4-Developing an Access Management Program

Introduction

Development along an arterial often has a major impact on traffic safety and traffic carrying capacity. The following pages describe access management strategies that can be used to plan development on land abutting the community's arterials. Specific strategies are illustrated to show how they work and why they are important.

Encouraging wide spacings between driveways is the single most important step that a municipality can take to ensure safety and maintain the traffic carrying capacity of its arterials. When local officials review a development proposal that is adjacent to an arterial, a primary consideration should be for the safety of people traveling on the arterial, and a secondary consideration should be for people entering and leaving the proposed development.

The following strategies are aimed at encouraging safe conditions. They have the added benefit of preserving traffic carrying capacity. These concepts can be included in a local zoning, site plan review, traffic, or subdivision ordinance.

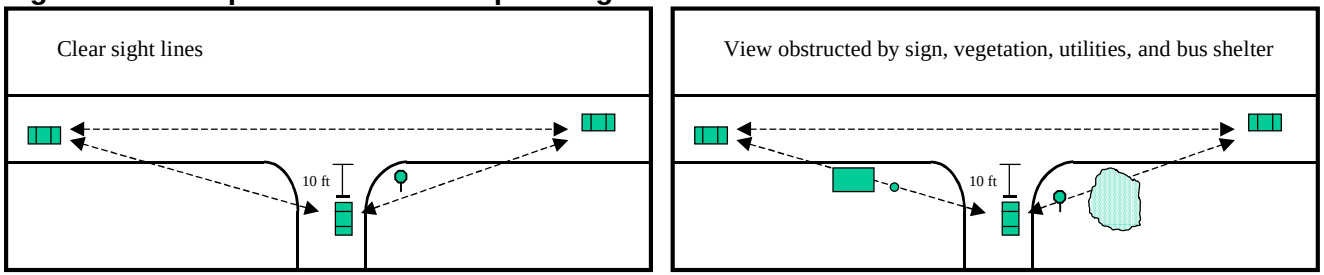
Access Management Strategies

Suggested access management strategies fall into three categories: limiting driveway numbers, removing slower-moving traffic from the arterial, and general strategies.

Limiting Driveway Numbers

Sight Distance. One of the most important actions a community can take to assure that its arterials will be safe for motorists and pedestrians is to require a safe sight distance for residential and non-residential development. Sight distance is the length of highway visible to a driver. A safe sight distance is the distance needed by a driver on an arterial, or a driver exiting a driveway or street, to verify that the road is clear and to avoid conflicts with other vehicles (Figure 18). The Iowa DOT's sight distance policy (see Appendix C) is based upon posted daytime speed limits. Table 4 shows the required distances for access to Iowa's primary highways at speeds of 35 and 45 miles per hour.

Figure 18—Adequate versus inadequate sight distances



Source: Adapted from Endnote (2)

Table 4—Iowa safe sight distance policy

Posted Speed Limit (mph)	Distance Required (feet)	
	Desirable	Minimum
35	395	265
45	560	395

Source: Iowa Primary Road Access Management Policy (Appendix C)

The safe sight distance for low and medium volume driveways should be large enough to allow vehicles on the arterial to slow down to a reasonable speed, but not stop, to avoid a collision with vehicles exiting a driveway. The safe sight distance for high volume driveways should be higher to allow a greater margin of safety.

A community should require that all new developments, including individual residences, subdivisions, and commercial developments meet a minimum sight distance requirement prior to the issuance of any permits or approvals (Figure 19). Ensuring that a safe driveway will be built is far easier during the development review process than after a project has been approved.

Figure 19—Inadequate sight distance (viewed from a driveway)

Minimum Distance between Driveways. Maintaining a minimum distance between driveways along an arterial minimizes the number of access points that a driver must monitor. This simplifies the driving task and reduces the opportunities for conflicts and crashes. There are no hard and fast guidelines for driveway spacing. In practice, guidelines must reflect a balance between traffic and engineering conditions and needs, local development objectives, and existing land-use characteristics (such as lot sizes, land-use type, and frontage requirements). Spacing requirements should be based, among other factors, on speed limits, the classification of the roadway, or the amount of traffic generated by a development. The Transportation Research Board (TRB) has published general guidelines (Table 5) for unsignalized access spacing.

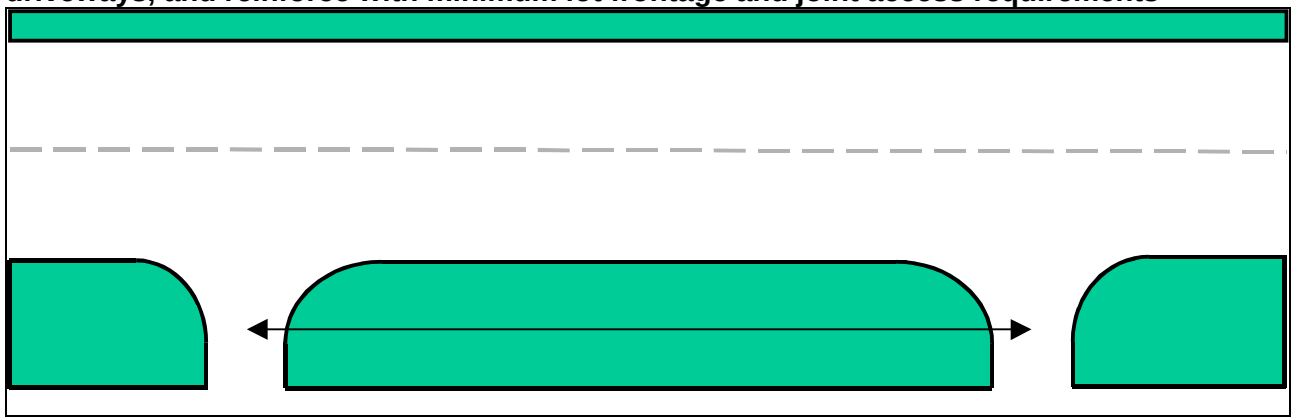
Table 5—General guidelines for unsignalized access spacing

Operating Speed	
30 mph	100 to 200+ feet
45 mph	300 to 550+ feet
Type of Facility	
Major Arterials	300 to 500 feet
Minor Arterials	100 to 300 feet
Collectors	100 to 200 feet

Source: Adapted from Endnote (9)

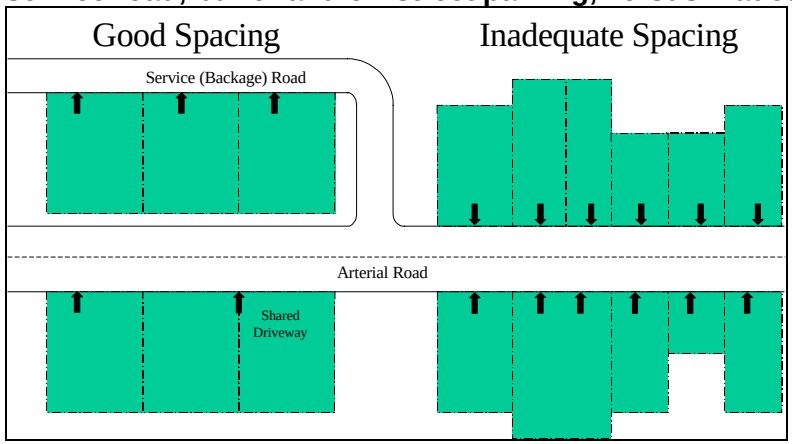
Shorter access spacings can be permitted on roadways having a raised center median and on lower classification roadways. Longer spacings are desirable on roadways in rural areas where speeds are higher. These guidelines can be used for both residential and non-residential development. Consideration should be given to establishing a frontage requirement that is consistent with the driveway spacing guideline (Figures 20–22).

Figure 20—Driveway spacing guidelines: Adopt minimum spacing requirements for driveways, and reinforce with minimum lot frontage and joint access requirements



Source: Adapted from Endnote (10)

Figure 21—Good spacing, with widely spaced driveways and deep lots with space for a service road, buffer and off-street parking, versus inadequate spacing



Source: Adapted from Endnote (3)

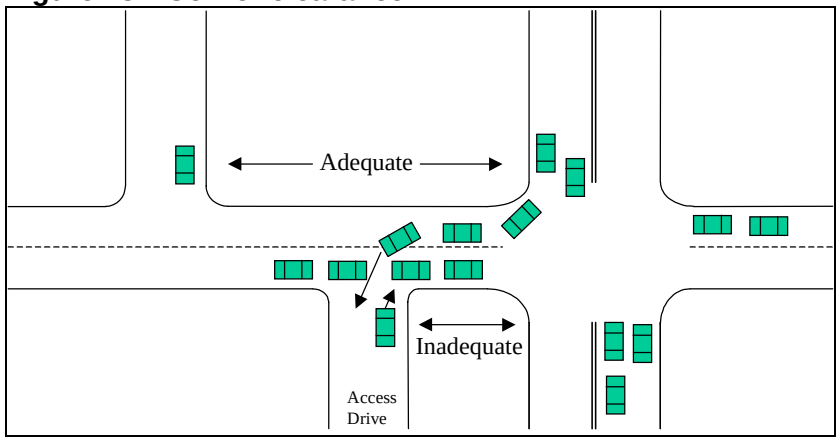
Figure 22—Inadequate driveway spacing

Maximum Number of Driveways Per Lot. Every driveway or intersecting street along an arterial has the potential to reduce the ability of the arterial to move traffic. While it is important to allow access to property, a municipality can limit the number of driveways permitted on any lot. Regulating the maximum number of driveways per property frontage limits the number of conflict points and provides drivers more time and distance to execute their maneuvers.

Corner Clearances. Establishing a minimum distance on an arterial between a driveway and an intersection can decrease the likelihood of crashes and minimize the interruptions to the flow of traffic. Inadequate clearance between driveways and intersections creates many conflict points within too small an area (Figure 23). Ideally, corner clearances on major roadways should be the same as driveway spacing requirements.

When this cannot be achieved due to a lack of frontage, the upstream corner clearance should be longer than the longest expected queue at the adjacent intersection.

Figure 23—Corner clearance



Source: Adapted from Endnote (11)

Corner clearance guidelines preserve good traffic operations at intersections, as well as the safety and convenience of access to corner properties. Factors affecting safe corner clearances include the posted speed limit, whether the driveway is "upstream" or "downstream" from the intersection, and whether or not the intersection is signalized.

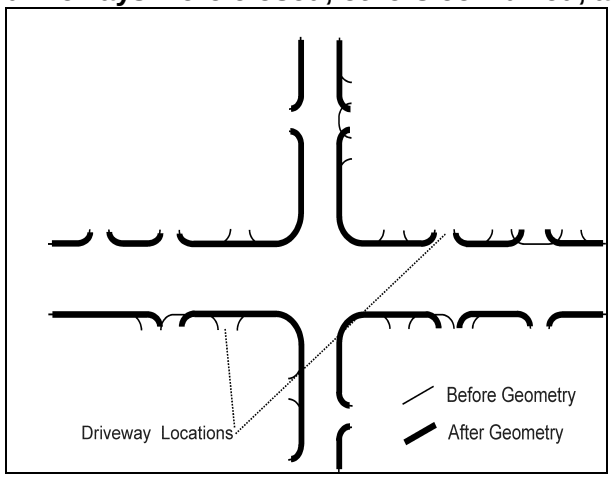
Figure 24 depicts one of the top 100 crash sites in Iowa. Inadequate access control is a contributing factor to many of the crashes.

Figure 24—Inadequate corner clearance: safety and operational concern

Communities should zone for higher volume uses, such as neighborhood convenience centers and grocery stores, near intersections of through streets. They can require corner lots to be larger to accommodate such uses and establish a minimum corner clearance for driveway connections at intersections and corners (Figures 25–26).

Figure 25—Good corner clearance and large lot to accommodate high volume use (traffic signal indicates location of intersection)

Figure 26—Driveway treatments: an example access management project in which some driveways were closed, others combined, and others cleared away from corners



Access to Service or Minor Road—Residential Development. A row of residential driveways along an arterial can reduce its traffic carrying capacity and lower the safe speed. Although it might be easier and cheaper for a land developer to subdivide the frontage rather than construct interior roads, the public loses when the result is unsafe conditions, congestion, lower speed limits, and eventually a need for costly road improvements (Figures 27–28).

Figure 27—Subdivision development

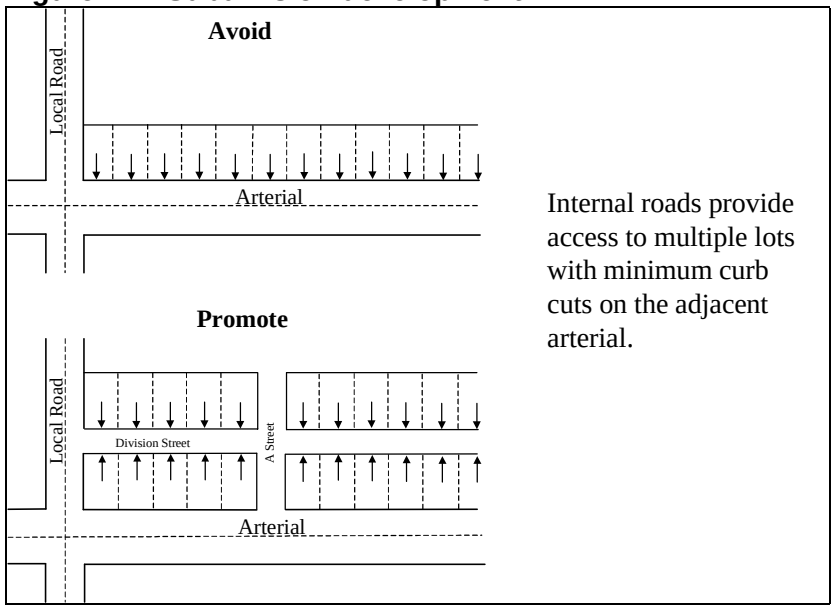


Figure 28—Internal access roads

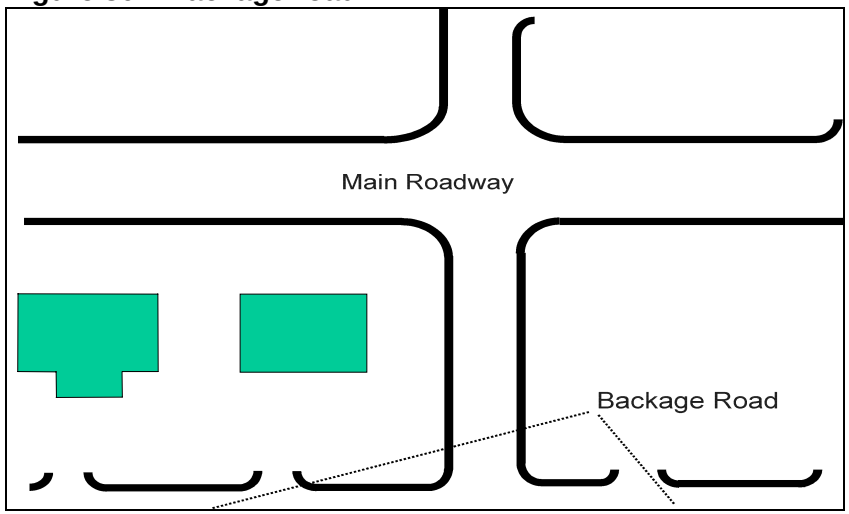
It is better to construct interior roads that provide access to lots. This reduces the number of access points and preserves the capacity of the arterial to carry large volumes of traffic. Some municipalities have used incentives to encourage developers to construct internal roads, rather than subdivide along the length of an arterial. For example, a municipality can consider a large frontage requirement on the arterial, such as a requirement that the frontage correspond to the driveway spacing guideline, but a much smaller frontage requirement on the internal road. For projects that are not subject to review, municipalities can also allow narrower internal roads, especially if the subdivision is built around a cul-de-sac.

Access to Service or Minor Road—Non-residential Development. A municipality can also require that developers of new businesses, shopping centers, and mini-malls provide a common service road parallel to the arterial (Figure 29). The businesses would then front on the service road, rather than the arterial. Vehicles can move between the arterial and the service road at one or two points that can be controlled with a traffic signal if necessary. If there is more than one developer, or if development proceeds piecemeal over time, the community may allow smaller sites to be served by an individual entrance until such time as adjacent lots are developed. When the service road is constructed, the temporary commercial driveways can be closed or consolidated into one or two access points.

Figure 29—Frontage road

Frontage roads may cause more problems than they solve if they are not set far enough back from an arterial. If frontage roads are only set back one or a few car lengths from the arterial, additional conflicts are created. The TRB recommends a separation of up to 300 feet between frontage roads at cross streets and the arterial. Problems associated with frontage roads can be overcome through careful attention to design and placement. "Backage" roads with development along both sides are preferable to frontage roads because they allow for greater distance between the connection and the intersection (Figure 30).

Figure 30—Backage road



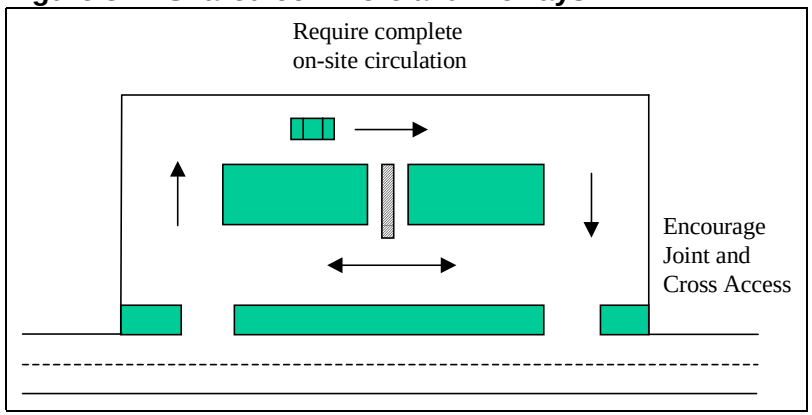
Corner Lot Access. On corner lots that abut both an arterial and a local road, a municipality can require that access to the proposed development be limited to the local road (Figure 31). This will reduce conflict frequency and severity by diverting some vehicles to roads where traffic volumes and speeds are lower.

Figure 31—Access to corner lot limited to local road

Shared Driveways—Residential Development. Shared driveways are another means of limiting the number of access points along an arterial. The shared driveway guideline should apply to new developments, not existing neighborhoods.

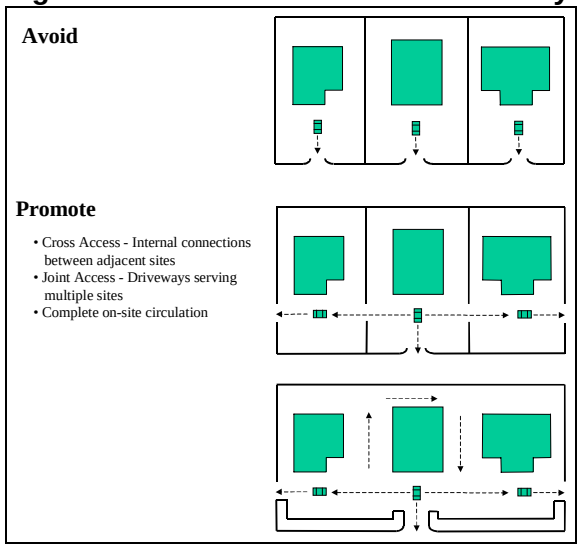
Shared Driveways—Non-residential Development. When a developer proposes to establish more than one business or other non-residential development at a given location, or when a series of adjacent developments are proposed over time, municipal officials have an excellent opportunity to require shared commercial driveways. Shopping centers and mini-malls should have shared commercial driveways (Figures 32–34). However, even a shared entrance for a smaller development involving two or three businesses is beneficial and helps preserve the traffic carrying capacity of the arterial.

Figure 32—Shared commercial driveways



Source: Adapted from Endnote (10)

Figure 33—Shared commercial driveway recommendations



Source: Adapted from Endnote (10)

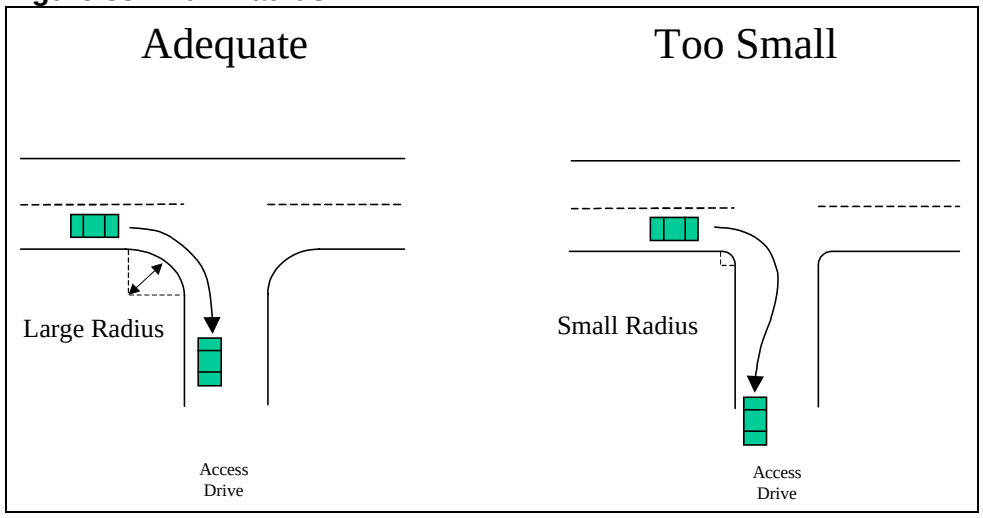
Figure 34—Businesses sharing a common driveway

Removing Slower Turning Traffic from the Arterial

Turn Radius, Driveway Width, and Driveway Slope. Guidelines for a minimum turn radius, driveway width, and driveway slope are important because they help slower, turning traffic move off the arterial more quickly, and help the traffic leaving a driveway turn and enter the stream of traffic more efficiently. Requirements for turn radius, driveway width, and driveway slope are generally applied to non-residential developments and subdivisions.

Turn Radius**.** The turn radius (or return radius) refers to the extent that the edge of the commercial driveway is "rounded" to permit easier entry and exit by turning vehicles. As shown in the diagram, a larger radius results in an "easier" entrance or exit movement for vehicles. The driveway movement can be performed at a greater speed and with less encroachment into oncoming through traffic (Figure 35).

Figure 35—Turn radius



Source: Adapted from Endnote (2)

The preferred turn radii will depend on the type of vehicles to be accommodated, the number of pedestrians crossing the access road, and the operating speeds of the accessed roadway. Since larger vehicles require larger turn radii, the turn radius should be designed to accommodate the largest vehicle generally expected to use the driveway. For example, a driveway to a gas station should be designed to accommodate a gasoline delivery truck. A minimum 15-foot turning radius should be provided in areas of heavy pedestrian traffic such as business districts and school crossings. Tighter radii should only be used for serving residential drives from low-speed roadways. In most suburban settings, 25 feet to 50 feet radii are desirable.

Driveway Width**.** It is important to regulate the maximum width of non-residential driveways. If the driveway is too wide, as is often the case, there is unrestricted access and no curb. The end result may be an enormous driveway, which is unsafe to drivers, who may have a hard time deciding where to position themselves, and to pedestrians, who will have a greater distance of pavement to cross. In the worst case, uncontrolled access across the entire frontage leads to a severe deterioration in the level of service of the arterial and to costly road improvements (Figure 36). On the other hand, if the driveway is too narrow, the access speed to and from the driveway will be slow, impinging on through traffic.

Figure 36—Driveway width: unrestricted access creates potential safety concern

All noncommercial driveways should normally have a width between 14 feet and 24 feet. Where a driveway is to be used by larger vehicles (farm equipment or trucks) at least a 20-foot width should be provided. Commercial driveways may vary from a minimum 14 to 16 foot wide one-way in or one-way out drive to a maximum of two inbound and three outbound lanes (each at least 11 feet wide).

Driveway Slope**.** The slope (vertical alignment) of the driveway should not be too steep. Steep driveways force motorists to unduly slow their speed when entering or exiting the driveway. A motorist slowing to negotiate a steep driveway may block through traffic on the arterial, cause through traffic to slow, and create the potential for crashes (Figure 37). In all cases, the profile must be sufficient to provide adequate vertical clearance between the surface and the vehicle. Access drives on major streets should permit the driveway maneuver to be made smoothly and comfortably at a forward speed of at least 10 miles per hour.

Figure 37—Driveway slope: Steep slope forces motorists to unduly reduce speed to negotiate driveway. This vehicle is almost "bottoming out."

Driveway Throat Length. Commercial driveway entrances should be designed to prevent a back-up of waiting vehicles on the arterial. This is particularly important for businesses with a drive-through service, or businesses that generate a high number of vehicle trips per day. The depth of the formal entrance way is referred to as the "throat length" (Figures 38–41).

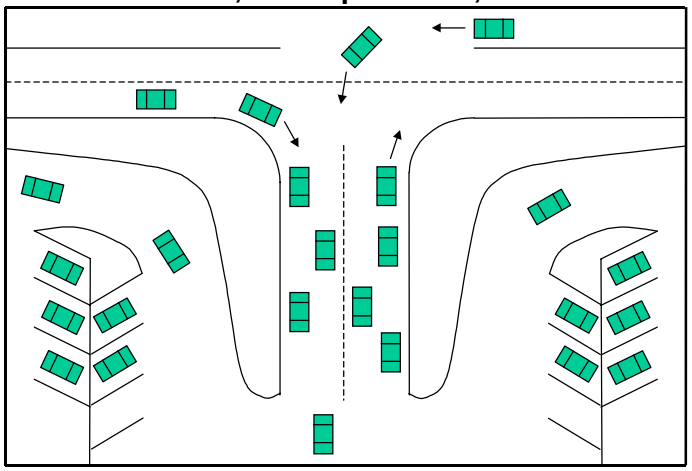
Throat length should be determined on a case-by-case basis, but generally varies according to the number of trips generated by the land use. Table 6 provides examples of different sized retail establishments and recommended driveway throat lengths. A traffic impact study based on peak hour demand is the best way to determine the extent of potential queuing problems and how best to resolve them.

Table 6—Example throat length requirements

Type of Retail Establishment	Recommended Throat Length	Approximate Number of Cars
Small strip mall	75 to 95 feet	5
Small shopping center or large supermarket	200 feet	11
Large regional mall	500 feet	28

Source: Adapted from Endnote (9)

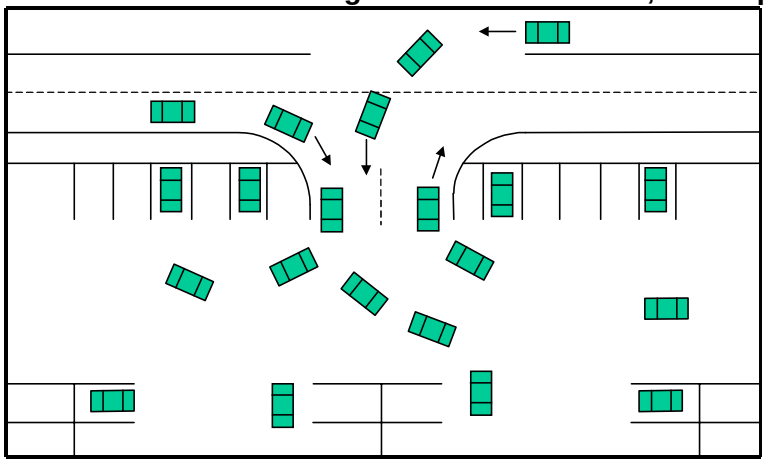
Figure 38—With adequate throat length, stacking, or queuing, occurs on site. This reduces driver confusion, traffic problems, and unsafe conditions.



Source: Adapted from Endnote (3)

Figure 39—Good example of sufficient driveway throat length

Figure 40—Insufficient throat length and poor site planning can cause unsafe conditions and result in vehicles backing out onto the arterial, interrupting traffic flow.



Source: Adapted from Endnote (3)

Figure 41—Example of insufficient driveway throat length

Landscaped Buffers. Landscaped buffers can be an important access management tool because they can define commercial driveway points and help make them safer (Figure 42). The width of the buffer can vary, depending upon the building setback and the function the buffer serves. It is important that buffers not interfere with sight distances from the exit.

Figure 42—Commercial driveway with wide landscaped buffer

Right Turn Deceleration Lane. Right turn lanes and tapers help to get turning vehicles out of the through traffic lanes. A municipality can require that a developer install a right turn, or deceleration lane. Right turn lanes or tapers reduce traffic delays that would otherwise occur as through traffic slows to permit turning traffic to exit the arterial (Figures 43–45). A deceleration lane should be used when a specific threshold of turning traffic is reached or when a traffic impact study indicates that a right turn lane is needed. Level-of-service criteria, volume warrants, crash experience, existing traffic operations, or engineering judgment that indicates a safety concern to right turning vehicles can justify the need for right turn deceleration lanes. The length of the deceleration lane will also vary according to the speed of traffic on the arterial. However, the turn lane should be sufficient length to allow the turning vehicle to leave the through lane at the posted speed limit, decelerate, and negotiate the turn.

The 1985 "Highway Capacity Manual" suggests that a separate right turn lane should be considered when the right turn volume exceeds 300 vehicles per hour and the adjacent through lanes also exceed 300 vehicles per lane. Therefore, only fairly large developments, such as a medium-sized or larger shopping center, would warrant a right turn lane. On lower-volume driveways in areas with limited right-of-way, tapers may be used to help remove turning vehicles from the roadway more quickly. Tapers may be most useful in rural areas, where speeds are high and volumes low.

Figure 43—Right turn lanes

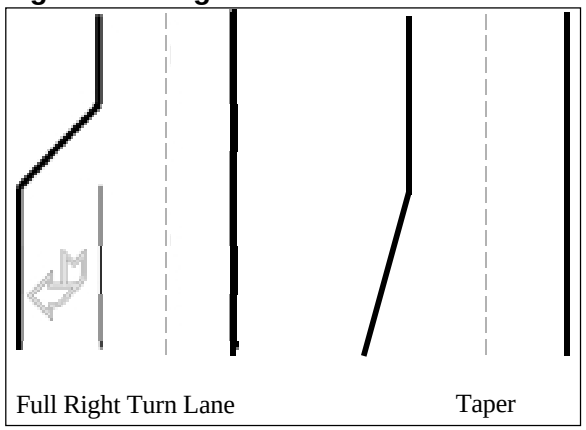


Figure 44—Right turn lane

Figure 45—Taper

Left Turn Lanes. A left turn lane may be warranted when arterial traffic reaches a specified threshold. The construction of a left turn lane on a heavily traveled arterial can reduce the conflict and delay that occur when through vehicles turn left across traffic. A left turn lane can also reduce conflicts that occur when cars behind the turning vehicle have to slow down, stop, or pass on the right of the turning vehicle. The left turn lane separates the turning vehicle from through traffic and provides a storage area where a number of left turning vehicles can wait to make a turn. Left turns can also be controlled through median strips that allow left turns at certain controlled points (Figures 46–50).

Figure 46—Left turn lane with raised median at intersection

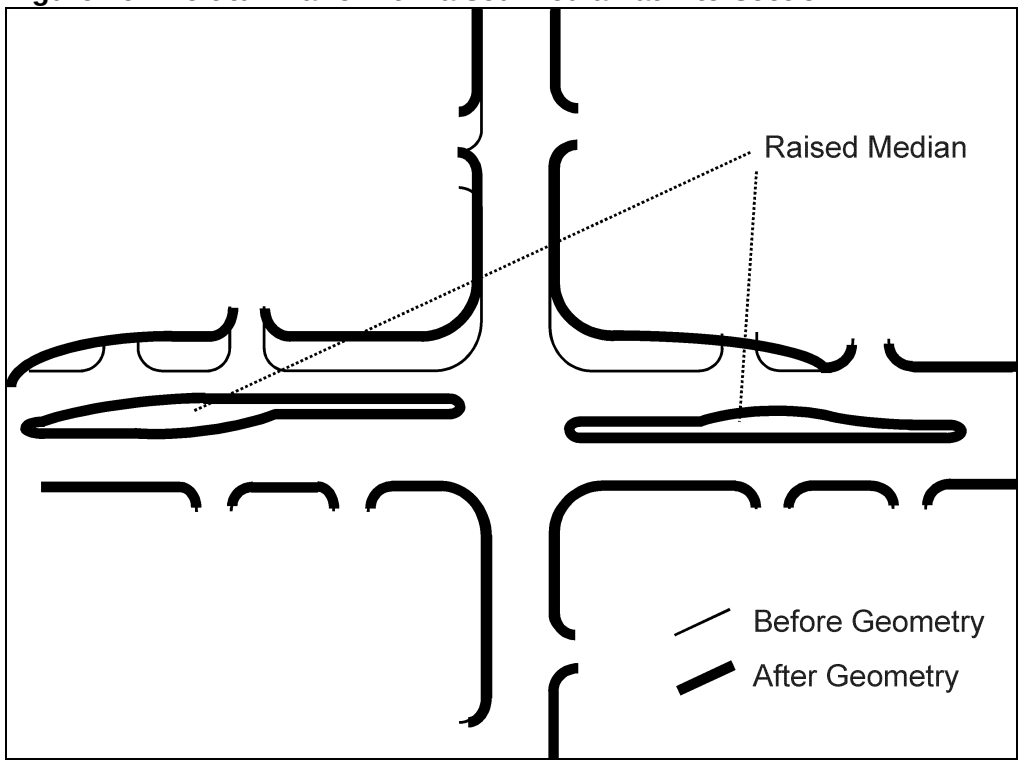


Figure 47—Left turn lanes with continuous raised median

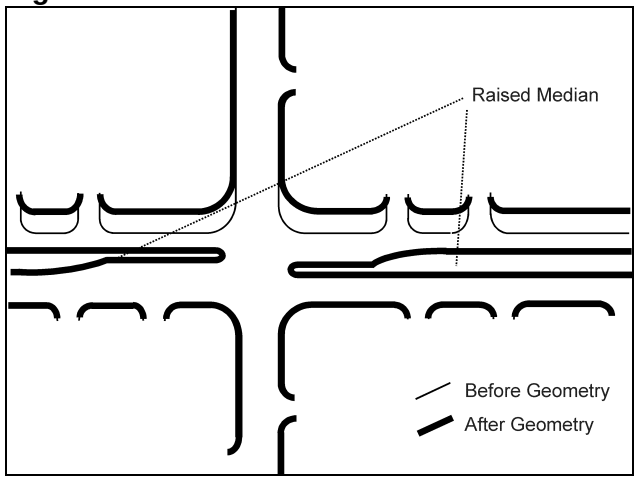


Figure 48—Left turn lanes with continuous raised median

Figure 49—Continuous two-way left turn lane

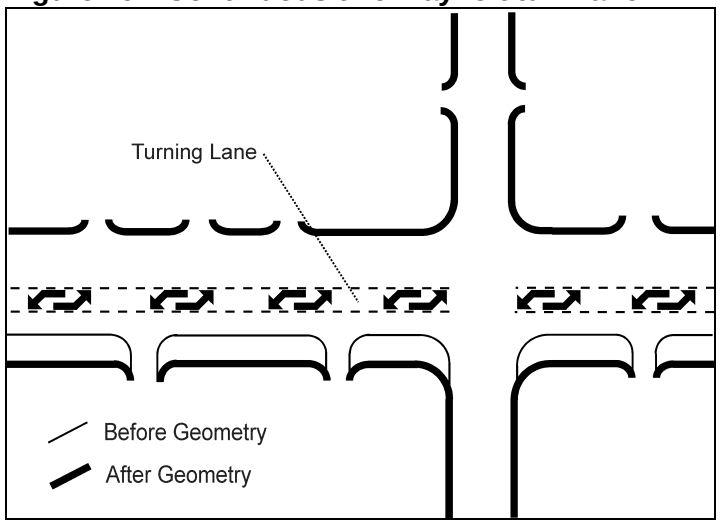
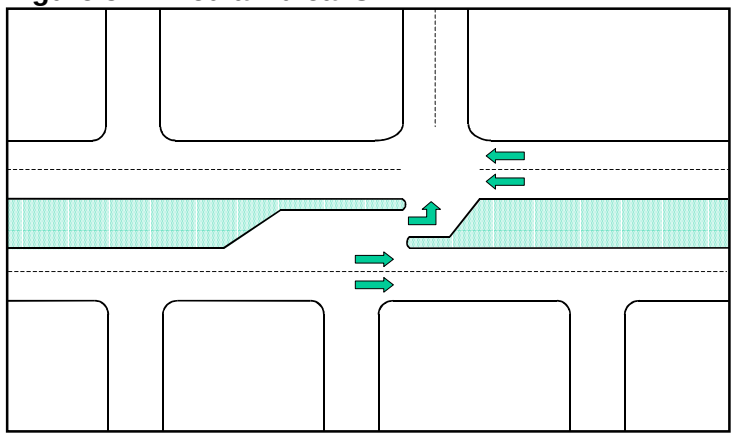


Figure 50—Continuous two-way left turn lane

When medians extend the full length of a road, the spacing of intersections and median breaks are crucial to providing access to properties on both sides of the road. In Figure 51, the median break allows for a left turn onto the side street. The median prevents vehicles from crossing the arterial and making left turns from side streets onto the arterial. Median breaks should generally only be provided at public road intersections or at driveways shared by several businesses. They should generally not be provided for access to individual businesses or residences. The number of median breaks should be kept to a minimum since they add conflict points and detract from safety.

Figure 51—Median breaks



Source: Adapted from Endnote (12)

Table 7 compares advantages and disadvantages of raised medians and two-way left turn lanes. Raised medians fully separate opposing traffic, define where turns and crossings are allowed, and provide a safe refuge for pedestrians. Raised medians are most desirable at major activity centers where relatively few high volume driveways provide access to adjacent properties. Where left turn lanes are not provided, raised medians limit land access to right turns only. Two-way left turn lanes are most appropriate for arterials that have a relatively high number of low volume driveways, such as strip commercial developments. However, selecting the appropriate design is a complex process that

involves consideration of many factors, including the number of through lanes, through traffic volumes, left turn volumes, access point density, and land use.

Table 7—Advantages and disadvantages of raised medians and two-way left turn lanes

Raised Median

Advantages	*Disadvantages*
+ Discourages strip development	- Reduces operational flexibility for emergency vehicles
+ Allows better control of land uses by local government	- Increases left turn volumes at median openings
+ Reduces number of conflicting maneuvers at driveways	- Increases travel time and circuity for some motorists
+ Provides pedestrian refuge	- May increase crashes at openings
+ If continuous, restricts access to right turns only	- Limits direct access to property
+ Reduces crashes in mid-block areas	- Operating speed usually limited to 45 miles per hour
+ Separates opposing traffic	

Two-Way Left Turn Lane

Advantages	*Disadvantages*
+ Makes use of odd-lanes	- Encourages random access
+ Reduces left turns from through lanes	- Illegally used as a passing or acceleration lane
+ Provides operational flexibility for emergency	- Offers no refuge for pedestrians
+ Safer than roads with no left-turn lanes or medians	- Higher maintenance costs
+ Facilitates detours	- Operates poorly under high volumes of through traffic
+ Separates opposing traffic	- Allows head-on crashes

Source: Adapted from Endnote (9)

Other Access Management Strategies

Traffic Impact Study. A traffic impact study is a report that analyzes how traffic generated by a proposed project will change existing traffic conditions on the arterial. A traffic engineer working for a developer, a neighborhood group, city, county, or the Iowa DOT may prepare it. Depending on the type and size of development, the impact study may range from a cursory examination of the site, the projected traffic volumes, and the impact on adjacent streets, to a detailed report that analyzes the estimated impacts of the development on a wide area and recommends a number of mitigation measures. A traffic impact study can be an integral part of a municipality's development review process. There are a number of reasons for preparing a traffic impact study:

- It ensures that the driveway and on-site circulation plan will be safe before it is built, thus avoiding or minimizing costly corrective action.
- It can result in better access management.
- It places the responsibly for congestion mitigation on the developer.
- It saves the community/county/state future costly highway improvements.
- It offers an opportunity for the municipality and developer to work together jointly to improve traffic conditions.

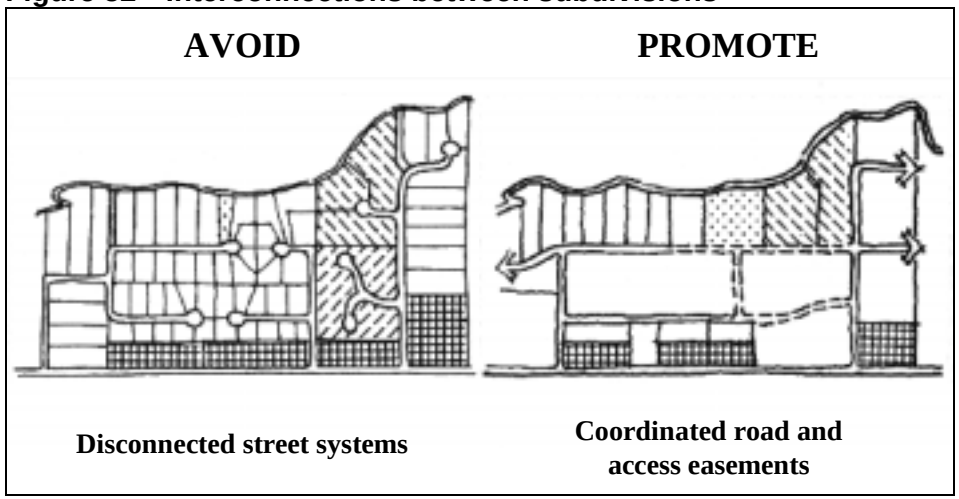
A traffic impact study should be required when a proposed new development, or change of use, will generate traffic in excess of a specified threshold established by the community. If the number of vehicle trips at the proposed driveways during a one-hour period exceeds this threshold, a modification or alteration would be needed to prevent increased congestion.

A traffic impact study should also be required for proposed changes in the use of a commercial or industrial site, and for projects in problem areas where there is a high crash rate or where the adjacent arterial is near its design capacity. Based on the results of the traffic impact study, a developer may be required to undertake on-site or off-site improvements (turning lanes, traffic signal improvements) to

mitigate the negative impacts that the development may create. The requirements for a traffic impact analysis should be included in a local ordinance.

Interconnections—Subdivisions. Requiring developers to provide interior roads on property they subdivide along arterials is an important step in maintaining safety and preserving capacity, but it may not be enough in a growing community. When a number of subdivisions are built adjacent to one another, each with its own access to the arterial, drivers may use the arterial to travel from one subdivision to another, thus contributing to highway congestion. A simple remedy is to require that a subdivision contain connecting points to adjacent, undeveloped land, where feasible, and that adjacent subdivisions inter-connect. This can reduce traffic on the arterial and help create a sense of community continuity, rather than isolation (Figure 52).

Figure 52—Interconnections between subdivisions

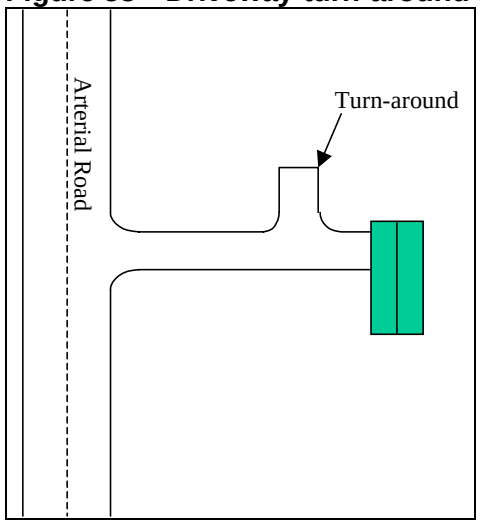


Source: Endnote (10)

Interconnections—Commercial Development. A municipality may encourage or require that new commercial developments be designed to connect with adjacent commercial development or, if the adjacent land is vacant, to allow for future internal connections. Requiring internal vehicle connections will limit the number of times a driver has to enter the arterial when traveling between adjacent businesses.

Driveway Turn-Around Area. Some jurisdictions require that private driveways on arterials have a turn-around area, as shown in Figure 53. A driveway turn-around eliminates the need to back out onto an arterial, which can be a potentially hazardous maneuver. While driveway turn-arounds are relatively rare, they are an example of innovative thinking that could increase traffic safety on an arterial. No Iowa cities were known to have a law requiring a driveway turn-around at the time of this publication, but a turn-around's benefits can be observed where homeowners have voluntarily installed this type of treatment for their own safety.

Figure 53—Driveway turn-around area



Source: Endnote (3)

Parking. The capacity and safety of an arterial can be compromised by the lack of off-street parking or by poorly designed parking facilities. In downtown areas, a city can provide municipal off-street parking facilities in conjunction with on-street, parallel parking. A municipality can also limit on-street parking during peak traffic hours. In all other areas, a municipality can require that businesses provide off-street parking.

Loading/Unloading. Truck loading/unloading operations can have a negative impact on traffic flow if any portion of the arterial is blocked, if backing movements take place on the arterial, or if the truck blocks or impedes the entrance to a commercial business. A municipality can include guidelines for loading bays and on-site maneuvers. When on-street deliveries are the only alternative, such as in an old downtown area, municipalities can restrict peak hour deliveries and pickups.

Public Transit. Improved transit access requires attention to the proximity and mix of land uses, continuity of pedestrian and bicycle ways, and coordination of land use and transit decisions. Mixed use activity centers, for example, create transit destinations and are more consistent with access management principles than strip development.

Clustering transit-compatible uses around a bus turn-around or locating buildings near the street line with parking in the rear provides more direct pedestrian and transit access and helps facilitate shared access. Bus pullout bays for transfer points reduce vehicular conflicts and preserve traffic flow by removing buses from through-traffic lanes.

Local governments and transit agencies may ensure that sites have adequate transit access by coordinating on a review of development sites. This may include guidelines for transit stops and stations, bicycle parking, bicycle paths, sidewalks, and direct bicycle and pedestrian access to buildings (Figure 54).

Figure 54—Bus pullout bay

Pedestrians and Bicyclists. Almost all access management designs and operational strategies impact pedestrians and bicyclists. In general, pedestrians and bicyclists need to be well protected where they cross major streets. Where vehicles cross pedestrian or bicycle facilities, the design should accommodate vehicles at low speeds. The following strategies promote pedestrian and bicycle travel.

- *Driveway spacing*. Larger driveway spacing reduces conflicts and hazards.
- *Sidewalk location*. Locating sidewalks away from the curb offers many operational and safety benefits. If the buffer strip is of an adequate width, drivers can pull completely out of the traffic stream before yielding to a pedestrian. Pedestrians are separated from street traffic and better protected.
- *Medians*. Medians offer areas of safe refuge to pedestrians. Pedestrian crash rates are lower on roads with raised medians than on undivided highways or those with continuous two-way left turn

lanes. Medians with cut throughs and adequate storage space promote pedestrian and bicycle safety.

- *Mid-block crossings*. Mid-block pedestrian crossings can reduce crashes, travel distance, and inconvenience.
- *Right turn lanes*. Right turn lanes can reduce speeds at the sidewalk crossing and reduce conflicts and confusion. Right turn lanes provide a dedicated space for vehicles to decelerate and turn using a minimum turn radius. This allows for slower turning speeds and narrower crossings for pedestrians.

Table 8 offers an example multi-modal access plan as a guide for anticipating a project's transportation needs.

Table 8—Example multi-modal access management plan

Access Level	Description/Function	Transit	Pedestrian	Bicycles
Freeway/ Expressway	High-speed, long distance travel Motor vehicle access only at grade-separated interchanges All direct access rights to property by deed	Regional transit stations Express bus service	Consider provision of independent trails Provide grade-separated crossings where needed Accommodate pedestrians at interchanges & grade separations	Consider provision of independent trails Provide grade-separated crossings where needed Accommodate bicyclists at interchanges & grade separations
Other Strategic Arterials	Move people and goods over long distances Properties may have right-in, right-out access where access rights have not been acquired & where there is no reasonable alternative access Wide spacing required for motor vehicle entrances and street intersections	Express bus service Transit stops and flag stops	Provide parallel pedestrian facilities in developed areas Accommodate pedestrians at intersections Provide grade separated crossings and mid-block crossings where needed	Shoulders may be useful for bicycle trips Merge and diverge locations need to be managed
Minor Arterials & Collectors	Serve motor vehicle traffic while accommodating other travel modes Serve moderate distance traffic that may operate at high or moderate speeds Moderate spacing guidelines	Location of most transit routes Provide transit stops at subdivisions and developments	Provide sidewalks on both sides in centers and multi-modal areas Land developments must accommodate pedestrian mobility and access Provide cross-walks at intersections Consider mid-block crossings with refuges where pedestrian crossings are likely Employ appropriate traffic calming measures where needed	Location of most bicycle travel Consider designating bicycle lanes or routes Land development should assure good bicycle access and parking
Local Streets	Provide convenient access to property Driveway spacing as close as 50 feet Discourage through traffic and speeding through roadway design	Assure good and direct pedestrian connections to higher volume streets with transit service	Sidewalks normally required Provide linkage trails if street layout restricts pedestrian mobility Assure a safe walking environment	Low traffic volume and speed accommodates bicycles Can be used with linkage trails to create alternative bicycle routes

Source: Delaware Dept. of Transportation