F

CONTEXT SPECIFIC APPLICATIONS

F.1 Current Practices for Highway Rights-of-Way

Lougheed Highway, Pitt Meadows, B.C.

F.1

CURRENT PRACTICES FOR HIGHWAY RIGHTS-OF-WAY

This chapter outlines the current context for planning and designing active transportation infrastructure within provincial rights-of-way in a variety of contexts. Many communities throughout B.C. have developed plans that outline short-, medium-, and long-term investments in active transportation. These plans typically include priorities for infrastructure that would be considered appropriate for both recreational and commuter trips. These proposed projects can also be found in a variety of contexts, including facilities that connect communities, are located in rural and small communities, or pass through urban contexts. For some communities, many of the projects are found on, or adjacent to, provincial rights-of-way. In addition, the provincial government is committed to active transportation and considering the needs of active transportation users within provincial rights-of-way.

Through the Ministry of Transportation and Infrastructure (MOTI), the provincial government's mandate for transportation is to plan transportation networks, provide transportation services and infrastructure, develop and implement transportation policies, and administer many related acts, regulations, and federal-provincial funding programs across the Province of B.C. The provincial government strives to build and maintain a safe and reliable transportation system and provide affordable, efficient, and accessible transportation options for all British Columbians. This work includes:

- Investing in road infrastructure, public transit, and active transportation improvements;
- Reducing transportation-related greenhouse gas emissions; and
- Strengthening the economy through the movement of people and goods.

The provincial government's investments generally include highway construction and rehabilitation and side road improvements, which include road resurfacing, bridge rehabilitation and replacement, seismic retrofits, intersection improvements and upgrades to smaller side roads to help connect communities throughout the province.

In addition, the provincial government is committed to encouraging healthy living and helping to address climate change. The provincial government has established a Cycling Policy, which has a goal to integrate cycling on the province's highways by providing safe, accessible, and convenient bicycle facilities and by supporting and encouraging cycling. The Cycling Policy states that:

1. Provisions for people cycling are made on all new and upgraded provincial highways. All exceptions to this policy will be subject to an evaluation procedure.
2. Route evaluations that impact people cycling will include consultations with cycling stakeholders. An evaluation can be applied on existing routes to identify measures that will improve cycling conditions.
3. The Province will involve cycling interests and local government officials responsible for cycling in all highway planning consultations. Municipal bicycle advisory committees and/or recognized cycling advocacy organizations can be utilized to provide advice on cycling needs, facilitate issues, and monitor the effectiveness of the Cycling Policy.
4. To accommodate the safety and travel requirements for different types of bicycle users, the provincial government plans, designs, and builds for the appropriate type of bicycle user based on the type of facility.
5. The cost of meeting the Cycling Policy will be managed within normal business practices and annual budgets.
6. Uniform signing and marking will be provided for cycling on all provincial highways.
7. The Cycling Policy will be monitored on a regular basis.

The provincial government works to incorporate pedestrian and cycling improvements as part of most major highway capital projects. This can range from the provision of grade-separated active transportation facilities in urban areas, such as the McKenzie Interchange Project within the District of Saanich, to smaller scale projects, such as shoulder widening during a road rehabilitation project, when feasible. It is important to note that shoulder widening can come with a significant cost if property acquisition or provision of clear zone is required.

In addition, the provincial government supports cycling through the cost-sharing of active transportation with local and regional governments through its grant program, which provides up to 50% of total eligible project costs (up to 75% for communities with a population under 15,000). Various project types are eligible for grant funding.

The New Building Canada Fund - Small Communities Fund can also be used to fund cycling projects. The provincial and federal governments will each allocate funding to support infrastructure projects in communities with a population of less than 100,000 people. This 10-year funding program runs from 2014 to 2024.

City of Nanaimo, B.C.

ACTIVE TRANSPORTATION INFRASTRUCTURE ON PROVINCIAL RIGHTS-OF-WAY

Design speed, road classification, topography, and other elements are considered when deciding where walking and cycling are permitted. Walking and cycling are permitted on all roadways in B.C., with the exception of some Schedule 1 highways, including the Trans-Canada Highway 1, Hope-Princeton Highway 3, Coquihalla Highway 5, and others. On these Schedule 1 highways, cycling is prohibited except to cross an intersection or where signs are in place permitting cycling. Some portions of the highway are excluded, meaning that cyclists are permitted. More details on the sections of the highways that are restricted, along with a list of exceptions, can be found on-line[1]. Walking and cycling is permitted on all other roadways under provincial jurisdiction.

For roadways under provincial jurisdiction, design guidelines for walking and cycling facilities are outlined in the MOTI *B.C. Supplement to TAC Geometric Design Guide*, which outlines the recommended practice for transportation projects on roadways under provincial jurisdiction. The MOTI *B.C. Supplement to TAC Geometric Design Guide* is the primary resource and design guide to follow for all projects that fall under provincial jurisdiction. The MOTI *B.C. Supplement to TAC Geometric Design Guide* classifies the different types of roadways under provincial jurisdiction (see **Table F-25**). There are specific guidelines for various design features, including vehicle lane width, shoulder width, and design speed. Guidance is provided on the accommodation of people walking and cycling within the context of paved shoulders on provincial rights-of-way, new roadway projects including new subdivisions, and alpine ski village roadways.

The remaining sections in this chapter outline the current mechanisms and process for implementing active transportation infrastructure on roadways under provincial jurisdiction, as well as applicable guidelines that should be followed based on the MOTI *B.C. Supplement to TAC Geometric Design Guide.*

1. 'Cycling Regulations, Restrictions & Rules of the Road,' Government of British Columbia, accessed June 12, 2019, *https://www2.gov.bc.ca/gov/content/transportation/driving-and-cycling/cycling/cycling-regulations-restrictions-rules*

Table F-25 // MOTI Design Standards

Source: MOTI *B.C. Supplement to TAC Geometric Design Guide,* Table 430.A

ROAD CLASSIFICATION	DESIGN SPEED (KM/H)	VEHICLE LANE WIDTH (M)	SHOULDER WIDTH (M)
Lower Volume Road (LVR)	30-90	3.25 - 3.6 m	0.5 m gravel
Rural Local Undivided (RLU)	50-80	3.6	1.0
Rural Collector Undivided (RCU)	50-80	3.6	1.5
	60-90	3.6	1.5
Rural Collector Divided (RCD)	60-90	3.6	2.5
Rural Arterial Undivided (RAU)	70-90	3.6	1.5-2.0
	80-100	3.6	2.5
Rural Arterial Divided (RAD)	80-100	3.7	3.0
Rural Freeway / Expressway (RED / RFD)	80-100	3.7	3.0

CURRENT MECHANISMS FOR IMPLEMENTING INFRASTRUCTURE ON PROVINCIAL RIGHTS-OF-WAY

The provincial government supports the goals and desires of local and regional governments to provide more active transportation facilities that are separated from provincial rights-of-way. There are a number of mechanisms available for local and regional governments, developers, and others agencies to help with the installation of active transportation infrastructure within provincial rights-of-way. The most common approaches are permits, licences of occupation and new development opportunities, each of which are described below.

The mechanism for implementation is strongly influenced by several factors, including: the facility type, project complexity, integration with provincial infrastructure (location adjacent to the roadway or separated from the roadway), and design standards.

- **Permits**: The provincial government permits certain infrastructure to be constructed within provincial rights-of-way. The details of this are outlined in Section 62 (Authorization of Use or Occupation on Provincial Public Highways) of the *Transportation Act*. Permits are often issued for projects such as sidewalks, off-street pathways, landscaping, bus shelters, benches, and other structures. A permit application is submitted to provincial government staff to review permit applications and make the final decision in the permitting process. Typically, projects that are approved through the permit process are funded by the applicant, including installation, operations, and maintenance.
- **Licence of Occupation:** A licence of occupation is typically issued for the installation of semi-permanent facilities where a licensee anticipates frequent use either by the broader public or specific user groups and will require significant and ongoing oversight (such as rail trails, parking lots, and transit amenities). Licences are typically issued for sections of provincial rights-of-way that are either unopened or adjacent to existing roadways where there is excess space available. A Temporary Licence of Occupation may also be issued to allow an applicant to investigate a potential location for new infrastructure/ structures.
- **New Developments / Subdivisions:** Decisions on new infrastructure installed through development opportunities are made by the provincial approving officer (PAO). The PAO functions as an independent body with authority over various types of land development. Their role is applicable for development and subdivision application approvals but not permits. Their role is to approve or deny various infrastructure proposed through development applications. This includes transportation infrastructure (roads as well as pedestrian and bicycle facilities) but also includes all other types of utilities. The PAO reviews and approves the designs while working with provincial government staff.

  Any infrastructure that gets constructed through this process becomes the provincial government's responsibility (unless it is built as part of a strata or unless there is agreement from the owner), which requires an allocation of funding and resources towards operations and maintenance. Developers and agencies can propose various designs, but it is ultimately up to the approvals official to approve any new infrastructure installed.

  It is important to note that new developments and subdivisions are a mechanism for installing active transportation infrastructure; however,

this process on its own does not address responsibility for operations and maintenance after installation.

Currently, the provincial government reserves the right to remove any infrastructure built within provincial rights-of-way if it is determined that the space is required for provincial use. The provincial government will attempt, where feasible, to accommodate existing active transportation infrastructure within capital expansion projects. The provincial government will explore opportunities to work with jurisdictions to identify funding opportunities to improve and maintain active transportation infrastructure.

Current Process for Project Approval (All Mechanisms)

This section outlines the current process for project approval of active transportation infrastructure within provincial rights-of-way. This process is typical for the three mechanisms listed above.

1. There are often **preliminary conversations** about the proposed project between provincial government staff and the applicant prior to submitting the application.
2. **Detailed design plans** are required to be submitted with the application. The review of these plans often requires some back and forth between provincial government staff and the applicant. The design plans are often reviewed before the application is formally submitted.
3. The application with project details and final detailed design plans are **submitted** to the provincial government.
4. The provincial government begins the **application review process**. This review is based on the facility design standards that are currently in place. Some of the context specific factors that the provincial government is looking for include:

- **Location and Type of Facility**: A major factor that influences the project review process is the impact the proposed facility will have on existing provincial infrastructure. For example, if the proposed facility is physically separated from the roadway under provincial jurisdiction, and/or outside the clear zone or within an unused right-of-way, then generally, the review process is less onerous. This is an important factor considered by the provincial government, as it impacts who is responsible for the ongoing operations and maintenance of the facility. If the active transportation infrastructure is physically separated from a roadway under provincial jurisdiction, the new infrastructure tends to be the responsibility of the applicant. This includes ongoing operations and maintenance responsibilities.
- **Right-of-Way Width**: The provincial government determines if there is space available to install the proposed facility and if the width and design of the facility comply with the provincial government's design standards.
- **Drainage:** Drainage is an important factor that the provincial government considers when reviewing projects. It is one of the main reasons the installation of sidewalk infrastructure in particular can be challenging. The need for drainage can have a significant impact on the cost of installing new facilities, as well as ongoing maintenance and operations. Drainage is also an important consideration if an off-street pathway is being built close to an adjacent roadway under provincial jurisdiction. The design must consider how the two facilities will interact with each other and the impacts on roadway operations and maintenance (even if they are not 'touching').

- **Provincial Roadway Classification**: The provincial government reviews the existing volumes and speeds of the roadway adjacent to a proposed active transportation facility. It also reviews the existing land use and topography. This is an important consideration, as the classification of the roadway influences the appropriateness of the proposed active transportation infrastructure and significantly factors into the design criteria and future highway plans.
- **Safety Considerations**: The provincial government reviews the proposed project from a safety perspective looking at the impact on all road users.
- **Determine Operations, Maintenance, and Liability:** Responsibility of operations and maintenance must be determined before a permit will be issued.

FACILITY SELECTION

Two critical components in determining if active transportation facilities are appropriate on roadways within provincial rights-of-way are the land use context and if the roadway travels through a more urban or rural environment. **Table F-26** outlines which active transportation facilities may be appropriate within different land-use contexts. It is important to note, however, that as discussed above, there are other considerations beyond land use that factor into whether an active transportation facility is appropriate on roadways within provincial rights-of-way.

The active transportation facility types that are most preferred along and adjacent to roadways within provincial rights-of-way are those that are physically separated from the roadway, including multi-use pathways or separated pedestrian and cycling pathways.

Table F-26 // Facility Types that May be Considered Based on Land Use*

LOCATION	FACILITY TYPE (IF FEASIBLE)	PRIMARY MODES OF ACTIVE TRANSPORTATION	MOTI INFRASTRUCTURE BY LAND USE		COMFORTABLE FOR PEOPLE OF ALL AGES AND ABILITIES
			Through Urban Environments	Between Communities / Rural Environments	
Physically Separated from Roadway	Separated Pedestrian and Bicycle Pathways	Cycling and Walking	✓	✓	✓
	Multi-Use Pathways	Cycling and Walking	✓	✓	✓
	Sidewalks	Walking	✓	X	✓
Within Roadway	Protected Bicycle Lanes	Cycling	✓	X	✓
	Painted and Buffered Bicycle Lanes	Cycling	✓	✓	X
	Bicycle and Pedestrian Accessible Shoulders	Cycling and Walking	X	X	X

*It is important to note that local context and engineering Judgement play a critical role in determining if a bicycle facility is appropriate on roadways within provincial rights-of-way.

Bicycle lanes and bicycle accessible shoulders may also be considered, provided maintenance can be accommodated and the safety of all road users is considered. Sidewalks are most appropriate in areas where drainage and maintenance can be accommodated, and are predominantly found within more urban contexts.

DESIGN GUIDANCE

This section summarizes design guidance on the types of active transportation facilities that may be considered on, or adjacent to, provincial roadways by facility type. These guidelines are based on the MOTI *B.C. Supplement to TAC Geometric Design Guide*. Design professionals should refer to that MOTI document for further guidance for active transportation facilities on roadways under provincial jurisdiction. This section outlines provincial specific guidance for the following active transportation facility types located on roadways under provincial jurisdiction.

- Physically Separated from Roadway
  - *Off-Street Pathways (including multi-use pathways and separated bicycle and pedestrian pathways)*
  - *Sidewalks*
- Within Roadway
  - *Bicycle and Pedestrian Accessible Shoulders*
  - *Painted and buffered bicycle lanes*
  - *Protected bicycle lanes*

Table F-27 outlines the recommended bicycle facility design guidance provided in the MOTI *B.C. Supplement to TAC Geometric Design Guide* (if applicable). Note that this document does not currently provide guidance for some facility types, including protected bicycle lanes and buffered bicycle lanes based on road classification and design speed on roadways under provincial jurisdiction.

TABLE F-27 // RECOMMENDED ACTIVE TRANSPORTATION FACILITY WIDTH BASED ON ROAD CLASSIFICATION

Source: Adapted from MOTI BC Supplement to TAC Geometric Design Guide

ROAD CLASS AND DESIGN SPEED	FACILITY TYPE SUMMARY					
	Bicycle and Pedestrian Accessible Shoulders		Painted Bicycle Lanes		Off-Street Pathways	
	Width	Offset	Width	Offset	Width	Offset
Rural < 70 km/h	1.5 - 2.0 m	N/A			3.0 - 4.0m (2.0m if constrained)[1]	Varies [2, 3]
Rural ≥ 70 km/h	2.0 - 3.0 [4]	N/A				
Urban			1.5 - 1.8 m (1.2 m if constrained)	N/A		Boulevard [5]

1. A minimum width of 2.0 metres should only be considered in exceptional circumstances, including in undeveloped rural contexts with very low volumes of people walking and/or cycling and if there are significant constraints such as property or natural features including significant trees, ditches, or slopes.
2. Separated off-street pathway to be located outside the roadway clear zone.
3. Roadside off-street pathways should be offset the greater of the barrier zone of deflection or 0.5 metres
4. Bicycle and pedestrian accessible shoulders are not recommended for design speeds > 70 km/h. However, if they are provided, they should be between 2.0 - 3.0 metres. See further guidance in the Pedestrian and Bicycle Accessible Shoulder section on page F15.
5. Boulevard can be replaced with a physical barrier in constrained conditions.

PHYSICALLY SEPARATED FROM ROADWAY

Off-Street Pathways

Off-street pathways are physically separated from motor vehicle traffic and can be used by non-motorized forms of transportation (see **Figures F-65** and **F-66**). Typically, off-street pathways along or adjacent to provincial roadways are multi-use facilities, particularly in rural contexts; however, in cases of higher volumes of people walking and cycling, bicycle and pedestrian pathways may be considered (**Chapter E.3**). Off-street pathways also typically accommodate bi-directional travel for all users, although there are some cases where bicycle travel may be uni-directional. Off-street pathways along or adjacent to provincial roadways are the preferred facility type where feasible. Off-street pathways should be considered where right-of-way and clear zone space is available.

Width

The width of an off-street pathway is influenced largely by adjacent land uses, anticipated volume of users, the type of users, topography, and the space available. It is also important to note that, as off-street pathways are considered all ages and abilities facilities, they often attract a variety of users, some of which may operate at slower speeds. As a result, providing sufficient space to pass others is an important consideration.

For off-street pathways along or adjacent to provincial roadways, the desirable width is 4.0 metres. The constrained limit width of a multi-use pathway is 3.0 metres. The absolute minimum width of a multi-use pathway is 2.0 metres, based on the operating envelope of a single bicycle user (1.2 metres) and the operating envelope of one person walking (0.75 metres). However, this minimum width of 2.0 metres should only be considered in exceptional circumstances, including in undeveloped rural contexts with very low volumes of people walking and/or cycling and if there are significant constraints such as property or natural features including significant trees, ditches, or slopes. Refer to **Chapter E.2** for more details about design speed, longitudinal grade, sight distance, signage, and pavement markings for off-street pathways.

Clear Zone (Provincial Highways)

In rural contexts, a Clear Zone shall be provided. The Clear Zone includes the total roadside border area, starting at the edge of the outer through vehicle lane. This area should consist of a shoulder, a recoverable slope, a non-recoverable slope, and/or a clear run-out area as well as a buffer area adjacent to the off-street pathway. The desired Clear Zone width is dependent upon the design traffic volume and speed and on the roadside slope. Section 620 of the MOTI *B.C. Supplement to TAC Geometric Design Guide* provides more detailed guidance on how to calculate the Clear Zone width on rural roads for new roadways and road rehabilitation projects. This guidance is summarized in **Table F-28**. In urban contexts where curb and gutter is provided, the Clear Zone is not required, but a boulevard in the Furnishing Zone should instead be provided (see **Figure F-65**).

In constrained urban conditions, the boulevard in the Furnishing Zone can be eliminated and replaced with a physical barrier, such as a concrete barrier or bicycle fence (see **Figure F-67**). More guidance on this treatment can be found in the Fencing and Barriers subsection on page F19.

Surface Material

As off-street pathways are intended to be accessible and accommodate a wide range of users and trip purposes, asphalt is the preferred surface type. However, local context may dictate that other materials such as compact aggregate, gravel, wood chips, or other treatments may be considered. These materials may be appropriate for off-street pathways through environmentally sensitive areas, rural communities, and situations where cost and implementation are constraints. It is important to note that these surface materials can have an impact on varying types of users (see **Chapter B.3**).

Ditches

If a ditch on one or both sides of the roadway is required, the ditch would typically be designed for a depth of 0.3 metres below the pavement structure. The design of side slopes and back slopes would typically be in accordance with the MOTI *B.C. Supplement to TAC Geometric Design Guide*, and should consider roadside safety, provincial right-of-way requirements, and geotechnical criteria.

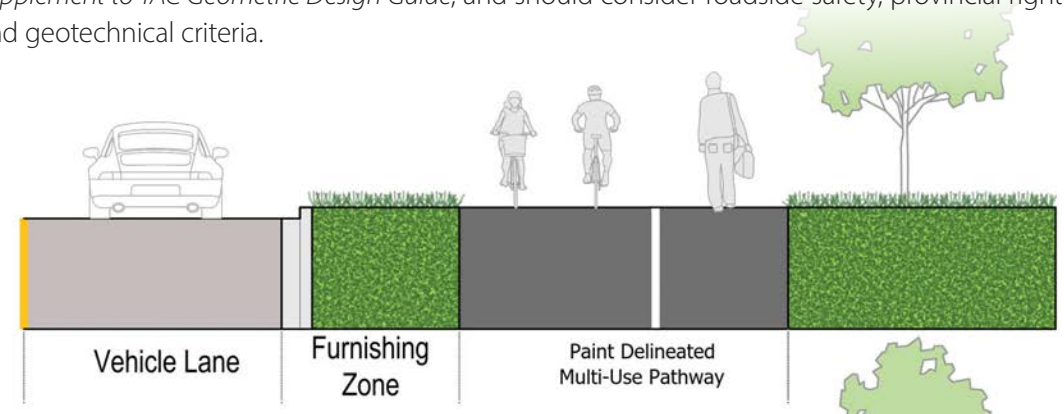


Figure F-65 // Multi-use Pathway (Urban Context)

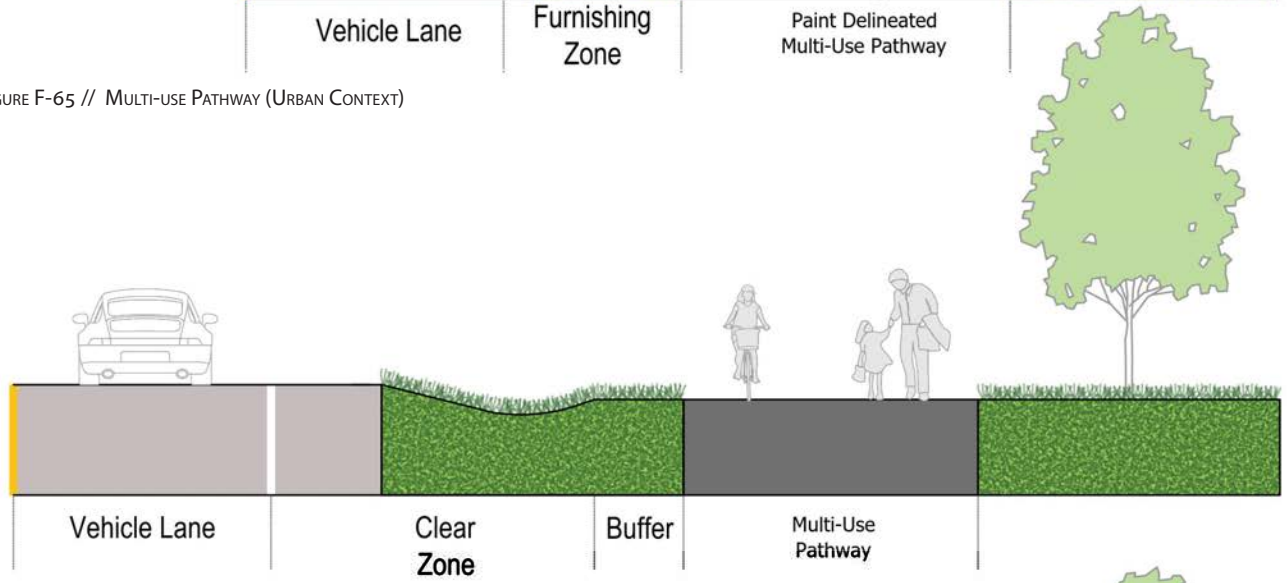


Figure F-66 // Multi-use Pathway (Rural Context)

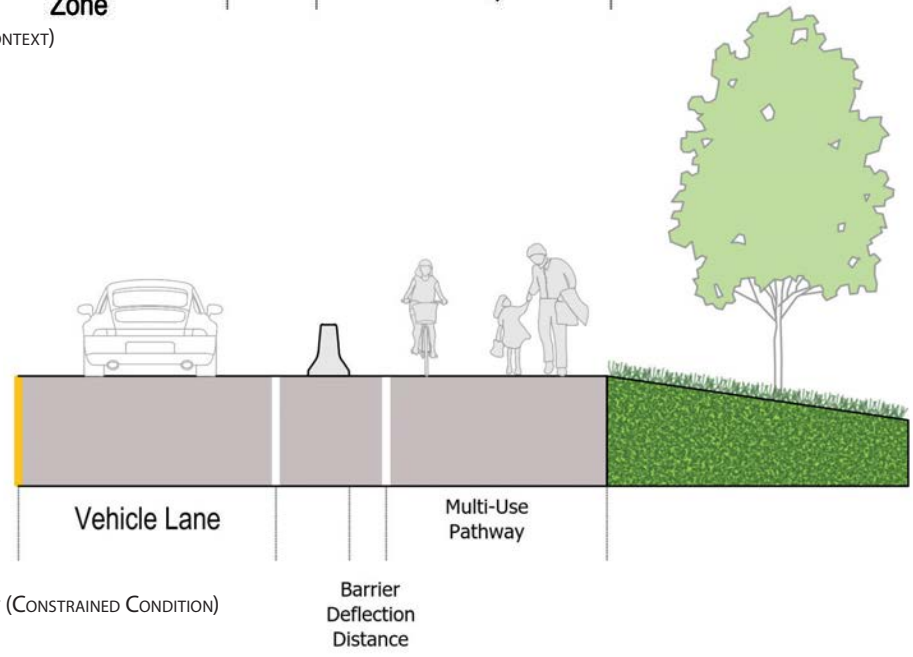


Figure F-67 // Protected Multi-use Pathway (Constrained Condition)

Table F-28 // Suggested(¥) Design Clear Zone Distances in Metres For New Construction and Reconstruction Projects on Rural Highways (¥¥)
Source: MOTI *B.C. Supplement to TAC Geometric Design Guide*, Table 20.A

DESIGN SPEED (KM/H)	DESIGN YEAR AADT (SEE NOTE 2)	FRONT SLOPES (FILL)			BACK SLOPES (CUT)		
		6:1 or flatter	5:1 to 4:1	3:1	3:1	5:1 to 4:1	6:1 or flatter
< 70	200 <AADT< 750 (see note 2)	2.0 - 3.0	2.0 - 3.0	**	2.0 - 3.0	2.0 - 3.0	2.0 - 3.0
	750 - 1500	3.0 - 3.5	3.5 - 4.5	**	3.0 - 3.5	3.0 - 3.5	3.0 - 3.5
	1501 - 6000	3.5 - 4.5	4.5 - 5.0	**	3.5 - 4.5	3.5 - 4.5	3.5 - 4.5
	> 6000	4.5 - 5.0	5.0 - 5.5	**	4.5 - 5.0	4.5 - 5.0	4.5 - 5.0
70 - 80	200 <AADT< 750 (see note 2)	3.0 - 3.5	3.5 - 4.5	**	2.5 - 3.0	2.5 - 3.0	3.0 - 3.5
	750 - 1500	4.5 - 5.0	5.0 - 6.0	**	3.0 - 3.5	3.5 - 4.5	4.5 - 5.0
	1501 - 6000	5.0 - 5.5	6.0 - 8.0	**	3.5 - 4.5	4.5 - 5.0	5.0 - 5.5
	> 6000	6.0 - 6.5	7.5 - 8.5	**	4.5 - 5.0	5.5 - 6.0	6.0 - 6.5
90	200 <AADT< 750 (see note 2)	3.5 - 4.5	4.5 - 5.5	**	2.5 - 3.0	3.0 - 3.5	3.0 - 3.5
	750 - 1500	5.0 - 5.5	6.0 - 7.5	**	3.0 - 3.5	4.5 - 5.0	5.0 - 5.5
	1501 - 6000	6.0 - 6.5	7.5 - 9.0	**	4.5 - 5.0	5.0 - 5.5	6.0 - 6.5
	> 6000	6.5 - 7.5	8.0 - 10.0*	**	5.0 - 5.5	6.0 - 6.5	6.5 - 7.5
100	200 <AADT< 750 (see note 2)	5.0 - 5.5	6.0 - 7.5	**	3.0 - 3.5	3.3 - 4.5	4.5 - 5.0
	750 - 1500	6.0 - 7.5	8.0 - 10.0*	**	3.5 - 4.5	5.0 - 5.5	6.0 - 6.5
	1501 - 6000	8.0 - 9.0	10.0 - 12.0*	**	4.5 - 5.5	5.5 - 6.5	7.5 - 8.0
	> 6000	9.0 - 10.0*	11.0 - 13.5*	**	6.0 - 6.5	7.5 - 8.0	8.0 - 8.5
≥110	200 <AADT< 750 (see note 2)	5.5 - 6.0	6.0 - 8.0	**	3.0 - 3.5	4.5 - 5.0	4.5 - 5.0
	750 - 1500	7.5 - 8.0	8.5 - 11.0*	**	3.5 - 5.0	5.5 - 6.0	6.0 - 6.5
	1501 - 6000	8.5 - 10.0*	10.5 -13.0*	**	5.0 - 6.0	6.5 - 7.5	8.0 - 8.5
	> 6000	9.0 - 10.5*	11.5 -14.0*	**	6.5 - 7.5	8.0 - 9.0	8.5 - 9.0

(¥) The designer may use lesser values than the suggested distances in this table only if these lesser values are justified using a cost-effectiveness analysis as outlined in section 620.07. The Design Clear Zone inventory form in Figure 620.C should be filled in by the designer and included in the design folder.
(¥¥) Rural highways are typically open ditch. Urban highways typically have curb and gutter with enclosed drainage. Refer to section 620.13 for a discussion of Clear Zone applied to an urban environment.
(*) Clear zones may be limited to 9.0 metres for practicality and to provide a consistent roadway template if previous experience with similar projects or designs indicates satisfactory performance.
(**) Since recovery is less likely on the unshielded, traversable 3:1 slopes, fixed objects should not be present in the vicinity of the toe of these slopes. Recovery of high-speed vehicles that encroach beyond the edge of the shoulder may be expected to occur beyond the toe of slope. Determination of the width of the recovery area at the toe of slope should take into consideration right-of-way availability, environmental concerns, economic factors, safety need and collision history. Also, the distance between the edge of the through travel lane and the beginning of the 3:1 slope should influence the recovery area provided at the toe of slope. While the application may be limited by several factors, the foreslope parameters which may enter into determining a maximum desirable recovery area are illustrated in Figure 620A.

1. All distances are measured from the outer edge of the through traveled lane. Where a site specific investigation indicates a high probability of continuing crashes, or such occurrences are indicated by crash history, the designer may provide clear zone distances greater than the clear zone shown in Table 620.A.
2. For clear zones, the 'Design Year AADT' will be total AADT for both directions of travel for the design year. This applies to both divided and undivided highways.
3. For AADT ≥200, the front slope is 2:1 or flatter, the back slope is 1.5:1 or flatter. Refer to section 510.08 of the Low-volume Roads chapter for the setback to fixed objects.
4. The values in the table apply to tangent sections of highway. Refer to table 620.B for adjustment factors on horizontal curves.
5. Refer to Fig. 620.B and the TAC *Geometric Design Guide for Canadian Roads* or AASHTO *Roadside Design Guide* for worked examples of calculations.

WITHIN ROADWAY

Protected Bicycle Lanes

A protected bicycle lane is a dedicated facility for the exclusive use of people cycling and using other active modes (such as in-line skating, using kick scooters, and skateboarding, where permitted) that is physically separated from motor vehicles and pedestrians by vertical and/or horizontal elements. Protected bicycle lanes are distinct from painted or buffered bicycle lanes as they provide physical separation between bicycle users and motor vehicles. Design guidance on protected bicycle lanes is not included in the MOTI *B.C. Supplement to TAC Geometric Design Guide*. Refer to **Chapter D.3** for additional guidance on facility design and applicable context for implementation.

It is important to note that there are several factors that need to be considered before designing and implementing protected bicycle lanes. Protected bicycle lanes should only be considered within an urban land-use context where motor vehicle volumes and speeds warrant implementation. Protected bicycle lanes should only be installed if feasible based on available right-of-way, ensuring limited impact on motor vehicle operations, and where safety is considered for all users. Protected bicycle lanes should only be considered if space is available to install the facilities based on the design guidance, and without impacting the operational requirements of the roadway by ensuring that the roadway will continue to have sufficient existing and future capacity to maintains its primary function of moving people and goods. It is critical to ensure maintenance is considered when determining if protected bicycle lanes are an appropriate facility type given the context and, if so, that it is considered throughout the design and implementation. The installation of physical separation may impact the type of maintenance equipment and machinery required, which can have a significant impact on operations and maintenance budgets. Additionally, the type of separation used will impact maintenance considerations and will be dependent on the type of roadway. Design professionals should consult and work with the provincial government to consider the feasibility and design considerations regarding maintenance of protected bicycle lanes at the outset of a project.

Buffered Bicycle Lanes

A buffered bicycle lane provides additional separation between the bicycle lane and the motor vehicle travel lane and/or parking lane by way of an additional white longitudinal line that runs parallel to the bicycle lane. Design guidance for buffered bicycle lanes can be found in **Chapter D.4**. The desired buffer width is 0.6 metres. In constrained situations, the buffer can be 0.3 metres wide. The maximum width of a buffer is 0.9 metres; if at least 0.9 metres of additional space is available, a protected bicycle lane should be considered instead. Wider buffers (greater than 0.6 metres) may be enhanced with additional hatch markings.

It is important to note that there are several factors that need to be considered before designing and implementing buffered bicycle lanes on roadways under provincial jurisdiction. Firstly, design guidance on buffered bicycle lanes is not included in the MOTI *B.C. Supplement to TAC Geometric Design Guide*. Refer to **Chapter D.4** for additional guidance on facility design and applicable context for implementation. Like protected bicycle lanes, buffered bicycle lanes should only be considered within an urban land-use context where motor vehicle volumes and speeds warrant implementation. Buffered bicycle lanes should only be installed if feasible based on available right-of-way, ensuring limited impact to motor vehicle operations, and when safety is considered for all road users. Buffered bicycle lanes should only be considered if space is available to install the facilities based on the design guidance, and without impacting the operational requirements of the roadway by ensuring that the roadway will continue to have sufficient existing and future capacity to maintains its primary function of moving people ands goods. Additional maintenance considerations may also be required and must be considered prior to installation.

Painted Bicycle Lanes

Painted bicycle lanes are separate travel lanes designated for the exclusive use of bicycles. Refer to **Chapter D.4** for guidance on painted bicycle lanes.

The desirable width of a bicycle lane is 1.8 metres. This provides sufficient width for single file bicycle traffic with some buffer from motor vehicle lanes. If the bicycle lane is wider than 1.8 metres it may encourage motor vehicle drivers to use the lane by mistakenly considering it as another motor vehicle lane or a parking lane. If the bicycle lane is wider than 1.8 metres, a buffered bicycle lane should be provided. The constrained limit of a bicycle lane is 1.5 metres. If the bicycle lane is narrower than 1.5 metres, it loses much of its capability to provide separation between bicycles and adjacent motor vehicles. Widths of less than 1.5 metres should only be provided in exceptional circumstances and require justification through a design exception in accordance with the TAC *Geometric Design Guide for Canadian Roads*. The absolute minimum width of a curbside bicycle lane is 1.2 metres based on the horizontal operating envelope of a person cycling.

Guidance on signage and pavement markings for bicycle lanes can be found in **Chapter D.4**.

Pedestrian and Bicycle Accessible Shoulders

On many roadways, shoulders can be used as an on-street walking and cycling facility. Shoulders are paved spaces on the edge of rural roads and highways outside of the motor vehicle lanes but within the road right-of-way that can be used by people walking, cycling, and using other active modes. Shoulders can provide a space for people riding their bicycle, similar to a bicycle lane. They are delineated by a solid white longitudinal line and can, in some cases, be supplemented by signage and pavement markings alerting motorists to expect bicycle travel along the roadway. Shoulders do not provide an exclusive space for people cycling as the shoulder space can be shared by a variety of users, including pedestrians and motor vehicles when required for safety, operations, and maintenance.

On roadways under provincial jurisdiction, cross-sectional elements are determined based on design speed, road classification, and design volumes as seen in **Table F-29**. The province also provides guidance on the minimum width of shoulder bikeways as seen in **Table F-29**. A minimum width of 1.5 metres is required for a bicycle accessible shoulder. A wider facility is recommended on roadways with higher design speeds and vehicle volumes. Bicycle and pedestrian accessible shoulders are not recommended for design speeds greater than 70km/h. However, in some cases this may be the only option available. Guidance on the use of rumble strips can be found in the section below.

Rumble Strips

On higher speed roadways, TAC recommends the use of Shoulder Rumble Strips (SRS) within the buffer space. SRS are milled out sections of the pavement along a roadway that provide feedback to motorists through noise and vibrations in the steering wheel, notifying them when they have deviated from the travel lane into the shoulder.

The MOTI *B.C. Supplement to TAC Geometric Design Guide* notes that SRS should be considered on rural highways in the following cases:

1. New rural highway sections;
2. When re-paving, rehabilitating or re-constructing existing rural highway sections, which include shoulders; and
3. Other rural highway sections that are not part of a project but would benefit from the installation of SRS in terms of decreasing the number of single vehicle off-road crashes.

SRS are typically placed on existing or new paved shoulders that are located on two-lane highways with minimum 1.5 metre shoulders, multi-lane divided

Table F-29 // Design Widths for Pedestrian and Bicycle Accessible Shoulders on Roadways Under Provincial Jurisdiction
Source: MOTI *B.C. Supplement to TAC Geometric Design Guide,* Table 530.B

Controlling Condition	Minimum Design Width (m)
For most cases, except as below	1.5
For Design Speeds, ≥ 70 km/h and SADT > 5000	2.0
For Design Speeds > 80 km/h and SADT >10,000	2.5[1]
All Freeways and Expressways	3.0 [1]

1. If cycling facilities are being proposed adjacent to existing provincial roadways, bicycle and pedestrian accessible shoulders are not recommended for design speeds > 70km/h. However, this table provides guidance in these case where pedestrian and bicycle shoulders are provided in such contexts.

highways with a minimum 1.5 metre shoulder,s and multi-lane divided highways with minimum 0.5 metre shoulders inside and 1.5 metres outside. SRS should not be installed in the following locations:

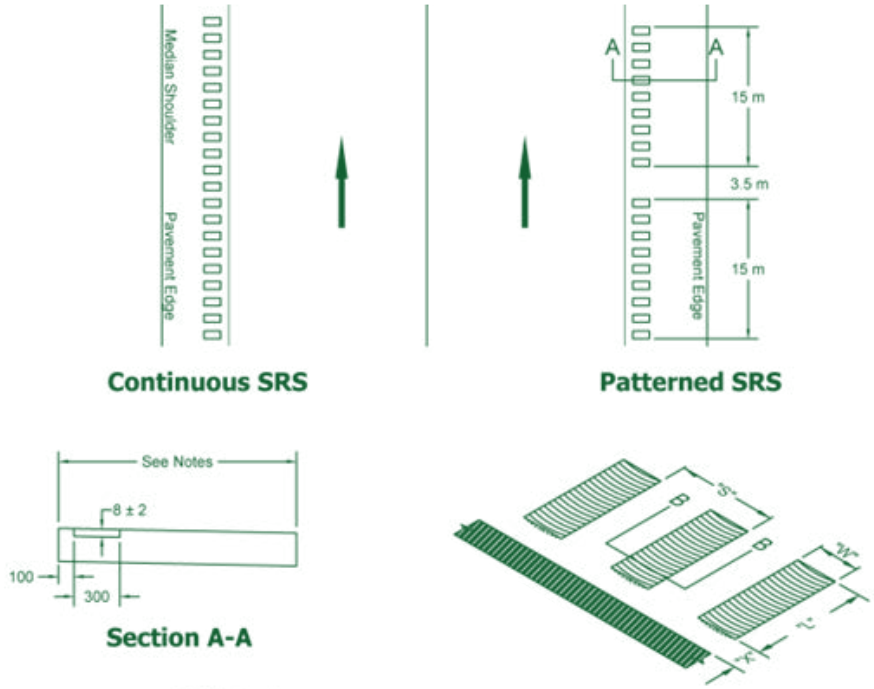
- Urban areas;
- Bridge decks;
- Overpasses; or
- Other concrete structures

Figure F-68 outlines design guidance for SRS from the MOTI *B.C. Supplement to TAC Geometric Design Guide* and notes that shoulders with SRS that have bicycle traffic should be at least 1.5 metres wide. When people riding their bicycles in the shoulders need to access the motor vehicle lane because of debris or other riding impediments in the shoulder, they would need to cross the rumble strip. It can be hazardous to ride over rumble strips at higher speeds because of the uneven surface, which may cause a loss of control. As such, if SRS are used, their design and placement must be properly considered to ensure the safety of all users. SRS are to be interrupted prior to driveways intersections, ramps, shoulder constraints and wherever it is needed and required to allow people cycling to merge to the left of the SRS. **Figure F-69** outlines guidance on SRS interruptions at shoulder constraints.

There is an existing standard practice in B.C. for the application of rumble strips; including installing 15 metres of rumble strips with a 3.5 metre gap pattern. This is done to allow people cycling a regular opportunity to leave the shoulder area without passing over the rumble strips. Continuous rumble strips are used for medians, not shoulders where cyclists are permitted.

Figure F-68 // Milled Rumble Strip Design

Source: B.C. Supplement to TAC Geometric Design Guide, Figure 650.A



See comments below for discussion of nominal dimensions

Offset 'X' from the edge of the lane paint line is 100 mm ± 10 mm. This may be reduced to 0 mm to maintain cycling width.

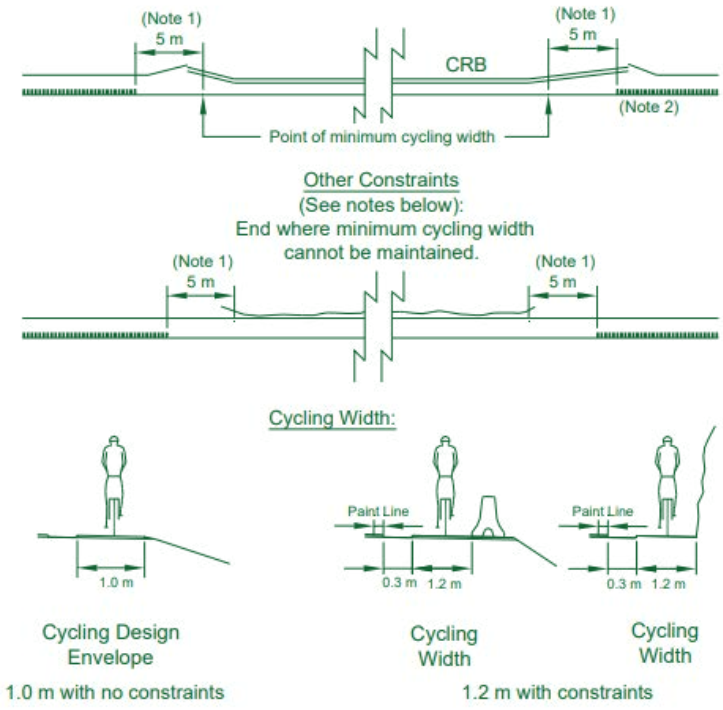
Length of Rumble Strip 'l' is 300 ± 10 mm.

Width 'W' is nominally 140 mm ± 20 mm, based on the tolerance of the cut depth (8 mm ± 2).

Spacing 'S' between strips is 300 mm.

Notes:

1. Milled-in SRS are to be placed to existing/new paved shoulders on:
• 2-Lane highways with minimum 1.5 m shoulders
• Multi-Lane undivided highways with minimum 1.5 m shoulders
• Multi-Lane divided highways with minimum 0.5 m shoulders inside and 1.5 m outside.
2. The minimum shoulder depth of pavement required is 50 mm, SRS are not to be installed if pavement deterioration or cracking is evident.
3. Milled-in SRS are to be placed on existing/new paved centre medians with a minimum 2.0 m painted width. This includes locations with existing median barrier if there is sufficient room for the milling machine to install the SRS. For widths less than 2.0 m, see Figure 650.F.
4. Patterned SRS installation is for outside shoulder locations. Continuous SRS installation is for median shoulder locations and painted flush medians.
5. Milled-in SRS may be placed where outside shoulders are less than 1.5 m if there is no cycling traffic on the shoulder.
6. Milled-in SRS are not to be placed through urban areas or in the presence of turning lanes.
7. Milled-in SRS are to be discontinued across private accesses and public road intersections. Refer to Figures 650.B and 650.C.
8. Milled-in SRS are to be discontinued in advance of all bridges and where minimum dimensions do not exist because of Roadside Barrier, Drainage Curb, Fencing, Rock Face, etc. Refer to Figure 650.D.
9. Shoulder rumble strips shall no be installed on bridge decks, overpass structures, or other concrete surfaced structures.



Notes:

1. The minimum acceptable cycling width with a longitudinal obstruction is 1.2 metres. The SRS should be discontinued 5 metres before and restarted 5 metres after where this width to longitudinal constraints cannot be maintained.
2. If there is adequate cycling width adjacent to a barrier, the SRS should not be discontinued.
3. SRS should not be installed on bridge decks, overpasses or other concrete surfaces.

Figure F-69 // SRS Interruptions at Shoulder Constraints
Source: B.C. Supplement to TAC Geometric Design Guide 2019 Figure 650.D

Sidewalks

Typically, sidewalks are not installed on roadways in rural contexts, but they may be installed as part of road renewal projects and in urban and suburban contexts, including developed rural core contexts. Operations, maintenance, and adequate drainage can impact the location of sidewalks. Sidewalks are typically proposed by a local or regional government., In such cases, the local or regional government would typically be responsible for the cost of the engineering, construction, and maintenance of the sidewalk.

Consistent with guidance in **Section C**, the minimum width of sidewalks should be 1.8 metres. The width should be increased where shared use by people walking and cycling is expected. If this is the case, refer to the design guidance for off-street pathways in **Section E**.

Fencing and Barriers on Provincial Infrastructure

The MOTI *B.C. Supplement to TAC Geometric Design Guide* outlines situations where fencing for people walking and cycling may be appropriate. One situation where fencing may be installed along a roadway under provincial jurisdiction includes locations on roadways and bridges that have a bicycle path or sidewalk where the average annual daily traffic (AADT) is greater than 35,000 vehicles or the seasonal annual daily traffic (SADT) is greater than 40,000 vehicles, and the posted speed is equal or greater than 70 km/h. The MOTI *B.C. Supplement to TAC Geometric Design Guide* suggests using fencing when the separation between the edges of the outside travel lane and the pathway or sidewalk is less than 2.1 metres (including the shoulder width). It is noted that if the outside roadway travel lane is wider than 3.6 metres, this offset requirement between the pathway or sidewalk and the vehicle lane may be decreased by the same amount that the roadway lane is in excess of 3.6 metres (**Figure F-70**). Fencing is typically installed when a slope is greater than 2:1. The standard concrete roadside barrier (CRB SP941-01.02.01/02) should be used on the side of the roadway, between the roadway and the sidewalk or pathway. Rails and posts should be installed on top of the barrier to make it conform to the sidewalk fence height for a sidewalk. The bicycle fence height should be used when a significant number of people cycling use the sidewalk or if the CRB is adjacent to a bicycle pathway. If the pathway next to a barrier is used by people cycling and walking, the minimum width from the edge of barrier to the outside edge of pavement should be:

- 2.5 metres for one-way bicycle traffic; and
- 3.5 metres for two-way bicycle traffic.

As noted in the MOTI *B.C. Supplement to TAC Geometric Design Guide*, there are no definitive guidelines to determine what constitute significant numbers of pedestrians and bicycles. Design professionals should consult with a regional Traffic Operations Engineer to determine whether and where there is significant pedestrian and bicycle traffic in the vicinity of the highway construction project. The offset between the off-street pathway and the back of the roadside barrier should be greater of the Barrier Deflection Distance or the minimum horizontal clearance between cyclists and the vertical obstruction (0.5 metre for objects >0.75 metres in height). Barrier Deflection Distance is variable and depends on the design speed of the roadway and barrier system used.

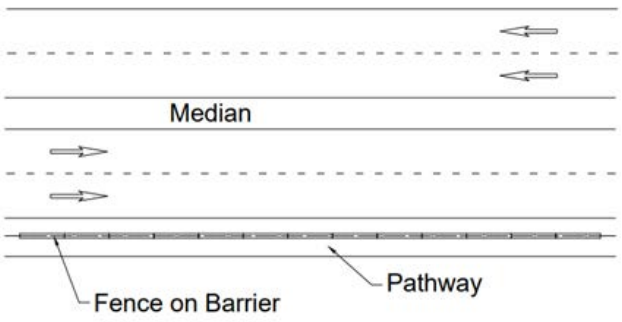


Figure F-70 // Fencing Along a High Volume Highway

Source: B.C. Supplement to TAC 2019 Figure 660.E