

Access Management System and Standards



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**STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION**

ACCESS MANAGEMENT SYSTEM AND STANDARDS

SECTION ONE
INTRODUCTION

1.1 Authority

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

1.2 Purpose

1. The purpose of these standards is to regulate access onto state highways in order to protect the health, safety and welfare of the public, to maintain the highway rights-of-way, and to preserve the functional level of state highways while meeting the needs of the motoring public.
2. Access points are the main source of crashes and congestion. The number of crashes at driveways is disproportionately higher than at other types of intersections. The location, spacing, and frequency of access points have significant impact on traffic patterns and public safety. Too many accesses increase accident potential and delays, and adversely affect efficient traffic signal timing and operations. Too few accesses inhibit access and over concentrates traffic entering the highway. By helping to reduce congestion, a proficient access management program can help to reduce the need to add additional lanes to highways. Proper spacing of access points balances access and mobility, improves capacity, and reduces crashes and lost time.

1.3 Organization

1. Section One describes the authority, purpose and structure of the Access Management System and Standards.
2. Section Two describes the administrative procedures for implementation of the Access Management System and Standards.
3. Section Three defines the roadway categories and access classifications, and the access allowed for each category and classification.
4. Section Four provides the standards for the design and construction of all access to the highway system.

1.4 Implementation

This Access Management System and Standards will become effective on July 1, 1999.

1.5 Definitions, Abbreviations and Acronyms

1. "85th percentile speed", defined, is that speed at which 85% of the traffic is traveling at or slower. 15% of the traffic is traveling faster than this speed.
2. "AADT" defined, is the two-way annual average daily traffic volume. It represents the total annual traffic volume divided by the days in the year.
3. "Acceleration Lane" defined, is a speed change lane, including tapered area, to enable a vehicle entering the traffic stream to accelerate to a speed where it can safely merge with traffic.

4. "Access" defined, is any driveway, approach or connecting street, road or highway that connects to a state highway.
5. "Access Classification" defined, is any of the four classifications which describes the type of access.
6. "Access Control Plan" defined, is a roadway design plan which designates access locations and designs.
7. "Access Permit", also "Permit", defined, is an 'Application and Permit for Occupancy of Nevada Department of Transportation Right-of-Way'.
8. "Access Point" defined, is the location of the intersection of a highway, street, road, driveway, or approach with a state highway.
9. "ADT" defined, is the two-way average traffic volume counted over a period of time, two days or greater, but less than one year, and divided by the number of days that traffic was counted.
10. "Alternate Access" defined, is another improved roadway which allows a vehicle to indirectly access a state highway instead of direct access from an adjoining lot.
11. "Applicant" defined, is any person, business, or agency applying for an access permit.
12. "Application and Permit for Occupancy of Nevada Department of Transportation Right-of-Way", defined, is the application form that is filled out when applying for a permit for access. This same form is also used for applying for all other uses of state highway rights-of-way. Upon approval this application form becomes the permit.
13. "Approach", also "Driveway", defined, is an access that is not a public street, road, or highway.
14. "Appropriate Local Authority" defined, is 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.
15. "Average Peak Hour Volume" defined, for the purpose of these standards, will be the same as design hour volume (DHV).
16. "Auxiliary Lane", also "Speed Change Lane" and "turn lane", defined, is a lane 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.
17. "Bandwidth" defined, is the width, represented as time in seconds or the percent of traffic signal cycle of a pair of parallel speed lines which delineate a progressive movement on a time-space diagram and indicating the period, or percent, of time available for traffic to flow within the band. It is a measurement of the through traffic capacity of a signal progression system.
18. "Bike Lane" or "Bicycle Lane", defined is a portion of the roadway which has been designated, by striping, signing, and pavement markings, for the exclusive use of bicycles.
19. "Bike Path" or "Bicycle Path", defined, is a shared use path which is separated from, and restricted from use by, motorized vehicular traffic. It can be used by pedestrians, skaters, wheelchairs, joggers, and bicycles.
20. "Board" defined, is the Board of Directors of the Nevada Department of Transportation.
21. "Collector Road", defined, is a road that balances direct access with travel demands and serves as a connection to the arterial system of streets.
22. "Consulting engineer" or "Engineer" defined, is a Nevada Licensed Professional Engineer.
23. "Control of Access" defined, is when the right of access to property adjacent to a highway is partially or fully controlled by public authority.
24. "Controlled-Access Highway" defined, is every highway to which owners or occupants of abutting lands and other persons are prohibited from having direct private access to or from the highway. Access is allowed only at selected public roads.

25. "Corner Clearance" defined is the distance measured along the curbline between the curvature of the corner radius (curb return) or curb cut and the point of curvature of the corner radius (curb return) of the nearest intersection.
26. "Curb Cut" defined, is a depressed curb driveway which is allowed for single family residences, only.
27. "Curbline" defined, is the line, whether curbing exists or not, which is the outer edge of the paved portion of a highway.
28. "Deceleration Lane" defined, is a speed change lane, including the tapered areas, which allow vehicles exiting the through traffic lanes a safe area to slow to a safe speed, or stop, before turning from the highway.
29. "Department" defined, is the Nevada Department of Transportation.
30. "Design Hour Volume" defined, also "DHV", is the 30th highest hour traffic (vehicle) volume during a one year period. Highways are designed to accommodate this volume of traffic.
31. "Design Manual" defined, is the State of Nevada Department of Transportation Road Design Division *Design Manual*, as amended.
32. "Directional Design Hour Volume" defined, also DDHV, is the 30th highest hour traffic (vehicle) volume during a one year period, in one direction only.
33. "District" defined, is the engineering district of the Department that administers one of three geographical areas of the state.
34. "District Engineer" defined, is the senior officer, or an authorized representative, of an engineering district of the Department.
35. "Divided Highway" defined, is 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.
36. "Driveway" also "Approach", defined, is an access that is not a public street, road, or highway.
37. "Emergency Access" defined, is 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, fire house, or other emergency service facility.
38. "Entering Sight Distance", defined, is the distance that drivers need, when entering a highway from an intersection or driveway, to see along the highway in both directions.
39. "Expressway", defined, is a high speed, divided highway that may have partial or full control of access, limited at grade intersections, and may have interchanges at major intersections.
40. "Federal Highway Administration" or "F.H.W.A.", defined, is the administrative branch of the United States Department of Transportation that administers Federal Aid Highways and Federal Aid Interstate Highways.
41. "Field Approach" or "Field Access" defined, is an access to undeveloped or agricultural property that has an average traffic volume of less than one vehicle per day.
42. "Freeway" defined, is a highway with full control of access and the only access points are at interchanges.
43. "Frontage Road", also "Service Roads", defined, is any public street or road providing service and access from areas adjacent to a freeway or highway.
44. "Functional Classification" defined, is a classification system that classifies a public roadway according to its purpose and hierarchy in the local or statewide highway system.
45. "General Street System" defined, is the overall system of streets, roads, and highways in an area.
46. "Grade Separation" defined, is a crossing of two roadways, or a roadway and railroad, at different elevations.

47. "Gradient" or "Grade" defined, is the rate or percent of change in slope from or along a highway. It is measured along the centerline of the highway or access.
48. "Headquarters", defined, is the administrative center for the Department of Transportation.
49. "Highway" defined, is the entire width between boundary (right-of-way) lines of every publicly maintained way.
50. "Interchange" defined, is a facility that grade separates intersecting roadways and provides directional ramps for movements between the roadways. The grade separation structure and ramps are considered to be part of the interchange.
51. "Intersection" defined, is the location where two or more roadways meet, at grade.
52. "Lane" defined, is the portion of a roadway for the movement of a single line of vehicles and does not include the gutter or shoulder of the roadway.
53. "Level of Service (LOS)" defined, is a description of traffic flow conditions ranging from "A", which is best, to "F", which is the worst. The *Highway Capacity Manual*, Transportation Research Board Special Report No. 209, as amended, gives detailed descriptions of the levels of service and the calculations involved in establishing them.
54. "Local Government" defined, is the board of county commissioners if the facility is located in an unincorporated area of a county and the governing board of a municipality if the facility is located in an incorporated municipality.
55. "Local Road" means a county or municipal road.
56. "Local Street" means a county or municipal street.
57. "Median" defined, is that portion of a highway separating opposing traffic flows.
58. "Minor Arterial", defined, is a two or four lane facility that is intended to move moderate volumes of traffic.
59. "MPH" means a rate of speed expressed in miles per hour.
60. "M.U.T.C.D." defined, is the Manual on Uniform Traffic Control Devices referenced in subsection 1.6.
61. "N.R.S.", defined, is Nevada Revised Statute, which is a law enacted by the Legislature of the State of Nevada and signed into law by the Governor of the State of Nevada.
62. "Occupancy Permit" defined, is an 'Application and Permit for Occupancy of Nevada Department of Transportation Right-of-Way'.
63. "Peak Hour Volume" defined, is, for the purpose of these standards, the same as design hour volume (DHV).
64. "Permit", also "Access Permit", defined, is an 'Application and Permit for Occupancy of Nevada Department of Transportation Right-of-Way'.
65. "Permit Issue Date" or "Date of Issue" defined, is the date when the authorized Department official signs and approves the permit.
66. "Permittee" defined, is the person to whom an access permit is issued.
67. "Person" defined, is an individual, agency, corporation, partnership, or other entity.
68. "Potential for Signalization" defined, is an intersection that, at a 20-year projection or at build-out, is determined that the volumes would be within 25% of those for meeting the warrants for a traffic signal as defined in the M.U.T.C.D.
69. "Principal Arterial", defined, is a multilane facility that is designed to move moderate to high volumes of traffic, with direct access being given secondary consideration.
70. "Private Access" defined, is access from an abutting parcel that is privately owned and is for the private or commercial use of the property owner.
71. "Public Access" defined, is a roadway connection provided for a public way.

72. "Public Way", "Public Road", "Public Street", or "Public Intersection", defined, is a highway open for use by the general public and under the control and jurisdiction of a local government or the Department.
73. "Ramp", defined, is a directional roadway that connects an intersecting roadway to a freeway, or a freeway to a freeway.
74. "Reasonable Access" defined, is 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 which should be used when determining reasonable access.
75. "Regional Highway", defined, is a highway designed to move moderate to large volumes of traffic over medium to long distances.
76. "Road" defined, is a thoroughfare that is generally located in a rural area and may have surface conditions that range from dirt to pavement.
77. "Roadway", defined, is that portion of a highway improved, designed and ordinarily used for vehicular travel, excluding the sidewalk, shoulder, and slopes.
78. "Roundabout", defined, is a traffic control devices which 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.
79. "Rural Highway", defined, is a highway that balances travel needs with access in rural areas.
80. "Sidewalk", defined, is a paved walkway for pedestrians, which runs parallel to a street.
81. "Sight Distance" defined, is 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 of vehicle.
82. "Signal" and "Signalization" defined, is a traffic control signal.
83. "Signal Progression" defined, is the movement of traffic without stopping, at a planned speed, through contiguous signalized intersections.
84. "Signal Spacing" defined, is the distance between traffic signals, along a roadway.
85. "Speed Change Lane" defined, also "auxiliary lane", is a separate lane, including the tapered areas, which allows a vehicle exiting or entering the through traffic lanes a safe area to decrease or increase its speed with minimal interference to through traffic.
86. "Standard Plans" defined, is the State of Nevada *Standard Plans for Road and Bridge Construction*, as amended.
87. "Standard Specifications" defined, is the State of Nevada *Standard Specifications for Road and Bridge Construction*, as amended.
88. "State Highway" defined, is any road, street, or highway which is on the state highway system and to which a current state route number has been assigned
89. "Stopping Sight Distance" defined, is 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 time.
90. "Storage Lane" defined, is the additional length required to store the maximum number of vehicles, based on a twenty year traffic volume projection, calculated to be stopped at any time during the peak traffic volume movement in a deceleration or turn lane.
91. "Street" defined, is 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.

92. "Time-Space Diagram" defined, is a chart on which the relative distances between traffic signals and the signal timing is plotted and referenced to time. The chart indicates the through-bandwidth, signal progression, and traffic (band) speed.
93. "Traffic Impact Report", "Traffic Impact Study" or "Traffic Impact Analysis" defined, is a 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* booklet.
94. "Traffic Signal" defined, is an electrically operated device that controls or directs the flow of traffic.
95. "Traveled Way" defined, is that portion of the highway available to the through movement of traffic. It does not include shoulders, sidewalks, gutters, medians, or auxiliary lanes.
96. "Vehicles per Day" also "vpd" defined, is AADT or ADT.
97. "Vehicles per Hour" also "vph" defined, is the design hour volume.
98. "Working Day" defined, is a normal day of work, excluding weekends and legal holidays.

1.6 References

1. Transportation Research Board, NCHRP *Report 420*, Impacts of Access Management Techniques, 1999
2. Transportation Research Board, NCHRP *Report 348*, Access Management Guidelines for Activity Centers, 1992.
3. Center for Transportation Research, University of Texas at Austin, *Research Report 1107-4*, Design Guidelines and Other Considerations for Strategic Arterial Streets, January 1991.
4. Kansas Department of Transportation, *K-TRANS:KSU-95-5*, Guidelines for Right-Turn Treatments at Unsignalized Intersections and Driveways, May 1996.
5. Transportation Research Board, *NCHRP Synthesis 225*, Left Turn Treatments at Intersections, 1996.
6. Transportation Research Board, *NCHRP Report 383*, Intersection Sight Distances, 1996.
7. *Traffic Engineering Handbook*, Institute of Traffic Engineers, 1992.
8. *A Policy on Geometric Design of Highways and Streets*, American Association of State Highway and Transportation Officials, 1994.
9. *Access Management, Location and Design*, National Highway Institute Course No. 15255.
10. Transportation Research Board, *NCHRP Digest 112*, Legal Implications of Control of Access to Uncontrolled-Access Highways, April 1979.
11. *Intersection Design and Safety Improvement Course*, University of Wisconsin-Madison.
12. *Manual on Uniform Traffic Control Devices for Streets and Highways* (M.U.T.C.D.), United States Department of Transportation, Federal Highway Administration, as amended.
13. Transportation Research Board, *NCHRP Report 375*, Median Intersection Design, 1995.
14. *Effectiveness of Median Storage and Acceleration Lanes for Left Turning Vehicles*, Institute of Transportation Engineers, 1986.
15. Transportation Research Board, *NCHRP Digest 164*, Rights of Abutting Property Owner Upon Conversion of Uncontrolled-Access Road Into Limited -Access Highway.
16. Colorado Department of Transportation, *Colorado State Highway Access Code*, 1998.
17. Florida Department of Transportation, *Access Management Classification System and Standards*, 1991.
18. Oregon Department of Transportation, *Access Management Classification System*.

SECTION TWO ADMINISTRATION

2.1 Purpose

To provide the administrative procedures for the implementation of this Access Management System and Standards.

2.2 Access Category Assignments

The classification of roadways into categories for defining minimum spacing standards shall be based on the existing or projected use of the highway. The information used for classifying roadways will be based on master plans, master street and highway plans, and twenty year projected traffic volumes, or existing traffic volumes, destinations, land uses and zoning, and recommendations of state and local authorities.

2.3 Permits for Access

A Permit for Occupancy of Nevada Department of Transportation Rights-of-Way is required for all points of access onto any street, road or highway that is a part of the state highway system. Permits will be applied for and approved in accordance with the provisions contained in the Department's *Terms and Conditions Relating to Right-of-Way Occupancy Permits* booklet and Nevada Administrative Code (NAC) 408.

2.4 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. Existing facilities, such as sidewalks, bike lanes, or bike paths, will be perpetuated and new facilities will be installed as needed.

2.5 Cooperation with Local Authorities

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

2.6 Access requests by Local Authorities

Requests by local authorities for new access or for reconstruction of existing access will require application for a permit in accordance with subsection 2.3.

2.7 Design Waivers

1. A design waiver may be granted to allow direct access to a highway when a property would not have reasonable access if the minimum access spacing requirements were adhered to.
2. A request for a design waiver must be submitted as an attachment to the Application for Occupancy of Nevada Department of Transportation Rights-of-Way. The request for the design waiver must state the specific reasons why a design waiver should be granted and include appropriate documentation to support the request.
3. The Department will consider the following when reviewing the design waiver request:
 - a. If there would be an undue and exceptional hardship on the applicant if the design waiver is not granted, and
 - b. A design waiver would not compromise the safety of the general public, or
 - c. The design waiver is reasonably necessary for the convenience or welfare of the public.

4. The approval of the design waiver will be a part of the normal review, recommendation and approval process of an occupancy permit.
5. The occupancy permit may contain provisions for the expiration of the design waiver if the reasons which authorized the design waiver no longer exist or if the land use changes.
6. If the design waiver is not approved and the occupancy permit cannot be approved without approval of the design waiver, the occupancy permit will also not be approved.

2.8 Appeals

If the design waiver applicant objects to the denial thereof or to the restrictions placed on the occupancy permit, an appeal may be filed within sixty (60) days of the denial of the design waiver or issuance of the permit. The appeal process starts with the District Engineer, who may, at his discretion, approve the appeal, or forward it to Headquarters for further review.

2.9 Use of Access

1. It is the permittee's or property owner's responsibility to ensure that the use of the access to the property is not in violation of these standards or occupancy permit terms and conditions. If any significant changes are made, or proposed, in the use of the property which will effect volumes or type of traffic the permittee or property owner must contact the Department's District office to determine if a new occupancy permit, or modification to the existing occupancy permit, is required.
2. When changes in property use results in changes in the type of access, peak hour volume increase of the access, or type of traffic using the access and the access is not in compliance with the standards or occupancy permit terms and conditions, the reconstruction, relocation, modification, closure, or compliance with the standards or occupancy permit terms and conditions may be required. The required changes will be the responsibility of the permittee or property owner. Changes in property use may be, but are not limited to, structural modification or additions, remodeling, change in type of business, change in zoning or land use, or changes in property lines. This subsection applies to all accesses constructed before, on, or after implementation of these standards.
3. The Department may, when necessary for the safety of the motoring 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 highway served by the access, in accordance with the provisions of this document.

2.10 Access Violations

1. In accordance with the provisions of N.R.S. 408.210, the Department may close, remove, or install barriers across any illegal access. Any access onto any state highway which is not permitted may be considered illegal. Any person driving onto or from a highway, except at a permitted access, shall be in violation of N.R.S. 408.423. All points of access, including 'grand fathered access' are required to be permitted.
2. 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 motoring public. The permittee, his assigns, or the property owner shall reimburse the Department all costs incurred by the Department, including but not limited to design, construction, inspection, and legal expenses.

2.11 Access Control Plans

1. The Department, or appropriate local authority, may at its discretion develop an access control plan or master streets and highway plan for a designated portion of a state highway. This plan provides the Department and local authority a comprehensive design plan for bringing that portion of highway into conformance with its access category, functional classification, and these standards. The Department has the authority to approve

or reject that portion of any access control plan or master street and highway plan, proposed by a local authority, which includes a portion of a state highway.

2. The access control plan shall include all existing and proposed points of access, traffic signals, and roadway design elements. It shall specify the proposed roadway category and classification of each access. All abutting property owners of record shall be notified by the Department, or appropriate local authority, of the proposed changes and at least one advertised public hearing shall be held to present the proposed changes.
3. The Department and the appropriate local authority must approve the access control plan for it to become effective. All changes to the access control plan must be approved by both the Department and the appropriate local authority.

2.12 Improvements to or Modifications of a Permitted Access

The permittee or property owner must submit a new Application for Occupancy of Nevada Department of Transportation Right-of-Way, and receive an approved permit prior to commencing improvements to, or modification of, an existing access. Denial of this new permit application does not revoke the original permit, the provisions of which shall remain in affect. The costs of the improvements shall be at the permittee's expense.

2.13 Interchanges

1. A concept plan must be submitted to the Department whenever a developer or local authority seeks to install any new interchange or modify an existing interchange. This concept plan must be approved by the Department. Interchanges on Federal Aid Interstate Highways will also require the approval of the Federal Highway Administration.
2. Access onto a freeway will not be considered if it does not comply with the Federal Highway Administration's Interstate System Access Policy.
2. The concept plan is a simplified roadway and right-of-way design plan for the interchange. Such plan 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.
3. The design of the plan shall be developed using desirable level of service traffic operation planning, based on twenty year traffic volume projections, and roadway design standards. Access rights should be obtained for a distance of 500 feet, but no less than 300 feet, along the intersecting street, measured from the radius point of any ramp touch down curve.

2.14 Department Construction Projects

1. During the course of a highway construction project it may become necessary to reconstruct, relocate, combine, close, or otherwise bring into conformance with these standards an existing access or accesses. The Department will initiate the appropriate procedures, permits, or agreements.
2. Access permits applied for during an active design or construction project shall be reviewed by the District Engineer and may require further review by various divisions in Headquarters.
3. An existing access may be removed, and will not be improved during a highway construction project, unless a permit has been applied for and approved for the improvements to the access.
4. Installation of and construction of new accesses, by permittee, will not be allowed to interfere with construction of a state highway.

SECTION THREE ACCESS CATEGORY STANDARDS

3.1 Purpose

This section describes eight levels of roadway categories and classifications and four levels of access classification. The design standards within each category are necessary to ensure that the highway will continue to operate at the functional level assigned to it. Also, see Tables 4.1 and 4.3.

3.2 Roadway Category One, Freeways

1. Functional Characteristics

Highways in this category have the capacity for high volumes and speeds of traffic and support traffic movements over long distances. This traffic movement may be interstate, interregional, intercity and in large urban areas intracity. The interstate freeways are typically in this category.

2. Design Standards

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 which are designed and spaced to provide a minimal speed differential for 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. Each category one access must be approved by the Director and the Board of Directors of the Department of Transportation. Access to federal-aid freeways must comply with federal regulations and be approved by the Federal Highway Administration. Temporary emergency access, or construction access within a construction zone, does not require approval of the Board or the Federal Highway Administration, however, approval is required through the normal occupancy permitting process.

3.3 Roadway Category Two, Expressways

1. Functional Characteristics

Highways in this category have the capacity for high speed and high traffic volume movements and provide for interstate, intrastate, interregional, intercity, and in large urban areas, intracity travel needs. Traffic movement along these routes is the primary consideration, with direct access from abutting property being closely regulated. At grade intersections are allowed at widely spaced intervals. High volume intersections may require an interchange.

2. Design Standards

- a. The design of these highways should allow speed limits of 45 mph in urban areas, 55 mph in suburban areas, and 60 to 70 mph in rural areas. Spacing of at-grade intersections range from one-half mile in urban areas to one mile in rural areas. Closer spacing is allowed only when there is no reasonable alternate access to the general street system and may be restricted to right in and right out turns.
- b. Private, direct access will only be permitted when the property retains access rights and the property has no other reasonable access available. The access permit will contain the provision that the access will be closed when an alternate, reasonable access becomes available, or if the access is no longer necessary. If known, the future access and date of closure will be specified.
- c. Any permitted direct private access will be for right turns, only, unless the intersection does not have the potential for signalization, and the out of direction travel would be more than two miles, and an intersection can be designed and constructed that, in the opinion of the Department, meets all safety standards and requirements.

- d. 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.
- e. Opposing traffic movements should be separated.
- f. Intersections with heavy intersecting traffic volumes should have grade separations or interchanges.
- g. 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.
- h. Livestock control will be utilized in rural areas.
- i. Traffic signals should be programmed to coincide with the posted speed limit and have a progression bandwidth of at least 50%. The minimum spacing for traffic signals will be one-half mile.

3.4 Roadway Category Three, Regional Highways

1. Functional Characteristics

These highways are rural arterials and can be two lane or multilane facilities and have the capacity to carry moderate to high volumes of traffic at medium to high speeds over medium to long distances. The primary function is to provide for interregional, intraregional, and intercity traffic movements. Access to abutting property is secondary to through traffic movements. Highways in this category are significant regional routes and are normally part of the National Highway System.

2. Design Standards

- a. The design of these highways should allow speed limits of 35 to 45 mph in developed areas, 50 to 55 mph in lightly developed areas, and 60 to 70 mph in rural areas.
- b. Private direct access will not be permitted if alternate, reasonable access is available or obtainable to the general street system. If the alternate access would cause unacceptable traffic operations or safety in the general street system, and the access meets minimum spacing standards for this category of roadway for public access, direct access may be permitted. This access may be terminated when acceptable, alternate reasonable access becomes available. Only one access will be allowed per parcel or for contiguous parcels under one ownership. The criteria for determining reasonable access from a local road or street will include consideration of the function, purpose, capacity, operation, and safety concerns, the possibility of improvements to the local road or street, and whether or not the alternate access would cause operational problems within the local road or street system.
- c. 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. In accordance with the provisions of section 2.9, changes in property usage or traffic volumes may require reconstruction, improvements, or relocation.
- d. Accesses allowed under 3.4.2.b, will generally be restricted to right turns, only. One or both left turns will be considered if (1) the intersection created by the access does not have the potential for signalization, and (2) the left turn will not create unreasonable congestion and safety problems, and (3) alternatives to the left turn would cause unacceptable traffic operations and safety problems within the general street system, or (4) the access meets the spacing criteria for a public access, and 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.

- e. 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 non-emergency uses, shall be maintained by the permittee as a closed access, will be located off the highway right-of-way, and will not be considered for conversion to a full time access.
- f. Because intersecting public ways may in time meet signalization warrants, all intersecting streets, roads, and highways and all direct private access that have the potential for signalization (see definition) must meet the minimum signalized intersection spacing of one-half mile and minimum bandwidth as provided in Section Four, Design Standards and Specifications.
- g. Exceptions to the one-half mile spacing will be considered on a case by case basis and spacings must not be less than specified in Section Four, Design Standards and Specifications, sub-section 4.6.
- h. Any access which meets, or is within 25% of the traffic volumes for meeting, the M.U.T.C.D. warrants for a traffic signal, but does not meet minimum spacing or bandwidth requirements, will be limited to right turns, only.

3.5 Roadway Category Four, Rural Highways

1. Functional Characteristics

These highways are generally two lane facilities and have the capacity to carry low to medium volumes of traffic at medium to high speeds. The primary function is to provide for a balance between rural traffic needs, safety, and direct access. These highways are typically the 'farm to market' roads or provide access to small rural communities. They may also be high speed rural frontage roads.

2. Design Standards

- a. The design of category four highways should allow speed limits of 35 to 45 mph in developed areas, and 50 to 70 mph in rural areas.
- b. One direct access point will be permitted to each parcel unless the Department establishes that the access would create a significant operational or safety problem or that the access would not meet acceptable design standards.
- c. Additional access may be allowed if the length of frontage of the existing parcel allows the additional access to meet spacing standards and if the trip generation potential of the parcel requires an additional access to maintain acceptable traffic operations on the roadway. Additional access and changes in the parcel use must also comply with section 2.9 of this standard.
- d. Access points under this roadway category will generally be allowed to have all turning movements if the access meets sight distance requirements, auxiliary lane requirements are met, and if the twenty year traffic volume projection indicates that the intersection volumes would be less than 75 percent of those required for M.U.T.C.D. traffic signal volume warrants.
- e. 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 non-emergency uses, shall be maintained by the permittee as a closed access, and will not be considered for conversion to a direct access.
- f. Because intersecting public ways may in time meet signalization warrants, all intersecting streets, roads, and highways and all direct private access that have the potential for meeting 75 percent of the volumes required for M.U.T.C.D. traffic signal volume warrants for signalization must meet the minimum signalized intersection spacing of one-half mile and minimum bandwidth as provided in Section Four, Design Standards and Specifications.

- g. Exceptions to the one-half mile spacing will be considered on a case by case basis and spacings must not be less than specified in Section Four, Design Standards and Specifications, sub-section 4.6.
- h. Any access which has the potential of generating 75 percent of the volumes required for M.U.T.C.D. traffic signal volume warrants, but does not meet minimum spacing or bandwidth requirements, will be limited to right turns, only.
- i. Roundabouts may be considered, in this roadway category on a case by case basis, as an alternative to public intersections. They may be used in lieu of a signalized intersection or at an intersection which would not otherwise allow left turning movements.
- j. Existing livestock control will be perpetuated in rural areas.

3.6 Roadway Category Five, Principal Arterials

1. Functional Characteristics

Highways in this category are principal arterials and have the capacity for medium to high speeds and high traffic volume movements and provide for intraregional, interregional, intercity, and in large urban areas, intracity travel needs. Traffic movement along these routes is the primary consideration, with direct access from abutting property being closely controlled. At grade public intersections are allowed at widely spaced intervals. These highways generally include National Highway System routes.

2. Design Standards

- a. The design of these highways should allow speed limits of 45 mph in urban areas, 50 to 55 mph in suburban areas, and 60 to 70 mph in rural areas. Spacing of at-grade intersections range from one-half mile in urban areas to one mile in rural areas. Closer spacing is allowed only when there is no reasonable alternate access to the general street system and may be restricted to right in and right out turns.
- b. Private, direct access will only be permitted when the property has no other reasonable access available. The access permit will contain the provision that the access will be closed when an alternate, reasonable access becomes available, or if the access is no longer necessary. If known, the future access and date of closure will be specified. The criteria for determining reasonable access from a local road or street will include consideration of the function, purpose, capacity, operation, and safety concerns, the possibility of improvements to the local road or street, and whether or not the alternate access would cause operational problems within the local road or street system.
- c. Any permitted direct private access will be for right turns only unless the intersection does not have the potential for signalization, the out of direction travel would be more than two miles, and an intersection can be designed and constructed that, in the opinion of the Department, meets all safety standards and requirements.
- d. 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 2.9, changes in property usage or traffic volumes may require reconstruction, improvements, or relocation.
- e. Opposing traffic movements should be separated by medians.
- f. 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.

- g. Existing livestock control will be perpetuated in rural areas.
- h. Traffic signals should be programmed to coincide with the posted speed limit and have a progression bandwidth of greater than 45%.

3.7 Roadway Category Six, Minor Arterials

1. Functional Characteristics

These highways may be two lane or multi-lane highways, are minor arterials, and have the capacity to carry medium to high volumes of traffic at medium speeds over short to medium distances. The primary function is to provide for intercity, intracity, and intercommunity traffic movements. This category is typically assigned to roadways within developed portions of communities where the extensive roadside development makes assigning these roadway to a higher category impractical. Access to abutting property is secondary to through traffic movements, although it allows more direct access.

2. Design Standards

- a. The design of these highways should allow speed limits of 35 to 45 mph in urban areas and 50 to 55 mph in suburban areas. These highways may have medians to separate opposing traffic flows and to control left turning movements.
- b. Private direct access will be permitted, at a minimum, for right turns if the access meets minimum spacing standards for this category of roadway. Only one access will be allowed per parcel or for contiguous parcels under one ownership. The access may also have left turns in, if the addition of the left turning movement will improve the operation of an adjacent full-movement intersection and not compromise safety at the access.
- c. Both left turns will be considered if (1) the intersection created by the access does not have the potential for signalization, and (2) the left turn will not create unreasonable congestion and safety problems, and (3) alternatives to the left turn would cause unacceptable traffic operations and safety problems on the general street system, or (4) the access meets the spacing criteria for a public access, and 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.
- d. Signalized intersections will be allowed only where the signalized intersection spacing requirements are met or the two way signal progression will allow a minimum 40 percent bandwidth through the signal network.
- e. Additional right turn access may be allowed where required auxiliary lanes can be provided and the additional access will relieve traffic congestion on the highway. Additional access will only be allowed when existing parcels, or contiguous parcels under one ownership or control, that are split or divided will meet minimum spacing requirements. Otherwise, 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 2.9, changes in property usage or traffic volumes may require reconstruction, improvements, or relocation.
- f. 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.
- g. Existing livestock control will be perpetuated in rural areas.
- h. Because intersecting public ways may in time meet signalization warrants, all intersecting streets, roads, and highways and all direct private access that have the potential for signalization must meet the

minimum signalized intersection spacing of one-half mile and minimum bandwidth as provided in Section Four, Design Standards and Specifications.

- i. Exceptions to the one-half mile traffic signal spacing will be considered on a case by case basis and spacings must not be less than specified in Section Four, Design Standards and Specifications, subsection 4.6.
- j. Any access which meets, or is within 25% of the traffic volumes required for meeting, the M.U.T.C.D. warrants for a traffic signal, but does not meet minimum spacing or bandwidth requirements, will be limited to right turns, only.
- k. Roundabouts may be considered, in this roadway category on a case by case basis, as an alternative to public intersections. They may be used in lieu of a signalized intersection or at an intersection which would not otherwise allow left turning movements.

3.8 Roadway Category Seven, Collectors

1. Functional Characteristics

Category Seven highways balance direct access with travel needs. Travel speeds and volumes are moderate and distances traveled are short to medium and provide for intercommunity, intercity, and intracity traffic movements.

2. Design Standards

- a. The design of highways in this category are characterized by highways with speed limits of 25 to 45 mph. The posted speed limit will be used to determine access requirements unless there are plans by the Department or local authority to improve the roadway to a higher category or speed limit and then the access criteria for that planned category or speed limit shall be used.
- b. Generally, only one access will be allowed per parcel, or two for contiguous parcels if spacing requirements can be met. Additional access may be permitted if the Department determines that it will not be detrimental to the safety and operation of the highway and the additional access will not cause a hardship to property adjacent to or across the highway from the property under consideration. Primary access to the local street system will be considered to be an additional access. Permittees will be encouraged to share access with the adjacent property owner(s).
- c. 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.
- d. 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 non-emergency uses, shall be maintained by the permittee as a closed access, and will not be considered for conversion to a direct access.
- e. Accesses allowed under 3.8.2.b, will generally be restricted to right turns, only. One or both left turns will be considered if (1) the intersection does not have the potential for signalization, and (2) the left turn will not create unreasonable congestion and safety problems, and (3) alternatives to the left turn would cause unacceptable traffic operations and safety problems on the general street system, or (4) the access meets the spacing criteria for a public access, and 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. In accordance with the provisions of section 2.9, changes in property usage or traffic volumes may require reconstruction, improvements, or relocation.

- f. 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.
- g. Existing livestock control will be perpetuated in rural areas.
- h. Because intersecting public ways may in time meet signalization warrants, all intersecting streets, roads, and highways and all direct private access that have the potential for signalization must meet the minimum signalized intersection spacing as provided in Section Four, Design Standards and Specifications.
- i. Any access which meets, or is within 25% of the traffic volumes required for meeting, the M.U.T.C.D. warrants for a traffic signal, but does not meet minimum spacing or bandwidth requirements, will be limited to right turns, only.
- j. Roundabouts may be considered, in this roadway category on a case by case basis, as an alternative to public intersections. They may be used in lieu of a signalized intersection or at an intersection which would not otherwise allow left turning movements.

3.9 Roadway Category Eight, Frontage or Service Roads

1. Functional Characteristics

Category Eight roads are frontage roads, service roads and local roads that provide low to moderate volumes of traffic at low to moderate speeds. The primary purpose of these roads is to provide safe and reasonable land access.

2. Design Standards

- a. The design of highways in this category are characterized by highways with the design of a local street. The 85th percentile speed will be used to determine access design requirements unless there are plans by the Department or local authority to improve the roadway to a higher category or speed limit and then the access criteria for that planned category or speed limit shall be used.
- b. Generally, only one access will be allowed per parcel. Additional access may be permitted if the Department determines that it will not be detrimental to the safety and operation of the highway, spacing requirements are met, and the additional access will not cause a hardship to property adjacent to or across the highway from the property under consideration. Permittees should be encouraged to consider shared access with the adjacent property owner(s). In accordance with the provisions of section 2.9, changes in property usage or traffic volumes may require reconstruction, improvements, or relocation.
- c. All turning movements, including left turns, may be allowed, providing adequate design and safety standards, such as sight distances, widths, and no current accident history, are met.
- d. 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.
- e. Existing livestock control will be perpetuated in rural areas.
- f. Minimum spacing between signals shall be whatever is 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 category.

- g. Roundabouts may be considered, in this roadway category on a case by case basis, as an alternative to public intersections. They may be used in lieu of a signalized intersection or at an intersection which would not otherwise allow left turning movements.

3.10 Access Classification One

1. Functional Characteristics

This class of access is for non-commercial use and may serve a single family dwelling, or multiple family dwellings of three or less dwelling units, or an agricultural land and field access.

2. Design Standards

- a. In areas with existing curb and gutter and serving a single residence, a "Single Family Driveway with Curb" with a minimum driveway width of 12 feet shall be used. Multiple family dwellings shall use a "Commercial Driveway" (see the *Standard Plans*) with curb returns with a minimum radius of 15 feet and a minimum width of 24 feet shall be used. The maximum width allowed is 32 feet.
- b. In areas without curb and gutter a "Type 5 Approach Road" (see the *Standard Plans*) shall be used for all driveways. Minimum width for single family dwellings shall be 16 feet. For multiple family and agricultural and field access the minimum width shall be 24 feet. 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 and gutter for the length of property frontage.
- c. In areas of 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, Multiple 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. In areas without curb and gutter single family driveways and agricultural and field access shall be surfaced with either an aggregate base with a minimum depth of 6 inches or paved with plantmixed or cold mixed asphalt surface with a minimum depth of 3 inches on an aggregate base with a minimum depth of 3 inches, to the end of the radii. All multiple family driveways shall be paved with plantmixed or cold mixed asphalt surface with a minimum depth of 3 inches on an aggregate base with a minimum depth of 3 inches, to a point ten feet beyond the end of the radii. As an alternative, a concrete driveway with a depth of 6 inches may also be installed.

3.11 Access Classification Two

1. Functional Characteristics

Driveways in this classification serve commercial or residential subdivision properties which generate less than 500 vehicle trips per day. All driveways in this classification shall be paved, at a minimum, to a point 25 feet beyond the end of the curb returns.

2. Design Standards

- a. A traffic impact report is required for access points in this classification. Access onto Category Two, Three, Five, and Six Roadways will require a traffic impact report. Access onto Category Four Roadways may require a traffic impact report, depending on proximity of other accesses, street intersections, and signalized intersections and proposed traffic volumes that will be generated.
- b. Plans for access in this category shall be prepared by a Nevada Licensed Engineer.

- c. Access in areas with curb and gutter will be a "Commercial Driveway" (see the *Standard Plans*). The minimum radius on the curb returns and the minimum width of the access shall be in accordance with sub-section 4.7 (Minimum Entry Widths) of Section Four and in no case shall the radii be less than 25 feet and the width less than 32 feet.
- d. Access in areas without curb and gutter will be either a "Type 5 Approach" or a "Type 4 Approach" (see the *Standard Plans*). Approaches serving passenger cars shall be a "Type 5" with a minimum width of 24 feet. Approaches serving single unit vehicles and trucks with semi-trailers shall be a "Type 4 Approach" with a minimum width of 32 feet. 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 and gutter for the length of property frontage.
- e. All access in this classification shall be paved in accordance with the appropriate drawing in the *Standard Plans*.

3.12 Access Classification Three

1. Functional Characteristics

Driveways in this classification serve commercial or residential subdivision properties which will generate 500 or more vehicle trips per day.

2. Design Standards

- a. A traffic impact report is required for all access points in this classification.
- b. The access will be designed by a Nevada Licensed Engineer and use the same minimum standards detailed in subsections 3.11.2.b, c, d, and e.

3.13 Access Classification Four

1. Functional characteristics

Access in this category consists of streets, roads, or highways. They may be either installed by a governmental agency or a private developer.

2. Design Standards

All access in this classification requires a traffic impact report and shall be designed by a Nevada Licensed Engineer in accordance with the State of Nevada Department of Transportation Road Design Division *Design Manual*, as amended.

SECTION FOUR
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 accesses onto state highways.

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

The elements of an intersection are shown in Figure 4.3 on page 31.

Table 4.1 gives a brief synopsis of the Roadway Categories and Classifications. Refer to Section Three for a full explanation.

Table 4.1

Roadway Category and Classification			
Category	Roadway Classification	Function	General Design Features
1	Freeway	Interstate and Interregional Traffic Movements	Multi-Lane with Medians, Interchange access
2	Expressway	Interstate, Intrastate, Interregional, Intraregional, Intercity and Intra-city Traffic Movements	Multi-Lane with Median and Widely Spaced Public Access Points
3	Regional Highway	Primary: Interregional, Intra-regional, and Intercommunity Traffic Movements Secondary: Land Access	May be Two or Multi-Lane Facilities
4	Rural Highway	Balances Rural Travel Needs with Land Access	Generally Two Lanes
5	Principal Arterial	Primary: Inter- and Intra-city and Inter- and Intra-regional Traffic movement Secondary: Land Access	Multi-Lane with Median
6	Minor Arterial	Primary: Intercommunity and Intracity Traffic Movement Secondary: Land Access	May be Two or Four Lanes, may have Median
7	Collector	Balances Traffic Movement with Land Access.	Generally Two Lanes, May be Four Lanes
8	Frontage or Service Road	Land Access	Two Lanes

4.2 Access Spacing

Access spacing is an important aspect of access management. Spacing standards vary by roadway category, with the higher (lower numerically) category of roadways being more restrictive.

These minimum spacing standards take into consideration the safety of the traveling public, as well as access to the street and highway system by private land owners. If reasonable access is not available by the use of these standards, sub-section 2.7 outlines the procedures for applying for a design waiver.

The speeds used for determining spacing are based on the 85th percentile speed of the traffic at the access location.

Sub-sections 4.3, 4.4 and 4.5, and their accompanying tables, should also be reviewed for further information and spacing requirements.

Table 4.2 presents a synopsis of access spacing requirements. For full details, refer to the appropriate section of Section Three.

Table 4.2

Access Spacing (Minimum)						
Roadway Category	Location	Public Road Spacing	Private Direct Access	Private Access Spacing	Private Access Geometrics	Private Access Remarks
1 Freeways	Urban	1 mile	No	N/A	N/A	All interchanges must meet public road spacing and comply with FHWA Policy
	Suburban	2 miles				
	Rural	3 miles				
2 Express-ways	45 mph	0.5 mile	No	N/A	See Section 3.3	Allowed only when no other access is available
	50-60 mph	0.75 mile				
	65+ mph	1 mile				
3 Regional Highways	35-45 mph	0.25 mile	Limited	See Tables 4.3, 4.4, and 4.5	See Section 3.4	Allowed only when no other access is available
	50-60 mph	0.50 mile	Limited			
	65+ mph	1 mile	Limited			
4 Rural Highways	35-45 mph	660 feet	Allowed	250 feet minimum	Right turns allowed, turn lanes may be required. See section 3.5 for left turns.	One access per parcel, two for large development when spacing standards can be met.
	50-60 mph	0.25 mile	Allowed	450 feet minimum		
	65+ mph	0.50 mile	Allowed	1000 feet minimum		
5 Principal Arterials	35-45 mph	0.25 mile	Limited	250 feet minimum	Right turns only allowed, turn lanes may be required	Allowed only when no other access is available
	50-55 mph	0.50 mile	Limited	450 feet minimum		
	60-70 mph	1 mile	Limited	800 feet minimum		
6 Minor Arterials	35-45 mph	0.25 mile	Limited	250 feet minimum	Right turns allowed, turn lanes may be required. See section 3.7, 2c for left turns.	One access per parcel, two for large development when spacing standards can be met.
	50-55 mph	0.50 mile	Limited	450 feet minimum		
7 Collector Roads	25-35 mph	660 feet	Allowed	150 feet minimum	Right turns allowed, turn lanes may be required. See section 3.8, 2e for left turns.	One per parcel
	40-45 mph	0.25 mile	Allowed	300 feet minimum		
8 Service Roads	25-35 mph	660 feet	Allowed	150 feet minimum	Left and right turns, turn lanes may be required.	One per parcel

4.3 Street and Driveway Classification

Breaking street and driveway intersections down into classifications allows spacing standards to be assigned to driveways based on volume of traffic generated and speeds of through traffic. Table 4.3 presents a brief synopsis of driveway classifications. For a complete detailed description refer to sections 3.10 to 3.13.

Table 4.3

Access Classification - Street and Driveway Classification		
Classification	Type of Connection	Driveway Use
Class I	Non-commercial	For access to single family dwellings Multiple family dwellings of three or less dwelling units Agricultural land and field access
Class II	Minor Commercial	Medium volume generator (less than 500 trips per day) Access to property other than Class I or Class III Driveways
Class III	Major Commercial	High volume generators (500 or more trips per day) Shopping centers, industrial parks, office parks, colleges, residential complexes and subdivisions and etcetera
Class IV	Public or Private Roads	New public or private roads or streets

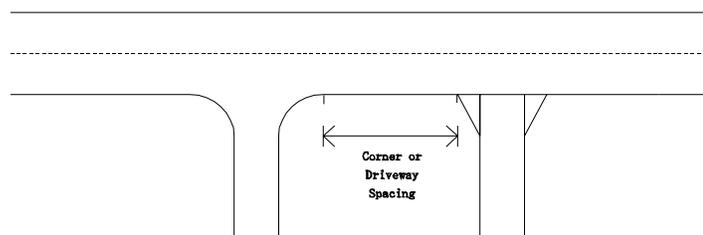
4.4 Driveway Clearances

The driveway clearances establishes the minimum distance that the various class of driveways may be placed from the nearest intersection. The distance from the intersection is measured from the point of curvature of the radius of the intersection to the point of curvature of the radius for the driveway. In the case of a depressed curb driveway the distance is measured to the beginning of the depressed curb.

Table 4.4

Minimum Corner Clearances by Driveway Classification		
Classification	From Corner (Intersection)	Comments
Class I	150 feet	One per lot
Class II	Use Spacings in Table 4.5	Depending on Roadway Category, one per lot, two for contiguous parcels
Class III	Use Spacings in Table 4.5	Depends on Roadway Category
Class IV	660 feet min.	Depends on Roadway Category

Figure 4.1 Clearances



4.5 Non-Signalized Driveway Spacing

Driveway spacings are based on speed to reduce collision potential due to right-turn conflict overlaps, as well as providing reasonable egress capacity. The spacing for signalized driveways must meet the spacing requirements of signalized intersections, see subsection 4.6. Class III driveways which meet the M.U.T.C.D. warrants for signalization, but do not meet the spacing requirements of subsection 4.6 shall be right in and right out driveways, only.

Streets or roads that are required by local authorities through street spacing standards or a master street and highway plan will not be considered to be one of the driveways for contiguous parcels, but will be considered a public thoroughfare.

Table 4.5 spacing criteria is to be use for determining the driveway spacing from public intersections and from other driveways.

Table 4.5

Spacing for Non-Signalized Driveways	
85th Percentile Speed (mph)	Minimum Separation (feet)
25	150
30	200
35	250
40	300
45	350
50	450
55	600
60	800
65	1000
70	1200

4.6 Signalized Intersection Spacing

The values in Table 4.6 lists the optimum signalized intersection spacing for signal progression timing. All signalized intersections will require separate left turn lanes. Accesses which cannot meet these spacing requirements shall be right in and right out driveways, only. One-half mile spacing may be used for all spacing greater than 2640 feet if signal progression can be maintained.

Table 4.6

Optimum Signalized Intersection Spacing										
Cycle Length (seconds)	Operating Speed (mph)									
	20	25	30	35	40	45	50	55	60	65
	Distances in Feet									
60	880	1100	1320	1540	1760	1980	2200	2430	2640	2860
70	1020	1280	1540	1800	2050	2310	2560	2830	3080	3340
80	1160	1460	1760	2050	2350	2640	2930	3230	3520	3815
90	1310	1640	1980	2310	2640	2970	3300	3630	3960	4290
100	1460	1820	2200	2570	2930	3300	3670	4030	4400	4765
110	1610	2010	2420	2830	3220	3630	4040	4430	4840	5245
120	1760	2200	2640	3080	3520	3960	4400	4840	5280	5720
150	2200	2750	3300	3850	4400	4950	5500	6050	6600	7150
180	2640	3300	3960	4620	5280	5940	6600	7260	7920	8580

Table 4.6a lists the minimum acceptable bandwidths which will be used when evaluating signal locations. These values will give acceptable signal progression timing.

Table 4.6a

Minimum Through Bandwidths for Signal Locations			
Roadway Category	Classification	Speed (mph)	Minimum Bandwidth
2	Expressways	45-65	50%
3	Regional Highway	35-65	45%
4	Rural Highway	35-65	40%
5	Principal Arterial	45-65	45%
6	Minor Arterial	35-55	40%
7	Collector	25-45	30%
8	Frontage Road	25-35	Not Required

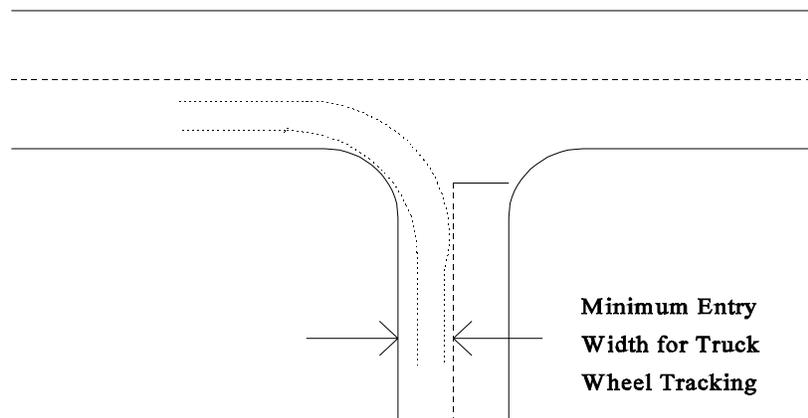
4.7 Minimum Entry Widths

1. Class I, Single Family Residential access, where curb and gutter is present, shall have a minimum "Residential Driveway" width of 12 feet and a maximum width of 24 feet. Access along roadways without curb and gutter shall have a minimum "Type 5 Approach" width of 16 feet and a maximum width of 24 feet. Multiple family dwellings, with three or less units, shall have a minimum "Commercial Driveway" width of 24 feet and curb return radii of 15 feet and minimum "Type 5 Approach" widths of 24 feet and a maximum width of 32 feet.
2. Class II, Minor Commercial access, shall have minimum "Commercial Driveway" widths of 32 feet and minimum curb return radii of 25 feet. Minimum approach widths with a "Type 5 Approach" shall be 24 feet (passenger cars only) and "Type 4 Approaches" shall have a minimum width of 32 feet. Refer to table 4.7 for minimum entry widths and curb return radii. The maximum access width shall be minimum entry width plus 16 feet for the egress.
3. Class III, Major Commercial, shall have minimum "Commercial Driveway" and "Type 4 Approach" widths of 32 feet, with wider widths and curb return radii based on type of vehicle usage in Table 4.7. The maximum width shall be based on the lane requirements as per the Traffic Impact Report. The minimum design vehicle shall be a single unit truck or bus (SU).
4. Table 4.7 shows the minimum entry widths required for SU and WB-50 vehicles at various curb return radii. These values are for one way, the exiting vehicle lane width, minimum 16 feet, must be added to these figures for the total driveway width. The listed values are for driveways which intersect the highway at 90E and require a minimum two feet shoulder width on the highway.

Table 4.7

Minimum Entry Widths For Commercial Access		
Curb Radius (Feet)	SU Single Unit Truck or Bus	WB-50 Semi-Trailer Truck
25	22	
30	18	
35	16	26
40		22
45		18
50		16

Figure 4.2 Minimum Entry Width



4.8 Left Turn Lane Requirements, Two Lane Unsignalized Roads

Table 4.8 lists the projected 20 year design hour volumes and the operating speeds of traffic which necessitate the installation of left turn lanes. The traffic volumes to be considered in making this determination are the opposing (oncoming) traffic volumes, the advancing traffic volumes and the percent of advancing traffic which is turning left. Turn lanes may be required at lower volumes, by a traffic impact study or by the Department, to protect the traveling public.

Table 4.8

Left Turn Lane Requirements For Two Lane Roads (unsignalized)				
	Advancing Volume (ddhv) with			
Opposing Volume (ddhv)	5% Left Turns	10% Left Turns	20 % Left Turns	30% Left Turns
40 mph (or less) Operating Speed				
800	330	240	180	160
600	410	305	225	200
400	510	380	275	245
200	640	470	350	305
100	720	515	390	340
50 mph Operating Speed				
800	280	210	165	135
600	350	260	195	170
400	430	320	240	210
200	550	400	300	270
100	615	445	335	295
60 mph Operating Speed				
800	230	170	125	115
600	290	210	160	140
400	365	270	200	175
200	450	330	250	215
100	505	370	275	240
70 mph Operating Speed				
800	180	140	100	95
600	230	165	125	110
400	290	210	160	140
200	355	260	200	170
100	400	300	220	190

4.9 Left Turn Lane Requirements, Four Lane, Undivided, Unsignalized Roads

Table 4.9 lists the projected 20 year design hour volumes of traffic which necessitate the installation of left turn lanes on multilane, undivided, unsignalized roads. The traffic volumes which are to be considered in making this determination are the opposing (oncoming) traffic volumes, the advancing traffic volumes, and the percent of advancing traffic which is turning left. Turn lanes may be required at lower volumes, by a traffic study or by the Department, to protect the traveling public.

Table 4.9

Left Turn Lane Requirements for Multilane Roads (unsignalized)				
	Advancing Volume (ddhv) with			
Opposing Volume (ddhv)	5% Left Turns	10% Left Turns	20% Left Turns	30% Left Turns
800	140	110	80	70
600	220	160	120	100
400	350	250	190	160
200	530	380	290	250
100	650	480	350	310

4.10 Left Turn Lane Requirements, Four Lane, Divided, Unsignalized Roads

Table 4.10 lists the projected 20 year design hour volumes of traffic which necessitate the installation of left turn lanes on divided, unsignalized, multilane roads. The traffic volumes which are to be considered in making this determination are the opposing (oncoming) traffic volumes, the advancing traffic volumes, and the percent of advancing traffic which is turning left. Turn lanes may be required at lower volumes, by a traffic study or by the Department, to protect the traveling public.

Table 4.10

Left Turn Lane Requirements for Multilane Divided Roads (unsignalized)				
	Advancing Volume (ddhv) with			
Opposing Volume (ddhv)	5% Left Turns	10% Left Turns	20% Left Turns	30% Left Turns
800	210	150	110	100
600	340	240	180	150
400	520	380	290	250
200	800	580	440	390
100	1000	720	550	480

4.11 Right Turn Lane Requirements, All Roads

Treatments for right turning traffic movements are based on the classification of the access and the speed. The appropriate treatment will reduce the exposure and accident potential created by right turning vehicles. These are the minimum requirements and turn lanes may be required at lower speeds and classifications, by a traffic study or by the Department, to protect the traveling public.

Table 4.11

Right Turn Lane Requirements, All Roads		
Access Classification	Speed (mph)	Treatment
I	25 - 35	Radius (none with curb and gutter)
	45 - 55	50 foot Taper, 25 foot Radius
	55+	100 foot Taper, 60 foot Radius
II	25 - 35	100 foot Taper, 60 foot Radius
	45+	Taper, Deceleration Lane (see Table 4.12), Radius based on Table 4.7
III	25	150 foot Taper, 60 foot Radius, Add Deceleration Lane for >750 vpd (see Table 4.12)
	35+	Taper, Deceleration Lane (see Table 4.12), Radius based on Table 4.7

4.12 Deceleration Lanes

Deceleration lanes allow vehicles, which are turning into an intersection, a safe area in which to slow prior to making the turn, thereby reducing the accident potential with through traffic.

Minimum storage lengths to be added for all left turns and non-free right turns is 100 feet. Longer storage lengths will be installed as required in the Traffic Impact Report for the development.

Deceleration lengths are based on a 10 mph speed differential with a six feet per second² deceleration rate for desirable lengths and nine feet per second² deceleration rate for minimum lengths. The taper lengths must also be added to the deceleration distances and storage lengths.

A symmetrical reversed curve taper, 300 foot radii, 120 feet in length, may be required, by the District Engineer, in lieu of a straight line taper, however the distances calculated for the taper length, using the taper ratio shown in Table 4.12 should still be used. In some situations the symmetrical reversed curve taper may encourage people to exit the through lanes sooner.

The desirable taper ratio and deceleration lengths shown in Table 4.12 shall be the standard taper ratio and deceleration lengths. The minimum taper ratio and deceleration lengths may only be used if the desirable lengths cannot be obtained.

Table 4.12

Deceleration Lane Table				
Length of Left and Right Turn Deceleration Lanes (To which Taper Length and Storage Length must be added)				
Speed (mph)	Desirable		Minimum	
	Taper Ratio	Length (feet)	Taper Ratio	Length (feet)
25	10:1	40	10:1	30
30	10:1	75	10:1	50
35	15:1	115	15:1	75
40	15:1	160	15:1	110
45	15:1	220	15:1	145
50	15:1	290	15:1	190
55	20:1	365	15:1	245
60	20:1	450	15:1	300
65	20:1	545	15:1	365
70	20:1	645	15:1	430
Multipliers for Grades other than 0-2% (To be Multiplied by Deceleration Lane Lengths)				
3 to 4 %	Upgrade = 0.9		Downgrade = 1.2	
5 to 6 %	Upgrade = 0.8		Downgrade = 1.3	

4.13 Redirect Tapers

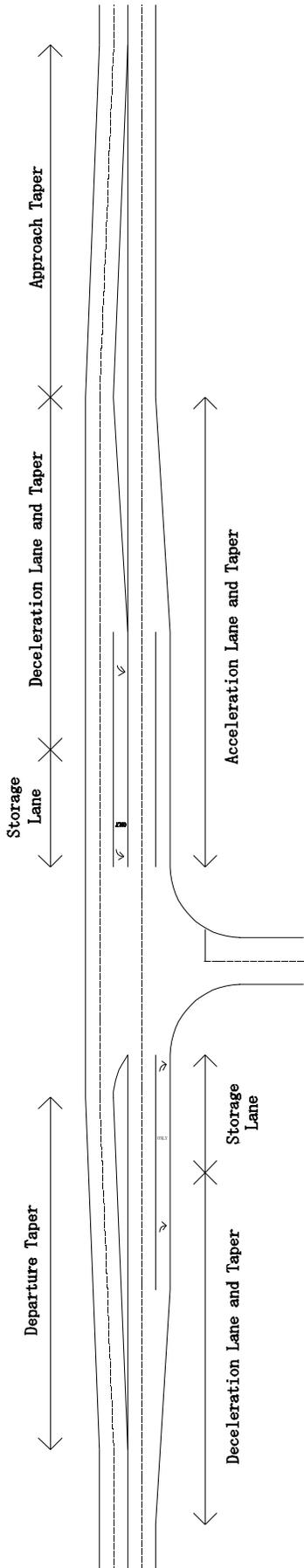
Redirect tapers are necessary to redirect through traffic when the highway is widened to accommodate left turn (median) lanes. The following table shall be used when redirect lanes are necessary.

Table 4.13

Redirect Tapers for Left Turn Lane Widening	
Speed (mph)	Taper Ratio
25	10:1
30	15:1
35	20:1
40	30:1
45	45:1
50	50:1
55	55:1
60	60:1
65	65:1
70	70:1

Figure 4.3

Elements of an Intersection



Symmetrical Reverse Curve Taper

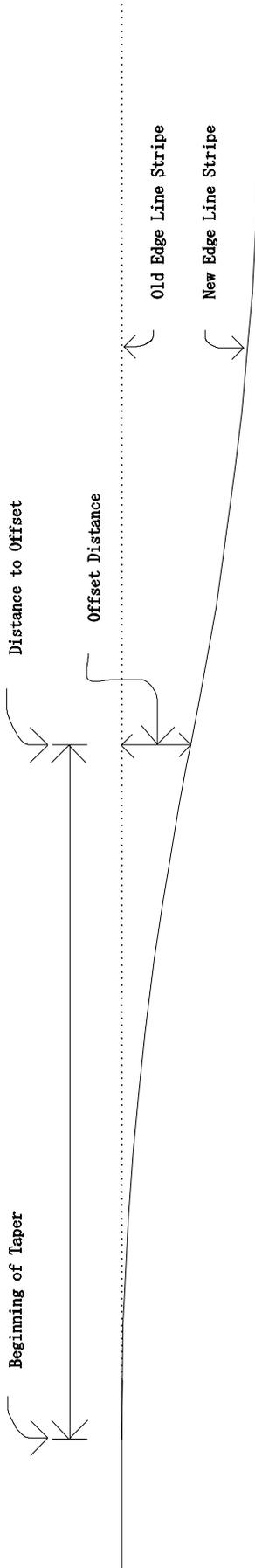


Table of Offset Distances for Symmetrical Reverse Curve Tapers (in feet)

Table of Radii		Ratio	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180	190	200	210	220	230	240	
Taper Ratio	Radius (ft.)																										
10:1	300	10:1	0.2	0.7	1.5	2.7	4.2	6.0	7.8	9.3	10.5	11.3	11.8	12.0													
15:1	675	15:1	0.1	0.3	0.7	1.2	1.9	2.7	3.6	4.8	6.0	7.2	8.4	9.3	10.1	10.8	11.3	11.7	11.9	12.0							
20:1	1200	20:1	0.1	0.2	0.4	0.7	1.0	1.5	2.0	2.7	3.4	4.2	5.1	6.0	6.9	7.8	8.6	9.3	10.0	10.5	11.0	11.3	11.6	11.8	11.9	12.0	

4.14 Median Design

1. Median lanes are necessary for the installation of left turn lanes, providing a lane for deceleration and storage of vehicles making left turns from the roadway. Acceleration lanes for vehicles turning left onto the roadway may utilize the median, also. The minimum width for a painted or raised median (edge of gutter pan to edge of gutter pan) is four feet. The minimum widths required for left turn lanes are shown in Table 4.14.
2. 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 will be widened symmetrically on both sides of the roadway.

Table 4.14

Minimum Median Widths for Left Turn Lanes	
Single Left Turn Lane	16 feet
Dual Left turn Lanes	28 feet
Triple Left Turn Lanes	40 feet
Two Way Left Turn Lanes	14 feet (max)

4.15 Median Openings

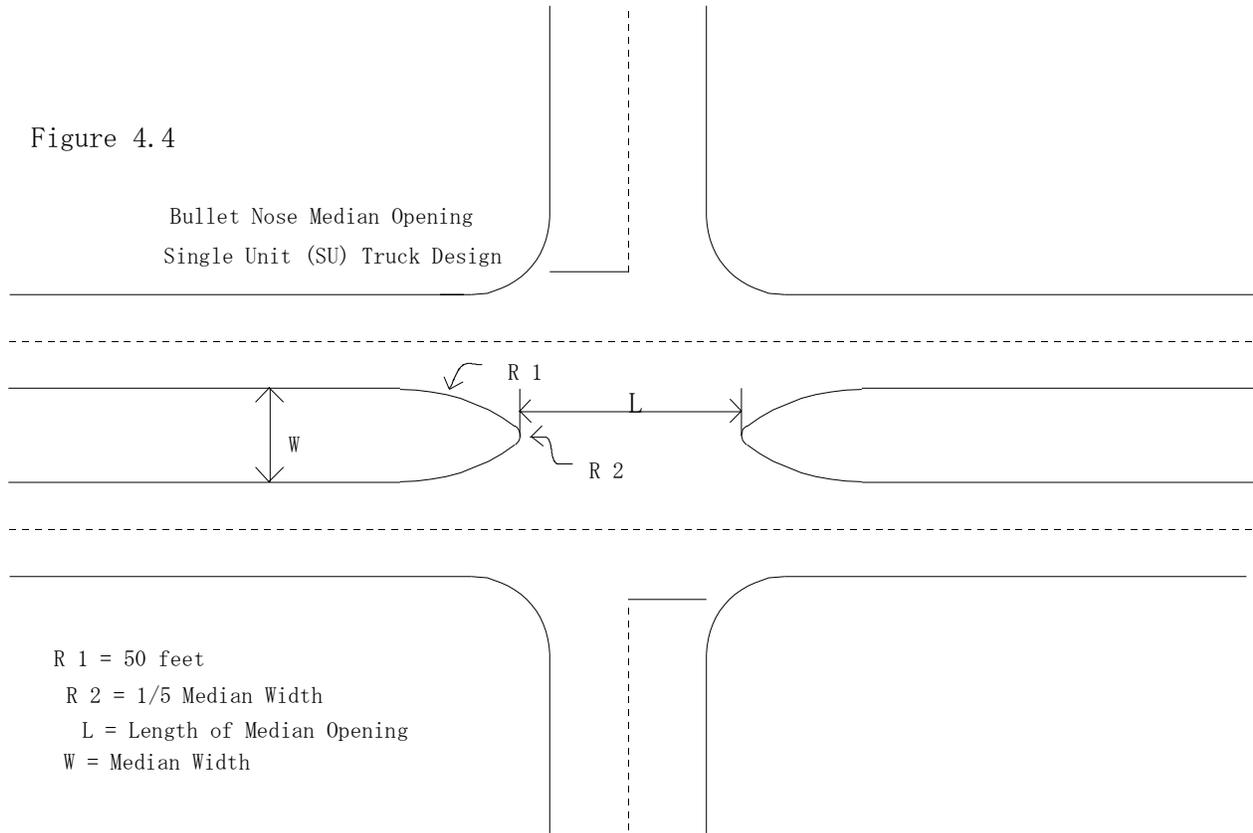
1. Median openings are necessary to accommodate left turning and cross traffic. A semicircular median end may be used on medians of less than ten feet in width. All medians that are ten feet or wider in width must use a bullet nose median end for a median opening at a cross road, or a parabolic curve at a "T" intersection.
2. The following table gives the minimum length of median openings, based on a single unit truck (SU) and occasional semi-trailer/trucks (WB-50) and perpendicular intersections. The length must be increased for skewed intersections and predominant semi-trailer/truck usage in accordance with Chapter IX, At Grade Intersections, of the current edition of *A Policy on Geometric Design of Highways and Streets*.

Table 4.15

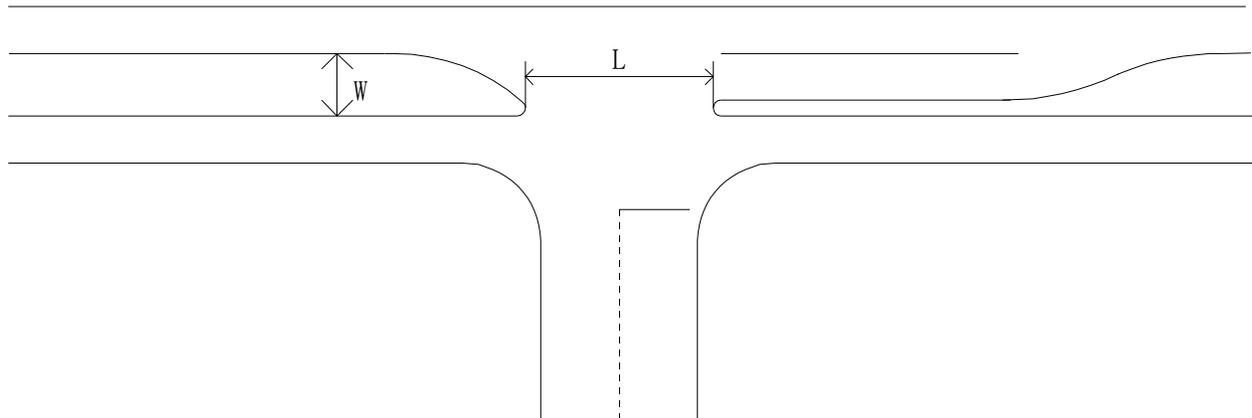
Lengths of Minimum Median Openings (feet)		
Median Width	Semicircular	Bullet Nose
4	96	96
6	94	76
8	92	68
10	N/A	62
12	N/A	58
14	N/A	53
16	N/A	50
20	N/A	44
24	N/A	40 (min.)
>24	N/A	40 (min.)

Figure 4.4

Bullet Nose Median Opening
Single Unit (SU) Truck Design



Alternate Design for "T" Intersection



4.16 Intersection Sight Distance

The drivers of vehicles which are preparing to enter a highway from a driveway or intersection must be able to see in both directions. This will enable them to have time to pull into the through lane and accelerate. This will also allow approaching traffic enough time to recognize the situation and slow to avoid a collision. This is called the entering sight distance.

If Entering Sight Distances are not obtainable, Stopping Sight Distances must be achieved as an absolute minimum.

Sight distances are calculated from driver's 'eye' height of 3.50 feet, 20 feet from edge of the nearest travel lane, to an approaching vehicle 4.25 feet above the pavement. These sight distances are for perpendicular intersections with entering vehicle stopped and are for passenger cars.

Stopping sight distance is the distance required to stop, after recognizing the need to stop, including the distance traveled during a reaction time of 2½ seconds and then braking to a stop.

If neither intersection sight distance is obtainable, an acceleration lane may be considered.

Table 4.16

Intersection Sight Distance								
Speed (mph)	Entering Sight Distance (feet)	Stopping Sight Distance (feet)						
		Level	Upgrade			Downgrade		
		0±2%	+3%	+6%	+9%	-3%	-6%	-9%
20	240	125	120	115	115	130	130	130
25	300	150	150	145	140	155	160	165
30	380	200	200	190	180	210	220	230
35	470	250	245	235	225	265	280	300
40	580	325	315	305	295	345	365	395
45	710	400	385	375	370	425	455	510
50	840	475	455	445	-	505	545	-
55	990	550	525	510	-	590	640	-
60	1150	650	620	600	-	700	760	-
65	1350	725	695	665	-	785	855	-
70	1560	850	810	780	-	920	1010	-

4.17 Intersection Sight Triangle.

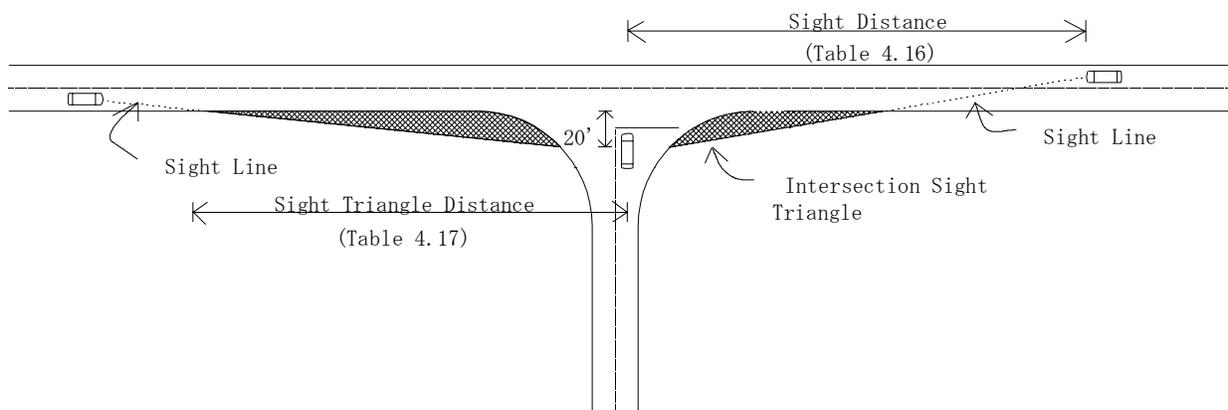
The sight triangle is the distance which must be kept clear, for visibility of approaching vehicles, from a point 20 feet from the edge of the nearest travel lane to the distance along the travel lane, in Table 4.17. This distance will give stopped passenger cars adequate distance to pull into the travel lanes and accelerate and through traffic time to slow 15%. The distance is based on 12 foot lanes with a 4 foot wide median for four lane roads, and for perpendicular approaches.

Table 4.17

Intersection Sight Triangle			
Speed (mph)	Left (feet)	Right Two Lane Road (feet)	Right, Four Lane Road (feet)
20	185	125	90
25	230	160	110
30	290	200	140
35	360	250	175
40	445	305	215
45	545	375	265
50	645	440	310
55	760	520	365
60	885	605	425
65	1040	710	500
70	1200	820	580

Figure 4.5

Intersection Sight Triangle



4.18 Acceleration Lanes

Acceleration Lanes should be used on high speed (~ 45 mph), high volume (~ 10,000 vpd, based on a 20 year projection) roads, when required by a traffic study, or when entering vehicles do not have a sufficient gap to enter traffic safely during the peak hour. Acceleration lanes should also be considered for use on roads with restricted sight distances.

Tapers should be 20:1 for speeds less than 45 miles per hour and 25:1 for 45 miles per hour and higher.

For long upgrades, where entering trucks cannot achieve a speed within 10 mph of the 85th percentile speed, an acceleration lane may be required to be lengthened for a truck climbing lane.

Table 4.18

Acceleration Lane Lengths (Right and Left Turns)						
For Level Grades ($\pm 2\%$ or less)			Multipliers for Other than Level Grades			
Highway Design Speed	Speed Reached (mph)	Length Required (Feet)	3 to 4% Upgrade	5 to 6% Upgrade	3 to 4% Downgrade	5 to 6% Downgrade
30	23	190				
40	31	380	1.3	1.5	0.7	0.6
50	39	760	1.4	1.9	0.65	0.55
60	47	1170	1.6	2.5	0.6	0.5
70	53	1590	1.8	3.0	0.6	0.5

Figure 4.6

