

KSM

# Access Management for Streets and Highways

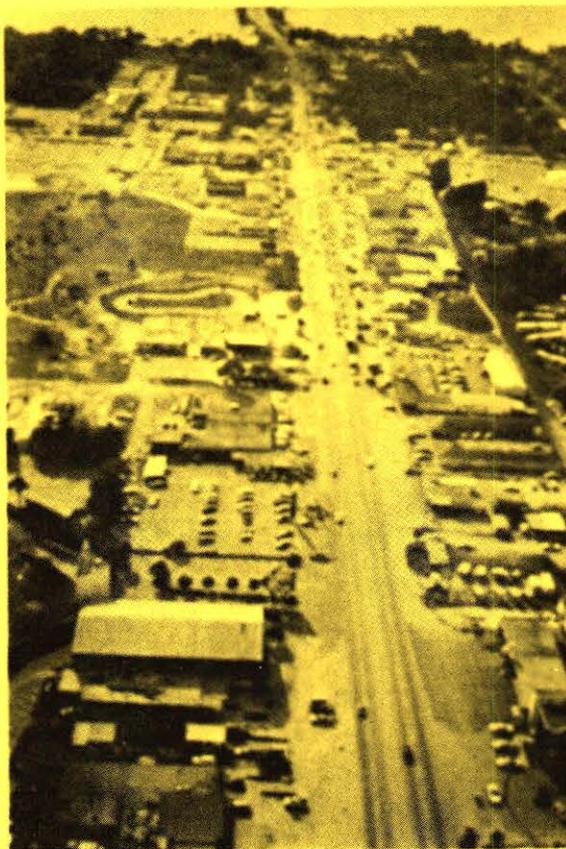
Implementation Package  
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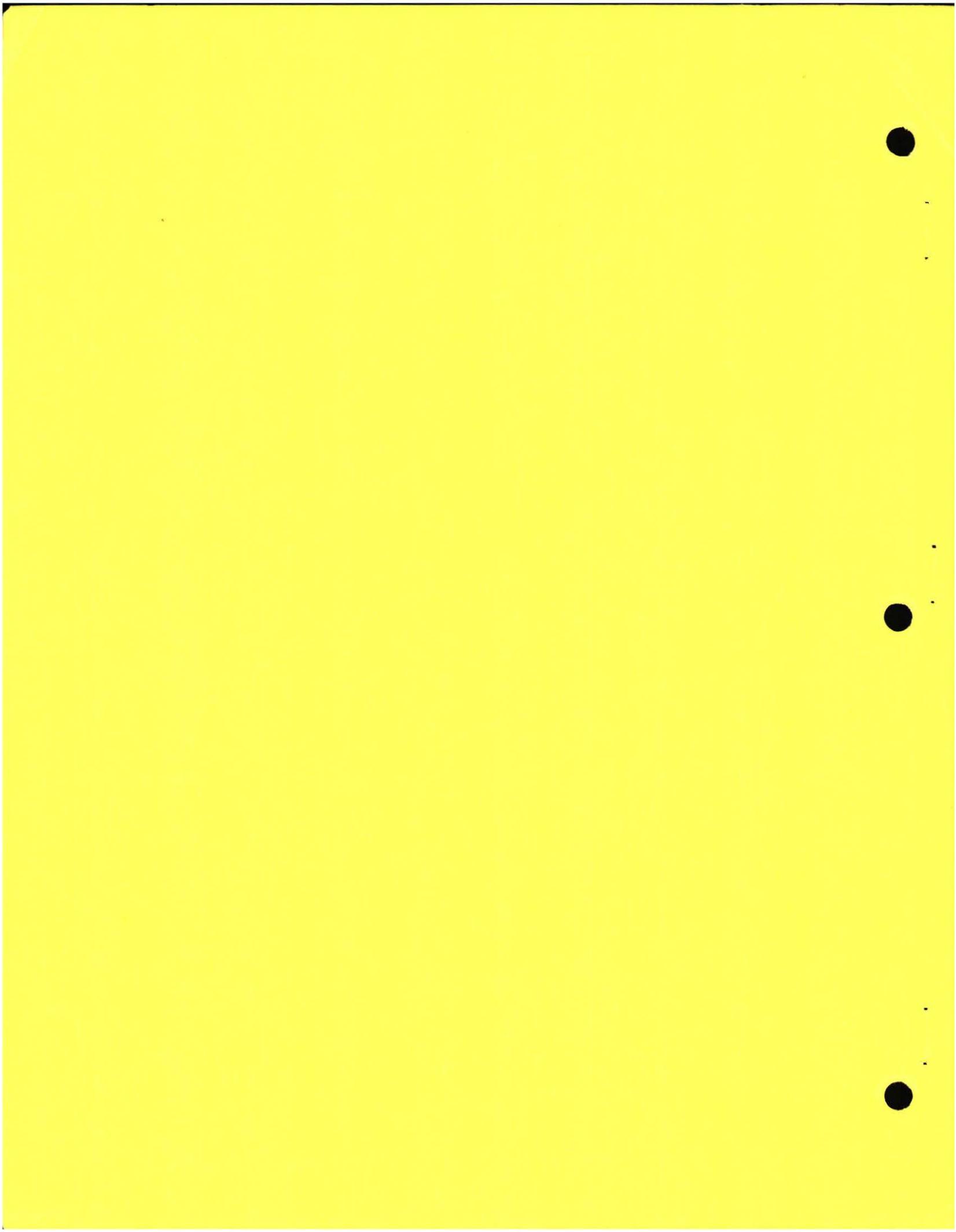
June 1982



U.S. Department  
of Transportation

**Federal Highway  
Administration**





# **Instructor's Guide**

## **Access Management for Streets and Highways**

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Prepared for  
**U.S. Department of Transportation**  
Federal Highway Administration

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Prepared by  
**PRC Voorhees**  
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McLean, Virginia 22102

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Kenneth M. Keitt  
Dr. Donald G. Capelle, P.E.

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## GENERAL INSTRUCTIONS

This instructor's manual is intended to supplement the student text as a guide to the instructor in preparing for and making class presentations. It includes a lesson plan, specific instructional details relating to each session, session objectives, training objectives, a print of the viewgraphs, a listing of slides, and a copy of the class problems.

The student text contains a very comprehensive presentation of the subject material for each session, and therefore the instructor should be thoroughly familiar with the content of the text. Also, the instructor should utilize his own experience, citing specific examples to further reinforce the material being submitted. The instructor should supplement references with examples of literature and research reports which reflect current state-of-the-art and recent developments for course participants.

### Introduction and Closure

The Course Coordinator will set the focus for the course with opening remarks that are most appropriate for the locality in which the course is being given. In all cases, the opening session should include the introduction of all the participants and a description of how the course is to be conducted. Course closure will normally involve the presentation of certificates by either the Course Coordinator or someone he feels is appropriate.

### Visual Aids

The basic visual aid format is viewgraphs and 35mm slides. A 16mm sound motion picture film is included in Session 4. Prints of the viewgraphs and a listing of the 35 mm slides are included with each lesson plan.

ACCESS MANAGEMENT FOR STREETS AND HIGHWAYS  
LESSON PLAN

SESSION 1 DURATION 30 MINS.

SESSION TITLE INTRODUCTION

**INSTRUCTIONAL OBJECTIVES**

1. Briefly describe course scope and content.
2. Describe schedule and procedures.
3. Introduce instructors and participants.

**INSTRUCTIONAL METHODS**

1. Lecture and discussion
2. Self-introduction of instructors and participants

**INSTRUCTIONAL MATERIALS**

Slides None

Viewgraphs Five (5) viewgraphs

Others Distribution of student textbook and supporting documents

**SPECIAL INSTRUCTIONS**

1. It is important that the instructor convey the importance of group discussion and participation since a great part of the value of the course is in the interchange of ideas among those participating.

**INSTRUCTIONAL ACHIEVEMENT**

1. Understand focus of the course.
2. Develop enthusiasm.
3. Acquaint oneself with the participants.

SESSION NO. 1

TITLE INTRODUCTION

TOPIC NO. 1

Note: Instructor should arrive one hour before beginning of class to check lights, projector equipment, spare bulbs, heat and/or air, chairs and tables, and to unpack instructional material.

- Introduce self (name plate on board)
- Introduce assistant instructor(s)
- Introduce guests
- Participant introductions
- Administrative notes
  - a. Parking
  - b. Restrooms
  - c. Coffee
  - d. Breaks
  - e. Lunch
  - f. Phone
  - g. Name plates
  - h. Roster
- Course materials
  - a. Textbook
  - b. Course evaluation (keep daily)

VI-1

**ACCESS MANAGEMENT  
FOR STREETS AND HIGHWAYS**

SESSION NO. 1  
TOPIC NO. 2 and 3

TITLE INTRODUCTION

- Course Objectives
  - a. Refresher -- Recover "lost" knowledge
  - b. Update -- Learn new developments
  - c. Expand -- Learn of new disciplines

COURSE OBJECTIVES

VI-2

- ASSESS THE SAFETY AND OPERATIONAL IMPACTS OF ALTERNATIVE ACCESS MANAGEMENT TECHNIQUES
- SELECT THE DESIGN, LOCATION AND CONTROL DEVICES ASSOCIATED WITH ACCESS ENTRANCES
- REVIEW PERMIT APPLICATIONS FOR APPROPRIATE FEATURES
- RECOGNIZE THE VARIOUS ELEMENTS INVOLVED IN DEVELOPING AND EXECUTING AN EFFECTIVE ACCESS MANAGEMENT PROGRAM

- Course Schedule
  - a. Overview of session content
  - b. Identify sessions with class problems
  - c. Mention overlapping of some sessions
  - d. Describe materials needed
    - Calculator
    - Scale
    - Pencils
    - Etc.
  - e. Establish daily starting and ending times

Course Outline -- First Day  
Session 1  
INTRODUCTION  
Session 2  
NEED AND BENEFITS  
OF ACCESS MANAGEMENT  
Session 3  
ELEMENTS OF  
COMPREHENSIVE PROGRAMS  
Session 4  
COMING COMPREHENSIVE  
PROGRAMS  
Session 5  
ATTORNEY PROGRAMS FOR  
EXISTING ROADWAYS  
Course Outline -- Second Day  
Session 6  
TECHNIQUES FOR ACCESS  
MANAGEMENT  
Session 7  
DESIGN GUIDELINES  
Session 8  
EVALUATION TECHNIQUES  
● Engineering  
● Operations  
● Economics

VI-3  
VI-4  
VI-5

Course Outline -- Third Day  
Session 9  
WORKSHOP ON APPLICATION  
OF TECHNIQUES  
Session 10  
REVIEW OF WORKSHOP RESULTS  
Session 11  
SITE PLAN REVIEW  
Session 12  
SITE PLAN REVIEW WORKSHOP  
Session 13  
SUMMARY AND EVALUATION

## LESSON PLAN

SESSION 2 DURATION 60 MINS.

SESSION TITLE NEEDS AND BENEFITS

### INSTRUCTIONAL OBJECTIVES

1. Discuss the needs for access control.
2. Describe the relationship between access control and traffic movement.
3. Discuss the benefits of access control.

### INSTRUCTIONAL METHODS

1. Lecture/Discussion
2. Slide presentation
3. Describe case studies

### INSTRUCTIONAL MATERIALS

Slides Forty (40) 35 mm slides

Viewgraphs Six (6) viewgraphs

Others \_\_\_\_\_

### SPECIAL INSTRUCTIONS

1. This session forms the cornerstone of the course. Emphasis should be placed on encouraging the participants to relate their own experiences.
2. Attempt to relate the needs and benefits resulting from having a control of access program.

### INSTRUCTIONAL ACHIEVEMENT

1. Understanding of the need for access control.
2. Awareness of where the basic problems occur.
3. Knowledge of the benefits that are likely to accrue from an access control program.

SESSION NO. 2

TITLE NEEDS AND BENEFITS

TOPIC NO. 1 and 2

- Lack of management of access is best illustrated by the miles of strip development found along major arterials in states throughout the United States.
- This slide shows typical example of what can be found in almost any urban or suburban area.

Slide 2-1

Arterial photo of an arterial with strip development and no control of access

- A typical cyclic program that is experienced in most developing areas is illustrated by this slide.
- In this cycle, the critical issue is not the volume of vehicles that have to be accommodated but rather the number of potential conflicts that arises as a result of the number and type of access points.
- Important to recognize that as vehicle delay increases, there is a corresponding reduction in safety and comfort.

Slide 2-2



Figure 2.1. Business Growth and Mobility Improvement Cycle

SESSION NO. 2

TITLE NEEDS AND BENEFITS

TOPIC NO. 3 and 4

Slide 2-3

- Many control of access problems occur at the intersections where major concentrations of traffic occur.
- Reducing number of conflicts can make significant improvements in terms of safety and comfort.
- Controlling access will help minimize the number of conflicts that occur.

Reducing number of conflicts with use of control of access techniques

Slide 2-4

- Stress that we live in a real-world that can never be as ideological as we would like.
- Control of access problems develop over a period of time in stages and therefore have to be recognized as the traffic service of a roadway deteriorates.

Typical real-world problems

SESSION NO. 2

TITLE NEEDS AND BENEFITS

TOPIC NO. 5 and 6

- Lack of a well-defined policy regarding access can sometimes lead to the physical construction of driveways which create serious problems with movement of vehicles in and out of a major generator.
- This slide represents a poor example of allowing multiple access points in a very short distance.

Slide 2-5

Photo of multiple access points  
from a drive-in bank

- With little development, the need for access control is not obvious. As a result, many of our urban/suburban streets have very little access control. As development starts occurring, the conflict between traffic movement and level of access becomes a serious problem.
- This slide illustrates such a situation in the very early stage of development.

Slide 2-6

No Access Control

SESSION NO. 2  
TOPIC NO. 7 and 8

TITLE NEEDS AND BENEFITS

- The need for access control is not limited to strip development areas. Downtown areas also encounter conflict problems.
- These slides illustrate two problems that are frequently encountered. The first slide illustrates backing onto street and conflicting with traffic movements. The second slide illustrates the use of parking in the median of a wide downtown street.

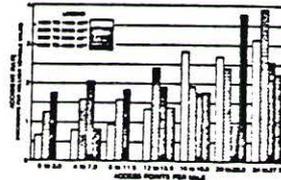
Slide 2-7  
Slide 2-8

No access control (backing onto streets)

Parking in median

- Many studies have been conducted to show how accidents vary with different levels of traffic volumes and access point frequencies.
- This slide illustrates the effect of access control on accidents and fatalities.
- One can observe a deterioration of safety as the number of access points increase.

Slide 2-9



SESSION NO. 2

TITLE NEEDS AND BENEFITS

TOPIC NO. 9 and 10

Slide 2-10

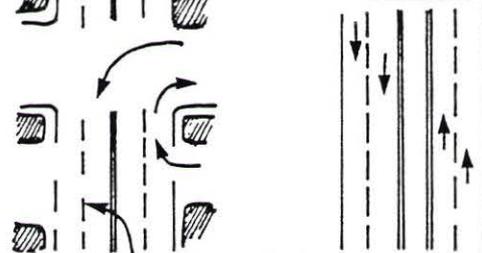
- The conflict between the safe and efficient movement of traffic and access to abutting properties is a limiting constraint in traffic operations.
- It has been a problem in the past, it is at the present time, and it will be in the future.

Cartoon:  
Access mixed with movements

Slide 2-11

MAJOR FUNCTION OF STREETS

- ACCESS TO ABUTTING LAND
- MOVEMENT OF PERSONS AND GOODS



- An arterial street has two major functions:
  - Movement of persons and goods
  - Access to abutting properties
- The design must meet both these functions.

SESSION NO. 2  
TOPIC NO. 11 and 12

TITLE NEEDS AND BENEFITS

- It has been established that there is a firm relationship between control of access and traffic movement.
- Slide #12 depicts this relationship.
- A freeway has little local traffic and therefore is designed with complete control of access. (Slide #13)
- On the other end of the spectrum, a local residential street may terminate through traffic movement thereby maximizing access to adjacent properties. (Slide #14)
- The major problem with control of access lies with roadways which fall between these two extremes and are subject to a wide variety of policies and standards. (Slide #15)

Slide:  
2-12 - Traffic/Access Relationship  
2-13 - Freeway Segment  
2-14 - Cul-de-sac  
2-15 - Substandard Arterial

- The above problem is further compounded by non-technical issues which sometimes surface as political problems.
- An example is shown in these two slides.
- This driveway was the result of pressures from an elected official which overshadowed the technical arguments.

Slide 2-16  
Slide 2-17

Motel Driveway  
- looking in  
- looking out

SESSION NO. 2  
TOPIC NO. 13 and 14

TITLE NEEDS AND BENEFITS

- Many access control problems can be directly related to inadequate designs:
  - Driveway entrance too wide (Slide 2-18)
  - Entrance too restrictive (Slide 2-19)
  - Utility Pole in Roadway (Slides 2-20 and 2-21)
  - Frontage road with bad design (Slide 2-22)
  - Excessive number of driveways (Slide 2-23)

Slide 2-18  
Slide 2-19  
Slide 2-20  
Slide 2-21  
Slide 2-22  
Slide 2-23

Photos of designs which are not up to standard

- Investigation of policies in various states showed a wide variety in current use.
- This slide depicts some of the policies currently applicable to driveway standards.

Slide 2-24

**Current State Policies**

Standards	States
● Minimum Entrance Width	21
● Maximum Entrance Width	43
● Minimum Turning Radius	37
● Skew Angle of Commercial Entrances	40
● Minimum Set-Back Distance	20
● Spacing Between Entrances	39
● Corner Clearances	37

SESSION NO. 2

TITLE NEEDS AND BENEFITS

TOPIC NO. 15 and 16

- Many techniques can be used to solve some of today's control of access problems
- These techniques will be discussed in detail under Session 6.
- The following are illustrations of some of these techniques.

Slide 2-25

What can be done?

- Simple median (Slide 2-26)
- High design arterial (Slide 2-27)
- Medians and turn lanes (Slide 2-28)
- Two-way left-turn lanes (Slides 2-29 and 2-30)
- Large shopping/retail area (Slide 2-31)
- Two-way left turn on narrow roadway (Slide 2-32)
- Frontage road system (Slides 2-33 and 2-34)

Slide 2-26  
Slide 2-27  
Slide 2-28  
Slide 2-29  
Slide 2-30

Slide 2-31  
Slide 2-32  
Slide 2-33  
Slide 2-34

Control of Access Management  
Techniques

SESSION NO. 2

TITLE NEEDS AND BENEFITS

TOPIC NO. 17 and 18

- In consideration of access management, a number of questions arise as to the legal position of an agency.
- Property owners are generally entitled to compensation if any of the conditions stated are implemented.
- Otherwise, no compensation is needed.

Slide 2-35

**ENTITLED TO COMPENSATION IF:**

- All Access Denied
- Access Permitted is Insufficient for "Highest and Best Use"
- Special Injury Incurred by Specific Property
- Damage Due to Relocation of Access Points

- The primary benefits of a well-conceived access management program are:
  - Reduced delay, and
  - Increased safety
- These benefits can be easily quantified by using user costs, accident costs and costs associated with implementing the improvements.

Slide 2-36

General Benefits

SESSION NO. 2

TITLE NEEDS AND BENEFITS

TOPIC NO. 19 and 20

- An example of some of the general safety benefits that can accrue is given by this slide.

Slide 2-37

**General Benefits**

<u>Technique</u>	<u>Accident Reduction</u>
Visual Cues for Driveways	25% - 50%
Left Turn Deceleration Lanes	50%

- The general distribution of control of access related accidents can often define the type of control problem that needs to be addressed.
- This slide depicts the characteristics of some of the problems at driveways.

Slide 2-38

<u>Movement</u>	<u>Percent of Accidents</u>
Right Turn Enter	15%
Right Turn Exit	15%
Left Turn Enter	43%
Left Turn Exit	27%

SESSION NO. 2

TITLE NEEDS AND BENEFITS

TOPIC NO. 20 and 21

- Another variable that has an input on the efficiency of an access point is the speed at which vehicles can leave the major street.
- As can be seen, the delay increases significantly when the entrance speed is 5 mph or less.
- This also has an impact on safety.

Slide 2-39

Delay as a function of driveway entrance speed

- Operation techniques can also have a positive impact.
- One-way operations not only reduce accidents but also increase the level of service.
- The elimination of parking can also have a very positive effect on reducing accidents merely by removing the potential conflict.

Slide 2-40

**General Benefits**

- One-Way Operations
  - Accident Reduction 25%
  - Delay Reduction 25%
- Parking
  - Accident Reduction Through Prevention Of Parking On Traveled Way 15%

SESSION NO. 2  
TOPIC NO. 22 and 23

TITLE NEEDS AND BENEFITS

- Some actual case studies show how control of access can solve operational problems.
- Route 123 and I-495 in suburban Virginia is a point of heavy concentration of through traffic and local traffic (V2-1).
- The problem was basically one of traffic leaving the freeway with a destination of a major shopping center. This traffic was crossing two lanes of Route 123 to get into the left-turn bay leading to shopping center (V2-2).
- Solution was to use channelizing islands to prohibit this movement (V2-3). This required, however, improvements at the next intersection.

V2-1  
V2-2  
V2-3

Case Study 1, Tysons Corner,  
Virginia

- Another case study is the Arlington Hall Reservation near Washington, D.C. (V2-4)
- Problem was at a median crossover serving an entrance to the Reservation (V2-5).
- Solution was to close the median opening. This eliminated the accidents at this location but moved the problem down to the intersection of George Mason Drive and Arlington Boulevard.(V2-6).
- The entire section was later improved with the construction of a grade-separated interchange.
- The point to be made is that there must be a concern about the transference of a problem from one location to another nearby location.

V2-4  
V2-5  
V2-6

Case Study 2, Army Intelligence  
Center in Virginia

## LESSON PLAN

SESSION 3 DURATION 60 MINS.

SESSION TITLE ELEMENTS OF COMPREHENSIVE PROGRAMS

### INSTRUCTIONAL OBJECTIVES

1. Discuss need for comprehensive program
2. Describe those elements involved in development of a comprehensive program

### INSTRUCTIONAL METHODS

1. Lecture/Discussion
2. Discuss each element of comprehensive program within content of real-world jurisdictional situations and constraints

### INSTRUCTIONAL MATERIALS

Slides None

Viewgraphs Ten (10)

Others \_\_\_\_\_

### SPECIAL INSTRUCTIONS

1. Absolute need for comprehensiveness should be stressed.
2. Illustrate problems if any element is missing and the importance of coordination.

### INSTRUCTIONAL ACHIEVEMENT

1. Awareness of the need for Comprehensive Program
2. Need for coordination of elements of Access Management Program

SESSION NO. 3  
TOPIC NO. 1 and 2

TITLE ELEMENTS OF COMPREHENSIVE PROGRAM

INTRODUCTION

- Discuss elements involved in comprehensive access management program and necessity for all elements to be involved.
- Legislation
- Technical
- Enforcement
- Coordination among agencies

V3-1

ELEMENTS OF  
COMPREHENSIVE PROGRAM

- LEGISLATION
- TECHNICAL
- ENFORCEMENT
- COORDINATION  
AMONG AGENCIES

LEGISLATION

- Legal base is needed for implementation of comprehensive program
- Adoption of clearly defined policy

V3-2

LEGISLATION

- AUTHORITY AND PURPOSE FOR PROGRAM ESTABLISHMENT
- DESIGNATION OF ADMINISTERING AUTHORITY
- CATEGORIZATION OF HIGHWAYS
- PROCEDURES FOR APPLICATION FOR ACCESS TO HIGHWAYS
- APPROPRIATE VARIANCE

SESSION NO. 3  
TOPIC NO. 3 and 4

TITLE ELEMENTS OF COMPREHENSIVE PROGRAM

- Begin discussion of components which go into legislation
- Authority and purpose for program establishment
- Discuss need to provide legal authority and need for program

V3-2

LEGISLATION

- AUTHORITY AND PURPOSE FOR PROGRAM ESTABLISHMENT
- DESIGNATION OF ADMINISTERING AUTHORITY
- CATEGORIZATION OF HIGHWAYS
- PROCEDURES FOR APPLICATION FOR ACCESS TO HIGHWAYS
- APPROPRIATE VARIANCE

- Discuss need to legally designate administering authority

V3-2

LEGISLATION

- AUTHORITY AND PURPOSE FOR PROGRAM ESTABLISHMENT
- DESIGNATION OF ADMINISTERING AUTHORITY
- CATEGORIZATION OF HIGHWAYS
- PROCEDURES FOR APPLICATION FOR ACCESS TO HIGHWAYS
- APPROPRIATE VARIANCE

SESSION NO. 3  
TOPIC NO. 5 and 6

TITLE ELEMENTS OF COMPREHENSIVE PROGRAM

### ROADWAY CATEGORIES

- To facilitate uniformity in application of access management program, jurisdictional roadways should be categorized according to character, type, and traffic service characteristics.
- This provides for reasonable application of access management techniques based on conditions.
- Five typical categories:
  1. Category One, a freeway with access permitted at determined interchanges.
  2. Category Two, a divided parkway or expressway with well-spaced intersections and usually frontage roads where necessary to limit direct access.
  3. Category Three, a medium-to-high speed primary or other major arterial and includes most major two-lane and multi-lane roadways in rural and urban areas.
  4. Category Four, a slower speed arterial or secondary highway in a developed area where the amount of existing adjacent development, existing cross streets and driveways would make it very difficult to impose the higher standards of Category Three.
  5. Category Five, major and minor collector streets and others not suitable for the higher control categories.

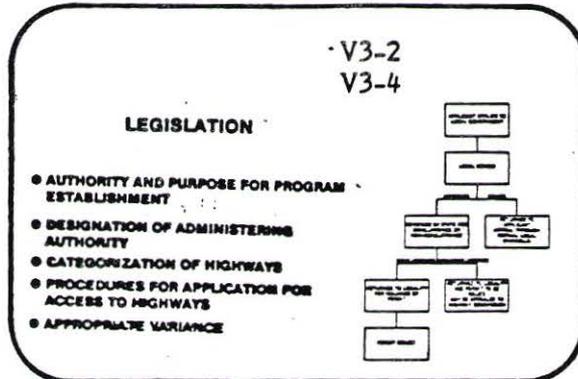
V3-2  
V3-3

LEGISLATION	HIGHWAY CATEGORIES
● AUTHORITY AND PURPOSE FOR PROGRAM ESTABLISHMENT	CATEGORY ONE - FREEWAYS
● DESIGNATION OF ADMINISTERING AUTHORITY	CATEGORY TWO - DIVIDED PARKWAY OR EXPRESSWAY
● CATEGORIZATION OF HIGHWAYS	CATEGORY THREE - MEDIUM TO HIGH SPEED MAJOR ARTERIALS
● PROCEDURES FOR APPLICATION FOR ACCESS TO HIGHWAYS	CATEGORY FOUR - SLOWER SPEED SECONDARY ARTERIALS
● APPROPRIATE VARIANCE	CATEGORY FIVE - MAJOR AND MINOR COLLECTORS AND OTHERS

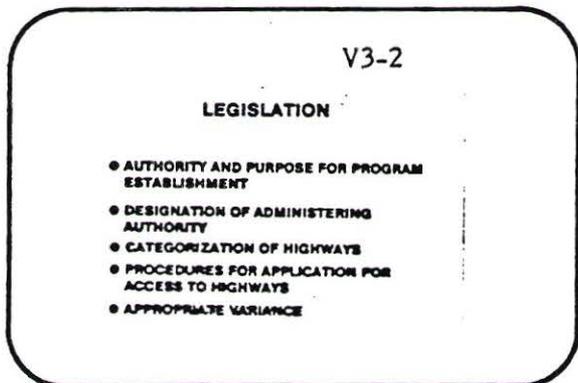
SESSION NO. 3  
TOPIC NO. 7 and 8

TITLE ELEMENTS OF COMPREHENSIVE PROGRAM

- Access permit applications
- Discuss the need to have clearly defined procedures for public to make application to gain access to roadway
- Coordination between State and locality



- Discuss the need for having standard provisions to grant variances where unusual hardships or conditions exist.



SESSION NO. 3  
TOPIC NO. 9 and 10

TITLE ELEMENTS OF COMPREHENSIVE PROGRAM

**TECHNICAL**

- Second major element in comprehensive program
- Criteria and guidelines must be established to control number, location, and design of access points on a roadway
- Guidelines must be applicable to existing conditions
- Written guidelines provide:
  - uniformity and consistency
  - public awareness

V3-5

**TECHNICAL**

- DESIGN GUIDELINES AND TECHNIQUES

**ENFORCEMENT**

- Third major element
- Police Power - implementation of appropriate legislation and enforcement regulations in the public's interest without interfering with private property rights, e.g., establishing driveway permit procedures and implementation of traffic regulations (signalization, barrier construction)
- Eminent domain - taking of private property with compensation when determined necessary for some public purpose e.g., taking private land for construction of a highway.
  - Eminent domain not desirable
  - May result in large compensational damages

V3-6

**ENFORCEMENT**

- POLICE POWERS
- EMINENT DOMAIN

SESSION NO. 3  
TOPIC NO. 11 and 12

TITLE ELEMENTS OF COMPREHENSIVE PROGRAM

### COORDINATION AMONG AGENCIES

- Fourth major element of comprehensive program
- Introduction: There are numerous agencies within a jurisdiction and among jurisdictions, which require coordination to achieve proper results.

#### COORDINATION AMONG AGENCIES <sup>V3-7</sup>

- ZONING
- SUBDIVISION APPROVAL
- SITE PLAN REVIEW
- BUILDING PERMITS
- OCCUPANCY PERMITS
- DRIVEWAY PERMITS
- STREET DESIGN AND CONSTRUCTION

### ZONING

- Discussion of various access control procedures which are often included in zoning ordinances, i.e.,
  - setbacks
  - sight distances
  - barriers around parking areas
  - require maneuvering off public R/W
  - control adverse intensive use

V3-8

#### ZONING REGULATIONS

- ESTABLISH SET-BACKS
- PROVIDE FOR ADEQUATE SIGHT DISTANCE
- REQUIRE BARRIERS AROUND PARKING AREAS
- REQUIRE ALL MANEUVERING OFF PUBLIC R/W
- CONTROL ADVERSE INTENSIVE USE

SESSION NO. 3  
TOPIC NO. 13 and 14

TITLE ELEMENTS OF COMPREHENSIVE PROGRAM

● Subdivision Approval

Discuss those elements of access control which are often found in subdivision ordinances:

- Building setbacks
- Street connections to main road
- Preservation of street system capacity
- Assure adequate frontage

V3-9  
SUBDIVISION APPROVAL

- BUILDING SET-BACKS
- MINIMIZE CONNECTIONS TO MAIN ROAD
- ASSURE STREET SYSTEM CAPACITY
- ASSURE ADEQUATE FRONTAGE

● Site Plan Review

- Site plan review gives jurisdiction opportunity to regulate access point location and design
- Reduce or eliminate adverse impact

V3-7  
COORDINATION AMONG AGENCIES

- ZONING
- SUBDIVISION APPROVAL
- SITE PLAN REVIEW
- BUILDING PERMITS
- OCCUPANCY PERMITS
- DRIVEWAY PERMITS
- STREET DESIGN AND CONSTRUCTION

SESSION NO. 3  
TOPIC NO. 15 and 16

TITLE ELEMENTS OF COMPREHENSIVE PROGRAM

● Building Permits

Prior to issuance of building permits many jurisdictions require review by traffic officials to minimize adverse access impact on traffic

V3-7

**COORDINATION  
AMONG AGENCIES**

- ZONING
- SUBDIVISION APPROVAL
- SITE PLAN REVIEW
- BUILDING PERMITS
- OCCUPANCY PERMITS
- DRIVEWAY PERMITS
- STREET DESIGN AND CONSTRUCTION

● Occupancy Permits

This provides jurisdiction with opportunity to review implications of change in occupancy. More intensive use often results in access problems

V3-7

**COORDINATION  
AMONG AGENCIES**

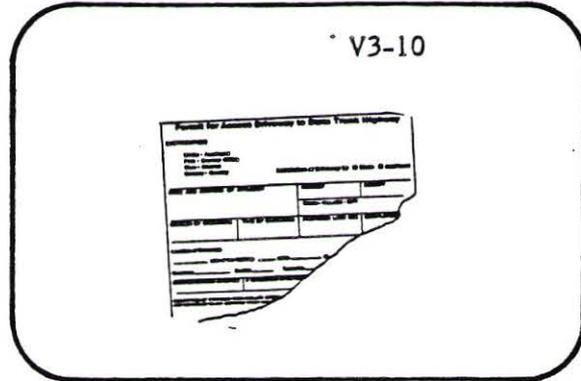
- ZONING
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- SITE PLAN REVIEW
- BUILDING PERMITS
- OCCUPANCY PERMITS
- DRIVEWAY PERMITS
- STREET DESIGN AND CONSTRUCTION

SESSION NO. 3  
TOPIC NO. 17 and 18

TITLE ELEMENTS OF COMPREHENSIVE PROGRAM

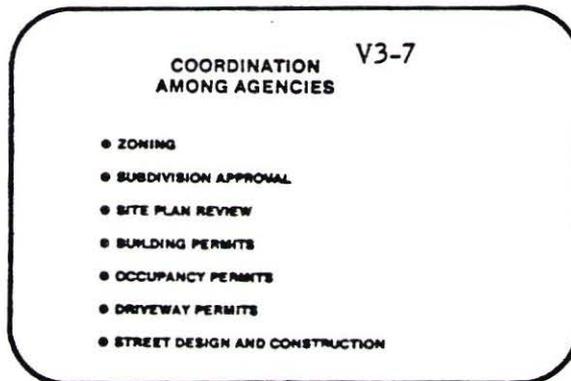
● Driveway Permits

- Most widely used process for controlling access
- Permit granted only after jurisdiction reviews location and plans
- Assures compliance with regulations
- Problem is that it is often applied inconsistently



● Street Design and Construction

- Roadways are often redesigned or upgraded and reconstructed with no improvement in access management



## LESSON PLAN

SESSION 4 DURATION 60 MINS.

SESSION TITLE EXISTING PROGRAMS

### INSTRUCTIONAL OBJECTIVES

1. Acquaint student with efforts and programs in other jurisdictions to manage access.
2. Discuss pros and cons of existing programs as they apply to various situations

### INSTRUCTIONAL METHODS

1. Lecture and Discussion
2. Film

### INSTRUCTIONAL MATERIALS

Slides None

Viewgraphs Eight (8)

Others 16 mm color film with sound on Wisconsin Program

### SPECIAL INSTRUCTIONS

1. Emphasize that other jurisdictions are enacting more comprehensive access management programs
2. Emphasize inadequacies due to lack of comprehensiveness

### INSTRUCTIONAL ACHIEVEMENT

1. Awareness that Access Management is a viable concept being embraced by a growing number of jurisdictions.

SESSION NO. 4

TITLE EXISTING PROGRAMS

TOPIC NO. 1 and 2

INTRODUCTION

- Range of Current Practices
  - No standards
  - Comprehensive standards

Most jurisdictions fall between

- Existing Programs (examples)
  - Wisconsin
  - Pennsylvania
  - Colorado

V4-1

**Existing Programs**

- Range of Current Practices
- Examples of Existing Programs
  - Wisconsin
  - Pennsylvania
  - Colorado

- Most jurisdictions use only driveway permits and site plan review. These are often based on single set of standards, however, and not on standards adapted to conditions (physical and traffic)
- Oregon -- predetermines access points
- Broward Co., Fla. -- no access easement
- Many jurisdictions use zoning, subdivision regulation, or driveway permits but have little coordination with traffic management or among agencies.

V4-1

**Existing Programs**

- Range of Current Practices
- Examples of Existing Programs
  - Wisconsin
  - Pennsylvania
  - Colorado

SESSION NO. 4  
TOPIC NO. 3 and 4

TITLE EXISTING PROGRAMS

EXISTING PROGRAM - WISCONSIN

- Development of access type, spacing criteria, and highway design standards related to route function, level of service, and traffic volume.

HIGHWAYS II:  
THE PLAN

V4-2

"...THE DEVELOPMENT OF ACCESS TYPE AND SPACING CRITERIA AND HIGHWAY DESIGN STANDARDS RELATED TO ROUTE FUNCTION, LEVEL OF SERVICE, AND TRAFFIC VOLUME...."

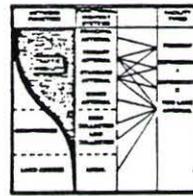
WISCONSIN

EXISTING PROGRAM - WISCONSIN

- Relationship between facility function and highway type thus allowing standards to be developed commensurate with purpose.

V4-3

RELATIONSHIP OF FUNCTIONAL  
HIGHWAY CLASSIFICATION  
SYSTEMS AND FACILITY TYPES



SESSION NO. 4

TITLE EXISTING PROGRAMS

TOPIC NO. 5 and 6

- Guidelines for access criteria were developed which related to these functional characteristics as well as traffic volumes
- Film later will explain more on Wisconsin program

V4-4

Guidelines for Access Type and Minimum Spacing for Suburban Areas

Access Type	Minimum Spacing (ft)								
Through	100	100	100	100	100	100	100	100	100
Front	100	100	100	100	100	100	100	100	100
Side	100	100	100	100	100	100	100	100	100
Back	100	100	100	100	100	100	100	100	100

#### EXISTING PROGRAM - PENNSYLVANIA

- State has developed comprehensive program
- State must approve all access onto State highways
- Provides for local review prior to State review if localities desire
- Location and design requirements based on volume and type of traffic and type and character of roadway

V4-5

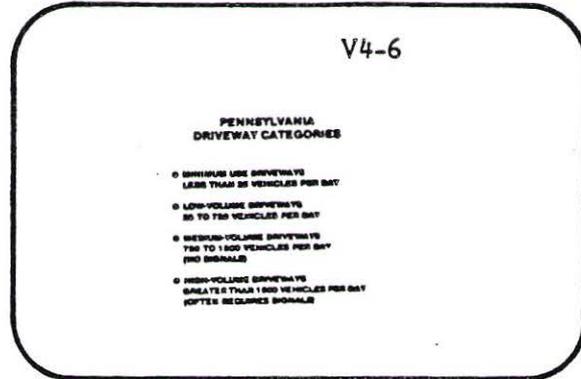
Title Page and Contents of Pennsylvania Department of Transportation Regulations

Section	Page
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2.00	100

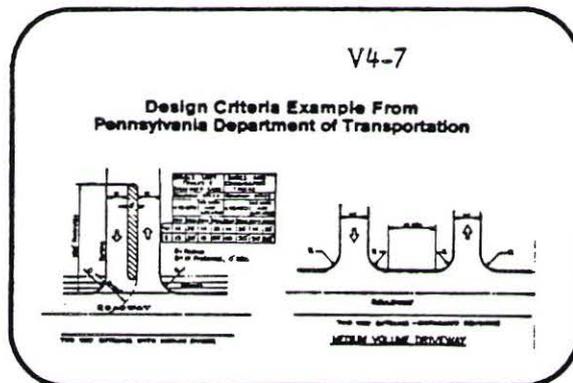
SESSION NO. 4  
TOPIC NO. 7 and 8

TITLE EXISTING PROGRAMS

- Driveway Categories
- Driveways are categorized by volumes of traffic expected to serve
  - minimum use: Less than 25 ADT
  - low volume: 25 to 750 ADT
  - medium volume: 750 to 1,500 ADT
  - high volume: greater than 1,500 ADT



- Example of design criteria established based on type and speed of traffic and volume of traffic



SESSION NO. 4

TITLE EXISTING PROGRAMS

TOPIC NO. 9 and 10

EXISTING PROGRAM -COLORADO

- Developed statewide comprehensive program
- Adopted September 1981; Appendix B of text
- Coordination and involvement of all jurisdictions
- Categorization of all roadways and standards applicable to each category
- Demonstration project underway in Colorado now

V4-8

Title Page,  
Colorado Access Code

WISCONSIN

- Film explaining importance and application of access management in Wisconsin

16 mm film prepared by Wisconsin  
State Highway Commission

## LESSON PLAN

SESSION 5 DURATION 60 MINS.

SESSION TITLE RETROFIT PROGRAM

### INSTRUCTIONAL OBJECTIVES

1. Illustrate differences between applying access management to new construction and applying it to existing arterials (Retrofit)
2. Awareness of need for different approach in Retrofit

### INSTRUCTIONAL METHODS

1. Lecture and Discussion

### INSTRUCTIONAL MATERIALS

Slides None

Viewgraphs Twelve (12)

Others \_\_\_\_\_

### SPECIAL INSTRUCTIONS

1. Continually emphasize public relations in Retrofit as well as political implications

### INSTRUCTIONAL ACHIEVEMENT

1. Awareness of Access Management as alternative to major reconstruction
2. Necessity of sensitivity to public

SESSION NO. 5  
TOPIC NO. 1 and 2

TITLE RETROFIT PROGRAM

### INTRODUCTION

- Difference between new construction and existing arterial
- Alternative to costly widening or reconstruction to maintain or increase LOS
- Social and political pressures
- Legal problems
- Individual disbenefit versus public benefit

V5-1

### RETROFIT

APPLYING ACCESS MANAGEMENT  
TO  
DEVELOPED ARTERIALS

### TECHNIQUES

- Techniques applicable to retrofitting fall primarily into four categories:
  - Driveways
  - Medians
  - Frontage roads
  - Miscellaneous

V5-2

### RETROFIT TECHNIQUES

- DRIVEWAYS
- MEDIANS
- FRONTAGE ROADS
- MISCELLANEOUS

SESSION NO. 5

TITLE RETROFIT PROGRAM

TOPIC NO. 3 and 4

### DRIVEWAYS

- Location
- Width and turning radius
- Number and spacing

V5-3

### DRIVEWAYS

- LOCATION
- WIDTH AND TURNING RADIUS
- NUMBER AND SPACING

### MEDIANS

- Types of medians
  - Flush
  - Raised
    - no turns
    - left-turn bays
  - 2-way left turns
- Discuss advantages/disadvantages of each

V5-4

### Medians

Flush Medians

Raised Medians

- Restrict Turns
- Left Turn Bays

2-Way Left Turns

SESSION NO. 5

TITLE RETROFIT PROGRAMS

TOPIC NO. 5 and 6

- Discuss effect of median openings on sales volume
- Studies in three Texas cities
- Impact on individual versus impact on area business

V5-5

Firms at Median Opening	Sales Volume	
	Before Median	After Median
1. Traffic-Serving Businesses	100	98
2. Non-Traffic-Serving Businesses	100	88
Firms Not at Median Opening		
1. Traffic-Serving Businesses	100	88
2. Non-Traffic-Serving Businesses	100	100

- Effect of medians on sales volume
- Studies in three Texas cities

V5-6

	SALES VOLUME COMPARISON	
	BEFORE MEDIAN	AFTER MEDIAN
PLEASANTON		
A. TRAFFIC-SERVING BUSINESSES		
1. STUDY GROUP	100	95.8
2. CONTROL GROUP	100	100.8
B. NONTRAFFIC-SERVING BUSINESSES		
1. STUDY GROUP	100	82.4
2. CONTROL GROUP	100	104.3
SAN ANTONIO		
A. TRAFFIC-SERVING BUSINESSES		
1. STUDY GROUP	100	78.4
2. CONTROL GROUP	100	102.0
B. NONTRAFFIC-SERVING BUSINESSES		
1. STUDY GROUP	100	108.4

SESSION NO. 5  
TOPIC NO. 7 and 8

TITLE RETROFIT PROGRAMS

**FRONTAGE ROADS**

- Primarily useful for new construction as opposed to existing situations
- Need for R/W
- Intersection problems
- Pedestrian/Bike safety
- One-way preferred

V5-7

**FRONTAGE ROADS**

- NEED FOR ADDITIONAL R/W
- INTERSECTION PROBLEMS
- PEDESTRIAN/BIKE SAFETY
- ONE-WAY VS. TWO-WAY

**MISCELLANEOUS**

- Signalization of high-volume driveways
- One-way operation
- Channelization
- Speed Control
- Prohibition of movements

V5-8

**MISCELLANEOUS TECHNIQUES**

- SIGNALIZATION OF HIGH-VOLUME DRIVEWAYS
- INSTALLATION OF ONE-WAY OPERATION
- CHANNELIZATION
- SPEED CONTROL
- PROHIBITION OF MOVEMENTS

SESSION NO. 5

TITLE RETROFIT PROGRAM

TOPIC NO. 9 and 10

**IMPLEMENTATION**

- Emphasize need for well-coordinated program involving the jurisdictional operating agencies and general public
- Documented Engineering Study
  - Define and quantify problems
  - Outline objectives
  - Develop alternative solutions
  - Evaluate alternatives

V5-9

**IMPLEMENTATION**

- COMPREHENSIVE, BALANCED PROGRAM
- DOCUMENTED ENGINEERING STUDY
  - DEFINE AND QUANTIFY PROBLEMS
  - OUTLINE OBJECTIVES
  - DEVELOP ALTERNATIVE SOLUTIONS
  - EVALUATE ALTERNATIVES

**PUBLIC INVOLVEMENT**

- Stress need to understand all problems and benefits accruing to public as result of retrofit actions

V5-10

**PUBLIC INVOLVEMENT**

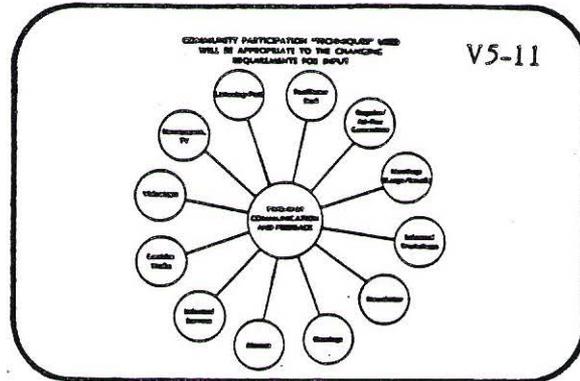
SESSION NO. 5

TITLE RETROFIT PROGRAM

TOPIC NO. 11 and 12

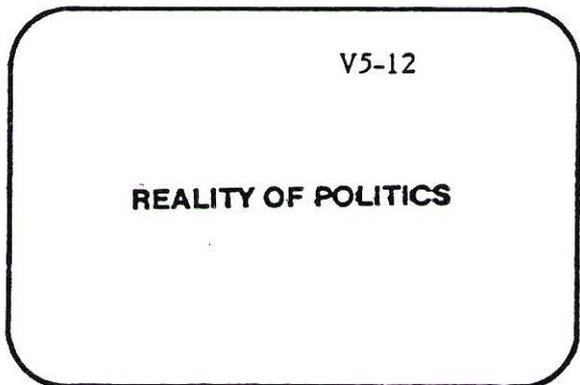
### COMMUNITY PARTICIPATION TECHNIQUES

- Stress two-way communication
- Discuss each of the various "public participation techniques" shown on the viewgraph and when they are applicable



### REALITY OF POLITICS

- Engineers and planners often feel they are above politics
- Real-world situations require working within framework of politics
- Keep politicians advised



**LESSON PLAN**

SESSION 6 DURATION 135 MINS.

SESSION TITLE TECHNIQUES FOR ACCESS MANAGEMENT

**INSTRUCTIONAL OBJECTIVES**

1. Illustrate use of access management techniques

**INSTRUCTIONAL METHODS**

1. Lecture and Discussion
2. 35 mm slide presentation

**INSTRUCTIONAL MATERIALS**

Slides Seventy Three (73) 35 mm

Viewgraphs None

Others \_\_\_\_\_

**SPECIAL INSTRUCTIONS**

1. Encourage discussion from participants as to experience with various techniques or anticipated applicability

**INSTRUCTIONAL ACHIEVEMENT**

1. Awareness of various techniques available to traffic manager.

SESSION NO. 6  
TOPIC NO. 1 and 2

TITLE TECHNIQUES FOR ACCESS MANAGEMENT

Slide 41

**Access Management -  
Technique Categories**

- Categories of access management techniques
  - a. Limit number of conflict points
  - b. Separate basic conflict areas
  - c. Limit deceleration requirements
  - d. Remove turning vehicles from through lanes

Slide 42

**Access Management Techniques**

- A. Limit Conflict Points**
- B. Separate Conflict Areas
- C. Limit Deceleration Requirements
- D. Remove Turning Vehicles From Through Lanes

Category A

Limit Conflict Points

This category reduces the frequency of basic or encroachment conflicts or reduces the area of conflicts along the highway by limiting certain vehicular movements.

SESSION NO. 6

TITLE TECHNIQUES FOR ACCESS MANAGEMENT

TOPIC NO. 3 and 4

- A.1: Install median barrier with no direct left-turn access

This technique reduces the basic conflict points from 9 to 2 at all driveways. More important, the barrier totally eliminates the more hazardous crossing conflict points at all driveways.

Warrants

This technique is generally warranted on multilane arterial highways with speeds greater than 40 mph, ADT's greater than 10,000 vehicles per day, and levels of development between 30-60 driveways per mile. Left-turning movements should equal or exceed 150 vph on a 1-mile section during peak periods. Also, this technique is warranted along highway sections where mid-block accident experience involving left-turning vehicles is excessive.

Slide 43

**Median Divider**

- A-2: Install raised median divider with left-turn deceleration lanes

Warrants

This technique is generally warranted on multilane highways with speeds of 30 to 45 mph, ADT's greater than 10,000 vehicles per day, and levels of development greater than 30 driveways per mile. Left-turning movements should exceed 150 vph on a 1-mile section during peak periods. In addition, this technique may be warranted by a high-accident experience associated with mid-block, left-turning vehicles.

Slide 44

**Median Divider With Left-Turn Lane**

SESSION NO. 6

TITLE TECHNIQUES FOR ACCESS MANAGEMENT

TOPIC NO. 5 and 6

- A-3: Install one-way operations on the highway

Warrants

A nearby parallel highway is needed to carry the reverse-direction traffic. Commercial driveways should number at least 30 per mile, and turning maneuvers into these driveways should comprise 30 percent or more of the total traffic over a 1-mile section during peak periods. Daily traffic volume should exceed 5,000 vehicles with posted speeds between 30 and 40 mph. Inadequate capacity could also warrant this technique.

Slide 45

**One-Way Operation**

- A-4: Install traffic signal at high-volume driveways
- Reduces right-angle collisions, vehicle-pedestrian conflicts, and can reduce opposing left-turn conflicts
- Can be used to create gaps in traffic
- Warrants must concur with Manual on Uniform Traffic Control Devices

Slide 46

**Install Signal at High-Volume Driveway**

SESSION NO. 6

TITLE TECHNIQUES FOR ACCESS MANAGEMENT

TOPIC NO. 7 and 8

- A-5: Channelize median openings to prevent left-turn ingress and/or egress maneuvers

Warrants

This technique is warranted on multilane divided highways with speeds of 30-45 mph, ADTs greater than 5,000 vpd, and levels of development greater than 30 driveways per mile. In particular, it is warranted at driveways where safety problems are caused by a small number of left-turn maneuvers. The prohibited turns should not exceed 100 vpd. Also, this technique may be justified at sites that meet accident warrants.

Slide 47

**Channelize Median to Prevent Left-Turn Egress/Ingress**

Slide 48

**Prevent Left-Turn Ingress**

- A-6: Widen right through lane to limit right-turn encroachment onto the adjacent lane to the left

Warrant

A level of development of 20 driveways is the major warranting condition. Traffic volume should exceed 5,000 vpd, and right-turn driveway entrance volume per mile should exceed 100 vehicles during the peak hour. Also, highway speeds should exceed 30 mph. This technique is also warranted where high accident rates indicate a right-turn encroachment problem exists.

Slide 49

**Widen Route Through Lane**

SESSION NO. 6

TITLE TECHNIQUES FOR ACCESS MANAGEMENT

TOPIC NO. 9 and 10

- A-7: Install channelizing islands to prevent left-turn deceleration lane vehicles from returning to the through lanes

Warrants

This technique is warranted on divided highways with greater than 10,000 vpd and at driveways with greater than 50 left-turn ingress vehicles during the peak hour. The site should be characterized by a history of encroachment conflicts due to left-turn vehicles reentering the through lanes.

Slide 50

**Channelizing Island for  
Left-Turn Lane**

- A-8: Install physical barrier to prevent uncontrolled access along property frontages

Warrants

This technique is warranted on all highways where open access exists and where the highway ADT exceeds 10,000 vpd.

Where open access highways exist, this technique is warranted when the highway ADT exceeds 10,000 vpd and the level of development is greater than 45 driveways per mile. For consideration at single properties only, total driveway ADT should exceed 50 vpd. High accident rates involving the open access situation will also warrant this technique.

Slide 51

**Physical Barrier to Prevent Access**

SESSION NO. 6

TITLE TECHNIQUES FOR ACCESS MANAGEMENT

TOPIC NO. 11 and 12

- A-9: Install medial channelization to control the merge of left-turn egress vehicles

Warrants

This technique is warranted on divided highways with greater than 10,000 vpd and at driveways with greater than 50 left-turn egress vehicles during the peak hour. The site should be characterized by a history of merge conflicts associated with left-turn egress vehicles.

Slide 52

**Median Channel to Control Merge of Left-Turn Egress**

- A-10: Offset opposing driveways

Warrants

This technique can be implemented on all undivided highways where the traffic volumes do not warrant 4-way traffic signals at driveway locations. Property frontage must also be sufficient to accommodate the 300-ft. driveway separation. Development near the driveway location should contain fewer than 45 driveways per mile with highway speeds ranging between 30 and 45 mph. Driveway volume should exceed 1,000 vpd and highway ADT should be less than 10,000. Driveway-to-driveway maneuvers should total at least 150 per day or 30 during the peak hour.

Slide 53

**Offset Opposing Driveways**

SESSION NO. 6  
TOPIC NO. 13 and 14

TITLE TECHNIQUES FOR ACCESS MANAGEMENT

- A-11: Locate driveway opposite a three-leg intersection or driveway and install traffic signals where warranted

Warrants

This technique is warranted on all types of highways where sufficient frontage is available to locate a driveway opposite a three-leg intersection or driveway. If an existing driveway is being relocated, the separation distance before relocation should be less than 300 feet. Driveway-to-driveway maneuvers should number either 30 during the peak hour or 150 per day for a signalized location. Cross-street volume should exceed 1,000 vpd, and highway ADT should be greater than 10,000.

Slide 54

**Driveway Opposite Three-Legged Intersection**

A-12: Install two one-way driveways in lieu of one two-way driveway

A-13: Install two two-way driveways with limited turns in lieu of one standard two-way driveway

A-14: Install two one-way driveways in lieu of two two-way driveways

A-15: Install two two-way driveways with limited turns in lieu of two standard two-way driveways

Slide 55

**Two One-Way Driveways**

These techniques are very similar and are designed to reduce conflicts.

SESSION NO. 6  
TOPIC NO. 15 and 16

TITLE TECHNIQUES FOR ACCESS MANAGEMENT

- A-16: Install driveway channelizing island to prevent left-turn maneuvers

Warrants

This technique is warranted on undivided highways with speeds of 30-45 mph, ADT's greater than 5,000 vpd, and driveway volumes of at least 1,000 vpd. The prohibited turns should number less than 100 vpd. High left-turn accident rates will also warrant this technique.

Slide 56

**Driveway Channel to Prevent  
Left-Turn Egress**

- A-17: Install driveway channelizing island to prevent driveway encroachment conflicts

Warrants

This technique is applicable on all types of highways and for driveways with two-way operations. A history of driveway head-on accidents between opposing vehicles or between entering and parking vehicles would warrant this treatment. Highway traffic volume should exceed 5,000 vpd with speeds ranging from 25-45 mph. At least 500 vpd or 100 vehicles during the peak hour should utilize the driveway before constructing medial channelization.

Slide 57

**Channel Island to Prevent  
Driveway Encroachment**

SESSION NO. 6  
TOPIC NO. 17 and 18

TITLE TECHNIQUES FOR ACCESS MANAGEMENT

- A-18: Install channelizing island to prevent right-turn deceleration lane vehicles from returning to the through lanes.

Warrants

This technique is applicable to all highways with greater than 10,000 vpd. At least 50 right-turn ingress vehicles should enter the driveway during the peak hour. The site should be characterized by a history of encroachment conflicts due to right-turn ingress vehicles reentering the through lanes.

Slide 58

**Channelizing Island for  
Right-Turn Lane**

- A-19: Install channelizing island to control the merge area of right-turn vehicles.

Warrants

This technique is warranted on all types of highways. Highway volumes should exceed 10,000 vpd, and highway speeds should be from 25 to 45 mph. Right-turn egress maneuvers should exceed 30 per hour. Total driveway volume should be less than 100 vph. This technique can also be applied at locations where accident histories indicate that an egress merge problem exists.

Slide 59

**Control Right-Turn Egress  
Merge Area**

SESSION NO. 6  
TOPIC NO. 19 and 20

TITLE TECHNIQUES FOR ACCESS MANAGEMENT

- A-20: Regulate the maximum width of driveways

Warrants

This technique is warranted on all highway types where excessively large driveway widths exist. Highway volumes should exceed 5,000 vpd, and highway speeds should be less than 45 mph. Driveway volumes should exceed 250 vpd. The technique is also warranted for general application along highways that experience high accident rates associated with undefined driveways.

Slide 60

Wide Driveway Showing Poor Regulation at Intersection

Slide 61

Front View of Driveway Entrance

Category B

Separate Conflict Areas

This category is aimed at separating driveway distances along the highway and to increase decision reaction time for the through movement.

Slide 62

Access Management Techniques

A. Limit Conflict Points

**B. Separate Conflict Areas**

C. Limit Deceleration Requirements

D. Remove Turning Vehicles From Through Lanes

SESSION NO. 6  
TOPIC NO. 21 and 22

TITLE TECHNIQUES FOR ACCESS MANAGEMENT

- B-1: Regulate minimum spacing of driveways

Warrants

This access control technique is generally warranted for all types of arterials where conflict areas overlap and delays are excessive. Highways with volumes greater than 5,000 vpd and speed greater than 25 mph are candidates for consideration. Also, the technique is warranted on arterials which have a level of development ranging from 30-60 driveways per mile and frontage widths greater than 100 feet. Minimum driveway volumes greater than 200 vph at peak periods are necessary for warranting this technique.

Slide 63

**Closely Spaced Driveways**

- B-2: Regulate minimum corner clearance

Warrants

This technique may be applied on all types of highways where corner lot driveways create conflict and delay problems to through and driveway traffic. Highway ADT and speed should exceed 5,000 vpd and 25 mph, respectively. Severe limitations on corner frontage widths may render this technique impractical at locations with frontage widths less than 100 feet.

Slide 64

**Bad Example -  
No Corner Clearance**

Slide 65

**Corner Clearance, Good Example**

SESSION NO. 6  
TOPIC NO. 23 and 24

TITLE TECHNIQUES FOR ACCESS MANAGEMENT

- B-3: Regulate minimum property clearance

Warrants

This technique may be applied on all highway types where insufficient property clearance contributes to conflicts and delays to the through and driveway traffic. Highway ADT and speed should exceed 5,000 vpd and 25 mph.

Slide 66

**Property Clearance Not Provided at all Driveways**

- B-4: Optimize driveway spacing in the permit authorization stage

Warrants

This technique is warranted for all types of highways. Its application is limited to the permit authorization stage. Highways with volumes and speeds greater than 5,000 vpd and 25 mph, respectively, are prime candidates. Also, the technique is warranted on arterials which have an anticipated level of development range from 30-60 driveways per mile. Minimum anticipated driveway volumes of 1,000 vpd are required.

Slide 67

**Shows How To Optimize (Graphic)**

SESSION NO. 6  
TOPIC NO. 25 and 26

TITLE TECHNIQUES FOR ACCESS MANAGEMENT

- B-5: Regulate maximum number of driveways per property frontage

Warrants

The application of this access control measure is warranted on all existing arterial highways or as a standard for all new facilities. For implementation on existing highways, highway volumes and speeds should exceed 5,000 vpd and 30 mph. Total access volumes to a property should exceed 500 vpd.

Slide 68

**Shopping Center**

- B-6: Consolidate access for adjacent properties

Warrants

This technique is warranted on all types of highways. Highway ADT should exceed 10,000 vpd and highway speeds should be greater than 35 mph. Driveway pairs with more than 500 vehicles using each driveway per hour will be good candidates for this technique.

Slide 69

**Shows Access Between Two Properties**

Slide 70

**Property Adjacent to Previous Slide; With Signalized Exit**

SESSION NO. 6  
TOPIC NO. 27 and 28

TITLE TECHNIQUES FOR ACCESS MANAGEMENT

- B-7: Require highway damages for extra driveways

Warrants

Requiring highway damages for extra driveways must be applied in the planning stage. This technique is applicable to higher volume highways using specified standards for the number of driveways permitted for specific frontage widths.

Not used very often.

Slide 71

**Compensational Damages**

- B-8: Buy abutting properties
- B-9: Deny access to small frontage

These access control measures are aimed at reducing the frequency of access points by purchasing small parcels that remain after a highway improvement, or denying access by purchasing rights.

Slide 72

**Residue Property Left From Ramp Construction**

SESSION NO. 6  
TOPIC NO. 29 and 30

TITLE TECHNIQUES FOR ACCESS MANAGEMENT

- B-10: Consolidate existing access whenever separate parcels are assembled under one purpose, plan, entity, or usage

Warrants

The objective of this technique is to increase average spacing of access points along the highway. The consolidation of driveways reduces the number of access points and thereby increases the spacing of driveways.

Slide 73

**Several Properties Served  
By One Access**

- B11: Designate the number of driveways regardless of future subdivision of that property

Warrants

This is a general regulatory policy, which designates the maximum number of driveways permitted to each existing property before development. The implementation of this technique requires an advance planning policy with a formal planning document made readily available to abutters. Such policy denies additional driveways regardless of future subdivision of that property.

Slide 74

**Undeveloped Property With Driveway  
Already Installed**

SESSION NO. 6  
TOPIC NO. 31 and 32

TITLE TECHNIQUES FOR ACCESS MANAGEMENT

- B-12: Require access on collector street (when available) in lieu of additional driveway on highway

Warrants

This access control technique is aimed at maintaining the average spacing of driveways by locating additional driveways on collector streets instead of on the arterial highway when the existing driveways on a property are utilized to their capacity.

Slide 75

**Access on Collector Street  
at Supermarket**

Category C

Limit Deceleration Requirements

This category reduces severity of conflict by increasing driveway speed and decreasing highway through speed.

Slide 76

**Access Management Techniques**

- A. Limit Conflict Points
- B. Separate Conflict Areas
- C. Limit Deceleration Requirements**
- D. Remove Turning Vehicles From Through Lanes

SESSION NO. 6  
TOPIC NO. 33 and 34

TITLE TECHNIQUES FOR ACCESS MANAGEMENT

- C-1: Install traffic signals to slow highway speeds and meter traffic for larger gaps

Warrants

This technique is applicable on all types of highways where, because of the lack of adequate gaps for driveway vehicles, speed differentials between through and turning vehicles are critical. Warrants in the Manual on Uniform Traffic Control Devices should be met.

Slide 77

**Traffic Signal Installation**

- C-2: Restrict parking on the roadway next to driveways to increase driveway turning speeds

Warrants

This technique is warranted at any driveway location where parked vehicles cause excessively slow turning speeds resulting in rear-end conflicts between right-turning and through vehicles. All highway and driveway ADT ranges, and all levels of development will benefit from this technique's application.

Slide 78

**Cars Parked Up to Edge of Intersection**

SESSION NO. 6  
TOPIC NO. 35 and 36

TITLE TECHNIQUES FOR ACCESS MANAGEMENT

- C-3: Install visual cues of the driveway

Warrants

Since sight distance could be a major problem, any isolated driveways with intersection sight distances less than the minimum, as set up by AASHTO, would warrant this technique. A level of development of less than 30 driveways per mile and daily highway volumes of greater than 2,500 are needed. Highway speeds should exceed 35 mph.

Slide 79

**Cars Parked So That Driveway Cannot Be Seen**

- C-4: Improve driveway sight distance
- C-5: Regulate minimum sight distance
- C-6: Optimize sight distance in the permit authorization stage

Warrants

All of these techniques deal with improving sight distance. Tech C.4 deals with retrofit situations whereas C.5 and C.6 are implemented at the review and implementation stage.

Slide 80

**Parked Cars Blocking Sight Distance From Entrance/Exit**

SESSION NO. 6  
TOPIC NO. 37 and 38

TITLE TECHNIQUES FOR ACCESS MANAGEMENT

- C-7: Increase the effective approach width of the driveway (horizontal geometrics)

Warrants

This technique has general application to all driveways. It should always be a part of the design process for all planned or reconstructed driveways. Also, it should be considered as a general accident countermeasure for medium-to-high volume existing driveways.

Slide 81

**Wide Entrance/Exit From Retail Area**

Slide 82

**Graphic on Larger Curb Returns**

- C-8: Improve the vertical geometrics of the driveway

Warrants

Application of this technique is desirable on all newly constructed or reconstructed driveways and on existing facilities where the driveway profile is adversely affecting traffic operations. Highway speeds should be at least 25 mph, and driveways should accommodate greater than 100 vpd. High accident experience could also warrant this method.

Slide 83

**Steep Entrance to Small Business**

SESSION NO. 6  
TOPIC NO. 39 and 40

TITLE TECHNIQUES FOR ACCESS MANAGEMENT

- C-9: Require driveway paving

Warrant

This technique is warranted at all commercial driveways where excessive interference to highway-driveway operations results from the absence of driveway paving. Highway speeds should exceed 25 mph, and driveway volume should exceed 100 vpd. High accident rates due to unpaved driveways will also warrant this technique.

Slide 84

**Driveway With No Paving**

- C-10: Regulate driveway construction (performance bond) and maintenance

Warrants

This technique is warranted for all driveways during the driveway permit process. This process is essential to minimize jurisdictional liability as well as costly maintenance.

Slide 85

**Driveway Constructed Out Into Street**

Slide 86

**Driveway With Reinforcing Steel For Crossing Ditch**

SESSION NO. 6  
TOPIC NO. 41 and 42

TITLE TECHNIQUES FOR ACCESS MANAGEMENT

- C-11: Install right-turn acceleration lane

Warrants

This technique is warranted on all highway types. Highway volumes should exceed 10,000 vpd, and speeds should be greater than 35 mph. The technique should be implemented only at driveways that have at least 75 right-turn egress movements during peak demand periods. Property frontages should exceed the recommended length of the acceleration lane. High accident rates involving right-turn egress vehicles will also warrant this technique.

Slide 87

**Right-Turn Acceleration Lane  
At Shopping Center**

- C-12: Install channelizing islands to prevent driveway vehicles from backing onto the highway

Warrants

This technique is warranted on all highways where open access exists with ADT's greater than 10,000. Highway speeds should be less than 45 mph. Driveway volumes should exceed 200 vpd. High accident rates involving vehicles backing onto the highway will also warrant the technique.

Slide 88

**Curbing Installed To Keep  
Vehicles From Backing Into Road**

Slide 89

**Poor Example of Previous Application  
Where Cars Can Hang Into Road**

SESSION NO. 6  
TOPIC NO. 43 and 44

TITLE TECHNIQUES FOR ACCESS MANAGEMENT

- C-13: Install channelizing islands to move ingress merge point laterally away from the highway

Warrants

This technique is warranted on all highway types. Highway volumes should exceed 10,000 vpd, and speeds should be less than 45 mph. Driveway volumes should exceed 1,000 vpd and at least 40 right-turn ingress movements per hour should occur over peak-use periods. Sites that have a history of frequent ingress conflicts will warrant special consideration.

Slide 90

**Right-Turn Channelization Island**

- C-14: Move sidewalk-driveway crossing laterally away from highway

Warrants

This technique is applicable for all types of highways and at driveways where pedestrian crossings cause interference between highway and driveway vehicles. Highways with volumes and speeds greater than 5,000 vpd and 30 mph, respectively, are applicable. Driveway volume should exceed 100 during the peak hour, and pedestrian crossings should total two or more during the same hour. The site layout must also provide adequate distance for the sidewalk shift.

Slide 91

**Graphic Showing Sidewalk Moved  
Away From Intersection**

SESSION NO. 6

TITLE TECHNIQUES FOR ACCESS MANAGEMENT

TOPIC NO. 45

Category D

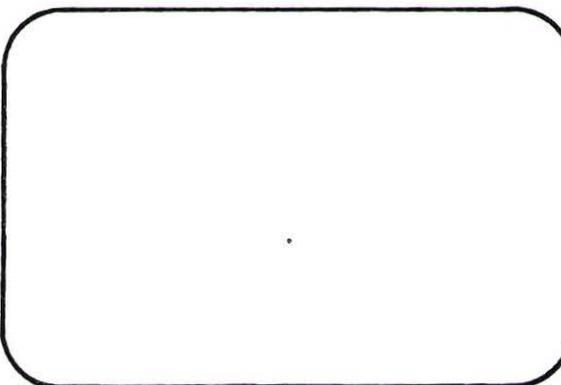
Remove Turning Vehicles From Through Lane

This category reduces the severity and frequency of vehicular conflicts by providing separate storage areas.

Slide 92

**Access Management Techniques**

- A. Limit Conflict Points
- B. Separate Conflict Areas
- C. Limit Deceleration Requirements
- D. Remove Turning Vehicles From Through Lanes**



SESSION NO. 6  
TOPIC NO. 46

TITLE TECHNIQUES FOR ACCESS MANAGEMENT

- D-1: Install two-way left-turn lane
- One of most useful techniques in developed areas
- Avoids confrontation with businesses that raised median often produces
- Does not eliminate left turns but removes them from through lanes

Warrants

This technique is warranted on multilane highways that have closely-spaced driveways with a uniform and medium density of left turns along the highway. Highway volumes and speeds should exceed 10,000 vpd and 30 mph. The level of development should exceed 60 driveways per mile, with less than 10 high-volume driveways. Left-turn driveway maneuvers per mile should total at least 20 percent of through volume during peak periods. High accident rates involving left-turn maneuvers will also warrant this technique.

Slide 93

**Two-Way Left-Turn Lane**

Slide 94

**End Treatment of Two-Way Left**

Slide 95

**End Treatment of Two-Way Left**

- D-2: Install continuous left-turn lane

Warrants

This technique is warranted on multilane highways that have occasional cross streets and closely spaced driveways with a uniform and medium density of left turns along the highway. Highway volume and speed should be greater than 10,000 vpd and 30 mph, respectively. At least 60 driveways should be served by 1 mile of highway, and high-volume driveways should number less than 10. Left-turn maneuvers should total at least 20 percent of through vehicles during peak periods along 1 mile of highway. High accident rates involving left-turn movements will also warrant this technique.

Slide 96

**Continuous Left-Turn Lane**

- D-3: Install alternating left-turn lane

Warrants

This technique is applicable on all types of highways where sufficient space is available for construction of medial turn lanes. Median widths greater than 11 feet are necessary. Multilane undivided highways with an odd number of lanes will readily accommodate this technique by converting the odd lane to an alternating left-turn lane. Application is particularly appropriate where concentrations of driveways alternate from one side of the highway to the other.

Highways volumes and speeds greater than 10,000 vpd and 35 mph, respectively, will warrant the technique. Left-turn movements should exceed at least 15 percent of the through traffic over 1 mile of highway during peak driveway demand periods. The level of development should be greater than 45 driveways per mile with spacing between major driveways or intersections greater than 1,000 feet. High accident rates due to left-turn crossing movements of adjacent driveways will also warrant the technique.

Slide 97

**Alternating Left-Turn Lanes on Arterial**

SESSION NO. 6  
TOPIC NO. 49 and 50

TITLE TECHNIQUES FOR ACCESS MANAGEMENT

- D-4: Install isolated median and deceleration lane to shadow and store left-turning vehicles

Warrants

All undivided highways are candidates for this technique. Typical locations would have levels of development of less than 30 driveways per mile, driveway volumes greater than 1,000 vpd, and highway volumes greater than 10,000 vpd. Left-turn volume should exceed 100 vph during the peak period.

Slide 98

**Isolated Median on Arterial (Painted)**

- D-5: Install left-turn deceleration lane in lieu of right-angle cross-over

Warrants

All multilane divided highways with median widths of 14 feet or greater are potential locations for this application. A median opening must exist in order to provide for turning maneuvers. The development near this location should include fewer than 45 driveways per mile with major driveways or intersections 1/4-1/2 mile apart. Highway speeds should exceed 35 mph, and driveway ADT and highway ADT should be greater than 1,000 and 10,000, respectively. Left turns should total 10 percent of the peak-period traffic volume.

Slide 99

**Left-Turn Deceleration Lane  
at Shopping Center**

SESSION NO. 6  
TOPIC NO. 51 and 52

TITLE TECHNIQUES FOR ACCESS MANAGEMENT

- D-6: Install medial storage for left-turn egress vehicles

Warrants

All multilane divided highways with median widths of at least 18 feet are applicable locations. A median opening has to exist in order to provide for the turning maneuvers. A development of less than 45 driveways per mile near the location is necessary, and highway speeds should range from 30-45 mph. Highway volume should exceed 10,000 vpd, and left-turning egress volume should exceed 300 vpd. Frequency of left-turn accidents could also constitute a warrant for this improvement.

Slide 100

**Median Storage for Left-Turn Egress  
on Major Arterial**

- D-7: Increase storage capacity of existing left-turn deceleration lane
- Increase length of existing lane, or
- Provide dual left-turn lanes

Warrants

All multilane divided highways with existing deceleration lanes and insufficient storage lengths are applicable locations. A level of development for the highway section should contain fewer than 45 driveways per mile with major driveways or intersections 1/4-1/2 mile apart. Driveway ADT and highway ADT should exceed 1,000 and 10,000, respectively.

Slide 101

**Cars Backed Up In To Through Lanes  
From Left-Turn Lane**

SESSION NO. 6  
TOPIC NO. 52 and 53

TITLE TECHNIQUES FOR ACCESS MANAGEMENT

- D-8: Increase the turning speed of right-angle median crossovers by increasing the effective approach width

Warrants

The application of this technique is possible on multilane divided highways with median widths exceeding 4 feet. Level of development should exceed 15 driveways per mile, and traffic volume should exceed 5,000 vpd on the highway.

Slide 102

**Median Tapered To Increase Turning Radius**

- D-9: Install continuous right-turn lane
- A continuous right-turn lane is essentially a combination of a right-turn acceleration and deceleration lane that is extended to accommodate several nearby driveways.

Warrants

This technique is warranted on all types of highways with volumes exceeding 15,000 vpd, levels of development greater than 60 driveways per mile, and speeds above 30 mph. Right-turning vehicles per mile should exceed 20 percent of the directional highway ADT.

Slide 103

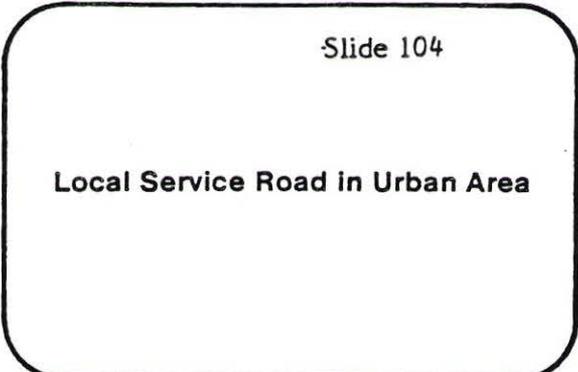
**Continuous Right-Turn Lane**

- D-10: Construct a local service road

The frontage road, as an access control measure, reduces the frequency and severity of conflicts along the highway by preventing direct left turns and removing slower-turning vehicles from the through lanes. This technique decreases delay on the highway for through vehicles as a result of the elimination of marginal stream friction. Some tradeoffs are realized by increasing the frequency of conflicts and delay by indirect routing for some maneuvers.

Warrants

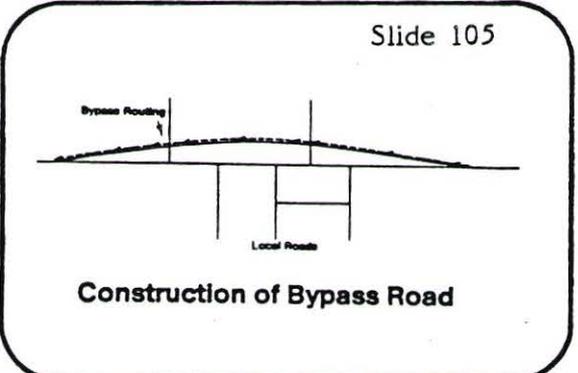
Frontage roads are warranted in the planning stage for primary divided arterials with speeds of 4-55 mph and an anticipated high level of development (greater than 60 driveways/a mile). Usually traffic volumes exceeding 20,000 vpd are associated with this type of development.



- D-11: Construct a bypass road

Bypasses provide motorists with the opportunity to avoid heavily developed or congested areas without conflicting with local traffic. As a result, this technique reduces the frequency and severity of conflicts on both facilities by separating longer-distance and faster-moving through traffic (including trucks) from slower local traffic.

Technically, however, this is an expensive alternative and does not really qualify as a low-cost access management technique.

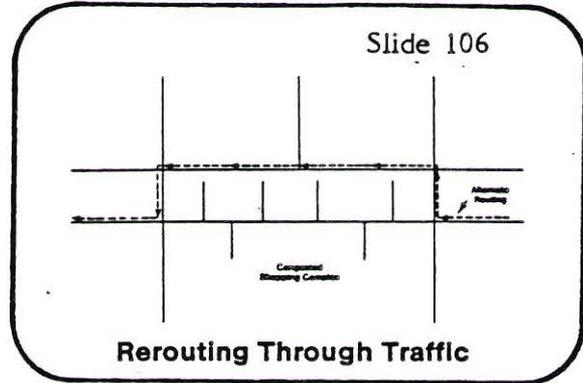


- D-12: Reroute through traffic

In this technique, the separation of through traffic from local traffic is achieved by using other adjacent facilities to reroute through traffic.

Warrants

Rerouting through traffic is warranted when the number of access points on arterials exceeds 80 driveways per mile, and ADT is over 20,000 vpd. Also, this technique is warranted when other on-site techniques are infeasible. Frequent accidents associated with driveway maneuvers could also constitute a warrant for application of this technique.

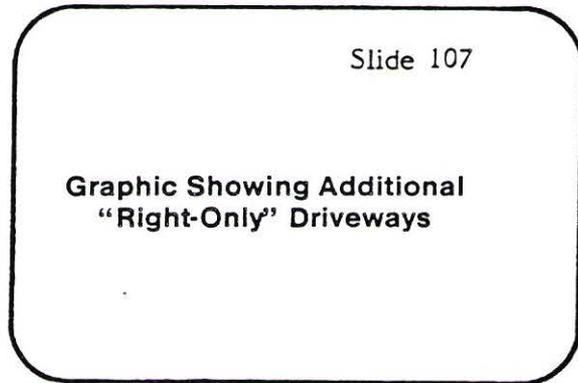


- D-13: Install supplementary one-way right-turn driveways to divided highway (noncapacity warrant)

This technique is intended at high-volume driveways to eliminate conflicts on the driveway and secondary rear-end conflicts on the highway associated with right-turn maneuvers.

Warrants

This technique is warranted at high-volume driveways on multilane highways that have volumes and speeds greater than 10,000 vpd and 30 mph. A minimum 300-foot frontage width is desirable.



SESSION NO. 6  
TOPIC NO. 58 and 59

TITLE TECHNIQUES FOR ACCESS MANAGEMENT

- D-14: Install supplementary access on collector street when available (noncapacity warrant)
- D-15: Install additional driveway when total driveway demand exceeds capacity

These techniques provide an additional access point for vehicles to use when entering or exiting a property.

Slide 108

Shopping Center With Access  
On Collector Road

- D-16: Install right-turn deceleration lane

The deceleration lane will reduce the severity of rear-end conflicts on the highway by allowing right-turn vehicles to leave the through lanes at a high speed.

#### Warrants

This technique is applicable on all highway types. Highway ADT's should exceed 10,000 vpd, and highway speeds should be at least 35 mph. Driveway volume should exceed 1,000 vpd with at least 40 right-turn ingress movements during peak periods. This technique should not be applied on frontages less than 150 feet in width, or where the deceleration lane will restrict access to upstream properties. High accident rates involving right-turn ingress vehicles will also warrant this technique.

Slide 109

Right-Turn Deceleration Lane

- D-17: Install additional exit lane on driveway

This technique involves construction of an additional driveway exit lane to better facilitate egress maneuvers. Right-turn and left-turn egress maneuvers are made more efficiently because drivers are not delayed by egress vehicles wanting to turn in the opposite direction.

Warrants

This technique is applicable for all highway types and at driveway locations where egress maneuvers are hindered because separate turning lanes are not provided. Highway speeds should normally exceed 30 mph with highway volumes surpassing 5,000 vpd. Existing driveway volumes should exceed 1,000 vpd (approximately 500 egress vehicles).

Slide 110

**Additional Right Turn Exit Lane  
On Exit Road From Shopping Center**

- D-18: Encourage connections between adjacent properties (even when each has highway access)

This driveway operation technique is aimed at removing turning vehicles or queues from the through lanes. The strategy for achieving this objective is to encourage adjacent property owners to permit property-to-property movements away from the highway.

A prime example of this access control measure is the neighborhood shopping center, where several adjacent properties are served by one open parking lot area. The patrons frequenting nearby establishments do not need to exit onto the highway and then enter the neighboring driveway.

Slide 111

**Available Access Between Adjoining  
Properties**

- D-19: Require two-way driveway operation where internal circulation is not available

This driveway design and operations technique is aimed at removing recirculating driveway vehicles or queues from the through lanes. The strategy for implementing this technique is to require two-way driveway operations in lieu of one-way operations at locations where internal circulation is not available. This technique is intended to be implemented in the permit stage; however, it may be implemented at existing locations to alleviate specific problems.

Slide 112

**Two-Way Driveway Operation**

- D-20: Require adequate internal design and circulation plan

This is a general access control policy that may be utilized on existing facilities or in the drawing permit stage.

Slide 113

**Built-Up Urban Area Showing Good Internal Design**

## LESSON PLAN

SESSION 7 DURATION 90 MINS.

SESSION TITLE DESIGN GUIDELINES

### INSTRUCTIONAL OBJECTIVES

1. Identify and discuss design practices that are applicable to control of access techniques.
2. Establish desirable ranges for design elements
3. Describe the geometric design requirements for control of access techniques.

### INSTRUCTIONAL METHODS

1. Lecture/Discussion

### INSTRUCTIONAL MATERIALS

Slides \_\_\_\_\_

Viewgraphs Twenty (20)

Others \_\_\_\_\_

### SPECIAL INSTRUCTIONS

1. Encourage participants to describe local practices at the state and local level
2. Discuss the problems encountered in applying some of the more critical design elements

### INSTRUCTIONAL ACHIEVEMENT

1. Awareness of purpose and effects of design standards.
2. Ability to identify problems and corresponding solutions related to the design of control of access techniques
3. Understanding of how operational controls, geometric design requirements and site parameters all fit together in developing a complete design.

V7-1

## Design Guidelines For Control Of Access

- The designer must account for a number of design elements which impact the safety and operation of the street system with which he is concerned.
- This session will concentrate on a discussion of these design elements in which we will discuss general design guidelines.
- Specific design criteria related to control of access techniques is covered in more detail in Appendix A.

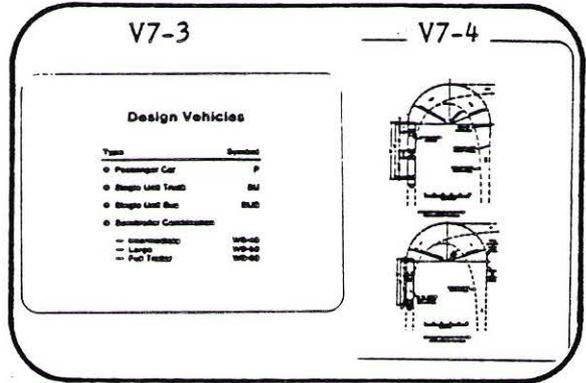
V7-2

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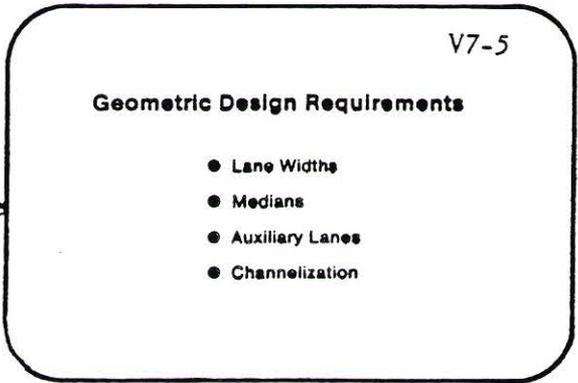
graph TD
    A["OPERATIONAL CONTROLS AND CRITERIA  
DESIGN VEHICLE DIMENSIONS  
VEHICLE ACCELERATION RATE  
VEHICLE ACCELERATION RATE  
DRIVER PERCEPTION-REACTION TIME  
BRAKE EFFICIENCY BETWEEN VEHICLES  
VEHICLE TURNING RADIUS AND SPEED"] -- LEADS TO --> B["GEOMETRIC DESIGN REQUIREMENTS  
LANE WIDTHS  
DESIGN DIMENSIONS  
ACCELERATION LANE LENGTHS  
DRIVEWAY SPACING  
DRIVEWAY DIMENSIONS  
CHANNELIZING ISLAND DIMENSIONS"]
    C["WHICH MAY BE CONSTRAINED BY  
SITE PARAMETERS  
AVAILABLE RIGHT-OF-WAY FOR VEHICLES  
DESIGN WIDTH  
FRONTAGE WIDTH  
SETBACK TO BUILDINGS AND PARKING AREAS  
DRIVEWAY SPACING  
CROSSING CLEARANCE  
MAJOR INTERSECTION SPACING  
DIMENSIONS OF DESIGN SPEEDS  
OTHER"] --> B
  
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- In developing designs for control of access techniques, there are three basic factors that have to be considered:
  - Operational Controls
  - Geometric Design Requirements
  - Site Parameters
- These factors are all interrelated and decisions relating to one will have a corresponding impact on the others.
- Each of these will be discussed as separate elements in the design process.

- The physical characteristics of vehicles greatly influence the design of access management techniques.
- There are basically four (4) categories of vehicles that are commonly used for design purposes. (Viewgraph 7-3).
- The turning paths of these design vehicles will determine what geometrics are required for a particular design (Viewgraph 7-4).
- The WB-50 design vehicle is generally most critical for design purposes.



- Geometric design deals with the visible dimensions of a roadway, and involves those elements which have a direct bearing on driver behavior and traffic performance.
- The major elements influencing control of access designs are lane widths, medians, auxiliary lanes and channelization.



SESSION NO. 7  
TOPIC NO. 5

TITLE DESIGN GUIDELINES

V7-6

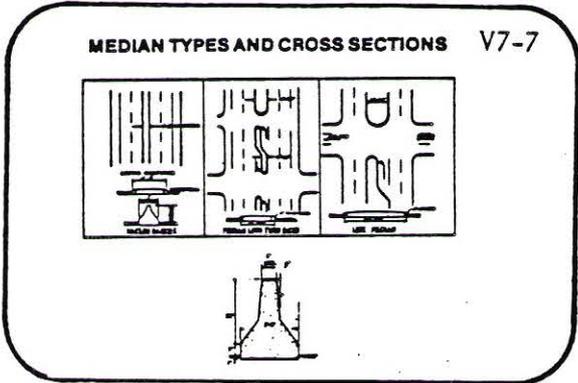
**Lane Widths**

- The safety and comfort of a driver is highway dependent on the widths of lanes used.
- Lane width most commonly used on urban arterials is 12 feet, especially on roadways with operating speeds greater than 40 mph.
- On roadways having operating speeds less than 40 mph, reduced lane widths are commonly used but generally in the 10-11 foot range.
- On turning roadways when the speeds are in the 10-15 mph range, it is common to find a 10-foot lane.

- 12' lanes, 40 mph or greater
- 11' lanes, 40 mph or less
- 10' lanes, turning lanes 10 - 15 mph

SESSION NO. 7  
TOPIC NO. 6

TITLE DESIGN GUIDELINES



- Purpose of medians:
  - a. Prevent illegal/unwanted crossovers
  - b. Prohibit or channelize left turns
  - c. Pedestrian refuge
  - d. Shield cars
  - e. Landscaping
  - f. Safety
- Two factors to consider:
  - a. Width
    - Narrow (4-8 feet)
    - Medians with turn bays (12-20 feet)
  - b. Type of separation
    - Physical (raised medians)
    - Painted areas
- Characteristics of raised medians:

Advantages

- a. Pedestrian refuge
- b. Traffic control devices
- c. Curb inlets
- d. Safety

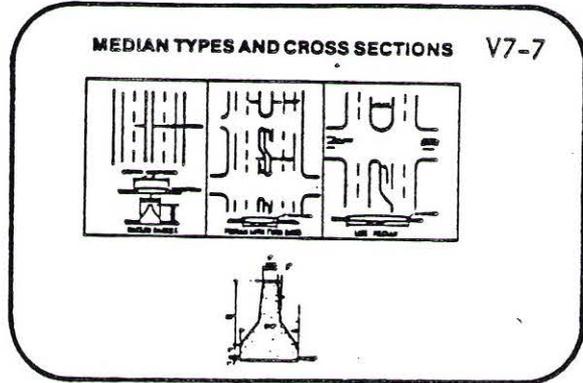
Disadvantages

- a. Cost
- b. Flexibility
- c. Maintenance

● Advantages and disadvantages of painted median just about opposite from raised median.

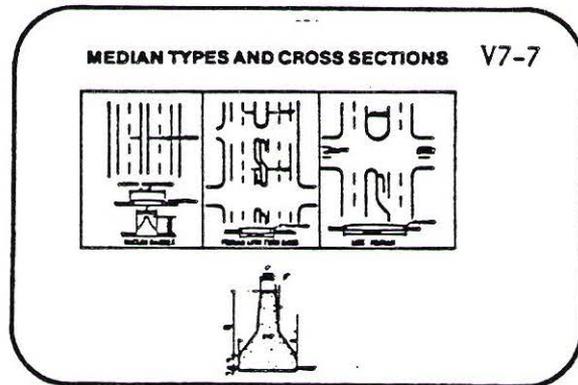
### NARROW BARRIER MEDIAN

- Useful for reducing vehicle crossovers and for eliminating left turns and related accidents.
- Tends to concentrate left-turns and create U-turns at intersections.
- Typically 4-8 feet in width.



### MEDIANS WITH TURN BAYS

- Used with both raised and painted median.
- With raised median, some degree of shadowing is provided and the unwanted midblock moves are eliminated. Also, the left-turn traffic is separated from the through traffic. However, this type not easily adaptable to changing access needs.
- With painted median, the advantages are the same as raised but not as restrictive. This type offers more flexibility and also requires less width in most applications. A problem sometimes exists, however, in wet night usage when visibility is poor.



**MEDIAN TYPES AND CROSS SECTIONS V7-7**

**WIDE MEDIANS**

- Typically 24-30 feet in width with physical barrier.
- Provides good shadowing for crossing vehicles and offers good usage for double left-turn lane and other uses in the future.
- Does require large Right-of-Way and not very flexible in responding to changing access needs.
- Very adaptable to use of U-turn lanes between intersections.
- Can create visibility problem for left-turn vehicles if care not taken.

**V7-8**

**Median End Treatments**

Semi-Circular

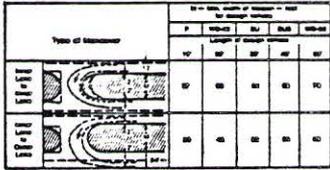
Bullet Nose

- Depends on the width of the median.
- For 4-foot sections, nose is generally semicircular.
- For wider medians, a bullet-nose design is preferred to conform better with the paths of the turning vehicle.

V7-9

**Minimum Designs For U-Turns**

- To accommodate vehicles making U-turns, the width of median becomes key design element.
- The type of maneuver required will vary with the length of design vehicle as well as the turning radii of the vehicle.
- A WB-50 typically requires about a 58-foot median for ease and comfort whereas a passenger vehicle requires only 20 feet.

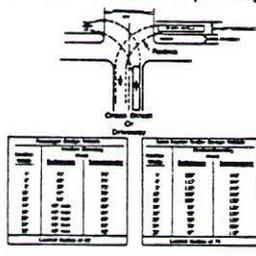


Type of maneuver	Minimum Median Width (ft)				
	WB-50	WB-30	WB-20	WB-10	Passenger
WB-50	58	45	35	25	20
Passenger	20	20	20	20	20

V7-10

**Minimum Median Openings**

- In most designs, the length of the median opening should be as great as the width of the crossroad but in no case less than 40 feet.
- This width will vary with the design vehicle and with the width of the medians.
- Values commonly used are shown in the tables of this slide.



Design Vehicle	Minimum Median Opening Length (ft)	
	Median Width (ft)	Minimum Opening Length (ft)
WB-50	40	40
WB-30	40	40
WB-20	40	40
WB-10	40	40
Passenger	40	40

### TURN LANES

- Turn lanes are comprised of two elements—deceleration area—storage area.
- The primary advantages to utilizing exclusive turn lanes are:
  - a. Turns are typically made at slow speed, and if such vehicles are removed from through traffic, capacity can be increased.
  - b. Safety is improved.
  - c. In areas where pedestrian volumes are heavy, both capacity and safety are even more enhanced by turn lanes.
- General design rules for left-turn lanes include:
  - a. A raised median should be a minimum of four feet wide in order to provide pedestrian refuge.
  - b. The clear length of the median break is dictated by the width of the cross street and the turning paths of the design vehicles.
  - c. The width of a turn lane can be less than that recommended for a through lane. Typical design utilizes 9 to 11 feet.
  - d. The ends of median islands should be designed with a bullet nose and should be especially treated to ensure high visibility.
- A critical design element is the left-turn storage length.
  - a. A minimum length usually is defined between 100 to 150 feet.
  - b. As a general rule, the following equation can be used:

$$L = \frac{K(v)25}{N}$$

Where L equals storage length, V equals turning volume during the hour, and N equals number of signal cycles per hour.

- c. When double left-turn lanes are used, the storage length should equal (0.6)L.

V7-11

### STORAGE LANE

$$L = \frac{K(V)25}{N}$$

L=LENGTH FOR LEFT TURN STORAGE

K=CONSTANT, GENERALLY A VALUE OF 2.0 IS USED

V=LEFT TURN VOLUME DURING DESIGN PEAK HOUR

N=CYCLES PER HOUR, DESIGN PEAK HOUR

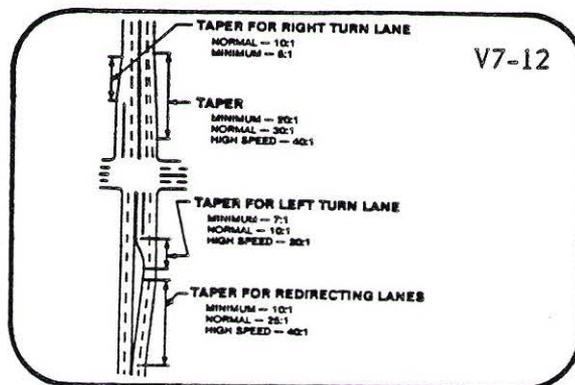
WHERE L IS GREATER THAN 300'  
CONSIDER DUAL LEFT TURN

SESSION NO. 7  
TOPIC NO. 14

TITLE DESIGN GUIDELINES

### TAPER DESIGNS

- There are two differing philosophies on taper designs for turn lanes:
  - a. Longer tapers should be used because they provide better deceleration and visibility.
  - b. Shorter tapers are preferred because they prevent entrapment and increase the length available for storage area.
- Generally a minimum 60' taper is described for left-turn lanes in urban areas. For typical urban arterials, a taper of 90' is adequate and preferred.
- Adding lanes can occur fairly quickly with a 1:10 taper being adequate.
- Dropping lanes should always occur on the far side of the intersection with a tangent area of approximately 150' prior to the lane drop taper. Tapers of 1:30 to 1:40 are adequate.
- For redirecting lanes, tapers of 1:25 or 1:30 are adequate for lower speeds (less than 40 mph) but 1:40 tapers should be used for higher speeds.



PURPOSES OF CHANNELIZATION

- The primary objectives of utilizing channelization include:
  - a. Improve safety
  - b. Increase capacity
  - c. Enhance driver comfort
- There are many reasons for utilizing channelization (Show series of viewgraphs representing individual reasons for channelization use.)
  - a. Separate conflicts
  - b. Provide guidance
  - c. Prohibit or favor certain movements
  - d. Protect pedestrian movements
  - e. Provide safe area for street appurtenances
  - f. Control speed through intersection

V7-13

CHANNELIZATION

- ONE DECISION AT A TIME
- AVOID UNNATURAL MANEUVERS
- REDUCE AREA OF CONFLICT
- TRY TO AFFECT RIGHT ANGLES
- SEPARATE TURNING AND THROUGH VEHICLES
- ISLANDS SHOULD HAVE MINIMUM 75 SQ. FT.
- ISLANDS SHOULD BE SET BACK FROM VEHICLE PATH
- PROVIDE FOR VEHICLE TURNING REQUIREMENTS

CHANNELIZATION DESIGN RULES

- The type of intersection control will have a large impact on the design rules.
- However, the following general rules of design should be followed:
  - a. Small islands (less than 75 sq. ft.) should be avoided.
  - b. Do not overly restrict movements. Serious restriction will reduce capacity, increase safety hazards, and negatively impact driver comfort.
  - c. Always drop lanes on the far side of an intersection.
  - d. Force vehicles using an exclusive lane to make a definite move into that lane.
  - e. Insure good visibility of islands, both during the day and at night.
  - f. Do not attempt to solve serious difficulties by developing a complex system of channelization. It may be better to restrict certain movements rather than to confuse the motorist.

V7-13

CHANNELIZATION

- ONE DECISION AT A TIME
- AVOID UNNATURAL MANEUVERS
- REDUCE AREA OF CONFLICT
- TRY TO AFFECT RIGHT ANGLES
- SEPARATE TURNING AND THROUGH VEHICLES
- ISLANDS SHOULD HAVE MINIMUM 75 SQ. FT.
- ISLANDS SHOULD BE SET BACK FROM VEHICLE PATH
- PROVIDE FOR VEHICLE TURNING REQUIREMENTS

COMMON CHANNELIZATION DESIGN ERRORS

- The following are errors commonly found in channelization design:
  - a. Too many islands.
  - b. Islands are too small.
  - c. The design fails to eliminate conflicts.
  - d. Poor approach design and visibility.
  - e. The inability to accommodate large vehicles.
  - f. Inattention to future needs for traffic control, such as traffic signals.
  - g. Inattention to local access requirements.
  - h. Landscaping and maintenance requirements are often difficult and costly.
- It is important to maintain future flexibility to any channelization design.

V7-13

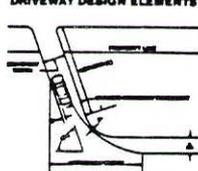
CHANNELIZATION

- ONE DESIGN AT A TIME
- AVOID UNUSUAL SHAPES
- REDUCE AREA OF CONFLICT
- TRY TO AFFECT RIGHT ANGLES
- SEPARATE TURNING AND THROUGH VEHICLES
- ISLANDS SHOULD HAVE MINIMUM 70 SQ. FT.
- ISLANDS SHOULD BE SET BACK FROM VEHICLE PATH
- PROVIDE FOR VEHICLE TURNING REQUIREMENTS

- The speed at which vehicles can negotiate turning movements at driveways is governed by several design factors:
  - driveway width
  - approach angle
  - lateral effect
  - etc.

V7-14

DRIVEWAY DESIGN ELEMENTS



L = EFFECTIVE DRIVEWAY LENGTH  
 R = CURB RETURN RADIUS, FT.  
 θ = DRIVEWAY ALIGNMENT ANGLE, DEGREES  
 Δ = LATERAL OFFSET DISTANCE, FT.

V7-15

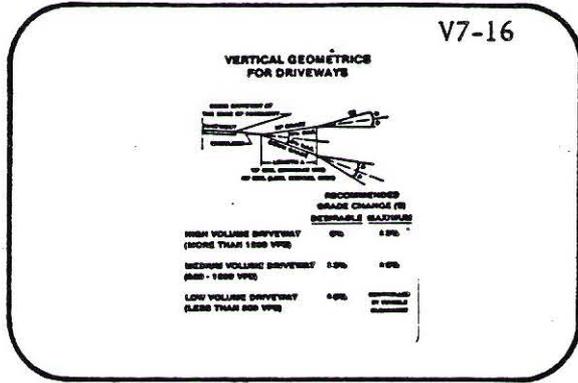
DRIVEWAY LANE WIDTHS AS A FUNCTION OF DRIVEWAY OFFSET AND RETURN RADIUS FOR A 90 DEGREE DRIVEWAY ANGLE AND VARIOUS DESIGN TURNING SPEEDS

TURNING SPEED = 0.5 MPH  
 DRIVEWAY LENGTH = 25 FEET

DRIVEWAY OFFSET (FEET)	DRIVEWAY RETURN RADIUS (FEET)			
	0	5	10	15
0	-	-	25	17
5	-	25	17	14
10	25	17	14	-
15	17	14	-	-

- Explain the various components with this viewgraph (7-14).
- Viewgraph 7-15 gives some parameters for one scenario.

- The vertical grade on driveways is often critical to safe and efficient operation.
- Viewgraph VII.16 illustrates recommended ranges for design purposes. Site parameters are often an issue in attempting to achieve these ranges.



- Frontage roads are sometimes used in urban areas to control access.
- Advantages are that they provide complete control of access to the arterial and eliminate the midblock side friction that typically occurs due to parking, pedestrians, etc.
- The major disadvantages are:
  - a. Large ROW required
  - b. Confusing at entrance and exit points
  - c. Create operational problems at intersections, especially if signals are used.

## Frontage Roads

- Number of conflicts at intersections severely restrict smooth flow.
- A separation of at least 150 feet between the frontage road and the main lanes is highly desirable.
- Forcing right turns at each cross street reduces total number of conflicts.
- Block-by-block control of access to frontage road also serves to solve the conflict problem.

V7-18

**FRONTAGE ROAD DESIGN CONSIDERATIONS**

- SEPARATION AT INTERSECTIONS
- TERMINATION AT EACH BLOCK
- ONE-WAY VS. TWO-WAY
- SEPARATION FROM MAIN ROAD
- INTERSECTION VISIBILITY
- PEDESTRIAN, BICYCLES, PARKING

- Reiterate the design considerations by referring to the illustrations in this viewgraph.

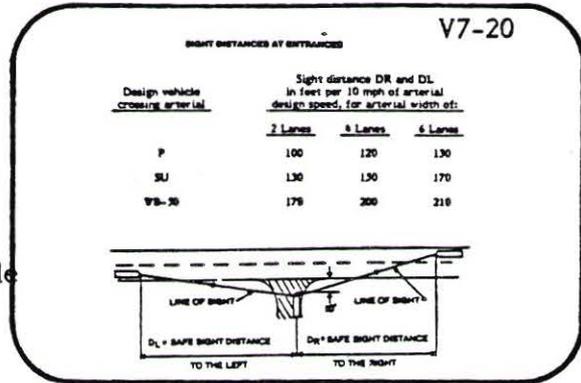
Frontage Road Design V7-19

The diagrams show various configurations of frontage roads and their intersections with main roads. Each diagram includes labels for lanes and intersection types.

SESSION NO. 7  
TOPIC NO. 23

TITLE DESIGN GUIDELINES

- At most driveways, greater than minimum sight distance must be available.
- This is particularly true because the vehicle in the driveway is having to start from a "stop" condition.
- Explain the variables illustrated in this viewgraph:
  - Number of lanes
  - Speed of vehicles on arterial
  - Width of median
- This is an area where more research has been identified as a need.



## LESSON PLAN

SESSION 8 DURATION 120 MINS.

SESSION TITLE EVALUATION OF TECHNIQUES

### INSTRUCTIONAL OBJECTIVES

1. Provide student with means to evaluate and choose among alternative techniques for access management.

### INSTRUCTIONAL METHODS

1. Lecture and discussion

### INSTRUCTIONAL MATERIALS

Slides None

Viewgraphs Nineteen (19)

Others \_\_\_\_\_

### SPECIAL INSTRUCTIONS

1. Emphasize need for justifying improvements through quantified measures.

### INSTRUCTIONAL ACHIEVEMENT

1. Ability to analyze and choose among alternatives based upon greatest benefits delivered per unit of cost.

SESSION NO. 8  
TOPIC NO. 1 and 2

TITLE EVALUATION OF TECHNIQUES

V8-1

## Evaluation of Alternatives

### INTRODUCTION

- Introduce 3 measures of evaluation:
  - Engineering feasibility
  - Operational effectiveness
  - Economic viability
- Discuss need to quantify benefits and costs of all improvements in order to compete with other public projects for funds and to gain support.

V8-2

### ENGINEERING EVALUATION

- Considers the geometric design and operational requirements for implementation
- Longitudinal constraints
  - Insufficient property frontage
  - Driveway spacing
- Transverse constraints
  - Sufficient median width
  - Building setback distance

- LONGITUDINAL CONSTRAINTS
- TRANSVERSE CONSTRAINTS



SESSION NO. 8  
 TOPIC NO. 5 and 6

TITLE EVALUATION OF TECHNIQUES

OPERATIONAL EVALUATION  
 PARAMETERS

- To simplify evaluation, parameters were categorized as low, medium, or high, based on values shown in Viewgraph 8-5.

V8-5

Level of Development	Number of Commercial Driveways per Mile	Average
Low	0-30	18
Medium	31-60	45
High	>60	75

Highway Volume	ADT Range	ADT Average
Low	0-6,000	3,000
Medium	6,001-15,000	10,000
High	>15,000	30,000

Commercial Driveway Volume	ADT Range	ADT Average
Low	0-600	200
Medium	601-1,500	1,000
High	>1,500	2,000

The results of this study are summarized in Table VIII.3 which provide an indication of the annual reduction in accidents or hours of delay which can be expected if a particular technique is implemented.

The combinations of site parameters used in quantifying and classifying the effectiveness measures are: (1) highway volume and level of development; (2) highway volume and driveway volume; or (3) highway volume alone.

V8-6

FUNCTIONAL OBJECTIVE 4 - LIMIT NUMBER OF CONFLICT POINTS

*Show technique listing*

SESSION NO. 8

TITLE EVALUATION OF TECHNIQUES

TOPIC NO. 7 and 8

### ECONOMIC EVALUATION

- Comparison of expected benefits, both quantitative and/or qualitative, with proposed expense is necessary during the early planning stages to determine project feasibility.

V8-7

**ECONOMIC EVALUATION**

### METHODS OF ANALYSIS

Many methods used. Two popular methods used by public agencies are:

- Benefit/Cost Analysis  
(Provides dollar comparison)
- Utility/Cost Analysis  
(Allows consideration of non-monetary items)

V8-8

• **BENEFIT/COST ANALYSIS**

• **UTILITY/COST ANALYSIS**

*B/C - if ratio > 1 alternative is economically feasible  
- alt. w/ highest ratio is preferred*

SESSION NO. 8  
 TOPIC NO. 9 and 10

TITLE EVALUATION OF TECHNIQUES

- Relative cost of implementing various techniques can be approximated by establishing reference construction cost for reach functional category.

V8-9

Implementation Costs of  
Access Management Techniques

**BENEFIT/COST ANALYSIS**

Describes B/C ratios:

- $B/C = \frac{\text{Annual Benefits}}{\text{Annual Cap. Costs} + \text{Annual Maint}}$

Annual Benefits = Reduction in Costs

Annual Maint. = Cost of Maint. Proj.

Annual Cap. Cost = Initial Cost x Cap. Rec. Factor

Cap. Recovery Factor depends on:

- Interest Rate (vestcharge rate)
- Life of Project

V8-10

$$B/C = \frac{\text{ANNUAL BENEFITS}}{\text{ANNUAL CAPITAL COSTS} + \text{ANNUAL MAINTENANCE}}$$

ANNUAL BENEFITS = REDUCTION IN COSTS

ANNUAL MAINTENANCE = COST OF MAINTAINING PROJECT

ANNUAL CAPITAL COST = INITIAL COSTS x CAPITAL RECOVERY FACTOR

CAPITAL RECOVERY FACTOR:  
 • INTEREST RATE  
 • LIFE OF PROJECT

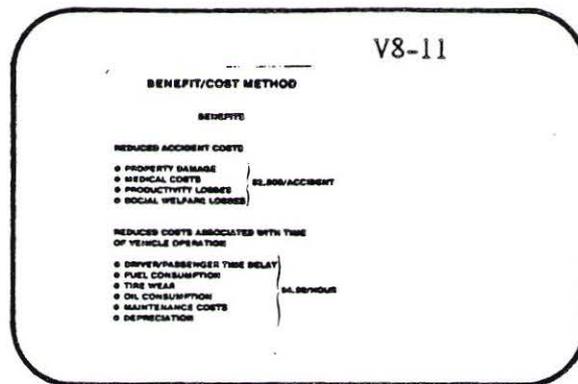
$$\frac{i(1+i)^n}{(1+i)^n - 1}$$

SESSION NO. 8  
TOPIC NO. 11 and 12

TITLE EVALUATION OF TECHNIQUES

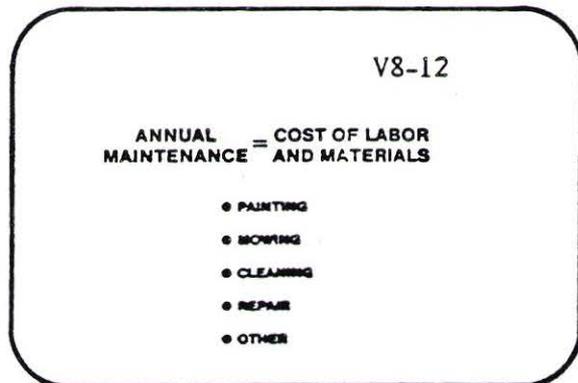
**BENEFITS**

- Reduced Accident Costs
- Reduced costs associated with vehicle operation:
  - Driver/Passenger Delay
  - Fuel Consumption
  - Tire Wear
  - Oil Consumption
  - Maintenance Costs
  - Depreciation



**ANNUAL MAINTENANCE**

- Cost of labor and materials:
  - painting
  - mowing
  - cleaning
  - repair
  - other



SESSION NO. 8  
 TOPIC NO. 13 and 14

TITLE EVALUATION OF TECHNIQUES

V8-13

**ANNUAL CAPITAL COST**

- Initial Cost x Capital Recovery Factor

$CR_{in}$  = Capital Recovery Factor  
 (value obtained from tables) based on interest rate (i) and projected life of project (n)

ANNUAL CAPITAL COST = (INITIAL COST) x  $(CR_{in})$

C.  $R_{in}$  = CAPITAL RECOVERY FACTOR

i = INTEREST RATE  
 n = LIFE OF PROJECT

i = 5% TO 20%  
 n = 1 TO 15 YEARS

V8-14

**TYPICAL EXAMPLE:**

B/C Ratio

- $B/C = \frac{\text{Annual Benefit}}{(\text{Cost} \times CR_{in}) + \text{Maint.}}$

Benefits = \$40,000/year

Maint. = \$1,500/year

Initial Cost = \$70,000

Capital Recovery Factor = (from tables) = .12

i = 8% = interest

n = 15 yr. = life of project

B/C =  $\frac{40,000}{(70,000 \times .12) + 1,500} = 4.0$

$B/C = \frac{\text{Annual Benefits}}{\text{Initial Cost} \times CR_{in} + \text{Maintenance}}$

BENEFITS = \$40,000/YEAR

MAINTENANCE = \$1,500/YEAR

INITIAL COST = \$70,000

CAPITAL RECOVERY FACTOR = .12  
 INTEREST RATE = 8%  
 LIFE OF PROJECT = 15 YEARS

C.  $R_{in} = .12$

$B/C = \frac{40,000}{(70,000 \times .12) + 1,500} = 4.0$

SESSION NO. 8  
TOPIC NO. 15 and 16

TITLE EVALUATION OF TECHNIQUES

INTRODUCTION TO:

- Utility/Cost Analysis
- Enables incorporation of non-quantifiable measures, i.e., noise pollution
- Enables values of a particular community to be used.

V8-15

# Utility Cost Analysis

METHODOLOGY UTILITY/COST ANALYSIS

- Establish goals and objectives
- Establish relative importance
- Define measures of effectiveness
- Rate each measure
- $\Sigma$  (rate x weighted measure)
- Compare with cost

V8-16

UTILITY/COST ANALYSIS

- ESTABLISH GOALS AND OBJECTIVES
- ESTABLISH RELATIVE IMPORTANCE OF GOALS AND OBJECTIVES
- DEFINE UTILITY MEASURES (MEASURES OF EFFECTIVENESS)
- RATE EACH UTILITY MEASURE
- $\Sigma$  (RATE x WEIGHTED MEASURE)
- COMPARE WITH COST

SESSION NO. 8  
 TOPIC NO. 17 and 18

TITLE EVALUATION OF TECHNIQUES

GOALS AND OBJECTIVES FOR STREET IMPROVEMENTS

- Objectives directly affecting highway users
- Objectives pertaining to highway design
- Objectives relating to community transportation
- Objectives related to community development
- Objectives related to community social factors
- Objectives related to economic factors

V8-17

Goals and Objectives for Street Improvements

- Example of typical MOE's and process of obtaining a utility rating
- Numerical weight and rank determined by relative importance

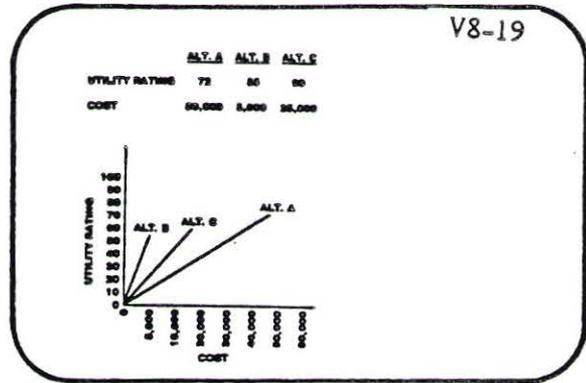
V8-18

OBJECTIVE	WEIGHT	ALT. A		ALT. B		ALT. C	
		RANK	RE × WT	RANK	RE × WT	RANK	RE × WT
MINIMIZE TRAVEL TIME	3	10	30	8	18	0	0
REDUCE ACCIDENTS	4	7	28	5	20	10	40
REDUCE EMISSIONS	1	10	10	5	5	0	0
MAINTAIN ACCESS	1	3	3	5	5	10	10
MINIMIZE CONSTRUCTION DISRUPTION	1	1	1	10	10	10	10
UTILITY RATING			72		55		60

SESSION NO. 8  
TOPIC NO. 19

TITLE EVALUATION OF TECHNIQUES

- Plotting utility ratings to graphically depict relative positions and impact.
- Provides easier understanding for presentation



## LESSON PLAN

SESSION 9 DURATION 135 MINS.

SESSION TITLE WORKSHOP ON APPLICATION OF TECHNIQUES

### INSTRUCTIONAL OBJECTIVES

1. Strengthen information gained from lectures and discussion through practical application
2. Critique of various solutions by full class, led by instructors

### INSTRUCTIONAL METHODS

1. Break into small groups; develop solutions to real-world situations presented through slides, hand-outs, statistics, and maps. "Problem" is section of arterial presently experiencing capacity and accident problems.

### INSTRUCTIONAL MATERIALS

Slides Seventeen (17)

Viewgraphs Two (2)

Others Maps of existing arterial and area, tables of information

### SPECIAL INSTRUCTIONS

1. Emphasize need to incorporate information from previous sessions combined with personal experience. Urge development and testing of alternative solution.
2. Groups should be formed so that there is good mix of skills and agency representation in each.

### INSTRUCTIONAL ACHIEVEMENT

1. Students will have better understanding of application of techniques; group discussion of alternative solutions will provide personal viewpoints of social, political, and legal problems experienced by others in implementation.

SESSION NO. 9  
TOPIC NO. 1 and 2

TITLE WORKSHOP ON APPLICATION  
OF TECHNIQUES

V9-1

Application of Techniques

- Identify and explain elements involved in the selection of appropriate access management technique(s)
  - Definition of problem
  - Inventory of operational and physical roadway characteristics
  - Identification of alternative solutions
  - Evaluation of alternative solutions
  - Selection of alternative providing greatest operational and cost-effective solution

Operational Parameter Table

- Distribute and explain use of Warrant Tables in selecting alternative techniques

V9-2

Viewgraph of Warrant Table

SESSION NO. 9  
TOPIC NO. 3 and 4

TITLE WORKSHOP ON APPLICATION  
OF TECHNIQUES

WORKSHOP

- Introduce problem and show slides, briefly discussing problems with access. Indicate number of accidents and general delays being experienced by motorists.

Roadway is multilane, urban arterial, presently experiencing rapid growth and decreasing traffic service. Students are required to analyze and make recommendations for access control measures which would improve level of service and reduce accidents. General benefit and cost values are to be obtained.

Slides 114  
through  
130

Slides of entrance along the arterial to be studied as well as general conditions

- Provide students with plan of arterial and surrounding area along with information as to traffic volumes and accidents. Be sure all have scales and pencils.

No viewgraph or slide

SESSION NO. 9

TITLE WORKSHOP ON APPLICATION

TOPIC NO. 5

OF TECHNIQUES

- Circulate among groups advising, discussing, and aiding in use of tables and alternatives analyses

No slide or viewgraph

## LESSON PLAN

SESSION 10 DURATION 75 MINS.

SESSION TITLE REVIEW OF WORKSHOP RESULTS

### INSTRUCTIONAL OBJECTIVES

1. Critique and discuss possible solutions to urban arterial problem

### INSTRUCTIONAL METHODS

1. Presentation by students with critique and discussion from class and instructors

### INSTRUCTIONAL MATERIALS

Slides None

Viewgraphs None

Others Conceptual drawings prepared by students

### SPECIAL INSTRUCTIONS

1. Bring out personal experiences of class members; provoke discussion. Be sure to emphasize that there is usually more than one solution to any problem

### INSTRUCTIONAL ACHIEVEMENT

1. Practical understanding of use of techniques and evaluation as to true beneficial value

SESSION NO. 10  
TOPIC NO. \_\_\_\_\_

TITLE REVIEW OF WORKSHOP RESULTS

- Each group will select a spokesperson to present the groups' solutions to the problem.
- Lead discussion in a constructive way as the solution is critiqued.

No visuals

- General discussion of solutions presented. No "final, correct" answer is provided.
- Those solutions and approaches which appear to have offered greatest benefits at lowest cost should be emphasized. Political and social repercussions should be discussed if they have not been brought out during individual presentations.

No visuals

## LESSON PLAN

SESSION 11 DURATION 60 MINS.

SESSION TITLE SITE PLAN REVIEW

### INSTRUCTIONAL OBJECTIVES

1. Show value of site plan review in access management
2. Indicate those elements involved in site plan review

### INSTRUCTIONAL METHODS

1. Lecture and discussion

### INSTRUCTIONAL MATERIALS

Slides None

Viewgraphs Four (4)

Others \_\_\_\_\_

### SPECIAL INSTRUCTIONS

1. Emphasize role of site plan review both during concept stage and prior to issuing permits

### INSTRUCTIONAL ACHIEVEMENT

1. Knowledge of value of site plan review
2. Capability to perform site plan review function

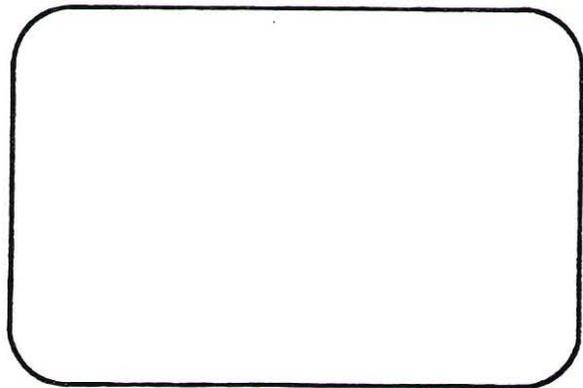
SESSION NO. 11  
TOPIC NO. 1

TITLE SITE PLAN REVIEW

INTRODUCTION

- Site Plan Review:
  - Essential to access management program
  - Review of all proposed construction and improvement plans to assess probable impact on street system, traffic movement and safety, and future transportation plans.

VII-1  
**SITE PLAN  
REVIEW**



SESSION NO. 11  
TOPIC NO. 2

TITLE SITE PLAN REVIEW

DISCUSSION OF ELEMENTS INVOLVED  
IN SITE PLAN REVIEW

1. Circulation pattern -- site plan and design should allow for all vehicular circulation to take place on-site and not on the street at any time.
2. Angle of driveways -- are they conducive to safe, efficient entry and exit of site.
3. Driveway radii -- are they designed to accommodate prevailing types of traffic and speeds on roadway as per design guidelines.
4. Driveway grade -- does it provide for entry and exit at safe speed.
5. Site distance -- can adequate sight distance be provided for entry and exit.
6. Driveway width -- is width adequate to handle type and volumes of traffic.
7. Driveway location -- is location relative to intersection, other driveways, and/or property line within prescribed guidelines.
8. Total number of driveways -- are there sufficient driveways to handle entering volume; can number of driveways be reduced.
9. Auxiliary lanes -- is there a need to provide auxiliary lanes on the main roadway to handle entering or exiting traffic.
10. Projected conditions -- is proposed site plan suitable for projected uses and expected traffic volumes.
11. Physical construction design -- an all-weather surface and construction materials sufficient to withstand type and volume of traffic should be required.
12. General -- does overall design, circulation pattern, entrance/exit location and drainage provisions provide for minimal impact on the street system consistent with providing reasonable access to the site for its proposed use.

-VII-2

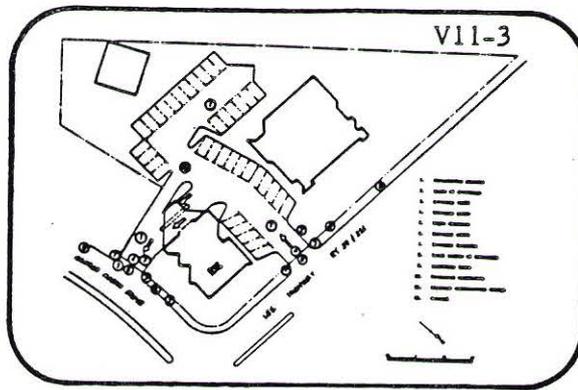
Site Plan Review

- |                        |                                  |
|------------------------|----------------------------------|
| 1. Circulation pattern | 8. Total number of driveways     |
| 2. Angle of driveways  | 9. Auxiliary lanes               |
| 3. Driveway radii      | 10. Projected conditions         |
| 4. Driveway grade      | 11. Physical construction design |
| 5. Sight distance      | 12. General                      |
| 6. Width               |                                  |
| 7. Location            |                                  |

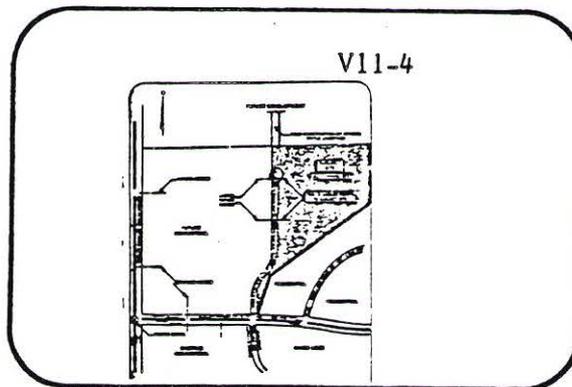
SESSION NO. 11  
TOPIC NO. 3 and 4

TITLE SITE PLAN REVIEW

- Explain how each of the elements discussed previously apply to the site plan



- Explain how prior review of subdivision plans can help in location of access points.
- Developers are more willing to make changes at this stage than they will be after engineering plans have been developed.



## LESSON PLAN

SESSION 12 DURATION 60 MINS.

SESSION TITLE SITE PLAN REVIEW WORKSHOP

### INSTRUCTIONAL OBJECTIVES

1. Critique of student solutions to workshop problem

### INSTRUCTIONAL METHODS

1. Presentation by students with critique and discussion

### INSTRUCTIONAL MATERIALS

Slides None

Viewgraphs None

Others Students' copy of site plan with critique

### SPECIAL INSTRUCTIONS

1. Bring out economic, political, and social considerations in site plan review

### INSTRUCTIONAL ACHIEVEMENT

1. Practical understanding of use of site plan review process on access management

SESSION NO. 12.  
TOPIC NO. 1 and 2

TITLE SITE PLAN REVIEW WORKSHOP

- Students will be separated into groups and given a typical site plan to evaluate.
- Instructor will circulate and discuss evaluation with each group.

No visuals

- Each group will select a spokesperson to present the group's evaluation/recommendations regarding the site plan.
- Instructor should lead the class in a constructive critique of each group's evaluation.

No visuals

## LESSON PLAN

SESSION 13 DURATION 30 MINS.

SESSION TITLE SUMMARY AND EVALUATION

### INSTRUCTIONAL OBJECTIVES

1. Highlight key items of course
2. Obtain input from course participants on adequacy of instructional techniques and course content

### INSTRUCTIONAL METHODS

1. Lecture
2. Individual's Evaluating Course

### INSTRUCTIONAL MATERIALS

Slides Eight (8) 35 mm Slides

Viewgraphs

Others Evaluation Form

### SPECIAL INSTRUCTIONS

1. Stress again the importance of a comprehensive program
2. Urge students to provide honest and well-thought-out answers in evaluation

### INSTRUCTIONAL ACHIEVEMENT

1. Bringing all elements of course in focus
2. Continuous process of improving presentation and upgrading course

SESSION NO. 13

TITLE SUMMARY AND EVALUATION

TOPIC NO. 1 and 2

- Discussion of need for "comprehensive" program, including:
  - Legislation
  - Technical
  - Enforcement
  - Coordination
- Ask for questions on previous material and respond

No visuals

- Series of 35 mm slides can be used as comical discussion of the various stages involved in the development of an urban project. Serves as a good overall summary

Slides 132 - 140

Program Stages

SESSION NO. 13

TITLE SUMMARY AND EVALUATION

TOPIC NO. 3

- Each participant should fill out two forms:
  - a. Overall Course Evaluation
  - b. Specific Course Evaluation
- Forms are included in back of textbook
- Forms should be collected by instructor

No visual



## OVERALL COURSE EVALUATION

Your Job Title and Agency: \_\_\_\_\_

Work Responsibilities: \_\_\_\_\_

1. Describe the overall value of the course to you.
2. Will you, or an associate, find the textbook of value as a reference?
3. Describe any changes you would make in technical content of the course, including adding or dropping topics and level of detail.
4. Describe any changes you would make in the educational aspects of the course, including schedule and visual aids.
5. Which specific topic(s) was of greatest value to you? Why?
6. Which specific topic(s) was of least value to you? Why?
7. What suggestions do you have for improving future presentations of the course that have not been mentioned above?
8. What types of persons can best benefit from this course?

## SPECIFIC COURSE EVALUATION

(Circle one for each category)

1 = Poor   2 = Below Average   3 = Average

4 = Good   5 = Excellent

	Material	Presentation	Visual Aids
1. Introduction	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
2. Needs and benefits	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
3. Elements of comprehensive program	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
4. Existing programs	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
5. Retrofit	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
6. Techniques for access management	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
7. Design Guidelines	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
8. Evaluation of techniques	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
9. Workshop on application of techniques	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
10. Review of workshop results	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
11. Site plan review	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
12. Site plan review workshop	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
13. Summary and evaluation	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5



