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16. Abstract This document presents guidelines for regulating the location, design, construction, and operation of driveways on city streets and urban highways in Texas. Also presented are recommended policies and procedures for developing, administering, and enforcing effective driveway regulations within the framework of local government. The recommended guidelines, policies, and procedures are based on research conducted in several Texas cities under the sponsorship of the Traffic Safety Section, Texas State Department of Highways and Public Transportation. They reflect the variety of access needs, traffic and land use characteristics, and political structures existing in cities and towns in Texas, and they are applicable to both new and existing driveways on all city streets and urban highways in the State.					
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GUIDELINES FOR DRIVEWAY DESIGN AND OPERATION
Vol. 3 - Guidelines for Urban Driveway Regulation

by

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Prepared for
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Traffic Safety Section

PREFACE

This report is one of a series of three reports submitted as part of a research study entitled "Guidelines for Driveway Design and Operation." The study was conducted for the Traffic Safety Section of the Texas State Department of Highways and Public Transportation (Contract 79-04-11-A-4-AA, Job Order No. 1), and the research results are documented in three volumes as presented below:

Volume 1 - Annotated Bibliography

Volume 2 - Technical Report

Volume 3 - Guidelines for Urban Driveway Regulation

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INTRODUCTION

PURPOSE

The purpose of this report is to encourage better location, design, construction, operation, and maintenance of urban driveways and thus, improve traffic flow and reduce the number of traffic accidents in urban areas. It presents:

1. guidelines for regulating the location, design, construction, and operation of driveways on city streets and urban highways, and
2. recommended policies and procedures for developing, administering, and enforcing effective driveway regulations within the framework of local government.

BACKGROUND

Much of the information presented in this document is based on research conducted in several Texas cities under the sponsorship of the Traffic Safety Section of the Texas State Department of Highways and Public Transportation. The variety of access needs, traffic and land use characteristics, and political structures existing in cities and counties in Texas are recognized. Some of the information presented herein is based on prior research and/or recommended practice as determined in an extensive literature review. A bibliography of pertinent literature is included at the end of the report.

SCOPE

The recommended guidelines, policies, and procedures are applicable to all urban areas in Texas, regardless of size, geographic location, or local government structure. They can be used to regulate both new and existing driveways on all city streets and urban highways. The information, however, is most appropriate for regulating driveways on urban roadways with curbs and gutters.

NEED

Each year in Texas there are more than 65,000 driveway-related traffic accidents reported occurring on city streets and urban highways. One out of six accidents in the State occurs at a driveway. These driveway-related accidents result in approximately 12,000 injuries and 100 deaths each year. Through effective and uniform driveway regulation, the negative impact that driveways have on traffic safety can be minimized.

More difficult to quantify, but also a critical concern, is the impact that driveways have on traffic flow in urban areas. The movement of vehicles at driveways reduces roadway capacity and operating speeds while increasing travel time, fuel consumption, and pollution.

USES AND LIMITATIONS

The guidelines, policies, and procedures recommended in this document are intended to:

1. provide guidance to public officials in developing and upgrading local driveway regulations and access control policies and procedures, and
2. aid engineers, architects, planners, inspectors, developers, and builders in interpreting and implementing regulations, policies, and procedures once they are adopted.

The recommended regulations, policies, and procedures presented herein are somewhat general in nature allowing flexibility to accommodate the variety of situations encountered in urban driveway control. Every effort has been made, however, to minimize the misuse of this flexibility. Desired values and practices are specifically stated where appropriate. Whenever variance from these desired values or practices is permitted, the warranting conditions and limitations of these variances are specifically noted.

Adoption of the regulations, policies, and procedures recommended in this document will not guarantee that urban driveways are designed, constructed, operated, and maintained in a safe and efficient manner. This assurance depends on the proper application of these regulations, policies, and procedures by concerned and trained individuals using good judgment.

It should be emphasized that this document does not constitute an official standard, specification, or regulation. Existing State and city regulations, policies, and procedures are not replaced or amended by this document.

DRIVEWAY CLASSIFICATION

TYPE OF STREET OR HIGHWAY

Driveways influence traffic safety and operation on a street or highway and the extent of this influence is determined by the amount and character (i.e., speed, vehicle type, etc.) of traffic on the street or highway. In order to be practical and effective, driveway regulations should recognize the variety of street and highway types in the urban environment and that both the character and amount of traffic on a street or highway are related to street function.

Classifying streets and urban highways by function into the following four types is a practical approach when developing driveway regulations:

1. Freeways and Expressways are those streets which are characterized by full control of access. Driveways and other unsignalized access points are prohibited by design and therefore driveway regulation is not a concern on these facilities.
2. Arterial streets are those streets without full access control which carry traffic entering, leaving, or passing through an urban area or intra-area traffic (e.g., traffic between the central business district and outlying residential areas, between major inner city communities, or between major suburban centers). A distinction may be made between "primary" and "secondary" arterial streets. Primary arterial streets serve very high traffic volumes and are critical transportation links within an urban area. Strict driveway control is most important on primary arterials.
3. Collector streets are those streets which carry traffic from arterials to an ultimate destination which may be on a local or collector street. They also "collect" traffic from local streets and carry this traffic to arterials.
4. Local streets are those streets which provide direct access to residential, commercial, and industrial properties. They should be designed to discourage through traffic flow.

A city or county should develop and adopt a master plan of existing and proposed streets and highways in its jurisdictional area and designate the functional classification of each facility. A policy on the level of access control for each functional class should be adopted. Driveway design and operating standards should be developed for each functional class.

TYPE OF LAND USE

The type of land use served by a driveway influences the type and amount of traffic which will use the driveway. Thus, in order to achieve safe and

efficient operation at a driveway, the design of the driveway must be compatible with the land use it serves.

Urban driveway regulations should recognize the influence of land use on driveway design requirements by classifying driveways by land use type. Classification of driveways by the type of land use served will help insure that driveway regulations do not become too general, thus allowing sub-standard design at some driveways. Three land use classifications are useful when developing urban driveway regulations:

1. A residential driveway is one serving a single family residence, duplex, or an apartment building containing no more than five single-family units. Residential driveways service very low volumes of traffic (2-50 movements per day), and the probability of two vehicles simultaneously entering and leaving the driveway is low. They usually service only passenger cars, panel and pickup trucks, and vans. Internal circulation and storage in the parking lot are usually not critical because of the low traffic volumes.
2. A commercial driveway is one serving an office, retail, institutional, or administrative building, or a large apartment (more than five single-family units). Commercial driveways generally are used by passenger cars, pickups, and vans, but are occasionally used by larger trucks (i.e., delivery trucks, garbage trucks, etc.). The amount of traffic using commercial driveways will vary depending upon the type and size of the commercial development. The amount of anticipated traffic, however, is critical in the design and operation of commercial driveways.
3. An industrial driveway is one at an industrial plant, warehouse, truck terminal, or loading dock which services a considerable amount of large truck traffic. The larger size and turning radius of trucks must be recognized in the design of industrial driveways.

GUIDELINES

NUMBER OF DRIVEWAYS

As more and more driveways are constructed along a street, the accident rate increases and roadway capacity decreases. Therefore, every development (or land parcel) should have only the minimum number of driveways needed to efficiently handle the traffic volumes generated by the development.

A development (or land parcel) should have only one two-way driveway or one-way driveway pair. A corner property may have a two-way driveway or one-way driveway pair on both streets, if it has enough frontage on both streets to provide adequate driveway spacings and corner clearance.

If adjacent land parcels have frontage lengths so narrow that minimum driveway spacing requirements would be violated by allowing each parcel a separate driveway, then a common driveway serving both parcels should be encouraged.

A development may have more than one two-way driveway or one-way driveway pair on a street only under one of the following conditions:

1. The total volume of traffic generated by the development will exceed 5,000 vehicles per day.
2. The traffic volume generated by the development will exceed the capacity of a stop sign controlled intersection during the peak hour.
3. A competent traffic engineering analysis indicates that traffic conditions at the site warrant more driveways (e.g., to facilitate on-site traffic circulation) and that providing additional driveways will not adversely affect traffic safety or operation on the street.

If multiple driveways are justified under one of the above conditions, minimum driveway spacings and corner clearance must be provided. These minimum spacings and clearances are presented in a later section of this document. Also, at some major traffic generators (e.g., a regional shopping mall), it may be desirable to signalize one well-designed driveway to obtain the needed capacity, rather than constructing additional unsignalized driveways.

DRIVEWAY DESIGN

Driveway design features (e.g., width, turning radius, throat length, approach angle, profile, etc.) should be regulated to promote safe and efficient operation. The following sections present driveway design recommendations.

Width and Curb Return Radius

Driveway width and curb return radius interact to affect vehicle speed and path. The selection of an appropriate width must be coordinated with curb return radii selection to achieve desirable driveway operation and safety.

The following tables present width and curb return radius requirements for two-way driveways and one-way driveways. The desirable values shown in the tables should be used whenever possible. If variation from these values is required because of site conditions, the width and radii selected should be as close as possible to the desirable values. Using both a small width and curb return radius should be avoided. Generally, if the width must be greatly reduced, then curb return radius should be increased, and vice versa.

Two-Way Driveways

Driveway Type	Width, Feet			Curb Return Radius, Feet		
	Desirable	Maximum	Minimum	Desirable	Maximum	Minimum
Residential	20	25	12	5	15	2½
Commercial	30	35	25	20	30	10
Industrial	35	40	30	30	--	15

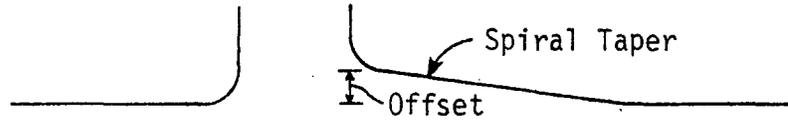
One-Way Driveways

Driveway Type	Width, Feet				Curb Return Radius, Feet		
	Desirable		Maximum	Minimum	Desirable	Maximum	Minimum
	Entry Drive	Exit Drive					
Residential	15	15	20	12	5	15	2½
Commercial	18	16	20	15	20	30	10
Industrial	20	20	25	15	30	--	15

Some additional considerations regarding driveway width and curb return radii are presented below:

1. The width of the street right-of-way should not be a limiting factor in selecting the appropriate curb return radii. Curb returns should extend onto private property if necessary.

2. At high-volume commercial and industrial driveways, off-set taper approach treatments, as shown below, may improve entering vehicle paths. However, they do not significantly affect entry speeds.



A typical design might include a 100-foot spiral taper resulting in a 9 to 10-foot offset.

3. If more than 100 vph turn left from a driveway during the peak hour, two exit lanes should be provided. Driveway width should be increased appropriately.
4. If a commercial development is serviced by moderate truck traffic (i.e., delivery trucks), it may be desirable to provide one well-designed "industrial" driveway for these vehicles and prohibit their use of the other "commercial" driveways.
5. At high-volume industrial driveways, the use of compound curves in the curb returns is recommended.

Throat Length

For commercial and industrial driveways, throat length refers to the distance from the street to where driveway traffic comes into conflict with traffic in the parking or on-site circulation area. For residential driveways, throat length is the distance from the street to the end of the driveway (e.g., the garage, carport, etc.).

The throat length of residential driveways is not particularly critical, but it should be long enough to accommodate a passenger car completely clear of the street and sidewalk if one exists.

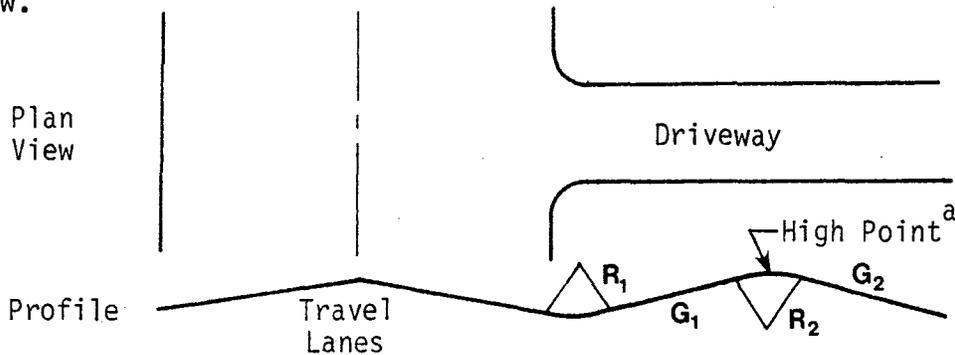
The throat length of commercial and industrial driveways is a critical driveway design feature. Sufficient length must be provided to store exiting vehicles clear of the parking and on-site circulation area. This length will depend upon anticipated exit queue lengths during the peak hour. Exit queue length is a function of driveway and street traffic volumes, as well as vehicle type. At major driveways, a queueing analysis should be conducted since at some driveways (e.g., regional shopping malls), up to 200 feet of storage may need to be provided.

Even if exiting vehicle storage requirements are minimal, throat length should be as great as practical in order to: 1) remove the parking/circulation area conflict point away from the driveway entrance and 2) encourage proper use of the driveway, in the case of two-way driveways, by exiting traffic. A minimum throat length of 25 feet is suggested although greater lengths are desirable.

Profile

Driveway profile is a critical element of driveway design. It influences the speed and path of driveway users and therefore affects driveway operation and safety. It also affects street and driveway drainage.

It is difficult to recommend a single set of standards for driveway profile, since site conditions (e.g., terrain, street cross-section, etc.) vary greatly from one driveway to the next. In fact, there are currently no standards available which have received widespread acceptance. Some general profile guidelines for typical driveways on a curbed street are presented below.



Street Type	Typical R_1 , Feet	G_1 , Inches/Foot		Typical R_2 , Feet	Typical G_2 , Inches/Foot
		Maximum	Typical		
Arterial	>50	3/4	1/4	>75	1-3/4
Collector	50	1-1/4	3/4	75	1-3/4
Local	50	3-1/4	1-1/4	75	1-3/4

^aThe high point should be 1 or 2 inches higher than the top of the street curb at the upstream end of the driveway.

The above guidelines are applicable to residential and commercial driveways only. Truck dimensions and operating characteristics must be considered when designing industrial driveways. However, there are currently no guidelines available for industrial driveway profiles.

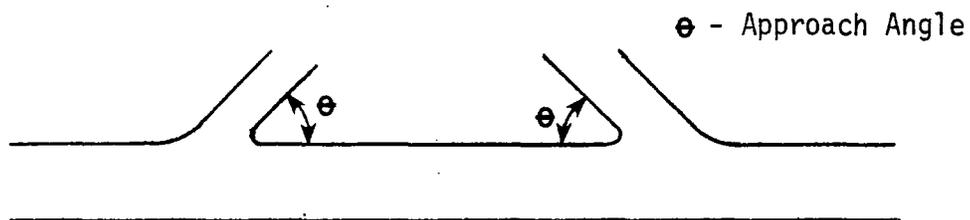
Approach Angle

The angle at which a driveway intersects the street affects motorist visibility and the speed and path of motorists using the driveway. Approach angles also interact with other design features (e.g., width, curb return radius, throat length, channelization, etc.) to encourage or discourage

particular types of driveway operation and maneuvers. An angled driveway, however, does not automatically imply to motorists that a certain type of driveway operation (i.e., one-way operation) exists or that certain turning movements are prohibited.

All two-way driveways and one-way driveways with unrestricted turning movements should intersect the street at a 90° angle. If site conditions (e.g., terrain, lot size and shape, etc.) will not permit a 90° approach angle, the angle may be reduced, but not below these values:

1. 70° for commercial and industrial driveways.
2. 60° for residential driveways.



If an approach angle of less than 90° must be used at one of these driveways, the driveway curb return radius and/or width should be increased to facilitate maneuvers made difficult as a result of the undesirable approach angle.

At one-way driveways where only right turns are permitted (e.g., one-way driveway pair on a divided street), it may be desirable to flatten the approach angle below 90° to increase entry or exit speeds. Under these conditions, an angle of approximately 60° is recommended, with the following exceptions:

1. At driveways where sidewalk pedestrian traffic is heavy, the approach angle should not be reduced below 70° . Lesser angles encourage high vehicle speeds and a pedestrian safety problem may result.
2. If an acceleration or right turn lane is provided at an exit driveway, the angle may be reduced down to 45° .
3. At industrial driveways which service large trucks, the angle may be reduced to as low as 30° to facilitate driveway operation. Angles less than 30° result in severe visibility limitations and are discouraged.

Acceleration/Deceleration Lanes

To enhance traffic operation and safety on arterial streets, acceleration and/or deceleration (turn) lanes may be provided at high volume driveways. Turn lanes should be designed to the same standards as turning lanes at arterial street intersections (see AASHTO's A Policy on Design of Urban Highways and Arterial Streets).

There are no specific warranting criteria for the use of an acceleration lane at a driveway. However, an acceleration lane may enhance safety and increase driveway capacity whenever arterial street speeds are high (e.g., 40 mph or greater) and/or right turn exit volumes from the driveway are heavy. An acceleration lane also can enhance the safety and operation of a flat angled exit driveway, since angled driveways encourage high speed exit maneuvers and restrict driveway users' view of approaching street traffic.

A deceleration lane should be installed at a driveway on an arterial street if 1) the average daily two-way volume at the driveway is at least 1000 vehicles, and 2) the average peak hour entering right turn volume is at least 40 vehicles. If two or more successive driveways meet this warrant or if adjacent driveways are spaced so close that a deceleration lane at the downstream driveway would encroach into the upstream driveway, a continuous right turn lane should be used. Continuous right turn lanes should also be provided when more than 20 percent of the traffic traveling in one direction on an arterial turns right into driveways along the arterial.

When a deceleration lane is installed at a driveway, no other driveways should intersect the street within the deceleration lane or approach taper to the lane.

DRIVEWAY LOCATION

To enhance traffic safety and operation on urban streets and highways, driveways should be located a sufficient distance from other driveways and intersecting streets. They should also be positioned so that driveway users have adequate sight distance to oncoming traffic.

Spacing Between Driveways

Driveways should be spaced far enough apart so that conflicting movements at adjacent driveways do not overlap, thus increasing the accident potential and/or reducing roadway capacity. Desirable minimum driveway spacings are presented at the end of this section.

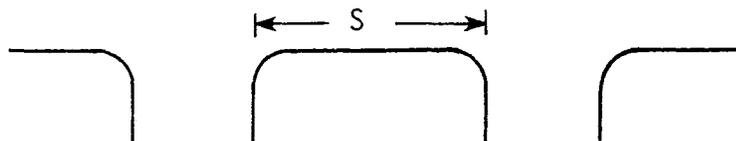
If individual property frontage lengths along a street are several hundred feet, providing adequate driveway spacing is generally not a problem. In these cases, adjacent driveways should be spaced as far apart as access and on-site circulation needs will permit. If the land along a street is subdivided into small lots, however, providing adequate driveway spacing becomes a critical problem and is very difficult to attain. The critical requirement of driveway spacing must be considered during land subdivision.

Driveway spacing is particularly critical on arterial streets. If the minimum spacings cannot be attained on arterial streets, then joint access driveways should be encouraged.

It should also be noted that special conditions at a driveway (e.g., installation of acceleration/deceleration lanes, driveway signalization, etc.) will increase the spacing requirements. These should be evaluated on an individual basis.

Street Type	Speed Range, MPH	Minimum Spacing Between Driveways, Feet ^{a,b}
Arterial	35-40	200
Collector	30-35	150
Local	25-30	50 ^c

^aThese spacings are measured from driveway throat to driveway throat as shown by "S".



^bThese minimum spacings can be halved if the adjacent driveways are one-way driveways.

^cResidential driveway spacings on local streets are not critical and are exempted.

Corner Clearance

The spacing between a driveway and an adjacent street intersection (corner clearance) should be regulated to enhance traffic safety and operations in the intersection area. Corner clearance control is sometimes difficult, however, due to the existence of corner properties with insufficient frontage lengths to enable good driveway location. Corner clearance requirements should therefore be considered when subdividing land.

Corner clearance requirements for commercial and industrial properties on collector and local streets are presented in the table below. Corner clearance at residential driveways on collector and local streets is generally not critical. The desirable minimum corner clearances shown in the table below are those needed to assure that conflicting driveway and intersection movements do not overlap.

Street Type	Minimum Corner Clearance, Feet ^a	
	Desirable Minimum	Absolute Minimum
Collector	100	50
Local	100	50

^aCorner clearance is measured from the intersection curb to the near driveway curb.

Corner clearance requirements for commercial and industrial driveways on arterial streets are presented in the table below. The desirable minimum corner clearances are those needed to assure that conflicting driveway and intersection movements do not overlap.

Intersection Type	Minimum Corner Clearance, Feet ^a	
	Desirable Minimum	Absolute Minimum
Arterial-Arterial	300	250
Arterial-Collector	200	125
Arterial-Local	100	50

^aCorner clearance is measured from the intersection curb to the near driveway curb.

If the desirable minimum corner clearances cannot be provided, then one of the following measures should be taken:

1. Left turns should be prohibited at the driveway.
2. Access to the corner property should be limited to the collector or local street approach.
3. Common access with a neighboring property should be sought.

Property Line Clearance

No part of a driveway, including the curb return, should extend over a property line or the perpendicular extension of a property line through the

street right-of-way. This requirement does not pertain to joint driveways which are constructed on a property line at the property owners' consent to service both properties.

The following minimum property line clearances should be maintained for commercial and industrial driveways:

Street Type	Minimum Property Line Clearance, Feet ^a
Arterial	100
Collector	75
Local	50

^aThese clearances are measured from the driveway throat to the property line or perpendicular extension of the property line through the street right-of-way.

The above property line clearance requirements are intended to promote adequate driveway spacings. It is recognized that in urban areas these property line clearance requirements may be too restrictive for some sites. When variation from these minimum clearances is proposed, however, an engineering evaluation must be conducted to determine if the reduced clearance will have an adverse impact on traffic safety or operations on the street. In addition, it will be necessary to coordinate driveway placement with the neighboring development.

Sight Distance

A driveway should be located, to the extent possible, at the point of maximum sight distance along a property frontage. Placement of a driveway in a horizontal curve along a street or just below the high point of a crest vertical curve on a street should be avoided.

Safe stopping sight distance must be provided at every driveway for all traffic movements which are permitted at the driveway. Minimum safe stopping sight distances for a range of street operating speeds (posted speed limits) are shown in the table below. The distances in the table are absolute minimum values; sight distances much greater than these distances should normally be used. A more detailed discussion of sight distance requirements at driveways is presented in the Appendix.

Operating Speed, MPH	Absolute Minimum Sight Distance Feet
20	100
25	150
30	200
35	250
40	275
45	325
50	350

Any movement for which sight distance is inadequate (e.g., left turn exit or left turn entry) should be prohibited using signs, pavement markings, and restrictive design features as needed. If safe sight distance is not available at any point along the frontage of a property, common access with a neighboring property or access to another street (in the case of corner properties) should be obtained.

Direct access to a property should be denied when minimum safe sight distance cannot be attained for the necessary ingress and egress movements. When direct access is denied, indirect access may be allowed, at the property owner's expense, in one of the following ways:

1. Paying compensation to adjacent property owners to acquire access to the subject parcel through easements.
2. Constructing a frontage road serving the subject property and connecting with a highway where safe access can be provided.

It is strongly suggested that access sight distance elements be made a part of local zoning standards. Zoning controls can be used to restrict certain types of developments on parcels where it would be impossible to provide proper sight distances for the types of vehicles generated by such developments.

Every city and county should develop and adopt an effective policy for regulating the placement of advertising signs, trees or shrubbery, etc., within a street or highway right-of-way or so near the right-of-way that sight distance is critically obstructed. Curb parking should also be prohibited where it obstructs the view of drivers entering or leaving a driveway or conceals a driveway from street traffic. On-site parking should be designed so that parked cars on a property do not obstruct the sight distance at a driveway or conceal a driveway to street traffic.

TRAFFIC CONTROL

Driveway traffic control devices (i.e., signs, pavement markings, channelization islands, and traffic signals) should be used in accordance with the Manual on Uniform Traffic Control Devices for Streets and Highways. Some additional guidelines on the use of traffic control devices at driveways are presented in the following sections.

Signing

Signing may be required at some driveways to identify the driveway, designate the type of operation (at one-way driveways), or inform motorists of special turn prohibitions. To be effective, driveway signing must be seen by motorists in time for them to respond appropriately and the intent of the signing must be clearly understood. Standard signs recommended in the Texas MUTCD should be used whenever appropriate. If special signing is needed, the signing should be consistent (in terms of color, shape, size, letter height, placement, mounting height, etc.) with guidelines established in the Texas MUTCD.

Driveway signing is usually not totally effective in discouraging illegal or undesirable maneuvers at driveways. This fact should be recognized and a "forgiving" driveway and parking area design should be used whenever possible. Driveway signing is most effective when the intent of the signing is supported by the design and layout of the driveways and the parking area. Situations where signing is relied upon to encourage motorists to make a difficult, illogical, or unsafe maneuver should be avoided.

Signs used to designate one-way operation at a driveway should be visible to both street and parking lot traffic. They should be visible to motorists before they have reached a "point of no return".

Left turn prohibition signing is particularly susceptible to violation. Every effort should be made to support left turn prohibition signing through appropriate design (e.g., small curb return radius, angled driveway, raised median in the street, driveway channelization, etc.).

Pavement Markings

The use of pavement markings may enhance the operational efficiency and/or safety of some commercial and industrial driveways. To be effective, pavement markings must be clearly visible to driveway users and positioned so that drivers have enough time to respond properly to them. Drivers must also understand the intended meaning of the markings. Driveway pavement markings should meet the requirements for pavement markings established in the Texas MUTCD.

At high-volume two-way driveways where conflicts between entering and exiting vehicles are frequent, a single solid yellow centerline can be placed in the driveway throat to separate opposing traffic. The centerline will

encourage exiting traffic to remain on the exit side of the two-way driveway. The centerline can be placed in the middle of the driveway or offset to provide additional space for entry or exit traffic.

A centerline should also be used at undivided two-way driveways where two exiting lanes are provided. The exiting lanes should be separated with a solid or dashed white lane line. At driveways where two exit lanes are provided, motorists should be informed of the intended operation by signing and/or pavement markings (e.g., arrow markings).

At one-way exit driveways where illegal entry maneuvers are frequent, white stop bars placed across the full width of the driveway may be used to discourage the illegal maneuvers. The stop bar must be visible to street traffic to be effective.

It should be noted that most driveway pavement markings are difficult to see from the street and, therefore, it may be more appropriate to use signs to present information to entry traffic at driveways.

Channelizing Islands and Driveway Dividers

At high-volume commercial or industrial driveways it may be desirable to control or confine particular driveway maneuvers by installing channelizing islands and/or a median divider (at two-way driveways). Channelizing islands and median dividers at driveways should be designed to the same standards recommended for islands and dividers installed at street intersections. (See A Policy on Design of Urban Highways and Arterial Streets published by AASHTO.)

Island and median shapes and sizes can vary considerably depending on site requirements; however, all islands should have an area of at least 50 feet, and preferably 75 feet. Triangular islands should be at least about 8 feet, and preferably more than 12 feet, on the side. Median dividers should be at least 4 feet wide and 12 to 20 feet long, as a minimum.

All driveway channelizing islands should be highly visible both day and night. The curbing of raised islands and median dividers should be painted with beaded paint.

Raised channelization at some driveways can create a significant safety hazard; particularly to motocyclists. Therefore, if the needed traffic control can be achieved with a lesser degree of channelization (e.g., raised pavement markers or painted islands), then the less obtrusive channelization technique should be used.

Raised channelization can also adversely affect surface drainage of the street and driveway throat. All islands and median dividers must be designed so that surface drainage is not impeded.

Raised channelization can be effective in discouraging certain driveway movements. However, channelization alone does not necessarily imply to motorists a legal restriction or prohibition.

Regulatory signing and/or pavement markings must be used along with channelizing devices to effectively and legally prohibit particular driveway movements.

Signalization

At high-volume commercial and industrial driveways, traffic operations and/or safety may be enhanced by installing a traffic signal. Signalization of a driveway should only be considered if traffic volumes or past accident experience "warrant" a signal at the driveway. Traffic signal warrants appropriate for driveways are presented in the Texas MUTCD. The Texas MUTCD also presents guidelines for the placement, design, operation, and maintenance of all traffic signal installations.

Even if conditions at a driveway "warrant" a traffic signal, the final decision to install one should be based on a traffic engineering study of the particular driveway site. This study should consider the effects that a driveway signal installation will have on traffic operations at nearby signalized street intersections.

To achieve optimum traffic flow conditions along a street or highway, it is desirable to have a spacing of 600 to 700 feet between a signalized "T" driveway and an adjacent signalized street intersection. Four-legged signalized driveway intersections should be spaced 1500 to 2000 feet from an adjacent signalized street intersection to achieve optimum traffic flow along the street.

At all signalized driveways, it is strongly recommended that a separate turn lane be provided on the street for traffic turning left into the driveway. Driveway signals should be semi-actuated with detectors provided for this entering left turn movement and for all exiting movements from the driveway. Driveway signals within 2500 feet of a signalized street intersection should be interconnected and coordinated with the intersection signal.

At signalized driveways where there is significant pedestrian traffic, pedestrian signals should be included as part of the signal installation. Guidelines for pedestrian indications are presented in the Texas MUTCD.

PARKING AND ON-SITE TRAFFIC CIRCULATION

Driveway location, design, and operation must be fully coordinated with parking facilities and on-site traffic circulation patterns. Special attention should be given to parking and on-site circulation at all driveways on arterial streets and at high-volume commercial and industrial driveways.

On-street parking should be regulated in the vicinity of commercial and industrial driveways, with on-street parking prohibited in areas where it will reduce the sight distance of driveway users below desirable values. Parking should also be prohibited within at least 20 feet of the curb returns of a commercial or industrial driveway so that vehicles can enter and exit these driveways safely and efficiently and parked cars will not conceal the driveways from street traffic. On-street parking should be prohibited on all major arterial streets.

On-site parking at commercial and industrial developments must be adequate so that parking areas do not become congested and block driveways. There should be enough parking spaces to accommodate peak period on-site parking needs. Parking spaces should be adequately designed to facilitate their use by motorists. On-site parking at commercial and industrial developments should be designed so that motorists leaving a parking space do not back across or through a driveway.

An efficient on-site traffic circulation pattern at a commercial or industrial development is critical to driveway operation and safety. The circulation pattern must be consistent with the type of driveway operation (one-way or two-way). The circulation pattern should not require on-site traffic to cross or conflict with driveway traffic or to use the street (via a driveway) as part of the pattern.

Service Fixtures

Service fixtures (i.e., gasoline pumps, mail boxes, etc.) should be placed as far from driveways as practical so that traffic using the service fixtures does not interfere with normal driveway operation. At service fixtures where queueing may occur, it is important to provide an adequate and well-defined storage area for the waiting traffic. This storage area should be located so that the waiting vehicles do not block or impede the movement of driveway traffic.

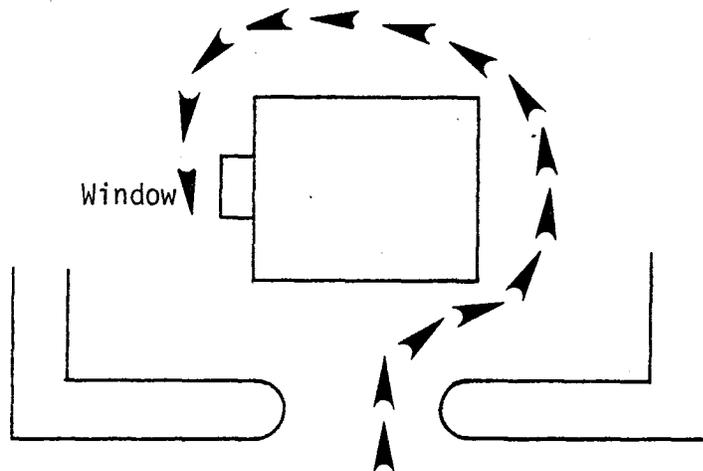
Service fixtures should also be positioned and operated in a manner that is consistent with the preferred driveway operation. If one-way driveway operation with counter-clockwise on-site traffic circulation is being encouraged, for example, the fixtures should be located and operated so that these operation and circulation patterns are promoted.

Drive-Thru Windows

Drive-thru windows, like other service fixtures, should be placed as far from driveways as practical so that traffic waiting at the window does not affect driveway operation or safety. Drive-thru windows should also be located and operated in a manner that is consistent with the type of driveway operation being encouraged.

Providing an adequate and well-defined storage area for drive-thru window traffic is particularly critical, especially at fast-food restaurants and motor banks where queues can and do become quite long. All waiting traffic must be stored on private property clear of driveways. Otherwise, traffic safety and operation at driveways and/or on the street may be adversely affected.

The drive-thru window design illustrated below is recommended for all single-window drive-thru facilities where on-site storage is a problem (e.g., shallow lots, long service times, high volume of window users, etc.). This design allows window users to drive behind the building and receive service on the left side of the building.



Waiting traffic is stored on-site away from driveways and the street. Signing and pavement markings should be used in conjunction with this design to encourage proper use of the drive-thru facility. Raised channelization should also be used as needed to assure proper traffic circulation.

In addition to drive-thru window design, window operation is critical at sites where a storage problem exists and service lines are long (several minutes). The following operating procedures can be used to increase window capacity and thereby reduce vehicle queue lengths at these drive-thru windows.

1. Motorists can be provided the opportunity to place their orders well upstream of the service window by installing a remote communication station and preparation of their orders can begin when they first arrive in the window storage area.
2. After placing an order or requesting a service, motorists can be instructed to leave the drive-thru window area and park temporarily in a nearby parking area until their order is ready or they can be serviced. They can then drive back through the service window, or in some cases, be serviced (given their order) in the parking area.

DRIVEWAY OPERATION

A two-way driveway can efficiently service several hundred vehicles per hour (vph) if properly designed. The capacity of a two-way driveway is essentially the same as a stop controlled "T" intersection.

If peak hour volumes exceed 100 vph, a divided driveway or one-way driveway pair should be considered in lieu of a two-way driveway. One-way operation is particularly desirable when there are over 40 left turns per hour at a driveway and property frontage exceeds 200 feet in length.

Driveway design must be completely coordinated with the type of driveway operation. Design standards should be developed which recognize the different operational requirements of one-way versus two-way driveways.

Turn Prohibitions

Under some conditions, it may be desirable to prohibit certain turning movements at a driveway. Turn prohibition should be accomplished by restrictive driveway design features and encouraged by the driveway layout. Regulatory signing and pavement markings should also be used as needed.

Left turn movements into and out of driveways are most commonly prohibited. Left turn prohibition can be advantageous under the following conditions:

1. The spacing between the driveway and an adjacent intersection (corner clearance) is inadequate.
2. There is inadequate sight distance at the driveway to safely perform a left turn maneuver.
3. The spacing between the driveway and an adjacent driveway is inadequate.
4. If a property parcel has a signalized driveway at which left turns can be made, left turns at the unsignalized driveways on the same approach should be prohibited.
5. Other capacity, traffic delay, or safety conditions as determined by a traffic engineering study may warrant left turn prohibition at particular driveway sites.

Left turn prohibition at driveways is most effectively achieved by physically restricting the left turn maneuver with median channelization (if a median exists) or driveway channelization. Driveway channelization, however, is not totally effective and should be supplemented with regulatory signing.

Median Crossings

A special concern of driveway regulation on high-volume, high-speed divided streets (e.g., major arterial streets) involves the location and design of openings in the median. Median openings regulate left turn maneuvers into and out of driveways.

To achieve optimum traffic flow conditions on a divided street, the spacing between median openings should be at least 400 feet. The spacing may be reduced to a minimum of 300 feet if a competent traffic engineering study indicates that the lesser spacing will safely and efficiently accommodate left turn movements to existing and projected future land development.

Generally speaking, median openings should not be provided at individual driveways, but rather at public street intersections. The exception to this policy would be at access points to major traffic generators where the access points (major driveways) conform in all respects to the standards for intersection spacing and design.

Median openings should be of the "bullet-nose" design to facilitate turning movements through the opening. Medians should be designed and constructed to prevent crossing except at designated points.

Operational Effects of Driveway Layout

The configuration or arrangement of driveways along a street can influence traffic operations at individual driveways. For this reason, driveways should be located, designed, and operated to function as a coordinated system of access points.

Some basic principles relating to driveway arrangement and layout to consider in developing a coordinated system of driveways are discussed below:

1. Motorists are very hesitant to violate normal one-way traffic operation (enter on the right and exit on the left) if it is implied by the driveway layout. Two driveways serving the same development located side by side, strongly imply one-way operation. Motorists will tend to enter using the driveway on the right (looking from the street) and exit using the driveway on the left (looking from the street). To a lesser extent, motorists even associate one-way operation with three driveway configurations. They will tend to use the far right driveway for entrance maneuvers, the far left driveway for exit maneuvers, and the middle driveway for both.
2. If a particular driveway configuration does not imply one-way operation, drivers tend to enter using the first driveway they reach. They tend to exit using this same driveway if returning to the point of origin of their trip.

3. Drivers will tend to avoid driveway maneuvers which are difficult, hazardous, or illogical. They avoid driving behind a building or through an intersection to use the "proper" driveway if access to the "improper" driveway is more convenient and use of this driveway is not physically restricted.
4. A turning maneuver may be discouraged by geometric design features (i.e., small turning radius, angled driveway, etc.), but design features alone generally do not imply to motorists that the turning maneuver is illegal or prohibited. Some motorists will invariably violate the intended operation if signing and/or pavement markings are not used. Even then, some violations may occur.

MAINTENANCE

All driveways and circulation or parking areas adjacent to driveways must be properly maintained by the property owner or at the property owner's expense. They should be kept free of potholes, depressions which permit water to pond, and any other surface or profile deficiencies which could adversely affect motorists' speed and path.

Vegetation growth around driveways should be strictly controlled to insure that driveway users have adequate sight distance year round. Trees, shrubbery and other landscape features should be located and maintained so that they do not conceal a driveway from street traffic.

Driveway signing and pavement markings should be kept in place and cleaned or replaced at regular intervals so that they are visible both day and night. Curbing and channelizing islands should be maintained in good condition.

DRIVEWAY CONSTRUCTION

Driveway construction standards should be adopted and incorporated into area building codes. The construction standards should establish requirements for pavement thickness and reinforcement, as well as material and workmanship quality. Driveway construction standards should recognize that driveways carrying high traffic volumes and/or truck traffic must be designed and constructed to accommodate the frequent or heavy vehicle loadings. Thus, separate standards for residential, commercial (low- and high-volume), and industrial driveway construction should be established.

Paving

All driveways on curbed streets in urban areas should be paved. On uncurbed streets, commercial and industrial driveways should be paved; residential driveways may be paved.

As a minimum, paving should extend from the street to the property line. It is recommended, however, that the full length of all commercial and industrial driveways, as well as adjoining parking and circulation areas, be fully paved.

All curbed driveways should be paved with reinforced concrete pavement (at least the part of the driveway extending from the street to the end of the curb returns). In this area, the curbing and driving surface should be constructed as a monolithic slab.

Curbing

Driveways constructed on a curbed street should be curbed. It may also be necessary to curb commercial driveways and some industrial driveways on uncurbed streets to discourage erratic and/or unlawful maneuvers.

Generally speaking, driveway curbing should be consistent in appearance (e.g., size, shape, etc.) with street curbing, although in special cases it may be necessary to vary the driveway curbing to enhance safety or traffic operations. Driveway curbing should be smoothly integrated with the existing street curbing to give the appearance of a continuous curb. All curbs should be highly visible and curbing at commercial and industrial driveways which service traffic at night should be painted with beaded paint. It is also recommended that all driveway curbs on arterial streets be painted with beaded paint to enhance safety on these high-volume, high-speed facilities.

At curbed commercial and industrial driveways, both curb returns should be fully curbed and the curbing should be continued far enough beyond the curb returns to establish the required driveway throat length. The curbing may need to be extended onto private property to satisfy the throat length requirements.

At curbed residential driveways, the curb returns should be fully curbed as a minimum.

Curb and Gutter Removal

Before a driveway is constructed on a curbed street, the existing street curb and gutter should be removed in the area of the driveway. The curb-cut area should be wide enough to accommodate the required driveway width and curb returns, as well as any turning lanes and/or taper approach treatment which are being installed. Removing only the back of a curb and paving over the broken curb section is not acceptable, since this practice results in a joint which is highly susceptible to spalling or ravelling.

On streets with mountable curbs, it is not acceptable to simply pave to the back of the curbing and require motorists to drive over the curbing.

Sidewalk Crossings

The intersection of a sidewalk with a driveway may be treated in one of two ways depending on site conditions:

1. A "step-down" from the sidewalk onto the driveway may be provided. This treatment has the advantage of alerting pedestrians (by requiring them to step down) that they are entering an area of possible vehicle conflict. The "step-down" treatment, however, may restrict the movement of mobility-impaired pedestrians and create a tripping hazard.
2. The sidewalk can intersect the driveway at grade. At curbed driveways, this treatment is provided by removing a portion of the curbing in the driveway throat and constructing a short, gently sloping sidewalk ramp. This treatment, sometimes called a "baby carriage" treatment, provides a smooth, unimpeded path for the mobility-impaired, baby carriages, etc., and it alleviates the tripping hazard associated with the "step-down" treatment. It has the disadvantage, however, of providing pedestrians (who may be unaware that they are crossing a driveway) an easy path into a driveway which services conflicting vehicle traffic.

The sidewalk treatment used ("step-down" or "baby carriage") should be dictated by the amount and type of pedestrian traffic, as well as the volume and speed of vehicular traffic at the driveway. As a general rule, however, the "baby-carriage" treatment is recommended, except at high-speed, high-volume commercial driveways where there is a high potential for pedestrian-vehicle conflicts.

At driveways where vehicle entry speeds are relatively high and pedestrian crossings are frequent, sidewalk crossings should be located as far from the street as possible. This practice will enhance pedestrian safety by allowing pedestrians to cross at a point where vehicle speeds are slower.

Drainage

Driveways should be designed and maintained to prevent water from ponding in the driveway or on the street or street right-of-way. Driveways must not impede or adversely alter area drainage.

On curbed streets, driveways should not divert water from the street gutter onto private property, except in special cases where an approved on-site drainage system exists. To insure that street water is not diverted, the high point of the driveway should be slightly higher (1 or 2 inches) than the top of the street curb on the upstream side of the driveway.

On some curbed streets, surface drainage may be a problem at driveways which have a very gentle approach grade (1-2 percent). At these driveways, the approach grade should be increased to 10 percent for a distance of 1 foot beginning at the edge of the street gutter.

On uncurbed streets, driveways should not impede or adversely affect side ditch drainage, and if a side ditch is filled in to accommodate a driveway, the following requirements must be fulfilled:

1. Surface drainage must be provided so that all surface water on the fill is carried away from the street in a suitable manner.
2. The drainage opening underneath the driveway fill must be adequate to carry the design water flow of the side ditch.
3. The fill area and any drainage structures must be properly delineated and safety-treated as prescribed by existing Texas State Department of Highways and Public Transportation standards.
4. The fill must extend from the pavement edge to a point which provides a smooth and consistent profile (e.g., to the sidewalk, top of side ditch, etc.).
5. The approach grade of a driveway constructed on a fill must conform to the slope of the street. Generally, it should slope downward at approximately $\frac{1}{4}$ -1 inch per foot for a distance necessary to place the low point of the driveway at least 8 inches below the street elevation at the edge of the pavement. If a valley gutter is used, the low point of the gutter should be at least 8 inches below the street elevation at the edge of pavement. The gutter should be at least 4 feet wide.

POLICIES AND PROCEDURES

In order to enhance the overall effectiveness and efficiency of driveway regulation and ensure due process of law, it is critical that formal access control policies and procedures be established. The following sections will discuss recommended policies and procedures for developing, administering and enforcing driveway regulations within the framework of local government.

RESPONSIBILITY

The right of unlimited access to a public street or highway does not automatically accompany property ownership. The right of access is a special privilege which is granted as a convenience and courtesy to a property owner. The granting of this privilege should not, under any circumstances, compromise the safety or general welfare of the motoring public or interfere with the rights of adjacent property owners. Once access privileges to a street or highway are granted, however, access does become a property right of the landowners.

The governing bodies of all cities, counties, and states, through their charters or constitutions, have the responsibility to protect public health, safety, and general welfare. Since inadequately designed or operated driveways contribute to traffic accidents and reduce the operational efficiency of a street or highway, it follows that a city, county or state has the responsibility to regulate all driveways or roadways under its jurisdiction.

AUTHORITY

Every state has enacted legislation which makes it legal to regulate driveways. The power to regulate driveways and property access in general is a "police power" and unlike the power to take property (the power of eminent domain), does not require compensation to the owner for inconveniences or for any consequential effects of the regulation. However, driveway regulation must not deny any citizen due process of law. In other words, the power that a city, county or state exercises to control driveways must be appropriate for individual situations; regulations must be practical, fair, and responsive to varying conditions.

POLICIES

Effective urban driveway regulation begins with the consideration of access in the local subdivision, street and zoning ordinances, and the adoption of an effective driveway ordinance. (In some cities, one or more of these ordinances are combined.)

Street and Subdivision Development

In order to have good driveways, driveway access must be considered in the earliest stages of street and subdivision planning and layout (e.g., long before streets are constructed, land is subdivided, houses or businesses are built, etc.). Local street and subdivision ordinances should encourage safe and efficient driveway design and operation by incorporating the following provisions:

1. Lots with inadequate width, depth or frontage length or with a confining shape for their intended land use should be avoided. Minimum allowed frontages should permit driveways to be appropriately spaced relative to adjacent driveways and intersections. Lot size should be sufficient to encourage good internal circulation and provide adequate parking for the intended land use. Lot size and frontage length are particularly critical for properties located on arterial streets or at the intersections of arterial streets with collector or local streets.
2. Building and fixture setback requirements which encourage good driveway location and design and efficient on-site traffic circulation should be established.
3. Streets should be laid out with adequate right-of-way to accommodate present and future needs. Attention should be given to providing adequate intersection spacing. In particular, intersections which are signalized should be spaced to permit efficient corridor traffic flow.
4. Curb and gutter should be required on all city streets, or at least on all non-residential streets.
5. Street design and layout should be consistent with intended land use and street function.
 - Optimum block lengths (intersection spacings) should be established which consider the needs of land access.
 - A new subdivision should not create any land parcels intended for single-family or duplex residential uses fronting on an arterial street. To the extent possible, any residential lot abutting an arterial street right-of-way should have its back yard face the arterial. Commercial and industrial developments should be allowed direct access to an arterial street only if sufficient frontage is available for adequate driveway design and on-site circulation.

Zoning

Many cities, through local zoning ordinances, attempt to control land use by establishment of zoning districts. Since driveway design and operation are

related to land use, it is important that zoning ordinances also consider driveways.

1. Zoning should be closely coordinated with an area's General Comprehensive Plan, especially the transportation element of the Plan. The land use encouraged along a street or highway must be consistent with the designed street function and subdivision layout.
2. Proposed zoning changes should be closely evaluated with regard to the access requirements that they will create.

Driveway Regulation

The purpose of considering driveways in the development of local subdivision, street and zoning ordinances is to guarantee that good driveway design and operation can be achieved. A city or county must adopt an effective set of driveway regulations, however, to actually achieve good driveway design and operation. Driveway regulations should recognize the needs and interests of all parties concerned if they are to be accepted; however, they should not be rendered ineffective by making them too compromising. They should reflect what is safe, effective, and practical rather than a political compromise that everyone can live with. They should be general enough to permit appropriate flexibility in site design; however, they should be very specific regarding their use under various conditions.

Driveway regulations and design standards should be administered in coordination with subdivision and zoning ordinances. A driveway ordinance should include the following:

1. A statement on the need and purpose of the ordinance.
2. A declaration of the authority vested in the local government to establish driveway regulations.
3. Implementation procedures (i.e., permit requirements).
4. Policies and procedures for granting exemptions and variances.
5. Inspection policies and procedures.
6. Field change policies.
7. Policies on accommodating future changes in land use, traffic conditions, etc. (the legal rights and responsibilities of the local governing body to modify access conditions as needed).

In addition to establishing basic criteria in ordinance form, it is recommended that local agencies develop a supplemental set of design standards and guidelines (including typical layouts) for use in the actual design process. These standards and guidelines should be required by ordinance.

PROCEDURES

Even though procedures for regulating urban driveways may differ somewhat from one area to the next, there should be certain basic similarities. The recommended procedures discussed herein are based on the critical evaluation of procedures currently being used in Texas cities and counties.

Driveway Permits

Driveway regulations should be implemented within cities and counties through the issuance of driveway or curb-cut permits. A driveway permit is a legal document granting permission to construct and operate a driveway of a certain basic design at a given location.

Driveway permits in an urban area should be issued for a certain type of land use and for a specific site plan. A change in the land use or in the site layout (e.g., building expansion) should void the driveway permit and require the submission of a new permit application.

Permit Applications

Driveway permit applications should contain sufficient information, when combined with the building permit and a site development plan, to allow the city or county to fully assess the adequacy of the proposed driveway design. Permit applications should include, as a minimum, the following:

1. The street or highway and land parcel on which the driveway(s) will be constructed.
2. The location and design of the driveway(s).
3. The date of the application and the proposed date of construction.
4. Notice of required assistance from the city or county.
5. A notice that the permit will be revoked if the driveway becomes a hazard or adversely affects traffic flow or if the lane use changes.
6. A statement on who will perform the construction work and who will pay for the work, materials, etc.
7. The name of the landowner.

Driveway permits should be filed after review and approval of a site development plan. The site development plan is a detailed drawing showing all buildings and other structures on the land, the parking area, and the proposed driveways. It should be a required part of the building and driveway permit applications. The site development plan must satisfy the following requirements:

1. It should be drawn to scale (1"=50' or less).
2. It should show the dimensions, location, and design of all proposed driveway(s).
3. The location of any buildings or structures, either existing or proposed, should be shown.
4. The type of land use activity and the extent of site development (e.g., floor space) should be stated.
5. The parking lot with the proposed internal circulation pattern should be shown.
6. All existing or proposed gutters, storm sewers, manholes, fire hydrants, utility poles, service fixtures, etc., which may be affected or which may affect driveway operations should be shown.
7. Any existing driveways or curb-cuts located on adjacent lots or lots across the street should be shown.
8. All of the geometric design features of the roadway itself should be shown, including the median, the number and width of travel lanes, the shoulder or a parking lane, etc.
9. The distances to intersecting streets should also be shown.

Multiple Driveway Permit Applications

When more than one driveway is being requested for a single development along a major arterial street, the permit applicant should be required to submit a professionally prepared report justifying the need, describing the internal circulation and parking system, and identifying the impact of the development, even if only part of the site is being developed at the time. Also, the report should consider projected traffic growth for a 20 year period. The report requirement will discourage the indiscriminant placement of driveways on critical arterial streets.

Permit Application Review

The department issuing the driveway permits as well as the permit review and approval process will vary depending on local government structure. However, in all cases it is recommended that traffic engineering and planning personnel review the permit applications for all commercial, industrial and multi-family residential driveways and all driveways on arterial streets. It is also recommended that the traffic and planning staff work directly with the developer or builder in arriving at an acceptable driveway layout. For the review process to be efficient and effective, all parties must be aware of the procedures and requirements.

Typical Procedure

At the time a developer, builder, or land owner requests a building permit application, he or she is 1) informed of the requirements and procedures for obtaining the necessary driveway permit; 2) given a driveway permit application and a copy of the driveway ordinance and supplemental guidelines, if appropriate; and 3) encouraged to contact the traffic and/or planning department for assistance if necessary. The individual is also informed of the requirement to obtain approval of a site development plan. The individual completes the building and driveway permit applications and submits them along with a site development plan. It is recommended, to avoid confusion, that building and driveway permits be obtained from and filed in the same department.

The building and driveway permit applications and the site development plan are then circulated to the planning and traffic departments (and other departments as necessary) for review and approval. In some cities, department representatives meet periodically to review permit applications as a team.

If all departments approve the site development plan and the applications, the permits are issued and work can begin. Otherwise, the permits are denied and the applicant must modify the permits and/or site development plan or file an appeal.

Appeals

If a driveway permit application is rejected and it cannot be resolved by submission of a revised permit application (in other words, if the applicant is unwilling or cannot make the necessary changes), a formal procedure of appeal should exist. A typical appeal procedure might be as follows:

Upon initial receipt of a permit application, the permit would be reviewed by all affected departments. If a department required modification of the requested driveway(s), then the permit application would be channeled back to the initial office and the applicant would be informed of the problems. At this point, the applicant could meet with representatives of the department to try to resolve the problems. If the problems could be ironed out, the applicant would make the corrections, refile the permit, and it would be approved. If the applicant did not feel like the changes were warranted or practical, the applicant should have the right of appeal.

The appeals procedure can vary depending on the city or county. The most important thing, however, is to have a standard appeals procedure to promote consistency and remove chances for political influence in the final decision.

Permit Fees

It may be desirable to charge a fee for the filing of driveway permits. In some cities fees are charged to cover the cost of actually reviewing and issuing the permits and inspecting subsequent construction. This approach is favored by those who feel it is unethical for general tax dollars to pay to regulate an individual property owner's driveway. On the other hand, it can be argued that when driveways are regulated, the public is benefited as well as the private individual's welfare and therefore, the use of public tax dollars in paying for the issuance of permits and the inspection of construction is a legitimate expenditure. Therefore, some cities charge no fee.

Performance Deposit

It is recommended that a performance deposit be collected from the construction contractor, developer, property owner, etc., at the time the driveway permit is issued. The deposit should be held to ensure that the driveway is located, designed, and constructed in accordance with the approved standard. After inspection, the deposit, less any inspection charge, would be returned to the individual.

Inspection

The inspection of driveways is a critical part of driveway regulation. The department responsible for issuing driveway permits, if possible, should do the inspection work. This will ensure maximum consistency and coordination. The inspection of driveways should include checking dimensions (i.e., width, driveway length, turning radius, etc.), the approach grade, the approach angle, sight distance, signing, channelization, pavement markings, pavement design, expansion joints, etc. In other words, all the critical aspects of driveway design and operation should be inspected for compliance with the approved site development plan and local construction standards.

It is necessary to inspect a driveway layout before it is actually constructed so that mistakes can be corrected before they become costly to correct. An inspection should also be made after construction.

Inspection may need to be more intensive on critical driveways, such as commercial driveways on arterials. A traffic expert should inspect these driveways. For all driveways, it is imperative that the inspector be trained and knowledgeable in the areas of driveway design and operation and traffic flow.

Enforcement

If a driveway is not constructed according to its approved design or is operated improperly, then it is the responsibility of the city or county to enforce the needed modifications. Several methods of gaining this compliance

can be used. One effective method involves the use of a certificate of occupancy. Issuance of a certificate of occupancy is required in order to occupy a new, renovated, or expanded structure. If a driveway is not constructed to standard, the certificate of occupancy is denied or revoked until the necessary modifications are completed. This particular procedure, combined with stiff fines on the landowner for each day the problem goes uncorrected, is a good deterrent to constructing driveways inadequately or not to standard.

Another enforcement tool that was mentioned earlier is the performance deposit. If a driveway is not constructed or operated as approved, the performance deposit is retained until the necessary changes are made. The deposit can be used, if needed, to finance the modifications.

Accommodating Change

After a driveway is constructed, many changes in area land use and/or traffic characteristics on the street can occur. A city must be able to respond to these changes. They must accommodate these changes by changing access characteristics to ensure the continued safety and travel efficiency of the motoring public.

Within ordinances, cities should establish the right to require property owners to make changes in their driveways when the land use or traffic characteristics along the street change significantly. These access modifications should be initiated by the city or county engineer or the traffic engineer. Generally, requiring a landowner to make driveway changes will be a major effort so a standard procedure for initiating and making these changes should be well established.

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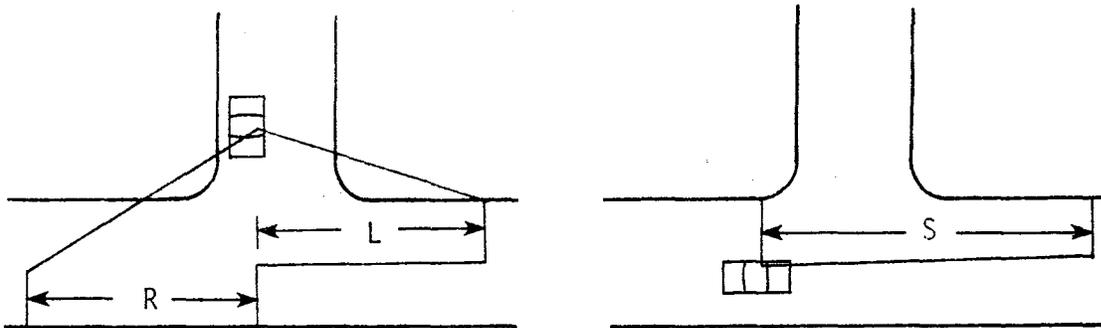
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APPENDIX

Sight Distance Requirements

Desirable minimum sight distance requirements for commercial and industrial driveways are presented in the tables below. The values presented are minimum sight distances which would permit the following:

1. Upon turning left or right, an exiting vehicle could accelerate to the operating speed of the street without causing approaching vehicles to reduce speed by more than 10 mph.
2. Upon turning left, an exiting vehicle could clear the near half of the street without conflicting with vehicles approaching from the left.
3. A vehicle turning left into the driveway would safely clear on-coming through traffic without affecting the speed of through traffic.



R - Sight distance for exiting traffic looking Right (measured from a driveway vehicle stopped 10 feet back of the street to a vehicle approaching in the median lane).

L - Sight distance for exiting traffic looking Left (measured from a driveway vehicle stopped 10 feet back of the street to a vehicle in the outside lane).

S - Sight distance for entering traffic looking Straight Ahead (measured from the point where a left turning vehicle stops to a vehicle in the outside approach lane).

Safe Sight Distance for Passenger Cars (in Feet)

Operating Speed, mph	Two-Lane Streets			Four-Lane Streets		
	R	L	S	R	L	S
20	130	150	150	130	130	160
30	260	350	230	260	220	250
40	440	530	370	440	380	390
50	700	740	520	700	620	550

Safe Sight Distance for Trucks (in Feet)

Operating Speed, mph	Two-Lane Streets			Four-Lane Streets		
	R	L	S	R	L	S
20	200	300	260	200	200	280
30	400	500	400	400	400	440
40	850	850	570	850	850	620
50	1600	1600	810	1600	1600	880

The safe sight distances were developed for urban conditions and assume level grades. The values should be increased or decreased as appropriate to allow for the effects of grade on vehicle operation.

The desirable minimum sight distances are based on the premise that driveway maneuvers should not severely degrade traffic flow on an urban street. Actual sight distances provided at driveways should be much greater than these minimum values if practical.