Chapter 3
Guidelines for Public Street and Driveway Connections

3.1 Overview

For each access category, guidelines have been developed for the spacing of public street connections and the allowance of driveways to the state trunk highway system. The guidelines are summarized in Figures 3.1 and 3.2.

3.2 Public Street Connections

3.2.1 Background and Approach

Guidelines for the spacing of public street connections to the trunk highway system are based on the following principles and technical considerations:

1. Network Connectivity

   To promote the development of a hierarchical network of interconnected roads throughout the state, the guidelines use a tiered approach to access connections. Access is limited and reserved first for primary, full-movement intersections connecting major public streets and highways. The guidelines provide for additional secondary public street intersections at one-half the spacing of full-movement intersections, under certain conditions.

2. Urban Arterials: Balancing Safety and Mobility through Coordinated Signal Progression

   State highways and major arterials extending through urban communities serve two groups of customers with somewhat competing needs: the through-trip drivers, who desire to travel through the community without undue speed reductions and signal delays, and the local-trip drivers, who need to cross or travel on a segment of the highway to get to home, work, and services within the community. To determine the optimal balance between these competing demands, Mn/DOT conducted corridor simulations for 1 mile, ½ mile, and ¼ mile intersection spacing to compare the mobility benefits of signal progression on the mainline with overall network travel time and delays.

   Based on these simulations, the recommended spacing of primary, full-movement intersections is directly related to the spacing of signals and the need to achieve signal progression. This is because every full-movement intersection represents the potential for a traffic signal. When signalized intersections are uniformly and adequately spaced, however, platoons of vehicles can travel in both directions through the corridor at uniform speeds without needing to stop for each signal. This reduces delays for through-movements and increases the carrying capacity of the roadway.

   The intersection spacing guidelines also make allowance for additional unsignalized intersections at one-half the spacing of signalized intersections, but restrict turning movements to right-in/right-out-only on higher-volume, divided roadways. This denser network of intersecting streets may disperse traffic among multiple access points and may actually eliminate or delay the need for signalization at an intersection. The additional street access also can reduce the need for individual driveways by providing a denser supporting road network for the corridor.

3. Rural Areas: Maintaining the Historical Road Network

   Throughout much of rural Minnesota, the Township-Range System and the US Public Land Survey's one-mile section grid have served as the framework for the development of a roadway grid system spaced at 1 mile, ½ mile, and ¼ mile intervals. Over time, some of these roads have assumed a more important function within the network and have been classified as minor arterials and collectors. Typically, the more important roads were about a mile apart and located on the township or range lines. This grid system remains the prevailing factor in the spacing allowance of rural intersections.

4. Rural Areas: Providing Adequate Intersection Geometrics

   The spacing of intersections on state highways in rural areas is also based on providing sufficient area for left-turn lanes. On two-lane rural highways, the distance needed to construct a left-turn lane typically exceeds 1000 feet.

3.2.2 Policy Guidelines for Public Street Connections

The location of new or reconstructed public street connections should conform to the recommended spacing, summarized in Figures 3.1 and 3.2, for the access category assigned to the roadway segment.

Primary Intersections on IRCs and Non-IRCs
Primary intersection allowance, as summarized in Figures 3.1and 3.2, refers to full-movement intersections that may be considered for signalization if the appropriate signal warrants have been met. The spacing of primary intersections is governed by the need to provide uniform spacing for effective signal coordination in urban/urbanizing areas and adequate spacing for left-turn lanes on unsignalized highways in both urban and rural areas.

Secondary Intersections on IRCs and Non-IRCs
Secondary intersection spacing and allowance, as summarized in Figures 3.1 and 3.2, refers to intersections that may be accommodated midway between primary intersections if they do not create a high-risk conflict condition.

1. On **undivided highways**, a secondary intersection may be provided if the analysis of future traffic conditions, per the *Gap Analysis Procedure* (Section 3.2.3), indicates that a low-risk conflict condition can be maintained. If the analysis indicates a high-risk conflict condition is anticipated, the intervening intersection should not be allowed. Where an undivided highway is planned to become a divided highway, the secondary intersection should be analyzed as if it were a divided highway.
2. On **rural divided highways**, a secondary intersection may provide full movement if the analysis of future traffic conditions, per the *Gap Analysis Procedure* (Section 3.2.3), indicates that a low-risk conflict condition can be maintained. A full-movement, intervening secondary intersection may be subject to future conversion to a right-in/right-out or to a ¾ movement (right-in/right-out/left-in-only) intersection if increased traffic growth creates the potential for a high-risk conflict.

   If the analysis indicates that a full-movement intersection on a divided highway would create a high-risk conflict condition, further analysis, per the *Gap Analysis Procedure* (Section 3.2.3), should be conducted to determine whether restricting the intersection to right-in/right-out-only would maintain a low-risk conflict condition. If the analysis indicates that a high-risk conflict condition would still be created, the intervening intersection should not be allowed, or it should be restricted to a right-in-only, if practicable, given the supporting road network.
3. On **urban/urbanizing and urban core divided highways**, the secondary intersection should be limited to right-in/right-out-only. Secondary intersections in urban/urbanizing areas are not conducive to two-way coordinated signal progression, and therefore, should not be signalized. If a secondary intersection meets warrants for a traffic signal, alternatives such as eliminating some turning movements or diverting some traffic should be considered instead of installing a traffic signal.

Figure 3.1 – Summary of Recommended Street Spacing for IRCs

Category	Area or Facility Type	Typical Functional Class	Public Street Spacing		Signal Spacing
			Primary Full-Movement Intersection	Secondary Intersection	
1	**High-Priority Interregional Corridors & Interstate System (IRCs)**				
1F	Interstate Freeway	Principal Arterials	Interchange Access Only		⊘
1AF	Non-Interstate Freeway		Interchange Access Only (see Section 3.2.7 for interim spacing)		See Section 3.2.5 for Signalization on Interregional Corridors
1A	Rural		1 mile	1/2 mile	
1B	Urban/ Urbanizing		1/2 mile	1/4 mile	
1C	Urban Core		300-660 feet dependent upon block length		
2	**Medium-Priority Interregional Corridors**				
2AF	Non-Interstate Freeway	Principal Arterials	Interchange Access Only (see Section 3.2.7 for interim spacing)		See Section 3.2.5 for Signalization on Interregional Corridors
2A	Rural		1 mile	1/2 mile	
2B	Urban/ Urbanizing		1/2 mile	1/4 mile	
2C	Urban Core		300-660 feet, dependent upon block length		1/4 mile
3	**Regional Corridors**				
3AF	Non-Interstate Freeway	Principal and Minor Arterials	Interchange Access Only (see Section 3.2.7 for interim spacing)		Interim
3A	Rural		1 mile	1/2 mile	See Section 3.2.5
3B	Urban/ Urbanizing		1/2 mile	1/4 mile	1/2 mile
3C	Urban Core		300-660 feet, dependent upon block length		1/4 mile

Figure 3.2 – Summary of Recommended Street Spacing for Non-IRCs

Category	Area or Facility Type	Typical Functional Class	Public Street Spacing		Signal Spacing
			Primary Full-Movement Intersection	Secondary Intersection	
4	**Principal Arterials in the Twin Cities Metropolitan Area and Primary Regional Trade Centers (Non-IRCs)**				
4AF	Non-Interstate Freeway	Principal Arterials	Interchange Access Only (see Section 3.2.7 for interim spacing)		Interim
4A	Rural		1 mile	1/2 mile	See Section 3.2.5
4B	Urban/ Urbanizing		1/2 mile	1/4 mile	1/2 mile
4C	Urban Core		300-660 feet, dependent upon block length		1/4 mile
5	**Minor Arterials**				
5A	Rural	Minor Arterials	1/2 mile	1/4 mile	See Section 3.2.5
5B	Urban/ Urbanizing		1/4 mile	1/8 mile	1/4 mile
5C	Urban Core		300-660 feet, dependent upon block length		1/4 mile
6	**Collectors**				
6A	Rural	Collectors	1/2 mile	1/4 mile	See Section 3.2.5
6B	Urban/ Urbanizing		1/8 mile	Not Applicable	1/4 mile
6C	Urban Core		300-660 feet, dependent upon block length		1/8 mile
7	**Specific Area Access Management Plans**				
7	All	All	By adopted plan		

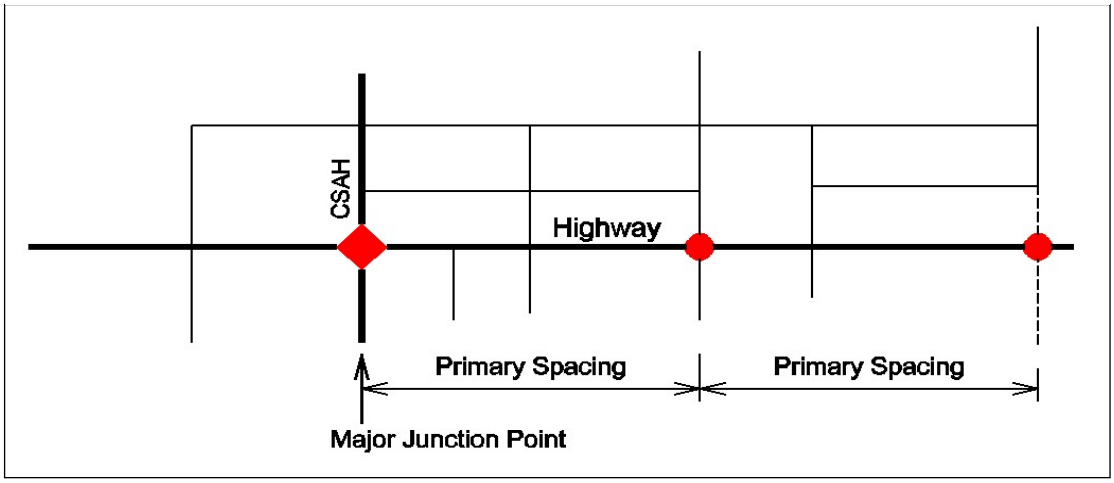
Identifying Primary and Secondary Intersections

Three steps are involved in the spacing of proposed public street intersections, as discussed in the following paragraph.

Step 1. To evaluate the consistency of a proposed public street intersection with the spacing guidelines, the reviewer must first determine the location of existing primary and secondary intersections along the corridor. Typically, a primary intersection is the junction between two major roads, and a secondary intersection is a junction between a major road and a minor road or a local street.

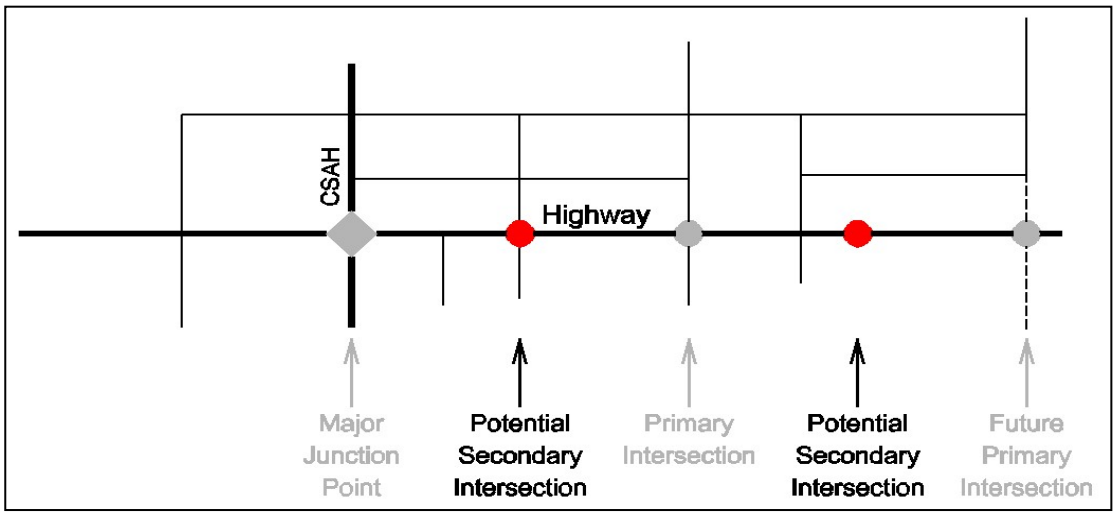
Step 2. Once identified, the major junction point becomes the beginning terminus from which the spacing of conforming intersections along the corridor is determined. In Figure 3.3, the junction of the CSAH and the trunk highway is identified as the major junction point. The primary intersection spacing is measured from that point.

Figure 3.3: Identifying Primary Intersection Spacing



Step 3. After the reviewer has determined the location of the primary and intersections along the corridor, they then identify the potential locations for secondary intersections. As shown in Figure 3.4, secondary intersections are typically located half way between the primary intersections.

Figure 3.4: Identifying Secondary Intersection Spacing



General Guidance for All Public Street Connections
The guidance below applies to all primary and secondary public street connections:

1. A high-volume driveway (Access Type 3) may substitute for an at-grade public street if:

   - The location is consistent with spacing guidelines for a public street connection;
   - The driveway is designed to provide access to a large development area encompassing multiple properties or structures served by a clearly-defined system of internal streets; and,
   - The driveway does not negatively impact the accessibility of adjacent land areas by disrupting the connectivity of the local supporting street network.

2. At-grade public street spacing should be measured from cross-street centerline to cross-street centerline along the primary highway. Minor variance, within 5% of the recommended spacing, constitutes conformance to the spacing guidelines if required to accommodate topographical constraints or connectivity to the established road network. Street spacing within 5% of the recommended distance should, in most cases, provide sufficient space to accommodate turn lanes, weaving maneuvers, and signal progression.

3. Breaks in existing access control to construct a new at-grade public street connection consistent with these guidelines may be considered, if necessary, to provide reasonable access and network connectivity. For Category 1F, 1AF, 2AF, 3AF, and 4AF highways, breaking access control should be considered only for a new interchange (Future chapters in this manual will provided additional guidance).

4. With regard to the impact of public street connections on the safety and operations of the transportation network, the location and design of each public street connection should be consistent not only with the guidance in this section, but also with the guidance provided in Section 3.4.

3.2.3 Secondary Intersections and Gap Analysis Procedure

Secondary Intersections Analysis
A secondary intersection is allowed between two primary intersections (per Section 3.2.2) if the secondary intersection does not create a potential risk to the safety and mobility. The Gap Analysis Procedure as described below and is illustrated with graphs (Figures 3.5 – 3.9) is part of the process of determining the appropriateness of a secondary intersection.

The Gap Analysis Procedure is used to evaluate the ability of vehicles at an access location to find adequate gaps in mainline traffic flows. If there are insufficient gaps, longer queues and delays will be experienced and the potential for greater risk-taking will occur. On low-volume highways, there will be fewer conflicting vehicles and many more gaps available. These low-volume roads allow for easier decision-making and less judgment by the driver. To identify potential high-risk areas where additional access is not advised, a simplified approach to gap analysis has been developed for application to unsignalized corridors.

This approach depends upon a series of risk-conflict graphs (Figures 3.5 – 3.7) that identify high-risk areas along unsignalized corridors, based on roadway configuration. These graphs are presented on the next page.

The gap analysis is intended for use on highways operating under a condition of random arrival. For this reason, the risk-conflict graphs are primarily applicable to unsignalized roadway segments. These unsignalized roadway segments include Category 1A, 2A, 3A, 4A, 5A, and 6A (rural areas) roadways.

Risk-Conflict Graphs

The risk-conflict graphs in Figures 3.5 – 3.7 were developed to be applied to specific roadway designs based on methodology in the *Highway Capacity Manual 2000*. The methodology assumes the following roadway design conditions:

- Side streets are stop-controlled;
- Traffic from nearby intersections does not impact the subject intersection or access point; and,
- Under wide median conditions (Figure 3.7), vehicles entering and crossing the mainline may use a two-step maneuver.

Figures 3.5 – 3.7 represent risk-conflict conditions based on roadway design. To select the appropriate figure to use, the reviewer chooses the graph representing the type of median on the primary roadway that is under consideration.

Figure 3.5 – Undivided Two-Lane Roadways

Figure 3.5 is used for all two-lane undivided roadways. Use this figure if there is no median along the primary highway.

Figure 3.5: Gap Analysis Graph for Undivided Two-Lane Roadways

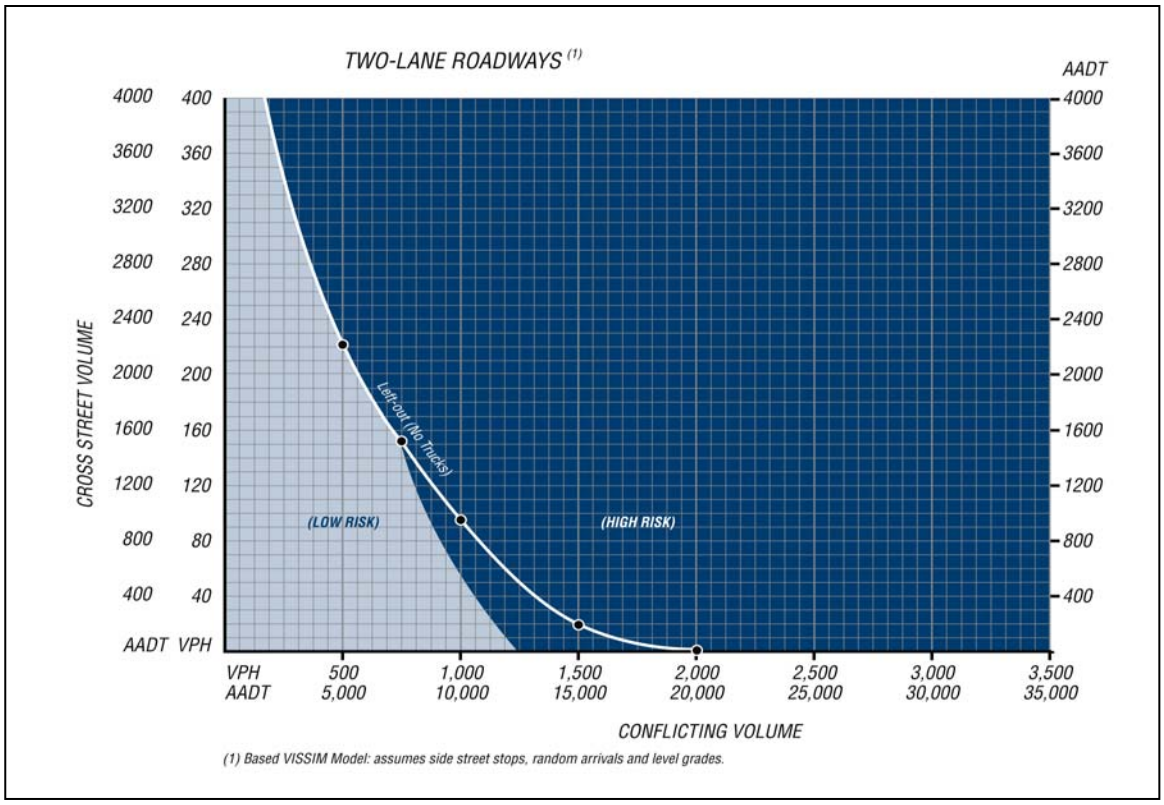


Figure 3.6 – Divided Four-Lane Roadways (with Narrow Medians)
Figure 3.6 is used for divided roadways with narrow medians. A narrow median is defined as having no storage space. Narrow medians require all vehicles crossing or turning left from the cross street to complete the maneuver as a single movement. This figure is also used when looking at right-in/right-out intersections.

Figure 3.6: Gap Analysis Graph for Divided Four-lane roadways with Narrow Medians

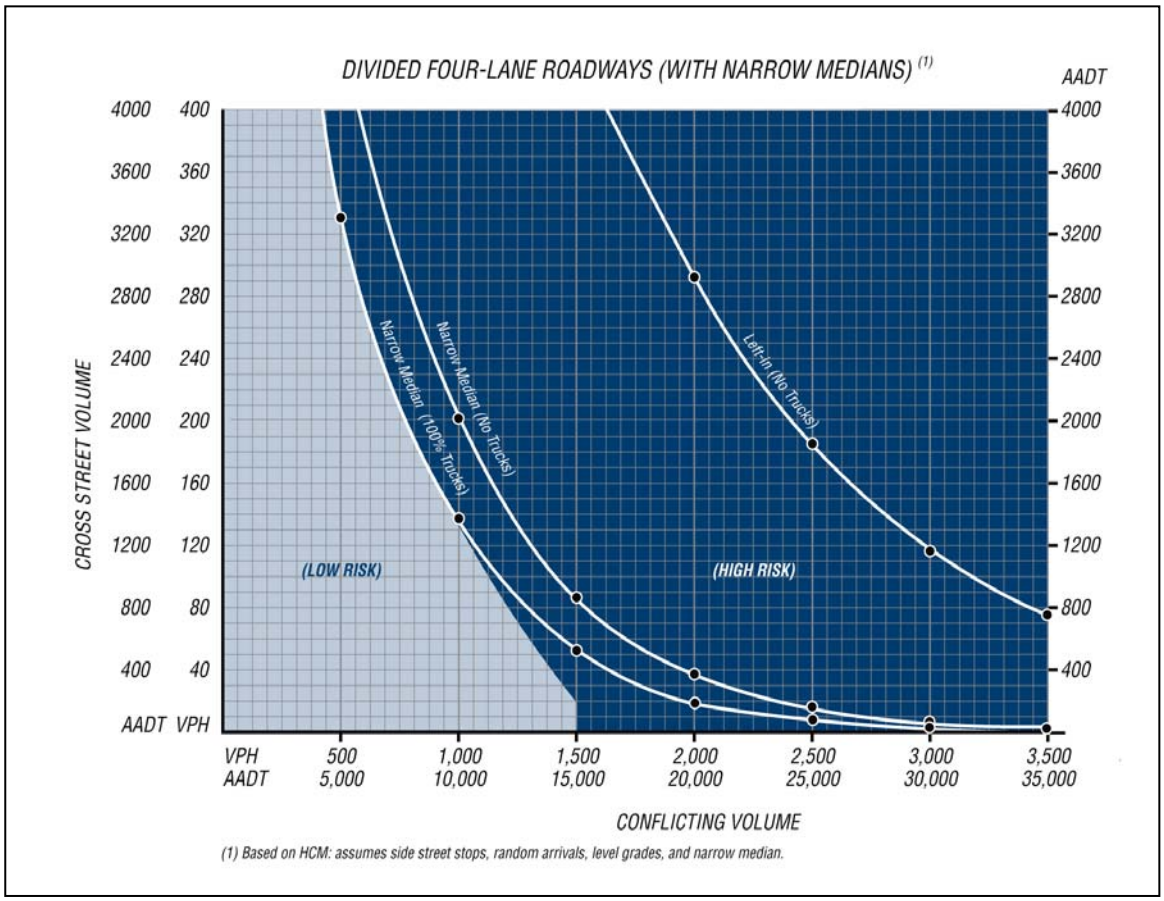
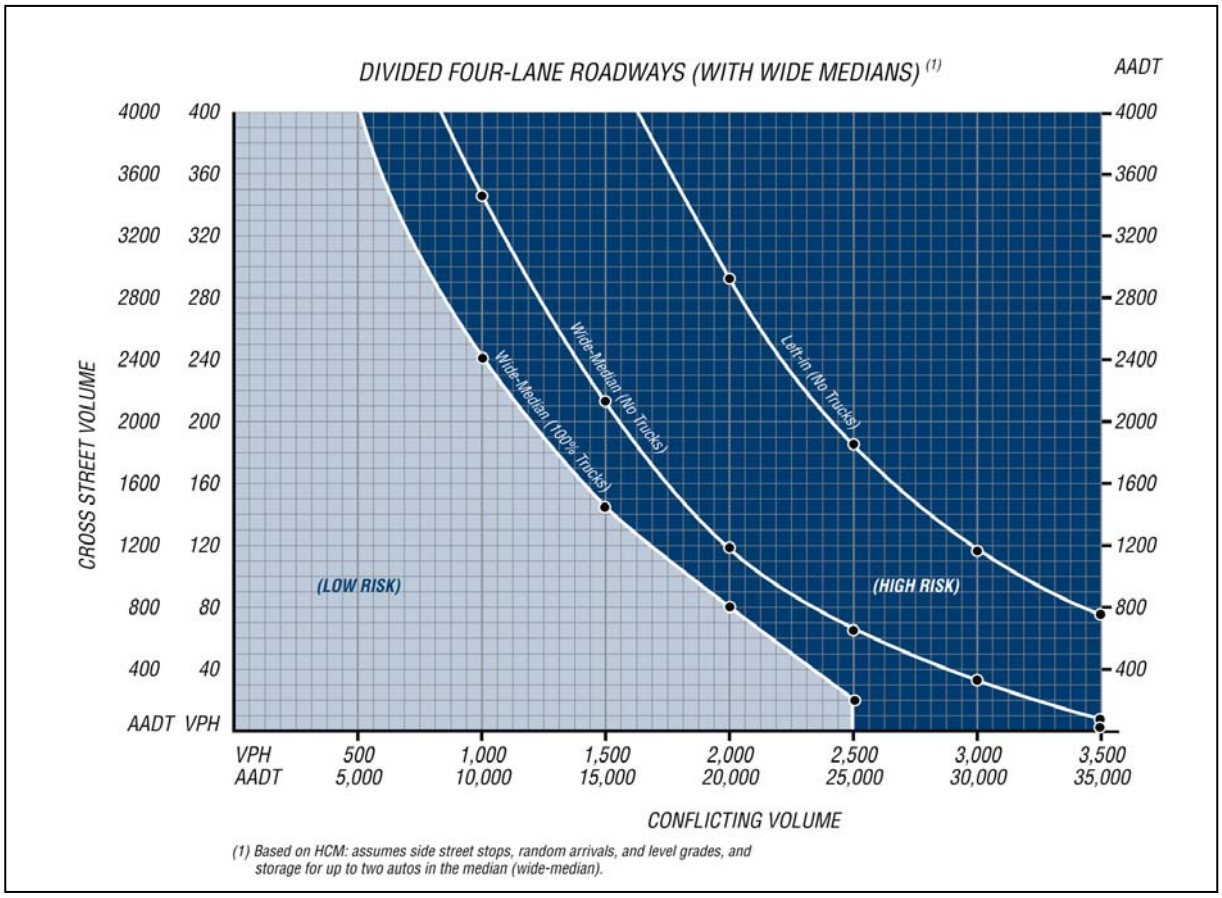


Figure 3.7 – Divided Four-Lane Roadways (with Wide Medians)
Figure 3.7 is used for divided roadways with wide medians. A wide median is defined as having storage for up to two vehicles in the median. This allows vehicles crossing or turning left from a side street to complete the maneuver in two steps.

Figure 3.7: Gap Analysis Graph for Divided Four-lane Roadways with Wide Medians



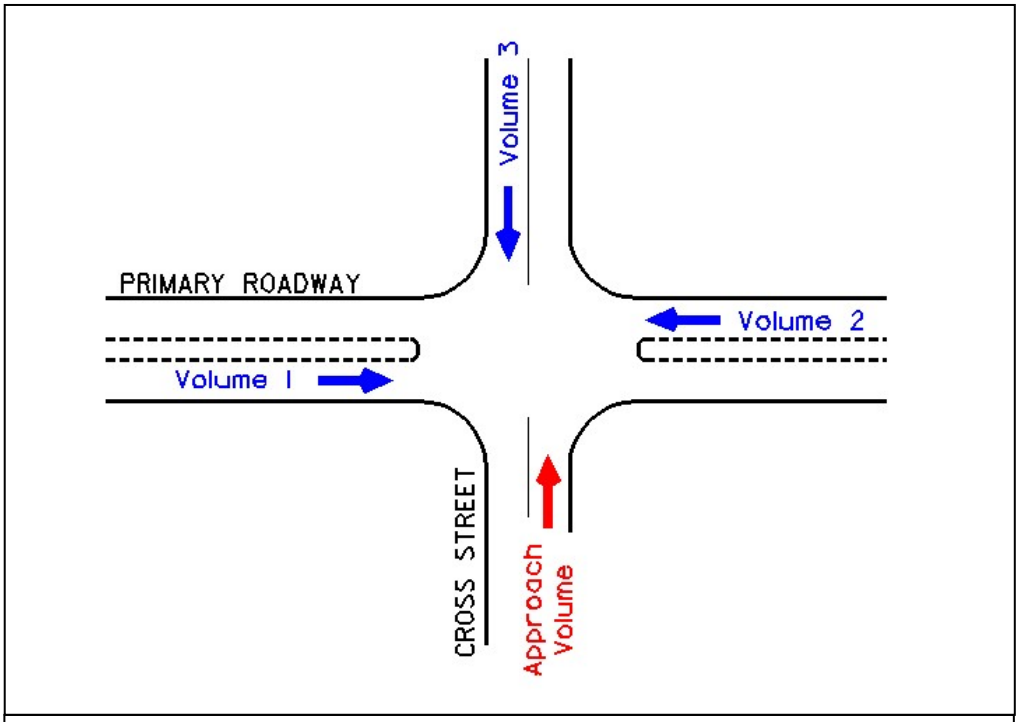
Using the Risk Conflict Graphs
The Risk Conflict Graphs are used to compare the approach volume on the potential secondary intersection with the conflicting volumes on the primary roadway and other legs of the potential intersection. The analysis looks first at whether the secondary intersection would safety operate as a full-movement intersection. If the secondary intersection would not safety operate as a full-movement intersection, it would be analyzed as a right-in/right-out-only intersection to see if would safely operate. If it would not operate safely either as full-movement intersection or a right-in/right-out-only intersection, the intersection should not be allowed. The following sections, and Figures 3.8 and 3.9, explain the calculations for determining the secondary intersection that should be allowed.

Full-movement Intersection Analysis

The following five steps determine whether a full-movement intersection is appropriate,

Step 1. The Conflicting Volume (horizontal axis on Figure 3.5, 3.6, or 3.7) is the estimated 20-year AADT of the primary roadway plus one-half of the 20-year cross street AADT (*in Figure 3.8, the Conflicting Volume is Volume 1 + Volume 2 + Volume 3*). At T-intersections, the horizontal axis of the graphs is only the estimated 20-year AADT of the primary roadway (*in Figure 3.8, the Conflicting Volume is Volume 1 + Volume 2*). The Approach Volume (vertical axis on Figure 3.5, 3.6, or 3.7) is one-half of the estimated 20-year AADT of the cross street or access point. If actual traffic data is available, that data should be used to determine the approach volume and the conflicting volumes.

Figure 3.8: Approach Volume and Conflicting Volumes for a Full-movement Intersection



Calculations:
Volume 1 = One-half of the Primary Roadway AADT
Volume 2 = One-half of the Primary Roadway AADT
Volume 3 = One half of the Cross Street AADT
Approach Volume = One-half of the Cross Street AADT
Conflicting Volume = Volume 1 + Volume 2 + Volume 3

Step 2. Determine which graph (Figure 3.5, 3.6, or 3.7) to use.

Step 3. Compare the Approach Volume (vertical axis) with the Conflicting Volume (horizontal axis) to determine the intersection condition. If the intersection falls within the low-risk conflict condition, a full- movement intersection may be allowed.

Step 4. If the intersection falls within the high-risk conflict condition and is located on a divided roadway, the intersection should be analyzed to determine if a right-in/right-out-only intersection is acceptable (see Right-in/Right-out-only Intersection Analysis below).

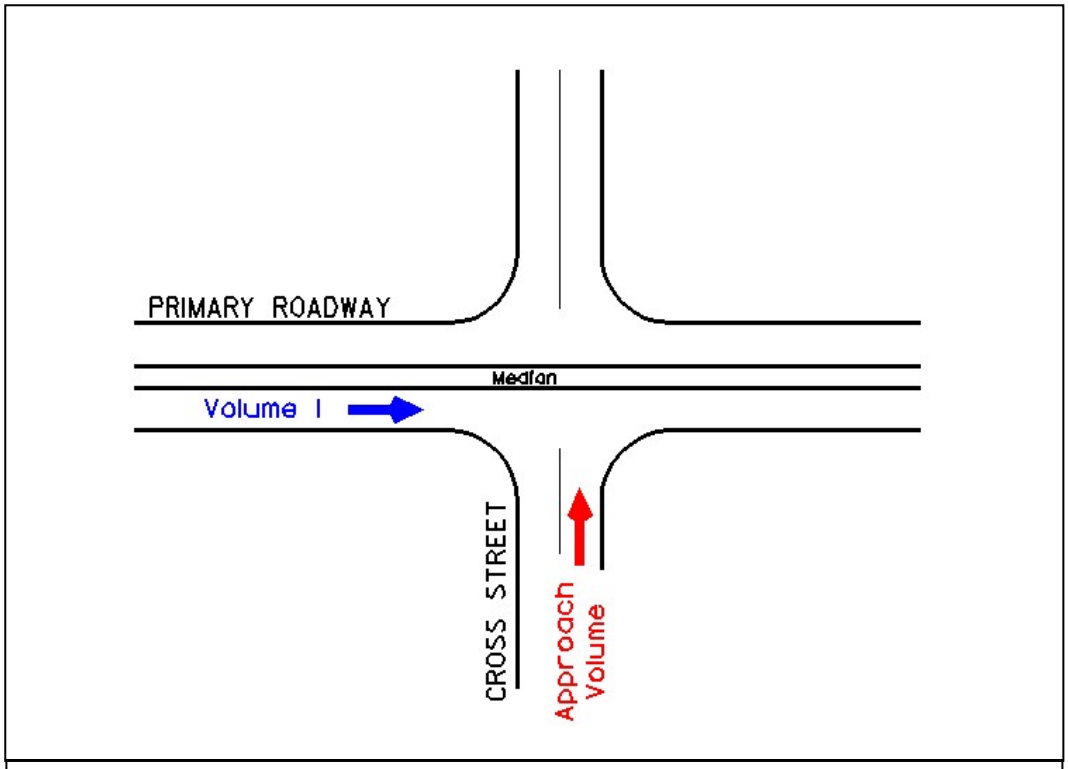
Step 5. If the intersection or access point falls within the high-risk conflict condition and is located on a two-lane undivided roadway, the intersection or access point should not be allowed.

Right-in/Right-out-only Intersection Analysis

The following two steps determine whether a right-in/right-out-only intersection is appropriate,

Step 1. Figure 3.6 represents the risk conflict conditions for right-in/right-out-only intersections. The Conflicting Volume (horizontal axis on Figure 3.6) Is one-half of the estimated 20-year AADT of the primary roadway (*in Figure 3.9, the Conflicting Volume is Volume 1*). The Approach Volume (vertical axis on Figure 3.6) is one-half of the estimated 20-year AADT of the cross street or access point.

Figure 3.9: Approach Volume and Conflicting Volumes for a Right-in/Right-out-only Intersection



Calculations:
Volume 1 = One-half of the Primary Roadway AADT
Approach Volume = One-half of the Cross Street AADT
Conflicting Volume = Volume 1

Step 2. Compare the Approach Volume (vertical axis) with the Conflicting Volume (horizontal axis) on Figure 3.6 to determine the intersection condition. If the intersection falls within the low-risk conflict condition, a right-in/right out only intersection may be allowed. If the intersection falls within the high-risk conflict condition, no intersection should be allowed. Alternatively, a right-in only intersection with a right-turn lane may be considered if connectivity to the supporting street network provides full circulation and return movements.

3.2.4 Guidelines for Supporting Street Connectivity

As communities grow and land is subdivided for development, it is important to promote the continuation and extension of the existing local street system. Dead-end streets, cul-de-sacs, and gated communities force traffic to use major roadways even for short local trips. Fragmented street systems also impede emergency access and increase the length of automobile trips.

A new public street connection to the trunk highway system should also provide direct connections to the existing or planned local street system.

Local subdivision regulations should also promote and support network connectivity.

In some cases, supporting street connectivity may not be feasible or appropriate, such as:

- Where existing topographical constraints or historical street patterns may prevent connectivity with the local street system;
- Where large developments with potential security concerns would warrant fewer access points, such as military bases, parks, airports, ports, and similar facilities; or,
- Where large regional developments would generate primarily long-distance or regional trips and would result in unacceptable traffic volumes on the local street system.

3.2.5 Guidelines for Signalization

Closely- or irregularly-spaced traffic signals result in frequent stops, unnecessary delays, increased fuel consumption, excessive vehicular emissions, and increased highway crash rates. Alternatively, uniform signal spacing facilitates coordinated signal timing plans that can effectively accommodate varying traffic conditions during peak and off-peak periods, and also allows for adaptation of a traffic control system as changes occur over time. Therefore, selecting uniform signalized intersection spacing is an essential element in establishing access spacing standards.

In rural areas, where traffic signals are usually isolated (spacing greater than one mile), this approach does not apply. Traffic signal spacing is most relevant in urban and urbanizing areas where through-traffic mobility and side-street accessibility are typically balanced through the use of signalized intersections.

The following tables (Figures 3.10 and 3.11) outline methods for determining signal spacing.

Figure 3.10: Signal Spacing Guidance for IRCs

Category	Signal Spacing Guidance
Interregional Corridors & Interstate Highways	
The Interregional Corridor system identifies important statewide mobility corridors. On these highways, performance targets have been developed based on overall corridor speed. A traffic signal on one of these corridors represents a delay penalty or a reduction in the corridor speed; therefore, a new traffic signal on an Interregional Corridor should generally be avoided, if possible. When a district is considering a new signal on an Interregional Corridor, the Office of Investment Management is available to assist in calculating the impact of the signal on the overall corridor performance.	
1F	All access to the interstate system is via interchanges. Signal spacing is not applicable.
1AF **2AF**	**Full Access-Controlled Highways:** All access to the highway system is via interchanges. Signal spacing is not applicable. **Transitioning Highways:** On IRC highways transitioning to a full freeway design, new traffic signals should not be considered unless no other economically feasible alternative is available. The new traffic signal should be considered interim, and a plan for its future removal should be developed. Wherever possible, the new traffic signal should be located where a future interchange is planned.
1A **2A**	On rural IRC highways, a new traffic signal may be considered if warranted and if it does not lower the performance of the corridor below the target speed. However, if the signal is warranted and needed for safety, and a cost-effective alternative is not feasible, an interim signal may be considered, even though it would lower the performance of the corridor below the target speed.
1B **2B**	On urban/urbanizing IRC highways, a new traffic signal may be considered if warranted, but it should be both uniformly-spaced and interconnected with other signals along the corridor to minimize delay and to promote platoon flow. • **Category 1B: The recommended signal spacing is one-half mile. The new traffic signal should be considered interim and a plan for its future removal should be developed.** • **Category 2B: The recommended signal spacing is one-half mile**.

Note:
The information provided in this Mn/DOT Access Management Manual does not supersede the Mn/DOT Traffic Engineering Manual or the Mn MUTCD.

Mn/DOT Traffic Engineering Manual:
"Traffic signals should not be installed unless one or more of the signal warrants in the Mn MUTCD are met, but the meeting of a warrant or warrants does not alone justify the installation of a signal."

Figure 3.11: Signal Spacing Guidance for Non-IRCs

Category	Signal Spacing Guidance
Non-IRC Highways	
3AF **4AF**	**Full Access-Controlled Highways:** All access to the highway system is via interchanges. Signal spacing is not applicable. **Transitioning Highways:** On highways transitioning to a full freeway design, new traffic signals should not be considered unless no other economically feasible alternative is available. The new traffic signal should be considered interim, and a plan for its future removal should be developed. Wherever possible, the new traffic signal should be located where a future interchange is planned.
3A **4A** **5A** **6A**	**Rural:** Because traffic signals located in rural areas are generally isolated, they do not directly impact the spacing of at-grade public street connections. In these areas, traffic progression is not an issue and traffic signals are generally installed to address safety concerns. In rare cases, two or more traffic signals may be closely spaced (spacing of one-half mile or less) along an otherwise rural and unsignalized highway. These signals should be interconnected and timing should be coordinated to minimize the impact on the mobility of the through-traffic.
1C **2C** **3B & 3C** **4B & 4C** **5B & 5C** **6B & 6C**	**Urban/Urbanizing and Urban Core:** The public street connection spacing policy is based on providing two-way coordinated traffic progression (or platoon flow) through a series of traffic signals. The policy balances mobility and accessibility and relies on the ability to provide uniform and interconnected traffic signal spacing. • **Categories 3B & 4B: The recommended signal spacing is one-half mile;** • **Categories 5B & 6B: The recommended signal spacing is one-quarter mile;** • **Category 1C: The recommended signal spacing is one-quarter mile. The new traffic signal should be considered an interim solution, and a plan for its future removal should be developed;** • **Categories 2C, 3C, 4C, & 5C: The recommended signal spacing is one-quarter mile;** • **Category 6C: The recommended signal spacing is one-eighth mile.**
7	By adopted plan

Note:
The information provided in this Mn/DOT Access Management Manual does not supersede the Mn/DOT Traffic Engineering Manual or the Mn MUTCD.

Mn/DOT Traffic Engineering Manual:
"Traffic signals should not be installed unless one or more of the signal warrants in the Mn MUTCD are met, but the meeting of a warrant or warrants does not alone justify the installation of a signal."

3.2.6 Guidelines for Other Higher-Level Traffic Control

Other higher-level traffic control, including roundabouts, four-way stop conditions, and continuous flow intersections may impact highway mobility and platoon flow. Where platoon flow is critical, these other traffic control methods need to be thoroughly analyzed with regards to corridor mobility before being considered as alternatives to traffic signals. The use of other higher level traffic control methods should be consistent with primary intersection spacing, as discussed above, in Section 3.2.2.

3.2.7 Interim Spacing on Transitioning Subcategory AF Highways

On subcategory AF highways transitioning to freeways, it is likely that both at-grade intersections and interchanges will be present. All at-grade intersections should be considered interim. The desirable spacing between an at-grade intersection and the merge point of the closest ramp should be a minimum of one-half mile (see Figure 3.35). If one-half mile cannot be attained, a shorter spacing may be considered if analysis shows that the shorter distance would not create unacceptable weaving operations.

The spacing between two at-grade, full-movement intersection spacing on an AF Highway should be one mile.

3.3 Driveway Connections

3.3.1 Background and Approach

Mn/DOT's policy on driveway connections is designed to respect the legal rights of abutting property owners while preserving safety and mobility on the trunk highway system. **Except where Mn/DOT has acquired access rights, abutting property owners are entitled to reasonably convenient and suitable access to the highway.**

Mn/DOT regulates access as an exercise of the police power of the state: the power to impose restraints on private rights as necessary for the general welfare. Regulations or restrictions on access that are legitimate exercises of the police power are generally not compensable. However, if the restriction on access denies a property owner reasonably convenient and suitable access, the denial becomes a taking of a property right, subject to compensation. The policy guidelines for driveway allowance are intended to support Mn/DOT's legitimate exercise of its regulatory authority without creating an unintended compensable taking.

The policy reflects the following considerations regarding driveways and property access:

- Property access via the **local street system**, when available, is generally preferred over direct driveway connections to the trunk highway system, as this is most conducive to safety and mobility. However property access via the local street system must provide reasonably convenient and suitable access.

- Within **urban/urbanizing areas**, Mn/DOT strongly encourages the development of a complete supporting local road network to serve as an alternative to direct driveway access to the trunk highway system. Urban/urbanizing areas offer the greatest opportunity to improve mobility and safety through access management.

- Within **rural areas**, Mn/DOT recognizes that developing a complete supporting road network may not be economically feasible. In many parts of the state, the road network is sparse and trunk highways must provide both mobility and property access. However, to preclude private access to the trunk highway altogether would overly restrict the economic use of the surrounding area.

- Where the combination of high speeds and high traffic volumes precludes the safe accommodation of driveways, Mn/DOT may seek to acquire access control or construct access roads to provide alternative access. On much of the rural trunk highway system, however, this level of investment is not feasible or cost-effective. Nevertheless, with proper consideration for location and design (Section 3.4), a driveway may be accommodated without unduly affecting safety and mobility.

The table that follows (Figure 3.12) provides an overview of Mn/DOT's policy on driveway connections to trunk highways.

Figure 3.12: Summary of Driveway Allowance

Category	Area or Facility Type	Driveway Allowance
1F	Interstate Freeways	• No private driveways are allowed
1AF, 2AF, 3AF & 4AF	Non-Interstate Freeways & High-Priority IRCs	• On facilities transitioning to full access control, driveways should not be permitted if reasonably convenient and suitable alternative access is available. • Where reasonably convenient and suitable alternative access is not available, an interim driveway may be permitted, and if possible, it should be designed so that traffic can be redirected to another road when the facility becomes fully access-controlled.
1A, 2A, 3A, 4A & 5A	Rural (Not planned for full access control)	• If a property retains access rights but no reasonably convenient and suitable alternative access is available, a driveway is permitted. • The driveway should be located and designed to minimize the impact on the safety and operations of the highway. • All driveways (Types 1, 2, and 3) should be spaced in accordance with Figure 3.27.
1B, 2B, 3B, 4B & 5B	Urban/ Urbanizing	• If a property retains access rights but no reasonably convenient and suitable alternative access is available, a driveway is permitted. • It is Mn/DOT's preference to permit public street connections rather than driveways in Urban/Urbanizing areas. Where possible, Mn/DOT should work with local agencies to encourage the development of a supporting road system to serve the property. • High-volume (Type 3) driveways should be spaced in accordance with Figure 3.27. • Driveways should be permitted as interim where a future supporting street system is anticipated.
1C, 2C, 3C, 4C & 5C	Urban Core	• If a property retains access rights but no reasonably convenient and suitable alternative access is available, a driveway is permitted. • The spacing of driveways will vary based on reasonableness of use and driver expectancy.
6A, 6B & 6C	All Collectors	• If a property retains access rights and no reasonably convenient and suitable alternative access is available, a driveway is permitted. • The spacing of driveways will vary based on reasonableness of use and driver expectancy.
7	Specific Access Plan	• The adopted Category 7 Plan should address the allowance and spacing of driveways.

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3.3.2 Policy on Driveway Connections

Policy
Where access rights have been acquired and complete access control established, direct property access is prohibited. At all other locations, driveways are allowed conditionally, subject to the following findings:

1. The property retains access rights (Section 3.3.3); and,
2. Reasonably convenient and suitable alternative access to the property is not otherwise available (Section 3.3.4).

If both of these findings are satisfied, a driveway should be allowed. Generally, only one driveway is allowed unless additional driveways are necessary to provide reasonably convenient and suitable access to the existing or proposed land use.

The location and design of the driveway should be considered after determining whether access is allowed. Considerations regarding the location and design of a driveway are described in Section 3.4.

Note: There may be circumstances where the reviewer determines that even though these two findings are satisfied, and location and design guidance are applied, the driveway connection would significantly impair the safety or mobility of the highway. In these situations, the District Engineer must determine whether investing in acquisition of the property's access rights to prevent the driveway is warranted.

3.3.3 Findings: The Property Retains Access Rights

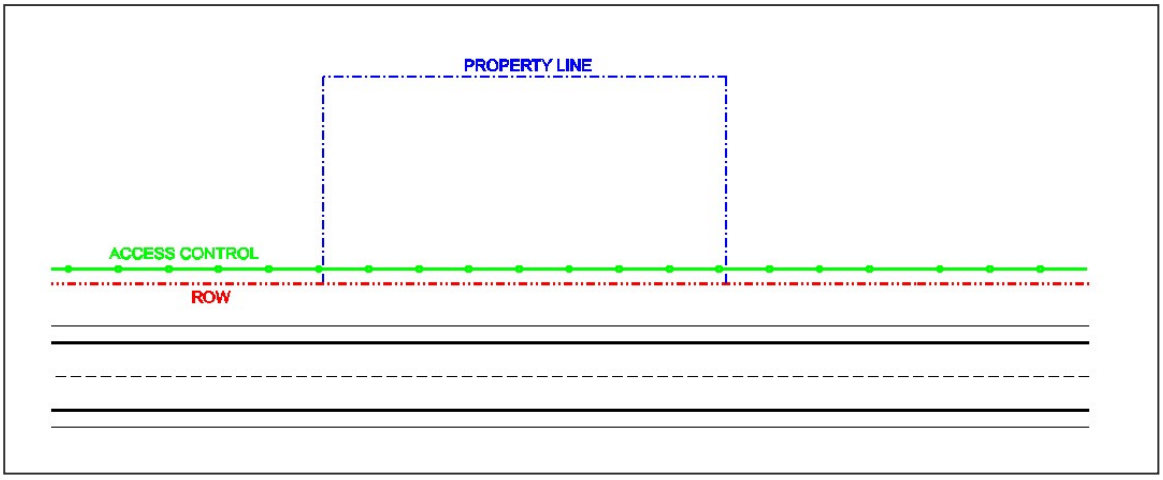
Mn/DOT and local governments have the authority to acquire access rights. The degree to which access rights are acquired will impact how Mn/DOT addresses driveway access.

Full Access Control

Full access control is the condition by which the right of access is acquired along the entire frontage of the property. The right of access may be acquired by Mn/DOT or by a local road authority through purchase, gift, or deed. Once the right of access is acquired along the property's frontage, it is considered Full Access Control, and the property retains **no right of access**.

Where Full Access Control exists, it is Mn/DOT's policy that driveway connections not be allowed.

Figure 3.13: Full Access Control

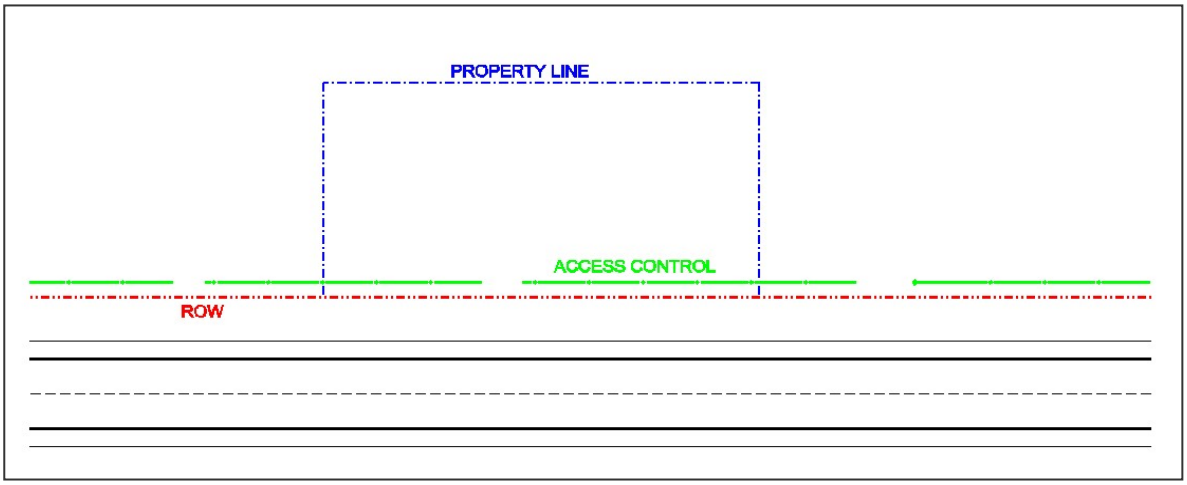


Partial Access Control

Partial Access Control is the condition by which the right of access is acquired along only parts of the property's frontage. The property owner retains the right of reasonably convenient and suitable access at those points or at remaining "openings" in access control where rights have not been acquired.

It is Mn/DOT policy that an opening established through the acquisition of partial access control does not confer an automatic right to a direct driveway connection at that point; rather, it is Mn/DOT's policy that a driveway be allowed at an opening in partial access control, subject to the finding that reasonably convenient and suitable alternate access is not available.

Figure 3.14: Partial Access Control

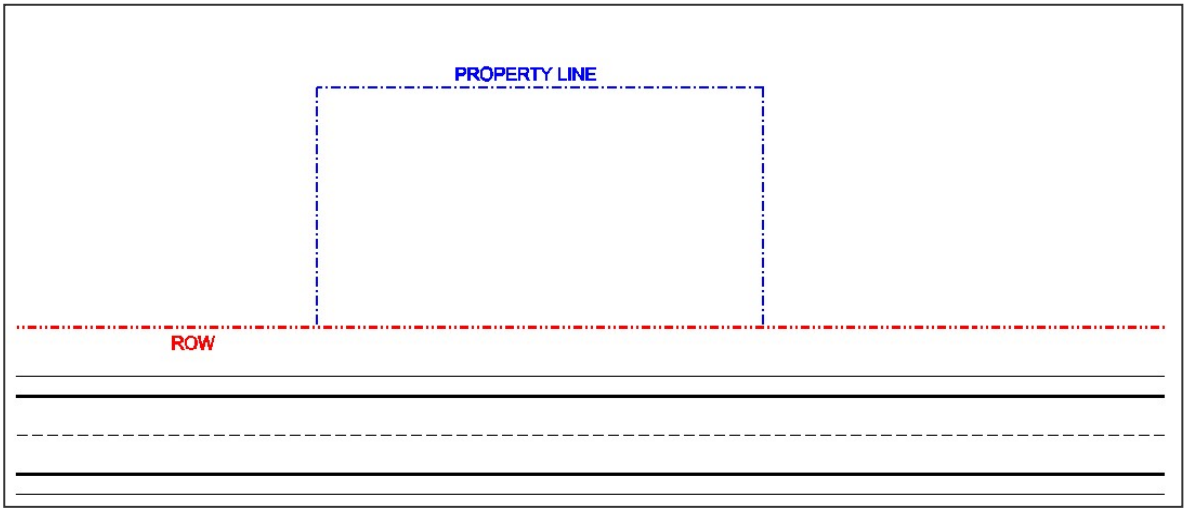


No Access Control

No Access Control is the condition by which the right of access has not been acquired at any point between a parcel and a highway.

It is Mn/DOT policy that a driveway be allowed from a property where Mn/DOT has not acquired any access rights, subject to the finding that reasonably convenient and suitable alternate access is not otherwise available.

Figure 3.15: No Access Control



Easements for Nonabutting Property

Minnesota Statute 160.18, Subdivision 3, provides statutory guidance regarding easements for property abutting a highway, as follows:

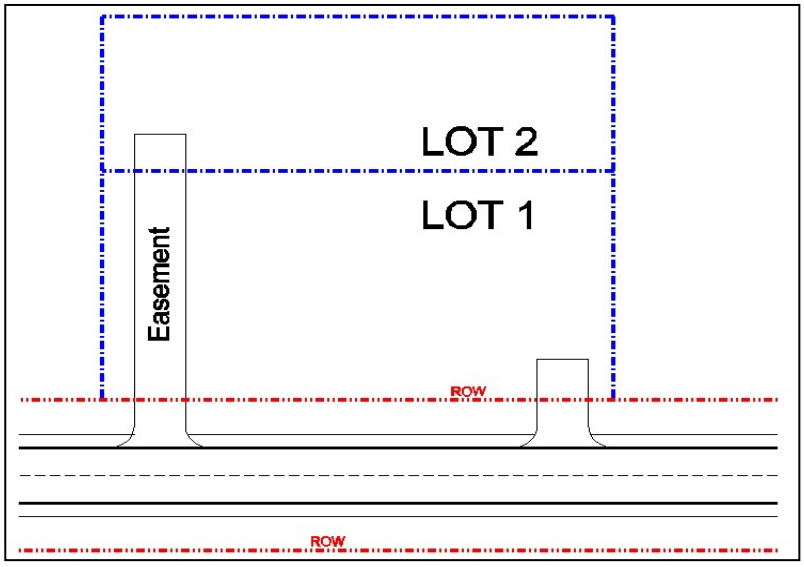
"The owner or occupant of property abutting upon a public highway, having a right of direct private access thereto, may provide such other or additional means of ingress from and egress to the highway as will facilitate the efficient use of the property for a particular lawful purpose, subject to reasonable regulation by and permit from the road authority as is necessary to prevent interference with the construction, maintenance and safe use of the highway and its appurtenances and the public use thereof."

Generally, only property abutting a highway has a right of access to the highway; therefore, it is Mn/DOT policy that a nonabutting parcel or lot does not have a right of access, unless all of the following findings are met:

- The nonabutting parcel or lot has a legal and documented easement; and,
- The easement represents the only reasonably convenient and suitable access to the nonabutting parcel or lot.

In Figure 3.16, Lot 2 is a nonabutting lot with an easement through Lot 1. If Lot 2 is landlocked and has no reasonably convenient and suitable alternative access, Lot 2 has a right to access to the highway, subject to the reasonable regulation as described in Section 3.4.

Figure 3.16: Access to Nonabutting Lot



An easement for a nonabutting parcel or lot is an unusual circumstance. Normally the local land use authority will not allow such a subdivision.

3.3.4 Findings: Reasonably Convenient and Suitable Alternative Access

Definition
The definition of "reasonably convenient and suitable alternative access" will vary depending on the specific circumstances of the property. It will also vary depending on the importance and function of the highway.

It is generally accepted that reasonably convenient and suitable access entitles the landowner access from the property to only the near lane of travel. On divided highways, the landowner is not legally entitled to a median opening.

What is reasonably convenient and suitable not only guides the location and design of a driveway, but also guides the determination of the number of driveways necessary to reasonably serve the property. In most cases, one driveway per parcel is sufficient to provide reasonably convenient and suitable access. In rare cases, though, multiple driveways may be necessary if the property cannot otherwise be developed or utilized using a single driveway.

In addition, Mn/DOT may recommend multiple driveways as an alternative to a single driveway where multiple driveways would lessen the impact on the safety and operations of the highway.

Guidance
While the ultimate decision on what is reasonably convenient and suitable alternative access can only be established through the judicial system, Mn/DOT staff must exercise administrative judgment when reviewing permits or designing projects. The following questions are provided as a guide to evaluating whether the potential alternative access is reasonably convenient and suitable:

- Are the existing or proposed structures and parking areas situated to allow use of the potential alternative access?
- Are there any environmental, topographic, or other physical constraints or easements associated with the property or surrounding area that would prevent reasonable use of the potential alternative access?
- Does the potential alternative access provide sufficient on-site circulation for the anticipated type of customer and delivery vehicles?
- Will the potential alternative access to the property be consistent or comparable with similar properties on the corridor?
- Are the potential alternative street routes functionally suitable and structurally capable of carrying the anticipated traffic volumes and vehicle types?
- Will the anticipated traffic volumes and vehicle types be compatible with the surrounding neighborhood?
- Is the functional classification of the potential alternative street route equal to or lower than that of the directly-abutting highway?
- Can the potential alternative access be constructed to meet design criteria, such as sight distance?
- Is the site adequately and safely served by a single access point?

3.4 Location and Design Considerations

The location and design of a public street connection or driveway should minimize the impact on the safety and operations of the transportation network to the greatest extent possible while still providing reasonably convenient and suitable access.

This section provides guidance and examples of access-related elements that should be considered when designating the location and design of a public street connection or driveway:

- Number of Driveways;
- Sight Distance;
- Spacing between Driveways;
- Corner Clearance and Access within the Functional Area of an Intersection;
- Offset Driveways and Streets;
- Restricted Movements and Median Openings;
- Shared Driveways;
- Interim Access; and
- Auxiliary or Turn Lanes.

3.4.1 Number of Driveways

Definitions
A **lot** is a designated tract or area of land established by plat, subdivision, or as otherwise permitted by law, to be separately owned, used, developed, or built upon.

A **parcel** is any contiguous quantity of land in the possession of, owned by, or recorded as the property of the same owner. A parcel may encompass one or more lots.

Guidance and Examples
The need for multiple driveways serving the same lot should be reviewed on a case-by-case basis.

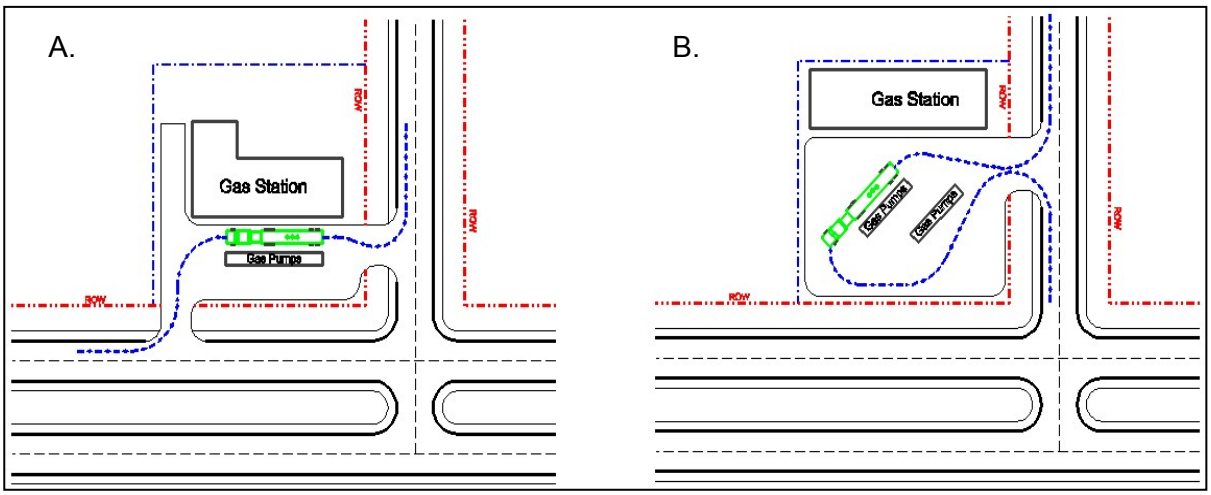
In most cases, one driveway per parcel is sufficient to provide reasonably convenient and suitable access. In rare cases, though, multiple driveways may be necessary if the property cannot otherwise be developed or utilized using a single driveway. Figure 3.17 demonstrates how the layout of a parcel can affect the number of driveways. In Figure 3.17A the location of the building and small pump area prevents a delivery truck from using a single driveway (without backing into the street). In Figure 3.17B the building is located back further and the pump area is larger, therefore a delivery truck would be able to enter and exit the property through a single driveway.

Examples of when an additional driveway may be considered include the situations cited below, as illustrated on the next few pages:

- A small parcel or lot where large delivery trucks are unable to safely maneuver and circulate on-site;

- A small parcel or lot serving highly-directional, highway-oriented traffic movements (such as service stations or drive-through banks, as shown in Figure 3.17) where the logical flow of traffic would be safely directed into the parcel at one driveway and out of the parcel at another driveway.

Figure 3.17: Multiple Driveways for Small Parcels



- A parcel or lot to separate incompatible vehicle uses (see Figure 3.18). *Examples of incompatible vehicle uses include: farms where one driveway would serve the house and another would serve an agribusiness; large commercial businesses where one driveway would serve employees and customers and another driveway would serve delivery trucks.*

Figure 3.18: Multiple Driveways for Incompatible Vehicle Uses

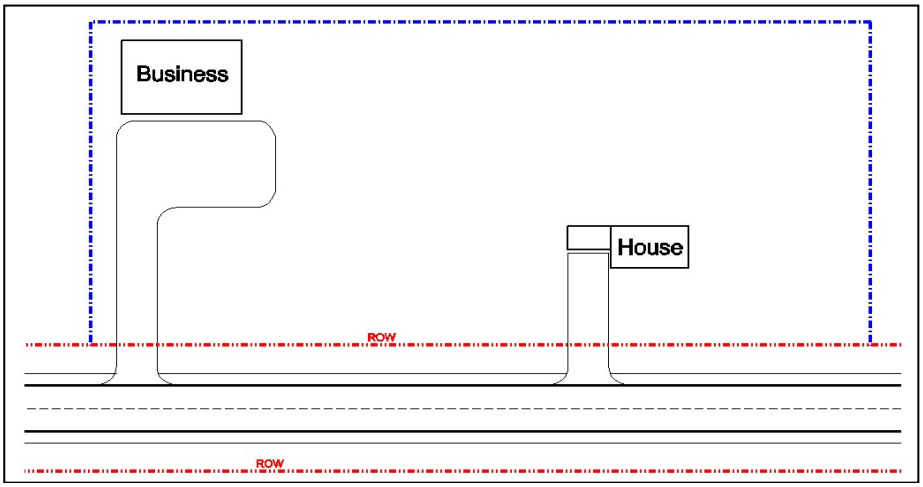
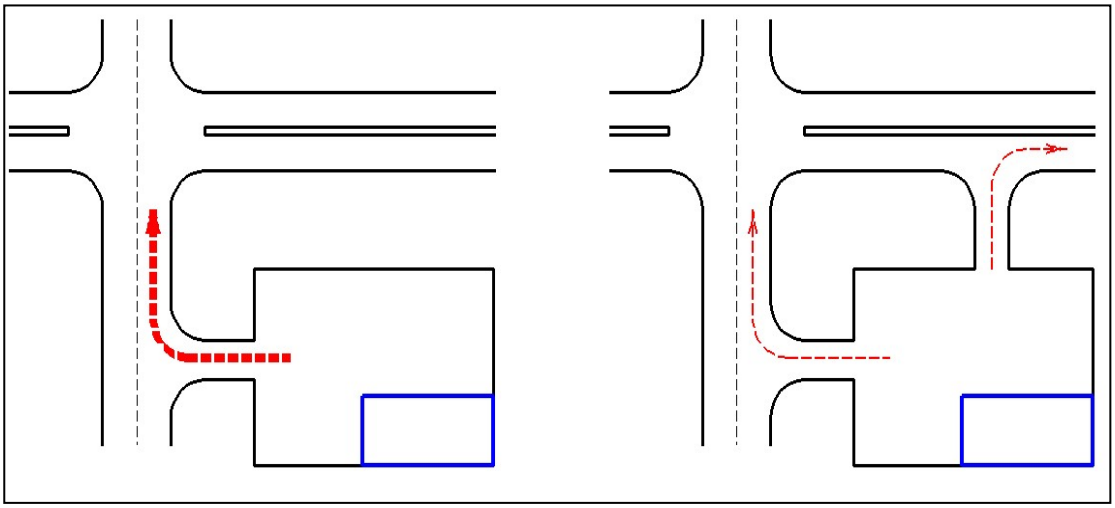


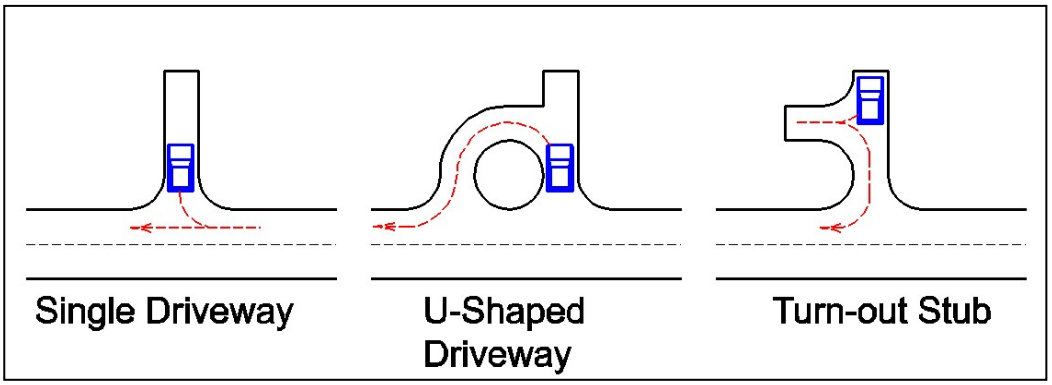
Figure 3.19: Multiple Driveways to Redirect Traffic



- A parcel or lot where there is a significant safety or congestion problem at one driveway or at a nearby public intersection. An additional driveway may be beneficial if the additional driveway would improve the travel patterns (see Figure 3.19). In some cases, an additional driveway may alleviate the immediate need for a traffic signal. *Example: if a public intersection serving a large development is overloaded, an additional driveway serving only the development may be considered to redirect traffic and relieve the traffic conditions at the public intersection. This approach may be more cost-effective than reconstructing the intersection.*

- A parcel or lot may be a candidate for a U-shaped driveway where exiting traffic would otherwise have to back up onto the highway, but where a turn-out stub is not practical. Generally, this is only applicable where having only one access point would greatly impact the safety of the highway, such as having large trucks or farm equipment backing up onto the highway. This is normally not the case with residential driveways.

Figure 3.20: U-Shaped Driveways & Turn-out Stubs

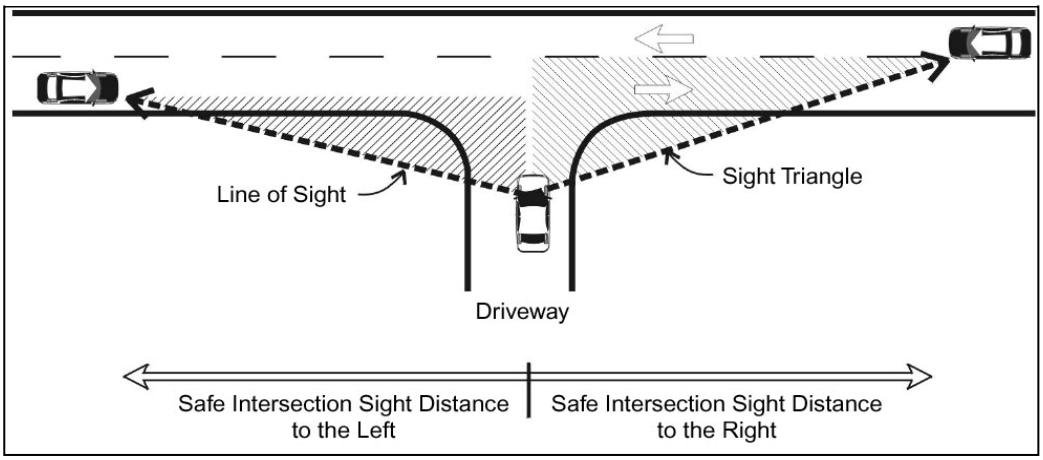


3.4.2 Sight Distance

Definitions

Intersection Sight Distance (ISD), as illustrated in Figure 3.21, allows vehicles entering a highway to turn into the through-lane and get up to running speed without adversely slowing down through-traffic. The *Mn/DOT Road Design Manual*, Section 5-2.02, provides a detailed description of Intersection Sight Distance.

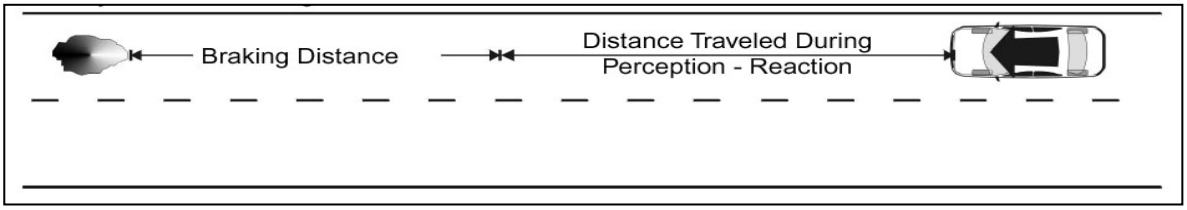
Figure 3.21: Intersection Sight Distance



Decision Sight Distance, also known as the Ten-Second Decision Sight Distance, allows a driver adequate time to react to a situation on the highway and maneuver, whether to stop or change lanes. Possible applications of Decision Sight Distance, including its application to driveways, are provided in the *Mn/DOT Road Design Manual*, Section 2-5.09.04. *As a rule of thumb, the Decision Sight Distance is determined by the distance at which an approaching vehicle has ten seconds from the moment it is within the driver's sight-line until the moment it reaches the access point.*

Stopping Sight Distance (SSD), shown in Figure 3.22, allows through-traffic adequate time and distance to stop in order to avoid a collision with a vehicle entering the highway from a driveway.

Figure 3.22: Stopping Sight Distance



Guidance and Examples

All public street connections and driveways should have adequate sight distance. This ensures that a vehicle entering the highway from a street or driveway can safely perform the maneuver while having a minimal impact on through-traffic. Adequate sight distance will vary, depending on the intensity of traffic at the access point. The recommended sight distance that should be applied, based on the access type, is shown in Figure 3.23.

Figure 3.23: Sight Distance Based on Access Type

Access Type		Recommended Sight Distance
1	Residential/Field Entrance	Decision Sight Distance
2	Low-volume Commercial	Decision Sight Distance
3	High-volume Commercial	Intersection Sight Distance
4	Public Intersections	Intersection Sight Distance

Sources:
Intersection Sight Distance (Mn/DOT Road Design Manual Section 5-2.02)
Decision Sight Distance (Mn/DOT Road Design Manual Section 2-5.09.04)

Figure 3.24: Stopping Sight Distance [(1)]

Design Speed (mph)	Stopping Sight Distance (feet) [(2)(3)]
25	155
30	200
35	250
40	305
45	360
50	425
55	495
60	570
65	645
70	730
75	820

(1) Stopping Sight Distance based on AASHTO Green Book, 5th Ed. 2004 and Mn/DOT Road Design Manual, Table 2-5.09A.

(2) The values shown in this table may be superceded to avoid the functional area (see Section 3.4.4) of adjacent intersections and driveways, or to accommodate turn lanes for the proposed access.

(3) Stopping Sight Distance is based on a level roadway without any horizontal curvature. In areas with vertical and horizontal curves, additional distance may be needed. See Mn/DOT Road Design Manual Table 2-5.09B.

When the recommended sight distance, as shown in Figure 3.23, cannot be met, the street connection or driveway should be located where the best possible sight distance can be achieved. Additional efforts to obtain the recommended sight distance may include the following:

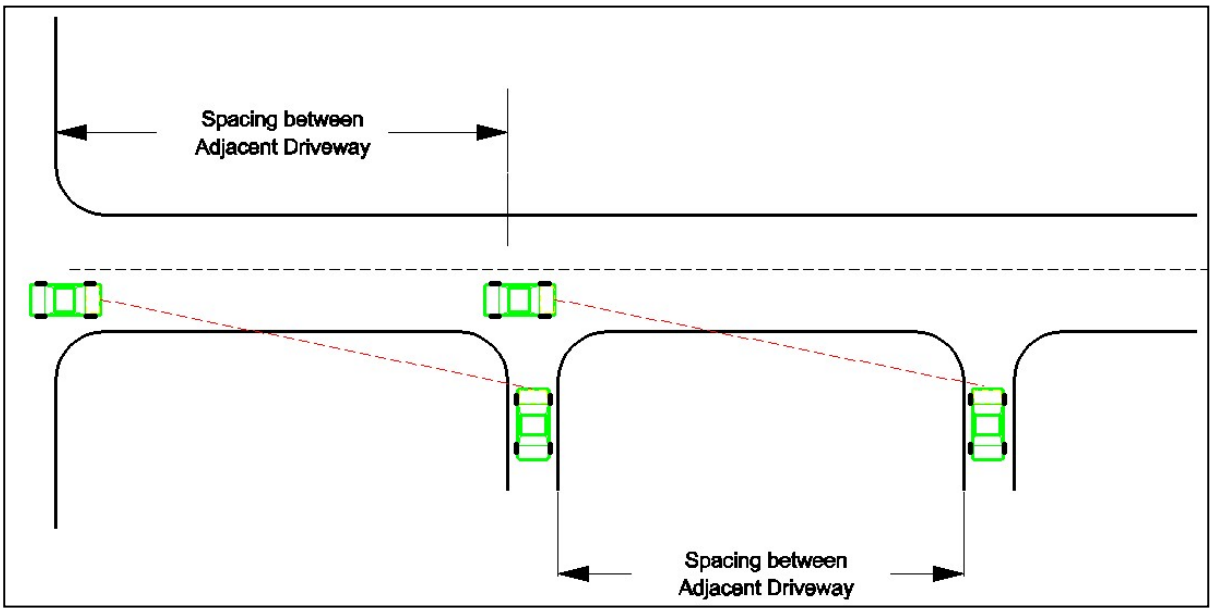
- Grading the slope or clearing a sight triangle to improve the sight distance;
- Installing warning signs along the highway;
- Recommending the construction of a turn lane (See Section 3.4.9); and,
- Developing a shared driveway with an adjacent parcel at a location where adequate sight distance exists (see Section 3.4.7). *(This condition cannot be required as a permit condition.)*

3.4.3 Spacing between Driveways

Definitions

The **Spacing between Driveways** is the spacing between adjacent driveways as measured from the near edges of each driveway (see Figure 3.25). The driveways may be on the same side of the highway or on opposing sides of the highway.

Figure 3.25: Spacing between Adjacent Driveways



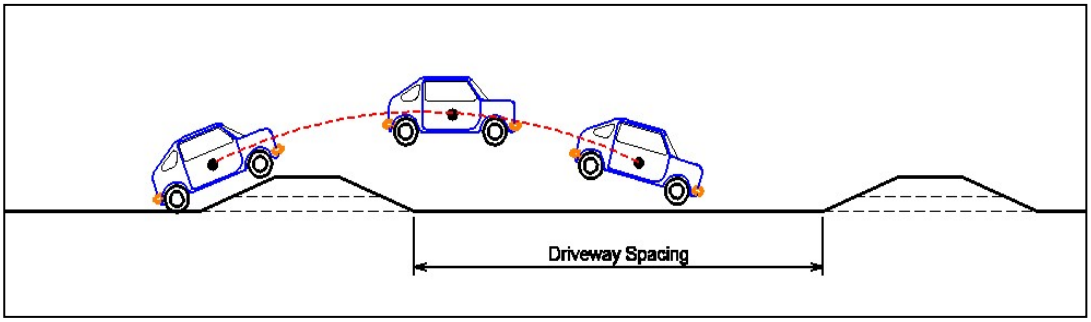
Guidance and Examples

The spacing between two driveways affects the safety and operations of a highway differently, depending on the design of the driveway and the volume of traffic using the driveway.

- The spacing of high-volume (Type 3) driveways along a high-speed highway has the potential to affect the safety and operations of the highway. The potential impact occurs when vehicles queuing at one driveway block the sight distance at an adjacent driveway. This generally is a concern only at high-volume driveways where vehicle queuing may take place. At low-volume (Types 1 and 2) driveways, vehicle queuing is unlikely, and the likelihood of vehicles entering the highway from adjacent driveways at the same time is also small. Spacing between high-volume driveways is also important in order to reduce the potential for overlapping right-turn lanes, should two adjacent high-volume driveways require turn lanes.

- The spacing of all types of rural design driveways (Types 1, 2, and 3) has the potential to affect the safety of the highway. The potential impact occurs when a vehicle runs off the road and hits the driveway side slope. To minimize the severity of the crash, all driveways should be designed in accordance with the *Mn/DOT Road Design Manual*. The spacing between the driveways is based on providing a clear landing area beyond a driveway for errant vehicles to safely land if they are launched over a driveway (see Figure 3.26).

Figure 3.26: Rural Driveway Spacing



- In rural areas (Subcategories AF and A), the spacing between low-volume (Types 1 and 2) driveways should provide a safe landing area for errant vehicles. Figure 3.27 lists the spacing needed to provide an adequate and safe landing area. The spacing is applicable for the following:
    - For two driveways serving the same parcel or adjacent parcels; and,
    - For two driveways on the same side of the highway.
- In rural and urban/urbanizing areas (Subcategories AF, A and B), the spacing between high-volume (Type 3) driveways should provide adequate stopping sight distance for the posted speed of the highway, as shown in Figure 3.27. This spacing is applicable for the following:
    - For two driveways serving the same parcel or adjacent parcels; and,
    - For two driveways on the same side of a highway or on opposing sides of an undivided highway.
- In urban core areas (Subcategory C), highway speeds are generally low and parcels are generally small. Using the Spacing between Adjacent Driveways as the basis for the spacing of adjacent driveways generally is not practical.

Figure 3.27: Spacing between Adjacent Driveways

Posted Speed Limit (mph)	Rural (Types 1 & 2) Spacing between Adjacent Driveways (feet) [2][4]	Rural & Urban/Urbanizing (Type 3) Spacing between Adjacent Driveways (feet) [1][2][3]
40	--	305
45	50	360
50	75	425
55	100	495
60	100	570
65	--	645

(1) The Spacing between Adjacent High-Volume Driveways is based on the Stopping Sight Distance described in the AASHTO Green Book 2001 and the Mn/DOT Road Design Manual, Table 2-5.09A, but uses the posted speed of the highway instead of the design speed.

(2) The values shown in this table may be superceded to avoid the functional area (see Section 3.4.4) of adjacent intersections and driveways, or to accommodate turn lanes for the proposed access.

(3) The spacing between adjacent driveways is based on a level roadway without any horizontal curvature. In areas with vertical and horizontal curves, additional distance may be needed.

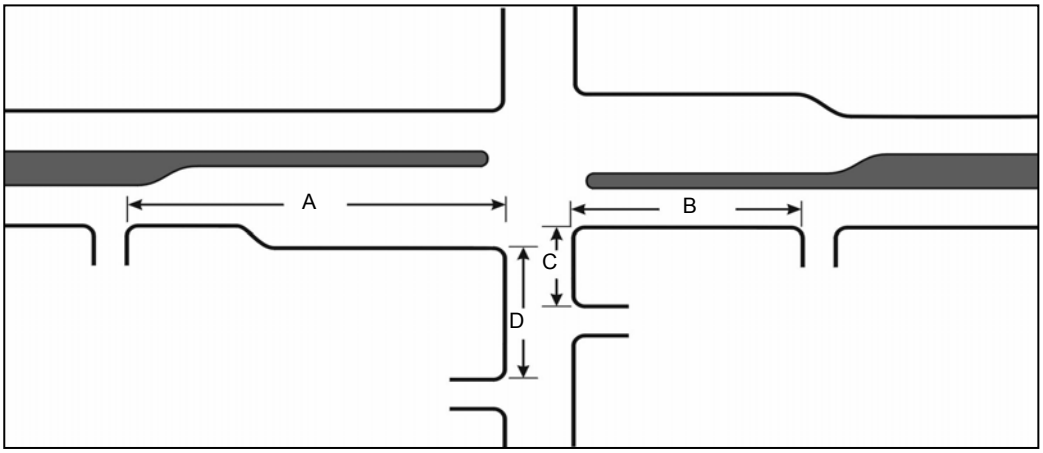
(4) Spacing based on the Texas Transportation Institute "Safety of Driveways in Close Proximity to Each Other." The spacing was modeled for speeds between 45 mph and 60 mph. No data is available for posted speeds below 45 mph or above 60 mph.

3.4.4 Access within the Functional Area of an Intersection

Definitions

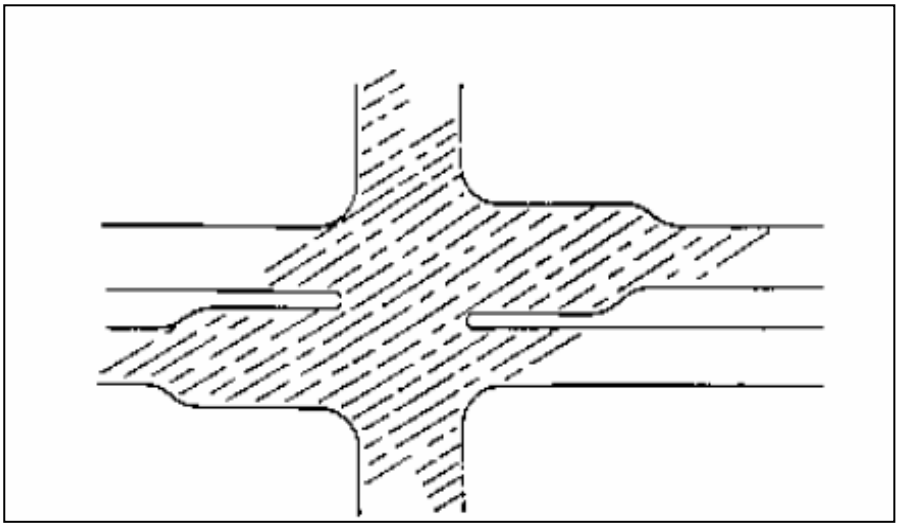
Corner Clearance – Mn/DOT defines corner clearance as the distance between the nearest edge of a driveway located next to an intersection and the nearest edge of the driving lane parallel to the driveway. The corner clearance may vary, depending on intersection geometrics, whether the driveway is located upstream or downstream of the intersection, and the priority of the intersection leg. In Figure 3.28, the distances "A," "B," "C," and "D" represent various corner clearances.

Figure 3.28: Corner Clearance



Functional Area –The functional area of an intersection, as shown in Figure 3.29, is the area beyond the physical intersection of intersecting roads that comprises decision and maneuvers distance, plus any required vehicle storage length. This area is protected through corner clearance standards and connection spacing standards.

Figure 3.29: General Intersection Functional Area

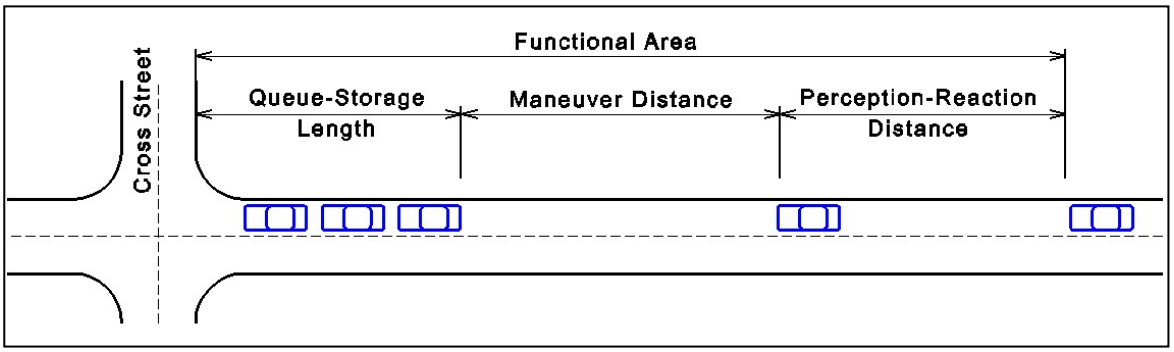


The functional area for each approach leg of an intersection consists of the three basic elements identified in Figure 3.30: perception-reaction distance, maneuver distance, and queue-storage length.

- The perception-reaction distance is the distance traveled during the perception-reaction time. The distance will depend upon vehicle speed, driver alertness, and driver familiarity with the location;
- The maneuver distance is the distance needed for both braking and lane changing (when a turn lane is present). In the absence of a turn lane, the maneuver distance is the braking distance required to make a comfortable stop; and,
- The queue-storage length is the distance needed to accommodate the longest queue that is expected most of the time, either in the turn lane or at the stop bar.

If no turn lane exists, the functional area of an intersection consists of only the perception-reaction distance and the maneuver distance and is considered the same as the Stopping Sight Distance (SSD) for the design speed on the highway (see Figure 3.24).

Figure 3.30: Basic Elements of Intersection Functional Area



Guidance and Examples

Mn/DOT delineates the functional area of an intersection by recommending corner clearance on each leg of an intersection. No access should be located within the corner clearance on a trunk highway. On non-trunk highway cross streets, the corner clearance is a recommendation to the local governmental unit.

Corner Clearance on Main Thoroughfares (Figure 3.28, "A" and "B")

In most cases, the main thoroughfare will be a trunk highway. The corner clearance on the main thoroughfare will vary, depending on the posted speed of the highway and whether a turn lane is present or planned. If a turn lane is present,

- On roadways with posted speeds of 45 mph or greater, the upstream corner clearance (distance "A" in Figure 3.28) is 650 feet; and,
- On roadways with posted speeds of less than 45 mph, the upstream corner clearance (distance "A" in Figure 3.28) is 435 feet.

If a turn lane is not present or planned on the highway, the upstream corner clearance is considered the same as the Stopping Sight Distance (SSD) for the design speed on the highway (see Figure 3.24).

On undivided roadways, the downstream corner clearance (distance "B" in Figure 3.28) is the same as the upstream corner clearance.

On divided roadways, the downstream corner clearance (distance "B" in Figure 3.28) is the greater of the following:

- If an acceleration lane is present or planned (including free-right turn merge areas): the length of the acceleration lane, or
- Stopping Sight Distance (Figure 3.24).

Corner Clearance on Cross Streets (Figure 3.28 "C" and "D")

The corner clearance on a cross street will vary, depending on the street's traffic volume:

- Major Cross Streets (Signalized Intersections) – On cross streets with an AADT greater than or equal to 2500, the upstream corner clearance (distance "C" in Figure 3.28) should be 225 feet;
- Minor Cross Streets – On cross streets with an AADT between 1000 and 2500, the upstream corner clearance (distance "C" in Figure 3.28) should be 125 feet;
- Local Cross Streets – On low-volume, low-speed local streets (AADT less than 1000), the upstream corner clearance (distances "C" in Figure 3.28) should be 75 feet; and,
- On all cross streets with existing or planned turn lanes, the access should be located outside the turn lane, if possible.

On undivided roadways, the downstream corner clearance (distance "D" in Figure 3.28) is the same as the upstream corner clearance (distance "C" in Figure 3.28).

On divided roadways, the downstream corner clearance (distance "D" in Figure 3.28) should be at least 75 feet.

When Corner Clearance Cannot Be Met

In some cases, no alternative access will be available, and an access will have to be provided. To minimize the impacts in these cases, the following options should be considered:

- The driveway should be located as far as possible on the parcel or lot from the intersection. A shared driveway with an adjacent parcel should be used to provide even greater clearance from the intersection (see Section 3.4.7);
- If a single driveway is being provided to a corner parcel, the driveway should be located on the cross street; and,
- A median may be installed on the approach legs to an intersection, or the driveway may be designed to prevent left-turn movements from crossing turn lanes.

3.4.5 Offset Driveways and Streets

Definitions
Figure 3.31, below, illustrates the varied configurations of aligned, offset**,** and overlapping driveways.

Guidance and Examples
On undivided highways, high-volume (Type 3) driveways and public street connections (Type 4) on opposite sides of a highway should be aligned with one another to the extent practicable, or they should be offset to minimize overlapping left turns and other maneuvers that could result in safety or operational problems.

High-volume (Type 3) Driveways

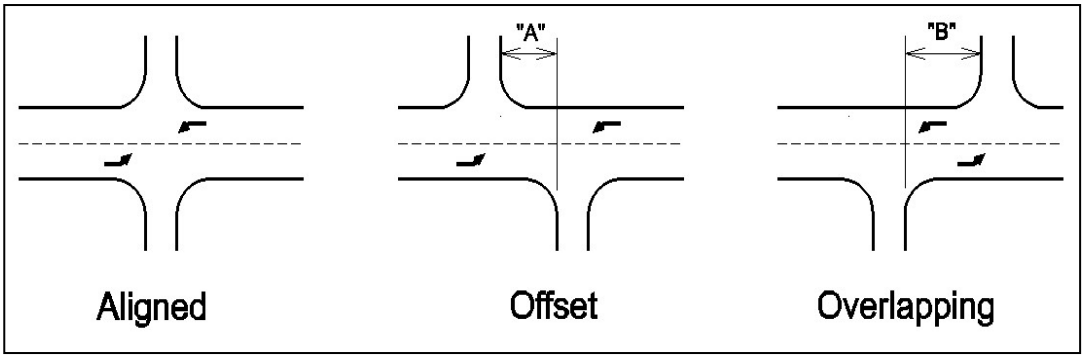
Aligned and Offset

High-volume (Type 3) driveways should be aligned to prevent opposing left-turning vehicles from blocking each other, as shown in Figure 3.31. The aligned and offset driveways allow opposing left-turn movements to occur at the same time. Offset driveways should be separated by at least the Spacing between Adjacent Driveways (Figure 3.27), as shown as distance “A” in Figure 3.31.

Overlapping

Overlapping driveways should be avoided, unless the access points can be separated by sufficient distance to allow back-to-back left-turn lanes (distance “B” in Figure 3.31).

Figure 3.31: Overlapping Driveways

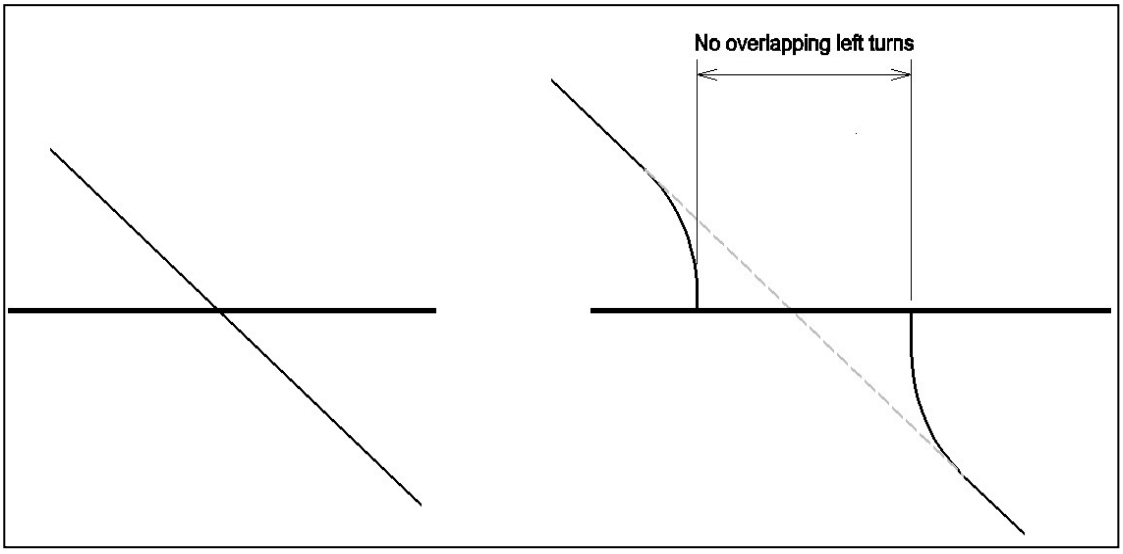


Public Street Connections (Type 4)

In some cases, an aligned four-legged intersection with a history of right-angle crashes or an intersection with an undesirable skew angle may be replaced with two “T” intersections. In these cases, left-turn movements should be carefully considered.

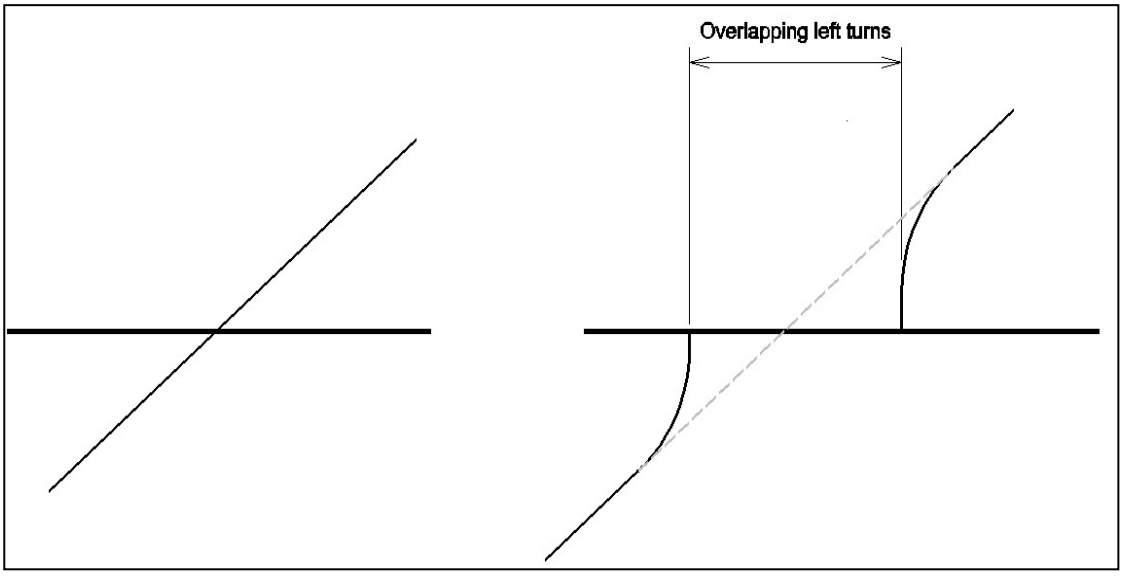
In Figure 3.32, left-turn movements are separated and do not overlap. The distance between the two “T” intersections should be at least the Spacing between Adjacent Driveways (Figure 3.27).

Figure 3.32: No Overlapping Left-turn Movements



In Figure 3.33, left-turn movements overlap, and the distance between the two "T" intersections should be sufficient of construct back-to-back turn lanes.

Figure 3.33: Overlapping Left-turn Movements



3.4.6 Restricted Movements and Median Openings

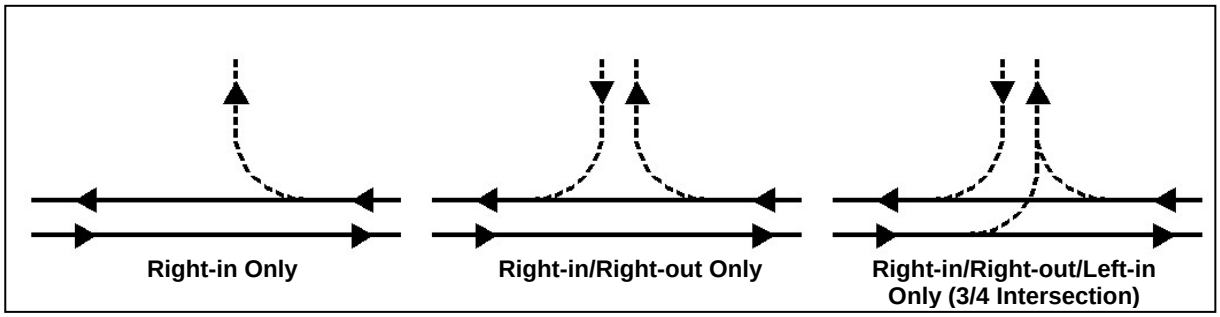
Definitions

Right-in-only permits access from the highway to a parcel or lot via a right-turn movement. Traffic leaving the parcel or lot cannot return to the highway using the same access.

Right-in/Right-out-only (RIRO) permits access between the highway and a parcel or lot via right-turn movements only. Left-turn movements are not permitted.

Right-in/Right-out/Left-in-only (3/4 Intersection) permits access between the highway and a parcel or lot via right-turn movements, and allows the left-turn movement from the highway into the parcel or lot. The left-turn movement returning to the highway is not permitted.

Figure 3.34: Restricted Turning Movement Definitions



Guidance and Examples

Turning and crossing movements at a public street connection or driveway may be restricted to address safety and operational concerns. Restricted movements are typically accomplished by the following methods:

- Closing a median opening on a divided highway;
- Constructing a median on an undivided highway; or
- Modifying the design of the driveway or intersection.

Restrictive signing and pavement markings may also be used but tend to be less effective where no physical barrier (median or traffic island) exists.

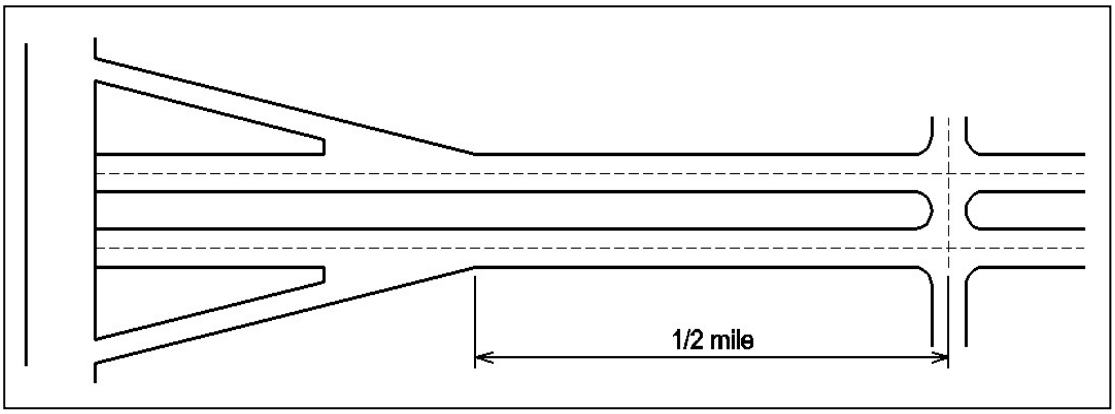
Restricting Movements using Medians
New median openings accommodating all turning movements should be provided only at public street connections, in accordance with Section 3.2.2.

New median openings should not be provided for driveways.

Existing, non-conforming median openings at either a public street connection or a driveway may be closed as a part of a construction project if the closure is considered necessary to address a safety or operational concern. Generally, a safety or operational concern includes any of the following:

- The median opening represents a high-risk conflict condition, as determined using the *Gap Analysis Procedure* (Section 3.2.3);
- The highway corridor has existing or planned signal coordination;
- There is a history of crashes of a type suitable to correction by closing the median (typically three or more left-turn crashes or right-angle crashes in one year) or where adequate trial of other remedies has failed to reduce the crash frequency;
- The median opening does not meet the intersection sight distance, and achieving adequate intersection sight distance is not economically feasible;
- The median opening is located within the functional area of an adjacent intersection and allows vehicles to cross through the turn lanes of the adjacent intersection;
- The median opening does not have a left-turn lane, and it would not be financially feasible to construct a turn lane to accommodate left-turn movements and U-turns;
- The median closure is part of a project converting a highway to a freeway;
- The median opening is located in an area transitioning from rural to urbanizing, and the closure is a part of a proactive and cost-effective plan to manage the transition; or,
- The median opening is located less than one-half mile from the merge point of an interchange ramp (as shown in Figure 3.35).

Figure 3.35: Spacing from Interchange Merge Point



Restricting Movements by Modifying the Access Point

Restricting movements by modifying the design of a driveway or intersection requires a combination of traffic islands, signing, and striping to be effective. This approach may be used both on undivided highways as well as in conjunction with medians on divided highways to address situations where the spacing guidance cannot be met. The design and approach will vary depending on the movements to be restricted. Some typical restrictions include the following:

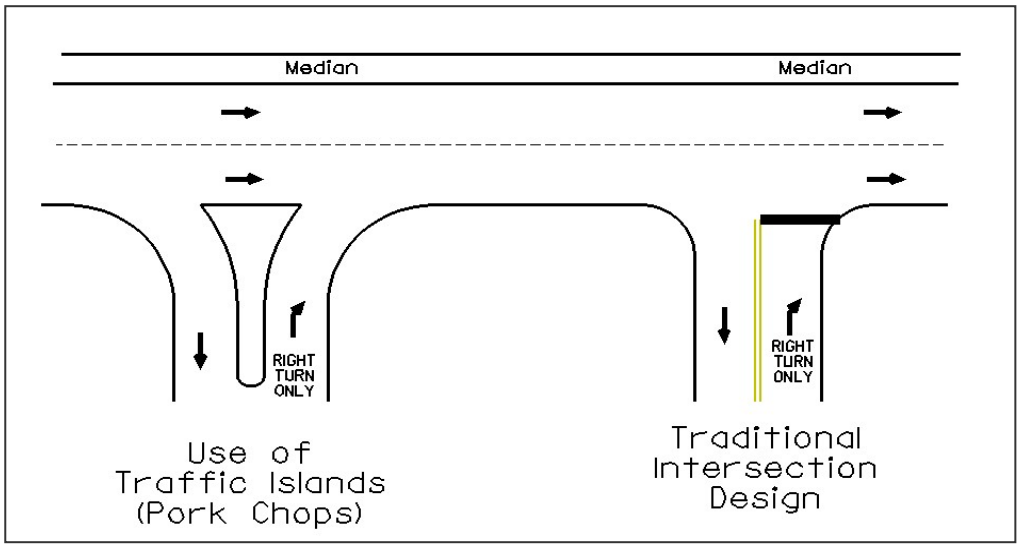
- When high traffic volumes result in a lack gaps for entering and exiting traffic to safely cross, left-turn movement and crossing movements may be restricted;
- When a driveway and an intersection are closely spaced such that a vehicle following a turning vehicle cannot anticipate where the lead vehicle will turn, right-in movements may be restricted;
- When an access is located where it may be blocked by queuing traffic from a nearby intersection, left-turn movements, crossing movements and right-out movements may be restricted;
- Where an access is needed for a specific movement such as a one-way driveway, the driveway may be limited to right-in-only or right-out-only;
- On a divided highway where a lack of gaps prevent entering traffic from safely weaving across multiple lanes to make a left-turn or U-turn, and a reasonably convenient and suitable alternative route is available, right-out movements may be restricted; or
- Where adequate sight distance does not exist for a specific movement, that movement may be restricted.

Considerations when Restricting Turning Movements

The impacts of restricting turning movements can extend beyond the immediate access point. The following issues should be considered before closing a median or restricting turning movements:

- Reasonably Convenient and Suitable Access – Restrictions on turning movements at a driveway cannot prevent reasonably convenient and suitable access for the existing or proposed land use;
- Redirection of Traffic – Restricting turn movements reduces the number of conflict points at the access by redirecting the traffic movements to other locations; it does not reduce the number of trips being generated by a development or along a cross street;
- Access Design – The design of the access point will vary depending of the characteristics of the access point and the highway (see Figure 3.36).
    - The use of traffic islands (pork chops) provides good directional guidance, thereby reducing illegal or wrong way maneuvers. Traffic islands also allow entering and exiting traffic to merge with through traffic, but the design of the islands may reduce the weaving distances to adjacent intersections and require acceleration and deceleration lanes.
    - The traditional intersection design requires entering traffic to stop and wait for a gap in through traffic, thereby eliminating weaving maneuvers. The traditional intersection also does a better job of accommodating the geometric issues associated with closely spaced access points, through additional signing and markings may be required to prevent wrong way movements. This design is ineffective on undivided highways because it does not provide a physical barrier to restrict movements.

Figure 3.36: Right-in/Right-out-only Examples



- Distance to Next Median Opening – The distance to adjacent median openings should allow reasonably convenient and suitable access for the users of the closed median opening. This distance generally should not exceed the recommended spacing of public intersections, per the Mn/DOT Access Management Policy;
- U-turn Operations at Next Opening – Adjacent median openings must facilitate u-turns for the design vehicle likely to make u-turns;
- Traffic Operations at Next Opening – Adjacent median openings should be analyzed to determine that the additional turning and u-turning traffic does not adversely affect safety and operations. This is critical at adjacent median openings with high traffic volumes or signalization;
- Impact to Local Street Network – The impact to cross-street traffic, adjacent neighborhoods, and the local street system should be reviewed with the local road authorities. The closure of a median opening should not redirect traffic to local streets not designed to accommodate the additional traffic or change in vehicle types (e.g., redirecting heavy truck traffic to residential streets).
- Pedestrians and Bikes – At median openings with measurable pedestrian and non-motorized vehicle traffic, the needs of non-motorized traffic must be reviewed by the local community. The closure of a median opening should not decrease the safety of non-motorized traffic or result in an unreasonable increase in the length of the trip. The Mn/DOT Bicycle Facility Design Guidelines provide additional guidance to address bicycle and pedestrian traffic;
- Emergency Vehicles – The median opening may be used by local emergency vehicles, the highway patrol, and maintenance vehicles. The local emergency services, highway patrol, and Mn/DOT District Maintenance staff should be contacted to determine if the median closure would have an adverse impact on their effectiveness.
- Trucks and Farm Equipment – At median openings that accommodate heavy truck and farm equipment traffic, the impacts of having heavy equipment crossing the highway compared to performing a u-turn movement should be reviewed. In some cases, the exposure time of heavy equipment to highway through-traffic has a greater impact on highway safety and operations during a u-turn maneuver than during a crossing maneuver; or,
- Coordination with Alternative Access – On highways transitioning to freeways, median closures should be coordinated with the construction of alternative access (such as frontage roads, service roads, or the redirecting of access to the local street system).

3.4.7 Shared Driveways

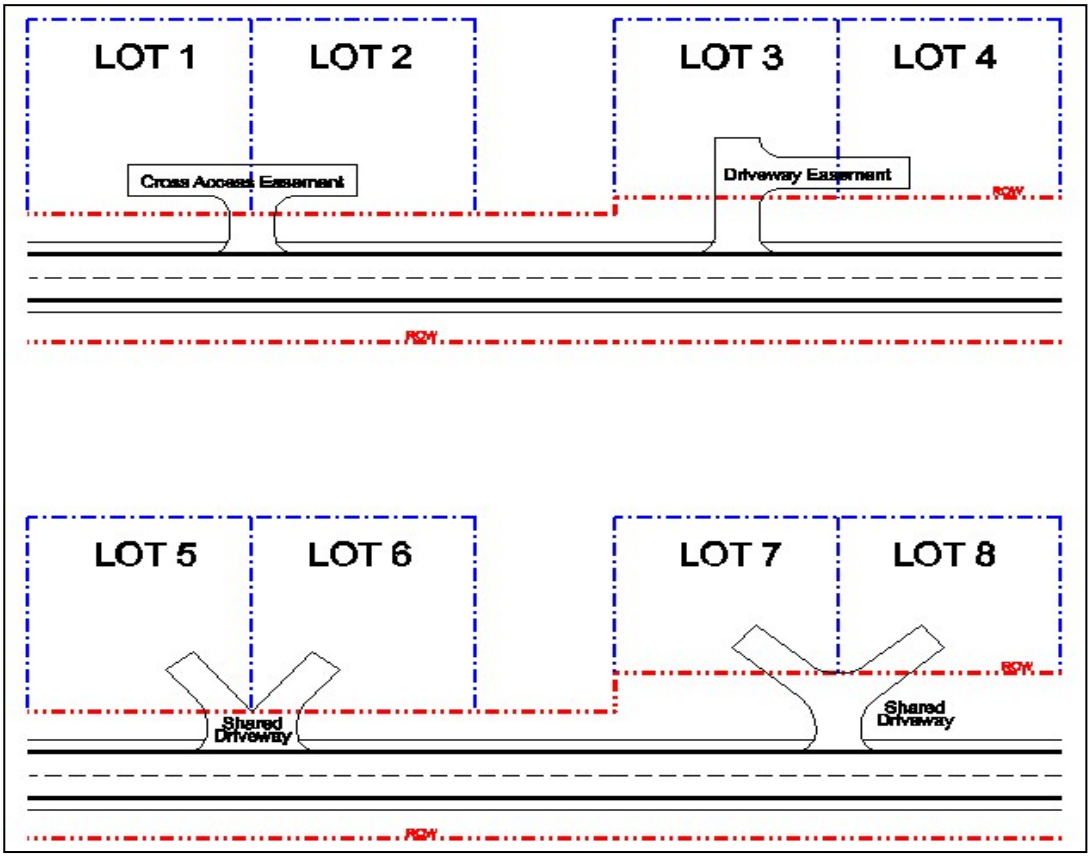
Definitions

A **Cross-Access Easement** allows two or more property owners to cross into each other's property for the purpose of accessing a public road. In Figure 3.37, lots 1 and 2 would require cross-access easements to share the driveway.

A **Driveway Easement** allows a property owner to cross through another parcel for the purpose of accessing a public road. In Figure 3.37, lot 4 is accessed via a driveway easement through lot 3.

A **Shared Driveway** is a single connection serving multiple lots or parcels. A shared driveway, in itself, does not allow property owners the right to use the portion of the driveway owned by another property owner. In Figure 3.37, lots 5 and 6, and lots 7 and 8 are served by shared driveways designed so property owners do not trespass.

Figure 3.37: Share Driveways, Cross-Access Easements & Driveway Easements



Guidance and Examples

A shared driveway, driveway easement, or cross-access easement may be considered to address the following safety or operational needs when:

- A driveway or private street connection is located within an existing turn lane or within the functional area of a public intersection without turn lanes;
- A driveway or private street connection does not have adequate stopping sight distance (Figure 3.24); or,
- Combining driveways would trigger the need for and construction of turn lanes and other geometric features.

For residential driveways, field entrances, and other low-volume driveways (Access Types 1 and 2), the combining of two driveways should be recommended for the purpose of removing a driveway from the functional area of an intersection, or for meeting stopping sight distance. This last solution should be considered only where sufficient right-of-way exists so that a cross-access easement would not be necessary.

The greatest advantage of a shared driveway is where ten or more low-volume driveways or multiple high-volume commercial driveways (Access Type 3) can be combined so that the shared driveway meets turn-lane warrants and turn lanes are constructed (see Section 3.4.9).

Additional guidance regarding driveways located within a turn lane or within the functional area of an intersection is found in Section 3.4.4.

Note: In all cases, a survey should be completed to determine exactly where the property line is before finalizing the location of the driveway. If a cross easement is provided, it should be legally recorded.

3.4.8 Interim Access

Definitions

An **Interim Access** is a public street agreement or driveway permit of limited duration. The agreement or permit specifies the time frame or conditions under which removal is required, requirements for the restoration of the right-of-way, and the location and design of any future access.

Guidance and Examples

An interim access may be considered if no reasonably convenient and suitable alternative access currently exists, but will exist in the future.

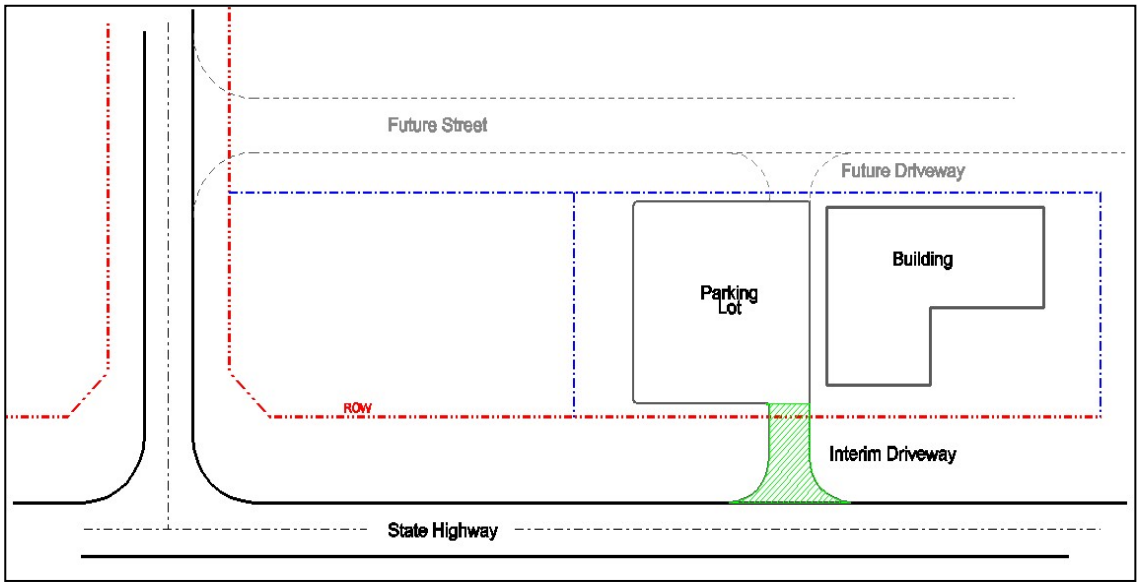
Improvements to the highway and local street system do not always occur in conjunction with the development or redevelopment of adjacent parcels. When parcels develop or redevelop before the road system does, it is preferable to have the parcel develop in a way that will function with any proposed changes to the highway. In this way, when the road system is improved, the impact on the development will be minimal. This can reduce the right-of-way costs and cost-to-cure damages due to the road improvements, and can limit disruption to the property.

Mitigation related to location

When a driveway cannot be located per the guidance shown in Section 3.4, an interim access may be necessary until a permanent solution is available.

Example: In Figure 3.38, a new development is constructed before the local street is constructed. An interim driveway is permitted, but when the future street is constructed, the interim driveway will be closed, and access will be provided from the future street. The proposed building and parking lot should be oriented to the future street.

Figure 3.38: Interim Access



Subcategory AF

Mn/DOT has categorized some highways as AF, indicating that they are either major mobility corridors with access only at interchanges, or they are moving towards having access only at interchanges. The transition to a fully access-controlled highway may take many years. Until that time, driveways may still be provided direct access with the understanding that some time in the future, alternative access will be required. Therefore, on subcategory AF highways, all new driveways should be considered interim. Where possible, these driveways should be designed to switch access to the local street system as the highway is converted to a fully access-controlled facility. The frontage of the building should be designed to take advantage of the future road system, and the parking lot should be constructed to provide circulation from the future access point.

3.4.9 Turn Lanes

Definitions

A **Turn Lane** is an auxiliary lane designed to separate turning vehicles from through-traffic. Turn lanes may be used on both divided and undivided highways (see Figure 3.39).

A **Right-Turn Treatment** is a modification to the roadway shoulder to accommodate right-turning vehicles (see Figure 3.39). A right-turn treatment may be used on divided or undivided highways and includes all of the following modifications to the outside shoulder:

- Widening the paved shoulder;
- Removing conflicting striping and shoulder rumble strips;
- Prohibiting on-street parking on the widened shoulder; and,
- Adding pavement thickness on the shoulder.

A **Bypass Lane** is an auxiliary lane on a two-lane undivided highway designed to guide through-traffic around left-turning vehicles stopped in the through-lane (see Figure 3.39).

Guidance and Examples

Turn lanes should be provided at public street connections and driveways in accordance with the Mn*/DOT Road Design Manual*, Section 5-3, and the guidance below.

Divided Highways

Left-Turn Lanes – A left-turn lane should be provided at all public street connections. For driveways, left-turn movements are generally not allowed; therefore, no left-turn lanes are needed. If a median opening is permitted, a left-turn lane should be provided.

Right-Turn Lanes – A right-turn lane should be provided at all public street connections, at all residential driveways serving more than five (5) units, and at all other driveways generating 50 or more trips per day.

Right-Turn Treatments – A right-turn treatment should be considered at all field entrances, residential driveways serving five (5) or fewer units, and all other driveways generating fewer than 50 trips per day.

Undivided Highways

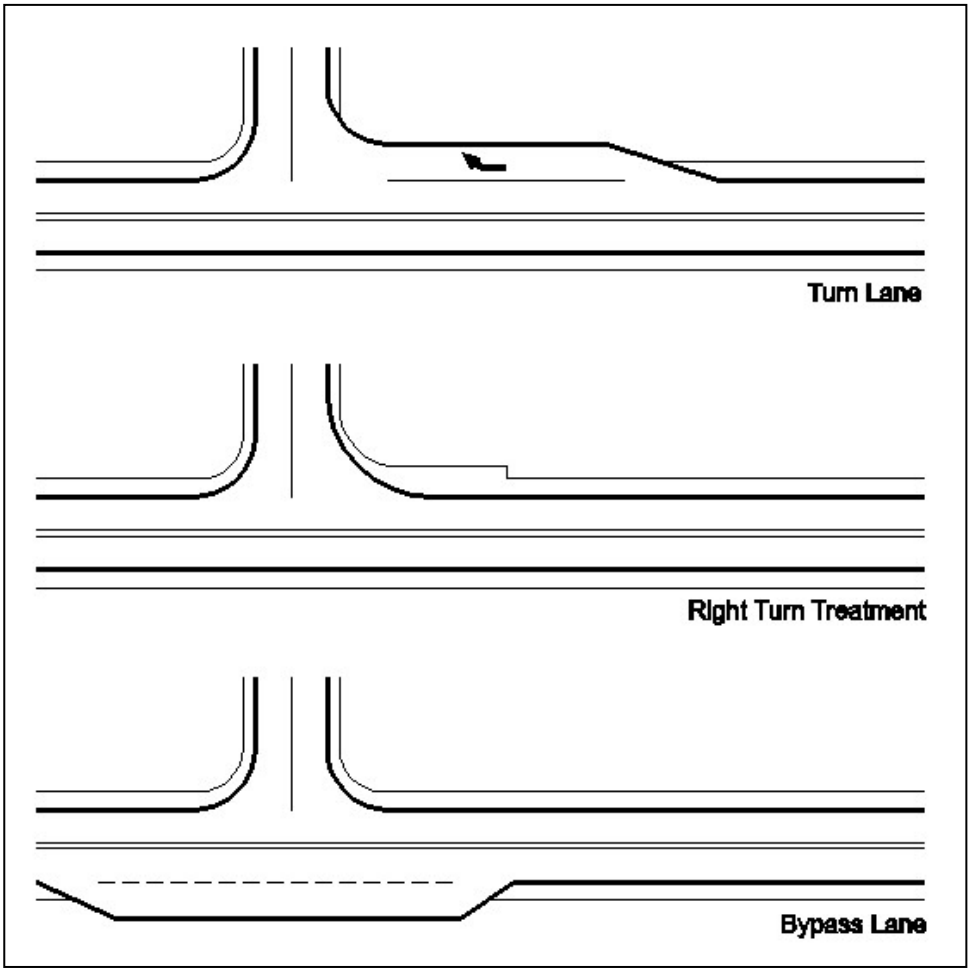
Left-Turn Lanes – A left-turn lane should be provided when there is a site-specific geometric or safety concern, as indicated by Turn-Lane Warrants 1 through 8 (shown below), or if the traffic volume levels meet Warrant 9, as shown in Figure 3.40.

Right-Turn Lanes – A right-turn lane should be provided when there is a site-specific geometric or safety concern, as indicated by Turn-Lane Warrants 1 through 8 (shown below), or if the traffic volume levels meet Warrant 9, as shown in Figure 3.41.

Bypass Lanes – A left-turn bypass lane may be considered when a left-turn lane is warranted but where its construction is not practical (due to limited right of way, steep terrain, existing structures, wetlands, or other protected features,). The bypass lane is for use at “T” intersections where no other public street connection or driveway will be located in the bypass lane or corresponding tapers.

Right-turn/bypass lanes at four-legged intersections should be used only after all other solutions have been found impractical and where the cross-street volume is low.

Figure 3.39: Right-turn Treatments & Bypass Lanes



Turn-Lane Warrants for Undivided Highways

The Turn-Lane Warrants for Undivided Highways are shown below. These warrants apply to both left-turn lanes and right-turn lanes.

- Warrant 1: Passing Lane/Climbing Lane – At high-volume driveways (> 100 trips per day) and all public street connections located on highway segments where passing lanes or climbing lanes are present in the approach direction.
- Warrant 2: Limited Sight Distance/Terrain – At all driveways and public street connections with inadequate stopping sight distance or located on short vertical curves or steep grades. Designers may consider alternative options, such as access relocation, vegetation removal, and spot grading as alternatives to building turn lanes.
- Warrant 3: Railroad Crossings – At high-volume driveways (> 100 trips per day) and all public street connections where a railroad is parallel to the highway and where the potential exists for vehicles delayed by a train to back up into the through-lanes of the highway, creating both safety and operational problems. At these locations, the queuing of traffic caused by train movements should be considered. If the cross street between the railroad and the highway does not provide adequate storage, then a turn lane or turn-lane treatment should be considered on the highway to provide the additional storage needed.

- Warrant 4: Signalized Intersections – At all signalized public street connections and driveways.
- Warrant 5: Heavy-Vehicle Traffic – At all driveways and public street connections on high-speed highways (posted speed ≥ 45 mph) where the heavy-vehicle turning volume is 15 or more vehicles per hour for at least eight hours a day for four months or more per year. Examples of this include gravel operations, large grain elevators, or large distribution centers.
- Warrant 6: School Entrances – At public and private school driveways on high-speed highways (posted speed ≥ 45 mph) used by school traffic.
- Warrant 7: Crash History – At high-volume driveways (>100 trips per day) and all public street connections that demonstrate a history of crashes of the type suitable to correction by a turn lane or turn-lane treatment (typically three or more correctable crashes in one year), or where adequate trial of other remedies has failed to reduce the crash frequency.
- Warrant 8: Corridor Crash Experience – On highway corridors that demonstrate a history of similar crash types suitable to correction by providing corridor-wide consistency in turn-lane use.
- Warrant 9: Vehicular Volume Warrant – At high-volume driveways (>100 trips per day) and all public street connections on high-speed highways (posted speed ≥ 45 mph) that satisfy the criteria in Figures 3.40 and 3.41 below.

Figure 3.40: Warrant 9 for Left-Turn Lanes

2-Lane Highway AADT	4-Lane Highway AADT	Cross Street or Driveway ADT	Turn Lane Requirement
1500 to 2999	3000 to 5999	> 1500	Left-turn lane warranted
3000 to 3999	6000 to 7999	> 1200	Left-turn lane warranted
4000 to 4999	8000 to 9999	> 1000	Left-turn lane warranted
5000 to 6499	10,000 to 12,999	> 800	Left-turn lane warranted
≥ 6500 AADT	≥ 13,000 AADT	101 to 400 > 400	Left-turn lane or bypass lane Left-turn lane warranted

Highway AADT one year after opening
Posted speed 45 mph or greater

Figure 3.41: Warrant 9 for Right-Turn Lanes

2-Lane Highway AADT	4-Lane Highway AADT	Cross Street or Driveway ADT	Turn Lane Requirement
≥ 1500 AADT	≥ 3000 AADT	> 100	Right-turn lane warranted

Highway AADT one year after opening
Posted speed 45 mph or greater