Designing a Walkable Community

Criteria for Designing a Pedestrian Circulation System

A pedestrian circulation system is a comprehensive and connected network of sidewalks, paths, trails, bikeways, and crosswalks that links key destinations, open spaces, and focal points of a community. A well-designed and maintained pedestrian circulation system can encourage people to be more active and less automobile dependent. Sound planning and design of a pedestrian network or components of the system, also will minimize the need in the future for costly facility maintenance, reconstruction, or rehabilitation.

Basic components of a pedestrian circulation system are sidewalks, shared-use paths, and trails that are continuously linked to form a connected network. Each component needs to be wide enough to accommodate the anticipated volume of pedestrians and persons in wheelchairs. Surfaces of these walkways and trails should be smooth, barrier-free, and level to promote universal access by persons of all ages and abilities. Well-designed intersections with curb ramps, crosswalks, and phased traffic signals to allow pedestrians to safely cross roads, are essential. Traffic-calming measures such as traffic circles, narrower streets, special crosswalks treatments, and speed bumps should be designed to control the speed of vehicles. Good lighting improves both pedestrian safety and attractiveness of a walkway or trail. Aesthetics can be further enhanced by installing landscaping, street trees, planting strips, and buffer zones. Streetscape features such as public art, benches, trash receptacles, water fountains, transit shelters, and light fixtures provide ambiance and promote a more human-scale orientation. If the pedestrian circulation system has shared-use paths or multi-use trails, they need to be designed to safely facilitate a wide variety of simultaneous users such as walkers, hikers, bicyclists, joggers, in-line skaters, wheelchairs, and strollers. Adequate signage is also needed on shared-use paths to inform users about potential conflicts, destinations, intersections street crossings, and regulatory information.

IPA has developed an Implementation Checklist for Walkable Communities that may be used by a community to design their pedestrian circulation system. The implementation checklist provides a comprehensive overview of pedestrian network sign features, codes and regulations governing the pedestrian environment, and operational issues such as maintenance as a basis for improving pedestrian access and overall character of the community (See Appendix A).

When designing pedestrian circulation system, five criteria should be considered (Brandywine Conservancy, 43 and Army Corps of Engineers, 70):

- **Continuity** – The circulation system provides a continuous, unbroken network; linkages connect sidewalks, public and private trails, shared-use paths, and major destination points within the community.
• **Safety** – The system separates vehicles and pedestrians, provides safe and well-marked crosswalks, is free from obstructions, well lit, is designed to minimize conflicts among users, and is aligned with the natural topography.

• **Comfort** – The walking surfaces are accessible and accommodate all persons; they are also smooth, level, and drain well.

• **Convenience** – The network is designed to promote access to the community’s major destinations; distances between origins and destinations are short and direct.

• **Visual appeal** – The design encourages pedestrian use, provides scenic interest, and provides unexpected and pleasing vistas.

### Design Standards

Two questions should be considered when designing a segment of a pedestrian circulation system such as a trail or shared-use path. First, who will use the facility after it’s developed? For example, designing a trail for hikers is different from designing a shared-use path that accommodates a variety of users and serves both transportation and recreation needs. Second, what is the primary purpose of the facility? Identifying the proposed uses of a facility is critical to the design, location, and construction of a walkability project. The design details of sidewalks, share-use paths, or trails, which are funded by state or federal transportation or other agency programs, must be approved by those agencies. It is important to consult with the funding agency early in the design process to ensure that the plans are prepared in conformance to agency design standards and requirements. Finally, it is important to remember that constructing a walkability project with sound design, resilient construction, and a management plan will contribute to the use, safety, and overall sustainability of a community’s pedestrian circulation system.

### Design Guideline Resources

There are numerous publications and technical manuals that provide design guidelines related to the alignment, materials, construction of trails, bike paths, shared-use paths, and other pedestrian and non-motorized infrastructure. There are additional sources on construction practices and sustainability of infrastructure and facilities in natural settings or environments. Some of the more helpful resources, related to trail design and construction, include:

**American Association for State Highway and Transportation Officials (AASHTO) Publications**

- Published in 1999, the *Guide for the Development of Bicycle Facilities* is still considered a “must have” for designing shared-use paths. These non-motorized, two-way, multi-use pathways are designed to accommodate an array of users such as bicyclists, pedestrians, in-line skaters, and wheelchair users.
  

- The *Guide for the Planning, Design and Operation of Pedestrian Facilities* provides...
information on designing pedestrian-friendly communities. This guide provides guidance on the planning, design, and operation of pedestrian facilities along streets and highways. Specifically, the guide focuses on identifying effective measures for accommodating pedestrians on public rights-of-way. The primary audience for this manual is local and state planners, roadway designers, and transportation engineers, who make decisions affecting pedestrians. This guide also recognizes the effect that land-use planning and site design have on pedestrian mobility.

To order see: bookstore.transportation.org/item_details.aspx?ID=120

**Community Trails Handbook**

Although written in the context of Southeastern Pennsylvania, the handbook provides helpful guidance for individuals, community groups, and public officials who wish to establish recreation- and transportation-oriented trails in their community. The handbook provides an understanding of the use of regulatory provisions as the basis of a trail system, components of trail planning, the design process, management issues, and sample trail documents.

To order see: www.brandywinemuseumshop.org/catalog

**Sidewalks and Shared-Use Paths: Safety, Security, and Maintenance**

Prepared by the University of Delaware’s Institute for Public Administration (IPA), this summary report addresses the current problems of safety, security, and maintenance associated with multi-modal facilities and add to the existing discussion of improving multi-modal facilities.

See: dspace.udel.edu:8080/dspace/handle/19716/3255

**Trail & Path Planning: A Guide for Municipalities**

Prepared as an implementation tool for Chester County, Pennsylvania’s Landscapes comprehensive plan, this guidebook was created by the Chester County Planning Commission to assist municipalities that wish to plan for a comprehensive system of trails, and address trails and paths in their comprehensive plan, official map and ordinances.

See: dsf.chesco.org/planning/cwp/view.asp?a=3&q=631389

**Pedestrian and Bicycle Information Center**

This organization emphasizes that design elements are essential for the successful and safe operation of a bikeway, trail, or shared-use pathway. The site provides “Principles of Shared-Use Path Planning and Design,” and a list of specific design guidelines for shared-use paths.

See: www.bicyclinginfo.org/engineering/paths-principles.cfm

**U.S. Department of Transportation, Federal Highway Administration (FHWA) Publications**

- The *Designing Sidewalks and Trails for Access* manual is an excellent resource for planning and designing sidewalk and trail facilities for all users, including persons with disabilities.

See: www.fhwa.dot.gov/environment/sidewalks
• The *Manual on Uniform Traffic Control Devices* defines the standards used by road managers nationwide to install and maintain traffic control devices on all streets and highways.
  See: [mutcd.fhwa.dot.gov](http://mutcd.fhwa.dot.gov)

**Sustainable Trail Design**

Sustainable trails, as defined by the Wisconsin Department of Natural Resources, minimize the need for ongoing trail maintenance by using construction materials and techniques designed for long-term self-sustaining use and by using on-site materials as much as possible. The trails begin with a good layout and design. According to the National Trails Training Partnership, core elements of sustainable trails “protect the environment, meet user needs, and require little maintenance.” Poorly designed trails need to be frequently maintained to deal with erosion and trail tread degradation. By designing more sustainable trails, more visitors can be carried into a natural area with minimal impact on the surrounding ecosystem.

Sustainable trails provide a balance between positive control points such as scenic features and negative control points such as the need to preserve environmentally sensitive areas. A sustainable trail that follows the natural contours of the land, is erosion resistant, drains water better, and requires less maintenance than fall-line or flat-ground trails. Sustainable trail design includes (Brown):

• Alignment of trails that ensure that water exits the tread (area of trail cleared for walking) often and that it follows the natural topography of the land.
• Construction of trail contours, build with outslopes so water will sheet across the trail and drain from hills rather than channel down the trail.
• Average trail grades not to exceed a 10% slope.
• Full bench construction, which means that the full width of the tread is cut into the side of a hill.

**Earthen-Surface-Trail Construction Rules of Thumb**

According to Delaware Department of Natural Resources and Environmental Control (DNREC) trail design expert David Bartoo, trails should be created based on a balance of impact on the environment, sustainability, type of use, future maintenance requirements, and aesthetics. One of the most important factors to consider in choosing a trail location or constructing a trail bed is the effective management of water (e.g., minimizing erosion and avoiding wet areas). Tips by Bartoo, for earthen surface trail construction, are to:

• Never have trail grade (percent of slope) exceed 40% of side slope. This creates a “fall-line” trail situation, which is when water flows down hill and as a result, down the trail.
• Construct trails along and not across a contour.
• Avoid construction of trails in wet areas.
• Build bridges at stream crossings to reduce the ecosystem impact of stream bank erosion and siltation.
• Design the trail to blend in with the landscape.
• Minimize impact in all phases of the project.
• Where opportunities exist, transfer any shrubs, ferns, trees, or flowers from the original landscape to a pre-arranged location.
• Use eco-friendly materials in trail construction.
• Place native vegetation on either side of the tread.
• Clear the open space above the trail to a height of seven feet. This height is adequate for users, but at the same time minimizes the amount of sunlight penetration.
• Construct trails on the uphill side of a tree rather than the lower side. The surface roots of a tree are typically deeper on the upper side, and the base of the tree helps to stabilize the trail against creeping downhill or erosion, and also helps to keep traffic on rather than off the trail.

Do’s of Earthen-Surface-Trail Building

Initial Clearing (Interview with David Bartoo)
• Check alignment for irregularities in flow and grade. Align the trail in such a way that provides as much continuous drainage as possible. Avoid unnecessary destruction of native animals, plants, and other natural and cultural resources.
• Make the trail corridor a safe width (33 - 54 inches).
• Remove woody plants, rocks, and roots from the trail tread (cleared area).
• Trimming only the lower branches or a tree to form a future canopy.
• Collect leaves and other small litter for later use. When raking, rake down the length of the trail to decrease the chance of creating a berm (a ridge that develops on the downhill side of a trail).
• Scatter all other debris as far from trail alignment as possible without damaging the habitat.

Tread Construction (Interview with David Bartoo)
• Use preliminary clearing procedures.
• Construct a full bench cut if the slideslope is over an 8% grade.
• Use the excavated dirt for later use at a pre-arranged location.
• Stock up on dirt to be reused later to re-cover the area if erosion occurs.
• Angle back-cut for better back slope stability and ascetics (2:1 minimum).
• Remove all roots and rocks unless otherwise specified.
• Trim all protruding roots within back slope and tread.
• Disperse any material not being saved as far from trail alignment as possible.
• Use saved leaves, branches, and logs to dress up the trail construction site.
• Remove all construction debris.
• Follow these steps when closing a trail or trail sections:
  • Open and make useable the new trail before closing the old trail section.
  • Loosen trail tread to encourage growing surface for plants.
  • Reshape tread to match the contour.
  • Replant the area if necessary.
  • Protect and stabilize the soil by covering the old tread with saved leaves and vegetation.
  • Block off both ends of closed-off trail section with logs and large debris.
  • Monitor the closed section for a year to prohibit use.

Resources for Earthen-Surface-Trail Design

The following are excellent online resources that provide detailed information about trail design, construction, and surfacing. These include:

**National Trails Training Partnership** – Sponsored by American Trails, the website offers an array of online resources on building trails and greenways: design guidelines, construction techniques, materials, trail paving and surfacing, and trailhead signs and facilities. See: [www.americantrails.org/resources/trailbuilding](http://www.americantrails.org/resources/trailbuilding)

**USDA Forest Service** – The 2004 online edition of the “Trail Construction and Maintenance Notebook” describes trail construction and maintenance information in an easy-to-understand fashion. It covers the basics, but it also offers detail-specific literature on different topics. Some of the subjects it talks about are planning and design, trail specifications, minimal impact of the trail on the land, and trail layout (Hesselbarth, Vachowski). See: [www.fhwa.dot.gov/environment/fspubs/00232839](http://www.fhwa.dot.gov/environment/fspubs/00232839)

**University of Minnesota** – A guide has been prepared to assist private property owners, organizations, and organizations (e.g. nature centers, youth groups, schools, and conservation clubs) that are interested in designing and constructing trails. It offers step-by-step construction methods, ways to handle trail obstacles, and recommended standards for the most common types of trails (Rathke, Baughman). See: [www.extension.umn.edu/distribution/naturalresources/DD6371.html](http://www.extension.umn.edu/distribution/naturalresources/DD6371.html)