

City of Homer  
**TRAIL MANUAL**  
Design Criteria



City of Homer Design Criteria Manual  
Article 5.13

**Non-Motorized Trails and Public Access Easements**

Adopted: February 9, 2009

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# A. INTRODUCTION

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## I. GENERAL

This is an article of the Homer Design Criteria Manual. It is supplemental to and based upon the Homer Non-Motorized Transportation & Trails Plan (HNMTTP). Criteria in this section provides specific direction for planning and designing trails in public access easements.

The HNMTTP articulates the goals of the community regarding trails, and provides city officials and developers specific direction for creating a comprehensive network of non-motorized transportation and recreation routes in the City of Homer. It states that “by establishing a truly superb trails network that enables visitors and residents alike to travel safely and comfortably through Homer without the need for an automobile, the community will capitalize on its outdoor culture and unmatched natural setting.”

### a. Objectives

The intent of this article is to provide guidelines and design criteria for establishing public access easements and for designing trails within such easements. City of Homer officials will use the criteria provided in this chapter to review subdivision applications, easement proposals, and development plans for trails with public access easements. The criteria will help protect the health, safety and welfare of the public while minimizing maintenance, environmental impact, and liability concerns for the City of Homer.

Based on meeting the criteria set forth in this article, the City of Homer accepts public access easements and approved trails that are constructed within those easements. The City of Homer is responsible for maintenance of all accepted trails. The purpose of this article is to provide a uniform set of design criteria that results in trails that are planned and constructed appropriately for their location and purpose. It is also a resource for owners and designers in navigating the planning and construction process.

This article provides criteria for both the planning and design phases of a trail project. Planning criteria focuses on identifying the appropriate trail type, trail uses, location, alignment, connectivity, and access. Design criteria and guidelines address the specific design parameters and details needed to construct each trail in a manner that suits the location and use, for maximum access and minimal impacts and maintenance.

### b. Applicability

Those who need to comply include:

- Subdivision projects that include a public access easement, whether it is required by Homer City Code, required or recommended in an adopted plan, or a voluntary effort by the owner;
- Projects proposing to dedicate a public access easement and construct a trail, either required or voluntary;
- Trail construction projects within already platted public access easements or within public recreation areas.

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## c. How to Use This Document

Consult the Homer City Code and review the Homer Non-Motorized Transportation & Trails Plan (HNMTTP) to identify any trail requirements that apply to the property. After determining that a trail is required or desired on a piece of property, the owner, sub divider, designer, or project manager, herein referred to as the “**Responsible Party**”, reviews the Trail & Easement Planning section of this article to understand the review process and begin to identify which trail level best fits the project. By reviewing the Trail Level Design Parameters Matrix on page 16, the Trail Level Summaries, and the Trail Selection & Planning Criteria to analyze the site, the Responsible Party should be able to select a trail level that best suits the project. Use the Trail Design Criteria to assist with fine-tuning the alignment of the easement and the design of the trail.

Developers and project designers shall adhere to the criteria in this article and the referenced documents unless compliance with such criteria is found to be unsafe or in conflict with the goals of the Design Criteria Manual or the HNMTTP, or where physical conditions restrict the ability to meet design criteria. This article gives the City of Homer Public Works Director the ability to approve alternative design solutions where required by extenuating circumstances. The Responsible Party is responsible for ensuring all trail projects meet safety standards.

## d. Abbreviations and Acronyms

<b>AASHTO</b>	American Association of State Highway and Transportation Officials
<b>ADA</b>	Americans with Disabilities Act
<b>ADAAG</b>	Americans with Disabilities Act Accessibility Guidelines
<b>ATBCB</b>	U.S. Architectural and Transportation Barriers Compliance Board
<b>ADOT&amp;PF</b>	Alaska Department of Transportation and Public Facilities
<b>FHWA</b>	Federal Highway Administration
<b>IMBA</b>	International Mountain Bike Association
<b>MUTCD</b>	Manual on Uniform Traffic Control Devices
<b>HNMTTP</b>	Homer Non-Motorized Transportation and Trail Plan
<b>OHM</b>	Ordinary High Water Mark
<b>UFAS</b>	Uniform Federal Accessibility Standards
<b>USDA</b>	United States Department of Agriculture

## 2. CODES AND REGULATIONS

### a. Homer City Code

Homer City Code 11.04.058 Design Criteria Manual--Adopted. The City of Homer adopts by reference the "Design Criteria Manual for Streets and Storm Drainage," dated April, 1985 and revised February 1987. The "Design Criteria Manual" shall augment the standards of this chapter and shall govern site reconnaissance, survey and soils and design for streets and storm drains. (Ord. 87-6(S) 1(part), 1987).

## b. ADA Accessibility Requirements and Resources

The Americans with Disabilities Act (ADA), passed by Congress in 1990, prohibits discrimination on the basis of disability. **ADA Standards for Accessible Design** (Department of Justice title III regulation 28CFR Part 36, Appendix A) are the adopted regulations, and they apply to “Places of Public Accommodation and Commercial Facilities” (private sector), “State and Local Government Facilities”, and “Transportation Facilities”. [www.access-board.gov](http://www.access-board.gov)

Additionally, there are design *guidelines* for accessibility that are written and produced by the U.S. Architectural and Transportation Barriers Compliance Board (aka ATBCB or Access Board) that may apply to pedestrian facilities, including trails. Whether or not these are adopted by the federal government, compliance is recommended, as they represent the current thinking and may likely become the adopted standards. The City of Homer expects all trail projects to adhere to applicable standards and to most recently developed guidelines.

**Accessible Trail Design.** It is the responsibility of the owner (Responsible Party) to determine which standards or guidelines apply to their project. The following information may be of assistance:

ADAAG (ADA Accessibility Guidelines) 2002 These are the Access Board’s accessibility guidelines, which include a combination of adopted standards and recommended guidelines. Recent (2004) supplements to ADAAG cover play areas, state and local government facilities, and some recreation facilities, such as amusement rides, fishing and boating facilities, golf courses, and sports facilities.

(DRAFT) Guidelines for Outdoor Developed Areas Additional supplements to ADAAG have been drafted by the ATBCB and (as of January 2009) but not yet approved, including guidelines for outdoor developed areas and public rights-of-way. These guidelines may apply to trail projects within the City of Homer. The federal government recognizes that not all trails can or should be constructed to be accessible, such as when it will result in irresponsible damage to the environment. Therefore, the ATBCB Guidelines for Outdoor Developed Areas include allowances and exemptions to providing accessible trails.

The design criteria for achieving “accessibility” on a **trail** is different than that for the pedestrian access routes for facilities currently required by ADA. A **trail**, as defined by the Access Board is **“a route that is designed, designated, or constructed for recreational pedestrian use or provided as a pedestrian alternative to vehicular routes within a transportation system.”**

Accessible trails are required when connecting to accessible trail heads or to other accessible trails, elements, or spaces. Where an accessible trail is provided, the amenities along that trail must also be accessible.

The U.S. Department of Transportation Federal Highway Administration (FHWA), which oversees implementation of accessibility standards within public rights-of-way, has produced **Designing Sidewalks and Trails for Access; A Best Practices Design Guide, 2001**.

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## c. Environmental Permitting

The following list is provided as a resource for project planning and may not include all information necessary for all projects. The Responsible Party shall identify and obtain all necessary permits prior to easement dedication and/or trail construction.

For multi-agency information regarding environmental permitting on the Kenai Peninsula, contact the [Kenai River Center](#), 514 Funny River Road, Soldotna. 907-714-2478, or online at [www.kenairivercenter.org](http://www.kenairivercenter.org) Agencies located in this office indicated with \*.

**U.S. Army Corps of Engineers** - Administers Section 404 of the Clean Water Act; oversees permitting for projects in waters of the U.S., including wetlands. Kenai Field Office, 805 Frontage Road, Kenai 907-283-3519. Online at [www.poa.usace.army.mil/reg](http://www.poa.usace.army.mil/reg)

**State of Alaska** at [www.state.ak.us](http://www.state.ak.us)

Department of Environmental Conservation, Division of Water. For projects requiring a National Pollutant Discharge Elimination System (NPDES) permit, such as when construction activity disturbs more than 1 acre of land. [www.dec.state.ak.us/](http://www.dec.state.ak.us/)

Department of Fish and Game, Division of Wildlife Conservation. A Special Area Permit is required for many land and water use activities, including any construction activity in a designated state refuge, critical habitat area, or sanctuary. [www.adfg.state.ak.us/](http://www.adfg.state.ak.us/)

\* Department of Fish and Game, Division of Habitat. Authorization from this agency is needed for work in designated anadromous fish streams or other fish-bearing waters.

State of Alaska Department of Natural Resources, Division of Coastal & Ocean Management. For projects within the Kenai Peninsula Coastal District.

State of Alaska Department of Natural Resources, Division of Parks and Outdoor Rec., Office of History & Archaeology. Section 106 of the National Historic Preservation Act requires review of any project funded, licensed, permitted, or assisted by the federal government for impact on significant historic properties. [www.dnr.alaska.gov](http://www.dnr.alaska.gov)

\* **Kenai Peninsula Borough. Coastal Management Program, Floodplain Administration, Habitat Protection.** Issues permits and/or guidance for other agency permits for projects in coastal zones, and those within 50 feet of salmon streams. For more information contact the [Kenai River Center](#) or visit [www.kenairivercenter.org](http://www.kenairivercenter.org)

**City of Homer** - Contact the Planning & Zoning Department to determine whether the project requires any City of Homer development permits. Construction activities, such as clearing, grading or paving, can trigger the need for such permits. [www.ci.homer.ak.us/](http://www.ci.homer.ak.us/)



## 3. RESOURCE INFORMATION

### a. References and Design Resources

The following resources were used in the development of design criteria for this article, and may provide additional useful information for project designers.

#### **United States Access Board Resources** [www.access-board.gov](http://www.access-board.gov)

ADA Standards for Accessible Design

ADAAG 2002 - ADA Accessibility Guidelines for Buildings and Facilities provides design standards and design guidelines for numerous facilities.

ATBCB Guidelines for Outdoor Developed Areas, 2007 (DRAFT). Includes guidelines for accessibility on trails designed for pedestrian use.

ATBCB Guidelines for Public Rights-of-Way, 2005. Includes accessibility guidelines for sidewalks and pedestrian amenities within public rights-of-way.

#### **American Association of State Highway and Transportation Officials (AASHTO)** [www.transportation.org](http://www.transportation.org)

A Policy on Geometric Design of Highways and Streets.

Guide for Planning, Design, and Operation of Pedestrian Facilities, 2004

Guide for the Development of Bicycle Facilities, 1999.

#### **USDA Forest Service** [www.fs.fed.us](http://www.fs.fed.us)

#### **U.S. Department of Transportation Federal Highway Administration** [www.fhwa.dot.gov](http://www.fhwa.dot.gov) [www.fhwa.dot.gov/environment](http://www.fhwa.dot.gov/environment)

Designing Sidewalks and Trails for Access. Best Practices Design Guide

MUTCD (Manual of Uniform Traffic Control Devices)

Wetland Trail Design and Construction

Equestrian Design Guidebook for Trails, Trailheads, and Campgrounds

Trail Construction and Maintenance Handbook

#### **Rails-to-Trails Conservancy** [www.railstotrails.org](http://www.railstotrails.org)

Trails for the Twenty-First Century

#### **International Mountain Bike Association IMBA** [www.imba.com](http://www.imba.com)

#### **Alaska Trails** [www.alaska-trails.org](http://www.alaska-trails.org)

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## b. Definitions

**ACCESSIBLE TRAIL** - A trail designed for use by pedestrians which is constructed to meet the accessibility criteria established by ATBCB for trails in outdoor developed areas with respect to grades, cross-slope, amenities, and surfacing.

**BICYCLE** - A vehicle propelled solely by human power upon which a person may ride, having two, three or four wheels.

**CROSS SLOPE** - The slope measured perpendicular to the direction of travel. For the purposes of this article, cross-slope refers to the trail itself, versus the general side slope of the natural terrain upon which the trail is constructed.

**FILL** - Material placed above the original or natural ground lines.

**FULL BENCH TRAIL** - A trail constructed on a cut slope. No part of the trail is built over fill material.

**GEOTEXTILE** - See current edition of Homer Standard Construction Specifications.

**GRADE** - The slope parallel to the direction of travel, measured in percent. For example, a 1 foot change in vertical elevation on a 50 foot long section of trail has a 2% grade.

**GRADE REVERSAL** - A change in the direction of the running grade along a trail, from uphill, to downhill, and vice versa. Used to control erosion.

**HALF RULE** - A general rule used when determining the grade of a trail on a hillside. The trail grade should be no more than half the side slope grade.

**INTERSECTION** - Area where two or more trails or roadways meet or cross.

**MEAN (ORDINARY) HIGH WATER MARK** - A line on the shore established by the fluctuations of water and indicated by physical characteristics such as clear, natural line impressed on the bank, shelving, changes in the character of soil, destruction of terrestrial vegetation, the presence of litter and debris, or other appropriate means that consider the characteristics of the surrounding areas.

**MULTI-USE TRAIL** - A trail designed for more than one type of user, or use, such as bicycles *and* pedestrians, or for transportation *and* recreation.

**NFS (Non Frost Susceptible)** - A classification for soil that is not as likely to be affected by seasonal freezing and thawing. Nonorganic soil containing less than three percent (3%) by weight, of grains smaller than .02mm obtained from minus three inch (3 in.) material.

**NON-MOTORIZED** - Trail recreation by modes such as bicycle, pedestrian, equestrian, skate, or ski. May include electric wheelchairs.

**OBSTACLE** - A physical object that limits the horizontal or vertical passage space, by protruding into the circulation route and reducing the clearance width of a trail.

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**PAVEMENT** - Surfacing constructed with asphaltic concrete (AC), Portland cement concrete (PCC) or dry laid concrete pavers.

**PASSING SPACE** - A widened section along a trail to allow for two users to more comfortably or safely pass one another.

**PEDESTRIAN** - A person on foot or who is using an assistive device, such as a wheelchair, for mobility. Pedestrians, for the purpose of this document, may include those using electrically powered mobility devices.

**PPP (POROUS PAVEMENT PANELS such as GeoBlock or EcoGrid)** - Porous pavement panels are three-dimensional, structural hi-density polyethylene panels designed to provide a durable wear surface and load distribution system.

**PUNCHEON** - Short-span footbridges or a series of short-span footbridges supported by sleepers.

**RAMP** - A sloped transition between two elevation levels. In reference to ADA accessibility, a portion of an accessible pedestrian walkway with a running grade  $>5\% \leq 8.33\%$ , for a maximum rise of 30 inches.

**RESPONSIBLE PARTY** - The property owner, either private or public.

**SIDE SLOPE** - Existing cross-slope of the natural terrain.

**SIGHT DISTANCE** - the length of a roadway visible to a trail user; the distance a person can see along an unobstructed line of sight.

**SHOULDER** - The area directly adjacent to either side of the trail surface.

**TRAIL** - As used in this article, a trail is a path or route identified and/or constructed for the purpose of non-motorized recreation and/or transportation. It may be located within an public access easement or right-of-way, or on public property.

**TRAIL PROFILE** - An elevation or cross-section through a trail easement, showing the proposed design of the trail and adjacent

**TRAIL SEGMENT** - That portion of a trail that lies between two intersections or destinations and is consistent in its design and use for it's entire length. Most trails are composed of multiple trail segments.

**TRAIL SPUR** - A short segment of trail that leads off a trail and connects the user to a nearby point of interest, such as an overlook, restroom, or picnic area.

**TRIP GENERATOR** - Any origin or destination that a trail user may be traveling to or from, including public facilities, residential or commercial areas, or another trail.

**UNDERDRAIN** - Drainage technique for allowing water to flow under the tread of low use, rustic trails, such as Level 1 or 2 trails.

**VERTICAL CLEARANCE** - Minimum unobstructed vertical passage space required along a sidewalk or trail.



# ***B. TRAIL & EASEMENT PLANNING***

## **I. GENERAL**

This section provides guidelines for the planning of public access easements and non-motorized trails within and near the City of Homer. The criteria established in this section also provides the basis for review and approval by the City of Homer, prior to accepting public access easements or constructed trails. Proposed easements or trails that are in conflict with this article, the HNMTTP, the Homer Comprehensive Plan, or any other adopted plans, will not be approved.

The purpose is to ensure that access easements and trails are planned and designed to result in a cohesive network of safe, enjoyable, low maintenance trails that blend with the varied landscapes of Homer and offer year round transportation and recreation opportunities for the citizens and visitors of Homer.

## **2. PLANNING & APPROVAL PROCESS**

The following is an outline of steps that the Responsible Party may need to follow to dedicate public access easements or to construct trails on public property or within public access easements or rights-of-way. This process may vary depending on the individual circumstances of each development project.

Table B-I Outline of the Planning & Approval Process

<b>PLANNING PHASE I Preliminary Plat or Easement Dedication</b>
<ul style="list-style-type: none"><li>- Research and Analysis - The Responsible Party reviews adopted plans and ordinances for any trail requirements or recommendations, conducts site analysis, and uses Trail Planning Criteria to begin to identify an appropriate trail level, location, alignment and use.</li><li>- Discuss the trail project with the City of Homer Planning &amp; Public Works Departments, and environmental permitting agencies to identify issues and adjust the trail proposal.</li><li>- Conduct preliminary engineering as necessary to fine-tune the trail level, location and alignment. Develop a trail plan &amp; profile, typical sections, and cross-sections at 50 foot intervals, or as required by Public Works.</li><li>- Submit a preliminary plat application or a proposal for easement dedication, based on the planning criteria of this chapter, to the City of Homer Planning Department. See following page for submittal requirements.</li></ul>
<b>PLANNING PHASE II Final Plat, Easement Dedication, or Subdivision Agreement</b>
<ul style="list-style-type: none"><li>- Field locate and survey the final trail alignment as necessary to ensure it meets planning and design criteria.</li><li>- Obtain environmental permits.</li><li>- Submit final plat or easement dedication to City of Homer Planning Department.</li></ul>
<b>CONSTRUCTION PHASE Subdivision Agreement or Construction Permit</b>
<ul style="list-style-type: none"><li>- Submit trail construction documents to the City of Homer Department of Public Works for review and approval.</li><li>- Trail construction.</li><li>- City of Homer inspection of the constructed trail.</li></ul>

# B. TRAIL & EASEMENT PLANNING

## 3. SUBMITTAL REQUIREMENTS

Refer to Table B-2 for a list of the information that is required during the planning and approval process for trail easement and trail construction projects.

Table B-2 Submittal Requirements

<b>PLANNING PHASE Preliminary Plat or Easement Dedication</b>
<p><b>Project Narrative.</b> A written description of the proposed project including:</p> <ul style="list-style-type: none"> <li>- How the proposed trail is consistent with adopted plans;</li> <li>- Proposed Trail Level, easement width, trail width, running grades, amenities or structures;</li> <li>- The intended and expected transportation and recreational uses for the trail or for each segment of the proposed trail, and any foreseen challenges or opportunities;</li> <li>- Existing and future land use of the project area, including trails, structures, features, as well as any designated areas of preservation;</li> <li>- Character of surrounding areas, including land use type and density;</li> <li>- How and where the trail will connect to public areas or adjacent destinations;</li> <li>- Natural features and how the project will incorporate or work around them, such as topography, vegetation, rocks, beach, wetland, and creeks, as well as views into or beyond the project area;</li> <li>- Explanation as needed to justify a proposed trail that does not conform to adopted plans and ordinances, does not meet design criteria standards, or involves any special user conflicts or construction challenges.</li> </ul> <p><b>Project Maps, Drawings, Information.</b> Submit scaled plan drawings and/or maps with the following information. All sheets are required to illustrate the location of the proposed trail or easement.</p> <ul style="list-style-type: none"> <li>- Context: Large scale map of the project area as it relates to surrounding areas. Identify all existing trails, easements, roads, public facilities, water bodies, natural features, land uses, and any other relevant features in and around the project area;</li> <li>- Topographic contours at 2 foot intervals;</li> <li>- Trail Route - identify the width, location and general alignment of the proposed easement on all plan views provided. Include locations of any existing trails or trails identified in any adopted plans, as well as proposed trail heads, amenities, points of interest;</li> <li>- Trail profile along the length of the trail, illustrating preliminary grades along the trail route;</li> <li>- Typical section of the trail, and cross-sections at intervals of 50 feet, or as required by the Department of Public Works. Identify existing and proposed slope across easement, proposed cut and fill requirements;</li> <li>- Wetlands, rivers, or other water bodies and all setbacks or areas with developmental restrictions;</li> <li>- Soils Information, mapped. For Level 1,2 &amp; 3 trails: Conduct a field assessment, consult wetland maps to determine potential for saturated soils, post hole to 12 in. deep. For Level 4 &amp; 5 trails: Soil boring to 4 ft .minimum and provide soils report as per Article 5.1.c. or as required by Public Works;</li> <li>- Vegetation - general vegetation areas; uplands, wetlands, pasture, etc.;</li> <li>- Site Analysis- show views into, beyond, or within the site, and land use conflicts or opportunities.</li> </ul>
<b>PLANNING PHASE II Final Plat or Easement Dedication</b>
<ul style="list-style-type: none"> <li>- Revised plat and updated project narrative, maps and drawings;</li> <li>- Environmental permits;</li> <li>- Any other information required by City of Homer Planning or Public Works Departments.</li> </ul>
<b>CONSTRUCTION PHASE Subdivision Agreement or Construction Permit</b>
<p>Submit the following to the Department of Public Works for a Subdivision Agreement or Construction Agreement:</p> <ul style="list-style-type: none"> <li>- Final plat or easement dedication and environmental permits;</li> <li>- Construction drawings.</li> </ul>

## *B. TRAIL & EASEMENT PLANNING*

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### **4. REVIEW CHECKLIST**

#### **a. Planning Phase.**

The following is a review checklist for the City of Homer to assess a proposed trail route or access easement:

- Conforms to all required and/or recommended trail routes for the project area, as found in Homer City Code and adopted plans. If not, there are justified reasons for deviation, such as: safety, excessive impact to surrounding area, land use conflict.
- All necessary environmental permits have been obtained. If not, demonstrates the permitting process is sufficiently underway with respect to the timeline of the trail project.
- Addresses any need for upgrading, re-locating or preserving of existing trail routes that do not meet the intent or design criteria of this article.
- The proposed trail level is appropriate for the existing land use and anticipated user groups and user volumes.
- Easement width meets minimum design criteria and is adequate to accommodate turns, structures, amenities and trail maintenance for the proposed trail.
- Proposed trail or easement route meets all planning and/or design criteria for the proposed trail level and uses, including:
  - Connectivity - compliments existing trails or walkways, provides logical and safe alignments, connections, and intersections;
  - Horizontal Alignment - safe and comfortable curves and sight distances, addresses views and slopes;
  - Design Fits Existing Conditions - Running grade, cut-fill, stairs, retaining structures, drainage, soils;
  - Minimizing Water Crossings - streams and wetlands;
- Maintenance Considerations - Proposed trail meets planning and design criteria while minimizing the use of structures.

#### **b. Construction Phase.**

The following is a review checklist for trail design / construction approval.

- Plans provide for appropriate level of trail hardening or surfacing, signage, amenities, structures, or other features as appropriate or necessary for the location and use.
- The trail design is consistent in its accessibility level, design and use throughout the entire length of the trail. If not, individual segments are consistent.
- Trail design is consistent with what was approved in the planning process.
- The trail design meets the minimum design criteria for the designated trail level and for the anticipated user groups.

# TRAIL LEVEL DESIGN PARAMETERS

	<b>LEVEL 1</b> Backcountry	<b>LEVEL 2</b> Recreation Corridor	<b>LEVEL 3</b> Semi-improved Trail	<b>LEVEL 4</b> Fully Improved Trail	<b>LEVEL 5</b> High Use Trail
<b>Description and Application</b>	A simple, narrow, potentially rugged natural surface trail primarily for recreation. Moderate skill needed, with steeper slopes, tight curves, and obstructions common. Uses may include hiking, snow-shoeing, skiing, equestrian, mountain biking. User volumes are very light.	An unimproved, informal, wide, flat or gently sloping natural surfaced trail corridor for single or multi-use recreation in rural or semi-rural areas or within public parks or recreation areas. Uses may include hiking, snow-shoeing, skiing, mountain biking, equestrian. User volumes are very light to moderate, depending on the use.	An informal trail through semi-urban to rural areas, used for access between neighborhoods and destinations, or for recreation. Accessibility may be limited. Use is primarily pedestrian, but may include bicycling, equestrian, snow-shoeing, skiing. User volumes light to moderate.	A wide multi-use trail with a firm surface meeting ADA accessibility standards for recreation trails. A transportation and recreational route through the developed areas of Homer and within residential neighborhoods. May accommodate occasional equestrians. User volumes moderate to heavy.	A wide, accessible paved trail that accommodates a wide variety of non-motorized users. These multi-use trails provide access between public spaces, sidewalks, civic & cultural buildings and other major destinations within the core civic and commercial areas of Homer. Two-way multi-use trail for pedestrians, in-line skates, bicycles. May be designed for equestrians. Heavy use.
<b>Widths</b>					
Easement	8 feet	20 feet	12 feet	15 feet	20 feet
Trail	6 - 24 inches	6 - 16 feet, depending on terrain and managed use	3 - 5 feet, depending on bicycle use	5 - 8 feet	8 - 12 feet, depending on user volumes.
Shoulders	None	None	None	12 in. for paved routes	24 in.
<b>Surface</b>					
Material/Type	Native materials. Planks, rocks, PPP or other turf reinforcement materials. Limited grading.	Native earth, ground cover and/or seeding. Boardwalk or turf reinforcement materials. Limited grading.	4 in. NFS gravel over geotextile. Boardwalk, PPP or other turf reinforcement materials.	Firm and stable, NFS gravel over geotextile. Paving optional. Boardwalk.	Uniform, firm and stable. Paved trail or boardwalk.
Obstacles	Roots, rocks, and log protrusions to 6 in., steps to 14 inches	Generally clear. Protrusions <6 in. No steps.	Generally clear. Protrusions < 4 in. Steps discouraged.	Few or no obstacles, protrusions 2-3 in., Steps discouraged	Smooth, no obstacles. Protrusions < 2 in. Steps discouraged.
<b>Structures</b>	Minimal, rustic structures	Typically unimproved with no structures	Medium duty boardwalks and retaining structures	Bridges, railings, retaining walls.	Bridges, railings, retaining wall.
<b>Clearance</b>					
Vertical	6 ft. hiking; 8 ft. bicycle & equestrian, 10 ft. snowshoeing	12 feet	8 feet ; 12 feet for winter and equestrian use	9 feet; 12 feet for equestrian use	9 feet; 12 feet for equestrian use
Horizontal	36 in. with minimal encroachment	8 - 20 feet wide, depending on managed use	12 in. beyond tread, 24 in. for trees, signs, structures	12 in. beyond tread , 24 in. for trees, signs, structures	24 in. beyond tread , 36 in. for signs, trees, structures
<b>Grade</b>					
Target	< 12%	< 10%	< 8%	< 8%	< 5%
Maximum	30%, for <30 feet	15% for < 50 feet	For Level 5 and other accessible trails: 5% for any length, 8.33% for up to 30 feet, 12.5% for up to 10 feet. Otherwise: Level 3 = Max 15% for up to 50 feet, Level 4 = Max 10% for up to 50 feet.		
<b>Cross Slope</b>					
Target	3 - 10%	5%	3%	2%	2%
Max	Up to natural side-slope; 10% for bicycle use	10%	10%	3%	3%, at driveway crossings



## ***B. TRAIL & EASEMENT PLANNING***

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### **5. TRAIL SELECTION & PLANNING CRITERIA**

This section provides guidance and planning criteria for selecting the appropriate trail location, level, use and alignment for the project location. The criteria will help ensure that all trails are constructed to provide safe and convenient routes between destinations, improve the continuity and connectivity of the whole trail network, meet the needs of all users, minimize impacts to surrounding areas, and utilize construction methods that are economical and will result in long lasting, low maintenance trail facilities.

The Responsible Party should be prepared to discuss how the proposed easement and/or trail will meet the intent and requirements of this article, and how it will mitigate any specific challenges encountered with the project. Refer to Design Criteria section (pages 33-49) for additional trail design criteria.

#### **a. Codes, Regulations and Plans**

All proposed development projects are required to provide trails and easements where they are required by Homer City Code, the HNMTTP, the Homer Comprehensive Plan, the Town Center Plan, and other adopted plans. All proposed trails within the City of Homer shall be in accordance with the standards of this manual and meet the intent of the HNMTTP, and any other plans adopted by the City of Homer. If a proposed trail is not in accordance with plans and ordinances, submit sufficient explanation and support data to justify an alternative design solution.

The HNMTTP identifies locations of existing, proposed, and recommended trail corridors, and provides direction to community leaders and developers for the development of a functional network of trails. It represents the latest cooperative effort by the community to identify the future direction of Homer's trail system. Use this document for direction when planning for new trails or when reconstructing or relocating existing trails.

#### **b. User Volumes and Types**

The design of a trail must accommodate the use of the trail. It is easier to build a trail to suit the anticipated users than to control the users to match the design of the trail. For this reason, it is important to carefully research and analyze the project area to determine the anticipated volume and types of users. Generally, high volumes and wide ranges of user groups warrant wider, more developed trails with shorter segments between destinations and more signage and amenities. Some recreational uses require specialized design solutions. For further assistance, refer to [D. Trail Design Criteria](#).

**i) User Volumes.** Consider the following when establishing the anticipated volumes:

- How many destinations or trip generators within 1/4 mile of the trail corridor, including other trails.
- If the trail connects to any large volume trip generators, such as a school, a visitor's center, a library, a popular recreation area, or a busy commercial area, such as the Spit, or Pioneer Avenue;
- If the trail provides multiple connections to nearby trails or destinations.

## ***B. TRAIL & EASEMENT PLANNING***

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**ii) Use Types.** Land use, existing and future (planned), establishes the basis for the type of trail users. Understanding the range and types of users that will use the trail is a critical component guiding the design of the trail.

Recreational Use. Trail conditions that attract recreational users:

- Connects to recreation destinations;
- Offers a scenic, or otherwise interesting route;
- Specially located and designed for a particular recreational use or event;
- Long routes, with few intersections or interruptions, especially loop trails;
- Wide, paved trails are attractive to in-line skaters and young families.

Transportation use. Trail conditions that serve transportation needs:

- Direct routes between destinations and trip generators;
- Few user conflicts;
- Frequent and convenient connections between trails, streets, sidewalks, parking areas and destinations;
- Safe and accessible trail routes and conditions.

Mixed Use. Trail conditions that attract a wide mix of user groups, including pedestrians, bicycles, in-line skates, strollers, wheelchairs, and children tend to require more width, structure, signage, and amenities:

- Paved trails;
- Trails that connect to a variety of generators, such as the Senior Center, a grocery store, a park, the library, a trailhead, and a neighborhood;
- Trails that provide access to a variety of destinations as well as an interesting and enjoyable route.

### **c. History, Access, & Connectivity**

Each new trail segment improves the continuity and connectivity of Homer's trail network. Proposed trail easements are required to meet the following criteria:

- It is as accessible as possible, within reason;
- It connects to other nearby trails, where safe, reasonable and appropriate;
- Existing trails are not removed or disrupted. They are upgraded, relocated or realigned to ensure they meet the planning and design criteria of this article;
- The trail is continuous and provides for the same design, use and level of accessibility for each segment;
- The trail provides a logical connection between publicly accessible destinations for all trail users. Dead end trail segments are not allowed unless it is shown that there are plans for continuation of the trail in the near future;
- Provide trail heads and/or parking, as needed;
- Trails with higher use volumes and a wide variety of user groups are high level trails, such as Level 4 or 5;
- Lower level trails and those of lesser accessibility and limited uses are in locations with physical constraints, low user volumes, or where the trail segment is not providing a transportation link between generators and destinations;
- A trail segment that connects two other trails is designed to the same level as the other trails;
- Intersections are located and aligned to provide for adequate site stopping distances, maximum safety, and logical connections between destinations;

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## ***B. TRAIL & EASEMENT PLANNING***

- Trails provide options and alternatives and avoid conflict or confusion;
- Where trails begin or end at another trail, those of lesser accessibility or more restrictive uses shall branch from those of higher level of accessibility, so as not to trap or inconvenience a trail user.

### **d. Topography & Natural Features**

A well designed trail feels natural, tends to flow with the natural landscape, avoids steep climbs and unnecessary exposure to water, and endures over time with little maintenance. Existing conditions, such as slopes, water, soils, vegetation, roads and structures, all affect the planning and design of trails.

**i) Objectives.** The three primary objectives relating to trail alignment and terrain:

- Access - Providing a trail that is as safe and as accessible as possible.
- Environmental Impacts and Maintenance - Minimizing contact with hydric soils and surface water, either flowing across or along the trail.
- Experience - Creating an interesting and enjoyable trail experience.

### **ii) Criteria**

1. Select a trail level that suits the landscape and align it to fit the terrain meet the design criteria for the trail's use;
2. Trail alignment should provide the most accessibility with the least impact to surroundings;
3. Avoid long segments where the trail travels only up or downhill. Provide grade reversals as needed to meet trail design criteria for water and erosion management;
4. Avoid excessive costs and engineering, (cut, fill, or structures) to make a particular trail design fit into the landscape. Balance costs and benefits to suit the trail location and use;
5. Locate trail or easement to avoid or minimize water crossings (creeks, seeps, wetlands). Re-route existing trails where practical;
6. Avoid intersections on curves or with maximum running grades.
7. Avoid stairs where possible, especially on multi-use trails;
8. Refer to Homer City Code Title 21 for steep slope requirements;
9. Align trail to minimize switchbacks, avoid problem soils, and protect existing natural features;
10. Align trail to take advantage of natural features and views, and to provide a variety of experiences.

### **e. Costs—Budget Planning**

Construction costs should align with the trail level and the volume and type of use. Higher Trail Levels are inherently more expensive to construct and maintain. Balance trail priority, use, cost and benefit for the location and purpose of the trail.

Proper trail selection and design should minimize maintenance. Specialized use trails, such as groomed ski trails and equestrian trails may require more maintenance, as do those that interface with water, such as bridges or boardwalks.



# C. HOMER TRAIL TIERS

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## I. GENERAL

The City of Homer's goals are to have non-motorized recreation trails and transportation corridors that provide a range of accessibility and experience for many types of users throughout the year.

This trail tier system is intended to provide for a logical hierarchy of public trails for access and recreation throughout the diverse developments and landscapes of Homer. Planning and design criteria are provided for each of the five standard trail types addressed in this chapter.

The objective is to have planning and design criteria that will result in trails that are planned and constructed appropriately for their purpose and their location. All trails will provide for maximum access for their users with minimum impacts and maintenance.

This section is intended to provide a brief overview of the planning and design criteria for each of the five (5) TRAIL LEVELS. These summaries are a starting point for the planning of an easement, and the design of a trail. The Responsible Party should refer to all applicable criteria in this Chapter and to the referenced resources, as needed, to plan and develop a trail that meets the City of Homer's objectives for a non-motorized transportation and trail system.

These trail levels should be applicable to most trail projects. If an alternative trail design is necessary, it should be as consistent as possible with the Forest Service trail design parameters and the criteria of this article. The City of Homer Public Works Director has the authority to accept alternate trail design solutions.

## 2. DESCRIPTION OF TRAIL TIERS

The trail matrix is a set of five (5) trail levels, with varying accessibility, widths, applicability, character and use. This section provides a two-page summary of planning criteria, design parameters, and a typical cross section for each trail level. The summaries are not intended to stand alone as the design criteria for any trail. The Responsible Party should consult all applicable criteria sections of this article when designing a specific trail.

- a. **Level 1 - Backcountry Trail.** For rural areas, rugged terrain and very low recreational use situations.
- b. **Level 2 - Recreation Corridor.** A basically unimproved natural terrain corridor primarily for groomed ski trails or low use, casual recreation routes, with little or no visible tread area.
- c. **Level 3 - Semi-Improved Trail.** A medium sized, constructed gravel trail, with limited accessibility, intended for a mix of recreational and transportation uses.
- d. **Level 4 - Fully Improved Trail.** A wide, accessible gravel or paved trail for medium to high use areas.
- e. **Level 5 - High Use Trail.** A wide paved, accessible trail, with amenities and structures for a mix of transportation and recreational uses.

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*City of Homer*  
Non-Motorized Trail Planning & Design Criteria Summary  
Level 1 - Backcountry

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*NOTE: This is a summary. Refer to Article 5.13 Non-Motorized Trails and Public Access Easements for full description of criteria.*

## PLANNING CRITERIA

### Location

- Rural, remote or lightly traveled recreational trails, typically in residential or undeveloped areas where a higher level trail is not feasible or appropriate.
- Branching off a higher level trail, with loops or connections to public access areas.
- Historic hiking routes through more remote areas, steep or rugged terrain. Alignment may change, as needed to meet design criteria.
- Connects to recreation destinations such as overlooks, trail heads, camping areas, and parks.

**Use** Recreational trail for very light volumes of traffic. May be designed and maintained for hiking, mountain biking, snow-shoeing, or equestrians.

**Easement Width** 8 feet minimum. More as needed to accommodate switchbacks, slopes, and trail maintenance operations.

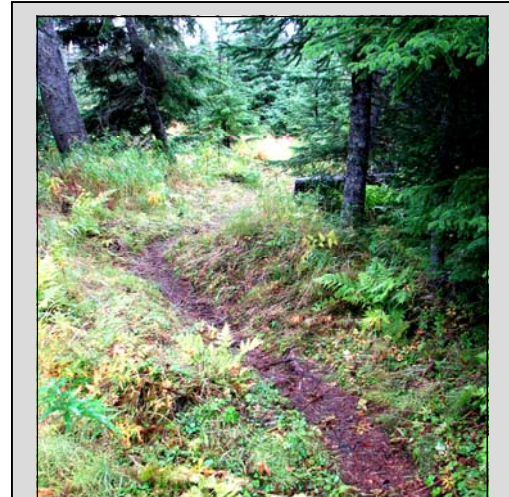
**Trail Maintenance.** Cut vegetation within clearance zones, and provide repairs or upgrades to trail surface, water crossings, signage and other amenities or structures, as needed, and as funding allows.

**Topography** Terrain can be quite varied, including flats or steep slopes, rocky, wet, wooded, or open. Topography must allow for a trail alignment that meets design criteria with little or no structures, cut or fill.

**Alignment** Level I trails are primarily recreation routes through semi-rural to remote areas. They connect neighborhoods, parks, trailheads, and other recreation destinations.

- The alignment of the easement must be finalized in the field, to ensure a feasible route that meets the objectives and the trail design criteria, and which utilizes existing features that will enhance the user's experience;
- Re-align any problematic portions of an existing trail as needed to provide a safe and sustainable trail route;
- Refer to IMBA "Trail Solutions" and USDA Forest Service Trails Management Handbook and "Trail Construction and Maintenance Notebook" - resources for planning and building Level I trails;
- Take advantage of natural features by meandering trail to align views, wrap around rocks or other features, and generally follow the natural flow of the terrain;
- Provide switchbacks as needed to meet design criteria;
- Erosion Control Criteria:
  - Follow the **half rule** as developed by IMBA; trail grade should be no more than 1/2 the side slope grade.
  - Align trail to follow natural dips in the terrain, or to create dips (grade reversals) along the trail, every 20-50 feet. These prevent water from flowing along, and eroding, the trail. They also enhance the trail experience.

**Soils, Water & Hydrology** Saturated soils are highly susceptible to erosion. Avoid seeps and other areas with saturated soils. Minimize the crossing of creeks, rivers and wetlands, which is more expensive to build and more difficult to maintain.



### Level I Trail Description

A simple, narrow, potentially rugged natural trail primarily for recreation. Moderate skill needed, with steeper slopes, tight curves, and obstacles common.

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*City of Homer*  
**Non-Motorized Trail Planning & Design Criteria Summary**  
**Level 1 - Backcountry**

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*NOTE: This is a summary. Refer to Article 5.13 Non-Motorized Trails and Public Access Easements for full description of criteria.*

## TRAIL DESIGN CRITERIA

**Trail Width & Shoulders.** 6 - 24 inch wide tread on native soil, or boardwalk. No shoulder necessary.

**Surface.** Native, with limited grading. Rock, soil, or wood where needed to cross wet areas. Roots, rocks and log protrusions to 6 inch, steps to 14 inches.

### Clearance.

- Vertical clearance - 6 feet for hiking, 8 feet for bicycle, 10 feet for equestrian and snowshoeing.
- Horizontal clearance - Minimum 36 in. width.

### Grade

- Target grade <12%, with grade reversals every 20-50 feet.
- Maximum 20% for trails where underlying soils are sand, silt, or clay. 20%- 30% for gravel or rock base.
- For grades over 30%, natural trail base and surface should be composed of angular rock, large rock or solid rock. Use steps to minimize erosion and steep grades.

### Cross Slope of Trail

- Target cross slope - 3-10%. Flowing toward the down hill side of the tread.
- Maximum - up to natural side slope, 10% for bicycles.

### Signage

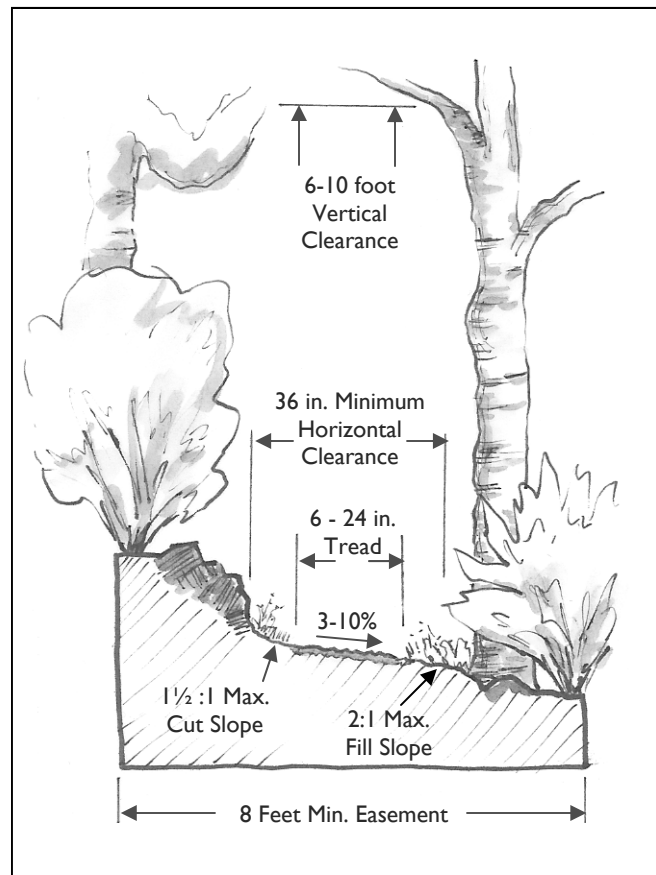
- Trail markers, as needed, to navigate trail year round.
- Resource protection information and trail identification signs including trail name, length, and any use restrictions or accessibility warnings posted at each end of the trail.
- Directional signage with trail name and length, at all trail intersections.

### Amenities

- Trail head, with parking and trail signage.

### Structures

- Minimal use of structures. Rustic plank with sleeper logs typical for low volume water crossings. Porous pavement panels or underdrains for short wet crossings.
- Steps constructed with on-site material such as rocks and logs.



**CROSS SECTION - LEVEL I BACKCOUNTRY**

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*City of Homer*  
**Non-Motorized Trail Planning & Design Criteria Summary**  
**Level 2 - Recreation Corridor**

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*NOTE: This is a summary. Refer to Article 5.13 Non-Motorized Trails and Public Access Easements for full description of criteria.*

## PLANNING CRITERIA

### Locations

- Groomed X-country ski trail corridors, or light use trails in public parks and recreation areas.
- Within utility easements, where the corridor has historic use as a recreational route and there are no existing or anticipated use conflicts or concerns with utilities or adjacent land use.
- Light use trail connections between residential areas and recreation destinations, where topography allows for gentle grades with little or no cut / fill.
- Wetland Routes - unimproved ski or snowshoe routes across wetlands, for winter use only.

**Use** Primarily a recreation route for light to heavy volumes of traffic, depending on the use. Heavy use for winter only. May be designed for one-way or two-way bicycle trails, classic and/or skate skiing, hiking and snow-shoeing, or equestrian use.

**Easement Width** 20 feet minimum. Wider, as needed, for safe turns, intersections, or where use requires a wider clear zone.

**Trail Maintenance** Mowing optional. Cut vegetation within clearance zones, and provide repairs or upgrades to trail surface, water crossings, signage and other amenities or structures, as needed, and as funding allows. Winter grooming optional. Seasonal installation of trail signs or markings on winter use trails, as needed.

**Topography** Generally located in flat to gently sloping areas. Must be able meet design criteria for the intended use with minimal disruption to natural terrain. Side slope: Max. approx. 20% (~2.5 feet difference) across a 12 foot wide easement, 10% is recommended for bicycle routes.

### Alignment

- The route may align with an existing utility easement corridor, if topography meets Level 2 running grade and cross-slope criteria. Occasional areas of moderate cut / fill allowed to level cross-slopes or soften grade changes.
- Wide curves. Meander as necessary to construct the trail with minimum disturbance to natural surroundings.
- Never align trail to run directly up or down slope. Provide turns and grade reversals to prevent erosion.
- Connects to similar trails, trail heads or recreation areas.
- Access trail to a Level 1 trailhead.
- Avoid alignments that result in maximum grades within 20 feet of intersections.
- Water Crossings: Minimize or avoid crossing ground seeps, creeks, wetlands, or other water bodies, other than for winter use only routes.

**Soils, Water & Hydrology** Saturated soils are highly susceptible to erosion. Avoid seeps and other areas with seasonally saturated soils. Minimize the crossing of creeks, rivers and wetlands. These structures are more expensive to construct and maintain. Avoid constructing trails along side slopes of 20% or greater.





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*City of Homer*  
**Non-Motorized Trail Planning & Design Criteria Summary**  
**Level 2 - Recreation Corridor**

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*NOTE: This is a summary. Refer to Article 5.13 Non-Motorized Trails and Public Access Easements for full description of criteria.*

## **TRAIL DESIGN CRITERIA**

**Trail Width & Shoulders** 6 - 16 foot wide grass corridor for a variety of low volume year-round recreational use. A worn central tread area may occur naturally over time.

- 6 foot wide trail in areas with challenging terrain, more cross-slope, wet soils, or other restrictions.
- 8-12 foot wide corridors are the standard - a mix of hiking, snowshoeing, biking, informal skiing, low volume equestrian.
- 16 foot wide corridor for ski routes that are groomed for both classic and skate ski.

**Surface** Native earth or ground cover with limited grading, imported material and/or seeding. Porous pavement panels or turf reinforcement materials may be used in wet areas. Generally clear, with protrusions <6 inches. No steps or retaining structures.

### **Clearance**

- Vertical clearance - 12 feet minimum above both trail and shoulders.
- Horizontal clearance - Vegetation clear zone 8-20 feet, depending on use. 2 feet beyond each side of trail.

### **Grade**

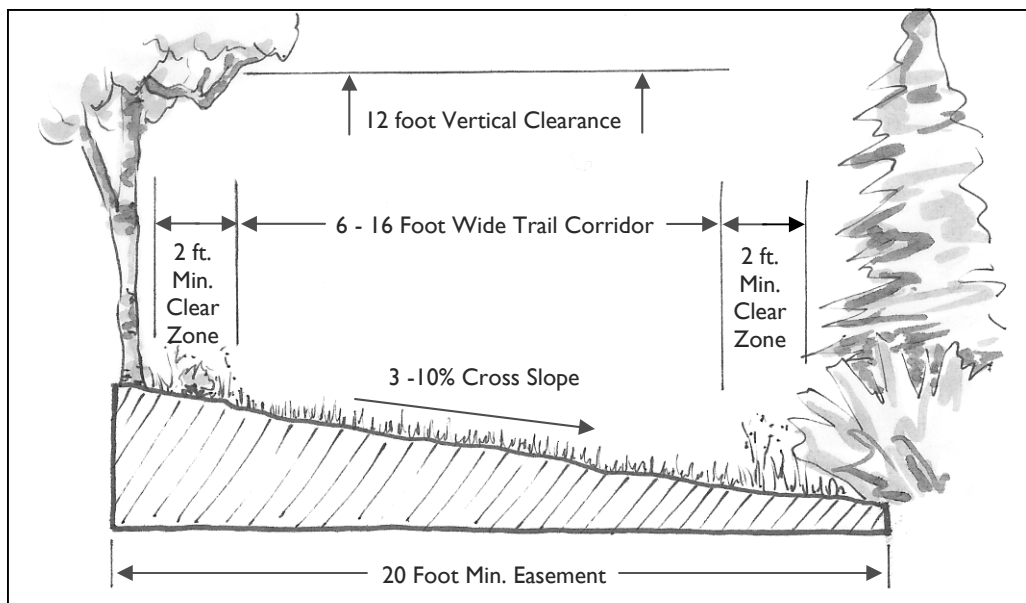
- Target grade: <10%. Maximum: 15% for distances up to 50 feet.

### **Cross Slope of Trail**

- Target cross slope - 5% Maximum, where natural cross slope warrants: 10%

### **Signage & Amenities**

- Trail markers as needed to navigate trails year-round.
- Trail information signage posted at each end of the trail: Trail system map (if appropriate), trail name, length, use restrictions or accessibility warnings, and resource protection information.
- Directional signage with trail name and length, at all trail intersections.



**CROSS SECTION - LEVEL 2 RECREATION CORRIDOR**

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*City of Homer*  
**Non-Motorized Trail Planning & Design Criteria Summary**  
**Level 3 Semi-Improved Trail**

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*NOTE: This is a summary. Refer to Article 5.13 Non-Motorized Trails and Public Access Easements for full description of criteria.*

## PLANNING CRITERIA

### Location

- Connections within and between residential areas where use volumes are not high, or where topography precludes meeting Level 4 Trail criteria.
- Light use, or specialized use trails within public parks and recreation areas.
- Rural trails with light to moderate traffic and year-round informal recreational use.

**Use** Primarily a recreational route for light volumes of traffic. May be designed for one-way or two-way bicycle trails or for equestrian use. Winter use may include snow-shoeing or classical skiing, depending on terrain.

**Easement Width** 12 feet minimum. Wider easements as needed for curves, side slopes, and maintenance.

**Trail Maintenance** Yearly maintenance of gravel surface, clearance zones, signage, and amenities. Cut vegetation within clearance zones, and provide repairs or upgrades to trail surface, water crossings, signage and other amenities or structures, as needed, and as funding allows. Winter grooming optional.

**Topography** Allows for construction to meet design criteria. Existing side slope within easement; Max. approx. 20% (~2.5 feet difference) across 12 foot wide easement.

**Alignment** Level 3 trails provide casual recreation and transportation routes through semi-rural to rural areas. They connect neighborhoods, parks, or other recreation destinations.

- The route can meander as necessary to construct the trail with minimum disturbance to natural surroundings.
- Route should not run directly up slope, but rather traverse a slope at <math><30^\circ</math> angle to the slope, with occasional grade reversals.
- Trail has public access at all ends, such as other trails of equal or greater Level, a parking lot, street ROW, park, school, etc.
- Connects to Level 5 or Level 4 trails. A Level 1 trail may branch from a Level 3 trail.
- Avoid alignments that require maximum grades within 20 feet of intersections with trails, rights-of-way or parking areas.
- Stairs are only allowed on Level 3 trails when an alternate alignment is not reasonable and when grades would otherwise exceed Level 3 maximums.
- Water Crossings: Minimize or avoid crossing ground seeps, creeks, wetlands, or other water bodies. Align crossings at  $90^\circ$  to water flow, choose narrow crossings, avoid crossing river bends or near naturally eroding banks.

**Soils, Water & Hydrology** Saturated soils are highly susceptible to erosion. Avoid seeps and other areas with saturated soils. Minimize the crossing of creeks, rivers and wetlands, which is more expensive to build and more difficult to maintain. Avoid constructing trails along side slopes of 20% or greater.

### Level 3 Trail Description

An informal trail through semi-urban to rural areas, used for access between neighborhoods and destinations, or for recreation. Accessibility may be limited.



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*City of Homer*  
**Non-Motorized Trail Planning & Design Criteria Summary**  
**Level 3 Semi-Improved Trail**

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*NOTE: This is a summary. Refer to Article 5.13 Non-Motorized Trails and Public Access Easements for full description of criteria.*

## TRAIL DESIGN CRITERIA

**Trail Width & Shoulders** 3 - 5 foot wide improved trail.

- 3 - 4 foot wide trail - for routes with lower volumes of traffic, and one-way or no bicycle use.
- 5 foot wide trail - for routes with moderate to high pedestrian volumes and/or two-way bicycle or equestrian uses.
- Trails should widen in areas of switchbacks, turns, steep side slopes, and as needed near structures or amenities.

**Surface** 4 inches NFS gravel over geotextile fabric, which may be placed over native vegetation. Alternate surfacing: porous pavement panels filled with native or imported material. Medium duty boardwalk or bridges where needed. Generally clear, with protrusions <4 inches and steps to 10 inches.

### Clearance

- Vertical clearance - 8 feet minimum. Optimum 12 feet for winter and equestrian users.
- Horizontal clearance - 12 in. beyond trail edge. 24 in. from signs, trees or structures.

### Grade

- Target grade < 8%, with grade reversals as needed to control erosion.
- 15% maximum for up to 50 feet.

### Cross Slope of Trail

- Target cross slope - 3%, flowing to downside of tread, or to uphill side, if a drainage ditch is provided.
- Maximum - 10%

### Signage

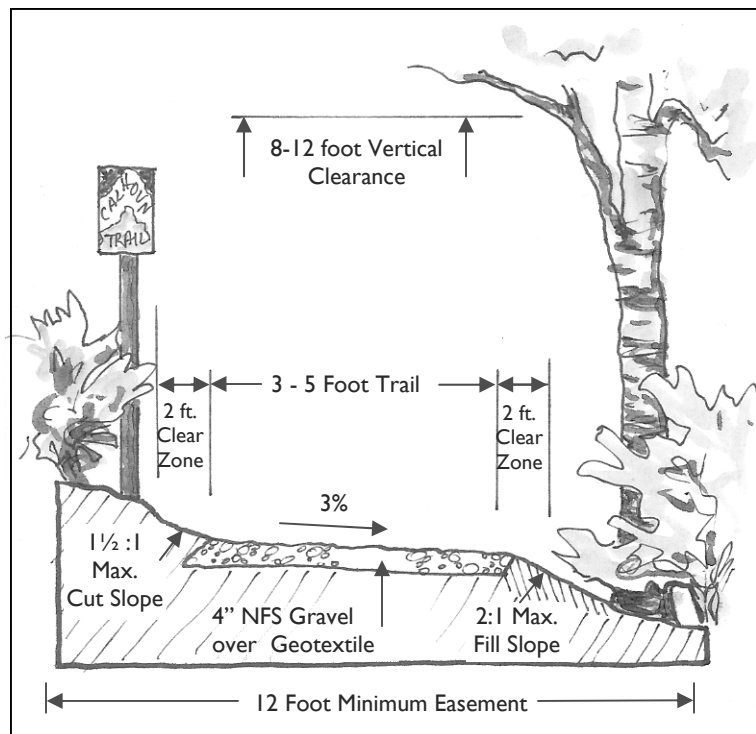
- Trail markers (as needed) to navigate winter use trails.
- Trail information signage posted at each end of the trail: Trail system map (if appropriate), trail name, length, use restrictions or accessibility warnings, and resource protection information.
- Directional signage with trail name and length, at all trail intersections.

### Amenities

- Few amenities, as approved by City of Homer, such as bear proof trash receptacles, trail heads, benches for rest or viewing, interpretive signs, such as at interesting historic or natural features.

### Structures

- Medium duty structures, as needed.
- Elevated plank crossing of wetlands, creeks.
- Few railings or boardwalks.
- Log, timber or rock retaining structures for cut / fill edges, as needed.



**CROSS SECTION - LEVEL 3 SEMI-IMPROVED TRAIL**

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*City of Homer*  
**Non-Motorized Trail Planning & Design Criteria Summary**  
**Level 4 - Fully Improved Trail**

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*NOTE: This is a summary. Refer to Article 5.13 Non-Motorized Trails and Public Access Easements for full description of criteria.*

## PLANNING CRITERIA

### Location

- For transportation and recreation routes through core civic or commercial areas and residential neighborhoods with moderate use levels.
- Where recreational use volumes are high and full accessibility is not critical.
- Moderate pedestrian activity, especially where accessibility is not critical.
- Where a Level 5 trail width is needed to accommodate volumes and user groups, but costs or topography preclude construction of a fully accessible route.

**Use** Two-way transportation routes with light to moderate volumes of primarily pedestrian & bicycle traffic. They may be designed for use by skiers and equestrians, where appropriate.

**Easement Width** 15 feet minimum.

**Trail Maintenance** Maintenance of clearance zones, trail surface, water crossings, signage and other amenities or structures, as needed, and as funding allows. Regular maintenance of approved trash receptacles. Winter maintenance, as use volumes dictate, and funding allows.

**Topography** Allows for construction with maximum running grades <8%, Existing side slope within easement: Max. approx. 12% (~2 feet difference) across width of easement, unless using retaining structures.

**Alignment** Level 4 trails provide comfortable, moderately accessible transportation and recreation routes with the following criteria:

- The route provides a fairly direct connection between major destinations, with spurs and exits where possible.
- Trail has public access at all ends.
- Avoid using stairs, where possible.
- Connects to Level 5 or Level 4 trails. Lower level trails may branch from a Level 4.
- Avoid alignments that require maximum grades within 20 feet of intersections with trails, rights-of-way or parking areas.
- Water Crossings: Minimize or avoid crossing ground seeps, creeks, wetlands, or other water bodies. Align necessary crossings at 90° to water flow, choose narrow crossings, avoid eroding banks.

**Soils, Water & Hydrology** Saturated soils are highly susceptible to erosion. Avoid seeps and other areas with saturated soils. Minimize the crossing of creeks, rivers and wetlands, which is more expensive to build and more difficult to maintain. Avoid constructing trails along side slopes of 20% or greater.

### Level 4 Trail Description

A wide multi-use trail with a firm surface meeting ADA accessibility standards for recreation trails. A transportation and recreational route through the developed areas of Homer and within residential neighborhoods.



*City of Homer*  
**Non-Motorized Trail Planning & Design Criteria Summary**  
**Level 4 - Fully Improved Trail**

*NOTE: This is a summary. Refer to Article 5.13 Non-Motorized Trails and Public Access Easements for full description of criteria.*

**DESIGN CRITERIA**

**Trail Width & Shoulders** 5 - 8 foot wide paved or gravel trail.

- 5 - 6 foot wide trail - for routes with lower volumes of traffic, and fewer recreational users.
- 7 - 8 foot wide trail - for routes with bicycles and/or moderate to high user volumes.
- PAVED TRAILS - where a Level 5 trail is recommended, but topography or other physical conditions prevent construction to Level 5 standards, a paved Level 4 trail is acceptable. Any Level 4 trail can be paved. Provide a minimum 12 in. gravel shoulders on all paved trails.

**Surface** Firm and stable. Smooth, few or no obstacles. Protrusions <3 in. Steps to 8 in. Remove surface vegetation and organic soils. For gravel trails: 2 in. leveling course over 8 in. NFS gravel over geotextile. For paved trails: 2 in. AC pavement over 2 in. leveling course over 24 in. NFS gravel over geotextile. Alternate surfacing: PPP filled with native or imported material.

**Clearance**

- Vertical clearance - 9 feet above trail and shoulders, 12 feet for equestrian use.
- Horizontal clearance - Minimum 12 in. beyond trail edge. 24 in. from signs and trees.

**Grade & Accessibility**

- Accessible trails: Target grade ≤ 5%, 8.33% for up to 200 feet, 10% for up to 30 feet, 12.5% for up to 10 feet. No more than 30% of trail length shall exceed 8.33%.
- Maximum: 10% for up to 50 feet.
- Stairs used where absolutely necessary and pedestrians are the primary user group.

**Cross Slope of Trail**

- Gravel trails - 3%
- Paved trails - 2%
- Shoulders - 10% Max.

**Signage**

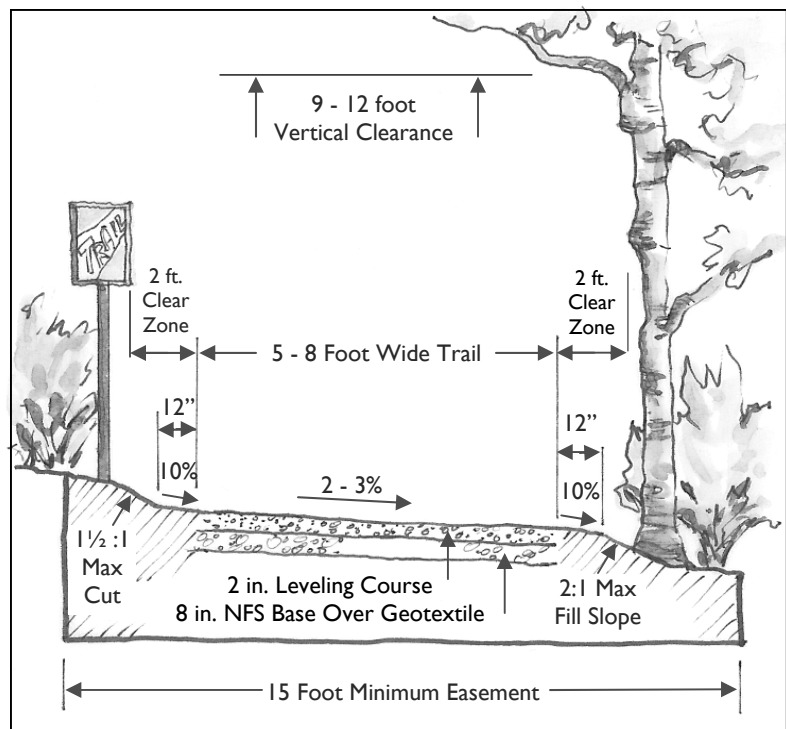
- Trail information signage posted at ends and intersections, as necessary, such as a trail system map, trail name, use restrictions, accessibility warnings, and resource protection information.
- Directional signs for nearby destinations, traffic control and warnings for intersections or other trail conditions.
- Directional signage with trail name and length, at all trail intersections.

**Amenities**

- Amenities common. Lighting, bear proof trash & recycling receptacles, maps, benches for rests or viewing, and interpretive signs, as approved.

**Structures**

- Heavy duty structures, as needed: bridges, boardwalks, retaining structures, railings.



**CROSS SECTION - LEVEL 4 FULLY IMPROVED TRAIL**

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*City of Homer*  
Non-Motorized Trail Planning & Design Criteria Summary  
Level 5 - High Use Trail

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*NOTE: This is a summary. Refer to Article 5.13 Non-Motorized Trails and Public Access Easements for full description of criteria.*

## EASEMENT PLANNING CRITERIA

### Locations

- Where required or recommended in Codes or Plans adopted by the City of Homer.
- Long, regional commuter routes.
- On-site pedestrian routes, as required by ADAGG, and any accessible connections between these and nearby pedestrian routes, such as sidewalks.
- Connections between Level 5 Trails and nearby streets, trails, public areas, or other destinations.
- Where high volumes and/or varied types of users are known or anticipated to use the existing route.

**Use** Accommodates two-way traffic of pedestrians, cyclists, in-line skaters, wheelchair users, and others. May be year-round for pedestrians, bicyclists, and wheelchairs.

**Easement Width** 20 feet wide minimum. Additional width may be needed to accommodate bridges, cut / fill needs, curves, trail amenities, or maintenance.

**Trail Maintenance** Maintain clearance zones, trail surface, water crossings, signage and other amenities or structures, as needed, and as funding allows. Regular maintenance of approved trash receptacles. Full winter maintenance as use dictates and funding allows.

**Topography** Must allow for an accessible trail without excessive cut / fill requirements; Structural slope management techniques, such as retaining walls, are encouraged as needed to meet design criteria with minimal impact to surrounding areas.

**Alignment** The primary objective is to provide accessible pedestrian transportation routes or high use recreation routes. Alignment should be based on the following criteria:

- Efficient and direct routes between origins and destinations;
- Avoid creating tunnels or blind corridors with restricted visibility;
- Avoid trail alignments that direct views into private residences;
- Align trail, where possible, to provide views of natural features and destinations;
- Water Crossings: Minimize or avoid crossing ground seeps, creeks, wetlands, or other water bodies. Align necessary crossings at 90° to water flow, choose narrow crossings, avoid eroding banks.

**Soils, Water & Hydrology** Saturated soils are highly susceptible to erosion. Avoid seeps and other areas with saturated soils. Minimize the crossing of creeks, rivers and wetlands, which is more expensive to build and more difficult to maintain. Avoid constructing trails along side slopes of 20% or greater.

### Level 5 Trail Description

A wide, accessible paved trail that accommodates a wide variety of non-motorized users.



These multi-use trails provide access between public spaces, sidewalks, civic & cultural buildings and other major destinations within the core civic and commercial areas of Homer. Winter maintenance can allow for convenient year round use of these transportation and recreation routes.

*City of Homer*  
**Non-Motorized Trail Planning & Design Criteria Summary**  
**Level 5 - High Use Trail**

*NOTE: This is a summary. Refer to Article 5.13 Non-Motorized Trails and Public Access Easements for full description of criteria.*

## TRAIL DESIGN CRITERIA

**Trail Width & Shoulders.** 8- 12 foot wide paved trail with 2 foot wide gravel shoulders.

- 8 foot Trail - for routes with lower volumes of traffic, few recreational users, or space limitations.
- 10 foot wide trail sections are the standard.
- 12 foot wide trails are recommended where traffic volumes are high, bicycles and in-line skates are common, near intersections with other trails or streets, as the trail approaches a bridge, where grades exceed 5% and handrails are provided, or near points of interest along the trail.
- ALTERNATE TRAIL DESIGN - Where trail is highly recreational, with bicycles, equestrians, joggers, an alternative design of 6 foot wide paved trail with 4 foot shoulders on each side or a trail with one 2 foot and one 6 foot wide shoulder is allowable. Or, provide a separated dual trail, one paved, one gravel, with a vegetated median in-between.

**Surface.** Uniform, firm and stable. Pavement or boardwalk. Smooth, no obstacles. Protrusions <2 inches. Construct using 2 in. AC pavement over 2 in. leveling course over 24 in. NFS gravel over geotextile fabric.

### Clearance.

- Vertical clearance - 9 feet above trail and shoulders, 12 feet for equestrian use.
- Horizontal clearance - Minimum 24 inches beyond trail edge. 36 inches for posts and structures.

### Grade

- Accessible Trails: Target grade  $\leq$  5%, 8.33% for up to 200 feet, 10% for up to 30 feet, 12.5% for up to 10 feet. No more than 30% of trail length shall exceed 8.33%.

### Cross Slope of Trail

- Target cross slope - 2% Shoulders - 10% Max.
- Maximum, where needed for driveway crossings or other intersections - 3%

### Signage

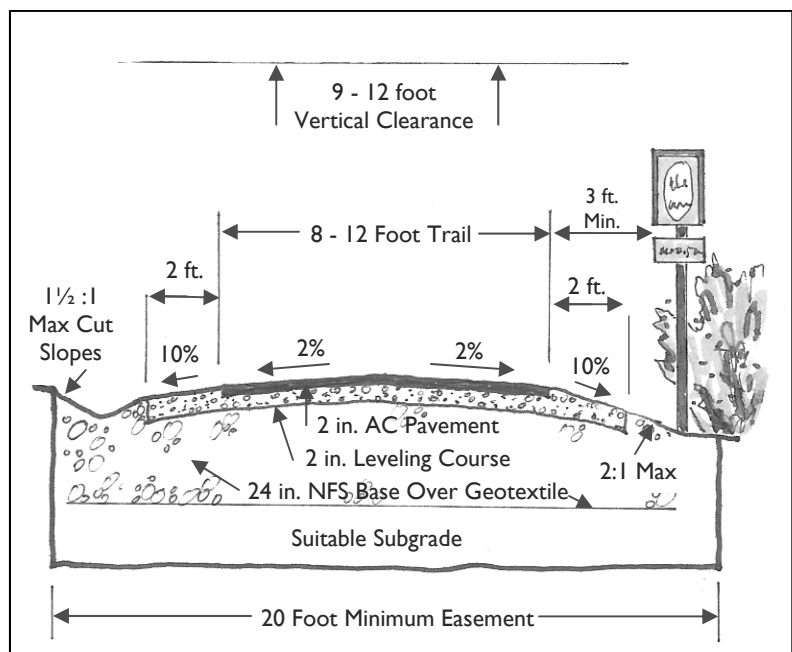
- Trail information signage posted at ends and intersections, as necessary: Trail system map (if appropriate), trail name, use restrictions or accessibility warnings, and resource protection information.
- Directional signs for nearby destinations, traffic control and warnings for intersections or other trail conditions.
- Directional signage with trail name and length, at all trail intersections.

### Amenities

- Amenities common. Lighting, bear proof trash & recycling receptacles, maps, benches for rests or viewing, and interpretive signs, such as at historic or natural features.

### Structures

- Heavy duty structures, as needed: bridges, boardwalks, retaining structures, railings.



**CROSS SECTION - LEVEL 5 HIGH USE TRAIL**





# ***D. TRAIL DESIGN CRITERIA***

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## **I. GENERAL**

The City of Homer's goals include having non-motorized trails that provide for a range of accessibility and experiences, through varying terrain and neighborhoods for a range of users. Such a system of trails will provide year round transportation and recreation routes throughout the City of Homer.

Accessible trails are expected within the central development area of Homer, connecting pedestrians to schools, parks, the hospital, the library, residential neighborhoods, businesses, and other public facilities.

### **a. Objectives**

This section provides design criteria for trail alignment, width, grade, cross-slope, clearance, materials, steps, railings, signage, boardwalks, ramps, switchbacks, water crossings, structures, bridges, and specialized uses. It is for use by project engineers when designing a trail and by City of Homer staff when reviewing applications for subdivisions, easement dedications, or trail construction.

The objective is to provide design criteria for most typical trail situations; however, the design criteria in this article does not dismiss the responsibility of the trail engineer or designer from appropriately addressing all site conditions and applying design solutions that are safe, structurally sound, attractive, and functional. Refer to the list of resources in section A.3.a. of this article when more specific design research is necessary for unique circumstances or issues.

## **2. TRAIL ALIGNMENT**

Trail alignment refers to the horizontal and vertical curvatures of the trail, and is responsible for ensuring the safety and comfort of trail users. Many factors are involved in determining a safe and effective alignment for a specific trail, including user volumes and types, and the condition, width and grade of the trail. For example, a wide, paved trail with an 8% grade will produce faster speeds and require broader curves and longer sight stopping distances.

### **a. Design Speed**

Design all trails based on the preferred speed of the fastest users, which are typically bicyclists and cross-country skiers. According to AASHTO's Guide for the Development of Bicycle Facilities, 1999, a paved shared use trail (Level 4 or 5) should be designed for a minimum speed of 20 mph, which is the appropriate maximum speed for a bicyclist on a paved trail. The design speed should increase to 30 mph if the grade exceeds 4 percent or where strong winds are prevalent.

On unpaved trails, such as Levels 1, 2, 3 or 4, a design speed of 15 mph is adequate. For ski trails with 0-4 percent grade, use a design speed of 15 mph, for grades 4-10 percent, 20 mph, and for grades over 10 percent, 25 mph. Where ski racing events are expected, higher design speed may be necessary.

# D. TRAIL DESIGN CRITERIA

## b. Horizontal Alignment

Horizontal alignment addresses the curvature of a trail corridor, and must be calculated to accommodate the user group with the greatest needs in order to provide a safe and comfortable trail facility. AASHTO recommends using the bicycle to calculate horizontal alignment on multi-use trails that are used by bicycles. The bicycle has a tendency to lean into a curve as needed to round a corner while traveling at top speed, but without a high rate of superelevation, the lean may result in the pedals striking the trail surface. Increasing the superelevation beyond 3%, however, does not comply with ADA requirements for pedestrian facilities. Therefore, multi-use trails need to accommodate a wider curve radius in order to accommodate both the speed of cyclists and the comfort of all pedestrians.

For Level 2, 3, 4 & 5 trails, use the formulas on this page to calculate curvature requirements, based on bicycle speed.

Table D-1

Desirable Minimum Radii for Paved Multi-Use Trails Based on 15° Lean Angle (AASHTO, 1999)	
Design Speed (V)	Minimum Radius (R)
mph	Feet (ft)
12	36
20	100
25	156
30	225

Use the following simple equation to determine the minimum radius of curvature for any given lean angle:

$$R = \frac{0.067 V^2}{\tan \Theta}$$

- R = Minimum radius of curvature (m) or (ft)
- V = Design Speed (km/h) or (mph)
- Θ = Lean angle from vertical (degrees)

Table D-2

Desirable Minimum Radii for Paved Multi-Use Trails Based on 2% Superelevation Rates and 20° Lean Angle (AASHTO, 1999)		
Design Speed (V)	Friction Factor (f) (paved surface)	Minimum Radius (R)
mph		ft
12	0.31	30
20	0.28	90
25	0.25	155
30	0.21	260

For gravel trails and situations where the lean angle approaches 20°, the following formula can be used:

$$R = \frac{V^2}{15 (e / 100 + f)}$$

- Where:
- R = Minimum radius of curvature (ft)
  - V = Design Speed (mph)
  - e = Rate of bikeway superelevation (%)
  - f = Coefficient of friction

## D. TRAIL DESIGN CRITERIA

### c. Stopping Sight Distance

Trail users need adequate time to see and react to unexpected obstacles or situations along a trail. Appropriate stopping site distances help to prevent accidents and provide a safe and comfortable environment for trail users. Proper design is based on the trail's design speed and is accomplished by the vertical and horizontal curvature and clearing limits of the trail corridor. The following summarizes AASHTO recommendations for providing effective Stopping Sight Distances. Consult AASHTO for more detailed information, diagrams and tabulated charts.

Stopping distance is a function of the trail user's perception and reaction time, the initial speed they're traveling, the coefficient of friction between the trail user and the trail (tires, wheels, skis), and the stopping ability of the user (brakes, etc.). Since many users tend to 'hug' the middle of the trail, lateral clearance on horizontal curves should be calculated based on the sum of the stopping sight distances for trail users traveling in opposite directions. If this is not feasible, place warning signs (in accordance with MUTCD), widen the trail through curves, and/or install centerlines.

For Minimum Stopping Site Distance vs. Grades for Various Design Speeds:

$$S = \frac{V^2}{30(f \pm G)} + 3.67V$$

For Minimum Length of Crest Vertical Curve (L) Based on Stopping Sight Distance:

$$\begin{aligned} \text{When } S > L \quad L &= 2S - 900 / A \\ \text{When } S < L \quad L &= AS^2 / 900 \end{aligned}$$

Height of cyclist's eye = 4.5 feet    Height of object = 0 feet  
Minimum Length of Vertical Curve = 3 ft.

For Minimum Lateral Clearance on Horizontal Curves:

$$\begin{aligned} M &= R [1 - \cos (28.65S / R)] \\ S &= R / 28.65 [\cos^{-1} (R-M / R)] \end{aligned}$$

A = Algebraic grade difference (%)  
S = Stopping sight distance (ft)  
V = Velocity (mph)  
f = Coefficient of friction (use 0.25)  
G = Grade rise/run (ft/ft)  
L = Minimum length of vertical curve (ft)  
R = Radius of centerline of lane (ft)  
M = Distance from centerline of lane to obstruction (ft)

**SOURCE:** AASHTO, Guide for the Development of Bicycle Facilities, 1999

# D. TRAIL DESIGN CRITERIA

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## d. Intersections

Safety on a trail becomes most critical at intersections, especially those between a trail and a roadway. Placement and treatment of trail intersections can make all the difference when it comes to the safety and function of a trail system. Consult AASHTO and MUTCD for additional guidance when designing trail intersections. Trail intersections are subject to the following design criteria:

### i) Criteria for All Intersections:

- Adequate stopping site distances and warning signs should be provided to ensure users will stop before the intersection;
- Provide clear sight lines to see on-coming traffic from all directions;
- All intersections and approaches should be as close to perpendicular as possible and on relatively flat grades. Exceptions include ski trails, or other recreational trails that utilize triangular intersections;
- Where an unpaved path crosses a paved path or road, a paved apron should be provided for the unpaved trail, extending a minimum 10 feet from the paved path or road (AASHTO 1999);
- Widen the intersection area if high volumes of traffic are present, or if the users tend to bunch up or move slowly, such as children, groups, or the elderly.
- Place warning signs 400 feet in advance of intersections.

### ii) Trail with Trail Intersections:

- Stop signs are required on one of the two trails, typically the lower level, lower volume, or lower speed trail. See section 8 of this article for additional safety and signage information;
- All intersections on higher level trails should be signed to alert users as to the type of crossing and the expected type of traffic;
- Assign right of way to each intersection, giving one trail priority and requiring the other to stop or yield. Consider the comfort and convenience of the trail user, any unique behavioral characteristics of the user, and trail conditions (approach grades, curves, visibility issues).

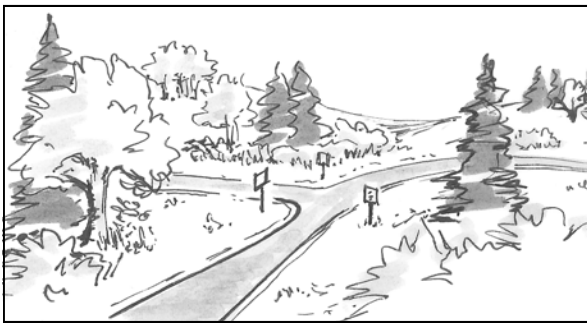


Figure D-1. Visibility and signage at trail intersections.

### iii) Trail with Road Intersections:

- If alternate locations for the intersection are available, the most favorable intersection condition should be selected;
- Establish right-of-way and provide traffic control in accordance with MUTCD;
- Sign type, size and location should be in accordance with MUTCD;
- Stop signs should be visible from 200 feet.

## D. TRAIL DESIGN CRITERIA

### 3. GRADE & CROSS SLOPE

This section discusses design criteria for running grade, cross slope, cut / fill, and the use of retaining structures. Grade and cross slope affect the safety, comfort, and sustainability of a trail. Keeping water off a trail is critical to minimizing erosion and reducing puddles and ice build-up on the trail surface.

It is the City of Homer's intent that trails are designed for maximum access with minimum impact. Proposed running grades and accessibility levels are subject to approval by City of Homer Planning or Public Works Departments.

#### a. Running Grade

Accessibility, topography, soils, construction methods, project budget, and trail use all play a role in determining the appropriate running grade of a trail. In general, grades should be kept to a minimum, especially on long inclines. Comfort and accessibility are a priority on all trails.

##### i) General Criteria for all Trails.

- Construct all Level 3, 4 & 5 trails to be accessible, unless exemptions apply;
- Apply the "half rule" on all trails, which says that the trail grades should be no more than half the side slope grade;
- Provide grade reversals to manage the flow of water;
- Plan switchbacks to navigate side slopes greater than 15%, to add interest to the trail, and to avoid using maximum grades for long distances. Place switchbacks at relatively flat areas or natural benches. Fewer, longer switchbacks are preferable to frequent, short ones. Switchbacks are not recommended on trails used by bicycles or for skiing.
- Use climbing turns on side slopes <15%.

ii) **Required ADA Accessibility.** Full ADA accessibility (<5% grade) is preferred for higher level trails, but is only required by law on trails that provide primary pedestrian access to facilities that are ADA accessible. For these trails, Table D.3 applies.

iii) **Accessible Trails.** Although not required by law, the Access Board has developed criteria for accessible trails in outdoor developed areas. Level 3, 4 and 5 trails should meet the criteria in Table D.4, unless they meet the exemption criteria.

iv) **Accessible Trail Exemptions.** Portions of trails that meet the following may be exempt from accessibility criteria:

- Compliance would cause substantial harm to cultural, historic, religious, or significant natural features of characteristics.

Table D-3

<p align="center"><b><u>ADA Pedestrian Accessibility Standards</u></b> Grades ≤ 5% (1:20) Ramps ≤ 8.33% (1:12) for maximum vertical rise ≤ 30 in. Level landings, 60 x 60 in., are required at each end of a ramp. Hand rails are required for most ramps; Consult ADAAG for more details.</p>
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Table D-4

<p align="center"><b><u>ATBCB Criteria for Accessible Trails</u></b> 1:20 (5%) any length 1:12 (8.33%) for up to 200 feet 1:10 (10%) for up to 30 feet 1:8 (12.5%) for up to 10 feet No more than 30% of the total trail length shall exceed 1:12</p> <p align="center"><b><u>Rest Area Criteria</u></b> Resting areas are required at intervals no greater than the above permitted lengths. 60 inch length, at least as wide as the widest trail segment adjacent to the rest area.</p>
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## D. TRAIL DESIGN CRITERIA

- Compliance would substantially alter the nature of the setting or the purpose of the facility, or portion of the facility.
- Compliance would require construction methods or materials that are prohibited by Federal, State, or Local Regulations or Statutes.
- Compliance would not be feasible due to terrain or the prevailing construction practices.

### v) Running Grade Criteria by Trail Level.

**LEVEL 1:** Maximum grade is based primarily on the ability of the trail to resist erosion caused by trail use, surface water, or wet soils. Target grade <12%. Maximum 20% for trails where underlying soils are sand, silt, or clay. 20%- 30% for gravel or rock base. For grades over 30%, natural trail base and surface must be composed of angular rock, large rock or solid rock. Provide grade reversals every 20-50 feet. Construct steps to minimize erosion.

**LEVEL 2:** Target grade: <10%. Maximum: 20% for distances up to 50 feet. Use on-site cut and fill to soften dips or peaks in trail corridor.

**LEVEL 3:** Target grade: < 8%. Maximum: 15% for up to 50 feet.

**LEVEL 4/5:** Target grade:  $\leq$  5%. Maximum: 8.33% for up to 200 feet, 10% for up to 30 feet, 12.5% for up to 10 feet. No more than 30% of trail length shall exceed 8.33%.

### b. Grade Reversals

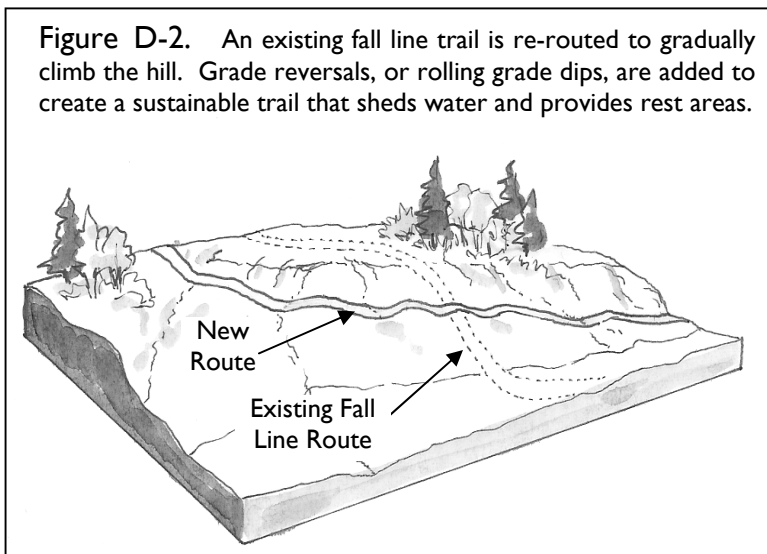
A grade reversal is a change in the direction of running grade, from an upslope grade to a down slope grade. They are used on unpaved trails to prevent erosion that is caused by water running *along* the surface of a trail versus *across* the trail. They should be provided every 20-50 feet along the trail corridor.

### c. Cross-Slope & Cut / Fill

All trails require enough cross-slope to shed water off the trail surface, but not so much that it impacts the comfort or safety for the trail user. Managing surface water drainage along a trail corridor is critical to maintaining a safe and long lasting trail. Poorly managed drainage can erode soils and destroy vegetation. Keeping water moving across the surface of a trail will prevent ponding, erosion, and icing.

Steep side slopes (> 30%) are a common obstacle to the construction of trails on Homer's hillside terrain, and often trigger the need for extensive cut and fill to "fit" a trail into a hillside. Careful planning can minimize expense and environmental damage.

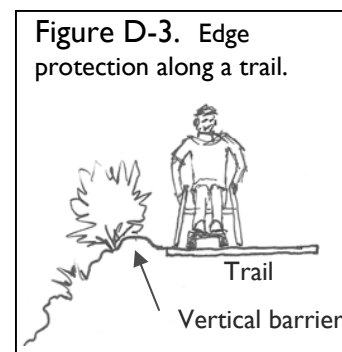
**Figure D-2.** An existing fall line trail is re-routed to gradually climb the hill. Grade reversals, or rolling grade dips, are added to create a sustainable trail that sheds water and provides rest areas.



## D. TRAIL DESIGN CRITERIA

### i) General Cross-Slope and Cut / Fill Criteria:

- All construction-related disturbance, including areas of cut or fill, shall occur within the limits of the easement;
- Limits of cut and fill should be in proportion to the construction level of the trail. For example: low level trails justify very little cut / fill, high level trails may utilize the entire easement for most of the length of the trail;
- Maximum 1½ :1 (75%) cut slopes, maximum 2:1 (50%) fill slopes. Where soils are unstable, sandy, or saturated, 3:1 (33%) max slopes are recommended.
- For trails along side slopes of 30% or greater, construct the trail on the cut bench portion only. Avoid locating the trail on fill portions of the side slope;
- Provide retaining structures, as needed to minimize disturbance and to improve accessibility on Level 3, 4 or 5 trails;
- Construct trails to ensure water flows across or under the trail surface, not along the trail. Where it is necessary to run the water along the trail, it should be contained in a ditch with provisions made to protect against erosion. Ditch length should be minimized by diverting runoff across the trail at the nearest point feasible.
- To accommodate vision-impaired or wheelchair users on Level 4 or 5 trails with an adjacent fill slope, provide a vertical barrier along the cut slope edge of the shoulder, such as vegetation, or a minimum 3 in. curb or barrier.



### ii) Criteria by Trail Level

LEVEL 1: Target cross slope is 3-10%. Maximum is up to the natural side slope. If the trail is designed for mountain bikes, cross slope maximum is 10%. Very minimal cut and fill. Little or no use of (rustic) retaining methods.

LEVEL 2: Target cross slope: 5%. Maximum: 10%. For ski trails, if bicycles are not allowed, steeper side slopes may be allowed. Minimal cut and fill as necessary to meet criteria and soften dips, ruts, bumps or peaks.

LEVEL 3: Target cross slope is 3%. Maximum is 10%. Cut and fill as needed to meet design criteria. Rock or timber used for most retaining needs.

LEVEL 4: Gravel trails: Target cross slope: 3%, Max.: 4%. Paved trails: target cross slope: 2%, Max.: 3%. Cut and fill may be significant, as needed to meet design criteria. May likely extend to edges of easement for much of the trail length. Imported materials for retaining structures common.

LEVEL 5: Target cross-slope is 2%. Where necessary, such as when crossing driveways, a cross-slope of 3% is allowable. Paved surfaces must be uniform enough to prevent ponding and icing. Shoulders should slope away from the paved sections of the trail with a target slope of 3%, and a maximum of 10%. Cut and fill may extend to the outer edges of the easement. Retaining structures common.

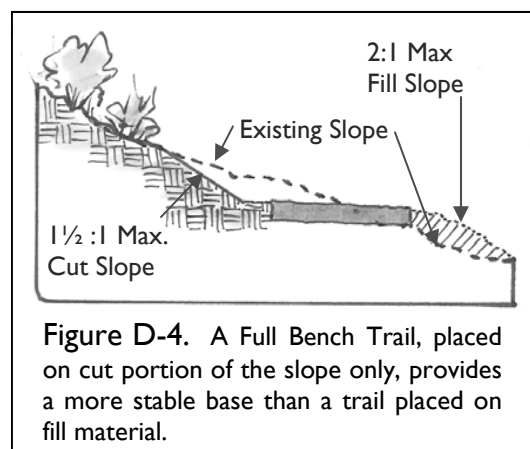


Figure D-4. A Full Bench Trail, placed on cut portion of the slope only, provides a more stable base than a trail placed on fill material.

**iii) Re-vegetation.** All cut / fill slopes should be vegetated with native species. Attempts should be made to salvage and stockpile existing vegetation for re-use on cut / fill slopes. Avoid reseeding with non-native species.

# D. TRAIL DESIGN CRITERIA

## 4. WIDTHS

The complete trail cross-section is composed of the easement, the trail surface, the shoulders, and the clearance zone. The desired width is primarily related to the volume and mix of users. Secondary considerations include topography, curves, intersections, structures, and amenities.

Table D-5

REQUIRED EASEMENT WIDTHS	
<b>LEVEL 1:</b>	<b>8 Feet</b>
<b>LEVEL 2:</b>	<b>20 Feet</b>
<b>LEVEL 3:</b>	<b>12 Feet</b>
<b>LEVEL 4:</b>	<b>15 Feet</b>
<b>LEVEL 5:</b>	<b>20 Feet</b>

### a. Easement Width

The following criteria apply to easement widths:

- A narrower portion of easement may be allowed when available space is limited by existing structures or property boundaries, for a short duration of the trail, and the narrow segment of the trail does not create a safety hazard or an uncomfortable trail segment of trail;
- Vary the easement width as needed to accommodate switchbacks or turns;
- Wider easement sections are allowed where existing side slopes require additional cut and fill, and retaining structures are not feasible, and the widened area is not extensive.

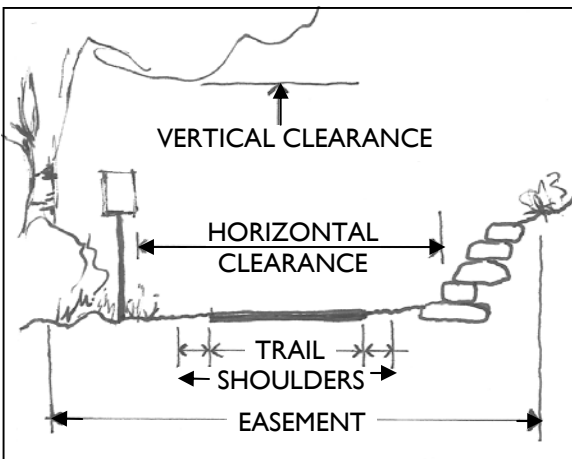
### b. Trail Width

The width of the trail surface, or tread, is determined by the volume and type of users, as well as the nature of the terrain and the trail surface. Always provide for the user with the most demanding needs.

**LEVEL 1:** Trail tread width may range from 6 - 24 inches. Consistent width along the length is preferred, but not required on this level of trail. Natural obstacles and topography may both affect variability of the tread width. Provide 24 in. width when the trail is expected to attract mountain biking, equestrians, snow-shoeing, or skiing.

**LEVEL 2:** There is typically not a constructed trail tread for recreation corridors. They are a specified width of area that is cleared of woody vegetation and obstacles, mowed (optional), and identified with trail markers for use as a recreation corridor. Minimum width for an un-programmed low use corridor is 6 feet. Groomed ski trail routes require up to a 16 foot wide mowed corridor.

FIGURE D-5 Trail Profile



**LEVEL 3:** Widths may range from 3-5 feet. Safety may be a concern on narrow trails with a mix of pedestrians, bicycles and equestrians, even if the volumes are low. It cannot be expected that bicycles will use these routes as “one-way” trails, or stay off them altogether, so it is imperative that they be designed to mitigate potential hazards. For trails that will expect regular use by bicycles, overall use volumes are moderate, or hills are frequent, the width should be 5 feet. Narrower trails are allowed for lower use trails, but horizontal clearance and sight stopping distance should both be increased, curves widened, and passing areas provided at a minimum of every 1000 feet.



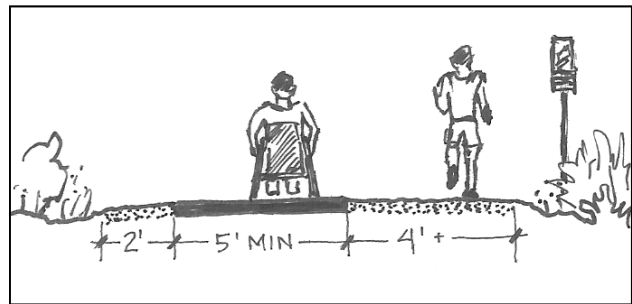
## D. TRAIL DESIGN CRITERIA

**LEVEL 4:** Widths can range from 5 feet to 8 feet wide. Increase widths for trails with higher volumes of traffic, or a wide mix of uses, such as equestrians, joggers, bikes, children, etc. Additional width should be provided as needed for a curve, rest areas or amenities, a passing zone, a transition to a bridge, or at intersections.

**LEVEL 5:** Widths can range from 8 - 12 feet wide. AASHTO recommends a minimum width of 10 feet for two-directional paved multi-use trail. Where lower volumes of traffic are expected, grades are relatively flat, and views are open, the narrower width is allowable. Wider trails are recommended for areas of high use, with frequent amenities, interruptions or intersections, busy areas with mixed land use, or frequent use by all types of users, including equestrians.

**ALTERNATE.** Joggers and equestrians prefer gravel surfaces. An alternative trail section may be appropriate where a wide mix of users frequent the trail. Options include an 8 foot wide paved trail with 4 foot shoulders on each side, or with one 6 ft. and one 2 ft. shoulder. A dual trail solution is another alternative for accommodating equestrians more comfortably along side a busy paved trail.

**FIGURE D-6** Alternate Trail Profile.



### c. Shoulders

Shoulders along side a paved trail offer a transition zone along side the trail, as well as stability for the paved surface. Shoulders are typically needed along all trails, where they abut cut/fill slopes, bridges or other structures, for comfort and safety.

**LEVEL 1:** Typically none. On bridges, provide minimum 6 in. on each side.

**LEVEL 2:** Typically none. If a bridge or boardwalk is needed, an additional 2 feet of clearance on each side is recommended.

**LEVEL 3:** Provide 2 foot wide shoulders for crossing bridges or boardwalks, with or without railings. Provide a 12 in. shoulder between trail edge and cut / fill areas.

**LEVEL 4:** Provide a 2 foot wide buffer on each side on bridges or boardwalks, with or without railings. Provide 12 in. shoulders between trail edge and cut / fill areas. 2 ft. gravel shoulders required on paved trails.

**LEVEL 5:** Minimum 2 foot wide gravel shoulders required on all trails.

### d. Passing Space

Where Level 3 trails are less than 5 feet wide, 60 x 60 in. passing spaces are required at least every 1000 feet. These areas are to be constructed adjacent to the trail, using the same construction method as the adjacent trail.

## ***D. TRAIL DESIGN CRITERIA***

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### **e. Horizontal and Vertical Clearance**

One of the most critical factors in developing safe and comfortable trail facilities is the provision of adequate clearance from obstacles that may be found along a trail. Sufficient clearances are needed for visibility and sight distance, trail maintenance, user comfort, passing room, snow storage, crowding, and emergency situations.

Much variability is found in trail clearances, and is based upon the trail design and setting, the various user groups, and the overall volume of users. Adjust clearance as needed for special user groups and maintenance vehicles.

Horizontal clearance refers to the width of clear space from the surface and sides of a trail corridor that is free of obstructions such as rocks, shrubs, amenities, sign posts, trees, railings.

Vertical criteria refers to the height of the clear zone. Trail users are higher when on bicycles, horses or skates, and snow conditions often raise the trail few feet, or more. Highly developed trail settings require a higher vertical clearance, due to our natural shy distance in these environments, compared to our tolerance for tree branches near our heads in wilderness settings.

- LEVEL 1: Horizontal: Maintain 36 inch wide clear zone.  
Vertical: 6 ft. Hiking, 8 ft. bicycle & equestrian, 10 ft. snowshoe.
- LEVEL 2: Horizontal: 2 feet additional clearance beyond the edge of the designated trail corridor, or more as needed for ski run-out.  
Vertical: 12 feet
- LEVEL 3: Horizontal: 2 feet beyond outer edge of trail to any trees, posts, railings, or signs. 12 in. beyond for other vegetation and cut / fill slopes.  
Vertical: 8 ft. for most trails, 12 ft. for equestrian and winter uses.
- LEVEL 4: Horizontal: Minimum 2 feet beyond outer edge of trail to any trees, posts, railings, or signs. 12 in. beyond for other vegetation and cut / fill slopes.  
Vertical: 9 ft. for most uses, 12 ft. for equestrians.
- LEVEL 5: Horizontal: Minimum 3 feet beyond trail edge (1 foot beyond shoulder) for any vertical obstructions, such as signs, railings, trees. 2 feet beyond outer edge of trail for vegetation and cut / fill slopes.  
Vertical: 9 ft. for most uses, 12 ft. for equestrians.

## D. TRAIL DESIGN CRITERIA

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### 5. TRAIL CONSTRUCTION

Trails should be constructed to last a very long time. High quality construction results in a more safe, enjoyable and low maintenance trail. Design higher level trails to withstand snow removal or maintenance vehicles, such as trucks.

#### a. Trail Base

The base material, or structure, under the trail surface is responsible for the trail's ability to endure loads and repeated freeze-thaw cycles. A soils investigation is required prior to trail design and will have a bearing on the engineering of the trail. More highly constructed or rigid trail surfaces, such as pavement, bridges and boardwalks, require more highly engineered base structure, such as excavating native material and replacing with NFS material, or using piles that are driven to a depth of at least 5 feet. Light use trails require minimal engineering.

#### b. Trail Surface

Trail surfaces vary with user groups, seasons, volumes and trail locations.

- i) **Pavement.** Preferred for high use areas. Paved trails are best for accommodating commuter bicycles, in-line skates, wheelchairs and strollers. Edge reinforcement is recommended where the width of the trail is such that maintenance vehicle tires will likely be at the edge of the pavement.
- ii) **Gravel Surfacing.** Suitable for many uses, and is preferred for jogging and equestrian use, but is not as accessible or durable as pavement.
- iii) **Natural Surface.** Appropriate for very light summer use, and for winter use. Horses and bicycles can easily damage natural surface trails, especially in wet conditions.
- iv) **PPP - Porous Pavement Panels.** Synthetic trail hardening materials are useful in a variety of situations. They are most applicable for wet conditions on Level 1, 2 or 3 trails.
- v) **Other surfacing.** Rock, wood, recycled plastic, treated wood, metal.

#### c. Criteria for Trail Levels

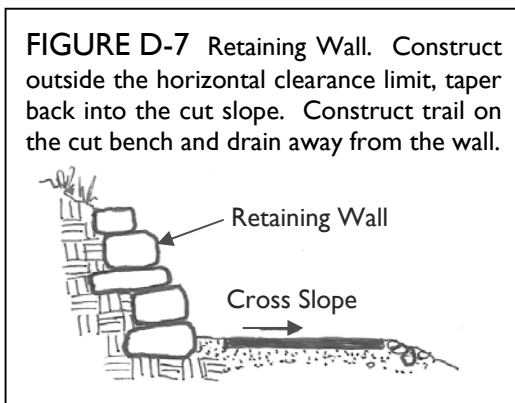
- LEVEL 1: Base - Native materials. Surface: native rock, gravel, or earth. For wet crossings use logs, PPP, or other turf reinforcement materials.
- LEVEL 2: Base - Native materials. Surface: existing vegetation mat. For wet crossings, use log, metal, synthetic, PPP or other turf reinforcement.
- LEVEL 3: Base - Native materials. Surface: 4 in. NFS gravel over geotextile fabric. Wet crossings: wood, metal, synthetic, PPP or other turf reinforcement.
- LEVEL 4: Gravel Trails. Base: Remove vegetation and organic soils. 8 in. NFS gravel over geotextile over suitable soil. Surface: 2 in. leveling course.  
Paved (or future paved) trails. Base: 24 in. NFS gravel over geotextile. Surface: 2 in. AC pavement over 2 in. leveling course. For wet crossings, wood, metal, synthetic.

## D. TRAIL DESIGN CRITERIA

**LEVEL 5:** Base: Remove vegetation and organic soils. 24 in. NFS gravel over geotextile over suitable soils. Surface: 2 in. AC pavement over 2 in. leveling course. For bridges and wet crossings: wood, synthetic, recycled plastic, treated wood, or metal.

### 6. STRUCTURES

Where trails cross creeks or traverse areas where existing grades or side slopes are too steep to construct the trail without excessive disruption to adjacent areas, structures may be necessary.



#### a. Retaining Walls

Construct all retaining walls outside the horizontal clearance limit of the trail. Retaining walls higher than 24 in. on the down slope side of a trail are discouraged. Where necessary, they should include a railing, for safety. Retaining wall materials vary depending on the level of the trail, with rock, concrete block, or timbers used on higher level trails and on-site materials, such as logs or rocks used on lower level trails. Where seeps occur behind retaining walls, provide method to ensure drainage through and under the wall.

#### b. Steps or Stairs

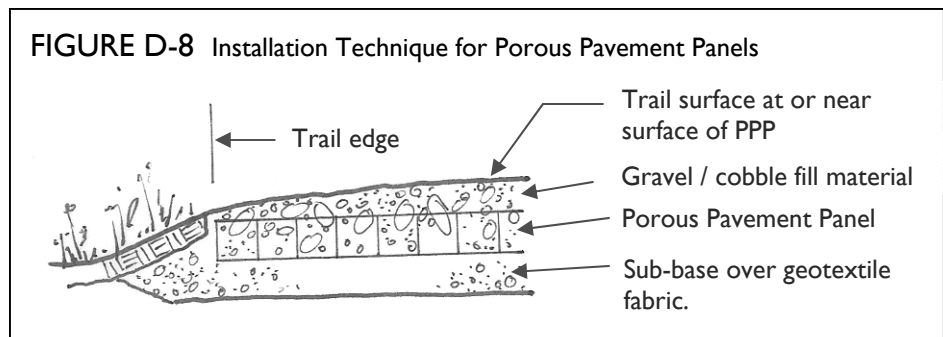
Steps and stairs are obstacles to many trail users, and are to be avoided, where possible. As needed, construct steps on Level 1 trails using on site materials, such as rocks. Only when all other options, including ramps, have been ruled out, are stairs allowed on Level 3, 4 or 5 trails. When stairs are necessary, consider providing long perron style steps, as strollers and wheelchairs can maneuver them easier.

#### c. Ramps

Along required ADA accessible pedestrian routes, sections of trail greater than 5% may be considered ramps, and are allowed for limited lengths (see section 3. GRADE & CROSS SLOPE).

#### d. PPP (Porous Pavement Panels)

These are three dimensional structural grids designed to provide a durable wear surface and load distribution system in wetland and other degradable soils



## D. TRAIL DESIGN CRITERIA

### e. Bridges

Bridges should be designed for pedestrian live loads and for maintenance or emergency vehicles if they may be expected to cross the bridge. Bridge decking should be designed with bicycle safe expansion joints or planks laid perpendicular to the trail direction unless bicycles are not allowed or not expected. Bridge widths should be the same as that of the approach trail plus 2 feet clear area on each side. Bridge decking should be flush with the approaching trail surface.

### f. Railings

Railings are provided for safety on elevated trail segments, such as bridges. All railings should be engineered to withstand all loads that may be expected to occur on the bridge. The type of railing that is required is determined by the accessibility level of the trail, and fall into three basic types:

**i) Urban Setting.** Railings in highly pedestrian urban settings must meet International Building Code (IBC) requirements. Railings must be at least 42 inches high with vertical rails to prevent climbing, and be spaced to not allow a 4-inch sphere to pass through. Railings are required on ADA accessible ramps.

**ii) Rural Bridges.** Handrails on bridges or crossings, that are elevated at 30 inches or more, on accessible trails, such as Level 4 & 5 trails, need to meet AASHTO standards for pedestrian highway bridges. These standards require a 6-inch sphere must not pass through the railing in the bottom 27 inches, and an 8-inch sphere must not pass through the area higher than 27 inches. It also requires that the top railing is at least 42 inches for bicycles use, and 54 inches high for equestrian traffic. Rails should also be horizontal to prevent wheels and other objects from catching. All accessible trail bridges that do not have a rail system must have a minimum 3 inch high curb.

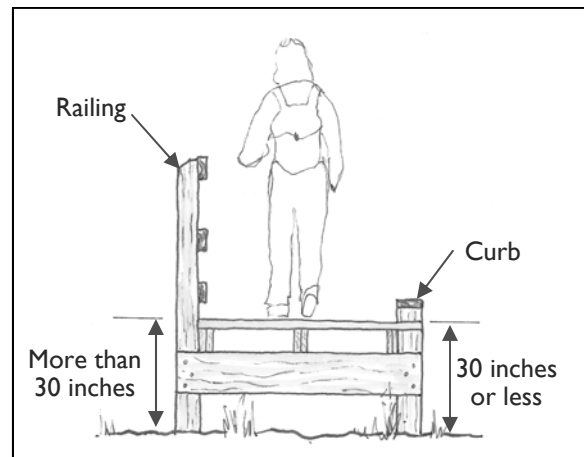
**iii) Remote Bridges.** For bridges in remote areas with a drop of 30 in. or more, railing requirements must meet OSHA standards. For typical crossings along Level 1, 2 & 3 trails, handrails are required to be at least 42 inches high for pedestrian traffic and 54 inches high for bicycle and equestrian traffic. They must include an intermediate rail so that vertical distances between rails do not exceed 15 inches between 2x4 wood rails or 19 inches between steel rails.

**iv) Railing Exceptions.** Not all trail bridges require railings. An analysis should be completed to identify and evaluate the bridge's potential users and the hazards of not having a rail system, including situations where a railing is provided on only one side. As a general rule, a remote trail or bridge with a drop of 8 feet or more, should have a pedestrian railing system.



FIGURE D-9 Bridge, railing and typical warning sign on a Level 5 Trail (Urban setting).

FIGURE D-10



# D. TRAIL DESIGN CRITERIA

## 7. WETLANDS, WATER CROSSINGS & DRAINAGE

### a. General Crossing Criteria for all Trails:

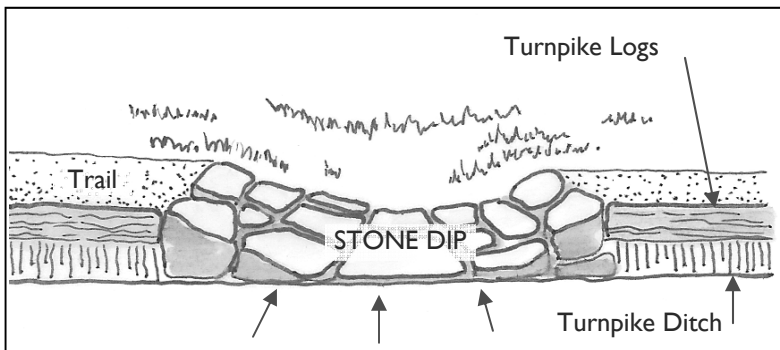
- Route the trail to minimize the number and length of crossings;
- Allow for water to pass freely under the trail, with minimal use of piping, culverts, or other constructed passage;
- Best alignment for crossing rivers, streams, and creeks: At a 90° angle on high ground, at a narrow point along the stream and away from curves or eroding soils;
- Best methods for seeps, saturated soils and wetlands: minimize crossing distance, avoid the need for fill, elevate and construct the structure to allow flow of water and growth of plant materials;
- All crossings shall be as wide as the approaching trail, with 1-2 feet additional clearance on each side, depending on the volume and type of users, and the level of the trail.

### b. Crossing Techniques

Many techniques are available for use in crossing wet areas along trails. Choose the crossing technique that best suits the users, the volume of use, the trail level, and the specific location. For additional guidelines on wetland crossings, see USDA Forest Service manual titled Wetland Trail Design and Construction, 2007. An investigation of soils and water will help avoid surprises when constructing trails in

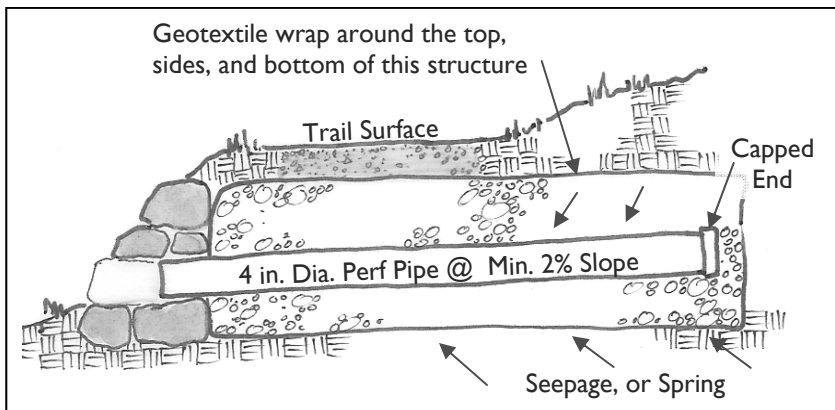
the hillside terrain. Problematic soil conditions may not be visible until a trail has experienced heavy use.

FIGURE D-10



**i) Dips.** Simple and effective ways to drain wet areas. The slope angle and depth vary with soil and water conditions. Stones help reinforce the dip. Geotextile may be installed underneath to prevent fines from washing out.

FIGURE D-11 Underdrain, or French Drain



**ii) French Drains or Underdrains.** For crossings over areas of low flow, on low level trails. Trail is constructed over a bed of round rock and perforated pipe, covered with fabric.

SOURCE OF DRAWINGS:  
Wetland Trail Design and Construction, USDA Forest Service, 2007.

## D. TRAIL DESIGN CRITERIA

iv) **Planks with Piles, Cribbing or Bents.** An elevated trail technique where one or more tread planks are laid parallel to the trail corridor, attached to piles, cribbing, or bents. Choice of support method depends on type of wetland, range of water depth, user volumes, size of trail. Piles are not recommended on low level trails, due to the depth needed to prevent frost heaving.

v) **Puncheons.** A crossing technique for low water areas that utilizes sleepers. Some have linear planks, others also have stringers to support perpendicular decking, which is necessary for bicycle travel.

vi) **Boardwalks.** These are the most substantially constructed form of elevated crossings. They use piles, diagonal bracing, stringers, and planking laid perpendicular to the direction of travel. They often include curbed edges or railings, and can be constructed to suit many user groups, including bicycles and wheelchairs.

vii) **Other Techniques.** Avoid using ditches, culverts or other channelization techniques to divert water, as they may create issues with landslides and super-saturation of soils. Corduroy, turnpikes and causeways are all variations of at-grade wetland crossings, each with their pros and cons. Use of these may be appropriate in some situations, but they are typically not the most environmentally friendly.

### c. Materials

Choose materials that are long-lasting and environmentally safe. More investment is expected on higher level trails.

FIGURE D-12 Log Cribbing with Two Sleepers

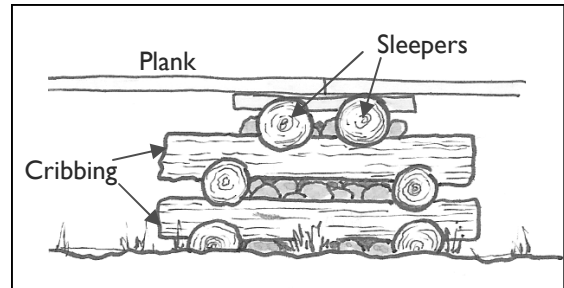


FIGURE D-13 Bog Bridge with Sleepers, or Single Plank Boardwalk

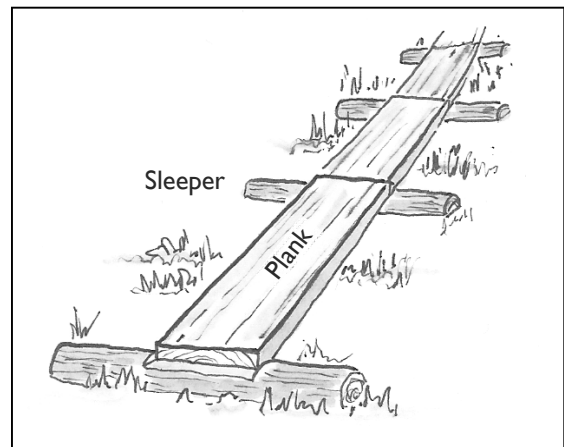


FIGURE D-15 Puncheon

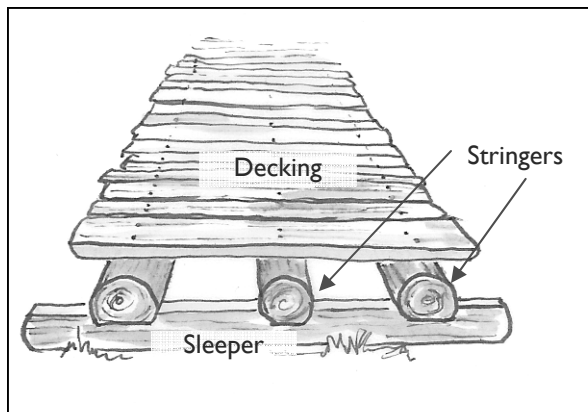
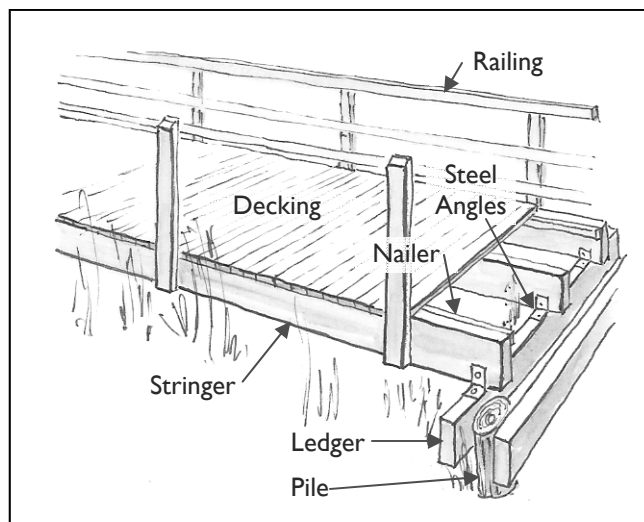


FIGURE D-14 Boardwalk



SOURCE OF DRAWINGS: Wetland Trail Design and Construction, USDA Forest Service, 2007.

# D. TRAIL DESIGN CRITERIA

## 8. TRAFFIC CONTROL, ACCESS & SAFETY

### a. Signage & Striping

Signing and marking are essential to ensure the safety, compatibility and enjoyment of multi-use trails. In general, uniform application of traffic control devices, as described in the MUTCD shall be used and will tend to encourage proper behavior. Additional criteria for signage located in D.2.d Intersections.

**i) Trail Identification Signs.** Locate at access points, trailheads, intersections, and at regular intervals along trail corridors. For consistency, use standard tan on brown recreation identification signs. Identification signage may include trail name, allowed and/or restricted uses, trail rules, accessibility level, directional information, and trail length information, as appropriate. Customized trail identification or character signs may be used in addition to standardized brown recreation signs.



FIGURE D-16 Trail signage.

**ii) Traffic Control Signage.** Provide as needed on trails or roadways, in compliance with MUTCD standards, including shapes and colors, where feasible.

**iii) Directional Signs.** are intended to be simple diagrams informing trail users as to trail direction and alignment, and are especially important in busy, high-use locations.

**iv) Regulatory and Warning Signs.** Use for hazards, cautions or for other traffic control information, in accordance with MUTCD. Place no less than 50 feet in advance of the hazard.

**v) Sign Placement.** Signs are intended to be post mounted 4-5 feet above trail grade to bottom of sign (MUTCD). Recommended distance from the edge of the trail or shoulder ranges from 1-7 feet, depending on the type of sign, volumes of users, mix of user groups, trail width, and potential for speed.

**vi) Striping.** Provide centerline striping on paved trails where bicycle traffic is heavy, on curves, and as needed to assist with trail safety. General guidance on marking is provided in the MUTCD.



FIGURE D-17 Boulder used for access restriction.

### b. Other Safety Criteria

Provide Detectable Warnings, as required by ADAAG, on the surface of curb ramps, and at other areas where pedestrian ways blend with vehicular ways. Provide detectable edges (no less than 3 in.) along the edge of a trail that abuts a hazard, such as a steep drop, or obstacle.

### c. Motorized Vehicle Access and Restriction

Motorized vehicles are prohibited from all trails, except as needed for maintenance or emergencies. In addition to signage, vertical barriers such as bollards, either removable or permanent, posts, vegetation, or boulders may be used to limit vehicular access. Set bollards 48-60 inches apart, and use removable bollards for maintenance access by authorized vehicles.



## D. TRAIL DESIGN CRITERIA

### d. Trail Heads & Parking

Provide adequate parking, signage and staging areas as needed to accommodate various recreational activities on trails. Amenities such as maps, educational information, trash receptacles, seating, and other trail information are all possible features found at trail heads. Place trail heads and parking areas at the most logical locations along the trail, typically at ends.

## 9. AMENITIES

Trails are expected to serve many purposes including transportation, recreation, education and social interaction. Amenities, such as benches, trash receptacles, lighting, interpretive panels, and structures are appropriate and necessary for a trail network that meets these objectives. Generally, the higher level trails require more amenities. All amenities should be located outside the trail's clear zone. All amenities provided on accessible trails must also be accessible.

### a. Benches

Benches are integral to recreation facilities, and can be used to provide seating for resting, socializing, or viewing. They should be provided at crests of hills, at midpoints of long inclines, in conjunction with other trail amenities, near recreation areas such as playgrounds, and at overlooks or viewpoints along a trail. All benches should meet ATBCB Guidelines for Recreation Facilities.

### b. Trash & Recycling Receptacles

Provide bear proof facilities for trash and recycling along higher level trails in locations such as trail heads, rest areas, & interpretive facilities. Locate these facilities for easy maintenance.

### c. Lighting

Lighting provides safety and comfort on trails used for transportation, which is primarily Level 4 and Level 5 trails. Where ambient lighting from nearby areas is not adequate to light the trail, additional pedestrian scale lighting may be advisable on these trails, especially at intersections.

### d. Information

Trail maps, interpretive information is useful and appropriate in many circumstances along trails, such as to provide information on nearby historic, cultural or natural features. Such amenities enhance the user experience and also protect those community assets. Provide a minimum 4 feet clearance between informational amenities, such as interpretive signs and kiosks, and the edge of the trail.

### e. Bicycle Racks

Provide bicycle racks at trail heads, parking areas, and other destinations along the trail corridor. Provide a minimum 4 feet clearance between bicycle racks and the trail.



FIGURE D-18 Trail widens to accommodate interpretive signage.

# ***D. TRAIL DESIGN CRITERIA***

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## **10. SPECIAL USES AND CONSIDERATIONS**

Where a trail will accommodate a variety of uses, design it for the mode of travel requiring the most demanding design, construction, and maintenance specifications.

### **a. Winter Only Trails**

Level 2 - Recreation Corridors may be located through wetlands, with the intent that these routes are not used during summer months, and that the entire trail segment, or loop, is managed and identified as winter use only. These routes require seasonally installed, removable, vertical identification markers to guide trail groomers and trail users.

### **b. Ski Trails**

Ski trails typically refer to one or two-way groomed x-country tracks and/or skate ski lanes. Minimum widths for classical ski trails is 6 feet. Minimum for a groomed skate track is 12 feet. Grooming for skate skiing with a classical track along side requires 16 feet.

When calculating design speed, turning radii, and sight stopping distance for ski trails, the effects of icy conditions must be considered, as well as any increased speed expected for specific events or races. A skier's speed may be as much as 30 mph at the bottom of a long hill. And, their turning and stopping ability are both impaired. Additional widths and clearances, as well as 'run out' zones are recommended to avoid accidents. On one-way ski trails, doubling travel time is not necessary for calculating sight stopping distance, and hills can be managed for one way travel, providing clearances only where needed for one direction of downhill travel.

### **c. Mountain Biking**

Assume that mountain bikes will find their way to every type of trail. If designing a trail specifically for mountain biking, refer to design guidelines developed by the IMBA when designing the trail. Always design for pedestrians to share the trail.

### **d. In-line Skates**

For paved multi-use trails that may attract In-line skaters, a minimum 10 foot width is advisable to accommodate a wide mix of users.

### **e. Beach Access Routes**

The U.S. Access Board provides design criteria for beach access in their draft guidelines for Recreational Facilities and Outdoor Developed Areas, 2007.

## D. TRAIL DESIGN CRITERIA

### f. Equestrian Use

Designing for equestrians involves many special considerations. Horses prefer not to travel on paved surfaces. Horse hooves are very destructive to natural surface trails, especially in wet or soft conditions. Gravel and stone surfaces are the most resilient to horse traffic. Porous pavement panel products can also be very durable and compatible surface hardening materials where equestrians are present.

Compatibility with other user groups can also be an issue. Typically, horses are more comfortable in the presence of pedestrians or motorized vehicles than they are around bicycles. Separation, or at least a wide trail profile, is recommended when both bicycles and equestrians frequent the trail.

Increase horizontal clearance (2-3 feet each side of the trail) for equestrian use. Provide 10-12 feet vertical clearance depending on the character of the trail. Low development setting - 10 foot clearance. Highly developed settings - 12 feet.

For trails that are design for equestrian use, at grade crossings are preferred to bridges, and should be used when practical.

For additional information and design criteria for equestrian facilities, refer to the [Equestrian Design Guidebook for Trails, Trailheads, and Campgrounds](#), produced by the USDA Forest Service, 2007.

**FIGURE D-19** Example of a divided trail for equestrian routes where space is available.

