CHAPTER 17

ACCESS MANAGEMENT

GENERAL

Access management is the process of providing safe, efficient ways of getting on and off our streets and highways. The concept, "concentrates on restricting the number of direct accesses to major surface streets, providing reasonable indirect access, effectively designing driveways, and enforcing safe and efficient spacing and location of driveways and signals," according to Ron Giguere, former chairman of the Transportation Research Board Access Management Committee. "There are a variety of techniques available for achieving access control. These include geometric design considerations such as medians and channelized islands that prohibit certain turning movements, consolidation actions such as shared driveways and service roads, and others such as removal and relocation of existing access and the introduction of auxiliary lanes for left and right turns. If these types of improvements are implemented correctly, users can expect smoother vehicle flow, reduced delay and fewer crashes. These benefits equate to larger aggregate cost savings in travel time, fuel consumption, property damage and injuries. In addition, there is potential for expanding market area for local businesses, reducing vehicular emissions and fostering quicker emergency response."

Access management can support property values by preventing situations where on-street congestion blocks drivers from entering and exiting driveways. Likewise, good access management maintains the effective service area of businesses by controlling congestion, making it possible for more drivers to reach the business within an acceptable time.

Access Management Minimizes Costs:

Driveway-related accidents alone cost South Dakota approximately $36.5 million each year.

<u>Principles of SDDOT Access Management Policy</u>

- Protect the public's investment in the highway system by preserving its functional integrity through the use of modern access management practices.
- Coordinate with local jurisdictions to ensure that the state's access policy and criteria are addressed early in decisions affecting land use.
- Provide advocacy, educational and technical assistance to promote access management practices among local jurisdictions.
- Undertake proactive corridor preservation through coordinated state/local planning and selective investment in access rights.
- Provide a consistent statewide management of the state highway system.
- Maintain and apply access criteria based upon best engineering practices to guide driveway location and design.

- Establish and maintain an access classification system that defines the planned level of access for different highways in the state.
- Establish procedures for determining developer responsibilities for paying for improvements that address the safety and capacity impacts for major development.
- Enhance existing regulatory powers and statutory authority to ensure safe and efficient access.
- Permit exceptions to the SDDOT’s access criteria only where retrofit techniques have been applied.

PERMIT PROCEDURES

Each new access onto the state highway system will require an approved access permit. The criteria in the access management rules will be used to determine whether a new access will be granted. Existing access points will be allowed to remain until the land is redeveloped to a higher intensity (including change of land use), or the access is changed through SDDOT reconstruction.

Design projects in developed areas will use retrofit techniques to try to clean up access problems as much as possible. (See Techniques, page 17-6.)

Permits associated with design projects will be generated internally. They are needed to update the access database. The designer should provide a copy of final plans to the Access Management Specialist so the permits can be prepared. The appropriate Area Office will process all other permits.

SDDOT-OWNED ACCESS RIGHTS

In some areas, SDDOT has sought to purchase access rights adjacent to high-volume roadways. These rights are usually recorded on the deeds of property abutting the right-of-way. Where these easements and ownership rights exist, no new access permits should be granted. In the rare instance when access rights are relinquished, the Transportation Commission must approve them. If SDDOT owns the control of access in fee title, there could be a charge based on appraisals. See Chapter 9 for more information on right-of-way procedures.

ACCESS MANAGEMENT RULES

Access to South Dakota highways is governed by administrative rule, found in Article 70:09 of state code. The access criteria found within the code are relevant to highway design functions. The criteria are shown in Figure 17-1.

The criteria include standards for traffic signal spacing, median opening spacing, unsignalized access spacing, and access density for seven access classifications of highway. The access classifications are maintained by the department on a spreadsheet and are updated periodically. The current system classification can be found at U:\regionM\Access Issues\ACCESS CLASSIFICATION AUG 06.xls.

To use the criteria, first determine which access classification applies to the highway section in question, then find and apply the appropriate standards from the criteria table.

Figure 17-1 South Dakota Access Location Criteria

Access Classification	Signal Spacing Distance (mile)	Median Opening Spacing (mile)	Minimum Unsignalized Access Spacing (feet)	Access Density	Denial of Direct Access When Other Available
Interstate	N/A	N/A	N/A	N/A	Yes
Expressway	1/2	1/2 F, 1/2 D	2640	at half-mile increments	Yes
Free Flow Urban	1/2	1/2 F, 1/4 D	1320	at quarter-mile increments	Yes
Intermediate Urban	1/2	1/2 F, 1/4 D	660	1 access/block face, right in/right out preferred	Yes
Urban Developed	1/4	1/4	100	2 accesses/block face	Yes
Urban Fringe	1/4	1/4	1000	5 accesses/side/mile	Yes
Rural	N/A	N/A	1000	5 accesses/side/mile	Yes

Notes:

1. Access to the Interstate system is governed by SDDOT interchange policy. No access shall be provided on non-interstate routes within the following distance of interstate ramp terminals: 1/8 mile directional access, 1/4 mile full access
2. N/A = Not Applicable, F = Full Movement – all turns and through movements provided, D = Directional Only – certain turning and through movements not provided.
3. SDDOT may defer to stricter local standards.
4. SDDOT will seek opportunities to reduce access density wherever possible.
5. Rural class minimum unsignalized access spacing may be reduced to 660' by the Area Engineer, based on results of an engineering study as described in 70:09:01:02
6. Unsignalized access spacing also is subject to corner clearance analysis.

Access Classification Definitions

Interstate – the designated Interstate highway system, including I-90, I-29, I-229, and I-190.
Expressway – high-speed divided highways serving interstate and regional travel needs.
Free Flow Urban – higher speed facilities with access subordinate to through traffic movement.
Intermediate Urban – serves through traffic while allowing moderate access density.
Urban Developed – traffic artery with high access density. Access and through movement have equal priority.
Urban Fringe – rural highway serving developing area immediately adjacent to a city or town. Access regulated to provide future through-traffic priority.
Rural – low volume, high-speed facility. Access points are spaced for safety and operations efficiency.

Designer Notes

- Corner clearance (page 17-12, 17-13) should also be checked when evaluating access close to intersections.
- Design in developed areas should use retrofit techniques to improve access as much as possible – strict use of criteria in developed areas may not be cost effective.

TECHNIQUES

The following techniques can be used to evaluate access issues presented in access applications or during project design. The techniques are listed below, along with indication whether the technique should be used for evaluating new access or in retrofit situations.

Technique	New Access	Retrofit
Consolidating access		X
Traffic signal spacing	X	X
Medians and openings	X	X
Unsignalized access	X	X
Two-way left turn lane	X	X
Coordinate drive locations	X	X
Provide separate enter/exit		X
Install barriers		X
Install driveway islands		
Construct/modify medians		X
Install right turn lane, multiple driveways		X
Convert to right in/right out		X

Consolidating Access

Adjacent properties abutting major roadways should be encouraged to share a common approach road connection. This will reduce the number of conflict points and separate the conflict areas. The longer spacing between approach road connections will also facilitate the provision of right-turn deceleration bays. (For more information on turn lane need and design, see Chapter 12.) The smoother traffic flow on the abutting street will help reduce vehicular crashes and increase egress capacity.

Joint access and interparcel circulation (cross access easements) can be readily implemented in the subdivision approval process. Close cooperation between SDDOT and local agencies is needed in developing these joint access requirements as well as in their implementation.

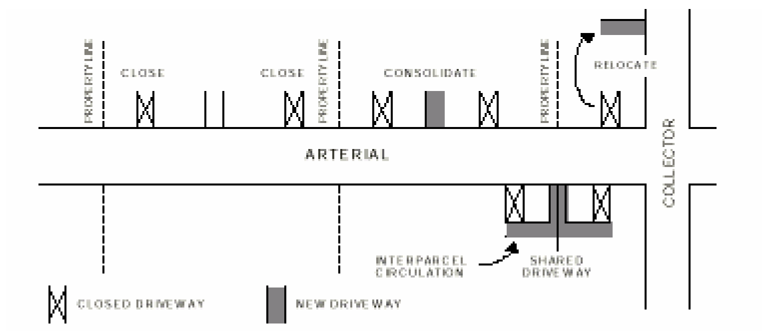
Once subdivision has already occurred, adjacent property owners may be encouraged to share a common access where it can be shown that customer convenience and safety can be improved. Reconstruction, which adds a nontraversable median, or median opening modifications, offers opportunities for encouraging joint access agreements.

Cross access easements that permit on-site circulation between adjacent properties decreases the number of vehicle trips that would normally use the abutting roadway. Providing for interparcel trips can reduce traffic volumes on the main roadway and, as important, reduce turning volumes. Property owners unable to meet driveway spacing standards should be required to provide for joint and cross access easements, wherever feasible. Abutting properties under different ownership are encouraged to comply but generally not required until they redevelop or expand. In the meantime, the applicant should be allowed a temporary driveway.

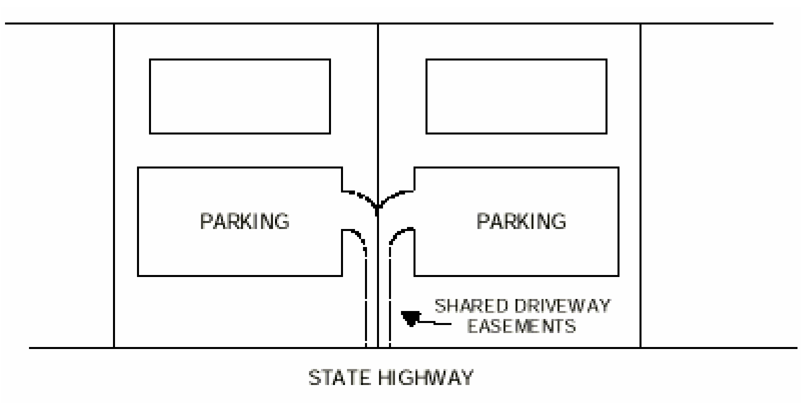
Flexibility is needed on an administrative level to work with the unique circumstances of each development site. Communities could relax driveway spacing standards for properties that agree to consolidate access, and provide for variances where compliance proves impractical. Some ordinances provide incentives, such as density bonuses, for combining access points, or relax parking and dimensional requirements where necessary to achieve shared access.

The interparcel circulation benefits the public and patrons by providing safer circulation. It benefits the private development by making it more convenient to attract patrons. This convenience and safety helps to attract more business to the area and hence, to each individual business.

Driveway Consolidation and Relocation



Shared Driveways



Traffic Signals

Traffic signal spacing, along with the uniformity of spacing, governs the performance of urban and suburban arterials. Signals account for most of the delay that urban motorists experience, frequently resulting in congestion and backups. Signals can cause particular problems if they are randomly located, ineffectively coordinated or improperly timed. Poor signal spacing can reduce arterial travel speeds, increase the number of stops and contribute to more accidents.

The main measure of arterial signal efficiency is progression. Progression is the ability of vehicles to pass through one signal after another without stopping, reaching each signal during the green phase. Progression is determined through time-space analysis, a graphical technique where the green phases of adjacent traffic signals are linked by lines representing platoons of vehicles moving at constant speed. Time-space analysis allows the traffic signal analyst to design signal systems that minimize the number of vehicle stops while maximizing the ability of vehicles to maintain speed.

While signal analysis requires specialized training, the mechanics of progression allows preparation of a table that describes optimum signal spacing for various speeds and cycle lengths.

Optimum Signal Spacing (feet)

Cycle Length (sec.)	**Speed (mph)**						
	25	**30**	**35**	**40**	**45**	**50**	**55**
60	1,100	1,320	1,540	1,760	1,980	2,200	2,430
70	1,280	1,540	1,800	2,050	2,310	2,500	2,820
80	1,470	1,760	2,050	2,350	2,640	2,930	3,220
90	1,630	1,980	2,310	2,640	2,970	3,300	3,630
120	2,200	2,640	3,080	3,520	3,960	4,400	4,840
150	2,750	3,300	3,850	4,400	4,950	5,500	6,050
Source: National Highway Institute, *Access Management, Location, and Design,* NHI Course No. 15255, 1991.							

The table above assumes that traffic is balanced by direction. Metric units may be found in NCHRP report 299, pages 10, 14.

Conversely, progression speed can be determined for various combinations of cycle length and signal spacing.

Progression Speed (mph)

Cycle Length (sec.)	**Signal Spacing (mile)**			
	1/8	**¼**	**1/3**	**1/2**
60	15	30	40	60
70	13	26	34	51
80	11	22	30	45
90	10	20	27	40
100	9	18	24	36
110	8	16	22	33
120	7.5	15	20	30
Source: National Highway Institute, *Access Management, Location, and Design,* NHI Course No. 15255, 1991.				

Time-space analysis clearly indicates the desirability of long and uniform signal spacing to achieve efficient traffic signal progression at desired travel speeds. The effects of signal cycle length and spacing on progressive speeds in both directions of travel have been well established. Speeds increase directly as signal spacing increases and inversely with cycle length. Longer spacing between signals allows higher speeds for any given cycle length. Similarly, for any given signal spacing, the shorter the cycle length, the higher the speeds.

Signal systems on urban or suburban arterials must respond to two different conditions. During peak traffic periods when volumes are high, operating speeds are usually slower and longer cycles, up to 120 seconds, are common. During off-peak traffic periods when traffic volumes are lower, speeds increase and cycle lengths can be decreased to range from 60 to 80 seconds.

The cycle length does not have to be the same for the entire day. At least two and maybe three different cycle lengths throughout the day will more efficiently respond to the varying traffic conditions. In larger urban areas, sophisticated traffic control systems provide the ability to change cycle length and other control parameters frequently in response to changing traffic conditions.

Uniform or nearly uniform spacing is essential. When signal spacing deviates from uniform spacing, the green time for the major arterial must be increased to maintain progression efficiency. Studies by Stover, Demosthenes, and Weesner show that for short cycles (i.e., 60 sec.) a deviation of one percent from optimum spacing will reduce the progression band by one percent. For longer cycle lengths (i.e., 120 sec.) a one percent deviation will reduce the through band by two percent.

Where signals must be provided at locations that do not conform to the time-space pattern, the green time for arterial traffic will be detrimentally affected. This effect may be offset by accepting a narrower green band or, as is more commonly done, by reducing the green time given the intersecting roadway. Signals also may be set to favor one direction of travel – but this usually reduces the through band in the other direction of travel.

Key issues to consider are as follows:

- Long, uniform spacing of traffic signals is desirable to allow effective progression of traffic in both directions of travel. During off-peak periods, arterial roadways should operate at speeds of 25 to 35 mph in urban environments and 35 to 45 mph in suburban settings. During peak conditions, roadways should operate at speeds in the range of 20 to 25 mph. Throughput is maximized, and fuel consumption and emissions are minimized at speeds of 35 to 45 mph.
- The green time per cycle for arterial roadway traffic should be maximized. This requires minimizing the time needed for left turns by prohibiting and redirecting the turns or by providing single or multiple left-turn lanes. Where left-turn phases are provided, cycle lengths may have to be increased to ensure sufficient green time and traffic progression efficiency (through bandwidth divided by the cycle length).
- Major urban and suburban arterials experience high travel demands, especially during the morning and evening peak periods. Therefore, capacity is critical. This may require longer cycle lengths to minimize the "lost" time that occurs each time the traffic signal indication is changed and to provide special phases for left turns. Cycle lengths during peak periods normally range from 80 to 120 seconds as compared with 60 to 80 seconds at other times.
- Cycle lengths that preclude achieving desired speeds for any given signal spacing should be avoided. For example, with ½-mile signal spacing along a suburban roadway and 30 mph travel speeds, cycle lengths should not exceed 120 seconds.
- Where signals must be provided at locations that do not "fit" in the time-space pattern, additional arterial green is necessary to ensure adequate through bandwidth. This results in less green time for the intersecting street or driveway.

Additional signal design details are available in Chapter 15 - Traffic.

Medians and Openings

Continuous raised medians with well-designed openings have been shown to reduce accident rates by 40%-200%. They also can preserve or raise the operating speed on heavily traveled roadways.

Medians should be used as part of reconstruction in areas with high traffic volumes and high driveway densities. Reconstruction should also include driveway consolidation and the use of other means to allow turning traffic to reach the median openings.

Median openings on divided roadways should be provided at all signalized at-grade intersections. They also are generally provided at unsignalized junctions of arterials and collector streets. They may be provided at driveways, where they will have minimum impact on roadway flow.

The access criteria provided in the access management rules regulate median opening spacing.

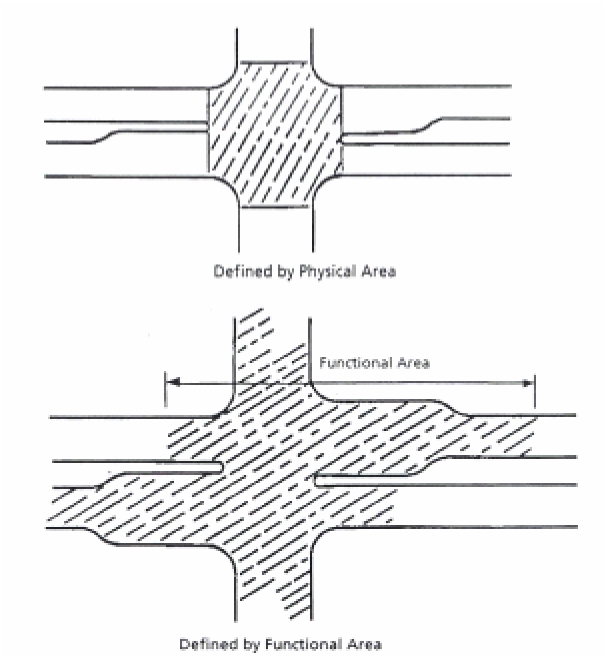
The following general guidelines are suggested for implementing the criteria for median openings on divided roadways:

- The spacing of median openings for signalized intersections should reflect traffic signal coordination requirements and the storage space needed for left turns.
- Ideally, spacing of openings should be conducive to future signalization, if it is ultimately needed.
- Median openings for left-turn entrances (where there is no left-turn exit from the driveway) should be spaced to allow sufficient storage for left-turning vehicles.
- Median openings should be set far enough back from nearby signalized intersections to avoid possible interference with intersection queues.
- In all cases, storage of left turns and the necessary deceleration distance must be adequate.

Unsignalized Access (Driveways and Intersections)

Unsignalized access, whether at a public street or a private driveway, is far more common than signalized intersections. They affect and serve all kinds of activity from residential areas to large activity centers. It must be remembered a driveway is an intersection and should be designed as such.
AASHTO defines intersection as the general area where two or more roadways cross or join. With respect to access management, AASHTO specifically states: “Driveways should not be situated within the functional boundary of at-grade intersections. This boundary would include the longitudinal limits of auxiliary lanes.” While AASHTO does not present guidelines as to the size of the functional area of an intersection, logic indicates that it must be much larger than the physical area.

Intersection Area, defined by physical or functional area



The access management rules provide criteria for spacing of unsignalized access points. When a driveway is planned in close proximity to an existing street intersection, additional analysis should be conducted. Those items of analysis include: 1) considering stopping sight distance, and 2) checking corner clearance to prevent interference with the intersection functional area.

Corner clearance is the distance between a private access drive and the nearest crossroad intersection. It should provide drivers with adequate perception-reaction time to assess potential downstream conflicts and is aimed at preventing the location of driveways within the functional area of an intersection. The functional boundary of an intersection should include all required storage lengths for separate turn lanes and for through traffic, plus any maneuvering distance for separate turn lanes. The minimum maneuvering distance assumes that the driver is in the proper lane and only needs to move laterally into an adjacent right or left-turn lane.

Corner clearance upstream of major intersections should meet the spacing standards in the following table.

Minimum Upstream Corner Clearance (feet)

Speed (mph)	Corner Clearance (feet)
30	200
35	225
40	250
45	280
50	350
55	425

Corner clearance will also minimize driveway/intersection conflicts by preventing blockage of driveways upstream of an intersection due to standing traffic queues. Minimum driveway setback distances should take into consideration typical traffic queue lengths while permitting sufficient movement to driveway vehicles. Corner clearances are applicable to all categories of roadways.

Continuous Two-Way Left-Turn Lane

A two-way left-turn lane (TWLTL) removes left-turning vehicles from the through lanes and stores those vehicles in a median area until an acceptable gap in opposing traffic appears.

Two-way left-turn lanes should be considered on roadways where numerous, closely spaced, low-volume access connections already exist. Projected major road volumes should be up to 24,000 vehicles per day and/or access density should be at least 60 driveways and/or local streets per mile. Operating speeds for roadways being considered for TWLTL's should be between approximately 25 and 45 mph. Two moderate to high volume access points should not be located in close proximity to each other. The preferred center turn lane width in South Dakota is typically 12 feet, but can range from 11 to 16 feet. The width should not exceed 16 feet, thereby precluding the possibility of side-by-side left turns.

Coordinate Driveway Locations on Both Sides of the Roadway

Description

Aligning access connections on opposite sides of a roadway to create a single four-leg intersection or providing a sufficient offset distance between driveways to avoid problems with spillback.

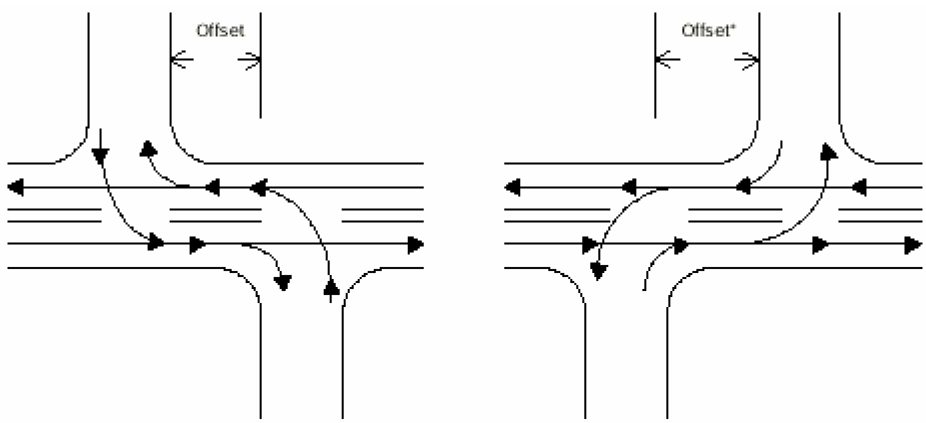
Application

On roadways where there is an excessive number of closely spaced access connections on both sides of the roadway and, as a result, there are safety and operational problems, such as inadequate storage distances for turning traffic. Increasing offsets applies to low-volume and low-speed roadways.

Implications

- Reduces conflicting movements along a roadway and improves safety.
- Simplifies signalization where traffic signals are involved.
- Increases available storage distances.

Driveway Location Coordination



Align driveways or, as shown above, provide sufficient offset distance.
* sum of storage requirements for both left-turn manuevers on arterial.

Provide Separate Left-Turn Entrances and Exits at Major Traffic Generators

Description

Replaces either one or two full-movement access connections with two limited-turn connections to separate the left-turn movements to and from the site.

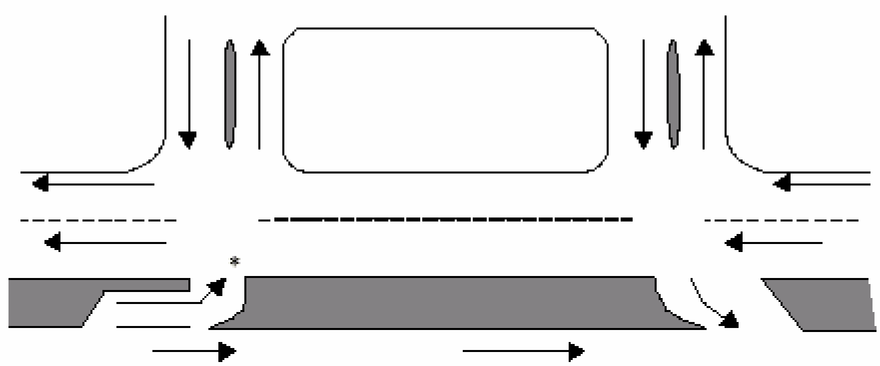
Application

Mainly applicable on divided roadways at regional shopping centers or major traffic-generators with significant left-turn volumes and sufficient frontage to provide for adequate separation distances between the two connections. Where there is insufficient storage distance for the turning movements at the two or more existing full-movement driveways.

Implications

- Reduces conflicts at each location.
- Where driveways are signalized, allows for two-phase signal operation.
- Disperses entering and exiting traffic within the development site.

Left Turn Exits and Entrances at Major Generators



* Median opening should be designed to physically prohibit the left turn exit from the development.

Install Barriers to Prevent Uncontrolled Access along Property Frontage

Description

The installation of a barrier (i.e. guide rail or curbing) between the edge of a roadway and the parking area to narrow the access connection and reduce the conflict area.

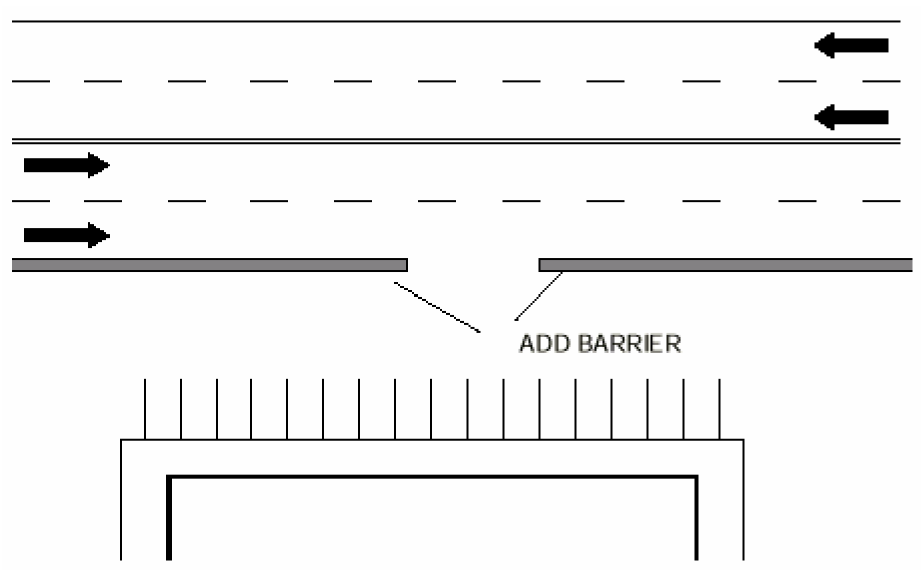
Application

Strip commercial developments where the parking areas are not physically separated from the adjacent roadway and, as a result, the driveway openings are not defined.

Implications

- Defines driveways and improves driveway visibility.
- Reduces number of conflicting movement locations and improves safety.
- Makes walking easier and safer for pedestrians, and allows for sidewalks.

Installation of Barriers



Install Driveway Channelizing Island to Discourage Left-Turn Maneuvers

Description

A channelizing island is used in a driveway throat at its intersection with a roadway to restrict selected left-turn movements and limit the basic crossing conflicts.

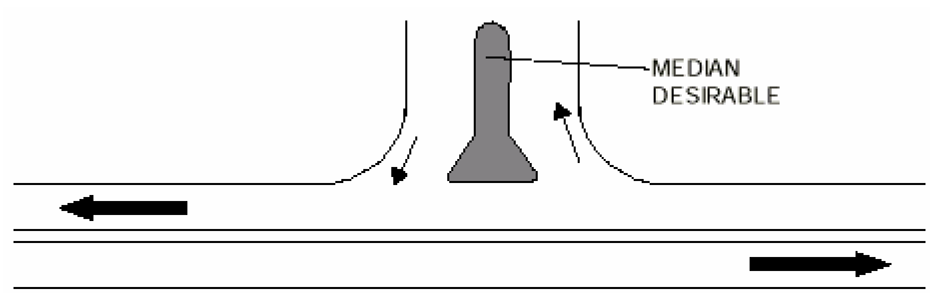
Application

Where left turns are undesirable and there is a need to restrict driveway movements to right-in/right-out on undivided roadways.
Where there is a high accident rate or frequency related to left-turn movements.

Implications

- Eliminates left-turn conflicts where these movements are problems.
- Provides pedestrian refuge at high-volume driveways.
- May need enforcement to prevent wrong-way moves.

Driveway Channelizing to Discourage Left Turns



Construct or Modify Median to Allow Only Left Turns from a Major Roadway

Description

A median opening is reconfigured to eliminate the left-turn movement from an abutting property onto the roadway.

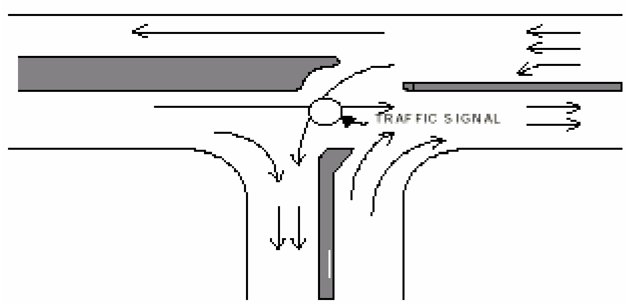
Application

Where there are safety or operational problems caused by the left-turn egress movement from a development and the rerouting that would occur due to the left-turn restriction could be satisfactorily accommodated.

Implications

- Reduces conflicts and delays.
- Where only one direction of travel is signalized, signals can be installed without adversely affecting progression.
- Adequate provisions are needed for the U-turns that will be made instead of direct left-turn exits.

Median Modifications



Install Right-Turn Deceleration Lane to Serve Several Driveways

Description

An auxiliary lane that removes right-turning vehicles for a series of driveways from the through travel lanes.

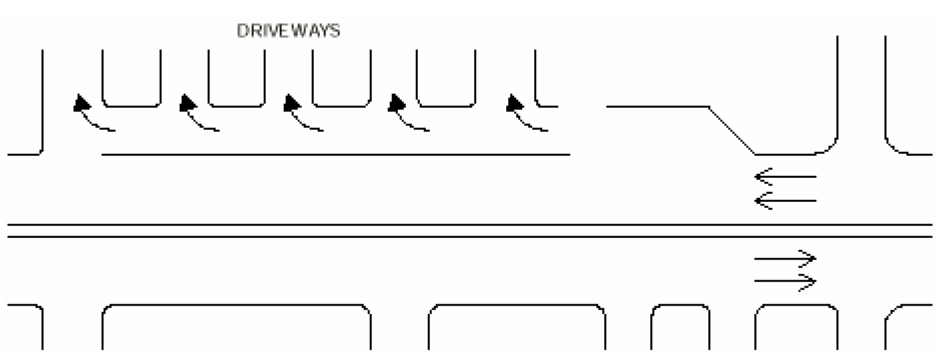
Application

Sections of roadway where the spacing of direct access connections makes the construction of separate right-turn lanes impractical. Where it is desirable to remove the right-turn movements from the through travel lane to reduce delays to the through traffic. Where there has been a problem with rear-end conflicts caused by right-turning vehicles along a roadway section with numerous access connections. ***This technique can create problems for exiting traffic and should only be used if other remedies cannot be applied. It is preferable to reduce the number of access points.***

Implications

- Reduces speed differential between through and right-turning vehicles.
- Reduces delay to through vehicles.
- Length should be limited to discourage use by through traffic.
- Allows for right-in and right-out.

Right Turn Deceleration Lanes Servicing Several Driveways



Converting Access to Right-In/Right-Out

Existing driveways providing all movements may develop operational problems as street congestion increases. Operational problems related to left turns may be remedied by restricting movements to right-in and right-out.

An alternative location for performing left turns must exist before an entrance is restricted to right movements only. The best locations for imposing restricted movements are grand fathered driveways that don't meet current access criteria. The intersection should be redesigned using restrictive channelization (above and beyond the simple islands shown in Technique 10).

Conversion of a driveway to right-in/right-out movements only is considered to be within SDDOT's authority for maintaining the highway system. No landowner compensation is required unless additional right-of-way is needed.

RESOURCES

There are a number of web-based resources available to assist transportation professionals in understanding access management and solving access problems. Some of the helpful links are provided in this section.

First, state and local access management officials coordinate on the maintenance of a comprehensive site devoted to access management. The following site provides good background on the latest happenings in access management: http://www.accessmanagement.gov

The State of Colorado was one of the pioneers in conducting programmatic access management. Their statutes and procedures can be found through the following reference: www.dot.state.co.us/AccessPermits/index.htm

The Center for Urban Transportation Research at the University of South Florida is a leader in access-related research. Their work can be found at: www.cutr.usf.edu

The Center for Transportation Research and Education at Iowa State University has produced some very user-friendly access materials. The general site for CTRE is: http://www.ctre.iastate.edu/Research/access/index.htm In particular, refer to their access management handbook: http://www.ctre.iastate.edu/Research/access/amhandbook/index.htm Also, their toolkit provides easy-to-understand one and two-page summaries of access issues and techniques http://www.ctre.iastate.edu/Research/access/toolkit/index.htm Many people with access duties keep a notebook with the toolkit pages and make copies for public education. Selected toolkit pages are reproduced in this section.

Many access-related reports are available through the Transportation Research Board: http://www.nas.edu/trb/index.html .