

# Chapter 10 Additional NCDOT Design Resources

## 10.1 Introduction

The purpose of all roadway networks is to provide connectivity for society; however, considerations should be made for safe and efficient connections to this roadway network. This chapter provides links to additional NCDOT resources and requirements for the connection of the roadway network.

## 10.2 Subdivision Roads – Minimum Construction Standards

If a new subdivision road (to be dedicated as public or private) will connect to a roadway on the state system, obtain a driveway permit or encroachment agreement authorizing construction on state right of way from the Division of Highways before beginning any construction. Submit applications to the District Engineer having jurisdiction in the area. On active State Transportation Improvement Program (STIP) projects, the District Engineer must coordinate with the NCDOT project manager.

Refer to the latest version of NCDOT Subdivision Roads – Minimum Construction Standards available on the [NCDOT Secondary Roads and Subdivisions](#) page of the Connect NCDOT website for complete information on requirements for subdivision roads.

Refer to Figures 1 through 9 in [NCDOT Subdivision Roads – Minimum Construction Standards](#) for detailed information regarding the required roadway typical section, connection width at intersections to state owned roads, and construction requirements.

## 10.3 Resurfacing, Restoration, and Rehabilitation of Highways and Streets

The primary purpose of resurfacing, restoration, and rehabilitation (R-R-R) projects is to provide a better riding surface, enhance safety, improve operating conditions, and preserve and extend the service life of existing non-freeway facilities. Highway safety is an essential element of R-R-R projects. Develop and design projects in a manner which identifies and incorporates safety improvements. Economic considerations are a major factor in determining the priority and scope of R-R-R projects.

The R-R-R guidelines provide the designer options for improving existing facilities and minimizing impacts to the project corridor. Not all projects are candidates for these guidelines. Ideally, these projects are identified in the Transportation Improvement Program. Coordinate with the NCDOT Project Manager and other appropriate NCDOT staff to determine if a specific project qualifies prior to initiating design work on a project:

The [NCDOT Resurfacing, Restoration, and Rehabilitation \(R-R-R\) of Highways and Streets](#) document is in the process of being updated to reflect NCHRP Report 876 which employs a cost-effectiveness approach to decision making for corridor improvements.

## 10.4 Supplemental Street and Driveway Access Guidelines

### 10.4.1 General Considerations

One of the primary concerns of those responsible for North Carolina's vast highway system is to provide for the safe and efficient movement of people and goods. As an aid in achieving this,

NCDOT published a Policy on Street and Driveway Access to North Carolina Highways, establishing requirements for the location, design, and construction of street and driveway access connections to the State Highway System.

The NCDOT Congestion Management Section maintains the policy document which is currently in the process of being edited with an anticipated release date in 2022. The update will focus primarily on general policy, while technical content related to design elements will reside in the RDM. This chapter of the RDM contains design elements related to street and driveway access that are useful to the roadway designer and that are intended to be removed from the policy document.

Refer to the latest version of [NCDOT Policy on Street and Driveway Access to North Carolina Highways](#) for more information on street and driveway access policies.

## 10.4.2 Technical Design Guidelines

The intent of the following information is to extract from the policy document all the information that communicates technical design criteria such as dimensional, slope, rate, and clearance data and bring it into the RDM. The intent of this content migration is to allow future revisions of the policy (subject to approval by the NCDOT Board of Transportation) to include only policy directives as opposed to the current mixture of both policy directives and technical design guidelines. This would allow the Roadway Design Unit to update technical design criteria over time through changes to the RDM, without having to revise and seek Board approval for the overall policy document.

### 10.4.2.1 Site Requirements

- **Functional Area of Intersection** – The functional area of an intersection consists of the distance traveled during reaction time, the deceleration distance, and queue storage length. The following reaction time and distances may be used:

**Table 10-1 Reaction Time and Distances for Functional Area of Intersections**

Reaction Time and Distance				
Areas	Sec.	35 mph	45 mph	55 mph
Rural	3.0	155 ft	200 ft	245 ft
Urban	9.1	470 ft	600 ft	735 ft

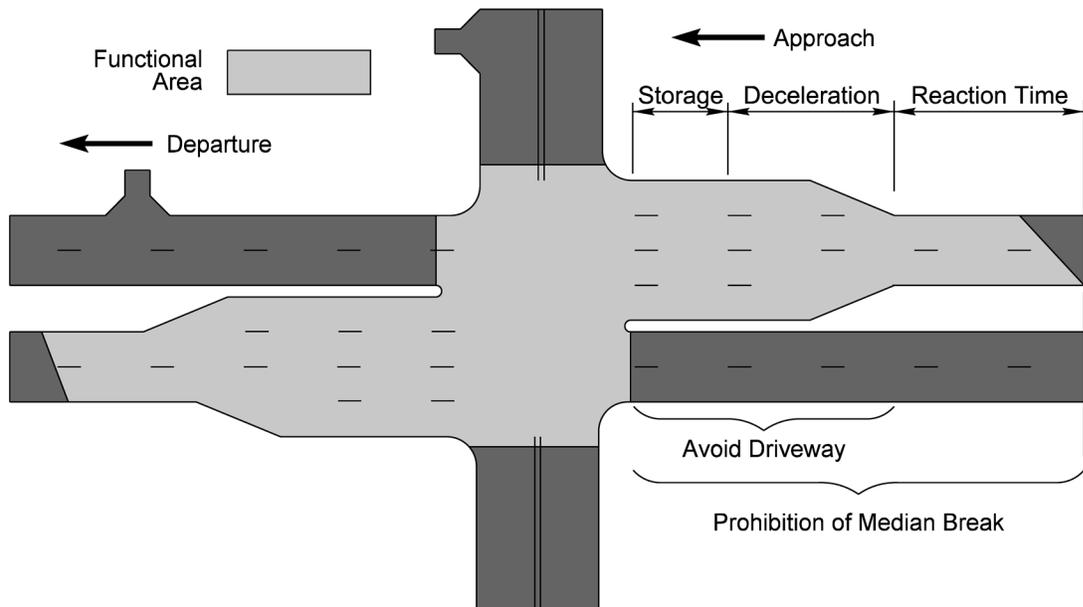
The reaction distance values shown in Table 10-1 were developed using GB Equation 3-5.

Avoid driveways within the storage and deceleration length of an intersection. Median breaks are not allowed within the storage length, deceleration length, or length of reaction time shown in Table 10-1.

Refer to Figure 10-1 for clarification on the functional area of an intersection.

Refer to GB Chapter 3 Section 3.2.3 for additional information on design sight distance.

Figure 10-1 Functional Area of an Intersection



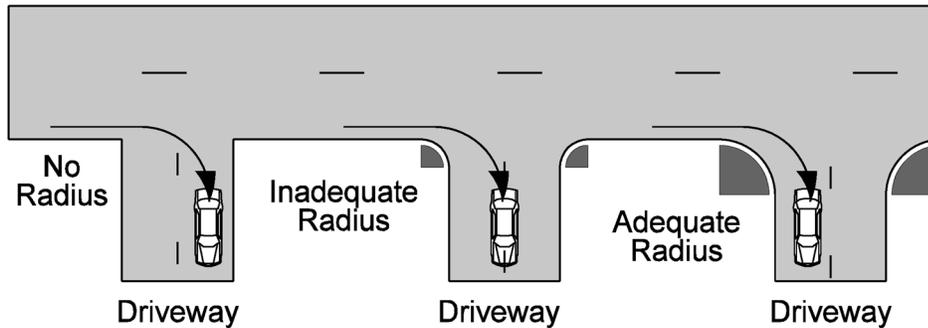
- Sight Distance – Refer to RDM Part I Chapter 8 Section 8.4 for guidance on intersection sight distance.
- Vehicle Storage Space and Driveway Stem – NCDOT has the authority and responsibility to require adequate internal storage and a sufficient length of protected stem within the right of way of a site, to ensure operational and safety needs of the adjacent roadway system. For example, a restaurant drive-thru line should not back up into the adjacent roadway and a driveway exit from a site should be of sufficient length to not inhibit vehicles from entering a site.

Refer to [NCDOT Policy on Street and Driveway Access to North Carolina Highways](#) Chapter 7 Section B for guidance on internal storage space and driveway stems accessing state highways.

- Driveway Radius – A primary concept in designing a driveway connection is to minimize the interference with traffic flow on adjacent streets. To accomplish this, use a driveway radius with the ability to handle the types of vehicles designated to use the driveway. A properly designed driveway radius will minimize the impact of turning traffic on through traffic. Consider the effects of a driveway radius on pedestrian and bicycle safety and mobility. Limit the radius of the street-type driveway connections to 20 feet minimum and 50 feet maximum.

Refer to Figure 10-2 for an illustration of adequate and inadequate turn radii.

Figure 10-2 Intersection Turn Radii



Note: An adequate radius allows turning vehicles to access the site readily and minimizes the impact to the through movement.

- Driveway Profiles – Refer to RDM Part I Chapter 4 Section 4.12.1 for guidance on driveway profiles.
- Subdivision Road Standards – Design residential subdivisions in accordance with the requirements set forth in the current edition of [NCDOT Subdivision Roads – Minimum Construction Standards](#).

#### 10.4.2.2 Number and Arrangements of Driveways

Refer to [NCDOT Policy on Street and Driveway Access to North Carolina Highways](#) Chapter 7 Section C for guidance on the number, spacing and arrangements of driveways along state highways.

#### 10.4.2.3 Maintenance Limits

Refer to [NCDOT Policy on Street and Driveway Access to North Carolina Highways](#) Chapter 7 Section G for public (NCDOT) and private maintenance limits and requirements.

#### 10.4.2.4 Control Dimensions

Comply with the following control dimensions for street and driveway connections. Refer to Figures 10-4, 10-5, and 10-6 for example applications of these control dimensions.

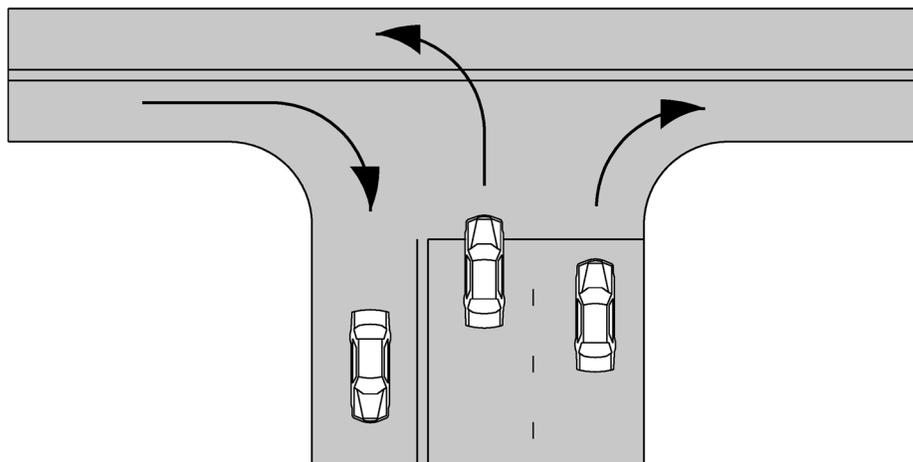
- Width of Driveways (W) – The width of driveways, W, measured parallel to the edge of travel way and from edge of pavement to edge of pavement at the narrowest width, shall be within the specified minimum and maximum limits.

A driveway with two-way operations shall have a minimum 20-foot and a maximum 36-foot width. A driveway with one-way operation shall have a minimum 12-foot and a maximum 24-foot width. The need for wider driveways will be considered on a case-by-case basis only after justification of actual necessity but should not exceed 50 feet.

Street type connections with multilane ingress or egress may exceed 50 feet based on traffic operation requirements as demonstrated in the traffic impact study for the project. These values are based on edge of pavement dimensions not including the width of gutter if a curb-and-gutter section is proposed.

Refer to Figure 10-3 for a recommended high volume driveway connection.

Figure 10-3 Three Lanes at Major Drives



Note: When driveway volumes are moderate or high, a three-lane cross section should be recommended.

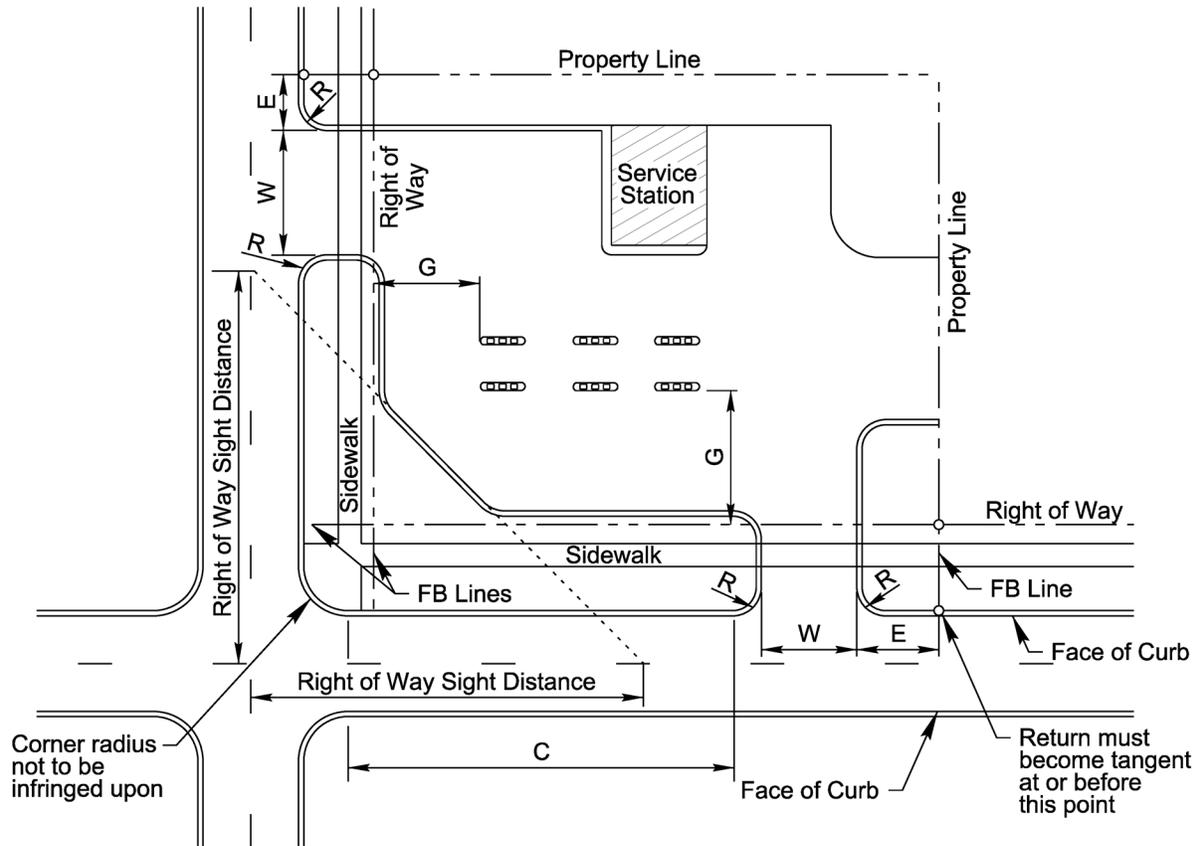
- **Driveway Angle (Y)** – The recommended driveway angle, Y, for a full access driveway is 90 degrees. The angle of the two-way operation driveway with respect to the pavement edge shall not be less than 75 degrees or greater than 90 degrees. For one-way right-in or right-out driveways, driveway angles between 45 and 90 degrees may be allowed on a case-by-case basis.
- **Edge Clearance (E)** – All portions of a commercial driveway including the returns shall be between two frontage boundary lines of the current or future right of way line. The edge clearance, E, measured parallel to the edge of pavement from the frontage boundary line to the nearest point on the projected edge of the driveway shall be a minimum of 20 feet.
- **Driveway Return (R)** – The radius of the street-type driveway connection, R, shall be within 20 feet desirable (5 feet minimum) and 50 feet maximum. However, the maximum radii dimension may be exceeded as an exception if larger radii are needed to accommodate larger vehicles expected to frequent a proposed development such as commercial service entrances, service stations being serviced by tanker trucks, or truck terminals.
- **Island Offset Distance (S)** – The near edge of an island area parallel to the highway shall be located no less than 6 feet and no more than 12 feet from the edge of pavement along uncurbed roadways or from the curb line on curbed roadways unless specifically instructed by District Engineer to be otherwise.
- **Distance Between Driveways (D)** – Where more than one driveway is permitted along a single property frontage, the distance, D, measured along the right of way line between the tangent projection of the inside edges of adjacent driveways shall be at least 100 feet. For high volume traffic generators, the minimum distance between the centerlines of full movement driveways, or between a full movement driveway and the next nearest full movement roadway, into developments that generate high traffic volumes should be at least 600 feet for most non-critical transportation corridors and a minimum of 1,000 feet for Major Thoroughfares, National Highway System and Intrastate Routes, Primary Routes, and corridors with identified safety concerns. This minimum distance between driveways does not apply to service drives not used by the general public.

- Setbacks (G) – Setbacks of gasoline pump islands parallel to the pavement edge shall be a minimum of 25 feet outside the highway right of way. Setbacks of gasoline pump islands not parallel to the pavement edge shall be a minimum of 50 feet outside the highway right of way. Buildings or other installations with one row of 90-degree parking between it and the highway right of way should be at least 50 feet outside the right of way. Buildings or other installations with one row of angle parking between it and the highway right of way should be at least 30 feet outside the right of way. All expected vehicular movements needed to serve a site must be accommodated internally.
- Corner Clearance (C) – Where the property's road frontage allows, the minimum corner clearance to the proposed driveway should be at least 100 feet from the point of tangency of the radius curvature of the intersecting streets. At no time shall the corner clearance be less than 50 feet from the points of tangency of the radius curvature. For full movement driveway connections at signalized intersections, the corner clearance may be required to extend beyond 100 feet when the property's road frontage allows. This is to avoid interference with the traffic signal operations and resulting traffic queues. The radius of the driveway should not encroach on the minimum corner clearance.

### 10.4.3 Figures

The following figures provide illustrations of example applications of the control dimensions for street and driveway connections described in Section 10.4.2.4.

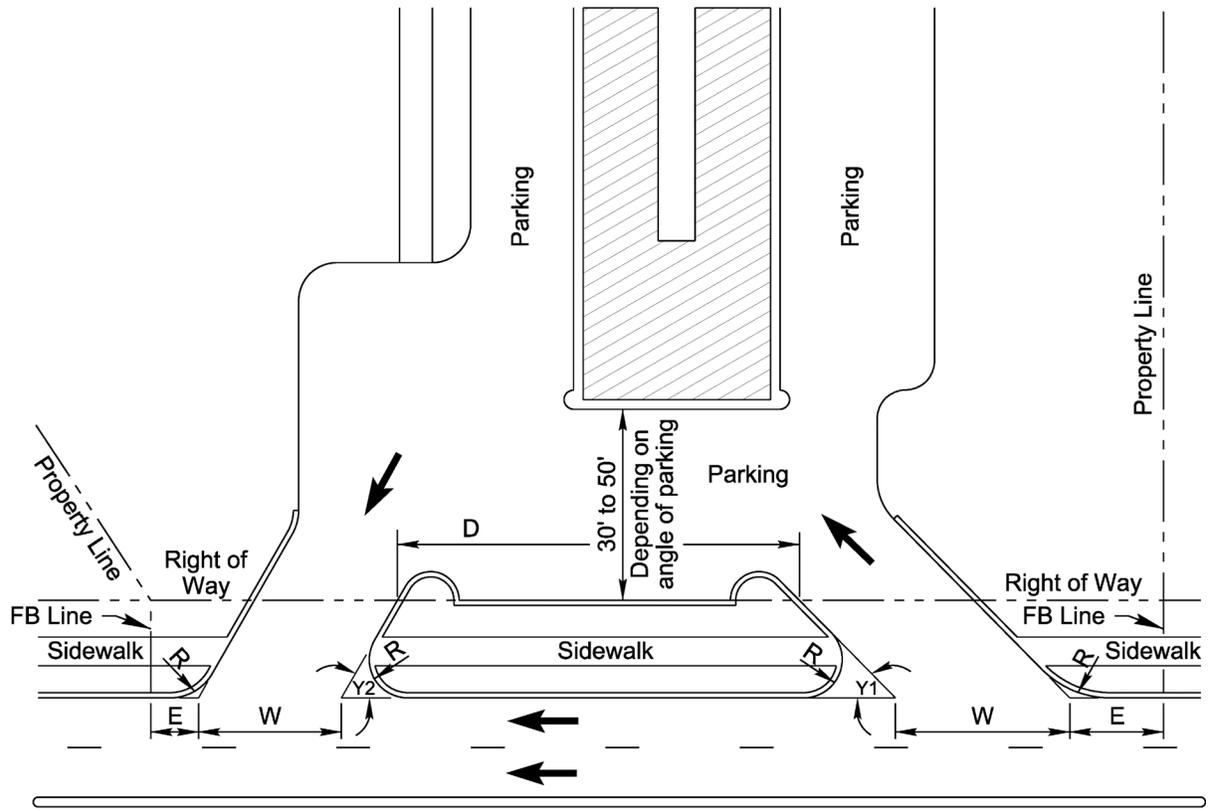
Figure 10-4 Example Driveway Scenario for Corner Business



Notes:

1. Access to major facilities may not be allowed if suitable access is available to other public facilities.
2. Connectivity to adjacent property recommended.
3. E - 20' minimum
4. R - 5' minimum, 30' maximum
5. G - 50' minimum where pump islands are perpendicular to right of way. 25' minimum where pump islands are parallel to right of way.
6. W - One way: 12' minimum, 24' maximum. Two way: 20' minimum, 36' maximum
7. C - 50' minimum, 100' desirable
8. FB - Frontage boundary line

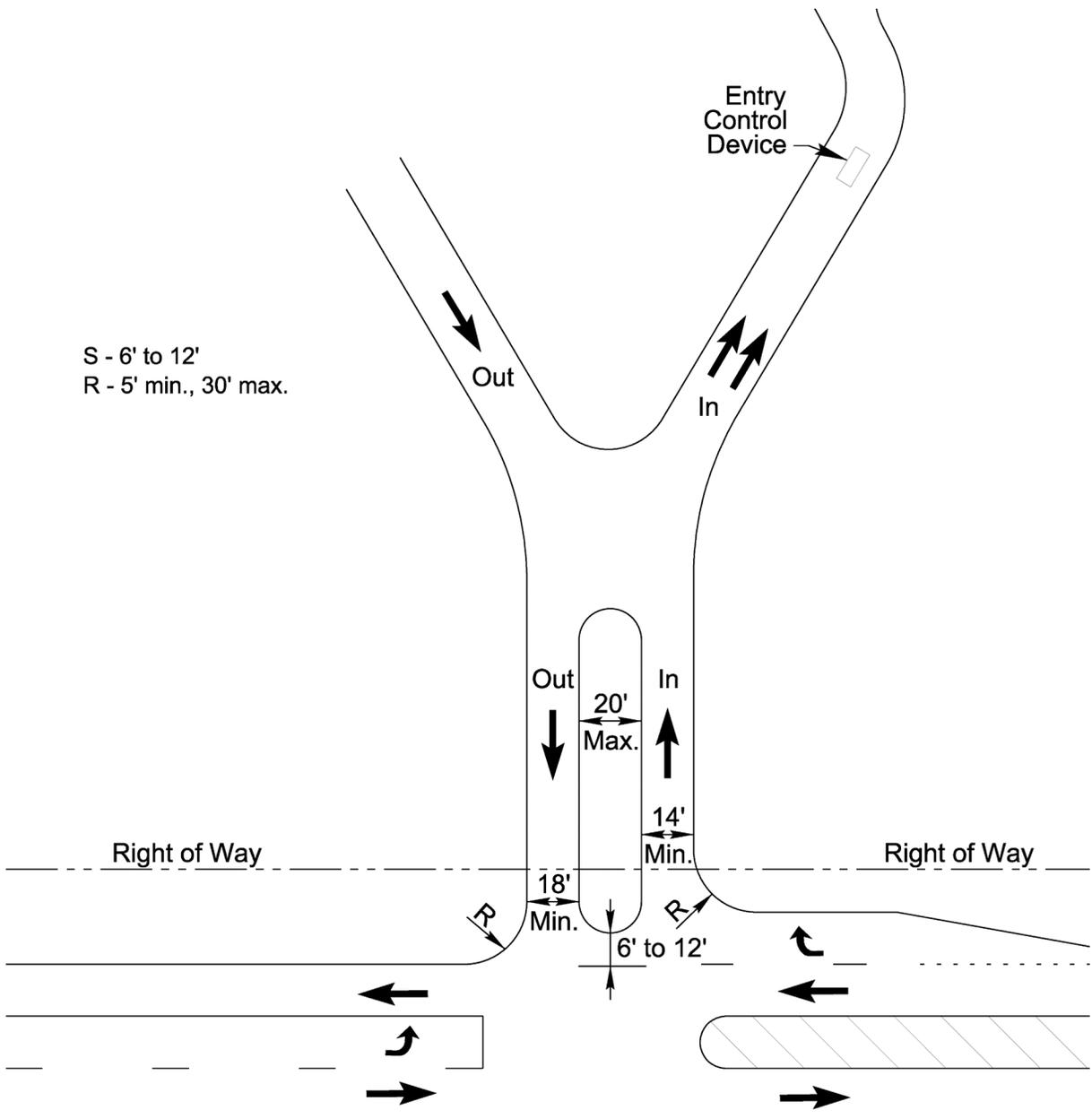
Figure 10-5 Angled Driveways on One-Way Streets



Notes:

1. Access to major facilities may not be allowed if suitable access is available to other public facilities.
2. Connectivity to adjacent property recommended.
3. E - 20' minimum
4. W - One way: 12' minimum, 24' maximum
5. Y1 - 45° minimum (one way roadway)
6. Y2 - 60° minimum (one way roadway)
7. D - 100' minimum
8. FB - Frontage boundary line

Figure 10-6 Driveway with Controlled or Restricted Entry



Note: Locate gates, ticket offices or other entry control devices to accommodate peak ingress traffic storage without spill back into the adjacent public street.

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