# **CHAPTER 16**

# **BICYCLE FACILITIES**

#### 16.0 INTRODUCTION

With an increase in the use of bicycles for commuting, for recreation and for other travel purposes, a wide variety of bicycle-related projects and programs are being developed and implemented. Provisions of adequate facilities as part of the overall transportation system enhance and encourage safe bicycle travel. This Chapter presents the guidelines for the development and design of bikeways and the procedures for the processing of a bikeway construction project after the Planning, Programming and Budgeting phase through the Final Design phase. Also included are guidelines for the issuance of Bikeway Occupancy Permits for bikeways located within the Department's right-of-way.

The development and design of bikeways within the Department's right-of-way and/or utilizing State or Federal funds for construction should reflect the criteria presented in the Association of State Highway and Transportation Officials' (AASHTO) *Guide for the Development of Bicycle Facilities\** and the Department's "Bicycle and Pedestrian Checklist" found in Publication 10X, Design Manual, Part 1X, *Appendices to Design Manuals 1, 1A, 1B, and 1C,* Appendix S. One important factor that should be considered in the design, especially when attempting to utilize existing roadways and streets, is the safety of bicyclists, pedestrians and motorists. Safety should not be compromised.

The following represent the definition of terms, frequently used throughout this Chapter, that are applicable to the planning, design and operation of bicycle facilities. Additional definitions of basic terms are presented in the AASHTO Bicycle Guide:

- 1. Bicycle Facilities. A general term denoting improvements and provisions made by public agencies to accommodate or encourage bicycling, including parking facilities, maps, all bikeways and shared roadways not specifically designated for bicycle use.
- **2.** Bike Lane or Bicycle Lane. A portion of a roadway which has been designated by striping, signing and pavement markings for the preferential or exclusive use of bicyclists.
- **3.** Bike Path or Bicycle Path. A bikeway physically separated from motorized vehicular traffic by an open space or barrier and either within the highway right-of-way or within an independent right-of-way.
- **4.** Shared Roadway. Any roadway upon which a bicycle lane is not specifically designated but which may be legally used by bicycles. Signs only are installed along shared roadways.
- **5.** Non-Motorized Vehicle. Any human-powered or horse-drawn apparatus under the jurisdiction of the PA Vehicle Code. The emphasis for this Chapter is on bicycles, which are regulated by the PA Vehicle Code as a vehicle, subject to the statutes contained therein.

#### 16.1 PLANNING AND DEVELOPMENT OF BIKEWAY CONSTRUCTION PROJECTS

Bicycle transportation planning and development represents more than just planning for bikeways and should consider many alternatives to provide for safe and efficient bicycle travel. Planning for bicycle facilities should be conducted in conjunction with planning for other modes of transportation. It should begin with observing and gathering data on the existing conditions to provide an inventory of the physical factors that affect bicycle transportation. Also, existing laws that affect bicycling and education and enforcement programs should be examined. The inventory of existing conditions can be used to modify and/or refine bicycle-use goals and objectives and to develop a plan of proposed improvements for bicycle travel.

-

<sup>\*</sup> Hereinafter referred to as the AASHTO Bicycle Guide.

To select the type, location and priority of a particular facility, the following factors should be considered:

- 1. Physical barriers to bicycle travel (widths, overhead obstructions, bridge restrictions).
- **2.** Assessing the reduction, prevention or alleviation of bicycle accident problems.
- 3. Integrating bicycle facilities properly into a multi-modal transportation environment.
- **4.** Providing frequent and convenient bicycle access and adequate access for emergency, maintenance and service vehicles.
- **5.** Considering the context sensitive orientation of a bikeway facility.
- **6.** Considering security along remote bicycle paths and the possibility of theft or vandalism at parking locations.
- **7.** Reviewing any delays or frequent stops required by bicyclists along the bikeway facility since this may cause them to avoid the route or disregard traffic controls.
- **8.** Evaluating and eliminating, if possible, any conflicts between bicyclists, motorists and pedestrians involving highway design.
- **9.** Providing for a bikeway pavement surface quality that shall accommodate bicyclists, commensurate with the type of facility.
- **10.** Truck and bus traffic, motorhomes and trailers that may cause special problems for bicyclists due to their aerodynamic effect and width.
- 11. On-street motor vehicle parking that affects bicycle safety through car door openings and angle parking spaces.
- 12. For bikeway facilities on roadways, traffic volumes, speeds of motor vehicles and the roadway width should be considered.
- **13.** The decision to implement a bikeway plan should be made with a conscious, long-term commitment to a proper level of maintenance and any required improvements.
- **14.** Bicycle facilities and programs that reflect local laws and ordinances to encourage bicyclists to operate in a manner consistent with Pennsylvania Title 75, PA Vehicle Code and the adopted "Pennsylvania Bicycle Driver's Manual".
- 15. Providing bridges that afford bicyclists safe access and movement across barriers.
- **16.** Since a high proportion of bicycle accidents occur at intersections, select intersection facilities to minimize bicycle/motor vehicle conflict points.

For additional information relative to bicycle facility planning, refer to the AASHTO Bicycle Guide and the Department's "Bicycle and Pedestrian Checklist" found in Publication 10X, Design Manual, Part 1X, Appendices to Design Manuals 1, 1A, 1B, and 1C, Appendix S.

#### 16.2 DESIGN OF BICYCLE FACILITIES

The controlling design feature for all bicycle facilities is the location; i.e., whether it is on the roadway or is on an independent alignment. Roadway improvements such as bike lanes are dependent on the roadway's design while bike paths are located on independent alignments and their design is dependent on many factors such as the performance capabilities of the bicyclist and the bicycle.

Most highways have not been designed with bicycle travel in mind; however, there are many methods to safely improve most roadways to accommodate bicycle traffic while also improving safety for motorized road users and pedestrians. Roadway conditions should be examined and, where necessary, safe drainage grates, railroad-highway grade crossing angles and crossing surface material, smooth pavement surfaces and traffic control devices responsive to bicycle traffic should be provided. In addition, the desirability of adding facilities such as bicycle lanes, bicycle routes, shoulder improvements and wide curb lanes should be considered. Raised pavement markings and raised barriers can cause steering difficulties for bicyclists and should not be used to delineate bike lanes.

Bicycle tolerable shoulder rumble strips should be considered for installation instead of shoulder rumble strips that can pose problems for bicyclists who utilize paved shoulders for travel. For additional guidance on these types of rumble strips, refer to the Publication 46, *Traffic Engineering Manual*.

Bike lanes should be considered when it is desirable to delineate available roadway space for preferential use by bicyclists and motorists and to provide for more predictable movements by each. Bike lanes should always be oneway facilities and carry traffic in the same direction as adjacent motor vehicle traffic. Two-way bike lanes on one side of the roadway are unacceptable because they promote riding against the flow of motor vehicle traffic and are in direct violation of the PA Vehicle Code. Figure 16.1 indicates three usual locations for a bike lane relative to the roadway.

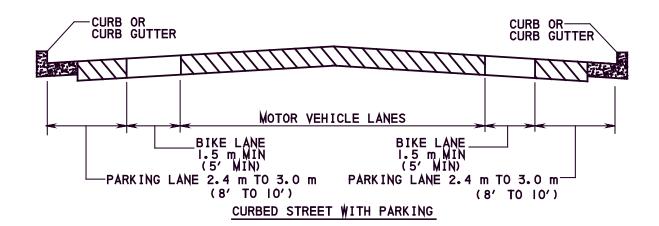
Bike lanes tend to complicate both bicycle and motor vehicle turning movements at intersections. Since they encourage bicyclists to keep to the right and motorists to keep to the left, both operators are somewhat discouraged from merging in advance of turns. At intersections, bicyclists proceeding straight through and motorists turning right may cross paths. Striping and signing configurations which encourage these crossings in advance of the intersection, in a merging fashion, are generally preferable to those that force the crossing in the immediate vicinity of the intersection.

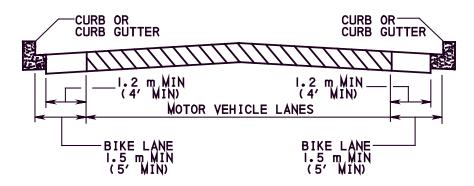
The AASHTO Bicycle Guide, Chapter 2, Figures 6 and 11 present examples of pavement marking details for bike lanes approaching motorists' right-turn-only lanes. Where there are numerous left-turning bicyclists, a separate turning lane, as indicated in Part 9 of the FHWA's Manual on Uniform Traffic Control Devices (MUTCD), should be considered. The design of bike lanes should also include appropriate signing at intersections to reduce the number of conflicts. General guidance for pavement marking of bike lanes is contained in the MUTCD.

Bike paths represent facilities located on exclusive rights-of-way and with minimal cross flow by motor vehicles. Bike paths should be thought of as extensions of the highway system that are intended for the exclusive or preferential use of bicycles. There are many similarities between design criteria for bike paths and for highways, such as determining horizontal alignment, sight distance requirements, signing and pavement markings. On the other hand, some criteria such as horizontal and vertical clearance requirements, grades and pavement structure are dictated by the operating characteristics of bicycles which are substantially different from those of motor vehicles. The designer should always be aware of the similarities and the differences between bicycles and motor vehicles and of how these similarities and differences influence the design of bike paths. The AASHTO Bicycle Guide, Chapter 2, Figure 17 indicates a typical bike path cross section on a separated right-of-way.

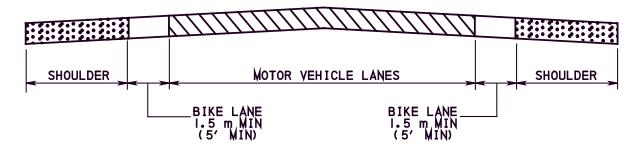
The following represent general design elements, design controls and other elements which should be considered to provide an adequate and safe bike path facility:

- 1. Paved width, operating width and vertical clearance to obstructions.
- **2.** Design speed of bicyclists.
- **3.** Horizontal alignment and superelevation.
- **4.** Grades on bike paths.
- **5.** Adequate stopping sight distances.
- **6.** Intersection design considerations.
- **7.** Adequate signing and marking.
- **8.** Pavement structure.
- **9.** Structures required to provide continuity.
- 10. Drainage of pavement and adjacent areas.
- 11. Fixed-source lighting luminaires and standards.





CURBED STREET WITHOUT PARKING



STREET OR HIGHWAY WITHOUT CURB OR GUTTER

FIGURE 16. I
TYPICAL BIKE LANE CROSS SECTIONS

DM2\_16M. DGN

- 12. Restriction of motor vehicle traffic.
- **13.** Multi-use bike paths.

The guidelines presented in the AASHTO Bicycle Guide and the Department's "Bicycle and Pedestrian Checklist" found in Publication 10X, Design Manual, Part 1X, *Appendices to Design Manuals 1, 1A, 1B, and 1C*, Appendix S should be used in the design and construction of bike lanes and separate bike paths that accommodate the operating characteristics of "bicycles".

## 16.3 OPERATION AND MAINTENANCE OF BICYCLE FACILITIES

The costs involved with the operation and maintenance of bicycle compatible facilities should be considered and budgeted for when planning a facility since neglected maintenance can render bicycle facilities unrideable and the facilities can become a liability. A smooth surface, free of potholes and debris, should be provided and maintained. Signs and pavement markings should be inspected regularly and kept in good condition. For bike paths, attention should be given to maintaining the full paved width. Trees, shrubs and other vegetation should be controlled by trimming or removal to provide adequate clearances and sight distances. If snow removal is required, it should be in the form of plowing since deicing agents and abrasives can damage bicycles or lower skid resistance. The agency responsible for the control, maintenance and policing of the bicycle facility should be established prior to construction. For additional information relative to the operation and maintenance of bicycle facilities, refer to the AASHTO Bicycle Guide.

## 16.4 BIKEWAY FUNDING PROCEDURES

Bikeways that are located outside of the Department's right-of-way and do not involve Federal funds do not require any action by the Department. Bikeways that are located within the Department's right-of-way and do not utilize Motor License or Federal funds shall require approval from the Central Office, Bureau of Project Delivery. Bike paths which are located within the right-of-way limits for Interstate and Other Limited Access highway facilities shall require approval from both the Bureau of Project Delivery and the FHWA. All bikeways located within the Department's right-of-way shall require a Bikeway Occupancy Permit (see Section 16.6). A log shall be kept by the District Executive of all approvals.

All bikeway construction projects that utilize Federal funds shall require processing for approval through the Program Management Committee (PMC) and the Bureau of Project Delivery whether they are inside or outside of the Department's right-of-way. Those bikeways utilizing Federal funding participation shall be consistent with the terms of the 1987 Surface Transportation and Uniform Relocation Assistance Act (STURAA); the Intermodal Surface Transportation Efficiency Act of 1991; Transportation Equity Act for the 21st Century (TEA-21); Title 23, USC, Section 217; and 23 Code of Federal Regulations (CFR), Part 652, Pedestrian and Bicycle Accommodations and Projects. For independent bikeways, only those projects which serve a transportation-related function are eligible for Federal funds. Incidental facilities, whether recreational or transportation-related, may be eligible for Federal funds. On highways without full access control, where a bridge and/or the roadway is being replaced or rehabilitated, and where bicycles are permitted to operate, consideration will be given to reconstruction to safely accommodate bicycle passage. Also, any bikeway utilizing either Federal or Motor License funds shall be incorporated into the Commonwealth's State Transportation Improvement Program (STIP) of projects. The construction phase of all bikeway projects should also be included in the Department's obligation plan. In addition to the STIP, Act 120 requirements should be satisfied for projects located on a State Route (SR).

#### 16.5 PROCEDURES FOR PROCESSING BIKEWAY CONSTRUCTION PROJECTS

Bikeway construction projects, regardless of bikeway type, can be categorized as either an independent bikeway construction project, which is a project to construct only a bicycle facility, or an incidental bikeway construction project, which is a project to construct a bicycle facility concurrently with a highway project or as a separate stage of construction. An incidental bikeway project should be processed with and as part of the accommodating project. Independent bikeway construction projects should be processed as follows:

- 1. The District Office shall direct and assist the sponsor of the bikeway project in preparing the required programming-related documents (see Figure 16.2). The following information which, for an area with a Metropolitan Planning Organization (MPO), should also include the documentation verifying that the project is endorsed by the MPO and is on the Transportation Improvement Program (TIP). Items A, B, C, D, E, F and K in Figure 16.2 shall be sent as a "package" to the Center for Program Development and Management (CPDM) for presentation to the Program Management Committee (PMC) for funding approval. Provisions in current programming strike-off letters pertaining to the Department's Bicycle Program and Funding Policy shall be followed. The remainder of the items listed shall be provided to the Bureau of Project Delivery for review during Final Design. Items A, D, E, F and J are required for programming Federal and State funds.
- 2. The sponsor shall submit four (4) copies of the following to the District Executive: (1) completed programming-related documents listed in 1 above, (2) resolutions on Cost Sharing, if applicable and (3) maintenance and policing responsibilities. The Department shall only be responsible for maintenance when the bikeway shares our roadway; this normally does not include signing and pavement markings or snow removal. However, on shared roadway projects, where no physical separation exists between the bikeway and roadway, the Department shall maintain the roadway edge striping and provide snow removal of the shoulder area. An agency other than the Department should agree to maintenance responsibility prior to construction of the facility.
- **3.** The District Office shall submit one (1) copy of the programming-related documents and resolutions mentioned in 1 and 2 above to the CPDM for funding approval by the PMC.
- **4.** Upon notification of PMC approval, the District Office shall submit a Form D-4232 to the CPDM for the appropriate preliminary design phase. Refer to Publication 10, Design Manual, Part 1, *Transportation Program Development and Project Delivery Process*, Chapter 5, Section 5.5 for proper Form D-4232 processing. The District Office shall arrange an environmental and engineering scoping field view for the project by contacting the Highway Design and Technology Section, Highway Delivery Division, Bureau of Project Delivery. The District Traffic Engineer and appropriate Central Office personnel, along with FHWA personnel, if applicable, shall be invited to attend. The primary purpose of the scoping field view shall be to identify the project limits, the scope of the environmental and engineering studies and the public involvement requirements.
- **5.** After the scoping field view, the District Office or municipality shall conduct the engineering and environmental studies and the public involvement activities as defined during the scoping field view. Sufficient engineering shall be performed to assess the environmental impacts and to solicit public input.
- **6.** Environmental documentation required for the construction of bicycle facilities should adhere to PENNDOT's NEPA handbooks (CEE, EA, EIS) and the Section 4(f) Handbook. If park property is required for the construction of the bicycle facility, the Negative Declaration may be applicable; however this determination must be made by FHWA.
- Section 6(f) (monies obtained from the Department of the Interior's Land and Water Conservation Fund) consultation process must include FHWA. Coordination is necessary with the Pennsylvania Department of Conservation and Natural Resources, Bureau of Recreation and Conservation and the Department of the Interior (DOI), National Park Service. Coordination with DOI must be done by FHWA.
- 7. The Bureau of Project Delivery shall obtain approval of all required documents from the FHWA, if required, and transmit such to the District Executive.
- **8.** Subsequent to the receipt of Design approval, the District Office shall take the proper steps to notify the sponsor to initiate the final design, utilizing Federal funding, if applicable, and the preparation of plans and legal agreements for the reimbursement of construction costs and for the maintenance responsibility. The reimbursement agreement should be executed prior to initiation of the project phase for which Federal reimbursement is requested (preliminary engineering and construction). Upon completion, the Plans, Specifications and Estimate (PS&E) shall be submitted to the Bureau of Project Delivery in accordance with the procedures for approval and authorization to advertise as directed in Publication 10C, Design Manual, Part 1C, *Transportation Engineering Procedures*. The plans should show all construction details including the location of signing and pavement markings for the bikeway.

	TYPES OF BIKEWAY PROJECTS				
PROGRAMMING-RELATED DOCUMENT ITEMS	BIKE PATH* ON NEW OR EXISTING R/W	BIKE LANE* REQUIRING ADDITIONAL R/W	BIKE LANE* WITHIN EXISTING R/W	SHARED* ROADWAY	
(A) Location Map	X	X	X	(1)	
(B) Strip Map, 1:2000 (1"=200') Scale	X	X	X	(1)	
(C) Detail Map, 1:500 (1"=50') Scale or Larger for Areas of					
Required R/W, Intersections, Points of Conflict	X	X	X	(1)	
(D) Cost and Quantities	X	X	X	X	
(E) Present and Future Expected					
Use	X	X	X	X	
(F) Support Facilities	X	_	_	_	
(G) Analysis of Turning  Movements and Capacity at  Intersections	(2)	X	X	X	
(H) Bikeway Profile and Typical					
Sections	X	X	(1)	(1)	
(I) Consideration of:  1. Drainage Requirement 2. Auto on Street Parking	<u>x</u>	X X	X X	(2)	
Requirement 3. Mass Transit Operation Effects 4. Alternative Locations	X	<u>X</u>	X	<u>x</u>	
(J) Maintenance Agreements	X	X	X	(2)	
(K) Overall Plan Relating Bikeway Project Existing or Proposed Areawide System with Due Consideration to Contiguous Routes	Х	X	X	X	

<sup>\*</sup>For definitions, see Section 16.0.

# **FIGURE 16.2** PROGRAMMING RELATED DOCUMENTS **REQUIRED FOR BIKEWAY CONSTRUCTION PROJECTS**

X = Required item.

<sup>(1) =</sup> Use latest highway plans.(2) = If applicable.

**9.** The Bureau of Project Delivery shall process the PS&E submission as a normal project as outlined in Department directives. A municipality may choose to let and award the project if the requirements of Publication 39, *Procedures for the Administration of Locally Sponsored Projects*, are met.

The District Office shall ensure that the following are properly advertised as directed in Publication 10C, Design Manual, Part 1C, *Transportation Engineering Procedures*: (1) the availability of all environmental documents, (2) all opportunities for and holding of public hearings and public meetings and (3) request for and receipt of Design approval.

For non-construction-type bikeway projects, the above listed procedures may be modified, as appropriate, to expedite project development. When construction involves minor signing and pavement markings or typical shoulder modifications, or when construction of facilities are other than standard roadway items, such as storage racks, etc., the procedures for minor projects in Publication 10C, Design Manual, Part 1C, *Transportation Engineering Procedures*, may be utilized.

### 16.6 BIKEWAY OCCUPANCY PERMIT

All bikeways located within the Department's right-of-way should have a Bikeway Occupancy Permit (Form TE-700) as shown in Figure 16.3 and should meet the requirements of the AASHTO Bicycle Guide. Bikeway Occupancy Permits for the establishment of bikeways within the Department's right-of-way, except Interstate and Limited Access right-of-way, shall be issued by the District Executive. For those bikeway projects occupying Interstate or Limited Access right-of-way, approval from the Bureau of Project Delivery and the FHWA shall be required prior to issuing the permit. The Bikeway Occupancy Permit should be modified accordingly to fit the needs of each bikeway construction project.

Proposed bikeway projects not utilizing Federal and/or Motor License funds should have a Bikeway Occupancy Permit issued by the District Executive if they are to be located within the Department's right-of-way. Prior to issuance of the Bikeway Occupancy Permit, municipalities and/or counties should submit to the District Office, for approval, the required documentation as specified in Section 16.5 and the maintenance agreements. The District Office should maintain a minimum of one copy of the fully-executed permit for record purposes. Bikeway Occupancy Permits shall only be issued for those bikeways which have an approved study "package" and are in conformance with the AASHTO Bicycle Guide and Publication 10X, Design Manual, Part 1X, Appendices to Design Manuals 1, 1A, 1B, and 1C, Appendix S, Bicycle and Pedestrian Checklist. For clarity, the location map required in the study "package" should accompany the permit.

The Bikeway Occupancy Permit should describe the entire bikeway route. If more than one State Route is involved, these should also be listed. For continuity and clarity, if local road segments are utilized for a portion of the bikeway route, they should also be listed. The State Routes and/or local roads should be listed in sequential order starting from one end and progressing to the other end of the bikeway route. In addition to the listing of the routes, the limits and identification of segments of each route in the bikeway route should also be indicated in the "From" and "To" columns and should include stations and reference points (intersecting State Routes or local roads, as an example) at each point. Segment and segment offset information are not applicable to local roads. In the "Type of Bikeway" column, indicate if the bikeway is a bike path, bike lane or shared roadway. This column should only be filled out for the State Routes involved. The next two columns only pertain to the bike paths and bike lanes and should only be filled out for the State Routes involved. The description and location should specify the bikeway width, which side or sides of the roadway are involved, whether pavement or a portion of the shoulder is utilized and any other pertinent information necessary to properly locate the bikeway route.

As an example of a bike lane, the description location should be: "1.2 m (4 ft) bike lane on pavement, measured from curb, both sides". As an example of a bike lane on a shoulder area, the descriptive location should be: "1.2 m (4 ft) bike lane on outer 1.2 m (4 ft) portion of the right shoulder". The type of separation which is necessary for bike lanes or bike paths should be specified as traffic line paint, curb, sidewalks, earth strip, etc.

As specified in Section 16.5, indicate any "special conditions" (environmental or otherwise) conditional to granting approval of the permit. Representatives from the Bureau of Project Delivery shall be available, upon request, to review complex bikeway problems.

# 16.7 SIGNING, SIGNALIZATION AND MARKING

All bikeway facilities should be properly signed and marked for identification and to convey instructions to either bicyclists, motorists, or both, in accordance with the MUTCD. The uniform application of traffic control devices should be used to encourage proper bicyclist behavior.

INTENTIONALLY BLANK

TE-700 (10/88) (Reproduced Locally)	BIKEWAY OCCUPANCY PERMIT		PERMIT N	0		
WHEREAS, It is desired to designate Bikeways on or along certain Highways as shown on the sketch attached hereto and made a part hereof, and WHEREAS, It is desired to have such Bikeways established and marked in accordance with the standards, rules and regulations of the Pennsylvania Department of Transportation. NOW THEREFORE, BE IT RESOLVED; That the following routes are hereby established for Bikeways:						
ROUTE <u>VIA</u> <u>FROM</u>	<u>TO</u>	TYPE OF BIKEWAY	DESCRIPTIVE LOCATION	TYPE OF SEPARATION (IF ANY)		
Said Bikeway to be established and maintained under and subject to the following items and conditions:						
(a) The of maintenance (including snow remove	County val), and proper tra	y of sh ffic signing and mark	nall be responsible the sikeway.	for the policing*,		
*Including the enactment of a local ordinance to ban all motorized vehicles other than maintenance vehicles and snowmobiles when snow conditions and local ordinances permit.						
(b) The Department maintains the right to cancel this permit upon thirty (30) day written notification to the permittee.						
(c) Shall provide and annually repair the necessary signs and markings in accordance with the standards as prescribed by the Secretary of Transportation.						
(d) The Bikeway hereby established shall be discontinued and all signs and markings thereon shall be removed therefrom if changes in physical or traffic conditions make such Bikeway impracticable or hazardous in the judgement of the Secretary of Transportation.						
				Sheet 1 of 2		

FIGURE 16.3 BIKEWAY OCCUPANCY PERMIT

SPECIAL CONDITIONS OF APPROVAL				
A certified copy of this resolution shall be sent to the Dep upon his approval, the aforesaid Bikeway shall be deemed to have thereof.				
ATTEST:				
Chief Clerk	Mayor			
I hereby certify the foregoing to be a true and correct copy adopted at a meeting of said body on the day of				
	Chief Clerk			
	(SEAL)			
The establishment of the aforesaid Bikeway is hereby approved in accordance with the terms and conditions expressed in the foregoing resolution.  Date:				
	District Executive			
	Engineering District			
I	Deputy Secretary for Highway Administration			
	Sheet 2 of 2			

FIGURE 16.3
BIKEWAY OCCUPANCY PERMIT
(CONTINUED)

**BLANK PAGE**