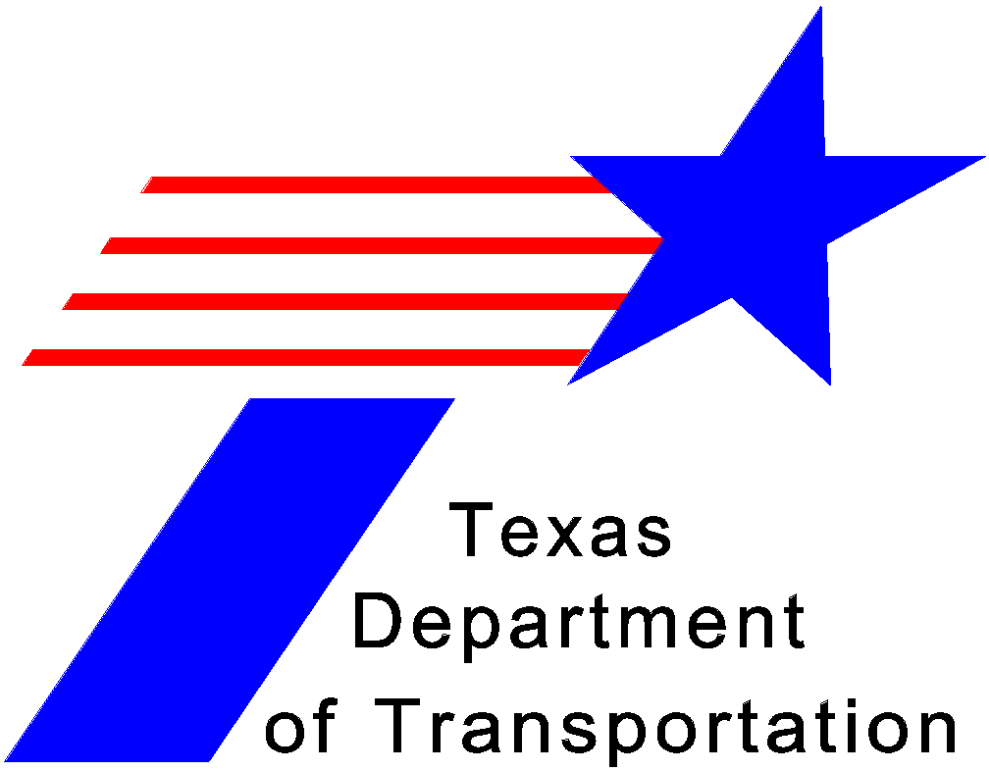
Access Management Manual



December 2003

Access Management Manual
December 2003

Manual Notices

Manual Notice 2003-1

To: Districts and Divisions

From: Ken Bohuslav, P.E.

Subject: Initial Manual Release

Manual: *Access Management Manual*

Effective Date: January 1, 2004

Purpose

This manual is intended to provide guidance for access location determination and procedures for municipalities to be granted permitting authority to the state highway system.

Instructions

The access management procedures described in this manual are applicable to all classes of state highways.

Contents

This manual includes chapters on general access management descriptions, access management criteria, administrative procedures, and reference material.

Contact

For general comments and suggestions for future revisions of this manual, contact the Design Division, Roadway Design Section.

Copyright Notice

Chapter 1
Access Management General

Contents:

Section 1
Introduction

The access management criteria contained in this manual are applicable to all classes of state highways. This manual also provides a mechanism for municipalities to be granted permitting authority to the state highway system. Municipalities that choose to handle access permitting for state highway system roadways within their jurisdiction can either develop their own access management guidelines or they can adopt the guidelines contained in this manual. Because they have authority to implement subdivision and zoning regulations, municipalities also have the ability to apply a host of access management techniques: shared access, cross access, lot width requirements, driveway throat length, internal street circulation, and general thoroughfare planning. It is through a cooperative relationship between the Department and municipalities that the safety and operational benefits of access management can be fully realized. The following subsection provides an overview of access management and discusses some of its principles.

Overview

Proper access management assists in protecting the substantial public investment in transportation by preserving roadway efficiency and enhancing traffic safety, thus reducing the need for expensive improvements. Furthermore, access management can significantly reduce traffic accidents, personal injury, and property damage. To appreciate how access management fits into the entire spectrum of the roadway network, one should understand that freeways, arterials, collectors, and local streets serve varying levels of through-traffic movement and access to property (see Figure 1-1).

- *Freeways* - provide the highest level of mobility and are intended to carry the greatest amount of traffic at the highest speeds. Accordingly, freeway mainlanes provide no direct access to property and access to the freeway mainlanes is provided only at interchanges and ramps.
- *Arterials* - provide the next highest level of mobility and are intended to carry substantial amounts of traffic over relatively long distances and at relatively high speeds. Direct property access may be provided but must be carefully managed to preserve arterial mobility and avoid creating unsafe and congested traffic operations.
- *Collectors* - provide lower mobility and are intended to carry lower volumes of traffic at lower speeds. Since most of the trips on collectors are shorter distance local trips, these streets can safely provide a higher amount of property access.
- *Local streets* - provide the lowest level of mobility and are intended to provide direct access to properties, preserve the neighborhood environment, and enhance pedestrian and bicycle safety.

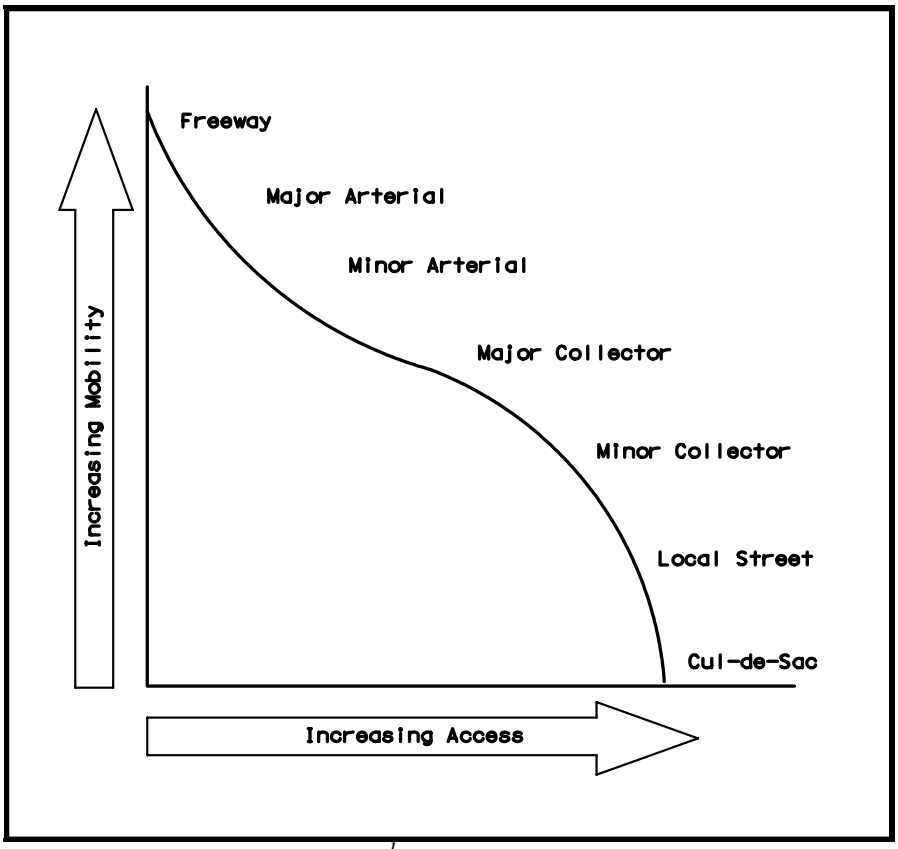


Figure 1-1: Access Function [1]

Section 2
The Benefits of Access Management

Overview

Below are some of the benefits that have been realized in communities with effective access management policies:

- Delaying or preventing costly highway improvements
- Improving roadway safety conditions (reduced crash rates)
- Reducing traffic delay and congestion, which has a positive economic effect on market areas (as seen in Figure 1-4)
- Promoting properly designed access and circulation systems for development
- Improving the appearance of transportation corridors and increasing the area available for landscaping, which can help attract investment and enhance the image of an area
- Providing property owners and customers with safe access to roadways
- Reducing air pollution
- Making pedestrian and bicycle travel safer.

Another significant benefit is that access management requires a more coordinated, long-term approach to land use and transportation; therefore, effective access management promotes intergovernmental cooperation relating to land development and transportation decisions.

Effects on Safety

More than four decades of research conducted throughout the United States have shown that access management improves roadway safety. These safety benefits are attributable to improved access design, fewer traffic conflict locations, and higher driver response time to potential conflicts. Some key findings on the impacts of arterial access management on safety are summarized below.

- *As access density increases, crash rates increase*. Relative increases in crash rates are remarkably consistent among the various studies. Figure 1-2 shows composite crash rate indices derived from the analysis of 37,500 crashes, as compared with a synthesis of previous studies[2]. The indices were developed by correlating crash rates with access density - using the crash rates for 10 access points per mile as a base and then averaging crash rates for each access density. For example, these indices suggest that an increase from 10 access points to 20 access points per mile would increase crash rates by roughly 30 percent.

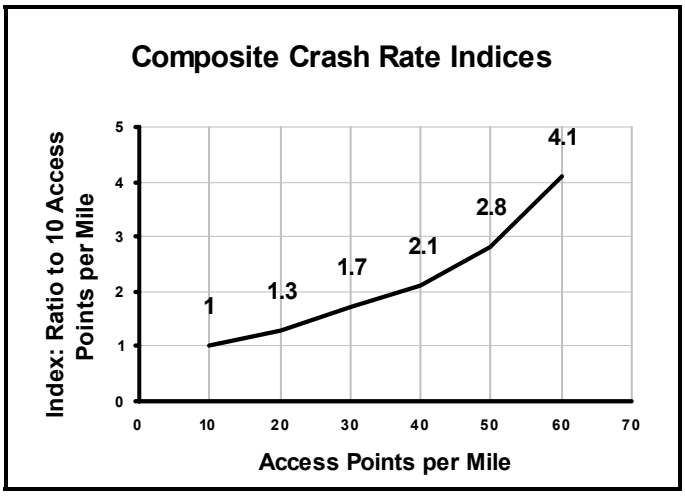


Figure 1-2: Composite Crash Rates

- *Roadways with nontraversable medians are safer at higher speeds and at higher traffic volumes than undivided roadways or those with continuous two-way left-turn lanes (TWLTL)*. Numerous studies from across the nation have been conducted relating to undivided, TWLTL, and divided roadways with a nontraversable median. Based on studies, it can be concluded that roadways with a nontraversable median have an average crash rate about 30 percent less than roadways with a TWLTL. Table 1-1 summarizes the representative crash rates by median type for urbanized areas. Additionally, where ADT exceeds 20,000 vehicles per day and the demand for mid-block turns is high, a raised median should be considered.[3]

Table 1-1: Accident Rates

Representative Accident Rates (Crashes Per Million VMT) by Type of Median –Urban and Suburban Areas			
	Median Type		
Total Access Points Per Mile (1)	**Undivided**	**Two-Way Left-Turn Lane**	**Non Traversable Median**
< 20	3.8	3.4	2.9
20.01-40	7.3	5.9	5.1
40.01-60	9.4	7.9	6.8
> 60	10.6	9.2	8.2
Average Rate	9.0	6.9	5.6
(1) Includes both signalized and unsignalized access points.			

Operational Effects

Frequent access connections, median openings, and closely spaced traffic signals are a recipe for congestion on major roadways (See Figure 1-3). Studies of the effects of access management on roadway operations have addressed effects of access spacing on travel time by simulating traffic performance. Collectively, these studies indicate that access management helps to maintain desired speed and reduce delays, which also reduces fuel consumption and vehicle emissions.

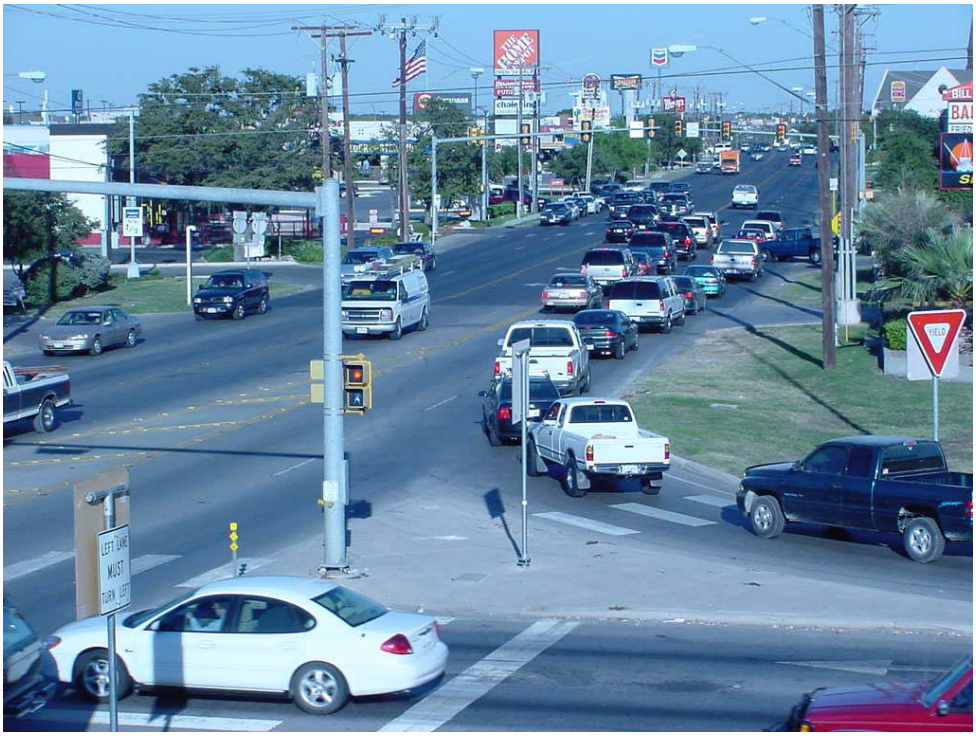


Figure 1-3: Signal Spacing and Queuing

For example, analysis based on procedures in the *Highway Capacity Manual* indicates that the typical reduction in free-flow speed (for one direction) is approximately 0.15 mph per access point and 0.005 mph per right-turning movement per hour per mile of road.[4] Using the *Highway Capacity Manual*, Table 1-2 provides suggested access density adjustment factors for level of service determinations. These benefits extend not only to free-flow conditions, but to platoon flow as well.

Table 1-2: Access Points and Free Flow Speed

Access Points and Free Flow speed	
Access points per mile	**Reduction in free flow speed, mph**
0	0.0
10	2.5
20	5.0
30	7.5
40 or more	10

Other analyses suggest that a four lane divided major roadway with long, uniform signal spacing, directional openings between signals, and auxiliary lanes could accommodate a

similar volume and similar quality of service as a six lane divided roadway having traffic signals at ¼-mile intervals, unregulated access between the signals, and no auxiliary lanes.[5]

Minimizing the number of traffic signals and promoting appropriate signal spacing significantly improves travel times. Each traffic signal per mile added to a roadway reduces through travel speed about two to three mph. Table 1-3 indicates percentage increases in travel times that can be expected as signal density increases, using two traffic signals per mile as a base. For example, travel time on a segment with four signals per mile is about 16 percent greater than on a segment with two signals per mile.

Table 1-3: Travel Time and Signal Density

Percentage Increase in Travel Times as Signalized Density Increases	
Signals Per Mile	**Percent Increase in Travel Times (Compared with 2 Signals Per Mile)**
2.0	0
3.0	9
4.0	16
5.0	23
6.0	29
7.0	34
8.0	39

Economic Effects

A safe and efficient transportation system is an important element of a vibrant economy. The quality of the transportation system affects the economy in a variety of ways: it determines how quickly goods get to market, whether an area is attractive to investors, and the size of the market area for a particular business.

For real estate developers, the importance of well designed access and circulation systems cannot be overstated. The Urban Land Institute's (ULI) *Shopping Center Development Handbook* warns that "poorly designed entrances and exits not only present a traffic hazard but also cause congestion that can create a negative image of the center".[6]

The market area for a business is important to its success as well. Closely spaced or poorly designed access connections reduce average travel speeds and increase delay on the roadway. Market area analysis shows that these increases in average travel times result in longer commute times and reduce the market area for businesses. The National Highway Institute reports that inadequate access management can increase travel time and delay by as much as 40 to 60 percent.[7] Yet, even a 10 percent reduction in average travel speeds can cause a business to lose 20% of its market area. Although the average size of market area varies for different types of businesses, the proportionate reduction in market area is the same. This relationship is illustrated in Figure 1-4.

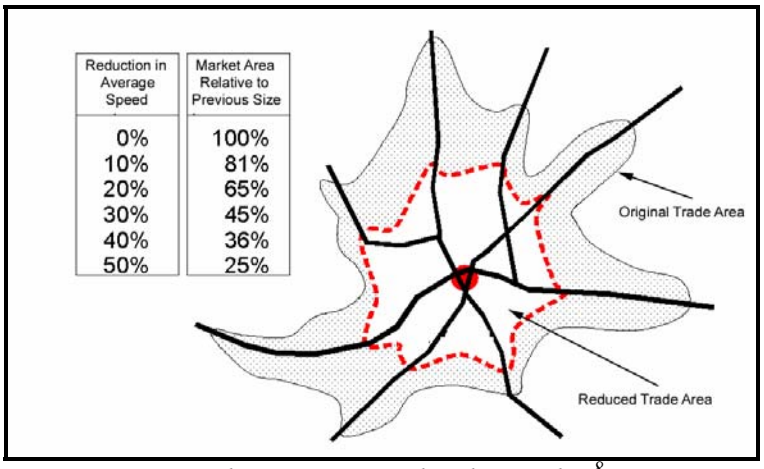


Figure 1-4: Market Area, Speed Relationship[8]

The appearance of a corridor and quality of access to development also impact property values and investment. Property values tend to increase rapidly during commercial development, but can decline after the corridor is built out if the character and efficiency of that corridor have been damaged in the process. This is exemplified by the growing number of older highway commercial strips across the state that are now experiencing economic decline; many such areas are the subjects of revitalization efforts that include access management strategies.

Individual business owners are sometimes concerned about the potential impact of access management requirements on business activity. Studies conducted of businesses within areas where access management has been implemented show that improved driveway spacing and design, alternative access, and installation of nontraversable medians have virtually no adverse impact on business activity. For example, a study of the economic impacts of left-turn restrictions in College Station, Houston, McKinney, Longview, Wichita Falls, Odessa, Port Arthur, and Amarillo was conducted for the Texas Department of Transportation in the mid 1990s.[9] Key findings relative to access management include the following:

- Business owners reported no change in pass-by traffic after median installation.
- Most business types (including specialty retail, fast-food restaurants, and sit-down restaurants) reported increases in numbers of customers per day and gross sales.
- When asked what factors were important to attracting customers, business owners generally ranked "accessibility to store" lower than customer service, product quality, and product price, and ahead of store hours and distance to travel.

A study of the effects of access management on business vitality was conducted in 1996.[10] Before and after data were collected on a series of corridor case studies. Results indicated that:

- Corridors with completed access management projects performed better in terms of retail sales than the surrounding communities. Business failure rates along access managed corridors were at or below the statewide average.
- Close to 80 percent of businesses reported no customer complaints about access to their businesses after project completion.
- Over 90 percent of motorists surveyed had a favorable opinion of improvements made to roadways that involve access management. The vast majority of motorists thought that the improved roadways were safer and that traffic flow had improved.

The results of these and other studies indicate that access management has little or no adverse impact on business activity. Before and after studies indicate that business owner perceptions of the potential for adverse impacts of access changes tend to be much worse than actual impacts. In addition, levels of business activity often correlate more closely with factors such as competition, the regional economy, quality of management, and other issues unrelated to property access.

Section 3
Definitions

Acceleration Lane: A speed-change lane, including tapered areas, for the purpose of enabling a vehicle entering a roadway to increase its speed to a rate at which it can more safely merge with through traffic.

Access Connection: Facility for entry and/or exit such as a driveway, street, road, or highway that connects to the highways under the jurisdiction of the department or municipality.

ADT: The average daily traffic volume. It represents the total two-way traffic on a roadway for some period less than a year, divided by the total number of days it represents, and includes both weekday and weekend traffic. Usually, ADT is adjusted for day of the week, seasonal variations, and/or vehicle classification.

Auxiliary Lane: A lane striped for use as an acceleration lane, or deceleration lane, right-turn lane, or left-turn lane, but not for through traffic use.

Connection Spacing: The distance between connections, which is measured along the edge of the traveled way from the closest edge of pavement of the first access connection to the closest edge of pavement of the second access connection.

Capacity: The number of vehicles that can traverse a point or section of a lane or roadway during a set time period under prevailing roadway, traffic, and control conditions.

Corner Clearance: The distance along the edge of the traveled way from the closest edge of pavement of the intersecting roadway to the closest edge of pavement of the nearest access connection.

Corner Lot: A lot located at the intersection of two roadways that has frontage on each roadway.

Deceleration Lane: A speed-change lane, including tapered areas, for the purpose of enabling a vehicle that is exiting a roadway to leave the travel lanes and slow to a safe exit.

Department: The Texas Department of Transportation.

Directional Median Opening: An opening in a nontraversable median that accommodates specific movements, such as U-turn movements and/or left-turn movements from the highway, and physically restricts other movements.

Divided Highway: A highway with a median designed to separate traffic moving in opposite directions.

Field Drive: A limited use driveway for the occasional/infrequent use by equipment used for the purpose of cultivating, planting, and harvesting or maintenance of agricultural land, or by equipment used for ancillary mineral production.

Frontage Road: A local street or road along an arterial highway allowing control of access and service to adjacent areas and property. A frontage road may also be referred to as a service road.

Full Median Opening: In a nontraversable median, an opening that allows all turning movements from the highway and the adjacent connection, as well as crossing movements.

Functional Area (Intersection): The area of an intersection necessary to provide all required storage lengths for separate turn lanes and for through traffic plus any maneuvering distance for separate turn lanes. The functional boundary of an intersection includes more than just the physical area of the intersection.

Intersection: Any at grade connection with a roadway, including two roads or a driveway and a road.

Level of Service (LOS): A measure of traffic flow and congestion. As defined in the *Highway Capacity Manual*, it is a qualitative measure describing operational conditions within a traffic stream, generally described in terms of such factors as speed and travel time, freedom to maneuver, traffic interruptions, comfort and convenience, and safety.

Limited Access Roadway: A roadway especially designed for through traffic and over, from, or to which owners or occupants of abutting land or other persons have no right or easement of access by reason of the fact that their property abuts such limited access facility or for any other reason. Interstate highways, parkways, and freeways are usually developed as limited-access facilities.

Local Access Management Plan: A plan or guideline in a formally adopted municipality rule or ordinance that is related to the application of access management within the municipality's jurisdiction.

Local Access Road: A local public street or road that is generally parallel to a highway under the jurisdiction of the Department. Access for businesses or properties located between the highway and the local access road is provided to the local access road rather than the highway. A local access road may also be called a lateral road, or reverse frontage road, depending on individual location and application.

Median: That portion of a divided highway separating the opposing traffic flows. A median may be traversable or nontraversable.

Median, Nontraversable: A physical barrier in a roadway or driveway that separates vehicular traffic traveling in opposite directions. Nontraversable medians include physical barriers (such as a concrete barrier, a raised concrete curb and/or island, and a grass or a swale median) that prohibit movement of traffic across the median.

Median Opening Spacing: The allowable spacing between openings in a non-traversable median to allow for crossing the opposing traffic lanes in order to access property or for crossing the median to travel in the opposite direction (U-turn). The distance is measured from centerline to centerline of the openings along the traveled way.

Median, Traversable: A median that by its design does not physically discourage vehicles from entering or crossing over it. This may include painted medians.

Reverse Frontage Road: See "local access road".

Right of Way: A general term denoting land, property, or interest therein, usually in a strip, acquired for or devoted to transportation purposes.

Service Road: See "frontage road".

Shared Access: A single connection serving two or more adjoining lots or parcels.

Sight Distance: The distance visible to the driver of a passenger vehicle measured along the normal travel path of a roadway from a designated location and to a specified height above the roadway when the view is unobstructed by traffic.

Signal: A traffic control signal.

Stopping Sight Distance (SSD): The distance required by a driver of a vehicle, traveling at a given speed, to bring the vehicle to a stop after an object on the roadway becomes visible. It includes the distance traveled during driver perception-reaction time and the vehicle braking distance.

Storage Lane Length: The portion of an auxiliary lane required to store the number of vehicles expected to accumulate in the lane during an average peak period.

Temporary Access: Time-limited provision of direct access to a roadway. Such access must be closed when permit conditions for access removal are satisfied. Typically, such conditions relate to such time when adjacent properties develop in accordance with a joint access agreement or frontage road plan.

TxDOT: Texas Department of Transportation.

---

[1] TRB Committee on Access Management, *Access Management Manual,* Transportation Research Board, Washington, D.C., 2003.
[2] Gluck, J., H.S. Levinson and V.G. Stover, *NCHRP Report 420: Impacts of Access Management Techniques,* National Cooperative Highway Research Program, Transportation Research Board, Washington, D.C., National Academy Press, 1999.
[3] Texas Department of Transportation (TxDOT), *Roadway Design Manual*, 2002.
[4] Reilly, W., et al., .Capacity and Service Procedures for Multi-lane Rural and Suburban Highways,. *Final Report NCHRP Project 3-33,* JHK & Associates and Midwest Research Institute, May 1989.
[5] S/K Transportation Consultants, Inc., *National Highway Institute Course No. 133078: Access Management, Location and Design,* April 2000.
[6] Urban Land Institute (ULI), *Shopping Center Development Handbook,* Second Edition, Washington, D.C., 1985.
[7] Reilly, W., et al., .Capacity and Service Procedures for Multi-lane Rural and Suburban Highways,. *Final Report NCHRP Project 3-33,* JHK & Associates and Midwest Research Institute, May 1989.
[8] Stover, V. and F. Koepke, *Transportation and Land Development,* Institute for Transportation Engineers (ITE), 1988, 2002.
[9] Eisele, W. and W. Frawley, .A Methodology for Determining Economic Impacts of Raised Medians: Data Analysis on Additional Case Studies,. *Research Report 3904-3,* Texas Transportation Institute, College Station, TX, October 1999.

[10] Iowa State University, *Iowa Access Management Research and Awareness Project: Executive Summary,* 1997.

Chapter 2
Access Management Criteria

Contents:

Section 1
Access Management Classification System

This section describes the Department's access management classification system and provides guidance for assigning access management criteria to state highways. The criteria in the following sections are designed to preserve highway safety and to assure that each highway's importance to statewide mobility will be considered when evaluating requests for access to a roadway under the jurisdiction of TxDOT. The number, spacing, design, and location of access connections, median openings, turn lanes, and traffic signals have a direct and often significant effect on the safety and operation of the highway. The criteria are necessary to enable the highway to continue to function efficiently and safely in the future, while at the same time providing reasonable access to development.

The criteria and procedures for managing highway access differ for new highways on new alignments versus existing highways. Therefore, new highways on new alignments will be addressed separately.

The access management classification systems discussed in the following sections are:

- New highways on new alignments
- Freeway mainlanes
- Frontage roads
- Other state system highways.

The following sections describe application of the access criteria and the purpose, function, and access management requirements for each of these roadway classifications.

Section 2
Application of Access Criteria

Overview

This section discusses the application of access connection criteria on the state highway system. The criteria are intended to provide reasonable access, while ensuring the safe and efficient operations of each roadway type.

Application of the Criteria

The access connection distances in the following sections are intended for application to state highways where municipalities have not been granted location permitting authority (as described in Chapter 3, Section 1). The access connection distances in the following sections are intended for passenger cars on a level grade. These distances may be increased for downgrades, truck traffic, or where otherwise indicated for the specific circumstances of the site and the roadway. In other cases, shorter distances may be appropriate to provide reasonable access, and such decisions should be based on safety and operational factors supported by an engineering study.

The distance between access connections is measured along the edge of the traveled way from the closest edge of pavement of the first access connection to the closest edge of pavement of the second access connection (Refer to Figure 2-1).

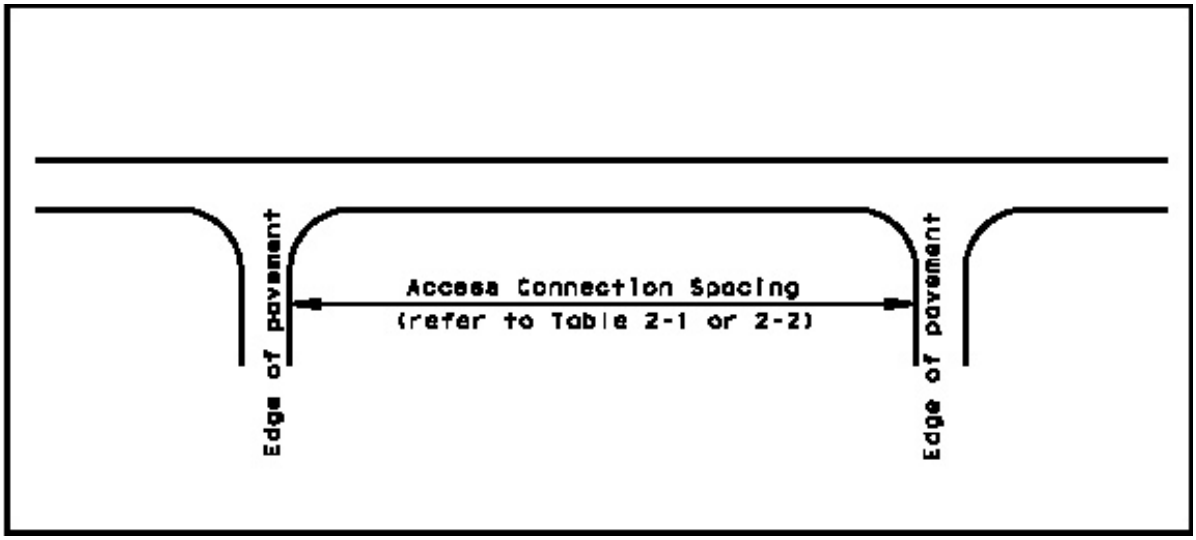


Figure 2-1: Access Connection Spacing Diagram

Conditions for granting access to the state highway system will be stated in the access permit. Violation of the conditions under which the permit was granted, as determined by the Department, may require reevaluation of the access by TxDOT.

Where topography or other existing conditions make it inappropriate or not feasible to conform to the connection spacing intervals, the location of reasonable access will be determined with consideration given to topography, established property ownerships, unique physical limitations, and/or physical design constraints. The selected location should serve as many properties and interests as possible to reduce the need for additional direct access to the highway. In selecting locations for full movement intersections, preference will be given to public roadways that are on local thoroughfare plans.

Sale of TxDOT Controlled Access

In locations where TxDOT controls the access along the state highway, a request to purchase the access must first be submitted to the local District office and then sent to the TxDOT Administration through the Design Division. If the Administration concurs with the purchase request, then the Commission will consider the sale of the access. It is important to understand that access is an interest in real property and cannot be sold without Commission approval.

While the data will vary based on the individual request or location, information required for submission of a request to sell TxDOT controlled access may include:

- District, county, city, highway, location, and right of way points of proposed access breaks
- Dated chronology of correspondence, meetings, or discussion concerning the access request
- Participants in the request process, including city, county, developers, consultants, legal counsel, etc.
- Any local funding contributions (amount or percentages)
- Highway layout showing the proposed access site and the upstream/downstream roadway system and associated access (including roadway/driveway geometrics if applicable to resolution)
- Future development (both of the roadway and adjacent property)
- Present and future traffic volumes, including turning movements, at intersections and access points within the logical termini
- Any engineering studies or traffic modeling that have been completed
- Unified Transportation Program (UTP) status
- Environmental status
- Right of Way (ROW) status
- District discussion/comments on present and future impacts to the state highway system

Refer to Chapter 3, Section 4 for engineering study and/or Traffic Impact Analysis (TIA) discussion.

Access Management Coordination with Municipalities

Access management techniques that are tailored to a particular highway segment may be established in a corridor access management plan (refer to Chapter 3, Section 3). Also, municipalities that have location permit authority, as described in Chapter 3, Section 1, will govern access connection location decisions within their jurisdiction. Municipalities wanting this authority are encouraged to develop access management guidelines or plans for the state highway system within their jurisdiction, or adopt the Department guidelines.

Granting location permit authority to municipalities does not preclude the need for engineering driveway locations. Any impacts to drainage or hydraulics on the state highway system resulting from access connections must be coordinated with TxDOT prior to any local access location approval. Issuance of access permits by a municipality must address driveway geometrics, utility location/relocation, compliance with the Americans with Disabilities Act (ADA) and Texas Accessibility Standards (TAS), environmental requirements, wetland considerations if appropriate, and all other applicable state and federal laws, rules, and regulations.

Approval of Existing Access and Additional Access Requests

As of the effective date of this manual, all previously permitted access will be "grandfathered" as accepted access. However, property owners must coordinate with the Department or the municipality responsible for access permitting prior to making any property modifications that will result in changes to the traffic patterns associated with the access. [See Chapter 2, Deviation Process (TxDOT as Permitting Authority) for additional discussion.] This paragraph will not operate to convey property rights or eliminate the need to purchase access in locations where TxDOT controls the access.

In areas where local access management guidelines or plans are not in place, municipalities should contact TxDOT, prior to the approval of new developments, with respect to the state highway access that will be provided. This will enable the Department to identify any problems with the proposed access and to suggest alternatives. Early state and local coordination will also help reduce unnecessary delays in the access permitting process.

In the absence of any safety or operational problems, additional access connections may be considered if the size and trip generation potential of the proposed development requires additional access in order to maintain good roadway traffic operations. Any additional access must not interfere with the location, planning, and operation of the public street system. Where the property abuts or has primary access to a lesser function road, to an internal street system, or by means of dedicated access easement, any access to the state highway will be considered as an additional access.

Deviation Process (TxDOT as Permitting Authority)

This deviation process applies except within the jurisdiction of municipalities that have access connection location permit authority. A spacing that is shorter than the minimum allowable, as set forth in this document, is considered a deviation from the guidelines. Deviations shall be submitted to the proper TxDOT District office for a decision. If the

deviation is denied by TxDOT, reference can be made to dispute resolution, Chapter 3, Section 2, of this manual.

It should be noted that a lesser connection spacing than set forth in this document may be allowed without deviation in the following situations:

- To keep from land-locking a property where such land-locking is solely the result of action by TxDOT (for example, design and construction modifications which physically prevent a driveway installation due to grade changes, retaining walls, or barrier installations) where TxDOT does not control the access; or
- Replacement or re-establishment of reasonable access to the state highway system under highway reconstruction/rehabilitation projects.

The above references to land-locking do not apply to circumstances where an existing larger tract of land is subsequently (after the effective date of this manual) further subdivided (and the subdivided lots sold to separate owners) and the original tract of land either already has an existing permitted access connection point, or would qualify for such an access connection point based upon the spacing requirements of this manual. Potential land-locking caused by subdivision and resale is the result of such subdivision process and will not alone justify variances or deviations in the spacing requirements contained in this manual. Therefore, as part of the sibdividing process, the party proposing the subdivision (and the municipality approving such subdivisions) should require and provide some type of internal access easements to the existing access connection points (or to such access connection point locations that qualify for future permits based on this manual's spacing requirements).

When a deviation is approved for an access connection spacing that is less than the given connection spacing criteria, the permit will include conditions such as the maximum permitted traffic volume to ingress and egress the property or other conditions with respect to granting the deviation. Violation of the conditions under which the deviation was granted may require reevaluation of the access permit, particularly if safety or crash records indicate deteriorated traffic safety on the abutting state highway.

For municipalities that have access connection location permit authority, refer to the deviation procedures outlined in Chapter 3, Section 1.

Median Openings

Median treatments and other design of median openings play a critical role in the operation and safety of roadways. These design requirements are not addressed in this manual. Median design and minimum median opening spacing requirements can be found in the *TxDOT Roadway Design Manual*, Chapters 2 and 3.

Emergency Access

Direct emergency access (to be used by authorized emergency vehicles only) may be permitted if it is not feasible to provide adequate emergency access to a secondary roadway. A written explanation with references to local criteria from an appropriate government public safety official will be included with the permit application.

Field Drives

Field drives will be permitted where, in the determination of TxDOT, the field has no other reasonable access. Typically, one field drive to a property under the same ownership or controlling interest may be granted; additional field drives may be permitted if the necessity for such additional access (due to topography or ongoing agriculture activities) is demonstrated. Field drives will be kept to the minimum necessary in order to provide reasonable access. A permit for a field drive will state the conditions as to its use by agricultural equipment only. A change in the use of the property may require a reevaluation of the access permit as determined by the Department or municipality that has been granted access connection location permit authority.

Section 3
New Highways on New Alignments

Purpose and Functional Criteria

When a new highway is constructed on a new alignment, and the Commission determines that the new highway will be access controlled, direct access to the new highway will be determined prior to right-of-way acquisition and will be described in the right-of-way deeds. (For application of access connections where TxDOT controls the access, refer to Chapter 2, Section 2, Application of Access Criteria).

Such new highways may initially have at-grade intersections, yet be intended for ultimate upgrade to full freeway criteria. In such cases, temporary access may be permitted where a property would otherwise be landlocked. When temporary access is permitted, the access permit will clearly state that the connection is temporary and will identify the terms and conditions of its temporary use and the conditions of the permanent access connection. The permit will also clearly state that the temporary connection will be closed and removed at such time that permanent access becomes available.

Section 4
Freeway Mainlanes

Purpose and Functional Criteria

Freeways are intended to provide a very high degree of mobility. Accordingly, freeway mainlanes provide no direct access to property and access to the freeway mainlanes is provided only at interchanges and ramps. The spacing of interchanges and ramps needs to allow entering and exiting vehicles to weave safely and to provide adequate acceleration/deceleration.

The design of freeways is governed by the *TxDOT Roadway Design Manual*, Chapter 3.

Section 5
Frontage Roads

Overview

This section describes the function and characteristics of freeway frontage roads, including how access connections will be applied along these frontage roads. Frontage roads are roadways that are constructed generally parallel to a freeway or other highway. Figure 2-2 shows a typical frontage road application.

Freeway frontage roads normally have at-grade interchanges with the arterial streets, which are generally perpendicular to the freeway and are grade-separated from the freeway mainlanes. Under fully developed conditions, the at-grade intersections of frontage roads and arterials are typically signalized.

Ramps provide connections between the frontage roads and the freeway. Traffic traveling from an arterial street to the freeway first turns from the arterial onto the frontage road and then travels along the frontage road to a freeway entrance ramp. Traffic traveling from the freeway to an arterial street leaves the freeway by means of an exit ramp that connects to the frontage road and then travels along the frontage road to its intersection with the arterial street.

Other streets may also intersect with frontage roads. By means of these intersections, access is provided between the freeway system and the developments that have access onto these streets.

Figure 2-2: Freeway with Frontage Roads

Application of the Criteria

Frontage roads may be considered in order to provide direct access to abutting property where 1) alternative access is not available and the property would otherwise be landlocked, 2) it is not feasible for the Department to purchase the access, and 3) the frontage road allows for improved mobility together with the property access.

Direct access to the frontage road is prohibited in the vicinity of ramp connections, as described in the *TxDOT Roadway Design Manual*, Chapter 3. Otherwise, on roadways where TxDOT does not control the access, access connecting to the frontage road is typically permitted subject to the access connection criteria set forth in this manual. For application of access connections where TxDOT controls the access, refer to Chapter 2, Section 2, Application of Access Criteria.

Connection Spacing Criteria for Frontage Roads

Table 2-1 gives the minimum connection spacing criteria for frontage roads. However, a lesser connection spacing than set forth in this document may be allowed without deviation in the following situations:

- To keep from land-locking a property where such land-locking is solely the result of action by TxDOT (for example, design and construction modifications which physically prevent a driveway installation due to grade changes, retaining walls, or barrier installations) where TxDOT does not control the access; or
- Replacement or re-establishment of reasonable access to the state highway system under highway reconstruction/rehabilitation projects.

The above references to land-locking do not apply to circumstances where an existing larger tract of land is subsequently (after the effective date of this manual) further subdivided (and the subdivided lots sold to separate owners) and the original tract of land either already has an existing permitted access connection point, or would qualify for such an access connection point based upon the spacing requirements of this manual. Potential land-locking caused by subdivision and resale is the result of such subdivision process and will not alone justify variances or deviations in the spacing requirements contained in this manual. Therefore, as part of the sibdividing process, the party proposing the subdivision (and the municipality approving such subdivisions) should require and provide some type of internal access easements to the existing access connection points (or to such access connection point locations that qualify for future permits based on this manual's spacing requirements).

It should be noted that for areas with conventional diamond ramp patterns the most critical areas for operations are between the exit ramp and the arterial street and between the arterial street and the entrance ramp. In X-ramp configurations, the most critical areas are between the exit ramp and the subsequent entrance ramp. While Table 2-1 gives minimum connection spacing criteria, the critical areas with respect to the ramp pattern may need greater spacing requirements for operational, safety, and weaving efficiencies.

The distance between access connections is measured along the edge of the traveled way from the closest edge of pavement of the first access connection to the closest edge of pavement of the second access connection (Refer to Figure 2-1). Additionally, the access connection spacing in the proximity of frontage road U-turn lanes will be measured from the inside edge of the U-turn lane to the closest edge of the first access connection (Refer to Figure 2-3)

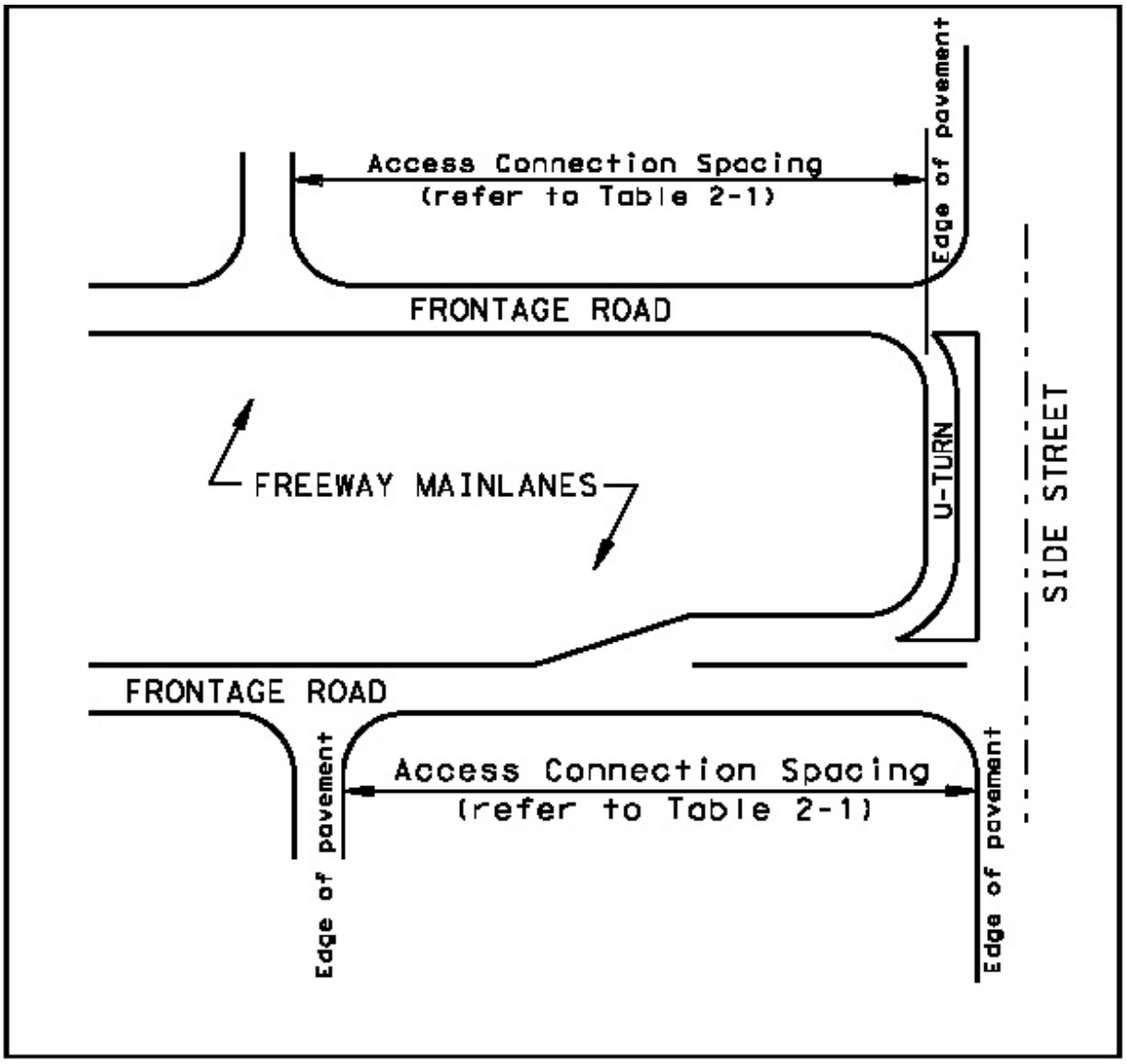


Figure 2-3: Frontage Road U-Turn Spacing Diagram

Table 2- 1: Frontage Road Connection Spacing Criteria

Minimum Connection Spacing Criteria for Frontage Roads[(1)(2)]		
	Minimum Connection Spacing (feet)	
Posted Speed (mph)	**One-Way Frontage Roads**	**Two-Way Frontage Roads**
≤ 30	200	200
35	250	300
40	305	360
45	360	435
≥ 50	425	510

(1) Distances are for passenger cars on level grade. These distances may be adjusted for downgrades and/or significant truck traffic. Where present or projected traffic operations indicate specific needs, consideration may be given to intersection sight distance and operational gap acceptance measurement adjustments.

(2) When these values are not attainable, refer to the deviation process as described in Chapter 3, Section 1 or Chapter 2, Section 2.

Section 6
Other State System Highways

Overview

This section provides a general description of this category and discusses specific spacing requirements. This classification applies to all state highway system routes that are not new highways on new alignments, freeway mainlanes, or frontage roads.

Connection Spacing Criteria

Table 2-2 provides minimum connection spacing criteria for other state system highways. However, a lesser connection spacing than set forth in this document may be allowed without deviation in the following situations:

- To keep from land-locking a property where such land-locking is solely the result of action by TxDOT (for example, design and construction modifications which physically prevent a driveway installation due to grade changes, retaining walls, or barrier installations) where TxDOT does not control the access; or
- Replacement or re-establishment of reasonable access to the state highway system under highway reconstruction/rehabilitation projects.

The above references to land-locking do not apply to circumstances where an existing larger tract of land is subsequently (after the effective date of this manual) further subdivided (and the subdivided lots sold to separate owners) and the original tract of land either already has an existing permitted access connection point, or would qualify for such an access connection point based upon the spacing requirements of this manual. Potential land-locking caused by subdivision and resale is the result of such subdivision process and will not alone justify variances or deviations in the spacing requirements contained in this manual. Therefore, as part of the sibdividing process, the party proposing the subdivision (and the municipality approving such subdivisions) should require and provide some type of internal access easements to the existing access connection points (or to such access connection point locations that qualify for future permits based on this manual's spacing requirements).

Table 2-2 does not apply to rural highways outside of metropolitan planning organization boundaries where there is little, if any, potential for development with current ADT volumes below 2000. For those highways, access location and design will be evaluated based on safety and traffic operation considerations. Such considerations may include traffic volumes, posted speed, turning volumes, presence or absence of shoulders, and roadway geometrics.

Table 2- 2: Other State Highways Connection Spacing Criteria

Other State Highways Minimum Connection Spacing[1][2][3]	
Posted Speed (mph)	**Distance (ft)**
≤ 30	200
35	250
40	305
45	360
≥ 50	425

(1) Distances are for passenger cars on level grade. These distances may be adjusted for downgrades and/or significant truck traffic. Where present or projected traffic operations indicate specific needs, consideration may be given to intersection sight distance and operational gap acceptance measurement adjustments.

(2) When these values are not attainable, refer to the deviation process as described in Chapter 3, Section 1 or Chapter 2, Section 2.

(3) Access spacing values shown in this table do not apply to rural highways outside of metropolitan planning organization boundaries where there is little, if any, potential for development with current ADT levels below 2000. Access connection spacing below the values shown in this table may be approved based on safety and operational considerations as determined by TxDOT.

Corner Clearance

Corner clearance refers to the separation of access connections from roadway intersections. Table 2-2 provides minimum corner clearance criteria.

Where adequate access connection spacing cannot be achieved, the permitting authority may allow for a lesser spacing when shared access is established with an abutting property. Where no other alternatives exist, construction of an access connection may be allowed along the property line farthest from the intersection. To provide reasonable access under these conditions but also provide the safest operation, consideration should be given to designing the driveway connection to allow only the right-in turning movement or only the right-in/right out turning movements if feasible.

Section 7
Auxiliary Lanes

Overview

This section describes the basic use and functional criteria associated with auxiliary lanes. Auxiliary lanes consist of left-turn and right-turn movements, deceleration, acceleration, and their associated transitions and storage requirements. Left-turn movements may pose challenges at driveways and street intersections. They may increase conflicts, delays, and crashes and often complicate traffic signal timing. These problems are especially acute at major highway intersections where heavy left-turn movements take place, but also occur where left-turn movements enter or leave driveways serving adjacent land development. As with left-turn movements, right-turn movements pose problems at both driveways and street intersections. Right-turn movements increase conflicts, delays, and crashes, particularly where a speed differential of 10 mph or more exists between the speed of through traffic and the vehicles that are turning right.

Functional Criteria

Table 2-3 presents thresholds for auxiliary lanes. These thresholds represent examples of where left turn and right turn lanes should be considered. Refer to the *TxDOT Roadway Design Manual,* Chapter 3, for proper acceleration and deceleration lengths.

Table 2-3: Auxiliary Lane Thresholds

Median Type	Left Turn to or from Property		Right Turn to or from Property (5)	
	Acceleration	Deceleration	Acceleration	Deceleration
Non-Traversable (Raised median)	(2)	All	Right turn egress > 200vph (4)	♦ > 45mph where right turn volume is > 50vph(3) ♦ ≤ 45 where right turn volume is > 60vph(3)
Traversable (Undivided Road)	(2)	(1)	Same as above	Same as above

(1) Refer to Table 3-11, *TxDOT Roadway Design Manual,* for alternative left-turn-bay operational considerations.

(2) A left-turn acceleration lane may be required if it would provide a benefit to the safety and operation of the roadway. A left-turn acceleration lane is generally not required where the posted speed is 40 mph or less, or where the acceleration lane would interfere with the left-turn ingress movements to any other access connection.

(3) Additional right-turn considerations:

♦ Conditions for providing an exclusive right-turn lane when the right-turn traffic volume projections are less than indicated in Table 2-3:
- High crash experience
- Heavier than normal peak flow movements on the main roadway
- Large volume of truck traffic
- Highways where sight distance is limited

♦ Conditions for NOT requiring a right-turn lane where right-turn volumes are more than indicated in Table 2-3:
- Dense or built-out corridor where space is limited
- Where queues of stopped vehicles would block the access to the right turn lane
- Where sufficient length of property width is not available for the appropriate design

(4) The acceleration lane should not interfere with any downstream access connection.

♦ The distance from the end of the acceleration lane taper to the next unsignalized downstream access connection should be equal to or greater than the distances found in Table 2-2.

♦ Additionally, if the next access connection is signalized, the distance from the end of the acceleration lane taper to the back of the 90th percentile queue should be greater than or equal to the distances found in Table 2-2.

(5) Continuous right-turn lanes can provide mobility benefits both for through movements and for the turning vehicles.[i] Access connections within a continuous right turn lane should meet the spacing requirements found in Table 2-2. However, when combined with crossing left in movements, a continuous right-turn lane can introduce additional operational conflicts.

[i] Florida Department of Transportation (FDOT), Florida's Driveway Handbook, 2002.

Chapter 3
Administrative Procedures

Contents:

Section 1
Approval Process for Local Guidelines

Overview

Municipalities, upon request, may use their own access management guidelines to determine appropriate access connection locations. Local access management guidelines will then apply to all or part, as stated in the guidelines, of the state highway system within that municipal jurisdiction, except where the Department controls the access. The local access management guidelines or plans should be based on sound engineering practices and accepted access management principles. There are two approaches for municipalities to apply their local access management plans or guidelines to state highways within that municipal jurisdiction.

Application Local Access Management Plans (TxDOT as Permitting Authority)

TxDOT will apply a local access management plan when the municipality provides in writing its local access management plan to the TxDOT district office with an indication of its desire that the plan be applied within its jurisdiction and an implementation date. TxDOT will implement any subsequent changes to the local access management plan when the municipality submits the changes to TxDOT with a proposed implementation date for the changes. The approval of the design and engineering of the access location will be handled by TxDOT. TxDOT will issue the access location permits.

Application Local Access Management Plans (Municipality as Permitting Authority)

A municipality that desires to undertake the access permitting process on highways on the state highway system within their jurisdiction shall submit in writing its proposed permitting procedures and an implementation date to TxDOT. If TxDOT determines that the proposed procedures adequately address the engineering and design of access locations as described in this manual in Chapter 3, Section 1, Engineering Access Locations, TxDOT will transfer to the municipality the access permitting function within the municipality's jurisdiction. The municipality will then issue the access permits.

The municipality shall submit to the Department a copy of each approved access permit on the state highway system within ten working days of its approval and prior to initiation of any access construction on the state highway system. The contractor installing the access connection should have a copy of the permit at the site.

A municipality may also choose to adopt the Department's guidelines as their own and retain access connection location permit authority. Access location permit authority may be transferred to the municipality by letter from the TxDOT District Engineer and then, at the next opportunity, incorporated into the municipal maintenance agreement between TxDOT and the participating authority. For example, if a city actively applies its subdivision regulations within its extraterritorial jurisdiction (ETJ), the municipal maintenance agreement may also extend the municipality's access permitting authority to the ETJ rather than the corporate limits.

Assumption of Permitting Function Optional

Municipalities are not required to take over the access permitting function for state highways within their jurisdictions.

Engineering Access Locations

Granting location permit authority to municipalities does not preclude the need to properly engineer access locations. Any impacts to drainage or hydraulics on highways on the state highway system resulting from access connections must be coordinated with TxDOT prior to any local access approval. Issuance of access permits must address driveway geometrics, utility location/relocation, compliance with the Americans with Disabilities Act (ADA) and Texas Accessibility Standards (TAS), environmental requirements, wetland considerations if appropriate, and all other applicable state and federal laws, rules, and regulations.

Deviation Process (Municipality as Permitting Authority)

Any deviation from the municipality's criteria shall be handled by the appropriate local appeals procedure (which shall be determined by the municipality). While the municipality will approve/disapprove individual deviations to the local access management plans or guidelines, the deviation should be coordinated with TxDOT prior to resolution of the deviation request to evaluate impacts to the state highway system.

Submission of Local Access Management Plans

Once the TxDOT District has transferred to the municipality the access permitting function within the municipal jurisdiction, a copy of the local access management plan and implementation date will be sent to the Design Division for record purposes. Also, when TxDOT will be the permitting authority and apply a local access management plan within a municipal jurisdiction, a copy of that local access management plan and implementation date will be sent to the Design Division.

Subsequent changes or updates to local access management plans and new implementation dates will be sent to the Design Division for record purposes.

The Design Division can be consulted on local access management plan development or implementation at the TxDOT District's request.

Section 2
Dispute Resolution

Dispute Resolution Process (TxDOT as Permitting Authority)

It is preferable that access requests to the state highway system be resolved at the District level. However, a dispute over a request for an access permit to the state highway system may be elevated through the Design Division to the TxDOT Administration for final resolution. Such elevation may be initiated either by the District, or by the permit applicant through the District office.

When an access connection request has been denied by the District, the appeal, if requested, must be submitted to the Design Division. The Design Division will coordinate the information needed for final resolution and make a recommendation for the Administration to consider in determining final resolution.

In the case where a municipality has access permitting authority, the permit requestor cannot appeal a denial of access to the Department as described above.

Data Requirements for Final Administrative Resolution (Design Division)

While the data will vary based on the individual request or location, information required for submission of an access request for final administrative resolution should include:

1. District, county, city, highway, and location
2. Dated chronology of correspondence, meetings, or discussion concerning the access request
3. Participants in the request process, including city, county, developers, consultants, legal counsel, etc.
4. Status of municipal platting/zoning requests and any city council actions or resolutions
5. Highway layout showing the requested access site and the upstream/downstream roadway system and associated access (including roadway/driveway geometrics if applicable to resolution)
6. TIA as indicated in Chapter 3, Section 4.
7. The requestor's proposed access solution
8. The District's proposed access solution
9. District discussion/comments with respect to the access request

The TxDOT Administration will determine final resolution of the access request and the District will issue the access permits based on the Administration's final resolution. Once the Administration has determined a final resolution of the access request, no additional appeal or dispute resolution will be granted.

Section 3
Corridor Access Management Plans

Overview

Any municipality or Metropolitan Planning Organization may, in cooperation with TxDOT, develop an access management plan for a specified state highway segment for the purposes of preserving or enhancing that highway's safe and efficient operation. Once adopted by the affected agencies, such plans will form the basis for all future access connection locations. Priority in developing corridor access management plans should be placed on those facilities with high traffic volumes or those that provide important statewide or regional connectivity and mobility, such as hurricane evacuation routes, relief routes, and NAFTA corridors.

Functional Criteria

The corridor access management plan will provide comprehensive area-wide traffic and mobility solutions, while providing reasonable access to abutting property. Each plan should include a combination of policy, design, and improvement actions aimed at achieving access management objectives. These plans should emphasize the host of access management techniques: shared access, cross access, internal street circulation, properly spaced collector system, proper driveway design, and median design techniques.

The corridor access management plan may include the following elements:

- Existing and future access locations
- All major access-related roadway design elements
- Lots or parcels currently having frontage on the highway segment
- Pedestrian and bicycle amenities and associated safety implication
- Transit facility considerations
- All supporting technical materials, if applicable

TxDOT and any local government within the plan area should be parties to the plan, which will then be adopted by agreement among the agencies. After an access management plan is in effect, all action taken in regard to access will be in conformance with the plan and any modifications to the plan must be approved by the affected local governments and TxDOT.

Section 4
Engineering Analysis

Overview

Engineering studies or analyses can be used to assist in the evaluation of future access connections to the state highway system. In many cases, such as low volume or rural access connections, an engineering study will not be needed. For locations where TxDOT is the permitting authority, the need for an engineering study, and the level of detail, will be determined by TxDOT. In the case of a dispute resolution, the Design Division can request an engineering study and specify the level of study detail.

The purpose of an engineering study is to determine the safety, mobility, and operational impacts that the access connection will have on the highway system. While not applicable to TxDOT, municipalities may require that such studies also determine the compatibility between the proposed land use and the transportation network.

Early Coordination

As early as possible in the development process, applicants are encouraged to meet with the local TxDOT staff, and the municipality if applicable, to discuss specific requirements associated with obtaining access to the state highway system. This meeting, in addition to bringing all affected parties together regarding access connection issues, will also help to define the requirements of any needed engineering study.

Concurrence with Local Guidelines

If the proposed development is within a jurisdictional boundary and the municipality has engineering study or traffic impact analysis guidelines in place, then the applicant is required to adhere to the municipality's guidelines.

Questions to Consider

When determining the need for and level of detail of an engineering study, the following questions should be considered:

- Do the proposed driveway(s) meet the minimum spacing requirements per Tables 2-1 and 2-2 (or local requirements, as applicable)?
- Will the proposed driveway(s) require a deceleration or acceleration lane? If so, refer to the *TxDOT Roadway Design Manual* for lengths and other design criteria.
- Are there any sight distance or physical obstructions that will result in a safety problem?
- Are there any environmental or hydraulic issues associated with the proposed driveway(s)?

The responses to the above list of questions will assist in determining the level of detail required in an engineering study.

If necessary, specifics regarding needed level of study, time of day analysis, phasing of development, and project area can be defined and agreed upon at the initial coordination meeting. Additional information and analysis may be required if the access connection cannot meet the minimum spacing requirements, or there is an operational or safety impact.

Engineering Study versus Traffic Impact Analysis (TIA)

A Traffic Impact Analysis (TIA), the requirements of which are described below, may be required when the sale of TxDOT controlled access is requested. The following section outlines the purpose and requirements of an engineering study and a TIA.

In nearly all other cases where the access requirements set forth herein are satisfied, a TIA will *not* be required. Typically, the impacts of an access point along a state facility can be ascertained by means of an engineering study that indicates the forecasted turning movements at the proposed access connections. The forecasted turning movements, used in conjunction with the *TxDOT Roadway Design Manual,* will determine the need for and the required length of left-turn and/or right-turn deceleration lanes.

Requirements for Engineering Studies and TIAs

The intent of this section of the *Access Management Manual* is to identify the possible criteria for engineering studies and TIAs. It is by no means meant to minimize the need for the applicant to meet with the local TxDOT District staff to determine the study's requirements. It is the intent of TxDOT to require only those elements of an engineering study or TIA that are necessary to answer the specific questions that arise during the permitting process for specific access points. It is not the intent of TxDOT to require an exhaustive TIA for every application for a driveway permit on a state roadway. The early coordination meeting, as discussed above, will be the mechanism to identify whether or not an engineering study or TIA is necessary and, if so, the level of detail that will be required.

Engineering Study. Should an engineering study be required, it may include the following elements: trip generation, trip distribution, and traffic assignment at the proposed access points. Additionally, the engineering study may require that existing traffic volume data be collected.

The trip generation will be conducted using the latest edition of the Institute of Transportation Engineers *Trip Generation* manual unless there is acceptable data that supports the use of another trip generation source. Trip distribution will be performed with input from the local TxDOT District staff (and the municipality, if applicable). The traffic assignment will be conducted to determine the forecasted turning movements attributable to the proposed development. The existing traffic counts will be grown using an annual growth rate as agreed to by the local TxDOT District staff (and the municipalityy, if applicable) to the build-out year of the proposed development. As an example, if the proposed development will take two years to construct and occupy, the existing traffic volumes will be grown by the agreed upon growth factor for two years. The resulting traffic volumes will be used as background traffic volumes, and the assigned forecasted turning movements will be added to the background traffic volumes resulting in the total traffic volumes.

The total traffic volumes will be used to determine the need for left-turn and right-turn lanes. If such lanes are needed, refer to the *TxDOT Roadway Design Manual* to determine their lengths and other design criteria.

TIA. In the rare instances where a TIA is required by TxDOT, it may include the above mentioned elements as well as the same type of data for intersections adjacent to the proposed site (specific study limits to be defined by TxDOT). Additionally, the TIA may require operational analyses (including LOS and capacity analyses) for the study intersections as determined during the initial meeting between the applicant and the local TxDOT District staff. Furthermore, the applicant's TIA should include recommendations for mitigation measures should the impact of the proposed access point(s) on the state highway system result in unacceptable levels of service.

Examples of Levels of Engineering Studies

This section presents examples of scenarios under which an engineering study or TIA would likely be required by TxDOT and the level of detail that would be needed to address the issues associated with the requested access connection. These scenarios are for illustration purposes only and should not be used as thresholds for study level requirements.

The first scenario involves a request that meets the driveway spacing criteria, but is a major development that consists of more than 200,000 square feet of retail development along with associated pad-type developments. Even though the driveway spacing criteria (as defined herein) have been met, it is important for TxDOT to understand the impacts that this large development will have on the adjacent roadway network and the intersections adjacent to the site. The parameters of the engineering study or TIA would be defined by TxDOT based upon the characteristics of the existing traffic, the major intersections relative to the site access, and other operational or safety concerns. Additionally, the engineering study or TIA would likely examine multiple phases of development, assuming that the entire site will not be developed at one time. The phased study or TIA would enable TxDOT to determine the necessary mitigation measures for each phase of development and the specific improvements that should be in place to accommodate the development's traffic. As stated previously, the intent of a TxDOT required engineering study or TIA is not to determine the compatibility of the land use with the surrounding area, but rather to determine the impact of the development and its associated traffic volumes on the state roadway.

The second scenario involves the application for a driveway for a small development such as a single residential unit, single retail unit, or similar land use. The driveway spacing requirements set forth herein are satisfied by the applicant. The existing traffic volumes along the state roadway are relatively low. Neither an engineering study nor TIA would be required in this scenario.

A third scenario would be the application for a driveway for a moderate-sized development that meets the spacing criteria outlined herein, but that raises questions about the proper length of a right-turn deceleration lane as well as the need for a left-turn lane. The TxDOT staff may require an engineering study to examine the issues at hand. The applicant would need to provide forecasted turning movement volumes at the subject driveway location as well as background traffic volumes that will also pass through the intersection. These forecasted volumes, along with the state roadway's design speed, can then be used in conjunction with the *TxDOT Roadway Design Manual* to determine if a right-turn deceleration lane and/or left-turn lane is needed. If it is determined that a left-turn lane is necessary, an operational analysis can be performed by the applicant to determine the appropriate length of the left-turn lane.

The fourth scenario involves an application for a driveway that does not meet the spacing requirements set forth herein. If necessary, TxDOT may request an engineering study or TIA to determine the operational impacts of the proposed driveway on the existing state roadway and adjacent driveways or intersections. The level of detail of this study or TIA will be dependent upon the intensity of the traffic expected to be generated by the planned development. The study may include trip generation, distribution and assignment, but may also include operational analyses at the proposed driveway and the adjacent intersections

and driveways. Further analyses may be necessary to determine the operational and safety impacts of the sub-standard spacing on the overall roadway system.