These Stations were made for Walking

Recommended Guidelines in Pedestrian-Oriented Facility Design at Rapid Transit Stations for Victoria, BC

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ACRONYMS

AASHTO - American Association of State Highway and Transportation Officials
ADA – Americans with Disabilities Act
APTA – American Public Transportation Association
BC MoT – British Columbia Ministry of Transportation & Infrastructure
BRT – Bus Rapid Transit
CES – Customer Emergency Station
CID – Comprehensive Information Display
CRD – Capital Regional District
EmX – Emerald Express
FTA – Federal Transit Administration
LOS – Level of Service
LRT – Light Rail Transit
MAX – Metropolitan Area Express
OCP – Official Community Plan
PTP – Provincial Transit Plan
RGS – Regional Growth Strategy
TAC – Transportation Association of Canada
TCRP – Transportation Cooperative Research Program
TOD – Transit-Oriented Development
TVM – Ticket Vending Machine
US DOT – United States Department of Transportation
VRRTP – Victoria Regional Rapid Transit Project
VRTS – Victoria Regional Transit System
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1. **INTRODUCTION**

1.1 **BACKGROUND**

This report focuses on pedestrian-oriented design considerations as they relate to rapid transit station facilities. BC Transit, the provider of transit services across British Columbia (excluding Vancouver), and the Capital Regional District (CRD), have jointly initiated the Victoria Regional Rapid Transit Project (VRRT) with the intent of establishing a high quality rapid transit corridor between Victoria’s Downtown and the Western Communities (i.e. View Royal, Langford & Colwood). To date, the VRRT has established a preferred alignment along the Trans-Canada Highway but has not chosen the technology (LRT or BRT) or station locations & design.

The specific need for additional focus on pedestrian accommodation at new transit facilities is closely tied to two prevalent demographic trends currently affecting the CRD, an aging population and the westward expansion of the urban fabric in the western communities.

As the population ages, an increasing number of residents will require mobility assistance to conduct their daily activities and maintain access to critical services such as health facilities. High quality rapid transit facilities will need to ensure that aging populations have strong linkages to the surrounding community and are designed in a fashion that is intuitive and easy to navigate.

As the population expands westward, it is crucial that new development is supportive of rapid transit facilities to encourage compatible designs and to optimize transit market coverage. These new stations should make rapid transit easy and enjoyable for prospective users, thereby encouraging them to shift their modal tendencies away from single-occupancy vehicles.

The need for better integration between new transit investment and pedestrian requirements is also established within BC Transit’s 2030 Strategic Plan *Shaping Our Future*. Priority 2.1 of the Plan calls for ‘Increased integration with other types of sustainable travel’ such as walking to broaden the reach of new and existing facilities while supporting the desire for a more compact pedestrian oriented urban form. This report supports the action item of leveraging new transit station investment to better integrate pedestrian facilities and to ensure their needs are considered during station design. Transit facilities in Victoria and elsewhere are often designed primarily to focus on the speedy boarding & alighting of riders to allow the buses to maintain short trip times. BC Transit’s current *Infrastructure Design Guidelines (2010)* does provide commentary on station design, but it is intended for lower volume facilities than would be expected along a rapid transit corridor. Also, little consideration is given to design environments where pedestrian needs such as seating, social amenities, and efficient linkages to surrounding land uses are prioritized.

Figure 1 - Preferred Alignment of Rapid Transit Corridor
Source: BC Transit Presentation to ITE, January 2011
1.2 RESEARCH QUESTION

This report will conduct four case studies on existing rapid transit stations that have been identified as having strong pedestrian-oriented design features. By determining what design features make a rapid transit station pedestrian-friendly the report will be able to establish a set of recommended guidelines for BC Transit to consider when designing station-areas for the VRRTP. This study will therefore seek to establish:

- What station-area design features are critical for establishing a pedestrian-oriented rapid transit facility?
- What recommendations can an analysis of the four case studies and pedestrian-oriented facility design literature offer BC Transit in designing its own rapid transit facilities in Victoria?

1.3 SCOPE OF WORK

This report will specifically focus on pedestrian-oriented design features at rapid transit stations that can be applied to the Victoria BC context. An important point of clarification is that the definition of ‘pedestrian’ for this report will not include those with disabilities as this component alone could occupy an entire report. Some consideration for those with disabilities is made, but it is often in the context of strategies that are mutually beneficial to all station users.

The audit tool employed is intended to focus solely upon facility design elements and does not take into account social or economic considerations such as user perception of the transit facility or the ability of these features to influence transit ridership patterns. Additionally, the focus of this report is the design of the station-area itself and although surrounding development patterns and accessibility to local off-property amenities are considered, they are discussed at a much more general level of detail as BC Transit does not have the ability to directly influence these attributes.

Finally, this report will briefly highlight some of the relevant policies and bylaws in Victoria that regulate design standards as a means of providing context for selecting design guideline recommendations; however, it will not provide specific recommendations on improving these documents or review the policies of other jurisdictions.

1.4 STRUCTURE OF REPORT

This report is broken into seven chapters and begins with a discussion of the research and data analysis methods used to collect data at the four case study locations. Chapter 3 provides contextual information on the demographics and transit system operating statistics of Victoria and the case study locations. It also provides a summary of the relevant provincial and municipal documents that frame the planning environment in which this rapid transit corridor is being developed. Chapter 4 provides general information on basic rapid transit concepts such as technology and station types. It is intended to provide a basic level of understanding for readers who may not have a strong background in rapid transit planning.

Chapters 5 & 6 are the bulk of the report, which provide the results of the site observation analysis and outline the recommended design guidelines based on these observations and additional pedestrian-oriented design literature. The final chapter provides an overview of the provincial and municipal co-ordination that will be required to implement these recommendations. The final chapter also recommends additional research to complement what has been started in this report.
2. RESEARCH & ANALYSIS METHODS

In order to conduct the case studies proposed and to produce a meaningful set of recommended design guidelines, this report will collect and analyze data using a literature review, site observations, photography, and the application of the evaluation criteria.

2.1 DATA COLLECTION METHODS

Literature Review

The literature review will initially be used to provide the background context for the work to be conducted. The background context establishes a basic level of understanding that the reader can use to make informed decisions about what are important considerations in pedestrian design and how they are linked to other concepts. For example, the literature review will provide direction to the Context and BRT & Pedestrian Design Concepts chapters by discussing the ‘spectrum’ of Bus Rapid Transit (BRT) possibilities. As BRT running-ways can take many forms, so can BRT stations. The literature review will be used to explore the spectrum of station forms to understand what pedestrian requirements are present and necessary at various scales. Understanding these components first, will assist in narrowing the scope of pedestrian-oriented design components to be addressed in the study.

Although pedestrian design guidelines for rapid transit stations are rare, articles regarding pedestrian-oriented design for other public spaces are not. Including broader literature on the subject of pedestrian design from scholars like Jan Gehl’s Cities for People (2010), assists in establishing a reliable and externally validated set of concepts. These concepts will be used to enhance the discussion of pedestrian needs at rapid transit stations that are often over-looked in existing station design manuals. The review will also assist in separating relevant pedestrian features that can be applied to transit stations from those in the literature that are not transferable to this context.

Regional planning and policy documents are also part of the literature review as they frame the problem statement and assist in refining the case study findings to fit into the Victoria context. BC Transit documents such as the 2030 Strategic Plan Shaping Our Future (2010) and the Victoria Regional Rapid Transit Work Plan (2009) are used to clearly articulate the general problem to be addressed and to highlight the current plans of BC Transit that this report will use to help guide the scope and requirements. Although generalizability is crucial during case study evaluation to ensure concepts from other jurisdictions are transferable, the nature of this report is to select recommended design guidelines for a very specific context. Local planning documents such as municipal by-laws, the CRD Regional Growth Strategy, and TravelChoices transportation plan will be used to ensure external recommendations are viable and valid in this context.

Case study selection will also be made in part through the literature review. The Characteristics for BRT Decision-making (2009) provides a series of data tables on existing BRT corridors including information on station amenities and design, which will be used to narrow down desirable stations. Articles such as TCRP Report 102 TOD in the United States: Experiences Challenges and Prospects (2004) further refine the list by reviewing existing Transit-Oriented Developments (TOD) and discussing their level of success in integrating transit and supportive communities. The literature review is also used to establish the evaluation criteria. The criteria address the common elements of design that are deemed critical to effective pedestrian facilities at rapid transit stations. Further, the literature review is used for compiling standards for evaluating the quality of each design feature. Utilizing pre-existing standards removes the subjectivity in grading pedestrian design features and establishes external validity in the findings.

Finally, the literature review is used to assist in filling gaps in the case study findings. Adding academic literature to these weak points enhances generalizability and assists in triangulating data to remove biases.
Direct Observation

Direct observations are conducted at the case study stations to document the pedestrian facilities and their conformance to the evaluation criteria. The initial component of direct observation involves a site observation of both the station-area and the surrounding neighbourhood. This method involves passive observation of the relationship between the facility and its users without observer interaction. In doing so, data is collected regarding how pedestrians interact with the station components in addition to the simple documentation of what design features are and are not present. A similar passive observation is conducted on the surrounding community, again noting the presence of design features in addition to land uses and amenities. Surrounding features often regulate the level of connectivity to the station-area as well as providing a broader selection of desirable amenities than what is available at the station. The passive observation, therefore, evaluates how these amenities are or are not used by transit users and whether or not a strong ‘sense of place’ as defined by Jane Jacobs and Jan Gehl are present at successful stations.

Measurements are made of certain station features such as corridor widths, platform dimensions, and sidewalk width. These design features can be tested to determine their ‘Levels of Service’ (LOS), a term that describes how efficiently a facility moves a medium; in this case people. Measurements add both a level of validity and standardization to the results as they can be compared equally against a pre-determined specification. Additional measurements for surrounding areas are made using Google Earth or other mapping software to determine distances to amenities, road widths, and distance to intersections. These metrics are used to verify how closely the case study locations relate to TOD tenants, such as distance to transit and mixed-use complexes.

Photography is used to document design features and to provide illustrations of key ideas. Photographs are taken at the station areas to show how design features are being used by patrons as well as showing the relationship between multiple design components, such as a corridor and potential obstructions. Photographic documentation is done for the surrounding neighbourhood to visually illustrate to the reader where amenities are and how the built form addresses the station-area. According to Rose (2007) photography adds to generalizability as the person viewing a photo must establish its context in their own minds and therefore can be related to other examples without taking into consideration the ‘big-picture’ (i.e. the whole station area).

2.2 Data Analysis Method

In order to evaluate the four case study transit stations, a matrix of evaluation criteria has been compiled as a means of standardizing data collection and reporting of results. The evaluation criteria provided in Appendix A have been broken into five categories: Information, Access, Safety & Security, Internal Circulation, and Amenities. These categories are based on a similar study conducted by Hiroyuki Iseki, et al. (2007) as part of the EPIC Project intended to improve public transportation. The evaluation criteria, themselves, are based on the works of Jan Gehl, an established authority in the field of designing city space for pedestrians and cyclists, and Sound Transit, the transit agency responsible for transit service planning and operation in the Seattle region.

Each of the criteria is accompanied by three to five sub-criteria and an intended method for data collection. Through the data collection method, each related component of the rapid transit facility is evaluated and ranked from 0 to 4 based on which sub-criteria are present. Although the sub-criteria are intended to be answered in a binary Yes/No fashion, some questions are inherently subjective. In this case, the decision of whether the sub-criteria is fulfilled will be based on best judgment and by consulting with the sources from which the sub-criterion was derived (these are listed at the bottom of each sub-criteria field).

Once the sub-criteria are summed and given a ranking out of 4, a data summary sheet is generated with the rankings displayed as round ideograms for a more clear depiction of results. The ideograms will
visually assist in locating weak areas for each case study station. In areas where all four case study stations have unsatisfactorily provided a design recommendation, I will include strategies discussed in the literature review to fill the gaps.

2.3 **Limitations to Methodology**

**Single Observer Direct Observations**

The findings and conclusions of the four case studies are primarily collected by a single observer engaged in passive direct observations. As a result, the ratings provided through the evaluation criteria are taken from only one viewpoint. As a young, healthy, male, who is not a resident of the case study communities, my view of the quality of station areas may be substantially different than those, who are for example in a wheel chair or travel with young children.

**Short Duration of Direct Observations**

Due to time constraints direct observations at each case study were conducted over two day periods in either the months of December or January. As a result, directly observing how the use of design criteria are affected by seasonal difference is not possible. Direct implications of how seasonal phenomena such as snow accumulation, changes in temperature and hours of sunlight affect the way patrons use these facilities are therefore beyond the considerations of the direct observation component of this report. In addition to physical changes, seasonal shifts also impact emotional responses to surroundings, such as a person being more stressed around Christmas time or feeling less positive due to the reduction in daylight hours. These will directly impact how users respond in the survey.
3. **Context**

This chapter will provide basic information on Victoria and the Victoria Regional Transportation System to give a background context to the environment in which the rapid transit system and station-areas must fit. As well, summaries of applicable municipal and BC Transit policies have been included in order to highlight existing planning & policy requirements. Maintaining an understanding of these policies and their objectives will be crucial when selecting what recommended design guidelines are best suited to this context and, which may require more evaluation before implementation.

Finally, this chapter will provide backgrounders on the four case study communities and their transit systems for comparison with Victoria. They can also be used to begin visioning exercises of what system features could be transferable.

### 3.1 Victoria Community & Transit System Profile

#### Location

Victoria is situated on the Southern tip of Vancouver Island, approximately 94km from Vancouver the provinces largest city and 34km from Port Angeles the nearest Canada/US border crossing.

![Location map of Victoria, BC](Source: www.BCVacationProperties.com)

#### Demographics

The City of Victoria had a population of 78,057 in 2006 but sits within the much larger Capital Regional District (CRD). The CRD had a population of 345,146 in 2006 and is comprised of 13 municipalities and 3 electoral areas:

**Municipalities**
- Central Saanich
- Colwood
- Esquimalt
- Highlands
- Langford
- Metchosin
- North Saanich
- Oak Bay
- Saanich
- Sidney
- Sooke
- Victoria
- View Royal

**Electoral Areas**
- Juan de Fuca
- Southern Gulf Islands
- Salt Spring Island

The City of Victoria has one of the nation’s highest population densities at 3,965 people/km² across a 19.6 km² area, although the ruggedness of the Island’s terrain and large sections of land under agricultural protection (through the Agricultural Land Commission) results in a much lower 474 people/sq.km for the CRD.

Victoria is often known as a city of ‘newlyweds and nearly deads’, which refers to its unique population pyramid shape. Although the Region’s largest age bracket in 2006 was between 25 and 39 years old at 60,570 (18.34%), the median age was 43.1 years old compared to the national average of 39.5 (Victoria CMA Community Profile, 2006).

City and Regional growth rates between 2001 and 2006 were relatively comparable at 5.3% and 6.0% respectively. High growth suburbs of View Royal (20.6%), Highlands (13.7%), and Langford (19.2%) illustrate the westward expansion trend of the Region (Victoria’s Population, 2009).
Victoria Regional Transit System

The Victoria Regional Transit System (VRTS) operates the transit services within the CRD and is managed by the Victoria Regional Transit Commission with planning & funding services provided through BC Transit.

The VRTS operates a fleet of 270 buses on 37 conventional routes in addition to 18 community bus routes for less populated areas, and handyDART services for the mobility impaired. In 2009/10, 24.8 million passengers used the Victoria public transit system. This equates to an approximate daily ridership of 70,000 and 6.5% mode share (2009/10 Annual Report, 2010).

The system’s fare structure operates on a single zone program where passengers pay flat fare of $2.50 to travel between any two points in the region.

Although bus priority facilities have been installed at some major intersections within the CRD, such as queue jump lanes at Highway 1 and Mackenzie Road, no other express bus services or facilities have been installed. BC Transit has, however, begun work on new transit exchange facilities within the CRD at key centres such as the new Uptown development at Hwy.1 & Saanich Rd., and at Hwy.17 and the new McTavish Interchange to service Victoria International Airport traffic. These facilities are part of the 20 year BC Transit strategic plan to add frequent or express bus services between the downtown and outer communities such as the Saanich Peninsula and Western Communities (BC Transit Strategic Plan, 2010).

Transit System Demographics in Victoria

The data in this section has been drawn from BC Transit’s Customer Satisfaction tracking Research Annual Report 2009-2010 (2010). 68% of system users in 2009-2010 considered themselves to reside in the Urban Core of the CRD while 20% considered themselves to live in the Westshore. While those saying that they live in the Core have fallen by 4% in the past seven years, the percentage residing in the Westshore has risen by 7% showing a significant westward trend of transit ridership expansion.

Age demographics suggest another interesting trend with the percentage of users above 55 years old growing 11% in the past seven years while users between 25 and 34 showed a significant 12% drop. The growth in the 55+ age bracket is partially reflective of the aging population, however no explanation has been provided for the drop in the 25 to 34 age bracket.
User demographics of housing income suggest a significant growth in ridership by high wage earners ($65,000+) with a 9% growth since 2003-2004 while low income families (less than $25,000) showed an 8% drop. The growth of ridership in the high income category could be a reflection of a maturing commuter service that users believe offers a desirable alternative to driving into the downtown.

The gender ratio of users has remained unchanged since 2003-2004 with women accounting for slightly more than half of all users (53%).

In 2009-2010 54% of survey respondents said that they used the bus system in the past year, which is an 8% drop from 2008-2009. Additionally, those who claimed they had never used the bus increased by 9% to 19% during the same period.

When questioned about the frequency of their transit usage, 72% of 15-24 year olds used the service in the past week with only 17% using transit infrequently. In the 25 to 54 bracket just 22% of respondents had used transit in the past week, and the percentage drops even lower for ages 55+ with only 3% reporting high usage.

The transit system demographics paint a very similar picture to that of the CRD wide census data. Population and ridership growth is shifting toward the new communities in the Westshore, so it will be important to ensure that rapid transit and new developments are mutually supportive. The population is aging in both demographic profiles and therefore it will be important to include amenities such as ample seating, clear wayfinding and good lighting at rapid transit stations. Less anticipated is the growth of affluent patrons, but this could reflect a maturity of the commuter services, which may require unique transit considerations such as newsstands, and real-time data. There is also the need to explore why many older users are only using the service occasionally. Further research could be required to determine why this trend is occurring.

### 3.2 Relevant Policies & Guidelines

The following documents form a general overview of current municipal & BC Transit planning policies. These documents range in scope from long-range regional planning goals to detailed standards for bus facility construction.

Although this report is most concerned with micro-level considerations impacting rapid transit facility design, long-term regional planning documents set the tone for all subsequent guidelines and are therefore important to consider when making new policy decisions.

#### 3.2.1 Municipal & Regional Documents

**Capital Regional District – Regional Growth Strategy (2003)**

The CRD’s Regional Growth Strategy (RGS) is the overarching regional planning document that directs the objectives of constituent municipalities Official Community Plans. The main objectives of the RGS are to curb outward expansion of urban areas and to focus new development within existing communities. Beyond maintaining Victoria as the main regional employment center, the RGS also defines the need for complementary regional population & employment centers in areas such as Langford and Colwood to act in a supporting role.

Part of the RGS objective is to locate 90% of new dwellings within the Regional Urban Containment Area by 2026, and striving to have the majority of that development be within a 10 minute walk of existing commercial and employment centers.

Although the document is primarily focused on housing and commercial development, it does set a region-wide mode share objective of 10% in part by supporting dedicated lanes for transit on major corridors. The RGS also makes specific mention of a need to
review the potential to establish a high-capacity transit connection between the Downtown and Langford to support regional center objectives.

**Capital Regional District – Travel Choices Long-Term Transportation Strategy (2005)**

Although operating as a wholly separate document, the Travel Choices Strategy was produced to build upon the CRD’s Regional Growth Strategy by offering a long term region-wide transportation plan.

Travel Choices has many of the same goals as the RGS, as they both support the enhancement of travel alternatives such as walking, cycling & public transportation, while ensuring a strong connection between population & employment corridor development and transportation planning. Like the RGS, Travel Choices also makes specific mention of initiating planning for a major transit network connecting the Downtown to Langford, as well as future connections to the University of Victoria, and the BC Ferries terminal at Swartz Bay.

The Strategy also makes mention of a need to enhance customer information and amenities around transit stations by making bus shelters more comfortable for users and to provide them with real-time information. Furthermore, the Travel Choices strategy puts forward a goal of making transit exchanges more pedestrian-friendly by establishing better connections between the transit facility and ‘major strategic centers’ (i.e. employment centers).

**Municipal Engineering Standards**

The proposed rapid transit corridor will pass through five municipalities and it is important to understand how existing municipal engineering standards will cope with any new rapid transit station design guidelines.

The City of Victoria maintains a Pedestrian Master Plan (2008), which among many things provides municipal guidelines for sidewalk placement and other accessibility considerations. Many of the City’s standards are based on other national or international standards, especially on the topic of accessibility and therefore it is important that new guidelines are flexible enough to fit without undue hardship on municipal engineers.

For example, the PMP maintains a minimum width of 1.2m for sidewalk standards however, mentions that this width may often be unsatisfactory for high traffic areas.

Municipalities within the CRD also often use Transportation Association of Canada (TAC) Geometric Design Guide standards, which is a comprehensive design manual for roadways, sidewalks and related facilities. The TAC guidelines often offer minimum standards for sidewalks, which can be improved upon; however, other standards such as the design and placement of crosswalks are usually not flexible and should be closely adhered to.

The TAC manual is primarily intended as a guide for traffic standards and although an Urban Supplement is available, it does not comprehensively cover pedestrian facilities.
3.2.2 BC Transit Documents

Shaping Our Future – BC Transit’s Strategic Plan 2030 (2010)

The ‘Shaping Our Future’ strategic plan was produced in part to address the requirements of the province of BC’s new Provincial Transit Plan (PTP). The PTP provides billions of dollars in investment to help BC Transit and Vancouver’s TransLink reach their respective ridership goals by 2020.

These agencies must produce and maintain a long-term strategy that establishes key programs and objectives that will require provincial funding to meet their ultimate ridership goals. The Shaping Our Future strategy lists as its second major objective to “support and shape livable communities” (pg.30).

The priorities stemming from this objective have substantial bearing on what elements should be present in a successful transit facility:

- **Priority 2.1** Increase integration with other sustainable forms of transportation
- **Priority 2.2** Influence land use development patterns
- **Priority 2.3** Identify and establish priority corridors for transit

The major applicable themes taken from these priorities are that new investments should be focused on transit supportive developments and that BC Transit must work more closely with local planning agencies to achieve mutually beneficial results. To expand, new transit exchange/station funding should be leveraged to support regional pedestrian & cycling networks. In part, this should be accomplished by linking the goals of upcoming community Transit Master Plans with those of municipal OCPs and the RGS.

Furthermore, BC Transit should work with local agencies to promote transit supportive developments through incentivization and development of desirable transit facilities and services.


The Infrastructure Design Guidelines were drafted in 2010 as a way of compiling the large collection of standards and specifications that BC Transit had historically been using, but were originally dispersed amongst numerous documents.

The guidelines are largely based on TAC standards, TransLink’s *Transit Infrastructure Design Guidelines* (2002), and guidelines of other North American transportation authorities. The majority of the document provides standards on bus turning radii and the placement of station facilities.

The document does, however, also provide some guidance on station-area design. In particular, Chapters, 3.5 (Physical Design for Safe Passenger Access & Amenities), 5.3 (Bus Stop Facilities), 6 (Off-Street Facilities), & 7 (Signing, Pavement Marking, & Lighting) are particularly relevant to this report.

Chapter sub-section 3.5 outlines the various safety & amenity considerations that should go into a station-area design based on its relative size and user volumes. It establishes a list of mandatory and desirable components that should be present at these stations although it does not look at components beyond the station footprint.

The three chapters (and sub-sections) address signage standards that are consistent across the province as well as internal bus & pedestrian circulation patterns within a facility.

BC Transit Municipal Systems Program – Design Guidelines for Accessible Bus Stops (Undated)

These undated guidelines have been largely adapted from the American’s With Disabilities Act (ADA) standards used in the USA. Although design standards for the disabled are beyond this reports
scope, there are certainly several points where standards for the mobility challenged and the general public are mutually beneficial.

The guidelines provide preferred standards for sidewalks, platform waiting areas and maximum grades etc. These components are of equal importance to able-bodied individuals and in fact, the additional space and grade considerations made for the mobility challenged also make using the facility more desirable for all users.

Although this reports recommended design guidelines will seek to include these standards where possible, it will most often direct report users to seek further guidance on disability standards from this or other guides when applicable.

3.3 Case Study Community & System Profiles

3.3.1 Yamhill Station – Portland, OR

Yamhill Station is located within the Downtown District of Portland. The city had a population of 582,130 in 2010 with a metro population of 2,226,000, making it the 23rd largest metropolitan area in the US (Portland State University, 2009).

The City of Portland had a population density of 1,655.3 people/km² in 2010 and covered an area of 376.5 km² making the city less than half as dense as the City of Victoria but covering 19 times the land area.

The transit mode share for Portland is slightly lower than that of Victoria at 6% of all trips, compared to 66% by personal vehicle. However, transit represents 12% of all work related travel compared to 62% by personal vehicles (City of Portland Community Survey, 2010).

Tri-Met MAX – Red & Blue Lines

Portland’s transit system is run by Tri-Met and in 2010 carried a total of 78.8 million riders. Of that, the Metropolitan Area Express (MAX) light rail network, carried 32 million riders or on average 96,800 per weekday (Tri-Met Ridership Information, 2010).

Yamhill Station is served by the Red & Blue MAX lines, which serve the Airport and Hillsboro & Gresham respectively. The Red Line is 41 km long with 29 station stops while the Blue Line is 52.5km long with 51 stations (Tri-Met Fact Sheet, 2010). Since several lines serve the same stations, ridership counts by line are not available.
Chapter 3 – Context

Station-Area Background

The station is located along Yamhill St. between the intersections of 1st & 2nd Ave. Its primary role since moving from the Yellow Line in 2004 is to serve the pre-existing Yamhill neighbourhood. The character of the station-area is dominated by its placement in a pedestrian only corridor surrounded by historic 3-4 storey mixed use units.

The pedestrian corridor around the station was the impetus for the adding of street patios in the summer as well as extensive beautification & enhancement projects in the surrounding area.

3.3.2 Orenco Station – Hillsboro, OR

Orenco Station is located in the Portland suburb of Hillsboro, which is located 24km directly west of the downtown. In 2010, the population of Hillsboro was estimated to be 90,380. The average density of the city is 1,256 people/km² covering an area of 55.9km² (Portland State University, 2009). Compared to Victoria, it is approximately a third as dense but covering nearly three times the area. This is not surprising as Hillsboro acts largely as a bedroom community for Portland.

Tri-Met Max – Blue Line

Similar Yamhill Station, Orenco is served by the Blue Line of MAX system. For ridership statistics and details on the MAX Blue Line, please see the ‘Tri-Met MAX – Red & Blue Lines’ section of the Yamhill Station backgrounder located above.

Station-Area Background

The station opened on September 12th, 1998 to coincide with the completion of the Westside MAX project, which extended the MAX Blue Line (Tri-Met Station Info, Online).

The location of the station was chosen because of its proximity to the Orenco Station smart growth development that was being built in tandem. The initial phase of the development opened a year before the station. The new community located around the intersection of NW 231st St. & NW 229th St. was built on a former 209 acre nursery.

The development became a case study for New Urbanist scholars for its success in achieving higher residential densities and mix of uses. In addition, the community has a transit mode share of 22% vs. the metro average of 6%. These elevated levels are also true for travel by cycling and walking (Podobnik, 2002).
### 3.3.3 Agate Station – Eugene, OR

Agate Station is located in Eugene, the second largest city in Oregon and approximately 170km south of Portland. The metropolitan population was estimated to be 351,715 in 2010, with the City population accounting for 156,185 during the same period. Eugene is the closest comparison to Victoria in terms of population but by density, its 1,487.5 people/km² is approximately a third as dense. The City occupies a total area of 105 km² (Portland State University, 2009).

**Emerald Express (EmX) – Green Line**

Agate Station is located along the EmX BRT corridor, which runs from downtown Eugene to downtown Springfield along the Franklin Blvd. (Hwy.99) corridor. The first corridor, referred to as the ‘Green Line’, was completed in 2007 and was one of the few BRT systems in North America to operate within an exclusive median right-of-way (60% within median), and feature buses with dual side loading capabilities. The 9km long corridor serves 10 stations of which, 6 are located within the median (left-side loading) and 4 are located curb-side (right-side loading).

Although the service was initially free, off-board ticket purchasing was later installed. At intersections the network makes use of transit-signal priority technology to advance lights (FTA, 2009). In 2009, the EmX service had an annual boarding of 1,592,112 passengers, or 14% of the 11,406,316 total boardings counted in the Lane Transit District. A new 14 station, 17.5km extension to the EmX service was opened in January 2011 and links downtown Springfield with Gateway Shopping Centre and Sacred Heart Medical Centre (LTD, 2009).

#### Station-Area Background

Agate Station opened in 2007 with the completion of the EmX Green Line as one of two stations that serve the University of Oregon campus. The station is located within the Franklin Blvd. median and links to the sidewalk network via a signalized intersection. When the station first opened, the surrounding area consisted primarily of single storey retail and fast food with several vacant parcels owned by the university. Since that time, several new 3-5 storey university buildings have been constructed, including a soon to be completed student residence all within walking distance of the station.

### 3.3.4 Joyce-Collingwood Station – Vancouver, BC

This station is located east of downtown Vancouver in close proximity to city boundary with Burnaby. The population of Metro Vancouver during the 2006 census was 2,116,581 with the City of Vancouver accounting for 578,041 of that total during the same period of time and spread over a 114.7km² area (Statistics Canada, 2006 Census).
Compared to the CRD, Metro Vancouver is substantially denser with 735.6 people/km². As well, the City of Vancouver is 27% more dense than the City of Victoria, with 5,039 people/km² (Victoria = 3,965 people/km²), making it the most dense city in Canada (Statistics Canada, 2006 Census).

These statistics also translate into higher transit ridership volumes for Metro Vancouver when compared to Victoria. TransLink reported in its 2009 Annual Report that transit ridership accounted for 13% of all trips, with cycling and biking also accounting for a combined 13%.

**SkyTrain - Expo Line**

The station is located along the SkyTrain’s Expo Line, which is an elevated light-rail corridor that opened in 1986 to serve Expo ‘86. The Line forms a major transit spine running from downtown Vancouver’s waterfront, through Burnaby, New Westminster and ending in Surrey. The Expo-Millennium corridor carried 240,000 passengers a day in the third-quarter of 2010 but since the service has been interlaced with the Millennium Line since 2001, it is not possible to determine the Expo Lines share of this total (APTA, 2010).

**Station-Area Background**

The station is located at Joyce St. & Vanness Ave. and was opened on December 11, 1985 in what was originally a low-rise area largely dominated by small retail and light-industry.

Since the stations construction a massive redevelopment of the Collingwood Village by Concert Properties has greatly redefined the surrounding area. Started in 1990 and completed in 2006, Concert built 2,700 units in 16 buildings (11 of which are high-rise condos) on an 11.3ha parcel of land extending east from the station-area.

Developed to be a TOD, all units are between 25m and 700m from the Station (CMHC, 2009).
4. **Basic Rapid Transit & Pedestrian Design Concepts**

The intent of this chapter is to provide basic technical information on rapid transit & pedestrian design concepts. Readers should use this information as a resource to help them better understand the implications that these broader concepts have on the design of pedestrian friendly rapid transit facilities. This chapter is the only time many of these broader concepts will be discussed in this report but their influence on the key factors of facility design should be kept in mind during any decision-making process.

4.1 **Rapid Transit Technology Options**

Public transit vehicle technologies are often discussed as a spectrum, where distinctions can be drawn between them, but often the boundaries are minimally defined. See Appendix B for details on transit vehicle technologies & characteristics. On one end of the spectrum is the ‘Conventional Bus’, which is often the work horse of the public transit system. It is highly flexible for route planning and has much lower purchase and operational costs. However, conventional bus services often suffer from lower travel speeds due to close stop proximities, and small passenger capacity per vehicle. Commuter rail is often placed at the other end of the spectrum because of its comparatively high speeds, large passenger capacity and inter-regional service capabilities. However, it has very few stops meaning extensive feeder networks are required to enhance its market capture. Also, the technology has substantial right-of-way and acquisition & operation requirements.

Many jurisdictions are now seeking intermediate technologies such as Bus Rapid Transit (BRT), and Light Rail Transit (LRT). These two technologies have been adopted by several jurisdictions for several reasons:

1) Greater travel speeds than conventional bus services (when operating within dedicated facilities)
2) Potential for greater passenger carrying capacity
3) Better impetus for development around stations than conventional services
4) Can use existing driving lanes that have been converted
5) Less expensive up front construction & acquisition costs over commuter rail
6) Stop spacings can vary from block to block in dense areas to every 1km or more in express corridors allowing for better market coverage

Even between BRT and LRT, there are significant differences. Usually they are defined by BRT having less passenger capacity and a slower travel speed, but LRT having a larger upfront construction & acquisition cost with reduced route flexibility. In the case of Victoria, BC Transit has trended toward BRT service because of its lower operating costs and greater service flexibility. Therefore, the remainder of this chapter will focus on BRT facilities.

4.2 **Transit Way Configuration Options**

Transit way configurations are outside the scope of this report, but it is important to have an understanding of their basic qualities as they heavily influence the design and operation of rapid-transit station areas. Although there are numerous configurations of BRT transit ways, this section will focus on the three most basic arrangements:

1) Curbside
2) Median
3) Side Running
Although the three corridor configurations are distinct, they can and are used in tandem in some jurisdictions. Please refer to Figure 11 for a graphical representation of the three options.

**Curbside Transit Way**

Curbside transit ways as the name suggests, operate in the lane adjacent to the curb. This configuration is often found to be safest for pedestrians as they are not forced to cross traffic to board the buses. Additionally, these stops are considered more convenient for other motorists in mixed traffic situations as the bus does not block through traffic as significantly.

**Median Transit Way**

Median transit ways are usually installed from the removal of the two central lanes of vehicle traffic that are rededicated as bus-only corridors. The other option along highway segments is to redevelop the median into a bi-directional bus corridor. Median transit ways are almost always exclusive bus facilities, which reduces conflicts with other vehicles and thus improves headways. Median corridors within cities will again require special signals but often maintain the ability of vehicles to make all movements at intersections. Along highway corridors median lanes fully segregate bus and vehicle traffic and therefore reduce conflict points at highway on and off ramps. The major drawback of the median design is that they require pedestrians to cross traffic lanes either through the use

However, curbside transit ways impact heavily on right-turning movements at intersections and often require special signalization to allow vehicles to cross the transit way. The alternative to special signalization is often the contentious removal of right turn movements. In mixed traffic situations, buses must also contend with parked vehicles, which slow headway times and require merging into other lanes to pass. This option is also fairly contentious amongst businesses as a dedicated shoulder corridor usually requires the removal of parking lanes. Curbside configurations are usually the least expensive of the three options because they use existing right-of-way.
of pedestrian signalization (in cities) or via grade separated walkways (usually highway situations). This puts pedestrians into conflict with vehicles, and also in highways situations forces them to wait in a facility surrounded by fast moving vehicles, which can be an uncomfortable experience.

**Side Running Transit Ways**

Although still quite uncommon, they are becoming more popular for quite a few reasons. This option places both bus only lanes adjacent to each other on either side of the existing roadway. They are effectively segregated from the rest of traffic usually by curbing and only come into contact with them at intersections, thus maintaining consistent headway times.

Other benefits are that pedestrians will come into conflict far less often with moving vehicles in this configuration as they are normally only expected to cross the transit way to access one of the station stops. Also, walking distances are usually much shorter in the case of highway applications as parking facilities, if present, are usually in close proximity to the transit way rather than on the other side of the highway. The physical separation of the transit way in a highway context also means pedestrians are not exposed to highway conditions but rather ones more closely related to smaller arterials, making for a more pleasant experience. The major down side to this option is the significant alterations required within the city corridor and the expensive right of way acquisition costs along the highway.

Again, parking will usually be lost with this method and major traffic disruptions can be expected during the conversion. The latter could also be the case in the other two options, albeit likely less severe (US DOT, 2009).
4.3 **BASIC TRANSIT STATION TYPES**

This section provides a brief description of the various transit station types that could be used by a BRT service. Part of the process of choosing what pedestrian facilities and amenities will be available within a station-area, is determining how large of a station is desired, and more importantly how much money a transit authority is willing to spend. Shelter selection should also be based on the volume of patrons being handled, which means a BRT system may use a range of sizes and configuration.

**Simple Shelter**
A simple shelter is the simplest form of the five BRT station types. It consists of a ‘basic’ transit stop with a simple shelter (often purchased “off the shelf” to protect waiting passengers from the weather. In general, this type of station has the lowest capital cost and provides the lowest level of passenger amenities.

**Cost:** $15,000 - $20,000 per shelter (includes cost of shelter only)

**Enhanced Shelter**
Enhanced BRT stations include enhanced shelters, which are often specially-designed for BRT to differentiate it from other transit stations and to provide additional features such as more weather protection and lighting. This BRT station type often incorporates additional design treatments such as walls made of glass or other transparent material, high quality material finishes, and passenger amenities such as benches, trash cans, or pay phones. Enhanced shelters are often installed for on-street BRT applications to integrate with the sidewalk infrastructure.

**Cost:** $25,000 - $35,000 per shelter (includes cost of shelter only)

**Station Enclosure**
Often based on a custom design, station enclosures are designed specifically for a BRT system and are fabricated off site, allowing for identical and modular designs for multiple locations. The station enclosure may include level passenger boarding and lighting, a full range of passenger amenities including retail service, and a complete array of passenger information.

**Cost:** $150,000 - $300,000 per station (lower-cost stations include cost of canopy, platform, station enclosure, and pedestrian access)

**Station Building**
The designated BRT building represents a large enclosure for passengers. Designs for station buildings are specific to each station location and often include enclosures for passengers waiting for both directions of travel, pedestrian passageways, accessibility features such as ramps and elevators, and grade-separated connections from one platform to another, as well as a full range of passenger amenities including retail service and a complete range of passenger information.

**Cost:** $500,000 - $2.5 million per station (lower-cost stations include cost of canopy, platform, station enclosure, and pedestrian access; higher-cost stations are designed for higher ridership and include longer platforms and canopies, larger station structure, passenger amenities and roadway access

**Intermodal Terminal or Transit Center**
The intermodal terminal or transit center is the most complex and costly of the BRT station listed in this section. This type of BRT facility often will have level boarding and a host of amenities and will accommodate the transfers from BRT service to local bus and other public transit modes such as local rail transit, intercity bus, and intercity rail.

**Cost:** $5 million - $20 million per facility or higher (includes the cost of platforms, canopies, large station structure, passenger amenities, pedestrian access, auto access, and transit mode for all transit modes served)

Source: US DOT, 2009
4.4 **Basic Pedestrian Design Considerations**

This section will briefly summarize some of the basic elements of pedestrian design at transit facilities, which will be the basis of the evaluation criteria for the case study station-areas. The five major categories used in this report are:

1) Information
2) Access
3) Safety & Security
4) Internal Circulation
5) Amenities

**Information**

There are two crucial times when patrons need information, before they have arrived at the station and once they are at the station. Information required upon arriving at the station include, its location, scheduled trip times, fare structures, and routing.

Prospective patrons attempting to access a facility should be able to locate wayfinding information in the neighbourhood surrounding these stations that is both readable and legible for first time users. The wayfinding could be a simple graphic with directional arrow, to an information display that is linked to a much broader area wayfinding program. Often branding through stylized designs or colouring is used to denote the presence of certain services such as a rapid transit corridor. Whatever the strategy, the information should be easy to find & digest for both familiar facility users and non-familiar users such as tourists, who likely need quality information the most (TCRP 118, 2007).

Information at the station area should be equally user-friendly by patrons. Information at the station can come in many forms such as, digital messaging, audible announcements, and fixed displays at information kiosks.

No matter how the information is displayed, it must be easy to access and simple to understand. Further to this, the amount of information provided should be sufficient for even inexperienced users to navigate the facility, system, and surrounding areas. A lack of understanding can lead to confusion & uncertainty, which in turn may dissuade continued service usage (TCRP 118, 2007).

**Access**

Station access is one of the most intuitive yet poorly executed components of facility design. A well designed station access supports easy mobility for a range of users, including the mobility impaired, women with young children, and the general public. Often, however, station users are met with narrow sidewalks, difficult grades, and pedestrian corridors that do not effectively link the station-area to surrounding uses.

Good quality access to a station often starts before the facility is installed, through well planned road and pedestrian pathway networks that support strong connectivity. This is most often achieved through urban design standards that support connectivity in new development or through redevelopment where pathway dedication is acquired through rezoning. Further to this, proper sidewalk widths capable of handling station user volumes are crucial both for safety as well as for the efficient movement of patrons. Related to good quality sidewalks, is the intrinsic need for pedestrian supportive intersections. A wide sidewalk is of minimal value if a patron cannot safely cross the road (Saelens, et al., 2003).
Safety & Security

Maintaining a safe and secure station-area is critical to establishing a successful service. Several reports have shown that facilities that have a real or perceived lack of security often discourage system use, especially among target groups such as young women (Iseki, H. et al., 2007; Banerjee, et al., 2005).

The main focus of safety design elements is to develop a ‘defensible space’. That is, designing an area in a manner where patrons feel a sense of personal security both day and night. Beyond the obvious application of lighting techniques, other strategies are to maintain clear sightlines throughout the facility thus removing hiding spaces, as well as encouraging supportive surrounding land uses.

The latter is often accomplished by placing the facility within an area that has activities occurring at various times of the day, and by orienting buildings in a fashion that allows them to look down upon the station-area thereby acting as a form of surveillance.

Safety & security also includes ensuring that patrons and vehicles (including transit vehicles) are suitably separated thereby reducing potential conflict points. These conflict points exist in both the surrounding neighbourhood as well as within the station-area itself (AASHTO, 2004).

Internal Circulation

Internal circulation focuses on the desire to move patrons around the facility as quickly and efficiently as possible while maintaining a satisfactory level of comfort. Much like the sidewalks that link the community to the station, efficient internal circulation is only possible when patrons are given enough space to both move and wait when they need to. This includes intuitively laid out access points, corridors and, if required, stairways. An efficient station design often requires substantially less wayfinding because its layout in fact acts in its place, directly linking users with where they need to be without circuitious routing. Efficient circulation is also linked to the efficient moving of patrons using ticketing or information services.

Finally, patrons waiting on platforms should be provided with ample space as crowding is often highlighted as a significant deterrent of system usage. Allowing alighting passengers to exit a vehicle without significant congestion also requires good platform planning to prevent congestion causing slower vehicle headways (TCRP QoS Manual, 2003).

Amenities

Amenities are the most frequently overlooked component of station design. Although some seating and canopy coverage is usually provided at rapid transit stations, they are often under supplied and poorly designed. Enhanced amenities such as food services or washrooms are frequently seen as ‘desirable yet not essential’ and although it is true that the transit service could function effectively without them, they are the basis for turning a simple space, into a desirable place.

Amenities can be as simple as a vending machine or newspaper box all the way up to a café and shopping services. The services can either be fulfilled by the transit agency itself or by private off-site retailers. Linking back to the idea of good urban form, a transit station can benefit heavily by simply being within easy access to amenities rather than providing the service themselves.

The aim of any good station-area is to be a part of its community, and one that is well integrated stands a better chance of being well used (Gehl, J., 2010; Iseki, H., 2007).
5. SITE OBSERVATION RESULTS

5.1 INTRODUCTION

This chapter details and illustrates the findings collected at the four case study locations using the evaluation criteria presented in Chapter 2 – Research & Analysis Methods. The results will objectively explain why each station feature was awarded its respective ranking out of 4, while detailing through photographs how the features functioned and were positioned within the station area. A summary table of results has been provided in Appendix C for a more concise presentation of the findings. It must be stressed that comparing results across the four stations may not advisable in all situations as different sizes and configurations of stations and transit ways will have different requirements. For a better understanding of the transferability of station features, please see Chapter 6 – Recommended Design Guidelines.

It is also important to again stress that the site observations were carried out in the winter and that re-conducting the station evaluations during the summer may achieve slightly different results. For example, patio seating is available at some stations in the summer but not in the winter. As a result, the evaluation criteria question regarding the comfort and placement of concession seating has been omitted from the following results review.

Finally, this chapter will conclude with a discussion of key observations drawn from the four case study stations. These observations will be carried forward into Chapter 6 and form part of the recommended design guidelines found there-in.
### Chapter 5 - Site Observation Results

#### 5.2 Information

##### 5.2.1 Wayfinding in the Surrounding Community

<table>
<thead>
<tr>
<th><strong>Yamhill Station</strong></th>
<th><strong>Ranking:</strong> 🍁</th>
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<tbody>
<tr>
<td>• Portland uses a comprehensive wayfinding program within its downtown</td>
<td></td>
</tr>
<tr>
<td>• Standardized in appearance and can be found on roughly every other street corner</td>
<td></td>
</tr>
<tr>
<td>• A local area map is provided on the wayfinding</td>
<td></td>
</tr>
<tr>
<td>o Denotes neighbourhood boundaries (using colour coding), local street names, transit corridors &amp; stations, and approximate walking distances from sign</td>
<td></td>
</tr>
<tr>
<td>• Uses branded colours to mark transit lines so those with language or reading impairments can easily recognize nearby stations</td>
<td></td>
</tr>
<tr>
<td>• Provides details such how to find the main information center in various languages</td>
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<tr>
<th><strong>Orenco Station</strong></th>
<th><strong>Ranking:</strong> ☯</th>
</tr>
</thead>
<tbody>
<tr>
<td>• No wayfinding found at surrounding intersections</td>
<td></td>
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<table>
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<tr>
<th><strong>Agate Station</strong></th>
<th><strong>Ranking:</strong> ☯</th>
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<tbody>
<tr>
<td>• Signage placed with broader wayfinding strategy for the University</td>
<td></td>
</tr>
<tr>
<td>• Provides local street position for bearing and marks station location using its branded green EmX logo</td>
<td></td>
</tr>
<tr>
<td>• No station name or other details provided</td>
<td></td>
</tr>
<tr>
<td>• Signs are not consistently placed around campus making it difficult for first time users to locate</td>
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<tr>
<th><strong>Joyce-Collingwood Station</strong></th>
<th><strong>Ranking:</strong> ☯</th>
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<tbody>
<tr>
<td>• No wayfinding found at surrounding intersections</td>
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</tbody>
</table>
5.2.2 Wayfinding within Station-Area

Yamhill Station  
- Station-area is open and plainly laid out making complex wayfinding unnecessary  
- Platform, ticket vending machine, and station-area information kiosk are all within sight of each other making it easy to navigate  
- Platform signage and information kiosk is colour branded in Tri-Met maroon  
- Basic information such as the station name and direction are clearly displayed on the platform sign along with a rail logo, denoting that this is only an LRT station stop  
- Transit vehicles entering this station only travel in an eastbound direction, reducing the need for direction of travel signage

Orenco Station  
- Signage clearly displays direction of travel and since this station only serves one line, there is minimal confusion  
- Direction of travel also linked to local area map to help new patrons understand where they are in relation to surrounding community  
- Signs are large and legible with clear indication of where patrons should be waiting for their respective trains  
- Station is plain and straightforwardly laid out with station info, ticket vending machine and platforms all within viewing distance of each other

Agate Station  
- Station is plainly laid out with legible & readable signs displaying both direction of travel and station name  
- Platform signage and info kiosk use EmX logos making them easy to find  
- Need for wayfinding minimized by grouping all station-area features (i.e. ticket vending machines, and information) together  
- Signs are only in English but legible and readable enough that visually impaired users should not have difficulty with them

Joyce-Collingwood Station  
- Station is complex but uses consistent blue wayfinding to direct patrons  
- Signage is placed at stairways and platform directing users to trains or to bus exchange located at street level  
- Signage is large with directional arrows clearly distinguishing where features are  
- Platform wayfinding provides both direction of travel and list of communities served providing clarity for first time users or those who know minimal English  
- Need for wayfinding minimized by limiting corridors and making the staircase the focus when entering and exiting
### 5.2.3 Payment and System Information

#### Yamhill Station

- Ticket vending machine uses a 3-step process for choosing and purchasing fare with each step of the process colour coordinated using very basic and simple instructions
- Machines offer instructions in Spanish and have a selection for the hearing impaired, which explains the instructions via a speaker
- Platform area includes an information kiosk which provides a system map, anticipated vehicle headways, a more detailed explanation of how to choose the appropriate fare for your trip, and the schedule for all stations on the same line
- Information kiosk also provides contact numbers for Tri-Met along with the station ID number to get more system details if necessary

#### Orenco Station

- Information kiosks and ticket vending machines are standardized across Tri-Met System, See Yamhill Station findings
- Adjacent photos are of information provided at typical information kiosk

#### Agate Station

- Ticket vending machines use 3-stage explanation for purchasing
- Stages are straightforward but machines do not have a detailed display
  - List of details in small hard to read font
- BRT route map is provided but no larger system map is shown at information kiosk
- A high level street map is provided but does not provide detail sufficient to allow a first time system user to navigate local streets
- Additional transit service contact information is provided

#### Joyce-Collingwood Station

- Ticket vending machines provide clear digital display that is colour coordinated with fare zones simplifying the process for new users
- Ticket vending machine provides system map and a list of locations within each zone
- Information provides clear outlay of system & local area maps showing where the station is and what other transit connections are near by
- Use of standardized and recognizable symbols such as question mark for info displays makes locating them easier for visually impaired
- Contact information and station ID numbers are readily available on platform
### 5.2.4 Arrival Time and Waiting Area Information

- **Yamhill Station**
  - Arrival times provided via the information kiosk’s headways and system schedule displays
  - Info kiosk is off to side of station-area, which may cause first time users to miss it
  - No real-time information displays available
    - Other stations in downtown do have real-time information displays and it is likely that Yamhill Station will acquire this technology in the near future
  - No observed inaccuracies in the schedule data
  - Only one platform available and it can only fit one train at a time, which makes locating and boarding your vehicle extremely easy

- **Orenco Station**
  - Arrival times are provided via the information kiosk as is information on anticipated headways
  - No real-time information display available
  - No observed inaccuracies in the schedule data
  - Platforms only accommodate one train per side at a time and provide direction of travel signs
  - Since station only serves one transit line, boarding the proper train is simple once patron knows direction of travel

- **Agate Station**
  - Anticipated arrivals are posted on information kiosk which is positioned directly beside entrance ramp
    - EmX branding and central location makes easy to find for first time users
  - No real-time information provided or details on routes connecting to Green Line
  - Platform sized for one vehicle at a time per side and makes use of direction of travel signage, limiting patron confusion
  - No errors in information found

- **Joyce-Collingwood Station**
  - No headway or expected time of arrival information provided
    - Trains arrive frequently enough at peak periods that this info is likely not needed but at off-peak hours this may be frustrating
  - No real-time information provided
  - Platforms are sized only to allow one train per side at a time and platform uses numerous direction of travel signs reducing confusion
  - No displayed arrival info means no errors
5.3 Access

5.3.1 Pedestrian Connections between Station-area and Community

Yamhill Station

- Station-area is built at street level, grade changes have been kept to a minimum reducing bottlenecks and limitations for the disabled
- City’s downtown is built on a grid-pattern with intersections approximately every 60m making for short and direct walking distances
- Because station was built over a pre-existing street, it is integrated into the existing sidewalk meaning transit users can directly access some adjacent uses without crossing the street

Orenco Station

- Minimal grade change between platform and pathway connection to adjacent housing but less than 3% so very gradual and usable by the mobility impaired
- Three intersections within close proximity to station-area offering numerous access points to station
- Direct pathway connection from platform to adjacent housing development to South and major arterial to East
  - Removes circuitous routing for patrons who live in area
- Although station has numerous connections to surrounding community one side of street directly in front of station does not have a sidewalk

Agate Station

- Minimal grade change from road to platform level approx. 3-4%
- Station is directly connected to a major intersection with pedestrians able to make immediate road crossings in either direction
- Sidewalk network on both sides of station is extensive and mostly direct as it connects to the University of Oregon pathway network

Joyce-Collingwood Station

- A pathway leading to an adjacent development makes use of both stairs and a moderate incline ramp (upward of 12%)
  - Ramp was likely a retrofit as its grade and positioning are awkward
- Entrance is within short walking distance of three intersections with strong linkages to surrounding community
- Local area built in a modified grid pattern (40m x 120m) offering pedestrians many direct routes to station
- Adjacent condo developments have extensive pathway systems linking the unit with primary and secondary street networks, offering shortcuts for local transit users
### 5.3.2 Width of Sidewalks Accessing the Station-Area

<table>
<thead>
<tr>
<th>Station</th>
<th>Ranking</th>
<th>Observations</th>
</tr>
</thead>
</table>
| **Yamhill Station**    | ![Ranking](image) | - As sidewalk and the station-area are directly linked it is difficult to assess what portion would only be considered the ‘stations access’ sidewalk  
- At its widest the two together are 12m on the west side and at its narrowest it is 3m.  
- Even at peak periods, pedestrians could move without causing conflict with others (LOS A)  
- Note: In the summer café tables are placed in this area but its impact on the sidewalk level of service was not considered |
| **Orenco Station**     | ![Ranking](image) | - Platform is linked to 6 sidewalks, each between 2-5m wide  
- Major sidewalk node links parking lot users and foot traffic from central Orenco Station (via NE Orenco Station Pkwy)  
- Diffusion of foot traffic meant that sidewalks rarely looked occupied even during peak periods (LOS A)  
- Only time pedestrians were ever in conflict was at gate leading to adjacent development and where three sidewalks joined (Negligible conflict) |
| **Agate Station**      | ![Ranking](image) | - Crosswalk is well sized at approximately 3-3.5m wide but due to long duration of lights, pedestrian crossing volumes are quite high  
  - A bus load of people must all cross at the same time and conflict with new arrivals significantly reduces Level of Service (LOS C at peak periods)  
- Sidewalks connected to cross-walk are between 1.5 and 2.5m wide which seems narrow for university traffic  
  - Minimal room available for two motorized vehicles to pass each other |
| **Joyce-Collingwood Station** | ![Ranking](image) | - Both the east and west station accesses are surrounded on all sides by sidewalk connections  
- Sidewalk widths vary substantially between 2-5m  
- Widest point found near southwestern bus connection waiting area  
- Despite bus waiting area being rather wide, sidewalk narrows abruptly to 2.5m at station entrance creating a pinch point (LOS C at peak periods)  
- Northwest bus waiting area also has narrow 2.5m sidewalk/waiting area which creates pedestrian conflict at peak periods |
5.3.3 Quality of Pedestrian Features at Adjacent Intersections

**Yamhill Station**
- Streets around station are narrow and two lanes, which are approximately 9m wide (curb to curb)
- Yamhill St. on this block and the block to the west are pedestrian & transit only, reducing the conflict between pedestrians and traffic
- Intersections adjacent to the station (1st Ave. & 2nd Ave.) both posted at 20mph (30 km/h)
  - Intersections do have pedestrian signal lights that cycle in less than 40 seconds but one leg of 1st Ave. does not have crosswalk markings
    - Observation is surprising considering it has a pedestrian signal and is on the same side as the station platform

**Orenco Station**
- NW 231st Ave. is 14.6m wide with two thru-lanes, one turning lane, and two cycling lanes and is the major thoroughfare in the area with a speed limit of 55km/h
- Pedestrian controlled mid-block crosswalk is available with amber flasher upon activation
- Campus Court is the major pedestrian corridor and is 12.3m wide with two traffic lanes and a parking lane
- Main pedestrian corridor, but two legs of intersection are not pedestrian controlled
  - 30km/h speed limit and minimal traffic volume partially mitigate conflict

**Agate Station**
- Although the intersection is 36m across, the median position of the station means that pedestrians are only expected to cross 15.6m in either direction
- Crossing is at-grade and offers pedestrian controlled signalization to activate the crosswalk after the next intersection cycle
- Intersection cycles can take over 2 minutes and although many wait for the change due to heavy traffic volumes, several were seen Jaywalking from the platform
- As it is a major corridor, the speed limit along this stretch of Franklin Blvd. is 55km/h
  - Vehicles moving faster than posted speed possibly because road is constructed like a highway with a median and large building setbacks

**Joyce-Collingwood Station**
- The pedestrian crossing of Joyce St. is 21.3m largely due to the asymmetric design of the intersection
- Pedestrian controlled signalization is available at each corner of the intersection and the wait time between signal cycling is less than 40 seconds
- Local speed limit is 50km/h and vehicles mostly travel at this rate due to numerous intersections and placement of adjacent parking lanes
5.4  SAFETY & SECURITY

5.4.1 Pedestrian Walkway Sightlines

**Yamhill Station**  
Ranking: ★★★★★
- Open layout of station-area means that there are very few visual obstructions that could impair sightlines
- Wideness of the walkways within the station-area and adjacent sidewalks means that pedestrians are not required to walk around blind corners
- Businesses such as Bally Total Fitness have cut the corner of their buildings for their entrances with unintentional benefit of improving sightlines
- Pruning of large deciduous tree maintains appeal of the area without impeding sightlines

**Orenco Station**  
Ranking: ★★★★
- Walkways leading away from station-area are largely free of any form of obstruction to sightlines
- Only exception is north-eastern walkway leading to NW 231st Ave. where sightlines are impaired by cycling lockers, a coniferous tree and a utility building
  - Placement of these features creates a 1.5m high wall for length of path
- Other landscaping features are either tall deciduous trees or low-lying shrubs, both of which offer little opportunity for concealment

**Agate Station**  
Ranking: ★★★★★
- Sightlines are mostly clear along adjacent walkways except a few obstructions between sidewalk and nearby parking lot
- Bike lockers surrounded by 2-3m tall deciduous trees creates an opportunity for some concealment although area is well lit at night
- Sidewalk adjacent to station is bounded by 0.5m bushes and young coniferous trees which are currently well pruned and pulled back from walkway
- Due to the sheer volume of landscaping placed here, if pruning were to stop in the future this area could pose significant safety issues

**Joyce-Collingwood Station**  
Ranking: ★★★★
- Although area adjacent to station is largely free of landscaping or other sightline impediments one section of shrubbery does exist and it poses as a significant opportunity for concealment
- Shrubbery is pruned and trimmed back of sidewalk but its height, thickness and volume could conceal potential threats
- Station uses novel solution of corrugated steel walls to reduce blind corners and threats around buildings
### 5.4.2 Lighting of Sidewalks Approaching Station-Area

<table>
<thead>
<tr>
<th>Station</th>
<th>Ranking</th>
<th>Details</th>
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</table>
| **Yamhill Station**   |         | • Sidewalks leading to station-area are well lit using decorative dual lamp standards  
|                       |         | • Light standards are placed approximately every 20m with 3-4 on every block  
|                       |         | • Light standards sit about 4m off the ground which keeps it significantly lower and therefore better at dispersing light than traditional street lights  
|                       |         | • The flat façade styling of this neighbourhood significantly reduces the number of spaces a person could hide in  
|                       |         | • Only a few trees along the streets approaching the station-area but those that do exist are taller than the light standards and do not obscure them |
| **Orenco Station**    |         | • All pathways leading to the station-area are fully illuminated using single lamp decorative standards  
|                       |         | • Lighting is spaced anywhere from 10-15m apart and range in height from 3-5m in height  
|                       |         | • Although lighting on the walkway leading to the parking lot was sufficient at the time of the evaluation, it is likely that when trees are in bloom that they obstruct some of the lighting  
|                       |         | • Some shrubbery between station and southern development could pose an obstruction as they mature if they are not pruned regularly |
| **Agate Station**     |         | • Sidewalks are well lit mostly due to their proximity to a busy roadway and its light standards  
|                       |         | • Walkways are lit using 1m tall bollard lamps placed every 5m or less  
|                       |         | • All inspected pathways were well lit and did not have any gaps  
|                       |         | • Bollard lamps are effective in adding basic path lighting but they may not cast enough light for passersby to see trouble from a distance  
|                       |         | • Uncertain if extensive foliage will further obscure bollard lamps in summer months causing lighting gaps |
| **Joyce-Collingwood Station** |         | • Lighting is provided along pathways linking to adjacent uses as well as along the sidewalks leading to the station entrances  
|                       |         | • Lighting often placed adjacent to concrete station supports meaning that gaps in coverage would occur within its shadow  
|                       |         | • Noted that under station structure on Joyce St. lighting seemed very spaced out potentially leading to lighting gaps (2 lights observed)  
|                       |         | • Landscaping poses other challenges but it is low enough to not interfere with lighting  
|                       |         | • Ambient indoor lighting passing through grate walls assists in lighting pathways |
### 5.4.3 Station-Area Lighting

<table>
<thead>
<tr>
<th>Station</th>
<th>Ranking</th>
<th>Details</th>
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</table>
| **Yamhill Station**      | ![Ranking](image) | - Station-area lighting relies heavily on the ambient light provided by the strings mounted to surrounding trees  
- With the addition of the dual lamp light standards, the station-area is very well lit with few dark spaces  
- Platform itself also makes use of high intensity bulbs mounted under the canopy to ensure sufficient lighting for waiting patrons  
- Since a large amount of the lighting is mounted directly to the tree trunks, the foliage itself is located well above and therefore does not impede coverage  
- No other form of shrubbery exists within the area to create blind spots |
| **Orenco Station**       | ![Ranking](image) | - Station-area is extensively lit via post lighting with no observed gaps  
- High intensity bulbs are used under the canopy, which is important since post lamps are taller than roof and it is not transparent  
- As platform uses translucent weather barriers it is important to have lighting on both sides of canopy  
- Landscaping is either far enough from station platform or too short to obscure station lighting  
- Lighting is so significant and close to adjacent developments that there could be too much entering their units (Light standards do not direct their spread) |
| **Agate Station**        | ![Ranking](image) | - Station platform and surrounding area is extensively lit by roadway light standards, car lights and ambient station lighting  
- Ambient lighting is effective because it is high intensity but reflects off a bright coloured ceiling onto station-area making it less harsh  
  - Lighting was likely done this way to make it less distressing to oncoming motorists  
- No perceived gaps in lighting found and landscaping is pushed back far enough from station platform that is does not obscure lighting |
| **Joyce-Collingwood Station** | ![Ranking](image) | - Station-area is well lit with platform and lower concourses using either high intensity bulbs or rows of fluorescent lighting  
- Interior lighting is extensive enough that it also provides ambient lighting for the surrounding sidewalks through the perforated walls  
- Due to stations compact layout and prevalence of lighting, there are no gaps or features to cause shadowing |
### 5.4.4 Lighting at Adjacent Intersections

<table>
<thead>
<tr>
<th>Location</th>
<th>Ranking:</th>
<th>Description</th>
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</thead>
</table>
| **Yamhill Station**     |          | - Dual lamp light standards are located at each corner of the intersection casting light evenly over both the crosswalks and the intersection itself  
|                         |          | - One leg of the intersection does not have a demarcated crosswalk  
|                         |          | - The crosswalks that do exist use reflective thermoplastic material to make them more visible to oncoming traffic but the reflectivity has faded and is not very effective  
|                         |          | - Pedestrian signals are placed at each intersection and offer a count-down light to know when the signal is about to switch  |
| **Orenco Station**      |          | - Intersections are satisfactorily lit in the sense that there are no gaps but the lighting provided is rather dim and supplied by small post lamps  
|                         |          | - The pedestrian crossings that do exists do not use thermoplastic reflective demarcation  
|                         |          | - Mid-block crossing of NW 231st Ave. uses an amber flasher and reflective signage but does not have any lights directly above it  
|                         |          | - Closest lights are 20m+ away and only barely illuminate road markings  |
| **Agate Station**       |          | - Intersection is very well lit as it is along a major corridor  
|                         |          | - All sides of the intersection are lit with high intensity lighting that fully covers all areas of the right of way  
|                         |          | - Same lighting benefits the crosswalk which is also very well lit  
|                         |          | - Crosswalk has pedestrian signal and demarcation but does not use thermoplastic high visibility markings  
|                         |          | - Not needed at this location as area is extremely well lit and signalized  |
| **Joyce-Collingwood Station** |          | - Lack of night photographs makes assessing this intersection difficult  
|                         |          | - Intersection does have light standards at each corner and it is likely that ambient light emitted from surrounding land uses and station makes this area well lit  
|                         |          | - Crosswalks do have pedestrian activated signals and thermoplastic demarcated crossings which would be highly visible at night  |
5.4.5 Use of Defensible Features around Station-Area

<table>
<thead>
<tr>
<th>Station</th>
<th>Ranking</th>
<th>Features</th>
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</thead>
</table>
| Yamhill Station       |         | • Both sides of station-area along adjacent intersections are defined by steel bollards  
|                       |         | • The bollards stand approximately 1m tall and are spaced a meter apart     
|                       |         | • Totally segregate the station-area from the existing roadway (excluding the space left for approaching LRT)  
|                       |         | • Bollard spacing and diameter ensure that pedestrians can freely flow between them while still maintaining a formal vehicle barrier  
|                       |         | • Placement distant enough that if an errant vehicle were to strike and partially pass through them, it is very unlikely the vehicle would reach any pedestrians  
| Orenco Station        |         | • North side of station facing toward access road and parking lot is defined by a 0.3m tall stone wall  
|                       |         | • Wall almost fully traces along sidewalk and gardens immediately between station and access road forming visual and physical barrier between the two  
|                       |         | • Access through the wall is still ample and wide enough as to not impede pedestrians while not being so tall as to impact sightlines or seem overwhelming  
|                       |         | • Wall sits approximately 20m from platform ensuring that errant vehicles would likely never reach it  
| Agate Station         |         | • Station is separated from roadway by a non-mountable curb median  
|                       |         | • Median is really intended it restrict this right-of-way to BRT vehicles only but also to reduce pedestrian and vehicle conflicts  
|                       |         | • Curbing is a physical barrier but not substantial enough to stop an errant vehicle from crossing it  
|                       |         | • Adjacent to pedestrian crossing area is a raised curb planter that also acts as a vehicle barrier  
|                       |         | o Has steel bollard and sign post that would help slow a vehicle but would not stop it (Functions more as a visual barrier than physical one)  
| Joyce-Collingwood Station |     | • Since the platform is above street level, the need for a defensible space is reduced  
|                       |         | • Street level is not defined by short walls or bollards but by concrete station supports and perforated metal walls which do allow patrons to see in and out  
|                       |         | • Due to compact nature of station, glass or perforated walls are viable alternative to defensible street features  
|                       |         | • Unlikely that bollards could be successfully installed here due to narrow sidewalks  
|                       |         | • Though not focus report, bus bay waiting areas could still benefit from increased vehicle separation as it has wider sidewalks and directly adjacent to a busy street  

### 5.4.6 Presence of a Public Emergency Phone

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<tr>
<th>Station</th>
<th>Ranking</th>
<th>Details</th>
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</table>
| **Yamhill Station**      |         | - No public phone is available within the station-area; however, a convenience store is directly adjacent to the facility and is open until mid-night with a desk phone available  
- This phone is not technically publicly available because it is located within a business, but the shop owner does allow patrons to use the phone for emergency calls |
| **Orenco Station**       |         | - Public pay telephone available on platform by entrance  
- Although telephone is in a well lit and clearly visible area, it is rather unassuming in appearance  
- No signage or emergency lighting emphasizes its presence |
| **Agate Station**        |         | - Closest publicly accessible phone is 150m+ away  
- Other school buildings and businesses are available closer but their hours of operation may leave periods when phones are not accessible |
| **Joyce-Collingwood Station** |         | - An emergency phone is available on the platform along with a fire extinguisher and other emergency supplies  
- Emergency cabinet is clearly marked and provides additional information if an event were to occur  
- Ground floor also provides a pay phone and information phone that dials Translink directly |
### 5.4.7 Activities in Surrounding Land Uses

<table>
<thead>
<tr>
<th>Station</th>
<th>Ranking:</th>
<th>Description</th>
</tr>
</thead>
</table>
| **Yamhill Station**          |          | - Station-area is surrounded by predominantly residential above retail  
- Retail at ground floor is mostly offices although a gym and convenience store are also present  
- A café is present at the south west corner of Yamhill St. & 2<sup>nd</sup> Ave. and puts out patio chairs in the summer  
- Although both 1<sup>st</sup> Ave. & 2<sup>nd</sup> Ave. are main streets within the downtown, they are usually very quiet after business hours  
  - This is offset by the convenience store and pedestrians heading to and from the bars |
| **Orenco Station**           |          | - Station is surrounded almost exclusively by residential developments  
- Although NW 231<sup>st</sup> Ave. is within 50m, it is still too far and obscured by large trees and housing to be able to see events occurring on the platform  
- Western neighbour is a commercial warehouse property but it is shielded by trees and is 200m from the platform area |
| **Agate Station**            |          | - Station is bounded on both sides by Franklin Blvd. a major corridor with moderate to high traffic volumes  
- South of the station is the John Jaqua Center a university building with student office space that would likely see foot traffic at all hours of the day  
- North of station are retail stores and a hotel, both of which would see business late into the evening hours  
- Although students do live on campus, currently no residences or other residential buildings are within sight of the station |
| **Joyce-Collingwood Station**|          | - Station is located above two busy roads (Joyce St. & Vanness Ave.)  
- Vanness Ave. has a bus layover and waiting area that is in operation the same hours as the Skytrain station  
- North and south of station are several condominium towers with businesses at the ground floor  
- Several cafes and bars are also located around the intersection |
### 5.4.8 Configuration of Surrounding Land Uses

<table>
<thead>
<tr>
<th>Station</th>
<th>Ranking</th>
<th>Features and Observations</th>
</tr>
</thead>
</table>
| **Yamhill Station**      | ![Yamhill Station] | - Surrounding land uses front directly onto the station-area and therefore a great deal of their windows are oriented in its direction  
- There are no front setbacks to these properties; however the placement of the patio area does partially act as one  
  - Patio area is located directly west of the station area during the summer  
- The surrounding buildings are between 2-4 storeys would certainly be able to both see and hear calls for help if they were to occur |
| **Orenco Station**       | ![Orenco Station] | - Neighbouring developments have the rear of their units facing the platform area, which includes balconies and lighted & windowed stair wells  
- Buildings are 3 storeys tall and although shrubs block platform view on the ground floor, floors 2 & 3 having direct views of the platform  
- Buildings parking lot is beside tracks and has fully unobstructed view of platform  
- Buildings are less than 20m from the station so it is likely that if calls for help were made, they would be heard  
- Uncertain if windows are sound resistant to mitigate train noise so there is potential that calls for help may not be heard if this is the case |
| **Agate Station**        | ![Agate Station] | - University buildings south of station are 3-4 storeys tall and have windows oriented to the street  
- Windows do not open and are shrouded by metal curtains obscuring outside views  
- Entrance is on other side of the building and also considering the distance and traffic noise, it is unlikely calls for help would be heard  
- North of station is a hotel with units oriented perpendicular to the street  
- Units set well back from the street to allow for parking lot in between  
- Drivers are only likely component of area to see or hear calls for help |
| **Joyce-Collingwood Station** | ![Joyce-Collingwood Station] | - Neighbouring buildings are oriented toward the station area and range from 1-20 storeys in height  
- Due to the cage like construction of the platform area, it is very unlikely that someone would see or hear distress calls from the surrounding area  
- Platform mitigates isolation by having a CCTV system in place  
- Station-area around entrance is much closer to adjacent uses and due to perforated walls, it is more likely calls for help would be heard  
- Café across the street has a patio area that is in direct sight of the station entrance |
5.5 INTERNAL CIRCULATION

5.5.1 Pedestrian and Transit Vehicle Separation

<table>
<thead>
<tr>
<th>Location</th>
<th>Ranking</th>
<th>Details</th>
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</thead>
</table>
| Yamhill Station | ⬤       | - As station is an extension of the existing sidewalk network, patrons are not required to cross the transit way to exit the station
- To head south patrons must cross tracks but do not do so at the station but rather at the pedestrian signalized intersections to the east or west
- Placing cross movements here reduces conflict between vehicle and pedestrians |
| Orenco Station | ⬤       | - Station placement between two transit ways requires pedestrians to cross the tracks to reach the platform
- Transit vehicles are given priority over patrons who are expected to wait behind clearly demarcated line until the vehicle has passed
- Crossings are clearly marked and do instruct patrons that they must stop for trains
- Crossings are the level pathways leading from platform and to the south side are the only means of leaving the station, greatly enhancing crossing control
  - Jaywalking is made highly undesirable using this approach |
| Agate Station  | ⬤       | - Stations configuration does require that patrons cross the transit way but the crossing does offer pedestrian priority signalization
- Transit vehicles cannot leave or enter the station while pedestrians are crossing the transit way and intersection, which reduces potential conflicts
- Pedestrians do still contend with other vehicles turning, which poses issues |
| Joyce-Collingwood Station | ⬤     | - Station platform is elevated with transit ways on both sides, which requires platform to be accessed by stairway
- Full segregation of pedestrian and transit vehicles with no chance of conflict due to crossing |
### 5.5.2 Stairway Level of Service

<table>
<thead>
<tr>
<th>Station</th>
<th>Ranking: N/A</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Yamhill Station</strong></td>
<td></td>
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<tr>
<td>• No stairs at facility</td>
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<tr>
<td><strong>Orenco Station</strong></td>
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<tr>
<td>• No stairs at facility</td>
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<tr>
<td><strong>Agate Station</strong></td>
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<td></td>
</tr>
<tr>
<td><strong>Joyce-Collingwood Station</strong></td>
<td></td>
</tr>
</tbody>
</table>
| • Station has two flights of stairs and one escalator
  • One flight and escalator serves west side of Joyce St. and one flight serves east side
  • Western stairs are approx. 1.75m wide and have no landing, escalator is approx. 1.25m wide, eastern stairs are approx. 2m wide and have a landing
  • Two flight system on west side is supposed to support one set for up (escalator) and one for down but patrons use both for up which causes crowding
  • Western stairs just wide enough for one person going up and one down
  • Eastern stairs see substantially less traffic since bus terminal is on other side so congestion was minimal |
### 5.5.3 Corridors Sufficiently sized for Pedestrian Traffic

<table>
<thead>
<tr>
<th>Station</th>
<th>Ranking</th>
<th>Details</th>
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</table>
| **Yamhill Station** | ![Ranking](image) | - Corridor in this instance is sidewalk width between store fronts and rear edge of canopy, which is 6.5m  
- Trees, bicycle lockups, and other street furniture reduce corridor capacity but only marginally  
- Patrons can still flow freely onto the platform area without conflicting with other station or sidewalk users |
| **Orenco Station** | ![Ranking](image) | - Two corridors are linked to the platform, an eastern corridor linked to NW 231st Ave. and a western corridor to the adjacent development and the parking lot  
- Both are 6m wide minus 1m of light standards and info kiosk = 5m functional width  
- Each corridor splits into two 4.5m transit way crossings  
- Major pedestrian flow is to parking lot but even at peak period conflicts and crowding did not occur |
| **Agate Station** | ![Ranking](image) | - Single corridor is approx. 4m wide and connects platform to crosswalk  
- Although corridor is sufficiently wide to handle average flow of patrons, backlog occurs as a result of long pedestrian signal cycle  
- Backlog volumes are not significant enough to cause congestion but if a large enough flow were to occur patrons could begin consuming platform space or start jaywalking more frequently to avoid waiting for crowd to clear |
| **Joyce-Collingwood Station** | ![Ranking](image) | - Corridor width is approximately 7m but subtracting escalator and other features produces two 2.5m corridors  
- Observation during peak period is that space restriction caused by placement of waste bins and ATM machine as well as patrons travelling in opposite direction from stairway causes noticeable conflicts  
- During off-peak period this problem does not exist |
### 5.5.4 Rapid and Convenient Fare Collection Facilities

<table>
<thead>
<tr>
<th>Station</th>
<th>Ranking:</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Yamhill Station</strong></td>
<td><img src="image1.png" alt="Image" /></td>
</tr>
<tr>
<td>- Two ticket vending machines available on station platform</td>
<td></td>
</tr>
<tr>
<td>- No on-vehicle purchasing permitted</td>
<td></td>
</tr>
<tr>
<td>- Machines face away from platform preventing any queues from stacking where patrons are boarding</td>
<td></td>
</tr>
<tr>
<td>- Ticket purchase times are reduced by clearly laid out purchasing stages and the placement of a system map for quick reference</td>
<td></td>
</tr>
<tr>
<td>- Only approx. 25% of patrons used ticket machine likely since multi-ride passes are also available</td>
<td></td>
</tr>
<tr>
<td><strong>Orenco Station</strong></td>
<td><img src="image2.png" alt="Image" /></td>
</tr>
<tr>
<td>- Two ticket vending machines are available on station platform near entrances</td>
<td></td>
</tr>
<tr>
<td>- Ticket machines both placed facing a brick pillar making it awkward to queue or access for those with disabilities</td>
<td></td>
</tr>
<tr>
<td>- Placement does allow access from both platform sides and for back to be used for information display but does obscure it from view when first entering the station area</td>
<td></td>
</tr>
<tr>
<td>- Queuing was never long enough to note any real issues with awkward placement</td>
<td></td>
</tr>
<tr>
<td>- Like Yamhill Station, the machine efficiently processes selection and purchasing</td>
<td></td>
</tr>
<tr>
<td><strong>Agate Station</strong></td>
<td><img src="image3.png" alt="Image" /></td>
</tr>
<tr>
<td>- One ticket vending machine is provided on station platform</td>
<td></td>
</tr>
<tr>
<td>- Machine faces parallel to running-way and is located adjacent to the platform entrance</td>
<td></td>
</tr>
<tr>
<td>- Although station sees moderate use due to proximity to University, only one machine is necessary as students use the system for free (paid through student fees) reducing vending machine users</td>
<td></td>
</tr>
<tr>
<td>- Machine provides suitable amount of space for queuing although awkward and dense information display leads to slower purchasing</td>
<td></td>
</tr>
<tr>
<td><strong>Joyce-Collingwood Station</strong></td>
<td><img src="image4.png" alt="Image" /></td>
</tr>
<tr>
<td>- Four ticket vending machines are available at this station, two on the west side and two on the east side</td>
<td></td>
</tr>
<tr>
<td>- Units are located directly by the entrances making them visible and easy to access</td>
<td></td>
</tr>
<tr>
<td>- All are also positioned very closely to the stairways, which could pose a queuing problem at peak times but none were observed during this study</td>
<td></td>
</tr>
<tr>
<td>- Eastern vending machines are set back about 2m from stairs which is likely sufficient to allow passersby to use the stairs while patrons queue for tickets</td>
<td></td>
</tr>
<tr>
<td>- Western machines also may contend with foot traffic from rear staircase</td>
<td></td>
</tr>
</tbody>
</table>
5.5.5 Platform Area Sizing

### Yamhill Station
- Station platform dimensions are 50m long x 3-9m wide (excluding sidewalk width)
- No more than 20 patrons were observed waiting for a train during peak time
- Result is that even with removing additional platform capacity by subtracting station furniture and trees, users had far more than the LOS A 1.2m sq. of personal space requirement
- Crowding is avoided by having 8 available doors for passenger loading and unloading
- A double length train is exactly the length of the platform

### Orenco Station
- Platform dimensions are 55m long x 6.5m wide
- Although platform can serve two trains at the same, scheduling reduces likelihood of occurring so platform demand is usually just for one side at a time
- Adjacent to canopied area platform narrows to 2.5m, and could cause conflict if two strollers or motorized vehicles were to pass each other
- Similar to Yamhill Station, trains use 8 door loading which significantly reduces platform crowding
- Passenger volumes at peak periods showed no signs of significant crowding

### Agate Station
- Platform dimensions are 20m long by 5.5m wide
- Platform serves buses headed in both directions but because transit way is mostly single lane beyond station-area it only serves one bus at a time
- Passengers most often queued at the front door as closest to intersection crossing but the bus does provide dual door loading
- Platform is not very large once station furniture is added but short headways and use of full platform for each bus means that only minor crowding occurred

### Joyce-Collingwood Station
- Platform dimensions are approx. 70m long x 6.5m wide
- Train observed had 3 cars offering 6 door loading to distribute boarding and alighting
- Three stairwells (including up escalator) access the track at equal distances along the track further aiding patron dispersion
- Trains do arrive at the same time reducing platform availability
- As buses board on western side of station, there was a higher proportion of patrons waiting on that side of the platform which did cause congestion at peak times
## 5.6 Amenities

### 5.6.1 Adverse Weather Protection on Platform

<table>
<thead>
<tr>
<th>Station</th>
<th>Ranking</th>
<th>Details</th>
</tr>
</thead>
</table>
| **Yamhill Station**      | ![Ranking](image) | - Station provides a 3m x 15m rain canopy but the sides are completely exposed to the weather  
- Snow is uncommon in Portland but wind funneling through buildings is common and the station offers little protection  
- Canopy is large enough to accommodate patrons but it is only long enough to be in front of half the train  
- This will make patrons only crowd the first two cars rather than walking through rain to access the two rear cars |
| **Orenco Station**       | ![Ranking](image) | - Station offers a canopy measuring 3.5m wide x 18m long  
- Canopy has three-sided wind shelter with semi-translucent frosted glass windows  
- Canopy is large enough to shelter all station patrons but it only covers a third of the platform which does cause crowding  
- Benches and canopy support pillars limit amount of space available of standing patrons |
| **Agate Station**        | ![Ranking](image) | - Platform has three canopies that overlap each other to act as a single unit  
- Dimensions are 15m long x 3.5m wide  
- Platform does not have any form of wind screening or other adverse weather protection  
- Canopy is sufficiently large to cover all patrons but unique architectural styling actually exposes patrons to more wind and rain than a traditional peaked roof because it fans upward |
| **Joyce-Collingwood Station** | ![Ranking](image) | - Platform is entirely covered by canopied roof with perforated walls similar to those at the ground floor of the station  
- Except for the gap above the running-way and the ends of the platform, pedestrians are removed from outdoor exposure  
- Platform had several space heaters mounted to the ceiling although it is uncertain how often they are in operation (if at all)  
- Although a breeze can be felt through the walls and other openings, it is very minor and waiting for the next train is relatively comfortable |
### 5.6.2 Quality and Placement of Platform Seating

<table>
<thead>
<tr>
<th>Station</th>
<th>Ranking</th>
<th>Seating Details</th>
</tr>
</thead>
</table>
| **Yamhill Station**      | 🏆      | - Station platform does not have any permanent seating available  
- Movable patio chairs are available during the summer but they are intended for business customers  
- Platform offers four leaning rails that are affixed to the canopy support pillars  
- Rails are used by patrons but they are too high to partially sit on and have no top so they cannot be used as tables  
  - May be intentional so garbage does not collect |
| **Orenco Station**       | 🏅      | - Platform offers two benches which are protected by the canopy and three walls  
- Seating is comfortable & attractive and made with treated wood slats which keeps it from becoming cold or pooling water  
- Only one bench is available per side of platform which is not enough for the number patrons seen waiting  
- Although seating was always available it appeared that once one person sat on the bench, others were unwilling to share leading to unused supply |
| **Agate Station**        | 🏅      | - Station offers two benches located under the platform canopy  
- Benches are comfortable to sit on and do not pool water because of their slatted steel design  
- From the look of their design, the benches are meant to seat four people (two per side) but they are too narrow to accomplish this and lead to two people max  
- More seating is desired as what was available was often used  
- Like Yamhill Station, Agate offers three leaning rails for standing patrons, which were also moderately used |
| **Joyce-Collingwood Station** | 🏅   | - Station offers eight (four per side) covered seats that are mounted to the hand railings in front of the platform information displays  
- Seats were well used and very under supplied  
- Rain and snow cannot reach the seats which makes pooling not an issue  
- Seating itself is not particularly comfortable although having a back rest is appreciated |
### 5.6.3 Washroom Availability at Station

**Yamhill Station**
- Public washrooms are not available at the station nor in the nearby community.
- Washrooms may be used at the adjacent convenience store or café just south west of the station platform.
- Bathrooms are generally reserved for customers but the convenience store does not ask.

**Orenco Station**
- No washroom available at station or within short walking distance of platform.

**Agate Station**
- No washroom available at station.
- Washrooms are available in student buildings but it is unlikely that they support non-students entering these facilities.
- A fast food diner is on the north west corner of the intersection, which also provides bathrooms but they are intended for customers only although no one asks.

**Joyce-Collingwood Station**
- No public washrooms available at station.
- Businesses across the road do allow the public to use their washrooms as does the CNIB office just north of the station.
5.6.4 Waste Receptacles at Station

**Yamhill Station**
- Two waste bins are available on station platform, one on each side of the platform
- Trash only, no recycling available
- Waste bins can be found on most street corners in the downtown

**Orenco Station**
- Two waste bins found on platform, one on each side
- Trash only, no recycling available
- No waste bins found anywhere else on station property or at any nearby intersections

**Agate Station**
- Two waste bins provided on platform near seating
- Trash only, no recycling
- No waste bins seen along Franklin Blvd. but campus usually has one near every intersection or building entrance

**Joyce-Collingwood Station**
- At least eight waste bins can be found within the station area (excluding recycling bins)
- Several other trash only bins can be found within the bus waiting area and surrounding intersections
- Platform and corridors also have paper receptacles mainly targeting newspapers
### 5.6.5 Presence of Station-Area Concessions

<table>
<thead>
<tr>
<th>Station</th>
<th>Ranking</th>
<th>Description</th>
</tr>
</thead>
</table>
| **Yamhill Station**       |         | - Concessions are not located directly on station property but do directly front onto the platform  
                          |         | - Beyond the convenience store, a bar & grill and a bakery are within meters of the platform  
                          |         | - Both have summer patio seating and offer breakfast plates, coffee, and other quick items  
                          |         | - The convenience store offers newspapers/magazines, and assorted beverages and snacks  |
| **Orenco Station**        |         | - Only newspaper dispensers are available within the station-area  
                          |         | - A range of food and convenience stores are available about a block north of the station at NE Cornell Road, but they are too far away to be of much value to patrons  |
| **Agate Station**         |         | - No concessions available within immediate station-area  |
| **Joyce-Collingwood Station** |         | - The community immediately adjacent to the station has several Asian and North American cafes and restaurants in addition to a convenience store and Asian grocer  
                          |         | - The station is not physically connected to these uses and due to it being elevated it can seem somewhat removed from them  
                          |         | - It is uncertain how many station patrons actually make use of these food vendors and other concessions  
                          |         | - The station itself has several newspaper dispensers, pop machines, and an ATM  
                          |         | - Presence of a dozen or more newspaper bins is a bit of an eyesore  |
5.7 Discussion of Results

This section will briefly discuss the results of the case study site observations. It will highlight successful pedestrian strategies that can be carried forward to Chapter 6 - Recommended Design Guidelines, in addition to establishing weak areas where more research into the literature will be required to make further recommendations.

5.7.1 Information Features Observations

Wayfinding information in the surrounding station areas for the most part was not well established. As no station made use of directional marker signs to assist users in finding the facility, more research will be required into their implementation. Portland’s comprehensive information display strategy is a strong example of a slightly more elaborate system that BC Transit and CRD municipalities could implement. The strategy provides clear and concise messaging regarding not only adjacent transit facilities, but other services provided in the neighbouring community. Guideline recommendations should focus on how messaging should be displayed (i.e. via text or symbology) as well as where it should be placed within the surrounding community.

Station-area wayfinding planning was observed to be well done with a strong use of colour branding and symbology to simplify messaging. Recommendations should focus on ensuring that signage is placed at key decision points and that the messaging is kept as brief as possible. More research may be needed into the use of standardized symbology and establishing a hierarchy of relevant messaging.

Although all stations had adequate payment information, Tri-Met provided the most clearly laid out and intuitive design. Focus for payment information strategies should be on maintaining a simple layout and ensuring that any pertinent information such as a zoning map is readily available for unfamiliar users. Static passenger information displays were available at each of the stations but Tri-Met and TransLink strategies were the most useful. Both systems provided information displays that were colour branded and easy to find with an abundance of information. Tri-Met’s kiosk style information display may be more desirable in an outdoor street-oriented station design, which may make it attractive recommendation for BC Transit. No station provided real-time information and therefore more research into this topic will be needed.

5.7.2 Access Observations

All stations were observed to have strong connections with the surrounding communities. Important elements to include in a recommended guideline is maintaining direct connections to surrounding land uses and ensuring pathways are sufficiently wide to support the intended volume of pedestrians. Orenco Station provides a good example of strong suburban connections to adjacent uses and the City of Portland appears to maintain a liberal standard of sidewalk widths that should be researched.

The quality of pedestrian facilities at adjacent intersections varied but generally observations support maintaining highly visible crossings with pedestrian priority lighting. Another common trait amongst more pedestrian friendly station-areas was a low speed limit and a greater focus on reducing the interaction between vehicles and patrons (i.e. short crosswalks or use of refuge medians). More research should be done on guidelines that will not require conflicts with TAC geometric standards as it is unlikely BC Transit would be interested in pursuing changes through BC MoT.

5.7.3 Safety & Security Observations

Station landscaping and its impact on sightlines were highly variable at the observed facilities. Stations such as Orenco & Yamhill effectively placed landscaping to accentuate the station-area without generating hiding areas. Bushes were kept below 0.5m and taller trees were well pruned so not to impact lighting. Joyce-Collingwood offered a contrary
result with the placement of a large shrub patch that due to its density and configuration created a substantial safety risk. This type of landscaping should be avoided in future recommendations.

Lighting of the area surrounding stations was mostly successfully done. Yamhill Station made creative use of accent lighting in conjunction with luminaires mounted on short poles, however, light spill over was prevalent and recommendations should seek to minimize this. All stations did a good job of lighting the platform area and each emphasized the need to ensure full waiting area coverage with special focus on benches, ticket vending machines, and information displays. Agate Station lit its platform well but it will be important to keep the angle of the canopy in mind as there may be potential with unique designs for lighting to dangerously shine into drivers’ eyes. Intersection lighting was not as well done as anticipated as some areas suffered from gaps in lighting or worn out thermoplastic markings. Any recommendations should insist upon the installation of pedestrian activated flashers where needed and the maintenance of crossing facilities.

Tri-Met stations best exemplified the implementation of defensible space with the use of bollards and low profile stone walls. These features maintained good pedestrian permeability while still separating vehicle and pedestrian movements.

Emergency telephones were only well implemented at Joyce-Collingwood station with the others relying on surrounding land uses or providing pay phones. Guideline recommendations should insist upon installation of emergency assistance devices in well lit areas. More research will be required to understand available technologies and their implementation.

Situating the station within security supportive land uses saw mixed results. Orenco Station had adjacent developments that were well oriented to the station but only consisted of residential uses, meaning surveillance was not occurring at all times of the day. Agate Station also was poorly oriented to the uses around it. BC Transit recommendations should highlight the successes of Yamhill Station by focusing on a mix of uses that are in close proximity of the station.

### 5.7.4 Internal Circulation Observations

Three of the four stations suitably separated vehicle and pedestrian movements. Agate Station unfortunately forced pedestrians to cross an intersection regardless of direction of travel, but it provided pedestrian signalization to reduce conflicts. Joyce-Collingwood fully removed pedestrian crossings by having grade separated access to the street. Recommendations should focus on good channelization, adequate warnings for crossing tracks when necessary, and eliminating jaywalking opportunities.

Only Joyce-Collingwood had stairways and they were observed to be undersized at peak period. Further research into proper stairway sizing will be required for making guideline recommendations.

Tri-Mets TVM units were the best at ensuring fast processing times. Their units as well as TransLinks were well located out of pedestrian corridors and provided clear displays to allow unfamiliar users to make quick decisions. Orenco Station does however point out the necessity of ensuring TVM queuing space is not obstructed by station features.

No stations had concession seating and therefore further research into this subject is necessary to provide recommendations.

All station platforms were sufficiently sized to handle their intended demand. Recommendations should focus on ensuring that adequate consideration is given to providing space for waiting, exiting/entering platform, and for station features such as furniture which may limit capacity.
5.7.5 Amenity Observations

The quality of pedestrian waiting areas were mixed, as all had canopy covers but only half provided windscreens or other enclosures. Agate Station should be used as an example of ensuring that canopies are not designed in a fashion that permits rain or snow to cover the platform. Additionally, canopy sizing in relation to platform sizing should be discussed as only a small portion of Yamhill’s waiting area is protected. Further advice should focus on maintaining sightlines from within enclosures and ensuring important features such as seating and TVMs are adequately protected.

Seating quality was only moderately well done. Often seating was under supplied or was not designed to support full occupation (i.e. too narrow to sit back to back). Yamhill and Agate station used leaning rails, which is a novel use of left over space that should be further investigated. Additionally, more research into proper seating design to ensure full occupation should be conducted.

Washrooms were only available at adjacent establishments. Further research should analyze the value of investing in station specific washrooms or maintaining a policy of having patrons use private facilities.

Waste receptacles were provided at each station but recycling was noticeably absent. Advice for guideline recommendations should include a discussion about supporting local recycling initiatives and understanding the specific waste needs of users.

Concession services within stations usually consisted of newspaper or pop machines. Yamhill station did not have any on-site concessions but was located adjacent to a convenience store. None of these stations had seating for concessions although Yamhill is located within close proximity to patio seating for adjacent restaurants in the summer. More research should be conducted into other types of concessions that could be provided at or adjacent to a station, as well as providing some discussion on the proper placement of accompanying seating.
6. RECOMMENDED DESIGN GUIDELINES

6.1 INFORMATION

Please see Appendix D.1 for general background information on basic wayfinding concepts. Though no recommendations are provided in Appendix D.1, they are the concepts that form the backbone of information recommendations within this chapter.

6.1.1 Guide to Wayfinding in the Surrounding Community

Pedestrian wayfinding often consists of two strategies, either comprehensive information displays or basic directional markers, although both can and do work in conjunction.

Comprehensive Information Displays

The basic premise behind comprehensive information displays (CID) like those used by the City of Portland is that they graphically represent the surrounding area in a manner that lets a user cognitively map out their chosen routing.

Based on the Portland’s CIDs and other international examples, the following information could be displayed (Grant, 2007):

- A map with labelled streets
- A ‘You Are Here’ marker
- Radial rings marking approximate walking distances from the display
- Major transit corridors & station locations
- Major landmarks
- Public facilities (e.g. washrooms, parking lots, libraries)
- Neighbourhood boundaries
- Contact details for additional information

Displays need not contain all this information, but there should be enough for unfamiliar users to make decisions (See Figure 15).

Figure 15 - Map Detail with Walking Distance and Local Features (Bendigo, AU)
Figure 16 - Area Map Including Local Historical Landmarks (Bristol, UK)
Figure 17 - Display with Directional Arrows and Neighbourhoods (Portland, OR)
Figure 18 - Concept with Distinctive Branding (Bendigo, AU)
It is recommended that the mapping only provide information within a 15 minute walk otherwise it loses too much detail.

Portland’s CIDs provide further written information below the display regarding names of transit stations & lines, and assorted landmarks, which can reduce the amount of clutter on the map itself (See Figure 16). In general, text should remain readable for users at a distance of approximately 1.5 to 2.0m and be kept to a bare minimum. Whenever possible graphical representations such as the standard washroom sign or the branded BC Transit logos should be used.

Graphic representations do not require as many words to convey a point and are more user friendly to non-English speaking users. Graphical representations also tell the user what symbol they should be looking out for if more wayfinding is necessary along their route.

Portland’s information displays seen in Figure 17 were a joint project between Portland Office of Transportation and the Portland Development Commission and placed in the downtown area where street networks are complex and landmarks are easily identifiable. BC Transit will need to consider a similar partnership with local municipalities to establish a detailed wayfinding strategy once station locations have been determined.

Often directional markers will be grouped together using a similar design scheme as part of a much broader downtown wayfinding program, but unique symbology can still be included to clarify services.

These signs should be kept as simple as possible while still accurately conveying what service they are linked to and the direction of travel. Much like CIDs, minimizing text through the use of standardized symbols or branding is imperative. This branding & symbology should match with what is provided on the CID. In the case of BC Transit’s rapid transit service, a branded service logo should be developed for easy identification. Text such as a station name or distance is acceptable but they must be legible and readable from a distance of at least 5 - 10m.

BC Transit will need to work with BC MoT and municipal engineering departments to safely place directional markers near vehicle intersections as these are the most common decision points. BC Transit should also consider locations such as at the exits of malls (I.e. Mayfair Mall and Uptown) or other shopping centers, and at the

**Directional Markers**

Directional markers are simple signs used to direct a user to their next decision point. They often act in a support role for CIDs when changes in direction are required along the route or in the case of long distances to re-enforce that a person is still travelling in the correct direction (See Figure 19).

As none of the case study stations made effective use of directional markers, the following information provides a more general overview of recommended guidelines that BC Transit can use in when preparing their own strategy. BC Transit will need to work with local municipalities to establish a detailed wayfinding strategy once station locations have been determined.
junction of pedestrian or cycling paths such as the Galloping Goose Trail (See Figure 21). CRD representatives should be involved in the development of any wayfinding strategy to ensure critical decision points are not overlooked.

A direction markers height is usually equal to that of road signage and is often placed on similar posts, but beware not to obscure regulatory information by over-cluttering it (See Figure 20). Many jurisdictions avoid using the road name signs and instead use the corner of buildings to mount them to if setbacks are minimal, or they establish a separate post set back from the intersection and across the sidewalk (Farrell, 2007).

6.1.2 Guide to Station-Area Wayfinding

Station information can be organized into a message hierarchy with the most important and critical components listed first for the user. Based on observations from the four case study stations, the most common major areas of concern are:

- Facility Entrance
- Fare Processing
- Gates to Platforms
- Locations Served from the Platform
- Vehicle Route/Destination
- Facility Name
- Exits to Street or Transfer Points
- Schedule Information

Secondary or auxiliary service signs are usually smaller and less prominently placed but still important. These services include:

- System Map/Directories
- Neighbourhood Maps
- Fare Information
• Schedule Information
• Regulatory/Prohibition Information
• Restroom Locations
• Telephone Locations
• Security/Police
• First Aid
• Services or Concessions

Regardless of a sign’s place in the hierarchy, a clear sight line must always be maintained between it and the users. A standard rule of thumb for fully mobile users is a sight line level of 1.7m, but for those in a wheelchair it is reduced to 1.2m. Therefore, signs should always be as elevated as possible to provide adequate viewing and decision-making.

Figure 22 at Broadway Station in Vancouver illustrates how facility entrance & name signage should be displayed either directly above the doorway and/or at the beginning of the main pedestrian pathway that leads to the facility (Also See Figure 23). The text used at Broadway Station is large and contrasts sufficiently from the building and sign background to be visible at all times of the day.

Fare processing and gates to platforms can be one-and-the-same but if they are not like in the case of Joyce-Collingwood Station, users must know immediately upon entering the facility where fares can be obtained and how they are to be routed to the platform afterward. At Joyce-Collingwood Station the decision point for these services has left sufficient time for patrons to evaluate their surroundings and locate their next steps by placing the TVMs well back of platform stairways. In smaller transit facility locations such as Orenco Station, the fare facility is located on the platform and is highly visible using bright colours and distinctive symbology to draw attention to it.

Platform signage such as direction of travel should again be presented in time to allow users to make informed decisions well before
reaching any crossings or intersections, such as in the case of side platforms. In the case of central platforms such as Orenco Station, they should face perpendicular to the running way and be visible for the length of the platform area. Orenco’s platform also labels the destination with direction of travel for greater clarification.

The facility name should again appear on the platform and should be visible to all passengers on an approaching vehicle. Most often they are displayed underneath the canopy but be sure that the roof is not obstructing its view or blocking illumination. More than one name sign will be necessary if the vehicle has more than one cab.

In the case of long platforms such as Joyce-Collingwood Station, exit signage should be visible immediately upon alighting. If there is more than one exit, the sign should state the direction of travel and the name of closest street (See Figure 25). If BC Transit intends for stations to include park & ride lots or bus transfer areas, they should be appropriately labelled along with the exit signage.

Whereas primary/major area signage is prominently displayed in large text, secondary signage is often represented through standardized symbology whenever possible and usually located directly adjacent to the service. Similarly, standardized sign colours such as blue used by TransLink for information, and yellow for cautionary should be applied (See Figure 24). Whenever possible they should be grouped together with appropriate direction arrows to reduce over-signage (TCRP Report 12, 1996).

**BC Transit Next Steps**

- Establish a strong BRT service branding strategy including standardized colours & symbology
- Work with local municipalities to co-ordinate CID wayfinding strategies for downtown areas
- Work with municipal & provincial agencies to establish directional markers within right-of-ways
- Establish a set of guidelines articulating proper wayfinding procedures within the station-area
6.1.3 Guide to Passenger Information Systems

In-station passenger information systems can either be provided through audio assistance, static messaging or real-time displays. Although static messaging is the most common and less expensive, implementation of all three makes for a more effective strategy.

Audio Assistance

Audio assistance in its basic form usually provides a telephone or intercom system with a direct connection to the transit authority where a patron can use an automated service for assistance. In large facilities like Joyce-Collingwood Station, these phones are located at the entrance near the fare payment facilities and on the platform (See Figure 26). They do in some cases double as a security phone for passengers to report safety concerns. These facilities are especially important for users with visual disabilities. They should be well lit, include tactile surfaces on the floor & audio unit, and distinctive floor or wall colourings, such as high visibility yellow to accentuate their location. New York’s MTA has recently installed ‘Help Points’ seen in Figure 27, which are highly visible (AASHTO, 2004; Sound Transit, 2007).

Audio assistance is now also closely linked with real-time information displays in jurisdictions such as Perth, Australia where users can press a button to hear an audio recording of next arrivals for each transit line.

Static Messaging

Static messaging is a comprehensive message display system that should provide station users with information about the transit service and the surrounding community. Base on observations at Joyce-Collingwood Station and US DOT’s (2009) Characteristics of BRT for Decision-making report, BC Transit should include the following information on its displays:
- System name & branding
- Route name or number
- Station name
- Route map
- Route hours or schedule
- Neighbourhood map with walking distances
- System map
- Additional fare payment information such as zone maps

Similar to most jurisdictions, TransLink often wall mounts this information on the station platform but in large facilities a similar display should be provided near the entrance (See Figure 29). Agencies such as Tri-Met and Cleveland’s RTA have begun displaying their information in freestanding kiosks, which reduces the space requirement and provides an additional station landmark if it is architecturally distinctive and system branded (See Figures 30 & 31).

As with wayfinding strategies, Tri-Met’s kiosks keep wording both legible & readable from a distance of at least 1.5m and use standard symbology on maps to reduce text. Static messaging at all four stations also displayed a contact number for station users if they require further assistance.

**Real-Time Information Displays (Dynamic Message Signs)**

Real-time displays at bus stops and stations are used mainly to provide arrival or departure information. The primary purpose of bus stop and station displays is to reassure the customer that they are waiting for the right vehicle in the right place and to inform them about the time the vehicle will arrive (See Figure 32). These displays often provide a countdown of times for approaching vehicles but more complex systems are also capable of displaying service disruption information. The most basic displays use a simple LED display to provide data on the next vehicle arrival. More complex systems like those used by TransPERTH, are necessary for stations...
serving multiple routes and are required to display four or more vehicle times (See Figure 33). As shown in Figure 34 Portland’s Tri-Met system has established a real-time display system that provides users with the next two scheduled arrivals for each transit line (Battelle and Multisystems, 2002).

The displays are most frequently placed under the platform canopy in a space that is clearly visible to users, away from architectural features or signage that could block sight lines. Where stations have been integrated directly into a surrounding land use such as a shopping centre, some jurisdictions such as Ottawa’s OC Transpo and Maryland’s MTA have installed real-time displays at key exits or information kiosks so shoppers can plan their time accordingly (TCRP Report 92, 2003).

Planning and implementation of real-time information displays requires a significant investment of time and capital to gather the information and report it efficiently. For a more in depth discussion of system implementation please see:


**BC Transit Next Steps**

- Establish a set of basic information requirements that are to be provided at every rapid transit facility
- Consider a standardized design for station information kiosks
- Conduct further research into the application of audio & real-time information systems at new rapid transit stations

Figure 32 - Basic Multi-Route LED Information Display (London, UK)
Source: TCRP Report 92, 2003

Figure 33 - LED Display Providing Next Arrival and Platform Details (Perth, AU)

Figure 34 - LCD Real-Time Display with ‘Next Two Vehicle’ Arrival Times Tri-Met MAX (Portland, OR)
6.2 Access

6.2.1 Guide to Local Pedestrian Connections

The quality of pedestrian connections to the surrounding community has a strong bearing as to whether or not locals will use the facility and how they will access it. The area around Yamhill and Joyce-Collingwood exhibit strong pedestrian connectivity because their grid patterns are reality small and feature multiple supporting mid-block pathways. This direct connectivity has been shown to be successful in stimulating pedestrianism like that exhibited at Gresham Central Transit Station in Oregon (See Figures 35 & 36). As BC Transit’s Shaping Our Future document clearly emphasizes a commitment to increased pedestrianism, it is important to ensure that the surrounding environment accomplishes two objectives:

1. Locations that are deemed desirable in the immediate area must be easy to access
2. The pedestrian facilities must be pleasant to use (Forsyth, et al., 2008)

These features are nearly inextricably linked to areas with dense and mixed-use built forms that possess employment or retail services within easy walking distance of a transit facility (Cervero & Kockelman, 1997).

It is recommended that BC Transit work with municipal planners to ensure that future commercial retail nodes be placed in the closest proximity as they are the heaviest generator of foot traffic. A good rule of thumb is that pedestrians are willing to walk up to 800m to access a rapid transit facility.

However, the distance diminishes as parking availability and/or circuitous pathway routing increases (O’Sullivan, 1996). For more general point on site design please see Appendix D.2.
6.2.2 Guide to Sidewalk Design

During the initial sidewalk planning process it is important to take into account the following considerations:

- Identify the area around the transit facility that will require sidewalk installation or improvement
- Identify the key trip generators such as concentrated residential, commercial or retail spaces and use this information to determine primary and secondary routes
- Inventory the existing condition and design of sidewalk facilities in the area
- Identify areas of particular concern relative to pedestrian mobility such as steep grades, overgrown landscaping, missing sidewalk segments, and unsafe or missing pedestrian crossing facilities (VTrans, 2002)

The community around Agate Station has pre-existing sidewalk dimensions of between 1.2m and 1.5m. Although these dimensions are likely to work on less busy corridors such as lower density residential streets, they are insufficient for rapid transit facilities located in more transit supportive communities (i.e. TODs or adjacent to large institutions). BC Transit should work with local municipalities to identify any necessary sidewalk enhancement areas, usually within 400m of the station-area. This will require mapping the primary and secondary pedestrian corridors. Establishing a corridor hierarchy early will assist in establishing expected volumes and identify any undersized corridors like those around Agate Station.

The sidewalks around Yamhill Station demonstrate desirable sizing for high traffic areas. See Appendix D.3 for the City of Portland guide to sidewalk sizing.

Sidewalk dimension selection should take into account a host of factors that may limit pedestrian through corridors such as:

- Utility poles & anchors
- Street furniture & public art
- Low hanging signage (including advertisements)
- Landscaping
- Cafe patios
- Street vendors
- Snow storage

Figure 37 Pedestrian movement through parking lots should include delineation and segregation from vehicles whenever possible
Source: City of Calgary, 2004
• Mailboxes
• Parking meters

These features reduce sidewalk capacity and their impacts should be included during sidewalk sizing (VTrans, 2002). The TCRP Transit Capacity and Quality of Service Manual (2003) suggests that sidewalk obstructions can reduce usable width by an additional 0.5m beyond the objects basic footprint, which also applies to walls and curbing.

To provide space for these considerations and to enhance the pedestrian experience, it is recommended that buffer zones be installed between the roadway and the sidewalk. The Vermont Pedestrian and bicycle facility Planning and Design Manual (2002) recommends the following buffer zones depending upon the roadway:

- 0.6-1.2 m - Local or collector streets.
- 1.2-1.8 m - Arterial or major streets.
- 1.5-2.4 m - Where street trees are proposed, where vehicle speeds or the percentage of heavy vehicles are high.

Beyond providing space for snow storage, landscaping, seating, and municipal infrastructure, it better separates vehicles and pedestrians from potential conflict. Agate Station provides a 1.5m buffer along Franklin Boulevard but there is no other form of vehicle deflection provided. In appropriate situations, buffer zone protection can be enhanced by shoulder parking or cycling lanes, which further distances the pedestrian from moving traffic (VTrans, 2002).

Avoid steep grades or stairways similar to the one adjacent to Joyce-Collingwood Station as it not only limits the mobility of disabled individuals but is also highly undesirable to able-bodied individuals as well. A common rule of thumb is that sidewalk grade should never be steeper than the adjacent street. Cross slopes are to be maintained at a grade of 2% or 1:50 (City of Portland, 1998).

As site design for those with disabilities is outside the scope of this report, it is recommended that practitioners consult ADA Standards for Accessible Design (1991) for a more comprehensive discussion on acceptable designs for steep pathways and stairways.

### BC Transit Next Steps

- Establish a strong corporate policy of working more closely with local government in the planning of pedestrian facilities that support connectivity to the station property.
- Work with municipalities to incorporate enhanced sidewalk standards into future designs around rapid transit facilities.
- Work with municipalities and local stakeholder groups to assess the quality of existing sidewalk facilities around planned station locations.

### 6.2.3 Guide for the Location of Pedestrian Crossings

As nationwide guidelines such as the Transportation Association of Canada’s Geometric Design Guide (2007) more comprehensively cover intersection & pedestrian crossing standards than this report could hope to, the intent of this section is to instead provide a brief overview of location considerations that support a more pedestrian friendly facility.

Yamhill Station illustrates that the proximity of a station exit/entrance to an intersection can assist in reducing walking distances and trip times. All stations had a pedestrian crossing available at adjacent roadways within 30 seconds of leaving the exit (Dixon, 1996). A lack of pedestrian crossing facilities can lead to dangerous activities such as jaywalking across major arterials or transit ways. Observations at Agate Station illustrate that overly long pedestrian signal delays can cause patrons to become impatient and start jaywalking especially if gaps in traffic begin to appear. Dixon (1996) recommends that pedestrian signal delays should be no longer than 40 seconds on side streets. No delay guideline was offered for major arterials but site
observations suggest that the average point at which jaywalking occurred at Agate Station was approximately a minute-and-a-half unless gaps in traffic appeared sooner.

BRT services will almost always operate along major urban arterials in order to maintain adequate headway. However, the large right-of-way required to establish these corridors creates an undesirable pedestrian environment. Site observations suggest that roadway crossings should be kept below 18.5m whenever possible. In situations like Agate Station where the right-of-way is wider, a pedestrian refuge median has been installed to give slower moving patrons such as the elderly an opportunity to rest rather than being stranded in the intersection after the signal has changed.

However, right turn slip-lanes and their associated islands are not recommended in high pedestrian traffic areas as they extend crossing distances considerably and due to their nature as a ‘yield’ movement, can create a significant conflict point (City of Portland, 1998).

High-speed traffic greatly decreases the comfort of pedestrians and can be a major deterrent to pedestrian trips. It was observed that at case study stations with posted speed limits of less than 55 km/h the pedestrian experience was more comfortable (Dixon, 1996). In high volume situations or when operating in a median transit way this recommendation can prove difficult to accommodate. In high volume mixed traffic situations, providing the bus a refuge bay will assist in distancing the patrons from surrounding traffic. Agate Station uses bollards to assist in adding to a perception of safety for those waiting to cross from median facilities (US DOT, 2009).

**BC Transit Next Steps**

- Maintain a policy that new rapid transit facilities should be placed in close proximity to high quality pedestrian crossing facilities
- During the corridor & station planning stage review options that reduce overall crossing distances or incorporate measures that provide refuge facilities
- Work with local transportation authorities to improve pedestrian signalization times
- Where feasible plan entrances/exits to face onto side streets to draw patrons away from busy vehicle corridors. This can be done by placing bus transfer points and parking facilities on these road segments.
6.3 **Safety & Security**

6.3.1 *Guide for Landscaping*

Good quality landscaping contributes to making rapid transit facilities a desirable and aesthetically appealing place, but great care must be taken in ensuring that their inclusion does not compromise personal safety. AASHTO’s (2004) Guide for Park and Ride Facilities argues that transit stations should be ‘defensible spaces’ that provide a sense of personal safety by discouraging opportunities for criminal activity. A defensible space design is accomplished in part by supporting physical design options that mitigate potential safety issues such as poor sightlines.

Proper selection of landscape vegetation is essential to on-site safety as not all plants provide clear sightlines. Although evergreens are predominant in Victoria, their broad and dense nature makes them undesirable in many station applications. Poor landscaping choices at Joyce-Collingwood station have led to the ability for potential attackers to disguise themselves and can also prevent motorists from seeing pedestrians approaching Joyce Street (See Figure 38). Although BC Transit should always select native species to prevent the infiltration of invasive or noxious species, designers should select foliage with (VTrans, 2002):

- Slender trunks (See Figure 39)
- Slow growth nature to curb constant pruning
- Upward growing branches (non-drooping)
- A maximum height of less than 8-10m, and for shrubs no more than 0.5m (See Figure 40)
- A growth nature that minimizes extensive spreading (for shrubs)

At all stations but Agate, landscaping along curbed roadways maintained a minimum clear distance of at least 1.2m. Agate has permitted landscaping adjacent to the roadway which has created the potential for encroachment of plants into the right-of-way if not adequately maintained. Additionally, landscaping along roadways and in median areas should not hang lower than 4.3m or bush higher than...
0.5m or they may obscure sightlines (City of Portland, 1998). Landscaped pathways adjacent to Orenco Station have at least 2.5m to 3.0m of head room but depending on the tree type and its propensity to quickly grow branches and/or leaves more pruning may be necessary (VTrans, 2002).

Landscaping around the Yamhill & Orenco’s platforms has been eliminated to ensure direct sightlines to nearby major roadways. This strategy also applies to all activity centers on the premises, such as the parking lots, transfer points, and information displays. BC Transit designers should co-ordinate lighting and landscaping plans early in the design process and take into account the growth patterns of the selected plant species (VTrans, 2002).

In instances where sightlines are not a concern, low profile evergreens may be considered to assist in establishing a light buffer for surrounding uses. Orenco Station uses evergreens in this manner but the landscaping is pruned to ensure views of the platform are not obscured as this reduces the ability for natural surveillance (See Figure 41) (AASHTO, 2004).

Finally, it is important to remember that landscaping does not end with its planting. BC Transit will need to ensure adequate maintenance and pruning is carried out, based on plant selection, to ensure that overgrowth is not obscuring sightlines (AASHTO, 2004).

**BC Transit Next Steps**

- Establish a landscaping policy for transit facilities that includes guidelines around maintaining sightlines and selecting appropriate plant species
- Consult with local horticultural societies to produce a list of appropriate native species
- Work with local authorities to establish regular maintenance and pruning programs to curb overgrowth

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**Figure 40 - Well pruned shrubs maintain good sightlines between station platform and surrounding activities (Hillsboro, OR)**

**Figure 41 - Evergreens used correctly to block some platform lighting while still allowing for station surveillance by residents (Hillsboro, OR)**
6.3.2 Guide to Station and Surrounding Area Lighting

For general objectives of station lighting and preferred standards of internal and external lighting levels, see Appendices D.4 & D.5.

Lighting designs must be developed within the context of the surrounding community so that undesirable light spillover into adjacent properties is minimal. The lighting design should avoid creating the perception for the patron of being on an island defined by the lighting at the transit platform. Transit patrons should be able to see adjacent activity points from the platform so that they can observe potentially dangerous situations.

In all situations lighting systems should be designed so that the failure of any single lamp does not leave an area in total darkness or at an unsafe level of illumination (Sound Transit, 2007).

Agate Station’s lighting covers the entire length of the platform and emphasizes the platform edges. As Joyce-Collingwood is grade separated, it also provides lighting for landings associated with stairs or elevators.

It is important to ensure that the location of platform or adjacent lighting is placed in a fashion that will not blind approaching transit drivers. Agate’s unique upward canopy angle does not prevent light from shining into drivers eyes, but station designers must have noticed this possibility and angled the light upward into the canopy rather than down thus eliminating this risk. Similar techniques of indirect or recessed lighting also ensure that platform or other station lighting is not cast directly onto neighbouring windows (AASHTO, 2004).

Lighting for information displays or ticket vending machines should ensure that it does not obscure the visibility of touch-screen displays or static text due to glare (See Figure 43).

The lighting of outdoor areas around such as plazas, and pedestrian walkways at Orenco Station has been done with luminaires on low poles. The low poles have reduced the light spillover onto adjacent properties by casting a narrower spread. University of Oregon pathways adjacent to Agate Station have made use of lighting features such as illuminated bollards and accentuating LED lighting. These fixtures have been used in place of pole mounted light standards and as a result the coverage in this area is minimal and creates several lighting gaps (See Figure 42). Architectural lighting features and low-mounted fixtures may be used to define boundaries or walkways but only in conjunction with standard luminaires, and only after a lighting design review has verified that light dispersion is sufficient. Portland’s downtown bus stations have started creatively incorporating architectural lighting into support columns to reduce the need for more standard luminaires (See Figure 44).

As stated earlier in this report, landscaping should also be selected in conjunction with lighting requirements so that safety and security of users are not compromised by the creation of shadows and dark areas (Sound Transit, 2007). Yamhill Station has used landscaping as a lighting medium but it has contributed to the existing light spillover problem due to the use of unfocused luminaires.

Lighting at adjacent intersections and crosswalks is of great importance. Like at any location within the station property, intersection lighting should fully cover the facility and ensure that oncoming vehicles can clearly see pedestrians with sufficient decision sight distance to come to a safe stop. The crosswalk facilities adjacent to Joyce-Collingwood have been further enhanced with illuminated flashers to provide even greater awareness to approaching motorists. Additionally, the Joyce St. & Vanness Ave. Intersection makes use of highly reflective signage and crosswalk markings will also assist in providing for a safe facility although regular maintenance of these components is necessary to ensure their continued functionality (VTrans, 2002).
Due to the very specific warrants that are in place for the assessment and design of potential crosswalks, it is imperative that BC Transit actively consults the TAC Geometric Design Guide (2007) and BC MoT when planning for these facilities.

**BC Transit Next Steps**

- Enhance existing station lighting requirements to include minimum illumination standards for the various indoor and outdoor facilities
- Ensure facility lighting design reviews are conducted during the planning stage to ensure adequate site coverage, and the mitigation of excessive lighting spillover
- Co-ordinate any necessary lighting system improvements in the areas surrounding new stations with applicable government authorities

![Figure 42 - Insufficient pathway illumination due to reliance on accent lighting (Eugene, OR)](image1)

![Figure 43 - Good illumination of information display (Portland, OR)](image2)

![Figure 44 - Creative use of station column as a platform lighting feature (Portland, OR)](image3)
6.3.3 Guide to Defining Station Property

A major component of establishing a defensible space within a transit facility is clearly demarcating the property line. Doing so provides a clear indication of when the private property begins and also when site surveillance should be expected by station users. At smaller station areas, defining the property line with bollards, low-profile walls and non-mountable curbing also can help shield users from errant vehicles (See Figure 45).

Agate Station also makes use of bollards at the median refuge facility as it is in close proximity to high volume and high speed traffic. They may also be useful in situations where station-areas and vehicle areas are not clearly defined such as in mixed-use urban centers or plazas where pedestrians and vehicles co-mingle (See Figure 46)(AASHTO, 2004).

Low profile walls at Orenco Station have been used to deter pedestrian movement across the tracks but it should not be used to the extent that it limits free movement on and off the site. Based on site observations property defining features should:

- Be placed at any location where users may congregate or an errant vehicle may be likely to approach from
- Be no taller than 1m, unless in the case of trees where their branches should hang no lower than 4m to maintain sightlines(See Figure 47)
- Be placed no more than 2.5m and no less than 1m apart
- Not include anything that can be concealed behind
- Not interfere with the movement of users or of vehicles within the travelling lane (Tri-Met, 2010)

**BC Transit Next Steps**

- Adopt a policy of including property definition at new stations

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**Figure 45 - Property line defined by bollards and a raised curb median with landscaping (Cleveland, OH)**
Source: Flickr user hYp_85

**Figure 46 - Bollards & trees defining property entrance (Subiaco, AU)**

**Figure 47 - Use of low profile stone wall to accent property line and walkways (Hillsboro, OR)**
6.3.4 Guide to Emergency Telephones

Emergency telephones can be provided to station patrons in two ways, either as a public pay phone or as a customer emergency station.

If public pay phones are included in a station design they should not be placed directly on the platform or any other place where their prolonged use could interrupt the flow of other users. At Orenco a pay phone was placed just before the platform but they can be placed at entrances/exits or adjacent to concession facilities but still well back of through corridors (See Figure 48). Despite possessing a telephone sign it lacked proper lighting. Phones should be well lit to make them easy to find (Sound Transit, 2007).

Customer emergency stations (CES) are usually integrated with audio information assistance facilities and can be located on station platforms, entrances/exits, and even parking lots (See Figure 49). Although Joyce-Collingwood’s is not, services should be hands-free and give users a direct connection to transit security or other transit emergency services. CES should not; however, be directly connected to 9-1-1 as prank calls can be common.

CES are usually identified by a bright blue light that should be placed high enough to be visible above vehicles, seating areas, or other low-level obstructions (See Figure 50). It is recommended for larger facilities that a sign located beside the CES display location details (e.g. Floor 3, NW Section). The units should be prominently placed so as to be easily seen by patrons and the area around them should be well lit (Tri-Met, 2010).

BC Transit Next Steps

- Adopt a policy of including CES or pay telephones at rapid transit facilities
6.3.5 Guide to Security Supportive Urban Design

Intelligent urban design around transit stations can support increased safety by enlisting nearby residents or shop patrons in the task of ‘natural surveillance’. Natural surveillance occurs when surrounding land uses are in close enough proximity to a transit station or pedestrian plaza that residents or shopkeepers feel a sense of proprietorship over it and therefore make efforts to reduce or report undesirable and/or violent situations.

When planning for development around a rapid transit station the following should be taken into account (Peel Region, 2006; Gehl, 2010):

- Windows, balconies, or patios of surrounding uses should face onto the station property (See Figure 51)
- Clear lines of site between the surrounding uses and critical station points such as the platform & ticket vending machines/ATMs should be maintained
- Adjacent developments should be in close enough proximity to hear calls for help
- Activities should be happening at various times of the day to maintain continuous natural surveillance

The orientation of building windows adjacent to Yamhill Station for example, is critical to the area’s natural surveillance as there are clear and unobstructed views from surrounding uses onto the station area. The windows allow residents and adjacent shop keeper to easily see critical station points such as the platform and ticket vending machines which, is important as these are where the majority of incidents will occur. The John Jaqua building shown in Figure 52 adjacent to Agate Station is an example of poor natural surveillance as windows do not open and they are shrouded thus preventing users from viewing the station-area.
Orenco’s adjacent residential balconies look upon the station which makes natural surveillance a much more integrated component of the community. When residents and business patrons are placed directly into the environment for long periods of time, the sphere of criminal activity shrinks as their risk of being caught has substantially increased (Gehl, 2010).

The proximity of adjacent uses is as critical to successful natural surveillance as sufficient lighting and good sightlines. As in the case of Joyce-Collingwood and Agate, if a building is located too far away or is too tall, residents will not be able to hear calls for help.

In Jan Gehl’s 2010 book *Cities for People* he provides the following findings on the ability of people to hear and see others in urban settings (See Figure 53):

- **100m** – Threshold for seeing movement and body language in broad outline. Voices are faint and unintelligible.
- **50m to 70m** – Ability to hear a cry for ‘Help’. Recognize gender, hair colour & age as well as more detailed body language.
- **35m** – One way communication is possible using loud voices.
- **22m to 25m** – Two way basic communications is possible. Ability to accurately read facial expression and dominant emotions.

Based on this data, it is important that the first line of natural surveillance occurs no further than 50m to ensure basic communication is possible with those seeking help.

The building height adjacent to Joyce-Collingwood has a strong bearing on why the ability of locals to see and hear emergency situations is so compromised(See Figure 54).
These are the elevated thresholds:

- **Ground level** – Ability to see and hear according to the data provided above
- **2nd to 3rd Floor** – Ability to see surrounding area increases but hearing ground floor sound reduces significantly
- **5th Floor** – Objects on ground start to become more vague and voices from ground floor become unintelligible
- **10th Floor** – No ground floor voices can be heard and angular plane and distance is too great to make out defining details

Therefore, it is most important for land uses within the first two to three storeys to support natural surveillance (Gehl, 2010). Having a mix of uses like those around Yamhill Station, operating at various times of the day while the station is open is a positive way of supporting natural surveillance as well as providing station users with a variety of adjacent amenities (See Figure 55).

When considering the mix of uses that fulfill this role, it important to ensure that they cover the various parts of the day as well as overlap in time. Morning activities normally include residents on the way to work and school as well as cafes. Figure 56 illustrates the potential of outdoor cafes to participate in natural surveillance. Afternoon activities include office workers as well as restaurants. Evening activities include grocery stores, social/recreational facilities and restaurants/pubs. (Gehl, 2010; ITE, 1998).

**BC Transit Next Steps**

- Work closely with local planning authorities to ensure transit supportive land uses are developed
- Work with local planning authorities on establishing design guidelines around rapid transit stations that support natural surveillance

Figure 55 - Good mix of residential, office and retail activities occurring throughout the day within easy sight distance of station (Subiaco, AU)

Figure 56 - Daytime cafe patio users have a direct sightline to the station entrance (Subiaco, AU)
6.4 Internal Circulation

6.4.1 Guide to Pedestrian & Vehicle Segregation

Whenever possible, transit vehicles and pedestrian movements should be separated to prevent conflicts. Although crossing the transit-way may be inevitable, it is desirable to plan facilities to limit any further crossings such as at the entrance or exit of the facility or by crossing through other transit bays at an exchange.

The Tri-Met Design Criteria manual (2010) provides the following ways to eliminate internal crossing hazards:

- Maintain clear sight lines between patrons and vehicles, and between patrons and the transit way
- Avoid landscaping or other ground cover in and adjacent to the transit way median
- Do not place buildings or large features on or immediately adjacent to platforms
- Avoid near side stations at intersections where possible
- Plan facilities so that trips between platforms, transfer points, and parking lots do not require crossings
- Provide high quality lighting at crossing points
- Consider grade separated crossings of high speed & high volume corridors

In instances where transit way crossings are unavoidable, risk mitigation strategies should be implemented to suitably protect patrons, either through passive or active safety treatments. Passive safety treatments are strategies that do not require activation by users. The following section is derived from site observations at Orenco Station and the standards and strategies provided by the Tri-Met (2010) Design Criteria manual. Although Orenco is a rail-based rather than road crossing, its strategies are equally applicable to BRT services operating in a dedicated right-of-way.

A basic form of passive safety treatment used at Orenco is pavement marking at the intended crossing point. The marking ‘STOP HERE’ identifies the safe waiting location for patrons that is outside the transit way. Their application can be also used in situations where transit way crossing is ambiguous and when speeds are greater than 30 km/h. The markings at Orenco are painted on but BC Transit should consider using thermoplastic material to maintain its durability and reflectivity (See Figure 57).

The ‘STOP HERE’ sign may be supplemented with a ‘DON’T STAND HERE’ which is not used at Orenco but can warn patrons when crossing two or more lanes of transit way to not stop in that location. Orenco does use tactile pavement markings that should always be present to notify the visually impaired that they have reached the crossing.

Formal channelization is not is not present at any of the case study facilities but it is another passive safety strategy that uses a railing or similar treatment to discourage patrons from taking shortcuts or from crossing the transit way in a risky manner. Channelization should be considered in environments where there is a high likelihood that crossing the transit way could significantly jeopardize the safety of users. These situations could include the presence of a transit passing lane or in situations where a vehicle is not required to pick up or drop off any users (See Figure 58). This technique could also apply to mid-block stations where transit way crossing could be a pre-cursor to unsafe jaywalking. However, as shown at Agate Station signal duration should also be considered with attempting to mitigate jaywalking.

Although site observations did not document any pedestrian Z-crossings, they can be used to demarcate preferred crossings of transit ways or adjacent bus loops at a transfer point. If BC Transit intends to include BRT with conventional service bus loops, the Z-crossings should cross the transit-way or bus loop as closely as possible to perpendicular, or with a slight angle so that a person is
oriented facing the nearest oncoming vehicle direction (See Figure 60). BC Transit designers should ensure that any design complies with ADA standards when crossings are not perpendicular.

Active safety treatments are strategies that are activated by an approaching transit vehicle. These strategies are most frequently applied in three operating environments:

- Slower speed transit ways in the median of city streets
- Higher speed transit ways where the control signals are used to maintain those speeds
- Pedestrian crossings at angles to the transit way that do not provide optimal sight lines of an approaching vehicle (most common in less urban situations where a trail may intersect the corridor)

Although not present at Yamhill or Orenco, ‘LED Pedestrian Flashing Sign’ strategies have been considered at transit way crossings at intersections equipped with traffic controls signals, where pedestrians cross the corridors in response to standard WALK and DON’T WALK signal indications (See Figure 61). The pedestrian LED can be coupled with an audible warning device and when activated, is intended to provide a supplemental warning to the pedestrian that a bus is approaching. This technique may also be appropriate in corridors where speeds exceed 30 km/h and when the pedestrian crossing is an unsignalized mid-block crossing.

Automatic pedestrian gates are another active safety treatment that prevents or discourages a pedestrian or cyclist from crossing the transit way when a vehicle is approaching. These gates can be activated by a GPS proximity device located in the vehicle. Automatic gates are expensive and will only be used when severe safety hazards exist that cannot otherwise be eliminated. Usually this application is used in corridors with speeds of over 70km/h and when the sight
distance between the bus and pedestrian is severely limited, either by topography or the angle of the crossing.

In situations where a transit passing lane may exist at a station, a Second Vehicle Coming Warning Device may be advisable. Patrons may perceive that a single vehicle has activated the warning system and disregard it. This technique is applied in conjunction with other strategies such as gated crossings. The sign is activated to clarify why the warning system has remained active for an extended period of time.

BC Transit Next Steps

- Maintain a policy of designing transit station-areas to eliminate or at least mitigate the need to cross transit ways or bus transfer loops
- Establish warrants for the application of passive & active pedestrian crossing safety measures
- Work with local and provincial agencies to verify compatibility of pedestrian crossing standards, specifically at road intersection crossings
- Work with local government at the transit way detailed design stage to identify potentially hazardous crossing that may need specific treatments (e.g. major pedestrian/cycling pathway corridor crossings)

Figure 59 - Tri-Met 2010 Design Guide specification drawing illustrating application of a flashing LED pedestrian warning sign for approaching vehicles

Figure 60 - Tri-Met 2010 Design Guide specification for a z-crossing of transit way
6.4.2 Guide to Stairway Facilities

Architectural features such as stairways should be strategically placed within a facility so that users can form a cognitive map of the facility. The stairways at Joyce-Collingwood Station are prominently placed in relation to the entrance/exit and platform area and therefore form part of the comprehensive wayfinding strategy of the station-area. As discussed in the ‘Guide to Wayfinding’ section in Appendix D.1, environmental communication is a strong component of assisting users in navigating the station-area with minimal confusion and using as little signage as possible (See Figure 61) (TCRP Report 12, 1996).

If BC Transit intends to include stairways into their stations designs, the stairways should be considered in relation to their purpose, beyond simply being movers of people between levels. Based on site observations at Joyce-Collingwood and TCRP Report 12, questions to be asked when considering stairway layout are:

• What locations is this stairway linking? Is it connected directly to the outside or is it linking a concourse where fare purchasing is happening?
• If it is linked to the entrance, where are patrons arriving from and is the entrance prominent and clearly visible?
• Where on the platform should stairs deposit people to ensure good dispersal and to mitigate crowding?
• When patrons want to leave the platform where do they want to go? Are they leaving in the same direction as the entrance or is there a transit transfer point elsewhere they should be directed to?

When answering these design questions it is important to consider the trip segments of a facility and what each is trying to accomplish (See Figure 62). For example, as Joyce-Collingwood’s stairs are linking the fare payment area to the platform, it is imperative that the stairs
are laid out in a fashion where patrons know intuitively that they must acquire fare before arriving at the stairway.

Part of this cognitive mapping process is ensuring that as patrons approach or use this stair facility, that they are able to see the next segment of their trip (e.g. they should see the platform from the fare payment center). Seeing the full segment allows users to better recall the routing for future trips (TCRP Report 12, 1996).

The 2003 TCRP Transit Capacity and Quality of Service Manual – 2nd Edition provides the following information on understanding stairway LOS and what additional considerations should be kept in mind.

A stairway’s width determines both the number of distinct lines of people who can traverse the stairs and the side-to-side spacing between people, which will affect a user’s ability to pass slower users and the level of interference between adjacent lines of people. As a result the narrowness of Joyce-Collingwood’s stairs, a minor pedestrian flow in the opposing direction causes a capacity reduction of up to half.

As patrons must exert more effort when walking up stairs than down, it is important to use the lower flow rate of the up direction when analyzing and designing bi-directional stairways. Ascending speeds on stairs range from 12m/min to 21m/min, while descending speeds range from 17m/min to 31m/min. For design purposes, the average up direction speed of 15m/min should be used and 18m/min in the down direction.

Stairway LOS is based on average pedestrian space and average flow rate (See Table 3). Although a pedestrian flow rate is only as fast as the slowest moving user, it is not simply the speed of the slowest user that determines the LOS but also the space available for others to pass by while maintaining their flow rate.

### Table 1 - LOS Criteria for Stairways

<table>
<thead>
<tr>
<th>LOS</th>
<th>Avg. Ped. Space</th>
<th>Flow per Unit Width</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(m²/p)</td>
<td>(p/m/min)</td>
<td></td>
</tr>
<tr>
<td>A</td>
<td>≥1.9</td>
<td>≤16</td>
<td>Sufficient area to freely select speed and to pass slower-moving patrons. Reverse flows cause limited conflicts.</td>
</tr>
<tr>
<td>B</td>
<td>1.4-1.9</td>
<td>16-23</td>
<td>Sufficient area to freely select speed with some difficulty in passing slower-moving patrons. Reverse flows cause minor conflicts.</td>
</tr>
<tr>
<td>C</td>
<td>0.9-1.4</td>
<td>23-33</td>
<td>Speeds slighting restricted due to inability to pass slower-moving patrons. Reverse flow cause some conflicts.</td>
</tr>
<tr>
<td>D</td>
<td>0.7-0.9</td>
<td>33-43</td>
<td>Speeds restricted due to inability to pass slower-moving patrons. Reverse flows cause significant conflicts.</td>
</tr>
<tr>
<td>E</td>
<td>0.4-0.7</td>
<td>43-56</td>
<td>Speeds of all pedestrians reduced. Intermittent stoppages likely to occur. Reverse flows cause serious conflicts.</td>
</tr>
<tr>
<td>F</td>
<td>≤0.4</td>
<td>Variable</td>
<td>Complete breakdown in pedestrian flow with many stoppages. Forward progress dependent on slowest moving patrons.</td>
</tr>
</tbody>
</table>


### BC Transit Next Steps

- Maintain a policy of ensuring that internal stairways are designed in a way that supports environmental communication and wayfinding through architectural design
- Update existing stairway standards to include Levels of Service for future designs
6.4.3 Guide to Walkway/Corridor Sizing

Pedestrian corridors within the station-area are not only those located internally between platforms and entrances/exits but also those that link the internal facility to surrounding uses such as bus transfer facilities or directly linked adjacent uses.

Like other architectural station features, corridor & walkway designs should seek to find the most direct connection possible between trip segments. The simple and direct routing present at Joyce-Collingwood and Yamhill increases the ability their users to cognitively map their path and therefore requires substantially less wayfinding signage to reach their next destination. Additionally, circuitous and/or long corridors reduce sightlines between station features and provide greater opportunities for the concealment of dangerous activities (TCRP Report 12, 1996).

Beyond its connectivity and routing, a walkway can also be limited by its capacity. A walkway must move its users efficiently through the station-area and take into account the factors that limit its capacity. Based on site observations, the capacity of a corridor or walkway is controlled by the following factors:

- Pedestrian walking speed
- Pedestrian traffic density
- Pedestrian characteristics, bikes or strollers present, and wheelchair users
- Effective width of the walkway at its narrowest point

The normal walking speed of a pedestrian varies depending on factors such as:

- Age
- Physical capacity (e.g. mobility issues)
- Time of day
- Weather
- Pedestrian traffic composition (e.g. wheelchairs, strollers)
- Trip purpose
- Reaction to surrounding environment

Free-flow speeds range from 45m/min to 145m/min depending upon the above factors. For design purposes a walking speed of 75m/min should be used.

Normal walking requires sufficient space for unrestricted movement and identification and reaction to potential obstacles. Increasing density reduces the available space for walking and increase conflicts between pedestrians, and therefore, reduces walking speeds. This is of particular concern to people who require mobility aids. Pedestrian speeds are free-flow up to an average pedestrian space of 2.3m² per person. As the average space decreases walking speeds begin to decline and eventually approach a stand-still situation.

Effective walkway width is also a factor affecting walkway capacity as studies have shown that pedestrians keep as much as a 0.5m buffer between themselves and adjacent walls, curbs, platform edges, and other obstructions. When designing walkways and corridors the 0.5m buffer should be deducted next to walls and platform edges and 0.3m should be deducted next to less imposing obstructions that are below 1m tall, such as waste receptacles.

Table 4 - Pedestrian LOS on Walkways provides the criteria for determining the LOS of corridors and walkways within a station-area. These levels are based on average pedestrian space and flow rates and may require adjustment to suite unique situations. Average speed and volume-to-capacity ratio are shown as supplementary criteria (TCRP Quality of Service Manual, 2003).
### Table 2 - Pedestrian Level of Service on Walkways & Corridors

<table>
<thead>
<tr>
<th>LOS</th>
<th>Pedestrian Space (m²/p)</th>
<th>Expected Flows and Speeds</th>
<th>Avg. Speed (m/min)</th>
<th>Flow per Unit Width (p/m/min)</th>
<th>Volume to Capacity Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>≥3.3</td>
<td></td>
<td>79</td>
<td>0-23</td>
<td>0.0-0.3</td>
</tr>
<tr>
<td>B</td>
<td>2.3-3.3</td>
<td></td>
<td>76</td>
<td>23-33</td>
<td>0.3-0.4</td>
</tr>
<tr>
<td>C</td>
<td>1.4-2.3</td>
<td></td>
<td>73</td>
<td>33-49</td>
<td>0.4-0.6</td>
</tr>
<tr>
<td>D</td>
<td>0.9-1.4</td>
<td></td>
<td>69</td>
<td>49-66</td>
<td>0.6-0.8</td>
</tr>
<tr>
<td>E</td>
<td>0.5-0.9</td>
<td></td>
<td>46</td>
<td>66-82</td>
<td>0.8-1.0</td>
</tr>
<tr>
<td>F</td>
<td>&lt;0.5</td>
<td></td>
<td>&lt;46</td>
<td>Variable</td>
<td>Variable</td>
</tr>
</tbody>
</table>


### 6.4.4 Guide to Platform Sizing

Transit platforms function as queuing areas for passengers waiting for arriving transit vehicles and as circulation areas for both departing and arriving passengers. The effective platform area required is based on maintaining a minimum LOS for queuing and circulation. It is important to keep in mind when planning platform sizes, that they have a holding capacity, that when exceeded can lead to passengers falling onto the transit way. It is also important to consider the personal space needs of platform users such as those with mobility aids when planning the facility.

The platform area can be divided into the following areas:

- Walking areas
- Waiting areas
- Waiting area buffers around platform obstructions
- Dead areas between bus loading areas
- Space taken up by seats, pillars, and other platform facilities
- Queue storage

These areas do not occur evenly across the platform as some are primarily used for walking while other are primarily used for waiting. Dead areas usually occur between buses if the station-area serves multiple routes (TCRP Quality of Service Manual, 2003).

The LOS required for waiting on a platform is based on the amount of time spent waiting, the number of people waiting, and the desired level of comfort. People will accept being tightly packed on an elevator for 30 seconds but not in a waiting area for 15 minutes. The population characteristics, weather conditions, trip of nature will all influence the level of comfort a patron is willing to accept (TCRP Quality of Service Manual, 2003).

For additional information regarding platform sizing including a list of basic considerations when making calculations, see Appendix D.6.
6.4.5 Guide to Fare Collection

The type fare collection employed at a transit facility has great bearing on the speed at which patrons can enter and exit a facility. Fare collections systems not only generate bottlenecks based on their transaction times but also based on their placement as they could potentially generate bottlenecks by those queuing to purchase tickets.

The fare collection scheme used at the four case study facilities is the ticket vending machine (TVM). TVMs allow users to pay their fares before they enter a platform area thus reducing vehicle load times. The number of TVM units present at a station is dependent upon its passenger volumes but all but Agate Station provided at least two to establish a redundancy in case one machine is out of service.

Passenger processing times at the four station TVMs varied widely depending because of the particular characteristics of the unit and the complexity of the transit systems fare structure. Passenger processing times at the TVMs increased with the complexity of the fare structure as users at Agate Station, who had the most complex machine, had decipher both the TVMs input requirements as well as the type of fare desired. Infrequent users will require more time at the TVM prior to paying the correct fare so it is important to understand the demographics of specific station locations when determining the number of required TVM units (TCRP Quality of Service Manual, 2003).

The legibility of the TVMs interface will therefore have a strong impact on the speed at which new users will be able to select and process their fare. For example Tri-Met’s TVM clearly indicates the steps involved in choosing and purchasing a ticket through a tri-colour scheming the steps and by numbering. This way, new users know logically what is expected next of them, such as what methods of payment are available to them after selecting the fare. Poor layout like that shown in Figure 65 leads to confusion and wasted time. Static

<table>
<thead>
<tr>
<th>LOS</th>
<th>Avg. Pedestrian Area (m²/p)</th>
<th>Avg. Inter-Person Spacing (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>≥1.2</td>
<td>≥1.2</td>
</tr>
<tr>
<td>B</td>
<td>0.9-1.2</td>
<td>1.1-1.2</td>
</tr>
<tr>
<td>C</td>
<td>0.7-0.9</td>
<td>0.9-1.1</td>
</tr>
<tr>
<td>D</td>
<td>0.3-0.7</td>
<td>0.6-0.9</td>
</tr>
<tr>
<td>E</td>
<td>0.2-0.3</td>
<td>&lt;0.6</td>
</tr>
<tr>
<td>F</td>
<td>&lt;0.2</td>
<td>Variable</td>
</tr>
</tbody>
</table>

text on the TVM should be concise and large enough for users with vision impairments.

TVM units should also provide any basic zone mapping that may be required to make fare choices. TRI-MET & Translink TVMs include a zone map with station names to add greater clarity to fare selections (See Figure 63). BC Transit station planners should not assume users know fare boundaries and should supply simplified mapping for quick reference. The digital displays should likewise be large enough with appropriate text sizes to be useful for the visually impaired. All stations, also made use of audio assistance and tactile features for additional clarity.

Although TVMs may be installed on platform if necessary, they are better located elsewhere under canopy protection to keep the units and queuing passengers sheltered. Maintenance of sightlines around TVMs is also important as they are common targets for criminals due to the transaction of money (AASHTO, 2004).

TVM location decision-making should also include the space required for queuing. Poor siting can lead to a situation like that shown in Figure 64 at Orenco Station, where minimal queuing space is available due to proximity to a station column. Facility planners should refer to Table 5 Levels of Service for Queuing Area to determine the space required for TVMs queues, as well as Table 4 Pedestrian Level of Service for Walkways & Corridors to ensure adjacent corridor circulation is not impeded (TCRP Quality of Service Manual, 2003).

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**BC Transit Next Steps**

- Review fare collection options for new facilities and integrate their unique requirements into station layouts
- Update existing standards to include guidelines on TVM considerations
6.5 Amenities

6.5.1 Guide to Platform Shelters

Good quality platform shelter design is essential to producing an environment desirable for patrons. Passenger shelters should be designed to achieve the following objectives (Tri-Met, 2010):

- Provide passengers with comfort and protection from adverse conditions; rain, wind, and sun
- Help provide protection for the fare equipment
- Help provide adequate lighting
- Provide branding identity for the station
- Provide a feeling of security and means of surveillance
- Have a level of standardization in materials and construction practices that makes maintenance and replication straightforward

Passenger comfort and protection should be primary considerations during the design phase of stations. Although their appearance may be somewhat standardized, shelters must fit their neighbourhood and be designed accordingly. As the CRD has several micro-climates the design of the facility will be based partially based on local weather needs.

A basic level of protection included at all four case study stations was the installation of a canopy roof. However, only Joyce-Collingwood had a canopy large enough to cover waiting passengers, platform seating, and ticket vending machines. The APTA’s 2010 report *Bus Rapid Transit Stations & Stops* recommends 0.92m² of canopy coverage per waiting passenger. Added to this figure should be the space consumed by seating, the ticket vending machines and a 0.3 to 0.5m buffer around these items for shy distance (AASHTO, 2004). Extended canopies also

Figure 66 - Canopy protecting Ticket Vending Machines (Los Angeles, CA)
Source: APTA, 2010

Figure 67 - Station enclosure that maintains sightlines of surrounding area (York, ON)
Source: APTA, 2010
help distribute passenger grouping along the platform, especially at multi-platform facilities.

Canopy designs should be elevated enough to maintain sightlines and to allow platform lighting to adequately cover all points (See Figure 67). Tri-Met’s facilities have a minimum eave height of 2.7m but this should be considered alongside the locations natural solar and rain patterns. A lower or extended eave may be desirable if the Sun faces directly into the facility during the day. Eaves should not extend beyond the curb line though, to prevent interference with moving vehicles.

As Victoria is subject to rain and snow, other treatments including the placement of windscreens to shield waiting patrons should be considered. Windscreens should be constructed of a transparent substance to maintain sightlines and allow for platform surveillance. Joyce-Collingwood uses opaque walls but since the station is grade-separated, the need for glass is reduced. Windscreen placement depends on local wind and rain patterns but assume a 10% angle from horizontal for rainfall as a rule-of-thumb (APTA, 2010).

For high volume locations at least three sides of the platform should be protected, but if all sides are given wind treatment ensure a minimum 1m opening to allow for wheelchairs (Mbatta, 2008).

Architectural treatments such as specially designed canopies or shelters also help to make stations more visible and can help in developing a brand identity for the BRT system. Cleveland’s Healthline BRT service uses unique canopy designs to make facilities stand out better (See Figure 68). These treatments can be supported by specific colour patterns or building materials to make the facility noticeable. Architectural flare is a crucial part of a successful wayfinding strategy.
but it should not compromise safety or comfort. Unique canopies such as the one present at Agate Station can be poorly angled allowing rain or snow to enter the platform (See Figure 69). More dangerously, though, poor canopy design could direct station lighting onto the transit way and blind oncoming drivers if it is not properly angled.

Finally, although unique architectural styling should be present at all stations, certain components such as transparent panelling and support columns should be standardized to reduce replacement costs and simplicity of installation (Tri-Met, 2010).

**BC Transit Next Steps**

- Establish basic design standards for BRT stations that discusses canopy sizing, acceptable construction materials, and considerations for local weather patterns
- Establish an architectural branding for BRT stations that includes preferred colours and textures
- Ensure integration of canopy design with lighting and local surveillance (sightline) plans

**6.5.2 Guide to Seating**

Station seating should be included where possible to make the waiting experience more desirable. The amount of seating made available at the three case study stations that provided was variable. The amount provided should be based on traffic volumes and the ability to place the units without adversely impacting pedestrian movements.

Sound Transit (2007) uses a standard of a minimum of 2.5 lineal meters per bus bay, where as the APTA (2010) use a standard of 1 seat for every 5 waiting passengers. Regardless of the standard used, it is desirable to place as many seats under the canopy as possible to keep patrons dry. Additional considerations must be given to disabled
patrons who should be given a defined priority area in which to wait, also under cover. Please see the ADA Standards for Accessible Design (1991) for more specific details. Portland’s MAX LRT stations have supplemented seating with leaning rails, which often make use of canopy columns (See Figure 71). Leaning rails should sit at least 1m from the ground and provide a railing that is 0.25m in radius (Sound Transit, 2007).

Seating should be located at least 2m back of the curb line and facing onto the street so that pedestrians can see approaching vehicles. Its placement should not interfere with the movement of users boarding or alighting the vehicle (See Figure 72). Double-sided benches like that used at Agate Station are insufficiently wide to accommodate two people sitting back-to-back. At least 0.9m is the desired width of a double-sided bench if it does not offer a backrest (Gehl, 2010). Station seating should contain at least some units with back and arm rests for the elderly or disabled as it is substantially more difficult to stand up and sit down without the support (See Figure 73). The inclusion of armrests also dissuades people from lying down across benches (APTA, 2010). Also, although aesthetically appealing Orenco’s bench supports laying down and does not provide enough division between seating meaning that one person can consume the entire bench.

Steel seating in many southern locations is seen to be undesirable because it holds heat; however, it has a long life and is easy to maintain. Plastic and wood seating have a shorter life span but do not hold heat the same way (Sound Transit, 2007).

**BC Transit Next Steps**

- Establish minimum seating and arm railing requirements for new rapid transit stations
- Evaluate seating options to ensure that will encourage use and have suitable life spans

*Figure 72 - Good quality seating well protected by enclosure and located out of pedestrian traffic area (Hillsboro, OR)*

*Figure 73 - Good quality seating with back and arm rests (Charlotte, NC)*

Source: Flickr User xbluegoox
6.5.3 Guide to Washroom Facilities

Not every transit station may require a washroom facility located directly on the property but it is essential to establish what facilities will be available to patrons at each location.

It is possible and indeed desirable in many cases to work with developers to establish washroom facilities at adjacent properties. However, it is important to ensure that the facility is tied to the development complex and not a particular tenant as in the case of the convenience store adjacent to Yamhill Station as it could change hands (See Figure 74). If off-site facilities are provided it is important that station users know where it is located and how to get there. Wayfinding signage and adequate lighting are essential as leaving the station at night in search of a washroom could be an unnerving experience. The washroom should be easily visible from the station area and lighting should cover the entire route. It is highly likely that if off-site facilities are established, that a maintenance agreement will be required between the transit agency and the developer (APTA, 2010).

On-site facilities are more desirable at high volume locations and are more easily patrolled by local surveillance. Washroom facilities should not access directly onto the station platform but should rather be set back from the facility to remove it from pedestrian movements and to provide space for its queuing (See Figure 75). Continuous maintenance of the facility is essential as it could easily become an eyesore to users (VTrans, 2002).

BC Transit Next Steps

- Establish a warrant for washrooms at rapid transit stations
- Work with adjacent developers to share use and responsibility for washrooms

Figure 74 - Convenience store adjacent to station allows patrons to use washroom but no certainty that the store or its generosity will remain in the future (Portland, OR)

Figure 75 - Freestanding station washroom also usable by adjacent business patrons (Subiaco, AU)
6.5.4 Guide to Waste Receptacles

Trash and recycling receptacles are necessary to minimize litter at BRT stations as many users have food & drink containers and other items to dispose of before boarding or after alighting a vehicle. The need for waste receptacles is greater if concession facilities are present in and around the station area (APTA, 2010).

Waste receptacle placement on platforms should be conscientiously placed out of pedestrian through routes or in positions that would obscure sightlines. Using multi-bins such as the one shown in Figure 76 can assist in reducing waste receptacle clutter and enhance station aesthetics. At large facilities such as Joyce-Collingwood, receptacles should also be placed adjacent to entrances, washroom facilities, concessions, and any other point where patron congregation is likely (Tri-Met, 2010).

As the CRD has high quality recycling facilities, plastic and paper dispenser should be included in station-areas especially if concessions are available. It is also equally important to understand the clientele using the facility. If they are predominantly businesspeople they will also likely produce large volumes of paper waste, while shoppers or cafe patrons may produce more trash or compost waste (See Figure 77).

Regardless of waste receptacle choice, regular maintenance is critical to station aesthetics as poorly maintained facilities are one of the leading deterrents of station usage (Iseki, et al., 2007).

Figure 76 - Multi-bin waste receptacle eliminates cluttering of bins
Source: www.landscapeonline.com

Figure 77 - An extreme example of not understanding the specific waste needs at a particular station (Toronto, ON)
Source: www-spacingtoronto.ca

BC Transit Next Steps
- Include waste receptacles in station design based on the needs of users (e.g. more paper recycling facilities)
- Support municipal waste reduction strategies by providing a diversity of recycling & composting options (If applicable)
6.5.5 Guide to Concessions

Concession facilities at transit stations can range from basic newspaper or bottle/snack food vending machines up to cafes or convenience stands designed right into the building. The inclusion of concession facilities can:

- Provide a natural surveillance facility (in the case of on-site cafes or convenience stores)
- Reduce boredom while waiting for the next vehicle
- Provide revenue to the transit agency through space rental
- Better integrate transit station with surrounding community rather than it acting like an island of activity

Newspaper vending boxes were available at Joyce-Collingwood and Orenco stations, which addressed the desire of many users to read while waiting for a train and/or while traveling to their destination. In Vancouver the numerous publications that are available has lead to several boxes being installed at Joyce-Collingwood (See Figure 78). This has lead to visual clutter as publishers have different style and colours of bins. One solution is to install a vending device like the one illustrated in Figure 80, which has the ability to store several different publications at the same time (APTA, 2010).

Food vending machines, much like newspaper machines provide patrons with an opportunity to occupy their time while waiting for the bus. It is important in the case of both vending machines to plan their installation along with the inclusion of appropriate waste receptacles. It should also be expected that waste receptacle emptying will need to be increased once the machines are installed.

Vending machines should not be placed with the platform area as they can consume quite a bit of space and are likely to block pedestrian traffic. In the case of newspapers, Joyce-Collingwood has correctly located them on the exterior of the facility but well back of

Figure 78 - Evesore created by oversaturation of newspaper boxes (Vancouver, BC)
Figure 79 - Vending machines located strategically away from pedestrian movements (Subiaco, AU)
Figure 80 - Multiple newspaper machine is more compact and replaces eyesore (Toronto, ON)
Source: torontogp.blogspot.com
the pedestrian travel portion. Joyce-Collingwood has also correctly located its food vending machines cover and well back in corridors to prevent exposure to the elements (See Figure 79). Ensure there is sufficient space for queuing (Sound Transit, 2007; TCRP Quality of Service Manual, 2003).

Cafes or concession booths greatly enhance the rider experience but only make sense in high volume areas or when placed to serve both passengers and the surrounding community. Concession booths can provide all the same services as vending machines and newspaper stands in addition to providing more perishable products such as coffee and sandwiches. Sydney, Australia has a unique program of standardized kiosks that are rented and can then be converted into a variety of shops including, cafes, newsstands, flower shops, and fruit stands (See Figure 82). Figure 81 illustrates how a cafe can in fact be integrated into the station building if desired. Although not always necessary, it may be desirable to provide a minor amount of table seating to complement the facility.

The amount of seating needed is dependent upon available space and the volume or traffic served. Outdoor seating should have the following characteristics (City of Kamloops, Undated):

- Should be movable to permit various arrangements and to allow for easy maintenance
- Should be constructed using sturdy and easy to maintain materials that avoid corrosion
- Should be placed in a clearly defined area away from the general flow of traffic
- Sufficient lighting should be present to clearly define the area
- Should be positioned to have clear sightlines of surrounding area
- Should be frequently maintained by the private business proprietor and kept in a state of good repair

Figure 81 - Cafe integrated into the architecture of a medium-sized transit station (Beveren, Belgium)  
Source: PROCEED, 2009

Figure 82 - Standardized concession stand rented by tenants and used as cafes, flower shops, and newsstands (Sydney, AU)
The ability to reposition furniture is essential as stationary placement has been shown to be less conducive to supporting conversations (Gehl, 2010). As well, movable furniture allows for easier site maintenance and also allows the items to be stored during the winter to reduce wearing.

Equally important is ensuring that sufficient room is provided for queuing at concessions. Based the queuing standards provided within the TCRP’s (2003) *Transit Capacity and Quality of Service Manual* the anticipated amount of space for people queuing will be between 0.65m$^2$ and 0.9m$^2$ depending on societal and space availability factors. When calculating the LOS for any adjacent sidewalks, ensure that an additional 0.5m is calculated to account for shy distance.

**BC Transit Next Steps**

- Review the potential to include vending machines and concessions at rapid transit stations
- Work with local planning authorities to determine how small concessions or cafes can be zoned for on-site use
- If concessions or vending machines are desired at stations, maintain a standard for their implementation and maintenance of any associated facilities

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*Figure 83 - Well designed patio seating located adjacent to a large transit facility (Subiaco, AU)*
This chapter will look at the next steps that must be undertaken by BC Transit before the recommended guidelines in this report can be implemented. It will briefly discuss the continuing need to work with applicable government agencies in ensuring that any new guidelines do not conflict with current policies. Additionally, it is important to ensure that there is the desire and/or political will to participate in strategies that may involve responsibilities and mandates beyond those given to BC Transit.

It will also briefly discuss the need to conduct a thorough review and survey of user needs to determine what station components transit riders believe are absent, need enhancing, or should be otherwise altered to provide a better pedestrian experience.

This chapter will conclude with recommendations for future topics of research that could not be included in this report due to scope and time constraints.

7.1 **CO-ORDINATION WITH OTHER GOVERNMENT AGENCIES**

Transit facilities have often been planned with minimal direct input or co-ordination with other government agencies. This is certainly not to say that other government agencies have not be consulted or included where their standards prevail, but rather that facilities are often planned in a ‘box’ where consultation only occurs when absolutely necessary. This is to say that facility design is largely conducted in-house and consultation only occurs when a proverbial jurisdictional line must be crossed, such as site selection within another jurisdictions right-of-way. This is a slight over-simplification but one need only look at the majority of transit facilities currently in place in Victoria to notice its common disconnect from the surrounding built environment.

This approach is not feasible with many of the guidelines recommended in this report. In order to derive true value from these recommendations, BC Transit will be required to engage external agencies earlier in the station design process and work more closely with them to integrate cross-jurisdictional strategies.

### 7.1.1 Provincial Level Co-ordination

At the provincial level, the majority of consultations supporting these guidelines will be with the Ministry of Transportation & Infrastructure (BC MoT). Historic co-ordination between BC Transit & BC MoT have usually involved the site selection of new transit facilities (E.g. bus stop & park and rides) and minor complementary infrastructure improvements such as crosswalks, curbing & sidewalks. The relationship will need to expand further to allow for more extensive improvements within BC MoT right-of-ways.

Certainly it will still include the permission to install signage such as directional wayfinding, which has occurred in the past; however, strategies to enhance pedestrian connectivity will require more effort. BC MoT adheres to the standards provided in the TAC Geometric Design Guidelines – BC Supplement which is largely focused on major rural arterials where the majority of the Ministry’s jurisdiction lays. Dialogue will involve discussing the possibility of better connected road networks that usually include greater access points/intersections. BC MoT has also historically not been interested in the construction of sidewalks within the right-of-way unless clearly warranted. These are more policy decisions than they are regulations and discussion will be required to determine the feasibility of expanding sidewalk policy to allow for more and wider walkways.
Historically, BC MoT has co-ordinated the installation of new pedestrian crossing facilities. New discussions involving pedestrian connectivity to rapid transit facilities should continue to place emphasis on high quality and well lit crossings, in addition to ensuring that high volume pedestrian movements are planned for during signal timing decision-making. Continued dialogue should also include discussion of improvements to existing crossing facilities in the areas surrounding rapid transit facilities that may require upgrades to handle elevated station patron levels.

Finally, if station property defining features such as bollards are to be placed within the right-of-way it is likely that significant discussions will be required to determine a safe means of doing so. BC MoT will have safe zone requirements that will likely prohibit the placement of immovable objects within the right-of-way so discussion with BC MoT’s Engineering Department will be required to determine if new standards could be drafted for their safe inclusion.

7.1.2 Local Government Level Co-ordination

The level of co-ordination required at the local level is substantially greater than at the provincial level as municipal government will not only possess a good deal of the rights-of-way involved but also control all of the land use and zoning controls regulating the space around the station-areas.

Like at the provincial level, co-ordination of wayfinding signage around station-areas will be essential to ensure their placement is effective and does not create visual clutter. The CID will require extensive cooperation as the projects are often lead by local governments for downtown wayfinding. Although this is a predominantly municipal project, its implications for station wayfinding are great and BC Transit should be an active partner in their development to ensure new rapid transit corridors and stations are clearly defined.

Also similar to co-ordination at the provincial level is the need to be an active stakeholder in the development of pedestrian supportive connectivity through strong road network design. Strong network connectivity has been shown to optimize ridership catchment areas and BC Transit should work with local government transportation & urban planning departments to ensure that new developments are fostering these connections when in close proximity to rapid transit stations. Largely this participation will come during zoning & official community plan reviews to ensure new policies are supportive of these objectives.

Local government will also be the major partner in any sidewalk & lighting discussions as they are the major planners and maintainers of this infrastructure. Although BC Transit is in control of sidewalk & lighting facilities with the station property, these facilities are only as effective as the municipal infrastructure they connect to. BC Transit should engage local engineering staff to ensure that their sidewalks standards are compatible with any widening that may be required to support enhanced transit facilities. Likewise adequate lighting must complement any improvements to municipal sidewalk infrastructure to maintain a safe transit patron environment.

BC Transit has historically had minimal input into the development of the built form surrounding station areas. This is largely because the station facilities provided to date have mainly been too small to take such extraneous components into account. This policy must change when implementing any future rapid transit systems. A great deal of the benefits reaped by communities with rapid transit service is the pronounced change in the quality of the built form surrounding the station-areas. This is only true, though, of communities that have co-ordinated the two initiatives. BC Transit should make participation in
the land use decision-making process a pre-requisite for the installation of rapid transit facilities within a community. This is not to say that BC Transit should be involved in every land use decision but simply that it must ensure that new transit facility potential is being optimized through strong land use and urban design policies.

If BC Transit wishes to pursue the idea of merchant operated concession facilities at rapid transit stations, it should again work with local government to determine the implications of this strategy. It is likely that since this is a new concept within the CRD, a good deal of additional research into its application in other jurisdictions will be necessary.

The CRD offers a broad range of waste services that BC Transit should include at new station areas. As these stations will likely filter more users than most existing facilities, it is important to ensure waste receptacles are provided to support this increase. BC Transit should work with the CRD to institute a waste program at these facilities that provides more than just the simple trash bin. The CRD also offers a full range of recycling and composting that should be considered where appropriate.

Finally, BC Transit should work with local maintenance staff to ensure that any landscaping within the area of the transit facility is well pruned and maintained to remove the potential for hazards. This coordination does currently occur, but with larger facilities the need for continued support will be elevated.

### 7.2 Developing a Better Understanding of User Needs

It is important that BC Transit develop a strong understanding of what users expect to be at these rapid transit facilities before they are designed. Not taking into account user needs can lead to expensive retrofits, which may never function optimally. BC Transit does currently conduct passenger surveys as stated in Chapter 3 - Context, but only one question is devoted to quantifying user perceptions of transit facility amenities, and the answer is that they do not hold them in high regard.

This reports purpose has been to provide examples of how rapid transit facilities can become more desirable places for pedestrians, and it has provided detail on numerous strategies that can support this goal. BC Transits next step is to understand where these strategies fit within its users ranking of station priorities.

Iseki, H. Et al. (2007) conducted a survey of users perspectives at Los Angeles County transit stations, which can be used as a platform for developing a similar survey in Victoria.

Below is a list of some of the questions provided:

- This station area is clean
- There are enough places to sit
- There are places for me to buy food or drinks nearby
- There are public restrooms nearby
- There is shelter here to protect me from the sun or rain
- The signs here are helpful
- It is easy to get schedule and route information at this station
- It’s easy to find my stop or platform
- I feel safe here during the day
- I feel safe here at night
- There is a way for me to get help in an emergency
- This station is well lit at night

This is not by any means an exhaustive list but it is a good beginning at understanding users’ priorities as well as their satisfaction with existing facilities.
Once BC Transit has a better understanding of where user priorities lay, it will be in a better position to determine what strategies should be implemented and what level of investment will be required.

7.3 **Follow up Research**

Due to time and project scoping constraints, it has not been possible to review all elements of rapid transit station design that would make for a desirable user experience. As a result, there is the potential for a great deal of follow up research that could enhance the results and recommendations borne out of this report.

First and foremost, as previously stated BC Transit should invest time and effort in better understanding user needs. There is little value in preparing plans and designs for strategies that may yield minimal results or conversely, overlook strategies that could provide a significant improvement to user satisfaction.

The majority of literature used to support the recommendations in this report, write at length of the need to ensure that new transit facilities make strong linkages to all modes of transit. Further research should be focused toward other modes such as bicycling and how their needs should be accommodated at rapid transit facilities. Cycling infrastructure is more than providing lock ups adjacent to sidewalks. It requires a great deal of connectivity like pedestrians, but it must also contend more closely with automobiles.

Dorothy Belina’s 2009 Master’s Report *A Pilot Study for Bicycle Lane and Intersection Design on Queen Street in Kingston, Ontario Using Canadian and Dutch Design Guidelines* clearly illustrates the need for local transportation authorities to enhance existing bicycle facility guidelines to promote a safer and more connected network. This report discusses only the roadway standards component of the much broader issue of ensuring that all modes are integrated into transportation planning. The next step is to better understand how these cycling networks should connect to rapid transit facilities and what additional services are needed for cyclists in the station-area.

Although planning for persons with disabilities was touched upon in some of the report recommendations, they were often only done because of their mutual benefit for all pedestrians using the facility. There is a great deal of regulation in the US regarding planning for the disabled and as the population of Canada and more specifically, Victoria ages, the need for additional research on this subject will grow.
## Evaluation Criteria

<table>
<thead>
<tr>
<th>Information</th>
<th>Data Collection Methods</th>
<th>How to Rate</th>
</tr>
</thead>
</table>
| **1** Is station wayfinding placed and clearly visible at key decision points in the surrounding community? | Photo-documentation of signage and how it is placed within the community | Score 4/4 must fully demonstrate the following sub-criteria:  
1. Are wayfinding signs placed along corridors within 100m of the station? (Yes=1, No=0)  
2. Do wayfinding signs clearly convey how to get to station for first-time users? (Yes=1, No=0)  
3. Are signs usable by people who have limited capacity to read or speak English? (Yes=1, No=0)  
4. Is additional information provided such as station name and type of transit (i.e. Bus or Rail)? (Yes=1, No=0)  
Score 2/4 must demonstrate sub-criteria 1 & one other sub-criteria  
Score 0/4 will not demonstrate any of the sub-criteria |
| **2** Is wayfinding provided at key decision points within the station-area? | Photo-documentation of signage to show where it is placed  
Survey question asking about the legibility & readability of signs  
Locations mapped to show station-area coverage | Score 4/4 must fully demonstrate the following sub-criteria:  
1. Are signs placed prominently at station platforms and other key locations such as exits, or ticket vending machines? (Yes=1, No=0)  
2. Are signs positioned as to be able to allow a new person to navigate the station at rush hour? (Yes=1, No=0)  
3. Are signs legible and readable? (Yes=1, No=0)  
4. Are signs usable by people who have limited capacity to read or speak English? (Yes=1, No=0)  
Score 2/4 must demonstrate sub-criteria 1 & one other sub-criteria  
Score 0/4 will not demonstrate any of the sub-criteria |
| **3** Does the station area provide payment and system information at major gathering areas? | Photo documentation of signage and their location in relation to ticket vending machines  
Direct observation of vending machine users and whether they appear to be able to use technology efficiently | Score 4/4 must fully demonstrate the following sub-criteria:  
1. Do ticket vending and validation facilities explain clearly and concisely how they are used? (Yes=1, No=0)  
2. Do platform or other central meeting areas provide route and system maps? (Yes=1, No=0)  
3. Does the station provide contact information for additional information if necessary? (Yes=1, No=0)  
4. Does the platform provide a local area street map? (Yes=1, No=0)  
Score 2/4 must demonstrate any two sub-criteria  
Score 0/4 will not demonstrate any of the sub-criteria |

Source:  
### Access

<table>
<thead>
<tr>
<th>Access</th>
<th>Question</th>
<th>Sub-criteria</th>
<th>Score 4/4</th>
<th>Score 2/4</th>
<th>Score 0/4</th>
</tr>
</thead>
</table>
| 1      | Are there efficient pedestrian connections provided between the station-area and the surrounding community? | 1. Does the connection between the station entrance and surrounding land uses avoid grade changes such as stairs or steep hills greater than 6%? (Yes=1, No=0)  
2. Is station entrance within 30 seconds of an intersection? (Yes=1, No=0)  
3. Is the pathway between various station area points and the surrounding land uses direct (as opposed to unnecessarily curving)? (Yes=1, No=0)  
4. Is there a sidewalk or pathway connection to adjacent land uses beyond the immediate street (i.e. corridors to adjacent developments or to secondary streets? (Yes=1, No=0) | Must demonstrate any two sub-criteria | Will not demonstrate any of the sub-criteria | Must demonstrate any two sub-criteria |
| 2      | Are the provided station-area pathways sufficiently wide to allow for uncongested movement from passers-by (includes passing those with mobility devices or strollers)? | 1. Can first time users easily access information on transit arrivals with minimal confusion? (Yes=1, No=0)  
2. Is real-time information provided? (Yes=1, No=0)  
3. Do people know where to expect the vehicle to stop when it arrives? (Yes=1, No=0)  
4. Is the information provided accurate? (Yes=1, No=0) | Must fully demonstrate the following sub-criteria: | | Must fully demonstrate the following sub-criteria: |
### Appendix A - Evaluation Criteria

#### Safety & Security

<table>
<thead>
<tr>
<th>Score 4/4 must fully demonstrate the following sub-criteria:</th>
<th>Score 2/4 must demonstrate any two sub-criteria</th>
<th>Score 0/4 will not demonstrate any of the sub-criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Photo-documentation of conflict points or concealable locations</td>
<td>2. Do walkways avoid making patrons walk around blind corners? (Yes=1, No=0)</td>
<td>Source: AASHTO (2004). Guide for Park and Ride Facilities</td>
</tr>
<tr>
<td>Mapping of deficient areas</td>
<td>3. Is landscaping cut well back of walkways and free of bushes that could be hidden behind? (Yes=1, No=0)</td>
<td></td>
</tr>
<tr>
<td>2. Are the walkways on local streets leading to the station-area sufficiently lit?</td>
<td>4. Is landscaping pruned to maintain a clear sightline through shrubbed areas? (Yes=1, No=0)</td>
<td></td>
</tr>
<tr>
<td>Photo-documentation of light deficient areas</td>
<td>1. Is the lighting along the street free from gaps? (Yes=1, No=0)</td>
<td></td>
</tr>
<tr>
<td>Photo-document any poorly lit areas</td>
<td>2. Are doorways or other concealable locations such as hedges along the walkway lit at night? (Yes=1, No=0)</td>
<td></td>
</tr>
<tr>
<td>3. Are all the streetlights turned on? (Yes=1, No=0)</td>
<td>4. Is street lighting free of obscurity from overgrown trees and awnings? (Yes=1, No=0)</td>
<td></td>
</tr>
</tbody>
</table>

### Appendix A – Evaluation Criteria
<table>
<thead>
<tr>
<th>No.</th>
<th>Question</th>
<th>Requirements</th>
<th>Score Requirements</th>
<th>Source</th>
</tr>
</thead>
</table>
| 3   | Is the perimeter of the station-area and platform sufficiently lit?      | • Mapping of light deficient areas  
• Photo-document any poorly lit areas  
• Survey question regarding user perception of station safety                                                                                      | Score 4/4 must fully demonstrate the following sub-criteria:  
1. Is the lighting in the facility free from gaps? *(Yes=1, No=0)*  
2. Are doorways or other concealable locations such as hedges along the walkway lit at night? *(Yes=1, No=0)*  
3. Are all of the buildings lights turned on? *(Yes=1, No=0)*  
4. Is the walkway lighting free of obscurity from overgrown trees and awnings? *(Yes=1, No=0)* | AASHTO (2004). *Guide for Park and Ride Facilities*                                                                                     |
| 4   | Are adjacent cross-walks clearly lit and demarcated for oncoming vehicles to see? | • Photo-document crosswalk attributes  
• Observe whether users are cross intersections at safe locations                                                                                   | Score 4/4 must fully demonstrate the following sub-criteria:  
1. Are there street lights at the intersection? *(Yes=1, No=0)*  
2. Do lights fully cover the crosswalk component of the intersection? *(Yes=1, No=0)*  
3. Are crossings marked with high visibility paint? *(Yes=1, No=0)*  
4. If there is a mid-block crossing, are activation flashers present to alert drivers? *(Yes=1, No=0)* | AIT (1998). *Design and Safety for Pedestrian Facilities*                                                                                   |
| 5   | Is the station property defined by defensible yet permeable features?    | • Photo-document station area perimeter                                                                                                                                                                       | Score 4/4 must fully demonstrate the following sub-criteria:  
1. Is the property defined by either barriers or bollards? *(Yes=1, No=0)*  
2. Are barriers less than 1m high or otherwise difficult to hide behind? *(Yes=1, No=0)*  
3. Are barriers placed in a fashion that prevents automobiles from errantly entering pedestrian areas? *(Yes=1, No=0)*  
4. Do barriers still allow station users to exit where desired (i.e. sidewalks, access points to adjacent land uses, parking lots)? *(Yes=1, No=0)* | AASHTO (2004). *Guide for Park and Ride Facilities*                                                                                     |
| 6   | Are public emergency telephones available throughout the facility?       | • Photo-document emergency phones  
• Map where phones are located within the facility                                                                                                                                                       | Score 4/4 must fully demonstrate the following sub-criteria:  
1. Are phones positioned at key locations such as near entrance and platform? *(Yes=1, No=0)*  
2. Are phones clearly visible either through lighting or clear signage?  
3. Are public phones available in the area immediately surrounding the station? *(Yes=1, No=0)* | AASHTO (2004). *Guide for Park and Ride Facilities*                                                                                     |
### Are there activities occurring at different times of the day in the surrounding land uses (within 50m of station)?

<table>
<thead>
<tr>
<th>7</th>
<th>Are there activities occurring at different times of the day in the surrounding land uses (within 50m of station)?</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Map surrounding land uses</td>
<td></td>
</tr>
<tr>
<td>• Observe what activities occur at various times of the day</td>
<td></td>
</tr>
<tr>
<td>• Survey question about what amenities around station are used by transit patrons</td>
<td></td>
</tr>
<tr>
<td>Score 4/4 will fully demonstrate the following sub-criteria:</td>
<td></td>
</tr>
<tr>
<td>1. Morning (i.e. residents going to work or school) (Yes=1, No=0)</td>
<td></td>
</tr>
<tr>
<td>2. Afternoon (i.e. retail shopping, cafes &amp; patio bars) (Yes=1, No=0)</td>
<td></td>
</tr>
<tr>
<td>3. Evening (i.e. restaurant, social &amp; recreation facilities) (Yes=1, No=0)</td>
<td></td>
</tr>
<tr>
<td>4. All day activities (i.e. moderate volume street) (Yes=1, No=0)</td>
<td></td>
</tr>
<tr>
<td>Score 2/4 will demonstrate any two of the sub-criteria</td>
<td></td>
</tr>
<tr>
<td>Score 0/4 will not demonstrate any of the sub-criteria</td>
<td></td>
</tr>
<tr>
<td>Source: Gehl (2010). <em>Cities for People</em></td>
<td></td>
</tr>
</tbody>
</table>

### Are surrounding land uses configured in a manner that would allow for 'eyes on the street'?

<table>
<thead>
<tr>
<th>8</th>
<th>Are surrounding land uses configured in a manner that would allow for 'eyes on the street'?</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Photo-document orientation of surrounding buildings</td>
<td></td>
</tr>
<tr>
<td>• Map out where sightlines are</td>
<td></td>
</tr>
<tr>
<td>Score 4/4 will fully demonstrate the following sub-criteria:</td>
<td></td>
</tr>
<tr>
<td>1. Are neighbouring buildings windows oriented toward the station area? (Yes=1, No=0)</td>
<td></td>
</tr>
<tr>
<td>2. Are front yards, patios, or balconies able to see key station areas? (Yes=1, No=0)</td>
<td></td>
</tr>
<tr>
<td>3. Do multi-storey buildings exist in the area that can look down on the station area? (Yes=1, No=0)</td>
<td></td>
</tr>
<tr>
<td>4. Are buildings close enough to hear calls for help? (Yes=1, No=0)</td>
<td></td>
</tr>
<tr>
<td>Score 2/4 will demonstrate any two of the sub-criteria</td>
<td></td>
</tr>
<tr>
<td>Score 0/4 will not demonstrate any of the sub-criteria</td>
<td></td>
</tr>
<tr>
<td>Source: Gehl (2010). <em>Cities for People</em></td>
<td></td>
</tr>
</tbody>
</table>

### Internal Circulation

<table>
<thead>
<tr>
<th>1</th>
<th>Are pedestrians traveling from the transit vehicle to the station or surrounding land uses suitably separated from moving transit vehicles?</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Photograph drop-off area and crossings if present</td>
<td></td>
</tr>
<tr>
<td>• Map route taken between vehicle and station area</td>
<td></td>
</tr>
<tr>
<td>Score 4/4 will fully demonstrate sub-criteria 1 or 2</td>
<td></td>
</tr>
<tr>
<td>1. Is the station designed in a fashion that eliminates the need to cross a running way or gives pedestrians a priority movement? (Yes=1, No=0)</td>
<td></td>
</tr>
<tr>
<td>2. Does the station provide a grade separated crossing of the running-way? (Yes=1, No=0)</td>
<td></td>
</tr>
<tr>
<td>3. If pedestrians are expected to cross the running way, is the route direct and clearly demarcated? (Yes=1, No=0)</td>
<td></td>
</tr>
<tr>
<td>Score 2/4 will demonstrate sub-criteria 3</td>
<td></td>
</tr>
<tr>
<td>Score 0/4 will not demonstrate any of the sub-criteria</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>2</th>
<th>Are stair facilities sufficiently sized to handle pedestrian traffic (Includes consideration for pedestrians moving in alternate directions)?</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Calculate Level of Service</td>
<td></td>
</tr>
<tr>
<td>• Photo-document stairway</td>
<td></td>
</tr>
<tr>
<td>Score 4/4 will have a Level of Service of: A</td>
<td></td>
</tr>
<tr>
<td>• See Table 3 - LOS Calculation for Stairways</td>
<td></td>
</tr>
<tr>
<td>Score 2/4 will have a Level of Service of: C</td>
<td></td>
</tr>
<tr>
<td>Score 0/4 will have a Level of Service of: E or F</td>
<td></td>
</tr>
</tbody>
</table>
### Appendix A – Evaluation Criteria

#### Question 3
- Are corridors sufficiently sized to handle pedestrian traffic?
  - Calculate Level of Service
  - Survey question regarding station congestion
  - Photo-document corridor and any obstructions
  - Score 4/4 will have a Level of Service of: A
    - See Table 1 - LOS Calculation for Corridors and Walkways
  - Score 2/4 will have a Level of Service of: C
  - Score 0/4 will have a Level of Service of: E or F

#### Question 4
- Is fare collection rapid and convenient in order to reduce bottlenecks?
  - Observation of queuing and time to clear backlog
    - Clock how long it takes someone to wait for and complete a transaction
  - Score 4/4 will be at or above highest threshold of relevant Volume-to-Capacity ratio:
    - See Table 4 - Fare Gate Headway and Capacities
    - See Table 2 – Queuing LOS if a ticket vending machine
  - Score 2/4 will be at or slightly above lowest threshold of relevant Volume-to-Capacity ratio
  - Score 0/4 will be below threshold of relevant Volume-to-Capacity ratio

#### Question 5
- Do concession facilities impede the movement of pedestrians (i.e. conflict with people queuing for food)?
  - Calculate Level of Service
    - Observe pedestrian movements and concession queuing
    - Photo-document obstructions
    - Map circulation if complex
  - Score 4/4 will have a Level of Service of: A
    - See Table 1 - LOS Calculation for Corridors and Walkways
  - Score 2/4 will have a Level of Service of: C
  - Score 0/4 will have a Level of Service of: E or F

#### Question 6
- Is the platform sufficiently sized to accommodate pedestrian volumes?
  - Measure and calculate Level of Service (TCRP Ser. Man, 2003)
    - Observe crowding at platform
  - Score 4/4 will have a Level of Service of: A
    - See Table 2 - LOS Calculation for Queueing and Waiting Areas
  - Score 2/4 will have a Level of Service of: C
  - Score 0/4 will have a Level of Service of: E or F

#### Amenities
1. Pedestrian waiting areas offer protection from adverse weather and vehicle exhaust?
   - Survey quality of protection from weather
   - Photo-document pedestrian weather protection
   - Observe whether protection is sufficient
   - Score 4/4 will fully demonstrate the following sub-criteria:
     1. Does platform offer a rain canopy? (Yes=1, No=0)
     2. If applicable, is there protection between the station area and the platform if far apart? (Yes=1, No=0)
     3. Is canopy sufficiently sized to offer protection for all users? If uncertain, use Waiting Area Calculation in Table 2. (Yes=1, No=0)
     4. Are there enclosures to protect against inclement weather (i.e. walls or other wind screens)? (Yes=1, No=0)
   - Score 2/4 will demonstrate any two of the sub-criteria
   - Score 0/4 will not demonstrate any of the sub-criteria
<table>
<thead>
<tr>
<th></th>
<th>Question</th>
<th>Criteria</th>
<th>Source</th>
</tr>
</thead>
</table>
| 2 | Is adequate and good quality seating provided on the station platform and is it protected from adverse conditions? | - Survey quality of platform seating  
   - Photo-document seating arrangement  
   - Observe whether patrons use seating   | Score 4/4 will fully demonstrate the following sub-criteria:  
   1. Is there adequate seating? (Yes=1, No=0)  
   2. Is all seating on the platform covered? (Yes=1, No=0)  
   3. Is seating comfortable for its climate? Too cold or allows water to pool. (Yes=1, No=0)  
   4. Is leaning space available if seating space is at a premium? (Yes=1, No=0)  
   Score 2/4 will fully demonstrate any two sub-criteria  
   Score 0/4 will not demonstrate any of the sub-criteria | TCRP. (2003) Transit Capacity and Quality of Service Manual.  
| 3 | Are washrooms available within the station?                                | - Map location of washroom facilities within and/or around station-area  
   - Survey desire for washroom and waste facilities | Score 4/4 will fully demonstrate the following sub-criteria:  
   1. Is a washroom located within the station area? (Yes=1, No=0)  
   2. Are public washrooms available in surrounding community (ie. Attached mall)? (Yes=1, No=0)  
   Score 2/4 will only demonstrate sub-criteria 2  
   Score 0/4 will not demonstrate any of the sub-criteria | TCRP (2007). Report 118 - BRT Practitioner’s Guide. |
| 4 | Are waste receptacles available throughout the facility?                  | - Observe where waste receptacles exist within and/or outside facility | Score 4/4 will fully demonstrate the following sub-criteria:  
   1. Are receptacles located within the station area? (Yes=1, No=0)  
   2. Are waste receptacles located in surrounding community? (Yes=1, No=0)  
   Score 2/4 will only demonstrate sub-criteria 2  
   Score 0/4 will not demonstrate any of the sub-criteria | TCRP (2007). Report 118 - BRT Practitioner’s Guide. |
| 5 | Are on-site concession stands available?                                  | - Survey question regarding desirability of onsite concessions  
   - Photo-document concession layout  
   - Observe type of concessions available | Score 4/4 will fully demonstrate the following sub-criteria:  
   1. Are amenities present in the area around the station(i.e. newspaper stand, coffee bar, or snack bar)? (Yes=1, No=0)  
   2. Are food/drink or newspaper dispensers present? (Yes=1, No=0)  
   Score 2/4 will only demonstrate sub-criteria 2  
   Score 0/4 will not demonstrate any of the sub-criteria | US DOT (2009). Characteristics of BRT for Decision-Making  
Iseki, H., et al. (2007) Evaluating transit Stops and Stations from the Perspective of Transit Users |
<table>
<thead>
<tr>
<th>Does the food vending area provide a desirable &amp; comfortable location that supports sitting and talking?</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Survey question regarding quality of station-area seating</strong></td>
</tr>
<tr>
<td><strong>Observe passenger interactions at seating areas</strong></td>
</tr>
<tr>
<td><strong>Photo-document seating arrangements</strong></td>
</tr>
<tr>
<td><strong>Measure Level of Service if obstructions to circulation are present</strong></td>
</tr>
<tr>
<td><strong>Score 4/4 will fully demonstrate the following sub-criteria:</strong></td>
</tr>
<tr>
<td>1. Is the seating area covered? <em>(Yes=1, No=0)</em></td>
</tr>
<tr>
<td>2. Is seating is comfortable? <em>(Yes=1, No=0)</em></td>
</tr>
<tr>
<td>3. Does the seating support group discussion? <em>(Yes=1, No=0)</em></td>
</tr>
<tr>
<td>4. Does the seating area have aesthetically pleasing features (i.e. public art, viewscapes, or landscaping)? <em>(Yes=1, No=0)</em></td>
</tr>
<tr>
<td><strong>Score 2/4 will fully demonstrate sub-criteria 3</strong></td>
</tr>
<tr>
<td><strong>Score 0/4 will not demonstrate any of the sub-criteria</strong></td>
</tr>
<tr>
<td><strong>Source:</strong> Gehl (2010). <em>Cities for People</em></td>
</tr>
</tbody>
</table>
## Appendix B - Transit Vehicle Technology & Characteristics

<table>
<thead>
<tr>
<th>Typical Characteristics of Each Transit System</th>
<th>Local Bus</th>
<th>Express or Rapid Bus</th>
<th>Modern Streetcar</th>
<th>Bus Rapid Transit (BRT)</th>
<th>Light Rail Transit</th>
<th>Metro / Subway</th>
<th>Commuter Rail</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>System Speed (including stops)</strong></td>
<td>8 to 25 km/hr</td>
<td>15 to 30 km/hr</td>
<td>15 to 40 km/h</td>
<td>20 to 40 km/h</td>
<td>30 to 50 km/h</td>
<td>40 to 70 km/h</td>
<td>30 to 80 km/h</td>
</tr>
<tr>
<td><strong>People Capacity / Vehicle</strong></td>
<td>40-60</td>
<td>40-110</td>
<td>130-160</td>
<td>75-110</td>
<td>150-200 per car</td>
<td>180-280 per car</td>
<td>100-200 per car</td>
</tr>
<tr>
<td><strong>Running Way</strong></td>
<td>Mixed traffic</td>
<td>Mixed traffic and/or exclusive lanes with traffic signal priority</td>
<td>Mixed traffic and/or exclusive lanes / right of way</td>
<td>Exclusive right of way with signal pre-emption at crossings</td>
<td>Exclusive running way generally at-grade</td>
<td>Exclusive running way fully segregated</td>
<td>Exclusive right of way with priority at grade crossings</td>
</tr>
<tr>
<td><strong>Stop/Station Spacing</strong></td>
<td>&lt; 0.3 km</td>
<td>0.5 km to 2 km</td>
<td>&lt; 2 km</td>
<td>0.5 km to 2 km Connects high-density centres “LRT on rubber tires”; can be guided buses</td>
<td>1 km to 2 km Generally higher capacity than streetcar</td>
<td>1 km to 2 km</td>
<td>&gt;2 km</td>
</tr>
<tr>
<td><strong>Other</strong></td>
<td>Frequent stops; all-day service</td>
<td>Fewer stops; peak-period emphasis</td>
<td>Often confused with LRT</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Source: BC Transit, 2011 Presentation*
## APPENDIX C – AGGREGATED SITE OBSERVATION RESULTS

<table>
<thead>
<tr>
<th>Evaluation Criteria</th>
<th>Yamhill Station</th>
<th>Orenco Station</th>
<th>Agate Station</th>
<th>Joyce-Collingwood Station</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Information</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 Is station wayfinding placed and clearly visible at key decision points in the</td>
<td>●</td>
<td>○</td>
<td>●</td>
<td>○</td>
</tr>
<tr>
<td>surrounding community?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 Is wayfinding provided at key decision points within the station-area?</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>○</td>
</tr>
<tr>
<td>3 Does the station area provide payment and system information at major gathering</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>○</td>
</tr>
<tr>
<td>areas?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 Does the platform area offer information regarding arrival times and waiting bay</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>○</td>
</tr>
<tr>
<td>locations?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Access</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 Are there efficient pedestrian connections provided between the station-area and</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>○</td>
</tr>
<tr>
<td>the surrounding community?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 Are the sidewalks linked to the station-area sufficiently wide to allow for</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>○</td>
</tr>
<tr>
<td>uncongested movement from passers-by?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 Are adjacent intersections supportive of pedestrian crossings?</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>○</td>
</tr>
<tr>
<td><strong>Safety &amp; Security</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 Are pedestrian walkway sightlines obscured by buildings or landscaping?</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>○</td>
</tr>
<tr>
<td>2 Are the walkways on local streets leading to the station-area sufficiently lit?</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>○</td>
</tr>
<tr>
<td>3 Is the perimeter of the station-area and platform sufficiently lit?</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>○</td>
</tr>
<tr>
<td>4 Are adjacent cross-walks clearly lit and demarcated for oncoming vehicles to see?</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>○</td>
</tr>
<tr>
<td>5 Is the station property defined by defensible yet permeable features?</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>○</td>
</tr>
<tr>
<td>6 Are public emergency telephones available throughout the facility?</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>○</td>
</tr>
<tr>
<td>7 Are there activities occurring at various times of the day in surrounding land uses?</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>○</td>
</tr>
<tr>
<td>8 Are surrounding land uses configured in a manner that supports 'eyes on the street'?</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>○</td>
</tr>
</tbody>
</table>
### APPENDIX C – CONTINUED...

<table>
<thead>
<tr>
<th>Evaluation Criteria</th>
<th>Yamhill Station</th>
<th>Orenco Station</th>
<th>Agate Station</th>
<th>Joyce-Collingwood Station</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Internal Circulation</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Are pedestrians traveling from the transit vehicle to the station or surrounding land uses suitably separated from moving transit vehicles?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>2. Are stair facilities sufficiently sized to handle pedestrian traffic?</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>☐</td>
</tr>
<tr>
<td>3. Are corridors sufficiently sized to handle pedestrian traffic?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>4. Is fare collection rapid and convenient in order to reduce bottlenecks?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>5. Do concession facilities impede the movement of pedestrians?</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>6. Is the platform sufficiently sized to accommodate pedestrian volumes?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td><strong>Amenities</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Pedestrian waiting areas offer protection from adverse weather and vehicle exhaust?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>2. Is adequate and good quality seating provided on the station platform and is it protected from adverse conditions?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>3. Are washrooms available within the station?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>4. Are waste receptacles available throughout the facility?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>5. Are on-site concession stands available?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>6. Does the food vending area provide a desirable &amp; comfortable location that supports sitting and talking?</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>
APPENDIX D – ADDITIONAL RECOMMENDED GUIDELINE INFORMATION

D.1 BASIC WAYFINDING CONCEPTS

The objective of wayfinding is to have its user successfully navigate between two points of the built environment. This can be accomplished in various ways but is most frequently done either through directional signage and familiar architectural cues, or through environmental communication based on station design.

The TCRP Report 12 Guidelines for Transit Facility Signing and Graphics (1996) argues that a successful wayfinding strategy must take into account five basic considerations:

1. Service Identity
2. Spatial Planning
3. Environmental Communication
4. Content & Placement
5. Legibility & Readability

Service Identity

Put simply ‘service identity’ refers to the branding and distinction of transit services. As transit systems often offer numerous services such as, conventional, HandyDART, community, and express routing it becomes crucial for agencies to convey these distinctions for the clarity of users.

Each service becomes responsible for its individual identity, for example, BRT must convey that the service is faster than conventional bus and that it operates within a distinct right-of-way with unique station facilities. Service identity also includes distinctive branding such as the use of logos & signage, unique station architecture and specialized service information.

A properly implemented identity will also explain how a service fits in with the other services provided by an agency. Users should know, for example, that BRT stations are the main transportation spine but that conventional bus services play a major support role in connecting users to points in the broader system.

Spatial Planning

Spatial planning is the process with which a wayfinding designer defines the circulation of the system and how all the internal parts are connected. Not only must a station’s wayfinding strategy link the entrance to the primary functions, but it must also do the mirror opposite and effectively link users to exit points.

This spatial planning of the circulation routes in turn requires a decision plan, which outlines the location of entrances/exits, corridors and primary functions early in the design phase. Furthermore, circulation patterns should be broken into trip segments such as fare collection and boarding/alighting. By defining and planning these segments a circulation plan emerges.

Environmental Communication

Environmental communication builds upon spatial planning by adding the visual, tactile and auditory cues that will be used to navigate the trip segments. Architectural features that direct the user to and through the facility should be designed in a manner that acts like ‘natural signing’ to the primary functions when possible. In addition, entrances to stairways or elevators should face prominently toward the street to make a direct and highly visible connection to the internal features.

Internal signage will be used to reinforce circulation patterns within the facility and to label features such as emergency panels, which in critical moments should be easily visible. Although much less under transit agency control, these concepts also apply to the street.
networks around a station. A direct sidewalk route will have fewer decision points and require less signage.

Content & Location

Although both content & location are crucial to a successful wayfinding strategy, location of the signage should be the first consideration during planning. The mistake is often made to place signs at intersections but this is too late and they should in fact be placed shortly before a decision is required to give time to process the information. In order to establish an acceptable location for the required information, the designer must take note of the physical characteristics of the setting, for example:

1) Light levels
2) Density of people using the facility
3) Ceiling heights
4) Corridor widths

Using the trip segment approach facilitates this planning because it will identify the decision points within the station and largely determine the information that still needs to be conveyed to users to complete their journey.

Legibility & Readability

It should first be noted that legibility & readability are distinct concepts and are not interchangeable. TCRP Report 12 (1996) defines the two as such, “Legibility is the ease with which information is able to be perceived by the senses. Readability is the ease with which information can be understood” (p.11).

Two common mistakes are made when providing information, 1) the information is not legible (e.g. Obstructed, poorly located, too small, garbled, or too busy to be understood), or 2) the information is not readable (e.g. it is perceived but the message cannot be understood).

To mitigate the potential for these mistakes a designer should consider several factors:

- Design using accepted standards
- Be aware of the importance of good sign placement
- Maintain good sightlines & sight distances
- Ensure good lighting levels
- Maintain clear message content

D.2 ADDITIONAL SITE DESIGN CONSIDERATIONS

Site design and/or redevelopment around a rapid transit facility should make the following considerations:

- Neighbourhood and/or commercial centres should be located and defined as the main focus of pedestrian movements
- Alignment of walkways between and through sites should always strive to be as short as possible
- Barriers such as walls, landscaping & ditching should not be placed in a manner that inhibits movement along a corridor
- Where potentially ambiguous, clearly define pedestrian access ways through striping, delineation with landscaping, curbing, or textured paving
- Ensure pedestrians are provided direct access to adjacent building entrances rather than making them walk through parking lots or fields
- Provide separate access points to the station-area for pedestrians and vehicles to mitigate conflicts
- Orient stations and adjacent buildings toward minor local streets or pedestrian plazas and allow vehicles to access via major arterials
- Seek to connect the station-area with established paths or cycle ways wherever possible (WS DOT, 1997)
### D.3 City of Portland Sidewalk Dimension Guidelines

<table>
<thead>
<tr>
<th>Width (m)</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.6 m</td>
<td>Recommended in Pedestrian Districts, especially for arterial streets or where ROW width is 24.5 m (80-40’).</td>
</tr>
<tr>
<td>3.7 m</td>
<td>Recommended for City Walkways, for local streets in Pedestrian Districts, and for streets where ROW width is 18.2 m (60-40’). Accepted for City Walkways where ROW width is 15.2 m (50-40’).</td>
</tr>
<tr>
<td>3.4 m</td>
<td>Recommended for Local Service Walkways where ROW width is 15.2 m (50-40’). Accepted for City Walkways where ROW width is 15.2 m (50-40’).</td>
</tr>
<tr>
<td>3.0 m</td>
<td>Recommended for Local Service Walkways in residential zones of R:7 or less dense where ROW width is less than 15.25 m (50-40’).</td>
</tr>
<tr>
<td>2.7 m</td>
<td>Not recommended for new construction or reconstruction. Accepted in existing constrained conditions when increasing the Sidewalk Corridor is impractical. Note: Minimum Sidewalk Corridor for placement of street trees. Street area not allowed in Furnishing Zone less than 0.65 m (4’-0’).</td>
</tr>
<tr>
<td>Less than 2.7 m</td>
<td>Not recommended. Accepted in existing constrained conditions when increasing the Sidewalk Corridor width is not practicable.</td>
</tr>
</tbody>
</table>

Source: City of Portland, 1998

### D.4 General Objectives of Transit Facility Lighting

- Promote safety by identifying and properly illuminating areas and elements of potential hazard. Of special concern are potential tripping hazards such as at entry to vertical circulation elements and at platform edges where crowding and rapid transfer to and from trains or vehicles can be anticipated.
- Enhance the system’s visual and functional clarity by differentiating between site circulation networks such as drop-off zones and parking areas, station entrances, stairways or elevators, fare vending areas, platforms, tunnels, maintenance shops, and storage yards. Adequate lighting is particularly important to partially sighted individuals, who frequently depend on public transit for transportation.
- Maximize legibility of signs and self-illuminating message displays, which will require quite different approaches to lighting them and the surrounding area (Sound Transit, 2007).
### D.5 Interior & Exterior Lighting Levels

<table>
<thead>
<tr>
<th>Table 1 - Interior Location Lighting</th>
<th>Illuminance/Lux (Measured at Ground-Level)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Station Platforms</td>
<td>215</td>
</tr>
<tr>
<td>Customer Emergency Stations</td>
<td>160</td>
</tr>
<tr>
<td>Concessions</td>
<td>215</td>
</tr>
<tr>
<td>Staff Rooms</td>
<td>215</td>
</tr>
<tr>
<td>Stairs, Elevators, Escalators</td>
<td>160</td>
</tr>
<tr>
<td>Mechanical Rooms, Toilets</td>
<td>160</td>
</tr>
<tr>
<td>Storage/Custodial Rooms</td>
<td>160</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Table 2 - Exterior Location Lighting</th>
<th>Illuminance/Lux (Measured at Ground-Level)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Station Platforms – Covered</td>
<td>50</td>
</tr>
<tr>
<td>Station Platforms – Uncovered</td>
<td>50</td>
</tr>
<tr>
<td>Customer Emergency Stations</td>
<td>107</td>
</tr>
<tr>
<td>Fare Vending Area</td>
<td>107</td>
</tr>
<tr>
<td>Parking Lots, Parking Garages, and Access Ways</td>
<td>See IESNA standards for specific applications</td>
</tr>
<tr>
<td>Pedestrian Circulation Paths in Parking Areas</td>
<td>See IESNA standards for specific applications</td>
</tr>
<tr>
<td>Load, Unload, Passenger Drop-off, Bicycle Stands</td>
<td>50</td>
</tr>
<tr>
<td>Pedestrian Walkways (adjacent to roadways)</td>
<td>50</td>
</tr>
<tr>
<td>Outdoor Plazas</td>
<td>50</td>
</tr>
<tr>
<td>Bus-Boarding Zones</td>
<td>50</td>
</tr>
<tr>
<td>Elevators &amp; Stairways (outdoor entrances)</td>
<td>107</td>
</tr>
<tr>
<td>Bus Roadways</td>
<td>50</td>
</tr>
</tbody>
</table>

Source: Sound Transit, 2007; IESNA, 2010

### D.6 Steps to Sizing Platforms

When sizing a platform the following steps should be taken:

1. Based on the desired LOS, choose the average patron space
2. Adjust as necessary for unique passenger characteristics
3. Estimate the maximum passenger demand for the platform at a given time
4. Calculate the required waiting space by multiplying the average space per person by the maximum passenger demand
5. Calculate the additional walkway width needed by using the Guide to Walkways & Corridors calculations above
6. Calculate the queue storage space required at exit points by referring to Table 5
7. Consider the additional platform space that will be unused, including dead areas and physical obstructions
8. Add 0.3m to 0.5m buffers around platform and other obstructions
9. Calculate the total platform area by summing the calculations from above steps

The following formula can help determine the required area with the station or stop (APTA, 2010):

\[
\text{Area} = P_{\text{max}} \times (\text{desired square meter per passenger}) + A_{\text{inf}}
\]

Where \(P_{\text{max}}\) is the maximum number of anticipated passengers in the station/stop at any given time, and \(A_{\text{inf}}\) is the area required for station/stop infrastructure.
REFERENCES


LTD (2009). EmX FAQ. Lane Transit District. Online: http://www.ltd.org/search/showresult.html?versionthread=6d517154d17fc3e09be84a0ee196bd7b.


