is to ensure that the space offers comfort for its users and invites people to use the space for daily activities, including walking, sitting, standing, and talking. The last ingredient is attractive and human-scaled design and architecture, which helps bring together all the previous criteria”.

The 12 criteria are listed on the next page, and briefly described in the rest of this section. Jan Gehl also describes sub-elements for each criterion, which are indicated in blue.
Protection

1. Protection against traffic and accidents - feeling safe.
2. Protection against crime and violence - feeling secure.
3. Protection against unpleasant sensory experiences.

Comfort

4. Opportunities to walk.
5. Opportunities to stand and stay.
6. Opportunities to sit.
7. Opportunities to see.
8. Opportunities to talk and listen.
9. Opportunities for play and exercise.

Delight

10. Human scale.
11. Opportunities to enjoy the positive aspects of climate.
Protection

According to Jan Gehl, “Feeling safe is crucial if we hope to have people embrace city space. In general, (street activity) and people themselves make the city more inviting and safe in terms of both experienced and perceived security”. Beyond that, the health and safety of pedestrians is also dependent on protection from dangerous vehicles, as well as the harsh elements of weather.

Protection is the most important element of design that we must consider, without which it would be meaningless to discuss comfort and delight. If people feel unsafe, and unprotected, they will not choose to walk or use transit if they can.
1. Protection against traffic and accidents - feeling safe.

Significant numbers of pedestrians and cyclists are injured or killed each year as a result of being struck by motor vehicles. Pedestrians hit by a vehicle travelling at 50km/h, the typical speed limit on Vancouver streets, are five times more likely to die from the accident than if the vehicle were travelling at 30km/h. Therefore, pedestrian safety from vehicles is a serious component of Protection, and a key design problem that cannot be ignored.

This criterion involves protection for pedestrians, and eliminating the fear of traffic.

Speeding cars and trucks are a pedestrian’s worst nightmare. This graph shows how the chances of a pedestrian dying from a crash increase dramatically between 30km/h and 50km/h. This is literally a life-or-death difference.

[Image credit: World Resources Institute]
2. Protection against crime and violence - feeling secure.

A lively public realm provides “eyes on the street”, or passive surveillance, that helps to deter crime because there will always be passers-by to serve as witnesses. Neighbourhoods with 24-hour use naturally generate street activity at all times, especially at night.

This criterion is a complex one, and includes a lively public realm, “eyes on the street”, overlapping functions day and night, as well as good lighting.

Lively streets are safe streets, because the presence of other people helps to deter violent crime. At the same time, an active and lively street is an inviting place to walk and explore, such as this street in Tokyo, Japan.

[author’s photo]
3. Protection against unpleasant sensory experiences.

Very few people enjoy being cold and wet, or hot and flustered. Make sure that people are protected from wind, rain or snow, excessive cold or heat, pollution, dust, noise and glare. Attention must be paid to the local climate and the immediate environment so as to minimize these unpleasant effects.

Rain awnings such as this one at the Holt Renfrew department store in Vancouver help protect pedestrians from Vancouver’s plentiful rain. However, they should not be placed too high, and they should be continuous, in order to be really useful.

[Image credit: Front Inc]
Comfort

Our starting point for considering comfort is simple: universal human activities. Cities must provide good conditions for people to walk, stand, sit, watch, listen, and talk. Urban design must thus ensure that these basic activities can take place under good conditions. These same activities also occur around rapid transit, although often times the conditions offered by our stations are not ideal – for example, busy roads and noisy platforms make it difficult to hold conversations.

Although comfort is not absolutely essential, it is nevertheless important, and will encourage people to participate in optional activities such as lingering and enjoying the outdoors, rather than only necessary activities like walking to a destination.
4. Opportunities to walk.

Adequate space must be given for people to walk where they want to go, without obstacles or dangerous surfaces. Routes must be accessible for all ages and abilities. Sights and sounds along the walk should be interesting and engage the senses.

Walking is a fundamental human activity that most of us do, unless we are frail or infirm. Of course, urban environments should allow us to walk, and to do so comfortably. This means providing room for walking, ensuring that there are no obstacles, providing good surfaces, ensuring accessibility for everyone, and lastly offering interesting facades for all to enjoy.

Stroget, in Copenhagen, is a great example of a place for walking. Jan Gehl played a key role in the pedestrianization of Copenhagen’s city centre, creating a network of walking streets that serve both locals and tourists wonderfully.

[author's photo]
5. Opportunities to stand and stay.

Stations and their communities must offer places for people to stand, or linger, in appropriate places. People like to stand with their backs to a solid structure, such as a wall or a post. Successful public spaces provide such attractive zones for standing and staying, and offer a variety of supports for standing.

This sculpture at Copenhagen Airport cleverly illustrates natural human behaviour - where there are interesting views to look at, and supports at the correct height, you will find people standing or leaning.

[author's photo]
6. Opportunities to sit.

Besides standing, another (sometimes necessary) activity that people perform in public spaces is sitting. Zones must be set aside for people to sit, especially where they have to wait. Utilise advantages such as pleasant views, warm sun, or interesting public life. Seating must be of good quality and in sufficient quantity, so that people have a place to rest.

One of Jan Gehl’s favourite examples, Piazza del campo in Siena, Italy, is a good example of providing places for people to sit, even in the absence of chairs or benches. The natural curvature of the plaza invites people to sit and lounge in the sun.

[image credit: Liz Meinders]
7. Opportunities to see.

Sight is the primary means by which we interact with our environment, and a key contributor to navigation and security. People should be able to see where they are going, and recognise their destinations.

Good cities consider viewing distances and offer unhindered sightlines to important sights. Views should be interesting and appropriate to the place. Lighting must be sufficient for seeing when it is dark.

The King Edward Canada Line station in Vancouver is attractive and well-lit at night.

[image credit: Dialog Design]
8. Opportunities to talk and listen.

Where possible, noise levels should be low enough that people can talk and listen to each other without raising their voices. Street furniture can be shaped to allow people to sit around in small groups, forming "talkscapes".

Noise is an often-ignored aspect of the outdoor urban environment, especially because it is difficult to control. Besides interfering with talking and listening, excessive noise can also lead to hearing damage. Normal conversation volumes are about 60 decibels; Prolonged exposure to noise above 85 decibels can damage hearing11.

A small park in the middle of New York City’s business district offers a tranquil and relaxing place for everyone to stop and have a rest. Note that groups of seats have been arranged as "talkscapes", where conversations can be held.

[image credit: Michalec.com]
9. Opportunities for play and exercise.

Play and exercise are vital components of a healthy and active lifestyle. Urban space must be set aside for recreation and creativity. Public spaces should invite people to exercise and play, by day or night, in summer or in winter.

Director Park in downtown Portland, Oregon, was designed to allow spontaneous play. Children and adults alike enjoy the space when the weather is good.

[image credit: NW Portland Hostel]
Delight

Unlike Protection and Comfort, which deal with physical and practical matters, Delight is about the city’s visual quality. It deals largely with the design and detail of individual elements, and how all the elements are coordinated. However, beauty is not enough if basic requirements for protection and comfort are not met.

At the same time, these criteria are more subjective and qualitative than the previous nine, and thus are more difficult to describe in unambiguous terms.
10. The Human Scale.

Buildings and spaces should be sized to suit the human scale, and not be too big as to be overwhelming or seem empty. Cities today are often designed for automobile speeds and automobile distances, and as a result have become uninviting and sparse, empty places that are not suitable for people.

Respecting the need to create conditions good for walking, sitting, standing, talking and listening, is a good first step towards creating human-scaled places that are made for people, not cars.

Traditional cities, such as Gamla Stan in Stockholm, were built before the age of the automobile. These streets and buildings were clearly designed for a city of humans, not for cars. Such charming places are increasingly difficult to find today.

[image credit: Jürgen Howaldt]
11. Opportunities to enjoy the positive aspects of climate.

Take advantage of the local climate and offer an invitation to enjoy sun or shade, heat or coolness, and breezes where available.

This is closely linked to the criterion of protection against unpleasant weather – of course, people should have the right to enjoy good weather, and not be denied the delightful aspects of their climate.

Sunshine and warmth are extremely important elements in Northern cities such as Vancouver. Well-designed places provide opportunities for people to enjoy the good weather when it is available, such as this public art on display along Robson Street during the summer.

[Image credit: Huffington Post]

Spaces and places should be designed with good design and detailing, to be attractive and to offer fine views. Where possible, greenery and water features can be provided.

This last criterion focuses not only on comfortable and pleasurable experiences, but on beauty, both natural and man-made. This does not mean that visual and aesthetic considerations should dominate urban design, but that these are part of an overall attention to meeting human needs. Beautiful cities and spaces make full use of public art, greenery, water, and views, to offer a sense of delight and relief from daily routines.

Scenic views are a hallmark of Vancouver, given its stunning natural setting.

[image credit: Joyce Fan]
In the next section, we will attempt to adapt Jan Gehl's 12 Quality Criteria to the specific circumstances of rapid transit (also referred to as Advanced Light Rail Transit ALRT) in the City of Vancouver. Through this process we will arrive at an Urban Design Framework, which can then be applied to any rapid transit station in Vancouver, and its neighbourhood.
2 An Urban Design Framework for Rapid Transit
In crafting an urban design framework for rapid transit, it is useful to borrow from existing norms and standards in urban design. In particular, we will draw inspiration from Jan Gehl’s *Cities for People*, from which the 12 Quality Criteria are drawn.

At the same time, we must also consider the local context, and seek to integrate our framework into existing policies and guidelines. As the City of Vancouver sits within the Metro Vancouver region, we will examine the current policy from Translink, the regional transportation authority.

The City of Vancouver (in blue) is situated at the heart of the Metro Vancouver region (in dark grey), in the Province of British Columbia, Canada.
2.1 Guidelines from Translink

Translink, the transportation and transit authority for the Metro Vancouver region, has two published sets of design guidelines that are aimed at helping municipalities achieve successful transit stations and station communities.

Respectively, these documents are:

The Transit Passenger Facility Design Guidelines\textsuperscript{12} (TPFDG), which provides a “framework for designing transit passenger facilities and their surrounding context”, and

Translink’s guidelines document on Transit Passenger Facility design. The guidelines cover multiple architecture and engineering design standards for all types of transit facilities, such as bus shelters, bus loops, as well as Skytrain stations.

[Image credit: Translink]
The Transit-Oriented Communities Design Guidelines (TOCDG), which provides “guidance for community planning and design”, based on best practices, “in the areas surrounding transit stations, exchanges, and stops”.

Translink’s guidelines document on Transit-Oriented Communities. Transit-oriented communities are places that, by their design, allow people to drive less and walk, cycle, and take transit more. This document provides guidance for community planning and design – based on best practices – in the areas surrounding transit stations, exchanges, and stops.

[image credit: Translink]
Together, these two documents set out detailed planning and design suggestions for transit stations and their surrounding neighbourhoods, the “transit-oriented community”, using knowledge gained from the study of best practices from around the world.

However, owing to the broad nature of these guideline documents, there are perhaps some aspects of urban design that are not covered in detail; or perhaps the guidelines may not be clear enough to guide action. We will thus attempt to supplement the Translink documents using Jan Gehl’s 12 quality criteria framework.

The first step is to review the TPFDG and TOCDG design guidelines.
Transit Passenger Facility Design Guidelines

According to Translink, the TPFDG guidelines "serve as a comprehensive resource for producing consistently excellent transit passenger facilities through a systematized and integrated design process. They are intended to supplement, rather than replace, existing design, engineering and environmental standards and requirements.

The Design Guidelines provide process and design guidance for the design, construction and operation of new or existing TransLink transit passenger facilities, including stops, stations, exchanges and their environments."\(^{14}\)
The TPFDG guidelines are grouped around 5 themes: *Usability (U)*, *Operations (O)*, *Placemaking (P)*, *Environment (E)*, and *Accountability (A)*. Each theme is supported by "design strategies", which are then articulated as guidelines.

Here are the themes and their design strategies:

**USABILITY - Put passengers and pedestrians first**
- **U1** Make it easy
- **U2** Make it universally accessible
- **U3** Make it safe and secure
- **U4** Make it comfortable

**OPERATIONS - Optimize transit efficiency**
- **O1** Facilitate transit operations
- **O2** Support transit by integrating with other modes
- **O3** Facilitate effective management and maintenance

**PLACEMAKING - Create great places**
- **P1** Make transit a community asset
- **P2** Seamlessly integrate transit, urban development and the public realm
Each design strategy contains one or more design guidelines. For example, strategy **U1**, "Make it easy", contains three guidelines:

**U1.1** Movement and capacity

**U1.2** Legible spaces

**U1.3** Wayfinding and passenger information
Each of these guidelines is further supported by evaluative measures. For example, U1.1, "Movement and capacity", has three sub-guidelines:

**U1.1.1** Does spatial provision meet with locational and functional needs?

**U1.1.2** Does the spatial configuration and sequence provide for logical passenger movement?

**U1.1.3** Does the spatial design minimize conflicts of movement?

Through analysis of the TPFDG and the 12 Quality Criteria, we can see that there is significant overlap especially under the design themes of **Usability** and **Placemaking**. The TPFDG guidelines typically have an engineering and architectural focus, but are very applicable to urban design as well.
Transit-Oriented Communities Design Guidelines

The TOCDG picks up where the TPFDG left off, addressing community design and urban planning in the communities around transit stations. According to Translink, the guidelines are about "creating walking- and cycling-friendly communities focused around frequent transit." It identifies the benefits of doing so by pointing out that "communities built in this way have proven to be particularly livable, sustainable, and resilient places. (and) also make it possible to operate efficient, cost-effective transit service."15.
The TOCDG introduces the 6Ds of transit (introduced in section 1.3): Destinations, Distance, Design, Density, Diversity, and Demand Management.

Here we will focus on the guidelines relating to Design (D3), which are intended to achieve the goal of creating "places for people". Like the TPFDG, each "D" is supported by strategies, which are then articulated as specific guidelines.

For example:

D3.1 Design multi-modal streets

is supported by:

D3.1.1 Supporting pedestrians (which contains a discussion on sidewalks, street design, crosswalks, medians, and signals)

D3.2.1 Supporting cyclists (which discusses the planning and design of bicycle facilities such as routes, crossings, and parking)

D3.1.3 Supporting transit (which discusses transit priority measures)
By comparing the 12 quality criteria to the guidelines that exist in the Translink documents, we can craft a set of additional guidelines that enhance and elaborate on the ideas that already exist. At the same time, we can leave out some criteria that can be found in the Translink documents in great detail.

I followed the following considerations for each of the 12 Quality Criteria (and their sub-criteria), in order to determine their inclusion in the adapted Urban Design Framework:

1. Is there an overlap between this criterion and one of the design guidelines in the TPFDG or TOCDG? Is the overlap sufficient to justify excluding this criterion from the adapted framework?

2. Within the context of a rapid transit station and its surrounding neighbourhood in Vancouver, is the criterion relevant?

3. Within the context of a rapid transit station and its surrounding neighbourhood, how can the criterion be operationalized or made more objective?

4. Can the criterion be combined with other related criteria in an overarching operational definition?

(Notes on this adaptation process for each criterion can be found in Appendix 1).
Adapting the 12 quality criteria to the Vancouver context gives us the following framework for urban design around rapid transit:

**Protection**

**SAFETY:** Does the design offer pedestrians protection against automobile and bicycle traffic and accidents on their way into the station?

**SECURITY:** Are the ground floors of buildings around the station designed to contribute to a feeling of activity and security?

**ACTIVITY:** Does the operation of station and station-area amenities (e.g. shops) extend over all hours of transit operation?

**RAIN:** Does the design offer protection against rain at places where people must walk or wait?

**WIND:** Does the design offer protection against wind at places where people must walk or wait?
Comfort

STANDING: Does the design offer opportunities to stand or stay at appropriate places?

SITTING: Does the design offer opportunities for passengers to sit when they need to?

SEEING: Does the design provide legibility and easy recognition of station entrances from all relevant directions?

HEARING: Does the design offer opportunities to talk and listen in relatively quiet environments?

Delight

VIEWS: Does the design offer opportunities to enjoy pleasant views?

CONNECTIONS: Does the design facilitate efficient and comfortable transfers between transit modes and with active modes?

NATURE: Does the design make use of “green” or “blue” features and other natural elements to improve the passenger experience?

These criteria will be discussed in the rest of this section.
2.4 Urban Design Criteria for the Framework

Safety: Does the design offer pedestrians protection against automobile and bicycle traffic and accidents on their way into the station?

This criterion comprises both sidewalk quality and street crossing quality immediately adjacent to the station. These are critical to the rapid transit context because of the heavy reliance on pedestrian access to rapid transit - everyone is a pedestrian at some point in the rapid transit journey.

A “pedestrian scramble” crossing gives pedestrians their own time to cross the road - in this case even at a diagonal. Cars and other vehicles all have a red light during this time. Scrambles such as this one in Shibuya, Japan, allow large numbers of people to cross the street in a safe manner, and save time by allowing diagonal crossings too.

[author's photo]
According to Jan Gehl\textsuperscript{16}, a good design has sidewalks that offer a dignified pedestrian experience, with sufficient space to walk. Pedestrians would not need to "apply" to cross the street by pressing buttons at traffic signals. On the whole, pedestrians would be afforded proper respect, with simple and direct crossings and paths, rather than having to surrender street space to vehicles. Together, these guidelines contribute to pedestrian safety.

To evaluate this, I have adapted pages 242-245 from Cities for People into a composite rating scheme, in which sidewalk and crossing quality are rated “good” or “poor”. This scheme can be found in Appendix 2.
Security: Are the ground floors of buildings around the station designed to contribute to a feeling of activity and security?

Based primarily on the concept of "eyes on the street", this criterion evaluates the quality of building ground floors within and adjacent to the station. This is because the ground floors of buildings interact intimately with the street and street activity, and thus play a key role in contributing to a sense of liveliness and security. This criteria also builds on Crime Prevention Through Environmental Design (CPTED) principles of transparency and visibility.

An example of good ground floor quality: along West 4th Avenue in Vancouver, one can find many distinctive shopfronts at short intervals, with high degrees of transparency, looking onto the street.

[Image credit: Google street view]
What makes a good building face? The façades must be interesting and full of character; active and varied in use, with many doors and windows to offer a changing view; have a high degree of transparency to allow for visual contact between inside and outside, and be made of good quality materials so as not to look run-down.

Adapting Jan Gehl's criteria for ground floor design, this criterion is evaluated using a composite scheme to rate ground floor quality from "A" to "E". This scheme can be found in Appendix 2).
Activity: Does the operation of station and station-area amenities (e.g. shops) extend over all hours of transit operation?

Another contribution to a feeling of activity and security is having shops and businesses that stay open throughout the day and night. This means that there is passive security, and places of refuge when you are feeling insecure, especially after dark.

The Skytrain system in Vancouver typically runs from around 5:30am to 1:30am – are the shops around the stations open so early or so late? This criterion is an attempt to evaluate the activity around the station before the morning peak, and after the evening rush.

This detailed analysis of station-area amenities also allows us to see what types of businesses exist around stations, which is also important for gauging perceptions of security.
Rain: Does the design offer protection against rain at places where people must walk or wait?

Rain protection is especially crucial in Vancouver’s wet climate. In Vancouver, rainfall can continue for weeks at a time, and this makes transit use unpleasant if one has to frequently brave the rain during transfers.

At station platforms and bus stops, where people must wait, it is thus vital to offer protection from the rain. This is also true of places like the ticket concourse, where people may be waiting for friends or for a ride.

The ticket concourse at Commercial-Broadway station is sheltered, but not the area immediate in front of it, where people must queue to wait for the bus.

[author’s photo]
Wind: Does the design offer protection against wind at places where people must walk or wait?

Similar to the previous criterion, wind protection is also important, although less of a threat to health and well-being. Vancouver’s winds tend to come from the East or the West\(^{18}\), and thus stations and waiting areas should be designed to shield passengers from strong winds from the East or West.

This wind diagram from the City of Vancouver’s Passive Design Toolkit shows the prevailing wind directions in Vancouver. The strongest winds come from the East, as well as the West.

[Image credit: City of Vancouver]
Standing: Does the design offer opportunities to stand or stay at appropriate places?

In addition to seating, good urban design should also make provisions for supported standing. This can be done through low walls that are appropriately placed, or pillars and bollards that allow one to lean on them. All these can help to provide some comfort and support when you are tired.

(C2) Adequate seating, though not a generous amount, is provided on train platforms. Here we see benches integrated with a security-monitored safe zone, at Commercial-Broadway station.

[author’s photo]
Sitting: Does the design offer opportunities for passengers to sit when they need to?
At station platforms and bus stops, many people would prefer to sit rather than stand and wait. Similarly, those who are frail or infirm will need seating in intermediate areas such as at elevators, and along lengthy walkways. Station design must provide for these.

Seeing: Does the design provide legibility and easy recognition of station entrances from all relevant directions?
Unhindered sightlines and a clear visual identity for the station help in wayfinding. When a station entrance is easily recognisable from all walking directions, the station becomes a landmark and lets you know where you are, which contributes to a sense of place. Entrances and pathways are clear and do not cause confusion.
Hearing: Does the design offer opportunities to talk and listen in relatively quiet environments?

As mentioned earlier, normal conversations occur at 60 decibels. If the noise levels in and around the station are greater than 60 decibels, it then becomes difficult to hold a conversation without raising your voice. How noisy are our transit stations? If the environment within and around the stations is too noisy to hold a conversation, that forces us to raise our voices, which can be uncomfortable.

Trains are a major source of noise in stations - especially when they are entering the station and braking to a stop. At these times, the noise generated can exceed 90 decibels.

[author’s photo]
Views: Does the design offer opportunities to enjoy pleasant views?

Vancouver is blessed with a spectacular geographic setting, with majestic mountains and calming water views. Good design makes use of opportunities to enjoy such views, so as to provide comfort and delight, and to relieve the stress of commuting.

The elevated Skytrain track and stations have the potential to offer views of the Downtown skyline, and the North Shore mountains, such as this one.

[Image credit: Alex at changehere.wordpress.com]
Connections: Does the design facilitate efficient and comfortable transfers between transit modes and with active modes?

All rapid transit passengers have to transfer between modes when riding the train – whether you arrive at the station by bus, by bicycle, or on foot. Good station design must make this transfer experience a positive one by minimising walking distances and locating facilities like bicycle parking in convenient locations.

Ample bicycle parking, such as at this station in Copenhagen, allows for the close integration between these sustainable modes of transportation. Safe and secure bike parking is key to encourage commuters to bike to transit.

[Image credit: European Cyclists' Federation]
Nature: Does the design make use of “green” or “blue” features and other natural elements to improve the passenger experience?

Besides making good use of the views on the outside, stations can also enhance the sensory experience of taking transit by including natural elements such as indoor greenery, water features, or even the use of natural materials like wood and stone. These elements offer relief from the concrete jungle outside the station, and provide a psychological connection with the natural beauty of Vancouver’s environment.
2.5 Challenges and Limitations

Urban design, by its nature, tends to be qualitative rather than quantitative. What this means is, because “good” urban design is often influenced by context, urban design guidelines are rarely described in numerical terms. How do you quantify a pleasant view? What is considered “pleasant” will likely vary from person to person. Perhaps you prefer views of the mountains, whereas someone else may only like water views.

As a result, most of the guidelines presented here are phrased to allow for some flexibility in implementation. This is a recognition that there are no simple rules in urban design, or any field relating to human psychology and behaviour, for that matter. However, I have tried to tap on a long tradition of urban design research to highlight the qualities and features that do make a difference. At the same time, it is perhaps inevitable that the framework presented above does not cover every single aspect of urban design – it would be too lengthy if we did so, and perhaps not as useful.
Finally, it must be clear that Design is only one of the 6Ds of successful transit and transit-oriented communities. Design alone cannot ensure the success of a rapid transit station, although bad design will surely threaten it. We must still be mindful of the other 5Ds in planning and designing a rapid transit station and its neighbourhood.

Burrard Station in the heart of Vancouver’s business district fulfills some but not all of the 6Ds. (Parking) Demand management is an issue, as is a lack of Diversity that sees the district being almost empty on weekends and on holidays, except for tourists.

[author’s photo]
3 Case Studies
In order to test the feasibility and usefulness of the urban design framework, I applied the framework to three test cases – Waterfront Station, Main Street-Science World Station, as well as Commercial-Broadway Station, through a physical audit process. The results of this audit would in turn help generate urban design remedies to help improve the urban design in and around these stations.

The three stations chosen are all significant transit interchanges within the City of Vancouver, and receive high passenger volumes as a result. The Waterfront station is a transit hub, linking the Millennium and Expo lines with the Canada line, multiple bus routes, as well as the West Coast Express and the SeaBus to North Vancouver. Main Street-Science World station is adjacent to the Pacific Central Terminal, a gateway for long-distance rail travel. Commercial-Broadway station is an interchange between the Millennium and Expo lines, and connects to the 99 B-line that runs down Broadway towards UBC. As a result, all three stations are vital connections in Vancouver’s rapid transit network, and thus need to be of the highest quality.
3.1 Methodology

The physical audit conducted was a simple one. Using the urban design framework described in the previous section, I visited each of the three test stations on separate days to evaluate and observe the urban design qualities of the stations and station neighbourhoods. A sample of the evaluation form used can be found in Appendix 2. Top-down maps of each station area accompanied the evaluation form, and were used to note the qualities of building faces, sidewalks, and street crossings.

A map of Vancouver’s frequent transit network, showing the locations of the three Skytrain stations used in this case study.

[adapted from Translink]
Concurrently, photographs were taken as visual evidence of the evaluation. In particular, I made sure to take photographs to show how certain qualities were incomplete or lacking in each station or station area. The detailed evaluation results for each station can be found in Appendix 3.

The results of the physical audit, as well as contextual information about the stations (including existing design plans), are presented next. I highlight specific criteria that demonstrate strengths and weaknesses at each station.

Lastly, in section 3.5, I suggest some remedial actions that can be taken to address the most glaring weaknesses and threats to urban design quality for the three Skytrain stations. These suggested remedies are intended to provide an example of how the urban design framework can help planners and designers target specific problems areas for improvement.
3.2 Waterfront Station Evaluation

Waterfront Station is a key transit hub in Downtown Vancouver, serving local residents who live, work, and play in the area, as well as the crowds of tourists who visit Vancouver or cruise from Canada Place.

The station consists of three platforms - one for the West Coast Express, a commuter train; one shared by the Millennium and Expo lines; and one for the Canada line. All three platforms are below street level. The station also connects to the SeaBus, a ferry service to North Vancouver, and has two bus stops situated in front of the main station building.

[author's photo]
The station building itself, which serves retail and office functions in addition to connecting the transit lines, is a heritage Canadian Pacific Railway building. The building, along with the adjacent Granville Square and PricewaterhouseCoopers Place, is owned and operated by Waterfront Properties, a Cadillac Fairview subsidiary.

Security (Are the ground floors of buildings around the station designed to contribute to a feeling of activity and security?)

This criterion is perhaps the biggest weakness for Waterfront station. While ground floor quality is fair or good towards the East (see figure on page 75), the same cannot be said of the parking garage beneath Granville Square, right beside Waterfront Station, presents a blank face to passers by. This walking route is especially important because it links Waterfront Station with the tourist activities and offices around Canada Place.

[author’s photo]
the buildings to the West side of the station. The intersection around Granville street is particularly poor in terms of facade quality, with two parkades and Sinclair Centre all presenting blank faces to the street.

Ground floor quality diagram for Waterfront station. Buildings are shaded in dark gray, sidewalks in white.

[author’s diagram]
A City proposal exists for improving the urban design around Waterfront station, and this would help to alleviate the poor ground floor quality around Cordova and Granville.

The City of Vancouver’s Central Waterfront Hub Framework\textsuperscript{21} proposes a more complete street network around Waterfront station, including the extension of Granville Street to meet Canada Place, and the consequent redesign of Granville Square - which currently sits over a parking structure. The re-development of the parkade at the South corner of Granville and Cordova would also remove a chief contributor to poor ground floor quality.
The Central Waterfront Hub Framework includes the continuation of Granville Street across Cordova Street, eventually intersecting with an extension of Canada Place. This could relieve some of the poor ground floor quality around the foot of Granville Street.

[image credit: City of Vancouver]
Opening and closing hours diagram for Waterfront Station. This diagram shows the earliest opening times and latest closing times for all the businesses within or adjacent to the Skytrain station, sorted by length of operation (longest at the top), and then by opening time. [author’s diagram]
Activity (Does the operation of station and station-area amenities (e.g. shops) extend over all hours of transit operation?)

From the diagram on page 78 we can see that the Station building itself houses a few food and beverage outlets that are mostly open during the hours of Skytrain operation. However, beyond these there are significant gaps either in the early morning (even during the morning peak), and after office hours (roughly from 6pm onwards). Walking around the station area after dark, there is a distinct lack of activity especially where the office buildings are situated.

Service and retail outlets in particular do not have long opening hours here, reflecting a lack of demand outside of regular office hours. Some are not open during weekends and on holidays, although this is not reflected here. This suggests an imbalance in the level of foot traffic between office hours and non-office hours, perhaps attributable to the predominance of office land use in the neighbourhood.
Rain (Does the design offer protection against rain at places where people must walk or wait?)

Rain protection in the station itself is more than adequate, since all platforms and waiting areas are indoors. There is also an underground connection between the Millennium/Expo line platform and the adjacent Waterfront Center and Sinclair Center, which affords office workers and tourists a sheltered route.

As a common problem with all of the stations surveyed, bus stop rain protection was lacking at Waterfront station. In particular, the two bus stops situated directly in front of the Station building had no shelter at all.

Note the lack of rain shelter at this bus stop, along Cordova Street at Seymour Street. Some bus passengers resort to waiting inside the Station building instead.

[author’s photo]
Seeing (Does the design provide legibility and easy recognition of station entrances from all relevant directions?)

The West entrance to the station features a distinctive entrance that clearly states "Waterfront Station", and is easily recognizable. The entrance at the Station building, though distinctive, is confounded by a lack of clear identification, despite the blue-and-white "T" sign. Here, the entrance awnings advertise for "Rogue kitchen and wetbar", rather than the Skytrain. It is not entirely clear how to access the Skytrain from this direction.

Entrance along Cordova Street, looking East. While the wayfinding sign indicates Transit, the building itself lacks any clear indication of where to enter and how to access the train.

[author's photo]
West entrance along Howe Street looks like a typical subway entrance, with large and legible signage. Conveniently, the exit is facing in the direction where most of its users will come from: towards Canada Place.

[author’s photo]

Hearing (Does the design offer opportunities to talk and listen in relatively quiet environments?)

The Waterfront Station building provides a relatively quiet indoor space where people can sit and gather, and talk to one another without needing to raise their voices. In the station building, noise levels peaked at 75dB, louder than a normal conversation, but quiet compared to the platforms or the street outside (peaking at 85dB, which is ten times as loud).
Connections (Does the design facilitate efficient and comfortable transfers between transit modes and with active modes?)

Waterfront station provides easy access and transfers between the Skytrain and other modes such as the SeaBus, helijet, and the West Coast Express commuter train. Bike racks are provided and located along the front of the Station building, under its eaves. With the exception of the buses, all other modes are connected along sheltered corridors.

The indoor seating at the Station building offers a relatively quiet place to sit and talk.

[author's photo]
In sum, Waterfront station is a busy and functional interchange between multiple transit modes. While it provides underground connections to its office building neighbours, this compromises the ground floor quality at street level, which is dominated by parkades and other blank faces. As prominent urban commentators have argued\(^22\), more careful attention has to be paid to the challenging conditions at the foot of Granville Street where it meets Cordova Street, as well as to enhancing the overall form of the area.

Because of its context and history, Waterfront station is a unique situation whose challenges and opportunities may not be transferable to other, more typical, rapid transit stations. Implementing the Central Waterfront Hub Framework would go a long way towards improving the street connectivity and the quality of the pedestrian experience at ground level, but further work has to be done. One could also argue that the area could benefit from a more diverse mix of uses, especially uses that take place beyond office hours (such as those at Gastown), so as to sustain retail and business activity to better match the operating hours of the transit system.
3.3 Main Street-Science World Station Evaluation

Main Street-Science World station is situated along the South-Eastern edge of False Creek, serving as a pivot point between the developing residential district and the industrial neighbourhood of the False Creek Flats. To the West, high-rise condominiums circle the inlet, spanning the former Expo lands, the 2010 Winter Olympics Athlete's village, pioneering housing developments at South False Creek, and Granville Island, among others. To the East, the long-standing Pacific Central Train terminal signals a transition to the False Creek Flats, a neighbourhood of industrial use, and anticipates the coming of the St. Paul's hospital to the North-East.

Main Street-Science World station functions as an interchange with the long-distance trains at Pacific Central station, and busy bus lines that ply Main Street.
Safety (Does the design offer pedestrians protection against automobile and bicycle traffic and accidents on their way into the station?)

Main Street-Science World station is equipped with generously wide sidewalks, in anticipation of heavy foot traffic. This is true especially along Terminal Avenue, where people head West towards Science World and False Creek, and head East towards the False Creek Flats. Both routes are busy during the morning and evening peaks.

[author's photo]
One weakness, however, is the right-turn-on-red provision along Terminal Avenue, which conflicts with heavy pedestrian traffic across Main Street on the North side of the intersection. Within the span of ten minutes during the morning peak, I observed several near misses as drivers heading West along Terminal Avenue, and turning onto Main Street, failed to notice pedestrians hurrying to complete their crossing.

**Security** *(Are the ground floors of buildings around the station designed to contribute to a feeling of activity and security?)*

For an area with a large residential population, it was strange to encounter very poor ground floor quality (see picture below and diagram on page 88).

![Author's photo](image)

Ground-floor commercial units along the condominium podiums just North of the station have poor facade quality. Note the grilles and the heavy curtains which create a hostile environment for pedestrians going by.

*Author's photo*
Ground floor quality diagram for Main Street-Science World station. Buildings are shaded in dark gray, sidewalks in white. The lawn areas of Thornton Park are shaded in green.

[author's diagram]
The neighbourhood around Main Street-Science World station had multiple examples of poor or even hostile ground floor quality, ranging from opaque windows to blank walls. These ultimately combine to produce a sense of insecurity when one walks through or around the area, despite the frequent pedestrian traffic and street activity.

The station itself, on the other hand, is newly redesigned and features a high degree of transparency and openness to its surroundings, with large glazed windows and space allocated for shops (one currently occupied by Starbucks).

Right behind Main Street-Science World station are several condominiums. A desolate and empty space has been left between two condominiums, creating a hostile space that has no natural surveillance (seen here from inside the station). Closed-circuit cameras have been installed to monitor the space instead, so as to deter crime.

[author’s photo]
Activity (Does the operation of station and station-area amenities (e.g. shops) extend over all hours of transit operation?)

A survey of the businesses around the station helps us better understand the nature of pedestrian traffic and what services are in demand. At Main Street-Science World, there were quite a few shops and business that were open early and closed late. On the other hand, two employment offices (in light green) suggest that the area is frequented by a significant population of unemployed residents, and that there are competing demands for services and businesses here.
In addition, because the commercial units are mainly clustered around the station itself, there may also be large portions of walking trips to and from the station that mainly feature residential facades. As a result, these shops and businesses do not tell the entire story of pedestrian security (from crime) in this station neighbourhood.

Rain (Does the design offer protection against rain at places where people must walk or wait?)

Here, the major bus stops (along Main Street) had shelter provided. The South-bound bus stop is located under the train tracks, and is accessed directly from the station's fare gates.

This north-bound bus stop along Main Street has generous shelter, but there is no connection between it and the station nearby. This forces passengers to either use their umbrellas, or dash the 25 metres to and from the station.
However, the North-bound bus stop is disconnected from the station building - perhaps some sheltered walkway is needed here so that transferring passengers do not have to brave the rain in order to get to and from the station.

Sitting (Does the design offer opportunities for passengers to sit when they need to?)

Ample seating is provided at this station. Beyond the typical benches on the platform, both sides of the station have benches situated just beyond the station itself - the only problem being that these benches are exposed to rain and inclement weather.
Seeing (Does the design provide legibility and easy recognition of station entrances from all relevant directions?)

As an elevated station, Main Street-Science World is a prominent visual landmark and is thus easily distinguishable when you walk towards it.

View of the station from the South-East. The elevated nature of the station and its distinctive look help passengers easily identify it.

[author’s photo]
Views (Does the design offer opportunities to enjoy pleasant views?)

The glazed shell of the station offers a high degree of transparency throughout. This is especially useful at the elevated platform, where one can catch glimpses of mountains to the North, and the activity of False Creek to the South-West.

The glass shell of Main Street-Science World station offers enticing views of the North Shore mountains, or South East False Creek on the other side.

[author’s photo]
Connections (Does the design facilitate efficient and comfortable transfers between transit modes and with active modes?)

Main Street-Science World station has a newly-installed Bike Parking room, which offers a secure place for cyclists to park their bicycles. However, Translink charges $1 a day (or a maximum of $8 a month) for the use of the bike parkade, which is expensive compared to the free bike racks just outside, to the East of the station.

The new bike parkade at Main Street-Science World station requires registration before one can use it.

[image credit: 604now.com]
Main Street-Science World station is located at the crossroads of several rapidly-changing neighbourhoods. To the West, the False Creek residential neighbourhood houses a growing resident population and increasing demand for transit. To the East, the industrial neighbourhood is undergoing planning for the future and a continual evolution towards office-based industry. To the North, the Strathcona and Chinatown neighbourhoods are also experiencing change and turnover. As a result, the station and its immediate area are also changing and adapting to new conditions.

A recently-improved station building, which provides space for amenities, leads this transformation of the station neighbourhood. Minor flaws remain, such as the poor ground floor quality and a lack of rain protection in some places, but in time I expect that the urban design around Main Street-Science World will benefit from the growing residential population and workforce.
Commercial-Broadway Station Evaluation

Commercial-Broadway station is the third of our study sites, and a major transit node serving the residents of Vancouver and beyond - at present it is the busiest station in Translink’s network, serving more than 90,000 train trips and 60,000 bus trips on a given day. It is comprised of two connected stations: "Broadway" station, which is located at the South-East corner of Broadway and Commercial Drive, and "Commercial Drive" station, located at the North-East corner and down in the Grandview cut.

At the moment, significant upgrades to the station are underway, including the addition of a new platform on the East side of "Broadway" station, and an improved pedestrian overpass to connect the two stations. These are intended to accommodate increased passenger volumes, and improve the passenger experience from its current overcrowded state at peak hours. As a result, the findings of this audit must be tempered by an expectation that the station, at least, is being improved.
Safety (Does the design offer pedestrians protection against automobile and bicycle traffic and accidents on their way into the station?)

While sidewalk and crossing provision around the station is generally good, there are some minor points that could be improved. One is the intersection of Broadway and Commercial Drive, where pedestrian traffic on the crosswalks is high. Right-turns-on-red are allowed here, which may be a potential source of conflict between vehicles and pedestrians.

Secondly, owing to the need to provide a queueing area for the 99 B-line bus heading West along Broadway, the sidewalk on the North side of Broadway is overly narrow at some points. The photo on page 99 shows how the painted queue lines for the bus occupy almost the entire sidewalk, leaving only a narrow gap for pedestrian movement to and from the station.

One might also note the lack of rain protection for commuters queueing for the bus. Currently, however, a more permanent bus shelter for the 99 B-line is being constructed, which may alleviate this choke point. In the future, we may also expect the terminus of the 99 to move West, as the Millennium line extension is constructed to reach Arbutus Street, thereby relieving pressure on the sidewalk here.
Security (Are the ground floors of buildings around the station designed to contribute to a feeling of activity and security?)

In a surprising outcome for such a busy station, I found that the ground floor quality around Commercial-Broadway station was poor, with many facades being boring or inactive. This was especially true around the South station, or "Broadway" station. The chief culprits of poor ground floor quality were firstly the banks, which occupied three corners of the main intersection, and also the Safeway grocery store, whose storefront faced East towards its parking lot, and away from Sidewalk on the North side of Broadway, East of the intersection with Commercial Drive. Note how the remaining sidewalk space is constricted by the queueing area provided for the handicapped.

[author’s photo]
Ground floor quality diagram for Commercial-Broadway station. Buildings are shaded in dark gray, sidewalks in white. Note the areas of poor ground floor quality clustered around "Broadway station". [author's diagram]
the station. The fact that all the buildings adjacent to the South station faced away from it, and often had left-over spaces in between (used for parking on the West side, for example), created a series of blank wall faces and residual spaces with low activity. This made for poor CPTED and passive security conditions, even though the station has been remodelled to feature transparent glass at ground level.

In addition, the three banks had installed large glass windows, but these were most often covered in opaque film or blinds. As a result the banks in particular had boring facades with very little visibility in and out.

This parking area and alleyway to the West side of the "Broadway" station is an example of extremely poor CPTED, because of the lack of pedestrian activity, there is no passive surveillance. Also, the area is unwelcoming, being clearly intended as a parking lot and not for pedestrians to move through.

[author's photo]
Activity (Does the operation of station and station-area amenities (e.g. shops) extend over all hours of transit operation?)

From the diagram on page 103, it is clear that Commercial-Broadway station has many more businesses and shops than the other two stations studied. In part, this is a result of zoning - the station sits in the middle of a commercial district; and in part this is a result of high passenger volumes, which create demand which allows shops and services to thrive.

Examining the types of shops available and their opening hours, one can see that food and beverage outlets around the station do open early and close late - the McDonalds here is a 24-hour outlet, and quite a few other food outlets operate even past midnight.

However, this is compromised by the prevalence of medical businesses, whose opening hours are more modest and typically only cover regular office hours (see the medium green colour in the diagram on page 103). The banks, which occupy prominent locations at the intersection, are also only open during office hours. This results in the after-hours environment around the station being less active, and looking less so, thanks to all the closed businesses.
Opening and closing hours diagram for Commercial-Broadway Station. This diagram shows the earliest opening times and latest closing times for all the businesses within or adjacent to the Skytrain station, sorted by length of operation (longest at the top), and then by opening time. [author’s diagram]
Standing (Does the design offer opportunities to stand or stay at appropriate places?)

A busy station is likely to need to accommodate standing (or leaning) more than sitting, because train frequency is high and waiting times are relatively short. This is especially true of the morning peak hour, where trains are entering the "Broadway" station almost head-to-tail. This is where station design can make use of low walls, or stout pillars, to offer passengers a place to lean on while they wait.

At the Commercial-Broadway station platform towards VCC-Clark, a man leans against a pillar for support.

[author's photo]
Connections (Does the design facilitate efficient and comfortable transfers between transit modes and with active modes?)

Owing to the split design of the overall station, there are some weaknesses in the integration of bus travel and train travel. For example, both termini for the 99 B-line, an extremely busy bus line, are both located around the North station ("Commercial Drive" station). This means that commuters transferring between the 99 B-line and the Expo line, which uses the South station, have to either make a crossing at the main intersection, or enter through the fare gates, then make their way up and across the elevated pedestrian walkway. This walkway experiences a high degree of pedestrian congestion because it is the main connection between the North and South stations - a replacement is being built to accommodate larger passenger volumes in greater comfort, a clear signal that the current walkway is inadequate.

Bicycle parking is also an issue, particularly around the North station, owing to the lack of provision of bike racks. Indeed, there are bike racks provided along Commercial Drive, but these are not readily visible from either station entrance. Instead, commuters are likely to lock their bikes to a chain link fence, rather than a proper bike rack.
Because bike racks are not conveniently located, cyclists will lock their bikes wherever they can.

[author's photo]

Its sunken location within the Grandview cut allows the North platform at Commercial-Broadway station to offer pleasant and calming greenery.

[author's photo]
Nature (Does the design make use of “green” or “blue” features and other natural elements to improve the passenger experience?)

Owing to its location within the Grandview cut, the "Commercial Drive" station is below ground level and thus is cut off from views and light. Instead, the designers have provided greenery (on the retaining walls) to compensate for this. The greenery contributes to an atmosphere of calm, and helps reduce noise levels as well.

Summary

Commercial-Broadway station is currently undergoing some change and upgrading works, in recognition of its important role and high passenger volumes. Most of the urban design weaknesses exist in the station's surroundings, however, and could be improved as the area re-develops and evolves. The sites around the "Broadway" station, in particular, have great potential for better integration with the station, and can be carefully designed to offer an excellent pedestrian experience.
3.5 Some Suggested Remedies

Based on the urban design framework described in section 2.3, and the weaknesses identified in sections 3.2 to 3.4, I suggest minor design and regulation interventions that address some of the major weaknesses that were identified. These solutions are by no means comprehensive, and are focused specifically on the urban design prescriptions derived from Jan Gehl’s 12 quality criteria. As a result, I do not discuss broader concerns relating to the other 5 Ds – Destinations, Diversity, Density, Distance to transit, and Demand management, although these are equally important to the success of transit-oriented communities.
As we have seen above, ground floor quality is a key weakness of all three station areas. Primarily, these are result of land uses that are not conducive to street-level transparency and activity – parking garages, banks, medical services, and condominium towers, among others.

Well-crafted design guidelines already exist to remedy these issues. For example, the C-3A zoning regulations that govern the area around Commercial-Broadway station state that “businesses… should provide a continuous and transparent retail frontage to enhance the pedestrian experience”. Furthermore, it also states that “uses that do not contribute to street level vitality… such as drug stores and supermarkets… should not be located” along the major streets.

However, perhaps the current buildings that we find there were developed before the guidelines were added to the zoning regulations. We expect all future re-development to conform to the higher standard of the current design guidelines. It is clear that the City has established high expectations for urban design in new developments, but time is needed for development to be adapted to these guidelines.
Another possible remedy would be to require that large stores or uses, such as supermarkets or parking garages, be “hidden” behind small and shallow shopfronts. For example, the parking garage at 15th and Pearl in Boulder, Colorado, can hardly be recognized as a parking structure – the actual parking is neatly hidden behind a cover of various shops and businesses, which generate street activity as well.

This parking garage does not look like one, because it is “hidden” with a layer of shops and offices. This creates a welcoming and friendly street environment that better meets the needs of pedestrians.

[Image credit: Pinkard Construction]
3.5.2 Sheltered Bus Stops and Walkways

Buses are an important transit mode that helps feed passengers into rapid transit. It is thus important to pay attention to the protection and comfort of bus users. Translink’s Transit Passenger Facility Design Guidelines state that transit facilities, including bus stops, should be designed to “ensure that passengers are protected from the full range of weather conditions (e.g. wind, rain, snow, sun, and extreme heat and cold)”. Furthermore, canopies and shelters should be sited and sized to “accommodate projected volumes of waiting passengers without impeding pedestrian movement”. The document provides photographic examples of adequately sized bus shelters and covered walkways. Thus, ensuring that bus passengers are protected and comfortable is a matter of following these guidelines and suggestions, and requires no technical innovation.

This covered walkway at Brentwood Station, featured in Translink’s design guidelines, was unfortunately removed in 2013 to make way for the development of the connected property.

[Image credit: metrovanwatch.wordpress.com]
Another set of problems around our transit stations is vehicular traffic, and the associated danger to pedestrians, as well as the noise that they cause. However, it is possible to address these issues with one simple strategy.

Traffic calming is a system of design strategies that aim to balance the needs of vehicle traffic with the needs of other street users, such as pedestrians and cyclists. Often, the result is that vehicles travel at slower speeds, which produces less noise and poses less of a danger to pedestrians. For example, having vehicles travel at 30km/h instead of 50km/h means that 9 out of 10 pedestrians will survive a crash with minor injuries, compared to just 5 out of 10.

Traffic calming elements include on-street parking, bus stops that “bump out” from the curb, roundabouts at intersections, and special paving that can indicate a section of street shared by cars, pedestrians and cyclists alike. For the intersection of Broadway and Commercial Drive, a raised intersection could be installed to slow vehicles and make crossings safer. Using these methods, we can address issues of pedestrian safety and traffic noise by calming traffic along the streets beside Skytrain Stations.
This diagram produced by the National Association of City Transportation Officials shows a raised intersection (in yellow) and shortened pedestrian crossing distances.

[image credit: NACTO]
4 Conclusion

[Image credit: Michel Lalonde]
Concluding Remarks

This project examined the case for applying general urban design principles to rapid transit stations in the City of Vancouver. Using people-centered design principles, summarized in Jan Gehl’s 12 quality criteria, I crafted an urban design framework as a supplement to the existing Translink design guidelines for transit passenger facilities and station communities. Using these guidelines, I then performed test case studies with three Skytrain stations in Vancouver, which are also major transit interchanges. The results of the test audits revealed strengths and weaknesses of each station and station area, and the recommendation of some simple remedial actions that can be undertaken in the short term.

Through this project, I have found that urban design quality around major Skytrain stations in the City of Vancouver is mixed at best. While the stations themselves are typically well-designed and well-equipped, it is clear that less attention has been paid to immediate station areas. Each station and station area suffers from one or more design issues, along with other weaknesses such as a lack of density or diversity of uses which were not discussed here. However, the urban design framework can also help guide remedial action – by identifying and prioritizing design flaws, and by suggesting ideal outcomes. The framework can also be applied, along with
Translink’s existing guidelines, to the planning and design of future rapid transit stations, such as those on the planned Millennium Line extension.

What about context and place?
The urban design framework, and the methodology used to create it, are intended to serve as a general checklist of urban design factors that help create a "well-designed" rapid transit station and its neighbourhood. However, because of the generic nature of this framework, it fails to take into account specific contextual factors that may be particularly important if stations are to be vibrant and successful hubs of their neighbourhoods. Some of these contextual factors include:

**Spatial and physical context** - for example, a station may be located on a sloping site that offers opportunities for the creation of a public plaza, or integration with existing buildings.

**Social and cultural context** - a station may be located in a heritage district, and therefore will need to respect the aesthetic and symbolic richness of its surroundings. A station in a place like Vancouver may be enhanced by acknowledging Vancouver’s First Nations heritage.

By recognizing and respecting context, a station’s role in the neighbourhood can be enhanced beyond just serving its tran-
sit functions, to make a social and cultural contribution to the community that it is embedded in.

**Other limitations**

While this study attempts to create a set of design guidelines for rapid transit using Jan Gehl’s framework as a starting point, it is by no means comprehensive and by no means represents all that it takes to make rapid transit successful. Urban design alone covers details are varying scales, from the micro-scale (such as rain protection) to the city scale (for example, the shaping of a city skyline). Furthermore, I must emphasize that Design is by no means the only component in successful transit, but one out of the six "D"s that must all be considered. For example, financially viable transit service requires a minimum threshold of population density in order for enough people to access and use the transit station; there must be sufficient destinations, and of sufficient diversity, to entice passengers to linger in the neighbourhood instead of just passing through. In addition, demand management is crucial because it is often the case that driving is much more convenient and quick compared to transit use - this means that few people would willingly use transit, unless they had no choice.

While we know that these urban design criteria all contribute to a better physical environment for transit users, thereby en-
helping to encourage transit use, there is no guarantee that fixing the problems identified in this study will automatically boost transit ridership. Indeed, our understanding of transportation choices tells us that there are a whole range of factors at play, including personal preferences, the usefulness of the transit system, and the quality of alternative modes of transportation. All these can have an effect on whether people will choose to use rapid transit, or any form of transit at all.

Future study

For future study, I suggest that the 12 quality criteria be used as a basis for crafting specific urban design frameworks for other situations where design guidance is needed – for example, at airports, or within large shopping complexes. Ultimately, the application of the 12 quality criteria for urban design helps to ensure that we build places that are good for people – protective, comfortable, and delightful.

The urban design framework could also be enhanced by more detailed consideration of Placemaking, which is mentioned in Translink’s guidelines, but is a highly subjective and contextual criterion. Placemaking considers the role of a place in the larger social context, and can include the programming of events or art in a space as well.

Note that the data collection methodology was changed in 2012. Instead of using Translink data, the city utilized its own survey in order to better capture short walking and cycling trips.

The Transportation 2040 plan for the City of Vancouver can be found at http://vancouver.ca/files/cov/Transportation_2040_Plan_as_adopted_by_Council.pdf.

The health and safety outcomes of good transit-oriented development have been established in many studies, including those by Reid Ewing and Robert Cervero, as well as Lawrence Frank. For example, "Travel and the Built Environment: A Synthesis", in Transportation Research Record: Journal of the Transportation Research Board 2001 1780:, 87-114.


Jeff Speck is a renowned city planner and urban design, who specialises in creating walkable places. The former Director of Town Planning at architecture firm Duany Plater-Zyberk and Co published the book Walkable City: How downtown can save America, one step at a time, in 2013. The material cited is from that book.
8 Published in 2010, Cities for People represents an accumulation of a lifetime of closely examining public life and human needs, by Danish architect and professor Jan Gehl. Gehl’s expertise has been consulted by cities around the globe, including Copenhagen, London, Sydney, San Francisco, and New York.

9 From Cities for People (Gehl, 2010), section 7, page 238.

10 Pedestrian mortality estimates were obtained from a paper by Erik Rosen and Ulrich Sander, published in Accident Analysis and Prevention volume 41 issue 3, May 2009. This paper was a review of existing accident data and presents a conservatively low estimate of mortality risk compared to other existing studies. A much higher estimate of 80% mortality risk at 50km/h is provided by the World Resources Institute, citing OECD data in their report Cities Safer by Design, retrieved from http://www.wri.org/publication/cities-safer-design.

11 This is a good resource on hearing damage caused by long exposure to high noise levels: http://www.cdc.gov/niosh/topics/noise/infographic-noiselevels.html.


From Transit-Oriented Communities Design Guidelines (Translink, 2012), page 1.

From Cities for People (Gehl, 2010), section 4.2, and also with reference to Pedestrian and Transit-Oriented Design (Reid Ewing and Keith Bartholomew, 2013).

A basic introduction to CPTED can be found on page 50 of Translink’s Transit Passenger Facility Design Guidelines, under U3.2.2.

The City of Vancouver’s Passive Design Toolkit can be found at http://vancouver.ca/files/cov/passive-design-large-buildings.pdf. The section on wind is on page 50 onwards.
19 For an attempt to quantify and operationalize various aspects of urban design, refer to "Measuring Urban Design" by Reid Ewing and Otto Clemente (2013, Island Press). The book presents a very detailed quantitative framework, but is onerous in its precision.

20 The portfolio map for Cadillac Fairview can be found at https://www.cadillacfairview.com/en_CA/portfolio-map.html. Fact sheets on each property are also found through the map.


24 These regulations can be viewed on the City of Vancouver website, at the following address: http://former.vancouver.ca/commsvcs/guidelines/B014.pdf.


26 For more details on traffic calming in the City of Vancouver and around the world, see the following resources. City of Vancouver: http://vancouver.ca/streets-transportation/traffic-calming-and-safety.aspx; Project for Public Spaces: http://www.pps.org/reference/livememtraffic/.
This appendix details how I adapted Jan Gehl's 12 Quality Criteria to create an urban design framework for rapid transit, while being sensitive to the Vancouver context by eliminating elements that are already established in Translink's Transit Passenger Facility Design Guidelines and Transit-Oriented Communities Design Guidelines.

Guidelines and concepts originating from Translink's guidelines are denoted by coded references. For example, U3.1.1 refers to the guideline on Lighting (also labelled U3.1.1), on page 52 of Translink’s Transit Passenger Facility Design Guidelines.

In my remarks I discuss overlaps and methodological issues. An “=” sign indicates similar concerns as the criterion above.

Additional inspiration for the final urban design framework can be attributed to other thinkers such as Jane Jacobs, John Fruin, William Whyte, Allan Jacobs, Edward T. Hall, and Donald Appleyard, among others.
<table>
<thead>
<tr>
<th>Protection</th>
<th>Remarks on inclusion/exclusion</th>
</tr>
</thead>
<tbody>
<tr>
<td>P1</td>
<td>Protection against traffic and accidents – feeling safe</td>
</tr>
<tr>
<td></td>
<td>(two criteria that can be combined into one for operational purposes; the basic idea is the same)</td>
</tr>
<tr>
<td></td>
<td>Potential use of Pedestrian priority solutions (Cities for People, pages 242-245)</td>
</tr>
<tr>
<td>P1.1</td>
<td>Protection for pedestrians</td>
</tr>
<tr>
<td></td>
<td>Similar to U3.1.1, but more specific to pedestrians’ needs</td>
</tr>
<tr>
<td>P1.2</td>
<td>Eliminating fear of traffic</td>
</tr>
<tr>
<td></td>
<td>Similar to U3.1.1, but more specific to pedestrians’ needs</td>
</tr>
<tr>
<td>P2</td>
<td>Protection against crime and violence – feeling secure</td>
</tr>
<tr>
<td></td>
<td>Some overlap with U3.2.2 (on CPTED principles)</td>
</tr>
<tr>
<td>P2.1</td>
<td>Lively public realm</td>
</tr>
<tr>
<td></td>
<td>See CPTED principle – “design high quality streetscapes adjacent to facilities with wide sidewalks that encourage active use”;</td>
</tr>
<tr>
<td></td>
<td>See also P1.2.1</td>
</tr>
<tr>
<td></td>
<td>Difficult to operationalize what &quot;lively&quot; means? Opportunity to use a proxy measure.</td>
</tr>
<tr>
<td>P2.2</td>
<td>Eyes on the street</td>
</tr>
<tr>
<td></td>
<td>See CPTED principle – “orient doors and windows of surrounding buildings towards transit facilities to encourage natural surveillance”;</td>
</tr>
<tr>
<td></td>
<td>See also Site level checklist in TOCDG, D3.9</td>
</tr>
<tr>
<td></td>
<td>Operationalise under Ground Floor Quality Assessment? (Cities for People pages 240-241)</td>
</tr>
</tbody>
</table>
| P2.3 | Overlapping functions day and night | Minimal overlap with CPTED principles  
|      |                                 | Less relevant to station itself but more relevant for station area. Potentially a Diversity/Density issue? |
| P2.4 | Good lighting                    | Overlap with existing U3.3.1 |
| P3   | Protection against unpleasant sensory experiences | Overlap with existing U4.1.1 but easier to operationalise if sources are broken down into separate criteria and emphasis is placed on the most important ones |
| P3.1 | Wind                             | = |
| P3.2 | Rain/snow                        | =  
|      |                                  | Most relevant for Vancouver - rain. |
| P3.3 | Cold/heat                        | = |
| P3.4 | Pollution                        | = |
| P3.5 | Dust, noise, glare               | = |

**Comfort**

| C1   | Opportunities to walk            | Overlap with U1.1 |
| C1.1 | Room for walking                 | Overlap with U1.1, O2.1.2, P2.2.1 and TOCDG Site-level D2.1.  
|      |                                  | Some overlap with above criterion on Pedestrian safety? |
| C1.2 | No obstacles                     | Some overlap with U2.1.1, typically an engineering issue. |
| C1.3 | Good surfaces                    | Overlap with U3.1.1, potential overlap with E1.1.2 |
| C1.4 | Accessibility for everyone       | Overlap with U2 |
| C1.5 | Interesting facades | Overlap with Site-level D3.1, D3.2  
Potential overlap with U1.2.2, P1.2.2  
Can use Ground Floor Quality Assessment – some overlap with P2.1, 2.2 above |
| C2 | Opportunities to stand/stay | No clear overlap; potential conflict with U1, which is focused on movement. Standing/staying may only be appropriate in specific contexts e.g. platform edges, concourse spaces, station entrances |
| C2.1 | Edge effect/attractive zones for standing/staying | = |
| C2.2 | Supports for standing | = |
| C3 | Opportunities to sit | = |
| C3.1 | Zones for sitting | =  
Some coverage in U2.1? |
| C3.2 | Utilizing advantages: view, sun, people | = |
| C3.4 | Benches for resting | = |
| C4 | Opportunities to see | = |
| C4.1 | Reasonable viewing distances | = |
| C4.2 | Unhindered sightlines | =  
Some overlap with U1.2.1 |
| C4.3 | Interesting views | =  
Some overlap with P1.2.3 |
| C4.4 | Lighting (when dark) | =  
Overlap with P2.4 above, can condense into one criterion |
| C5 | Opportunities to talk and listen | No clear overlap |
| C5.1 | Low noise levels | =  
Overlap with P3.5 above, consider condensing |
<p>| C5.2 | Street furniture that provides “talkscapes” | No clear overlap |</p>
<table>
<thead>
<tr>
<th></th>
<th>Opportunities for play and exercise</th>
<th>No clear overlap</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Invitations for creativity, physical activity, exercise and play</td>
<td>=</td>
</tr>
<tr>
<td>C6.2</td>
<td>By day and night</td>
<td>=</td>
</tr>
<tr>
<td>C6.3</td>
<td>In summer and winter</td>
<td>=</td>
</tr>
</tbody>
</table>

**Delight** Some overlapping concerns as “Placemaking” category in TPFDG

<table>
<thead>
<tr>
<th></th>
<th>Scale</th>
<th>Some overlap with Site-level D3.2</th>
</tr>
</thead>
<tbody>
<tr>
<td>D1</td>
<td>Buildings and spaces designed to human scale</td>
<td>=</td>
</tr>
<tr>
<td>D1.1</td>
<td>Opportunities to enjoy the positive aspects of climate</td>
<td>Overlap with P3 and C2, C3 above.</td>
</tr>
<tr>
<td>D2</td>
<td>Sun/shade</td>
<td>=</td>
</tr>
<tr>
<td>D2.1</td>
<td>Heat/coolness</td>
<td>=</td>
</tr>
<tr>
<td>D2.2</td>
<td>Breeze</td>
<td>=</td>
</tr>
<tr>
<td>D3</td>
<td>Positive sensory experiences</td>
<td>Difficult to operationalize? May reference pleasant views as in C4.3 above.</td>
</tr>
<tr>
<td>D3.1</td>
<td>Good design and detailing</td>
<td>=</td>
</tr>
<tr>
<td>D3.2</td>
<td>Good materials</td>
<td>=</td>
</tr>
<tr>
<td>D3.3</td>
<td>Fine views</td>
<td>=</td>
</tr>
<tr>
<td>D3.4</td>
<td>Trees, plants, water</td>
<td>Can include, no clear overlap.</td>
</tr>
</tbody>
</table>
Appendix 2
This table contains the working urban design framework.

<table>
<thead>
<tr>
<th>Desired outcome</th>
<th>Evaluation Measure</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PROTECTION</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Safety</strong></td>
<td>Does the design offer pedestrians protection against (automobile and bicycle) traffic and accidents on their way into the station?</td>
</tr>
<tr>
<td><strong>Security</strong></td>
<td>Are the ground floors of buildings around the station designed to contribute to a feeling of activity and security?</td>
</tr>
<tr>
<td><strong>Activity</strong></td>
<td>Does the operation of station and station-area amenities (e.g. shops) extend over all hours of transit operation?</td>
</tr>
<tr>
<td><strong>Rain</strong></td>
<td>Does the design offer protection against rain at places where people must walk or wait?</td>
</tr>
<tr>
<td><strong>Wind</strong></td>
<td>Does the design offer protection against wind at places where people must walk or wait?</td>
</tr>
<tr>
<td><strong>COMFORT</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Standing</strong></td>
<td>Does the design offer opportunities for passengers to stand or stay at appropriate places?</td>
</tr>
<tr>
<td><strong>Sitting</strong></td>
<td>Does the design offer opportunities for passengers to sit when they need to?</td>
</tr>
<tr>
<td><strong>Seeing</strong></td>
<td>Does the design provide legibility and easy recognition of station entrances from all relevant directions?</td>
</tr>
<tr>
<td><strong>Hearing</strong></td>
<td>Does the design offer opportunities to talk and listen in relatively quiet environments?</td>
</tr>
<tr>
<td><strong>DELIGHT</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Views</strong></td>
<td>Does the design offer opportunities to enjoy pleasant views?</td>
</tr>
<tr>
<td><strong>Connections</strong></td>
<td>Does the design facilitate efficient and comfortable transfers between transit modes and with active modes?</td>
</tr>
</tbody>
</table>
Does the design make use of green/blue features and other natural elements to improve the passenger experience?

Identification of green elements (if present) in stations and subjective assessment of potential locations for more green elements especially in areas where commuters may experience high stress.

In addition, the urban design framework uses two sub-frameworks:

Ground Floor Quality Assessment Sub-Framework
(adapted from Cities for People, pages 240-241)

<table>
<thead>
<tr>
<th>Criterion</th>
<th>A – Active</th>
<th>B – Friendly</th>
<th>C – Mixture</th>
<th>D – Boring</th>
<th>E – Inactive</th>
</tr>
</thead>
<tbody>
<tr>
<td>Doors/100m</td>
<td>15-20</td>
<td>10-14</td>
<td>6-10</td>
<td>2-5</td>
<td>0-2</td>
</tr>
<tr>
<td>Variation in function</td>
<td>Large</td>
<td>Some</td>
<td>Modest</td>
<td>Almost none</td>
<td>No visible variation</td>
</tr>
<tr>
<td>Blind and passive units</td>
<td>None</td>
<td>Few</td>
<td>Some</td>
<td>Many</td>
<td>All</td>
</tr>
<tr>
<td>Façade relief</td>
<td>Lots of character, primarily vertical articulation</td>
<td>Relief present</td>
<td>Some relief present</td>
<td>Uniform facades</td>
<td></td>
</tr>
<tr>
<td>Details</td>
<td>Good detailing and materials</td>
<td>Many details</td>
<td>Few details</td>
<td>Few or no details</td>
<td>No details, nothing to look at</td>
</tr>
</tbody>
</table>
Sub-Framework for Pedestrian safety (adapted from Cities for People, pages 242-245)

<table>
<thead>
<tr>
<th>Desired situation</th>
<th>Evaluation Measure</th>
<th>Good</th>
<th>Fair</th>
<th>Poor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sidewalks</td>
<td>Effective sidewalk width (real sidewalk width – maximum width occupied by obstacles)</td>
<td>5m or wider.</td>
<td>2-5m.</td>
<td>&lt;2m.</td>
</tr>
<tr>
<td>Continuity of sidewalk</td>
<td>Presence or absence of curb cuts for driveways, parking, etc</td>
<td>0 per block face.</td>
<td>1-2 per block face.</td>
<td>&gt;2 per block face.</td>
</tr>
<tr>
<td>Respect for pedestrian desire lines</td>
<td>Desire lines analysis (qualitative)</td>
<td>No interruptions.</td>
<td>Few interruptions.</td>
<td>Many interruptions.</td>
</tr>
</tbody>
</table>

**Street Crossings**

| Friendly pedestrian signals                | Crosswalk signal type                                                              | Pedestrian crosswalk signal active by default. Shows walk time and/or wait time countdown. | Pedestrian signal active by default. | Pedestrian signal requires button activation or does not exist. |
| Simple and accessible pedestrian crossings | Pedestrian crossing type                                                            | Street level simple crossing with curb extensions. | Street level simple crossings. | Pedestrian crossing does not exist or requires going up or down stairs. |
| Disallowed left turns on red for pedestrian safety | Presence of absence of left-turn-on-red | No left turns on red in all directions. | No left turns on red in major traffic directions. | Left turns on red allowed. |
Appendix 3
### Case Study Summary: Waterfront

<table>
<thead>
<tr>
<th>Desired outcome</th>
<th>Evaluation comments</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Safety</strong> Does the design offer pedestrians protection against (automobile and bicycle) traffic and accidents on their way into the station?</td>
<td>No obviously dangerous crossings or narrow sidewalks, although sidewalk in front of station can get crowded.</td>
</tr>
<tr>
<td><strong>Security</strong> Does the design offer protection against crime and violence, contributing to a feeling of security?</td>
<td>Largely office/commercial character to the district. Many blank faces belonging to office buildings or parking structures, especially around the intersection of Granville and West Cordova. Shops mainly serving food and drink. Office district is quiet after office hours.</td>
</tr>
<tr>
<td><strong>Activity</strong> Does the operation of station and station-area amenities (e.g. shops) extend over all hours of transit operation?</td>
<td>No, especially at night.</td>
</tr>
<tr>
<td><strong>Rain</strong> Does the design offer protection against rain at places where people must walk or wait?</td>
<td>Station entirely indoors, but bus stops especially just outside the main station are not sheltered. Millennium/Expo line west exit connects directly underground to Sinclair Center and Waterfront Center.</td>
</tr>
<tr>
<td>Wind</td>
<td>Does the design offer protection against wind at places where people must walk or wait?</td>
</tr>
<tr>
<td>------------</td>
<td>----------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Standing</td>
<td>Does the design offer opportunities for passengers to stand or stay at appropriate places?</td>
</tr>
</tbody>
</table>
| Sitting    | Does the design offer opportunities for passengers to sit when they need to?          | 6 benches in station building that can seat 3-4 people each. Mostly occupied during observation hours.  
Canada line platform has 2 benches offering 2 seats each.  
Millennium line platform has 2 benches, offering 3 or 4 seats each. |
| Seeing     | Does the design provide legibility and easy recognition of station entrances from all relevant directions? | Station external entrances are mostly legible, except for main station building (awnings say “Rogue”, lack of indication of transit stations beyond small signs at the street edge).  
Connections between the platforms are not always clear (tourists in particular have trouble finding their way between M/E lines and Canada line). |
| Hearing    | Does the design offer opportunities to talk and listen in relatively quiet environments? | Station building is typically 75dB or quieter.  
Millennium/Expo line platform: 75db to 85dB.  
Canada line platform: 75db to 85dB.  
Street: 80-95dB |
<table>
<thead>
<tr>
<th>Views</th>
<th>Does the design offer opportunities to enjoy pleasant views?</th>
<th>Platforms are below grade, so views are extremely limited. Millennium line platform has some views towards the North, but mostly blocked by the West Coast Express platform.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Connections</td>
<td>Does the design facilitate efficient and comfortable transfers between transit modes and with active modes?</td>
<td>Main station building has bike parking at the front, partially sheltered but with very low visibility as they are situated between large columns. 4 bike racks with 5-7 bikes each.</td>
</tr>
<tr>
<td>Nature</td>
<td>Does the design make use of green/blue features and other natural elements to improve the passenger experience?</td>
<td>None.</td>
</tr>
</tbody>
</table>
## Case Study Summary: Main Street-Science World

<table>
<thead>
<tr>
<th>Desired outcome</th>
<th>Evaluation comments</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Safety</strong></td>
<td>Simple crossings but many require manual activation of walk signal. Right-turn-on-red may be dangerous because of heavy traffic and high demand for right turns especially Westbound on Terminal Avenue at Main Street. Wide sidewalks immediately adjacent to station, especially on the west side of the station leading to Science World crosswalk.</td>
</tr>
<tr>
<td><strong>Security</strong></td>
<td>Station is newly renovated and maximises transparency. Station area suffers from lack of vitality and commercial activity? General feel is less than safe owing to tenant mix and signs of homelessness. Mostly residential land use with some commercial ground floors, key pedestrian drivers include Columbia college to the South-East and the Vancity building.</td>
</tr>
<tr>
<td><strong>Activity</strong></td>
<td>Operation hours typically only during the daytime. Industrial and medical-related businesses typically closed early. See diagram.</td>
</tr>
<tr>
<td><strong>Rain</strong></td>
<td>Rain protection is good, including Southbound bus stop on Main Street which is under the tracks. Northbound bus stop on Main Street has a shelter but no covered walkway linking to the station. Other minor bus stops have no shelter.</td>
</tr>
<tr>
<td>Wind</td>
<td>Does the design offer protection against wind at places where people must walk or wait?</td>
</tr>
<tr>
<td>------------</td>
<td>-----------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Standing</td>
<td>Does the design offer opportunities for passengers to stand or stay at appropriate places?</td>
</tr>
<tr>
<td>Sitting</td>
<td>Does the design offer opportunities for passengers to sit when they need to?</td>
</tr>
<tr>
<td>Seeing</td>
<td>Does the design provide legibility and easy recognition of station entrances from all relevant directions?</td>
</tr>
<tr>
<td>Hearing</td>
<td>Does the design offer opportunities to talk and listen in relatively quiet environments?</td>
</tr>
<tr>
<td></td>
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<tr>
<td>------------------------------</td>
<td>------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Views</td>
<td>Does the design offer opportunities to enjoy pleasant views?</td>
</tr>
<tr>
<td></td>
<td>Platform has partially obstructed views of False Creek developments, Thornton park, and Pacific Central Terminal. Some mountain views to the North. Views facilitated by transparent platform envelope.</td>
</tr>
<tr>
<td>Connections</td>
<td>Does the design facilitate efficient and comfortable transfers between transit modes and with active modes?</td>
</tr>
<tr>
<td></td>
<td>Plentiful bike parking is available, especially with the new “bike parkade”, although that costs $8 a month to use. Some outdoor bike parking is on the East side of the station, under the tracks. During morning peak hour, the bike racks were mostly empty.</td>
</tr>
<tr>
<td>Nature</td>
<td>Does the design make use of green/blue features and other natural elements to improve the passenger experience?</td>
</tr>
<tr>
<td></td>
<td>No significant features.</td>
</tr>
<tr>
<td>Desired outcome</td>
<td>Evaluation comments</td>
</tr>
<tr>
<td>-----------------</td>
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</tr>
<tr>
<td>Safety</td>
<td>Does the design offer protection against (automobile and bicycle) traffic and accidents on their way into the station? Mostly good, but need wider sidewalks around the North Station complex, especially where 99 bus stop is. Right turns on red may be hazardous.</td>
</tr>
<tr>
<td>Security</td>
<td>Does the design offer protection against crime and violence, contributing to a feeling of security? Inconsistent opening hours, many inactive block faces especially on the South side. Odd mix of services – day-labour office, healthcare, banks, fast food. What does the mix indicate about the area? Safeway and Shoppers’ Drug Mart present blank facades. Sufficient foot traffic during peak hours to provide passive surveillance, but presence of many homeless and panhandlers may threaten feeling of security during off-peak hours.</td>
</tr>
<tr>
<td>Activity</td>
<td>Does the operation of station and station-area amenities (e.g. shops) extend over all hours of transit operation? Some liveliness in the early and late hours, especially with food and beverage businesses.</td>
</tr>
<tr>
<td>Rain</td>
<td>Does the design offer protection against rain at places where people must walk or wait? Station is sheltered, but bus stops lack shelter. #99 queueing area proposed to have a shelter, but not yet built.</td>
</tr>
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<td>Wind</td>
<td>Does the design offer protection against wind at places where people must walk or wait?</td>
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</tr>
</tbody>
</table>
|       | **Connections**                                   | **Bike racks present on both ends of the South Station, but not fully utilised. Broadway side has 3 racks, 10th Avenue side has one rack.**  
        | Does the design facilitate efficient and comfortable transfers between transit modes and with active modes? | **North station has bike racks along Commercial Drive, but not sheltered and only half occupied. Some commuters lock their bikes to the security fence on the South side of the ticket concourse.** |
|       | **Nature**                                        | **Grandview cut is lined with greenery.**  
        | Does the design make use of green/blue features and other natural elements to improve the passenger experience? | **New expo line platform is being built, design details are not readily available.** |