

4 Conceptual Design

The purpose of this Section is to provide an overview of design criteria that need to be considered when designing a bicycle and pedestrian facility.

4.1 Design Criteria

The criteria governing the design of bicycle and pedestrian facilities is based on the following guidelines and regulations:

- MassHighway Project Development & Design Guide (2006)
- American Association of State Highway and Transportation Officials (AASHTO) Guide for the Planning, Design and Operation of Pedestrian Facilities (2004)
- AASHTO Guide for the Development of Bicycle Facilities (1999)
- Federal Highway Administration (FHWA) Designing Sidewalks and Trails for Access Part II of II: Best Practices Design Guide
- The Rules & Regulations of the Massachusetts Architectural Access Board (521 CMR)
- Americans with Disabilities Act Accessibility Guidelines (ADAAG)
- Manual on Uniform Traffic Control Devices (MUTCD)

The applicability of the guidelines and regulations listed above will vary depending upon the anticipated funding source and administering agency. For example, the MassHighway Project Development & Design Guide, and documents referenced therein, would apply to any project being funded using Transportation Enhancement monies as this funding program is administered by MassHighway.

Many of these documents acknowledge that site-specific conditions often warrant the need to take a more flexible and accommodating design approach. However, deviations from the design guidelines need to be properly justified.

It is recommended that the Bike and Walkway Committee review these documents as they include valuable information on the design of bicycle and pedestrian facilities that may be applicable to other projects in town.

4.2 Facility Types

A project can be comprised of different facility types in order to connect users with various destinations in a community. The MassHighway Project Development & Design Guide makes the following distinction in bicycle and pedestrian facilities:

- Shared use path or trail
- Sidewalk
- Greenway trail
- Bicycle lane
- Bicycle route or shared roadway

The typical cross section of each facility type is typically governed by the existing right of way or property boundaries, location of adjacent environmental resource areas, and types of abutting land uses.

On the following pages is a graphic showing each facility type and a discussion on some of the key design criteria.

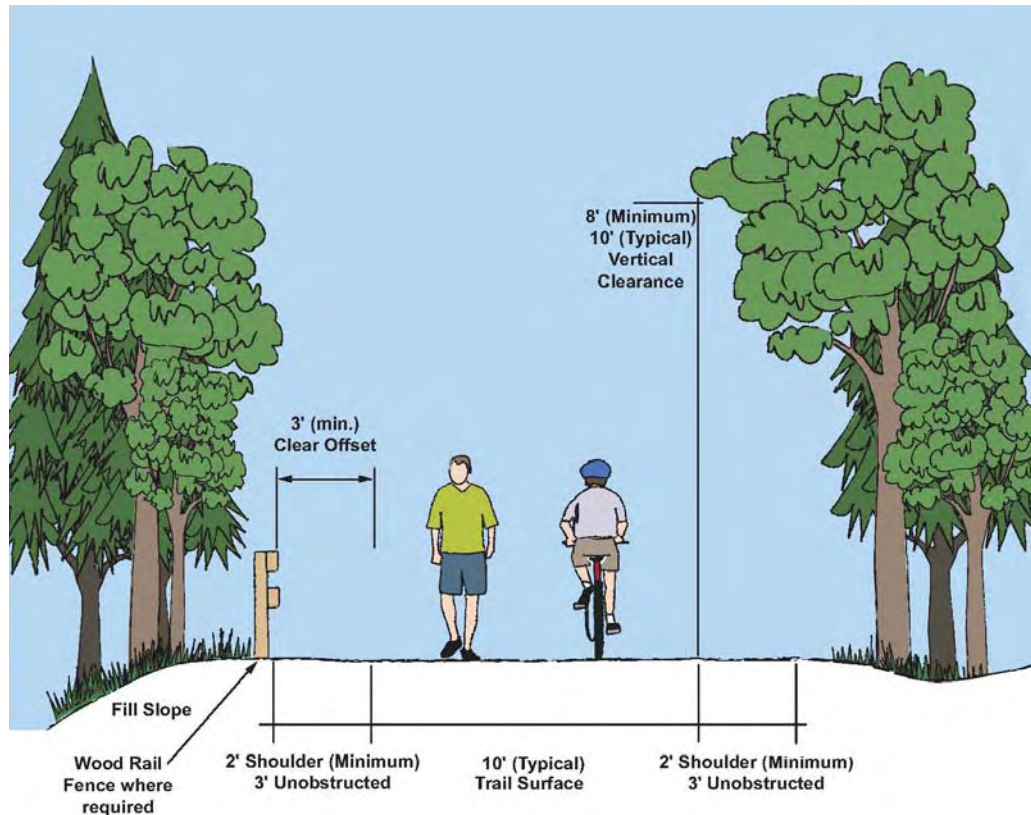


Figure 25: Shared Use Path or Trail

Shared Use Path / Trail

A shared use path or trail is a facility for non-motorized uses that is independently aligned and can be used for a variety of purposes including recreation, commuting and local travel. This type of facility is attractive to all ages and skill levels because of the separation from automobile traffic. In addition to bicycling, separate shared use paths are used extensively for walking, running and in-line skating. As it is a shared use facility, the more stringent pedestrian accessibility requirements for grades govern. Where these requirements cannot be met, a variance must be requested from the Massachusetts Architectural Access Board (AAB).

Key Design Criteria:

- 10 foot surface width (typical)
- 8 foot surface width in sensitive areas (minimum)
- 2 foot shoulders
- 3 foot min. clear offset from edge of trail to obstructions (i.e. tree, fence, sign, wall)
- 5 to 7 foot min. separation from roadway (less requires suitable physical barrier)
- 4.5% max. running slope or grade (construction tolerance +/- 0.5%)
- 1.5% max. horizontal cross slope (construction tolerance +/- 0.5%)

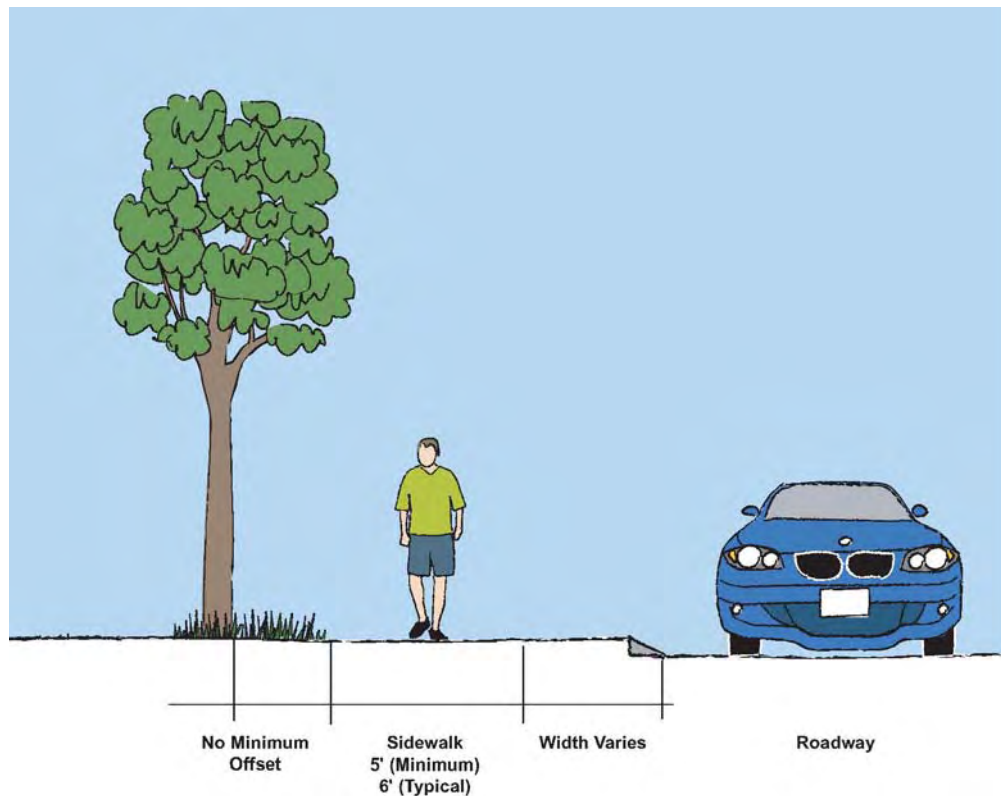


Figure 26: Sidewalk or Walkway

Sidewalk

A sidewalk (or walkway) is a pathway intended for pedestrian use. There is no minimum offset from a sidewalk to an adjacent roadway or to obstructions (i.e. utility pole, tree, sign post, mailbox). However, an unobstructed path of travel with a minimum width of 36" (excluding curb) shall be maintained past all such obstructions.

A sidewalk must meet the Rules & Regulations of the Massachusetts Architectural Access Board (AAB) (521 CMR). If these guidelines cannot be met, then a variance should be requested from the AAB with input from local people with disabilities. The Massachusetts AAB is authorized by law to grant variances when full compliance is "impracticable," i.e. is...technologically unfeasible, or...would result in excessive and unreasonable costs without any substantial benefit to persons with disabilities." (521 CMR 5.44)

Key Design Criteria:

- 5 foot minimum surface width (excluding curb)
- 6 foot surface width preferred (excluding curb)
- Minimum 36" clear path of travel (excluding curb)
- 4.5% max. running slope (construction tolerance +/- 0.5%)
- 1.5% max. horizontal cross slope (construction tolerance +/- 0.5%)

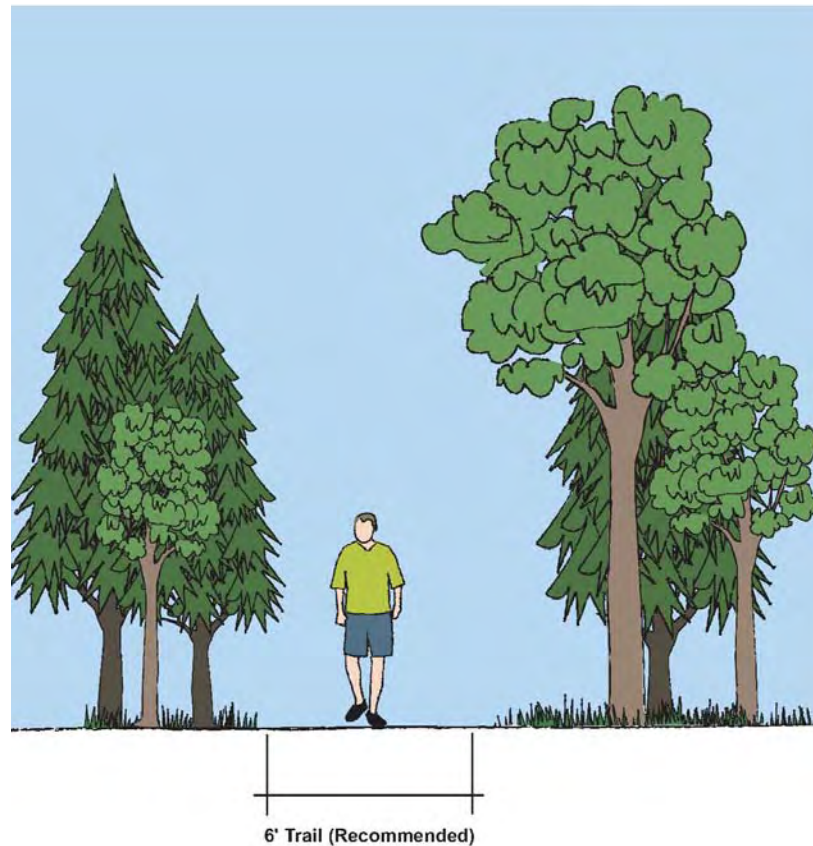


Figure 27: Greenway Trail

Greenway Trail

A greenway trail is a recreational facility through backcountry or other rural areas that is generally an unpaved trail that serves hikers, mountain bikers, equestrians and other off-road users. These facilities vary in width and are often designed for differing levels of accessibility. Although design guidelines for greenways are not as well established as those for other facilities, the trail should be designed to be accessible to users of varying abilities. Depending upon the funding source, a variance may be required from the Massachusetts AAB if accessibility guidelines cannot be met.

Key Design Criteria:

- Less defined design guidelines
- Width varies depending upon anticipated user types and intensity of use
- Should be accessible to users of varying abilities

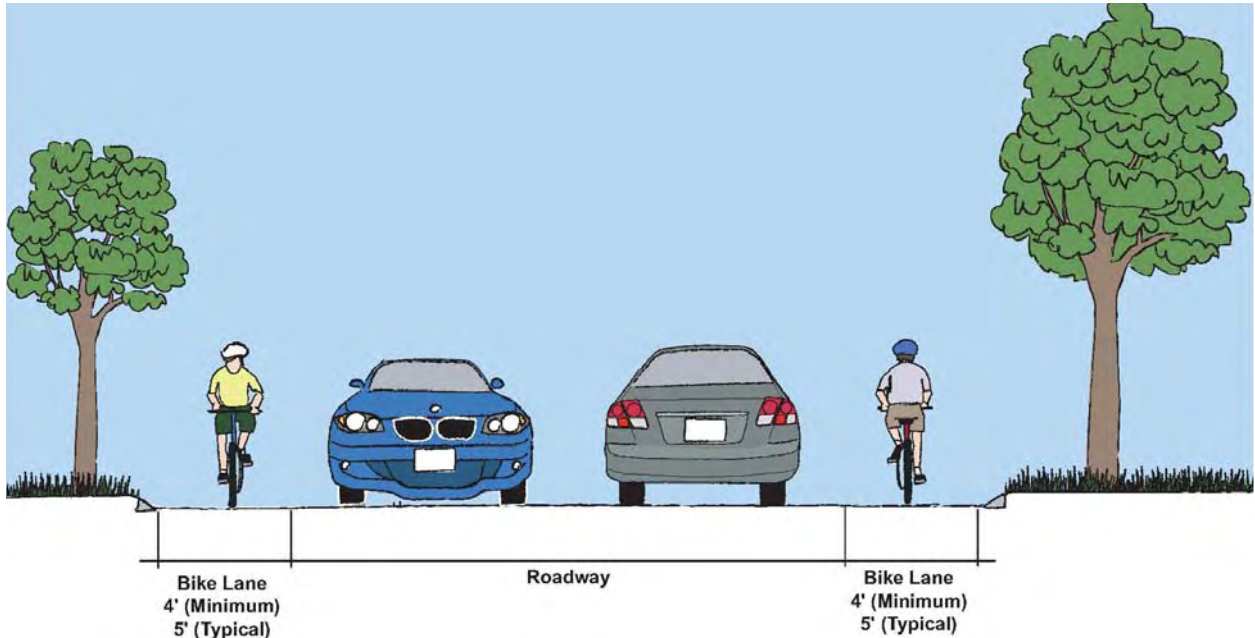


Figure 28: Bicycle Lane

Bicycle Lane

A bicycle lane is an in-road facility that is designed specifically for bicycle use. These one-way facilities carry bike traffic adjacent to and in the same direction as motor vehicle traffic. A marked bicycle lane delineates available road space for preferential use by bicyclists. These facilities are typically 4 to 5 feet wide depending upon adjacent curb locations and on-street parking. This type of facility is used mostly by bicyclists that are experienced in sharing roadways with motor vehicle traffic. They do not attract the variety of users and skill levels that a separated shared use path normally attracts.

Key Design Criteria:

- 4 foot minimum width when adjacent to the edge of pavement
- 5 foot preferred width when adjacent to curb, parking or guardrail
- Grades greater than 5% are undesirable
- Maximum grades can range from 5% to 11% for lengths of 800 to 50 feet, respectively

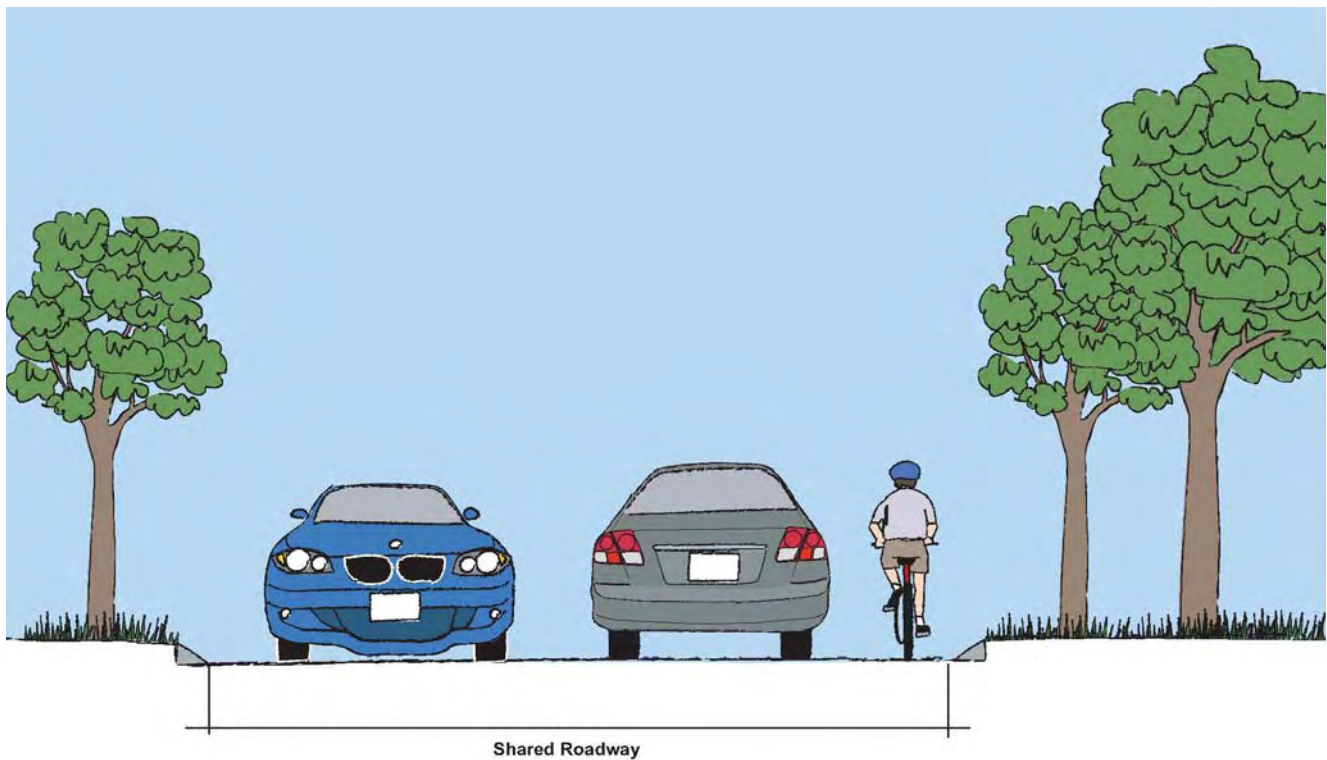


Figure 29: Bicycle Route or Shared Roadway

Bicycle Route

A bicycle route refers to use of normal roadway travel lanes by both motor vehicles and bicyclists. These facilities are also referred to as shared lanes or a shared roadway. “Share the Road” warning signs or “Bike Route” directional signage is typically installed along these facility segments. Similar to bicycle lanes, this type of facility is also used mostly by bicyclists that are experienced in sharing roadways with motor vehicle traffic. They do not attract the variety of users and skill levels that a separated shared use path normally attracts.

Key Design Criteria:

- Travel lanes at least 14 to 15 feet wide (preferred)
- Recommended for roadways with low speeds and low to moderate traffic volumes
- Grades greater than 5% are undesirable
- Maximum grades can range from 5% to 11% for lengths of 800 to 50 feet, respectively

4.3 Surface Material

An important consideration in rail trail design is the type of surface that will be provided. The selection of a suitable material is a very important aspect of the functionality and aesthetic appeal of the final product.

The selection of surface material primarily depends on:

- Intended types of use
- Intensity of use
- Project setting (environmental, historic and aesthetic)
- Maintenance requirements

Other factors to consider include:

- Project terrain and climate
- Material costs
- Constructability

The following is a brief discussion of common surface materials used in trail construction.

Paved Surfaces

Hot mix asphalt, also referred to as pavement or bituminous concrete, is the same surface material used on roadways and other Massachusetts trails such as the Cape Cod Rail Trail. Asphalt is a durable material which, when properly constructed, requires minimal maintenance and has a long service life. For example, the Cape Cod Rail Trail was recently resurfaced after more than 25 years of use. Surface and crack sealing can further expand its service life. By its nature, asphalt meets ADA requirements for firmness, stability and skid resistance. Asphalt accommodates the widest variety of users and is suitable for all levels and abilities. As an impervious surface, runoff from the asphalt needs to be directed to adjacent vegetated swales.

Granular Surfaces

When selecting a natural surface, it is important to consider the properties of the material in both wet and dry conditions. For example, many granular surfaces may be firm when dry but get soft when wet. In addition, because these surfaces are not impenetrable, seeds can establish root in the trail to produce weeds without proper maintenance.

Stone Dust

A crushed stone or stone dust mixture can be placed on a compacted base, separated by a geosynthetic liner. When properly compacted and maintained, such granular surfaces can provide moderately firm and stable surfaces to meet ADA requirements. Angular, crushed fines will interlock and provide a more stable surface than aggregates with a higher percentage of "round" particles. Stone dust provides a repairable surface with a natural appearance. The performance of stone dust is dependent upon drainage patterns, as it is highly susceptible to rutting and washouts. This type of surface requires a considerable level of ongoing maintenance including such activities as re-grading, resurfacing and weed removal. Crushed stone or stone dust surfaces also limits the types of user activities. When dry, a stone dust surface is flexible and when it becomes wet, the entire surface softens.

Stabilized Granular Surface

Natural surfaces may become more firm and stable when combined with a stabilizing agent. Stabilizing agents can be in the form of a spray application or a material admixture. This agent, when added or applied to native soils, granite or crushed aggregate screenings, binds the aggregate to provide a firm natural surface that meets ADA requirements. As the water evaporates from the mixture, the surface becomes hard and will resemble an asphalt surface. Stabilized granular surfaces can provide increased durability and erosion resistance over conventional granular surfaces. Repairs can be accomplished with a small mixer. The performance of a stabilized surface is dependent upon drainage patterns and trail slopes, as it is also susceptible to rutting and washouts. The color, texture and appearance of the finished surface depends on the selected aggregate (e.g. tan, gray, red). There are many different products available. Stabilizer Solutions is the material used at the Minuteman National Park Battle Road Trail and DCR's Charles River Reservation trails. When dry, a stabilizer granular surface is firm and when it becomes wet, the top ¼" of the surface softens.