Calgary

GREEN LINE URBAN INTEGRATION

Hatch | ZGF | Sturgess | IBI | Stantec

GLUI

Green Line Urban Integration – Volume II | 12 January 2018 | Revision 3 | Final | H-351173-UD-REP-00-PG-CR0002

TABLE OF CONTENTS

i. INTRODUCTION

GLUI VOLUME 2

GLUI Volume 1 introduced the concept of urban integration, its importance, its relationship to the Vision for the Green Line, as well as a series of community-derived guiding principles. Volume 1 established four distinct LRT typologies, defining the conceptual look and feel as well as the level of enhancement for transit owned and operated assets within the LRT environment. It then described a methodology of assigning typologies to each segment of the alignment, using the alignment for the Green Line as an example.

GLUI Volume 2 assumes that the reader has read and is familiar with Volume 1. The purpose of Volume 2 is to present a guideline document to further address urban integration by detailing how to generally apply the material and design options as a comprehensive urban integration framework. It is meant to provide guidance on the general look and feel of the LRT environment, but is in no way meant to address every condition that may be found in the network. Certain exceptions do and will apply, and it is up to the project team to satisfy the intent of GLUI, while using their best judgement when situations arise that challenge the application of GLUI.

GLUI Volume 2 includes a catalogue of potential design and material options for these components, constituting a range of acceptable solutions. This is followed by a matrix of infrastructure categories and individual components organised by LRT typology. The catalogue of design and material options set forth in Volume 2 are not binding but serve to provide guidance on design and material choices available to project teams.

GLUI applies to current LRT projects- the Green Line, as well as all future light rail transit projects. While the intent is not to apply it retroactively to existing stations and alignments, the guidance contained herein could be used to inform renovations to existing stations and plazas, and to revitalize existing alignments and transit corridors.

The documentation contained with GLUI Volume 2 will be used to help support stakeholder engagement. GLUI Volume 3 will determine final design and material selections through contractual language and will form part of the procurement documents for the Green Line Stage 1 (16 Avenue to Shepard). Note that all volumes of GLUI have a purposeful and strategic focus on rail transit given the procurement schedule of Stage 1 work for the Green Line.

1.0 LRT TYPOLOGIES

1.1 TYPOLOGY 1

OBJECTIVE

- To minimize interactions between the LRT and surrounding environment while still designing an aesthetically pleasing corridor

CONTEXT

- LRT in its own right-of-way
- At the side or median of major roads, adjacent to highways, freight rail/industrial, park/open space
- Can be located in suburban neighbourhoods

CROSSINGS/ACCESS

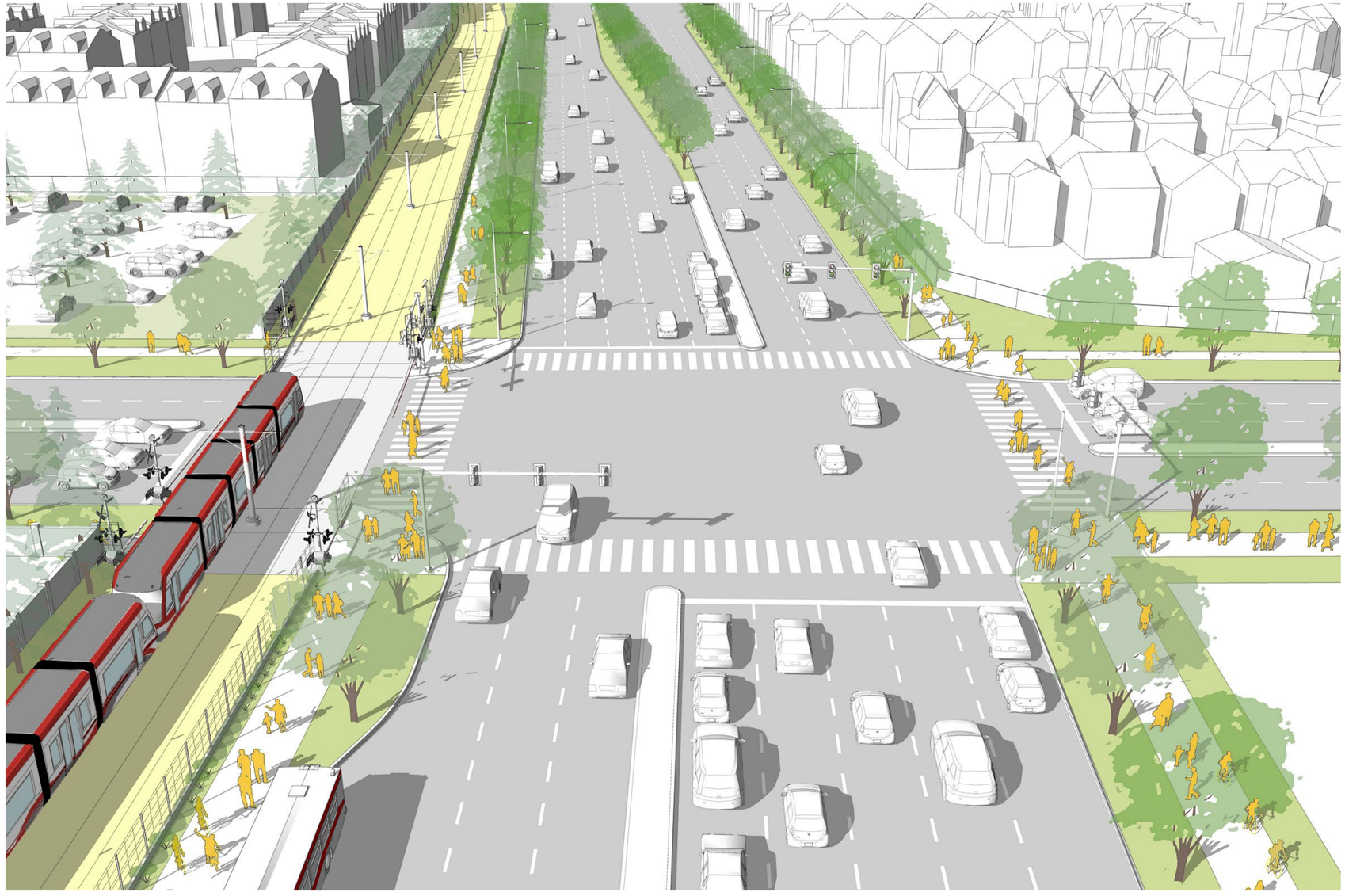
- Typically at-grade crossings for cars, pedestrians and cyclists controlled by gates.
- Some grade separations may be required
- LRT right-of-way typically fenced, although in certain instances, other means of physical separation may be used

URBAN INTEGRATION

- Transit plazas are included and can be enhanced community civic space
- Enhanced sidewalk public realm to encourage walking, civic life and attract Transit Oriented Development (TOD) (where adjacent streets are present and appropriate for pedestrian mode)
- Surface treatment within the right-of-way, fencing style and height, landscaping determined by context sensitivity

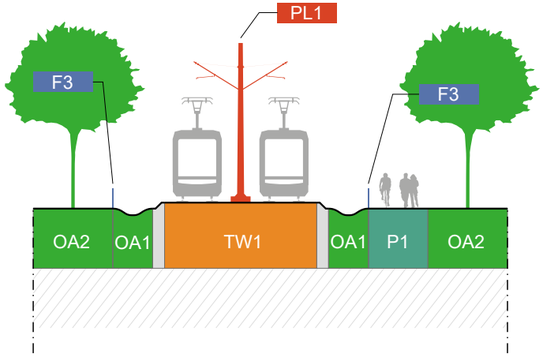
EXAMPLE SEGMENT

- 52 Street SE

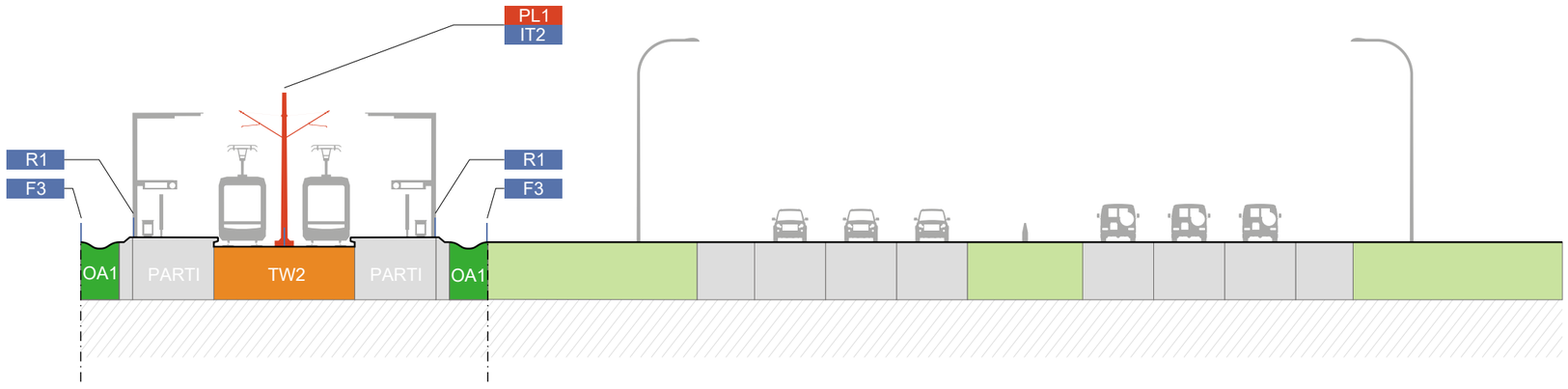


Enhanced design treatments in an exclusive, LRT right-of-way with an adjacent arterial

TYPOLOGY 1: INFRASTRUCTURE COMPONENTS



OPEN SPACE

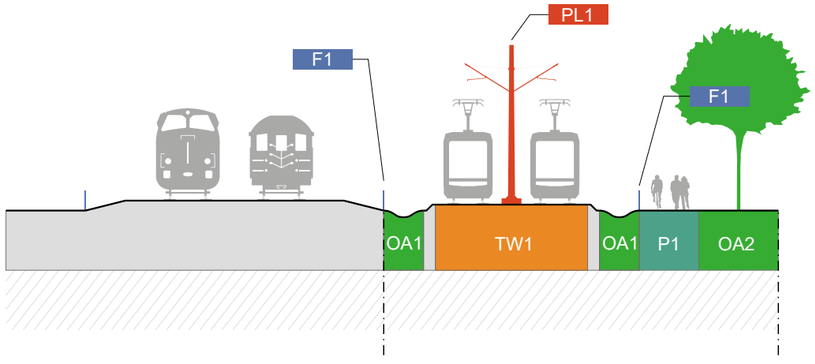


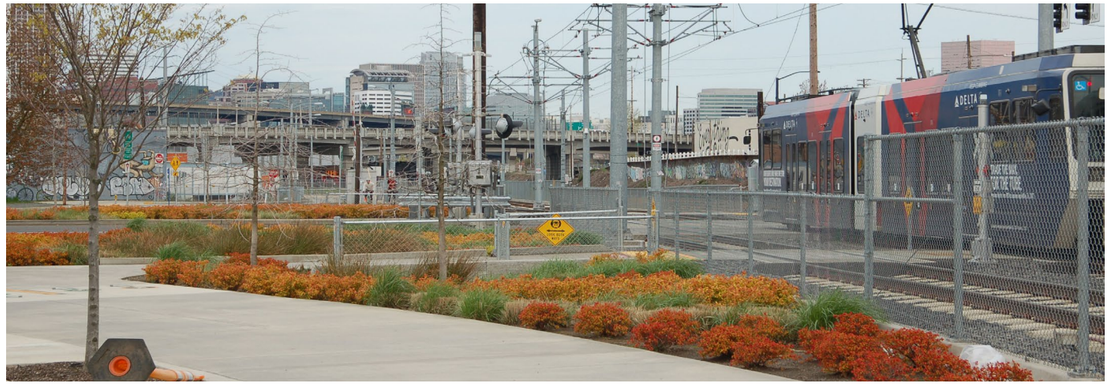
SKELETAL ROAD

LEGEND

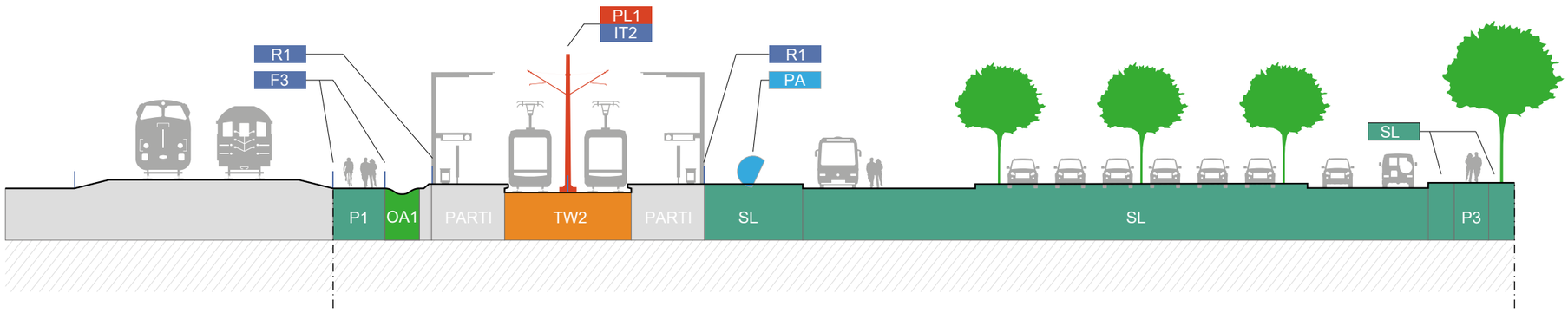
- STATION AREA
- LANDSCAPE ARCHITECTURE
- LANDSCAPE ARCHITECTURE: HARDSCAPE AND STATION LANDSCAPING
- FENCING AND RAILINGS
- OCS SYSTEM
- TRACKWAY
- LRT STRUCTURES
- PUBLIC ART
- ROADWAY
- WORK LIMITS - VARIES

OA1, TW2, etc. FOR CODES, REFER TO MATRIX

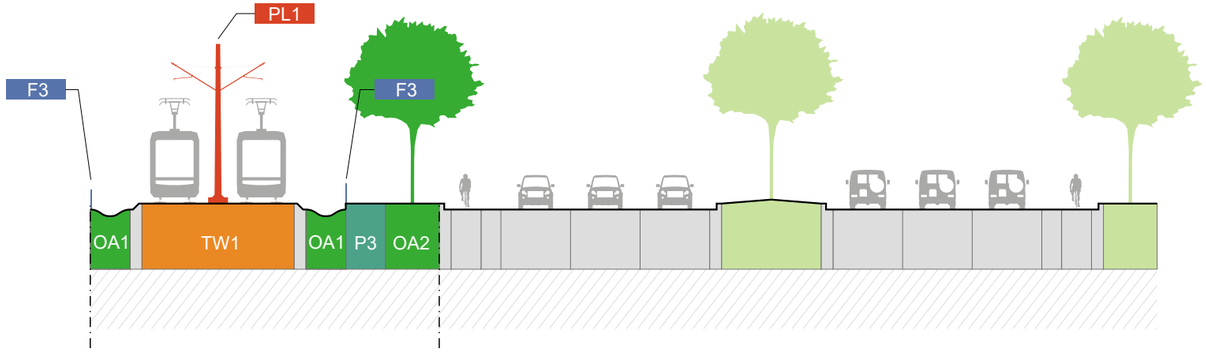




FREIGHT/INDUSTRIAL: NON-STATION



FREIGHT/INDUSTRIAL: STATION

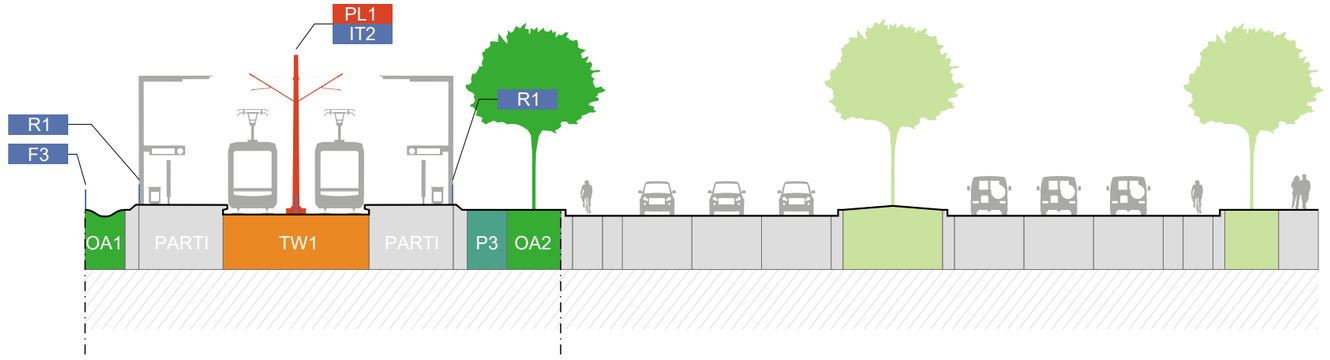


SUBURBAN MAJOR ARTERIAL: NON-STATION

LEGEND

- STATION AREA
- LANDSCAPE ARCHITECTURE
- LANDSCAPE ARCHITECTURE: HARDSCAPE AND STATION LANDSCAPING
- FENCING AND RAILINGS
- OCS SYSTEM
- TRACKWAY
- LRT STRUCTURES
- PUBLIC ART
- ROADWAY
- WORK LIMITS - VARIES

OA1, TW2, etc. FOR CODES, REFER TO MATRIX



SUBURBAN MAJOR ARTERIAL: STATION

VISUAL CATALOGUE: TYPOLOGY 1

LANDSCAPE ARCHITECTURE

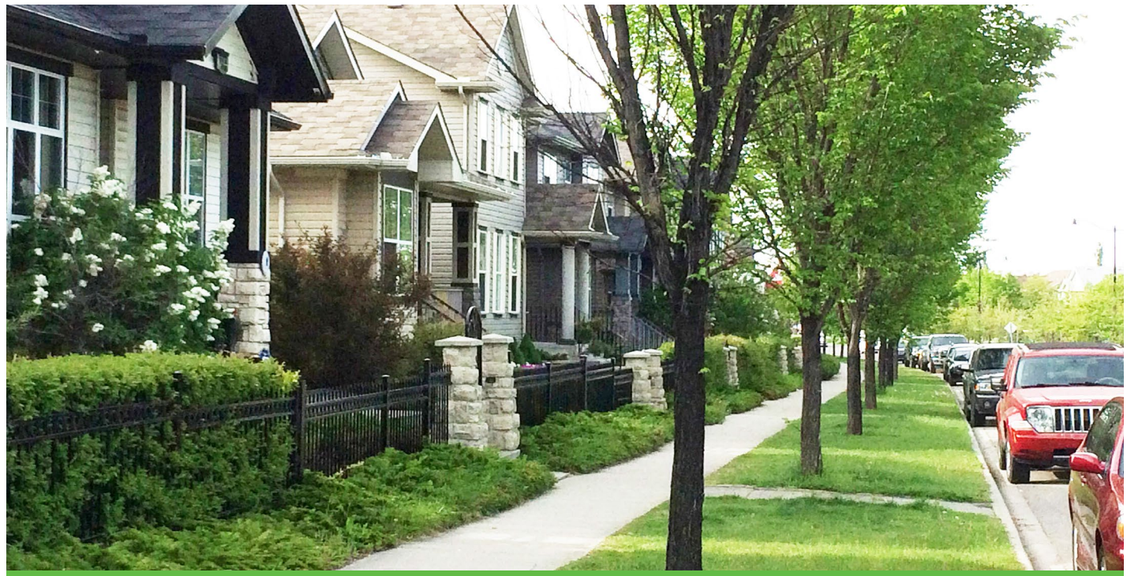
OPEN AREA

OA1 Hydroseeded grass open area

OA2 Grass lawn and mixed trees open area

LANDSCAPE ARCHITECTURE

BOULEVARD



B1 **Boulevard: grass and trees**

LANDSCAPE ARCHITECTURE

MEDIAN

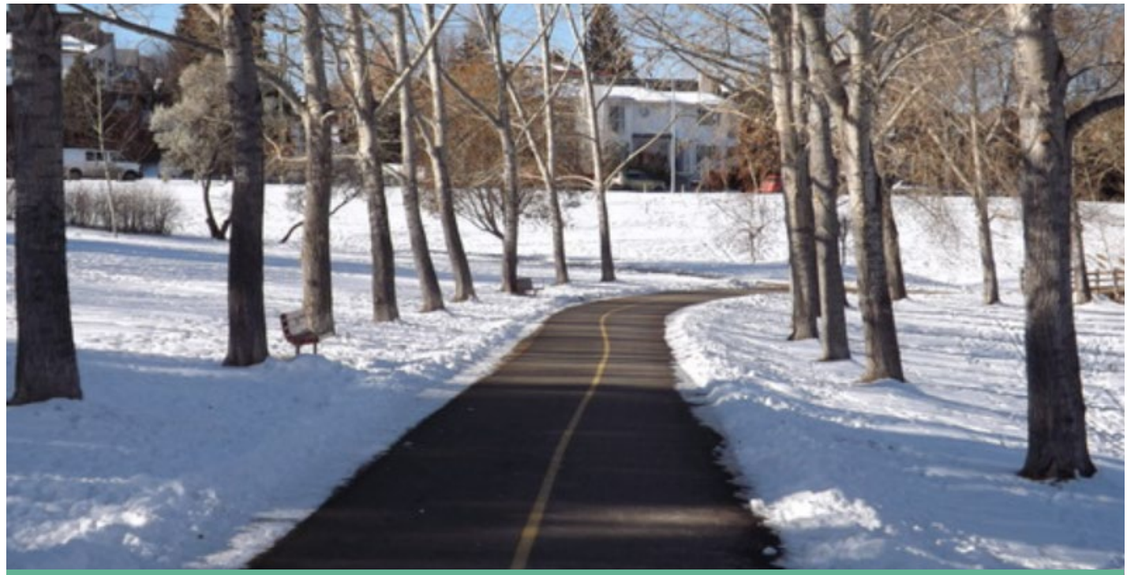
M1 Median: natural grasses (swale)

M2 Median: natural grasses and trees

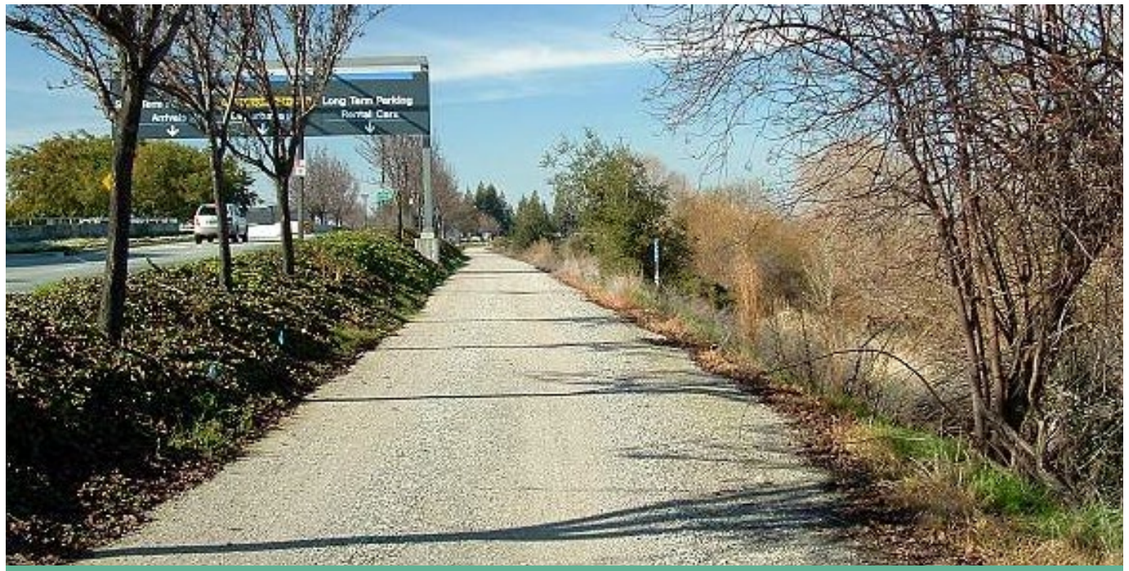
M3 Median: rough aggregate

LANDSCAPE ARCHITECTURE

PATHWAYS



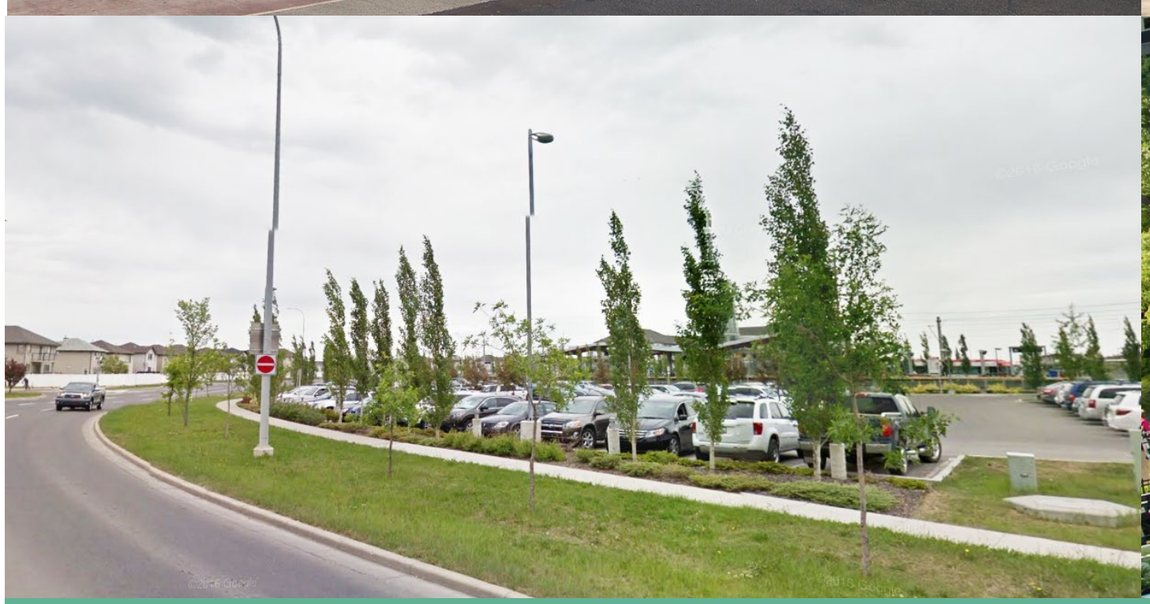
P1 Asphalt MUP



P2 Gravel trail

P3 Concrete sidewalk

LANDSCAPE ARCHITECTURE
STATION LANDSCAPING



SL STATION LANDSCAPING

CROSSINGS

CROSSINGS

C1 Grade-separated crosssing

C2 At-grade crossing with gates

CROSSINGS

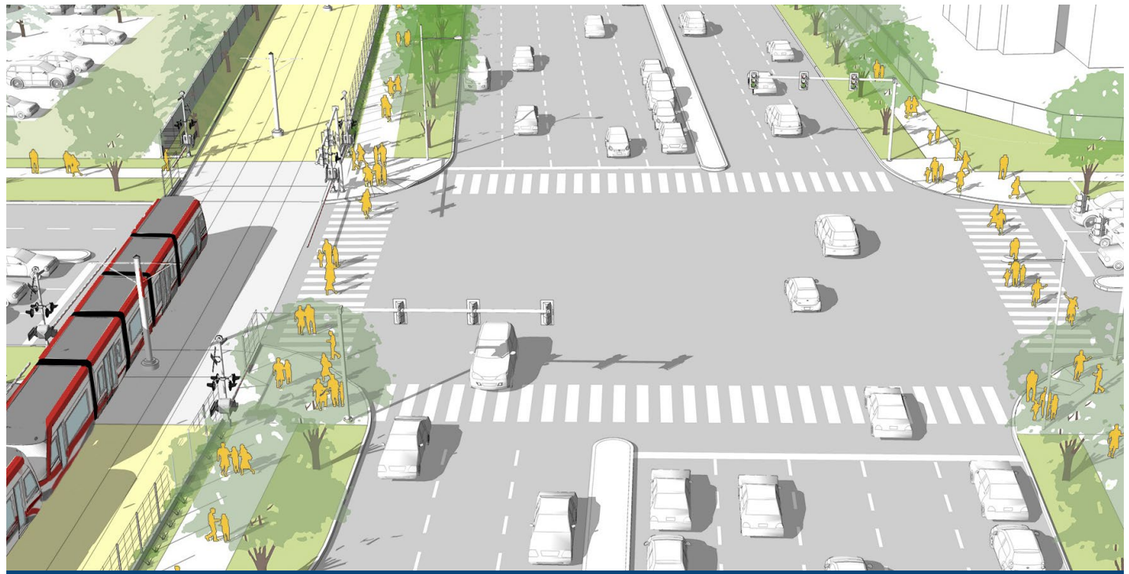
NON-STATION INTERSECTION

IS1 **Non-station intersection - gated**

(Note: different image unique to Typology 1)

CROSSINGS

STATION INTERSECTION



IS2 **Station intersection - gated**

(Note: different image unique to Typology 1)

FENCING + RAILINGS

FENCING

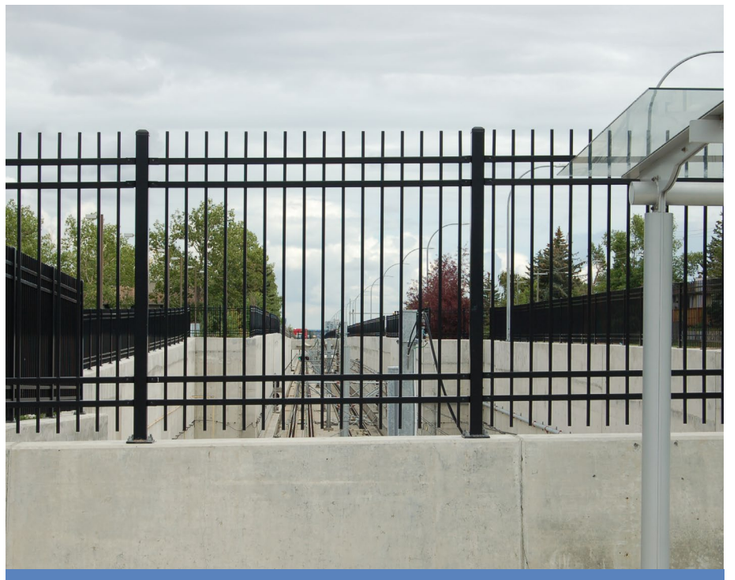
F1 Galvanised chain link fence

F2 Coated chain link fence

F3 Coated wire mesh fence

F4 Galvanised metal punched or cut panel fence

F5 Coated metal punched or cut panel fence



F6 Painted or coated metal picket fence

FENCING + RAILINGS

INTER-TRACK BARRIER

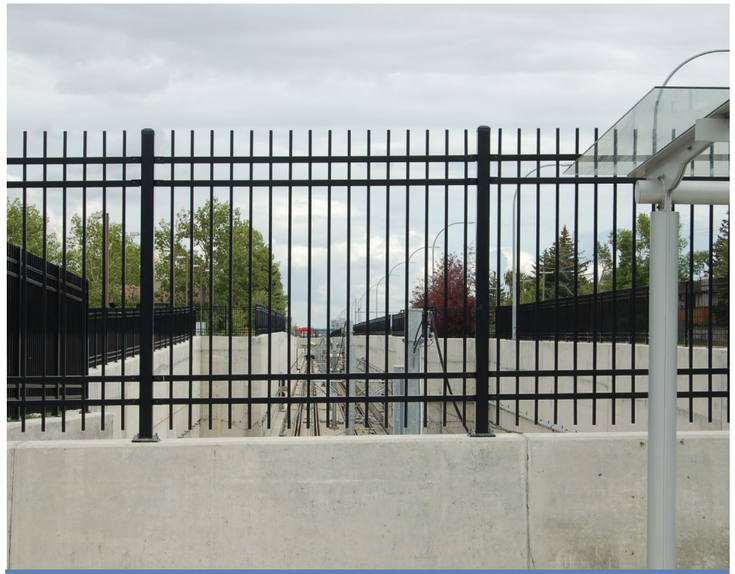
IT1 Inter-track barrier: bollard and chain/ cable

IT2 Inter-track barrier: galvanised metal punched or cut panel

IT3 Inter-track barrier: post and rail

FENCING + RAILINGS

STATION RAILING



R1 Station railing: painted or coated metal picket

R2 Station railing: artist collaboration

R3 Station railing: weathering steel

R4 Station railing: stainless steel frame with glass panels

R5 Station railing: galvanised metal punched or cut panel

OVERHEAD CONTACT SYSTEM (OCS)

OVERHEAD CONTACT SYSTEM - POLES

PL1 **Pole: round/beveled galvanised steel poles- single use**

OVERHEAD CONTACT SYSTEM (OCS)

OVERHEAD CONTACT SYSTEM - WIRES

W1 Aesthetically Treated Simple Catenary Wire with Low Profile (SCAT-LP)

W2 Simple Catenary Auto Tension (SCAT)

TRACK

TRACK

TW1 Ballasted track

TW2 Direct fixation track

LRT STRUCTURES

RAIL BRIDGE

BR **Bridges - rail**

LRT STRUCTURES

PEDESTRIAN BRIDGE

BR **Bridges - pedestrian**

LRT STRUCTURES

PORTAL-BARRIER

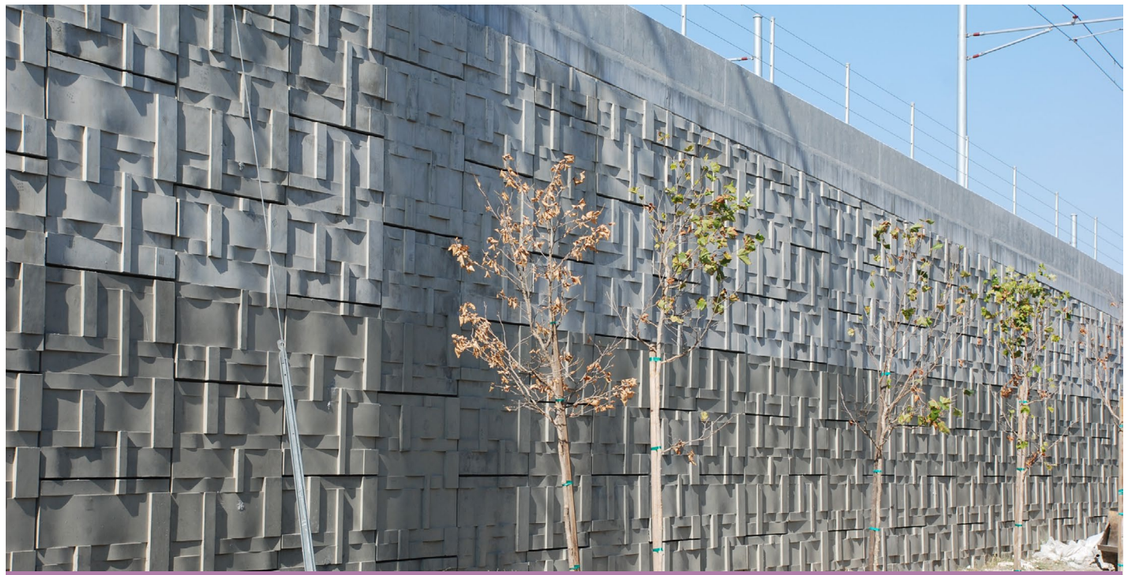
PB1 Portal- barrier: concrete

PB3 Portal-barrier: fencing

LRT STRUCTURES

RETAINING WALLS

RW1 Retaining walls: cast-in-place, form-liner



RW2 Retaining walls: MSE- large cell, form-liner

RW3 Retaining walls: MSE- CMU

RW4 Retaining walls: gabion, rock or glass aggregate

LRT STRUCTURES
SOUND ATTENUATION WALLS

RW5 Sound attenuation walls: precast concrete formliner

RW6 Sound attenuation walls: composite - patterned

LRT STRUCTURES

SCREENING WALLS

RW7 Screening walls: pre-cast concrete - formliner

RW8 Screening walls: composite - patterned

RW9 Screening walls: timber panels

RW10 Screening walls: metal panel

SYSTEMS BUILDINGS

TRACTION POWER SUBSTATION (TPSS), SIGNAL AND COMMUNICATIONS BUILDING (SIGCOMM)

SYS1 Metal framing and cladding

SYS2 CMU with metal mesh cladding

SYS3 CMU walls, metal roof

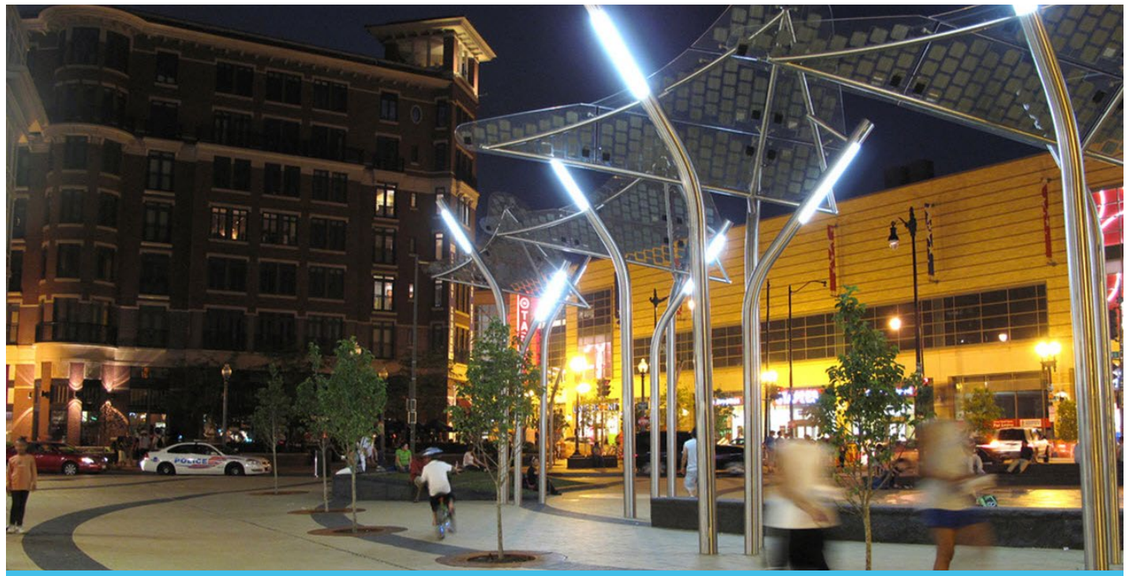
SYSTEMS BUILDINGS

OPERATOR BREAK BUILDING (OBB)

SYS6 Operator break building (OBB): metal cladding, roofing, glass curtain wall

OTHER

PUBLIC ART



PA Public art: free standing, solar lights

PA Public art: free standing, sculpture

PA Public art: integrated, glass windscreen

PA Public art: integrated art tiles

1.2 TYPOLOGY 2

OBJECTIVE

- To embrace design features that subtly separate the LRT and surrounding environment, while still providing an integrated look and feel

CONTEXT

- LRT operates on an exclusive trackway, adjacent to shared environment; aesthetics are critical as neighbourhood faces the corridor
- In median or side of an urban street

CROSSINGS/ACCESS

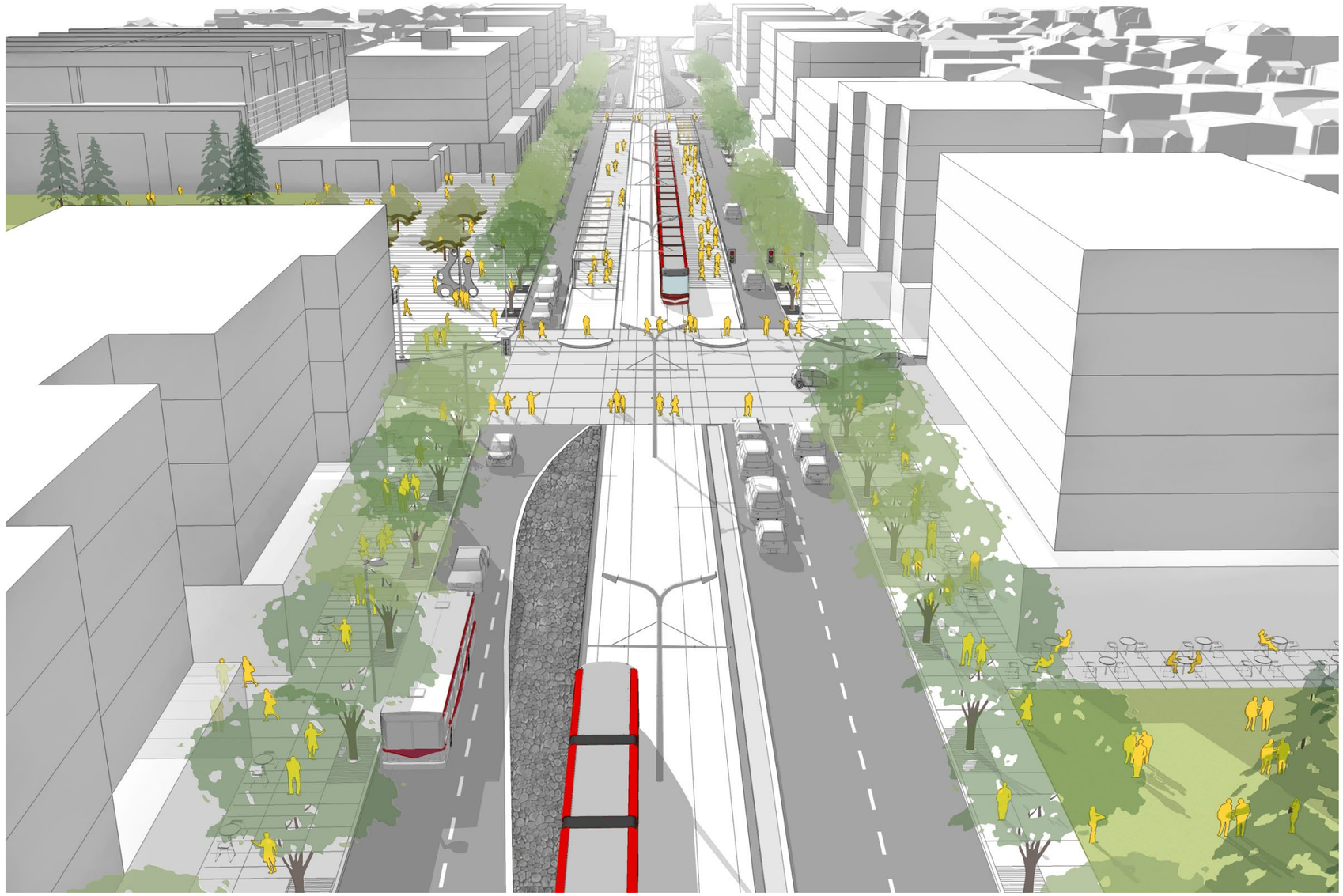
- Signalized vehicle, pedestrian and cyclist crossings at intersections; controlled pedestrian-only crossings between intersections
- Crossings may have crossing protection
- Increased pedestrian crossings at controlled intersections reflective of the existing community grid spacing and road network

URBAN INTEGRATION

- Transit plazas are included and can be enhanced community civic space
- Enhanced sidewalk public realm to encourage walking, civic life and attract TOD
- Track type, track protection, landscaping determined by context sensitivity

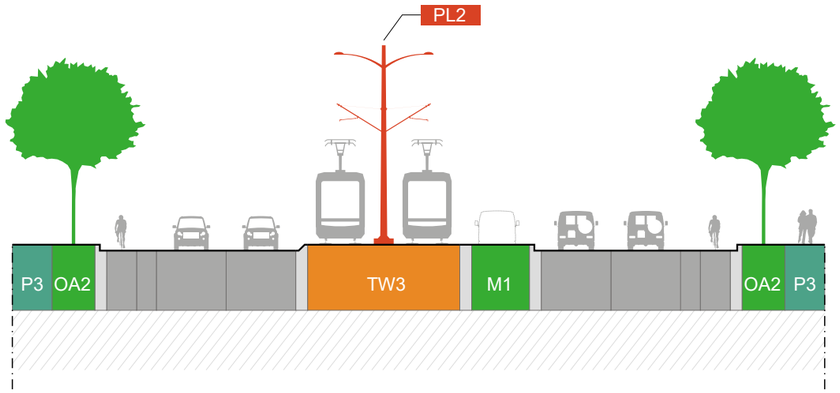
EXAMPLE SEGMENTS

- Centre Street/20 Ave N to McKnight Boulevard – MDP Urban Corridor
- Centre Street/64 Ave N to Beddington Boulevard – MDP Residential – Developed/Established

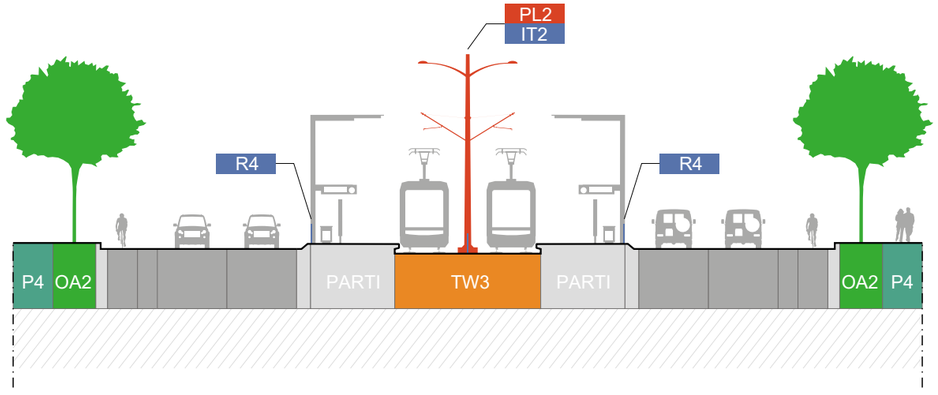


Surface LRT fully integrated into a mixed modal, urban street at a station with major TOD and enhanced public realm

TYPOLOGY 2: INFRASTRUCTURE COMPONENTS



LOCAL ARTERIAL STREET: NON-STATION

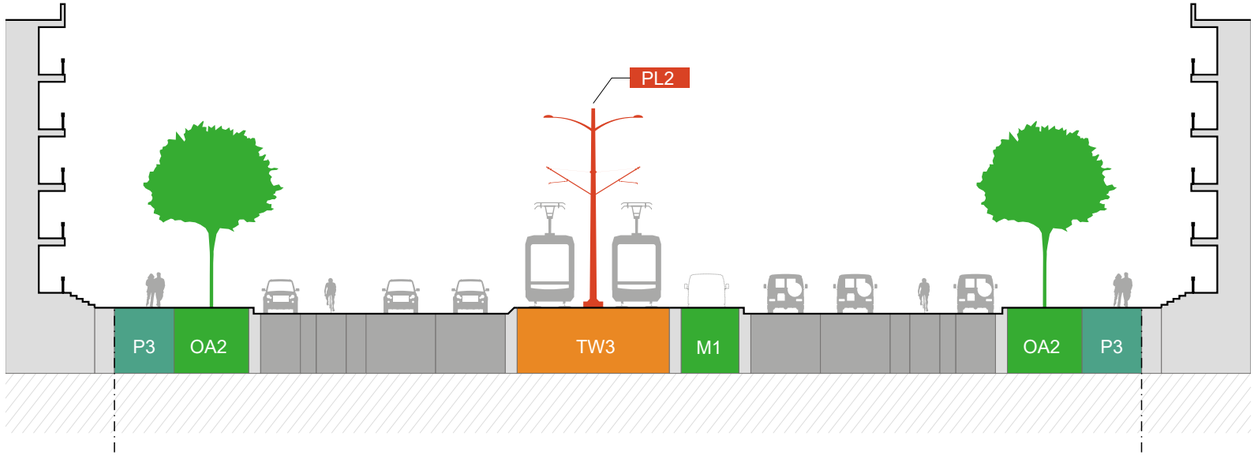


LOCAL ARTERIAL STREET: STATION

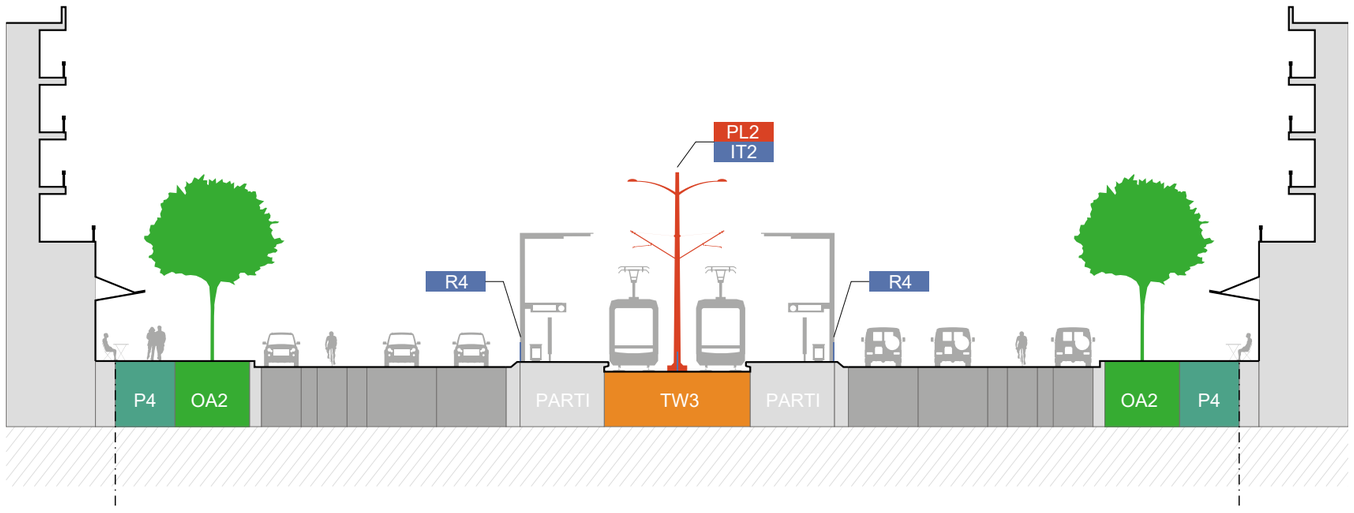
LEGEND

- STATION AREA
- LANDSCAPE ARCHITECTURE
- LANDSCAPE ARCHITECTURE: HARDSCAPE AND STATION LANDSCAPING
- FENCING AND RAILINGS
- OCS SYSTEM
- TRACKWAY
- LRT STRUCTURES
- PUBLIC ART
- ROADWAY
- WORK LIMITS - VARIES

OA1, TW2, etc. FOR CODES, REFER TO MATRIX



URBAN BOULEVARD: NON-STATION

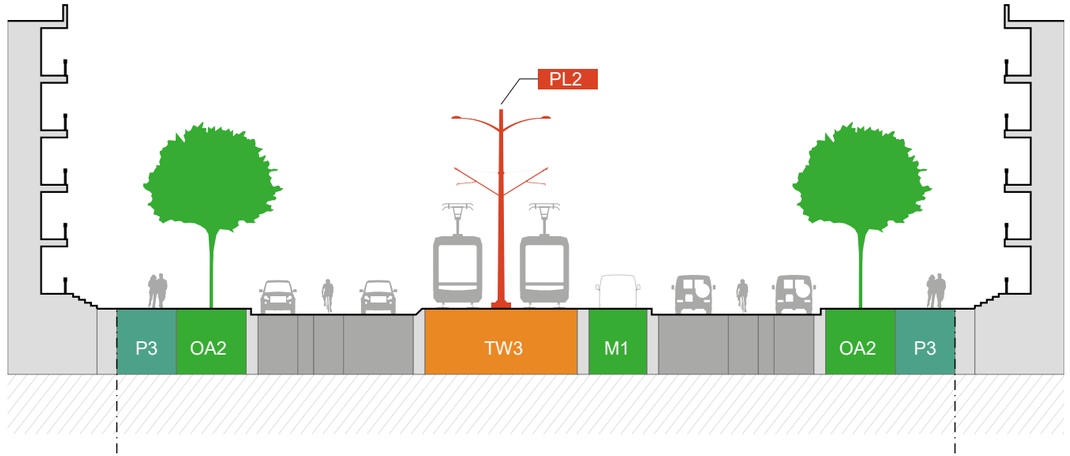


URBAN BOULEVARD: STATION

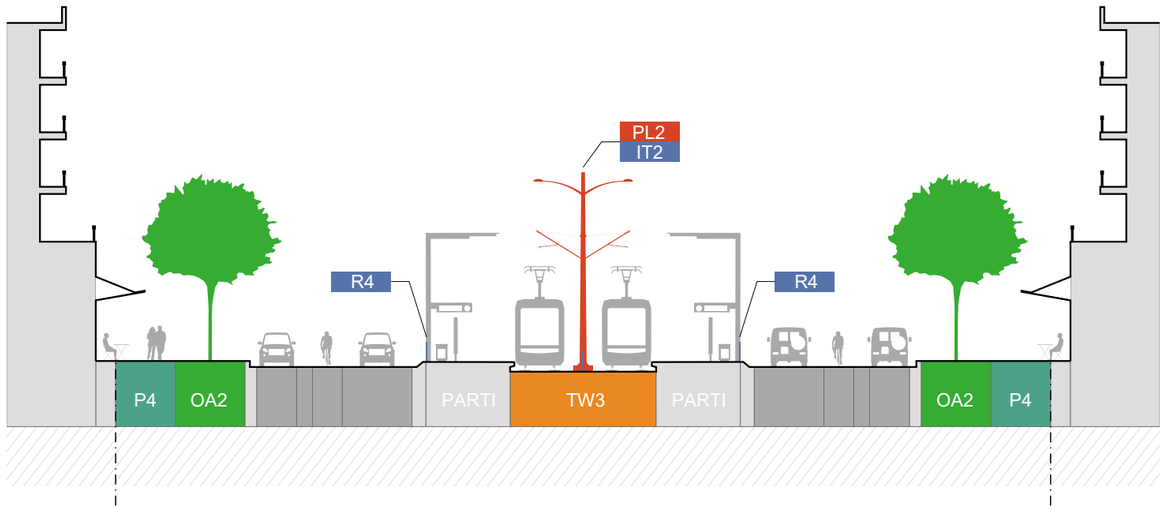
LEGEND

- STATION AREA
- LANDSCAPE ARCHITECTURE
- LANDSCAPE ARCHITECTURE: HARDSCAPE AND STATION LANDSCAPING
- FENCING AND RAILINGS
- OCS SYSTEM
- TRACKWAY
- LRT STRUCTURES
- PUBLIC ART
- ROADWAY
- WORK LIMITS - VARIES

OA1, TW2, etc. FOR CODES, REFER TO MATRIX



NEIGHBOURHOOD BOULEVARD: NON-STATION



NEIGHBOURHOOD BOULEVARD: STATION

VISUAL CATALOGUE: TYPOLOGY 2

LANDSCAPE ARCHITECTURE

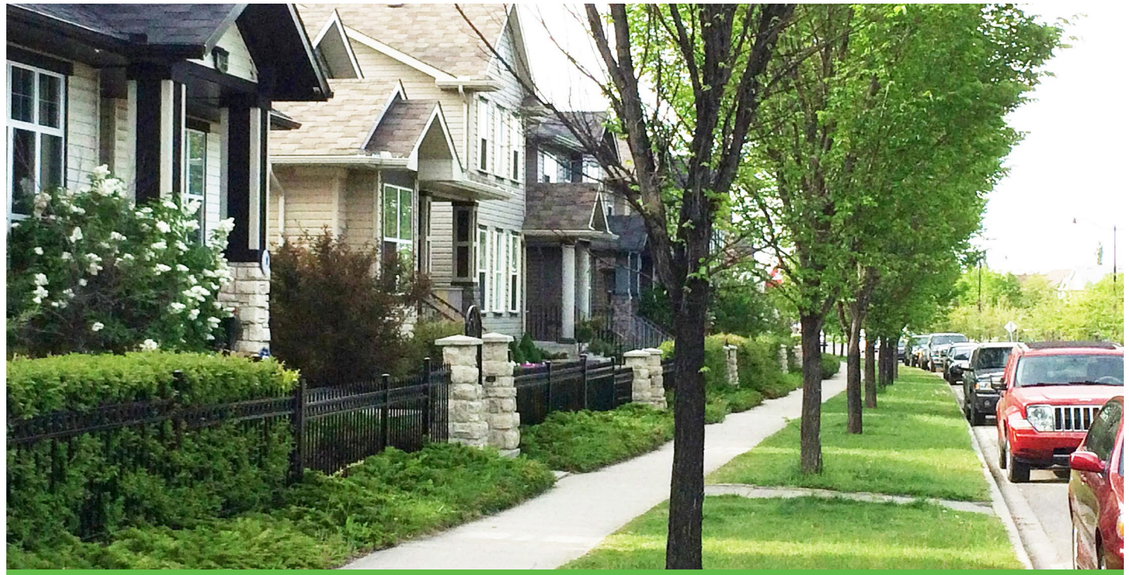
OPEN AREA

OA1 **Hydroseeded grass open area - embankment***

** refer to the matrix*

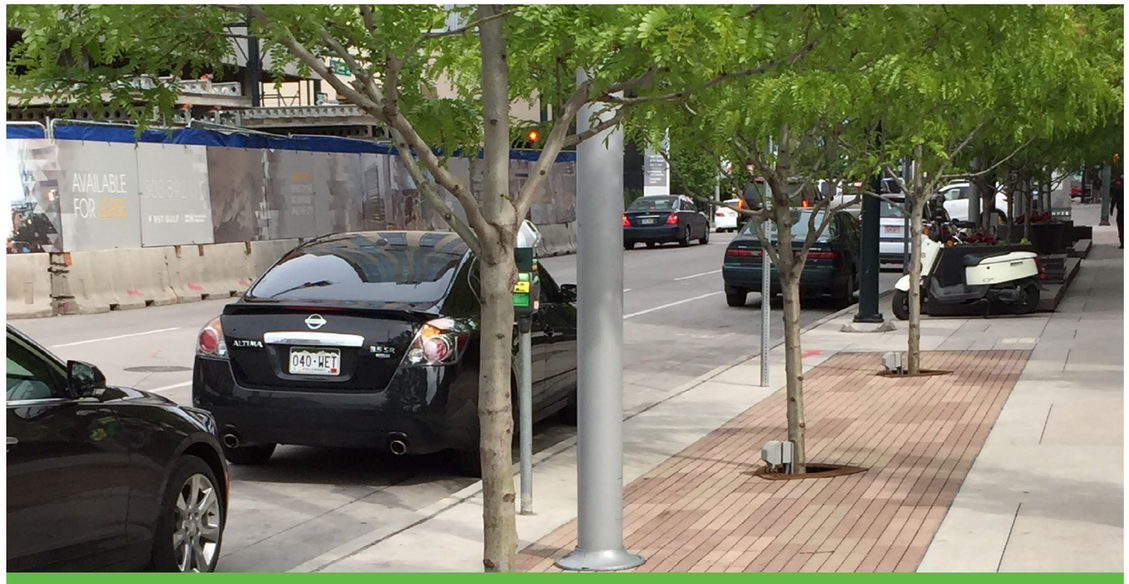
LANDSCAPE ARCHITECTURE

BOULEVARD



B1 Boulevard: grass and trees

B2 Boulevard: trees in planted tree wells



B3 Boulevard: pervious pavers and trees

LANDSCAPE ARCHITECTURE
STREET FURNISHINGS

SF1 **Street Furnishings: City standard**

SF2 **Street Furnishings: Centre City**

LANDSCAPE ARCHITECTURE

MEDIAN

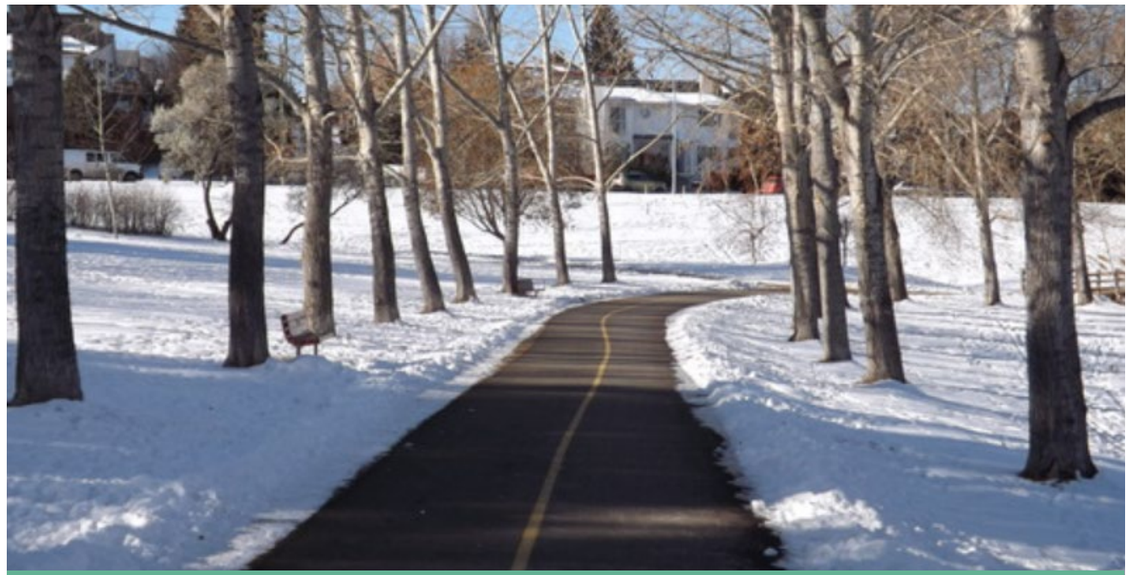
M1 Median: natural grasses (swale)

M2 Median: natural grasses and trees

M3 Median: rough aggregate

LANDSCAPE ARCHITECTURE

PATHWAYS



P1 Asphalt MUP

P3 Concrete sidewalk

P4 Upgraded sidewalk

LANDSCAPE ARCHITECTURE

STATION LANDSCAPING

SL **STATION LANDSCAPING**

CROSSINGS

CROSSINGS

C1 Grade-separated crosssing

C2 At-grade crossing with gates

C3 Signalised at-grade crossing

C5 Mid-block pedestrian/cyclist crossing

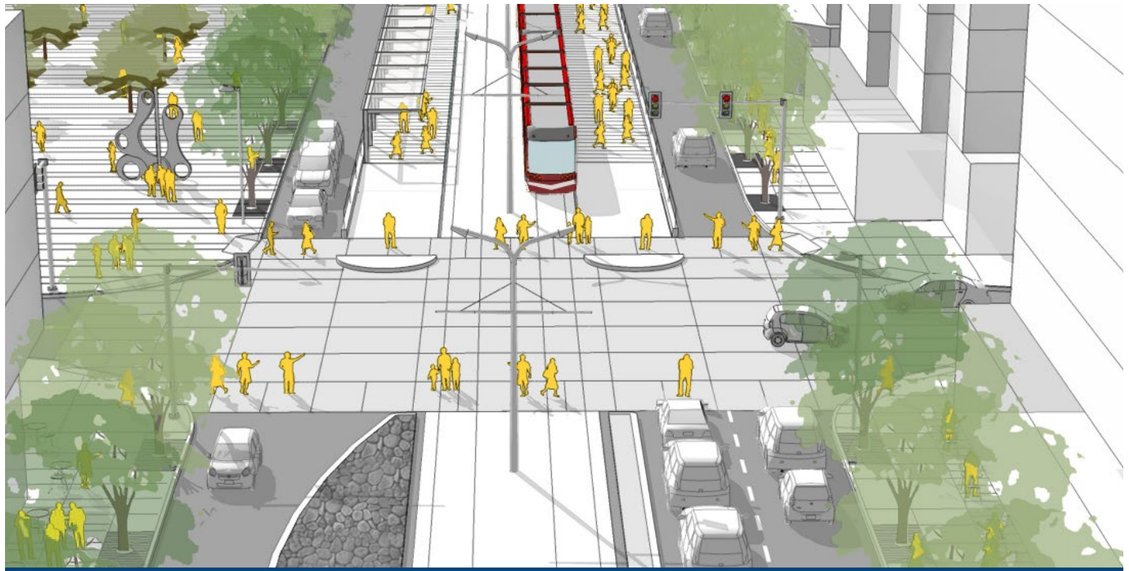
CROSSINGS

NON-STATION INTERSECTION

IS1 **Non-station intersection - white striped crosswalks, asphalt paving**

CROSSINGS

NON-STATION INTERSECTION



IS2 **Station intersection - enhanced paving**

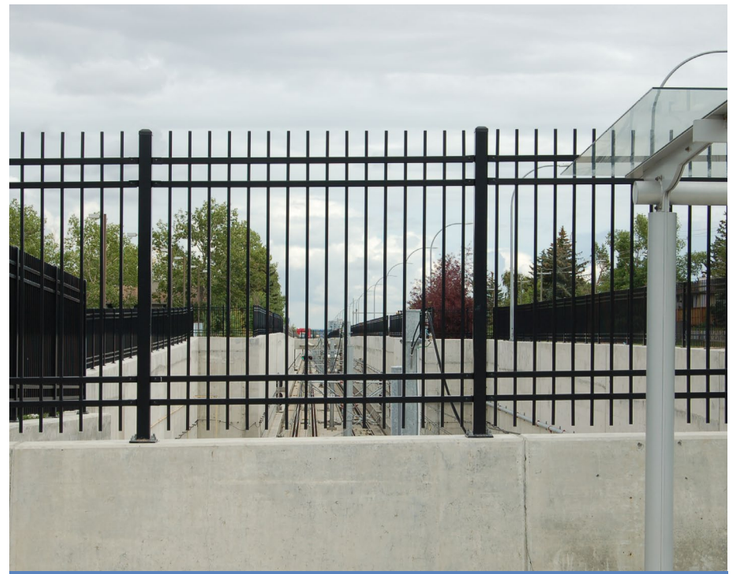
(Note: different image unique to Typology 2)

FENCINGS + RAILINGS

FENCING

F4 Galvanised metal punched or cut panel fence

F5 Coated metal punched or cut panel fence



F6 Painted or coated metal picket fence

FENCING + RAILINGS

INTER-TRACK BARRIER

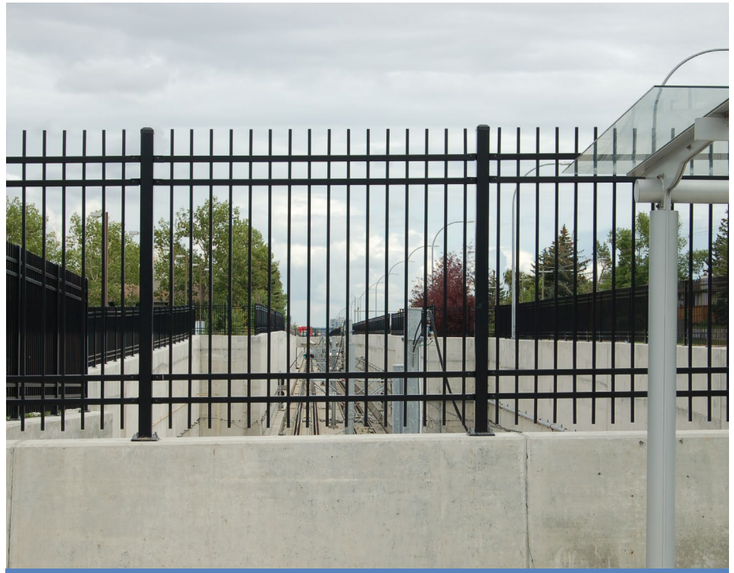
IT1 Inter-track barrier: bollard and chain/ cable

IT2 Inter-track barrier: galvanised metal punched or cut panel

IT3 Inter-track barrier: post and rail

FENCING + RAILINGS

STATION RAILING



R1 Station railing: painted or coated metal picket

R2 Station railing: artist collaboration

R3 Station railing: weathering steel

R4 Station railing: stainless steel frame with glass panels

R5 Station railing: galvanised metal punched or cut panel

OVERHEAD CONTACT SYSTEM (OCS)

OVERHEAD CONTACT SYSTEM - POLES

PL1 Pole: round/beveled galvanised steel poles- single use

PL2 Pole: round galvanised steel poles: shared use with street lights, traffic, pedestrian and cycle signals

OVERHEAD CONTACT SYSTEM (OCS)

OVERHEAD CONTACT SYSTEM - WIRES

W1 Aesthetically Treated Simple Catenary Wire with Low Profile (SCAT-LP)

TRACK

TRACK

TW2 Direct fixation track

TW3 Embedded track

LRT STRUCTURES

RAIL BRIDGE

BR **Bridges - rail**

LRT STRUCTURES

PEDESTRIAN BRIDGE

BR **Bridges - pedestrian**

LRT STRUCTURES

PORTAL-BARRIER

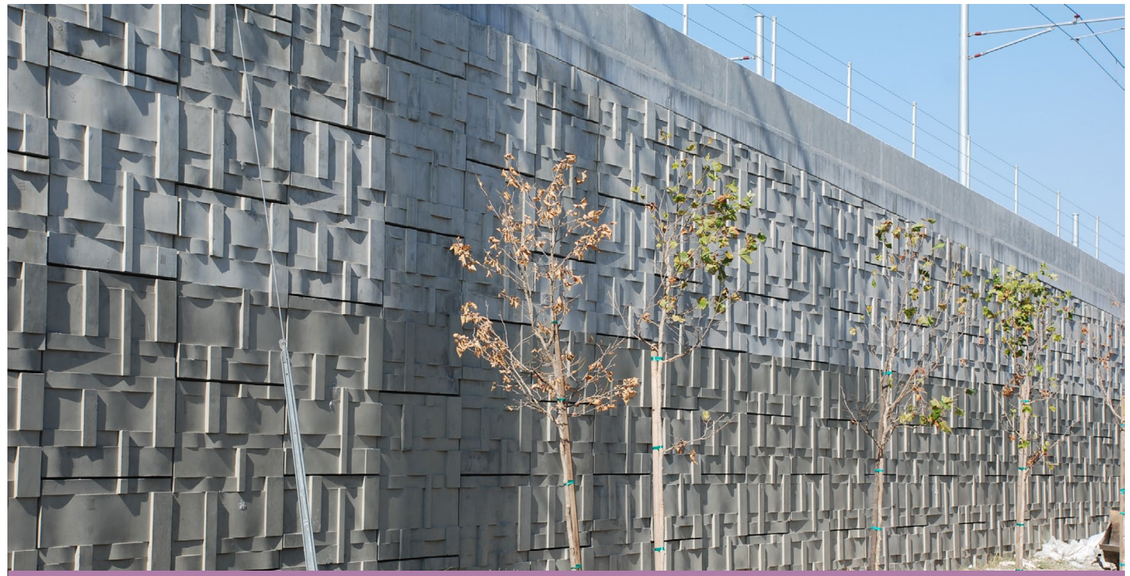
PB2 Portal barrier: steel tube

PB3 Portal-barrier: fencing

LRT STRUCTURES

RETAINING WALLS

RW1 Retaining walls: cast-in-place, form-liner



RW2 Retaining walls: MSE- large cell, form-liner

RW3 Retaining walls: MSE- CMU

RW4 Retaining walls: gabion, rock or glass aggregate

LRT STRUCTURES

SOUND ATTENUATION WALLS

RW5 **Sound attenuation walls: precast concrete formliner**

LRT STRUCTURES

SCREENING WALLS

RW7 Screening walls: pre-cast concrete - formliner

RW9 Screening walls: timber panels

RW10 Screening walls: metal panel

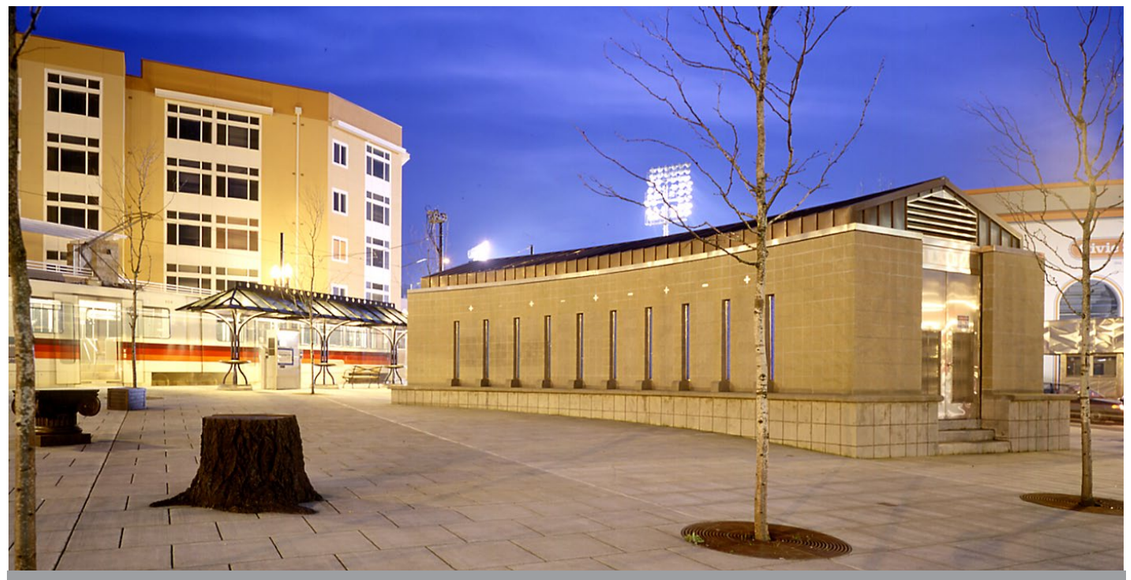
SYSTEMS BUILDINGS

TRACTION POWER SUBSTATION (TPSS), SIGNAL AND COMMUNICATIONS BUILDING (SIGCOMM)

SYS1 Metal framing and cladding

SYS2 CMU with metal mesh cladding

SYS3 CMU walls, metal roof



SYS4 Concrete base, CMU and glass block walls, metal roof

SYSTEMS BUILDINGS
OPERATOR BREAK BUILDING (OBB)

SYS6 Operator break building (OBB): metal cladding, roofing, glass curtain wall

OTHER

PUBLIC ART

PA Public art: free standing, solar lights

PA Public art: free standing, sculpture

PA Public art: integrated, glass windscreen

PA Public art: integrated art tiles

1.3 TYPOLOGY 3

OBJECTIVE

- To enhance visibility and integration of station entrances to the underground transit network

CONTEXT

- Station entrance in transit plaza
- In-street or off-street alignment; Downtown Calgary, urban and suburban neighbourhoods

CROSSINGS/ACCESS

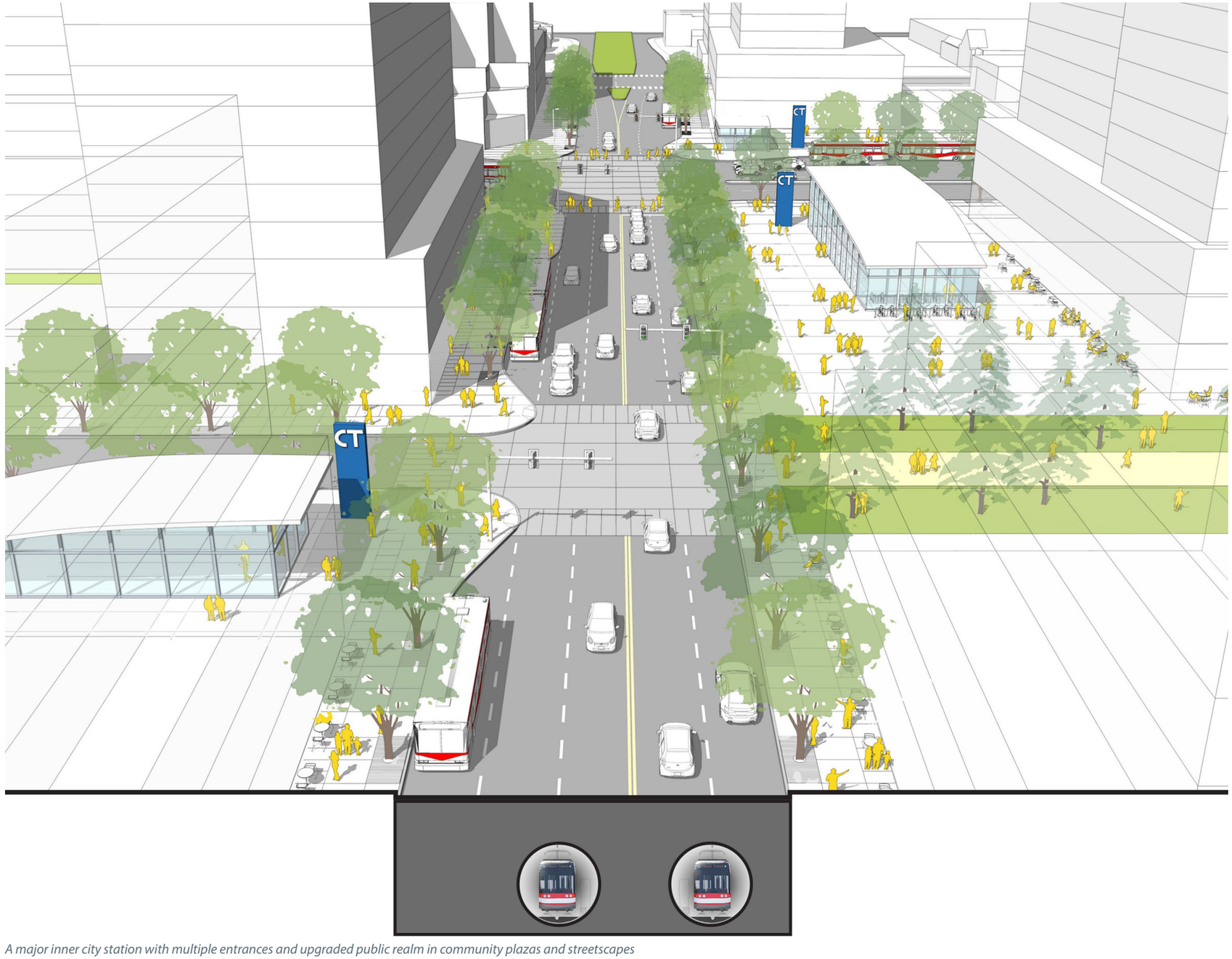
- Good street-level pedestrian, bicycle, bus access and wayfinding to station entrances is critical

URBAN INTEGRATION

- High quality station entrances architecture to support wayfinding and visibility
- Station entrance locations at natural crossroads, in a transit plaza
- Public realm landscape/streetscape of transit plaza and surface streets over tunnel alignment to enhance or fit within setting

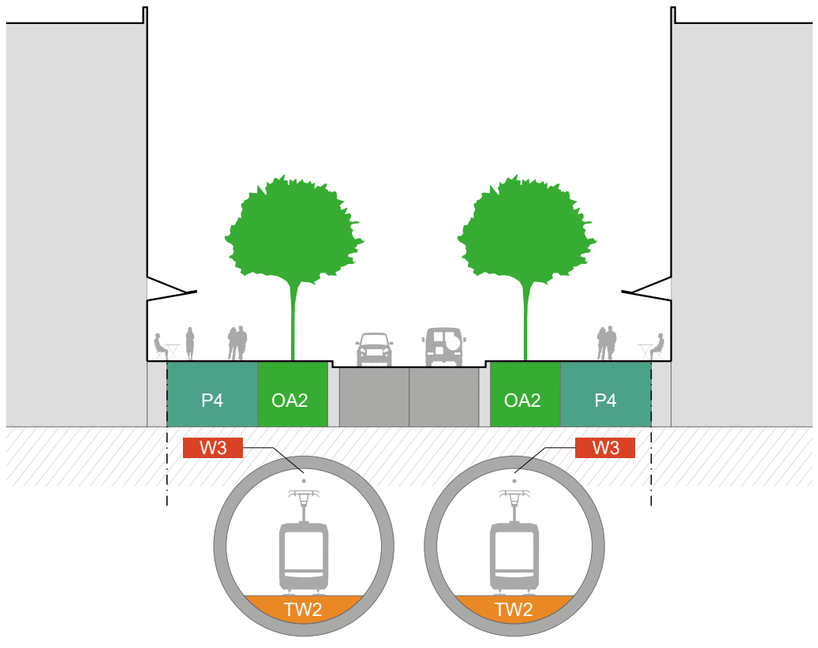
EXAMPLE SEGMENT

- Centre St N/16 Ave Station



A major inner city station with multiple entrances and upgraded public realm in community plazas and streetscapes

TYPOLOGY 3: INFRASTRUCTURE COMPONENTS

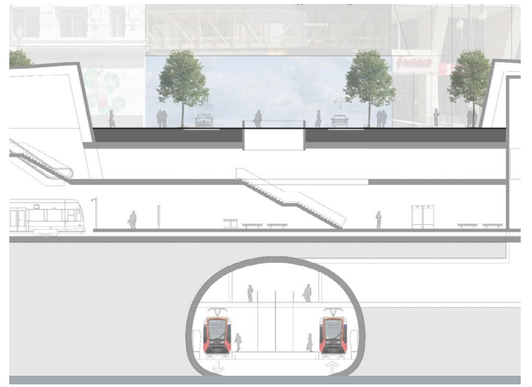


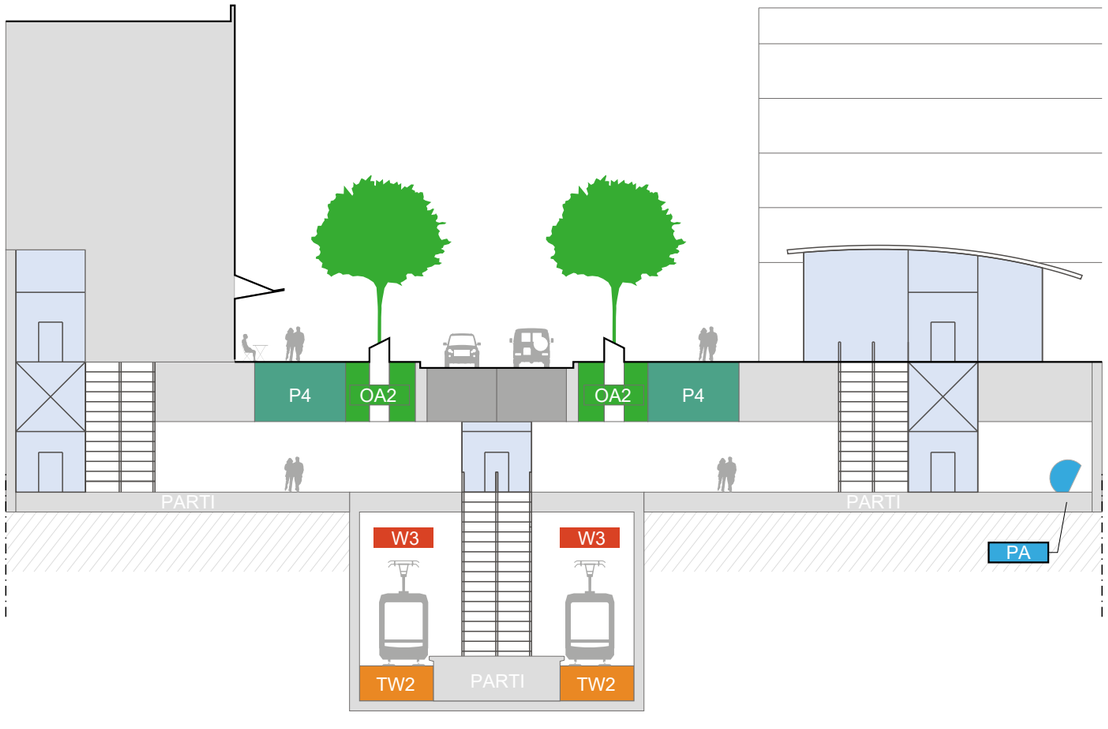
CENTRE CITY TUNNEL: NON-STATION

LEGEND

- STATION AREA
- LANDSCAPE ARCHITECTURE
- LANDSCAPE ARCHITECTURE: HARDSCAPE AND STATION LANDSCAPING
- FENCING AND RAILINGS
- OCS SYSTEM
- TRACKWAY
- LRT STRUCTURES
- PUBLIC ART
- ROADWAY
- WORK LIMITS - VARIES

OA1, TW2, etc. FOR CODES, REFER TO MATRIX



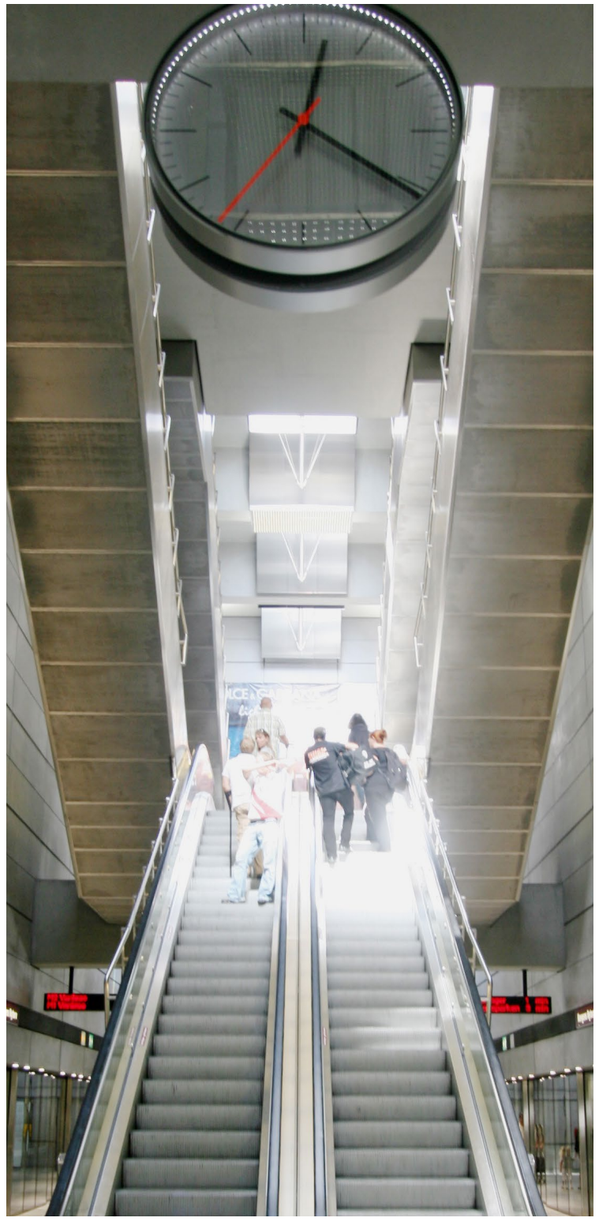


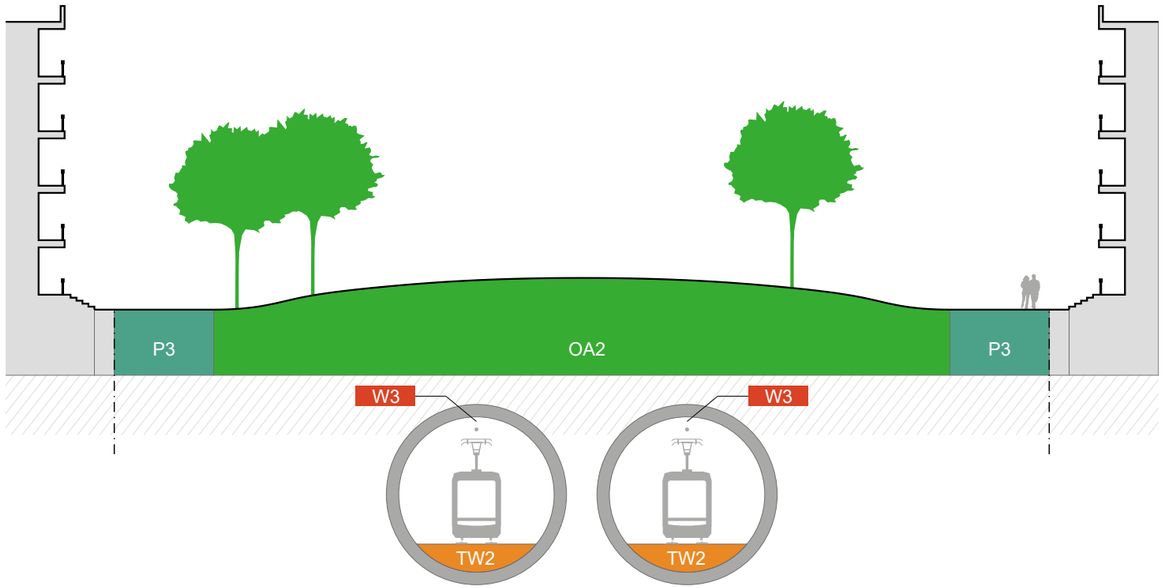
CENTRE CITY TUNNEL: STATION

LEGEND

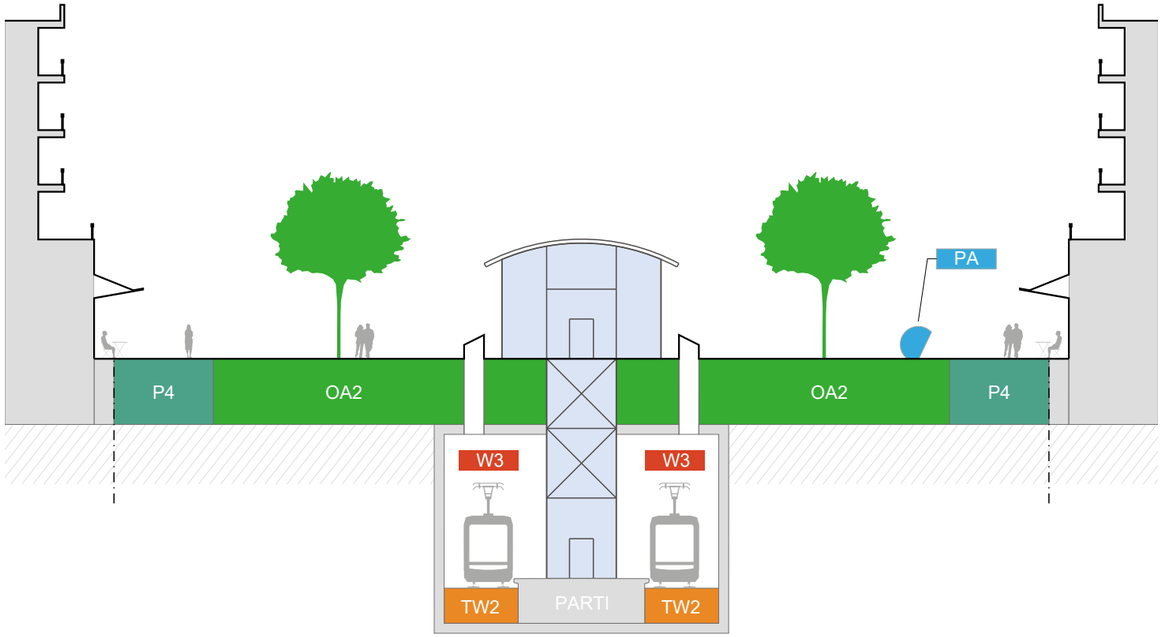
- STATION AREA
- LANDSCAPE ARCHITECTURE
- LANDSCAPE ARCHITECTURE: HARDSCAPE AND STATION LANDSCAPING
- FENCING AND RAILINGS
- OCS SYSTEM
- TRACKWAY
- LRT STRUCTURES
- PUBLIC ART
- ROADWAY
- WORK LIMITS - VARIES

OA1, TW2, etc. FOR CODES, REFER TO MATRIX





OPEN SPACE TUNNEL: NON-STATION



OPEN SPACE TUNNEL: STATION

VISUAL CATALOGUE: TYPOLOGY 3

LANDSCAPE ARCHITECTURE

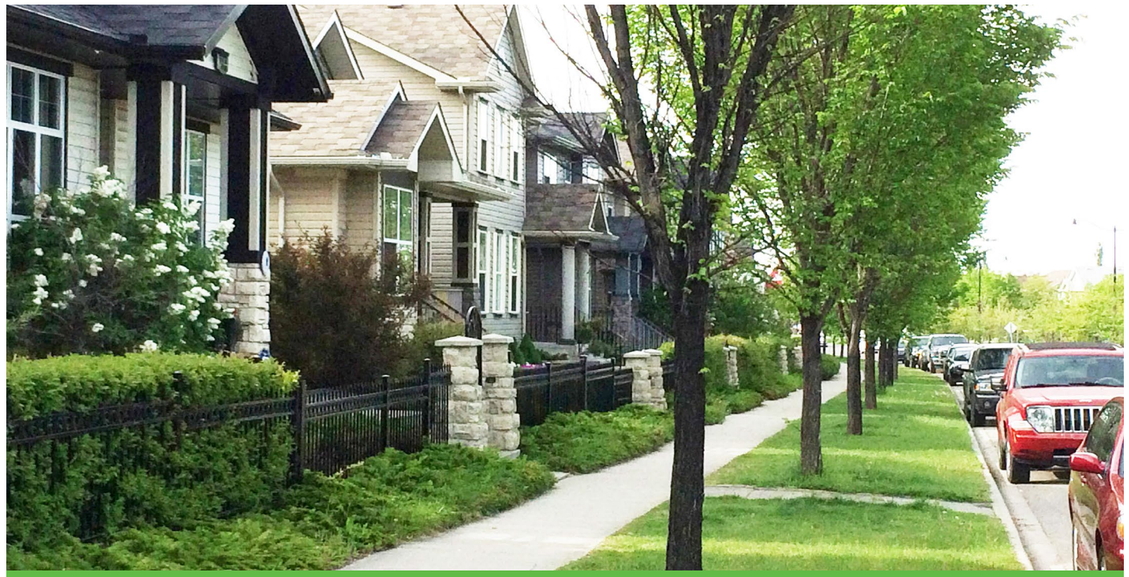
OPEN AREA

OA1 Hydroseeded grass open area

OA2 Grass lawn and mixed trees open area

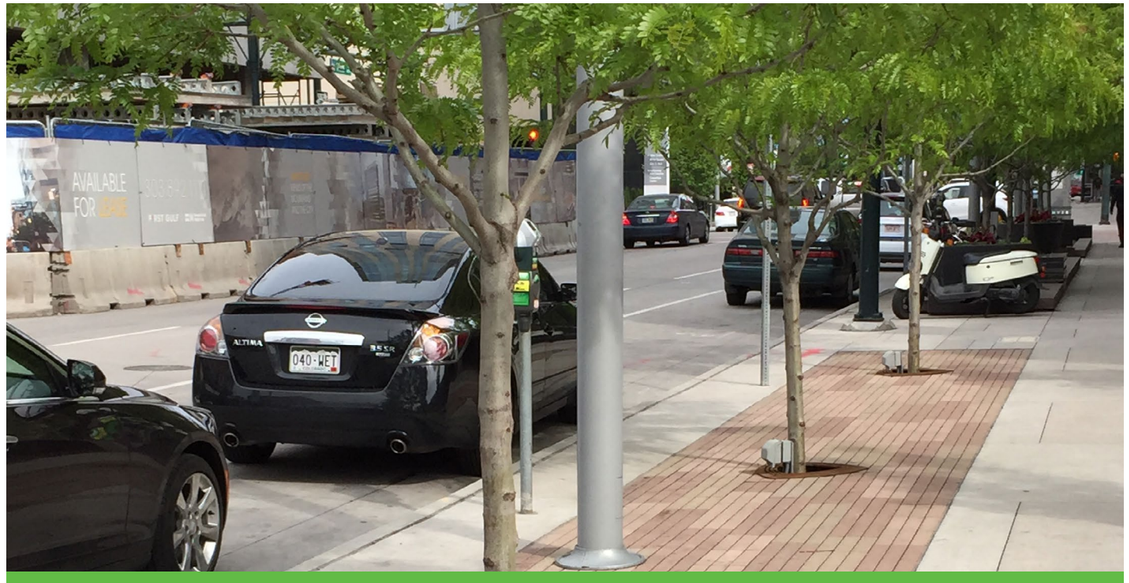
LANDSCAPE ARCHITECTURE

BOULEVARD



B1 Boulevard: grass and trees

B2 Boulevard: trees in planted tree wells



B3 Boulevard: pervious pavers and trees

LANDSCAPE ARCHITECTURE
STREET FURNISHINGS

SF1 **Street Furnishings: City standard**

SF2 **Street Furnishings: Centre City**

LANDSCAPE ARCHITECTURE

MEDIAN

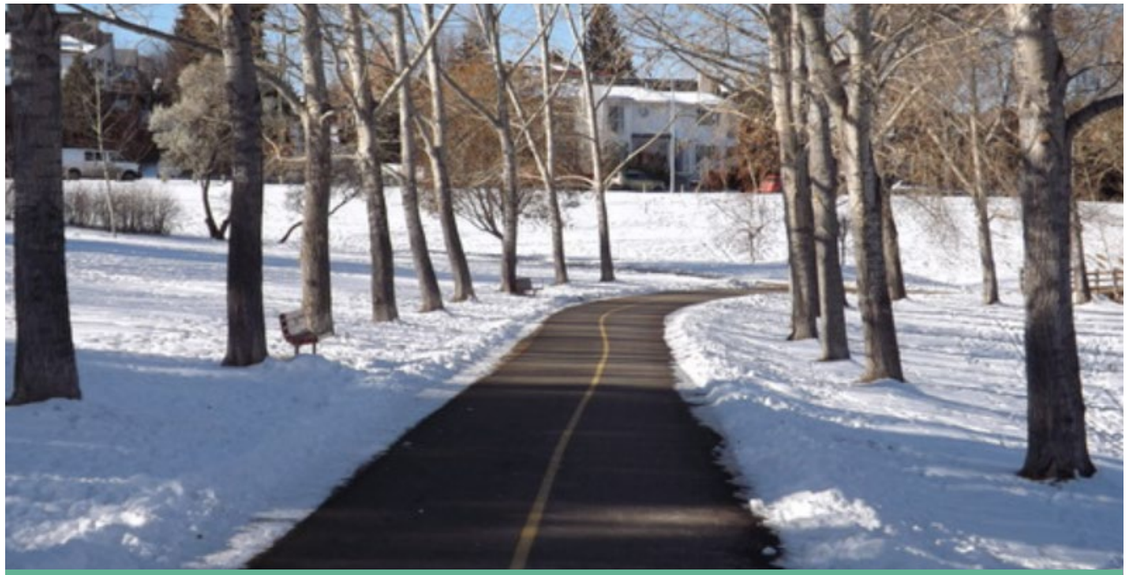
M1 Median: natural grasses (swale)

M2 Median: natural grasses and trees

M3 Median: rough aggregate

LANDSCAPE ARCHITECTURE

PATHWAYS



P1 Asphalt MUP

P2 Gravel trail

P3 Concrete sidewalk

P4 Upgraded sidewalk

LANDSCAPE ARCHITECTURE

ACCESS DRIVES, PARK & RIDE, INTERNAL LANDSCAPING, AND CIRCULATION

SL **STATION LANDSCAPING**

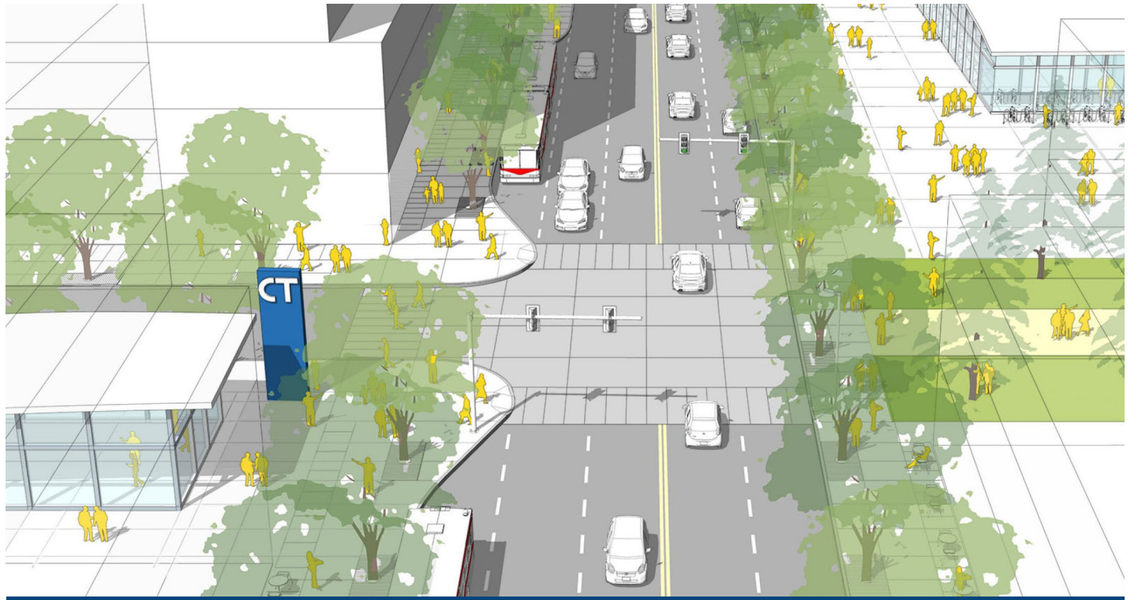
CROSSINGS

NON-STATION INTERSECTION

IS1 **Non-station intersection - white striped crosswalks, asphalt paving**

CROSSINGS

STATION INTERSECTION



IS2 **Station intersection - enhanced paving**

(Note: different image unique to Typology 3)

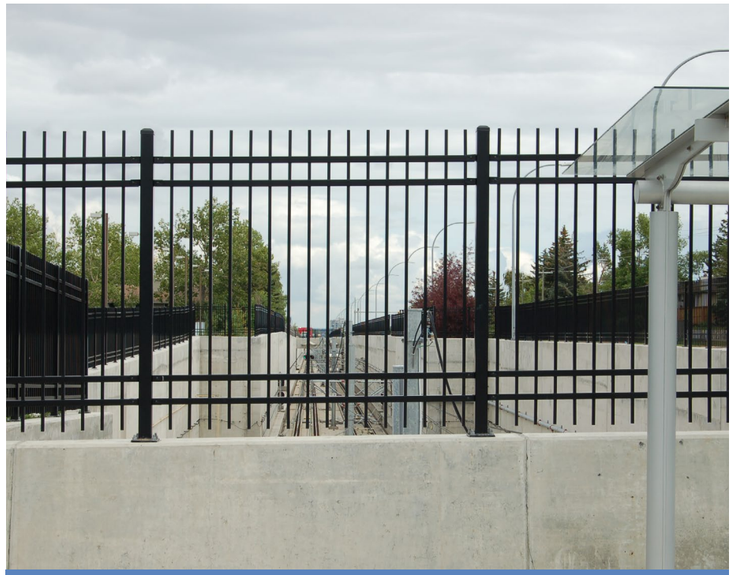
FENCINGS + RAILINGS

INTER-TRACK BARRIER

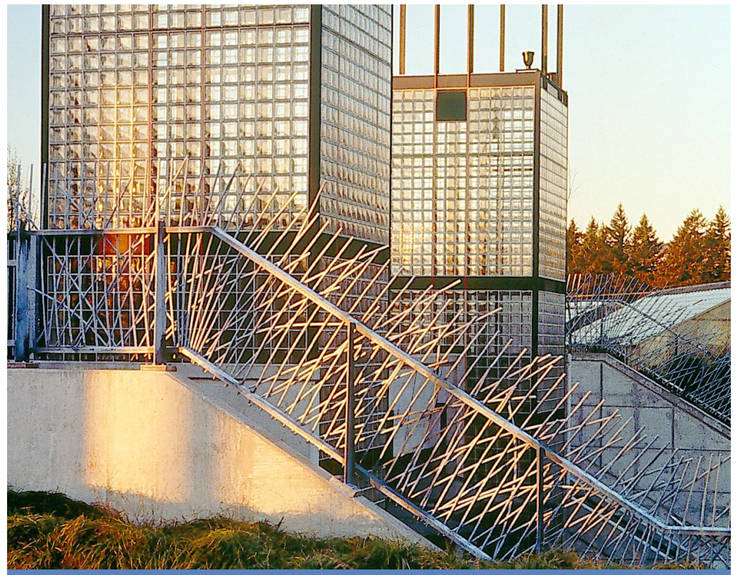
IT2 **Inter-track barrier: galvanised metal punched or cut panel**

FENCINGS + RAILINGS

STATION RAILING



R1 Station railing: painted or coated metal picket



R2 Station railing: artist collaboration

R4 Station railing: stainless steel frame with glass panels

R5 Station railing: galvanised metal punched or cut panel

OVERHEAD CONTACT SYSTEM (OCS)

OVERHEAD CONTACT SYSTEM - WIRES

W3 Overhead Contact Rail (OCR)

TRACK

TRACK

TW2 Direct fixation track

LRT STRUCTURES

PORTAL-BARRIER

PB1 Portal- barrier: concrete

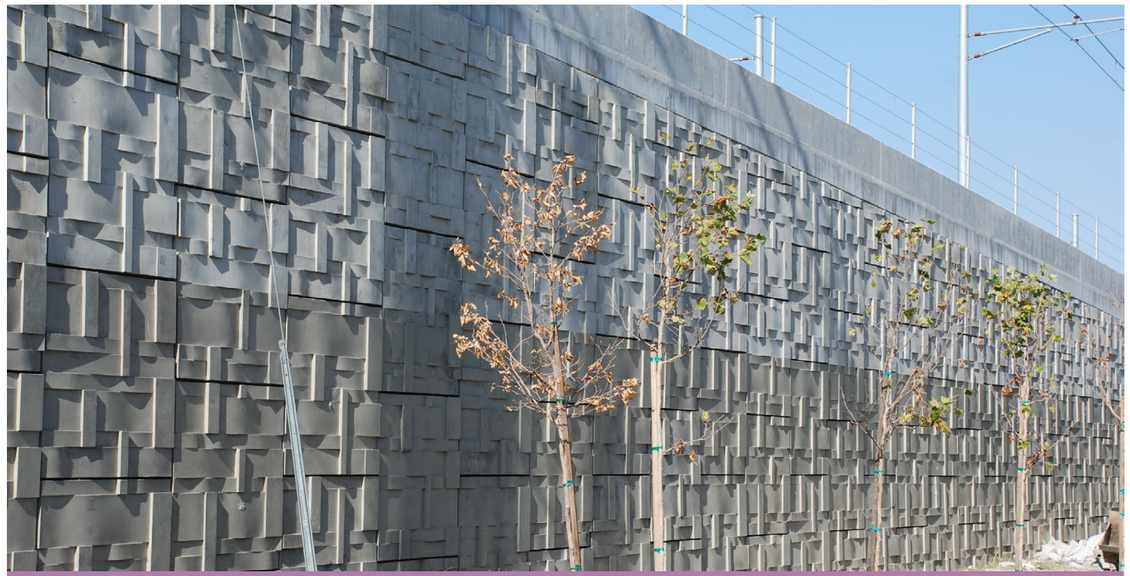
PB2 Portal barrier: steel tube

PB3 Portal-barrier: fencing

LRT STRUCTURES

RETAINING WALLS

RW1 Retaining walls: cast-in-place, form-liner



RW2 Retaining walls: MSE- large cell, form-liner

RW3 Retaining walls: MSE- CMU

RW4 Retaining walls: gabion, rock or glass aggregate

LRT STRUCTURES

SOUND ATTENUATION WALLS

RW5 Sound attenuation walls: precast concrete formliner

LRT STRUCTURES

SCREENING WALLS

RW7 Screening walls: pre-cast concrete - formliner

RW9 Screening walls: timber panels

RW10 Screening walls: metal panel

SYSTEMS BUILDINGS

TRACTION POWER SUBSTATION (TPSS), SIGNAL AND COMMUNICATIONS BUILDING (SIGCOMM)

SYS5 **Integrated into station**

SYSTEMS BUILDINGS

OPERATOR BREAK BUILDING (OBB)

SYS6 Operator break building (OBB): metal cladding, roofing, glass curtain wall

SYSTEMS BUILDINGS

ENHANCED VENT SHAFT OPENINGS

V Tunnel ventilation shafts in a transit plaza or right-of-way

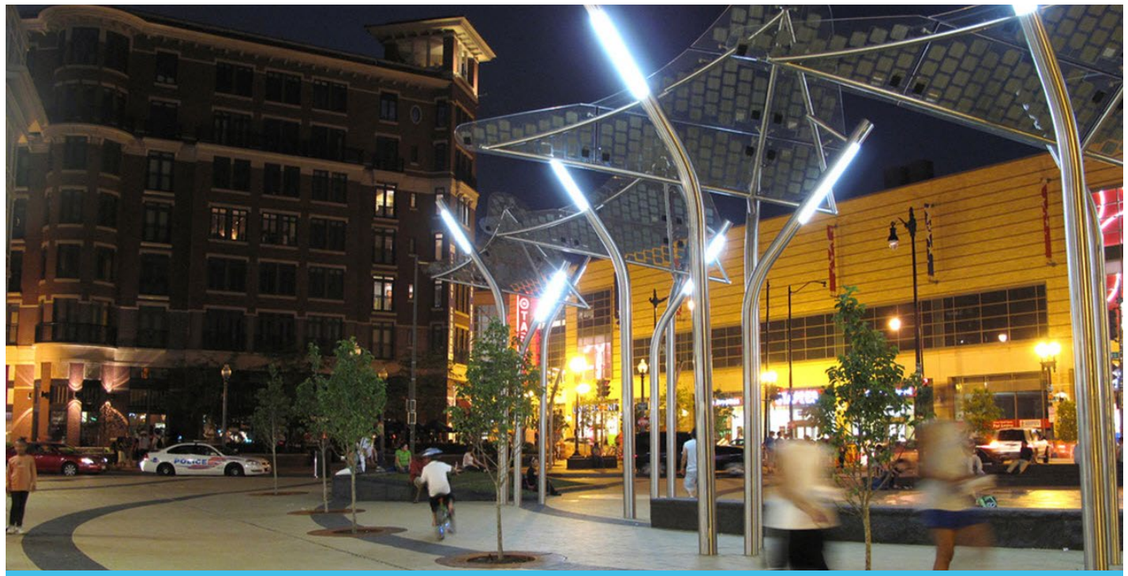
V Tunnel ventilation shafts integrated into station entrance

V Tunnel ventilation shafts with integrated seating in a right-of-way

V Tunnel ventilation shafts with integrated signage in a transit plaza

OTHER

PUBLIC ART



PA **Public art: free standing, solar lights**

PA **Public art: free standing, sculpture**

PA **Public art: integrated art tiles**

1.4 TYPOLOGY 4

OBJECTIVE

- To enhance integration and public realm under and around the elevated structure by designing an aesthetically pleasing corridor

CONTEXT

- LRT on guideway structure where grade separation is necessary

CROSSINGS/ACCESS

- Station entrance elevators/escalators/stairs from transit plaza to concourse and platforms
- Vehicle, pedestrian and bicyclist access at street level remains

URBAN INTEGRATION

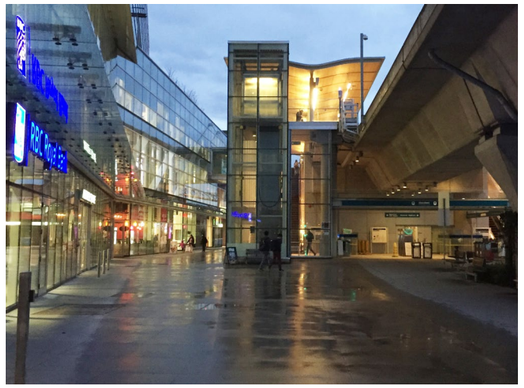
- Transit plazas are included and can be enhanced community space
- Aesthetics of guideway structures are critical
- Integrate at-grade space with existing and new development

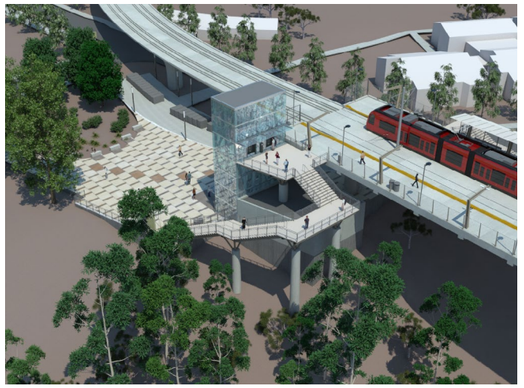
EXAMPLE SEGMENT

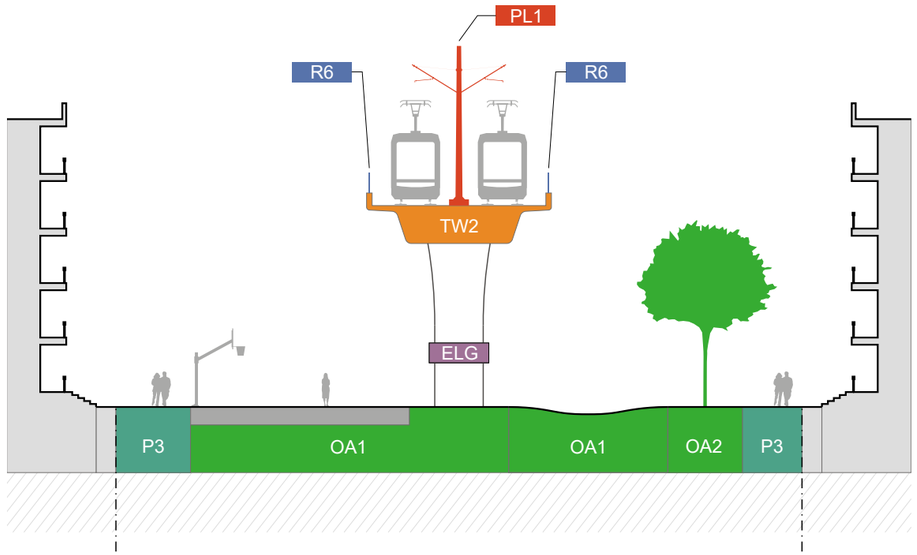
- Along 11 Street SE between Inglewood/ Ramsay and 26 Ave SE stations

Potential for enhanced public realm at surface street level below an LRT elevated guideway

TYPOLOGY 4: INFRASTRUCTURE COMPONENTS





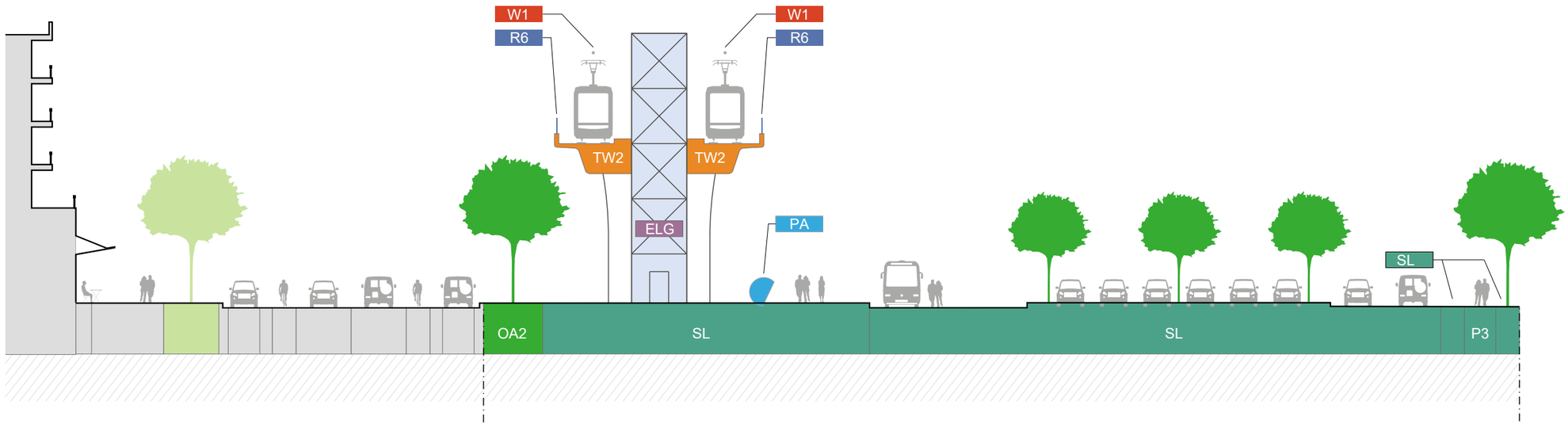


ELEVATED GUIDEWAY IN EXCLUSIVE ROW: NON-STATION

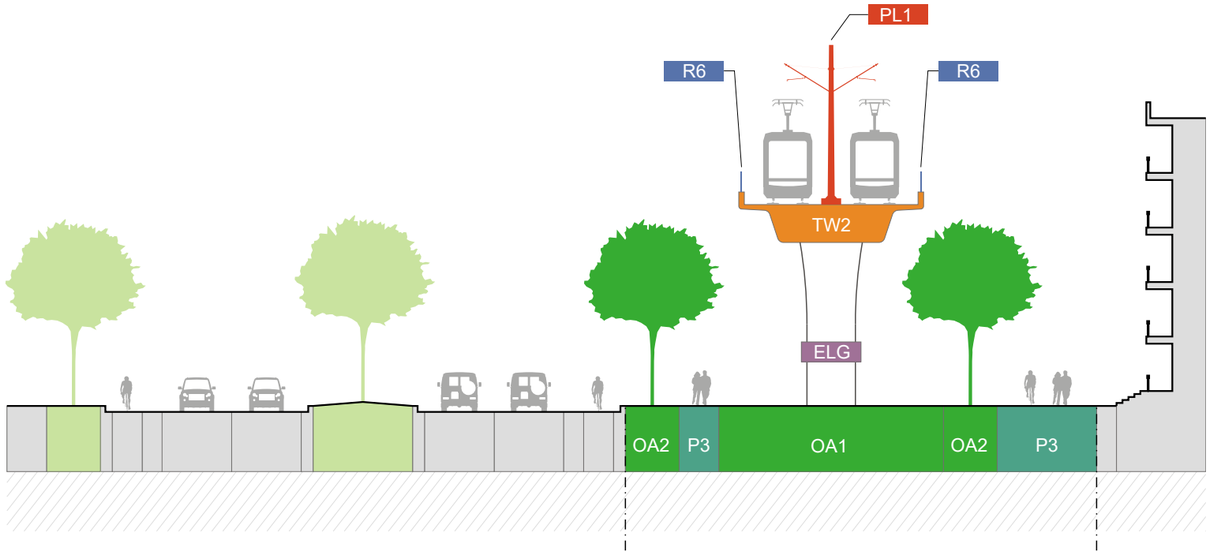
LEGEND

- STATION AREA
- LANDSCAPE ARCHITECTURE
- LANDSCAPE ARCHITECTURE: HARDSCAPE AND STATION LANDSCAPING
- FENCING AND RAILINGS
- OCS SYSTEM
- TRACKWAY
- LRT STRUCTURES
- PUBLIC ART
- ROADWAY
- WORK LIMITS - VARIES

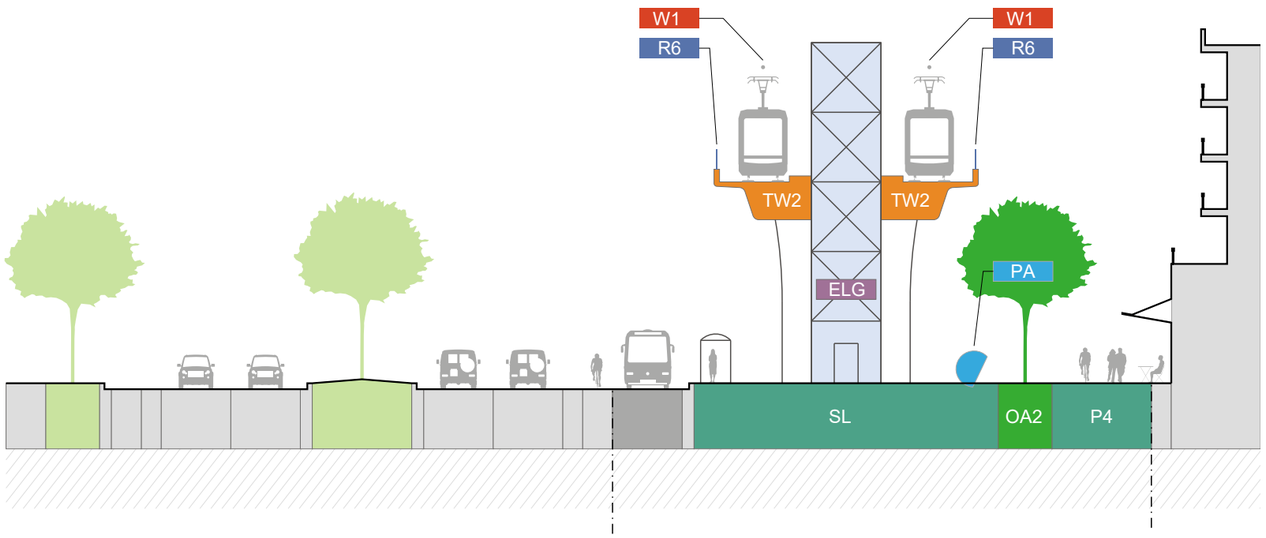
OA1, TW2, etc. FOR CODES, REFER TO MATRIX



ELEVATED GUIDEWAY IN EXCLUSIVE ROW: STATION



ELEVATED GUIDEWAY AT ARTERIAL: NON-STATION



ELEVATED GUIDEWAY AT ARTERIAL: STATION

LEGEND

- STATION AREA
- LANDSCAPE ARCHITECTURE
- LANDSCAPE ARCHITECTURE: HARDSCAPE AND STATION LANDSCAPING
- FENCING AND RAILINGS
- OCS SYSTEM
- TRACKWAY
- LRT STRUCTURES
- PUBLIC ART
- ROADWAY
- WORK LIMITS - VARIES

OA1, TW2, etc. FOR CODES, REFER TO MATRIX

VISUAL CATALOGUE: TYPOLOGY 4

LANDSCAPE ARCHITECTURE

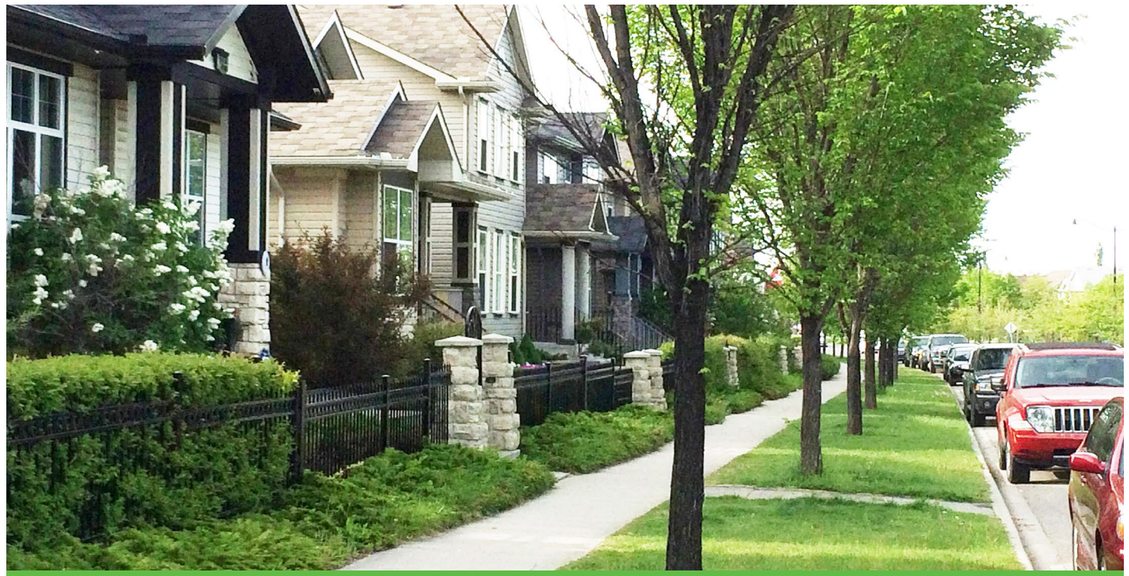
OPEN AREA

OA1 Hydroseeded grass open area

OA2 Grass lawn and mixed trees open area

LANDSCAPE ARCHITECTURE

BOULEVARD



B1 Boulevard: grass and trees

B2 Boulevard: trees in planted tree wells

B3 Boulevard: pervious pavers and trees

LANDSCAPE ARCHITECTURE
STREET FURNISHINGS

SF1 Street Furnishings: City standard

SF2 Street Furnishings: Centre City

LANDSCAPE ARCHITECTURE

MEDIAN

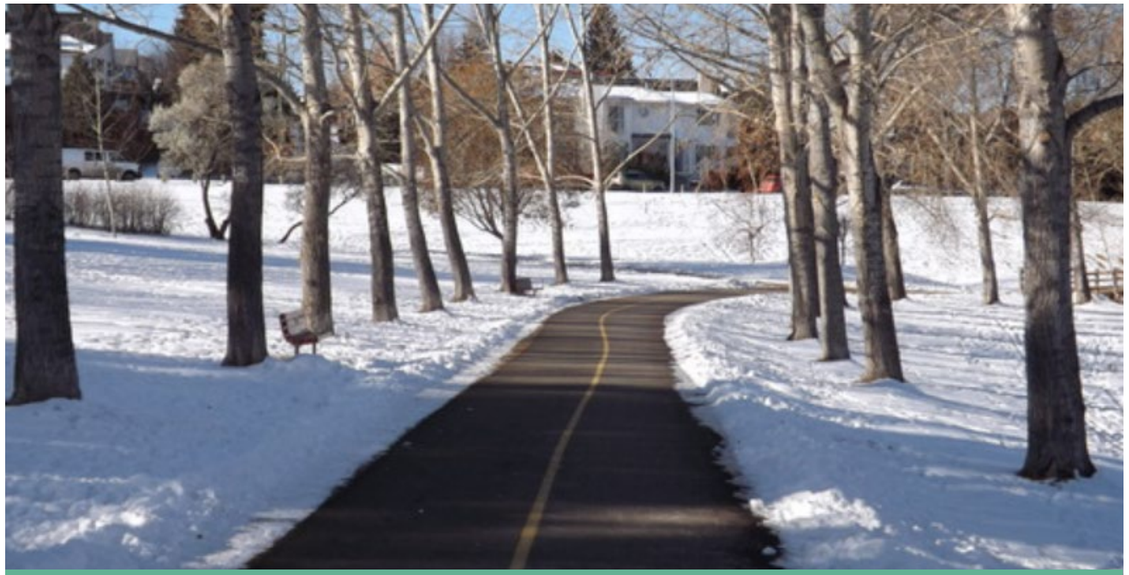
M1 Median: natural grasses (swale)

M2 Median: natural grasses and trees

M3 Median: rough aggregate

LANDSCAPE ARCHITECTURE

PATHWAYS



P1 Asphalt MUP

P2 Gravel trail

P3 Concrete sidewalk

P4 Upgraded sidewalk

LANDSCAPE ARCHITECTURE

STATION LANDSCAPING

SL STATION LANDSCAPING

CROSSINGS

NON-STATION INTERSECTION

IS1 **Non-station intersection - white striped crosswalks, asphalt paving**

CROSSINGS

STATION INTERSECTION

IS2 **Station intersection - enhanced paving**

(Note: different image unique to Typology 4)

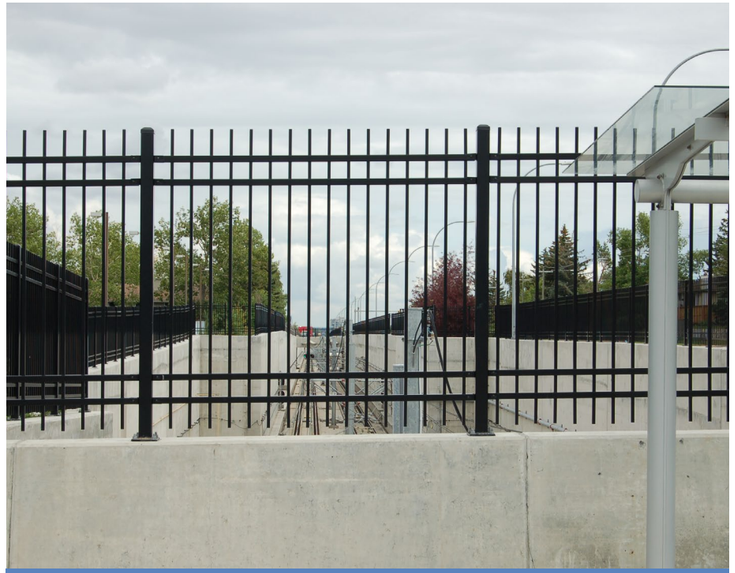
FENCING + RAILINGS

INTER-TRACK BARRIER

IT2 **Inter-track barrier: galvanised metal punched or cut panel**

FENCING + RAILINGS

STATION RAILING



R1 Station railing: painted or coated metal picket

R2 Station railing: artist collaboration

R3 Station railing: weathering steel

R4 Station railing: stainless steel frame with glass panels

R5 Station railing: galvanised metal punched or cut panel

R7 Safety railing: steel stanchions and cable guideway

OVERHEAD CONTACT SYSTEM (OCS)

OVERHEAD CONTACT SYSTEM - POLES

PL1 **Pole: round/beveled galvanised steel poles-single use**

OVERHEAD CONTACT SYSTEM (OCS)

OVERHEAD CONTACT SYSTEM - WIRES

W1 Aesthetically Treated Simple Catenary Wire with Low Profile (SCAT-LP)

W2 Simple Catenary Auto Tension (SCAT)

TRACK

TRACK

TW2 Direct fixation track

LRT STRUCTURES
ELEVATED GUIDEWAY

ELG **Elevated LRT guideway**

LRT STRUCTURES

RAIL BRIDGE

BR **Bridges - rail**

LRT STRUCTURES

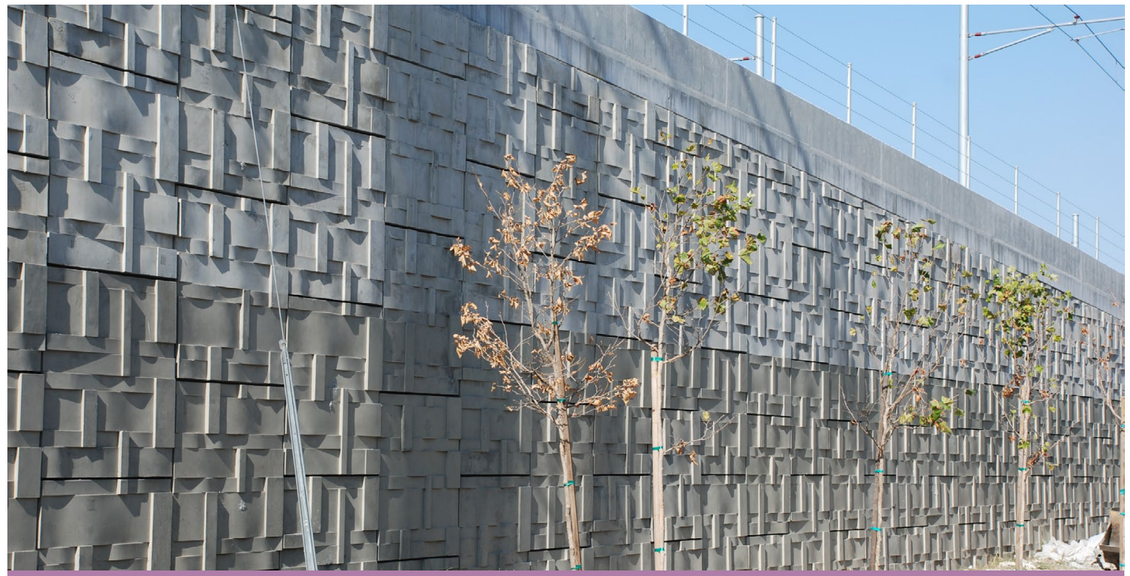
PEDESTRIAN BRIDGE

BR Bridges - pedestrian

LRT STRUCTURES

RETAINING WALLS

RW1 Retaining walls: cast-in-place, form-liner



RW2 Retaining walls: MSE- large cell, form-liner

RW3 Retaining walls: MSE- CMU

RW4 Retaining walls: gabion, rock or glass aggregate

LRT STRUCTURES
SOUND ATTENUATION WALLS

RW5 Sound attenuation walls: precast concrete formliner

RW6 Sound attenuation walls: composite - patterned

LRT STRUCTURES

SCREENING WALLS

RW7 Screening walls: pre-cast concrete - formliner

RW8 Screening walls: composite - patterned

RW9 Screening walls: timber panels

RW10 Screening walls: metal panel

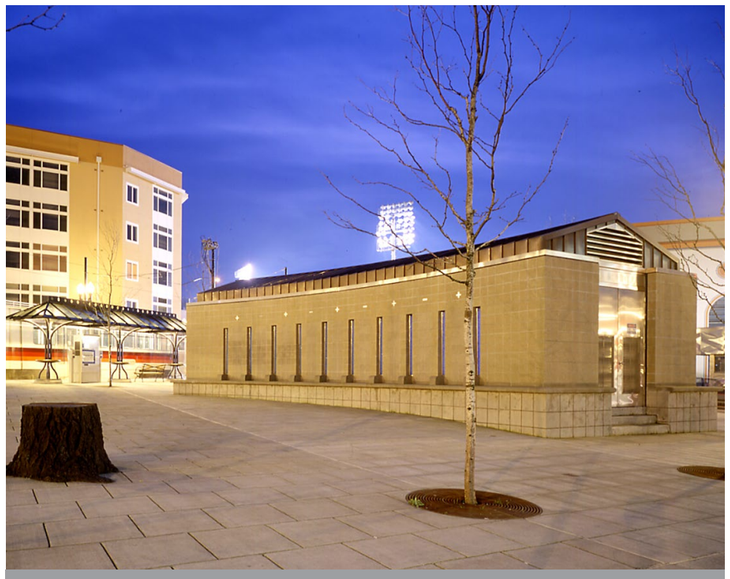
SYSTEMS BUILDINGS

TRACTION POWER SUBSTATION (TPSS), SIGNAL AND COMMUNICATIONS BUILDING (SIGCOMM)

SYS1 Metal framing and cladding

SYS2 CMU with metal mesh cladding

SYS3 CMU walls, metal roof



SYS4 Concrete base, CMU and glass block walls, metal roof

SYS5 Integrated into station

SYSTEMS BUILDINGS

OPERATOR BREAK BUILDING (OBB)

SYS6 Operator break building (OBB): metal cladding, roofing, glass curtain wall

OTHER

PUBLIC ART

PA Public art: free standing, solar lights

PA Public art: free standing, sculpture

PA Public art: integrated, glass windscreen

PA Public art: integrated art tiles

2.0 LRT COMPONENT AND TYPOLOGY MATRIX

SUMMARY MATRIX

GLUI Volume 2 has so far introduced the idea that each typology is composed of a combination of components that collectively shape the LRT environment. With few exceptions, (safety considerations tied to speed and operations), each component category is typically common to all four typologies. What differs is the design treatment - appropriate and contextually sensitive to each component within the different typologies - that each component receives. GLUI Volume 2 illustrates the categories and range of design treatments for the various components within the LRT environment. As a companion to the visual catalogue, the following matrix provides a selection of applicable and non applicable design and material treatments that may be employed to achieve the desired look and feel for each typology. Component locations are shown within typical cross sections on pages 5 to 7, 33 to 35, 61 to 63, and 85 to 87 with abbreviations shown in the matrix below.

LEGEND

- LANDSCAPE ARCHITECTURE
- LANDSCAPE ARCHITECTURE: HARDSCAPE AND STATION LANDSCAPING
- CROSSINGS
- FENCING AND RAILINGS
- OCS SYSTEM
- TRACKWAY
- LRT STRUCTURES
- SYSTEMS BUILDINGS
- OTHER

	TYPICAL LOCATION	DESIGN TREATMENT	LRT TYPOLOGY 1	LRT TYPOLOGY 2	LRT TYPOLOGY 3	LRT TYPOLOGY 4
1.60		**LANDSCAPE ARCHITECTURE**				
	OA1	HYDROSEEDED GRASS OPEN AREA	APPLICABLE	NOT APPLICABLE[1]	APPLICABLE[2]	APPLICABLE[2]
	OA2	GRASS LAWN AND MIXED TREES OPEN AREA	APPLICABLE	NOT APPLICABLE	APPLICABLE	APPLICABLE
	B1	BOULEVARD (GRASS + TREES)	APPLICABLE	APPLICABLE	APPLICABLE	APPLICABLE
	B2	BOULEVARD (TREES, PLANTED TREE WELLS)	NOT APPLICABLE	APPLICABLE	APPLICABLE	APPLICABLE
	B3	BOULEVARD (PERVIOUS PAVERS + TREES) *OPTIONAL HARDSCAPE SWALES	NOT APPLICABLE	APPLICABLE	APPLICABLE	APPLICABLE
	SF1	STREET FURNISHINGS- CITY STANDARD	APPLICABLE	APPLICABLE	APPLICABLE	APPLICABLE
	SF2	STREET FURNISHINGS- CENTRE CITY	NOT APPLICABLE	APPLICABLE	APPLICABLE	APPLICABLE
	M1	MEDIAN, NATURAL GRASSES (SWALE)	APPLICABLE	APPLICABLE	APPLICABLE	APPLICABLE
	M2	MEDIAN, NATURAL GRASSES + TREES	APPLICABLE	APPLICABLE	APPLICABLE	APPLICABLE
	M3	MEDIAN, ROUGH AGGREGATE	APPLICABLE	APPLICABLE	APPLICABLE	APPLICABLE
1.6.1		**HARDSCAPE AND STATION LANDSCAPING**				
	P1	ASPHALT MUP	APPLICABLE	APPLICABLE	APPLICABLE	APPLICABLE
	P2	GRAVEL TRAIL	APPLICABLE	NOT APPLICABLE	APPLICABLE	APPLICABLE
	P3	CONCRETE SIDEWALK	APPLICABLE	APPLICABLE	APPLICABLE	APPLICABLE
	P4	UPGRADED SIDEWALK	APPLICABLE	APPLICABLE	APPLICABLE	APPLICABLE
	SL	STATION LANDSCAPING	APPLICABLE	APPLICABLE	APPLICABLE	APPLICABLE
1.70		**CROSSINGS**				
1.7.1	**C1**	GRADE-SEPARATED CROSSING	APPLICABLE	NOT APPLICABLE*	NOT APPLICABLE	NOT APPLICABLE
1.7.2	**C2**	AT-GRADE CROSSING WITH GATES (CROSSING ARM), BELLS, TRAFFIC AND PEDESTRIAN SIGNALS	APPLICABLE*	NOT APPLICABLE*	NOT APPLICABLE	NOT APPLICABLE

	TYPICAL LOCATION	DESIGN TREATMENT	LRT TYPOLOGY 1	LRT TYPOLOGY 2	LRT TYPOLOGY 3	LRT TYPOLOGY 4
1.7.3	**C3**	AT-GRADE CROSSING WITH TRAFFIC AND PEDESTRIAN SIGNALS ONLY- NO GATES (CROSSING ARM)	NOT APPLICABLE*	APPLICABLE*	NOT APPLICABLE	NOT APPLICABLE
1.7.6	**C4**	END-OF-PLATFORM (NON-INTERSECTION)	NOT APPLICABLE	NOT APPLICABLE	NOT APPLICABLE	NOT APPLICABLE
1.7.7	**C5**	MID-BLOCK PEDESTRIAN/CYCLIST CROSSING	NOT APPLICABLE	APPLICABLE	NOT APPLICABLE	NOT APPLICABLE
1.7.4	**IS1**	NON-STATION INTERSECTION	APPLICABLE	APPLICABLE	NOT APPLICABLE	NOT APPLICABLE
1.7.5	**IS2**	STATION INTERSECTION	APPLICABLE	APPLICABLE	APPLICABLE	APPLICABLE
1.80		**FENCING + RAILINGS**				
1.8.1		ALIGNMENT ROW FENCING				
	F1	GALVANISED CHAIN LINK FENCE	APPLICABLE	NOT APPLICABLE	NOT APPLICABLE	NOT APPLICABLE
	F2	COATED CHAIN LINK FENCE	APPLICABLE	NOT APPLICABLE	NOT APPLICABLE	NOT APPLICABLE
	F3	COATED WIRE MESH FENCE	APPLICABLE	NOT APPLICABLE	NOT APPLICABLE	NOT APPLICABLE
	F4	GALVANISED METAL PUNCHED OR CUT PANEL	APPLICABLE	APPLICABLE**	NOT APPLICABLE	NOT APPLICABLE
	F5	COATED METAL PUNCHED OR CUT PANEL	APPLICABLE	APPLICABLE**	NOT APPLICABLE	NOT APPLICABLE
	F6	PAINTED OR COATED METAL PICKET	APPLICABLE	APPLICABLE**	NOT APPLICABLE	NOT APPLICABLE
1.8.2		INTER-TRACK BARRIER				
	IT1	BOLLARD AND CHAIN/ CABLE	APPLICABLE	APPLICABLE	NOT APPLICABLE	NOT APPLICABLE
	IT2	GALVANISED PUNCHED OR CUT PANEL	APPLICABLE	APPLICABLE	APPLICABLE	APPLICABLE
	IT3	POST AND RAIL	APPLICABLE	APPLICABLE	NOT APPLICABLE	NOT APPLICABLE
1.8.3		STATION RAILING				
	R1	PAINTED OR COATED METAL PICKET	APPLICABLE	APPLICABLE	APPLICABLE	APPLICABLE
	R2	ARTIST COLLABORATION (?)	APPLICABLE	APPLICABLE	APPLICABLE	APPLICABLE
	R3	WEATHERING STEEL	APPLICABLE	APPLICABLE	NOT APPLICABLE	APPLICABLE
	R4	STAINLESS STEEL FRAME WITH GLASS PANELS	APPLICABLE	APPLICABLE	APPLICABLE	APPLICABLE
	R5	ACRYLIC PANELS	APPLICABLE	APPLICABLE	APPLICABLE	APPLICABLE
	R6	GALVANISED PUNCHED OR CUT PANEL	APPLICABLE	APPLICABLE	APPLICABLE	APPLICABLE
1.8.4	**R7**	GUIDEWAY SAFETY RAILING- STEEL STANCHIONS & CABLE OR OTHER OPTIONS, DETERMINED BY PARTI	NOT APPLICABLE	NOT APPLICABLE	NOT APPLICABLE	APPLICABLE

	TYPICAL LOCATION	DESIGN TREATMENT	LRT TYPOLOGY 1	LRT TYPOLOGY 2	LRT TYPOLOGY 3	LRT TYPOLOGY 4
1.90		**OVERHEAD CONTACT SYSTEM (OCS)**				
1.9.1	**PL1**	ROUND/BEVELED GALVANISED STEEL POLES - SINGLE USE	APPLICABLE	APPLICABLE	NOT APPLICABLE	APPLICABLE
1.9.2	**PL2**	ROUND GALVANISED STEEL POLES - SHARED USE WITH STREET LIGHTS, TRAFFIC, PEDESTRIAN AND CYCLE SIGNOT APPLICABLES	NOT APPLICABLE	APPLICABLE	NOT APPLICABLE	NOT APPLICABLE
1.9.3	**W1**	AESTHETICALLY TREATED SIMPLE CATENARY WIRE WITH LOW PROFILE (SCAT-LP)	APPLICABLE	APPLICABLE	NOT APPLICABLE	APPLICABLE
1.9.4	**W2**	SIMPLE CATENARY AUTO TENSION (SCAT)	APPLICABLE	NOT APPLICABLE	NOT APPLICABLE	APPLICABLE
1.9.5	**W3**	OVERHEAD CONTACT RAIL (OCR)	NOT APPLICABLE	NOT APPLICABLE	APPLICABLE	NOT APPLICABLE
1.10		**TRACK**				
1.10.1	**TW1**	BALLASTED TRACK	APPLICABLE	NOT APPLICABLE	NOT APPLICABLE	NOT APPLICABLE
1.10.2	**TW2**	DIRECT FIXATION TRACK	NOT APPLICABLE[3]	NOT APPLICABLE[3]	APPLICABLE	APPLICABLE
1.10.3	**TW3**	EMBEDDED (PAVED)	NOT APPLICABLE	APPLICABLE	NOT APPLICABLE	NOT APPLICABLE
1.11		**LRT STRUCTURES**				
1.11.1	**ELG**	ELEVATED LRT GUIDEWAY - CONNECTIONS AND FINISHES	NOT APPLICABLE	NOT APPLICABLE	NOT APPLICABLE	APPLICABLE
1.11.2	**BR**	BRIDGES	APPLICABLE***	APPLICABLE***	NOT APPLICABLE	APPLICABLE***
1.11.3		PORTAL-BARRIER				
	PB1	PORTAL-BARRIER, CONCRETE	APPLICABLE	NOT APPLICABLE	APPLICABLE	NOT APPLICABLE
	PB2	PORTAL-BARRIER, STEEL TUBE	NOT APPLICABLE	APPLICABLE	APPLICABLE	NOT APPLICABLE
	PB3	PORTAL-BARRIER, FENCING	APPLICABLE	APPLICABLE	APPLICABLE	NOT APPLICABLE
1.11.4		RETAINING WALLS				
	RW1	CAST-IN-PLACE, FORM-LINER	APPLICABLE	APPLICABLE	APPLICABLE	APPLICABLE
	RW2	MSE- LARGE CELL, FORM-LINER	APPLICABLE	APPLICABLE	APPLICABLE	APPLICABLE
	RW3	MSE- CMU	APPLICABLE	APPLICABLE	APPLICABLE	APPLICABLE
	RW4	GABION, ROCK OR GLASS AGGREGATE	APPLICABLE	APPLICABLE	APPLICABLE	APPLICABLE
1.11.5		SOUND ATTENUATION WALLS				
	RW5	PRE-CAST CONCRETE- FORM LINER	APPLICABLE	APPLICABLE	APPLICABLE	APPLICABLE
	RW6	COMPOSITE- PATTERNED	APPLICABLE	NOT APPLICABLE	NOT APPLICABLE	APPLICABLE
1.11.6		SCREENING WALLS				
	RW7	PRE-CAST CONCRETE- FORM LINER	APPLICABLE	APPLICABLE	APPLICABLE	APPLICABLE
	RW8	COMPOSITE- PATTERNED	APPLICABLE	NOT APPLICABLE	NOT APPLICABLE	APPLICABLE

	TYPICAL LOCATION	DESIGN TREATMENT	LRT TYPOLOGY 1	LRT TYPOLOGY 2	LRT TYPOLOGY 3	LRT TYPOLOGY 4
	RW9	TIMBER PANELS	APPLICABLE	APPLICABLE	APPLICABLE	APPLICABLE
	RW10	METAL PANEL	APPLICABLE	APPLICABLE	APPLICABLE	APPLICABLE
1.12		**SYSTEMS BUILDINGS**				
1.12.1		TRACTION POWER SUBSTATION (TPSS), SIGNAL AND COMMUNICATION BUILDINGS				
	SYS1	METAL FRAMING AND CLADDING	APPLICABLE	APPLICABLE	NOT APPLICABLE	APPLICABLE
	SYS2	CONCRETE MASONRY UNIT (CMU) WITH METAL MESH CLADDING	APPLICABLE	APPLICABLE	NOT APPLICABLE	APPLICABLE
	SYS3	CONCRETE MASONRY UNIT (CMU) WITH METAL ROOF	APPLICABLE	APPLICABLE	NOT APPLICABLE	APPLICABLE
	SYS4	CONCRETE BASE, CMU AND GLASS BLOCK WALLS WITH METAL ROOF	NOT APPLICABLE	APPLICABLE	NOT APPLICABLE	APPLICABLE
	SYS5	INTEGRATED INTO STATION ARCHITECTURE	NOT APPLICABLE	NOT APPLICABLE	APPLICABLE	APPLICABLE
	SYS6	OPERATOR BREAK BUILDING (OBB)	APPLICABLE	APPLICABLE	APPLICABLE	APPLICABLE
1.12.2	V	ENHANCED VENT SHAFT OPENINGS	NOT APPLICABLE	NOT APPLICABLE	APPLICABLE	NOT APPLICABLE
1.13		**OTHER**				
1.13.1	PA	PUBLIC ART- FREE-STANDING OR INTE-GRATED	APPLICABLE	APPLICABLE	APPLICABLE	APPLICABLE

NOTES:

[1] EXCEPTION: EMBANKMENT

[2] EXCEPTION: TYPICALLY NOT IN URBAN/ DOWNTOWN AREAS

[3] EXCEPTION: AT STATIONS

* UNLESS OTHERWISE DETERMINED BY A SAFETY AUDIT

** WHERE REQUIRED AT STATION FOR PERIMETRE FENCING

*** WHERE ACCOMMODATION FOR PEOPLE WHO WALK AND BICYCLE IS INCLUDED, A HIGHER LEVEL OF ENHANCEMENT/ CONSIDERATION IS REQUIRED FOR PAVING, FINISHES, RAILINGS, LIGHTING, SIGNAGE, LINE OF SIGHT, ETC

3.0 EXPLANATION OF LAYERS 1,2,3 AND 4

The Green Line is planning for Calgary's future, with the goal of providing more choices to citizens in the way we move, live, work and play. This will be achieved through a layered approach that will integrate transit infrastructure, connections to stations, transit oriented development (TOD) supportive infrastructure, and City Shaping connections to people, places and programs.

A comprehensive description of each of the four layers is provided in the Council Approved 'Green Line LRT Long term vision: 160 Avenue N to Seton' (June 2017). A description of how the GLUI Volume 2 acts to complement and support each of the layers is provided below. Coordinating the design of infrastructure within layers 2,3 and 4 with the urban integration supportive design treatments detailed in layer 1 will provide a cohesive transit corridor and consistent passenger experience, network-wide.

TRANSIT INFRASTRUCTURE - LAYER 1

Layer 1 will consist of everything the City of Calgary will build to operate low floor light rail transit in the Green Line corridor. This includes tracks, overhead electrical system, stations, structures and streetscape improvements necessitated by the alignment that will be delivered as part of the Stage 1 scope. GLUI Volume 2 provides a range of acceptable design treatments and materials for components of the LRT environment that constitute layer 1 infrastructure and the interface of layer 1 with existing and future urban development. GLUI will act as a guideline for the Green Line design team by providing a palette of urban integration and design treatments to be implemented along the corridor.

STATION CONNECTIONS - LAYER 2

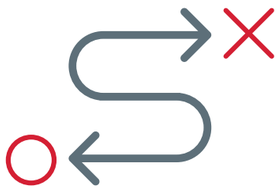
Layer 2 focuses on the infrastructure that connects people to and from stations. This includes pedestrian, cycling, bus, and automobile connections to ensure stations are accessible to riders. GLUI focuses on layer 1, however, the document may be used as a reference to inform and influence the design and materials of layer 2 station connections, specifically when these connections are delivered in conjunction with the layer 1 infrastructure.

TRANSIT ORIENTED DEVELOPMENT (TOD) SUPPORTIVE INFRASTRUCTURE – LAYER 3

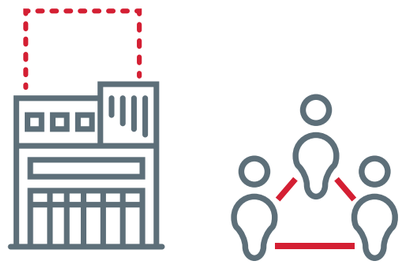
Transit Oriented Development (TOD) refers to a form of development typically characterized by multi-storey buildings incorporating a mix of activities (shopping, employment, housing, recreation) in a community designed to encourage walking, cycling, and transit use. A core element of these communities is a major transit station that is easily accessible and provides frequent service. GLUI Volume 2 may again provide a reference point in terms of the materials selected and the design approach, in order to provide a more seamless and cohesive transition from public (transit stations, transit plazas, etc) to private properties (housing, shopping, etc).

CITY SHAPING – LAYER 4

City Shaping is leveraging Calgary's investment in transit infrastructure to strengthen and support the social needs of communities along the Green Line. City Shaping is investing in people, places, and programs that are accessible by high quality transit service. An important aspect of City Shaping is to provide a level of design and functional space to support the people and programs that will use these spaces. The guidance provided by GLUI is broadly applicable to and may be employed in the design of public spaces being delivered with layer 1 of the Green Line, as well as other major capital projects that serve to fulfill long-range City-Shaping goals.

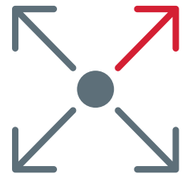


PEOPLE



PLACES

PROGRAMS



RELIABLE MULTI-MODAL TRANSPORTATION

ZGF

355 Burrard Street
Suite 350
Vancouver, British Columbia
V6C 2G8 Canada
T 604 558 8390