FARMINGTON VALLEY TRAILS COUNCIL
Box 576, Tariffville, CT 06081
www.fvgreenway.org
860.202.3928

MULTI-USE TRAIL BARRIERS INSTALLATION & REPLACEMENT

1.0 Introduction

The Farmington Valley Trails Council (FVTC) wishes to take a proactive role in helping our towns with multi-use trails identify areas where trail barriers (predominantly wooden rail fencing) originally installed at the insistence of local or ConnDOT officials need to be replaced as they age. These trails include the Farmington Canal Heritage Trail (FCHT) and the Farmington River Trail (FRT). We acknowledge our reliance on the excellent document produced for the Vermont Agency of Transportation, entitled *Shared Use Path Fencing Usage*, UMass, 2007. In compiling this document we reviewed available guidelines and specifications for multi-use trail systems; developed a design guideline based on existing design guidance and usage of barriers on existing trails; and found safety as the major reason for barriers next to a trail. Other reasons in descending order are: property separation and screening; access control; aesthetics; noise abatement; and wind abatement.

We will adopt a best practices series of guidelines for fencing/barrier selection based on: width of shoulder; adjacent embankments slope; adjacent vertical drop; and hazardous conditions existing at the bottom of an adjacent slope. There are a multitude of design parameters and issues for fencing usage on multi-use or shared use paths. Such paths are physically separated from motorized vehicular traffic by an open space or a barrier within an independent right-of-way in our case. They permit more than one type of user, such as pedestrians, joggers, people in wheelchairs, inline skaters, bicyclists, and cross country skiers. Throughout the Farmington Valley, equestrians and motorized vehicles of any kind are not allowed, with the only exception being motorized wheelchairs.

We will seek to identify fencing conditions and what needs to be replaced in our towns. Additionally, a critical question is: should certain fencing be replaced at all? There is little or no technical guidance available, and without such guidance, there is a tendency to err on the side of caution which results in the excessive use (and ultimately replacement) of costly fencing. The intent of our research is to develop more specific guidance about when fencing is needed so that its use is minimized to only those areas deemed critical. *Finally, the formation of a matching grant fund for maintenance available to our member towns will be discussed.*

1.1 Research

The FVTC has relied on documents published by the American Association of State Highway and Transportation Officials (AASHTO), Institute of Transportation Engineers (ITE), Federal Highway Administration (FHWA), Rails to Trails Conservancy, National Park Service, other State Departments of Transportation (DOTs) and various regionally generated designs were

reviewed. Additional existing guidance from organizations like trails and greenways groups was also included.

1.2 Identification of Hazardous Conditions

The majority of the literature identified fencing or other barriers as used for safety purposes to protect users from hazardous conditions adjacent to the actual trail. Other uses of fencing and barriers were briefly discussed above, and are rarely required. Protection of trail users is our main concern. Conditions that effect safety are mainly physical. The most commonly identified hazards for trail users were: insufficient recovery area, insufficient clear distance to fixed objects, drop-offs and steep embankment slopes, insufficient path width, sharp curves, and path surface condition. Each of these is described in more detail in the following sections.

1.3 Clear Zones

Most states follow AASHTO in their 1999 *Guide for the Development of Bicycle Facilities*. They recommend maintaining a minimum 2 ft (0.6 m) wide graded area adjacent to both sides of the trail. In addition, where the trail is adjacent to canals, ditches or slopes steeper than 1:3 (vertical: horizontal), a wider separation should be considered. Ideally, a minimum 5 ft (1.5 m) separation from the edge of the trail to the top of the slope should be provided.

Table 1: Suggested Horizontal Clearances Zones

Source	***Horizontal Distance to Hazard***
AASHTO	5 ft (1.5m)
Arizona	2 ft - 4 ft (0.6 m -1.2 m)
Florida	6 ft (1.8 m)
Georgia	5 ft (1.5m)
Idaho	5 ft (1.5m)
Iowa	5 ft (1.5m)
Massachusetts	5 ft (1.5m)
Minnesota	5 ft (1.5m)
New York	5 ft (1.5m)

It is also useful to specify a separate horizontal clearance distance to fixed objects that pose a collision threat such as abutments, trees, posts, walls, etc. Additionally, this makes maintenance such as mowing and leaf removal easier. Again, AASHTO's recommendations are mostly followed, with ConnDOT and MassHighway recommending that a clear distance of 3 ft (0.9m) is desirable from the edge of the path to all horizontal obstructions. Three feet (3 ft) is the average of the 15 specifications studied.

1.4 Drop-Offs & Embankments

Drop-off hazards are steep or abrupt downward slopes that can be dangerous to trail users. The trail should be designed to consider shielding any drop-off determined to be a hazard. Generally, pedestrians and bicyclists will be adequately protected from a drop-off hazard if a barrier has been installed between the path and the drop-off. AASHTO suggests a barrier be considered if there is less than a 5 ft (1.5 m) separation from the path edge to ditches or slopes with down-grades steeper than 1:3. They further state, "Depending on the height of the embankment and condition at the bottom, a physical barrier, such as dense shrubbery, railing or chain link fence, may need to be provided."

Figure 1.

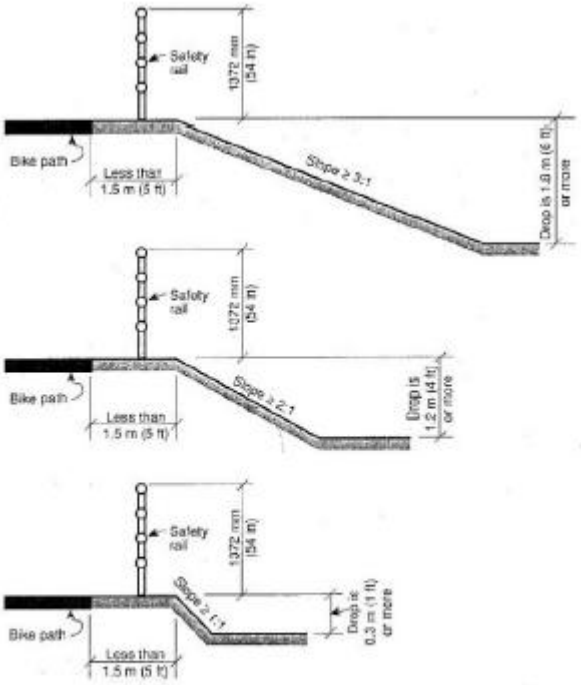


Figure 10: Connecticut Identification of Drop-Off Hazards (5)
Original Source: AZ Bicycle Facilities Planning & Design Guidelines; AZDOT, 1955.

Figure 2.

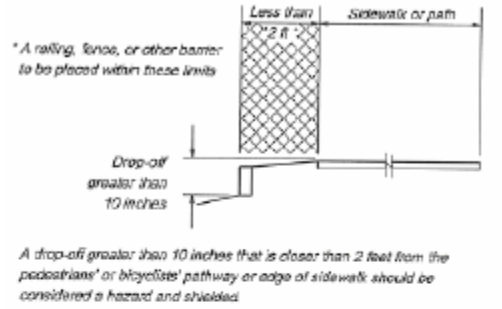


Figure 11: Florida Identification of Drop-Off Hazard – Case I (24)

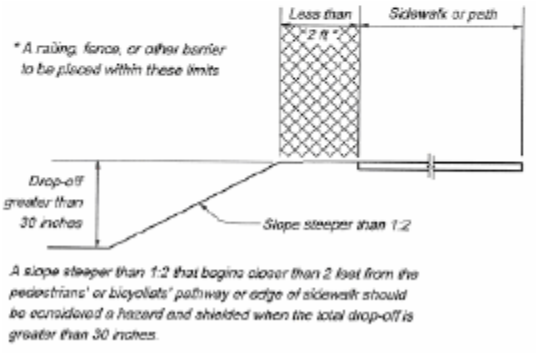


Figure 12: Florida Identification of Drop-Off Hazard – Case II (24)

1.5 Curves

Sharp curves on a multi-use trail may increase the potential for the bicyclists or other trail users to veer off and injure themselves. Fencing around sharp curves may inflict injury upon users, but protect them from even more dangerous conditions like a drop-off and steep side slopes adjacent to the curve. The FCHT and the FRT have very few instances of sharp curves, however, where they exist, bicyclists can travel a good deal faster than the design speed of the trail. At high rates of speed, a bicyclist would probably be unable to remain on the trail if entering a sharp curve from a steep slope. Thus, given the lack of any firm criterion the FVTC would not advise the use of any barrier or fencing on such curve unless other dangerous conditions exist.

1.6 Material Placed on Slopes Adjacent to the Trail

The materials placed in the clear zone on slopes adjacent to the trail can be hazardous to users who impact it in the event of a fall. Vermont states, "The surface material of the slope has an impact on path user safety. Grassed or vegetated slopes are preferred versus crushed stone or rock (rip-rap) slopes."

2.0 Determining Fencing Needs

The design and selection of fencing and other barriers adjacent to multi-use trails is dependent on several factors including their intended function (i.e. protection from falls, separation of adjacent uses, delineation of property boundaries or screening), safety, proximity to the path, aesthetics and overall continuity of barrier type(s) within a trail corridor. The Vermont Agency of Transportation recommends: "determine the need to include protection along a shared use path on a case-by-case basis after evaluating the following factors:"

1. "**Amount of recovery area available**. If an adequate recovery area is provided, the need for a protective barrier is lessened."
2. "**Height.** The greater the height of a drop-off, the greater the need for protection. A protective barrier may be required when a vertical drop from the path surface to the base of the slope is more than 1.2 m (4 ft) in height."
3. "**Steepness of the slope.** Where the side slope is 1:3 or greater, the need for a protective barrier may be increased, unless the side slope material is forgiving (see #4) or a suitable recovery area is provided."
4. "**Side-slope material.** If the material used on a side slope is grass, the need for protection is lessened. Shrubbery may also lessen the need for a physical barrier. Riprap is considered a harmful material where the need for a protective barrier is increased."
5. "**Nature of hazard on or at the base of the slope.** If the consequences of colliding with a protective barrier would be less than the consequences of a crash at the bottom of a drop-off, a protective barrier should be strongly considered. Where protection is required, provide it along the full extent of the grade drop." Massachusetts' specification closely follows the recommendations made by Vermont. Oregon further warns, "Fences, railings or barriers can become obstructions and should only be used where they are needed for safety reasons; for example, in an area where a pedestrian or bicyclist could fall into a river, a high-speed roadway or canyon. They should be placed as far away from the path as possible."

2.1 FCHT and FRT Barrier Types

The Federal Highway Administration (FHWA) documented that barriers included fencing (34%), vegetation (21%), vertical grade (16%), and drainage ditches (12%). The fencing style varied considerably from chain-link to wire, wrought iron, vinyl, and wooden rail.
The vast majority of "hard barrier" fencing in the Farmington Valley is wooden rail. Older types are split rail. ***The FVTC would strongly urge that any new fencing be of the round rail cedar variety which lasts longer and is much safer for users who brush or crash against it.***

FRT in Unionville, ex. round rail fencing. Note conditions left and slope right.

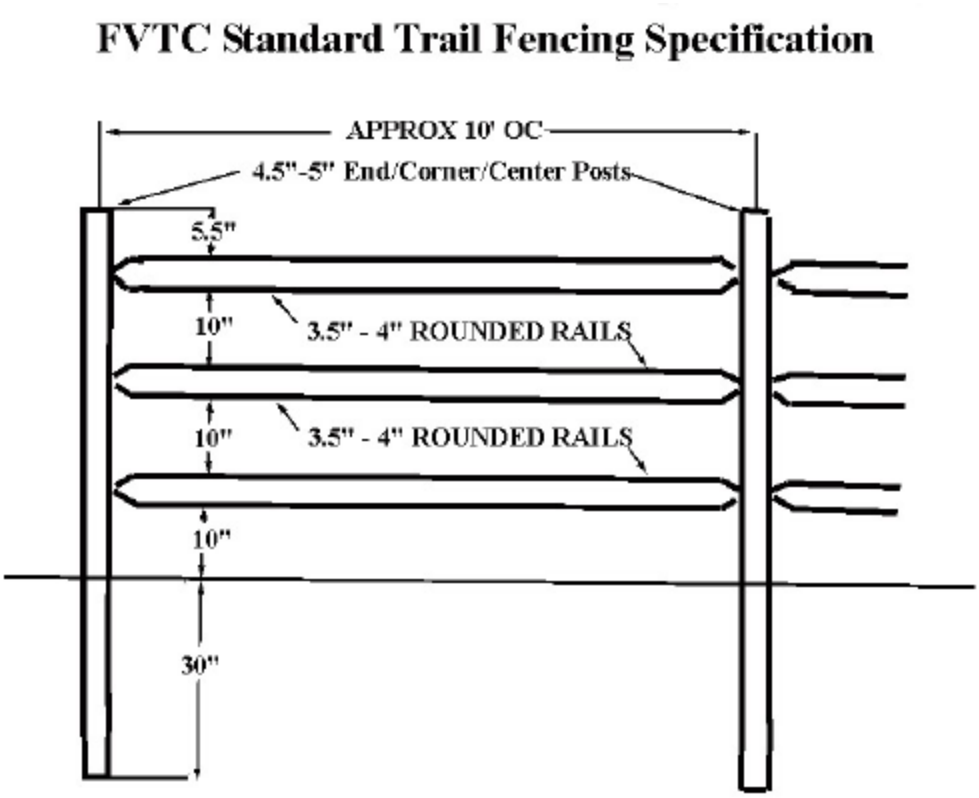
2.2 Barrier Heights

In terms of using fencing for safety considerations and protection of trail users from hazardous conditions, height is understood to be either 3.5 ft (1.1m) or 4.6 ft (1.4m) with the majority specifying the former. ConnDOT specifies the latter: 4.5 ft (1.4m). The justification for these two heights is related to the majority of literature review sources following the various AASHTO specifications for bicycle facilities.

2.3 Barrier Maintenance

Barriers require regular maintenance in order to ensure that they do not impact path safety. In fact, according to the FHWA, improperly maintained fencing is a higher liability risk than no fencing at all. Hard barriers, such as fencing or railings, must also be checked regularly to ensure they are intact. For example, it may be necessary to check if they are in any way damaged (possibly by a storm) or even vandalized. This routine maintenance will ensure that all barriers constructively fulfill their function and of the trail.

2.4 Figure 3



2.5 Fencing Costs
Current costs on 10' doweled round cedar three-rail with round cedar posts range upward from $97.00 per section installed depending on the linear amount ordered.

2.6 Field Inspections
The FVTC expects to have every town that it works in completely mapped as to current fencing placement, condition, and identification of hazardous risk sections. We will be using proprietary information as well as the results of an extensive Boy Scout project. We expect our database to be completed sometime in 2011.

3.0 Fencing Replacement Guideline
The users of this guideline should recognize that these values are suggestions only, and that specific site details may supersede the use of this guideline. Best engineering practices and sound engineering judgment should be used at all times to protect the trail users since safety is of the utmost importance. This guideline is not intended to replace or supersede any AASHTO, ConnDOT, or other mandated municipal specification. ***It is the FVTC's intention however, to make sure that this guideline helps all of our municipalities understand that in many instances, failing fencing need not be replaced on certain sections of trail.***

4.0 FVTC Matching Grant Maintenance Program

The FVTC will attempt to help our area towns as much as we can with identification of fencing and barriers that are in the most need of replacement as well as in the most dangerous sections of the trail for users. We will meet with town staff and determine critical areas. ***We will also be in a position to offer matching funds for the replacement of some of these areas.*** The amount of such funds is dictated by yearly fluctuations in memberships and donations to the organization. We will be in close contact regarding this initiative and look forward to striving toward the safest trails we can have in the Farmington Valley. In 2011-12 we granted $3,000 to Avon and $7,500 to Farmington.

R. Bruce Donald, President, FVTC
Updated March, 2013

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