



# Access Management System and Standards

2017 Edition



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# **Access Management System and Standards**



**November 2017**



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## 1. INTRODUCTION

### 1.1. What is Access Management?

Access management is defined as “the coordinated planning, regulation, and design of access between roadways and land development. It encompasses a range of methods that promote the efficient and safe movement of people and goods by reducing conflicts on the roadway system and at its interface with other modes of travel.” [1] Effective access management balances the competing objectives of through traffic movement on roadways with access to land use adjacent to the roadways. Figure 1-1 illustrates the roadway hierarchy based on the relative priority given to land access or through movement.

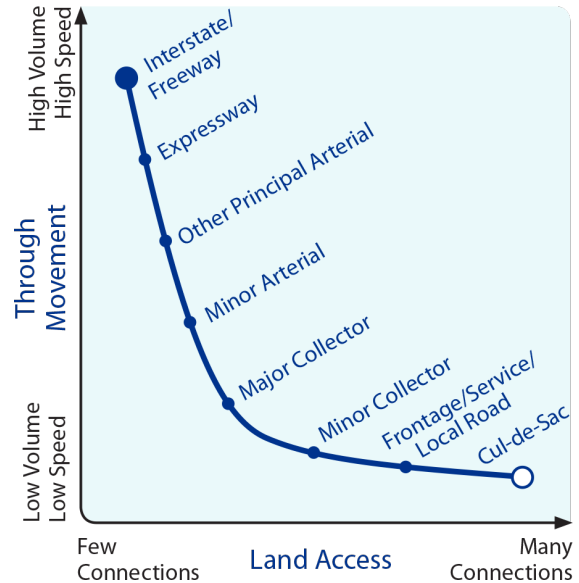
Each access point along a roadway, whether a driveway or an intersection, introduces potential for conflict and friction within the traffic stream. Proper access management regulates the number, location, and design of access points along roadways, reducing the potential for conflict. Access management helps protect public investments in transportation infrastructure by preserving the safety and efficiency of traffic flow, thus reducing the need for expensive and potentially invasive improvements to roadways, transit lines, and bicycle/pedestrian facilities.

### 1.2. Purpose

The purpose of these standards is to regulate access onto state roadways in order to protect the health, safety, and welfare of the public; to improve traffic operations for the movement

of people and goods; and to preserve the planned function of state roadways.

**Figure 1-1: Conceptual Roadway Functional Hierarchy [1]**



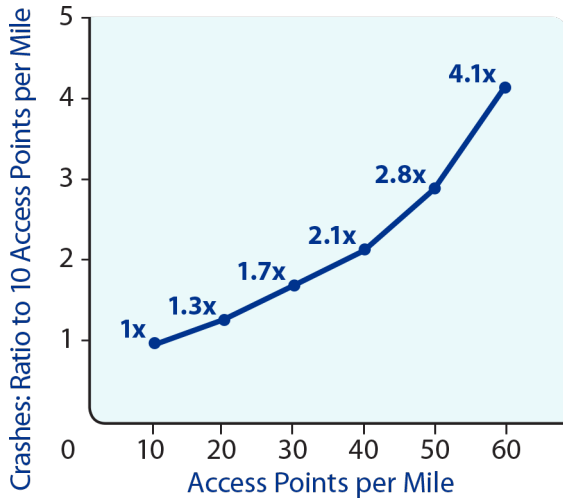
#### 1.2.1. Access Management Improves Driver Safety

Access points are a main source of crashes. The number of crashes at intersections is higher than at mid-block segments of roadways. Furthermore, the number of crashes at driveways is disproportionately higher than at other types of intersections. As access density increases, crash rates increase. The relationship between access density and crashes is conceptually summarized in Figure 1-2.

The location, spacing, and frequency of access points have a significant impact on traffic patterns and public safety. Consequently, roadways with proper access management, with nontraversable medians are generally safer than undivided roadways or those with two-way left-turn lanes (TWLTLs).



**Figure 1-2: Access Density and Crashes [1]**



**1.2.2. Access Management Improves Safety of Vulnerable Road Users**

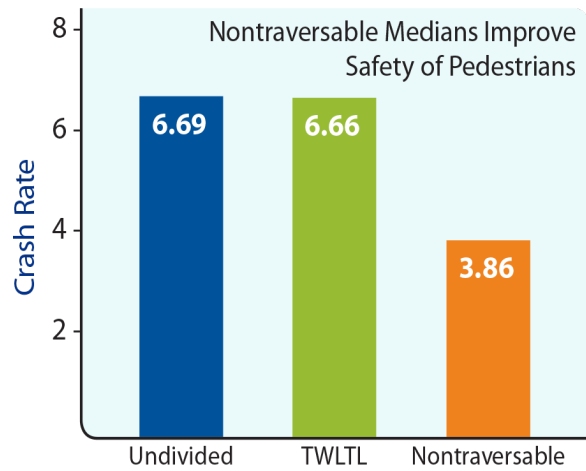
Most crashes involving vulnerable road users (pedestrians, people with disabilities, and bicyclists) occur when the road user crosses the road. Proper access management and properly designed medians reduce the chances of conflict between vulnerable road users and automobiles. Vulnerable road users also benefit from more predictable automobile travel patterns resulting from improved access management.

The most common crash type involving pedestrians is a conflict between a crossing pedestrian and a turning vehicle at an intersection. Properly designed medians can provide a refuge for pedestrians as they cross a roadway. Undivided roadways and roadways with TWLTLs do not offer such refuge to pedestrians. Therefore, arterial roadways with nontraversable medians are generally safer for pedestrians. [1] This is illustrated in Figure 1-3. Proper access management, in addition to

improving the safety of motor vehicles, also improves the safety of vulnerable roads users.

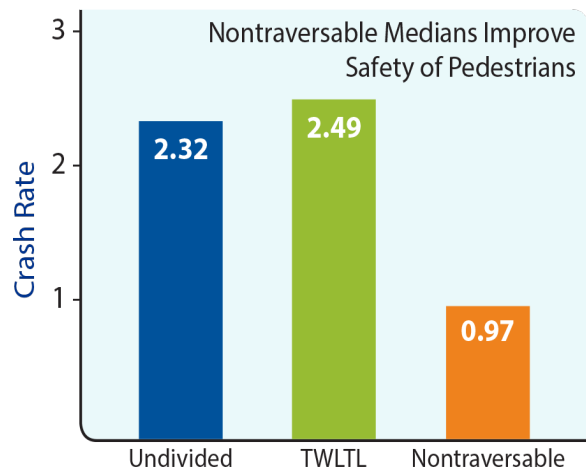
**Figure 1-3: Pedestrian Crash Rates for Suburban Arterials [1]**

**At Mid-Block Locations:**



*Midblock crash rate = Number of crashes per 100 million vehicle miles.*

**At Intersections:**

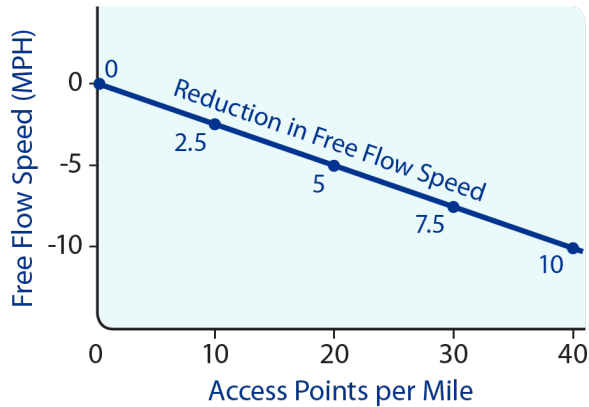


*Intersection crash rate = Number of crashes per 100 million entering vehicles.*

### 1.2.3. Access Management Improves Traffic Operations

Increasing the number of access points and signals along a roadway results in increased delay [2]; this is illustrated in Figure 1-4. Minimizing the number of access points and traffic signals and promoting uniform signal spacing significantly improves travel times. Consequently, transit users also experience reduced delay and reduced travel times and benefit from a safer walking environment due to fewer access points.

**Figure 1-4: Access Density and Speed [2]**



By helping to reduce congestion, a proficient access management program can help to reduce the need to add additional lanes to roadways. Application of access management techniques preserves the public's investment in the state highway system by extending the useful life of the facility.

### 1.2.4. Other Benefits of Access Management

Economic development is supported when people and goods move safely and efficiently on the transportation system. Access management supports economic activity by preserving the function of the roadway system

by ensuring that roadway access and site circulation are properly located and designed. Businesses and property owners also benefit from stable or increasing property values attributable to a well-managed roadway corridor.

Passenger cars consume the least amount of fuel at speeds ranging from 35 to 55 mph. Energy consumption increases by about 20 percent for every additional stop per mile. [1] Proper implementation of access management techniques helps preserve the efficiency of traffic flows and thereby results in lower fuel consumption and reduced emission of greenhouse gases and other air pollutants.

## 1.3. Authority and Application

This Access Management System and Standards is authorized by Nevada Revised Statutes (NRS) 408.100 (Declaration of legislative intent.), NRS 408.210 (Powers of director: Closing and construction of highways; removal of encroachments.) and NRS 408.423 (Permit required to excavate state highway; exception; fee.)

The Access Management System and Standards, adopted and contained herein, replaces the previous Access Management System and Standards, dated July 1999. This policy is intended to apply to new points of ingress and egress to the Nevada State Highway System as well as to changes in existing ingress and egress.

This Access Management System and Standards will become effective on November 15, 2017.





### 1.4. Organization

Chapter One explains the concept of access management and describes the need, purpose, and structure of the Access Management System and Standards.

Chapter Two describes the administrative procedures for implementation of the Access Management System and Standards.

Chapter Three defines the roadway classification and the types of access connections.

Chapter Four provides the standards for the design and construction of accesses to the state highway system.

### 1.5. Definitions, Abbreviations, and Acronyms

For the purposes of this Access Management System and Standards, the following definitions apply:

1. **85<sup>th</sup> percentile speed:** The speed at which 85 percent of the traffic is traveling, or slower. Fifteen percent of the traffic is traveling faster than this speed.
2. **Acceleration lane:** A speed change lane, including tapered areas, that enables a vehicle entering the traffic stream to accelerate to a speed that allows the vehicle to safely merge with through traffic.
3. **Access Management Plan:** A roadway design plan that designates access locations and designs.
4. **Access permit:** A Right-of-Way Occupancy Permit issued pursuant to the provisions of

NRS 408.423, NRS 408.210, and Nevada Administrative Code (NAC) 408.

5. **Access connection:** Any driveway, street, turnout, or other means of providing for the movement of vehicles to or from the public roadway system.
6. **Access point:** See **Access connection**.
7. **Alternative access:** An access location other than the one in consideration. It usually refers to an access connection to a roadway of lower functional classification.
8. **Alternative Access Plans:** Alternative access management plans that advance access management and other public goals. Alternative Access Plans may be proposed for existing accesses (that require a new access permit) in existing developed areas when these access management standards cannot be met due to the existing configuration of properties and accesses in the vicinity of the subject site or if the standards can be met but the applicant desires to submit an alternative plan.
9. **American Association of State Highway and Transportation Officials (AASHTO):** A nonprofit, nonpartisan association representing highway and transportation departments in the 50 states, the District of Columbia, and Puerto Rico.
10. **Americans with Disabilities Act (ADA):** The ADA is a civil rights law that prohibits discrimination against individuals with disabilities in all areas of public life, including jobs, schools, transportation, and all public and private places that are open to the general public.
11. **Annual Average Daily Traffic (AADT):** The two-way total volume of traffic on a



## Chapter One: Introduction

- roadway segment for one year divided by the number of days in the year.
12. **Applicant:** Any person, business, or agency requesting an access and applying for an access permit. Once the request for access is accepted and an access permit is accepted, the applicant is considered a permittee.
  13. **Application for the Occupancy of Nevada Department of Transportation Right-of-Way:** The application form that is filled out when applying for an access permit. This same form is also used for applying for all other uses of state highway rights-of-way. Upon acceptance, this application form becomes the access permit.
  14. **Approach:** The set of lanes making up one leg of an intersection.
  15. **Appropriate local authority:** The board of county commissioners if the access is located in an unincorporated area of a county or the governing body of the municipality if the access is located in an incorporated municipality.
  16. **Arterial:** A major roadway intended primarily to serve through traffic at which access is carefully controlled. Arterials are roadways of regional importance, intended to serve moderate to high volumes of traffic traveling relatively long distances and at higher speeds.
  17. **Auxiliary lane:** Any lane (including the taper areas) striped for use by decelerating or accelerating vehicles and for storing vehicles that are waiting to make a turn from the roadway. These lanes are not for use by through traffic.
  18. **Average Daily Traffic (ADT):** The two-way total traffic volume during a given time period (more than a day and less than a year) divided by the number of days in that time period.
  19. **Bandwidth:** The time (seconds) elapsed between the passing of the first and last possible vehicle in a group of vehicles moving at the selected progression speed through a progressive traffic signal system. It is a quantitative measurement of the through traffic capacity of a signal progression system; the greater the percentage of bandwidth, the higher the roadway capacity.
  20. **Bicycle lane:** A portion of the roadway that has been designated by striping, signing, and pavement markings for the exclusive use of bicycles.
  21. **Bicycle path:** A shared-use path, which is separated from, and restricted from use by, motorized vehicular traffic. Pedestrians, wheelchairs, and bicycles can use it.
  22. **Bike lane:** See **Bicycle lane**.
  23. **Bike path:** See **Bicycle path**.
  24. **Board:** The Board of Directors of the Nevada Department of Transportation.
  25. **Capacity:** The maximum rate of flow at which vehicles reasonably can be expected to traverse a point on a lane or road during a specified period under prevailing traffic, roadway, and signalization conditions, usually expressed as vehicles per hour. Capacity is most often considered the maximum amount of traffic that can be accommodated by a roadway during the peak hours of demand.
  26. **Change in use:** Any change in the use of the property, or change in the size of the



- use, causing a change in the trip generation of the property. Also, see **Significant change in use.**
27. **Channelization:** The separation or regulation of conflicting traffic movements into definite paths of travel by traffic islands or pavement markings to facilitate safe and orderly movements of both vehicles and pedestrians.
  28. **Collector:** A road that balances direct access with travel demands and is intended to move traffic from local roads to secondary arterials.
  29. **Conditional access:** Access that is permitted for use until an alternative access becomes available.
  30. **Conflict:** A traffic event that causes evasive action by a driver to avoid collision with another vehicle. It is usually designated by a braking application or evasive lane change.
  31. **Conflict point:** An area in which intersecting traffic either merges, diverges, or crosses.
  32. **Connection:** See **Access connection.**
  33. **Consulting Engineer:** A Nevada Licensed Professional Engineer.
  34. **Control of access:** The condition in which the right of access to property adjacent to a highway is partially or fully controlled by public authority.
  35. **Controlled-access highway:** A highway to which owners or occupants of abutting lands and other persons are prohibited from having private, direct access to or from the highway. Access is allowed only at selected public roads.
  36. **Corner clearance:** The distance measured along the curb line between the point of curvature of the radius of the driveway and the point of curvature of the radius of the nearest intersection. In the case of a depressed curb driveway, the distance is measured to the beginning of the depressed curb.
  37. **Cross access:** An easement or service driveway providing vehicular access between two or more contiguous sites so the driver does not need to reenter the public street system.
  38. **Curb cut:** An opening along a curb line where vehicles may enter or leave the roadway.
  39. **Curb line:** The line, whether curbing exists or not, consisting of the outer edge of the paved portion of a highway.
  40. **Curb return:** See **Curb cut.**
  41. **Date of issue:** The date when the authorized Department official signs and accepts the access permit.
  42. **Deceleration lane:** A speed change lane, including the tapered areas, which allows vehicles exiting the through traffic lanes a safe area to slow to a safe speed or stop before turning.
  43. **Decision sight distance:** The distance needed for a driver to detect an unexpected or otherwise difficult-to-perceive information source or condition in a roadway environment that may be visually cluttered, recognize the condition or potential threat, select an appropriate speed and task, and initiate and complete a complex maneuver.
  44. **Department:** The Nevada Department of Transportation.



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45. **Design Hour Volume (DHV):** The traffic volume expected to use a roadway segment during the 30<sup>th</sup> highest hour of the design year. Roadways are designed to accommodate this volume of traffic.
46. **Design speed:** A selected speed used to determine the various geometric features of the roadway. The selected design speed establishes the range of design values for many of the other geometric elements of the roadway.
47. **Design year:** The year for which a roadway facility is designed. This is usually 20 years from the opening year but may be any time within a range of years from the present (for restoration type projects) to 20 or more years in the future (for new construction type projects).
48. **Deviation:** A departure from an adopted access management standard.
49. **Directional Design Hour Volume (DDHV):** The traffic volume expected to use a roadway segment during the 30<sup>th</sup> highest hour of the design year in the peak direction.
50. **Directional median opening:** An opening in a restrictive median that provides for specific movements and physically restricts other movements.
51. **District:** The engineering district of the Department that administers one of three geographical areas of the state.
52. **District Engineer:** The senior officer or an authorized representative of an engineering district of the Department.
53. **Divided highway:** A highway with opposing traffic movements physically separated by medians, concrete barrier rails, raised traffic islands, or pavement markings. Due to conflicting traffic movements, a two-way left-turn lane does not establish a divided highway.
54. **Driveway:** The physical connection for vehicular traffic between a roadway and abutting land.
55. **Driveway flare:** Pavement surface at the entrance of a driveway that facilitates turning movements and is used to replicate turning radius in areas with curb and gutter construction.
56. **Driveway return radius:** A circular pavement transition at the entrance of a driveway that facilitates turning movements.
57. **Driveway throat length:** The length of the driveway from the outside edge of the traveled way to the first on-site location at which a vehicle driver can execute a turn maneuver.
58. **Driveway width:** The edge-to-edge distance of the driveway measured at the right-of-way line.
59. **Easement:** A right-of-way granted, but not dedicated, for specific and limited use of private land and within which the owner of the property shall not erect any permanent structures.
60. **Egress:** The act of leaving a place or exiting; the exit of vehicular traffic from abutting properties to a roadway.
61. **Emergency access:** An access for the exclusive use by police, fire, and emergency service vehicles when responding to an emergency service situation. Such accesses shall not include the access to a police station, firehouse, or other emergency service facility. Emergency accesses shall be gated unless



- approved by the District Engineer or designee.
62. **Engineer:** See **Consulting Engineer**.
  63. **Engineering study:** The comprehensive analysis and evaluation of available pertinent information, and the application of appropriate principles, provisions, and practices as contained in this document and other sources, for the purpose of deciding upon the applicability, design, operation, or installation of a traffic control device or facility.
  64. **Expressway:** A high-speed, divided highway that may have partial or full control of access, limited at-grade intersections, and interchanges at major intersections.
  65. **Federal Highway Administration (FHWA):** The administrative branch of the United States Department of Transportation that administers Federal Aid Highways and Federal Aid Interstate Highways.
  66. **Field access:** An access to undeveloped or agricultural property that has an average traffic volume of less than one vehicle per day.
  67. **Field approach:** See **Field access**.
  68. **Freeway:** A principal arterial roadway designed for relatively uninterrupted, high-volume mobility and to which access is limited to grade-separated interchanges only. Interstate highways are freeways.
  69. **Frontage road:** Any public street or road providing service and access from areas adjacent to a freeway or highway.
  70. **Functional area of an intersection:** That area beyond the physical intersection of two controlled-access facilities that constitutes decision and maneuver distance, plus any required vehicle storage length, and is protected through corner clearance standards and connection spacing standards.
  71. **Functional classification:** A classification system that classifies a public roadway according to its purpose and hierarchy in the local or statewide highway system.
  72. **General street system:** The overall system of streets, roads, and highways in an area.
  73. **Grade:** The rate or percent of change in slope from or along a highway. It is measured along the centerline of the highway or access.
  74. **Grade separation:** A crossing of two roadways, or a roadway and railroad, or a roadway and a pedestrian walkway, at different elevations.
  75. **Gradient:** See **Grade**.
  76. **Headquarters:** The administrative center for the Department of Transportation.
  77. **Highway:** The entire width between the right-of-way boundary lines open to the use of the public for purposes of vehicular travel. The highway includes all related structures and appurtenances such as bridges, culverts, drains, ditches, embankments, retaining walls, trees, shrubs, and fences within the public right-of-way.
  78. **Illegal access connection:** An access connection for which a valid access permit has not been issued. Connections in existence before the adoption of access regulations (i.e., grandfathered connections) are not considered illegal access connections.



79. **Impact analysis:** A study or report generated by a Nevada Licensed Professional Engineer with expertise in traffic engineering, in accordance with the requirements contained in the Department's "Terms and Conditions Relating to Right-of-Way Occupancy Permits." This study or report analyzes anticipated roadway conditions with and without an applicant's development and includes an analysis of mitigation measures.
80. **Ingress:** An entry into a place; the entrance of vehicular traffic into abutting properties from a roadway.
81. **Interchange:** A facility that grade separates intersecting roadways and provides directional ramps for movements between the roadways. The grade separation structure and ramps are considered part of the interchange.
82. **Intersection:** The location where two or more roadways meet, at-grade.
83. **Intersection sight distance:** The distance along the through street that, from the perspective of a driver waiting at a driveway or street intersection, provides the driver with a sufficient line of sight to ascertain whether it is safe to attempt to turn onto or cross the through street.
84. **Lane:** The portion of a roadway for the movement of a single line of vehicles, not including the gutter or shoulder of the roadway.
85. **Level of Service (LOS):** A qualitative measure describing the operational conditions within a stream of traffic. The measure uses factors such as speed, travel time, ability to maneuver, traffic interruptions, safety, waiting periods (delay), and driver comfort and convenience. LOS is represented by one of the letters A through F, where A designates the freest flow and F the least free flow.
86. **Licensed Professional Engineer:** A person who by reason of his/her professional education and practical experience is granted a certificate of registration by the Nevada Board of Professional Engineers and Land Surveyors to practice professional engineering.
87. **Local government:** See **Appropriate local authority.**
88. **Local road:** See **Frontage road.**
89. **Major deviation:** All deviations (departures from an adopted standard) other than minor deviations are considered major deviations.
90. **Median:** That portion of a divided highway separating opposing traffic flows. Medians can be depressed, raised, or level with the pavement surface, as well as traversable or nontraversable.
91. **Median opening:** An opening in a nontraversable median that provides for crossing and turning traffic.
92. **Minor deviation:** A deviation from an adopted standard that typically results in minimal (if any) impacts on safety or traffic operations. If a deviation is within or equal to 10 percent difference from the standards, then the deviation is considered a minor deviation.
93. **MPH:** Speed expressed in miles per hour.
94. **MUTCD:** Manual on Uniform Traffic Control Devices.



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95. **Nevada Administrative Code (NAC):** The codified, administrative regulations of the Executive Branch.
96. **Noncompliant access connection:** An access connection for which an access permit has been issued; however, it is not in conformance with the location, design, or other conditions stated in the permit.
97. **Nontraversable median:** A physical barrier in the roadway, such as a concrete barrier or landscaped island, that separates traffic traveling in opposite directions.
98. **Nevada Revised Statutes (NRS):** The current codified laws of the State of Nevada.
99. **Occupancy permit:** See **Access permit**.
100. **Peak Hour Volume:** The traffic volume in a 60-minute period during a 24-hour period in which the largest number of vehicles passes over a designated section of a roadway.
101. **Permit:** See **Access permit**.
102. **Permit issue date:** See **Date of issue**.
103. **Permittee:** The corporation(s), person(s), entities(s), or their agent(s) to whom an access permit is issued.
104. **Person:** An individual, agency, corporation, partnership, or other entity.
105. **Potential for signalization<sup>1</sup>:** An intersection that, at a 20-year forecast or at build-out, is determined that the volumes would be within 25 percent of those for meeting the warrants for a traffic signal as defined in the MUTCD.
106. **Private access:** Access from an abutting parcel that is privately owned and is for the private or commercial use of the property owner.
107. **Public access:** A roadway connection provided for a public way.
108. **Public intersection:** A facility open for use by the public and under the control and jurisdiction of a local government or the Department.
109. **Public Right-of-Way Accessibility Guidelines (PROWAG):** Accessibility guidelines for the design, construction, and alteration of pedestrian facilities in the public right-of-way.
110. **Public road:** See **Public intersection**.
111. **Public street:** See **Public intersection**.
112. **Public way:** See **Public intersection**.
113. **Ramp:** A directional roadway that connects an intersecting roadway to a freeway, or a freeway to a freeway.
114. **Reasonable access:** Access that is generally considered a matter of physical necessity for use of the property, not a matter of convenience or competitiveness in the marketplace. If alternative access locations and routes are available and do not significantly impair access to the property, the criteria for reasonable access is generally considered satisfied. Circuity of route and off-site turning movements in route to the site are not factors that should be used when determining reasonable access.
115. **Restrictive median:** See **Nontraversable median**.

<sup>1</sup> The term does not imply that a traffic signal can be installed at every location that has the potential for signalization. Refer to Section 4.2.1 for a list of criteria that need to be satisfied for the installation of a traffic signal.



116. **Right-of-way (ROW):** The entire width between the boundaries of a strip of land occupied or intended to be occupied by a road, sidewalk, crosswalk, railroad, electric transmission line, oil or gas pipeline, water line, sanitary storm sewer, or other similar uses.
117. **Roadway:** The portion of the right-of-way that is improved, designed, or ordinarily used for vehicular travel.
118. **Roundabout:** A traffic control device, which typically consists of a circular intersection, with traffic in the roundabout flowing counterclockwise, and with traffic that is about to enter the intersection yielding to traffic that is already in the roundabout.
119. **Service road:** See **Frontage road**.
120. **Shared access:** A single connection that serves two or more adjoining lots or parcels.
121. **Shoulder:** The portion of the roadway that lies between the edge of the traveled way and curb line, excluding auxiliary lanes.
122. **Sidewalk:** A paved walkway for pedestrians which runs parallel to a street.
123. **Sight distance:** The distance clearly visible to the driver of a motor vehicle along the roadway from a specified "eye" height above the roadway to a specified height above the roadway when the view is unobstructed by traffic.
124. **Signal:** An electrically operated device that controls or directs the flow of traffic.
125. **Signal progression:** The progressive movement of traffic, at a planned rate of speed without stopping, through adjacent signalized locations within a traffic control system.
126. **Signal spacing:** The distance between traffic signals along a roadway.
127. **Signalization:** See **Signal**.
128. **Significant change in use:** Change in the use of the property, or expansion in the size of the use, causing an increase in the trip generation of the property, equal to or exceeding 10 percent more trip generation (either peak hour or daily) or, 10 or more vehicles per hour more than the existing use.
129. **Speed change lane:** See **Auxiliary lane**.
130. **Standard plans:** The State of Nevada Standard Plans for Road and Bridge Construction, as amended.
131. **Standard specifications:** The State of Nevada Standard Specifications for Road and Bridge Construction, as amended.
132. **State highway:** Any road, street, or highway which is on the state highway system and to which a current state route number has been assigned.
133. **Stopping sight distance:** The distance required by a vehicle traveling at a given speed to come to a stop after an object on the highway becomes visible to the driver of the vehicle. It includes the distance the vehicle travels during the driver's perception and reaction times and the vehicle braking distance.
134. **Storage lane:** The additional lane footage added to a deceleration lane to store the maximum number of vehicles likely to accumulate during a peak period





so as not to interfere with the through travel lanes.

135. **Street:** A thoroughfare, generally in a city or town, that is wider than an alley and usually is paved and includes sidewalks. Boulevards and parkways are types of streets.
136. **Terms and Conditions:** Standards for permit work.
137. **Time-space diagram:** A chart on which, the distance between signals and signal timing is plotted against time. The chart indicates signal progression, efficiency, bandwidth, and speed of traffic. Efficiency is the width of the through band expressed as a fraction of the entire signal cycle. For example, 50 percent efficiency means that 30 seconds of a 60-second signal cycle is devoted to the movement of through traffic.
138. **Traffic control device:** Any sign, signal, marking, or device placed or erected for the purpose of regulating, warning, or guiding vehicular traffic or pedestrians.
139. **Traffic impact analysis:** See **Impact analysis**.
140. **Traffic impact report:** See **Impact analysis**.
141. **Traffic impact study:** See **Impact analysis**.
142. **Traffic signal:** See **Signal**.
143. **Traveled way:** The portion of the roadway available to the through movement of traffic. It does not include shoulders, sidewalks, gutters, medians, or auxiliary lanes.
144. **Turn lane:** See **Auxiliary lane**.
145. **Two-way left-turn lane (TWLTL):** A continuous lane located between opposing traffic flows that provides a refuge area from which vehicles may complete a left turn from a roadway.
146. **Variance:** Permission to depart from a regulatory standard when the conditions at a location are such that compliance with the standard requirement is impractical or will result in an unsafe situation.
147. **Vehicles per day (vpd):** The number of vehicles passing a point on a roadway or traveling on a specific segment of roadway in a 24-hour interval of time. For the purposes of this document, “vehicles per day” refers to AADT.
148. **Vehicles per hour (vph):** The number of vehicles passing a point on a roadway or traveling on a specific segment of roadway in a 1-hour (60-minute) interval of time.
149. **Vehicles per hour per lane (vphpl):** The number of vehicles passing a point on a single lane of roadway in a 1-hour (60-minute) interval of time.
150. **Working day:** A normal day of work, excluding weekends and legal holidays.



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## 2. ADMINISTRATION

### 2.1. Purpose

This chapter provides administrative procedures for the implementation of the Access Management System and Standards.

### 2.2. Access Requests and Access Permits

A Permit for the Occupancy of Nevada Department of Transportation (Department) Rights-of-Way (access permit) is required for all points of access onto any street, road, or highway that is a part of the state highway system.

Accesses shall be designed and requested for in accordance with these Access Management System and Standards. Access permits shall be applied for in accordance with the provisions contained in the Department's "Terms and Conditions Relating to Right-of-Way Occupancy Permits," [3] and the Nevada Administrative Code (NAC) 408.

Accesses already in place by the effective date (November 15, 2017) of these standards are not affected by these new standards until a new access permit is requested or a change in use (as defined in Section 2.3.1) occurs. Existing accesses that do not meet these access management standards shall then be upgraded to the extent feasible to conform to the intent of these standards. A new access permit and, consequently, a new access request and a new access permit application are required for an existing access if the site is redeveloped or if there is a change in use.

#### 2.2.1. Access Request Process

Figure 2-1 illustrates the access request process. The following steps are typically involved in the access request process.

Once the applicant decides to request for an access, the first step is to have a pre-application/scoping meeting/conversation with the District to identify the scope and the requirements of the access request.

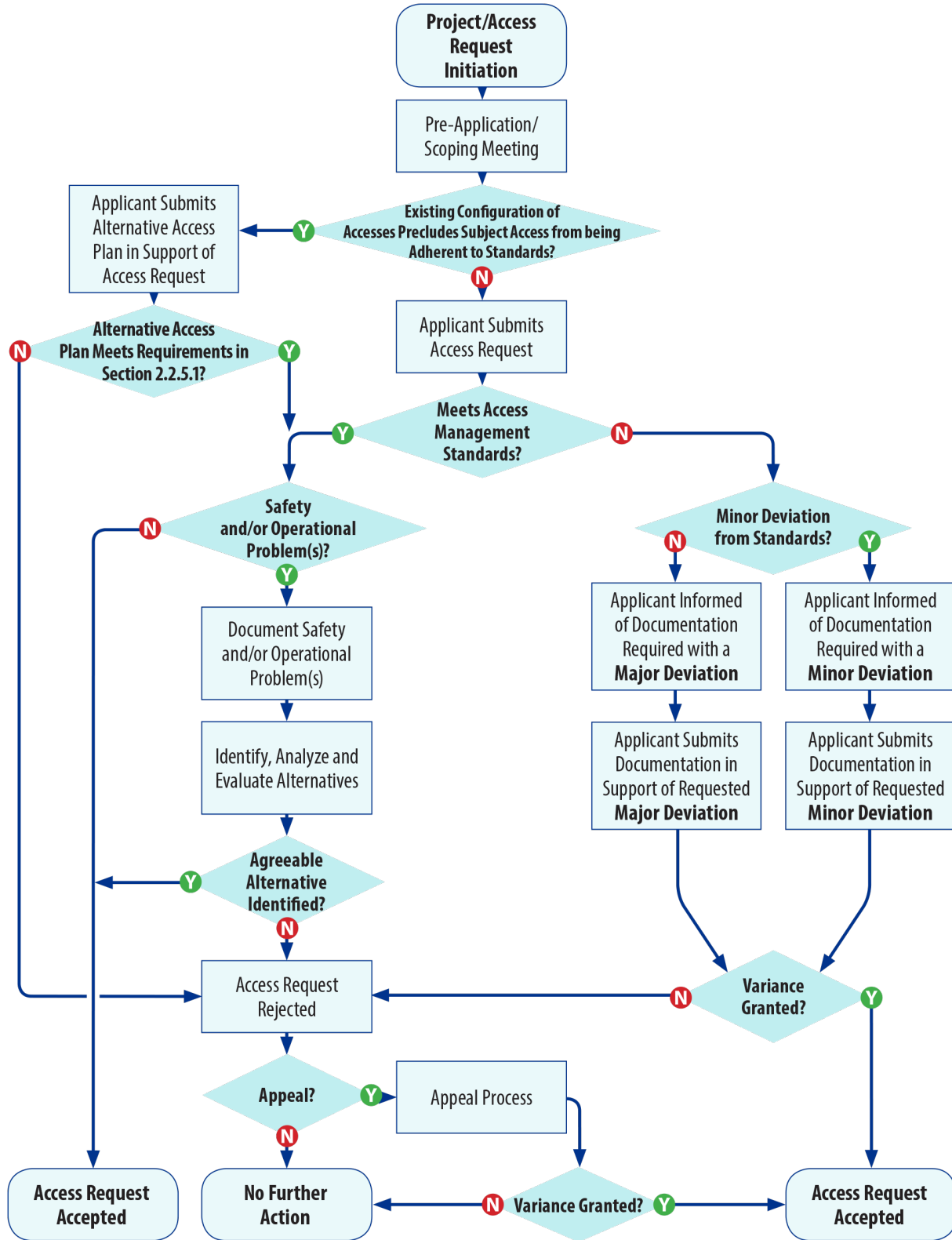
This is followed by the applicant's formal submittal of an access request and a traffic impact study (if needed, per requirements in Section 2.2.2). Deviations from standards and variances are addressed as explained in Section 2.2.4 and Section 2.2.5. In cases where the existing configuration of properties and accesses in the vicinity of the subject site precludes the subject access point from being adherent to these Access Management System and Standards, or if the standards can be met but the applicant desires to submit an alternative plan, the applicant may submit an Alternative Access Plan (as explained in Section 2.2.5.1).

After the District has completed a review of the access request, the request may be accepted or rejected. Conditions shall be established on all accesses, as to the location, design, construction, maintenance, type and volume of traffic, and other conditions (such as the provision of cross access, etc.), as specified by the Department. Upon receipt of the Department's decision, the applicant may appeal the decision as explained in Section 2.2.6.

Subsequent to the appeals process, depending on the findings, the access request may be accepted or the original decision to reject the access request may be sustained.



Figure 2-1: Access Request Process





In all cases, the access may have restrictions and/or provisions for the expiration of the permit if the land use or other prevailing conditions change.

The Department will keep a record of all meetings (in-person and telephonic) with the applicant and/or applicant's representatives and include these in the permanent file corresponding to the access request.

All decisions and findings relative to an access request shall be clearly documented in the permanent file corresponding to the access request. Where an access request is rejected, the technical reasons for the rejection shall also be documented in the permanent file.

### 2.2.2. Traffic Impact Studies

A traffic impact study is a study or report that analyzes anticipated roadway conditions with and without an applicant's development and includes an analysis of mitigation measures.

1. A traffic impact study is required with all access requests for accesses that serve developments that generate 100 or more vehicles per hour.
2. A traffic impact study may be required, at the discretion of the District Engineer or designee, with access requests for accesses that serve developments that generate less than 100 vehicles per hour, when the proposed access connects onto a roadway that is congested or has high crash areas.
3. Except under extenuating circumstances, as determined by the District, a traffic impact study is required with all access requests that request a variance for a major deviation.

4. A traffic impact study may be required, at the discretion of the District Engineer or designee, with access requests that request a variance for a minor deviation.
5. A traffic impact study is required with all Alternative Access Plans for existing accesses in developed areas.
6. All traffic impact studies shall be prepared by, signed by, and contain the seal of a Nevada Licensed Professional Engineer knowledgeable in traffic engineering.
7. All traffic impact studies shall be prepared per the requirements detailed in the Department's "Terms and Conditions Relating to Right-of-Way Occupancy Permits" [3] document. The scope of the traffic impact studies shall be determined by coordinating with the District.
8. For all access requests, the applicant shall document:
  - a. All the email correspondence that has taken place between the applicant and the District regarding this access request
  - b. The approved<sup>2</sup> minutes of all meetings (in-person and telephonic) between the applicant and the District regarding this access request
  - c. In cases where a traffic impact study is required, this documentation shall be an addendum/appendix to the traffic impact study

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<sup>2</sup> It is the responsibility of the applicant to distribute the minutes of the meetings to the District to obtain their concurrence.



### 2.2.3. Temporary Access

1. At the discretion of the Department, temporary access may be granted for:
  - a. construction
  - b. agriculture
  - c. mining
  - d. land-clearing
  - e. special events
2. The Department may review the traffic operations and safety impacts of the temporary access before granting them.
3. The temporary access shall have restrictions and limitations, at a minimum, on the types of uses, vehicular volumes, and the duration for which the temporary access will be allowed. The temporary access permit shall have an expiration date.
4. Temporary access will be allowed pursuant to the condition that it will be eliminated, at the permittee's expense, when the access violates the restrictions placed on the access permit, or when the temporary access permit expires, or when alternative access becomes available.

### 2.2.4. Deviations

Deviations (departure) from the access management standards may be allowed to avoid precluding viable operational solutions. Depending on the extent of deviation from the standards, deviations may be:

- Minor deviations, or
- Major deviations

The permission to deviate from adopted standards is called a variance.

If a variance is not granted and the access request cannot be accepted without the variance, the access request will be rejected.

#### 2.2.4.1. Minor Deviation

A minor deviation is a deviation from access management standards that typically results in minimal (if any) impacts on safety or traffic operations. If a deviation is within or equal to 10 percent difference from the standards, then the deviation is considered a minor deviation.

**Example:** The Access Spacing Standards (Table 4-1) require a minimum spacing of 660 feet between adjacent left-in/right-in/right-out only driveways along Minor Arterials. If a design includes adjacent left-in/right-in/right-out only driveways along a Minor Arterial spaced at 600 feet, this constitutes a minor deviation because the design is nine percent (within 10 percent) different from the standard.

A request for a variance must state the specific reasons why the deviation from standards is necessary. For a request of a variance for a minor deviation, a traffic impact study may be required, at the discretion of the District Engineer or designee. The traffic impact study (completed, signed, and sealed by a Nevada Licensed Professional Engineer knowledgeable in traffic engineering) shall document the impacts of the deviation on the safety and traffic operational efficiency of the roadway. Request for variances for minor deviations will be evaluated by the District.

#### 2.2.4.2. Major Deviation

All deviations other than minor deviations shall be considered major deviations. Except under extenuating circumstances, as determined by





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the District, all requests for major deviations shall be accompanied by a traffic impact study.

**Example:** The Access Spacing Standards (Table 4-1) require a minimum spacing of 660 feet between adjacent left-in/right-in/right-out only driveways along Minor Arterials. If a design includes adjacent left-in/right-in/right-out only driveways spaced at 500 feet along a Minor Arterial, this constitutes a major deviation because the design is 24 percent (greater than 10 percent) different from the standard.

Except under extenuating circumstances as determined by the District, the applicant shall submit appropriate documentation and proof of necessity for the variance that includes (but is not limited to) the following:

1. A traffic impact study (completed, signed, and sealed by a Nevada Licensed Professional Engineer knowledgeable in traffic engineering) that documents the impacts of the deviation on the safety and traffic operational efficiency of the roadway
2. A request for a variance must state the specific reasons why the deviation from standards is necessary
3. Documentation of unique conditions (based on established engineering principles) that make strict application of the standards impractical
4. Demonstration of how the strict application of the standards would result in a safety, maneuvering, or traffic operational problem
5. Demonstration of how the deviation creates opportunities to alleviate

significant traffic congestion or improve traffic safety

It is the responsibility of the applicant to demonstrate to the District how the specific conditions related to the access request constitute extenuating circumstances.

Request for variances for major deviations will be evaluated by the District. If needed, the District may consult with the Headquarters (Principal Operations Engineer, NDOT Traffic Operations Division).

### 2.2.5. Variances

Variances authorize an applicant to deviate from access management standards. The District is primarily responsible to review requests for variances.

1. A variance may be granted to allow direct access to a highway when a property would be landlocked or would otherwise not have reasonable access<sup>3</sup> in the absence of the requested access. If alternative site access via the local roadway system or inter-parcel cross access exists, a variance will not be granted.
2. The Department will consider the level of deviation (explained in Section 2.2.4), as well as the following when reviewing the request for a variance:
  - a. If there would be an undue and exceptional hardship on the applicant if a variance is not granted, and

<sup>3</sup> In construing reasonable access, the Department will consider whether access to the site would be substantially diminished. If alternative access is available via the local street system, the criteria for reasonable access is generally considered satisfied.



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- b. A variance would not compromise the safety of the general public, or
  - c. A variance is reasonably necessary for the convenience or welfare of the public.
3. The access permit shall contain provisions for the expiration of the variance, such as, whether the conditions that justified the variance no longer exist.

### **2.2.5.1. Alternative Access Plans in Existing Developed Areas**

For existing access connections requiring a new access permit (due to redevelopment), where the existing configuration of properties and accesses in the vicinity of the subject site precludes the subject access point from being adherent to these standards, or if the standards can be met but the applicant desires to submit an alternative plan, the applicant may submit an alternative access plan which will require approval of the District Engineer or designee. The plan shall document why standards cannot be met in that location, or if standards can be met why the alternative is more desirable for the public, and show how the plan advances the principles and intent of access management to the maximum extent feasible. In addition, the following shall apply:

1. Any Alternative Access Plan has to be consistent with the Department's adopted Access Management Plan, (Section 2.6) if available.
2. Any Alternative Access Plan proposed under this section will need to provide documentation, in the form of a traffic impact study (completed, signed, and sealed by a Nevada Licensed Professional Engineer), as to how the plan increases/improves traffic safety and

operations and how the plan better serves the public and not just the applicant or its clients or customers.

3. Cross-access easements, joint-use driveways, and shared access will be required and promoted wherever possible.

### **2.2.6. Appeals**

Any applicant that objects to the rejection of an access request or to the conditions placed on the access may request for an appeal within sixty (60) calendar days of the issuance of the District's final decision. If an appeal is not requested within this period, the access request is considered resolved.

In support of the appeal, the applicant shall submit:

1. The documentation of correspondence between the applicant and the District, as explained in Section 2.2.2 Bullet 8
2. All the materials that were submitted to the District in support of the access request that resulted in the original decision
3. Information and technical details explaining how the applicant has addressed the concerns (of the District) that resulted in the original decision

The appeal will be addressed by the District Engineer. The applicant and the applicant's engineer may be invited to present their case to the District Engineer. At his/her discretion, the District Engineer may forward the appeal to the Access Management Review Committee.

Any applicant that objects to the District Engineer's decision on the appeal may request for a re-appeal within sixty (60) calendar days of the issuance of the District Engineer's



decision. If a re-appeal is not requested within this period, the access request is considered resolved. In support of the re-appeal, the applicant shall submit all the documentation that was required for the appeal and other documentation (such as additional analyses or justification) that has been created since the appeal. The re-appeal will be addressed by the Access Management Review Committee.

The Department's Director shall appoint an Access Management Review Committee to handle the appeals forwarded by the District Engineers and to handle re-appeals. Furthermore:

1. The committee shall include the Department's Chief Road Design Engineer or designee, the Chief Traffic Operations Engineer or designee, and the Chief Traffic Safety Engineer or designee.
2. The District staff/District Engineer who reviewed the access request/appeal shall provide the technical reasons and the rationale for the access request/appeals decision.
3. The applicant and the applicant's engineer may be invited to attend these committee meetings.

Following the decision of the Access Management Review Committee, the access request is considered resolved.

### 2.3. Enforcement

#### 2.3.1. Change in Use of Access

1. It is the responsibility of the permittee or property owner to ensure that the use of the access to the property is not in violation of the Department's access management standards or any access

permit terms and conditions. This section applies to all accesses constructed before, on, or after the implementation of these standards.

2. The terms and conditions of any access permit are binding upon all assigns, successors-in-interest, heirs, and occupants.
3. If any significant change in use (as defined in Section 1.5) is made or will be made in the use of the property that will affect access operation, traffic volume, and or vehicle type, the permittee or property owner shall contact the local issuing authority or the Department to determine if a new access permit and modifications to the access are required.
4. The reconstruction, relocation, modification, or closure of a permitted access may be required when a change to the access results in, but is not limited to, any of the following:
  - a. A significant change in use as defined in Section 1.5
  - b. An increase of more than 5 percent in the number of heavy vehicles (vehicles that are larger than the passenger car design vehicle as defined by AASHTO's "A Policy on Geometric Design of Highways and Streets" [4]) during a 24-hour period or during a 60-minute interval
  - c. Any modification of a temporary access connection
  - d. Safety and/or operational issues
5. The required changes to the access connection will be the responsibility of the permittee or property owner. Changes in property that may result in significant change in use include, but are not limited



to: structural modification or additions, remodeling, change in the type of business, change in zoning or land use, or changes in property lines.

6. The Department may, when necessary for the safety of the public, require the permittee or property owner to reconstruct, modify, relocate, or close the access, or add turning lanes or auxiliary lanes to the street or roadway served by the access, in accordance with the provisions of this document.

### **2.3.2. Access Violations**

In accordance with the provisions of NRS 408.210, the Department may close, remove, or install barriers across any illegal access. Any access that is not permitted is considered illegal. Any person driving onto or from a roadway, except at a permitted access, shall be in violation of NRS 408.423. All points of access, including “grandfathered accesses,” are required to be permitted.

If closure of an access would constitute an undue hardship on users of the access other than the permittee, the Department may perform the modifications to the access necessary for the safety of the public. The permittee, his/her assigns, or the property owner shall reimburse the Department all costs incurred by the Department, including but not limited to the design, construction, inspection, and legal expenses.

### **2.3.3. Improvements to or Modifications of a Permitted Access**

The permittee or property owner shall submit a new access request and a new Application for Occupancy of Nevada Department of

Transportation Right-of-Way and receive an amended access permit prior to commencing improvements to, or modification of, an existing access. Rejection of this new access request and new permit application does not revoke the original access permit, the provisions of which shall remain in effect. The costs of the improvements shall be at the permittee’s expense. Also, see Section 2.2.5.1.

## **2.4. Cooperation with Local Authorities**

All developments must comply with the requirements of, and be approved by, local governmental agencies. These include, but are not limited to: Planning Commissions, Community Development Departments, Building Departments, Regional Transportation Commissions, City Councils, Boards of Supervisors, and Boards of County Commissioners.

## **2.5. Access Requests by Local Authorities**

Requests by local authorities for new access or for reconstruction of existing access will require an access request and application for an access permit in accordance with Section 2.2.

## **2.6. Access Management Plans**

1. The Department, or appropriate local authority, may, at its discretion, develop an “Access Management Plan” or “Master Streets and Highway Plan” for a designated portion of a state roadway to improve the safety and operation of that portion of the roadway and bring it into conformance with its roadway classification and these standards. The Department has the



authority to approve or reject that portion of any Access Management Plan or Master Street and Highway Plan proposed by a local authority, which includes a portion of a state roadway.

2. The Access Management Plan shall include all existing and proposed points of access, intersection controls, and roadway design elements. It shall include a plan for improving the supporting network and reducing direct driveway access connections to the state highway in consideration of existing and proposed land use plans.
3. All abutting property owners of record and the public shall be notified by the Department, or the appropriate local authority, of the intent to prepare the plan, its purpose, and opportunities to participate in the planning process. At least one advertised public hearing shall be held to present the proposed plan prior to adoption.
4. The Department and the appropriate local authority must jointly approve the Access Management Plan for it to become effective. All changes to the Access Management Plan must be approved by both the Department and the appropriate local authority.
5. Adopted Access Management Plans shall supersede the standards and guide administration of access permits in the planning area.
6. Adopted Access Management Plans shall be reviewed every five years following adoption to determine if updates are needed to reflect changing land use and transportation conditions in the planning area.

### 2.7. Pedestrian, Bicyclist, and Disabled Facilities

All proposed developments along a state highway must take into consideration and comply with all local, state, and federal standards for these facilities, including but not limited to the Nevada Department of Transportation's Complete Streets Policy [5], the Americans with Disabilities Act (ADA) Transition Plan [6], the Nevada Department of Transportation's Pedestrian Safety Improvement Evaluation Guideline [7], and the Proposed Accessibility Guidelines for Pedestrian Facilities in the Public Right-of-Way (PROWAG) [8]. Existing facilities, such as sidewalks, bike lanes, or bike paths, will be perpetuated; and new facilities will be installed as needed.

### 2.8. Interchanges

1. New interchanges or modification of an existing interchange will be subject to special access management requirements to protect the safety and operational efficiency of the limited access facility and the interchange area, pursuant to the preparation and adoption of an Access Management Plan. The plan shall address current and future connections, turn lanes, medians, median openings, and intersection controls within at least 0.25 mile of the interchange.
2. The Access Management Plan must be prepared whenever any new interchange is planned to be installed or when an existing interchange is planned to be modified. Interchanges on Federal Aid Interstate Highways will also require the approval of the Federal Highway Administration.



3. Access onto a federal aid or interstate freeway will not be considered if it does not comply with the Federal Highway Administration's Interstate System Access Policy.
4. Access Management Plans shall include all current and future points of access, traffic patterns and volumes, signal systems, signing and striping, right-of-way limits, and alignment. Property and access rights, which must be acquired, will also be shown. Strategies for management of access in coordination with local government agencies shall also be provided.
5. The design of the plan shall be developed using desirable level-of-service traffic operation planning and shall be based on 20-year traffic volume forecasts and roadway design standards. Access rights should be strategically (Refer to Section 4.2.5 for spacing standards near interchanges) acquired on new and modified interchanges to avoid access in the interchange functional area.
6. Access to the crossroad within the functional area of an interchange should be avoided.
2. Where access connections are to be modified, the Department will notify the affected property owners and initiate the appropriate procedures, access requests, access permits, or agreements. The Department will document the reasons for nonconformance with standards or potential safety or operational problems associated with the connection.
3. Access requests and access permits applied for during an active design or construction project shall be reviewed by the District Engineer or designee and may require further review by various divisions in Headquarters.
4. When a permitted or grandfathered connection is modified as part of a Department construction project, no additional permit shall be required. The Department will bear the cost of modification of existing approved connections necessitated solely by Department construction projects.
5. Installation and construction of new accesses by the permittee will not be allowed to interfere with the construction of a state highway.

### 2.9. Department Construction Projects

1. During the preliminary engineering and design phases of a roadway reconstruction project, roadway corridors will be evaluated to determine if existing connections, median openings, and signal spacing are in conformance or can be brought into conformance with these Access Management System and Standards.



### 3. ROADWAY CLASSIFICATION AND TYPES OF ACCESS CONNECTIONS

#### 3.1. Purpose

This Chapter describes seven levels of roadway classification and four types of access connections.

Roadway classification is the foundation of an access management program. These establish the planned function of various types of roadways and the priority placed on access versus through movement. The design standards within each classification are necessary to ensure that the roadway will continue to operate at the functional level assigned to it.

The seven levels of roadway classification are consistent with Federal Highway Administration FHWA's *"Highway Functional Classification: Concepts, Criteria and Procedures"* [9]. For design purposes, roadway segments in each class are further identified by the speed limit. The seven levels of roadway classification are:

1. Interstate Freeways (Roadway Class One)
2. Other Freeways & Expressways (Roadway Class Two)
3. Other Principal Arterials (Roadway Class Three)
4. Minor Arterials (Roadway Class Four)
5. Major Collectors (Roadway Class Five)
6. Minor Collectors (Roadway Class Six)

7. Frontage/Service/Local Roads (Roadway Class Seven)

Sections 3.2.1 through 3.2.7 describe the roadway classifications, and Table 3-1 provides a summary of the roadway classifications.

The Department's classification of roadways in Nevada is available from the Department's website [10]. The procedure to determine the functional classification of roadways is available from the Department's "Functional Classification Process and Procedures" [11]

#### 3.2. Roadway Classification

##### 3.2.1. Roadway Class One, Interstate Freeways

###### 3.2.1.1. Functional Characteristics

This roadway class exclusively includes the interstate freeways.

Freeways are a class of roadway with full control of access, designed for the movement of high volumes of traffic at high speed over long distances. Opposing traffic streams are typically separated by a nontraversable median. Access is available only via grade separations. Interstate freeways primarily provide for interregional and interstate travel.

Secondarily, they may also provide intrastate; intercity; and, in large urban areas, intracity travel. Pedestrians, bicycles, and non-motorized modes of transport are prohibited.

**Figure 3-1: Roadway Class One, Interstate Freeways**



*I-80 between Battle Mountain and Carlin (Interstate Freeway)*



*I-15 in Las Vegas (Interstate Freeway)*

### **3.2.1.2. Design Standards**

The design of these roadways should, in general, allow speed limits of 65 mph to 75 mph. All opposing traffic movements are separated by physical constraints, such as medians or concrete barrier rail. All cross traffic is separated by grade separation structures. Access to the facility is limited to directional ramps that are designed and spaced to provide a minimal speed differential between the through traffic stream and the entering or exiting traffic. Design of access to this type of facility will be determined on an individual basis by the Department. Access to interstate freeways must comply with federal regulations and be approved by the Federal Highway Administration. Private access to interstate freeways is not permitted. Temporary emergency access, or construction access within a construction zone, does not require approval of the Federal Highway Administration; however, approval is required through the normal access request and permitting process.

### **3.2.2. Roadway Class Two, Other Freeways & Expressways**

This roadway class includes freeways that are not interstate freeways and expressways.

#### **3.2.2.1. Functional Characteristics – Other Freeways**

Roadways in this class look very similar to Interstate Freeways. Freeways are a class of roadway with full control of access designed for the movement of high volumes of traffic at high speed over long distances. Opposing traffic streams are typically separated by a nontraversable median. Access is available only via grade separations.



**Figure 3-2: Roadway Class Two, Other Freeways**



*US 95 in Las Vegas (Other Freeway)*



*US 95 in Las Vegas (Other Freeway)*

A freeway provides for interregional; interstate; intrastate; intercity; and, in large urban areas, intracity travel. Pedestrians, bicycles, and non-motorized modes of transport are prohibited.

### **3.2.2.2. Design Standards – Other Freeways**

The design of these roadways should, in general, allow speed limits of 65 mph to 75 mph. All opposing traffic movements are separated by physical constraints, such as medians or concrete barrier rail. All cross traffic is separated by grade separation structures. Access to the facility is limited to directional ramps that are designed and spaced to provide a minimal speed differential between the through traffic stream and the entering or exiting traffic. Design of access to this type of facility will be determined on an individual basis by the Department. Private access to freeways is not permitted. Access to federal-aid freeways must comply with federal regulations. For temporary emergency access, or construction access within a construction zone, approval is required through the normal access request and permitting process.

### **3.2.2.3. Functional Characteristics – Expressways**

Expressways are a class of roadway designed for high-speed and high-volume movement without full control of access. They may provide for intrastate, intercity, and intracity travel; in some cases, they may provide for interregional and interstate travel. Traffic movement along these routes is the primary consideration. A very limited number of at-grade intersections are allowed and at widely spaced intervals. High volume intersections may require an interchange. Pedestrians, bicycles, and other non-motorized vehicles are prohibited.

**Figure 3-3: Roadway Class Two, Expressways**



*Academy Boulevard in El Paso County, Colorado  
(Expressway)*

### 3.2.2.4. Design Standards – Expressways

1. The design of these roadways should, in general, allow speed limits of 45 mph or greater in urban areas, 55 mph or greater in suburban areas, and 60 mph or greater in rural areas.
2. Spacing of at-grade intersections ranges from 1 mile in urban areas to 2 miles in rural areas. Where the traffic volume on the expressways exceeds an AADT of 24,000, access connections shall be limited to

right-in, right-out only unless the location of the connection is suitable for signalization [1].

3. Because intersecting public ways may in time meet signalization warrants, all intersecting streets, roads, and highways that have the potential for signalization must meet the signalized intersection spacing standards (Chapter Four). Any access that has the potential for signalization but does not meet the signalized intersection spacing or bandwidth requirements will be limited to right turns only.
4. Private, direct access is not permitted.
5. Opposing traffic movements shall be separated by medians.
6. Intersections with heavy intersecting traffic volumes should have grade-separated interchanges.
7. Turning lanes and access points near railroad crossings will be designed and located so that they do not interfere with traffic movements across the railroad crossing.
8. Livestock (and wildlife) control will be utilized in rural areas.
9. Traffic signals should be programmed to coincide with the posted speed limit and have a progression bandwidth of at least 50 percent.

### 3.2.3. **Roadway Class Three, Other Principal Arterials**

#### 3.2.3.1. Functional Characteristics

Roadways in this class are intended for the movement of high volumes of traffic at high speeds over long intercity and intracity

distances. Roadways in this class may be two-lane or multi-lane facilities. These roadways serve major centers of metropolitan areas, provide a high degree of mobility, and can also provide mobility through rural areas. This class of roadway carries the major portion of trips entering and leaving the urban area and interconnects major areas of development within the urbanized area. These principal arterials should have continuity throughout the urbanized area.

**Figure 3-4: Roadway Class Three, Other Principal Arterials**



*US 50 in Ely (Other Principal Arterial)*



*US 50 near Fallon (Other Principal Arterial)*



*St. Rose Parkway in Las Vegas (Other Principal Arterial)*

Multilane arterials should have a nontraversable median wide enough to accommodate dual left turns (at a minimum) of signalized intersections. Direct access to abutting land is subordinate to the movement function. Roadways in this class are significant regional routes and are normally part of the National Highway System.

### 3.2.3.2. Design Standards

1. The design of these roadways should, in general, allow speed limits of 35 to 45 mph in urban areas, 50 to 55 mph in suburban areas, and 60 to 70 mph in rural areas.
2. Where the traffic volume on the principal arterials exceeds an AADT of 24,000, access connections may be limited to right-in, right-out only unless the location of the connection is suitable for signalization [1].
3. Private, direct access will be permitted only when the property has no other



## Chapter Three: Roadway Classification and Types of Access Connections

reasonable access<sup>4</sup> available. Generally, only one access will be allowed per parcel or for contiguous parcels under one ownership. The access permit will contain the provision that the access will be closed when an alternative, reasonable access becomes available or if the access is no longer necessary. If known, the date of closure shall be specified.

4. Any permitted private, direct access will be for right turns only unless:
  - a. the access is in a clearly rural area with little potential for inclusion in an urban area; or
  - b. the out of direction travel would be more than 2 miles; and
  - c. the intersection does not have the potential for signalization, and the left turn(s) will not create unreasonable congestion problems, and alternatives to the left turn would cause unacceptable traffic operations and safety problems on the general street system; and
  - d. the intersection conforms to the relevant spacing standards (Chapter Four); and
  - e. an intersection can be designed and constructed that, in the opinion of the Department, meets all safety standards and requirements and does not interfere with access to nearby property or with public way intersections.
5. No additional access will be allowed if existing parcels or contiguous parcels under one ownership or control are split or divided. All access to the new parcels will be provided internally from the existing access. With the approval of the Department, the primary access may be relocated if such relocation will be beneficial to the highway and remain in conformance with these standards. In accordance with the provisions of Section 2.3.1, changes in property usage or traffic volumes may require reconstruction, improvements, or relocation.
6. Because intersecting public ways may in time meet signalization warrants, all intersecting streets, roads, and highways that have the potential for signalization must meet the signalized intersection spacing standards (Chapter Four). Any access that has the potential for signalization but does not meet the signalized intersection spacing or bandwidth requirements will be limited to right turns only.
7. Medians may be installed to separate opposing traffic flows and to control left turning movements.
8. Turning lanes and access points near at-grade railroad crossings will be designed and located so that they do not interfere with traffic movements across the railroad crossing.
9. Livestock (and wildlife) control will be utilized in rural areas.
10. Traffic signals should be programmed to coincide with the posted speed limit and have a progression bandwidth of at least 45 percent.

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<sup>4</sup> In construing reasonable access, the Department will consider whether access to the site would be substantially diminished. If alternative access is available via the local street system, the criteria for reasonable access is generally considered satisfied.

11. Refer to the Department's Intersection Control Evaluation methodology to identify the best intersection control at accesses along roadways of this class.

### 3.2.4. Roadway Class Four, Minor Arterials

#### 3.2.4.1. Functional Characteristics

Minor Arterials provide service for trips of moderate length; serve geographic areas that are smaller than those served by the principal arterials, and offer connectivity to the principal arterial system. These roadways may be two-lane or multilane roadways, and have the capacity to carry medium to high volumes of traffic at medium speeds over short to medium distances. Multilane arterials should have a nontraversable median.

**Figure 3-5: Roadway Class Four, Minor Arterials**



*US 93 near Crystal Springs (Minor Arterial)*



*Cheyenne Avenue in Las Vegas (Minor Arterial)*

The primary function is to provide for intercity, intracity, and intercommunity traffic movements. This class is typically assigned to roadways within developed portions of communities where the extensive roadside development makes assigning these roadways to a higher class impractical. Access to abutting property is secondary to through traffic movements, although roadways in this class allow more access than the principal arterials.



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### 3.2.4.2. Design Standards

1. The design of these roadways should, in general, allow speed limits of 35 to 45 mph in urban areas and 50 to 55 mph in suburban areas.
2. Private, direct access may be permitted for right turns if the access meets the spacing standards (Chapter Four) for this class of roadway. Generally, only one access will be allowed per parcel or for contiguous parcels under one ownership.
3. Any permitted private, direct access will be for right turns only unless:
  - a. the intersection does not have the potential for signalization, and the left turn(s) will not create unreasonable congestion problems, and alternatives to the left turn would cause unacceptable traffic operations and safety problems on the general street system; and
  - b. the intersection conforms to the relevant spacing standards (Chapter Four); and
  - c. an intersection can be designed and constructed that, in the opinion of the Department, meets all safety standards and requirements and does not interfere with access to nearby property or with public way intersections.
4. Additional right turn access may be allowed if the spacing standards (Chapter Four) are met, the required auxiliary lanes can be provided and the additional access will relieve traffic congestion on the roadway, and if the Department determines that
  - a. it will not be detrimental to the safety and operation of the roadway; and
  - b. the additional access will not cause a hardship to property adjacent to or across the roadway from the property under consideration
5. Additional access will not be allowed solely because existing parcels or contiguous parcels under one ownership or control are split or divided. All access to the new parcels will be provided internally to the existing access. With the approval of the Department, the primary access may be relocated if such relocation will be beneficial to the highway and remain in conformance with these standards. In accordance with the provisions of Section 2.3.1, changes in property usage or traffic volumes may require reconstruction, improvements, or relocation.
6. Because intersecting public ways may in time meet signalization warrants, all intersecting streets, roads, and highways that have the potential for signalization must meet the signalized intersection spacing standards (Chapter Four). Any access that has the potential for signalization but does not meet the signalized intersection spacing or bandwidth requirements will be limited to right turns only.
7. Medians may be installed to separate opposing traffic flows and to control left turning movements.
8. Turning lanes and access points near at-grade railroad crossings will be designed and located so that they do not interfere with traffic movements across the railroad crossing.
9. Existing livestock (and wildlife) control will be perpetuated in rural areas.

10. Traffic signals should be programmed to coincide with the posted speed limit and have a progression bandwidth of at least 40 percent.
11. Refer to the Department's Intersection Control Evaluation methodology to identify the best intersection control at accesses along roadways of this class.

### 3.2.5. Roadway Class Five, Major Collectors

#### 3.2.5.1. Functional Characteristics

Collectors serve a critical role in the roadway network by gathering traffic from local roads and funneling them to the arterial network. Collectors generally serve intracounty (rather than statewide) travel and constitute those routes on which (independent of traffic volume) predominant travel distances are shorter than on arterial routes. Consequently, lower speeds may be posted.

**Figure 3-6: Roadway Class Five, Major Collectors**



*NV 375 near Crystal Springs (Major Collector)*

Generally, Major Collector routes are longer in length, have lower connecting driveway densities, have higher speed limits, are spaced at longer intervals, have higher annual average traffic volumes, and may have more travel lanes than their Minor Collector counterparts.

#### 3.2.5.2. Design Standards

1. The design of these roadways should, in general, allow speed limits of 25 to 45 mph.
2. The posted speed limit will generally be used to determine access design standards for these roadways. However, if the Department or local authority has plans to improve the roadway to a higher class or speed limit, then the access design standards or speed limit for that planned class shall be used.
3. Generally, only one access will be allowed per parcel for private, direct access. In lieu of additional access, permittees will be encouraged to share access with the adjacent property owner(s). Additional access may be allowed if the spacing standards (Chapter Four) are met and if the Department determines that
  - a. it will not be detrimental to the safety and operation of the roadway, and
  - b. the additional access will not cause a hardship to property adjacent to or across the roadway from the property under consideration
4. Additional access will not be allowed solely because existing parcels or contiguous parcels under one ownership or control are split or divided. All access to the new parcels shall be provided internally from the existing access. With the approval of the Department, the primary access may

be relocated if such relocation will be beneficial to the highway and remain in conformance with these standards. In accordance with the provisions of Section 2.3.1, changes in property usage or traffic volumes may require reconstruction, improvements, or relocation.

5. When local regulations require a secondary access for emergency services, the Department may allow a gated emergency access. Such an access shall not be open for nonemergency uses, shall be maintained by the permittee as a closed access, and will not be considered for conversion to a direct access.
6. Because intersecting public ways may in time meet signalization warrants, all intersecting streets, roads, and highways and all private, direct accesses that have the potential for signalization must meet the signalized intersection spacing standards (Chapter Four). Any access that has the potential for signalization but does not meet the signalized intersection spacing will be limited to right turns only.
7. Turning lanes and access points in the vicinity of at-grade railroad crossings will be designed and located so that they do not interfere with traffic movements across the railroad crossing.
8. Existing livestock (and wildlife) control will be perpetuated in rural areas.
9. Refer to the Department's Intersection Control Evaluation methodology to identify the best intersection control at accesses along roadways of this class.

### 3.2.6. Roadway Class Six, Minor Collectors

#### 3.2.6.1. Functional Characteristics

Collectors serve a critical role in the roadway network by gathering traffic from local roads and funneling them to the arterial network. Collectors generally serve intracounty (rather than statewide) travel and constitute those routes on which predominant travel distances (independent of traffic volume) are shorter than on arterial routes. Consequently, lower speeds may be posted.

Generally, Minor Collector routes are shorter in length, have higher connecting driveway densities, have lower speed limits, are spaced at smaller intervals, have lower annual average traffic volumes, and may have fewer travel lanes than their Major Collector counterparts.

**Figure 3-7: Roadway Class Six, Minor Collectors**



*Lackawanna Road near Ely (Minor Collector)*





*Hacienda Avenue in Las Vegas (Minor Collector)*

### 3.2.6.2. Design Standards

The distinctions between Major Collectors and Minor Collectors are often subtle. Refer to Section 3.2.5.2 for the general design standards that apply to roadways in this class and Chapter Four for detailed Design Standards and Specifications.

### 3.2.7. **Roadway Class Seven, Frontage/Service/Local Roads**

#### 3.2.7.1. Functional Characteristics

Frontage/Service/Local Roads are not intended for use in long-distance travel; they are primarily used at the origin or destination end of the trip due to their provision of direct access to abutting land. The primary purpose of these roads is to provide safe and reasonable land access. They are often designed to discourage through traffic.

**Figure 3-8: Roadway Class Seven,  
Frontage/Service/Local Roads**



*Eldorado Lane in Las Vegas (Frontage/Service/Local Road)*

#### 3.2.7.2. Design Standards

1. If a Frontage/Service road is classified as a roadway class other than Class Seven (Frontage/Service/Local Roads), then the design standards of that higher roadway class shall apply instead of the design standards for Class Seven (Frontage/Service/Local Roads).
2. The posted speed limit will generally be used to determine access design standards for these roadways. However, if the Department or local authority has plans to improve the roadway to a higher class or speed limit, then the access design standards or speed limit for that planned class shall be used.



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3. Generally, only one access will be allowed per parcel for private, direct access. Additional access may be allowed if the spacing standards (Chapter Four) are met and if the Department determines that:
  - a. it will not be detrimental to the safety and operation of the roadway, and
  - b. the additional access will not cause a hardship to property adjacent to or across the roadway from the property under consideration
4. All turning movements, including left turns, may be allowed for private, direct access, provided the following are met:
  - a. adequate design, spacing, and safety standards, such as sight distances and widths, and
  - b. no crashes in the most recent three-year period<sup>5</sup>
5. Turning lanes and access points near at-grade railroad crossings will be designed and located so that they do not interfere with traffic movements across the railroad crossing.
6. Existing livestock (and wildlife) control will be perpetuated in rural areas.
7. Minimum spacing between signals shall be an appropriate spacing as necessary for the safe operation and proper design of adjacent accesses. Traffic signal timing and operation priority shall be given to highways and cross streets with a higher roadway class.
8. Refer to the Department's Intersection Control Evaluation methodology to identify the best intersection control at accesses along roadways of this class.

<sup>5</sup> For new access points, review the crash history along the roadway segment. For entirely new roadway segments, this does not apply.



## Chapter Three: Roadway Classification and Types of Access Connections

**Table 3-1: Roadway Classification**

Class	Roadway Classification	Function	General Design Features
1	Interstate Freeways	<ul style="list-style-type: none"> <li>Primary: Interregional and interstate travel</li> <li>Secondary: Intrastate; intercity; and, in large urban areas, intracity travel</li> </ul>	<ul style="list-style-type: none"> <li>Multilane with median</li> <li>Interchange access</li> </ul>
2	Other Freeways	<ul style="list-style-type: none"> <li>Interregional; interstate; intrastate; intercity; and, in large urban areas, intracity travel</li> </ul>	<ul style="list-style-type: none"> <li>Multilane with median</li> <li>Interchange access</li> </ul>
	Expressways	<ul style="list-style-type: none"> <li>Intrastate, intercity, and intracity travel</li> <li>In some cases, provide interregional and interstate travel</li> </ul>	<ul style="list-style-type: none"> <li>Multilane with median</li> <li>Very limited number of at-grade intersections</li> <li>High volume intersections may require an interchange</li> </ul>
3	Other Principal Arterials	<ul style="list-style-type: none"> <li>Primary: Through movement (intercity and intracity travel in urban areas and mobility in rural areas)</li> <li>Secondary: Land access</li> </ul>	<ul style="list-style-type: none"> <li>May be multilane; should have median</li> <li>Multilane arterials should have a median wide enough to accommodate dual left turns of signalized intersections</li> </ul>
4	Minor Arterials	<ul style="list-style-type: none"> <li>Primary: Through movement (Intercity, intracity, and intercommunity travel)</li> <li>Secondary: Land access</li> </ul>	<ul style="list-style-type: none"> <li>May be multilane; should have median</li> </ul>
5	Major Collectors	<ul style="list-style-type: none"> <li>Balance traffic movement with land access</li> <li>Serve intracounty travel (rather than statewide)</li> </ul>	<ul style="list-style-type: none"> <li>May be multilane</li> <li>May have median or Two-Way Left-Turn Lane (TWLTL)</li> </ul>
6	Minor Collectors	<ul style="list-style-type: none"> <li>Balance traffic movement with land access</li> <li>Serve intracounty travel (rather than statewide)</li> </ul>	<ul style="list-style-type: none"> <li>May be multilane</li> <li>May have median or TWLTL</li> </ul>
7	Frontage/ Service/Local Roads	<ul style="list-style-type: none"> <li>Primary: Land access (serve the origin or destination end of the trip)</li> <li>Secondary: Through movement</li> </ul>	<ul style="list-style-type: none"> <li>Generally two lanes</li> </ul>



### 3.3. Types of Access Connections

The four types of access connections (driveways) to roadways are:

1. Non-commercial connections
2. Minor commercial connections
3. Major commercial connections
4. Public or private roads

The following sections describe the types of access connections, and Table 3-2 provides a summary of these types of connections.

#### 3.3.1. Non-Commercial Connections

##### 3.3.1.1. Characteristics

This type of connection is for non-commercial use and may serve a single-family dwelling, or multi-family dwellings of three or fewer dwelling units, or an agricultural land and field access, or an emergency gated access.

##### 3.3.1.2. Design Standards

1. Design of this type of connection shall conform to the standards provided in the Nevada Department of Transportation's Standard Plans for Road and Bridge Construction (Department's Standard Plans [12]) and Section 4.6 of these Access Management System and Standards. At the discretion of the District Engineer or designee, the design of this type of connection may be required to conform to appropriate local standards in lieu of the Department's Standard Plans.
2. In areas with existing curb and gutter and serving a single residence, a "Single Family

Driveways with Curb" (see Department's Standard Plans [12]) shall be used. Multi-family dwellings shall use a "Multi-Family, Commercial & Industrial Driveway" (see Department's Standard Plans [12]).

3. In areas without curb and gutter, a "Type 5 Approach Road" (see Department's Standard Plans [12]) shall be used for all driveways. If the access is in a developing area, the permittee may be required to widen the roadway to the ultimate design width and/or install curb, gutter, and sidewalk for the length of the property frontage. Where existing pedestrian paths/sidewalks are adjacent to proposed improvements, they shall be connected for continuity.
4. In areas with curb and gutter, single-family residences shall, at a minimum, pave the driveway from the front face of the curb to the right-of-way line or 25 feet, whichever is less. Multi-family driveways shall be paved from the front face of the curb to the right-of-way line or 25 feet or to the end of the curb returns, whichever is less.
5. In areas without curb and gutter, single-family driveways and agricultural and field access shall be paved to the end of the radii. All multifamily driveways shall be paved to a point 10 feet beyond the end of the radii.
6. This type of connection shall be paved in accordance to the Department's "Terms and Conditions Relating to Right-of-Way Occupancy Permits" [3] and the Department's Standard Plans [12].
7. Agricultural land and field access may be required to be gated at the discretion of the District Engineer or designee.



## Chapter Three: Roadway Classification and Types of Access Connections

### 3.3.2. **Minor Commercial Connections**

#### 3.3.2.1. **Characteristics**

This type of connection serves commercial or residential subdivision properties that generate fewer than 500 vehicles per day.

#### 3.3.2.2. **Design Standards**

1. Design of this type of connection shall conform to the standards provided in the Department's Standard Plans [12] and Section 4.6 of these Access Management System and Standards. At the discretion of the District Engineer or designee, the design of this type of connection may be required to conform to appropriate local standards in lieu of the Department's Standard Plans.
2. A traffic impact study may be required for this type of connection as explained in Section 2.2.2.
3. This type of connection shall be designed and plans shall be prepared by a Nevada Licensed Professional Engineer.
4. Access in areas with curb and gutter will be a "Multi-Family, Commercial & Industrial Driveway" (see Department's Standard Plans [12]).
5. Access in areas without curb and gutter will be either a "Type 5 Approach" or a "Type 4 Approach" (see Department's Standard Plans [12]). Approaches serving passenger cars exclusively shall be a "Type 5 Approach." Approaches serving single-unit vehicles and trucks with semitrailers shall be a "Type 4 Approach." If the access is in a developing area, the developer may be required to widen the roadway to the ultimate design width and/or install curb,

gutter, and sidewalk for the length of the property frontage. Where existing paths/sidewalks are adjacent to proposed improvements, they shall be connected for continuity.

6. This type of connection shall be paved, at a minimum, to a point 25 feet beyond the end of the radii and in accordance to the Department's "Terms and Conditions Relating to Right-of-Way Occupancy Permits" [3] and the Department's Standard Plans [12].

### 3.3.3. **Major Commercial Connections**

#### 3.3.3.1. **Characteristics**

This type of connection serves commercial or residential subdivision properties that generate 500 or more vehicles per day.

#### 3.3.3.2. **Design Standards**

1. Design of this type of connection shall conform to the standards provided in the Department's Standard Plans [12] and Section 4.6 of these Access Management System and Standards. At the discretion of the District Engineer or designee, the design of this type of connection may be required to conform to appropriate local standards in lieu of the Department's Standard Plans.
2. A traffic impact study may be required for this type of connection, as explained in Section 2.2.2.
3. This type of connections shall be designed and plans shall be prepared by a Nevada Licensed Professional Engineer.
4. Access in areas with curb and gutter will be a "Multi-Family, Commercial & Industrial



## Chapter Three: Roadway Classification and Types of Access Connections

Driveway” (see Department’s Standard Plans [12]).

5. Access in areas without curb and gutter shall be a “Type 4 Approach” (see Department’s Standard Plans [12]). If the access is in a developing area, the developer may be required to widen the roadway to the ultimate design width and/or install curb, gutter, and sidewalk for the length of the property frontage. Where existing paths/sidewalks are adjacent to proposed improvements, they shall be connected for continuity.
6. This type of connection shall be paved, at a minimum, to a point 25 feet beyond the end of the radii and in accordance to the Department’s “Terms and Conditions Relating to Right-of-Way Occupancy Permits” [3] and the Department’s Standard Plans [12].

### 3.3.4. Public or Private Roads

#### 3.3.4.1. Characteristics

This type of connection consists of streets, roads, or highways. They may be installed either by a governmental agency or by a private developer.

#### 3.3.4.2. Design Standards

A traffic impact study may be required for this type of connection, as explained in Section 2.2.2. This type of connection shall be designed and plans shall be prepared by a Nevada Licensed Professional Engineer in accordance with the Nevada Department of Transportation’s Road Design Guide [13].

**Table 3-2: Types of Access Connections**

Type of Connection	Use
Non-commercial	<ul style="list-style-type: none"> <li>• For access to single-family dwellings</li> <li>• Multiple family dwellings of three or fewer dwelling units</li> <li>• Agricultural land and field access</li> <li>• Emergency gated access</li> </ul>
Minor Commercial	<ul style="list-style-type: none"> <li>• Medium volume generator (fewer than 500 vehicles per day)</li> </ul>
Major Commercial	<ul style="list-style-type: none"> <li>• High volume generators (500 or more vehicles per day)</li> <li>• Provides access to shopping centers, industrial parks, office parks, colleges, residential complexes, and subdivisions, etc.</li> </ul>
Public or Private Roads	<ul style="list-style-type: none"> <li>• New public or private roads or streets</li> </ul>



### 4. DESIGN STANDARDS AND SPECIFICATIONS

#### 4.1. Purpose

The Department has developed the following design and construction standards and specifications to provide standards for the design, development, and construction of roadways and accesses onto roadways.

All installations within the Department's right-of-way shall conform to the current editions of the Department's Standard Plans for Road and Bridge Construction [12] and Standard Specifications for Road and Bridge Construction [14].

Where applicable, different design standards are provided for different roadway speeds and for urban, suburban, and rural areas. For small urban areas, the standards corresponding to suburban areas shall be applied where available. When standards corresponding to suburban areas are unavailable, the more conservative values between the standards for urban and rural areas shall be applied for small urban and suburban areas.

Depending on any unique conditions (e.g.: grade, environmental factors, type of community, special needs of the users, etc.), the Department may require different standards to be met. In all cases, these standards correspond to the minimum requirements; a detailed engineering study may be required.

If the standards prescribed in this document cannot be met, refer to the guidance provided for deviations and variances in Section 2.2.4 and Section 2.2.5 respectively.

If the standards prescribed in this document cannot be met by an existing access connection requiring a new access permit (due to redevelopment) because the existing configuration of properties and accesses in the vicinity of the subject site precludes the subject access point from being adherent to these standards, or if the standards can be met but the applicant desires to submit an alternative plan, refer to the guidance provided in Section 2.2.5.1.

#### 4.2. Access Location Standards

Each new access point introduces conflicts and friction into the traffic stream. With more conflicts, comes a higher potential for crashes, and the resulting friction translates into higher travel times and greater delay. The minimum requirements for access spacing and the other access location standards provided in this section are intended to address these issues.

Figure 4-1<sup>6</sup> illustrates the standards that are to be reviewed in locating an access. In reviewing these standards successively, the largest spacing standard is to be applied conservatively. Refer to Section 4.2.6 for an example of the application of these standards.

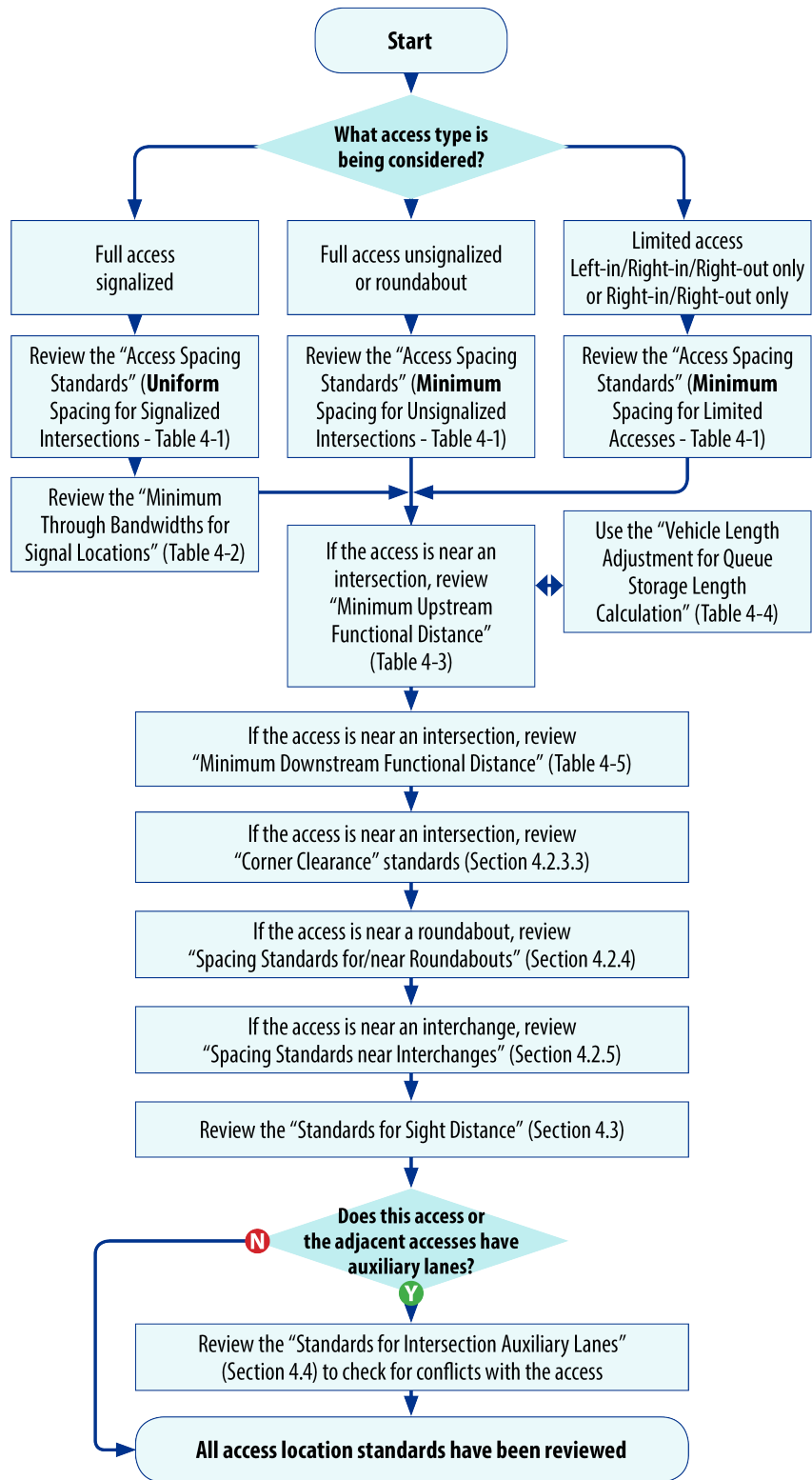
Access spacing standards are provided in Table 4-1. The standards vary by the roadway class, with more restrictive standards on roadways of a higher functional class (e.g., expressways, principal arterials).

<sup>6</sup> Figure 4-1 does not list all the standards that are to be reviewed for designing an access. Figure 4-1 also does not show all the steps involved in the design process. Figure 4-1 illustrates only the spacing standards that are to be reviewed and is provided for information purposes only.



## Chapter Four: Design Standards and Specifications

Figure 4-1: Reviewing Access Location Standards







## Chapter Four: Design Standards and Specifications

**Table 4-1: Access Spacing Standards**

Roadway Class	Location/ Posted Speed Limit	Full Access		Limited Access	
		Signalized Intersection Uniform <sup>1</sup> Spacing	Unsignalized Intersection/Roundabout Minimum <sup>2</sup> Spacing	Left-in/Right-in/ Right-out only Minimum <sup>2</sup> Spacing	Right-in/Right-out only <sup>3</sup> Minimum <sup>2</sup> Spacing
1: Interstate Freeways	Urban/ Suburban/ Rural	<ul style="list-style-type: none"> <li>• Full control of access</li> <li>• Access is available only via grade-separated interchanges</li> <li>• All interchanges must meet public road spacing (1 mile in urban, 2 miles in suburban, and 3 miles in rural areas) and comply with FHWA Policy</li> </ul>			
2: Other Freeways	Urban/ Suburban/ Rural	<ul style="list-style-type: none"> <li>• Full control of access</li> <li>• Access is available only via grade-separated interchanges</li> <li>• All interchanges must meet public road spacing (1 mile in urban, 2 miles in suburban, and 3 miles in rural areas)</li> <li>• Access to federal aid freeways must comply with federal regulations</li> </ul>			
2: Expressways	≤ 55 mph	5,280'		5,280'	1,320'
	≥ 60 mph	10,560'			
3: Other Principal Arterials	≤ 35 mph	1,320'		660'	350'
	40-55 mph	2,640'	1,320'	990'	660'
	≥ 60 mph	5,280'	2,640'	1,320'	800'
4: Minor Arterials	≤ 35 mph	1,320'		660'	300'
	≥ 40 mph	2,640'	1,320'		350' – 600'
5: Major Collectors	≤ 35 mph	1,320'		440'	250'
	≥ 40 mph	2,640'	1,320'	660'	300' – 500'



## Chapter Four: Design Standards and Specifications

**Table 4-1: Access Spacing Standards (continued)**

Roadway Class	Location/ Posted Speed Limit	Full Access		Limited Access	
		Signalized Intersection Uniform <sup>1</sup> Spacing	Unsignalized Intersection/Roundabout Minimum <sup>2</sup> Spacing	Left-in/Right-in/ Right-out only Minimum <sup>2</sup> Spacing	Right-in/Right-out only <sup>3</sup> Minimum <sup>2</sup> Spacing
6: Minor Collectors	≤ 30 mph	1,320'	660'	440'	200'
	≥ 35 mph				250' – 400'
7: Frontage/Service/ Local Roads	-	As necessary for the safe operation and proper design of adjacent accesses		330'	200'

**Notes:**

All dimensions above are measured from center-to-center of accesses.

The spacing standards provided above also apply to private, direct access. Restrictions may be placed on the access permit. Refer to the rest of the document for additional information.

<sup>1</sup> Uniform spacing refers to the exact spacing to be achieved. Any spacing either greater or smaller than these standards is considered a deviation.

<sup>2</sup> Minimum spacing refers to the minimum spacing to be achieved between two adjacent accesses. However, greater spacing may be needed, depending on other requirements. Refer to the rest of Chapter Four for these standards.

<sup>3</sup> Where applicable, the range of spacing values corresponds to a range of speeds. The greater spacing values will be required at higher speeds.



Spacing standards also vary by the posted speed limit on the roadway and the design of the access (full access vs. limited access).

### 4.2.1. Spacing Standards for Signalized Intersections

Closely spaced or irregularly spaced traffic signals on roadways result in frequent stops, unnecessary delay, increased fuel consumption, excessive vehicular emissions, and high crash rates. Uniform signal spacing, in contrast, allows timing plans that can efficiently accommodate varying traffic conditions during peak and off-peak periods.

The uniform spacing to be achieved between signalized intersections is the “Full Access Signalized Intersection Uniform<sup>7</sup> Spacing” values provided in Table 4-1.

The required Minimum Through Bandwidths for Signal Locations are provided in Table 4-2. The applicant shall complete the progression analysis using the methodology and the assumptions prescribed by the Department. The assumptions prescribed by the Department may include but are not limited to the following:

- Progression speed along the roadways
- Cycle length of the signals
- Extents of the roadway sections to be included in the analysis

The Department will consider the installation of a traffic signal at a location if all of the following are true:

<sup>7</sup> Uniform spacing refers to the exact spacing to be achieved. Any spacing either greater or smaller than these standards is considered a deviation.

1. The uniform spacing standards provided in Table 4-1 are met.
2. The requirements prescribed in the Department’s “Traffic Signal Warrant Approval Process” [15] to justify the installation of traffic signals are met.
3. The Minimum Through Bandwidths for Signal Locations provided in Table 4-2 are achieved.
4. An intersection can be designed and constructed that, in the opinion of the Department, meets all safety standards and requirements.

**Table 4-2: Minimum Through Bandwidth for New Signal Locations [1]**

Roadway Category	Minimum Bandwidth
Expressways	50%
Other Principal Arterials	45%
Minor Arterials	40%
Major Collectors	Not required
Minor Collectors	Not required
Frontage/Service/Local Roads	Not required
<b>Note:</b> The minimum bandwidths provided above must be achieved in both directions for new signal locations.	

In cases where the uniform signalized intersection spacing cannot be achieved, and a variance is requested, the Department shall

specify the conditions of cycle length and progression speed to be considered in the AM peak, PM peak, and other time periods as designated by the Department. The minimum through bandwidths provided in Table 4-2 shall be achieved for all the combinations of progression speed and cycle length designated by the Department. Where traffic volumes permit, the minimum bandwidth may be achieved by increasing the green time of the major arterial and decreasing the green time of the intersecting cross street.

### 4.2.2. Spacing Standards for Unsignalized Accesses

Unsignalized access connections introduce conflicts and friction into the traffic stream as vehicles enter and leave the through traffic lanes. As the number of conflict points decreases with the increased distance between connections, the driving task becomes simpler, and the likelihood of crashes decreases. Unsignalized accesses can be either:

- Full access – all turning movements allowed at the intersection
- Limited access – certain turning movements are restricted

#### 4.2.2.1. Spacing Standards for Full Access Unsignalized Intersections

The minimum spacing to be achieved between full access unsignalized intersections or between an unsignalized intersection and an adjacent signalized intersection is provided in the “Full Access Unsignalized Intersection Minimum Spacing” values in Table 4-1.

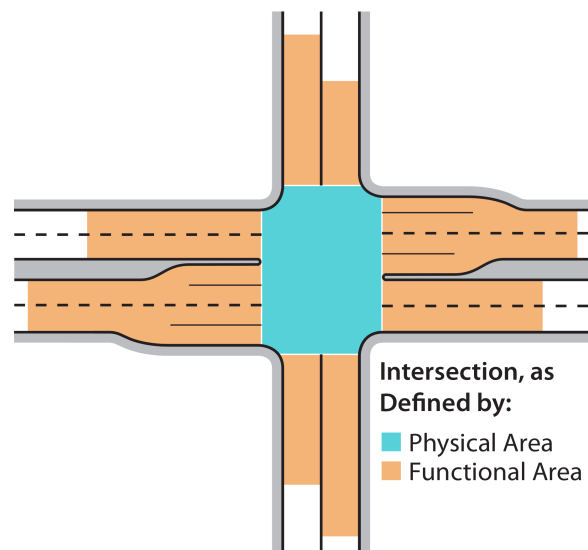
#### 4.2.2.2. Spacing Standards for Limited Access Driveways

The minimum spacing to be achieved between limited access driveways (Left-in/Right-in/Right-out only, and Right-in/Right-out only) is provided in Table 4-1.

#### 4.2.3. Spacing Standards near Intersections

The functional area of an intersection includes any area upstream or downstream of an intersection where intersection operation and conflicts significantly influence driver behavior, vehicle operations, or traffic conditions. The functional area of an intersection is generally larger than the physical intersection, as illustrated in Figure 4-2.

**Figure 4-2: Functional Area of an Intersection**



Driveways Should be Located Outside the Functional Area of the Intersection

The concept of the functional area of an intersection applies to signalized intersections, stop-controlled intersections, and



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roundabouts. The standards provided in this section shall apply when an access is requested near an intersection. Note that these standards are not an alternative to the spacing standards provided in Table 4-1. When an access is requested near an intersection, these standards apply in addition to the spacing standards in Table 4-1.

In general, accesses should not be located within the functional area of an intersection. In cases where an access is required within the functional area of an intersection, the Department may place one or more of the following (or other) conditions on the access permit:

1. The access connection shall be located as far away as possible from the intersection.
2. The access shall be limited to right-in/right-out only, by the provision of a nontraversable median or flexible pylons.
3. The maximum volume entering and leaving the driveway in the 1-hour peak period and in a 24-hour period shall be restricted.
4. Cross-access easements, joint-use driveways, and shared access will be required and promoted where possible, in coordination with the local government agency of jurisdiction.
5. The applicant shall be required to agree to close the access connection if and when alternative access becomes available.

In ensuring that the accesses are not located within the functional area of an intersection, the functional distances are to be measured along the curb line from the point of curvature of the radius of the intersection to the point of curvature of the radius of the driveway. In the

case of a depressed curb driveway, the distance is measured to the beginning of the depressed curb (Refer to Figure 4-15).

### 4.2.3.1. Upstream Functional Distance

The upstream functional distance of an intersection consists of three elements:

- Distance traveled during perception–reaction time ( $d_1$ ), plus
- Deceleration distance while the driver maneuvers to a stop ( $d_2$ ), plus
- Queue storage ( $d_3$ )

Table 4-3 provides the minimum values for ( $d_1 + d_2$ ). The required queue storage length must be added to the values provided in Table 4-3 to obtain the upstream functional distance.

Queue storage length is to be determined from an operations analysis, using the methodology and the assumptions prescribed by the Department. The 95<sup>th</sup> percentile queue length from the operations analysis must be used in the queue storage length determination. The Vehicle Length Adjustment values provided in Table 4-4 are to be used in determining the queue storage length.

The upstream functional distance shall be determined for the following:

- AM peak
- PM peak
- Other time periods identified by the Department.

The longest distance shall be used as the upstream functional distance.



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**Table 4-3: Minimum Upstream Functional Distance [1]**

Posted Speed Limit (mph)	Distance Traveled during Perception – Reaction and Deceleration (feet)	
	Rural Conditions	Urban and Suburban Conditions
20	145	115
25	195	160
30	260	215
35	355	300
40	435	380
45	525	460
50	625	550
55	725	645
60	875	785
65	995	900
70	1,130	1,030
75	1,270	1,160

**Notes:**

The queue storage length must be added to the “Distance Traveled during Perception – Reaction and Deceleration” provided in the table above to obtain the upstream functional distance.

All dimensions above are measured from the point of curvature of the radius of the intersection (See Figure 4-3).

Values in the table above are based on a Perception – Reaction time of 1.5 seconds for urban and suburban conditions and 2.5 seconds for rural conditions respectively.

**Table 4-4: Vehicle Length Adjustment for Queue Storage Length Calculation [1]**

Trucks (%)	Vehicle Length <sup>1</sup> (feet)
≤ 2	25
5	28
10	32
15	35
20	38
≥ 25	41

<sup>1</sup> Includes the space between vehicles

### 4.2.3.2. Downstream Functional Distance

Table 4-5 provides the minimum downstream functional distance of an intersection.



**Table 4-5: Minimum Downstream Functional Distance [1]**

Posted Speed Limit (mph)	Downstream Functional Distance (feet)		
	Rural	Suburban	Urban
20	305	340	430
25	375	400	525
30	450	535	620
35	525	625	720
40	600	715	825
45	675	800	930
50	750	890	1,030
55	865	980	1,135
60	990	1,125	1,280
65	1,050	1,220	1,365
70	1,105	1,275	1,445
75	1,180	1,365	1,545

**Note:**  
All dimensions above are measured from the point of curvature of the radius of the intersection (See Figure 4-3).

### 4.2.3.3. Minimum Corner Clearance

Corner clearance is a form of unsignalized access spacing that refers to the distance between an intersection and the nearest unsignalized access connection. Therefore, the corner clearance standards are to be used in conjunction with the Access Spacing Standards (Table 4-1).

Corresponding to the four approaches present in a typical four-legged intersection, the corner clearances at an intersection are:

- Upstream corner clearance along the major roadway
- Downstream corner clearance along the major roadway
- Upstream corner clearance along the minor roadway
- Downstream corner clearance along the minor roadway

These corner clearances at an intersection are illustrated in Figure 4-3. Table 4-6 provides the minimum corner clearance standards.

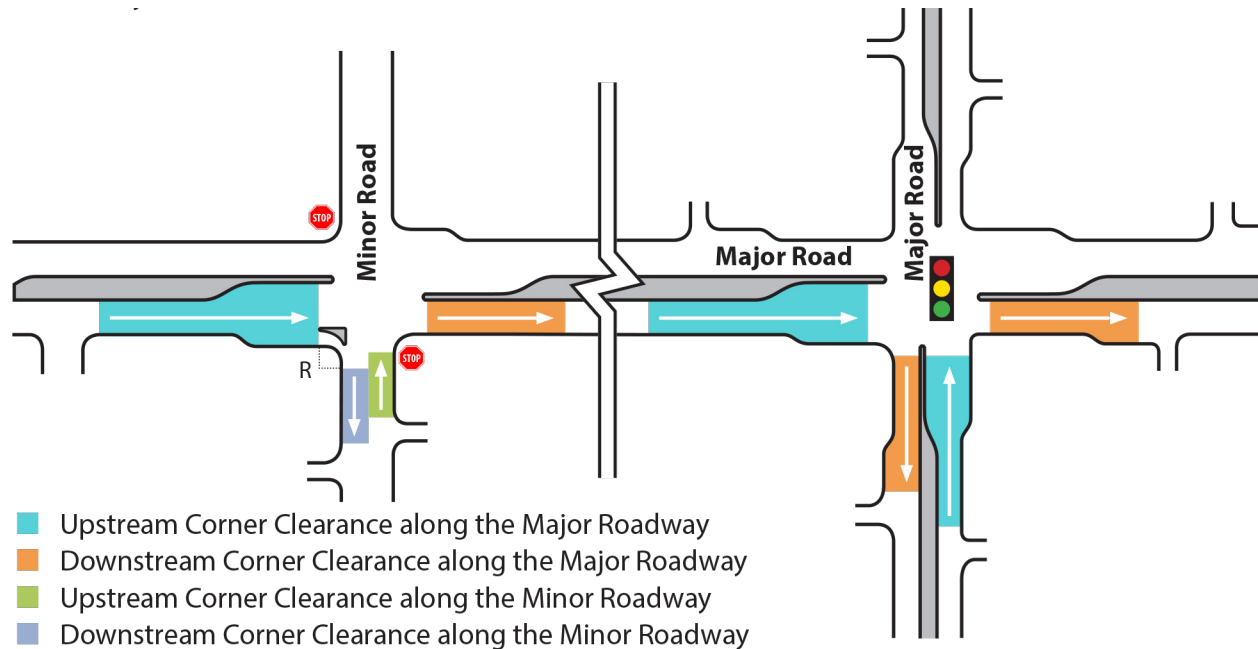
If two major roadways (roads of the same classification) intersect, then the corner clearances along the major roadway apply on all approaches of the intersection.

If a minor roadway intersects with a major roadway, then the upstream and downstream corner clearances along the major roadway apply for the major roadway and the upstream and downstream corner clearances along the minor roadway apply for the minor roadway.

Corner clearance distances are to be measured along the curb line from the point of curvature of the radius of the intersection to the point of curvature of the radius of the driveway. In the case of a depressed curb driveway, the distance is measured to the beginning of the depressed curb (Refer to Figure 4-15).

The minimum upstream corner clearance distance along the major roadway (illustrated in Figure 4-3) is the upstream functional distance of intersections provided in Section 4.2.3.1.

**Figure 4-3: Intersection Corner Clearances**



**Table 4-6: Minimum Corner Clearances [1]**

Type of Corner Clearance	Minimum Clearance to be Used
Upstream corner clearance along the major roadway	Upstream functional distance of intersections (Section 4.2.3.1)
Downstream corner clearance along the major roadway	Stopping sight distance (Section 4.3.1)
Upstream corner clearance along the minor roadway	Queue storage length
Downstream corner clearance along the minor roadway	Figure 4-4, Table 4-7

The minimum downstream corner clearance distance along the major roadway (illustrated in Figure 4-3) is the stopping sight distance provided in Section 4.3.1.

The minimum upstream corner clearance along the minor roadway (illustrated in Figure 4-3) is the queue storage length required upstream along the minor road approach. The

queue storage length is to be determined as explained in Section 4.2.3.1.

The minimum downstream corner clearance along the minor roadway (illustrated in Figure 4-3) depends on the presence/absence of a right-turn channelizing island. In the absence of a right-turn channelizing island, the clearance on the departure side of the minor

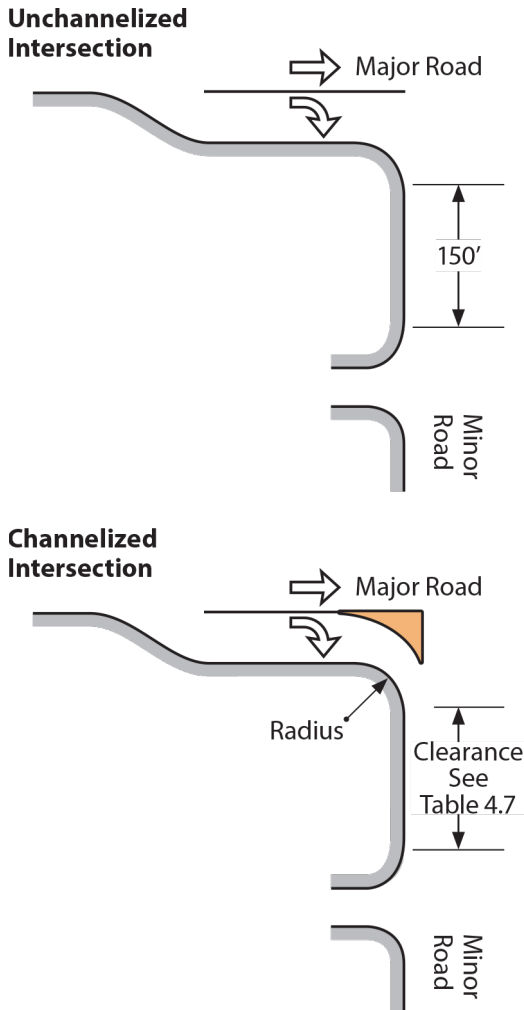




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roadway is 150 feet, as illustrated in Figure 4-4. If a right-turn channelizing island is present, the clearance on the departure side of the minor roadway depends on the radius and is provided in Table 4-7.

**Figure 4-4: Minimum Downstream Corner Clearance along the Minor Roadway [1]**



In cases where an access does not meet the minimum corner clearance standards, the Department may place one or more of the conditions listed in Section 4.2.3 and one or more of the following (or other) conditions on the access permit:

1. The access shall be prohibited from having a channelized right-turn onto the roadway.
2. The maximum radius of the access shall be restricted.

**Table 4-7: Minimum Downstream Corner Clearance along the Minor Roadway [1] (Channelized Right-Turn on the Major Road)**

Radius (feet)	Clearance (feet)
50	250
75	300
100	370
125	440
150	510

**Note:**

All dimensions above are measured from the point of curvature of the radius of the intersection to the point of curvature of the radius of the driveway (See Figure 4-4). In the case of a depressed curb driveway, the distance is measured to the beginning of the depressed curb (Refer to Figure 4-15).

### 4.2.4. Spacing Standards for/near Roundabouts

A roundabout may be considered a “Full Access Unsignalized Intersection,” and the corresponding access spacing standards provided in Table 4-1 shall be applied.

Roundabouts are ideal for providing U-turn opportunities; and, when designed in series, they help create an integrated system of moving traffic safely and efficiently, with potentially better traffic flow and access to adjacent businesses. Roundabouts allow U-turns within the normal flow of traffic, which



often are not possible at other forms of intersection. The slower speeds provide more flexible turning opportunities that would typically disrupt a signalized intersection. The ease of making a U-turn at a roundabout reduces the need for median openings upstream of roundabouts. Consequently, median openings will generally not be allowed upstream of roundabouts. However, the upstream functional distances and the upstream corner clearance distances (for right-in right-out only driveways) are less restrictive because roundabouts reduce speed and queuing.

An access point downstream of a roundabout may have less capacity and higher delay than one downstream of a traffic signal due to random arrival of vehicles. Because roundabouts provide larger corner turning radii, vehicles are able to turn right at a higher speed at a roundabout than at a traffic signal. Therefore, the downstream functional distances and downstream corner clearance distances have a greater safety impact at roundabouts. The queuing from nearby intersections (the roundabout or others nearby) and the storage needed to serve the access should also be specifically checked to see if the operation of the downstream access point will be affected.

### **4.2.5. Spacing Standards near Interchanges**

Traffic conditions in the vicinity of interchanges are often characterized by high volumes with moderate to high speeds. Too many access connections and choices in close proximity to the interchange can create confusion and increase the potential for sudden decisions, erratic movements, and crashes. Signalized intersections too close to

interchange ramps can cause heavy volumes of weaving traffic, complex traffic signal operations, and traffic queues. Curb cuts and median openings near the interchange ramps further compound these problems. Proper access management near interchanges can reduce the occurrence of these problems.

The standards provided in this section shall apply when an access is requested near the ramp terminal intersections of an interchange. Note that these standards are not an alternative to the spacing standards provided in Table 4-1. When an access is requested near the ramp terminal intersections of an interchange, these standards apply in addition to the spacing standards in Table 4-1. However, these standards are an alternative to Spacing Standards near Intersections (Section 4.2.3). When an access is requested near an interchange, these standards shall apply rather than Spacing Standards near Intersections (Section 4.2.3).

Figure 4-5 and Table 4-8 provide the spacing standards for access connections on multilane crossroads near interchanges. Figure 4-6 and Table 4-9 provide the spacing standards for access connections on two-lane crossroads near interchanges. These standards can be used for non-traditional interchanges as well, such as the Single Point Urban Interchange (SPUI) and the Diverging Diamond Interchange (DDI).

Figure 4-7 and Table 4-1 provide the spacing standards for access connections on two-lane and four-lane crossroads near roundabout terminals.

Figure 4-5: Minimum Spacing for Multilane Crossroads near Freeway Interchanges [1]

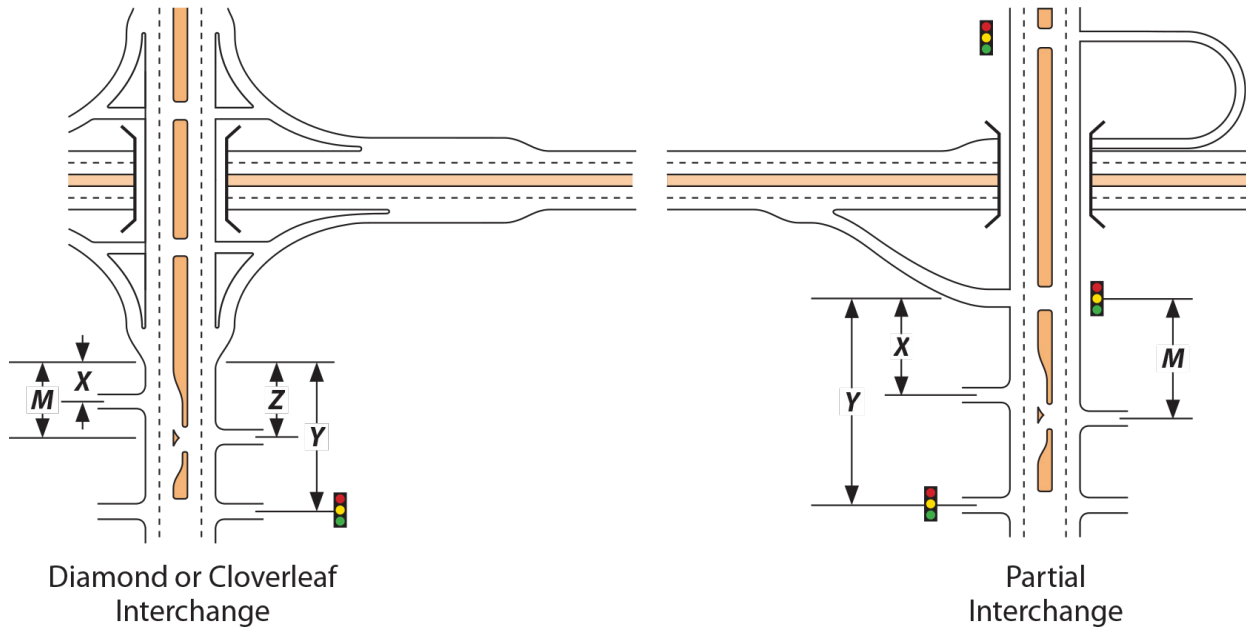


Table 4-8: Minimum Spacing for Multilane Crossroads near Freeway Interchanges [1]

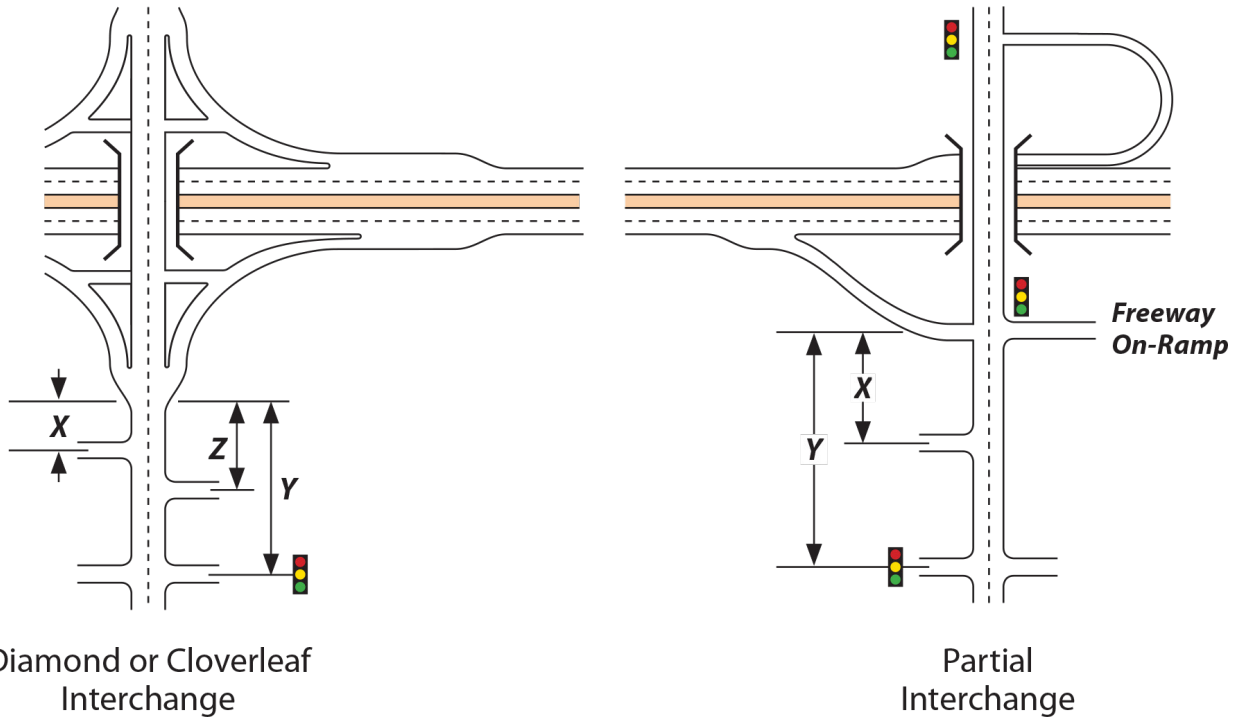
Type of Area	Spacing Dimension (feet)			
	X	Y	Z	M
Fully developed arterial*	750	2,640	990	990
Suburban or Urban	990	2,640	1,320	1,320
Rural	1,320	2,640	1,320	1,320

X = distance to first approach on the right (right-in, right-out only).  
 Y = distance to first major intersection. No four-leg intersections may be placed between ramp terminals and the first major intersection.  
 Z = distance between the last access connection and the start of the taper for the on-ramp.  
 M = distance to first directional median opening. No full median openings are allowed in nontraversable medians up to the first major intersection.

\* Free-flow ramps are generally discouraged in fully developed urban areas and are questionable in suburban and urban areas because pedestrian and bicycle movements are difficult and potentially dangerous.

All dimensions above are measured center-to-center.

**Figure 4-6: Minimum Spacing for Two-Lane Crossroads near Freeway Interchanges [1]**



**Table 4-9: Minimum Spacing for Two-Lane Crossroads near Freeway Interchanges [1]**

Type of Area	Spacing Dimension (feet)	
	X or Z	Y
Fully developed arterial	750	1,320
Suburban or Urban	990	1,320
Rural	1,320	1,320

X or Z = distance to first access connection from the taper of the off-ramp or on-ramp. This dimension provides for either X or Z, but not both, to avoid a four-way connection.

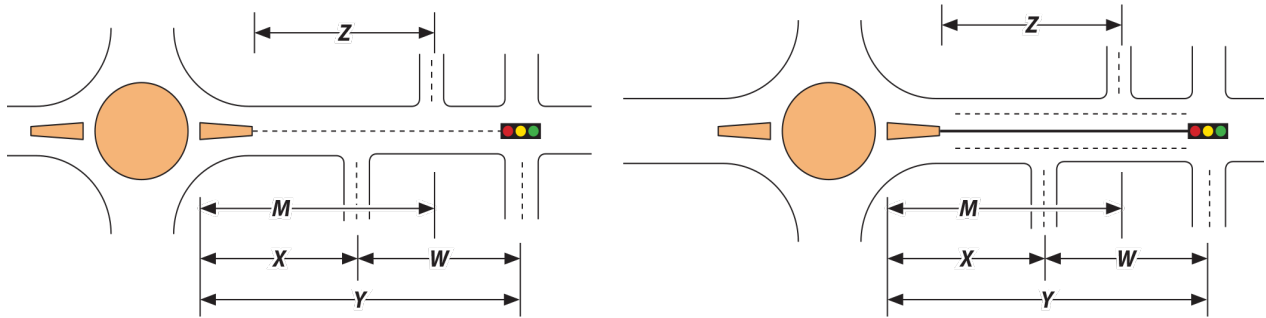
Y = distance to first major intersection. No four-leg intersections may be placed between ramp terminals and the first major intersection.

All dimensions above are measured center-to-center.



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**Figure 4-7: Minimum Spacing for Two-Lane and Four-Lane Crossroads near Roundabout Terminals [1]**



**Table 4-10: Minimum Spacing for Two-Lane and Four-Lane Crossroads near Roundabout Terminals [1]**

Arterial Width (Number of Lanes)	Roundabout Design Speed (mph)	Spacing Dimension (feet)				
		X	W	Y	Z	M
Urban Area						
2	25	400	1,000	1,000	400	-
	30	490	1,090	1,090	400	-
	35	590	1,140	1,140	400	-
4	25	400	1,000	1,000	450	475
	30	490	1,090	1,090	450	565
	35	590	1,140	1,140	450	665
Suburban Area						
2	25	400	925	925	460	-
	30	490	915	915	460	-
	35	590	965	965	460	-
4	25	400	925	925	510	340
	30	490	915	915	510	400
	35	590	965	965	510	475
Rural Area						
2	25	280	530	530	545	-
	30	350	525	525	545	-
	35	425	500	500	545	-



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**Table 4-10: Minimum Spacing for Two-Lane and Four-Lane Crossroads near Roundabout Terminals [1] (continued)**

Arterial Width (Number of Lanes)	Roundabout Design Speed (mph)	Spacing Dimension (feet)				
		X	W	Y	Z	M
4	25	280	530	530	545	205
	30	350	525	525	545	245
	35	425	500	500	545	300

X = distance to first driveway on right (right in, right out only).

W = distance from last driveway to first major intersection.

Y = distance to first major intersection. Y must be greater than or equal to X + W if a driveway is allowed between the ramp terminal and the first major intersection. No four-leg intersections may be placed between ramp terminals and first major intersection.

Z = distance between last driveway and start of taper for on-ramp.

M = distance to first directional median opening. No full median openings are allowed in nontraversable medians to first major intersection.

Unless specified otherwise, dimensions above are measured from the beginning of the splitter island of the roundabout terminal to the center of the access.



### 4.2.6. Example Application of Access Location Standards

The following examples are typical application of the access location standards to determine the location of a new access connection.

#### 4.2.6.1. Example 1

Consider the case of an east-west Minor Arterial “MA Avenue” (Figure 4-8) located in an urban area with level grade, with a posted speed limit of 45 mph and a design speed of 50 mph. Three intersections and one driveway are located along a section of this roadway. The following is further information regarding these:

- Intersection A is a full access signalized intersection.
- Intersection B is a full access unsignalized intersection located 0.5 mile east of Intersection A.
- Driveway D is a right-in/right-out only driveway located 800 feet east of Intersection B, with access to the eastbound direction of MA Avenue.
- Intersection C is a full access signalized intersection located 1 mile east of Intersection A (0.5 mile east of Intersection B). The eastbound left-turn movement at this intersection has an auxiliary deceleration lane that is 640 feet long. Intersection C is formed by the intersection of two Minor Arterials.

Spacing values between accesses are measured center-to-center of accesses.

Now, a left-in/right-in/right-out only driveway (Driveway E) is being considered 1,000 feet west of Intersection C. The distance along the curb line from the point of curvature of the

radius of Intersection C to the point of curvature of the radius of the proposed Driveway E is 890 feet.

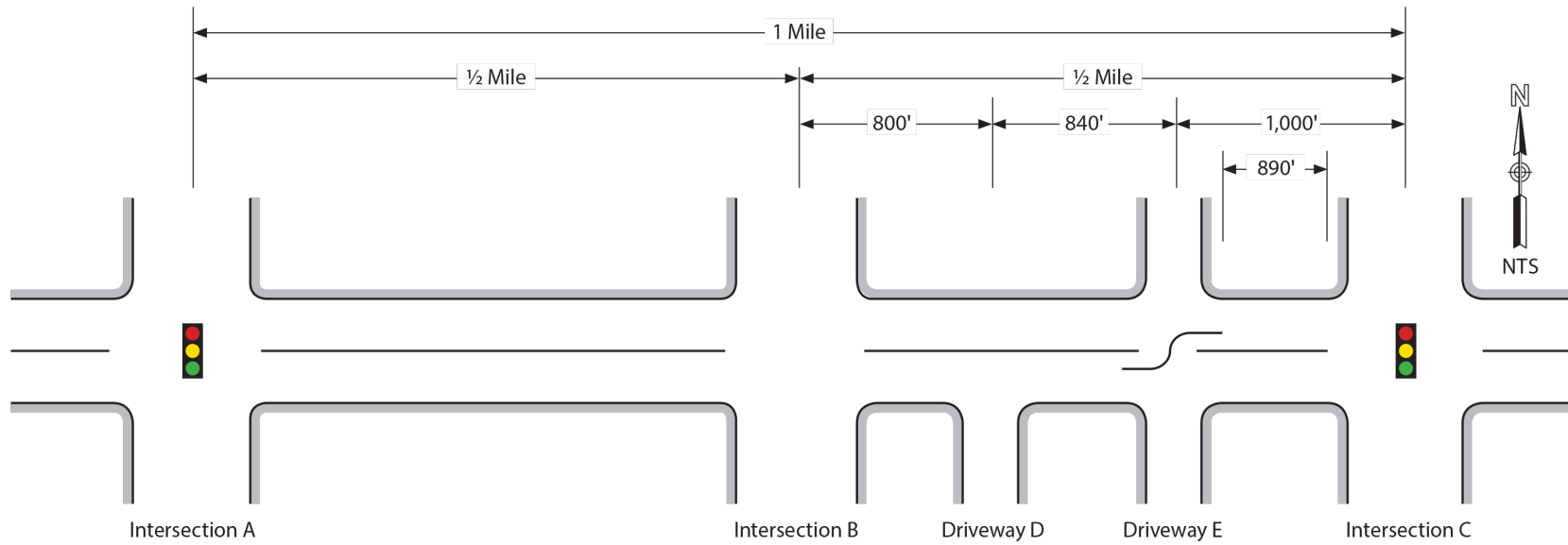
As outlined in Figure 4-1, access location standards are reviewed as follows:

1. For Minor Arterials with posted speed limit of 45 mph, left-in/right-in/right-out only driveways can be spaced at a minimum spacing of 660 feet (Table 4-1). The proposed Driveway E will be located 840 feet east of Driveway D and 1,000 feet west of Intersection C. These are greater than the required minimum (660 feet). Therefore, limited access spacing standards provided in Table 4-1 are met.
2. The proposed access, Driveway E, is not a signalized intersection. Therefore, the minimum through bandwidth standards provided in Table 4-2 do not apply.
3. Since Driveway E is adjacent to an intersection (Intersection C), the upstream and downstream functional distances and the corner clearance standards apply.
4. The upstream functional distance of Intersection C (eastbound direction) is calculated to be 750 feet. The calculation of the upstream functional distance is as follows:
  - a. The distance traveled during Perception – Reaction and Deceleration from Table 4-3 for urban roadways with posted speed limit of 45 mph is 460 feet.
  - b. The queue storage length for the eastbound left movement of Intersection C was determined, from an operations analysis and using standards in Table 4-4, to be 290 feet.



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Figure 4-8: Application of Access Location Standards (Example 1)







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The available distance along the curb line from the point of curvature of the radius of Intersection C to the point of curvature of the radius of the proposed Driveway E is 890 feet. This is greater than the required minimum of 750 feet. Therefore, the upstream functional distance standard is met.

5. The downstream functional distance of Intersection C (westbound direction) is 930 feet, corresponding to urban roadways with a posted speed limit of 45 mph (from Table 4-5). The available distance along the curb line from the point of curvature of the radius of Intersection C to the point of curvature of the radius of the proposed Driveway E is 890 feet, which makes the required distance greater than the available distance. Therefore, the downstream functional distance standard provided in Table 4-5 is not met. This constitutes a minor deviation (Refer to Section 2.2.4), because the available distance deviates from the standard by 4.3 percent.
  6. Given that Intersection C is formed by the intersection of two Minor Arterials, Driveway E connects onto a major crossroad. Therefore, the corner clearance standards along the major roadway provided in Section 4.2.3.3 apply.
  7. The upstream corner clearance (from intersection C, eastbound direction) along the major roadway is the same as the upstream functional distance. This standard was reviewed in Step 4 above and was determined to be compliant with the standards.
  8. The downstream corner clearance (from intersection C, westbound direction) along the major roadway is the stopping sight distance. For a design speed of 50 mph, and level grade, the required stopping sight distance is 425 feet. The available distance along the curb line from the point of curvature of the radius of Intersection C to the point of curvature of the radius of the proposed Driveway E is 890 feet. This is greater than the required minimum of 425 feet. Therefore, the downstream corner clearance along the major roadway specified in Table 4-6 is satisfied.
  9. Driveway E is not located near a roundabout. Therefore, Spacing Standards for/near Roundabouts (Section 4.2.4) do not apply.
  10. Driveway E is not located near an interchange. Therefore, Spacing Standards near Interchanges (Section 4.2.5) do not apply.
  11. From a geometric analysis, it was determined that the design of Driveway E ensures that all the required sight distance standards provided in Section 4.3 are satisfied.
  12. The auxiliary deceleration lane for the eastbound left turn movement at Intersection C is 640 feet long. It was determined that no conflict occurs between this auxiliary lane at Intersection C and Driveway E.
  13. A traffic impact study was completed to evaluate the impacts of the proposed Driveway E, and it did not reveal any operations and safety issue.
- After reviewing these spacing standards, proposed Driveway E does not meet the downstream functional distance of Intersection C (Step 5 above). The required distance is 930 feet; whereas, the available

distance is 890 feet, constituting a deviation of 4.3 percent.

The following solutions are available for Driveway E to become compliant with the standards:

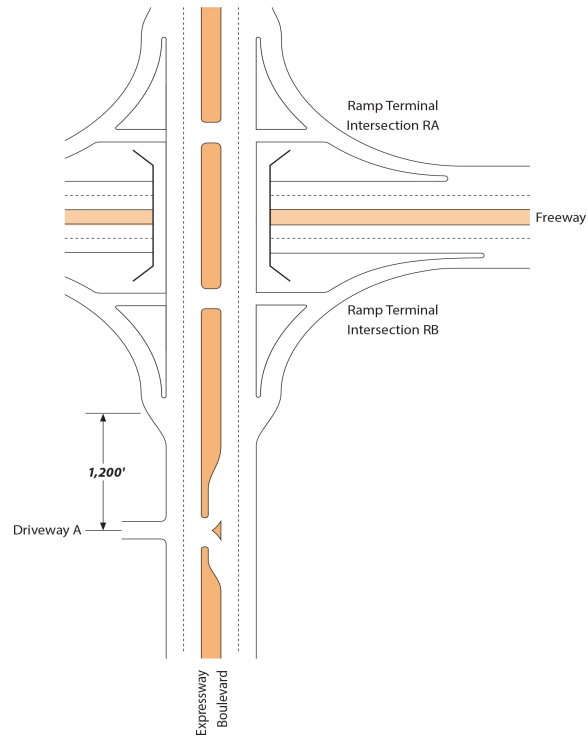
- The proposed location of Driveway E is within the functional area of Intersection C. The applicant shall submit a request for a variance for a minor deviation (Section 2.2.4 and Section 2.2.5). The Department, after its review, may grant this access and place restrictions on the access as explained in Section 4.2.3 (because the access is located within the functional area of an intersection).
- Alternatively, the applicant may consider relocating the driveway at least 40 feet to the west of the proposed location so that the access is outside the functional area of Intersection C and compliant with the standards. Note that relocating the driveway 40 feet to the west results in this access still being compliant with the other access location and spacing standards. Otherwise, this would not be a viable solution.

### 4.2.6.2. Example 2

Consider the case of a multi-lane north-south Expressway “Expressway Boulevard” (Figure 4-9) located in a small urban area, with a posted speed limit of 45 mph. An east-west freeway runs below (grade-separated) Expressway Boulevard and forms two ramp terminal intersections - Intersection RA is located to the north of the freeway and Intersection RB is located to the south of the freeway. Now, a gas station is being considered in the southwest quadrant of intersection RB. An unsignalized left-in/left-out/right-in/right-

out driveway (Driveway A) is being considered 1,200 feet south of Intersection RB (distance measured center-to-center) to serve the proposed gas station.

**Figure 4-9: Application of Access Location Standards (Example 2)**



As outlined in Figure 4-1, access location standards are reviewed as follows:

1. For Expressways with posted speed limit of 45 mph, left-in/left-out/right-in/right-out driveways can be spaced at a minimum spacing of 5,280 feet<sup>8</sup> (Table 4-1) from

<sup>8</sup> A left-in/left-out/right-in/right-out driveway provides greater access than a left-in/right-in/right-out only driveway. Therefore, the conservative spacing standard corresponding to full-access unsignalized intersections apply. Note that in this case, the minimum required spacing for both full-access unsignalized intersections and left-in/right-in/right-out only driveways was the same.



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adjacent accesses or intersections. This required spacing is greater than the available spacing of 1,200 feet. Therefore, access spacing standards provided in Table 4-1 are not met. Furthermore, from Table 4-1, the required spacing for a right-in right-out only driveway is 1,320 feet.

2. The proposed access is not a signalized intersection. Therefore, the minimum through bandwidth standards provided in Table 4-2 do not apply.
3. Since the proposed access is adjacent to an interchange (ramp terminal intersection), Spacing Standards near Interchanges (Section 4.2.5) apply rather than Spacing Standards near Intersections (Section 4.2.3).
4. From Figure 4-5 and Table 4-8, the minimum spacing required from the ramp terminal intersection to the first directional median opening is 1,320 feet. This required spacing is greater than the available spacing of 1,200 feet. Therefore, access spacing standards near an interchange are not met. Furthermore, the minimum spacing required to a right-in right-out only driveway is 990 feet. Note that the spacing standards determined from Step 1 above are more conservative (and therefore apply) than the standards determined here from Table 4-8.
5. The proposed access is not located near a roundabout. Therefore, Spacing Standards for/near Roundabouts (Section 4.2.4) do not apply.
6. From a geometric analysis, it was determined that the design of the proposed access ensures that all the required sight distance standards provided in Section 4.3 are satisfied.

7. It was also determined that the auxiliary deceleration lanes at this access do not conflict with the ramp terminal intersection (Intersection RB).
8. A traffic impact study was completed to evaluate the impacts of the proposed Driveway A, and it did not reveal any operations and safety issue.

After reviewing these spacing standards, the proposed left-in/left-out/right-in/right-out Driveway A does not meet the Access Spacing Standards (Step 1 above) and the Spacing Standards near Interchanges (Step 4 above). Therefore, the proposed access, a left-in/left-out/right-in/right-out driveway cannot be granted without a deviation/variance.

As an alternative, a right-in right-out only driveway may be considered. However, the available spacing (1,200 feet) between Intersection RB and Driveway A does not meet the minimum required (1,320 feet) spacing for a right-in right-out only driveway. A right-in right-out only driveway access may be granted (without requiring a variance for a deviation) if the access is moved further south along Expressway Boulevard, such that the spacing between Intersection RB and Driveway A is at least 1,320 feet.



### 4.3. Standards for Sight Distance

Sight distance is another essential consideration for the proper placement of an access point along a roadway. Drivers need a clear view of the access from the highway to be able to slow or stop if required. Drivers also need a clear view of the highway from the access when selecting an appropriate gap in traffic to cross or turn.

Three types of sight distances are typically involved in the location and design of access connections. They are:

- decision sight distance
- stopping sight distance
- intersection sight distance

#### 4.3.1. Decision Sight Distance and Stopping Sight Distance

Decision sight distance is the distance needed for

- a driver to detect an unexpected or otherwise difficult-to-perceive information source or condition in a roadway environment that may be visually cluttered,
- recognize the condition or its potential threat,
- select an appropriate speed and path, and
- initiate and complete complex maneuvers.

Stopping sight distance is the distance required for a driver to perceive and react to a discernible hazard and then brake to a stop before reaching the hazard.

For all new access points, the decision sight distance is desirable along the roadway in all directions of anticipated conflict. The stopping sight distance is the absolute minimum<sup>9</sup> sight distance required along the roadway.

A driver must be able to see the pavement surface (zero height of object) in order to identify the location and geometrics of an access connection in advance, to complete a safe maneuver. Sight distances are to be measured

- to the nearest “point of curvature of the radius of the driveway” in the direction of travel, in cases with
  - a return radius driveway (Figure 4-15), or
  - a “Type 4 Approach” or “Type 5 Approach” roads (see Department’s Standard Plans [12]), or
- to the nearest “beginning of depressed curb” in the direction of travel, in cases with a depressed curb driveway (Figure 4-15), or
- to the nearest edge of pavement on the approach side of the driveway in the direction of travel, in other types of driveways.

Table 4-11 provides the decision sight distance and the stopping sight distance standards for roadways, recommended by AASHTO’s “A Policy on Geometric Design of Highways and Streets” [4].

<sup>9</sup> Deviations (Refer to Section 2.2.4) from the required stopping sight distances are generally not allowed without mitigation strategies. However, access may be granted if the property is landlocked and no alternative access is available.



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**Table 4-11: Sight Distances along the Roadway — Decision Sight Distance and Stopping Sight Distance [1] [4]**

Design Speed (mph)	Decision Sight Distance (feet)			Stopping Sight Distance (feet)						
	Rural	Suburban	Urban	Level 0±2%	Downgrades			Upgrades		
					3%	6%	9%	3%	6%	9%
15	-	-	-	80	80	82	85	75	74	73
20	305	340	430	115	116	120	126	109	107	104
25	375	400	525	155	158	165	173	147	143	140
30	450	535	620	200	205	215	227	200	184	179
35	525	625	720	250	257	271	287	237	229	222
40	600	715	825	305	315	333	354	289	278	269
45	675	800	930	360	378	400	427	344	331	320
50	750	890	1,030	425	446	474	507	405	388	375
55	865	980	1,135	495	520	553	593	469	450	433
60	990	1,125	1,280	570	598	638	686	538	515	495
65	1,050	1,220	1,365	645	682	728	785	612	584	561
70	1,105	1,275	1,445	730	771	825	891	690	658	631
75	1,180	1,365	1,545	820	866	927	1,003	772	736	704
80	1,260	1,455	1,650	910	965	1,035	1,121	859	817	782

**Note:**  
The standards shown in the table above are from *AASHTO's A Policy on Geometric Design of Highways and Streets, 6th Edition ed., 2011*. If updated values are available from a newer edition of the AASHTO document, the updated values are to be used.

### 4.3.2. Intersection Sight Distance and Intersection Sight Triangles

Intersection sight distance is the distance required for drivers to safely make a left turn or right turn from an access connection, or to cross a roadway, or for a driver to safely make a left turn from a roadway into an access connection. Intersection sight distances are

provided by establishing a sight triangle at the access connections.

The sight triangle is the specified area along approach legs and across their included corners that should be clear of obstructions that might block a driver's view of potentially conflicting vehicles. Refer to AASHTO's "A Policy on Geometric Design of Highways and Streets" [4] for the dimensions of the sight



triangles that are to be provided at access connections. Refer to NCHRP Report 672 “Roundabouts: An Informational Guide” [16] for intersection sight distances at roundabouts.

### 4.4. Standards for Intersection Auxiliary Lanes

Auxiliary lanes at intersections improve safety (reduce crashes) and optimize traffic operations (reduce delay and increase capacity). Auxiliary lanes can also significantly reduce fuel consumption and vehicular emissions. Access connections should generally be avoided within the extents of auxiliary lanes. Note that this section only applies to the auxiliary lanes at intersections. This section does not apply to freeways and expressway road sections with interchanges.

Figure 4-10 illustrates the elements of an intersection including deceleration lane, acceleration lane, and tapers. The following sections provide the standards for these.

#### 4.4.1. Deceleration Lanes

Deceleration lanes allow vehicles that are turning into an intersection, a safe area in

which to slow down prior to making the turn, thereby reducing the crash potential with through traffic.

#### 4.4.1.1. Warrants for Auxiliary Deceleration Lanes at Unsignalized Intersections

Table 4-12 through Table 4-19 provide the warrants for the implementation of auxiliary left-turn and right-turn lanes along two-lane and multilane roadways in urban and rural areas at unsignalized intersections. Figure 4-11 illustrates these combinations and the specific table that provides the warrants.

Auxiliary left-turn lanes shall be provided at all median openings.

The need for the deceleration lanes should be assessed using the design hour traffic volumes forecast for the traffic study implementation year with the proposed development, or based on the future year traffic forecasts developed for a roadway improvement project. Turn lanes may be required at lower volumes by a traffic impact study or by the Department to protect the traveling public.



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**Figure 4-10: Elements of an Intersection**

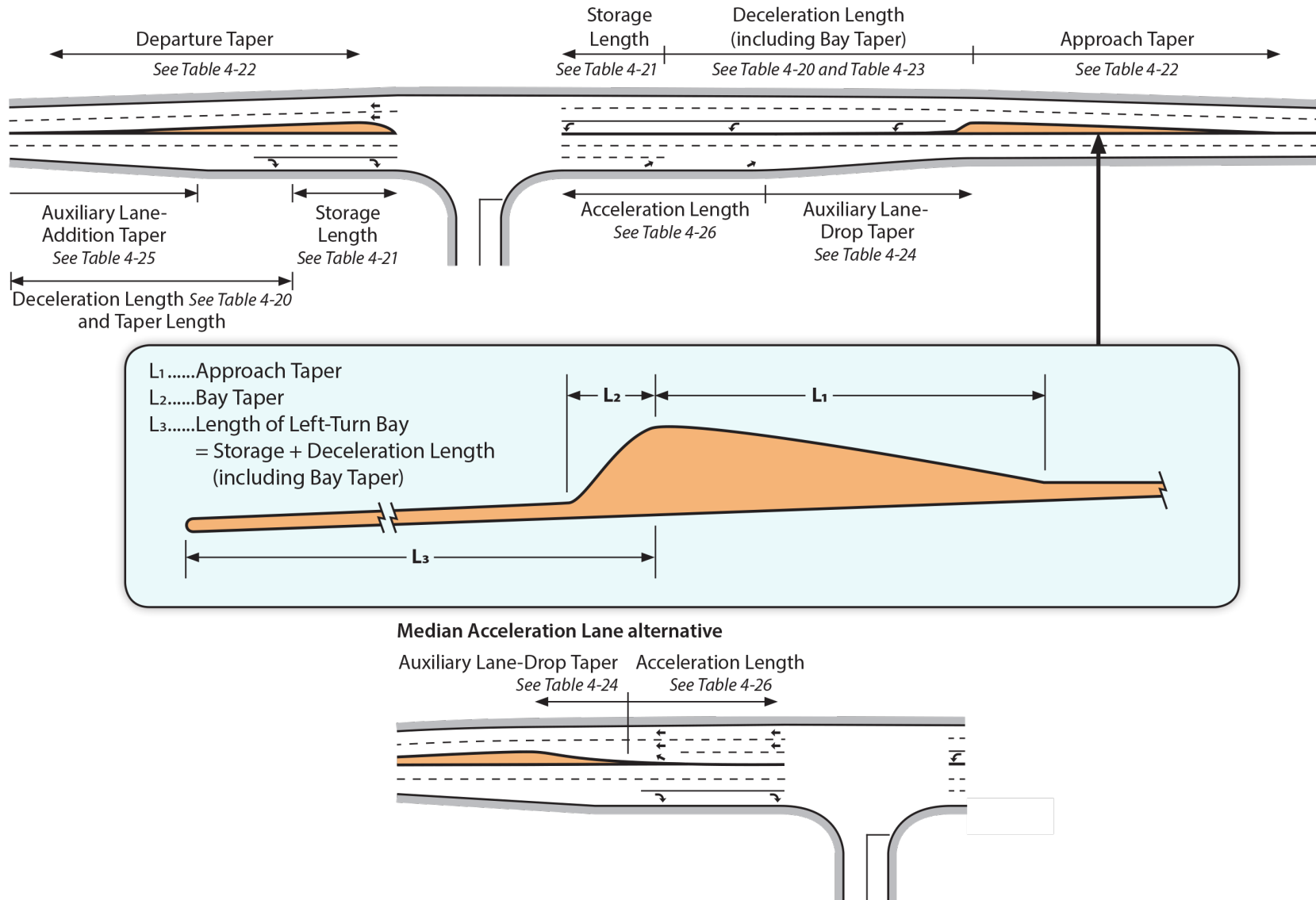
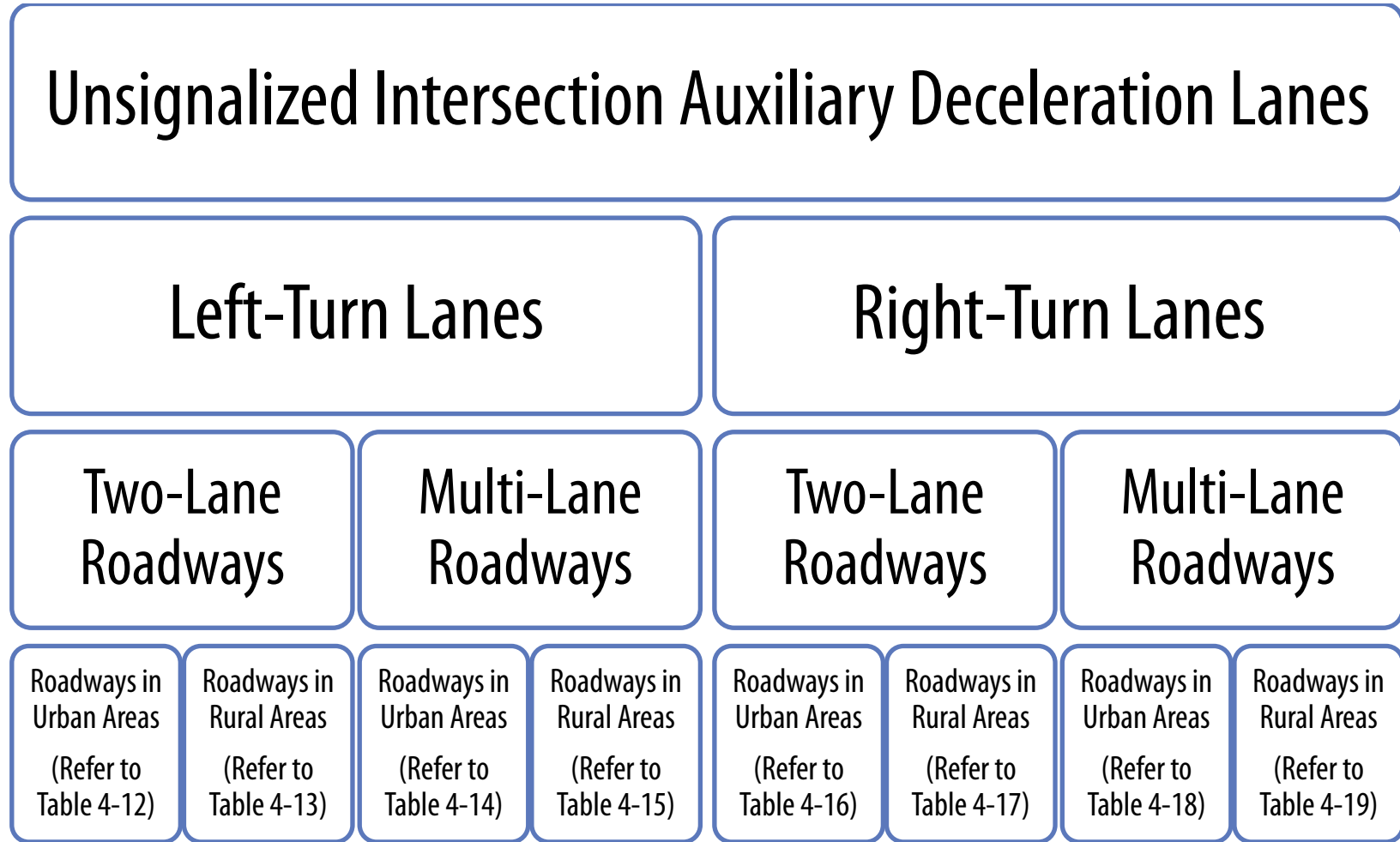




Figure 4-11: Warrants for Auxiliary Deceleration Lanes at Unsignalized Intersections







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**Table 4-12: Left-Turn Lane Warrants at Unsignalized Intersections, Two-Lane Roadways in Urban Areas**

Turning Volume <sup>1</sup> (vph)	Minimum Directional Volume in the Through Lane <sup>2</sup> (vphpl)		
	≤ 30 mph	35 to 40 mph	≥ 45 mph
< 5	Not Required	May be Required	May be Required
5	510	450	330
10	390	330	210
15	320	250	150
20	270	200	120
25	230	160	100
30	200	130	Required
35	170	110	Required
40	150	Required	Required
45	130	Required	Required
≥ 46	Required	Required	Required

**Notes:**

Turn lane is warranted if the design year volumes are equal to or greater than the volumes provided above. Posted speed (mph) of the roadway should be used in the warrant analysis.

<sup>1</sup> Use linear interpolation for turning volumes between 5 and 45 vph.

<sup>2</sup> The directional volume is the volume in the same direction as served by the auxiliary lane. The directional volume in the through lane includes through vehicles and turning vehicles.



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**Table 4-13: Left-Turn Lane Warrants at Unsignalized Intersections, Two-Lane Roadways in Rural Areas**

Turning Volume <sup>1</sup> (vph)	Minimum Directional Volume in the Through Lane <sup>2</sup> (vphpl)			
	≤ 30 mph	35 to 40 mph	45 to 55 mph	≥ 60 mph
< 5	Not Required	May be Required	May be Required	May be Required
5	400	220	120	60
10	240	140	80	40
15	160	100	60	Required
20	120	80	Required	Required
25	100	Required	Required	Required
≥ 26	Required	Required	Required	Required

**Notes:**

Turn lane is warranted if the design year volumes are equal to or greater than the volumes provided above. Posted speed (mph) of the roadway should be used in the warrant analysis.

<sup>1</sup> Use linear interpolation for turning volumes between 5 and 25 vph.

<sup>2</sup> The directional volume is the volume in the same direction as served by the auxiliary lane. The directional volume in the through lane includes through vehicles and turning vehicles.



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**Table 4-14: Left-Turn Lane Warrants at Unsignalized Intersections, Multilane Roadways in Urban Areas**

Turning Volume <sup>1</sup> (vph)	Minimum Volume in the Adjacent Through Lane <sup>2</sup> (vphpl)		
	≤ 30 mph	35 to 40 mph	≥ 45 mph
< 5	Not Required	May be Required	May be Required
5	Not Required	490	420
10	420	370	300
15	360	290	220
20	310	230	160
25	270	190	130
30	240	160	110
35	210	130	100
40	180	120	Required
45	160	110	Required
50	140	Required	Required
55	120	Required	Required
≥ 56	Required	Required	Required

**Notes:**

Turn lane is warranted if the design year volumes are equal to or greater than the volumes provided above. Posted speed (mph) of the roadway should be used in the warrant analysis.

<sup>1</sup> Use linear interpolation for turning volumes between 5 and 55 vph.

<sup>2</sup> The volume in the adjacent through lane includes through vehicles and turning vehicles. The through volume shall be assumed to be distributed evenly across all through lanes unless field observed patterns indicate otherwise.



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**Table 4-15: Left-Turn Lane Warrants at Unsignalized Intersections, Multilane Roadways in Rural Areas**

Turning Volume <sup>1</sup> (vph)	Minimum Volume in the Adjacent Through Lane <sup>2</sup> (vphpl)			
	≤ 30 mph	35 to 40 mph	45 to 55 mph	≥ 60 mph
< 5	Not Required	May be Required	May be Required	May be Required
5	450	310	210	130
10	310	220	130	90
15	240	160	100	70
20	190	130	80	Required
25	150	110	Required	Required
30	130	Required	Required	Required
35	110	Required	Required	Required
≥ 36	Required	Required	Required	Required

**Notes:**

Turn lane is warranted if the design year volumes are equal to or greater than the volumes provided above.

Posted speed (mph) of the roadway should be used in the warrant analysis.

<sup>1</sup> Use linear interpolation for turning volumes between 5 and 35 vph.

<sup>2</sup> The volume in the adjacent through lane includes through vehicles and turning vehicles. The through volume shall be assumed to be distributed evenly across all through lanes unless field observed patterns indicate otherwise.



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**Table 4-16: Right-Turn Lane Warrants at Unsignalized Intersections, Two-Lane Roadways in Urban Areas**

Turning Volume <sup>1</sup> (vph)	Minimum Directional Volume in the Through Lane <sup>2</sup> (vphpl)		
	≤ 30 mph	35 to 40 mph	≥ 45 mph
< 5	Not Required	May be Required	May be Required
5	1,080	610	360
10	700	400	240
15	500	280	170
20	380	210	140
25	300	180	120
30	250	160	110
35	220	150	100
40	200	140	Required
45	190	Required	Required
≥ 46	Required	Required	Required

**Notes:**

Turn lane is warranted if the design year volumes are equal to or greater than the volumes provided above. Posted speed (mph) of the roadway should be used in the warrant analysis.

<sup>1</sup> Use linear interpolation for turning volumes between 5 and 45 vph.

<sup>2</sup> The directional volume is the volume in the same direction as served by the auxiliary lane. The directional volume in the through lane includes through vehicles and turning vehicles.



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**Table 4-17: Right-Turn Lane Warrants at Unsignalized Intersections, Two-Lane Roadways in Rural Areas**

Turning Volume <sup>1</sup> (vph)	Minimum Directional Volume in the Through Lane <sup>2</sup> (vphpl)			
	≤ 30 mph	35 to 40 mph	45 to 55 mph	≥ 60 mph
< 5	Not Required	May be Required	May be Required	May be Required
5	800	460	270	160
10	430	280	170	110
15	290	180	110	80
20	200	140	90	70
25	170	120	80	Required
30	160	110	Required	Required
≥ 31	Required	Required	Required	Required

**Notes:**

Turn lane is warranted if the design year volumes are equal to or greater than the volumes provided above. Posted speed (mph) of the roadway should be used in the warrant analysis.

<sup>1</sup> Use linear interpolation for turning volumes between 5 and 30 vph.

<sup>2</sup> The directional volume is the volume in the same direction as served by the auxiliary lane. The directional volume in the through lane includes through vehicles and turning vehicles.



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**Table 4-18: Right-Turn Lane Warrants at Unsignalized Intersections, Multilane Roadways in Urban Areas**

Turning Volume <sup>1</sup> (vph)	Minimum Volume in the Adjacent Through Lane <sup>2</sup> (vphpl)		
	≤ 30 mph	35 to 40 mph	≥ 45 mph
< 5	Not Required	May be Required	May be Required
5	1,200	730	450
10	820	490	320
15	600	350	240
20	460	260	180
25	360	230	150
30	290	200	130
35	260	180	120
40	240	170	110
45	220	160	Required
50	200	Required	Required
55	190	Required	Required
≥ 56	Required	Required	Required

**Notes:**

Turn lane is warranted if the design year volumes are equal to or greater than the volumes provided above. Posted speed (mph) of the roadway should be used in the warrant analysis.

<sup>1</sup> Use linear interpolation for turning volumes between 5 and 55 vph.

<sup>2</sup> The volume in the adjacent through lane includes through vehicles and turning vehicles. The through volume shall be assumed to be distributed evenly across all through lanes unless field observed patterns indicate otherwise.



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**Table 4-19: Right-Turn Lane Warrants at Unsignalized Intersections, Multilane Roadways in Rural Areas**

Turning Volume <sup>1</sup> (vph)	Minimum Volume in the Adjacent Through Lane <sup>2</sup> (vphpl)			
	≤ 30 mph	35 to 40 mph	45 to 55 mph	≥ 60 mph
< 5	Not Required	May be Required	May be Required	May be Required
5	910	520	310	180
10	520	330	200	130
15	370	220	140	100
20	270	170	110	90
25	220	140	100	Required
30	200	130	90	Required
35	180	120	Required	Required
≥ 36	Required	Required	Required	Required

**Notes:**

Turn lane is warranted if the design year volumes are equal to or greater than the volumes provided above.

Posted speed (mph) of the roadway should be used in the warrant analysis.

<sup>1</sup> Use linear interpolation for turning volumes between 5 and 35 vph.

<sup>2</sup> The volume in the adjacent through lane includes through vehicles and turning vehicles. The through volume shall be assumed to be distributed evenly across all through lanes unless field observed patterns indicate otherwise.





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### 4.4.1.2. Warrants for Auxiliary Deceleration Lanes at Signalized Intersections

The need for the deceleration lanes should be assessed using the design hour traffic volumes forecast for the traffic study implementation year with the proposed development, or based on the future year traffic forecasts developed for a roadway improvement project. Turn lanes may be required at lower volumes by a traffic impact study or by the Department to protect the traveling public.

#### 4.4.1.2.1 Left-Turn Lane Warrants

Exclusive left-turn lanes are warranted at signalized intersections under the following conditions:

1. At intersections along state roadways where new or modified traffic signal control will be implemented.
2. Dual exclusive left-turn lanes are warranted at signalized intersections where the left-turn design hour volume equals or exceeds 300 vehicles per hour or the volume-to-capacity (v/c) ratio for a single-lane left-turn movement is determined to be equal to or greater than 0.95 for the left-turn movement based on accepted analysis methodologies.

#### 4.4.1.2.2 Right-Turn Lane Warrants

Exclusive right-turn lanes are warranted at signalized intersections under the following conditions:

1. Where the right-turn design hour volume equals or exceeds 150 vehicles per hour, and the posted speed is 40 mph or lower; or

2. Where the right-turn design hour volume equals or exceeds 100 vehicles per hour, and the posted speed is 45 mph or higher

### 4.4.1.3. Deceleration Lane (Turn-Lane) Design

The components of deceleration lane length are:

- perception-reaction distance
- full deceleration length
- queue storage length

It is assumed that the perception-reaction and a moderate amount of deceleration occur within the through lanes. The length of deceleration lane to be provided is:

$$\begin{aligned} \text{Minimum Length of Deceleration Lane} \\ &= \text{Deceleration Length} \\ &+ \text{Queue Storage Length} \end{aligned}$$

Table 4-20 provides the deceleration length to which the queue storage length must be added to obtain the total deceleration lane length. Note that the deceleration lengths provided in Table 4-20 includes the taper lengths provided in Table 4-23 or Table 4-25.

The queue storage length is to be determined from an operations analysis using the methodology and the assumptions prescribed by the Department. The 95<sup>th</sup> percentile queue length from the operations analysis must be used in the queue storage length determination. The Vehicle Length Adjustment values provided in Table 4-21 are to be used in determining the queue storage length.



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**Table 4-20: Minimum Length of Left-Turn or Right-Turn Deceleration Lanes [1] [4]**

Posted Speed Limit (mph)	Deceleration Length (Excluding Queue Storage Length) (feet)
25	115
30	160
35	215
40	275
45	350
50	425
55	515
60	605
65	710
70	820
75	940
Multipliers for grades other than 0-2% (To be multiplied by deceleration lengths provided above)	
3 to 4 % Upgrade	0.9
5 to 6 % Upgrade	0.8
3 to 4 % Downgrade	1.2
5 to 6 % Downgrade	1.35
<b>Note:</b> The queue storage length must be added to the deceleration lengths provided in the table above to obtain the total length of deceleration lanes. The deceleration lengths provided in the table above includes the taper lengths.	

The queue storage length shall be determined for the following:

- AM peak

- PM peak
- Other time periods identified by the Department.

The longest distance shall be used as the queue storage length.

Accesses that allow traffic across deceleration lanes should be avoided.

**Table 4-21: Vehicle Length Adjustment for Queue Storage Length Calculation [1]**

Trucks (%)	Vehicle Length <sup>1</sup> (feet)
≤ 2	25
5	28
10	32
15	35
20	38
25	41
<sup>1</sup> Includes the space between vehicles	

### 4.4.2. Tapers

The following types of taper may be involved in the design of auxiliary lanes:

- approach taper
- departure taper
- bay taper
- auxiliary lane-drop taper
- auxiliary lane-addition taper

Figure 4-10 illustrates the application of these tapers.



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### 4.4.2.1. Approach and Departure Taper

Table 4-22 provides the taper ratios for the design of the approach taper and departure taper (see Figure 4-10). The “Desirable Taper Ratio” in Table 4-22 provides the recommended desirable taper ratios. Tapers shorter/less conservative than the “Minimum Taper Ratio that may be Permitted by Variance” are generally not allowed<sup>10</sup> without mitigation strategies.

### 4.4.2.2. Bay Taper

The bay taper directs traffic into a deceleration lane turn-bay (see Figure 4-10). Table 4-23 provides the minimum bay taper lengths.

### 4.4.2.3. Auxiliary Lane-Drop Taper

Table 4-24 provides the taper ratios for the design of the auxiliary lane-drop taper (see Figure 4-10).

### 4.4.2.4. Auxiliary Lane-Addition Taper

Table 4-25 provides the taper ratios for the design of the auxiliary lane-addition taper (see Figure 4-10). The “Desirable Taper Ratio” in Table 4-25 provides the recommended desirable taper ratios. Tapers shorter/less conservative than the “Minimum Taper Ratio that may be Permitted by Variance” are generally not allowed<sup>11</sup> without mitigation strategies.

**Table 4-22: Approach and Departure Tapers**

Posted Speed Limit (mph)	Desirable Taper Ratio	Minimum Taper Ratio that may be Permitted by Variance
25	10:1	8:1
30	15:1	9:1
35	20:1	12:1
40	30:1	12:1
45	45:1	15:1
50	50:1	20:1
55	55:1	25:1
60	60:1	30:1
65	65:1	35:1
70	70:1	40:1
75	75:1	45:1

**Table 4-23: Bay Taper Length [1]**

Number of Turn Lanes	Taper Length (feet)
1	50
2	100
3	125

<sup>10</sup> Deviations (Refer to Section 2.2.4) from this standard are generally not allowed without mitigation strategies.

<sup>11</sup> Deviations (Refer to Section 2.2.4) from this standard are generally not allowed without mitigation strategies.



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**Table 4-24: Auxiliary Lane-Drop Tapers**

Posted Speed Limit (mph)	Taper Ratio/Length
25	8:1
30	9:1
35	12:1
40	12:1
45	15:1
50	20:1
55	25:1
60	25:1
65	25:1
70	25:1
75	25:1

**Table 4-25: Auxiliary Lane-Addition Tapers**

Posted Speed Limit (mph)	Desirable Taper Ratio	Minimum Taper Ratio that may be Permitted by Variance
25	10:1	7:1
30	10:1	8:1
35	15:1	9:1
40	15:1	9:1
45	15:1	10:1
50	15:1	10:1
55	21:1	10:1
60	21:1	10:1
65	21:1	10:1
70	21:1	10:1
75	21:1	10:1



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### 4.4.3. Acceleration Lanes

Acceleration lanes should be used on high speed ( $\geq 45$  mph), high volume ( $\geq 10,000$  vehicles per day, based on a 20-year forecast) roads, as determined by a traffic impact study, or when entering vehicles do not have a sufficient gap to enter traffic safely, or as required by the Department. Acceleration lanes should also be considered for use on roads with restricted sight distances.

lengths provided in Table 4-26 do not include the required taper lengths. Taper length is to be provided as shown in Table 4-24.

For long upgrades, where entering trucks cannot achieve a speed within 10 mph of the posted speed limit, an acceleration lane may be required to be lengthened for use as a truck-climbing lane. Accesses that allow traffic across acceleration lanes should be avoided.

Table 4-26 provides the minimum acceleration lane lengths. Note that the acceleration lane

**Table 4-26: Minimum Length of Left-Turn or Right-Turn Acceleration Lanes [4]**

For Level Grades ( $\pm 2\%$ or less)			Multipliers for Other than Level Grades			
Design Speed (mph)	Speed Reached (mph)	Length Required (feet)	3 to 4% Upgrade	5 to 6% Upgrade	3 to 4% Downgrade	5 to 6% Downgrade
30	23	180				
35	27	280				
40	31	360	1.3	1.5	0.7	0.6
45	35	560	1.35	1.6	0.675	0.575
50	39	720	1.4	1.9	0.65	0.55
55	43	960	1.45	2.05	0.625	0.525
60	47	1,200	1.6	2.5	0.6	0.5
65	50	1,410	1.7	2.75	0.6	0.5
70	53	1,620	1.8	3.0	0.6	0.5

**Notes:**

Taper length must be added to the acceleration lengths provided above. Taper length is to be provided as shown in Table 4-24.

The standards shown in the table above are from *AASHTO's A Policy on Geometric Design of Highways and Streets, 6th Edition ed., 2011*. If updated values are available from a newer edition of the AASHTO document, the updated values are to be used.



### 4.4.4. Example Application of the Standards for Intersection Auxiliary Lanes

The following is a typical application of the standards for intersection auxiliary lanes.

Consider the case of an east-west four-lane roadway "Arterial Avenue" (Figure 4-12) located in a rural area with level grade, with a posted speed limit of 55 mph and a design speed of 60 mph. Now, a driveway (Driveway A) is considered; the intersection of Driveway A with Arterial Avenue results in an unsignalized "T" intersection, with access to the south. The eastbound right, westbound left, northbound right, northbound left are the possible movements to/from Driveway A at this intersection. The following is further information regarding these:

- The design hour volume in the westbound direction is 500 vph, with 250 vph in each lane of the westbound direction. The westbound left turn volume is 10 vph.
- The design hour volume in the eastbound direction is 400 vph, with 200 vph in each lane of the eastbound direction. The eastbound right turn volume is 20 vph.
- The design year AADT along Arterial Avenue is greater than 10,000 vehicles per day.

The standards for intersection auxiliary lanes are reviewed as follows:

1. Warrants for left-turn lanes at unsignalized intersections along multilane roadways in rural areas are provided in Table 4-15. With a posted speed limit of 55 mph and a left-turn design hour volume of 10 vph, a left-turn lane is warranted when the volume in

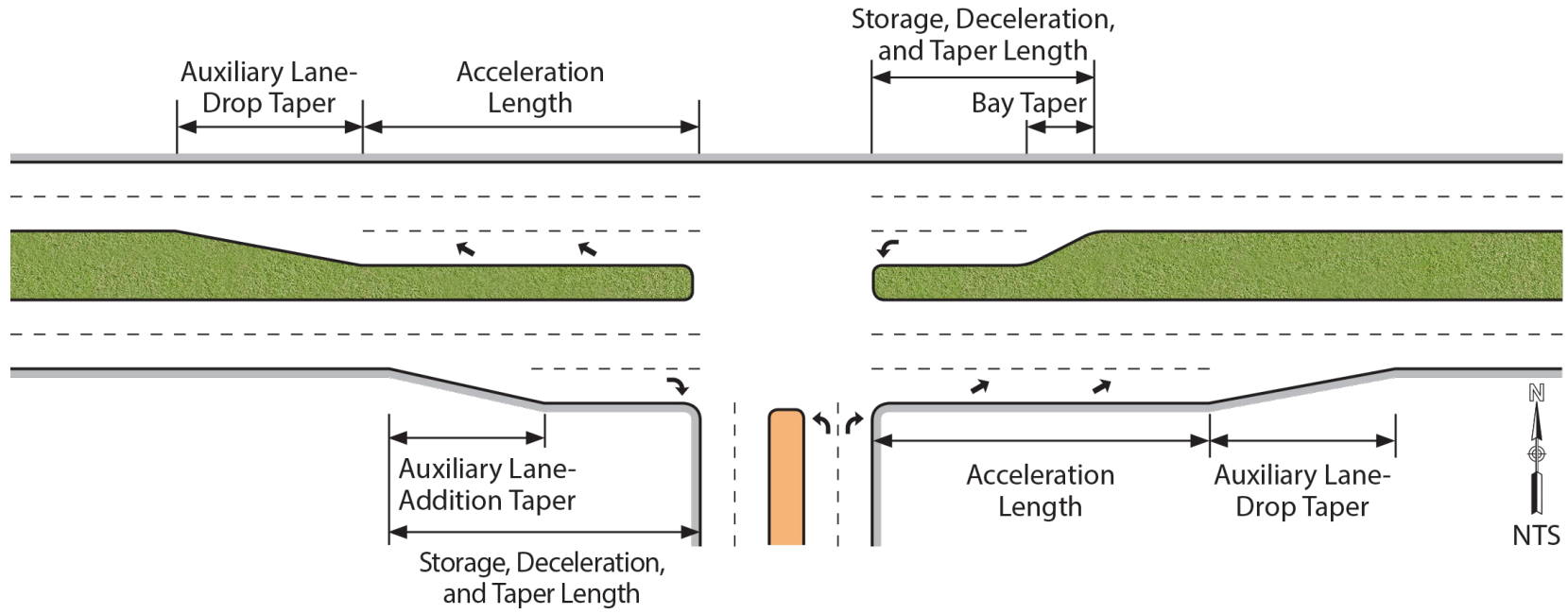
the adjacent through lane is 130 vph or greater. The design hour volume of 250 vph is greater than this warrant volume. Therefore, a westbound left-turn lane is warranted.

2. Warrants for right-turn lanes at unsignalized intersections along multilane roadways in rural areas are provided in Table 4-19. With a posted speed limit of 55 mph and a right-turn design hour volume of 20 vph, a right-turn lane is warranted when the volume in the adjacent through lane is 110 vph or greater. The design hour volume of 200 vph is greater than this warrant volume. Therefore, an eastbound right-turn lane is warranted.
3. Standards for the design of deceleration turn-lanes are provided in Section 4.4.1.3. From Table 4-20, the minimum deceleration length corresponding to a posted speed limit of 55 mph is 515 feet. Based on an operations analysis, the queue storage length for the westbound left-turn and the eastbound right-turn was determined to be 35 feet. The total deceleration lane length is therefore 550 feet.
4. For the westbound left-turn, as shown in Figure 4-12, the required taper is the Bay Taper. From Table 4-23, for a one-lane left-turn, the required bay taper length is 50 feet. Therefore, for the westbound left-turn, a deceleration lane length of 550 feet including a taper length of 50 feet is to be provided.



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**Figure 4-12: Example Application of the Standards for Intersection Auxiliary Lanes**





5. For the eastbound right-turn, as shown in Figure 4-12, the required taper is the Auxiliary Lane-Addition Taper. From Table 4-25, for a posted speed limit of 55 mph, the desirable taper ratio is 21:1. With a 12-foot lane, the required taper length is 252 feet. Therefore, for the eastbound right-turn, a deceleration lane length of 550 feet including a taper length of 252 feet is to be provided.
6. The posted speed limit on Arterial Avenue is 55 mph and the design year AADT is greater than 10,000 vehicles per day. Per Section 4.4.3, and based on a traffic impact study, acceleration lanes are required to receive the northbound right and northbound left movements.
7. From Table 4-26, for a design speed of 60 mph, the required acceleration lane length is 1,200 feet. The required taper is the auxiliary lane-drop taper. From Table 4-24, the desirable taper ratio is 25:1 for a posted speed limit of 55 mph. With a 12-foot lane, the required taper length is 300 feet.

Variance” are generally not allowed<sup>12</sup> without mitigation strategies.

If an existing median is of sufficient width to accommodate the proposed left-turn lane(s), the existing median may be used without further widening. When it is necessary to widen the roadway to accommodate left-turn lanes, the roadway should be widened symmetrically on both sides of the roadway.

### 4.5. Standards for Medians

Properly designed medians provide many benefits including vehicular safety, pedestrian safety, operational efficiency, and aesthetics.

#### 4.5.1. Median Width

The appropriate median width depends on the function that the median is designed to serve. Table 4-27 provides the median width standards.

The “Desirable Minimum Width” in Table 4-27 provides the recommended desirable median widths. Median widths narrower than the “Minimum Width that may be Permitted by

<sup>12</sup> Deviations (Refer to Section 2.2.4) from this standard are generally not allowed without mitigation strategies.



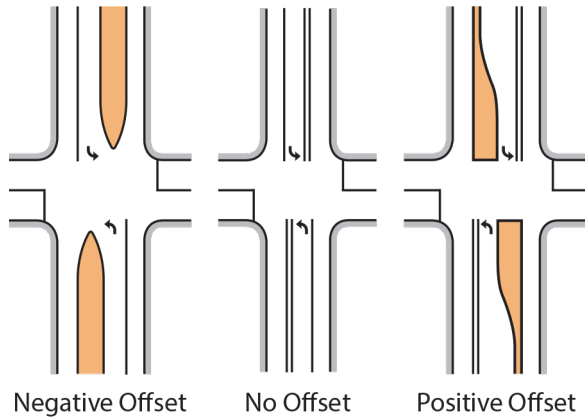


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**Table 4-27: Median Width**

Median Function	Desirable Minimum Width (feet)	Minimum Width that may be Permitted by Variance (feet)
Separation of opposing (through) traffic streams	10	4
Pedestrian refuge and space for signs and appurtenances	14	6
Left-turn deceleration and storage; Single turn bay, no pedestrians; Negative offset <sup>†</sup>	16	14
Left-turn deceleration and storage; Single turn bay, no pedestrians; Positive offset <sup>†</sup>	≥ 20	18
Left-turn deceleration and storage; Single turn bay, pedestrians present; Negative offset <sup>†</sup>	18	18
Left-turn deceleration and storage; Single turn bay, pedestrians present; Positive offset <sup>†</sup>	≥ 22	20
Dual left-turn bay	30	28
Triple left-turn bay	45	40
Two-Way-Left-Turn Lanes	14 (maximum)	
Protection for passenger vehicle crossing or turning left onto roadway	30	25
Directional opening for selected left-turn ingress or egress by passenger vehicle	30	25
<b>Note:</b>		
† Refer Figure 4-13 for an illustration of negative, no, and positive offset left-turn lanes.		

**Figure 4-13: Offset Left-Turn Lanes**

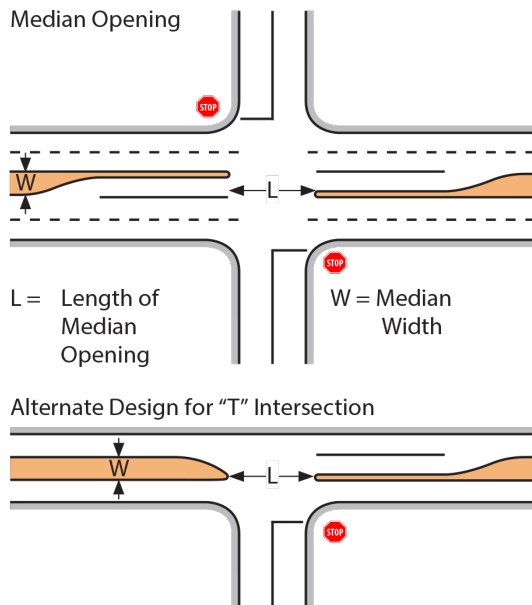


**4.5.2. Median Openings**

Median openings are necessary to accommodate left turning and cross traffic. Auxiliary left-turn lanes shall be provided at all median openings to accommodate all possible left-turn movements (Figure 4-14).

Median openings are to be designed in accordance with the guidance provided in AASHTO’s “A Policy on Geometric Design of Highways and Streets.” [4]

**Figure 4-14: Median Openings**



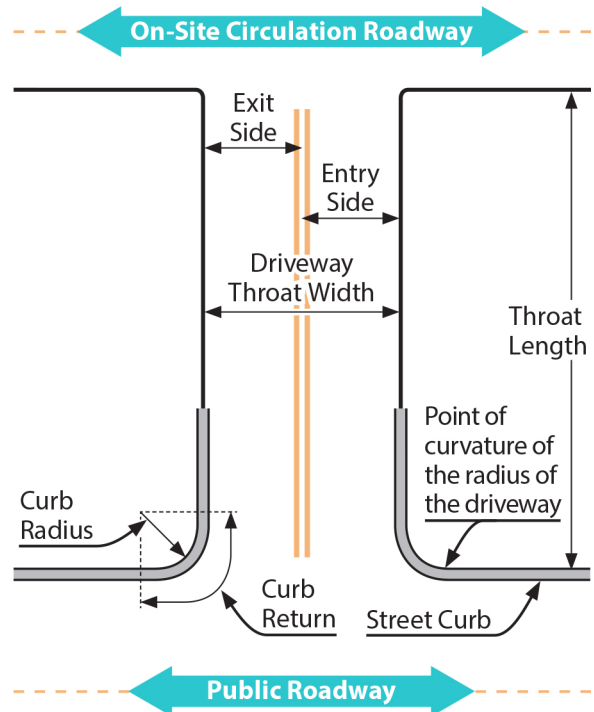
**4.6. Standards for Driveway Design**

The four types of access connections (driveways) to roadways are summarized in Section 3.3. Figure 4-15 illustrates a return radius driveway and a depressed curb driveway. Figure 4-15 also illustrates the elements of a driveway. The standards provided in this section are based primarily on the Department’s Standard Plans [12]. At the discretion of the District Engineer or designee, the design of driveways may be required to conform to other/local standards in lieu of these standards.

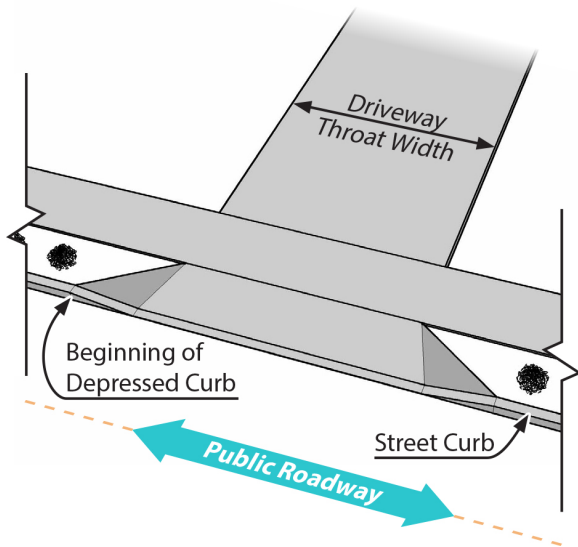
The throat length of the driveway shall be designed per the Department’s Standard Plans [12].

**Figure 4-15: Elements of a Driveway**

**Return Radius Driveway:**



### Depressed Curb Driveway:



The width and the curb radius of a driveway work together to accommodate the design vehicle. As a result, a wide access can be used together with a small radius to achieve a similar operation to that of a narrow access with a larger radius.

Table 4-28 provides the minimum entry<sup>13</sup> widths for commercial access for different curb radii. The listed values are for driveways, which intersect the roadway at 90 degrees and require a minimum of 2 feet of shoulder width on the highway. An engineering study (completed, signed, and sealed by a Nevada Licensed Professional Engineer) is required if vehicles longer than WB-50 are expected or if the driveway does not intersect the roadway at a 90-degree angle. Other combinations of radius and throat width could also be

appropriate. An engineering study is required to validate these combinations.

**Table 4-28: Minimum Entry Width and Curb Radius for Commercial Access**

Curb Radius (feet)	Minimum Entry Width (feet)	
	Passenger Car, Single-Unit (SU) Truck, Bus	Semitrailer Truck (WB-50)
25	22	
30	18	
35	16	26
40		22
45		18
≥ 50		16

Table 4-29 provides the specific driveway detail in the Department's Standard Plans [12] that is to be provided depending on the location and the intended use of the driveway. Table 4-29 also provides the minimum and maximum throat width standards for these driveways.

<sup>13</sup> Entry width is the one-way width of the driveway for the entry side only. The driveway throat width is the sum of the entry width and the exit width.



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**Table 4-29: Minimum and Maximum Driveway Throat Width [12]**

Type of Access Connection/ Driveway (Refer Section 3.3)	Curb and Gutter Present?	Intended Use of the Driveway	Driveway Detail in the Department's Standard Plans [12]	Minimum Entry Width (feet)	Minimum Throat Width (feet)	Maximum Throat Width (feet)
Non-commercial connections	Yes	Single-family dwelling	Single Family Driveways with Curb	N/A	12	24
	No	Single-family dwelling	Type 5 Approach Road		16	24
	Yes	Multi-family dwellings of three or fewer dwelling units	Multi-Family, Commercial & Industrial Driveway		24	32
	No	Multi-family dwellings of three or fewer dwelling units	Type 5 Approach Road		24	32
Minor commercial connections	No	Predominantly serves passenger cars	Type 5 Approach Road	Refer to Table 4-28	24	Minimum Entry Width + Exit Width <sup>1</sup>
	Yes	Predominantly serves passenger cars	Multi-Family, Commercial & Industrial Driveway		32	
	No	Serves passenger cars and trucks	Type 4 Approach Road		32	
Major commercial connections	Yes	Serves passenger cars and trucks	Multi-Family, Commercial & Industrial Driveway		32	
	No	Serves passenger cars and trucks	Type 4 Approach Road		32	

<sup>1</sup> Exit width shall be 16 feet for a one-lane exit. For two or more exit lanes, the exit width shall be 12 feet for each lane.

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# Access Management System and Standards

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