CHAPTER 7: SHARED-USE PATHS

INTRODUCTION

Originally called “bike paths,” then “multi-use paths,” shared-use paths are used by pedestrians, joggers and skaters. Shared-use path planning and design must take into account the various skills and characteristics of these different users. Many inexperienced cyclists don’t want to ride in traffic and may not ride on streets until they gain experience and confidence. A separated path provides a learning ground for bicyclists and can attract cyclists who prefer a more aesthetic experience.

Well planned and designed paths can provide access and mobility to pedestrians and bicyclists in areas where the roads don’t serve their needs. They can have their own alignment along streams, canals, utility corridors, abandoned or active railroads, and greenways. Many serve as liner parks. Paths can serve both utilitarian and recreational cyclists.

The key components to successful paths include:

- **Continuous separation from traffic,** by locating paths along a river or a greenbelt such as a rail-to-trail conversion, with few street or driveway crossings; however, this must be balanced with
- **Frequent connections to land-uses,** such as residential areas, shopping, schools and other destinations.
- **Security:** proximity to housing and businesses increases visibility (despite fears of some property owners, paths do not attract crime into adjacent neighborhoods); illumination helps provide a sense of security at night.
- **Scenic qualities,** offering an aesthetic experience that attracts cyclists and pedestrians;
- **Well-designed street crossings,** with measures such as signals or median refuge islands (paths directly adjacent to roadways are not recommended, as they tend to have many conflict points);
- **Shorter trip lengths** than the road network, with connections between dead-end streets or cul-de-sacs, or as short-cuts through open spaces;
- **Good design geometric,** by providing adequate width and grades, and avoiding problems such as poor drainage, blind corners and steep slopes;
- **Good pavement design,** including subgrade and base preparation, to ensure path longevity, good surface conditions and to reduce maintenance cost; and
- **Proper maintenance:** regular sweeping and repairs can prevent paths from falling into disrepair, with the subsequent increased liability and decreased use.

IMPORTANT CONSIDERATIONS

To ensure success, the following concerns must be addressed at the planning, design, construction and maintenances phases of path projects:

Crossings

The number of at-grade crossings with streets or driveways should be limited; street crossings often put path users in a position where conflicts with motor vehicle drivers are expected by any usres.

Access

Limiting crossings must be balanced with providing access. To serve users well, a path must have frequent and convenient access to the street network. Access points that are spaced too far apart will require users to travel out of direction to access or leave the path. The path should terminate where it is easily accessible to and from the street system, e.g. at a controlled intersection or at the end of a dead-end street. Terminating a path midblock on a busy thoroughfare, or at a busy intersection, is generally not recommended; if there is no alternative, a well-designed connection and crossing must be provided when. Directional signs should be erected to direct users to and from the path.

Security

Shared-use paths in secluded areas should ensure personal security. Illumination and clear sight distances improve visibility. Location markers, mileage posts and directional signing help users know where they are. Frequent accesses improve response time by emergency providers.

Maintenance

Shared-use paths require special trips for inspection, sweeping and repairs. They must be built to a standard high enough that allows heavy maintenance equipment to use the path without deterioration. Building to a high standard also decreases long-term maintenance needs.

On-street facilities

Many experienced bicyclists prefer to ride on the road rather than a path adjacent to roadways. This can be confusing to motorists, who may expect all cyclists to use the path. The presence of a path should not be used as a reason to not provide adequate shoulders or bike lanes on roads where appropriate, or sidewalks for pedestrians in urban areas.

Standards

Paths should be built to a standard that accommodates all users, from commuters to recreationists, with minimal conflicts. Building a narrow path to save money can lead to problems if the path is popular. If usage is expected to be low, reconsider the need for a path. Pavement design is another important standard: even though paths do not get driven on by heavy motor vehicles, they do experience deterioration due to weather. A path should last many years before needing maintenance or repaving.

PATHS NEXT TO ROADWAYS

CONCERNS

Shared-use paths should not be placed next to roadways with many driveway and or street accesses. Half of the bicycle traffic will ride against the normal flow of motor vehicle traffic, with the following consequences for bicyclists:

- At intersections, motorists crossing the path often do not notice bicyclists coming from the direction opposite to prevailing traffic, especially if sight distance is poor.
- Bicyclists on the path are often required to stop or yield at cross-streets and driveways. Stopping often disrupts wheeled users' momentum; consequently, they end up not stopping, placing themselves in jeopardy when approaching a busy street crossing where yielding and/or stopping is required.
- Motor vehicles stopped on a cross-street or driveway may block the path.
- When the path ends, some bicyclists riding against traffic continue to travel on the wrong side of the street, as do bicyclists getting to a path. Wrong-way travel by bicyclists is a major cause of bicyclist-to-automobile crashes and should be discouraged.
- Because of the proximity of motor vehicle traffic to opposing bicycle traffic, barriers are often necessary to separate the path from the roadway. These barriers are obstructions, complicate maintenance of the facility and use available right-of-way.

GUIDELINES

Separated paths along roadways should be evaluated using the following guidelines:

- Bicycle and pedestrian use is anticipated to be high;
- The traffic conditions (high-speed, high-volumes) on the adjacent roadway are such that on-road bikeways and sidewalks may be undesirable;
- The path can be kept separate from motor vehicle traffic, with few roadway or driveway crossings.
- There are no reasonable alternatives for bikeways and sidewalks on nearby parallel streets;
- There is a commitment to provide path continuity throughout the corridor;

- The path can be terminated at each end onto streets with good bicycle and pedestrian accommodation, or onto another safe, well-designed path;
- There is adequate access to local cross-streets and other facilities along the route.
- Any needed grade-separation structures do not add substantial out-of-direction travel; and
- The total cost of providing the path is proportionate to the need. This evaluation should consider the costs of:
  1. Grading, paving, drainage, fences, retaining walls, sound walls, crossings, signs and other necessary design features;
  2. Grade-separated structures needed to eliminate at-grade crossings; and
  3. Additional maintenance, including the need for specialized maintenance equipment.

Note: In many cases, the best choice is to improve the roadway system to accommodate cyclists and pedestrians, which may require connecting up local streets or improving nearby, parallel streets.

DESIGN STANDARDS

ODOT has adopted the AASHTO Guide for the Development of Bicycle Facilities for path design standards. The AASHTO guide should be consulted for geometric design standards such as sight-distance, and horizontal and vertical curves. The following section is an explanation of these standards. Though shared-use paths are intended for many users, the bicycle is the design vehicle of choice because of its higher travel speeds.

Most of the design standards discussed here are for paths intended for both transportation and recreation. For designing recreational trails in more rural settings, refer to “Designing Sidewalks and Trails for Access,” published by FHWA: Publication No. FHWA-HEP-99-006.

Standards should be met wherever possible, but there are circumstances where economics or physical constraints make it difficult to meet standards. A reasonable approach must be taken, so extraordinary sums are not spent on a short section of path; nor should the natural landscape be excessively disturbed.

Conversely, there are areas where high usage, or potential high speeds dictate dimensions greater than standards for user safety and comfort.

WIDTH & CLEARANCES

Width

10 feet is the standard width for a two-way shared-use path; they should be 12 feet wide or more in areas with high mixed-use. Faster-moving bicyclists require greater width than pedestrians; optimum width should be based on the relative use by these two modes. High use by skaters may also require greater width.

The minimum width is 8 feet; however, 8-foot wide paths are not recommended in most situations because they may become over-crowded. They should only be constructed as short connectors, or where long-term usage is expected to be low, and with proper horizontal and vertical alignment to ensure good sight distances.

Although one-way paths may be intended for one direction of bicycle travel, they will often be used as two-way facilities, especially by pedestrians. Caution must be used in selecting this type of facility. If needed, they should be 6 feet wide and designed and signed to ensure one-way operation by bicyclists. One-way paths are primarily used for short connections to a roadway.

Paths with Heavy Use

A well-planned and designed path, connecting land uses conveniently, will attract many users; if this can be anticipated, the path should be wider than standard - 12 feet or greater. A separate soft-surface jogger or equestrian path may be constructed with bark mulch parallel to the paved path. A stable gravel shoulder is still required adjacent to the path to keep the surface from breaking up. Placing soft-surface jogger or equestrian path adjacent to the path also results in bark mulch encroaching onto the paved portion of the path.

With very high use by both pedestrians and bicyclists, the two modes can be separated with striping, to provide two one-way bike lanes next to a single walking area. For separation to work, adequate width for each mode must be provided. The minimum total width required is 16 feet: two 5-foot bike lanes and a 6-foot walking area. 18 or 20 feet are needed in areas of very high use; the areas dedicated to walking and bicycling can vary based on their respective anticipated use. The pedestrian portion of the path should be closer to the vistas, such as next to a river, as pedestrians are more likely to linger, stop and admire views.

With exceptionally high use by both pedestrians and bicyclists, totally separate facilities should be considered: a path for cyclist and a path for pedestrians, with signing to indicate proper use.

Lateral Clearance

A 3 foot or greater (min 2 feet) shy distance on both sides of a shared-use path is necessary for safe operation. This area should be graded level, flush to the path and free of obstructions to allow recovery by errant bicyclists. This applies to cut-sections, where falling debris can accumulate, stimulating weed growth, further restricting the available width.

Overhead Clearance

The standard clearance to overhead obstructions is 10 feet, min. 8 feet where fixed objects or natural terrain prohibit the full 10-ft clearance.

Separation from roadway

Where a path is parallel and adjacent to a roadway, there should be a 5-foot or greater width separating the path from the edge of roadway, or a physical barrier of sufficient height should be installed.

GRADES & CROSS-SLOPE

AASHTO recommends a maximum grade of 5% for bicyclists, with steeper grades allowable for up to 500 feet, provided there is good horizontal alignment and sight distance; extra width is also recommended. Engineering judgment and analysis of controlling factors can help determine what distance is acceptable for steep grades.

On paths intended primarily for transportation, ADA requirements should be met: the grade of separated pathways should not exceed 5%, to accommodate wheelchair users. Based on AASHTO recommendations and ADA requirements, 5% should be considered the maximum grade allowable for shared-use paths.

For trails with primarily a recreational purpose in areas with steep terrain, these grades may be exceeded. Consult “Designing Sidewalks and Trails for Access for guidance (Publication: FHWA-EP-01-027)

The standard cross-slope grade is 2%, to meet ADA requirements and to provide drainage. Sharp curves should be banked with the high side on the outside of the curve to help bicyclists maintain their balance.

TYPICAL PAVEMENT SECTIONS

Shared-use paths should be designed with sufficient structural depth for the subgrade soil type to support maintenance and emergency vehicles. A good rule of thumb is to use the typical pavement section recommended for local streets in a given environment. The pavement structures in figure 21 are just examples; each path must be individually designed to meet the local geological and meteorological conditions.

The use of concrete surfacing for paths is best for long-term use. Concrete provides a smooth ride when placed with a slip-form paver. The surface must be cross-broomed. The crack-control joints should be saw-cut, not trowelled, to avoid bumps. Concrete paths cost more to build than asphalt paths, but long-term maintenance costs are lower, since concrete doesn't become brittle, cracked and rough with age, or deformed by roots and weeds as does asphalt.

If the path are constructed over a very poor subgrade (wet and/or poor material), treatment of the subgrade with lime, cement or geotextile fabric (placed between the subgrade and the base rock) should be considered. Where paths are built in environmentally sensitive areas, the additional runoff must be accounted for. Pervious pavement materials should be considered in these circumstances.

DRAINAGE

Shared-use paths must be constructed with adequate drainage to avoid washouts and flooding, and to prevent silt from intruding onto the path due to standing water.

VEGETATION

All vegetation, including roots, must be removed in the preparation of the subgrade. New growth should be controlled with a soil sterilant or lime treatment of the subgrade. Plants that can cause other problems should be controlled; for example, plants with thorns can puncture bicycle tires.

Paths built in wooded areas present special problems. The roots of shrubs and trees can pierce through the surface and cause it to heave and break apart. Preventive methods include removal of vegetation, realignment of the path away from trees, and placement of root barriers along the edge of the path. A 12" deep shield creates an effective barrier; greater depth is required for some trees such as cottonwoods.

RAILINGS, FENCES & BARRIERS

Fences or railings along paths may be needed to prevent access to high-speed roadways, or to provide protection along steep side slopes and waterways. Fences should only be used where they are needed for safety reasons. They should be placed as far away from the path as possible; minimum offset 2 feet. Many of these principles apply to cut-sections of paths where retaining walls are required: minimum 2' offset, with a rub-rail where feasible.

42" height fence is recommended. Where concrete barriers are used, tubular railing may be added to achieve the required height. Openings in the railing must not exceed 6" in width. Where a cyclist's handlebar may come into contact with a fence or barrier, a smooth, 12" wide rub-rail should be installed at a height of 3 feet.

Double fencing should be avoided, e.g. a fence at the right-of-way and a fence to keep pedestrians off freeways. A high chain-link fence on each side of a path creates an undesirable cattle-chute effect, making users feel trapped.

The need to include a railing next to a path is dictated by a combination of factors, few of which can be isolated or quantified. When determining the need for a rail or barrier, the designer should look at the combined effects of:

1. **Clear zone** (also called recovery zone): A 2-foot wide (1 foot min) level area should be provided at the outer edges of the paved area so users can recover their balance if they leave the pavement. Shrubbery planted at the edge of the slope (2 feet from the path edge) can help users shy away from the edge.
2. **Height**: The need for railing increases with the height of the path above the adjacent roadway, waterway or other hazard, unless there are other mitigating factors.
3. **Cross-slope**: 2:1 or flatter is generally considered adequate, unless side-slope material is potentially harmful. Cyclists are more comfortable with 3:1 or 4:1 slope. Maintenance staff prefer a flatter slope for mowing.
4. **Side-slope material**: while a grassy berm or soft shrubbery would not harm a person falling, prickly vegetation, rip-rap, gabion baskets or other hard or jagged objects would not adequately protect a user from injury.
5. **Hazard below**: a freeway, deep river or torrent is a greater potential hazard than a field of hay.
6. **Users**: small children or seniors may need greater protection than other users.

These factors should be evaluated on a case-by-case basis, and a decision made based on engineering judgment. The best decision is to flatten the slope to avoid the need for a barrier. Another option is to shift the path closer to the upslope, offering more shoulder at the down slope side.

ILLUMINATION

The need to illuminate paths depends on many factors:

- Location: is it isolated, or adjacent to a well-lit roadway?
- Purpose – safety or security?
  - Security may require continuous illumination;
  - Safety may require illumination only at street crossings and access points, especially where bollards and other objects are placed to prevent motor vehicle access.
- Light pollution concerns: many jurisdictions have adopted dark sky ordinances; low-level lighting aimed down at the path surface helps reduce light pollution, and illuminate the path surface.

Engineering judgment should be used to determine the need, quantity and type of path illumination. One solution to satisfy these often competing needs is to illuminate a path only in the evening, with a sign telling users when the lighting will be turned off.

STRUCTURES

The width of shared-use path bridge is normally the same as the approach paved path. Where feasible, a 2-foot shy distance on both sides may be added for additional comfort. For example, a 14-foot wide structure for a 10-foot wide path.

If the costs of a wider bridge are prohibitive, yet extra width is needed because it is anticipated that pedestrians will want to stop and linger to admire the view, viewpoints can be added by bulbing out the bridge at strategically chosen locations.

Undercrossings should be 14 feet wide or more. The standard overhead clearance of under-crossings is 10 feet; an 8-foot minimum may be allowable with good horizontal and vertical clearance, so users approaching the structure can see through to the other end. Undercrossings should be visually open for users' personal security and comfort. Illumination is needed in areas of poor visibility.

STREET CROSSINGS

Minor street crossings

In most cases, at-grade crossings of minor streets are acceptable. As traffic volumes on the cross-street increase, so does the need for special treatments, such as a median island or a signal.

The assignment of right of way must be consistent with accepted traffic engineering principles: if the number of anticipated path users is greater than the traffic on the cross-street, the latter should be required to yield or stop to path users. Only when the path crosses a street with higher traffic volumes should path users be required to yield to or stop for traffic on the cross-street. Path users should never be required to yield or stop to traffic in driveways. Requiring path users to stop or yield to traffic on minor streets and driveways creates a potential for conflicts and collisions, for the following reasons:

- Wheeled path users (cyclists, skaters etc.) who want to maintain their momentum, will quickly learn to ignore stop or yield signs at minor street or driveway intersections with little cross traffic. Then when a stop or yield sign is placed appropriately at a more important street crossing (with more traffic), cyclists, skaters etc. often ignore it too, and proceed into traffic without stopping or yielding.
- This behavior carries over onto other streets, where cyclists have learned to ignore stop signs.
- Those who do stop at every driveway or minor street intersection cannot take advantage of the momentum naturally generated by cycling or skating.

Major street crossings

At-grade crossings of busy roads can introduce serious conflicts, and grade separation should be sought, as most path users expect continued separation from traffic.

When grade separation structures cannot be justified, signalization or other measures should be considered to reduce conflicts. Good sight distance must be provided so vehicle drivers can see approaching path users. Most of the techniques described in Chapter 5 “Street Crossings” are applicable to path crossings. For example, a traffic signal, a median island, advance stop lines on multi-lane roadways, etc.

Where a path crosses a roadway at an intersection, improvements to the alignment should be made to increase the visibility of approaching path users. One method is to curve the path, so that it is not parallel to the adjacent roadway and the approach is a closer to a right angle. This improves visibility and forces cyclists to slow down.

The greatest conflicts occur where paths cross freeway ramps. Motorists using these ramps are not expecting bicyclists and pedestrians at these locations.

At all path/roadway intersections, illumination should be provided so path users and vehicle drivers can see each other as they approach the conflict area. This is especially critical on paths that are otherwise unlit.

When traffic volumes are too high for path users to find acceptable gaps, even with a median island, signalization should be considered. A two-step crossing, as described in Chapter 5 can be used for path crossings.

Rails-to-trails crossings

Unlike trails built on a new alignment, rails-to-trail conversions follow the alignment of the old railbed. This can result in many midblock crossings, or crossings too close to intersections. Since the alignment cannot be changed, extra care and attention must be given to ensure drivers and path users are aware of the conflicts, and to provide the best-designed crossing possible.

Undercrossings vs. Overcrossings

When the decision has been made to separate a path from the roadway with a structure, the two choices are over and undercrossings. In some instances, natural terrain makes the choice obvious:

- If the roadway is lower than the path, an overcrossing is the obvious choice;
- If the roadway is higher than the path, the solution is an undercrossing.

When they are both at the same level, the decision is based on weighing a variety of factors. There are advantages and disadvantages to both overcrossings and undercrossings.

Undercrossings

ADVANTAGES: They provide an opportunity to reduce approach grades, as the required 10 feet clearance is less than the clearance required for crossing over a roadway. They are often less expensive to build. Sometimes slightly elevating the roadway (3-4 feet) is enough to make an undercrossing attractive.

DISADVANTAGES: They present security problems, due to reduced visibility. An open, well-lighted structure can cost as much as an overcrossing. They may require drainage if the sag point is lower than the water table.

Overcrossings

ADVANTAGES: They are more open and present fewer security problems.
DISADVANTAGES: They require longer approaches to achieve the required clearance over roadways. The total rise can be 20 feet with an additional structural depth of 3 feet. At 5%, this requires a 400-foot approach ramp at each end, for a total of 800 feet. This can be lessened if the road is built in a cut section.

PREVENTING MOTOR-VEHICLE ACCESS

Geometric Design

The most effective way to discourage motor vehicle access to paths is to make it physically difficult to do so. One method branches the path into two narrower one-way paths just before it reaches the roadway, making it difficult for a motor vehicle to gain access to the path:
Another method is to create very tight curb returns to make it difficult for motorists to enter a path from the roadway.

Bollards

Bollards may be used to limit vehicle traffic on paths. However, they are often hard to see and cyclists may not expect them. When used, they must be spaced wide enough (min. 5 feet) for easy passage by cyclists and bicycle trailers as well as wheelchair users. A single bollard is preferred, as two may channelize bicyclists to the middle opening, with a potential for collisions. They should not be placed right at the intersection, but set back 20 feet or more, so users can concentrate on motor vehicle traffic conflicts rather than on avoiding the bollard. They should be painted with bright, light colors for visibility.

Offset Fencing

Placing railing or other barrier part way across a trail makes it possible for intended users to accesses the trail; maintenance vehicle operators are provided with keys to unlock the fences when they need access. The fences should be coated with retro-reflective material and well-lit.

Signing

Refer to page 14 for signing recommendations.

CURB RAMPS

Ramps for bicycle access to shared-use paths should be built so they match the road grade without a lip. The width of the ramp is the full width of the path when the approaching path is perpendicular to the curb

and a minimum of 8 feet wide when the approaching path is parallel and adjacent to the curb. Greater widths may be needed on downhill grades. There should be no lip between the roadway surface and the ramp.

Detectable warnings are required wherever a path intersects a public street; they should not be installed at every driveway, nor where an on-road bike lane merges with an off-street path.

STAIRWAYS

Where a connection is needed to a destination or another path at a different elevation, a stairway can be used where the terrain is too steep for a path. A grooved trough should be provided so bicyclists can easily push their bicycles up or down.

Note: Stairways are usually provided as a shortcut and do not meet all ADA requirements; destinations should also be accessible along a flatter route, even if it is longer and more circuitous. ADA should not be used as a reason to not provide stairs where beneficial and practicable.

SIGNS

Paths should be signed with appropriate regulatory, warning and destination signs.

REGULATORY SIGNS

Regulatory signs inform users of traffic laws or regulations. They are placed at the point where the regulations apply. Common regulatory signs for bicyclists are signs R1-1 and R1-2 (Stop and Yield signs); they are reduced versions (18” x 18”) of standard motor vehicle signs, to be used where they are visible only to bicyclists (where a path crosses another path or where a path intersects a roadway at right angles).

Note to Sattergreen: insert graphic showing appropriate use of standard (18” x 18”) STOP signs.

Signs OBR1-1 and OBR1-2 should be used where the signs are visible to motor vehicle traffic (where a path is parallel and close to a roadway).
Sign OBR1-3 may be used at the beginning of shared-use paths and at important access points to warn cyclists of the presence of other users.

Signs R5-3 and OBR10-14 may be used at the beginning of a shared-use path if there are problems with motor vehicles using the path.

Where bicyclists using the path must cross a road at a signalized intersection (in a crosswalk) and proceed as pedestrians, sign OBR10-11 may be used

WARNING SIGNS

Warning signs are used to inform path users of potentially hazardous conditions. They should be used in advance of the condition. Most are reduced versions (18" X 18") of standard highway warning signs.

Curves:
Intersections:

Hill:

Height and Width Constraints:
Railroad, STOP Ahead, etc:

Path Crossing Roadway

Sign OBW8-22 with "XING" rider should be used only where a shared-use path crosses a roadway in an unexpected location. **This sign is not for use where bike lanes cross streets at controlled intersections.**

Directional, destination & street signs

Where a path crosses a roadway or branches off into another path, directional and destination signs should be provided. It is also helpful to have street name signs at street crossings and access points. Signs directing users to the path are also helpful.

End of path

Where bicyclists continue riding on the roadway at the end of a path, the following sign should be used to direct cyclists to the right side of the road to minimize wrong-way riding.

PLACEMENT OF SIGNS

Signs should have 3 feet of lateral clearance from the edge of the path (min 2 feet). Because of cyclists' and pedestrians' lower line of sight, the bottom of signs should be about 5 ft above the path. If a secondary sign is mounted below another sign, it should be a minimum of 4 feet above the path. Signs placed over a path should have a minimum vertical clearance of 8 feet.

STRIPING

A centerline stripe is generally not recommended for shared-use paths. Users like to walk or ride side-by-side; a centerline stripe makes them feel confined to one side only, which is rarely possible on a standard 10-foot path. A solid centerline stripe may be used through curves and areas of poor sight distance; the approach to this area may be striped with dashes.

Captions (photo captions may not be in exact order)

Path in urban setting next to river

Fig 1: Appropriate locations for paths in urban setting:

1. **As short cut through parks and other public spaces**
2. **To bridge obstacles such as rivers or freeways**
3. **To connect cul-de-sacs or other discontinuous streets**
4. **To provide access to large commercial land uses from back roads**
5. **Along rivers, railbeds, utility lines and other corridors not served by streets, with frequent connections to the street system**

- ***Note: paths parallel to urban freeways are not recommended, due to the high-speed conflicts at interchanges.***

Fig 2: Path next to street, conflicts at intersection

Fig 3: Shared use path standards

Fig 4: Paved path with separate soft-surface trail

Path next to roadway with few conflicts

Fig 5: Wide path striped to separate users

Popular paths quickly become crowded

Path in steep terrain follows the lay of the land

Fig 6: Midblock crossing with island, advance stop bar

Fig 7: path curves prior to intersection

Fig 8: 14’ wide bridge on a 10’ wide path

Fig 9: Bridge widened for view points

* Required clearances:

- 17.5' over interstate freeways and NHS routes
- 17' over other state highways
- 16' over other roads and streets
- *23' over railroad tracks.*