

Access Management Techniques: Preserving Roadway Safety and Mobility

A VARIETY OF METHODS AND TECHNIQUES CAN BE USED TO MAINTAIN THE FUNCTION OF A ROADWAY SYSTEM AND TO PRESERVE THE SAFETY OF, AND MOBILITY PROVIDED BY, A ROADWAY.

INTRODUCTION

Implementation of access management involves a variety of methods and techniques that include planning, engineering-based techniques and administrative methods. This paper identifies the basic issues to be addressed in a plan to underpin access management regulations. Six objectives for identifying the effectiveness of individual access management techniques are identified. Selected access management techniques are then presented together with the effectiveness of each in addressing these objectives. Various techniques and their applications are briefly described.

PLANNING METHODS

A strategic plan and a statement of principles and objectives provide the basis for effective access management. For a state department of transportation (DOT), this will include a functional roadway classification system and a statement of access principles for each roadway category.

The transportation element of the general (comprehensive) plan provides this function for a local government. It establishes roadway categories, a plan for the extension of arterials and policies regarding signal spacing, medians, driveway spacing and land development.

A corridor plan is a means of coordinating the actions of state DOTs and local governments in the development and redevelopment of an important roadway corridor. It identifies such elements as roadway cross-section, signal spacing, median design, a supporting circulation system, unsignalized access, and use, implementation schedule, and agency responsibilities.

ENGINEERING TECHNIQUES

The National Highway Institute course titled "Access Management, Location and Design," developed for the

Federal Highway Administration in 1991, identified access management techniques according to the six categories of objectives in improving traffic operations and safety listed in Exhibit 1.

Traffic Signal Spacing

A half-mile (804 meter) spacing enables the traffic engineer to develop efficient traffic-progression plans to respond to changing speed and volume conditions that occur during the day and over time.^{1,2} Hauer also found that crashes increase as signal density increases.³ Consequently, a half-mile is an increasingly common spacing standard. The Colorado DOT codes restrict full median openings and intersections that might be signalized to half-mile intervals. The Florida DOT regulations specify 2,640-foot spacing on major roadways.

Regulations need to include criteria and procedures for deviation from the adopted signal spacing interval. These should consist of two elements: 1) minimum progression efficiency and 2) conditions (including the roadway segment, combinations of cycle length and progression speed, volumes and analysis method) to be specified by the state DOT or local government on a case-by-case basis to determine whether minimum progression efficiency can be maintained.^{4,5}

Median Treatments

A very high proportion (approximately 75 percent) of crashes at unsignalized access connections involve a left turn.⁶ In addition to enhancing safety, a landscaped median enhances community appearance.

A nontraversable median also reduces the unprotected area where pedestrians cross a roadway.⁷ Pedestrians can cross one traveled way, take refuge in the median, and then cross the other traveled way. Vehicular-pedestrian crash rates are typically less than one-half that on undivided roadways or those with a two-way left-turn lane (TWLTL).

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Exhibit 1. Objectives of access management techniques

Objective	Comment
1. Limit the number of conflict points	Collisions increase when drivers are faced with complex situations. Limiting the number of conflict simplifies the driving task and improves safety.
2. Separate conflict areas	Separating conflict areas enables drivers time to address one conflict problem at a time.
3. Remove turning vehicles from the through traffic lane	Crash potential increases exponentially as the speed differential between a turning vehicle and through traffic increases. Left-turn and right-turn lanes limit the speed differential to an acceptable level.
4. Limit conflicting volumes	A collision is unlikely when the conflicting volume is low.
5. Improve roadway operations and safety	Protection of the functional integrity of the roadway preserves the public investment.
6. Improve driveway operations and safety	Appropriately located and designed access connections to major roadways contribute to a safe and efficient access to abutting property.

Applications for a nontraversable median include major roadways on new locations, major roadways with four or more lanes, existing roadways with a current or projected volume in excess of 24,000 vehicles per day and undivided roadways and roadways where operational safety problems are observed.

A barrier of flexible pylons can be used to restrict movements to right-in/right-out where the median is not of sufficient width to install a raised median, or such a barrier can be used as an inexpensive retrofit.

Comparison of Crash Rates on Apalachee Parkway in Tallahassee, Florida

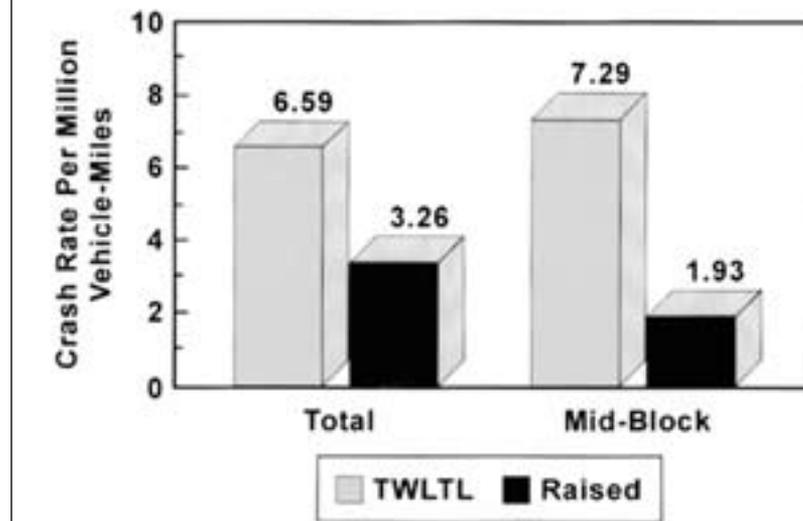


Figure 1. Research showed that the raised median section was safer. Consequently, the TWLTL was replaced with a raised, landscaped median in 1998.

Where a nontraversable median is present, the full median opening might be closed or reconstructed as a directional opening.

Corner Clearance

Corner clearance (an unsignalized access connection adjacent to a signalized intersection) is a special case of access-connection spacing. The Colorado code, for example, recognizes this in that it does not mention corner clearance per se; access connections apply. The Missouri DOT guidelines also recognize this by having tables for connection spacing and corner clearance, with both tables having the same minimum distances. Ideal corner clearance is the sum of the functional distance of the intersection plus the functional distance of the adjacent unsignalized access.

These functional distances vary depending upon volume (turning and through), speed and driver expectancy. When an access connection must be located closer to an intersection than the ideal corner clearance, movements should be restricted to only right-in/right-out by a nontraversable median or other barrier. The Transportation Research Board's *Access Management Manual* provides suggestions for minimum corner clearance where local conditions make longer distances impractical.

Deceleration Lanes

Auxiliary lanes for left and right turns are the only effective way to limit the speed differential between turning vehicles and following through traffic. Florida DOT policy is to add a left-turn lane at any median opening where a turn lane does not exist, or to close it when a roadway is resurfaced. The Texas DOT has retrofitted many divided roadway left-turn lanes. Conflict analysis and anecdotal information indicate that a short turn lane can be effective on high-speed, divided roadways with volumes less than about 20,000 vehicles per day.

Left-turn and right-turn lanes are needed to maintain traffic progression on signalized urban/suburban roadways to maintain traffic progression. In absence of such auxiliary lanes, vehicles turning directly from a through traffic lane will disrupt platooned traffic flow. This interference with efficient traffic progression may continue for several cycles when traffic volumes are high.

It is increasingly recognized that low-volume access connections degrade roadway operations and safety. Consequently, recently adopted regulations require deceleration lanes at lower volumes than in the past. The Georgia and Colorado warrants are examples of current best

Source: Long, Gatt & Morrison, 1993

practice. Lewisville, Texas, USA, requires a right-turn lane at access connections. The ordinance provides for a waiver where subdivision has already resulted in lots with narrow frontage.

An access connection should not be located within the influence distance of another connection.⁸ Thus, unsignalized access-connection spacing increases with speed and drivers' perception-reaction

time. Minimum spacing may range from 200 feet (60 meters) on an urban collector to more than half a mile (804 meters) on a rural highway. Some jurisdictions restrict access locations that do not conform to the signal-spacing interval to right-in/right-out only. Stopping sight distance is a rational criterion for minimum unsignalized spacing where a longer spacing can not be achieved.⁹ This criterion en-

ables drivers to clear a connection before having to consider possible conflicts at a subsequent connection.

SELECTED ADMINISTRATIVE METHODS

Selected administrative techniques are identified in Exhibit 3. Some methods, such as zoning and subdivision regulations, control the actual use of land and land use activities over which local gov-

Exhibit 2. Selected Engineering Techniques and their Effectiveness in Achieving Access Management Objectives

Access Management Technique	Manner in Which the Technique Contributes to Safety and Improvement of Traffic Operations					
	1 Limit Conflicts	2 Separate Conflicts	3 Auxiliary Lanes	4 Conflicting Movements	5 Roadway Operations	6 Driveway Operations
Access Spacing and Design Within the Traveled Way						
Traffic signal spacing		●			●	
Continuous two-way left-turn lane (TWLTL)			●		○	
Nontraversable median	●				●	
Directional median opening	●	○			●	
Close an existing median opening	●	○	●		●	
Access Spacing and Design at the Margin of the Traveled Way						
Unsignalized access spacing		●			●	○
Corner clearance		●			●	○
Driveway channelizing island	○					
Right-in/Right-out	●			○	●	
Prevent uncontrolled access along property frontage	●	●			●	○
Consolidate driveways	●	●		○	●	
Close an existing access connection	●	●			●	
Auxiliary Lanes						
Left-turn deceleration lane			●		●	○
Shoulder bypass lane					●	○
Right-turn deceleration lane			●		●	○
Continuous right-turn lane			●		●	○
Acceleration lane					●	○
Alternative Access						
Access on the minor roadway	○				●	
Indirect left-turn (jughandle)					●	
U-turn in lieu of direct left-turn	●				●	○
Frontage road	●				○	
Service road (other than frontage road)	●				●	○
Design of Access Connections						
Provide visual cue					●	●
Driveway throat width and curb return radii					●	●
Driveway throat length					○	●
Driveway profile					○	●
Driveway construction					●	●

Key: ● Major Effect ○ Secondary Effect

Source: V. G. Stover, "Access Management Techniques and Practices: A Toolbox for the Practitioner, Teach America, www.teachamerica.com, 2007, Revised 2009.

ernments have authority. Therefore, local governments can implement a variety of regulations that affect the traffic circulation and that are not available to a standard DOT.

Acquisition of Access Rights

This technique restricts the location where access to a parcel is not allowed but does not restrict the type and volume of traffic permitted to enter or leave a site. Access is permitted outside the limits of the access control line and is subject to the same application requirements and procedures as other access connections. The technique can be used to limit access to designated locations or to a minor roadway; to limit access to major at-grade roadways, a new bypass and freeways; and to preserve corner clearance at major intersections.

Acquisition of Development Rights

Acquisition of the development rights limits the type and intensity of use of a given property and thereby limits the type and volume of traffic. The technique has been widely used to protect scenic vistas and for conservation easements. Access management applications include limiting driveway traffic volume at a critical location such as a major intersection.

Vehicular Use Limitations

Vehicular use limitations restrict the number of trips permitted during any 60-minute interval and in a 24-hour period. They also can be used to limit the largest size and type of vehicle, limit the movements to right-in/right-out only and/or to limit the driveway operation to one way in or one way out. A state DOT can make these limitations as conditions of the driveway permit. In addition to these limitations on the type and volume of traffic, local governments can include limitations on lane use per se—such as the specific lane use, square feet of structure and so forth. Applications include the following: properties that have less frontage than the minimum access connection spacing, corner properties where access within the functional area of intersection cannot be avoided and locations where high driveway volumes could result in traffic operations or a safety problem.



Figure 2. Example of the use of flexible pylons as a “retrofit” to limit movements to right-in/right-out. Location: Briarcrest Drive, Bryan, TX



Figure 3. The full median opening was converted to a directional opening because of the numerous collisions involving crossing maneuvers and left-turns onto the major roadway. Location: Santa Rita Road, Pleasanton, California

Exhibit 3. Selected Administrative Methods and Effectiveness in Achieving Access Management Objectives

Access Management Technique	Manner in Which the Technique Contributes to Safety and Improvement of Traffic Operations					
	1 Limit Conflicts	2 Separate Conflicts	3 Auxiliary Lanes	4 Conflicting Movements	5 Roadway Operations	6 Driveway Operations
Administrative Methods						
Acquire access rights	●	●			●	
Purchase/transfer of development rights				●		
Zoning				●	○	
Designate access for each existing property	●	●			●	
Internal access to outparcels	●	●		●	●	
Joint access	●	○			●	○
Cross-access	●	○		●	●	
Vehicle use limitation (traffic generation budget)				●	●	
Access management overlay zone	●	●	●	●	●	●

Key: ● Major Effect ○ Secondary Effect
 Source: V. G. Stover, "Access Management Techniques and Practices: A Toolbox for the Practitioner, Teach America, www.teachamerica.com, 2007, Revised 2009.

Internal Access to Outparcels

Outparcels result when a large parcel of land is subdivided to create corner lots at the intersections and along the roadway frontage. These lots are often sold or leased to generate cash flow before the larger tract is developed. Applications include large parcels that will involve standalone commercial sites for intersections or fronting on major roadways. A local government can include language in its development code to require on-site circulation to serve outparcels (both platted lots and ground leases). A state agency might address access to outparcel through including conditions through the driveway-permitting process.

Joint Access (Shared Driveways)

Joint access results in fewer driveways (longer spacings) than would occur if each individual lot had direct access to the abutting roadway. A local government can implement joint access by requiring reciprocal access easements on adjacent lots to be included in the plat when a larger tract is subdivided. Incentives that may be used by a local government as well as a state DOT to encourage joint access (and driveway consolidation) after subdivision has occurred include permitting a higher trip generation as a condition of the permit than the total trip generation

that would be permitted for two separate driveways and allowing a median opening opposite a shared driveway (providing that it is a reasonable location), whereas two separate driveways would be limited to right-in/right-out only.

Cross Access

Cross access provides interparcel circulation between properties so that delivery, service and customers do not need to use the abutting roadway for very short trips. A local government can achieve implementation by requiring circulation easements to be shown on the plat when a tract is subdivided and by adopting an ordinance requiring that a clearly defined interparcel circulation for vehicles and pedestrians be incorporated into site plans. Compliance can be achieved by withholding the certificate of occupancy until development conforms to the approved site plan.

Access Management Overlay Zone

An overlay district adds special access management requirements within a designated corridor, in the vicinity of an intersection, or within interchange areas while retaining the requirements of the underlying zoning. The overlay district requirements are adopted by local government ordinance, and the affected

area is shown on the official zoning map. Applications include implementing high-priority corridors, implementing a corridor plan, obtaining joint access and interparcel circulation on commercial properties fronting on a major arterial, implementing a service road system, ensuring adequate corner clearance at major intersections and implementing a development circulation and access plan for an interchange area.

CONCLUSION

The various access management techniques provide state DOTs and local governments with a range of tools to enhance safety and preserve the public investment in major roadways as well as maintain the private investment in abutting property. Incorporating access management policies into each local government's comprehensive plan is the first step in implementing an effective access management program. A corridor plan can be an effective method of coordinating state and local implementation. Signal spacing, nontraversable medians and deceleration lanes are effective means of preserving safe and efficient traffic operations on major roadways. The various administrative techniques can be used to manage corridor development and preserve the function of major roadways. ■

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