Resolution No. 16 -92

RESOLUTION ADOPTING THE TRAILS MASTER PLAN FOR PARK CITY, UTAH

WHEREAS, public hearings have been held before the Planning Commission on April 22, 1992 and the City Council on April 30, 1992 at their respective regularly scheduled meetings; and

WHEREAS, the Planning Commission, Community Development Department, and Parks Recreation and Beautification Advisory Board recommend adoption, recognizing the pending importance of establishing design guidelines and construction standards for development;

NOW, THEREFORE, BE IT RESOLVED that:

The attached Trails Master Plan written text is adopted in its entirety. The maps attached to the text are not adopted pending revisions and modifications which are currently under review.

PASSED AND ADOPTED this 30th day of April, 1992.

PARK CITY MUNICIPAL CORPORATION

Mayor Bradley A. Olch

Park City

Trails Master Plan Update

A Non-motorized Transportation, Recreation and Fitness System

April 1992

Trails Supplement

to the

Comprehensive Master Plan

April 1992

Introduction

This section of the Park City Trails Master Plan Update is a supplement to the Park City Comprehensive Master plan. It is intended for the use of decisionmakers and advisory boards, such as, the Mayor; City Council; Parks, Recreation and Beautification Advisory Board; and trail oriented groups. The Trails Master Plan Update is intended to facilitate the development of a recreation and alternative transportation system for all non-motorized forms of transportation. This plan is primarily a document for planning and securing a city-wide trail system. It is not intended to set forth strict standards, but to present sound guidelines for the location, policies, type, and construction of trails.

This document is designed for decisionmakers such as the City Council; Planning Commission; and Parks, Recreation and Beautification Advisory Board to: set policy for staff regarding trail acquisition, development and maintenance; give direction regarding priorities for trail funding; provide ideas and options for trail funding; and set policy guidelines for special events. Policy regarding trail implementation priorities, and direction on special projects such as: community volunteer projects, community information materials, user information materials, and user conflicts management, are also included.

This comprehensive plan supplement is one of a three part update to the trails master plan. Two other documents: Park City Trails Master Plan Polices and Guidelines for Construction, Construction Standards, and Maps, and Park City Trails Maintenance and Operations Guidelines, address specific construction guidelines and standards, trail plans, maintenance and operations standards and responsibilities, approval requirements, and dedication requirements. They are designed to meet the needs of the planning staff, City Engineer, parks and public works departments. The Planning Staff is responsible for interpreting all of the master plan documents. The other documents may be referenced for additional information.

Assumptions

Park City Trail use has changed dramatically in recent years since the original approval of the 1981 Trails Master Plan. As the Park City area urbanizes and as infill is constructed there has been an increased demand for multi-use trails to: provide safe access for children to schools, provide recreational opportunities, and provide alternative transportation. The need for the Trails Master Plan Update has been influenced by many factors, including the

following assumptions: locating trails is more flexible than locating streets; people rely more heavily on pedestrian transportation rather than on vehicular transportation in certain parts of Park City and at certain times of the year; opportunities for public access to trails on private land have not been realized; and the tremendous growth of mountain biking has created a need for a trail system which disperses uses.

There is a desire in the community to better identify and preserve existing trails, and there is support for trail development. The Rails-to-Trails Committee; Parks, Recreation and Beautification Advisory Board Trails Committee; Safe Committee; and Park Meadows Homeowners Association Transportation Committee have all expressed an interest in trail planning. Utility companies servicing the Park City area and the Park City Fire District have also expressed an interest in developing joint utility, fire access, and trail corridors.

Objectives

The objectives of the Park City Trails Master Plan Update are as follows:

1. To develop policies, standards, and an updated trails plan which will provide direction for the community to develop an area-wide trails network.

2. To provide the following benefits and opportunities to the Park City Community:
    a. -Improve the general quality of life in the community.
    b. -Provide a more aesthetic and multiple-use experience than traditional sidewalks.
    c. -Provide non-motorized routes for pedestrians, equestrians, and bicyclists.
    d. -Provide handicap access in portions where access is appropriate and reasonable.
    e. -Anticipate and design an interconnecting trail system.
    f. -Preserve access to existing trails within and outside of the city limits.
    g. -Tie to present and future trails in Summit, Wasatch and Salt Lake Counties.
    h. -Trail use is split between residents, destination visitors, and day visitors from the Salt Lake City metropolitian area. Various user activities include: hiking, walking, bicycling, jogging, rollerblading, horseback riding, etc. The trail system should accommodate these multiple-uses and users.

i. -Plan for the future- The trail system should design a non-motorized commuter system to lessen vehicular traffic in Park City.

j. -Consider municipal bus stops when developing the trails master plan map with the notion of developing improved pedestrian access to these areas.

k. -Consider school bus stops when developing the trails master plan map with the notion of developing improved pedestrian access to these areas.

3. To address existing or anticipated problems:
   a. -Provide information about liability to Landowners regarding the granting of public access onto existing roads and trails.
   b. -Currently there is no city department prepared to provide substantially increased maintenance of new or existing trails within the community. This document will provide options and recommendations for long-term maintenance of trail systems.
   c. -Provide opportunities for public access to historically used trails on private lands.
   d. -Provide recommendations to increase user compatibility between various user groups.

Policy Statements

Following are several general policy statements. Each is further elaborated with goal and objective statements to impement individual policies. These are intended to provide some specific direction to the policy statements. As the community grows and changes and as user preferences change over time the specific recommendations may also change. However, the more general general policy statements and goals should remain the same.

I. A trail system is an asset to the Park City community - Trails are an asset to the Park City community. As the city grows, trails can mitigate other aspects of development. The Park City trail system should be aesthetically pleasing and contribute to the general quality of life in the community.

The Park City trail system should connect public and private recreational amenities. Amenities to consider are: City parks, schools, resorts, Historic Union Pacific Rail Trail, dedicated open space parcels,

Park City Racquet Club, golf courses, and other private recreational facilities.

Where feasible, trails should be separated from motorized transportation corridors as snow removal and general maintenance are less costly, users are generally safer, and recreational experiences are enhanced on paths which are separate from roads.

As various portions of the trail system are developed, uniform materials, surfacing, and signs should be installed. For examples, refer to standard construction details.

The Park City trail system should provide opportunities for trail users to observe historic and ecological features which comprise Park City's alpine environment. Stream corridors, wetland edges, edges along forested areas, and drainage swales are often good areas for trail locations and wildlife interpretation. Trails within historic districts and historic mining areas, such as the Union Pacific Rail Trail should provide interpretation of these features.

As new development occurs, trails should be developed as greenways and located to take advantage of Park City's environmental qualities, including: views, natural vegetation, wildlife, geology and water features. Developed greenways should be aesthetically pleasing and provide a pleasant recreational experience. On steep slopes and highly vegetated areas, trail locations should be based upon trail user, topography and visual compatibility rather than along convenient property boundaries.

The Park City trail system helps to mitigate growth and development, by providing open space corridors, greenways, and supporting the concept of no net loss of amenities.

II. Development of a comprehensive trail network - Park City desires to develop a comprehensive network of trails for public access, connecting various parts of the community, preserving historic trails, and coordinating existing and future trail connections within and outside the corporate limits of the community.

The Park City trail system should provide safe non-motorized access: to schools for children, for recreation and fitness purposes, and along key transportation corridors. Trails should be constructed to accommodate year round pedestrian and bicycle access to schools, throughout the community and especially in areas within the school district which do not have school bus service.

Park City should acquire and develop trail corridors in existing developed areas, according to identified priorities. Park City should work with landowners in order to obtain public access to important existing and

desired trail corridors.

Trail connections and public easements, as shown on the Master Plan Map, should be required when new development is reviewed; however, needs generated by new development may not be anticipated in the Plan. The Master Plan Map should be updated as new development occurs. Trails should be developed according to standards. Public access should be guaranteed through the dedication of public trail easements. In general trails should be required along all through streets within already developed parts of the City. New developments should incorporate trail systems. Wherever practical separated trail easements are preferred.

Trails should be planned and constructed according to anticipated uses. Trails which are serving or expected to serve multiple uses in the future should be constructed to accomodate those uses. For example, trails serving school children should be paved to allow for winter snow removal. The Trail Types part of the Policies and Guidelines for Trail Construction, Construction Standards and Maps section of this master plan provides specific information.

Park City should examine alternatives for the acquisition of trail corridors according to the adopted trails master plan. Trail easement acquisition and development can be accomplished in a variety of ways including: purchase, donation, or condemnation of fee title, easements, leases or other possessory interests. Park City should explore a variety of funding sources and mechanisms for the development of trails. Grants, special districts, transportation funds, joint-funding with other jurisdictions or agencies, exactions, and various taxing mechanisms are a few of the funding mechanisms which are available.

III. Liability - The Park City Trails Master Plan should provide liability information to private landowners regarding the granting of public access to existing roads and trails, use of private property for public recreation purposes, and the intent of the Utah landowner liability act.

The Park City Trails Master Plan is being implemented, in part, by requiring developers and landowners to include trails internal to and connecting through their property as part of the development review process. Developers, ski resort owners, and owners of undeveloped property adjacent to city development have voiced concerns about landowner's liability. No activity is entirely free from exposure to liability, but the dedication, construction and operation of public trails can be at the low end of the landowner liability spectrum.

Utah has adopted the Landowner's Liability Act. The Utah version of this Act states,

"the purpose of this Act is to encourage public and private owners of land to make land and water areas available to the public for recreational purposes by limiting their liability towards persons entering thereon for those purposes." The Act further provides that "the owner of the land owes no duty of care to keep the premises safe for entry or use by any person using the premises for any recreational purpose, or to give any warning of a dangerous condition, use, structure or activity on those premises to those persons."

The Act also provides further protection for landowners, including limitations on representations as to safety of the premises, limitations on the duty of care owed to visitors and limitations on liability for injuries caused by the acts of visitors while on the premises.

The Utah Landowner Liability Act was construed by the Utah Supreme Court in Crawford v. Tilley, 780 P.2d 1248 (1989). The court in Crawford v. Tilley found the landowner not to be protected by the Utah Act because the premises on which the injuries occurred were not open to the public and were, in fact, posted "No Trespassing."

An annotation in American Law Reports suggests that counsel representing a landowner should consider, in advance of any litigation, the nature and number of warning signs that the landowner could place on his property so as to best take advantage of the protection from liability afforded by a recreational use statute. The annotation also suggests that counsel should advise his client to post signs that warn of the danger but do not bar entry, such as one advising entering "At your own risk"(47 A.L.R. 4th 262).

In addition to the Utah Landowner Liability Act, the Summit County Board of Commissioners has passed a resolution regarding the designation of recreational trails.

There are a variety of solutions to the liability concerns raised by private landowners when asked to allow public access on their properties for recreation purposes. The first, of course, is reliance on the applicable landowners' liability statute and posting of appropriate warning signs. Another alternative includes the leasing of trail and recreational use areas to the city or other governmental entity desiring public use. The more traditional method would be to convey or dedicate the trail or recreation use area to the city or other governmental entity in fee, thereby removing any status liability of the former landowner.

This is not to suggest that construction and operation of a public trails system is without liability whatsoever, but such activities probably expose landowners and sponsoring governmental agencies to much lower

levels of liability for damage claims than most other activities. In fact, attempts by landowners to prevent public recreational access to their properties may actually remove the protection offered by the Act.

The Park City Trail System should be located in new developments, in existing developed areas, and in undeveloped areas; landowner liability concerns should be addressed in each of these cases. To help address these concerns, an educational Pamphlet describing different trail dedication possibilities and landowner responsibilities should be developed. In cases where public easements are dedicated or lease agreements are negotiated for public use with private landowners, the city should assume general liability responsibility in the same manner as for streets and other public areas.

In meetings with landowners and mountain bike users a number of positive and negative issues were raised regarding mountain bike use on private property as well as possible solutions. Landowner concerns include: the high cost of liability insurance coverage; property damage due to erosion, litter, vandalism and trail cutting; lack of local knowledge by out of town visitors; the risk versus the return by loss of access to visitors; a lack of respect for private landowner rights by trail users; a lack of good trail information; and excessive parking on or near private property. Some of the positive aspects which trails can offer include: using trails to direct traffic away from undesirable areas; increased trail use can often make a trail safer; informed trail users can often help reduce vandalism; mountain biking in the Park City area has the potential to become very popular, add to the local economy and mountain bikers are a potential resource to construct trails. Some of the suggestions which were offered to address landowner concerns include: passing legislation to limit liability; share liability costs amoung those who benefit; require mountain bikes to be licensed; designate a percentage of the money used to promote Park City in the summer for developing solutions to trail user concerns; use City resources to resolve the liability issue; encourage user courtesy and respect of private property rights by posting signs a trailheads and access points; develop and promote trails at various skill levels; promote user self-regulation; and explore a variety of public/private relationships.

IV. Development of a safe multiple-use trail system - <u>The design, development and implementation of the Park City Trails Master Plan should consider safe multiple-use throughout the trail system.</u>

Trail construction standards should include such things as: width, surface materials, slopes, appropriate sight distances, signage, and trail curvature, to provide a safe multiple-use trail system.Trail use types are

identified on the Trails Master Plan Map. Different standards for various trail use types are delineated. See Trails Matrix for further guidelines.

Trails may have signs at trailheads and significant access points specifying allowed uses and user etiquette. Generally trails should be open to hikers, joggers, pedestrians and bicycles. Trails allowing equestrian access should be specifically designated. Some trails should be designated as pedestrian trails only, excluding mountain bike and equestrian access. Additional trails should be designated for cross country skiing and horse drawn sleighs or carriages as appropriate. Trails accommodating school children should be constructed for year round access. Rollerblades and skateboards should be allowed only on designated trails. Trails should allow access for the physically impaired where appropriate and reasonable. Trails should not permit motorized vehicles except for emergency or maintenance purposes. Pet owners should manage pets in accordance with municipal and county laws.

V. Trail user courtesy - Trail user courtesy shall be promoted and encouraged throughout the Park City trail system.

Park City should encourage peer enforcement of trail rules and user courtesy on the trail system. Rules to consider that would promote user courtesy include:

1) All users should yield to horses.
2) Bicyclists should dismount when encountering horses on steep slopes.
3) Bicyclists should reduce speeds in areas of limited visibility and high volume multiple-use areas.
4) Bicyclists should alert other trail users with a bell,or some other audible signal when approaching from behind, or in locations with limited visibility.
5) All users should respect private property by staying on designated trails.
6) All users should avoid damaging activity patterns such as any activity that would accelerate erosion along a trail corridor, etc.

Community service in the form of trail maintenance could be implemented for trail rules violators.

The City should work with various organizations and participate in the development of educational materials as funding is available which promotes trail user safety and courtesy. Schools, bike shops and rental facilities and various user groups and organizations could work together to develop educational materials such as maps, brochures, tours, and handlebar fliers. Signs should be installed at trailheads and significant

access points indicating; yield heirarchy, trail etiquette, and proper trail uses in an educational manner, (example: Please refrain from cross-cutting switchbacks, because it causes soils erosion).

VI. Environmental sensitivity - The trail system should be designed and constructed in an environmentally sensitive manner.

In visually or environmentally sensitive areas, special location and/or construction methods should be used which protect the site from environmental or visual impact. Examples of visually or environmentally sensitive sites might include: wetlands, highly visible hillsides, areas with significant vegetation, highly erodable soils, unstable and/or steep slopes and ridgelines. Techniques such as: limits of disturbance, site specific trail routing, erosion control measures, site specific adjustment of construction standards and design guidelines, site specific construction practices should be implemented to minimize environmental, visual or construction impacts. See the Construction Standards section of this document for specific environmental requirements.

Environmental hazards should also be considered when locating a trail. Examples of environmental hazards might include: mining hazards, mine tailings, lightning prone areas, avalanche corridors, raptor nesting sites, or other hazards. See the Construction Standards section of this document for further details.

VII. Trail standards and Park City character - Park City should develop a trail system which is functional and conforms to national standards, where applicable, while preserving the unique character of the Park City community.

National standards are important when considering trail user safety, and the potential liability to the city. Due to the mountainous terrain and dynamic nature of outdoor recreation, national standards are not always practical for our community or available by any nationally recognized organization. Where practical and available, national standards should be followed.

Park City's unique mountain resort character is a valued quality. Trails should reflect that character in siting and materials.Wherever possible, materials indigenous to the site should be used during construction. Where the use of indigenous materials is not possible, use of historic materials should be considered.

VIII. Trail-user and Community Needs - Park City intends to develop a trail network providing for the needs of residents, destination

visitors, and day-use visitors.

Trail guides and/or maps provide greater access to trails for visitors to the area as well as enriching recreational and educational experiences for all trail users. Park City encourages the development of trail guides and maps for trail users. Maps and guides might include:

1) Locations of trails, trailheads and a description of trail steepness.
2) Location of public and private facilities such as: drinking water, restrooms, restaurants, parking, lodging, rental facilities and sports shops.
3) Public transportation routes.
4) Interpretive information.

The trail network should connect neighborhoods with important resident and visitor destinations. Important destinations in the community which should be considered include: Main Street, resorts, shopping, bus stops, schools, equipment rental facilities, the library, convention facilities and city parks.

As new trails are developed, reasonable measures shall be taken to assure adjacent landowner privacy. Fencing, landscaping and physical separation are several suggested ways to preserve adjacent landowner privacy.

As new trails are constructed and where funding allows, directional, safety, informational, and orientation signing should be installed along the major corridors of the trail system. Specific location of signs needs to be evaluated on a case by case basis. Placement guidelines are listed in the Construction Standards section of this document. The guidelines are intended to provide examples, general direction for signs, and placement. Final signing may not be possible until trails are constructed.

IX. Long-Term Maintenance Policies and Standards - The long-term maintenance of trails is integral to the ultimate success of the trail system.

At the time of this writing the city had no clear-cut policy as to the maintenance of trails throughout the community. In general, the adjacent landowner or homeowner's association is responsible for maintenance of trails adjoining or passing through their property. In special cases the City Council has assumed maintenance responsibilities for specific sections of trails. A variety of optional maintenance programs are set forth in the Maintenance and Operation Guidelines section of this document to provide decision-makers with relative costs for various levels of city maintenance.

City maintenance levels are dependent on funding. It is expected that

in the future the city may assume maintenance responsibility for specific trails. It is recommended that when street improvements are made, sidewalks and trails be installed at the same time in order to reduce costs and inconvenience. It is also recommended that higher volume multiple-use corridors be given priority over lower volume single-use trails, unless specific conditions warrant otherwise. Below several maintenance guidelines are described.

X. Special events - Special events on parts of the trail system need to be accommodated and planned for, where possible, during the initial design phase.

The Park City Trails Master Plan map should identify where special events are likely to occur. Locations of special events may include: historical locations, resort centers, new facilities, the rail-trail and where adequate facilities are available. In order to accommodate Park City's changing needs in the future, new special event locations should be evaluated and meet the following requirements:

1) Landowners adjacent to proposed special events locations should be notified

2) The planning department should review special event location compatibility and make recommendations to the City Council regarding approval. Prior to approval, the City Council may request review and comment from advisory boards or commissions.

A Special Events Policy and permitting requirements for trail events should be developed as part Park City's Master Festival Licensing ordinance. It is recommended that any event which is publically advertised and promoted for open public participation, or for private events for 50 or more, including spectators, should be required to obtain a permit from the City. The Master Festival Licensing permitting procedure should consider the following: the number of restrooms necessary to accommodate special events, insurance, trash clean-up, traffic control, security and parking.

Policies and Guidelines for Trail Construction, Construction Standards and Maps

Introduction

This section of the Trails Master Plan Update has been written to assist the Park City Planning Department and the City Engineer throughout the trails planning, dedication and construction process. It is anticipated that the Planning Department will use these documents to: interpret trails policies for developers, determine specific mapping and tracking of trail locations, coordinate with the Engineering department concerning trail construction and dedication for trail requirements, provide recommendations to the Planning Commission and City Council regarding trail improvements and dedications. It is expected that the City Engineer will use this document to: coordinate with various utilities for joint use of trail corridors, manage and apply construction standards, inspect trails which are constructed as development requirements, review and approve trail easements and dedications. This document provides detailed specification information where operations are specific to trails. Refer to the current editions of the Park City Design Standards, Construction Specifications and Standard Drawings and the Uniform Building Code for operations which are general to operations other than trail construction.

Two other sections: The Comprehensive Master Plan Supplement for Trails and Park City Trails Maintenance and Operations Guidelines, address the needs of the City Council, trails oriented community groups, the City Parks and Public Works Departments. These other documents may be referenced for additional information.

The Planning Staff is to be responsible for interpreting this section of the documents.

General Standards and Guidelines

As various portions of the trail system are developed, uniform materials, surfacing, and uniform signs should be installed.

1. Trail siting
   a. Trails should be located and constructed in such a manner to reduce or minimize maintenance.
   b. Trails should follow the contours where possible and respect natural landforms.
   c. Drainage features such as waterbars should be constructed where appropriate to reduce erosion.
   d. Trails should have a minimum 2% cross slope to allow drainage.
   e. Trail slopes should match expected user volumes and types. The Trails Matrix provides specific guidelines for different trail types.
2. Trail separation - Where feasible, trails should be separated from motorized transportation corridors. Snow removal and general maintenance are less costly when trails are separated from roads and parking lots. Users are generally safer on separated paths. Recreational experiences are enhanced on paths separate from roads. The amount of separation depends upon highway speeds and the size of parking areas.
   a. Minimum separation between trails and low speed streets or small parking lots is 10'.
   b. Minimum separation between trails and high speed streets or large parking lots may need to be as much as 50'.
   c. Along existing developed road easements and street rights-of-way separated trails may not be feasible. As much separation as possible is recommended.
3. Trails along existing developed streets
   a. Sidewalks should be required on through streets.
   b. Sidewalks in Cul-de-Sacs may not be necessary unless they provide necessary pedestrian connections.
4. Security for trail improvements - Where trails are required as part of a development project, a security shall be posted for the full cost of the trail improvements is required prior to the issuance of any occupancy permits or recordation of plats.
5. Trail easements - All trails which are open to the general public should be located on publicly dedicated property. There are a variety of mechanisms for this to occur. Within the public street rights of way and dedicated easements are the most common and acceptable forms of access rights. In special circumstances some other form may want to be considered. For example, a temporary easement across property which is not yet developed may be appropriate if the final location is likely to change in the future. The

Trails Matrix provides recommended easement widths for the various trail types.

6. Phasing of trail improvements - When trails are part of a phased project the phasing of various trail segments shall follow a logical sequence for trail users. For example, trail construction may be required through an entire project to provide completed trail connections at an early phase in the project. At a minimum, trails shall be completed within each phase of a project at the time of the development of that phase so that trails are not constructed after a phase is completed. If the ultimate trail type is not required at initial approval, at a minimum the ultimate easement width and some trail physical improvements should be required.
7. Temporary trail easements and/or improvements - In specific cases temporary trail easements and installations may be required. An example of such a need, might be on a large phased project where an trail exists but is slated to be relocated and dedicated in a future phase. In this case, a temporary trail easement is needed to access the existing trail until the future phase is constructed. Another example requiring a temporary trail easement would involve a landowner who has property they wish to develop in the future, have no specific development plans and are willing to allow trail access on an interim basis until such time as they decide to develop their property. A temporary easement could be granted to the City for trail purposes.

Environmental sensitivity

In visually or environmentally sensitive areas, special location and/or construction methods should be used which protect the site from environmental or visual impact. Examples of visually or environmentally sensitive sites might include: wetlands, highly visible hillsides, areas with significant vegetation, highly erodible soils, unstable and/or steep slopes and ridgelines. Techniques such as: limits of disturbance, site specific trail routing, erosion control measures, site specific adjustment of construction standards and design guidelines and site specific construction practices should be implemented to minimize environmental, visual or construction impacts.

Environmental hazards should also be considered when locating a trail. Examples of environmental hazards might include: mining hazards, mine tailings, lightning prone areas, avalanche corridors, raptor nesting sites, or other hazards. Various specific construction details and techniques are provided under specific construction standards.

1. Guidelines for environmentally sensitive sites.
   a. Limits of disturbance should be implemented to minimize

construction impacts. Construction limits should be as small as practical to construct the trail. Significant vegetation and it's root zone should be considered when locating the trail and establishing construction limits.

b. Erosion control methods should be employed to protect areas adjacent to the trail from impacts during and after construction. Siltation fences, straw bales, detention basins, revegetation protection such as excelsior matting and slope protection methods are all examples of erosion control which may be required on specific sites.

c. Indigenous materials should be used when constructing trail surfaces, retaining walls, bridges, and barriers wherever possible.

d. Native and/or self-sustaining plant materials should be used for revegetation of all disturbed areas where trails pass through native or non-irrigated sites. If plants are not self-sustaining, a permanent irrigation system shall be installed at the time of trail construction. Revegetation of natural areas should match the vegetation patterns of the tract surrounding the area to be revegetated.

e. Special location or construction methods may be necessary to reduce impacts and/or minimize disturbance. Rerouting a trail to avoid a hazard, narrowing the trail section through a limited area to preserve significant vegetation or exceeding recommended minimums or maximums in selected areas to reduce cut or fill slopes are examples of special locations of trails to reduce impacts. Examples of construction methods which could reduce impacts might include installing retaining walls to reduce cut and fill slopes on a visually prominent hillside, hand construction of the trail, stabilizing a mine hazard which is located within or adjacent to a trail corridor or installing a tree well around a significant tree to be preserved. The above examples are just that. Specific trail proposals through environmentally and visually sites shall be considered on a case by case basis.

f. Where significant wildlife or other natural features exist, special trail routing, construction and trail use should be considered.

g. Existing significant vegetation should be preserved wherever possible. Trees, riparian vegetation, scrub oak and rare plants are considered significant. Root zones as well as above ground vegetation require protection when preserving plants. In general, the area within the drip line of trees, especially on the down slope side of the vegetation, is sensitive to disturbance. If root zones are impacted or grades changed significantly, temporary irrigation may be necessary.

h. Trails which cross or are located adjacent to wetlands should be designed for minimal impact. Wooden boardwalks or other

techniques may be necessary to impose minimal construction impacts. Wildlife needs should also be considered when siting trails near wetlands.

i. Visually sensitive areas may require reduced cut and fill slopes, hand-construction, and low retaining walls to minimize site disturbance and visual intrusion.

j. Revegetation to provide screening, construction techniques to preserve vegetation, and trail routing techniques should be used to minimize visual intrusion.

k. In steeply sloped and highly vegetated areas, trails should be located for trail user compatibility rather than along convenient property boundaries.

2. Guidelines for environmental hazards.

a. Where environmental hazards are present, special trail construction techniques or locations should be used to mitigate the hazard.

b. Mine tailings should be stabilized, topsoiled and revegetated.

c. Trails should be located away from lightning prone areas, avalanche areas and raptor nesting sites, or should be closed seasonally when hazardous conditions are a problem.

3. Guidelines for microclimatic trail use opportunities

Locate the trails for both summer and winter activities, where possible, given the terrain and climatic considerations. Identify snow retention areas for possible cross-country ski trails. In open areas, place trail alignment to take advantage of opportunities for shade and wind protection.

Utilities

The routing of utilities within trail corridors is generally encouraged. Locations which are visually or environmentally sensitive may restrict or preclude sharing utilities with trails. The following guidelines for placement, disturbance and access should be followed. See the Operations and Maintenance Guidelines for recommendations on maintenance and access agreements for utilities.

1. Placement

Utility lines that run parallel to the trail should be placed under the trail bed where possible to minimize site disturbance. Utility lines that are perpendicular to the trail and lateral lines should be located to minimize site disturbance and removal of significant vegetation. Physical obstructions such as utility pedestals, transformers and the like should be located so they are not a hazard to trail users. Access points which are not a physical obstruction, such as manhole covers should be located flush with the trail surface and where they do not pose a hazard to trail users.

2. Site disturbance
   Construction of utility lines within naturally vegetated areas should minimize site disturbance wherever possible. All disturbance should be revegetated as per the revegetation requirements for trail construction. When disturbance is required after the trail is constructed and operating, trail cut permits are required from the City Engineer. Bonding for this work may be required at the discretion of the City Engineer.
3. Access
   Access for utility maintenance vehicles shall be evaluated on a case by case basis and provided for as part of the trail construction. Visually or environmentally sensitive sites may preclude full access to trail/utility corridors.

Access for the Disabled

At the time of this writing, the Americans with Disabilities Act of 1992 (ADA) had just been passed. Specific rules for the Act in general were not yet written and little information for required compliance for trails was available from national organizations. While it is clearly not practical for all types of trails in a mountain resort community to be fully accessible to the disabled, the City will make every effort to comply with the standards set forth in this law where reasonably appropriate. Until such time as more definitive standards are set forth, this section of the master plan will provide a policy as to what trails are required to comply with this law and how the City will approach city improved trails. Actual compliance with ADA requirements will be determined by the Building Department.

1. Trails Required to Comply with ADA. - All new trails which provide access between new parking lots and new public facilities such as recreation or institutional facilities, club houses, resort facilities, commercial or business facilities, etc. All new trails providing access to new public, private and institutional transportation facilities. Trail renovation or new trails which are located in existing developed areas of the community which meet the above access criteria shall comply with the ADA standards where reasonable and practical.
2. Trails Not Required to Comply with ADA - All soft surface trails.

1. TRAIL MATRIX

TRAILS MATRIX *						
Trail Types **	**Widths**	**Surfaces**	**Slopes *****	**Min. radius******	**Sight Distances******	**Easement Width**
1. Multi-use high volume	10' adjacent plus	Asphalt	<12%	Turning-8'	75-100'min	20' minimum
paved	4' soft surface	Wood Chips		Travel-15'		
				Horses-12'		
2. Multi-use paved	8' paved plus 2' soft surfac	Asphalt	<15%	Turning-8'	75'min	15' minimum
	8' paved,			Travel-20'		
	8' lane plus 4' sidewalk					
3. High volume multi-use	8'	Crushed Rock	<15%	Turning - 8'	75-100'min	10' minimum
crushed rock				Travel-15'-20'		
				Horses-10-12'		
4. Multi-use unpaved	4'	Compacted	<30%	Turning-8'	75-100'min.	10' minimum
		Crushed rock		Travel-15'		
				Horses-12'		
5. Bicycle lanes within street	5'	Asphalt	In street	8'-15'*	100'min	
asphalt on either side of						
street						
6. Pedestrian only paved at	4'	Concrete	<15%	3'	30'min	10' recommended
back of curb						
7. Pedestrian only paved and	6'	Concrete	<15%	3'	30'min	10' minimum
separated from street						
8. Pedestrian only unpaved	2'	Wood Chips	<20%	3'	30'min	6' minimum
9. Multi-use backcountry	2'	Dirt	<30%	8'	50'min	6' minimum
Single track						
					Guidelines for	
* Ranges shown depend upon grade					determining sight	
**Cross slopes 2% minimum where possible					distances	
***Trails in excess of slopes indicated should have stairways					10 mph 35'-60'	
**** Turning= turns at intersections, Travel= curves while travelling at 10 mph.					15 mph 85'-130'	
Note: For further information see specific Construction Standards and Details					20 mph 130'-200'	

2. TRAIL SURFACING

Trail Surfacing Guidelines

Weed or root barriers may be necessary where invasive vegetation is located adjacent to the trail or where one side of the trail is irrigated and the other side is not and where woody vegetation may seek water on the irrigated side of the trail. See the section on Weed Barriers for more specific information.

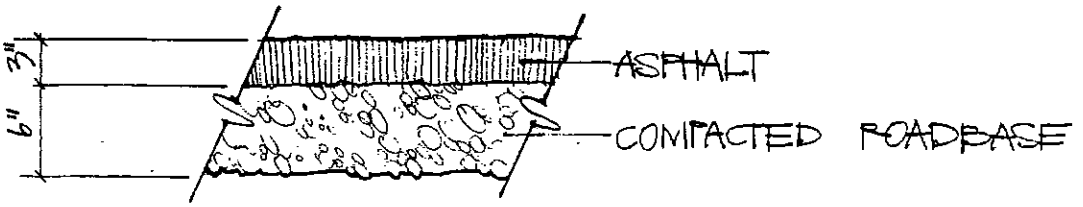
Asphalt, concrete and base specifications shall meet those set forth in the current edition of The Park City Design Standards, Construction Specifications and Standard Drawings.

The 6" crushed rock trail surface may be substituted with a compacted 2" dolomitic limestone material meeting the following specification.

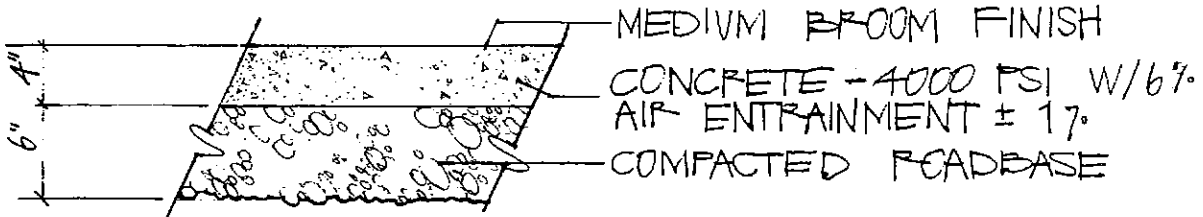
Passing 1/2" screen - 100%
Passing 3/8" screen - 97-99%
Passing #4 screen - 75-80%
Passing #8 screen - 50-55%
Passing #16 screen - 30-35%
Passing #30 screen - 20-25%
Passing #50 screen -17-20%
Passing #100 screen - 13-17%
Passing #200 screen - 12-15%
Maximum water absorption - less than 3%

A compacted roadbase subgrade may be necessary under the wood chip surface in areas with a high water table or poorly draining subgrade material.

If a wood or other edging material is used along any of the trail surfaces, care shall be taken to assure trail surface drainage. An edging is not recommended along soft surface trails. As the soft surface changes over time, the hard edge impedes drainage.



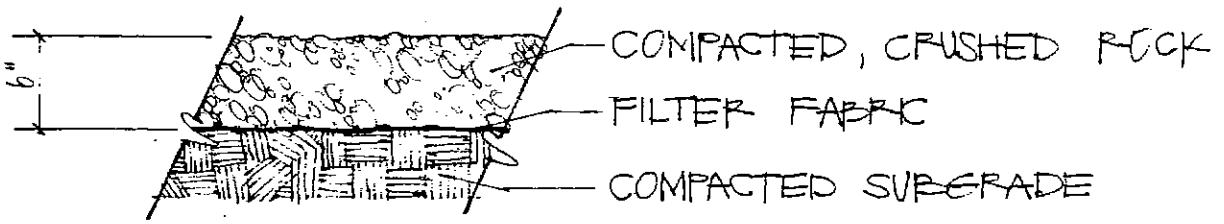
1. ASPHALT BIKE PATH DETAIL



SCORE JOINTS TO MATCH EXISTING CONCRETE

2. CONCRETE SIDEWALK DETAIL

3. WOOD CHIP SURFACE



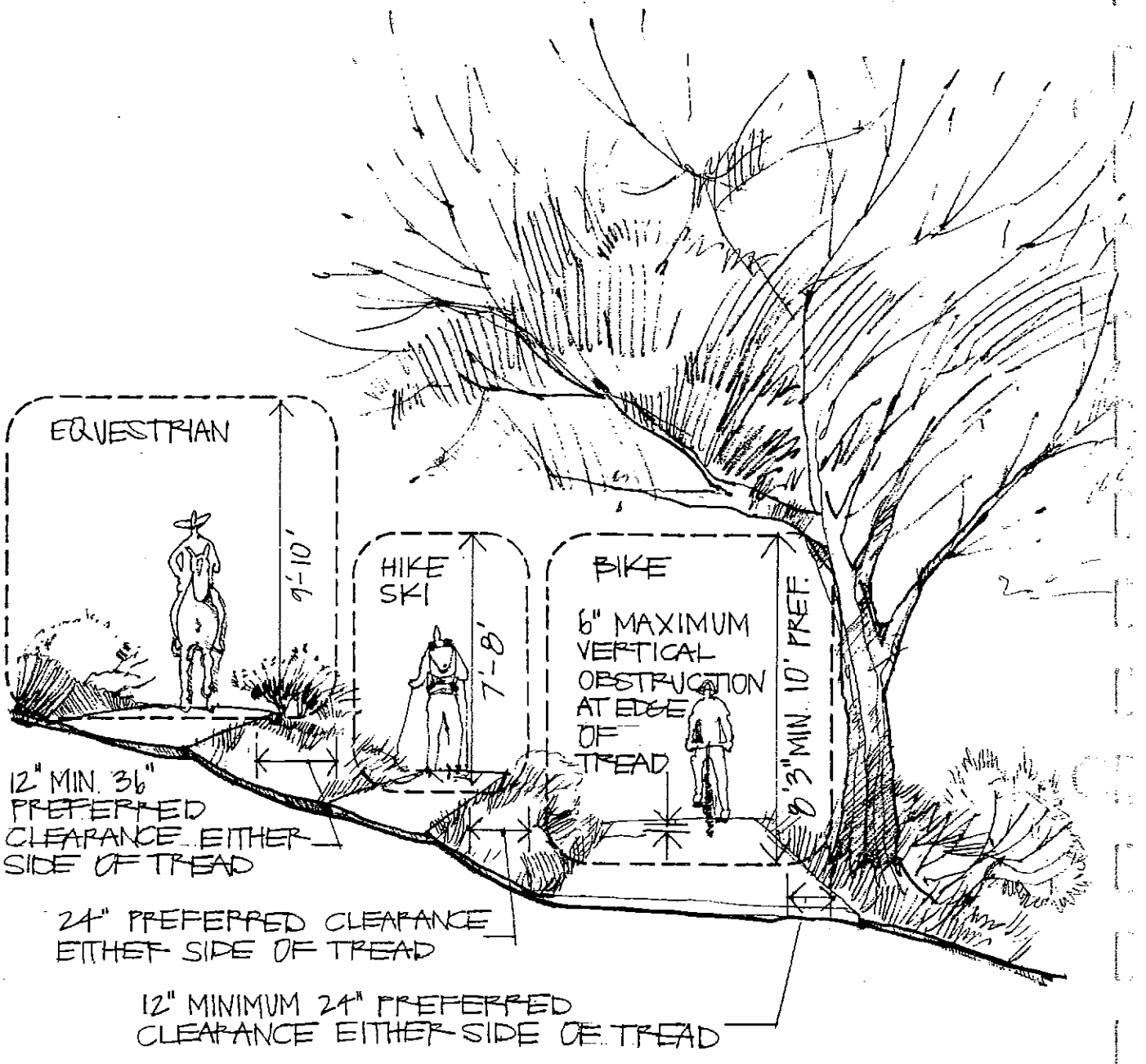
4. CRUSHED ROCK TRAIL SURFACE

NOTE: THE CRUSHED ROCK SURFICING MAY BE SUBSTITUTED WITH 2" OF COMPACTED DOLOMITIC LIMESTONE AS PER THE SPECIFICATION.

3. CLEARANCE GUIDELINES

Horizontal Clearance Guidelines

Trails which are used for cross country skiing and are steeper than 8% should have an increased minimum horizontal clearance of 8'. This increased width does not need to be cleared of all vegetation but should allow for skiers to snowplow when the trail is snow covered. Steep cross country skiing trails may need to provide gently sloped clearings for skiers to slow down.



TRAIL PRISMS

4. TRAIL TYPES

Trail Types Guidelines

Anticipated Uses and Locations of Multiple Use Paths

Uses include all types of non-motorized use including: bicycles (road and mountain), pedestrians (walking, jogging, hiking), baby strollers, skate boards, rollerblades, and horses (if soft surface is provided). Locations generally connect major areas, destinations and recreation facilities.

General Guidelines for Paved Paths with Bicycle Use

The following standards are recommended in accordance with the American Association of State Highway and Transportation Officials Standards for Bicycle Facilities Manual for separated bicycle facilities.

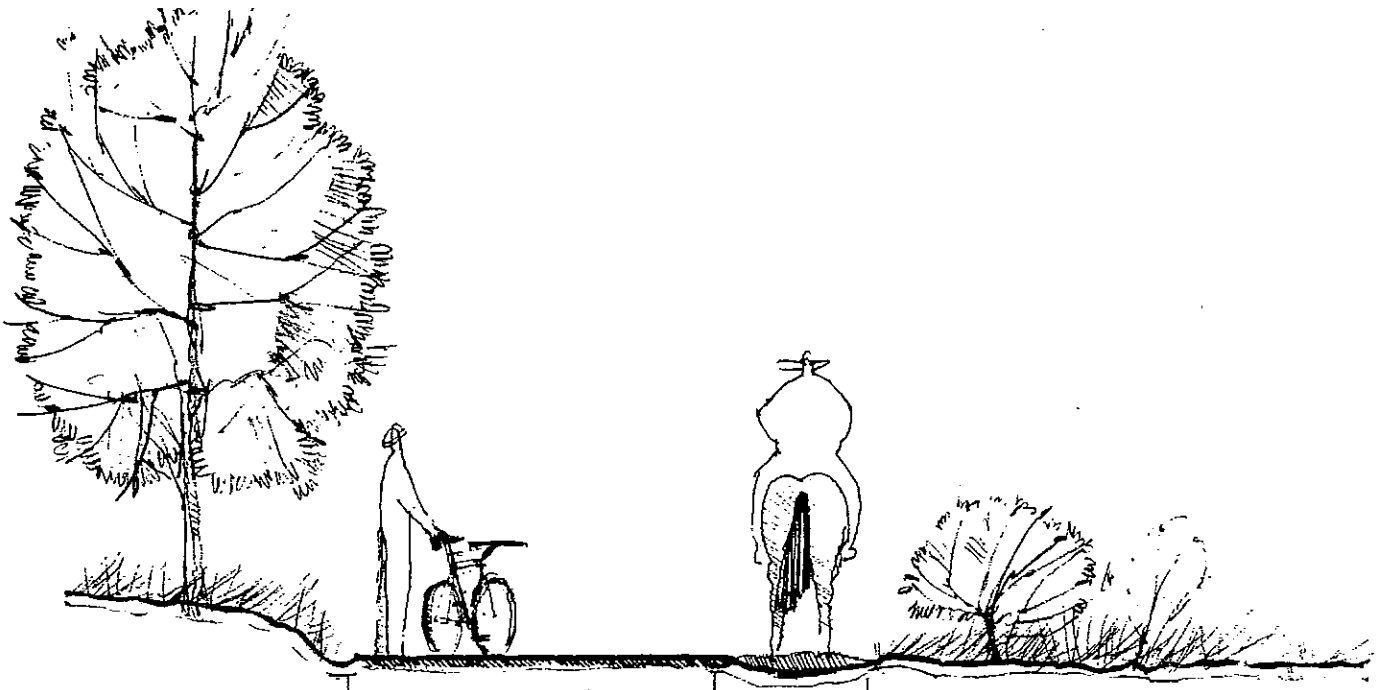
1. Minimum trail width of 8' on asphalt surfaces. Note: This standard does not include multiple-use where a 10' asphalt surface, plus 4' of soft surface is recommended for high volume multiple-use trails.
2. A 2' minimum horizontal clearance on either side of trail is recommended.
3. 10' vertical clearance from the trail surface is recommended.
4. Bicycle path intersections and approaches should be on relatively flat grades. Sight and stopping distances at intersections should be adequate for the expected speed of trail users.
5. A 4" wide yellow non-skid center stripe should be painted on high volume asphalt trails to separate direction of travel or uses.

1. High Volume Multi-use Paved Trails with Adjacent Soft Surface

1. Where parallel and adjacent hard and soft surfaces are installed, the finish grade of the soft surface should be slightly below the hard surface so the hard surfacing helps to contain any loose soft surfacing material.
2. Surface drainage should be prohibited from washing fines onto hard surfaced trails and creating a potential hazard to trail users.
3. Multi-use trails should be separated from streets or parking facilities wherever possible. The General Standards and Guidelines section of this document provides specific guidelines for separation.

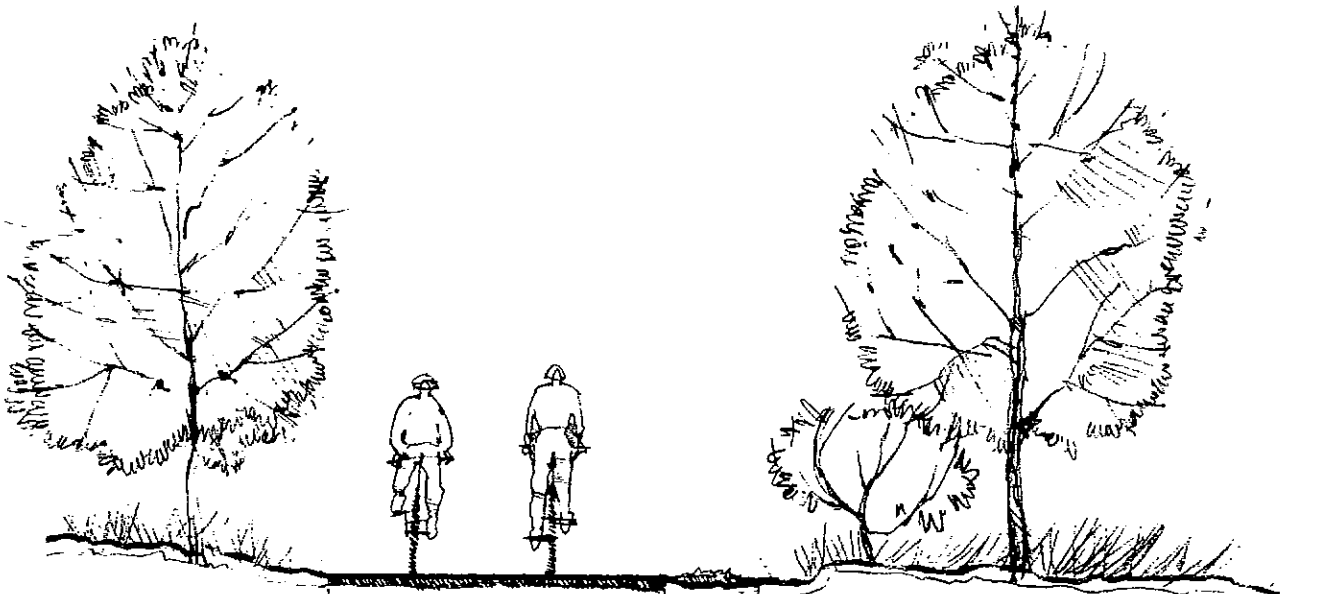
2. Multi-use Paved

1. It is generally recommended that this trail type provide 8' of asphalt plus 2' of wood chips along one side.
2. The wood chip surface can be eliminated where sites are environmentally sensitive or special circumstances exist which prohibit full development.
3. A third option of an 8' striped lane on one side of the street plus a 6' concrete sidewalk on the other side of the street should only be considered along existing streets where physical obstructions prohibit the above options.



1. MULTI-USE HIGH VOLUME PAVED WITH ADJACENT SOFT SURFACE.

NOTE: ALLOWS FOR WINTER SNOW REMOVAL.



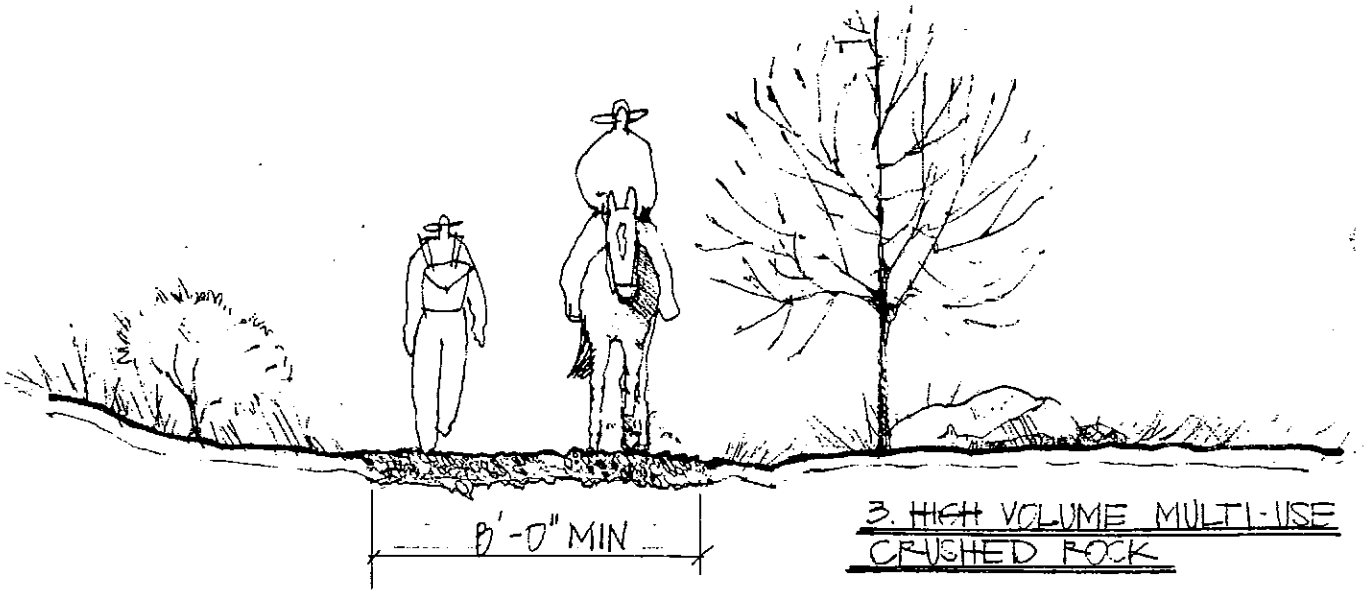
2 MULTI-USE PAVED

NOTE: ALLOWS FOR WINTER SNOW REMOVAL.

3. Soft-surfaced Trails

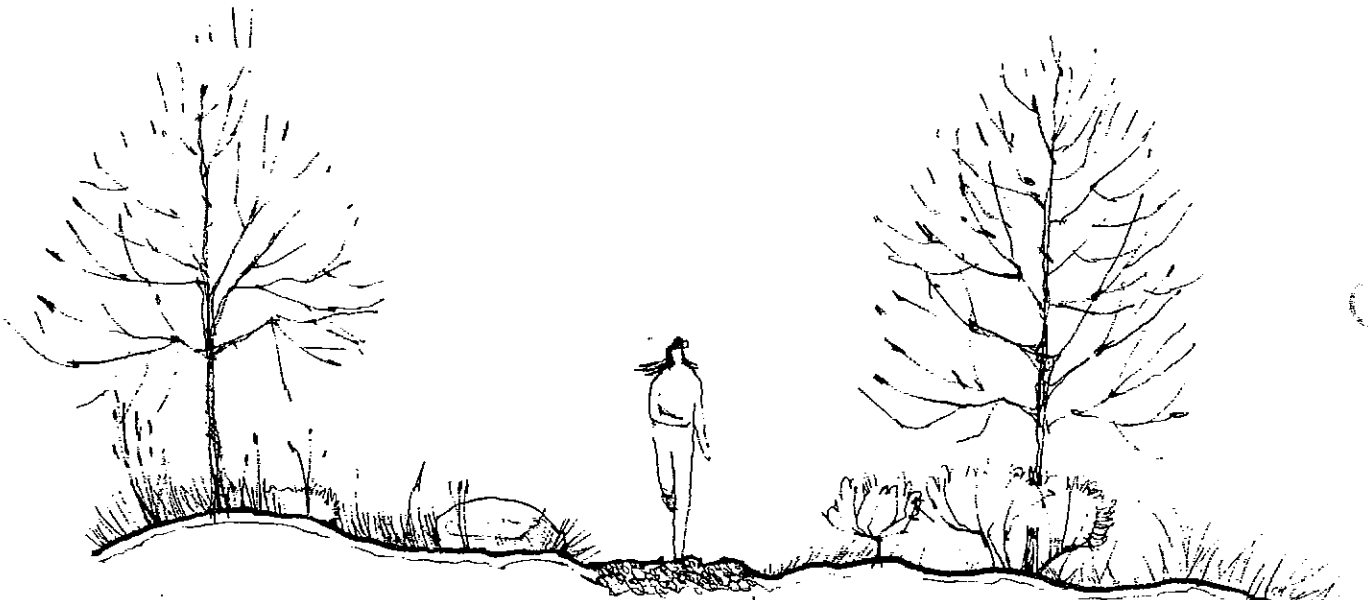
1. Anticipated uses along soft-surface trails include mountain bikes, pedestrians and horses (where specifically designated). Width varies with anticipated intensity of use.

Surface drainage across soft surfaced trails should be designed to minimize erosion of the trail surface and edges.



3. ~~HIGH~~ VOLUME MULTI-USE CRUSHED ROCK

NOTE: DOES NOT ALLOW FOR SNOW REMOVAL ALLOWS FOR X-COUNTRY SKI ACCESS.

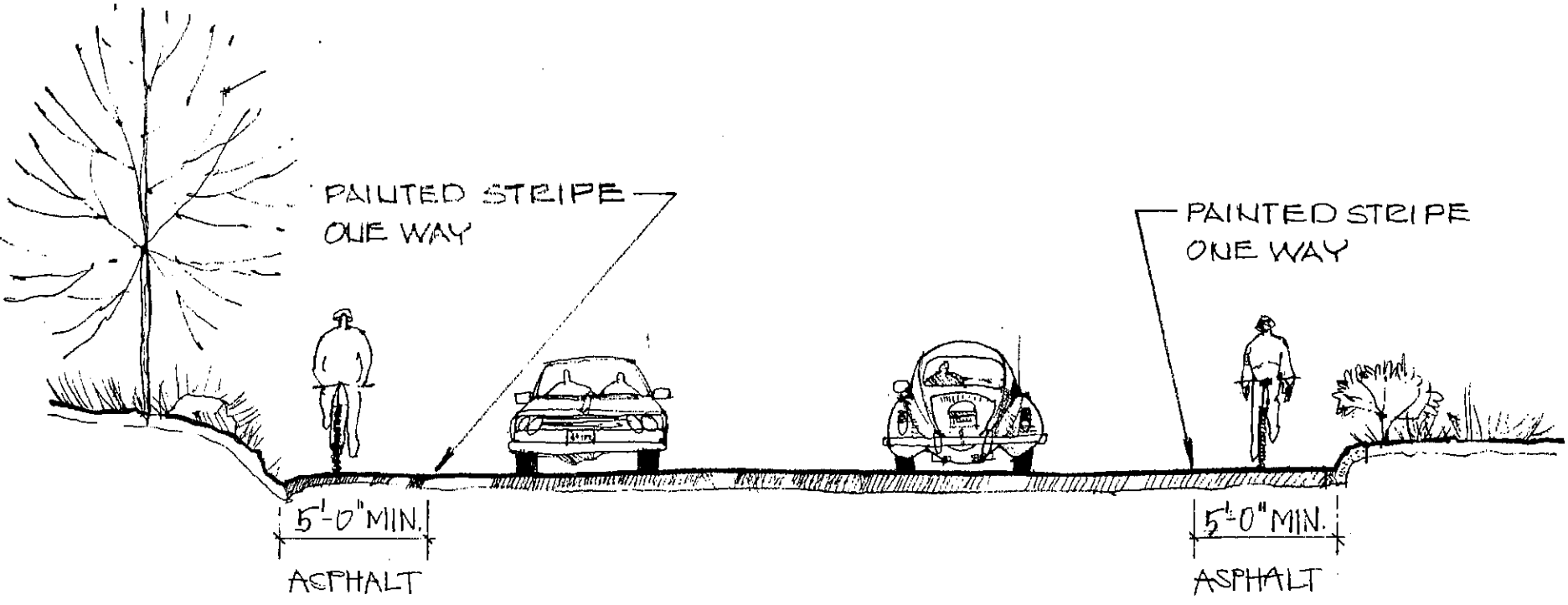


4. MULTI-USE UNPAVED CRUSHED ROCK.

NOTE: DOES NOT ALLOW FOR WINTER SNOW REMOVAL ALLOWS FOR X-COUNTRY SKI ACCESS IN AREAS WITH GENTLE TERRAIN UNLESS ADDED CLEARANCE IS MADE.

5. Bicycle Lanes

1. Uses - Painted bike lanes located within the street are intended for use by bicyclists only. They should not be used for other uses unless other elements prohibit the development of other facilities elsewhere.
2. The following standards are recommended in accordance with the American Association of State Highway and Transportation Officials (AASHTO) Standards for Bicycle Facilities Manual
    a. Bicycle only lanes within a curb and gutter street should be a minimum of 5' wide, one-way, and installed on either side of major collectors and arterials.
    b. Two-way bicycle lanes on one side of the street are not recommended.
3. Bike lanes should be installed at the same time that streets are paved. Installation of bike lanes on existing streets should be considered when an asphalt overlay is done.
4. Width of bike lanes shall be measured as a single integral surface. For example, a rolled concrete gutter shall not be included within the bike lane width nor shall a ravelled asphalt road edge.
5. Where street width allows, bicycle lanes can be installed between curbside parking and the travel lane. In this case, the minimum width for a one way bicycle lane is 4 feet.

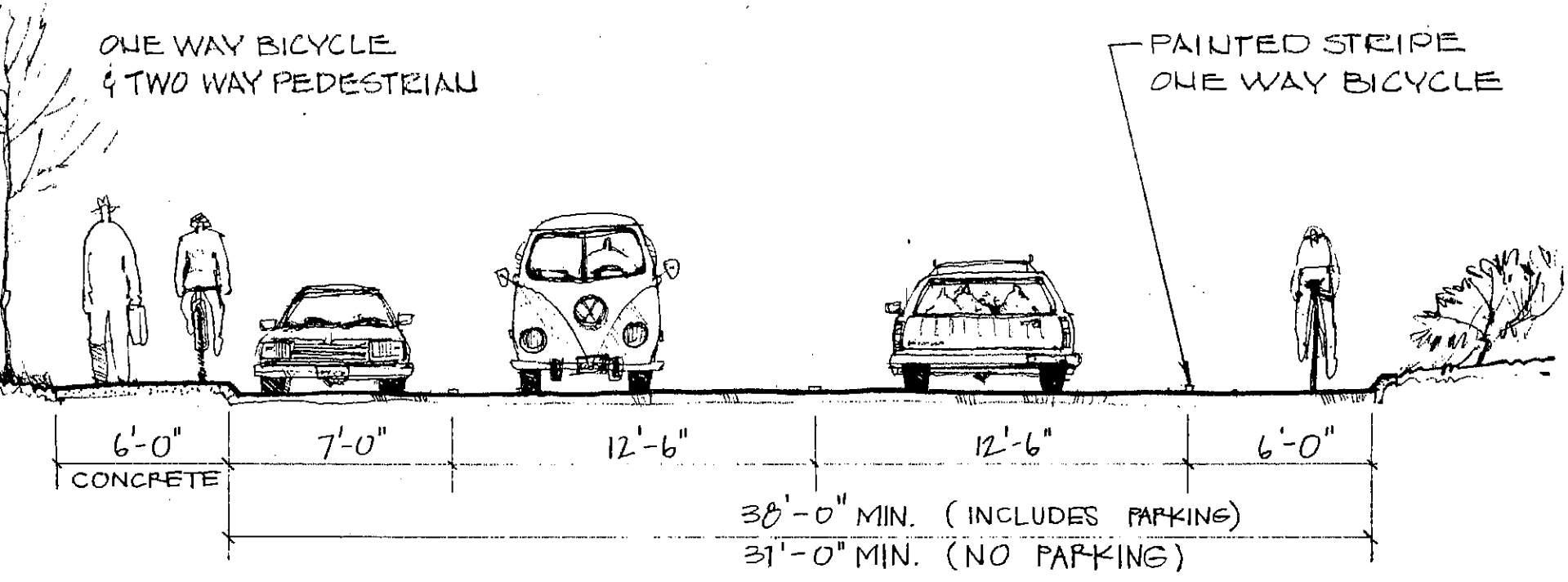


5. BICYCLE LANES WITHIN STREET

NOTE: ALLOWS FOR WINTER SNOW REMOVAL

6. Combined Bicycle Lane and Sidewalk

1. If the street width does not allow for a one way bike lane on each side of the street or if pedestrians also need access, then an option is to install a painted bike lane on one side of the street for one way bicycle traffic and a minimum 6' wide concrete sidewalk on the other side of the street for one way bicycle and two-way pedestrian traffic as shown in Detail 6.
2. If the painted lanes are shared with pedestrians, the width should be increased to a minimum of 6' and preferably 8'.

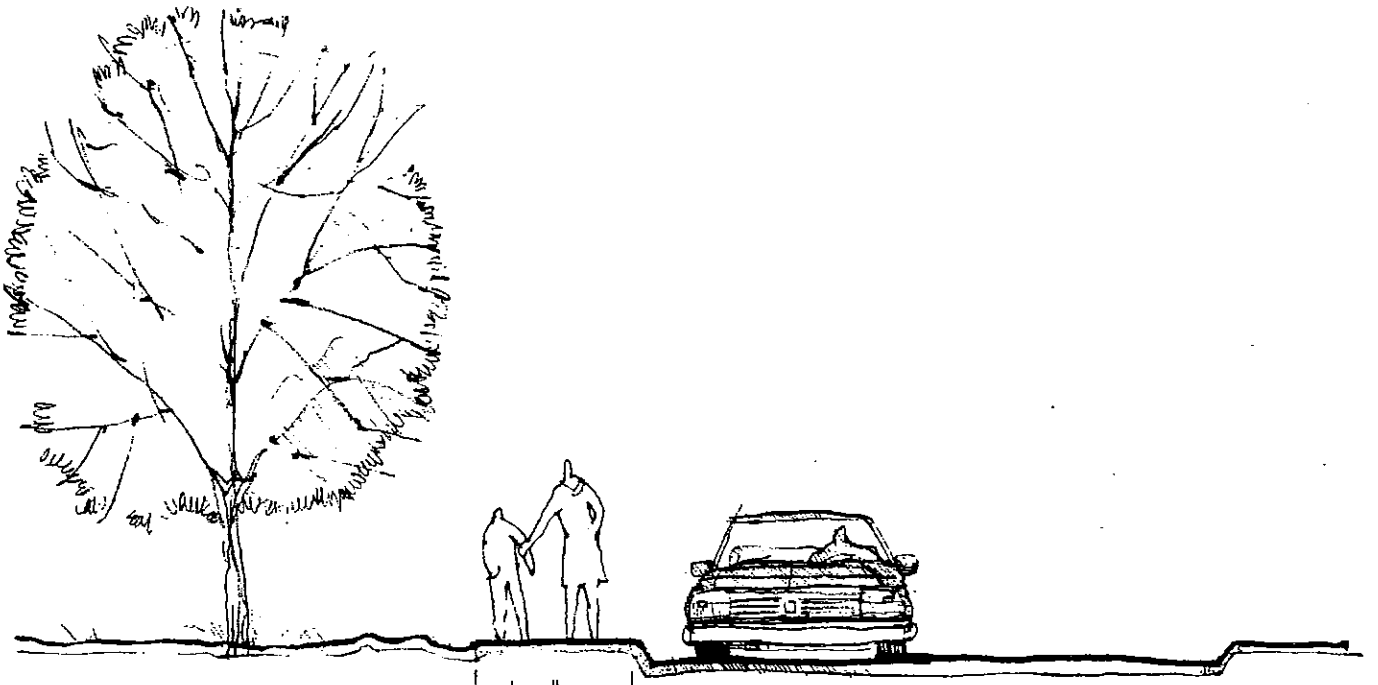


6. 6' BIKE PATH/SIDEWALK ADJACENT TO STREET AND 6' BICYCLE LANE WITHIN STREET.

NOTE: PARKING ON ONE SIDE OF STREET - 38'-0" MIN. CURB TO CURB. NO PARKING - 31'-0" MIN.

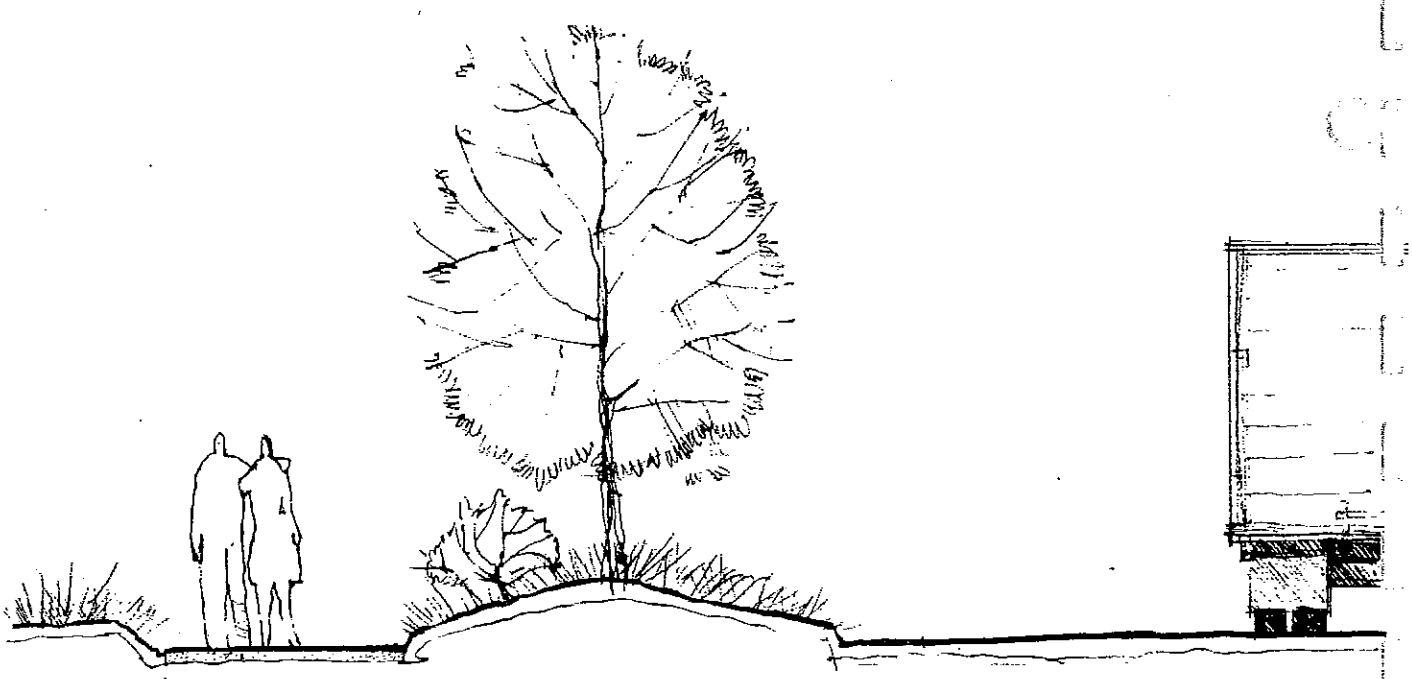
7&8 Paved Pedestrian Sidewalks

1. Use and Location - Sidewalks are generally required along all new through streets and along cul-du-sacs where higher volume pedestrian use is anticipated. They may be installed in already developed areas where traffic vlomues are high enough to create conflicts for pedestrians.They are generally not intended for bicycle use.
2. Sidewalks located immediately behind the curb are generally recommended only along existing streets where a separation is not feasible. Wherever possible a separation should be established to reduce maintenance costs and increase user safety. The General Standards and Guidelines section of this document provides specific separation guidelines.



7. PEDESTRIANS ONLY PAVED AT BACK OF CURB

NOTE: ALLOWS FOR WINTER SNOW REMOVAL.

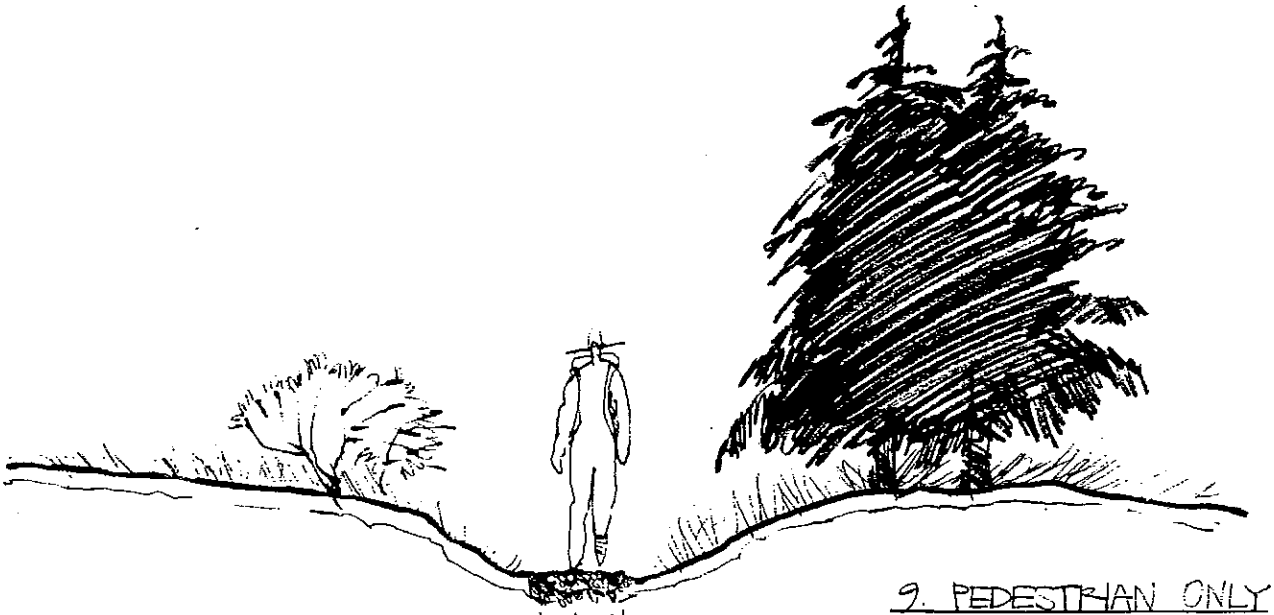


8. PEDESTRIANS ONLY - PAVED AND SEPARATED FROM STREET.

NOTE: ALLOWS FOR WINTER SNOW REMOVAL.

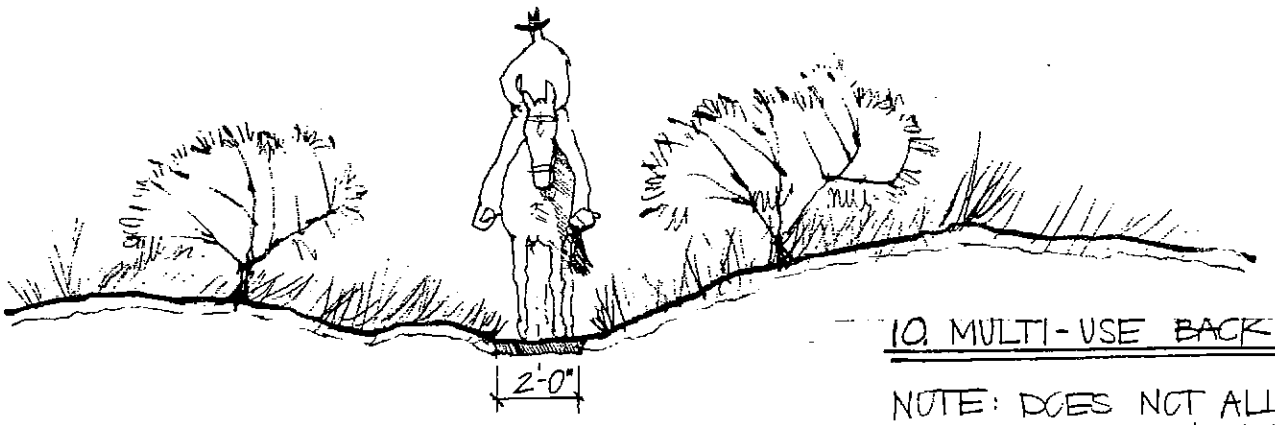
9&10 Back Country Pedestrian Only and Multi-use

1. Location - These trail types are generally only used where low volume recreational use is anticipated and to access natural areas.



9. PEDESTRIAN ONLY
WOOD CHIP

NOTE: DOES NOT ALLOW FOR WINTER SNOW REMOVAL. ALLOWS FOR X-COUNTRY SKI ACCESS IN AREAS OF GENTLE TERRAIN UNLESS ADDITIONAL CLEARANCE IS MADE.



10. MULTI-USE BACK COUNTRY

NOTE: DOES NOT ALLOW FOR WINTER SNOW REMOVAL ALLOWS FOR X-COUNTRY SKI ACCESS IN AREAS OF GENTLE TERRAIN UNLESS ADDITIONAL CLEARANCE IS MADE.

5. Drainage

Drainage

Planning guidelines

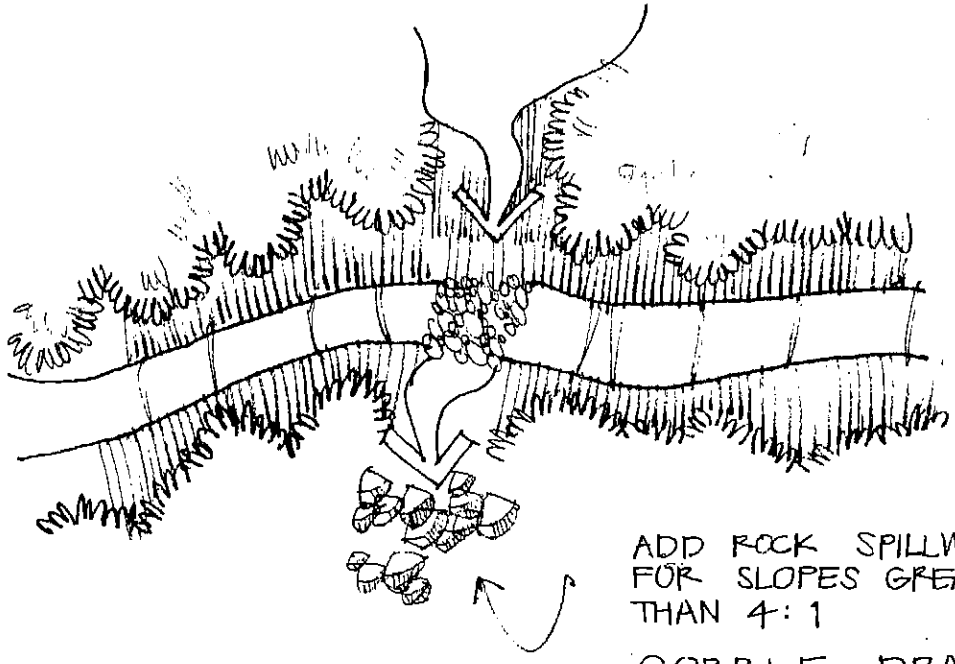
Careful study of topography adjacent to the trail may yield insight to maximize protection of the trail, while minimizing trail structures. In general drainage should be studied every lineal 50' with provision made to protect the trail.

Swales and culverts

Drainage swales or culverts should be installed on trails at locations where normal cross slope will not allow for adequate drainage. Drainage swales are not permitted on paved trails. Drains are best located at low points or bends in the trail along already existing natural drainage ways.

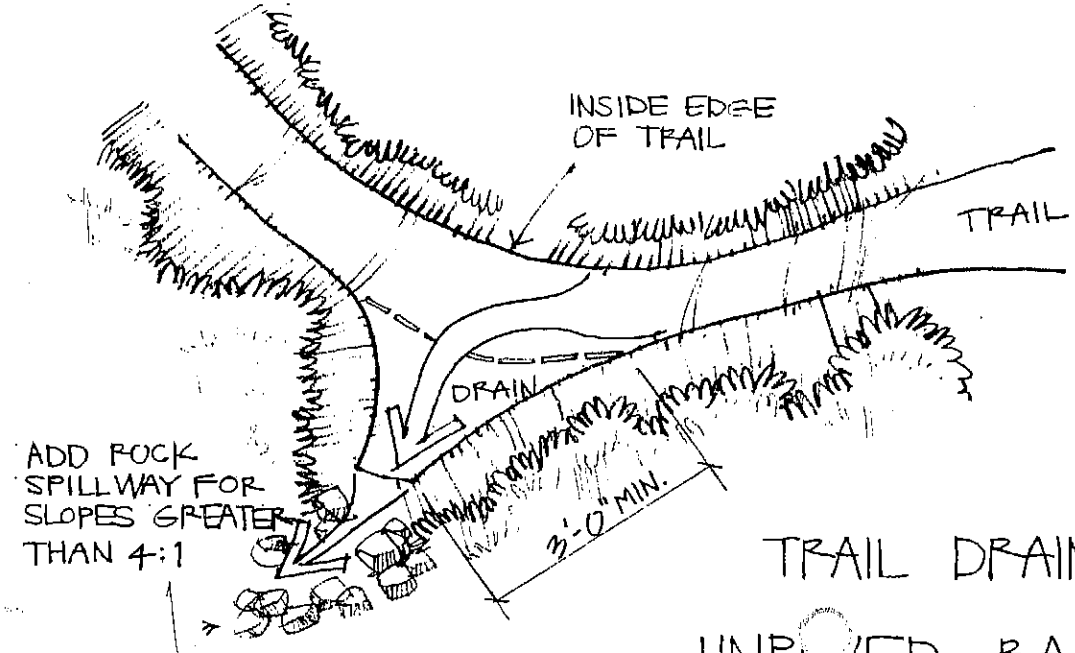
Concentrated flows

Wherever water is concentrated into new locations or in heavier concentrations, erosion protection needs to be evaluated and installed if necessary. Native stone riprap is the preferred material.



COBBLE DRAIN

COBBLE DRAIN: USE WHERE INTERMITENT FLOW IS EXPECTED SUCH AS IN PRONOUNCED GULLYS OR ESTABLISHED DRAINAGEWAYS. DO NOT USE WHERE CONTINUOUS FLOW IS EXPECTED SUCH AS AT SEEPS, SPRINGS OR STREAMS. COBBLES SHALL BE 2-3" STONES STOCKPILED DURING TRAIL CONSTRUCTION.



TRAIL DRAIN

TRAIL DRAIN: USE WHERE TRAIL CONSTRUCTON REQUIRES DRAINAGE SUCH AS ALONG LONG AND/OR STEEP VERTICAL ASCENTS. DO NOT USE WHERE ESTABLISHED DRAINAGEWAYS EXIST. THESE ARE BEST IF LOCATED AT LOW POINTS OR BENDS IN TRAIL. TRANSITION FROM TRAIL TO DRAIN MAY REQUIRE 6'. AT LOW POINTS, 6' TRANSITION WILL BE REQUIRED UP TO NORMAL TRAIL

UNPAVED BACKCOUNTRY TRAIL

7. Waterbar

Waterbars

Waterbars will likely need to be installed at regular intervals on soft surface trails which are steeper than a 5% gradient for more than 5 vertical feet. Rubber waterbars should be used since they are safest for multiple use trails, also construction is more economical, faster and easier than other construction methods. Detailed instructions and construction information are included.

PLAN VIEW

DIMENSION VARIES WITH TRAIL WIDTH

PROFILE VIEW

6"

4"

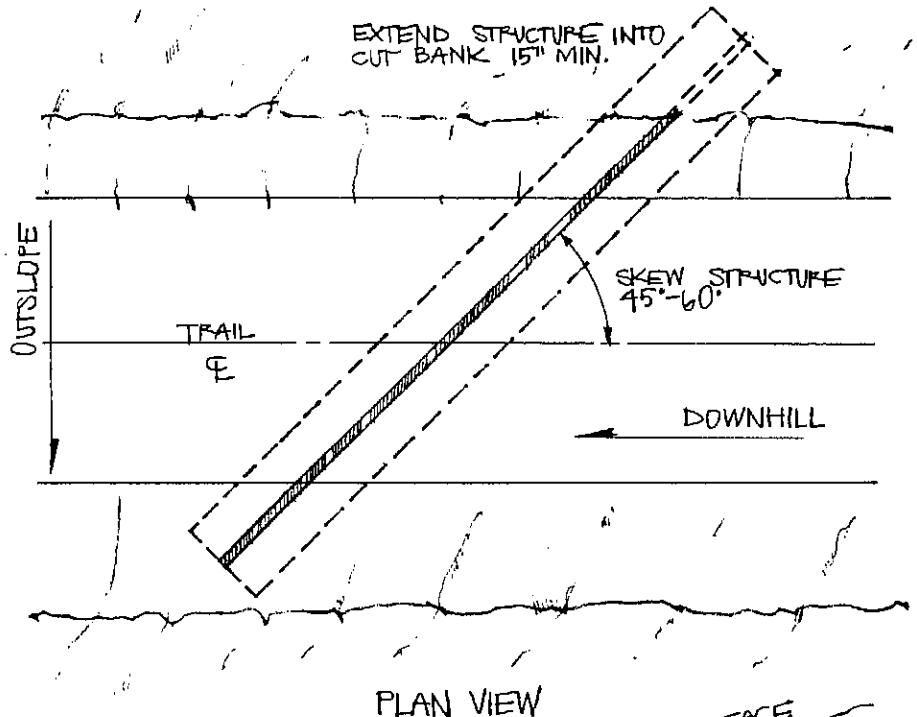
2 x 6"

3/8" THICKNESS CONTINUOUS RUBBER BELTING.

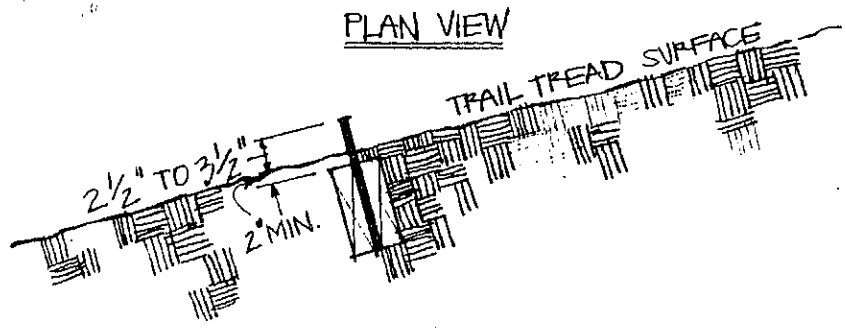
30d GALVANIZED NAILS

END VIEW

PRESERVATIVE TYPE CCA
MIN. NET RETENTION 0.4 LB/CU. FT.
USE 30d GALVANIZED NAILS
4" NAILING PATTERN, IN 2 ROWS, STAGGERED



PLAN VIEW



PROFILE VIEW

WATER BAR DETAIL

THE TRAIL FORUM

This feature of the TRAIL FORUM focuses on use and installation of Rubber Belt Waterbars as used by Jefferson County Open Space and the U.S. Forest Service. We also describe various volunteer groups and work programs available for performing trail construction and maintenance. You may want to consider these alternative work-forces for some of your future trail projects.

RUBBER BELT WATERBARS

Rubber Water Deflectors: Alternative Erosion Control Technique For Multiple Use Trails

--By Sharon Kolarik

Since 1972, Jefferson County Open Space (JCOS) has acquired over 17,000 acres of land and developed 79 miles of natural surface trails. Situated in the foothills west of the Denver metropolitan area, these trails accommodate hiking, jogging, mountain biking, horseback riding, and cross country skiing. Increased use, especially from mountain bikes has caused various impacts. Users tend to avoid log, rock and soil waterbars, which widens treads, increases erosion, and accelerates deterioration of waterbars.

During a 1989 trail seminar at Red Rocks Community College, a Forest Service employee introduced surface water deflectors used on logging roads. They consist of two 2"x10" boards nailed together with a piece of 1/2"x13" rubber in between, and installed like a water bar. We felt this technique might be an alternative or complement to our existing erosion control devices on natural surface trails. To test these water deflectors, we selected several trail sections with heavy traffic and areas with shortcutting, braided trails, steep grades, wide, concave, and eroded tread, and on service roads.

Several types of deflectors were constructed so that different designs could be tested. Water deflectors are easily made by bolting a piece of conveyor belt rubber between two pieces of lumber. Treated logs can also be used, but they proved unstable in the trail tread and were difficult to bolt together because the natural grain twists them. After trying various types of lumber, we concluded that 2"x6" and 4"x4" dimensional lumber worked best. Discarded conveyor belts, obtained free from a local gravel pit, provided the rubber. The rubber should extend 3" to 6" above the base lumber. The time involved for assembly will vary depending on the design, but we averaged 20-30 minutes each.

During the first few months, the effectiveness of the deflectors was minimal because many trail users indicated the black rubber gave the appearance of rigid metal. As they became accustomed to the new water deflectors, they were accepted quite well. The deflectors are functioning as designed; braided trails are becoming one trail, widened trails are now three feet wide again, and overall tread stability and appearance is improving. The results from establishing service road deflectors are still pending due to recent installation. The rubber pieces seem to be flexible and durable. No problems with the rubber tearing or pulling out of the base wood has been apparent. This ongoing project is still in the experimental stages and new designs and test sites will be evaluated in the near future. Consideration may be given to this type of design when developing barrier free types of trails. For additional information regarding this topic, please contact Open Space at (303) 278-5925.

Use of Rubber Waterbars on the Grand Mesa, Uncompahgre & Gunnison National Forest

During the summer of 1990, we let a contract to reconstruct the West Bench Trail No. 501 on the Collbran District of the Grand Mesa National Forest. The trail extends from Mesa Lakes Recreation Area to the top of Lift #2 of the Powderhorn Ski Area and receives very high use from hikers, mountain bikes and horses.

As part of our evaluation process a Trail Management Decision Worksheet was completed. Design features specified reconstruction to an "Easiest" difficulty level, 24" minimum tread width, with a minimum of tread breaks or obstructions. Since the trail passes through sections of very rocky terrain, construction methods to minimize earth movement for drainage structures were seriously considered.

I saw an article on Rubber Belting Waterbars in the "Engineering Field Notes," a Forest Service engineering publication, and felt they would meet the criteria needed for this project. They can be installed with a minimum of grade and tread disturbance, are more easily installed in rocky areas compared to conventional

waterbars while providing a fairly maintenance-free structure. I made some changes in the design, drew two typical installation sheets (see drawings on next page), and added the pay item to the proposed contract.

When the bids were opened, the successful contractor bid the water bars at $50.00 each, which included labor and contractor furnished materials except for rubber belting. I chose to provide the rubber belting to ensure the quality of material. In government contracts, all new materials are required, so we purchased new materials from Colorado Rubber and Supply in Denver. The cost of the new 3/8" thick solid rubber belting was $2.90/lin. ft. and it was cut in 12" x 16' lengths. The solid rubber was chosen over belting with fabric laminations to prevent moisture from working down the seam and separating the layers.

Construction: Many advantages came to light during construction. The installation of the rubber belting waterbars proved to be considerably faster and easier than more traditional methods, as only an 8" x 12" trench was excavated at a 45 to 60 degree skew to the tread. Since the tread grade was not changed, much less material was excavated. Typically, only a small ditch was required to remove the water if the tread was entrenched. In areas where there were multiple treads, the belting could be used in 16 foot lengths to cover the full width of the ROW. In areas where cross slope was available to restrict tread width, a 6 to 8 foot length was used. We did determine that height of the exposed rubber should be maintained at 2 1/2" to 3" to prevent the rubber from taking a "memory".

Material delivery from the staging area to the installation location proved to be considerably easier. The Contractor used only horses to transport all materials. The treated 2"x6"x8' boards used to sandwich the belting were packed in, usually in groups of 6, and belting was carried in panniers, as many rolls as would fit. If the Contractor used ATV's to transport materials, the process could have been even easier.

Conclusion: Rubber belting waterbars have thus far proven a viable alternative for any trail where a mix of users is expected. The reaction has been mostly positive. Most cyclists, when first encountering the structures, get off and kick the rubber to make sure it is not a solid obstruction. After that, they ride over them as if nothing were there. Horses have not shown any fear, and hikers seem to have no problem stepping on them to see if they bend. The installations have not caused the past problem of wheeled users riding up the cut slope to avoid the bump. This has also helped eliminate the problem of multiple treads in areas of little cross slope.

Maintenance of rock or log waterbars and rolling dips in the past involved cleaning a large transition area and most times an outlet ditch, something which crews tended to neglect. With rubber waterbars, the area to be cleaned is much less, speeding operations and lowering costs. Wheels sliding on wet logs when struck at a skew have also been eliminated.

The results of this last year's contract were very pleasing to me and the District, and we plan to use the waterbars on ATV and mountain bike trails and a portion of a stock driveway. They really have endless possibilities as use increases on trails and low volume roads. In addition, increased labor costs makes the ease and speed of these installation more attractive. Future options will include investigating earth tone colors and laminated belting with an edge seal. For more information, contact Doug Marah, Engineering Trails Coordinator, Grand Mesa, Uncompahgre and Gunnison National Forest, at (303) 874-7691.

ALTERNATIVE WORKFORCES

Trail Building by International Work Camps

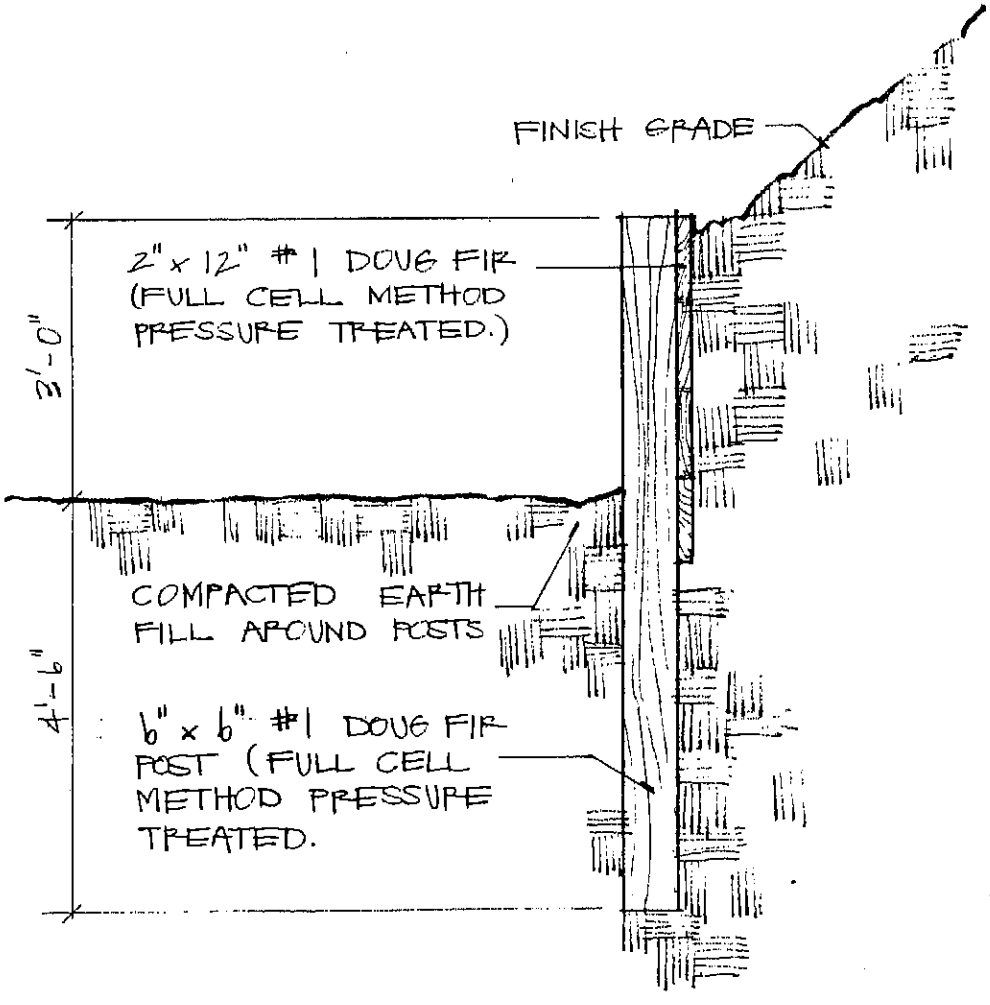
International Work Camps is a volunteer service provided by the Council on International Education Exchange (CIEE). CIEE recruits the volunteers from the U.S. and other countries and selects a crew leader from the U.S. to work on various types of projects, including trail construction and reconstruction. In addition to the value of work provided by the volunteers, this program allows for cultural interaction among the volunteers. The National Park Service, the U.S. Forest Service and other government agencies have used the crews in projects across the country. The sponsoring agency food, lodging and insurance coverage for an average 12 person crew, and transportation for the crew leader. As a ball-park figure, costs total $1500 to $2000. For more information on how to apply for a work camp project contact: Brenda Dean, Coordinator for Volunteer Services, Council on International Educational Exchange, 205 E.42nd Street, New York, NY 10017, phone (212) 661-1414. Work camps are also organized by Peter Coldwell, Director, Volunteers for Peace, 43 Tiffany RD, Belmont, VT 05730.

Jefferson County Open Space Youth Work Program

The Youth Work Program annually employs county youth ages 14 to 18. Participants are selected through a public random-drawing process. The program runs 6-8 weeks, with five eight-hour days per week. Normally 50-100 participants are selected; crews with eight laborers and one crew leader each are established. The work conducted by the crews includes trail maintenance and construction, park cleanup, and building maintenance. The Youth Work Program has been active since 1974. For more information contact Open Space at 278-5925.

8. Permanent Slope Stabilization

9. Cut and Fill Slopes



RETAINING WALL

GUIDELINES:

CUT AND FILL SLOPES SHOULD BE A MAXIMUM OF 2:1 UNLESS SITE SPECIFIC SOIL ANALYSIS IS PERFORMED TO JUSTIFY STABILITY OF STEEPER SLOPES.

A MAXIMUM OF 4 VERTICAL FEET OF CUT OR FILL IS ALLOWED. ENVIRONMENTALLY OR VISUALLY SENSITIVE AREAS MAY BE LESS.

AREAS WHICH REQUIRE STEEPER CUT OR FILL SLOPES THAN THE ALLOWABLE SHALL USE RETAINING WALLS AS SHOWN IN THESE DETAILS.

ALL DISTURBED AREAS SHALL BE REVEGETATED. SPECIES FOR REVEGETATION SHALL BE APPROPRIATE AND WHEREVER POSSIBLE SHALL MATCH THE SURROUNDING SPECIES. SEE THE REVEGETATION GUIDELINES FOR ADDITIONAL SPECIFICATIONS.

Permanent Slope Stabilization

Permanent slope stabilization includes native stacked rock or wood retaining walls, rock filled gabions, wattling, and slope serration. Revegetation is contained under a separate section. Following are some guidelines for when various techniques are used. All uninterrupted cut or fill slopes shall not exceed 6 vertical feet unless site specific analysis is performed to justify otherwise. Some method of permanent slope stabilization is required for all slopes in excess of two horizontal to one vertical unless site specific soils analysis is performed to justify otherwise.

Retaining Walls

Should be installed where necessary for safety, to prevent erosion of cut or fill slopes, to reduce cut and fill slopes, or to minimize disturbance on environmentally or aesthetically sensitive sites. Retaining walls should be constructed of indigenous or natural materials. Walls located on visually sensitive sites should be designed to blend with the natural surroundings. Materials, texture, color and height all affect the visual prominence of a retaining wall. Walls exceeding a height of 4 feet must conform to the requirements set forth in the Uniform Building Code.

Wattling

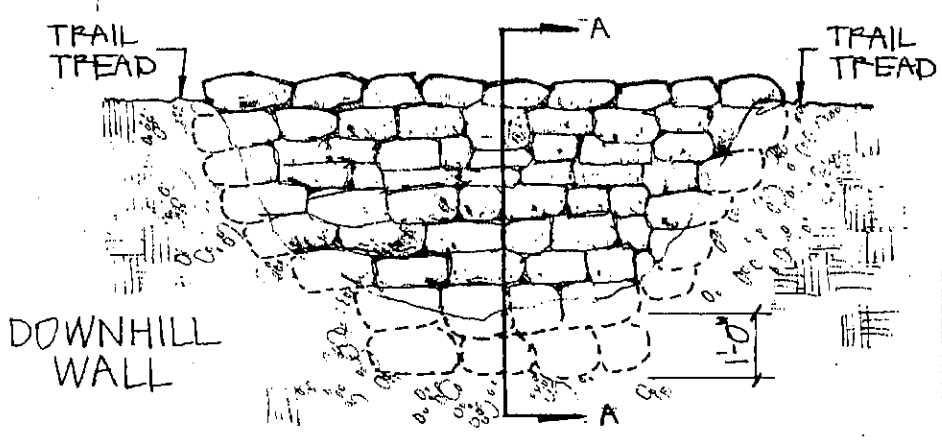
Wattling is bundles of branches used to both stabilize and revegetate slopes which are nearly stable but continue to erode. This method is only recommended after initial methods have failed and where the unstable areas are minor.

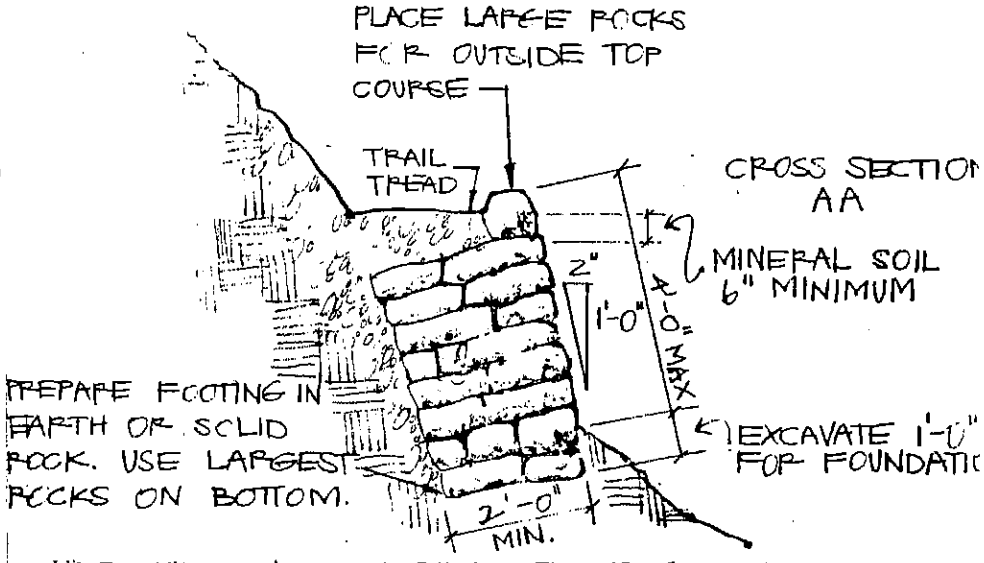
Slope Serration

These are small steps or indentations in the slope face which are useful for providing small favorable sites for vegetation establishment. This technique should be used only on soils which are fairly cohesive. Site which have a severe exposure to heat and/or sun, are windy, or are excessively steep will likely benefit the most from this method.

NOTES: WALL SHALL BE 2' WIDE OR ½ THE WALL HEIGHT, WHICHEVER IS GREATER.

REVEGETATE ALL DISTURBED AREAS.





WALL GUIDELINES

USE STONE WHICH IS NATIVE TO THE SITE WHEREVER POSSIBLE.

TO STABILIZE THE TRAIL IN LESS THAN ADEQUATE SITUATIONS.

TO WIDEN A TRAIL THAT OTHERWISE WOULD BE TOO NARROW.

TO TAPER UP OR DOWN IN AREAS WHERE TYPICAL TREAD CONSTRUCTION WILL NOT WORK.

WALLS SHOULD BE BUILT IN AREAS WHERE ADEQUATE FOOTINGS CAN BE DUG.

ALL STONES SHOULD BE ANGULAR, FREE FROM DEFECTS, PROJECTIONS AND IMPRESSIONS.

APPROXIMATELY 25-33% OF WALL SHOULD BE TIE STONES.

MAXIMUM HEIGHT OF WALL SHOULD BE 4'-0".

USE WHEREVER NATURAL TREES OR OTHERWISE SIGNIFICANT VEGETATION CAN BE SAVED WITH THE USE OF WALLS.

UNIFORMLY DISTRIBUTE SIZES AND SHAPES OVER THE ENTIRE FACE OF THE WALL.

SHAPE STONES FOR BEST FIT. USE A 4" HAMMER IF AVAILABLE.

ALL WALLS MUST BE BATTERED: 3 IN 12 THROUGH 12 IN 12 ARE ACCEPTABLE.

TRENCH SHOULD SLOPE INWARD AS SHOWN, AND DRAIN TO DAYLIGHT. TIE STONES SHALL COMPLETELY PENETRATE WALL. MISCELLANEOUS BACKFILL MUST BE FREE FROM ORGANIC MATTER. SELECT BACKFILL LESS THAN ½" MAXIMUM DIMENSION, 4" DEPTH OPTIMUM.

WALLS WHICH ARE GREATER THAN 4'-0" IN HEIGHT SHALL BE ENGINEERED.

USE WHERE EITHER CUT OR FILL SLOPES FOR TRAIL CONSTRUCTION EXCEED 4 VERTICAL FEET.

Cut and Fill Slopes

Combined cut and fill slopes should not exceed twelve vertical feet and individual cut or fill slopes should not exceed six vertical feet, less in environmentally and visually sensitive areas. Slopes which exceed this should consider low retaining walls or alternate routing of the trail to a more acceptable location.

Cut or fill finish grades should not exceed 2 horizontal to one vertical unless a site specific soil analysis is performed to justify the stability of steeper slopes.

All cut and fill slopes shall be stabilized and revegetated as per the revegetation and slope stabilization guidelines.

10. Slope Stabilization, Revegetation and Planting

Slope Stabilization, Revegetation and Planting

General Guidelines

All disturbed areas shall be stabilized and revegetated as part of the trail construction process.

Existing Vegetation Protection

Existing significant vegetation which is to be saved shall be protected with temporary fencing along the limits of disturbance. Trees which are to be saved should not be disturbed within the dripline of the tree if possible and the protective fencing should extend to the dripline. Where this is not possible, all work within the dripline should be done by hand and mechanical equipment should not be allowed within the drip line. If filling is necessary above the root zone, perforated pipe along the drip line and vertical air wells should be installed. If cutting of roots or interception of natural drainage to the root zone is necessary, temporary irrigation may be required to compensate for the disturbance.

Temporary Runoff Management

During construction and establishment of revegetation temporary erosion control and runoff measures and slope stabilization techniques may be necessary. Techniques such as hydromulching, straw mulch, jute matting, wood excelsior matting, tackifiers, straw bales, siltation fences, matting in drainage channels and stone mulching are all examples of temporary runoff management. The following guidelines provide some direction for the use of these measures. All are temporary measures and are intended to last from one to two years until such time as permanent stabilization techniques are effective.

1. Hydromulching - This is a mechanized, rapid method for mulching large areas and is generally used with seeding to revegetate disturbed areas. Use may be limited on sites where equipment access is limited. Only 100% wood fiber mulch shall be used and applied at a rate of 3000 pounds per acre.
2. Straw Mulching - This method can be used over small areas where it is applied by hand or on large sites where it is installed mechanically. It is generally used in combination with seeding to revegetate disturbed sites. Straw must be held in place by matting, crimping or other method. Apply at a rate of 2 tons per acre or a uniform depth of 2-3".
3. Jute Matting - This can be used alone or in combination with hydromulching or straw mulching for erosion control and slope stabilization. It is generally used in combination with seeding to revegetate disturbed areas. Apply up and down the slope, never along the slope. Overlap edges a minimum of 4" and use wire staples which are a minimum of 6" long and spaced approximately 5' apart down the sides and middle of

the role. Extend the mat a minimum of 3' beyond the top and bottom of the slope and bury the mat end in an 8" deep trench at the top of the slope. Uniform contact of the mat to the slope underneath is critical.

4. Wood Excelsior Matting - This is used for erosion control generally in combination with revegetation. Care must be taken during installation to prevent concentrated flows under the mat. Apply up and down the slope, never along the slope. Edges should butt snugly together and held down with wire staples, a minimum of 8" long spaced approximately 2' along the edges and 4' down the center. Extend the mat a minimum of 3' beyond the top and bottom of the slope and bury the mat end in an 8" deep trench at the top of the slope.

5. Tackifiers - Generally mixed with mulches to provide better adhesion to steep and/or windy slopes. Tackifier should be applied at a rate of 80 pounds per acre dry ingredients or 200 gallons wet ingredients per acre.

6. Straw Bales - Can be used in a variety of ways to protect areas from impact, reduce uninterrupted flow in low and intermittent flow channels, and provide a siltation device for slopes or gullies until revegetation establishment. When installing, anchor in place with steel rebar stakes driven a minimum of 12" into the sub-grade and placed in a 6" deep trench which has soil tamped firmly along the uphill side.

7. Siltation Fences - Are used to protect down slope undisturbed areas from upslope erosion.

8. Matting in Drainage Channels - Generally jute matting or fiberglass roving is installed in open drainage channels for temporary erosion control. Use this technique only where flow velocities do not exceed 2 feet per second. Apply from the top and overlap edged a minimum of 4". Secure the top and bottom ends in an 8" deep trench secured with steel staples every 12". Edged should be stapled every 2"

9. Stone Mulching - May be used during construction to control erosion, mud or dust.

Revegetation

Revegetation consists of seeding and planting operations. Seed and plant species and application rates shall be submitted and approved with the construction plans. In general the revegetation of natural sites shall match that of the undisturbed areas in species, density and vegetation patterns. Seeding can be used for grasses and forbes but container stock should be used for all trees and shrubs. Revegetation shall be accomplished as soon as grading work is completed and weather permits. Unless the site is irrigated, native plant species shall be used which are indigenous to the site. All revegetation work on non-irrigated sites shall be done between April 15th and October 15th unless approval is granted otherwise. Sites which are revegetated between June 1st and September 1st will require temporary irrigation.

11. Gabions

Gabions

Gabions are rock filled wire baskets used to retain steep slopes or stabilize drainageways. They may be preferable to stacked rock walls where the native rock is too small or too rounded for effective stacking. They are particularly effective seepage is anticipated.

Installation - Empty gabions are placed in position, wired together and filled with rock which ia a minimum of 4-6" in diameter. When used as a retaining wall the bottom basket should be buried a minimum of 6" at the toe. Gabions should be keyed into the slope and laid back at a maximum of 6 vertical to 1 horizontal.

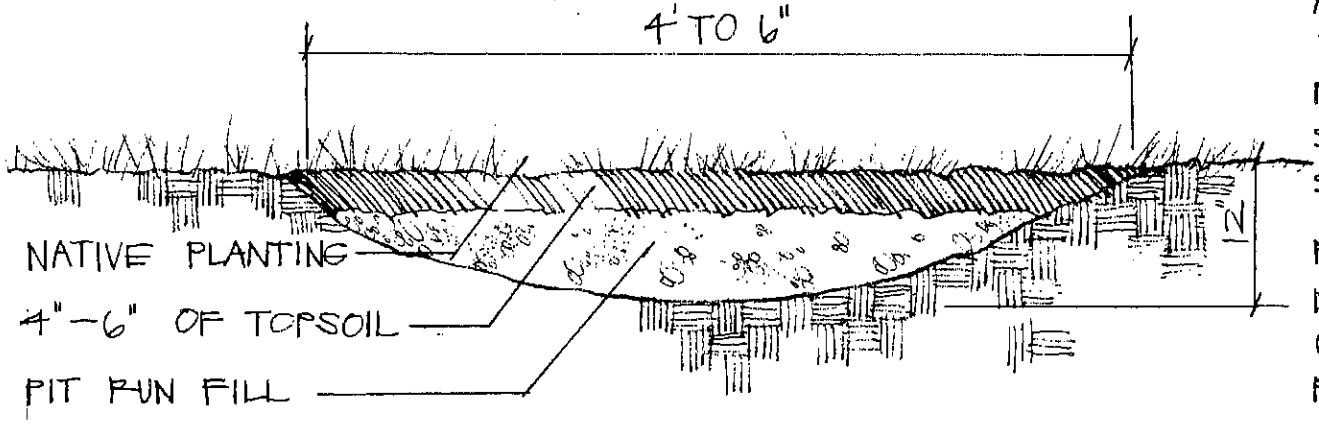
Seedbed Preparation - Subgrade soils should be scarified to a depth of 3-4" and topsoil placed to a minimum depth of 4".

Seeding - Seed shall be broadcast or hydroseeded and raked into topsoil prior to the application of mulch, matting or other surface stabilization materials.

Planting - Planting of container grown materials on non-irrigated sites shall be confined to tubling stock unless there is sufficient natural moisture present to sustain larger plants.

Maintenance - Revegetated sites shall be maintained until sufficient establishment has occurred to reasonably stabilize the site. Security shall be posted for all revegetation work for a minimum of 1 year at which time it will be reviewed and released if it meets the above requirements.

NOTE: ADD BRUSH CUTTINGS TO REVEGETATED AREAS - A ROCK OR LOG BARRIER AT POTENTIAL ACCESS POINTS.



TYPICAL TRAIL REVEGETATION

TRAIL REVEGETATION GUIDELINE USE WHERE EXISTING TRAILS WILL BE RELOCATED.

ADDITIONAL EROSION CONTROL TECHNIQUES MAY BE NECESSARY WHERE STEEP SLOPES OR EASILY ERODED SOILS ARE ENCOUNTERED.

FOR USE IN NATURAL AREAS MORE FORMALLY LANDSCAPED OR IRRIGATED. SITES WILL REQUIRE A DIFFERENT TREATMENT.

12. Switchbacks

Switchbacks

Planning and design

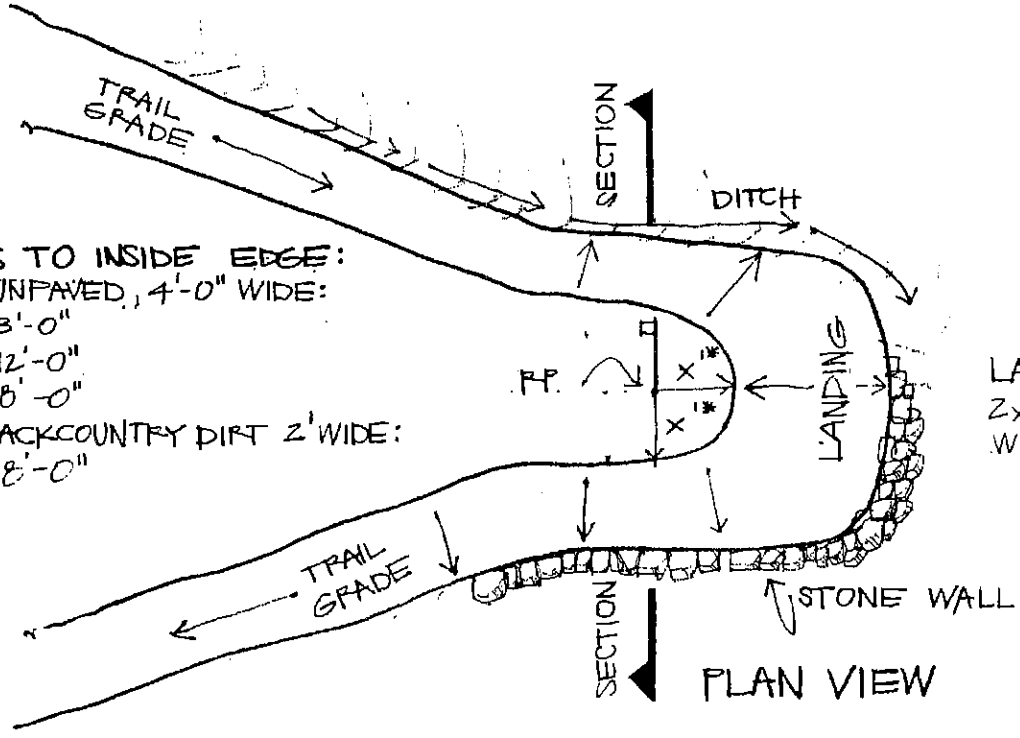
Switchbacks are often necessary when steep slopes are encountered. Sensitive alignment and construction methods are required. If switchbacks are required, they should be designed to discourage crosscutting and subsequent erosion. See the Trails Matrix for minimum turning radii and sight distances for switchbacks.

Location considerations

Locating switchbacks where natural barriers exist, installing physical or visual barriers, staggering them or providing sufficient separation between switchbacks all help to discourage crosscutting.

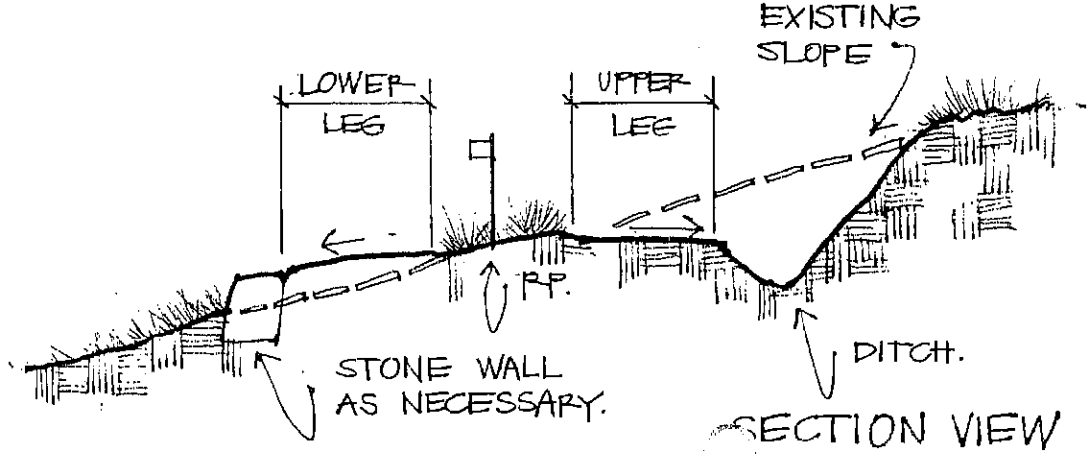
Alternatives to switchbacks

If crosscutting cannot be discouraged through design or construction then the installation of stairs or relocation of the trail should be considered.



* MINIMUM RADIUS TO INSIDE EDGE:
MULTIPLE USE UNPAVED, 4'-0" WIDE:
PEDESTRIAN 3'-0"
EQUESTRIAN 12'-0"
BICYCLISTS 8'-0"
MULTIPLE USE BACKCOUNTRY DIRT 2' WIDE:
ALL USER TYPES 8'-0"

NOTE: RP EQUALS RADIUS POINT



13. Bollards and Barriers

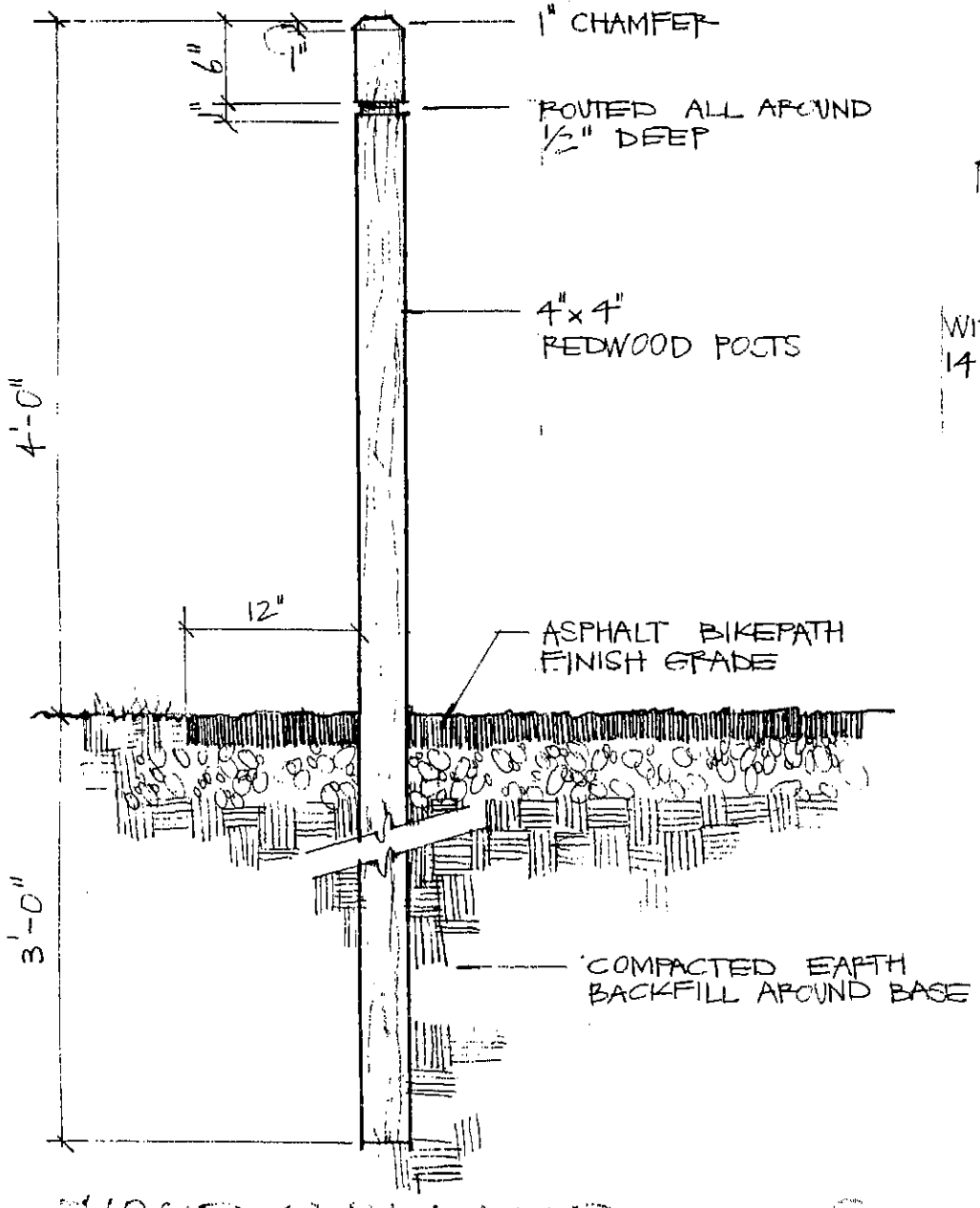
Barriers

Use

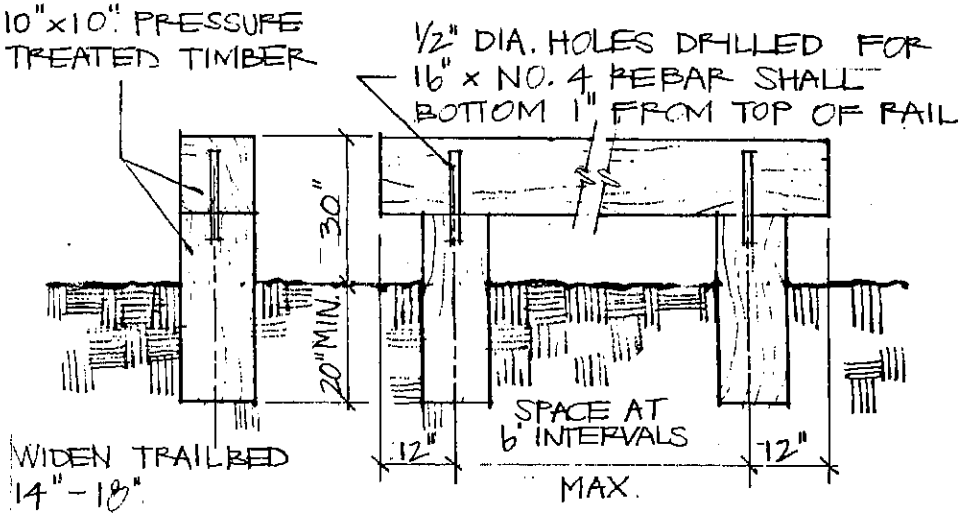
Barriers should be installed at trail heads to control access of prohibited uses. They should serve to obstruct motor vehicle or other prohibited access. They can also be used along the trail to direct trail users and/or protect users from steep or hazardous areas along the trail.

Types

Three types of barriers are generally anticipated; large boulders, timber barriers and wood bollards. Placement and spacing of barriers is dependent upon physical site characteristics and trail use requirements. For additional requirements see the appropriate Construction Details.



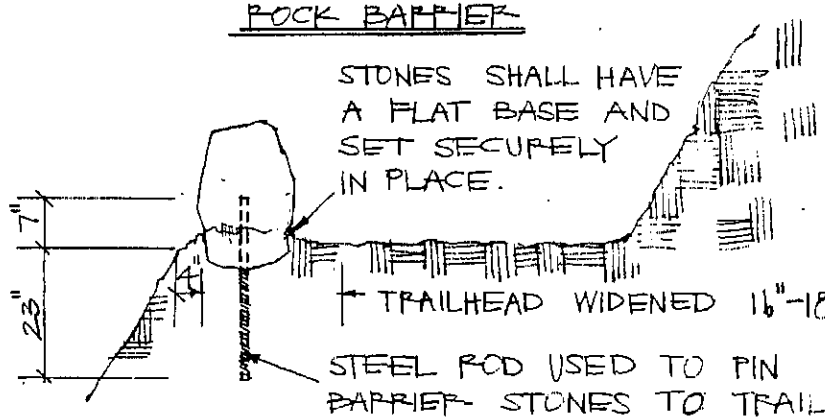
WOOD BOLLARD



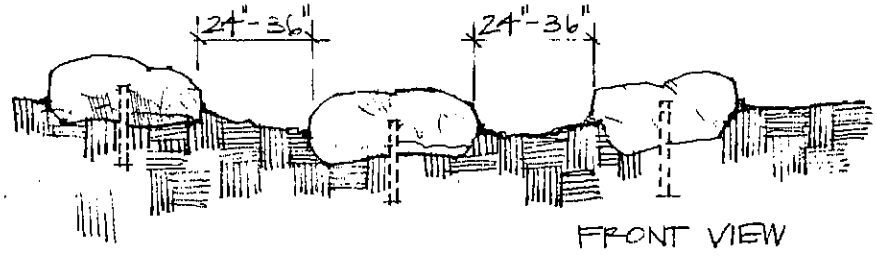
TIMBER BARRIER

GUIDELINES:
USE WHERE MOTORIZED ACCESS COULD BE A PROBLEM SUCH AS AT TRAILHEADS, WHERE TRAILS INTERSECT OR CROSS STREETS AND WHERE TRAILS PARALLEL ROADS AT POINTS WHERE ACCESS IS LIKELY.
BOLLARDS ARE USED WITHIN THE TRAIL SURFACE TO PROHIBIT OR LIMIT ACCESS.

ROCK BARRIER



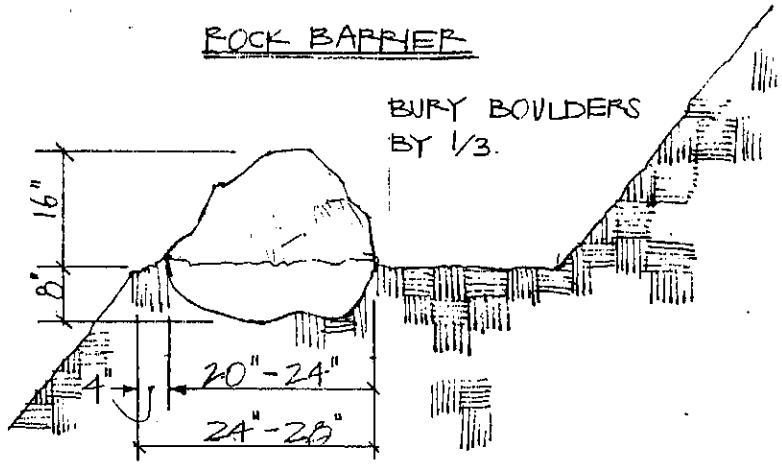
SIDE VIEW



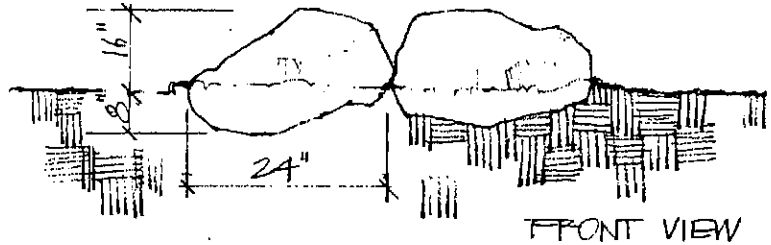
FRONT VIEW

NOTE:
SIZE OF BARRIER STONES SHALL BE APPROXIMATELY 14" - 24" IN HEIGHT, WIDTH AND LENGTH. MINIMUM DIMENSIONS SHALL NOT BE LESS THAN 12" FOR HEIGHT AND WIDTH AND 18" FOR LENGTH.

ROCK BARRIER



SIDE VIEW



FRONT VIEW

GUIDELINES FOR USE

USE ALONG TRAIL WHERE DOWNSLOPE GRADES ARE STEEP AND HAZARDOUS.

USE ALONG OUTSIDE EDGE OF TRAIL CURVES WHERE SLOPES ARE STEEP AND EXPOSED.

USE WHERE SWITCHBACK CUTTING COULD BE A PROBLEM.

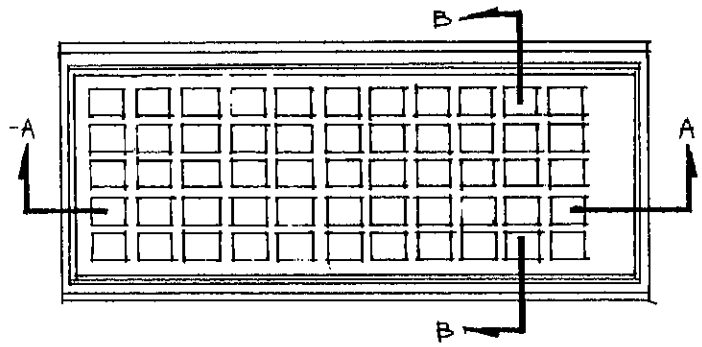
USE AT TRAILHEADS OR ROAD CROSSINGS TO DISCOURAGE OR PROHIBI MOTORIZED ACCESS.

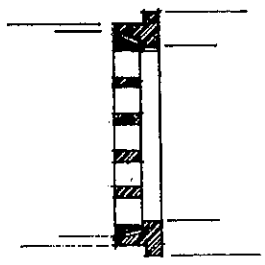
USE TO DIRECT TRAIL USERS TO STAY ON THE TRAIL.

14. Bicycle Safe Drainage Grates

Drainage grates

Should be installed where necessary to allow drainage and safe passage for bicycles. Bicycle or trail user safe grates should be used wherever trail user access is feasible.

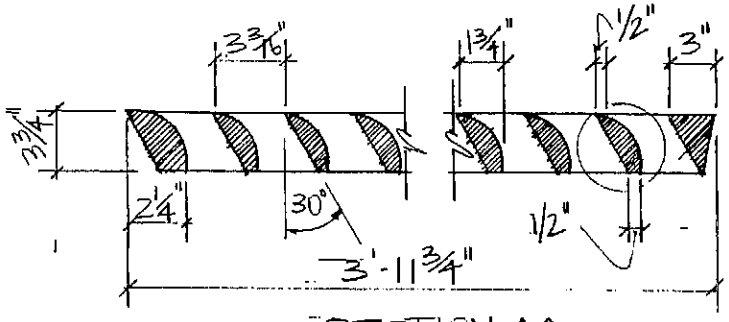




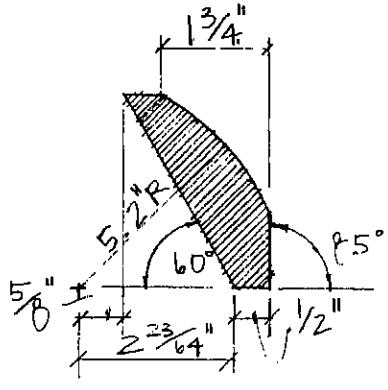
SECTION BB

GUIDELINES FOR USE

USE FOR ALL SURFACE DRAINAGE GRATES IN PUBLIC STREETS, PRIVATE ROADS, PARKING LOTS, ETC WHERE BICYCLE TRAFFIC IS POSSIBLE.



SECTION AA



MANUFACTURER D&L SUPPLY I 1803

BICYCLE-SAFE GRATING & FRAME

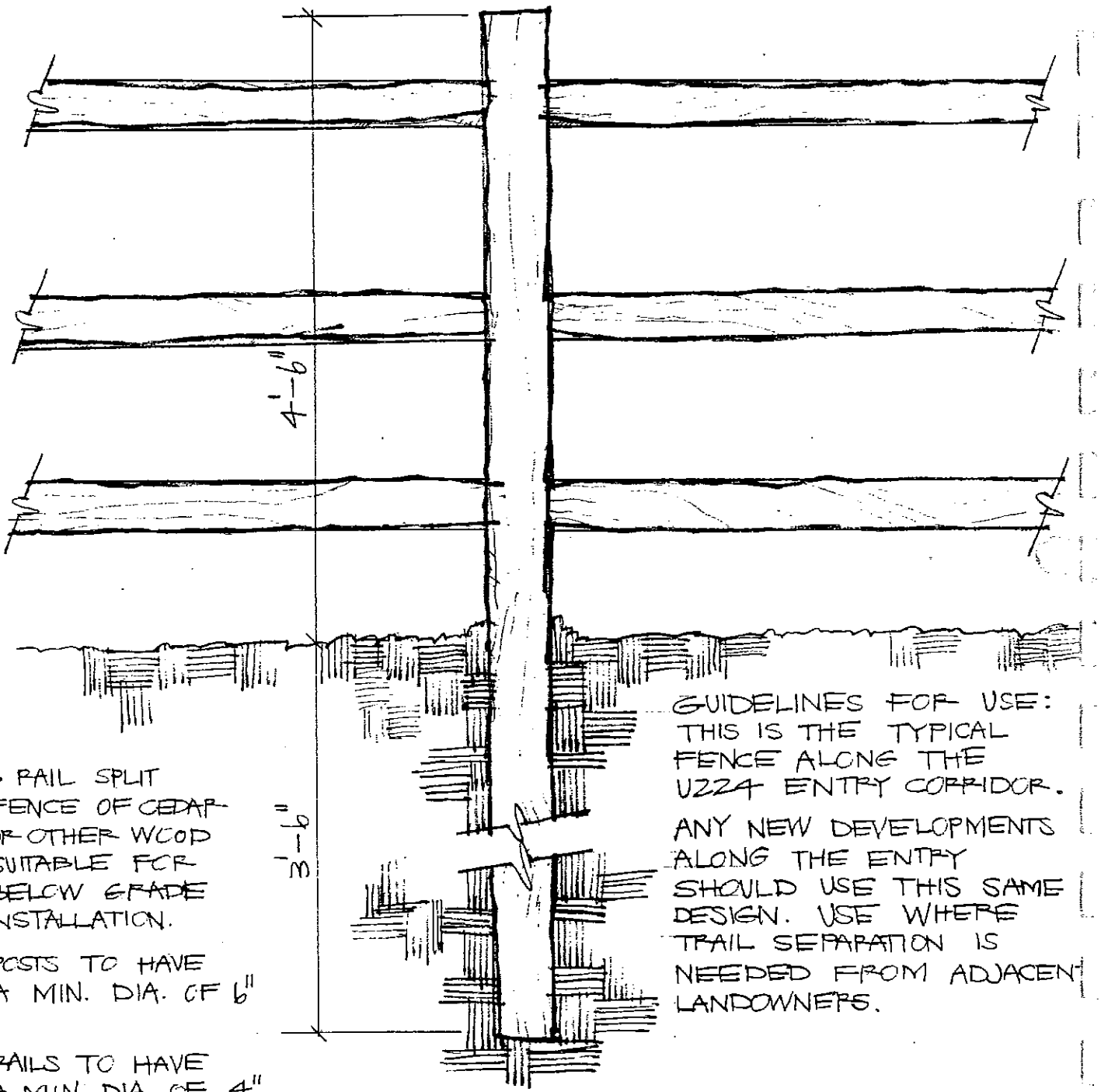
15. Fencing

Fencing

Should be installed only where physical separation is necessary for safety and/or to preserve adjacent landowner privacy. Fences should not create a narrow corridor effect for long stretches along the trail. Where possible fencing should be located only on one side of the trail at a time.

Fences should be no closer than 5' from the trail edge. Where fences are necessary along both sides of a trail, the minimum width should be 20'.

Where gates are required for trail which cross stock grazing area, they shall be a self-closing lever latch type gate as manufactured by Powder River.



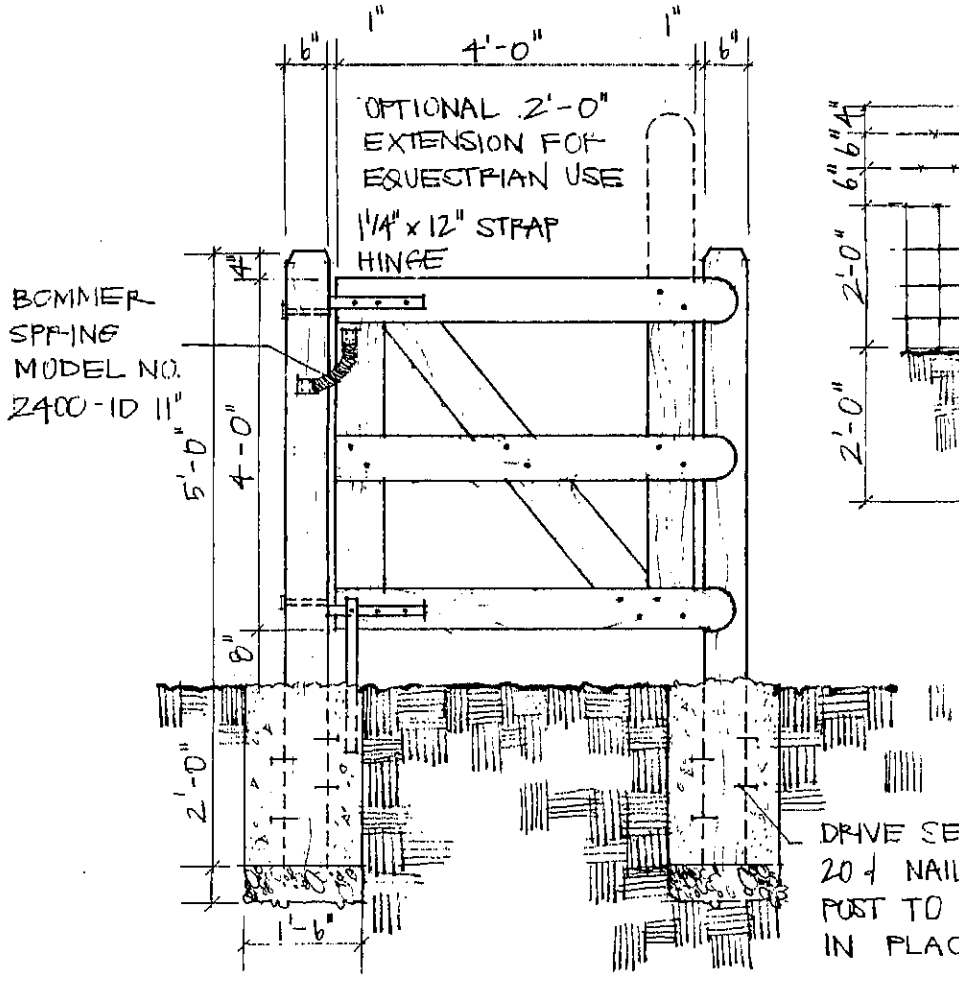
3 RAIL SPLIT FENCE OF CEDAR OR OTHER WOOD SUITABLE FOR BELOW GRADE INSTALLATION.

POSTS TO HAVE A MIN. DIA. OF 6"

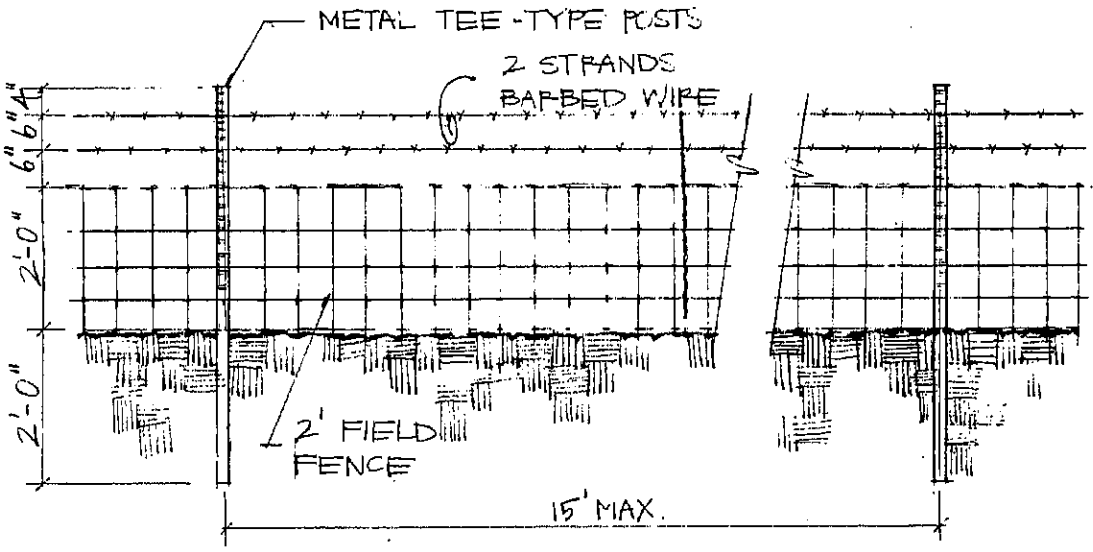
RAILS TO HAVE A MIN. DIA. OF 4"

GUIDELINES FOR USE:
THIS IS THE TYPICAL FENCE ALONG THE U224 ENTRY CORRIDOR.

ANY NEW DEVELOPMENTS ALONG THE ENTRY SHOULD USE THIS SAME DESIGN. USE WHERE TRAIL SEPARATION IS NEEDED FROM ADJACENT LANDOWNERS.

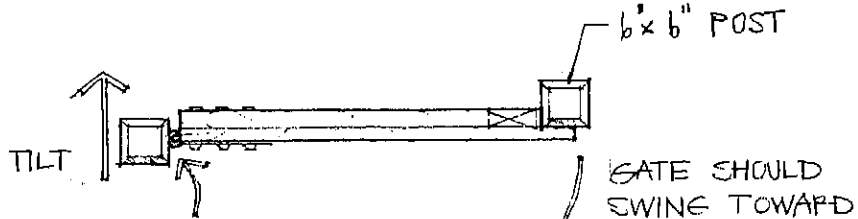


ELEVATION



STOCK FENCE

NOTE:
USE SELF CLOSING GATE WHERE TRAIL PASSES THROUGH UNFENCED GRAZING PROPERTIES.



PLAN

SELF CLOSING GATE

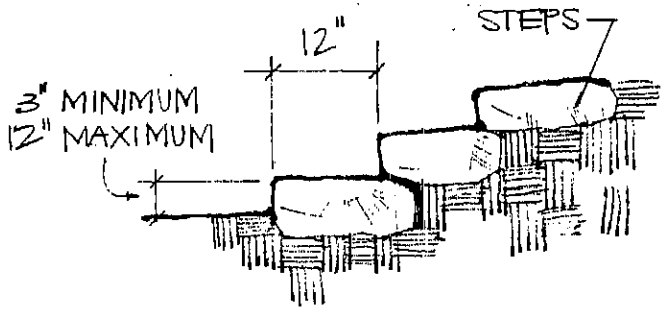
16. Stairs

Stairways

Trails in excess of the slopes indicated on the Trails Matrix should consider stairways. Stairways may be required to conform to the requirements set forth in the Uniform Building Code.

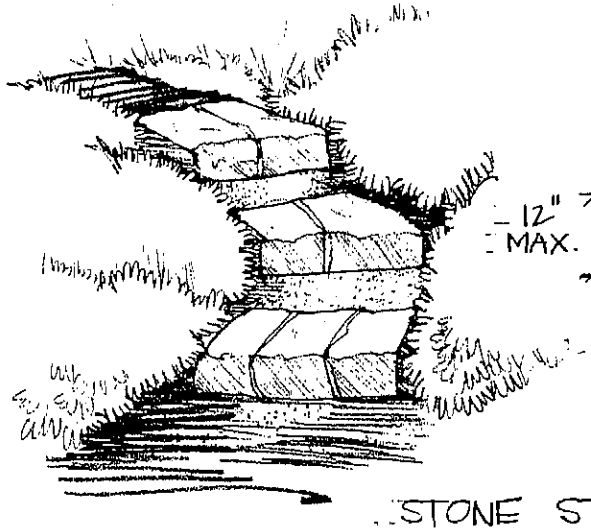
All wooden stairways shall be constructed of pressure treated or an approved rot resistent timber.

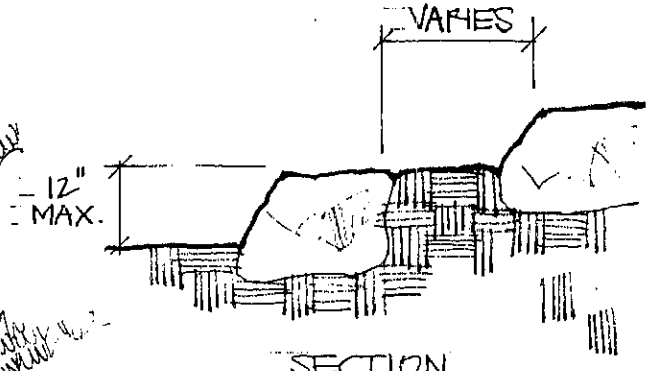
STAIRS OPTION



SECTION

NOTE: A MAXIMUM OF 10 VERTICAL IS ALLOWED BETWEEN LANDING AREAS.





SECTION

STONE STAIRS FOR BACKCOUNTRY TRAILS

GUIDELINES FOR STAIRS

STONE STAIRS CAN BE USED WHERE TRAIL GRADES EXCEED THE MAXIMUM ALLOWABLE SLOPES AND WHERE GRADE MUST BE GAINED QUICKLY. STAIRS SHOULD NOT BE USED ON TRAILS WHICH ARE USED BY HORSES ROAD BIKES OR THE DISABLED. THIS DETAIL IS INCLUDED FOR REFERENCE ONLY. STONE STAIRS SHOULD BE BUILT WITH THE INTENT THAT INTENSIVE USE SHOULD NOT IMPACT THE STAIRS THE SLIGHTEST.

CHOOSE STONES WITH A GOOD SHAPE FOR STAIRS. MINIMUM SIZES ARE SHOWN

START AT THE BOTTOM AND WORK UP

USE THE BIGGEST STONES POSSIBLE TO SPAN THE TRAIL. ONE STONE WOULD BE THE BEST, TWO ARE FINE, AND THREE IS MAXIMUM.

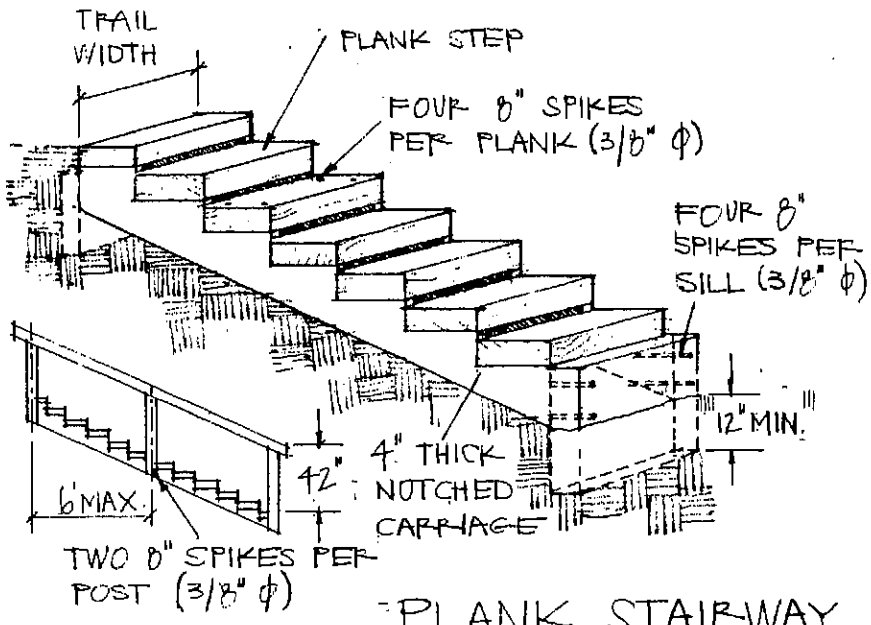
COMPLETELY CROSS THE TRAIL. ROUTE THE TRAIL SO PEOPLE WILL STAY ON THE TRAIL AND STAIRS.

BUILD TO THE DIMENSIONS SHOWN AND MAKE EACH SET OF STAIRS UNIFORM.

KEEP THE HEIGHT OF EACH STEP AND THE DISTANCE BETWEEN STEPS AS UNIFORM AS POSSIBLE WITHIN EACH SET OF STAIRS.

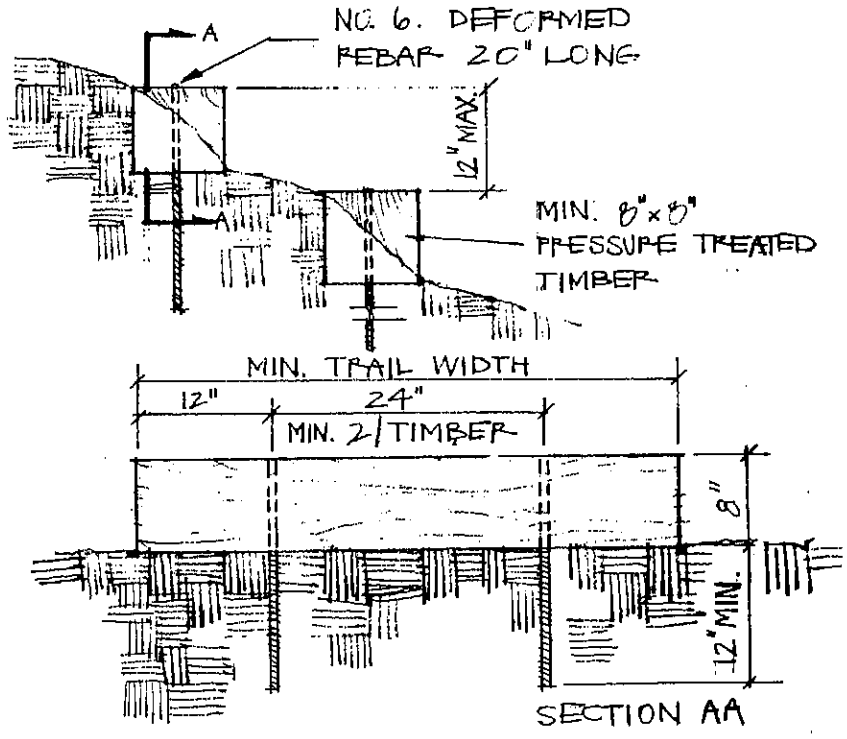
MAXIMUM GRADE AT TOP AND BOTTOM OF STAIRS AS WELL AS BETWEEN STAIRS SHOULD BE 0%.

WALK YOUR STAIRCASE TO ENSURE IT IS SMOOTH AND UNIFORM.



PLANK STAIRWAY

NOTE:
WHERE STAIRS ARE LOCATED IN DEVELOPED AREAS OF THE COMMUNITY, COMPLIANCE WITH THE UNIFORM BUILDING CODE IS REQUIRED

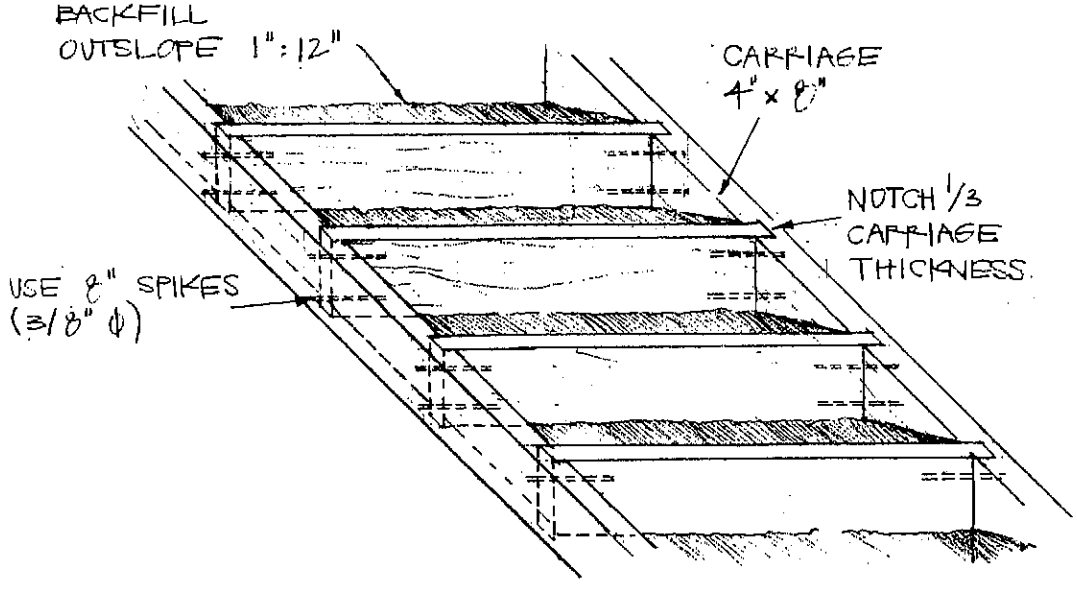


PINNED STAIRWAY

TREADS TO BE DUG INTO THE SLOPE AND SET INTO PLACE.

DRILL HOLES THROUGH EACH TREAD FOR EACH REBAR STAKE.

DRIVE REBAR STAKES THROUGH TREADS AND INTO GROUND BELOW.

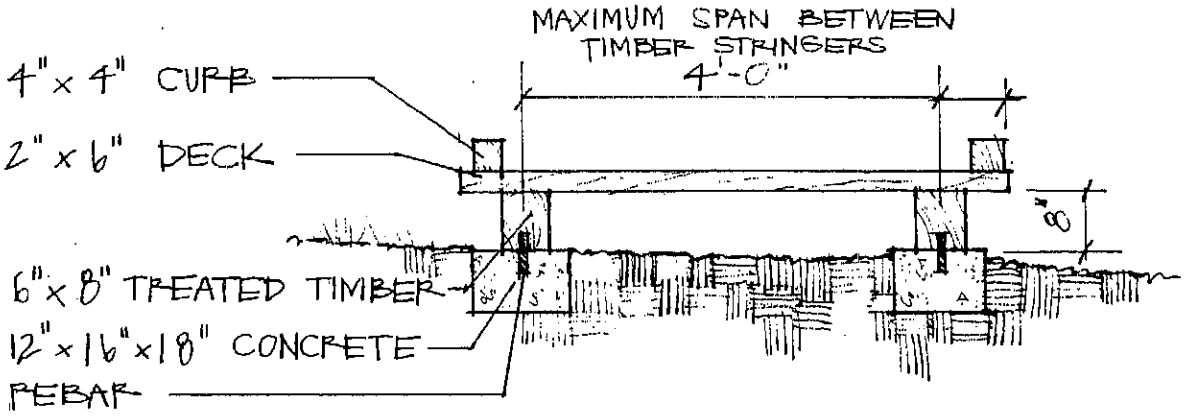


CRIB-LADDER STAIRWAY

17. Boardwalks

Boardwalks

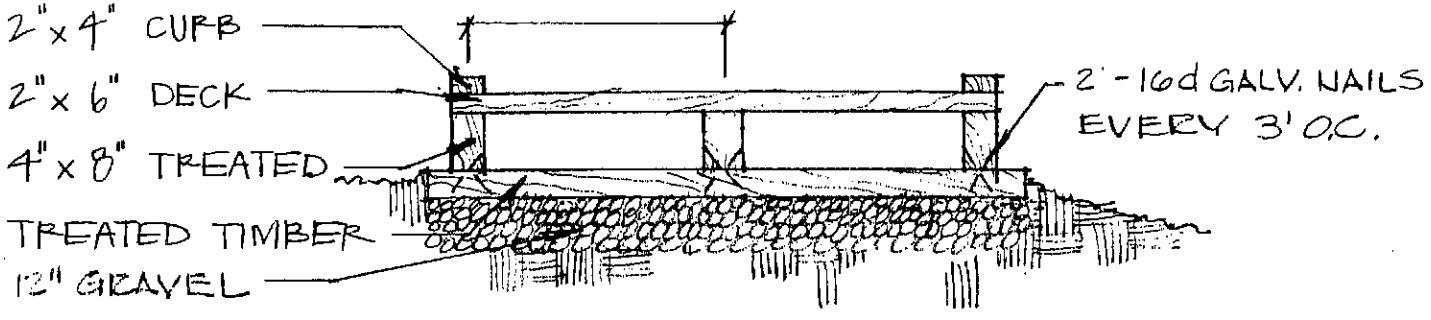
All wood used in boardwalk construction shall be pressure treated or an approved rot resistent timber.



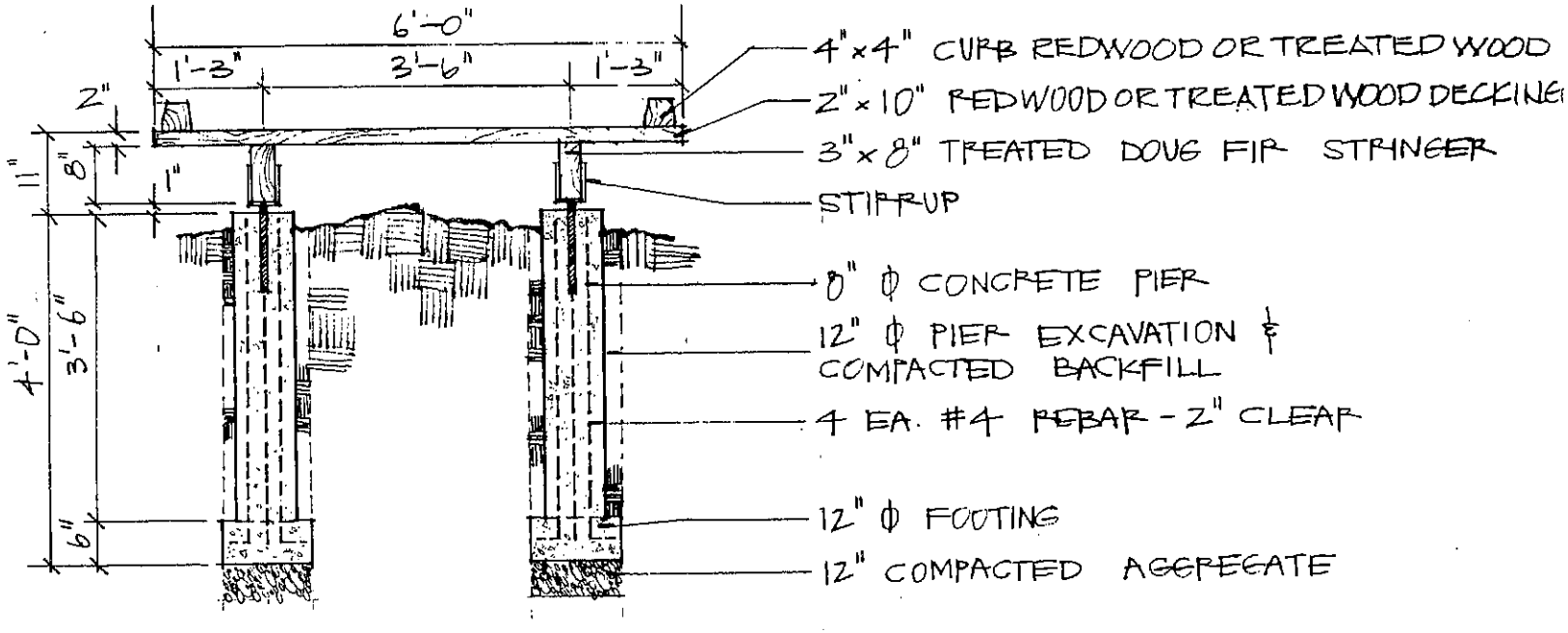
BOARDWALK DETAIL - A

BOARDWALK GUIDELINES FOR USE IN WETLANDS OR OTHER LOCATIONS WHERE CONVENTIONAL PAVEMENT IS NOT PRACTICAL OR APPROPRIATE.

DO NOT USE WHERE MOTORIZED VEHICLES OR HORSES ARE EXPECTED.



BOARDWALK DETAIL - B



BOARDWALK DETAIL - C

18. Root Barriers

Root barriers

Should be installed along the edges of trails where riparian or aggressively suckering vegetation is present. Willows, Gamble's oak, aspens and cottonwoods are examples of aggressively spreading plants. Trails where irrigated land is on one side of the trail and non-irrigated land is on the other may cause water seeking vegetation in the non-irrigated side to send roots to the irrigated side. In this case, a root barrier should be installed.

Weed or root barriers may be necessary where invasive vegetation is located adjacent to the trail or where one side of the trail is irrigated and the other side is not and where woody vegetation may seek water on the irrigated side of the trail.

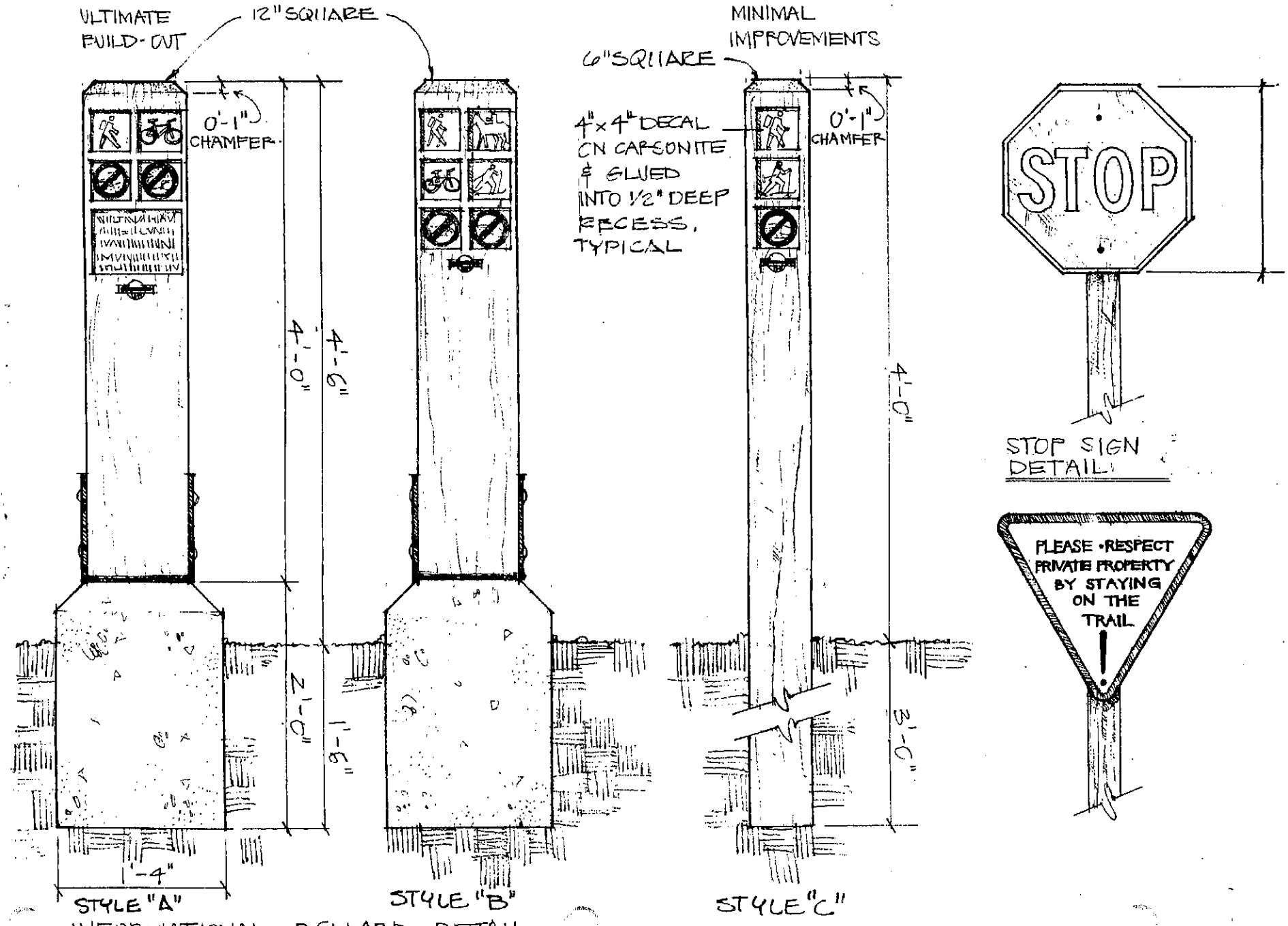
19. SIGNS

Bollards, Posts and Typical Attachment Systems

Sign Bollards - To be located at all trail access points. Style "A" or "B" to be located at trail head facilities. "A" is for all named trails such as the Historic Union Pacific Rail Trail or the designated access to the Great Western Trail. "C" is for all other access points. Style "C" can be used in conjunction with plain bollards where motorized access is restricted. The individual symbols are 3" square, reflective decals that can be ordered from Carsonite International. They should be mounted on __ gauge aluminum plate, routed into the post a minimum of 1/2" and epoxyed into place. All bollards shall be constructed of pressure treated doug. fir.

Sign Posts - Post location shall conform to the standards set forth in the Manual on Uniform Traffic Control Devices section on Traffic Control Devices for Bicycle Facilities. Sign posts shall be 4x4 pressure treated Doug. fir embedded into the ground a minimum of 24" unless other materials are specifically approved.

Attachment Systems - Signs should be attached to wood posts with 1/2" diameter galvanized carriage bolts in a minimum of 2 locations per post.



INFORMATIONAL BOLLARD DETAIL

Signs

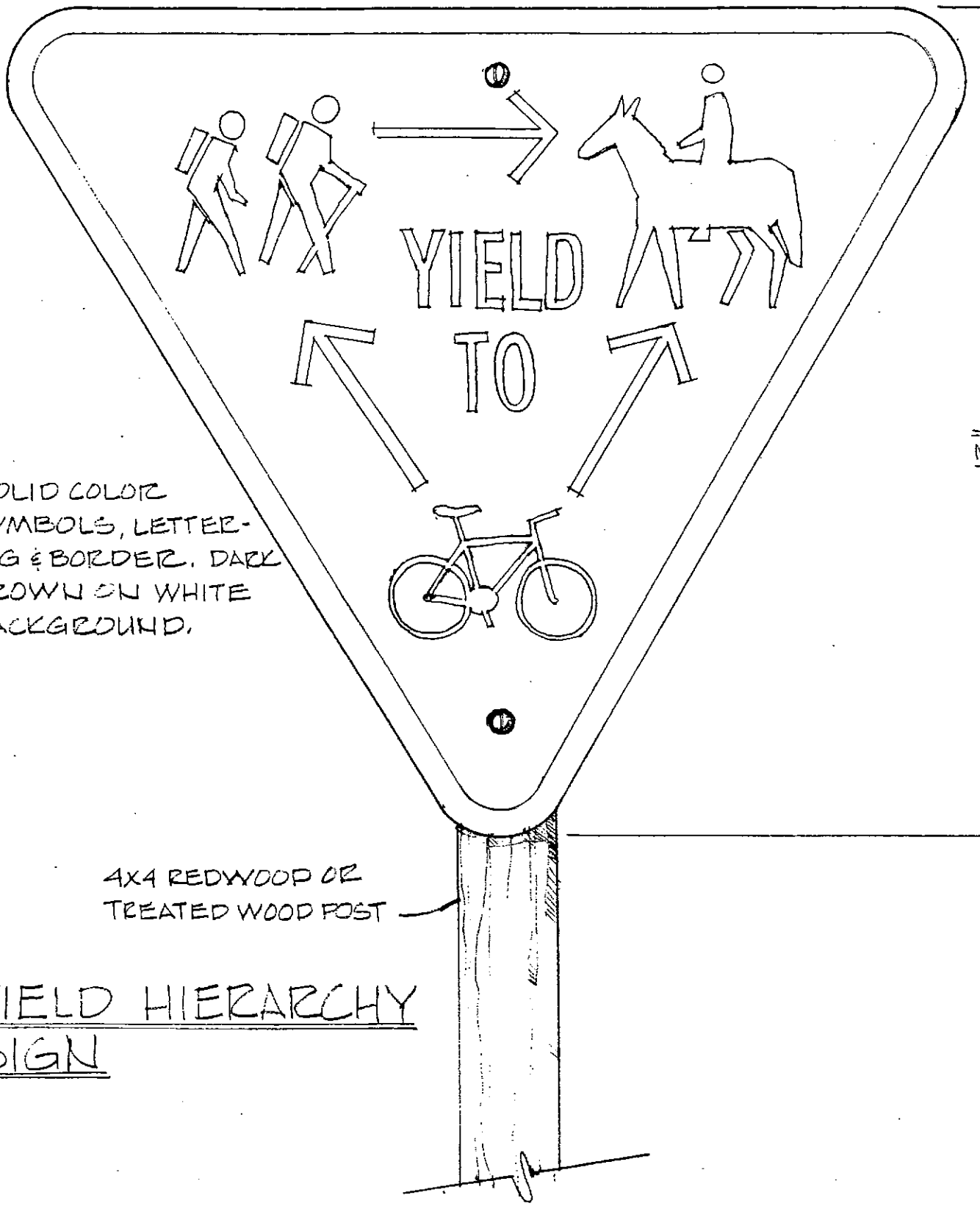
Specific location of signs needs to be evaluated on a case by case basis. The following guidelines are intended to provide general direction for signs and their placement. Signs should be posted only where necessary to avoid over signing. See Construction Details for specific sign specifications. Signs along trails which are constructed by private parties shall be supplied by Park City Municipal Corporation, paid for and installed by the private party constructing the trail. The Public Works Department keeps a stock of commonly used signs. Contractors should notify the Public Works Department a minimum of 30 days prior to trail completion to assure the signs they need are available.

1. Informational signs
   a. Signs indicating allowed uses should be posted at trailheads.
   b. Trail courtesy signs should be posted at trailheads and access points.
   c. At high volume multiple-use trailheads, informational signs indicating user etiquette should be posted.
   d. At trail access points, a shortened user courtesy sign should be installed.

2. Regulatory signs
   a. Stop signs should be placed at all road crossings along major trail corridors unless traffic is required to stop at trail intersections.
   b. Speed limit and slow signs should be installed where trails approach maximum slopes and areas with limited sight distance.
   c. Curve signs should be placed at curves which have a smaller than recommended travel radius and/or limited sight distance. Curve signs should be posted at points along the trail where travel at a moderate rate would cause a trail user to leave their lane.
   d. Dismount signs should be posted in areas where slope exceeds recommended standards and where trail width is less than recommended standards.
   e. School zone signs should be posted near schools.

Yield Hierarchy Sign

Sign Placement - This sign should be placed at all major access points of multiple use trails. It should be located where it is clearly visible and where it does not impede trail use or present a hazard to trail users.



SOLID COLOR SYMBOLS, LETTERING & BORDER. DARK BROWN ON WHITE BACKGROUND.

4X4 REDWOOD OR TREATED WOOD POST

YIELD HIERARCHY SIGN

Trail User Information Sign

Sign Placement - This sign should be placed at all major trailhead facilities and city parks where trails are accessed. It should be located where it is clearly visible and where it does not impede trail use or present a hazard to trail users.

WELCOME TO PARK CITY TRAIL SYSTEM
TRAIL USER INFORMATION :

ALL VISITORS :

Respect the privacy of landowners along the trail system. Please leave no trace of your passage, pack out all trash. Respect trail closures implemented to protect visitors and natural resources.

HIKERS AND PEDESTRIANS :

Be aware that you are sharing the trails with cyclists and equestrians. Please yield to equestrians, and allow ample space for their passage.

CYCLISTS AND OTHER FORMS OF HUMAN - POWERED TRANSPORTATION :

Yield to hikers and equestrians. Please dismount when encountering equestrians on steep slopes, or in areas with limited sight distance. Alert other trail users with a bell, or other audible signal when approaching from behind. Please use a helmet and gloves. Ride at a safe and controlled speed.

Trail Courtesy Sign

Sign Placement - This sign should be placed on the same post as the Yield Hierarchy sign wherever the Trail User Information sign is not located also.

REMEMBER TRAIL COURTESY

1. IF IN DOUBT YIELD

2. RESPECT HORSES

3. RIDE SAFELY AND AWARE

4. ALERT OTHERS WHEN APPROACHING

5. LEAVE NO TRACE

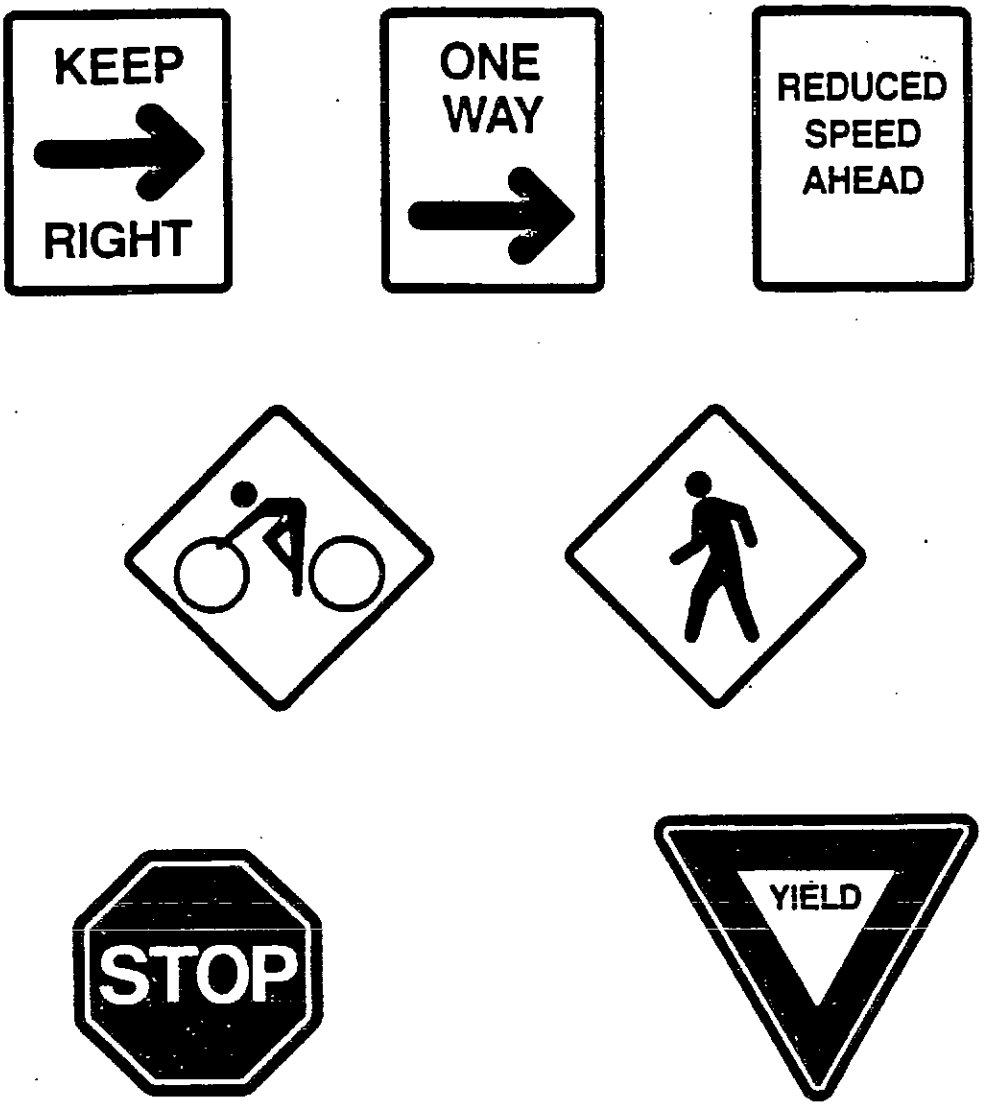
Stop and Private Property Signs

Stop Signs - Stop signs shall be installed wherever paved multiple use trails cross public streets or other potentially hazardous areas.

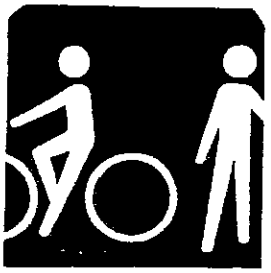
Private Property - This sign should be located on an as needed basis.

Regulatory Signs

Requirements for the use and placement shall follow the standards set forth in the Manual on Uniform Traffic Control Devices section on Traffic Control Devices for Bicycle Facilities and apply to all multi-use paved trails.

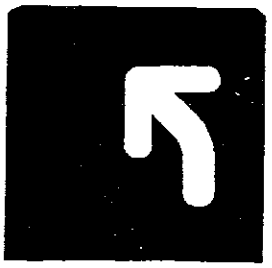


Examples of other signs available. Copy and graphics can be altered to fit your needs and size.



Slow

Dismount



Caution

A second honored design by the Hanlon Group of Boulder, Colorado, is this system of signs designed for bicycle riders. Initiated first for the University of Colorado, which needed help in resolving the separation of bike, pedestrian, and car traffic on its campus, the program was later expanded for use in similar areas throughout the Boulder area. Unlike most traffic signs that are 8 ft high, meant to be read from a car or truck, these signs are 5 ft high, a height calculated as eye level for bike riders. Graphics tell riders what they are allowed to do, where they are allowed to ride, where they should dismount. "Before this system," the designers say, "riders felt as though they were being punished for bike riding. Now they feel that they have rights." A consistency in appearance makes the signs easily identifiable: on a brown background, there are white symbols, blue letters for standard messages, and red letters for regulatory messages. Sign faces are 14 in. × 17 in.

Materials and fabrication: Sign faces use vinyl Mylar sheets with adhesive backs. Supporting posts of 2 in. × 3 in. steel with rounded corners.

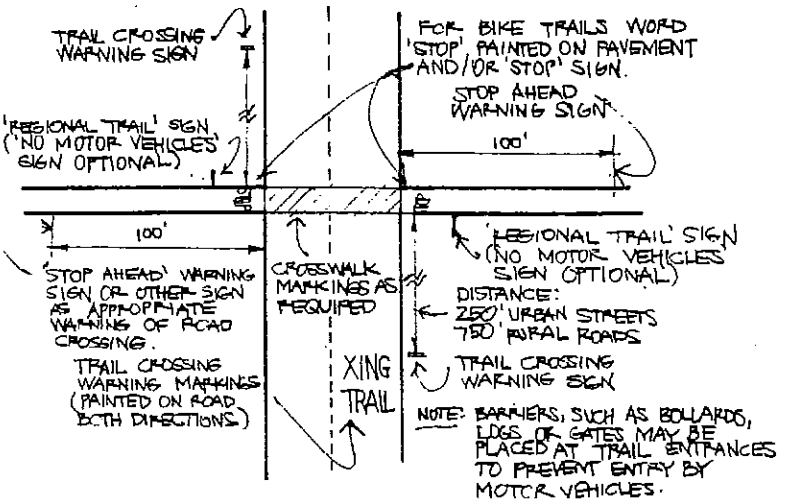
Client:
University of Colorado, Boulder, Colorado.

Staff design:
Bill Deno.

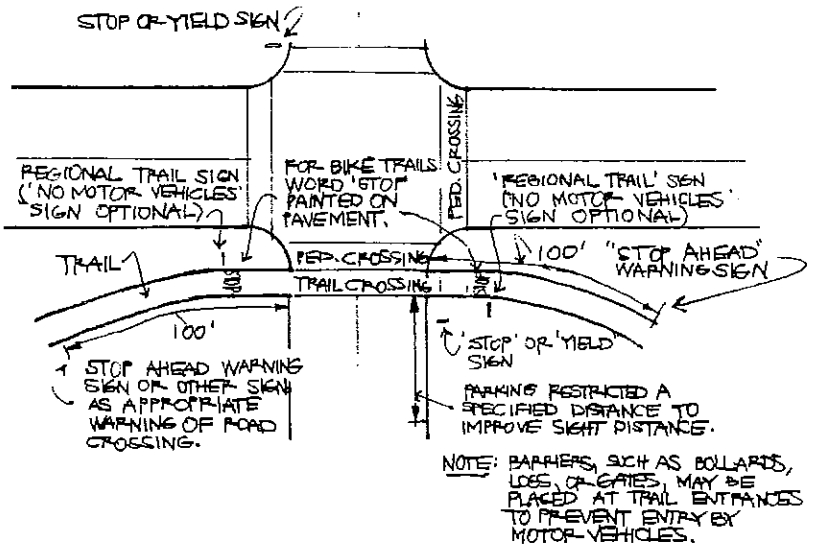
Consultant design:
Hanlon Design Group: Gary Hanlon

Intersection Signs

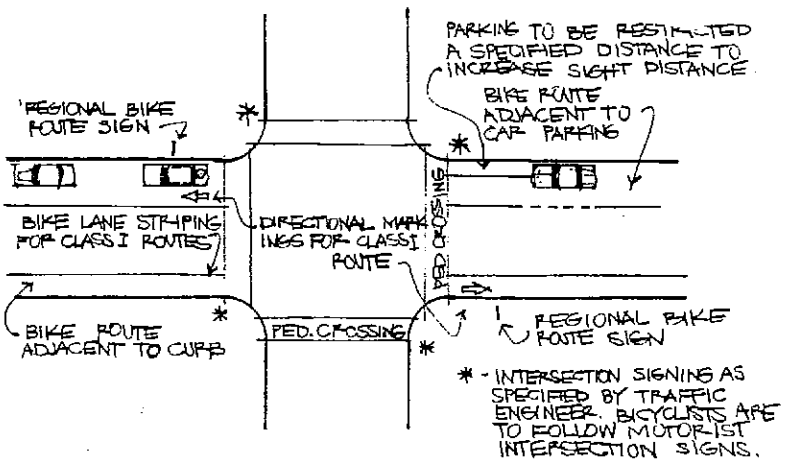
Requirements for the use and placement shall follow the standards set forth in the Manual on Uniform Traffic Control Devices section on Traffic Control Devices for Bicycle Facilities and apply to paved trails.



TYPICAL SIGNING - TRAIL CROSSING AT MID-BLOCK



TYPICAL SIGNING - TRAIL CROSSING AT INTERSECTION



TYPICAL SIGNING - ON STREET BIKE ROUTE CROSSING

Trail Courtesy Brochure

The following brochure is an example of what another community has done to encourage safe and courteous multiple use of their trail facilities. Any maps, guides, other trail related literature, or trail user education or orientation programs should contain similar information.

EQUESTRIANS

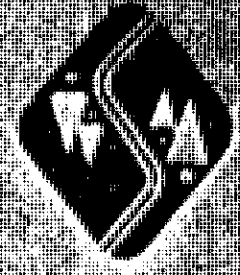
- Travel at a safe speed. Slow to a walk when approaching or overtaking other users.
- Walking, trotting and slow cantering are appropriate on these trails.
- Horses have the right-of-way over bikes.
- Do not ride on the trail when it is muddy. Deep hoof ruts are difficult to repair and make the trail hazardous to other users.
- Stay on the trail.

HIKERS/RUNNERS

- Be alert and aware of the needs of other users. Pass equestrians with caution.
- Stay on the trail.

BICYCLISTS

- Ride single file when passing or being passed.
- Yield right-of-way to all other users.
- Use of a helmet is advised.
- Control your speed. Have your bike under control at all times.
- Stay on the trail for optimum traction. Spinning damages trails.
- Do not ride in the mud or on trails where ruts are created by your tires.



For more information on South Suburban's Trail System, Call 798-6131.

This information made available by Metro Trail System Committee.

Trails are for Everyone

SHARE THE TRAIL

With increased awareness of the need for healthful outdoor exercise, multiple-use trails for non-motorized use have become extremely popular. As a result, they can sometimes become crowded, and safety can be a major issue.

SUGGESTED GENERAL RULES

- **Be Courteous.**
  All trail users need to be respectful of other users, regardless of their mode, speed, or level of skill.
- **Be Predictable.**
  Travel in a consistent and predictable manner. Always glance behind before changing position on the trail.
- **Do Not Block The Trail.**
  When in a group or with a pet, use no more than half the trail. Do not block the flow of other users. Pets should be on a leash.
- **Keep Right.**
  Stay as near the right side of the trail as is safe, except when passing.
- **Pass On The Left.**
  Look ahead and back to be sure the lane is clear before you move out. Give the other user plenty of room as you pass.
- **Use Lights at Night.**
- **Slower Traffic Has The Right-of-Way.**
  Faster traffic is responsible for yielding to slower and on-coming traffic.
- **Let Other Users Know You Are About To Pass.**
  Using your voice, a bell or horn, give a clear warning signal before passing, such as "passing on your left."
- **Yield When Entering Or Crossing Trails.**
  At uncontrolled points, yield to traffic.
- **Keep The Trail Clean.**
  Use litter baskets, and make it your personal responsibility to keep the trail [illegible].

Appendix

D6.1—1978

MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES

FOR STREETS AND HIGHWAYS

THIS EDITION DEVELOPED WITH THE COOPERATION OF
THE NATIONAL ADVISORY COMMITTEE
ON UNIFORM TRAFFIC CONTROL DEVICES

American Association of State Highway & Transportation Officials
Institute of Transportation Engineers
National Committee on Uniform Traffic Laws and Ordinances
National Association of Counties
National League of Cities
National Association of Governors' Highway Safety Representatives
International Association of Chiefs of Police, Inc.
National Electrical Manufacturers Association
American Road and Transportation Builders' Association
International Bridge, Tunnel & Turnpike Association

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
1978

Part IX. TRAFFIC CONTROLS FOR BICYCLE FACILITIES

A. GENERAL

9A-1 Requirements for Bicyclist Traffic Control Devices

Traffic control devices, whether they are intended for motorists or bicyclists, must adhere to five basic requirements to be able to perform their intended function. They must:

1. Fulfill a need.
2. Command attention.
3. Convey a clear, simple meaning.
4. Command respect of road users.
5. Give adequate time for proper response.

The design, placement, operation, maintenance, and uniformity of traffic control devices must be considered to meet the above requirements. Design is a critical feature to permit the device to fulfill a need and to command respect of road users. The placement—lateral, vertical, and longitudinal—plays an important part in making the device effective and in giving adequate time for proper response. The operation of traffic in response to the device is, of course, the critical test of the device's effectiveness and a check on all five of the basic requirements.

Uniformity, achieved by following the recommendations and standards of this Manual, greatly enhances the ability of a device to convey a clear, simple meaning to the user.

Whenever devices are installed, they should be warranted and based on a prior engineering study. Where the guidance provided by this part of the Manual does not fully define where particular devices should be used, qualified traffic engineers should determine the application of devices on any bicycle facility before installation is made. It is intended that this Manual define the standards for traffic control devices, but shall not be a legal requirement for their installation.

9A-2 Scope

This Part covers bicycle-use related signs, pavement markings and signals which may be used on highways or bikeways.

9A-3 Definitions Relating to Bicycles

The following terms are used throughout Part IX:

1. Bikeway—Any road, street, path, or way which in some manner is specifically designated as being open to bicycle travel, regardless of whether such facilities are designated for the exclusive use of bicycles or are to be shared with other transportation modes.
2. Bicycle Trail—A separate trail or path from which motor vehicles are prohibited and which is for the exclusive use of bicycles or the shared use of bicycles and pedestrians. Where such trail or path forms a part of a highway, it is separated from the roadways for motor vehicle traffic by an open space or barrier.
3. Designated Bicycle Lane—A portion of a roadway or shoulder which has been designated for use by bicyclists. It is distinguished from the portion of the roadway for motor vehicle traffic by a paint stripe, curb, or other similar device.
4. Shared Roadway—A roadway which is officially designated and marked as a bicycle route, but which is open to motor vehicle travel and upon which no bicycle lane is designated.
5. Bicycle Route—A system of bikeways designated by appropriate route markers, and by the jurisdiction having authority.

9A-4 Standardization of Devices

Standards for basic design elements and devices using these standards are given in this Manual. These standard devices generally will serve most applications. Where particular conditions require the use of a device that is not included in this Manual, the general principles in this Manual as to color, size, and shape should be followed wherever practical. Such devices should also follow the design, installation and application concepts contained in the Manual.

9A-5 Maintenance

Bicycle signs and markings should be properly maintained to command respect from both the motorist and the bicyclist. When installing signs and markings on bicycle facilities, care should be taken to have an agency designated to maintain these devices.

9A-6 Legal Authority

Traffic control devices shall be placed only by the authority of a public body or official having jurisdiction, for the purpose of regulating, warning, or guiding traffic. No traffic control device or its support shall bear any advertizing or commercial message, or any other message that is not essential to traffic control.

All regulatory devices, if they are to be enforced, need to be backed by applicable laws, ordinances, or regulations.

9A-7 Meanings of "Shall," "Should," and "May"

In this Part as in other parts of the Manual, the words "shall," "should," and "may" are used to describe specific conditions concerning traffic control devices. To clarify the meanings intended by use of these words, the following definitions are provided:

1. SHALL—A *mandatory* condition. Where certain requirements in the design or application of the device are described with the "shall" stipulation, it is mandatory that these requirements be met.
2. SHOULD—An *advisory* condition. Where the word "should" is used, it is considered to be advisable usage, recommended but not mandatory.
3. MAY—A *permissive* condition. No requirement for application is intended. If a particular device is used under a "may" condition, however, its design shall follow the prescribed format.

9A-8 Relation to Other Documents

The Uniform Vehicle Code and Model Traffic Ordinance published by the National Committee on Uniform Traffic Laws and Ordinances, have provisions for bicycles and are used as the legal basis for the control devices included herein. Under the Uniform Vehicle Code, bicycles are generally considered to be vehicles, so the bicyclists have the same privileges and obligations as other drivers.

Informational documents used during the development of the signing and markings recommendations in this part of the Manual include the following:

1. Guide for Bicycles, American Association of State Highway and Transportation Officials, 1974.
2. Bikeways, State of the Art, Federal Highway Administration, 1974.
3. Bicycle Facility Location Criteria, Federal Highway Administration, 1976.
4. Bicycle Facility Design Criteria, Federal Highway Administration, 1976
5. State and municipal design guides.

Other documents which relate to the application of traffic control devices in general, are listed in section 1A-7 of this Manual.

9A-9 Colors

The use of colors for bicycle facility traffic control devices should conform to the color code specified in section 1A-8 for signs and markings. This in part is as follows:

YELLOW—General warning
RED—Stop or prohibition
BLUE—Service guidance

GREEN—Indicated movements permitted, direction guidance
BROWN—Public recreation and scenic guidance
ORANGE—Construction and maintenance warning
BLACK—Regulation
WHITE—Regulation

8. SIGNS

9B-1 Application of Signs

Bicycle—use related signs on highways and bikeways serve three basic purposes; regulating bicycle usage, directing bicyclists along pre-established routes, and warning of unexpected conditions. Care should be taken not to install too many signs. A conservative use of regulatory and warning signs is recommended as these signs, if used to excess, tend to lose their effectiveness. The frequent display of guide signs, however, aids in keeping the bicyclist on the designated route and does not lessen their value. Some signs for the bicyclist can also serve the motorist and the pedestrian.

9B-2 Location and Position

Where signs are to serve both bicyclists and motorists, mounting heights and lateral placement shall be as specified in Part II, Signs. Figure 9-1 illustrates typical signing placement for bicycle trails. Overhead sign clearance on bicycle trails shall be a minimum of 8½ feet. The clearance provided should also be adequate for the typical maintenance vehicles used on the bikeway. Where signs are for the exclusive use of bicyclists, care should be taken that they are located so that motorists are not confused by them.

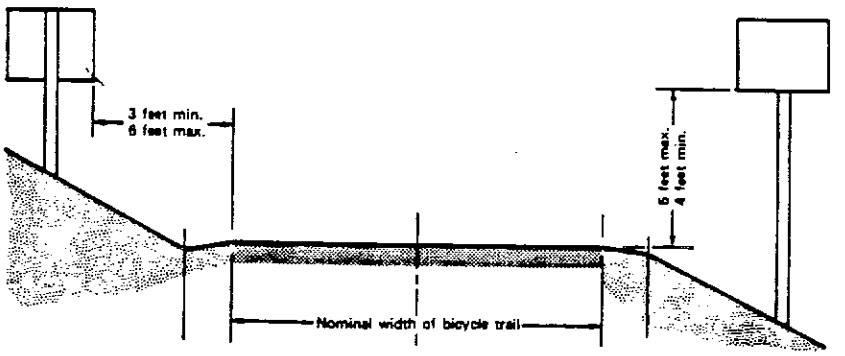


Figure 9-1. Bicycle sign placement on a trail.

9B-3 Design

The design of signs for bicycle facilities should, wherever possible, be identical to that specified in this Manual for motor vehicle travel. Uni-

formity in design includes shape, color, symbols, wording, lettering, and illumination or reflectorization. Detailed drawings of the standard signs illustrated in this Manual are available to State and local highway and traffic authorities, sign manufacturers, and similar interested agencies.* Standardization of these signs does not preclude further improvement by minor changes in the proportion of symbols, stroke width, and height of letters, or width of borders. However, all shapes and colors shall be as indicated, all symbols shall be unmistakably similar to those shown and (where a word message is applicable) the wording shall be as provided herein.

The sign dimensions shown in this part of the Manual shall be considered standard for application on all types of bicycle facilities. Where signs shown in other parts of this Manual are intended for exclusive bicycle use, smaller sign sizes from that specified may be used. Incremental increases in special bicycle facility signs are also desirable to make the sizes compatible with signs for motor vehicles, where both motorists and bicyclists benefit by a particular sign.

The sign lettering shall be in upper-case letters of the type shown in the Standard Alphabets for Highway Signs and Pavement Markings*

All signs should be reflectorized for bicycle trails as well as for shared roadway and designated bicycle lane facilities.

9B-4 Regulatory Signs

Regulatory signs are to inform bicyclists, pedestrians and motorists of traffic laws or regulations and indicate the applicability of legal requirements that would not otherwise be apparent.

Regulatory signs normally shall be erected at the point where the regulations apply. The sign message shall clearly indicate the requirements imposed by the regulations and shall be easily visible and legible to bicyclists and where appropriate, motorists and pedestrians.

9B-5 Bicycle Prohibition Sign (R5-6)

This sign is intended for use at the entrance to facilities, such as freeways, where bicycling is prohibited. Where pedestrians and motor—driven cycles are also prohibited from using these facilities, it may be more desirable to use the R5-10a word message sign (sec. 2B-28).

In reduced size (18 × 18 inches), this sign may be used on sidewalks where bicycle riding is prohibited.

9B-6 Motor Vehicle Prohibition Sign (R5-3)

This sign is intended for use at the entrance to a bicycle trail.

* Available from the Federal Highway Administration (HTO-20) Washington, D.C. 20590

C. MARKINGS

9C-1 Functions and Limitations of Markings

Markings are important on roadways that have a designated bicycle lane. Markings indicate the separation of the lanes for motor vehicle and bicycles, assist the bicyclist by indicating assigned travel paths, and can provide advance information for turning and crossing maneuvers.

9C-2 General Principles

Although bicycles are generally not equipped with strong lighting equipment, the added visibility of reflectorized pavement markings is desirable even where there is exclusive use by bicyclists.

Markings shall be reflectorized on bicycle trails and on facilities used by both motor vehicles and bicycles.

Recognized bikeway design guides should be used when laying out markings for a bicycle lane on a highway facility (sec. 9A-8).

The frequent use of symbols and word messages stenciled in the bike lanes, is a desirable method of supplementing sign messages. Figures 9-4 through 9-6, show acceptable examples of the application of lines, word messages and symbols on designated bikeways with and without parking for motor vehicles.

If a specific path for a bicylist crossing an intersection is to be designated, a dotted line may be used to define such a path.

9C-3 Marking Patterns and Colors

The color and type of lines used for marking bicycle facilities shall be as defined in section 3A-7. Normally, center lines would not be required on bicycle paths. Where conditions make it desirable to separate two directions of travel at particular locations, a double solid yellow line should be used to indicate no passing or no traveling to the left of the line.

Where bicycle paths are of sufficient width to designate two minimum width lanes, a broken yellow line may be used to separate the two directions of travel.

Broken lines used on bicycle paths should have the normal 1 to 3 segment-to-gap ratio. To avoid having gaps excessively long, a nominal 3-foot segment with a 9-foot gap is recommended.

Where bicycles and pedestrians use a common facility, it may be desired to separate the two traffic flows. A solid white line should be used to mark this separation of path use. The R9-7 sign may be used to supplement the pavement marking (sec. 9B-9).

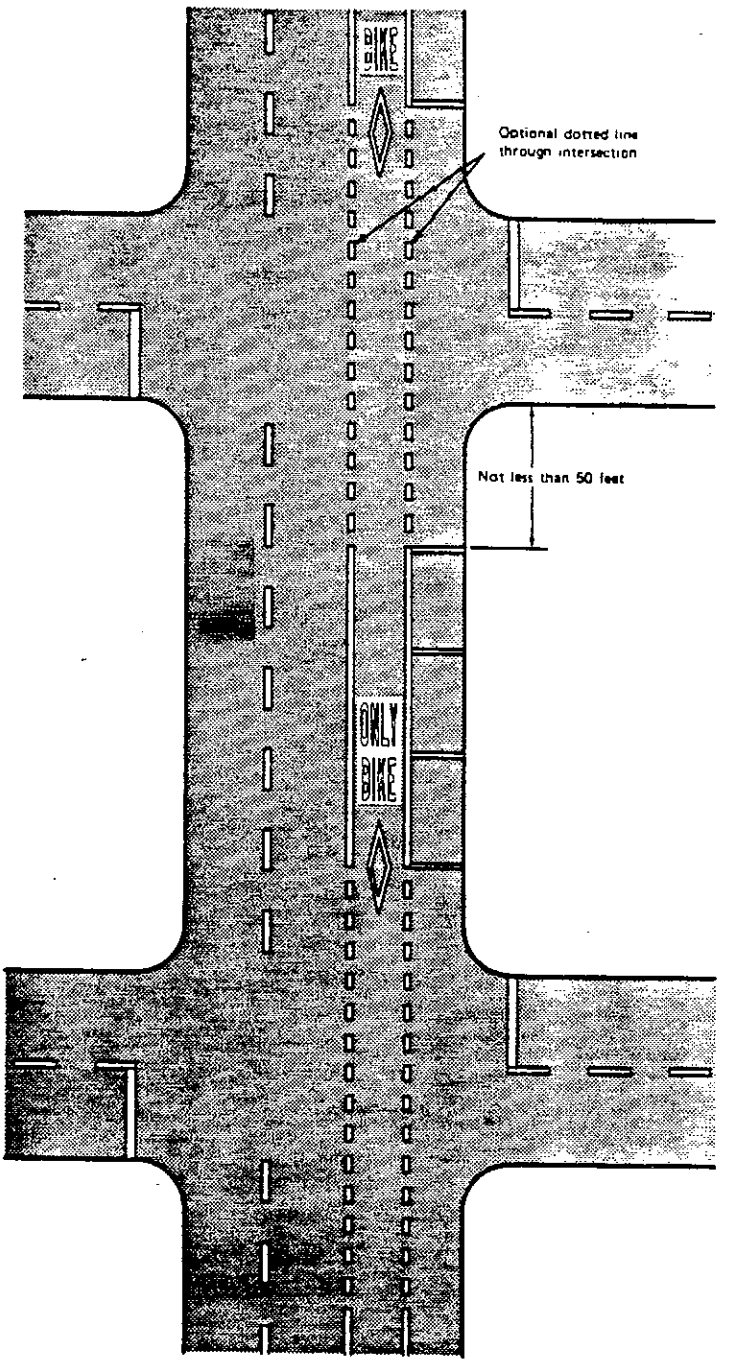


Figure 9-4. Typical pavement markings—designated bicycle lane, two-way traffic with parking and low right turn volume.

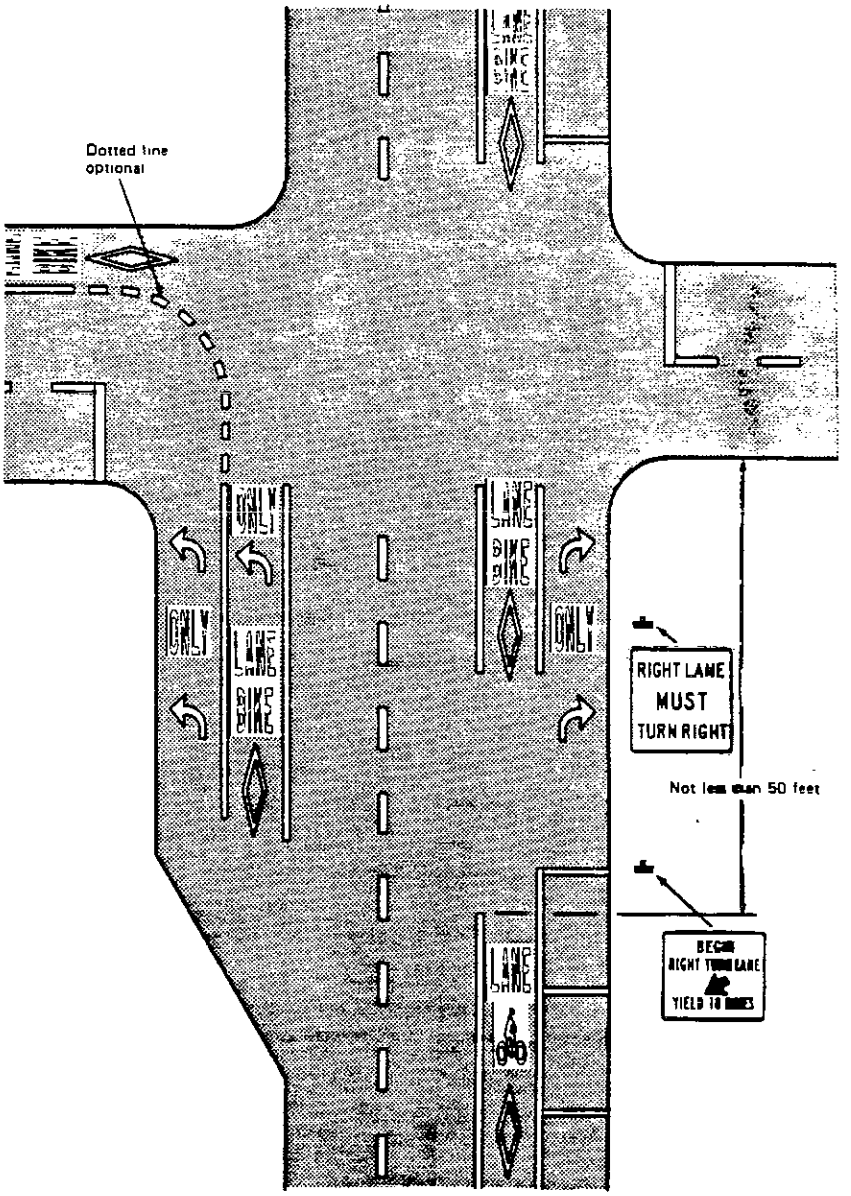


Figure 9-3. Intersection pavement markings—designated bicycle lane with left turn area, heavy turn volumes, parking, one-way traffic or divided roadway.

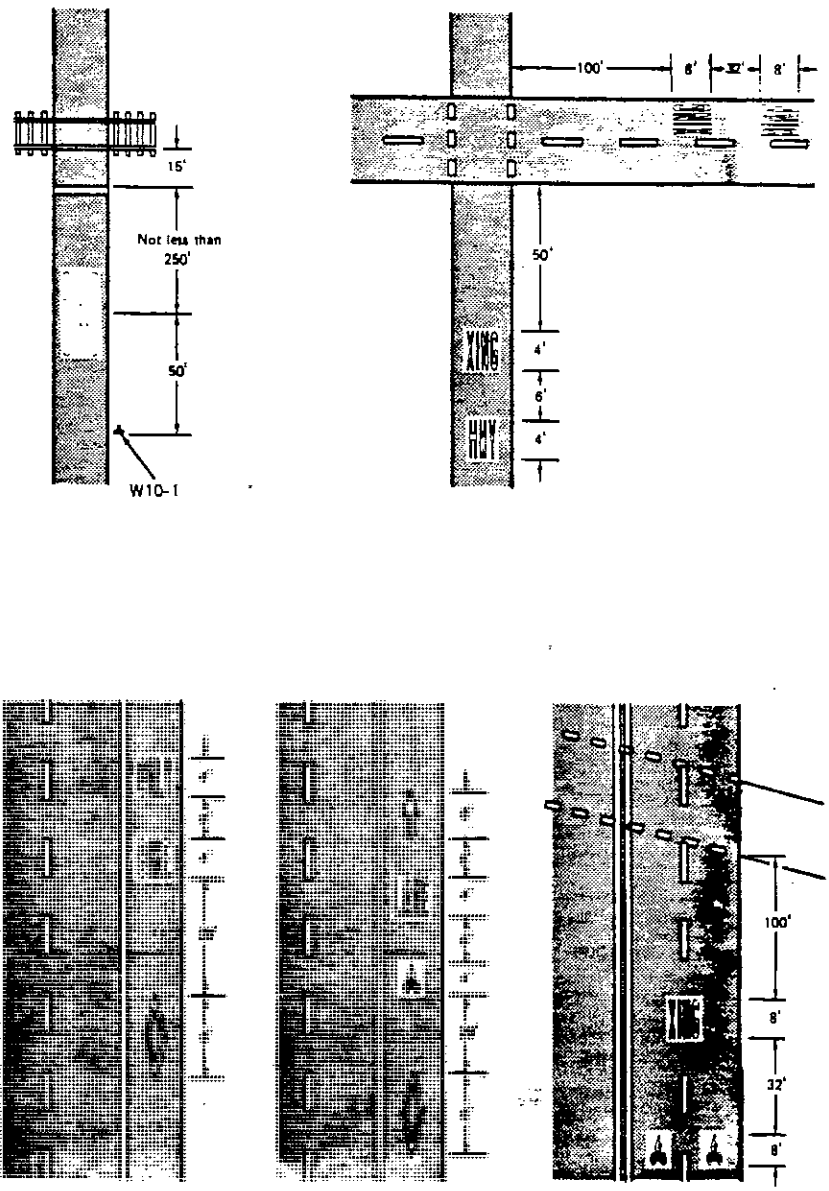


Figure 9-6. Word and symbol pavement markings for bicycle facilities

9C-4 Marking of Designated Bikeways

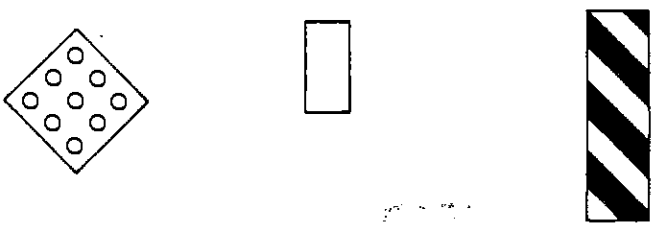
The diamond-shaped Preferential Lane Symbol is intended for use on highway facilities where lanes are reserved for exclusive use by a particular class of vehicle. Designated bikeways are considered as this type of lane and shall include use of the Preferential Lane Symbol as a pavement marking and on appropriate signing (sec. 9B-8). The symbols as a pavement marking shall be white and shall be used immediately after an intersection to inform motorists turning of the restricted nature of the lane. If the Preferential Lane Symbol is used in conjunction with other word or symbol messages, it shall precede them. A supplemental lane symbol or word may be used following as shown in figures 9-4 through 9-6.

9C-5 Word Messages and Symbols Applied to the Pavement

Where messages are to be applied on the pavement, smaller size letters can be used on exclusive bike lanes than are used on regular highways. Where arrows are needed, half-size layouts of the arrows can be used (sec. 3B-17). Optional word and symbol markings considered appropriate for use with the Preferential Lane Symbol marking are shown in figure 9-6. Standard pavement marking alphabets and symbols have been prepared.*

9C-6 Object Markings on Bicycle Trails

There may be hazardous objects located adjacent to bicycle trails which, if visible to the rider, can be avoided with little difficulty. Such objects can be marked with highly visible markings to make their identification by approaching riders more certain. Care should be taken to avoid having object markers become hazardous objects. Corners of object markers as well as signs should be rounded to prevent their becom-



Type I
18"×18"

Type II
6"×12"

Type III
12"×36"

* Available from the Federal Highway Administration (HTO-20) Washington, D.C. 20590

R5-6
24"×24"

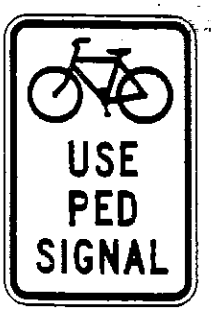
R5-3
24"×24"

9B-7 Bicycle Restriction Signs (R9-5 & 6)

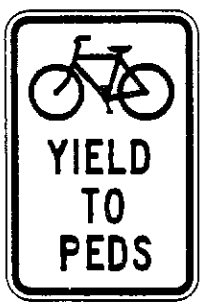
This series of signs is intended for use where pedestrian facilities are being used for bicycle travel. They should be erected off the edge of the sidewalk, near the crossing location, where bicyclists are expected to dismount and walk with pedestrians while crossing the street.

The R9-5 sign may be used where bicycles can cross the street only on the pedestrian walk signal indication.

The R9-6 sign may be used where bicycles are required to cross or share a facility used by pedestrians and are required to yield to the pedestrians.



R9-5
12"×18"

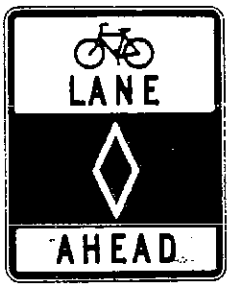


R9-6
12"×18"

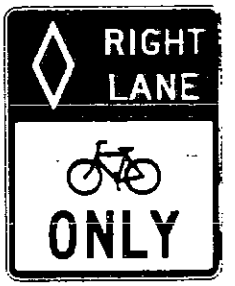
9B-8 Designated Lane Signs (R3-10 & 11)

The R3-10 sign should be used in advance of the beginning of a marked designated bicycle lane to call attention to the lane and to the possible presence of bicyclists. The R3-10 and R3-11 signs should be used only in conjunction with the Preferential Lane Symbol pavement marking and erected at periodic intervals along the designated bicycle lane and in the vicinity of locations where the preferential lane symbol is used (sec. 9C-4).

Where appropriate, the message ENDS may be substituted for AHEAD on the R3-10 sign and LEFT or CURB can be substituted for RIGHT on the R3-11 sign.



R3-10
24"×30"



R3-11
24"×30"

9B-9 Travelpath Restriction Signs (R9-7)

The R9-7 sign is intended for use on facilities which are to be shared by pedestrians and bicycles and on which a designated area is provided for each (sec. 9C-3). Two of these signs may be erected back-to-back with the symbols reversed for the opposite direction.

R9-7
12"×18"

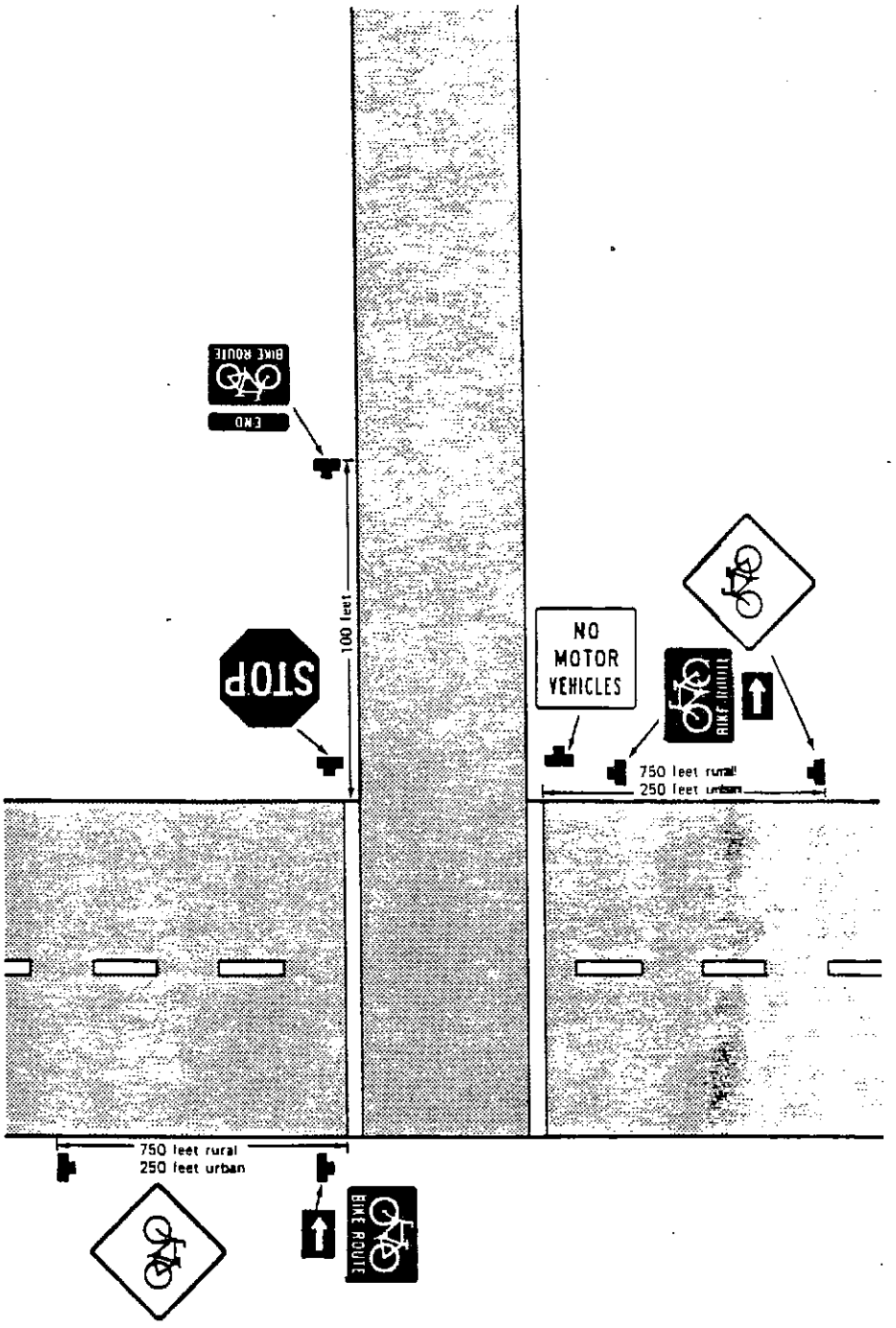


Figure 9-2. Typical signing for beginning and ending of bicycle trail.

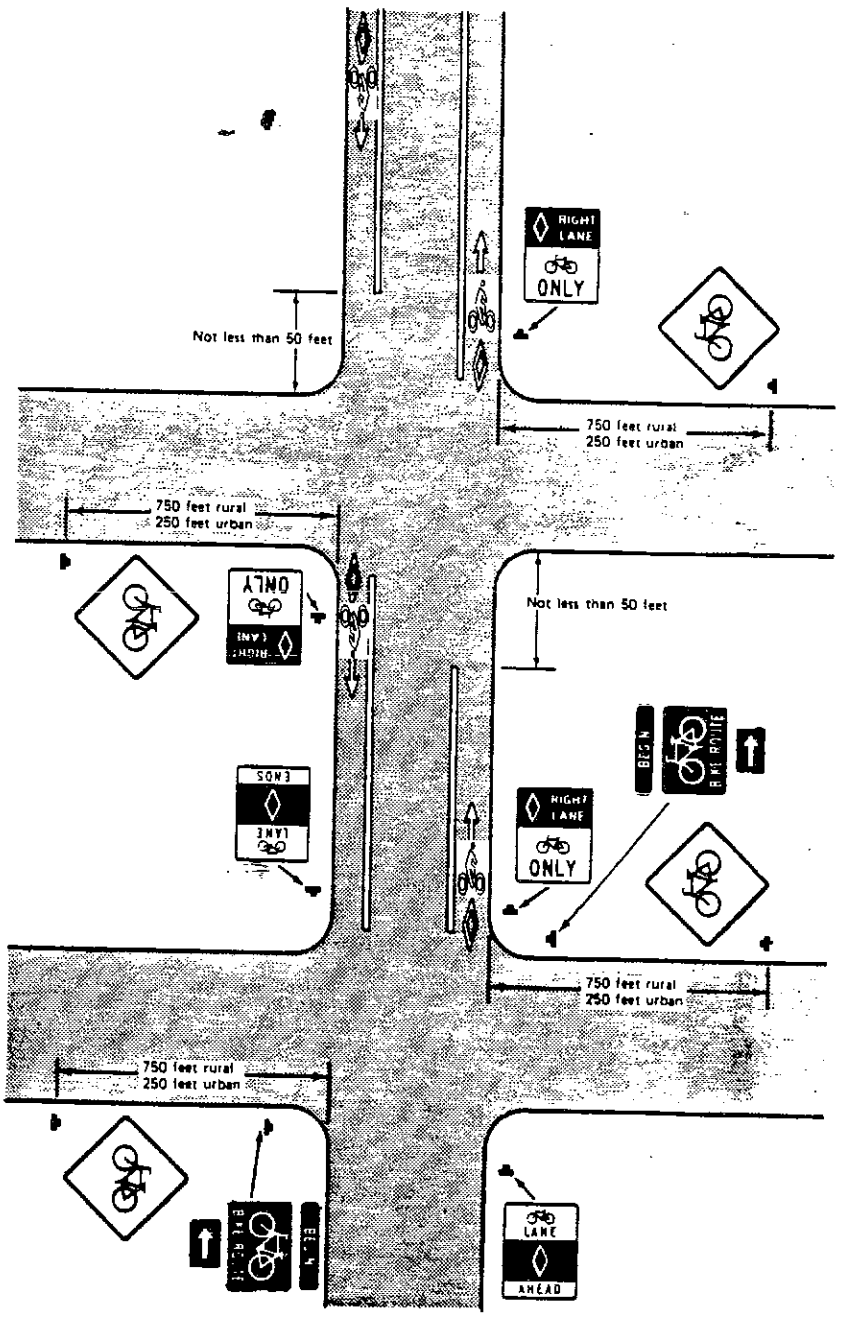


Figure 9-3. Typical signing for beginning and ending of designated bicycle lane.

9B-18 Other Warning Signs

Other warning signs may be required on bicycle facilities to warn riders of unexpected conditions. The intended use of these signs generally is self-explanatory. They should normally be installed no less than 50 feet in advance of the beginning of hazards.

Where construction or maintenance activity is present on bicycle trails, appropriate signs from Part VI of the Manual should be used.

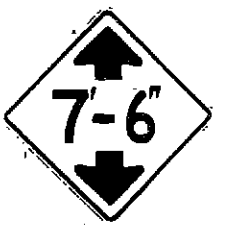
W3-1
18"×18"

W3-3
18"×18"

W5-4
18"×18"

W7-3
18"×18"

W11A-2
18"×18"



W12-2
18"×18"

W10-1
18" Diameter

9B-19 Guide Signs

On highways where a bicyclist is sharing a lane with motor vehicles or is using an adjacent bikeway, the regular guide signing as described in Part II of this Manual will serve both modes of travel. Where a designated bikeway exists, special bicycle route signing should be provided at decision points along the bikeway, including signs to inform cyclists of bicycle route direction changes and confirmatory signs to ensure that route direction has been accurately comprehended.

Figure 9-2 shows an example of the signing for the junction of a bicycle trail with a highway. Figure 9-3 shows the signing and marking for the beginning and ending of designated bikeways. Guide signing should be repeated at regular intervals to ensure that bicyclists approaching from side streets know they are traveling on an officially designated bikeway. Similar guide signing should be used for shared lane bikeways with intermediate signs placed frequently enough to ensure that cyclists already on the bikeway do not stray from it and lose their way.

9B-20 Bicycle Route Sign (D11-1)

This sign is intended for use where no unique designation of routes is desired. It should be placed at intervals frequent enough to keep bicyclists informed of changes in route direction and to remind motorists of the presence of bicyclists.

D11-1
24" × 18"

M1-8
12" × 18"

9B-21 Bicycle Route Marker (M1-8)

Where it is desired to establish a unique identification (route designation) for a State or local bicycle route, the standard Bike Route Marker, M1-8, should be used. The route marker shall contain a numerical designation and shall have a green background with a reflectorized white legend and border. The Bike Route Marker is intended for use on both shared facilities and on designated bikeways, as required, to provide route guidance for bicyclists.

9B-10 STOP and YIELD Signs (R1-1, 2)

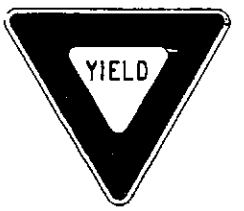
STOP signs are intended for use on bicycle facilities where bicyclists are required to stop. Where conditions require bicyclists and not motorists to stop, care should be taken to place the sign so it is not readily visible to the motorist.

YIELD signs are intended for use where the bicyclist can see approaching traffic and where bicyclist must yield the right of way to that traffic. The visibility of approaching traffic must be adequate to permit the bicyclist to stop or to take other measures to avoid that traffic.

For added emphasis STOP and YIELD signs in regular 30 × 30-inch and 36 × 36 × 36-inch sizes may be used.

The smaller signs shown below are intended for use on bicycle trails where bicyclists are required to stop or yield the right of way. If the sign applies to motorists and bicyclists, then the size should be as shown in Part II-B.

R1-1
18" × 18"



R1-2
24" × 24" × 24"

9B-11 No Parking Signs (R7-9, & 9a)

Where it is necessary to restrict parking, standing, or stopping in a designated bicycle lane, appropriate signs as described in sections 2B-31 through 2B-33 may be used, or signs R7-9 or R7-9a shall be used.

R7-9
12" × 18"

R7-9a
12" × 18"

9B-12 Lane-Use Control Signs (R3-7, R4-4)

Where right turning motor vehicles must merge with bicycle traffic on designated bike lanes, the R3-7 and R4-4 signs may be used. The R4-4 sign is intended to inform both the motorist and the bicyclist of this merging maneuver. Where a designated bicycle lane is provided near the stop line, an R3-7 sign may be used to prevent motorists from crossing back over the bike lane.

R3-7
30" × 30"

R4-4
36" × 30"

9B-13 Warning Signs

Warning signs are used when it is deemed necessary to warn bicyclists or motorists of existing or potentially hazardous conditions on or adjacent to a highway or trail. The use of warning signs should be kept to a minimum because the unnecessary use of them to warn of conditions which are apparent tends to breed disrespect for all signs.

Warning signs specified herein cover most conditions that are likely to be met. If other warnings are needed, the signs shall be of standard shape and color for warning signs, and the legends shall be brief and easily understood.

9B-14 Bicycle Crossing Sign (W11-1)

The Bicycle Crossing sign is intended for use on highways in advance of a point where a bikeway crosses the roadway. It should be erected about 750 feet in advance of the crossing location in rural areas where speeds are high, and at a distance of about 250 feet in urban residential or business areas, where speeds are low.

If the approach to an intersection is controlled by a traffic control signal, stop sign or yield sign, the W11-1 sign may not be needed.

9B-15 Hazardous Condition Sign (W8-10)

The Hazardous Condition sign is intended for use where roadway or bicycle trail conditions are likely to cause a bicyclist to lose control of his bicycle. These conditions could include slippery pavement, slick bridge

W11-1
30″×30″

W8-10

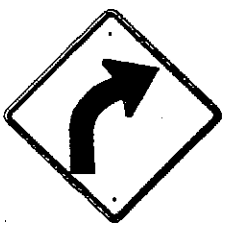
Roadway Signs	Bicycle Trail Signs
30″×30″	18″×18″
24″×18″	12″×9″

decking, rough or grooved pavement, or water or ice on the roadway. The W8-10 sign may be used with a supplemental plaque describing the particular roadway or bicycle trail feature which might be of danger to the bicyclist such as SLIPPERY WHEN WET, STEEL DECK, ROUGH PAVEMENT, BRIDGE JOINT, or FORD.

9B-16 Turn and Curve Signs (W1-1, 2, 4, 5, 6, 7)

On bicycle trails where it is necessary to warn bicyclists of unexpected changes in path direction, appropriate turn or curve signs should be used. They should normally be installed no less than 50 feet in advance of the beginning of the change of alignment.

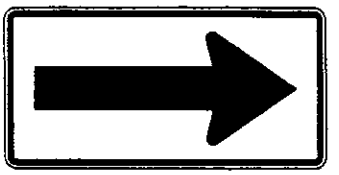
W1-1
18″×18″



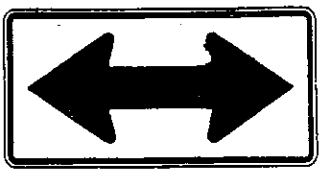
W1-2
18″×18″

W1-4
18″×18″

W1-5
18″×18″



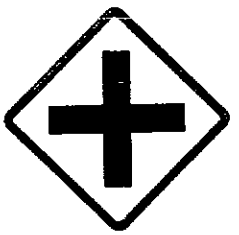
W1-6
24" × 12"



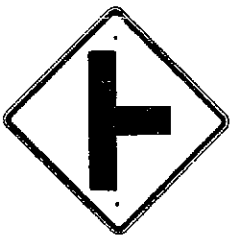
W1-7
24" × 12"

9B-17 Intersection Signs (W2-1, 2, 3, 4, 5)

Intersection signs are intended for use as appropriate to fit the prevailing geometric pattern on bike trails where connecting routes join and where no STOP or YIELD signs are required. They should be used wherever sight distance at the intersection is severely limited, and may be used for supplemental warning at intersections where STOP and YIELD signs are erected.

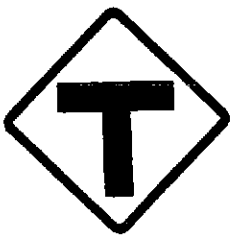


W2-1
18" × 18"



W2-2
18" × 18"

W2-3
18" × 18"



W2-4
18" × 18"

W2-5
18" × 18"

9B-22 Supplemental Plaques for Route Signs and Route Markers

Where desired, supplemental plaques can be used with the D11-1 and M1-8 signs to furnish additional information, such as directional changes in the route, and intermediate range distance and destination information. The M4-11 through M4-13 signs may be mounted above the appropriate Route Signs or Route Marker. Supplemental plaques D1-1a, b and c are intended for use with the D11-1 Bicycle Route Sign. The appropriate arrow sign (M7-1 through M7-7), if used, should be placed below the Route Sign or Route Marker. These signs shall have a white arrow on a green background.

M4-11
24" × 6" or 12" × 4"

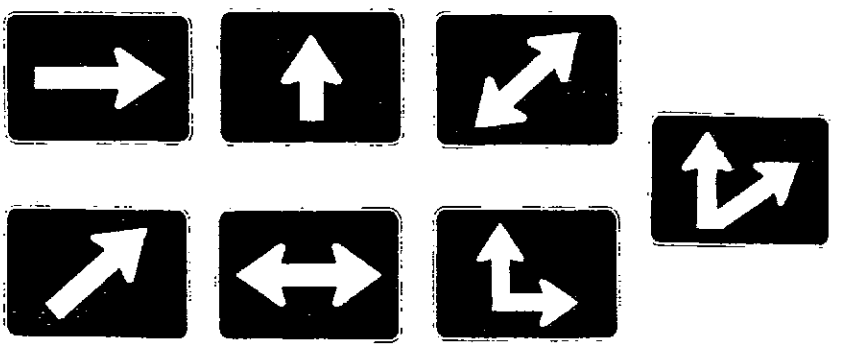
D1-1b(R)
24" × 6"

M4-12
24" × 6" or 12" × 4"

D1-1b(L)
24" × 6"

M4-13
24" × 6" or 12" × 4"

D1-1(c)
24" × 6"



M7-1 through M7-7
12" × 9"

D. SIGNALS

9D-1 Application

It is rare when a traffic signal is installed solely for bicyclists; however, at some locations there may be a need to install signal devices to facilitate bicycle travel through the intersection. For warrants and other requirements relating to signal installations, see Part IV of this Manual. Warrants used for motor vehicles are considered appropriate for use in determining the need for signals to serve bicyclists. Warrant Four for school crossings is considered to be appropriate for bicyclists also.

9D-2 Visibility Requirements

At installations where programmed signals are used, special attention should be given to adjusting the signals so bicyclists on the regular bicycle lanes or travel paths can see the signals. If programmed signals cannot be aimed to serve the bicyclist, then separate signals shall be provided.

9D-3 Signal Operation for Bicycles

Bicycles generally can cross intersections under the same signal timing arrangement as motor vehicles. Where bicycle use is expected, extremely short change intervals should not be used and an all red clearance interval may be necessary.

Park City

Trails Master Plan Update

A Non-motorized Transportation, Recreation and Fitness System

Policies and Guidelines for Maintenance and Operation

March 1992

Maintenance and Operation Policies and Guidelines 1/24/92

Introduction

This document has been designed to address the needs of the Park City Parks and Public Works staff. It provides policies, guidelines and standards for trails maintenance, policy guidelines for special events, gives direction regarding priorities for trail funding and provides cost estimates for trail maintenance, operation and installation.

Two other documents: the Trails Supplement to the Comprehensive Plan and the Policies and Guidelines for Trail Construction, Construction Standards and Maps, adddress the needs of the Mayor and City Council, trail oriented community groups, the Park City Planning department, and the City Engineer. They provide general goals, objectives and policies for trail development and specific standards for trail construction. Please refer to them for additional information.

Summary of General Trail Policy Statements - The following statements provide the basis for the maintenance and operation guidelines set forth later in this document. More specific policies directly related to maintenance and operation of the trail system are also included with the general policy statement. For a more detailed explanation of these policies refer to the Trails Supplement to the Comprehensive Plan and the Policies and Guidelines for Trail Construction, Construction Standards and Maps.

I. A trail system is an asset to the Park City community - Trails are an asset to the Park City community. As the city grows, trails can mitigate other aspects of development. The Park City trail system should be aesthetically pleasing and contribute to the general quality of life in the community.

Where feasible, trails should be separated from motorized transportation corridors as snow removal and general maintenance are less costly, users are generally safer, and recreational experiences are enhanced on paths which are separate from roads.

As various portions of the the trail system are developed, as new sections are added and old sections repaired uniform materials, surfacing and signs should be installed.

II. Development of a comprehensive trail network - Park City desires to develop a comprehensive network of trails for public access, connecting various parts of the community, preserving historic trails, and coordinating existing and future trail connections outside the corporate limits of the community.

Park City should acquire and develop trail corridors in existing developed areas, according to identified priorities. Park City should work with landowners in order to obtain public access to important existing and desired trail corridors.

Park City should explore a variety of funding sources and mechanisms for the development of trails. Grants, special districts, transportation funds, joint funding with other jurisdictions or agencies, exactions and various taxing mechanisms are a few of the funding sources which are available.

III. Liability - The Park City Trails Master Plan should provide liability information to private landowners regarding the granting of public access to existing roads and trails, and explain the intent of the Utah landowner liability act.

IV. Development of a safe multiple-use trail system - The design, development and implementation of the Park City Trails Master Plan should consider safe multiple-use throughout the trail system.

Trails should have signs at trailheads and significant access points specifying allowed uses and user etiquette. Generally trail are open to hikers, joggers and mountain bikers. Trails allowing equestrian access should be specifically designated. Some trails should be designated as pedestian use only, excluding mountain bike and equeatrian use. Additional trails should be designated for cross country skiing and horse drawn sleighs or carriages as appropriate. Trails accomodating school children should be constructed for year round access. Rollerblades and skateboards should be allowed only on designated trails. Trails should allow access for the physically impaired where appropriate and reasonable. Trails should not permit motorized vehicles except for emergency or maintenance purposes. Pet owners should manage pets in accordance with municipal and county laws.

V. Trail user courtesy - Trail user courtesy shall be promoted and encouraged throughout the Park City trail system.

Park City should encourage peer enforcement of trail rules and user courtesy on the trail system.

VI. Environmental sensitivity - The trail system should be designed and constructed in an environmentally sensitive manner.

Both new construction and maintenance practices should consider visual and environmental sensitivity.

VII. Trail standards and Park City character - Park City should develop a trail system which is functional and conforms to national standards, where applicable, while preserving the unique character of the Park City community.

Park City's unique mountain resort character is a valued quality. Trails should reflect that character in siting and materials. Wherever possible, materials indigenous to the site should be used during construction and maintenance. When the use of indigenous materials is not possible, use of historic materials should be considered.

VIII. Trail-user needs - Park City intends to develop a trail network providing for the needs of residents, destination visitors, and day-use visitors.

IX. Special events - Special events on parts of the trail system need to be accommodated and planned for, where possible, during the initial design phase.

As new locations for special events are considered, the following requirements should be weighed: input from adjacent landowners and the planning department's evaluation of compatibility.

A Special Events Policy and permitting requirements for trail events should be developed as part of the Master Festival Licensing ordinance. City departments that host a trail event should follow the guidelines set forth in this ordinance.

X. Long term maintenance policies and standards - The long term maintenance of trails is integral to the ultimate success of the trail system.

At the time of this writing the city has no clear-cut policy as to the maintenance of trails throughout the community. In general, the adjacent landowner or homeowner's association is responsible for maintenance of trails adjoining or passing through their property. In special cases the City Council has assumed maintenance responsibilities for specific sections of trails. A variety of optional maintenance programs are set forth in this document to provide future decision-makers with relative costs for various

levels of city maintenance.

City maintenance levels are dependent on funding. It is expected that in the future the city may assume maintenance responsibility for specific trails. It is recommended that when street improvements are made, sidewalks and trails should be installed at the same time in order to reduce costs and inconvenience. It is also recommended that higher volume multiple-use corridors be given priority over lower volume single-use trails, unless specific conditions warrant otherwise. Following is a series of recommended maintenance guidelines.

Maintenance Guidelines

1) Existing city maintained trails in Park City - A program needs to be established for the maintenance of existing city maintained trails throughout the city. Snow removal; litter pick-up; installation of root barriers; resurfacing of paved trails; installation of signs, crosswalks, bollards, and centerline striping; vegetation trimming and trail sweeping all need to be considered as part of this program.

2) High-volume paved multiple-use trails with year round maintenance - It is expected that this type of trail would become a city maintained trail when it is constructed and/or dedicated to the city. As new trails are added to the system snow removal, inspection, litter pick-up, sweeping, sign maintenance, paint striping, resurfacing, and wood chip replacement all need to be programmed into a maintenance schedule.

3) Sidewalks - It is expected that this type of trail would be dedicated to the city and generally maintained by the adjacent landowner or homeowner's association unless a special maintenance agreement such as a special service district is established. Because these trails are publically dedicated the following city obligations are recommended. Periodic inspection with a report to the maintaining party, concrete replacement.

4) High volume unpaved trails - It is expected this type of trail would be dedicated to and maintained by the city. The following city obligations are recommended. Summer maintenance only with inspection, litter pick-up, grading, spot patching of gravel, sign maintenance and no snow removal.

5) Hiking Trails, low volume gravel trails, and backcountry trails - It is expected that this type of trail would be dedicated to the city and generally maintained by the adjacent landowner or homeowner's association unless a special maintenance agreement is established. The following city obligations are recommended. No winter maintenance, periodic inspection with report to responsible maintaining party and coordination with volunteer groups who offer trail and sign maintenance

or other improvement services.

6) Bike lanes - It is expected that this type of trail would be within the city street right of way and therefore maintaind by the city. If bike lanes are required within private streets then maintenance would be by whomever is responsible for maintaining the street. Within city owned streets the following maintenance obligations are recommended. Paint striping, sign maintenance, sweeping and additional spring clean-up.

Long-Term Maintenance Standards and Costs - A detailed analysis of maintenance and installation costs is provided later in this document. This section describes general maintenance assumptions, standards and composite costs.

Mainenance assumptions.

The following maintenance assumptions have been made: no trails have trash receptacles, restrooms, drinking water facilities or lighting; cross country skiing track setting, signs and management should be contracted similar to the touring center at the golf course.

Long-term maintenance needs for existing paved trails in Park City - Snow removal, litter pick-up, resurfacing, root barriers, signs, crosswalks, bollards, centerline spriping, tree trimming and periodic sweeping all need to be considered throughout the existing trail system. Some of these procedures are currently being done, others need to be incorporated int the maintenance program. Currently needed one time costs total $22,606. Long term amortized costs are $1404 per mile per year. Short term yearly costs are $2103 per mile. We currently have approximately 8 miles of existing trails. A total appropriation of $28,056 per year is needed to maintain the current trail system to the recommended standard plus the one time cost of $22,606.

High-volume multiple-use trails with year round maintenance - Snow removal, weekly year-round inspection and litter pick-up, sweeping 2 times per year, sign maintenance, center stripe repainted every year, resurfacing: asphalt every 15 years, seal coat asphalt every 3 years, spot wood chip replacement yearly. Long term amortized costs are $2243 per mile per year for combined 10' paved/ 4' wood chip trails and $1342 per mile per year for 8' paved trails. Yearly maintenance costs are $2495 per mile for combined 10' paved/ 4' wood chip trails and $2070 per mile for 8' paved. Approximately 10 miles of combined 10' paved/ 4' wood chips trails and 36 miles of 8' paved trails are shown on the approved trails master plan map. If the total mileage were built out, the annual maintenance costs would be $143,594.

Sidewalks - Yearly inspection with a report to the maintaining party, concrete replacement every 25 years. It is expected that sidewalks will vary in width from 4' to 6'. The average combined yearly and long term costs are $2447 per mile. There are approximately 17.4 miles of sidewalks shown on the master plan. If all were built, the annual cost would be $42,569. If city maintenance and year round snow removal were added, the total average annual cost would be $3360 per mile or $101,025 for the total mileage.

High volume unpaved trails - Summer maintenance only: weekly inspection, and litter pick-up, yearly grading and spot patching of gravel, sign maintenance, no snow removal. The annual cost per mile for this trail type is $1250. Ther are 5 miles of this trail type shown on the master plan for a total annual cost of $6250 if the entire mileage were to be constructed.

Wood chip hiking trails, low volume gravel trails, and backcountry trails - No winter maintenance. Yearly inspection with yearly report to responsible maintaining party and yearly coordination with volunteer groups who offer trail and sign maintenance or other improvement services. The average annual maintenance for this trail type is $335 per mile. The master plan shows approximately 3 miles of gravel trails, 14.5 miles of wood chip hiking trails and 65 miles of back country trails. If these were completely built out the annual cost to maintain them would be $26,318.

Bike lanes - Yearly striping, sign maintenance, and monthly sweeping with additional spring clean-up. The annual cost per mile of this trail type is $1088. The total number of miles is not known as this type of trail would likely be used where other trail types are not appropriate, do not fit the site, or could not be negociated.

Construction Guidelines to Reduce Maintenance and Environmental Impacts. For more detail, see Policies and Guidelines for Construction, Construction Standards and Maps. The following guidelines provide specific recommendations for how trails should be routed and/or constructed to reduce maintenance and environmental impacts.

Trails should be located and constructed in such a manner to reduce or minimize maintenance.

a. Trails crossing steep sites should flow with the landforms.
b. Drainage structures should be constructed in natural drainage areas where possible, in order to reduce erosion.
c. Trails should have a minimum 2% cross slope to allow drainage.
d. Maximum trail slopes should match user volume and types of usage.

Snow removal and general maintenance are less costly when trails are separated from roads and/or parking lots where snow storage can be expected.

a. The amount of separation depends upon highway speeds and parking lot size.
    1) Minimum separation between trails and small parking lots or low speed streets is 10'.
    2) Minimum separation between trails and large parking lots or high speed streets may need to be as much as 50'.

In visually or environmentally sensitive areas, special location and/or construction methods should be used which protect the site from environmental or visual impact. Examples of visually or environmentally sensitive sites might include: wetlands, highly visible hillsides, areas with significant vegetation, highly erodible soils, unstable and/or steep slopes and ridgelines. Techniques such as: limits of disturbance, site specific trail routing, erosion control measures, site specific adjustment of construction standards and design guidelines, site specific construction practices should be implemented to minimize environmental, visual or construction impacts.

Environmental hazards should also be considered when locating a trail. Examples of environmental hazards might include: mining hazards, mine tailings, lightning prone areas, avalanche corridors, raptor nesting sites, or other hazards.

a. Limits of disturbance should be implemented to minimize construction impacts. Construction limits should be as small as practical to construct the trail. Significant vegetation and it's root zone should be considered when establishing construction limits.
b. Erosion control methods should be employed to protect areas adjacent to the trail from impacts during of after construction.

Siltation fences, straw bales, detention basins, revegetation protection such as excelsior matting and slope protection methods are all examples of erosion control which may be required on specific sites.

c. Indigenous materials should be used when constructing trail surfaces, retaining walls, bridges, and barriers.

d. Native and/or self-sustaining plant materials should be used for revegetation of all disturbed areas where trails pass through native or non-irrigated sites. If plants are not self-sustaining, a permanent irrigation system shall be installed at the time of trail construction. Revegetation of natural areas should match the vegetation patterns of the tract surrounding the area to be revegetated.

e. Special location or construction methods may be necessary to reduce impacts and/or minimize disturbance. Rerouting a trail to avoid a hazard, narrowing the trail section through a limited area to preserve significant vegetation or exceeding recommended minimums or maximums in selected areas to reduce cut or fill slopes are examples of special locations of trails to reduce impacts. Examples of construction methods which could reduce impacts might include installing retaining walls to reduce cut and fill slopes on a visually prominent hillside, stabilizing a mine hazard which is located within or adjacent to a trail corridor or installing a tree well around a significant tree to be preserved. The above examples are just that. Specific trail proposals through environmentally and visually sites shall be considered on a case by case basis.

f. Where significant wildlife or other natural features exist, special trail routing, construction and trail use should be considered.

g. Existing significant vegetation should be preserved wherever possible. Trees, riparian vegetation, scrub oak and rare plants are considered significant. Root zones as well as above ground vegetation require protection when preserving plants. In general, the area within the drip line of trees, especially on the down slope side, is sensitive to disturbance. If root zones are impacted or grades changed significantly, temporary irrigation may be necessary.

h. Trails which cross or are located adjacent to wetlands should be designed for minimal impact. Wooden boardwalks or other techniques may be necessary to impose minimal construction

impacts. Wildlife needs should also be considered when siting trails near wetlands.

i. In visually sensitive areas may require reduced cut and fill slopes, hand-construction, and low retaining walls to minimize site disturbance and visual intrusion.

j. Revegetation to provide screening, construction techniques to preserve vegetation, and trail routing techniques should be used to minimize visual intrusion.

k. In steeply sloped and highly vegetated areas, trails should be located for trail user compatibility rather than along convenient property boundaries.

l. Where environmental hazards are present, special trail construction techniques or locations should be used.

m. Mine tailings should be stabilized, topsoiled and revegetated.

n. Trails should be located away from lightning prone areas, avalanche areas and raptor nesting sites, or should be closed seasonally when hazardous conditions are a problem.

o. Locate the trails for both summer and winter activities, where possible, given the terrain and climatic considerations. Identify snow retention areas for possible cross-country ski trails. In open areas, place trail alignment to take advantage of opportunities for shade and wind protection.

TRAILS MASTER PLAN UPDATE
MAINTENANCE COSTS

Existing Trail Maintenance Cost Estimates				
Currently Approximately 8 miles				
One time costs				
Centerline striping	4" reflectorized stripe $0.16/ft for 8 mi.			$6,758.40
Root barrier cost and installation-approx.600 ft.				$4,770.00
Bike path tear-up cost- approx.600ft.		pvt. removal$0.52/sq.ft.		$2,496.00
Root removal cost	undetermined			$1,000.00
Bike path repavement				$6,240.00
Striping for crosswalks-6 crosswalks		$41.20/crosswalk		$247.20
6"striping, stripes every 2 ft, 8 stripes		$0.20 lin.ft		
Signs	2 safety signs at tunnel- Caution $23.48			$93.92
	6 path street crossing signs-$13.21 ea.			$158.52
8"x8" Trail Bollards	3 bollards			$828.00
Main street, City park and Prospector Park				
Carsonite symbols	$0.90/decal $1.70/custom decal			
est. 5 decals at $0.90 per bollard				$13.50
			Total	$22,605.54
Long term costs= less than yearly basis				Annual CPM
Asphalt	1" Overlay replace every 15 years			$648.00
Asphalt	Fog seal replace every 3 years			$30.98
Asphalt	Slurry seal replace every 5 years			$100.25
Root Barriers	19.5"x100' root barriers $495.00/roll			$139.92
	Install as needed $4.95/ft.			
	15 year life	1mi in 20 miles		
	plus installation cost $3.00/ft-1 mi in 20 miles			
Crosswalks-Restripe every other year		Cost for 5 crossings		$62.50
Centerline restripe every other year				$422.40
		Subtotal CPM		$1,404.05
Short term costs= yearly or more frequent basis				
				Annual CPM
Snow Removal based on 26 removal days				
$25.00 per mile for bombadier				$793.00
$5.50 per mile labor				
Snow removal clean up 3x per year				$141.00
$25.00 per mile for bombadier		$47.00 per mile		
$22.00 per mile labor				
Inspection cost		$5.00/mile in vehicle		$130.00
		weekly, 26 weeks		
		$10.00/mile on foot		$260.00

			weekly, 26 weeks		
Tree trimming			$10.00 equipment		$50.00
			$40.00 labor		
Sweeping	2x per year continuous				$55.00
		discontinuous			$75.00
Signs	Lose 10% of signs				$46.96
	1 sign/mi				
Bollard replacement 2 replacements					$552.00
				Subtotal CPM	$2,102.96
High volume multiple use paved					
10' paved with 4' soft surface					
Approximately10.2 miles					
at build out					
					Annual CPM
Long term costs					
Asphalt	1" Overlay replace every 15 years				$810.00
Asphalt	Fog seal replace every 3 years				$38.72
Asphalt	Slurry seal replace every 5 years				$125.31
Centerline stripe every other year					$422.40
Wood chips					
4' Soft surface		Spot replacement $22.00/cu yd.			$283.91
		Replace 1 mi in 20 miles			
Root Barriers	19.5"x100' root barriers $495.00/roll $4.95/ft.				
	Install as needed, $3.00/ft.				
	15 year life		Replace 1 mi in 20 mi		$139.92
4" Reflectorized pavement striping replace every other year,					$422.40
every 3 years if not winter maintained					
				Subtotal CPM	$2,242.66
Short term maintenance					
Snow Removal based on 26 removal days					Annual CPM
$25.00 per mile for bombadier					$793.00
$5.50 per mile labor					
Snow removal clean up 3x per year					$141.00
$25.00 per mile for bombadier			$47.00 per mile		
$22.00 per mile labor					
Inspection cost			$5.00 / mile in vehicle		$260.00
			biweekly, 26 weeks		

			$10.00/mile on foot	$520.00
			biweekly 26 weeks	
Tree trimming			$10.00 equipment	$50.00
			$40.00 labor	
Sweeping	2x per year continuous			$55.00
		discontinuous		$75.00
Signs	Lose 10% of signs			$46.96
	1 sign/mi			
Bollards 2 replacements				$552.00
			Subtotal CPM	$2,492.96
8' paved				
Approximately 36 miles at build out				
Long term maintenance				Annual CPM
Asphalt	1" Overlay replace every 15 years			$648.00
Asphalt	Fog seal replace every 3 years			$30.98
Asphalt	Slurry seal replace every 5 years			$100.25
Root Barriers	19.5"x100' root barriers $495.00/roll			$139.92
	Install as needed $4.95/ft.			
	15 year life		1mi in 20 mi	
4" Reflectorized pavement striping replace every other year,				$422.40
every 3 years if not winter maintained				
			Subtotal CPM	$1,341.55
Short term maintenance				Annual CPM
Snow Removal based on 26 removal days				
$25.00 per mile for bombadier				
$5.50 per mile labor				$793.00
Snow removal clean up 3x per year				$141.00
$25.00 per mile for bombadier			$47.00 per mile	
$22.00 per mile labor				
Inspection cost			$5.00/mile in vehicle	$130.00
			biweekly, 26 weeks	
			$10.00/mile on foot	$260.00
			biweekly, 26 weeks	
Tree trimming		cost per mile	$10.00 equipment	$16.67
once every 3 years		heavily	$40.00 labor	
		wooded		

		cost per mile	$5.00		
		sparsely wooded			
Sweeping	2x per year continuous				$55.00
		discontinuous			$75.00
Signs	Lose 10% every year				$46.96
	1 sign/mi				
Bollards 2 replacements					$552.00
			Subtotal CPM		$2,069.63
Sidewalks					
Approximately 17.4 miles at build out					
Long term maintenance					Annual CPM
4' Concrete Replace every 25 years					$1,900.80
Inspection	once yearly	$15.00/mi on foot			$15.00
Noticing cost	mailing cost for 200 ? notices $0.29/notice				$58.00
			Subtotal CPM		$1,973.80
6' Concrete Replace every 25 years					$2,851.20
Inspection	once yearly	$15.00/mi on foot			$10.00
Noticing cost	mailing cost for 200 ? notices $0.29/notice				$58.00
			Subtotal CPM		$2,919.20
Additional Maintenance option					
Short term maintenance					Annual CPM
Snow removal		Tractor cost	$82.00/storm	$9.42/mi	$9.42
		Fuel/supplies	$750.00 yearly		$750.00
		Personnel	$10.00 hr	$10.00/mi	$10.00
Monthly inspection/litter removal					
		$10.00/mi on foot			$120.00
		12 months			
Signs	Lose 10% every year				$23.48
	1 sign/mi				
			Subtotal CPM		$912.90
				added to	
				above costs	
4' Cost per mile with additional maintenance				Total CPM	$2,886.70
6' Cost per mile with additional maintenance				Total CPM	$3,832.10

Unpaved high volume multiple-use trails					
Approximately 5.0 miles of 8' trail					
at build out					
8' crushed limestone paving compacted on compacted subgrade					
Yearly costs					
					Annual CPM
Grading					$200.00
Spot patching of gravel as needed			1 mi in 20 miles		$60.55
30 year life					
Inspection cost/litter remo			$5.00/mile in vehicle		$130.00
			biweekly, 26 weeks		
			$10.00/mile on foot		$260.00
			biweekly, 26 weeks		
Signs	Lose 10% every year				$46.96
	1 sign/mi	Sign and installation cost			
Bollards 2 replacements					$552.00
			Subtotal CPM		$1,249.51
Hiking trails, Low volume gravel trails and Backcountry trails					
Low volume 4' Crushed limestone trails					
Approximately 3.0 miles of 4' trail					
at build out					
Yearly costs					Annual CPM
Spot patching of gravel as needed			1 mi in 20 miles		$30.27
30 year life					
Inspection cost once yearly		$10.00/mi on foot			$10.00
Signs	Lose 10% every year				$23.48
	1 sign/mi				
Bollards 2 replacements					$276.00
			Subtotal CPM		$339.75
Wood chip hiking trails					
Approximately 14.5 mi at build out					
Yearly costs					Annual CPM
2' wood chip hiking trails			1 mi in 20 miles		$45.30
Spot replacement as needed					
Inspection cost once yearly		$5.00/mi in vehicle			$10.00
		$10.00/mi on foot			
Signs	Lose 10% every year				$23.48
	1 sign/mi				
Bollards 2 replacements					$276.00

			Subtotal CPM		$354.78
Backcountry trails					
Approximately 65.0 miles at build out					
Yearly costs					Annual CPM
Inspection cost once yearly					$10.00
		$10.00/mi on foot			
Signs	Lose 10% every year				$23.48
	1 sign/mi				
Bollards 2 replacements					$276.00
Volunteer Coordination					undetermined
			Subtotal CPM		$309.48
Bike Lanes					
Reflectorized white or yellow striping					Cost per mile
4" wide	$844.80/mi + symbols estimated				$1,000.00
Signs	Lose 10% every year				$46.96
	1 sign/mi	Sign and installation cost			
Crosswalks-	$41.20 per crosswalk				
1 crossing or less per mile					$41.20
Symbols letters and shapes	Cost/sq. ft.				
	$1.09				
Replacement	2 times per year on roads				
	1 time per year on bikeways with winter maintenance				
	1 time every 2 years on bikeways without winter maintenance				
			Subtotal CPM		

TRAILS MASTER PLAN UPDATE
INSTALLATION COSTS

Park City Trails Master Plan Update Cost Estimates				**DATE:**	**8/23/91**
Trails Installation costs					
1. One time expenditure on existing trail system					$22,605.54
2. High Volume paved trail					Cost Per Mile
(10' paved with 4' soft surface)					$77,697.40
includes filter fabric and wood chips					
4" striping					$1,000.00
Crosswalks	$41.20 ea.	1 crosswalk			$41.20
Signs		2 signs	23.48 ea + installation		$93.92
Bollards		3 bollards	$138.00 ea. + installation		$828.00
				Total	$79,660.52
3. 8' paved trail					$54,912.00
4" striping					$1,000.00
Crosswalks	$41.20 ea.	1 crosswalk			$41.20
Signs		2 signs	23.48 ea + installation		$93.92
Bollards		3 bollards	$138.00 ea. + installation		$828.00
				Total	$56,875.12
4. 6' Concrete Sidewalk					$71,446.84
Crosswalks	$41.20 ea.	1 crosswalk			$41.20
Signs		2 signs	23.48 ea + installation		$93.92
Bollards		3 bollards	$138.00 ea. + installation		$828.00
				Total	$72,409.96
5. 4' Concrete Sidewalk					$47,446.84
Crosswalks	$41.20 ea.	1 crosswalk			$41.20
Signs		2 signs	23.48 ea + installation		$93.92
Bollards		3 bollards	$138.00 ea. + installation		$828.00
				Total	$48,409.96
6. 8' Unpaved High Volume Gravel Trail					$29,568.00
Filter Fabric					$6,758.00
Signs		2 signs	23.48 ea + installation		$93.92
Bollards		3 bollards	$138.00 ea. + installation		$828.00
				Total	$37,247.92
7. 4' Unpaved High Volume Gravel Trail					$14,784.00
Filter Fabric					$3,379.00
Signs		2 signs	23.48 ea + installation		$93.92
Bollards		3 bollards	$138.00 ea. + installation		$828.00
				Total	$19,084.92

8. Woodchip Hiking Trails					$3,614.80
Signs					
Bollards		3 bollards	$138.00 ea. + installation		$828.00
				Total	$4,442.80
9. Backcountry trails					
Volunteer Coordination		undetermined			
Signs		2 signs	23.48 ea		$46.96
Bollards		3 bollards	$138.00 ea.		$414.00
				Total	$460.96
10. Bike Lanes		4" Striping			$1,000.00
Symbols	$1.09/	undetermined			
Signs		2 signs	23.48 ea + installation		$93.92
				Total	$1,093.92

Please feel free to make comments or add projects you think are needed. Jen.

Trails Master Plan Update
February 1992
Implementation

Olympic Parkway Multi-Use Trail - Utah Department of Transportation is planning to begin widening of U-224 in the spring of 1992. This work includes the construction of a pedestrian/bicycle underpass near the Osguthorpe dairy barn and a 8' wide gravel bike way from the proposed underpass to Silver Springs along the east side of the highway. This proposal would acquire the necessary easements (hopefully through donation) and develop a 10' wide paved plus 4' wide wood chip trail from the existing path at the Park Avenue berm located across from the Mt.Air Cafe to the proposed underpass. Significant portions of the corridor are already city owned and would require development only. It is recommended that a minimum separation of 25' from the state highway be maintained where possible and a preferable separation is 50'. Where possible natural and aesthetic amenities should be used and/or developed ~~where possible~~ to create a greenway as well as a trail. Groups which have expressed an interest in the development of this trail include High Country Flyfishers, Kids for Creeks, Utah Winter Sports Authority and White Pine Touring. The projected development only costs are:

Deer Valley Drive Multi-Use Trail - This proposal would continue the main trail spine and develop a multi-use trail connection from the existing trail by Utah Coal and Lumber to the existing trail at Telemark Park. This connection would provide a valuable link in a recreational loop trail from Park City to the Jordanelle Reservoir, the Historic Union Pacific Rail Trail at Phoston and returning to Park City paralleling U-248 on the Rail Trail. Wherever possible an 8' wide paved plus 4' wood chip section should be installed behind the existing curb. Due to the steep topography, existing improvements and encroachments this likely will not be possible along the entire length of this corridor. Right of way may need to be acquired and creative alternate solutions explored in order to complete this project. Use along this trail corridor is expected to be a combination of recreational and transportation. The major purpose of the trail, especially along the Deer Valley Drive section is safety as the road receives heavy traffic at moderately high speeds and poor visibility. The projected acquisition and development costs are:

Historic Union Pacific Rail Trail - There are two short sections of

the rail trail which are still owned privately. One is located adjacent to Bonanza Drive and continuing west approximately '. The other is from Phoston to the Mayflower property and extends approximately '. This project proposes to acquire or assist in the acquisition of these sections of the trail. The Phoston section is not only outside of the City limits but also outside of the County boundary and is located in Wasatch County. Both require coordination with and assistance from State Parks who owns the corridor. Its too early to estimate the cost of this project. Several other entities may be willing to share in the costs, including: State Parks, Wasatch County and Mayflower Development.

Connection to the Great Western Trail - The Great Western Trail is a trail which is proposed to extend from Canada to Mexico. Significant portions of this trail are existing and just require relatively short connections for completion. Much of the trail is non-motorized although there are portions which are motorized. In those areas, there are long range plans to construct parallel non-motorized trails. The section closest to Park City is the Ridge Trail which runs along the Wasatch ridge from Park West to Scott's and Guardsman Passes where it continues south to Gobbler's Knob. This proposal would connect the Great Western Trail to the Historic Union Pacific Rail Trail. A specific route has not been determined yet. The Guardsman Pass Road provides an existing publicly owned access but may not provide the best opportunities from a non-motorized recreational trail perspective. There are several other existing routes which traverse the Park City Resort, United Park City Mines, or Deer Valley Resort properties. Each of these property owners would be contacted to determine if any are friendly to dedicating a public trail easement for this connection. Actual costs cannot be accurately determined until a route is selected. Since much of this trail is located in the County, they should be contacted for coordination. The National Forest Service has offered to assist the City with this project.

Gamble Oak Park Trails - The City has this 88 acre parcel under a long term lease with the Bureau of Land Management. It is hoped that as mining claims are resolved on this property, full ownership of this parcel can be passed to the City under the Recreation and Public Purposes Act. It is located above the Pinnacle and Daystar projects in Deer Valley and extends from Mellow Mountain Road to the cul-de-sac at the southwest end of the Oaks Subdivision. An trail easement was dedicated between this parcel and Sunridge Court but an established trail was not built.

Between this parcel and Mellow Mountain Road and existing trail crosses private property but is not publicly dedicated. The site offers several potential trail routes as the views are spectacular and the terrain and vegetation varied and interesting. This project proposes to resolve the access issue from the southwest and construct trails elsewhere throughout the parcel. A combination of prison labor and community work projects are proposed to accomplish the trail construction. The total cost is projected to be $5000.

Red Maple Park Trails - This parcel, like the Gamble Oak Park property, is a Bureau of Land Management parcel which the City has leased under a long term contract. It is located at the east end of town and extends along both sides of U-248 and east of Prospector Park. It is contiguous to the city park located in Prospector Park and the recently acquired PC hill property. It is bisected by the Historic Union Pacific Rail Trail. There are numerous trail opportunities throughout this parcel, especially interpretive trails. This parcel has several exposures, vegetative zones, opportunities for varied wildlife viewing and historical interpretation. The close proximity to the schools enhances the opportunity for interpretation for school age children. Interesting trail connection possibilities also exist to Park Meadows and Deer Valley. The site does have some tailings located on it adjacent to the stream corridor. Several groups including the High Country Flyfishers and the Kids for Creeks have expressed an interest in this parcel. It is recommended that coordination with various agencies be started to work toward the clean-up of the tailings and that a trail connection between Park Meadows and the rail trail be planned and constructed as a first phase. The amount anticipated for the trail construction is $5000.

Pedestrian Connection Between American Saddler Drive and Crestline Drive - In meetings with the Park Meadows residents several trail locations were identified. It is anticipated that existing appropriations will provide funds for many of their requests. There is one request which will likely not be funded with existing funds. This is a pedestrian connection between American Saddler Drive and Crestline Drive. Two of the adjacent landowners have observed a fair amount of school age pedestrian and bicycle traffic here and have offered to cooperate with the City in the construction of a sidewalk in this location. There are four adjacent landowners involved. On the last occasion when we spoke, the two cooperating landowners were going to contact the

remaining property owners to see if they were also willing to cooperate. If easements can be donated, it is expected to cost $ to install a 6' wide concrete sidewalk.

Easement Dedication Program with Private Landowners - Last fall the City hosted a Mountain Bike Summit to bring together private landowners and mountain bicyclists. The major purpose of the meeting was to identify conflicts between the two groups and some ways to begin to deal with those conflicts. As a follow-up to the meeting a committee was formed to work on a solution to the private landowner liability issue. Despite the existence of the Utah Landowners Liability Act, several landowners did not feel comfortable with their liability exposure. The committee developed and proposed an ordinance regulating recreational biking and hiking on designated trails. It was passed by the Summit County Commission and basically considers trail users who are outside of a trail corridor to be trespassing. Hopefully this will alleviate landowner concerns and provide some incentive for landowners to open their properties along designated trail corridors. This project proposes establish a program whereby private landowners can dedicate trails within their property for recreational purposes. It is recommended that an amount of $10,000 be devoted to this program. This would provide funds for such things as: preparing legal documents, making trail improvements, fencing, signs or minor acquisition costs.