DESIGN GUIDELINES FOR DRIVEWAYS AND ENTRANCES
in the
Town of Ashland, Virginia

I. INTRODUCTION

This document provides guidelines for the location and design of driveways and entrances providing access from public streets and highways to developments on abutting property, within the corporate limits of the Town of Ashland, Virginia. The guidelines presented herein were developed to not only protect through traffic from indiscriminate interferences along the roadway but to provide, without undue restriction, safe and convenient entrance and exit to and from developments abutting public streets and highways.

It should be stressed that the design values presented herein are guidelines. The dimensions called for or shown may be adjusted by the Director of Public Works as required to handle expected traffic conditions.

The basis for the guidelines presented herein have been adopted from learned experience from past development in the Town of Ashland, the Institute of Transportation Engineers "Guidelines for Driveway Location and Design", and the Virginia Department of Transportation "Minimum Standards of Entrances to State Highways".

In order for these guidelines to be of maximum value, it is necessary that wide flexibility be retained in their application. Engineering judgement should override recommended dimensions if warranted by specific traffic conditions.

II. CLASSIFICATIONS AND DEFINITIONS

The following definitions and classifications apply to these guidelines.

Streets

The term "major route" includes marked state or federal routes and all streets which have extensive continuity, carry substantial amounts of through traffic and on which traffic is assigned the right-of-way by stop signs facing cross streets.

Land Uses

Most residential, neighborhood business and industrial streets have low pedestrian activity. Areas of higher pedestrian activity include streets through or abutting central and secondary business districts as well as those in the same block with auditoriums, schools, and libraries. Under certain conditions, streets and highways immediately adjacent to, and leading to and/or from public parks, churches or like uses, may also fall into this category.

DESIGN GUIDELINES FOR DRIVEWAYS AND ENTRANCES
in the
Town of Ashland, Virginia

DRAFT
23 JAN 1990

I. INTRODUCTION

This document provides guidelines for the location and design of driveways and entrances providing access from public streets and highways to developments on abutting property, within the corporate limits of the Town of Ashland, Virginia. The guidelines presented herein were developed to not only protect through traffic from indiscriminate interferences along the roadway but to provide, without undue restriction, safe and convenient entrance and exit to and from developments abutting public streets and highways.

It should be stressed that the design values presented herein are guidelines. The dimensions called for or shown may be adjusted by the Director of Public Works as required to handle expected traffic conditions.

The basis for the guidelines presented herein have been adopted from learned experience from past development in the Town of Ashland, the Institute of Transportation Engineers "Guidelines for Driveway Location and Design", and the Virginia Department of Transportation "Minimum Standards of Entrances to State Highways".

In order for these guidelines to be of maximum value, it is necessary that wide flexibility be retained in their application. Engineering judgement should override recommended dimensions if warranted by specific traffic conditions.

II. CLASSIFICATIONS AND DEFINITIONS

The following definitions and classifications apply to these guidelines.

Streets

The term "major route" includes marked state or federal routes and all streets which have extensive continuity, carry substantial amounts of through traffic and on which traffic is assigned the right-of-way by stop signs facing cross streets.

Land Uses

Most residential, neighborhood business and industrial streets have low pedestrian activity. Areas of higher pedestrian activity include streets through or abutting central and secondary business districts as well as those in the same block with auditoriums, schools, and libraries. Under certain conditions, streets and highways immediately adjacent to, and leading to and/or from public parks, churches or like uses, may also fall into this category.

Driveway Types

Residential - Provides access to a house, duplex or apartment building with up to 4 dwelling units.

Commercial - Provides access to an office, retail or institutional building or an apartment building with 5 or more dwelling units. Trucks use these entrances to service buildings as a secondary use rather than a primary use. Driveways to industrial buildings with a main intent to service administrative and/or employee parking lots are to be considered commercial.

Industrial - Provides access to and from loading docks of an industrial building, warehouse or truck terminal for a significant number of trucks of various sizes. Industrial driveways also provide access to a centralized retail establishment such as a shopping mall or community shopping center. One or more driveways may be designed or incorporated into various access points.

Methods of Measurement

Dimensions in these guidelines refer to distances from faces of curb or edges of pavement for widths and along face of curb or edges of pavement for lengths. Driveway angles are measured from the driveway centerline and one edge of the roadway.

III. DESIGN CONSIDERATIONS

The efficiency and safety of a street or highway depends on the amount and character of interferences affecting vehicles moving along it. Significant interferences are caused on most roads by vehicles entering, leaving, or crossing at intersecting streets and driveways. In order to minimize accidents and to assure best overall use of the road by the general public, it is necessary to regulate vehicle movements in and out of abutting developments and cross streets.

With respect to driveways, road users and property owners have certain rights of access to abutting property as well as the right to travel on the highway with relative safety and freedom from interference. Since these various rights sometimes conflict, the Town of Ashland has the responsibility for reconciling and to the extent feasible, for satisfying the needs and rights of all road users in respect to driveway location, design, and operation. When conflicts cannot be fully resolved, preference will be given to the safe and efficient use of the highway, after the property owners' minimum rights for access and egress have been considered.

A number of design considerations have been established on which these guidelines are based, as follows:

1. Direct driveway access to public rights of way is typically an owner's right; driveways are not special concessions to land owners.

2. The conflict effect of driveways is a function of traffic flow along the street and at the driveway. Traffic from adjacent driveways and from driveways on the opposite side of the roadway may also be in conflict.

3. A low-volume driveway causes relatively little conflict on a major route, and a high-volume driveway causes little conflict on a minor route. The relationships, however, are not necessarily linear.

4. Driveways are essentially "T" intersections. High activity land uses produce driveway volumes greater than those of most local or collector streets.

5. The design elements of each high-volume driveway (location, spacing, sight distance, throat width, radii, angles, deceleration and acceleration lanes, and grades) should be based on expected volumes by directions of arrival and by vehicle characteristics.

6. In the absence of a separate left-turn lane, the left-turn entry movement generally causes the greatest hazards and street congestion.

7. The left-turn exit movement is the most sensitive to spacing of the driveway relative to the nearest point of street traffic control (especially a signal). Such movements are also relatively hazardous.

8. The right-turn entry into a driveway is the second most sensitive movement in respect to spacing from the location of street traffic control. Such movements also impede through traffic.

9. Driveways along major and collector streets should be designed for curb lane access and with minimal encroachment on travel lanes, disregarding present parking practices.

10. In order to preclude encroachment on travel lanes, radii for right turn entry and exit should be consistent with the design vehicle's sweep path requirements.

11. If the radii for right turn entry or exit are inadequate, encroachment will occur unless the entering or leaving vehicle temporarily occupies a substantial width of the driveway throat.

12. For low-volume two-way driveways, it is acceptable for vehicles to sweep across the entire throat.

13. Two-way driveways represent the most practical design for many conditions; for high-volume operations, such a driveway may be considered as two adjacent one-way driveways separated by a centerline.

14. Pedestrian accidents involving cars entering or leaving driveways are infrequent compared with the number of vehicular collisions involving the driveways.

15. In areas of high pedestrian activity, designs for low speed vehicular entry and exit may be based on radii of intermediate dimensions and restricted total widths. Such designs, however, will increase vehicle/vehicle conflicts and increase the number and length of delays to vehicle occupants.

16. Most driveway design elements are directly related to the layout of the parking area, amount of on-site storage for exiting traffic, amount of reservoir space (for drive-in type service facilities), type of loading facility, circulation pattern, and building placement within the site. Each of these factors are integral elements of the entrance design, and must be reviewed.

17. The relationship of the site plan, including landscaping and signs, to driveway design is so critical that review and approval of both building and driveway permits should be concurrent.

18. Land use is strongly related to traffic volume, which in turn affects driveway design; therefore, zoning changes and subdivision plats should not be approved without considering driveway access elements.

19. No one set of regulations can be expected to apply to all access requirements (even for a single type of land use). Therefore, "controls" should be expressed as guidelines, subject to engineering judgment.

20. Widening of existing streets in built-up areas may require variations to access regulations to accommodate the existing building or parking placement within the site.

IV. TRAFFIC VOLUMES

Importance of Traffic Generation Data

The potential traffic generation of specific land uses is important to the planners, designers and engineers who will review subdivision layouts and site plans. Traffic volume data is critical in calculating and designing the number of lanes required on approaches to critical intersections.

Driveways serving commercial, industrial, and high density residential developments represent an important element in the highway system. Studies have shown that approximately 10 to 15 percent of the accidents on major urban routes are related directly or indirectly to vehicles entering or leaving commercial driveways. Many commercial driveways have much more traffic than the typical local street at its intersection with a major traffic route. At very high-volume driveways such as those serving shopping centers and major office or industrial developments, high-type design, including left-turn bays and signalization may be warranted. To evaluate such facilities in advance of development of the generator, estimates are needed of future traffic volumes and turning movements.

Traffic generation rates should be used to estimate the total number of vehicles entering and leaving a given driveway or access street in the peak hours. The turning movements that will be associated with these volumes must then be estimated separately.

Methods of Determining Traffic Generation Rates

Traffic generation rates, as presented in the latest edition of Trip Generation, published by the Institute of Transportation Engineers, Washington, D.C., including any revisions or errata thereof, shall be utilized in determining traffic generation rates.

Design for driveways and entrances shall be based on traffic movements during either the peak hour of adjacent street traffic or the peak hour of traffic to and from the proposed development (peak hour of generator). Which ever method results in the greatest number of vehicle trips generated, during either the AM or PM peak period, shall be utilized in the traffic analysis.

V. TRAFFIC IMPACT ANALYSIS

A Traffic Impact Analysis (TIA) is a specialized study of the effect any particular size and type development will have on the immediate area transportation system. The scope of the TIA will depend upon the size and type of the development. The TIA will be an integral part of the development impact review process conducted by the Town of Ashland during the site plan review process. Specifically, it should address the generation, distribution and assignment of traffic to and from the proposed development. The purpose of the TIA is to provide Town Staff with data on the impacts that traffic will have on the existing and proposed roadway network and what impact the existing and projected traffic on the roadway system will have on the proposed development.

A complete TIA shall be performed by a consultant regularly engaged in traffic engineering when any of the following occurs.

- A proposed development can be expected to generate more than 100 vehicles trips in the peak hour of the adjacent street or generator;

- Where increased land use intensity will result in an increase in traffic generation by more than 15 percent or a change in directional distribution in the site by more than 20 percent;

- All applications for rezoning, unless waived by the Town of Ashland;

- Any change in land use of an existing industrial or commercial site, if required by the Town of Ashland; or

- When the original or most recent TIA is more than two years old.

Upon receiving the properly performed TIA, when required, the Town of Ashland shall review and return it within 15 working days. When other agencies are involved additional review time will be required.

Since no two developments are exactly alike the traffic analyst performing the TIA will be allowed reasonable latitude to tailor the TIA to the specific situation.

The traffic consultant should discuss the project with Town Staff at an early stage in the development process to establish the study area and to obtain information relative to and including, but not limited to, the following:

- available existing and future traffic data;

- plans for street improvements near the site;

- traffic counts required to be made; and

- intersections at which capacity analyses will be required.

The developer shall submit a copy of a vicinity map to the Town, indicating the proposed location of the development, along with information relative to the proposed type and size of the development. The Town Staff will review this information and indicate on the vicinity map the limits of the study area and the intersections required to be analyzed.

As noted previously, the specific content for each TIA will vary for each site and the prevailing conditions. The following, as a minimum, should be addressed in the Traffic Impact Analysis.

1) Existing Conditions
2) Trip Generation and Design Hour Volumes
3) Trip Distribution and Traffic Assignment
4) Existing and Projected Traffic Volumes
5) Capacity Analysis

6) Traffic Improvements, including proposed entrance location(s) and design
7) Conclusions
8) Summary of Findings and Recommendations

VI. DESIGN GUIDELINES

General Requirements

The developer shall be required to construct entrances which will be compatible with the ultimate plan for the roadway to/from which access will be provided.

The developer will be required to supply sufficient information for the Town to determine entrance design features to adequately serve the roadway facility as well as the proposed development. Detailed engineering plans and traffic analysis plans from a certified professional firm will be required by the Town.

In order to insure the maximum efficiency of all entrance designs, it is essential that certain general requirements be satisfied by each developer. Consequently, those interested in applying any individual designs shown herein should first familiarize themselves with the following design guidelines.

Radii and Width

A critical element of driveway design is the radius of the curb return of the curbing connecting the edge or throat of a driveway with the edge of the nearest travel lane. The radius should be related to the sweep path of a vehicle making a right turn in or out considering the width of the adjacent street lane and the width of the driveway.

The minimum radii shown in these guidelines are based on type of land use served. However, greater radii are desirable. The curb return radius values provided in these guidelines shall apply on the side of the driveway used for entry or exit by right-turning vehicles. For a one-way driveway, the proper radius for the side not used for right turn entry (or exit) shall be established by the sweep path needs of a vehicle entering by a left turn from the far side of the street (or exiting by a left turn onto the far side). Except for very narrow streets or for large vehicles, the "off-side" radii shall be small.

Since parking may be prohibited along any major thoroughfare, and a curb lane adjacent to a given driveway may be clear at times on any street, driveways (other than single-family residential driveways on local streets or low-volume collectors) shall be designed for entry from the curb without encroachment onto adjacent lanes or beyond the centerline.

The radius used at a given driveway is meaningful only when related to the width of throat. The throat is basically a point of narrowest controlled width. When the distance between curb line and right-of-way is equal to or greater than the design radius, the throat width shall be measured along either the property line or the end of the radius. In many cases, the proper radius will be greater than the distance between curb line and property line. In such cases, if a raised barrier curbing extends into private property, the throat width shall be measured at the end of the radius even though this may be on private property.

The widths of two-way driveways shall be measured parallel to the roadway. One-way driveways shall be measured at right angles to the driveway. When a center channelizing island is used in a two-way driveway to restrict entries to right turns in and right turns out, the width shall be measured separately and at right angles between the curbing of the channelizing island and the driveway curb return. In this type of design, radii and total width of driveway at the throat are usually somewhat greater than for a two-way driveway without a channelizing island due to the need for lateral clearance between faces of the barrier curbs.

The minimum width of one-way driveways, measured at the throat or at another control point, range from 10 to 20 feet. For commercial or industrial driveways, this minimum width shall be based on one-way operation and will range from 30 to 40 feet depending on type of land use served, for two-way operation. The use of channelizing islands in any of these driveways, however, should automatically produce variations for such additional widths as necessary to assure efficient and safe traffic movements. In general, medians separating driveway movements are seldom needed except to channelize turns, or for high volume 4-lane driveways. The width of the center median shall be a minimum of 4 feet. Wider medians are more attractive if landscaped and may be utilized if a site identification sign is planned. Anything placed in the median shall be set-back and/or so maintained as to not restrict visibility in the driver eye height range from 3 to 8 feet above grade.

Where public sidewalks abut the curb, it may be difficult to make the edge of the driveway visually apparent if the sidewalk is warped down into the driveway rather than using a stepdown curb along the edge of the drive. While most driveways will function satisfactorily with warped sidewalks, thus avoiding pedestrian inconvenience, use of step-down curbs warrants consideration for special circumstances, since curbs have the important secondary advantage of notifying the pedestrian that they are in a zone of conflict.

If step-down curbs are used, sidewalk ramps for use by persons in wheelchairs and other physically handicapped persons shall be provided.

Angles

As with other geometric design elements of driveways, the angle between the driveway centerline and roadway edge shall be based primarily on safety requirements. The speed at which a vehicle can enter or leave a public roadway is affected by the angle of approach or departure. If a desirable angle cannot be used because of lot size, physical obstructions, or other limitations, the design speed shall be increased by altering radii, width, or grade of the driveway. Also, the main roadway may be modified by adding acceleration or deceleration lanes.

The choice between 90-degree ("T" driveways) and angled driveways is most often dictated by direction of travel and ease of turning into or off of the public street. Angled or one-way driveways are appropriate on one-way streets or streets divided by medians which limit movements to only right turns in and out. A pair of such driveways may be widely separated or consist merely of two one-way driveways separated by a triangular island. This treatment shall not be used for two-way driveways on two-way streets since both entering and exiting drivers might presume that the driveways were one-way. The use of angled driveways shall be studied carefully to ensure that an unusually hazardous condition is not created.

Angled driveways shall not be used for single-throat driveways with movements to and from both directions of traffic. Acute-angle turns must be made more slowly and thus cause greater interference with through traffic. If physical obstructions make use of an angled driveway unavoidable, the angle shall be as near 90 degrees as possible for two-way operation.

Due to the relationship between driveway angle and operating speeds, angles of 70 degrees or greater shall be used in areas of high pedestrian activity. For all other conditions, a minimum angle of 45 degrees shall be used for one-way operation.

Driveways that must accommodate large volumes of truck traffic shall be designed for each particular condition. Turning templates shall be used to test movements to and from both directions of travel. Large trucks usually do not enter and leave driveways at high speeds so driveways at flat angles will seldom be hazardous. Facilitating the movement of trucks on and off traveled ways without impeding through traffic can best be accomplished by using angled driveways. For these reasons, flat angles and one-way drives are encouraged. Exits should be at an angle of not less than 45 degrees to assure that drivers will have a good view when merging with through traffic.

Spacing

The spacing of driveways is related to adjacent driveways and nearby street intersections. The number of driveways serving a single piece of property is also a consideration.

Typical driveways shall be at least 60 feet from the point of tangency of curb radii at urban street intersections. For example, at a major cross street, a 30 foot corner radius, a 25 foot commercial driveway radius, and a 60 foot tangent section produces a 115 foot setback. This is illustrated in Figure 1. Keeping a driveway away from an intersection, even by such small distances, reduces conflicts.

Spacing from intersections for high-volume driveways is very critical (see Major Driveway Design Factors).

Driveways shall be far enough from an interior property line to permit the curb radius to fall entirely in front of the subject property.

The maximum number of driveways allowed for a single property, based upon width of frontage, shall be as follows:

WIDTH OF FRONTAGE	MAXIMUM NUMBER OF DRIVEWAYS
0'-160'	1
161'-500'	2
OVER 500'	3

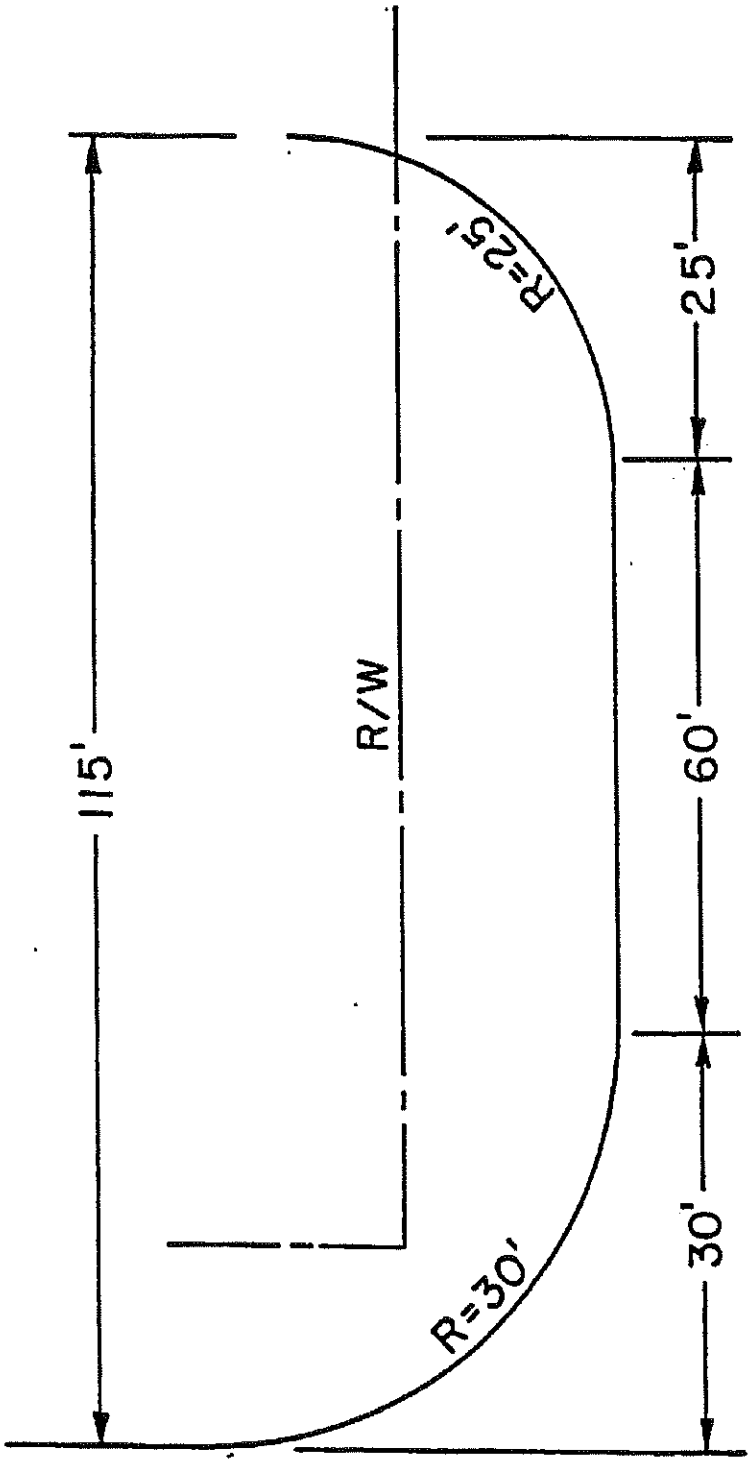
An additional factor concerns the spacing of high-volume driveways where deceleration or acceleration lanes are required. Examples would include driveways into shopping centers as well as those into major industrial, commercial, and apartment complexes. At least several hundred feet between major driveways is desirable. Factors to be considered include the speeds and volumes of entering and leaving traffic, the speeds of through traffic, and the resultant merging movements upstream and downstream.

Right-turn Lanes

The following is to be used as an aid in selecting appropriate treatment for right turn movements at entrances.

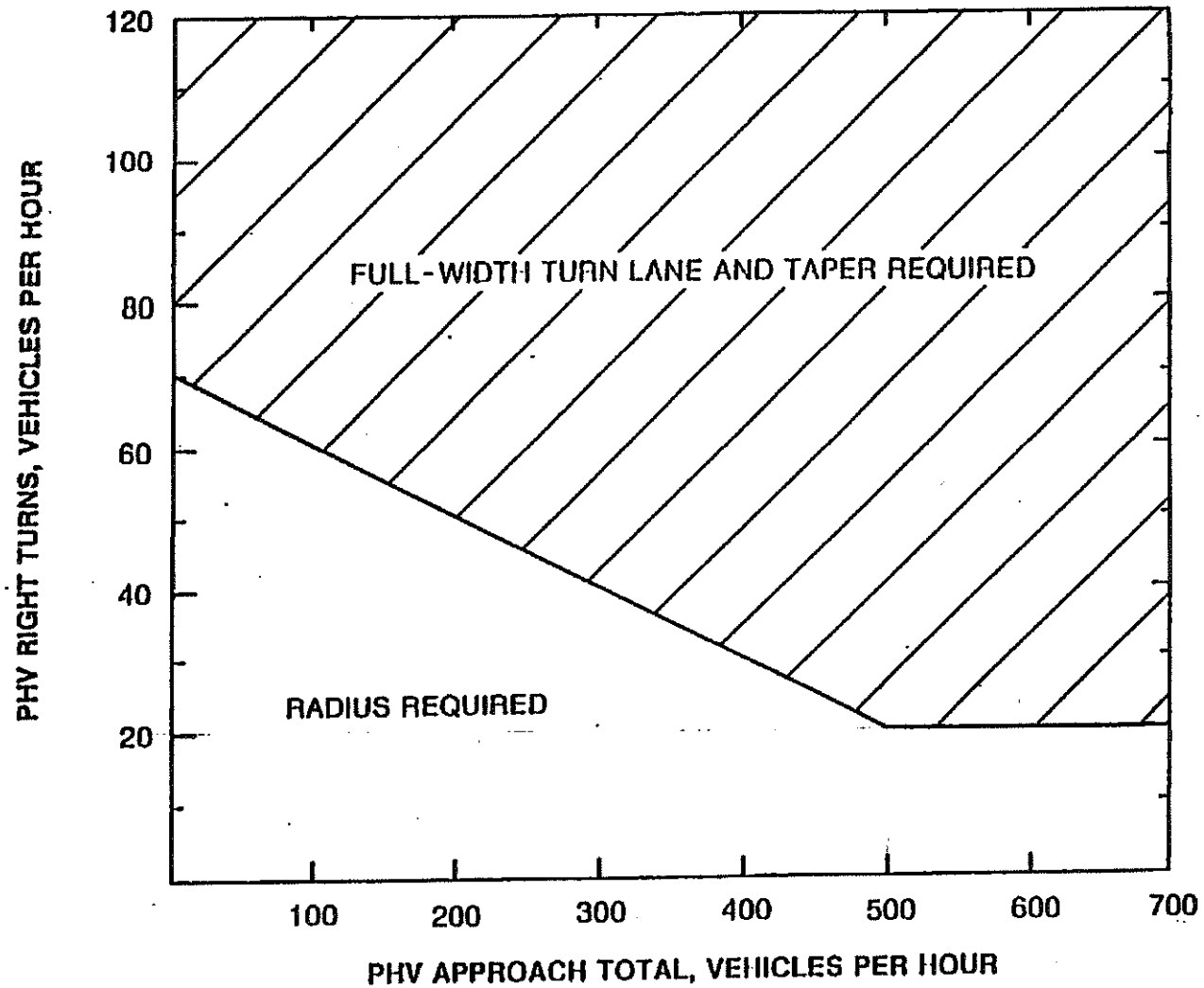
Figures 2 and 3 shall be used to determine the proper treatment for right turn movements at entrances. The peak hour volume (PHV) of right turning vehicles shall be determined as previously discussed in these guidelines.

The guidelines are differentiated on the basis of the number of lanes on the roadway for which an entrance is proposed. Figure 2 shall be referred to for 2-lane roadways, while Figure 3 shall be used for multi-lane roadways; i.e., four or more lanes. All volumes refer to the volumes on the approach under consideration for right turn treatments.



APPLICATION OF OFFSET CORNER RADIUS ALLOWANCE
FOR DRIVEWAY AT INTERSECTION OF TWO ROUTES

DESIGN GUIDELINES FOR DRIVEWAYS AND ENTRANCES ASHLAND, VIRGINIA	FIGURE 1



LEGEND

PHV - Peak Hour Volume (also Design Hourly Volume equivalent)

Adjustment for Right Turns

For posted speeds at or under 45 mph (72 km/hr.), PHV right turns > 40, and PHV total < 300

Adjusted PHV Right Turns = PHV Right Turns - 20

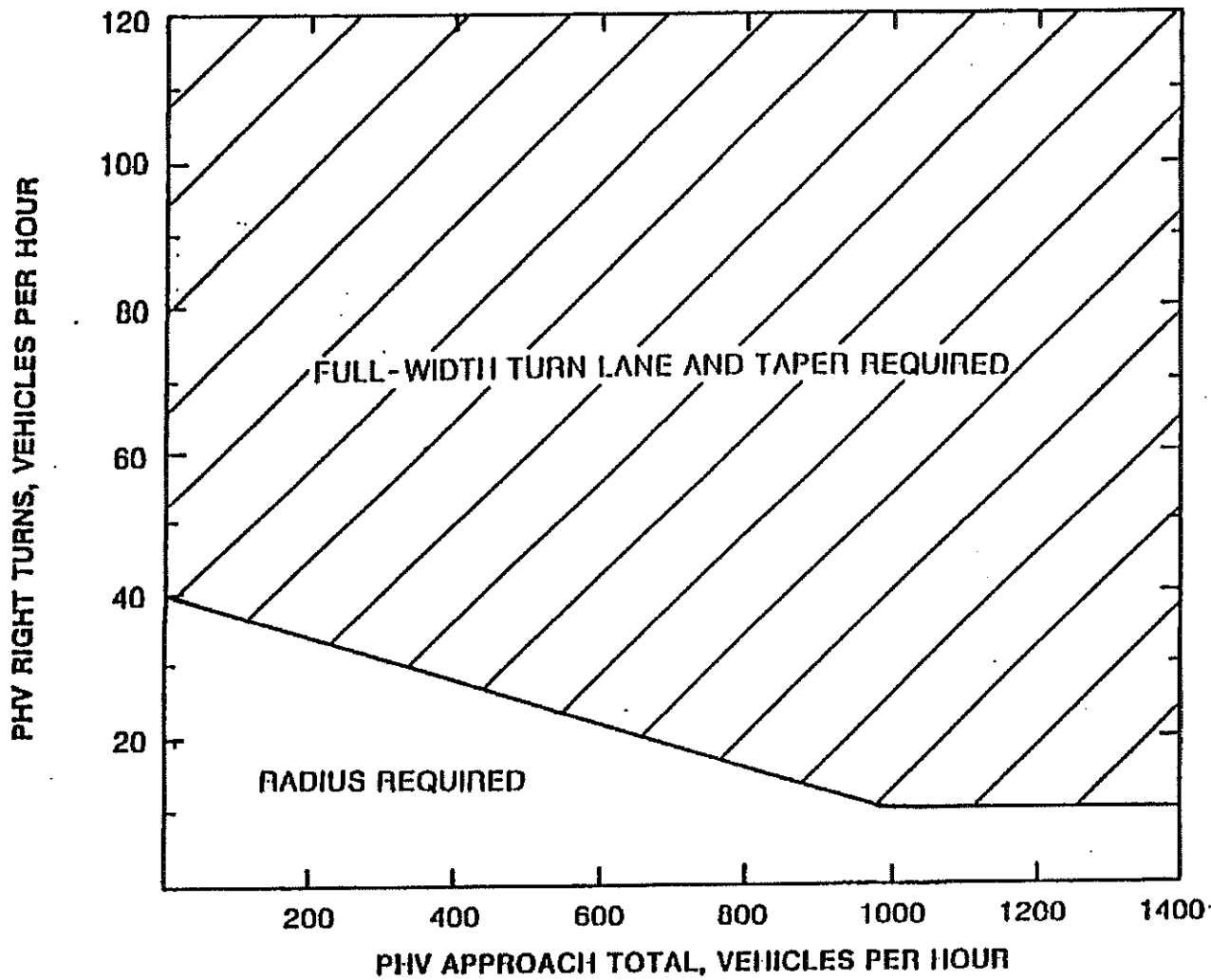
If PHV is not known use formula: PHV = ADT x K x D

K = the percent of AADT occurring in the peak hour
D = the percent of traffic in the peak direction of flow

Note: An average of 11% for K x D will suffice.

GUIDELINES FOR RIGHT TURN TREATMENT (2-LANE HIGHWAY)

FIGURE 2



LEGEND

PHV - Peak Hour Volume (also Design Hourly Volume equivalent)

Adjustment for Right Turns

If PHV is not known use formula: PHV = ADT x K x D

K = the percent of AADT occurring in the peak hour
D = the percent of traffic in the peak direction of flow

Note: An average of 11% for K x D will suffice.

GUIDELINES FOR RIGHT TURN TREATMENT
(4-LANE, OR MORE, HIGHWAY)

FIGURE 3

Using Figure 2 for 2-lane roadways, the predominant treatment for 2-lane roadways will be the radius. The following adjustment shall be made for posted speeds at or under 45 mph, with the Peak Hour Volume (PHV) of right turns greater than 40 and the PHV of the approach less than 300:

Adjusted PHV of Right Turns = PHV of Right Turns-20

This adjustment shall be made to treat local type roadways in an equitable manner since they would experience more turns than an arterial type roadway.

A radius shall be used when the percentage of right turning vehicles makes up less than 10% of the total traffic, unless the volume conditions require a full-width turn lane.

Using Figure 3 for multi-lane roadways, multi-lane roadways will tend to have a full-width turn lane to facilitate right turn movements.

Other factors that influence the selection of a treatment for right turn movements are sight distance, availability of right of way, grade, and angle of turn. These factors shall also be given consideration in determining the proper treatment for right turn movements. The guidelines should be used unless the Director of Public Works determines that special treatment is necessary due to other factors.

When a full width right turn lane is called for, its width shall be 12 feet. The length of the full width turn lane shall be determined by capacity analysis for right turn storage. The length of its taper shall be a minimum of 150 feet. On a case-by-case basis, the Town of Ashland may waive the requirements to provide curb and gutter along the length of the right turn lane taper.

Left-Turn Lanes

On a major street with frequent intersections and parallel streets, it is usually possible to prohibit left turns into some driveways without causing undue hardships for motorists. Under such conditions, breaks in barrier medians may not be warranted. As many as half of all driveway accidents may involve left turn entry and a very high percentage of accidents reported as rear end collisions are thought to involve cars attempting to turn left into driveways. The number of such accidents can be greatly reduced by a median area of sufficient width to accommodate a recessed left turn bay or use of two-way left turn lanes. Thus, at high-volume driveways, well-designed breaks in a median may be preferable to the alternative of diverting relatively high turning volumes to downstream intersections. The added intersection turns, together with the attendant circuitous routing, may be more hazardous than the turns into driveways from a left turn bay that has been properly designed.

Other factors affecting median openings include:

1. Potential number of left turns into driveways.

2. Length of frontage along the street right-of-way line of the property proposed to be served.

3. Distance of proposed opening from adjacent intersections or other openings.

4. Length and width of the left turn storage lane as functions of the estimated maximum number of vehicles to be in the lane during peak hours.

5. Traffic control, including signalization, that will be necessary at the median cut. If a traffic signal at the median cut is within one-half mile of another traffic signal, the two shall be coordinated.

Special consideration is needed where major driveways exist on both sides of the thoroughfare. If signal control is warranted and can be employed at a point that allows progressive coordinated flow on the street, several benefits apply. Simultaneous right-turn exit and the left-turn entry flows can take place as overlapping phases. Crossover traffic can be given direct control.

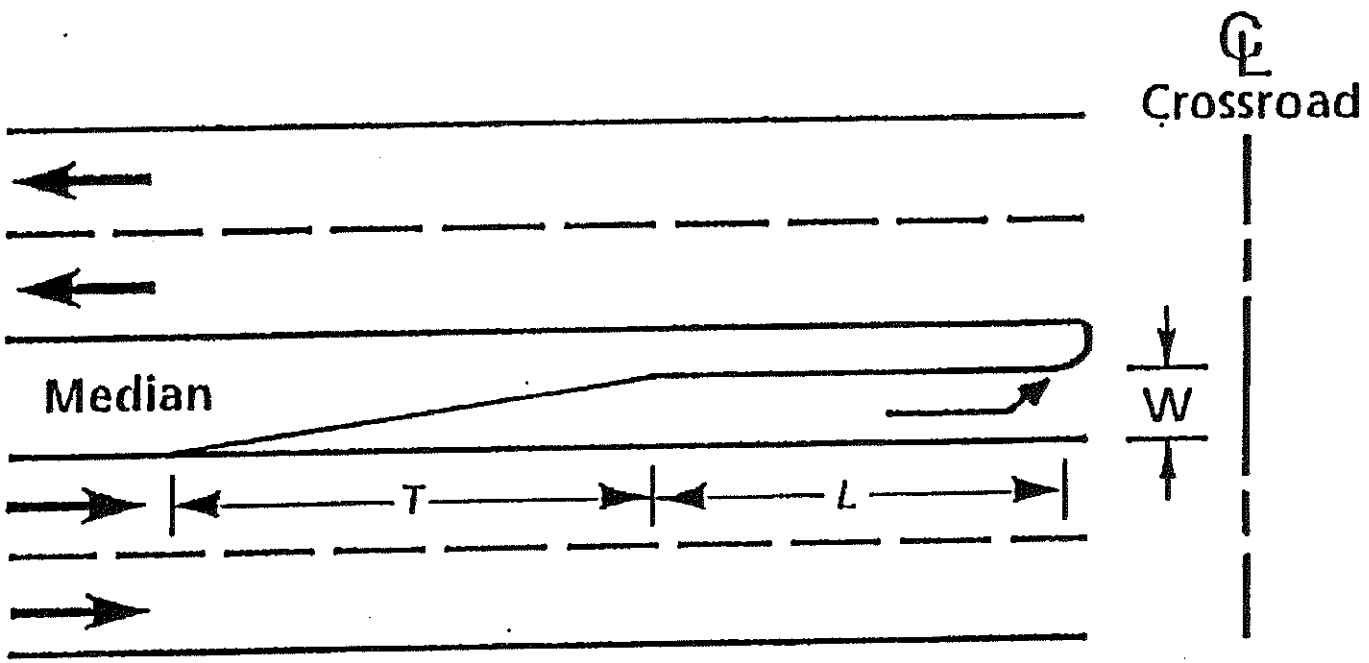
Driveway Alignment

Where a wide median is not available, and signal control is not warranted, then the traffic flow characteristics, and particularly the volumes, of the thoroughfare must be considered. If there are adequate gaps to allow safe crossover of the estimated driveway volumes, with due allowance for the conflicts introduced by left turn entry and exit, then alignment of the driveways is preferable. If the peak hour gaps are projected to be inadequate, then a staggered or offset of the driveways should be considered. The required lengths for weaving must be determined in order to calculate the appropriate offset, but it would normally be several hundred feet. In all cases, short offsets shall be avoided.

These considerations relate to high-volume operations. Most shopping centers have some driveways that primarily serve truck operations and may have very low hourly rates of flow. Spacing of these driveways from others across the street is obviously less critical than in the case of high volume flows.

Left turn lanes will be provided in the design of all median crossovers in accordance with the controls shown in Figure 4. Left turn lanes shall also be designed on two-lane roadways, when traffic volumes are high enough to warrant them, in accordance with the guidelines shown in Figure 5.

When double left turn lanes are required, a capacity analysis of the intersection shall be performed to determine what traffic



TAPER:

FOR DESIGN SPEEDS
35 MPH OR GREATER *T = 200' MINIMUM

FOR DESIGN SPEEDS
LESS THAN 35 MPH *T = 100' MINIMUM

* TAPERS SHALL BE STRAIGHT LINE

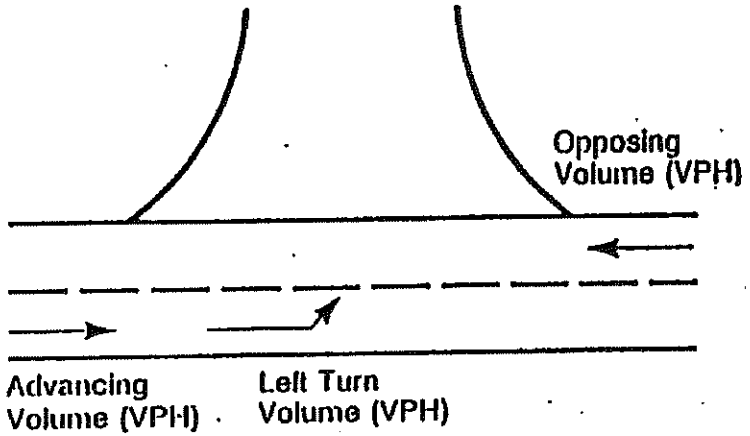
TURNING LANE:

LENGTH OF TURN LANE (L) SHALL BE DETERMINED BY CAPACITY ANALYSIS FOR LEFT TURN STORAGE

DESIGN FOR LEFT TURN LANES

(VPH) Opposing Volume	Advancing Volume (VPH) 5% Left Turns	10% Left Turns	20% Left Turns	30% Left Turns
	35-mph Posted Speed			
800	330	240	180	160
600	410	305	225	200
400	510	380	275	245
200	640	470	350	305
100	720	575	390	340
	45-mph Posted 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

Warrants for left-turn lanes on two-lane highways



Example

Two-lane highway with 35 mph posted speed

Opposing Volume (VPH) = 600
Advancing Volume (VPH) = 440
*Left turn Volume (VPH) = 44 or 10% of advancing volume

With opposing volume (VPH) of 600 and 10% of advancing volume (VPH) making left turns, an advancing volume (VPH) of 305 or more will warrant a left turn lane.

*Left turn volume to be obtained from developer.

WARRANTS FOR LEFT TURN LANES
ON TWO LANE HIGHWAYS

FIGURE 5

controls are necessary, such as signalization and separate phasing, in order for the double left turn to function properly.

Sight Distance

Sight distance criteria shall be considered essential in designing commercial and industrial driveways, and desirable in connection with residential driveways.

The sight distance requirements shall be based on a 3.5 foot height of eye and a 4.25 foot height of object. At any driveway or entrance there are numerous objects that can restrict sight distances, such as cut slopes, buildings, vegetation, vehicles, etc. It is very possible to have sight distance in the winter and not in the spring or summer due to the growth of vegetation. These obstructions shall be considered when designing a driveway or entrance. Sight distance requirements should be obtained at the left turn position into the entrance as well as at the driveway or entrance.

To provide the greatest possible safety for not only through traffic but also for traffic entering and leaving an entrance or driveway, the minimum sight distances shown in Table 1, shall be used.

When the criteria for sight distances to the exiting driver's right cannot be met, the need can be eliminated by prohibiting left turns by exiting vehicles.

Restriction of turning movements to right turns in and out of a driveway, together with provision of a right turn acceleration lane designed in accordance with Town standards, can reduce the sight distance criteria, as approved by the Town of Ashland.

Driveway Grades

Vehicles entering and leaving driveways which have abrupt changes in grade must travel at extremely low speeds. For those entering, the possibility of rear-end collisions on the public street is greatly increased. Exiting vehicles must wait for larger gaps in traffic, and thus hazards may become greater. The driveway profile is also an important design element with respect to comfort of vehicle occupants and as it affects potential damage to the underside of vehicles.

Acceptable vertical profiles of driveways are generally governed by the operating characteristics of vehicles. Maximum grades are established by the physical dimensions of vehicles (principally wheelbase) and braking capabilities, primarily of trucks. Designs must then be further refined as to: curb and shoulder cross-section within the right-of-way, and whether a sag or a crest curve is required to complete the driveway beyond the right-of-way.

TABLE 1

SIGHT DISTANCES ALONG ROADWAYS AT INTERSECTION WITH ENTRANCES

Design Guidelines for Driveways and Entrances
Ashland, Virginia

* Speed Limit	25	30	35	40	45	50	55
2 & 3 Lane Road or 4-Lane Divided Highways not at Crossovers	250	300	350	400	450	500	550
4-Lane Undivided And 4-Lane Divided Highways at Cross-overs	300	350	400	475	525	600	650

* Where the operating speed on the respective segment of highway is determined to be lower than the legal speed limit, and in the judgment of the engineers the operating speed will not create hazards for either a driver at a connection or on the major roadway and the legal speed limit cannot, and in all probability will not be obtained in the foreseeable future as a result of improvement or reconstruction, the sight distance requirements for the operating speed may then be applied. The operating speed shall be determined by a traffic engineering study at the location in question. In all cases when the operating speed is used in lieu of the speed limit, full documentation of its determination shall be attached to the site plan review submittal.

Figure 6 shows desirable and suggested maximum grade changes for three classes of driveways. For the values shown, no vertical curve connecting the tangents is necessary. The value of G1 is limited by shoulder slope or by the presence of a sidewalk within the right-of-way, but desirable should not exceed 10 percent.

For grade changes more abrupt than those shown in Figure 6. vertical curves at least 10 feet long should be used to connect tangents.

Maximum grades (G2) shall generally be limited to 15 percent for residential driveways and to 5 to 8 percent for commercial and industrial driveways. If possible, driveways that must be steeper than those recommended limits should have longer tangent sections (at G1 grade) than those discussed below.

Within 10 feet of the roadway edge, the driveway grade shall be limited to 6.0 percent when possible. The maximum difference between the downward cross slope of the traveled way and the upward slope of the driveway to the sidewalk shall not exceed 8.0 percent. The driveway crossing of the sidewalk shall be made with little or no change in the sidewalk grade or cross-section. If adequate curb return radii precludes meeting this objective, the sidewalk shall be warped into the driveway grade. The driveway slope upward from the gutter line on a straight slope (no vertical curve) shall be at least 10 feet long for residential driveways and 40 feet long for commercial and industrial driveways.

The same physical limitations apply to roadways with shoulders except that the driveway grade across the shoulder shall be that of the shoulder. The grade between the outer edge of the shoulder and the property line shall be appropriate for the type of drainage provided.

Basic Driveways

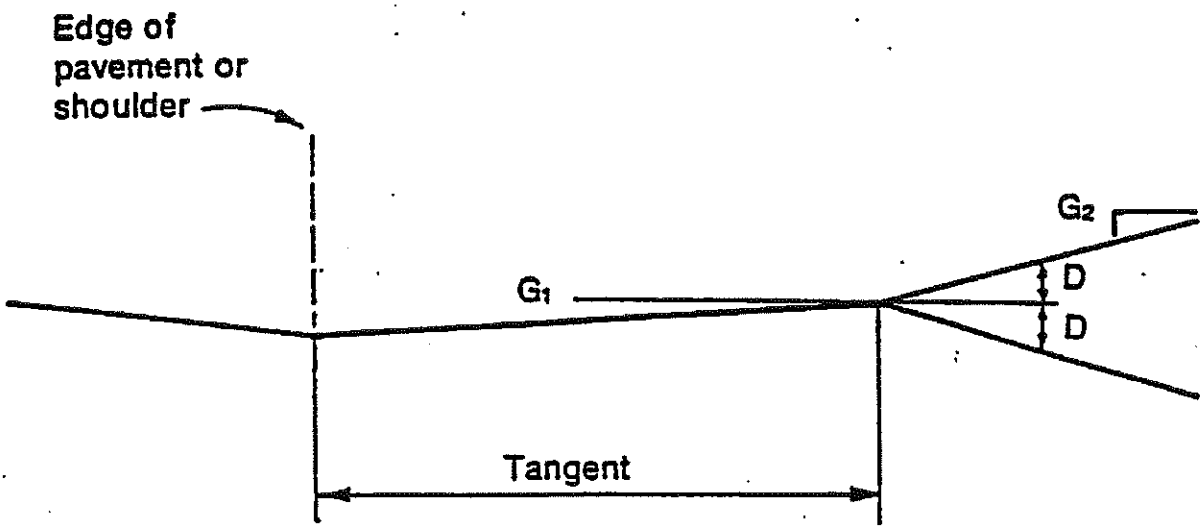
Basic widths, curb spacing, radii, and angles of driveways for various land uses are given in Table 2.

Illustrations presented in Appendix A detail specific treatments that will apply at entrances along roadways with shoulders, entrances along roadways with curb and gutter and special entrances.

It should be stressed that these design values are guidelines. The dimensions may be adjusted by the Director of Public Works as required to handle expected traffic conditions.

Major Driveway Design Factors

Special care shall be taken in designing driveways serving very high generation uses such as shopping centers, large industrial plants, major office building complexes, and high density apartment developments. Specific elements have been



	Suggested Maximum Grade Change (D)	
	Desirable	Maximum
High Volume Driveway	0 %	± 3 %
Low Volume Driveway on Major or Collector Streets	± 3 %	± 6 %
Low Volume Driveway on Local Streets	± 6 %	Controlled by Vehicle Clearance (± 15%)

SUGGESTED DRIVEWAY PROFILE

DESIGN GUIDELINES FOR DRIVEWAYS AND ENTRANCES ASHLAND, VIRGINIA	FIGURE 6

TABLE 2

BASIC DRIVEWAY DIMENSION GUIDELINES

Design Guideline for Driveways and Entrances
Ashland, Virginia

Design Element	Single Family Residential		Multi Family and Commercial		Industrial	
	Min.	Max.	Min.	Max.	Min.	Max.
Nominal Width						
one-way	10	24	14	20	20	30
two-way	--	--	30	50	40	50
Right turn radius	--	--	25	--	25	--
Spacing						
From property line	--	--	25	--	25	--
From street corner(1)	40/60	--	50/75	--	50/75	--
Minimum Angle(2)						
one-way	45	--	45	--	50	--
two-way	70	--	80	--	80	--

(1) XX/YY: XX - measured from the right-of-way line of the intersecting street to the face of the entrance curb; YY - measured from the extended curb line of the intersecting street to the face of the entrance curb; which ever value results in the greatest distance shall be used.

(2) Minimum acute angle measured from the edge of pavement.

discussed under sections on volumes, radii and width, angles, spacing, crossovers, right-turn and left turn lanes, sight distances, and driveway grades.

When left-turn lanes are to be provided at major driveways, a minimum spacing is automatically established for successive driveways that are to have left turn entry or exit. The basic factors are the distance required for the median taper and the length of the storage lane. If a driveway on a major route is opposite a street, a left-turn lane for the street shall be incorporated. This will further increase the required distance between major driveways.

The distance of a major driveway, with left-turn channelization from a nearby intersection which also has left-turn lanes, will vary depending on whether the driveway is on the approach or departure side of the intersection with respect to the left-turn lane.

It is difficult to specify the distances, consistent with actual traffic needs, that driveways should be from intersections. It is important that driveways be designed for the particular traffic characteristics anticipated and that upstream and downstream factors affecting a driveway location be considered in each instance.

The entry movement to a series of driveways serving interconnected or common parking areas tends to be heavily concentrated at the first driveway in the series. Thus, deceleration lanes for right turns may be needed only at the first one or two driveways serving a given approach to a major facility. The value of a deceleration lane and the length of lane required is a function of the right-turning volume into the driveway, the volume in the curb lane, and the speed of entry allowable by the driveway's geometric design. Driveways with relatively high speed entries may require no deceleration lane for even high volumes.

Signalization

Traffic signal control of high volume driveways shall be considered by the Town on a case by case basis, based on the results of a Traffic Signal Warrant Analysis. The Traffic Signal Warrant Analysis shall be performed by a traffic engineering consultant, in accordance with the warrants contained in the latest edition of the Manual on Uniform Traffic Control Devices for Streets and Highways.

All traffic signals proposed within one-half mile of an existing traffic signal, shall be coordinated with the existing signal(s). Appropriate traffic signal design plans shall be submitted to the Town for review and approval.

Reservoir Space

In designing driveways, attention shall be given those situations where on-site geometrics affect safe and efficient movement of traffic on public rights-of-way. This problem is most evident with the drive-in type service developments which generate high volumes and require drivers to remain in their vehicles while being served or until service begins. Examples of this type of development are drive-in banks, automatic car washes, drive-in theaters, and attendant-park lots and garages. In such cases, the design shall provide adequate off-street reservoir space for waiting vehicles. Extreme care must be taken to minimize the probability that a queue of waiting vehicles will extend into the roadway.

In designing these site improvements, peaking within the design hourly volume is critical. Therefore, in addition to using the conventional critical hourly volume to measure the peak demand, the 5-minute, 15-minute, or 30-minute demand shall also be considered.

For all types of reservoirs, a length of 20 feet shall be used for each car space.

Construction

To prevent undue interference with free traffic movements, entrance locations shall be avoided within intersection areas, traffic circles, railroad grade crossings, within the limits of ramp connections to interchanges or any similar areas of traffic congestion. It is further essential that entrances be designed so as to allow reasonably unimpeded traffic movements entering and leaving the entrances. Parking and storage spaces must be located a reasonable distance from the entrance location so as to not unduly interfere with vehicles attempting to enter or exit the main traveled way.

The type and depth of pavement must be clearly indicated in the plans, and the pavement of entrances, turn lanes, and tapers must be stable material which is at least comparable to the pavement of the main roadway.

Curbing should be set inside the right of way line, in accordance with subdivision and zoning ordinance requirements, and should extend from the setback distance from the edge of pavement to the right of way line. Curbing will be required to be set back a minimum distance of 5 feet along the right of way line abutting parking areas.

The Town will determine the need for additional curbing along the right of way to the adjacent property line.

All curbing and entrance gutters used to construct entrances must be installed in accordance with the latest edition of the Virginia Department of Transportation's "Road and Bridge Specifications" and "Road and Bridge Standards". "Mountable" curbing (VDOT Standards CG-3 or CG-7, or similar) will not be permitted in the Town of Ashland.

Drainage

Entrances are to be construction so as not to impair drainage within the right of way, and so that surface water will drain from the roadway.

The property owner constructing a new private entrance shall furnish the necessary size pipe which meets the specifications of the Town of Ashland or the Virginia Department of Transportation. The property owner or developer shall be responsible for the entire construction of the entrance. Pipe ends must be flared and grading at pipe ends must be done in such a manner as to minimize any hazard which the pipe end may present to an out of control vehicle.

Facilities for the Physically Handicapped

Ramps in curb sections to aid the physically handicapped shall be provided as established by the General Assembly of Virginia and covered under Title 15.1, Chapter 10, Section 15.1-381 of the Code of Virginia, as amended, should a pedestrian way be determined necessary by the Town.

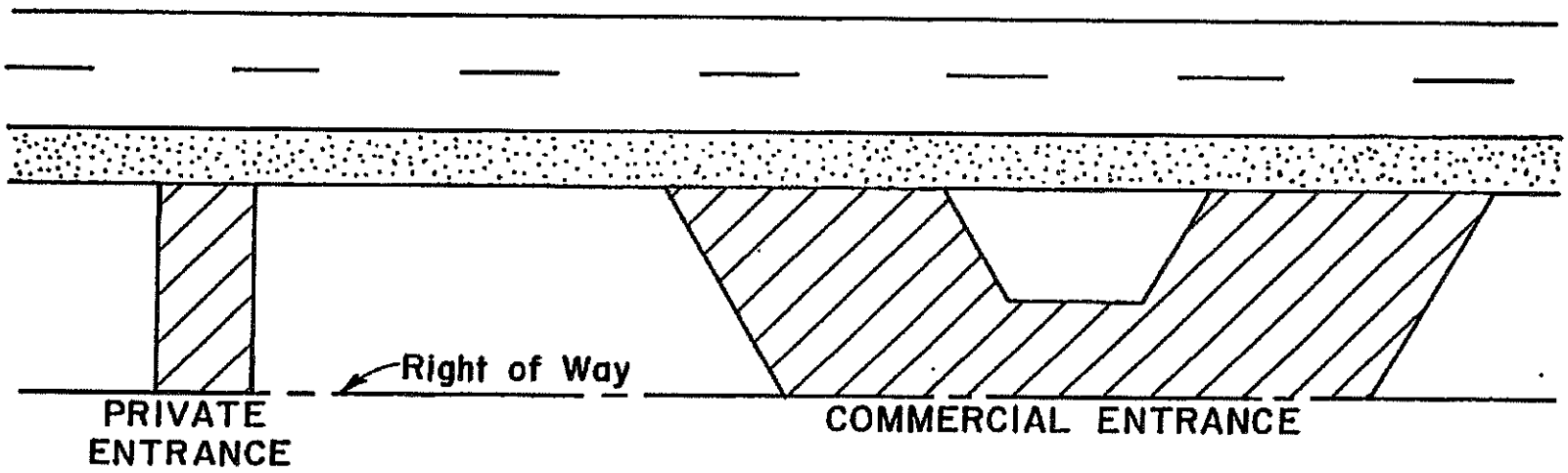
Responsibility for Maintenance, Private Entrances

The Town is responsible for the maintenance of that portion of the entrance within the normal shoulder as shown in Figure 7. The property owner is responsible for the maintenance of the remainder of the entrance except that the Town may periodically add stabilization stone to that portion of the entrance on the right of way. The Town is not responsible for any maintenance on hard surfaced entrances beyond the normal shoulder line.

In a curb and gutter section with sidewalk, where the Town is responsible for the maintenance of the sidewalk, the Town is responsible for the maintenance of entrances to the back edge of the sidewalk. Where the Town is not responsible for the maintenance of the sidewalk, its responsibility is for the maintenance of the entrance to a line 2 feet behind the gutter line.

Responsibility for Maintenance, Commercial Entrances

Section 33.1-198 of the Code of Virginia places the responsibility for the maintenance of commercial entrances on the property owner.



LIMITS OF MAINTENANCE
RESPONSIBILITY FOR ENTRANCES

To insure the safety of the traveling public, the Town will maintain that portion of the entrance between the edge of the pavement and the normal shoulder line. The property owner will be responsible for satisfactory maintenance of the remainder of the entrance with the following exceptions:

1. Maintenance of a separation island is the responsibility of the property owner. However, when the Town constructs the separation island as a result of a road project or safety improvement measure, the Town is responsible for the maintenance of the island unless the right of way agreement designates the responsibility to the landowner.

2. Any alternations, shifting or changes not approved or shown on the plans must be submitted to the Town for review and approval.

3. No signs, banners or other advertising media are permitted in islands at entrances within the rights of way.

4. Flowers or low growing shrubs may be planted in islands; however, they are to be properly maintained by the property owner and never allowed to grow above two feet in height so as to restrict sight distance. No planting shall be allowed on highway right-of-way without the approval of the Town of Ashland.

1/23/90

Appendix A

LEGEND FOR MULTI-FAMILY, COMMERCIAL AND INDUSTRIAL STANDARD ENTRANCE DETAILS

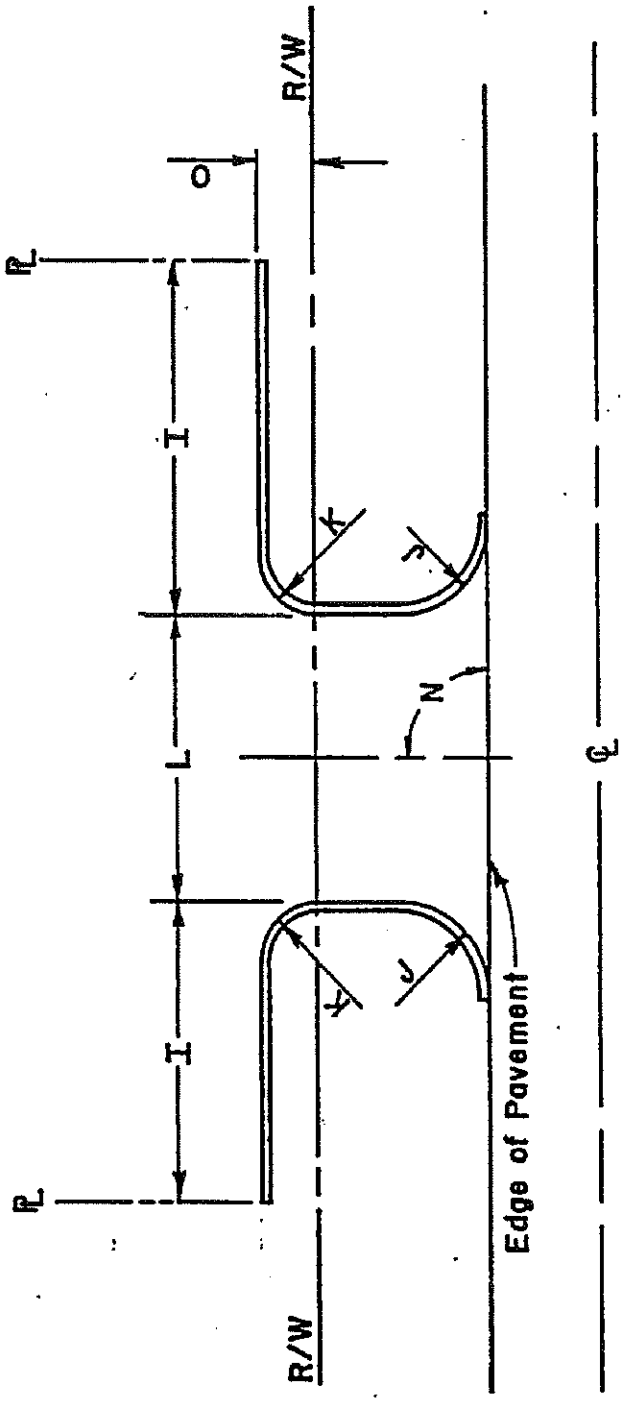
Design Guidelines for Driveways and Entrances
Town of Ashland, Virginia

DESIGN FEATURE	LETTER SYMBOL	DIMENSIONS
Length of auxiliary lanes (right turn lanes or acceleration lanes)(Note: Refer to Figures 2 and 3 to determine if an auxiliary lane is required)	A & C	200' - posted speed 35 MPH or higher 100' - posted speed less than 35 MPH
Length of tapers	B & D	200' - posted speed 35 MPH or higher 100' - posted speed less than 35 MPH
Minimum length of tangent curbing from point of curvature forming connection radius at intersection to point of curvature of radius forming entrance	E	60' minimum
Width of auxiliary lane	F	12' minimum, or to the ultimate cross-section design standards as specified in the Transportation Plan
Width of island separating entrances between 2 two way or 1 two way and 1 one way entrance	G	50' minimum
Width of island separating entrances between 2 one way entrances	H	4' minimum
Face of entrance curb to adjoining property line, except for combined entrances	I	25' minimum
Radius of the outside or larger curve radius used to delineate entry and/or exit path of vehicle	J	25' minimum

LEGEND FOR MULTI-FAMILY, COMMERCIAL AND INDUSTRIAL STANDARD ENTRANCE DETAILS
(Continued)

Design Guidelines for Driveways and Entrances
Town of Ashland, Virginia

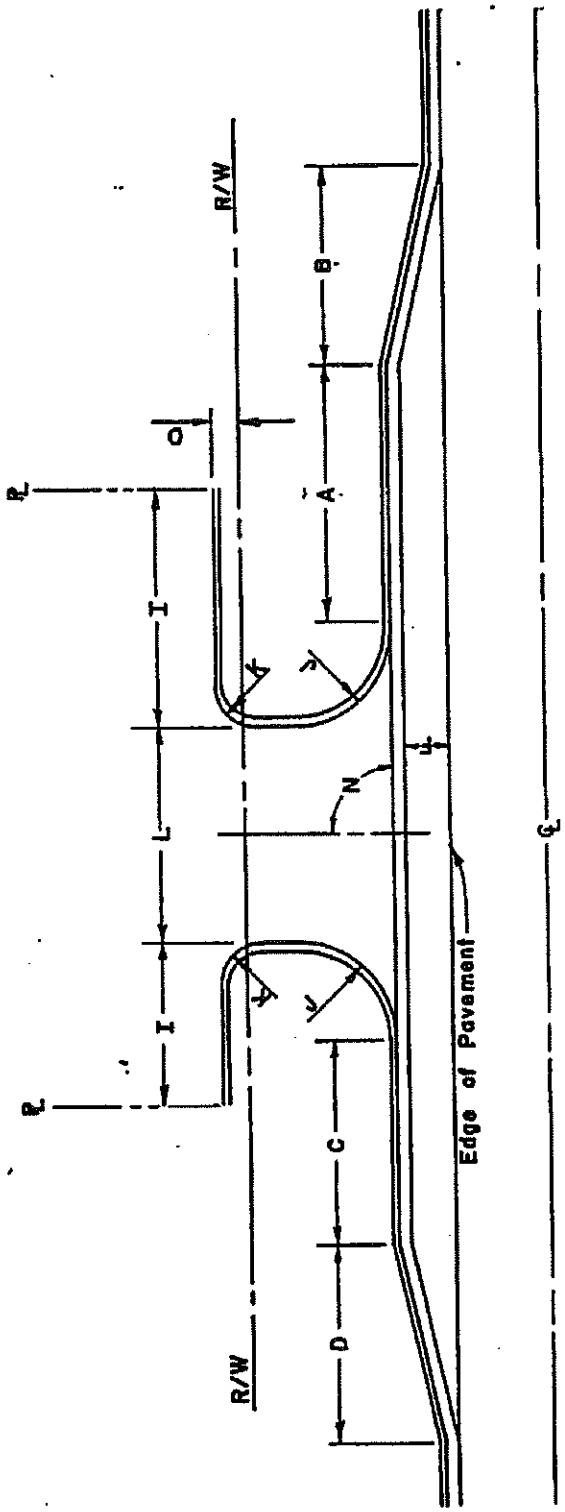
DESIGN FEATURE	LETTER SYMBOL	DIMENSIONS
Radius of the inside or smaller curve used in connection with Radius (J) to connect tangent sections of entrance curbing	K	12.5' minimum
Width of two way entrance	L	30' minimum, See Table 2
Width of one way entrance	M	10' minimum, See Table 2
Angle of entrance to highway pavement edge	N	45 degrees minimum, See Table 2
Set-back distance of curbing from right of way line where parking areas abut the right of way line	O	5' minimum



STANDARD SINGLE TWO-WAY ENTRANCE

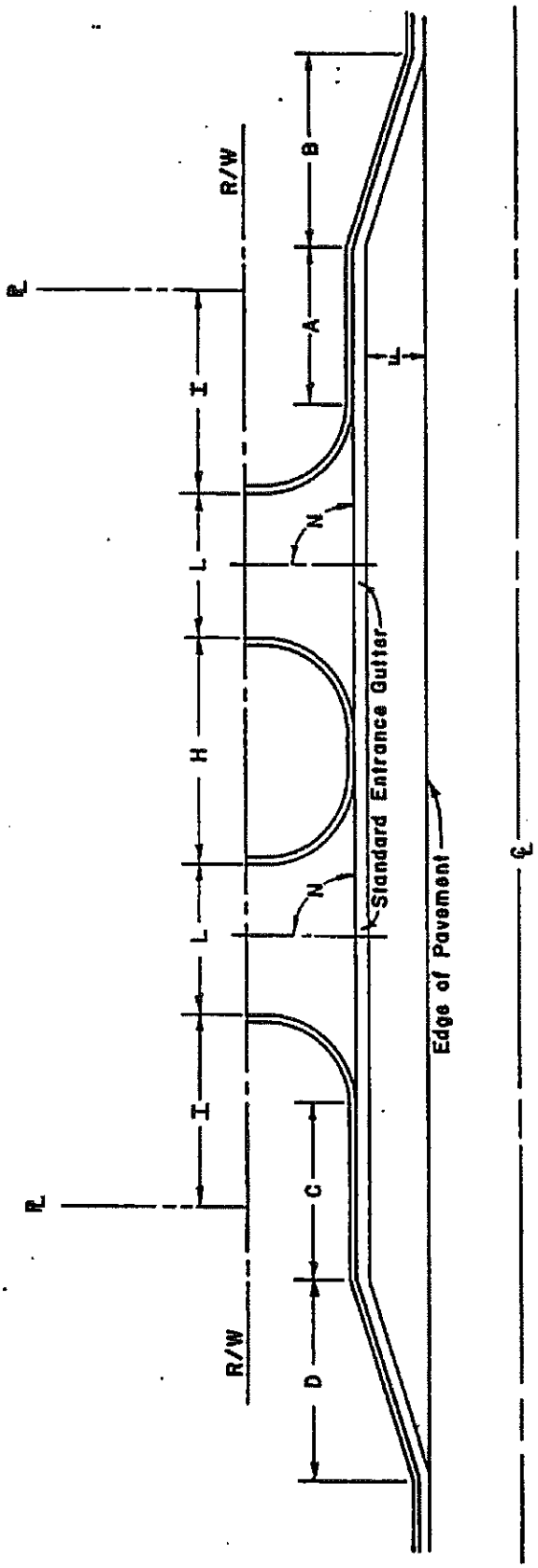
DESIGN GUIDELINES FOR DRIVEWAYS AND ENTRANCES
ASHLAND, VIRGINIA

FIGURE
A1



STANDARD SINGLE TWO-WAY ENTRANCE
WITH RIGHT TURN AND ACCELERATION LANES

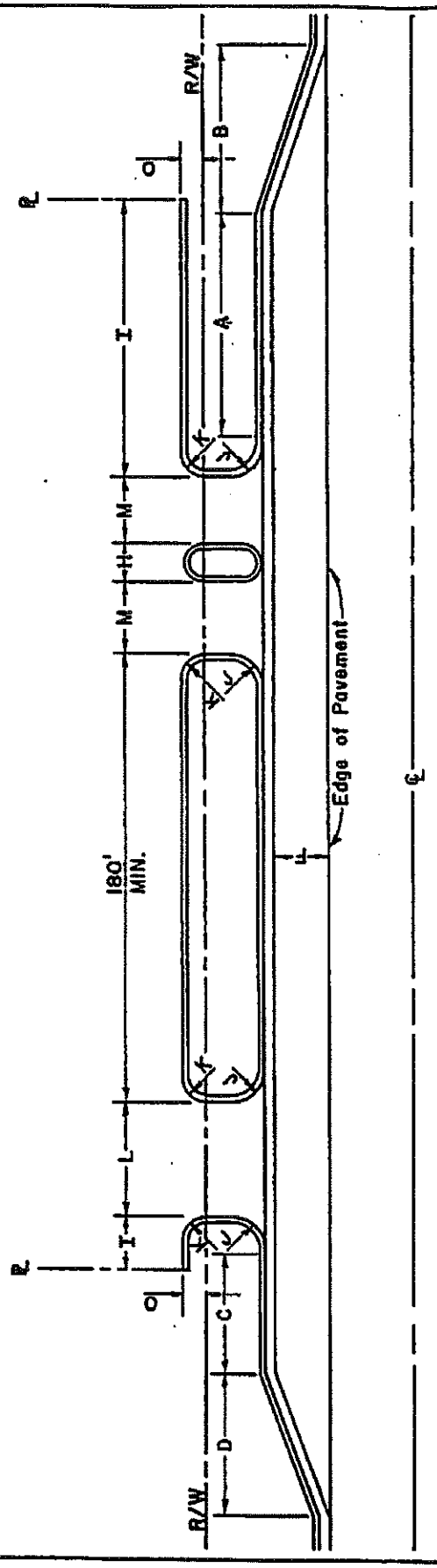
DESIGN GUIDELINES FOR DRIVEWAYS AND ENTRANCES ASHLAND, VIRGINIA	FIGURE A2



STANDARD MULTIPLE ENTRANCES WITH
RIGHT TURN AND ACCELERATION LANES

DESIGN GUIDELINES FOR DRIVEWAYS AND ENTRANCES
ASHLAND, VIRGINIA

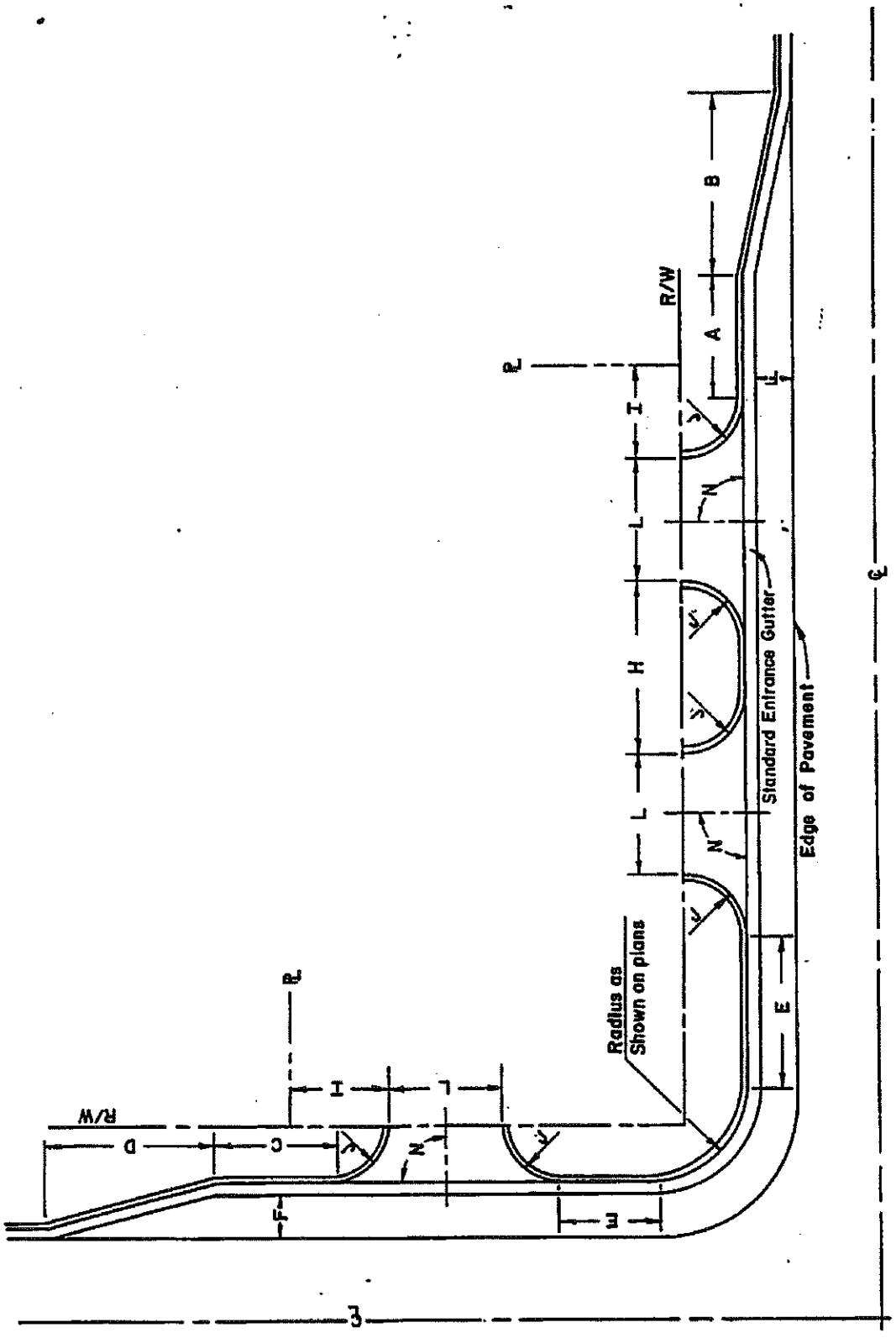
FIGURE
A3



STANDARD SHOPPING CENTER ENTRANCES

DESIGN GUIDELINES FOR DRIVEWAYS AND ENTRANCES
ASHLAND, VIRGINIA

FIGURE
A4



STANDARD MULTIPLE ENTRANCES
AT AN INTERSECTION

DESIGN GUIDELINES FOR DRIVEWAYS AND ENTRANCES
ASHLAND, VIRGINIA

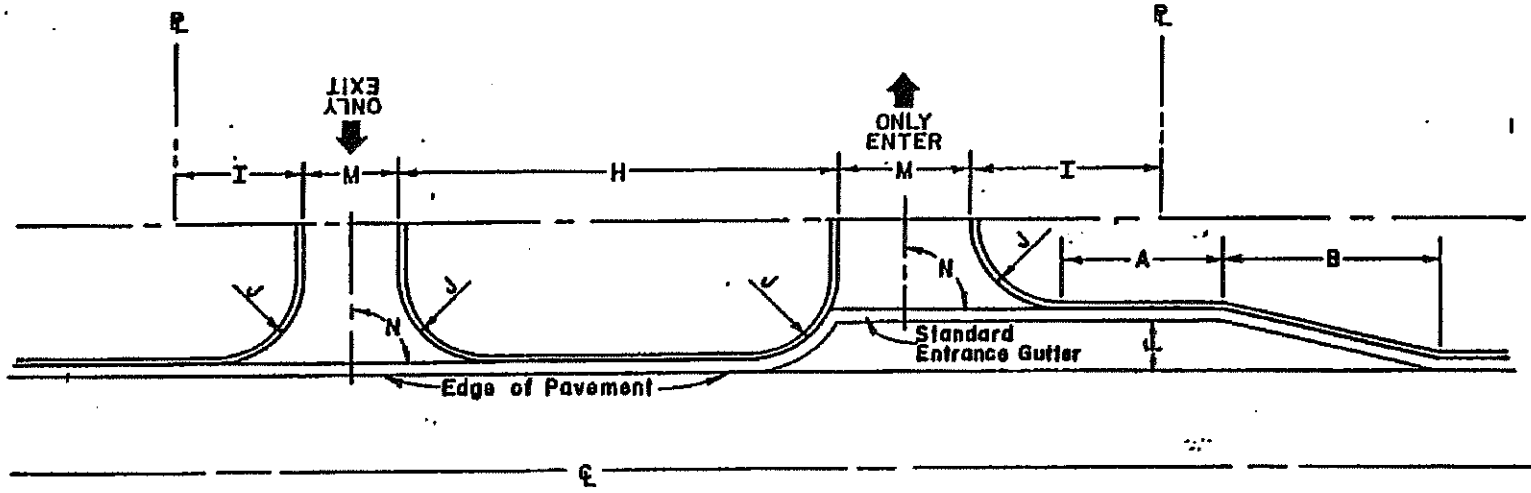
FIGURE
A5

DESIGN GUIDELINES FOR DRIVEWAYS AND ENTRANCES
ASHLAND, VIRGINIA

Minimum Distance From Gasoline Pump to R/W Line For Service Stations	
Pump Island to Pavement Edge	Distance
Parallel	25 ft.
1° to 45°	25 ft.
46° to 90°	50 ft.

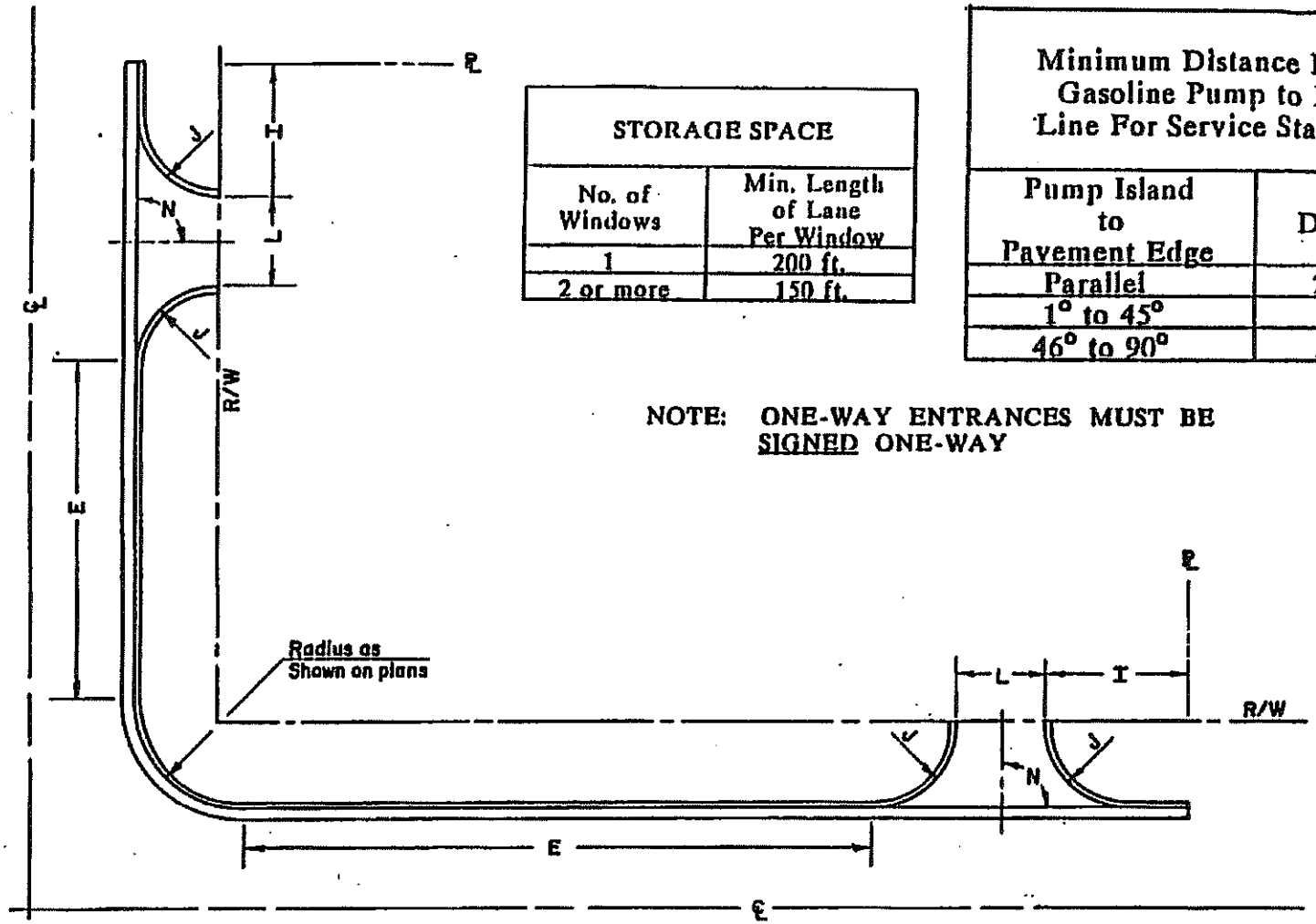
STORAGE SPACE	
No. of Windows	Min. Length of Lane Per Window
1	200 ft.
2 or more	150 ft.

NOTE: ONE-WAY ENTRANCES MUST BE SIGNED ONE-WAY



STANDARD ENTRANCES TO SERVE A DRIVE-IN TYPE BUSINESS AT MID-BLOCK WITH RIGHT TURN LANE

FIGURE A6



STORAGE SPACE	
No. of Windows	Min. Length of Lane Per Window
1	200 ft.
2 or more	150 ft.

Minimum Distance From Gasoline Pump to R/W Line For Service Stations	
Pump Island to Pavement Edge	Distance
Parallel	25 ft.
1° to 45°	25 ft.
46° to 90°	50 ft.

NOTE: ONE-WAY ENTRANCES MUST BE SIGNED ONE-WAY

STANDARD ENTRANCES TO SERVE A DRIVE-IN TYPE BUSINESS AT AN INTERSECTION

FIGURE A7