SECTION 3000
STREETS
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3010 GENERAL

The latest revision of the NCDOT "Standard Specifications for Roads and Structures" shall apply unless otherwise specified herein. The following substitutions shall be read into the aforementioned specifications:

- "State" or "Commission" shall be replaced by "Cary".
- "Resident Engineer" shall be replaced by "Director of Transportation, Director of Utilities, or their authorized representative".
- "Sampling and testing by Commission" shall be replaced by the words "sampling and testing by Cary or its duly authorized testing agent".
- "Inspection by Commission" shall be replaced by "Inspection by Cary or its duly authorized representative".
- Public streets shall be designed and constructed to Cary Standards unless NCDOT Standards are applicable. NCDOT Standards shall be applicable on all existing state roads, extensions of state roads, or roads expected to be maintained by the state. On Cary Streets, for any standard specification not mentioned in this document please refer to NCDOT Standard Specifications.

3020 DESIGN CONTROLS AND CRITERIA

A. STREET CLASSIFICATIONS

Transportation, quality of life, and economic development are undeniably connected to well-planned, well-designed, and context sensitive transportation solutions. The designations “well-planned”, “well-designed”, and “context- sensitive” imply that transportation is an integral part of a comprehensive network that safely supports the needs of the community and traveling public that are served. Cary supports that complete streets are an important aspect of the quality of life we enjoy in Cary. Cary has developed a wide- range of street types, including both public and private, that accommodate all users in context with surrounding land uses.

Streets are classified according to the nature of the land uses they serve and the mode of travel (non-motorized and motorized) they accommodate. Streets are networked to provide a balance between access and mobility.

All streets shall conform to the Cary Planned Roadway Widths map within the Cary Community Plan when applicable or shall be designed and located in proper relation to existing streets and the surrounding environment. Street design should be consistent with topography and preserve developed properties and community values.

All street networks are to provide safe and efficient access to all properties. No property shall be landlocked or excessively removed from the street facilities.
All streets should be continued with the development of adjacent properties when there is a transportation and connectivity need.

All single-family detached dwelling units, townhouse dwelling units and semi-attached/attached dwelling units must be served by public streets. Private streets will only be permitted for non-residential and multi-family residential uses.

1. Local

Local streets provide the highest degree of access and the least mobility. They are generally associated with residential areas and permit direct access to abutting land. Local streets shall be designed to discourage high speed traffic and minimize excessive cut and fill slopes. Local streets also constitute the backbone of neighborhood pedestrian and bicycle networks.

a. Minor Local Streets

This is a street whose primary function is to serve abutting residential land uses where the traffic volume is expected to be very low.

1) Cul-de-sacs

The standard maximum length for a cul-de-sac street shall be 900 feet. The length of a cul-de-sac shall be measured from the last point of alternate access.

Median islands are generally not allowed in a cul-de-sac. A median island may be permitted where the cul-de-sac radius is increased and it can be demonstrated that all emergency vehicles can be readily accommodated. In no means can a cul-de-sac radius be less than 55 feet with a median. On- street parking in the cul-de-sac bulb area is prohibited where a median island is located.

Hammerheads, or other types of alternative turn-around types, shall not be allowed for any construction. This applies to private streets, public streets, and temporary dead-end streets.

2) General Characteristics of Minor Local Streets

a) Serves residential uses only;
b) Less than ¼-mile in length;
c) Do not provide direct continuity or direct connection to thoroughfares;
d) ADT volumes are expected to be less than 400 vehicles per day (VEHICLES PER DAY);
e) Sidewalk –see Section 3030(B)2;
f) Bicycles and vehicles share the same travel-way;
g) Posted speed of street shall be 25 mph;
h) Driveway cuts are permitted;

i) Along townhouse streets, a 4-foot wide utility and street lights easement is required for providing water and sewer services. On street parking is permitted but shall in no way obstruct 2-way travel lanes or bike lanes;
j) Perpendicular parking, located outside of the public right of way, is allowed within townhouse developments; and
k) The design vehicle type – passenger vehicle.

b. Major Local Streets

This is a street whose primary function is to serve abutting residential land uses. Motorists using such streets generally include only residents and their visitors. Use of such streets by large trucks and heavy vehicles is rare, except for occasional use by maintenance and delivery vehicles. Primary design concerns focus on fostering a safe and pleasant environment for the residential community, with convenience to the motorist secondary.

1) General Characteristics of Major Local Streets
   a) Serves residential uses only;
   b) Less than ½-mile in length;
   c) Do not provide direct continuity or direct connection between thoroughfares;
   d) ADT volumes are expected to be more than 400 vehicles per day but less than 1,500 vehicles per day;
   e) Sidewalk –see Section 3030(B)2;
   f) Bicycles and vehicles share the same travel-way;
   g) Posted speed of street shall be 25 mph;
   h) Driveway cuts are permitted;
   i) On street parking is permitted but shall in no way obstruct 2-way travel lanes or bike lanes; and
   j) The design vehicle type – passenger vehicle.

c. Alleys

The purpose of an alley is to provide utility and vehicular access to developments as an alternative to front loading streets. Services, such as garbage removal, can be provided via alleys. Measures shall be taken as needed to ensure that alleys are not obstructed in any manner, including parking.

Alleys that serve single-family detached dwelling units, townhouse dwelling units and semi-attached/attached dwelling units shall be public.

General Characteristics of Public Alleys:
1) Minimum turning radii to allow emergency vehicles, such as a fire truck apparatus and garbage vehicles, to comfortably and safely maneuver through the site;
2) Driveway cuts are permitted;

3) On street parking is limited; and
4) Along townhouse alleys, a 4-foot wide utility and street lights easement is required for providing water and sewer services.

d. Private Streets

Private streets will only be permitted for commercial, office, public/institutional, industrial and multi-family residential uses, regardless of the form of ownership (individual, condominium, rental, etc.).
Private streets require approved street names and street sign installations.

1) General Characteristics of Private Streets
   a) Allow rows of parking on either side of street in a parallel, front-in, or angled configuration. If on-street parking is provided, the parking area shall in no way block or obstruct two-way travel lanes, bike lanes, or interfere with an intersection;
   b) Main travel-way will be within a public vehicle access easement, not maintained by Cary;
   c) Sidewalk – see Section 3030(B)2;
   d) Bicycles and vehicles share the same travel-way;
   e) Driveway cuts are permitted;
   f) The design vehicle - passenger vehicle (residential)
   g) Single unit truck or predominate truck type (commercial).

e. Private Access-ways

Private access-ways will only be allowed for multi-family residential and commercial uses. Such access-ways shall provide direct access to relatively high levels of on-site parking. These types of streets serve a dual function of providing access to adjacent property as well as providing connections between other local roads. They provide a formal path for pedestrians, bicycles, and vehicles. Parking spaces may be parallel, front-in, or angled in configuration.

1) General Characteristics of Private Access-ways
   a) Minimum travel lanes are 11 feet (exclusive of curb and gutter treatment);
   b) Main travel-way will be within a public vehicle access easement, not maintained by Cary;
   c) Minimum turning radii to allow emergency vehicles, such as a fire truck apparatus and garbage vehicles to comfortably and safely maneuver through the site;
   d) Driveway cuts are permitted; and
   e) On street parking is limited.

f. Private Alleys

Private Alleys that serve non-residential uses and multi-family uses (condos

and apartments) shall be privately maintained. A cross-section and pavement design shall be submitted to and approved by Cary. Cary shall not be responsible for damage to the pavement structure due to its use of a privately maintained alley in providing public services.

1) General Characteristics of Private Alleys
   a) Alleys serving commercial types of property are generally 20 to 24 feet in width (exclusive of curb and gutter treatment);
   b) Main travel-way will be within a public vehicle access easement that is not maintained by Cary;
   c) Minimum turning radii to allow emergency vehicles, such as a fire truck apparatus and garbage vehicles, to comfortably and safely maneuver through the site;
   d) Driveway cuts are permitted; and
   e) On street parking is limited.

2. **Collector**

Collector streets provide a balance between land access and mobility which penetrate various land use classifications. They typically serve as a link between local streets and thoroughfares. The streets are walkable and provide primary routes for pedestrians and bicycles. The typical section generally consists of two travel lanes, striped bike lanes, and sidewalks on both sides. Collector streets are normally identified on the Cary's adopted Planned Roadway Widths map within the Cary Community Plan (Roadway Widths Map); however, for large developments, if the criteria for a new street meets the collector street criteria, then it may also be classified as a collector street. Collector street alignment and location may be modified at the time of development approval based on the location of uses, property lines, topography, soil types, stream features, etc.

a. Minor Collector Street

Minor Collector streets are generally associated with residential areas and permit some limited direct access to abutting residential lots. The street provides two travel lanes including striped bike lanes to accommodate all levels of cyclists. Sidewalks are required on both sides of the street. Access conditions apply when the extent of a development so isolates the remote units of that development from a thoroughfare, that access by emergency or service vehicles can be deemed unsafe, uneconomical, or the ability for residents to reach community travel destinations by means other than access to a thoroughfare can be achieved. Ideally, no residential location is more than one-half mile from a collector street. Access conditions shall also apply where it is deemed reasonable and feasible to interconnect abutting neighborhoods.

1) General Characteristics of Minor Collector Street
   a) Serves residential uses only;
   b) Expected ADT volumes of the roadway are not

anticipated to exceed 3,000 vehicles per day;
c) Sidewalks provided on both sides;
d) Bike lanes provided on both sides of street;
e) On-street parking will not be permitted unless marked spaces are provided that do not block through lane or bike lane;
f) The posted speed should be 30 mph;
g) Driveway cuts are limited;
h) On street parking is limited; and
i) The design vehicle type - single unit truck

b. Major Collector

Major Collector provides two travel lanes including striped bike lanes to accommodate all levels of cyclists. Sidewalks are required on both sides of the street. Curb cuts should be kept to a minimum. If the proposed collector street has a future ADT of 3,000 vehicles per day or greater and meets one of the following criteria, the collector avenue classification will apply:

a) Classification as a major collector road on Cary's adopted Planned Roadway Widths map within the Cary Community Plan (Roadway Widths Map) or aneighboring municipality; and
b) Provides a direct link between two thoroughfares.

1) General Characteristics of Major Collector

a) New road to be named as an Avenue, unless the street is an extension of an existing street network with an existing street name already established;
b) Typical posted speed limit of 35 mph (maximum);
c) On-street parking will not be permitted unless marked spaces are provided that do not block through lane or bike lane;
d) There are a variety of standard cross-sections available for collector avenues, depending on the context of land uses abutting the street. The cross sections are either divided with medians, or are without medians;
e) A 3-lane section must also be used within 200-feet of the intersection of another collector street, and within 400-feet of a thoroughfare; and
f) The design vehicle type – Single unit truck vehicle or predominate truck type.

2) Standard Collector Avenue – Median Divided Design Requirements

a) Driveway cuts along avenues are to be minimized;
b) Installation of bicycle facilities in the form of striped bicycle lanes will be required;
c) Landscape material selection and layout for permanent turf, plantings, and plant beds will be illustrated on the submitted

plan for review. Medians and traffic island landscape maintenance will be the responsibility of the Homeowner's Association. All ornamental plantings shown on the plan will be maintained by the Homeowner's Association. A Cary right-of-way encroachment agreement will be required as part of site plan submittal. Planting design shall be submitted and approved with site plan;

d) Collector avenues serving primarily residential developments will use a median with minimum width of 14 feet. Collector avenues serving primarily commercial, industrial, office or mix-use developments will use a median with minimum width of 19 feet; and

e) Turning lanes may be required at major street intersections and driveways to mitigate potential congestion or for safety reasons.

3) Standard Collector Avenue – Undivided Design Requirements

a) Individual driveway cuts serving single family residential units will not be allowed. Medians will not be required due to the restriction of single-family residential driveway cuts;

b) Collector Avenues serving primarily commercial, industrial, office, or mixed-use and desiring driveway cuts must use a 3-lane cross-section, with a middle turning lane;

c) Installation of bicycle facilities in the form of striped bicycle lanes will be required. Turning lanes may be required at major street intersections and driveways to mitigate potential congestion or for safety reasons; and

d) Design recommendations:

i. Shared access driveways between adjacent lots fronting Collector Avenues (applicable for the Standard cross-section only).

ii. Rear alley construction to provide rear access to development fronting Collector Avenues.

3. Thoroughfare

a. Major Thoroughfares

Major Thoroughfares are heavily traveled streets where mobility is its primary focus. Posted speeds of 45 to 55 miles per hour are recommended. They generally have multiple travel lanes with wide outside lanes to accommodate experience bicyclists. On-street parking and driveway cuts are restricted.

b. Minor Thoroughfares

Minor Thoroughfares are moderately heavy traveled streets where

mobility is also a primary focus and are designed for posted speeds of 35 to 45 miles per hour. They provide two to three travel lanes and wide outside lanes or striped bike lanes to accommodate bicyclists. On-street parking is prohibited, and driveway cuts are limited.

4. Non-Curb and Gutter Streets

Only streets that are located within areas as defined by Cary's Land Development Ordinance that allow non-curb and gutter streets may be constructed with ditch and swale sections.

B. DESIGN SPEED

Design speed is the maximum safe speed that can be obtained on a street when conditions are favorable enough for the design features of the street to control. The design speed chosen for a street should be logical with respect to topography, the adjacent land use, and the classification of the street.

Once selected, all pertinent features of a street, such as width, curvature, sight distance, access points and parking should be related to the design speed.

C. TRAFFIC COMPOSITION

1. General

The physical characteristics and performance of different users have a direct impact on geometric design. Although the dimensions and performance of motorized vehicles typically dictate the components of street design, consideration of the characteristics of non-motorized vehicles and pedestrians should be taken into account.

2. Vehicles

Streets shall be designed such that the traveling paths of these vehicles do not conflict with the physical constraints of the street or hinder the other users of the street. The applicable category of design vehicle is based upon the classification of the street.

Local streets can be subject to both passenger cars and small service trucks. In particular, local streets are to be designed for passenger.

Collector streets are to be designed to accommodate single-unit trucks, or in the case of a non-residential setting, the streets shall accommodate the type of vehicle prevalent for use along the street.

Thoroughfares are to be designed for larger trucks types and buses.

3. Pedestrians

The trip purpose and pedestrian physical abilities are important factors affecting the design of streets and pedestrian facilities. The purpose and frequency of

pedestrian trips, as well as the variability in the abilities of the pedestrians themselves, are heavily dependent upon the adjacent land uses. Measures should be employed to facilitate the pedestrians' use of a roadway and help to reduce pedestrian-vehicular conflicts. More information on pedestrian characteristics and facilities can be found in FHWA's *Pedestrian Facilities Users Guide*.

4. Bicycles

The physical dimensions and abilities of a bicyclist are important factors affecting the design of streets and bicycle facilities. While the physical dimensions are relatively consistent, the skills, confidence, and preference of bicyclists vary dramatically. The design of bicycle facilities will vary with user type, roadway characteristics/conditions. Measures should be employed to facilitate the bicyclist's use of a roadway, help to promote bicyclist use of a roadway and help promote bicyclist/motor vehicle safety and operation. More information on bicyclist characteristics and bike facilities can be found in AASHTO's *Guide for Development of Bicycle Facilities*.

D. STREET INTERSECTION SPACING

There shall be a minimum of 250 feet between centerlines of street jogs on collector streets and thoroughfares. Local streets shall be offset no less than 125 feet from their street centerlines.

Median crossovers and/or signalized intersections shall be evaluated from an operational and safety perspective and provide safe and efficient movement of traffic. The availability of adequate spacing, existing crossovers, alternative routes, access points, and preservation of adequate length of landscape median shall be considered in all proposed crossover locations.

Full movement median crossovers and/or signalized intersections should be spaced along roadways at the following minimum intervals:

1. Thoroughfares: 2,000' (posted speeds > 45mph);
2. Thoroughfares: 1,200' (posted speeds 45 mph and less);
3. Collector Streets: 600'; and
4. Local Streets: 300'.

3030 TYPICAL CROSS SECTION ELEMENTS

The elements which compose the cross section of a street should take into account the classification, design speed, traffic volume, traffic composition, and terrain of that street. The elements of the cross section include the roadway, roadside and the median area. All of these elements lend themselves together into determining the required right-of- way width.

A. ROADWAY

1. Pavement Design

A pavement design will be required for all collector streets and thoroughfares. A pavement design shall also be required for all public streets located within areas with Triassic soils (as shown on Figure 3). The pavement design shall be in accordance with the following specifications.

a. The pavement design and traffic analysis shall be signed and sealed by a NCPE, and shall be submitted for approval prior to placement of curb and gutter or pavement material. All streets maintained by the NCDOT must receive approval of the pavement design from the NCDOT prior to the placement of curb and gutter or pavement material.

b. Approved pavement design methods include those most current as proposed by NCDOT, AASHTO and the Asphalt Institute MS 1 document. Other design methods will not be accepted.

1) The AASHTO method will require use of a terminal serviceability index of 2.0 for collectors and local streets and 2.5 for thoroughfares, $S_o = 0.49$ for flexible pavement or $S_o = 0.39$ for rigid pavements, and a reliability of 98 percent for thoroughfares and 95 percent for collectors.

2) Rigid pavement design shall follow the most current AASHTO Method or the Portland Cement Association Method.

c. Pavement design shall be based on sub-grade conditions, a 20 year design life and projected traffic loading.

d. Truck loading requirements: Local Streets - 3% minimum; Collectors - 5% minimum; Thoroughfares - 6% minimum.

e. Subgrade conditions shall be based upon corrected soaked CBR values at 0.1 inch penetration per ASTM D1883.

f. Soil samples used for these CBR tests shall be obtained at intervals not greater than 500 feet measured along the street centerline.

g. Boring logs and scaled drawings designating boring locations with CBR tests and other pertinent data shall accompany the pavement design.

2. Lane Widths

Travel lane widths:

a. For thoroughfares - desired width of 12-feet for inside thru lanes and 14-feet width for wide outside thru lanes.

b. For collectors and local streets, refer to standard detail drawings.

Cary considers bicycle traffic an important mode of transportation. Bike lanes shall be incorporated into thoroughfare and collector street design as required per Cary's Planned Roadway Widths map within the Cary Community Plan.

3. Curb and Gutter

Curb and gutter shall be required on all streets except as defined by Cary's Land Development Ordinance.

On all public streets, median curb shall be standard 18-inch mountable curb, and all other curb and gutter shall be standard 30 inch. Valley/rolled curb and/or a concrete border curb shall be allowed on public alleys in townhouse and semi-detached/attached residential developments in accordance with Cary standards.

Curb and gutter on all private streets or access ways is preferred, but not necessarily mandatory. If curb and gutter is provided, the standard 30" curb and gutter is encouraged; however, alternative curb treatments are allowed.

A minimum 5-foot section of curb and gutter shall remain when removing curb for the installation of a driveway, street turnout or repair of curb and gutter. When less than 5 feet of the curb remains, the curb shall be removed to the next joint.

B. ROADSIDE

1. Utility Strips

Utility strips shall be sufficient to permit the adequate installation and maintenance of sidewalks and utilities, as well as provide sufficient clear distance as defined by NCDOT.

2. Sidewalk

Sidewalk shall be constructed within the street right of way or within a dedicated sidewalk easement in accordance with Cary Standards and Cary policy. Sidewalks shall be installed at the time of roadway construction, or unless otherwise approved by Cary.

Sidewalk shall be installed on both sides of all thoroughfares and collector streets. In non-residential developments and property located within mixed-use centers, sidewalk shall be provided on both sides of all local and private streets, as well as, along one (1) side of all primary travel ways. Shifting the sidewalk to an adjacent linear island is permitted if it creates better pedestrian connectivity. The Planning Director may approve sidewalk on one (1) side of the street in cases where a street is single-loaded and the opposite side of the street is not expected to develop in the future. Sidewalk shall be required on one (1) side of all local and private streets in residential developments outside of a mixed-use center.

The minimum thickness of a sidewalk shall be 4 inches. A 6-inch depth is required at locations where a driveway crosses a sidewalk, at street intersections (along the length of radius curb returns), and in the handicap ramps. Sidewalks shall have a uniform slope toward the roadway of 0.02' per foot. The utility strip between the sidewalk and the back of curb should slope at ¼" to ½" towards the roadway.

Sidewalks should typically be a minimum distance of five (5) feet off the back of curb with a minimum width of five (5) feet.

Where sidewalks and/or greenways intersect any section of curb and gutter (public or private), a curb ramp shall be installed.

Pedestrian and bike facilities along roadway bridges shall be buffered from adjacent vehicular traffic in accordance with Detail 3100.10. Minimum 48" high barrier required adjacent to vehicular travel lane, and minimum 54" high outside barrier/railing to be provided. Striping to delineate pedestrian and bicycle space to be located in accordance with standard detail.

3. Street-side Trails

Location of paths shall be in keeping with the Greenways Master Plan. In those situations where greenways are proposed to run parallel with roadways, they shall be called street-side trails. Width, offset and pavement design are indicated on the standard details for street-side trails. If right-of-way is not sufficient width for entire street-side trail to be inside the right-of-way, then a public greenway easement shall be provided.

Street-side trails along roadway bridges shall be constructed in accordance with Detail 3100.10. Minimum 48" high barrier adjacent to vehicular travel lane and minimum 54" high outside barrier/railing to be provided. Minimum clear width of trail between vertical barriers shall be 12-feet.

4. Drainage Channels and Side Slopes

Streets designed without curb and gutter must meet all of the following requirements:

a. Meet the latest edition of the NCDOT Roadside Design Guide standards.
b. Minimum 50 feet of right of way;
c. 5% maximum and 0.5% minimum vertical grade;
d. Swales shall be designed per section 8010 and be located within the right-of-way;
e. Driveway pipes shall be designed per section 8010;
f. Driveway pipes shall have flared end sections or headwalls on both ends.

5. Shoulder Sections

Shoulder sections are only allowed on streets where curb & gutter is not required. Shoulder sections must be a minimum of 6 feet wide.

6. Retaining Walls

Retaining walls shall not be located within the public right-of-way. In addition, the retaining wall's structural zone of influence may not extend into the public right-of-way. The structural zone of influence is defined as the area behind the retaining wall to a line rising 45 degrees from the top edge of the wall footing. Retaining wall plans and permits shall include cross-sections and plan sheets denoting the extent of the structural zone of influence for the purpose of documenting that it does not extend into any adjacent rights-of-way. See Section 2120 for additional requirements.

C. MEDIAN SECTIONS

Raised median sections shall be designed per the typical section drawings based on classification of roadway. It is desirable to have continuous median sections on thoroughfare roadways. In no case shall plantings in a median obstruct the required intersection sight distance.

For narrow medians, the brick pavers shall be installed as follows:

Brick pavers and brick soldier course shall be traffic bearing 8" x 4" x 2-3/4" Pine Hall Brick Company, Inc. or equal (Comply with ASTM C1272 – Type F. Application PX and ASTM C67 for freeze/thaw). English edge full range. Brick pavers and soldier course shall bond to the bituminous setting bed using an adhesive Neoprene modified asphalt with 2% neoprene, 10% Asbestos-Free Fibers and 88% Asphalt

Bituminouse setting bed shall consist of an ashplat cement/binder complying with ASTM D3381 and fine aggregate complying with ASTM D1073.

Tack coat shall be emulsified asphalt complying with ASTM D977, Type SS-1 or cutback asphalt complying with ASTM D2028.

Concrete base slab shall cure for at least 14 days prior to placement of setting bed. Class "A" concrete shall meet the requirements of Table 1000-1 of the NCDOT Standard Specifications. Concrete base slab shall control joints as shown in order to control expansion and contraction. Control joints shall continue as an expansion joint through the pavers above.

Compacted aggregate base course (ABC) shall conform to the requirements of NCDOT Standard Specifications Section 520-9.

Subgrade shall be excavated as necessary to remove any substandard or soft materials and replace with acceptable backfill. The subgrade shall be compacted in accordance with NCDOT Standard Specifications Section 500-2(C).

D. DIRECTIONAL CROSS-OVER (LEFT-OVER)

The directional crossover or left-over design eliminates full-movement median openings. Traffic on the major street (thru, left, right) is still permitted. Traffic on the secondary street must turn right onto the major street. This type of crossover design may be used in various situations after an engineering evaluation is performed.

E. ROUNDABOUTS

Roundabouts are circular intersections with specific design and traffic control features. These features include yield control of all entering traffic, channelized approaches, and appropriate geometric curvature. Roundabouts must be sized to accommodate emergency vehicles and fire apparatus vehicles and require a minimum 120'outside diameter (60' radius), edge-of-pavement to edge-of-pavement for single lane roundabouts. Splitter islands must be installed on all approaches.

3040 GENERAL DESIGN ELEMENTS

A. HORIZONTAL ALIGNMENT CONTROLS

1. Pavement Cross Slopes

Normal crown for the pavement section shall be 0.02' per foot.

A desirable rate of superelevation should not exceed 0.04' per foot where required. Superelevation should not exceed 0.06' per foot. Superelevation is required along all collector streets and thoroughfares unless the horizontal curvature is large enough to support a normal crown. Tangent sections shall be of sufficient length to accommodate minimum superelevation runoff lengths as noted in the latest edition of AASHTO's, "A Policy on Geometric Design of Highways and Streets". See Figure 1 for cross slope requirements.

2. Tangent Lengths

The minimum tangent length on the stop approach to an intersection of a local street shall be:

a. Local Street – 50' minimum;
b. Collector Street – 100' minimum; and
c. Thoroughfare – 200' minimum.

The beginning of tangent section approaching an intersection is measured at the curb-line extension of the intersecting street.

Tangent sections shall not exceed 500 feet for local streets and minor collector streets, otherwise traffic calming measures may be required to deter speeding.

Tangent sections between reverse curves needs to be in accordance with the latest edition of AASHTO to ensure adequate transition between superelevation runoff and run-out is provided.

3. Curves

Curves are to be designed to establish the proper relation between design speed and pavement cross slope. The minimum radius of curvature is limited by a given design speed and pavement cross slope rate. The minimum radii of curves for each roadway classification is specified in Figure 1. On local streets, large horizontal curves that act similar to long tangent sections as noted above or in combination with tangent sections that create potential speeding conditions may require traffic calming measures.

Horizontal and vertical curves should be designed concurrently so as to encourage uniform speed, and accent or preserve the significant natural features of the land.

a. Traffic Calming

To promote appropriate speeds and reduce the frequency of cut-through traffic within residential streets, curvilinear road layouts should be used. Residential streets that contain long tangent sections of road, due to design constraints, shall provide traffic calming devices to reduce the likelihood of speeding. Traffic calming devices to be considered include traffic circles, medians, neck-downs, narrowing, chicanes and speed humps. Speed humps or any other vertical deflection devices shall not be considered on roads posted above 25 mph. See Section C.3 for more information on Traffic Calming.

4. Lane Configuration

Tapers shall be used as necessary in street design. Approach tapers are used to shift lanes laterally. The following equations shall be used as applicable:

L = WS for posted speeds of 45 mph and greater;
$L = WS^2/60$ for posted speeds of 40 mph or less;
where : L = Length in feet
S = Speed in miles per hour W
= Lateral offsets in feet.

B. VERTICAL ALIGNMENT CONTROLS

1. Grades

Street grades shall be established such that drivers can negotiate in adverse weather.

The minimum grade allowed on any street shall be one-half of one percent (1/2%).

The maximum grade allowed for a local street when approaching an intersection is five percent (5%) for the last 100 feet of pavement before the intersection.

The maximum grade allowed for a collector street or thoroughfare when approaching an intersection is two percent (2%) for the last 100 feet of pavement before the intersection.

The beginning of the minimum grade allowed for a street approaching an intersection is measured at the curb-line extension of the intersecting street.

The maximum grades allowed per street type classification are listed in Figure 1.

Street grades at pedestrian crossing locations shall meet the following criteria or the latest approved Federal Access Board standards whichever is more stringent.

a. 2% maximum cross slope for crossings located at approaches with a stop or yield condition; and
b. 5% maximum cross slope for crossings located at approaches without stop control.

2. Curves

Vertical curves affect the gradual change between grades of a vertical alignment. The curves should produce a design which provides adequate sight distance, proper drainage, and rider comfort. To meet these criteria, the vertical curves are designed to curve at rates specified in Figure 1. The product of the curvature rates and the algebraic difference in adjoining grades is the basis for the minimum length of curves, but should never be less than the minimum lengths provided in Figure 1.

a. Crest Vertical Curves

The design of crest vertical curves should focus on providing sufficient sight distance. Crest vertical curves which are too abrupt in their curvature can impede the line of sight to drivers and thereby limit sight distance.

b. Sag Vertical Curves

The design of sag vertical curves should focus on rider comfort and drainage. Sag vertical curves which are too abrupt in their curvature can magnify the effects of the gravitational and vertical centrifugal forces acting on a rider. Sag curves which are too gradual can create substandard drainage conditions within the curve. The rate of vertical curvature is to ensure that a minimum grade of 0.003 ft./ft. is obtained within a 50’ distance from the level point. In addition, sag vertical curves in cut situations should be avoided to prevent potential problems associated with ponding of water.

C. TRAFFIC CONTROL

1. Traffic Signs, Pavement Markings, and Street Name Signs

All streets (public or private) require traffic signs and pavement markings. Traffic signs and pavement markings shall be installed in accordance with the latest revision of the MUTCD, unless otherwise approved by the Director of Transportation. Where two public streets cross or where a private street meets a public roadway and signalization is not warranted, a stop bar and stop sign shall be used on the minor street approaches. Stop bars must be located 4 feet behind a crosswalk, if present.

A pavement marking and signing plan showing description and placement of traffic signs, pavement markings, and specialty signs shall be submitted with all roadway and subdivision plans as a requirement of the Developer, and shall be done prior to issuance of a Certificate of Occupancy for the development or final acceptance of the roadway by Cary.

Warning signs provided for pedestrian, bicycle, and school crossing zones shall use the florescent yellow-green sheeting.

The pavement markings for all streets, both public and private, shall be thermoplastic in accordance with NCDOT standards. Exception of the use of thermoplastic is granted in the case of private parking stalls.

Traffic Control and Street Name Signs within subdivisions which will be maintained by Cary shall be consistent with the MUTCD. All specialty traffic control and street name signs and posts must comply with Policy Statement Number 85 including all amendments as approved by the Cary Council. Requests for specialty signs shall be submitted to and approved by the Director of Transportation.

At signalized intersections, street name signs should be mounted overhead. The designer should determine the best attachment type. Oversized signs will be used at major intersections.

Street name signs should be mounted on the posts in a “staggered” fashion so each street name will be easily read from all directions. Non-staggered signs are not acceptable. Hardware must pass through post and be secured with a locking washer and nut on the backside of the post. Metallic shim is required between u-channel post and sign. All hardware shall be zinc-coated to prevent corrosion. See NCDOT Standard detail 903.20, for your reference.

All signs must comply with the Manual on Uniform Traffic Control Devices (MUTCD). Compliance includes, but is not limited to, color, size, placement, and reflectivity. All new signs must use prismatic sheeting and meet the minimum retro- reflectivity levels shown in the latest edition of the MUTCD. All signs must meet MUTCD standards for height of lettering and visibility. In accordance with the MUTCD, all proposed signs should be located so as not to interfere with other existing signs.

Use 3-lb galvanized steel U-channel supports for all sign applications, except as specifically noted otherwise in the Cary Standard Details.

2. <u>Traffic Signals</u>

In general, the design, installation and construction of traffic signals shall meet the specifications put forth by NCDOT’s Traffic Engineering Branch in the latest

version of the "Traffic Management and Signal Systems Unit Design Manual". The following items are specific to Cary's Advanced Traffic Management System (ATMS) and these standards shall supersede those provided for the NCDOT standards for new signal installations or signal modifications in Cary.

a. Traffic Signal Cabinet

At intersections where landscaped areas are present, an effort should be made to have the cabinet located near landscaping features. However, the landscaping must not prevent access to the front and rear doors of the cabinet or block the view of the electrical meter. Plantings that need minimal periodic trimming shall be selected and placed in such a way that access to the cabinet is maintained.

The signal cabinet shall not be located behind any feature if the line of sight from the cabinet to the signal heads cannot be maintained. This is necessary for maintenance purposes. Additionally, entry to the cabinet shall not be restricted and access to both the front and back of the cabinet shall be always accessible. Four feet of clear access shall be maintained on all sides of the cabinet.

b. Traffic Signal Equipment

The following field equipment shall be required for the traffic signal to be accepted by Cary for operations and maintenance:

- Cabinet – Signal cabinet shall be a P-64, NEMA TS2-1 with NC8 internal design that accommodates two detector racks, or comparable specification as approved by Cary Staff.
- Controller – Shall be compatible with the existing controller class used in field.
- Connected Vehicle Equipment – Shall be compatible with existing system. The designer or contractor shall coordinate with Cary staff for appropriate equipment selection.
- IP Domed Networked PTZ camera – Shall be compatible with current system requirements.
- Software – Shall be compatible with the existing software used in field.
- Signal heads – All signal heads shall comply with NCDOT standards

Overhead street name signs that comply with the latest edition of the MUTCD shall be installed with all traffic signal installations and upgrades.

The cabinets from the manufacturer may have a polished metal finish with no paint. However, the cabinets located at signals with decorative metal pole and mast arms, shall be powder coated black. In addition, the equipment (including but not limited to the traffic signal cabinet,

connected vehicle antenna brackets, etc.) shall be painted with a low gloss two-part epoxy primer and have a semi-gloss two-part epoxy acrylic urethane finish.

If decorative entrance or architectural features are present near new signal installations, the cabinet or other signal equipment shall be installed at a location that would not obstruct visibility of such feature(s).

All traffic signals in Cary are to be centrally controlled in Cary's Traffic Management Center (TMC). This will require the connection of all signals via fiber optics or wireless communication devices integrated into Cary's Traffic Signal System. The responsible party for the installation of signals, pedestrian hybrid beacons, school flashers, rectangular rapid beacon flashers and other similar devices shall be responsible for connection of these devices to Cary's Traffic Signal System. Connections can be made by either providing an additional fiber optic cable, wireless connectivity or radio connection as needed. Fiber optic connectivity shall be considered the standard option and only under certain extenuating circumstances a wireless connection may be considered by Cary Staff.

c. Signal Poles

Metal poles with mast arms design shall be employed at all intersections in Cary. Any exceptions to this design may be considered by Staff on a case-by-case basis. Where applicable, consideration should be given to standard designs of metal poles and mast arms and footings as approved by NCDOT.

All mast arms shall be monocurve in design. If the mast arm lengths exceed 65', then metal strain poles may be considered in place of the mast arm poles as determined by Cary and/or NCDOT staff.

Wooden poles should only be used for temporary signal installations.

For signals located in the Town Center zoning district, metal poles with mast arms shall be used. These poles shall be powder coated black and shall incorporate Cary approved architectural elements in the design. The signal poles and mast arms shall be treated with a low gloss two-part epoxy primer and have a semi- gloss two-part epoxy acrylic urethane finish. Refer to Cary's Standard Details for decorative mast arm design.

d. Cary Intelligent Transportation Systems (ITS)

Cary ITS system features Global Positioning System (GPS) enabled Emergency Vehicle Preemption. This shall be implemented at all new signal installations and existing signal upgrades. Use of preemption for railroad crossings should be considered carefully. All designs shall be

reviewed by NCDOT through their Signals and Geometrics Section.

e. Accessible Pedestrian Signal (APS) accommodations are required at all locations where sidewalks and pedestrian crossings exist.

   Installations shall be located so the pedestrian heads are visible to the users in the crosswalks. If the pole location cannot facilitate the pedestrian signal head, then a pedestrian pedestal may be used.

   If the pedestrian push buttons are not accessible from the sidewalk, additional accommodations must be made so they are accessible.

f. Special Signal Features

   All meter bases for new installations located in Cary shall use the combination meter disconnect with pedestal extension or be directly mounted to the signal pole if wooden poles are used. This combined meter disconnect unit can be seen on NCDOT Standard Drawing 1700.01 and is labeled as “Combination Panel with Pedestal Extension”. To provide a uniform look to the signal hardware, the meter bases should be located on the side of the controller cabinet, facing away from the side of the cabinet. The meter bases should be located within 3 feet of the cabinet unless otherwise restricted due to other utility conflicts. The meter should have a height between 4 and 5 feet from the ground to the meter face.

   System loops should be considered for all new signal installations and upgrades. Guidance from staff should be sought during the planning for the signal design.

   All new signalized intersection should provide a W3-3 signal ahead sign for all approaches. A W16-8 street name placard should be used with all W3-3 signs.

   The installation of a CCTV camera will be required for all new traffic signal plans provided to meet mitigation requirements of private development, unless otherwise approved by the Director of Transportation. The CCTV equipment, attachment location and location shall be approved by Cary staff prior to submittal of signal plans for review.

g. Traffic Signal Easements (TSE)

   The dimensions of a traffic signal easement can vary depending on several factors, including but not limited to local regulations, street layout, site specific design of the traffic signal, etc. During the review of Development Plans or Signal Plans, any proposed easement dimensions shall be reviewed by Cary staff to determine if they meet the specific requirements for the intersection.

a. **Traffic Calming**

All traffic calming devices must be shown and approved as a part of a site plan prior to installation and must be in conformance with the Specifications. The traffic control devices and all related signs and pavement markings shall be maintained by the Owner. Traffic control devices may include traffic circles, medians, pavement undulations (speed humps) or other devices.

i. Traffic Circles

Traffic circles are circular intersections that require the deflection of the path of travel for all vehicles that pass through the intersection. Traffic circles are considered different than roundabouts as they are smaller than roundabouts and they do not require yield upon entry. The purpose of the traffic circle is simply to provide a barrier within the roadway that requires drivers to slow their vehicles in order to traverse the intersection. Not all approaches require yield or stop control.

ii. Medians

Narrow medians can be effective at reducing speeds as these devices narrow the travelway. Landscaping shall be considered for all medians to improve the conspicuity of the median within the roadway. Centerline striping should be used along the approach and departure of the median to help delineate traffic around the median.

iii. Pavement Undulation (Speed Hump)

A pavement undulation is a gradual raised pavement surface which transverses the travelway, commonly known as a speed hump. The surface material for a pavement undulation shall be the same as the adjacent travelway, typically asphalt.

Speed humps installed on public or private roadways shall be flat- top and conform to the standard dimensions found in the detail drawings. When speed humps are desired in paved areas other than streets, such as parking lots, speed humps should be parabolic and conform to the standard dimensions found in detail drawings.

All speed humps shall be clearly marked with pavement markings or warning signs for each direction of travel. Pavement undulations must be located a minimum distance of 500 feet from a signalized intersection. Cary and/or NCDOT may require the removal of any speed undulation which causes traffic to back up onto a public street.

iv. Other Traffic Calming Devices

Alternative, innovative traffic calming devices may be used on Cary streets with the approval of the Director of Transportation. These devices may include chicanes, neck- down, narrowings, and/or traffic

deflectors.

b. **School Speed Zone Flashers**

According to North Carolina General Statute 20-141.1, the speed limit in all school zones will be reduced by 10 mph. For all schools in the Cary, this school speed zone will be designated using a school speed zone flasher assembly. All schools will be responsible for coordinating with Cary and/or NCDOT on the location and design of school speed zone and the flasher units.

h. **Pedestrian Facilities**

The implementation and location of pedestrian crosswalks shall adhere to Policy Statement 128.

a. **Pedestrian Crosswalks – General**

All signalized intersections, stop-controlled intersection approaches and roundabouts with connecting pedestrian facilities shall be marked with high-visibility (longitudinal bar-style) crosswalks. All uncontrolled intersections identified for marking shall receive high-visibility (longitudinal bar-style) pavement markings and be provided with a pedestrian-activated, lighted warning device or equivalent. Lighted warning devices or equivalent shall be as approved by Cary staff.

All locations which are designated for pedestrian traffic crossings shall be designated as a crosswalk with pavement markings and signage. The type and placement of signage and markings shall be consistent with MUTCD.

For pedestrian crosswalks on stop-controlled approaches, no signing is required to denote the presence of the facility.

b. **Pedestrian Crosswalks – Mid-Block Crossings**

Marked pedestrian crossings at non-stop controlled locations (mid-block) shall be avoided for public roadways with the following characteristics:

1) Where the street is a multi-lane (4 or more lane) street *without* raised medians* AND the Average Daily Traffic (ADT) volumes exceed 10,000 OR the posted speed limit is 30 MPH or greater.
2) Where the street is a multi-lane (4 or more lane) street *with* raised medians* AND the ADT volumes exceed 12,000 AND the posted speed limit is 40 MPH or greater.
3) Where the street provides three travel lanes AND the ADT volumes exceed 10,000 OR the posted

speed limit is 40 MPH or greater.

4) Where the street is residential in nature, providing two travel lanes AND the ADT volumes are less than 400 OR greater than 12,000.

* Raised medians must be 4 feet or greater in width and 6 feet or greater in length to provide an adequate pedestrian refuge.

** Pedestrian refuge areas with Rectangular Rapid Flashing Beacons must meet current NCDOT specifications.

If a mid-block crossing is approved, the crossing shall utilize high-visibility markings and W11-2 signs with W16-7P placards. Signs shall be provided for both directions of travel and will located in the direct vicinity of the crossing.

It may be acceptable to use raised pedestrian crosswalks with stamped concrete in place of the high-visibility pavement markings on private streets. If this option is used, the W11-2 and W16-7P signs must be used.

Appropriate sight distance shall be provided for mid-block pedestrian crossings. Refer to the latest version of AASHTO's Policy on Geometric Design of Highways and Streets to calculate the appropriate stopping sight distance.

For locations that do not meet the criteria listed above, a mid-block crosswalk may be considered for approval if additional traffic control measures are provided and it can be determined that substantial pedestrian traffic is anticipated.

i. BICYCLE FACILITIES

Bicycle lanes shall be separated from the vehicular traffic with a 4" white edge line. The lane will be designated as a bicycle lane with standard pavement markings as shown in the MUTCD. This should include a bicycle symbol followed by a through arrow. Signs should be placed at the beginning and end of the bicycle lane as well as along the corridor. Signs should be considered after major intersections or after cross-section changes. A R3-17 sign with appropriate placard should be used for signage for the bicycle path. See Standard Drawings for the recommended pavement marking design and spacing.

a. General

The provision and placement of bicycle facility pavement markings and signs are to be included with all roadway design or retrofit projects.

i. Ensure all streets in Cary are “complete” to create a safe and efficient multi-modal street network for all users
ii. Guide the placement of bicycle facility pavement markings on streets in Cary
iii. Ensure facility design is consistent with best practices for traffic control design and bicycle operation

b. **Coverage**

This policy shall be applicable and implemented with all new or improved roadway design within Cary if the qualifying criteria outlined in this policy statement are met.

c. **Qualifying Criteria**

If a street meets any of the outlined criteria below, the bicycle facility pavement marking installation policy will apply:

i. Identified as a collector or thoroughfare level street on Cary’s adopted Planned Roadway Widths map within the Cary Community Plan
ii. Identified as an existing or future bike facility on Cary’s bicycle plan
iii. Local street that serves as a link in the existing bicycle network

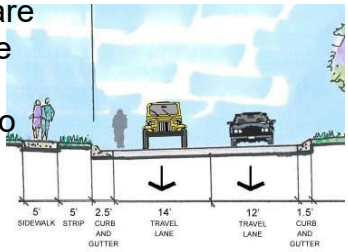
d. **Facility Types and Typical Applications**

i. **Shared Lane Marking (SLM) or “Sharrow”-** pavement marking symbols that serve to alert all road users of a shared facility, encourage the safe passing of bicyclists by motorists and reduce the incidence of wrong-way cycling. Sharrows are also used to assist bicyclists with lateral positioning in lanes that are too narrow for a motor vehicle and a bicycle to safely travel side by side within the same lane. **Typical Application:** Preferred on streets posted 35 mph or less. Bicycle Warning signs (W11-2) shall be installed beginning at the commencement of the shared route and continuing along the route to its termination. The “sharrow” symbol should utilize MUTCD 2009 Edition Part 9 Figure 9C-9 Shared Lane Marking

ii. **Striped bike lanes** are defined as a portion of the roadway which has been designated by striping, signing and pavement markings for the preferential or exclusive use by bicyclists. **Typical Application:** Current Planned Roadway Widths map within the Cary Community Plan (CTP) calls for 4’ bike lanes on 2-lane minor arterials and collector
streets. All bicycle lanes shall be identified using Bike Lane signs (R3-17) with accompanying placards to denote the commencement and termination of the route. Bike lane symbol thermoplastic markings are required along the entire length of

the route. The bike lane symbol should utilize MUTCD 2009 Edition Part 9 Figure 9C-3 B – Helmeted Bicyclist Symbol.

iii. **Wide outside lanes** are typically14’ wide and the Cary standard for all new or improved thoroughfares. The 14’ wide outside lane is used to provide an extra 2’ of width over the standard 12’ wide lane to give additional room for cyclists and motor vehicles to share the road. Where 14’ lanes are not achievable, Cary will provide an 11’ inside lane and a 13’ wide outside lane. **Typical Application:** Required to be incorporated into the design of all new and/or improved thoroughfare streets per Cary’s existing Planned Roadway Widths map within the Cary Community Plan and the Land Development Ordinance (LDO).



iv. **Door zones** are the space in which a cyclist is in danger of getting hit by a car door. **Typical Application:** Door zones should be factored into the design of bike lanes when adjacent to on-street parking to provide a buffer between the right side of the bike lane and the left edge of parked vehicles.

v. Green paint – the use of green colored pavement in marked bicycle lanes and in extensions of bicycle lanes through intersections and traffic conflict areas shall be designated by staff.

Based on qualifying criteria, facility type and typical application, Table 1 outlines bicycle facility pavement marking requirements:

Table 1: Bicycle Facility Pavement Marking Requirements

Facility Type	**Cary Recommendation**
Shared Lane Marking (SLM)	
Prohibited on-street parking/14' lane or wider	minimum 4' from the face of curb to direct bicyclists away from gutters, seams, and other obstacles
Prohibited on-street parking/less than 14'	middle of the travel lane*
Permissible On-street parking	
parallel	middle of the travel lane
diagonal	middle of the travel lane
Striped Bike Lanes	
Prohibited on-street parking	Typical 4' clear pavement width from the edge of pavement, excluding gutter pan.

Permissible On-street parking	Minimum 3' door zone from left edge of minimum 8' parking space, with the total bike lane plus adjacent travel lane no less than 16' wide**
Wide outside lanes	
Collector/Thoroughfares	Required to be incorporated into the design of all new and/or improved thoroughfares per Cary's existing Comprehensive Transportation Plan and Land Development Ordinance.
*typical; may be adjusted based on field conditions or engineering study	
**Flexibility from standards with staff review /approval may be permitted within Adopted Mixed Use Activity Centers	

e. Bike Facilities on Roadway Bridges

Buffered bike facilities shall be colocated with sidewalks and provided along both sides of roadway bridges. Construction shall be in accordance with Detail 3100.10, and as approved by Cary or NCDOT whichever is more stringent. Minimum 48" high barrier adjacent to vehicular travel lane and minimum 54" high outside barrier/railing to be provided. Striping to delineate pedestrian and bicycle space to be located in accordance with standard detail and as indicated in plans; with minimum lane widths to be 5' clear. In those locations where street-side trails are proposed along roadway bridges, cyclists will be diverted off-road to use the street-side trail to cross the bridge via use of a greenway curb ramp, trail driveway apron or bike access ramp. Construction shall be in accordance with standard detail 3100.10 and as approved by NCDOT or Cary, whichever is more stringent.

j. **STREET LIGHTING**

The owner or developer of a site plan or subdivision shall be required to install street lighting via underground contribution, along all proposed streets and along all existing streets, which adjoin the property, in accordance with the Land Development Ordinance. Along NCDOT roadways where street lights do not exist, a 3' wide Cary utility and street lights easement for the installation of street lights is required.

a. The placement of street lighting fixtures on residential streets shall be at 400 to 600-foot intervals unless:

   i. the roadway length is less than 400 feet but more than 200 feet in which case a street light will be provided at the end of the street; or

   ii. where the roadway length is less than 200 feet and a street light is placed at the intersection and no natural features create a problem, no street light will be placed at the end of the roadway; or

   iii. the vertical and horizontal street alignment or natural features necessitate shorter spacing intervals.

b. The placement of street lighting along non-residential streets shall be in accordance with the latest revision of the Illuminating Engineering Society's "American National Standard for Roadway Lighting."

c. A street light shall be provided at all street intersections.

d. Standard street light fixtures shall be LED and conform to the following:

i. All Fixtures on residential streets shall be 50 or 75 Watt LEDs on gray fiberglass poles twenty-five (25) feet in height. The 50-Watt LED fixtures shall be placed in cul-de-sacs when spillover from the 75-Watt fixtures would be excessive.

ii. All fixtures along thoroughfares shall be 105, 150 or 215 Watt LEDs on gray fiberglass poles thirty (30) feet in height or 280 Watt LED on gray fiberglass poles thirty-five (35) feet in height. The 105, 150 and 215-Watt LED fixtures shall be placed in residential areas when spillover from the 280-Watt LED fixtures would be excessive.

k. **CURB RAMPS**

Curb ramps shall be designed and constructed to meet the latest requirements per the NCDOT for curb ramps located in public right-of-way. Curb ramps located outside of right-of-way shall be designed and constructed to meet the latest North Carolina Building Code. Except that all curb ramps, whether located inside or outside the right of way, shall be a minimum of 5 feet wide.

Installation of double curb ramps is preferred at locations where sidewalk is planned to extend in multiple directions from an intersection.

Detectable warning systems shall be a cast in place, composite tile, on the NCDOT Approved Projects List. Alternate materials may be approved by the Transportation Department. Detectable warning domes shall cover 2 feet length and full width of the ramp floor. Plans shall note the color of detectable surface to be black.

l. **RIGHT-OF-WAY ENCROACHMENTS**

Any work performed or placement of objects or utilities within Cary's right-of- way shall follow Code Chapter 28, Article VI, and accordingly will require a right-of- way encroachment agreement to be submitted to the Transportation Department for review and approval. The provisions provided in this section apply to individual property owners, homeowners associations, private utility providers and their owners or operators, as well as their working for these entities, for placement of

electric power, gas, communications, irrigation, and similar facilities, in Cary right-of-way.

a. **North Carolina 811**

Persons desiring to perform work within the public right-of-way shall notify the North Carolina 811 before any excavation or demolition activities in accordance with G.S. 87 – Article 8 – Underground Damage Prevention (87-115 Underground Utility Safety and Damage Prevention Act or the most current applicable legislation).

b. **Vertical Obstructions**

Vertical obstructions are fixed objects or poles greater than 4-inches in height. Vertical obstructions within the public right-of-way shall be located as near the right-of-way line as practical on the far side of the sidewalk. Vertical obstructions located on streets with curb and gutter shall not be located within the clear zone, as defined in the table below.

Vertical obstructions on streets without curb and gutter shall be located outside of the clear zone as defined in the **"NCDOT Roadway Design Manual"** and the **"AASHTO Roadway Design Guide."**

Posted Speed Limit	Clear Zone with Curb & Gutter
45 mph	12 feet
35 mph	10 feet
30 mph	8 feet
25 mph	6 feet

In no case should a fixed object obstruction be located closer than 4.0 feet from the face of the curb near driveways and intersections, and 1.5 feet from the face of the curb elsewhere.

Where fixed objects are located in the clear zone, Cary may require the following mitigations:

i. Remove the obstacle;
ii. Redesign the obstacle so it can be traversed safely;
iii. Relocate the obstacle to a point where it is less likely to be struck;
iv. Reduce impact severity by using an appropriate breakaway device;
v. Shield the obstacle with a longitudinal traffic barrier for redirection; or
vi. Delineate the obstacle if the above alternatives are not appropriate.

The maximum dimensions for an above ground utility vault, fixture, object, or cover within the public right-of-way is 4'x6' and may not exceed 36 inches in height. These items shall be located outside of the clear zone.

The maximum diameter dimension of a pole or other circular structure, fixture, or object located within the public right-of-way may not exceed 24-inches and any such structure shall be located outside of the clear zone.

c. **Underground Utilities**

Underground utility construction shall conform to all applicable federal, state, and local codes, standards, and specifications.

Location of underground facilities and associated appurtenances are specified on Cary detail drawing 3000.26.

Any concrete foundations or slabs required for a cabinet, pedestal, or other appurtenance shall not protrude more than 4 inches above the surrounding ground surface.

On either cased or uncased installations, particularly on crossings of the roadway, consideration shall be given for placing spare conduit or duct to accommodate known or planned expansion of the underground system. Any spare conduit or duct will be appropriately sealed and, if fabricated of non-metallic material, shall be installed with tracer wire for future locating purposes.

The utility owners shall place service connection points at or beyond the right-of- way line within their utility easement to prevent the underground utility's customers from entering Cary right-of-way to make a connection.

All facilities shall be of durable materials and designed to be free from routine maintenance. Inspection points or maintenance locations should be located in areas that will not cause disruption to traffic.

Open cutting of pavement on any Cary street is not allowed unless granted by written permission.

Longitudinal locations of utilities under pavement should be avoided. Where impracticable the utility owner shall provide justification for accommodation under pavement.

Vault access panels shall not be placed in the sidewalk if possible. Exceptions shall be considered by Cary on a case-by-case basis.

All underground vaults, manhole, or other structures (including covers) within the clear zone of the roadway shall be designed to carry a minimum vertical load capacity of 20,000 lbs. in accordance with ANSI/SCTE 77 and ANSI Tier 15 test provisions. All structures proposed for installation should either be on NCDOT approved products list for specified use or plans sealed by NC Professional Engineer submitted for approval by Cary's Transportation Department prior to structure's installation.

d. **Horizontal directional drilling and jack and bore**

Directional drilling should follow the construction and safety practices as described in the current edition of the "Horizontal Directional Drilling Installation Guidelines" manual published by the National Utility Contractors Association (NUCA).

Jack and bore operations should follow the construction and safety practices as described in the current edition of the "Guide to Pipe Jacking and Microtunneling Design" manual published by the National Utility Contractors Association (NUCA).

All bore pits less than 5 feet deep shall be a minimum distance of 5 feet from the back of curb or from the edge of pavement. All bore pits 5 feet deep or greater shall be a minimum distance from the back of curb or from the edge of pavement based upon a ratio of one foot of horizontal distance per one foot of depth; so a 7 foot deep bore pit shall be a minimum of 7 feet from the back of curb or edge of pavement.

e. **Private Utility Easement**

All new developments will be required to provide a 3' private utility easement adjacent to the right-of-way for the convenience and placement of private utilities.

f. **Cary Utility and Streetlight Easement**

All new developments with townhouse streets will be required to provide a 4' wide Cary Utility and Streetlight easement adjacent to the right-of-way for the convenience and placement of Cary utilities and streetlight facilities.

m. **WORK ZONE TRAFFIC CONTROL**

During construction activities and incomplete projects, temporary measures may

be required to provide accessibility. If a development project requires the removal of existing sidewalk or prevents access to existing sidewalks, as part of the development plan, a pedestrian traffic control plan may be required to be designed to address the safe re-routing and detouring of pedestrians around the development site.

3050 SPECIFIC DESIGN ELEMENTS

A. INTERSECTIONS

1. Alignment

Streets shall intersect each other at right angles whenever possible. The desirable intersection angle is 90 degrees. At no time shall a street intersect any other street at less than 75 degrees.

2. Layout Configuration

Curb radii shall be designed to satisfy the turning radius of the predominant design vehicle using the roadway. Minimum radii are listed in Figure 1.

Separate turning lane storage, deceleration, and bay tapers should be designed in accordance with NCDOT "**Policy on Street and Driveway Access to North Carolina Highways."**

Streets with medians shall be designated to allow for proper turning movements for a SU (single unit truck) design vehicle. AASHTO guidelines should be followed for the actual median design and median opening dimension.

3. Intersection Sight Distance

a. Sight Distance Calculations

The amount of sight distance required at an intersection depends on the type of traffic control at the intersection and the speeds of the vehicles. The measurement methods and equations for determining the sight line for left-turn, right-turn, and through movements from the side street as well as left-turns from the major road are based on values listed in the AASHTO's "**Policy on Geometric Design of Highways and Streets."** The calculation of the applicable sight distance should be sealed by a Professional Engineer and submitted for review. All new development within Cary's ETJ shall meet these requirements.

b. Sight Distance Obstructions

Some objects located within sight distance areas may not significantly obstruct the required visibility of the driver. The driver may be able to see over, under or around some objects within sight distance areas. Objects that may be required within sight distance areas include fire hydrants, utility poles and traffic control devices which are located to minimize visual obstruction. Other objects 12 inches in diameter and smaller, such as tree trunks and sign posts, may be allowed within the sight distance areas if

located so as to not substantially restrict the driver's view. The Director of Transportation shall determine what objects, if any, may be located within sight distance areas. Trees greater than 12 inches in diameter and located in the right of way shall be evaluated in accordance with other applicable Cary policies and requirements considering health, safety and welfare.

Some conditions may exist that prevent the attainment of desirable sight distance. In such cases, the maximum practical sight distance shall be obtained. In addition, where desirable sight distance is not attained, additional measures such as warning signs, reduced speed zones and other traffic controls shall be provided. In all cases, unless otherwise provided by Code or granted an exemption from the Director of Transportation, the minimum provision of adequate stopping sight distance shall be required.

Cary shall remove sight distance obstructions located within Cary right of way. Cary will notify the NCDOT of sight distance obstructions located within their right of way. Cary shall provide written notification to the owner(s) of private property on which a sight distance obstruction exists. The property owner(s) shall be responsible for the prompt removal of the obstruction on their property and may be liable for any damage resulting from their failure to remove the obstruction.

In addition, intersection sight distance is based on conflicts with opposing vehicles rather than with objects located in the roadway. Intersection sight distance is measured in the horizontal (plan) and vertical (profile) planes. In both situations, a driver must be offered an unobstructed line of sight to the roadway they wish to cross or join. The horizontal intersection sight distance shall be measured along the centerline of the major street between the drivers of the two opposing vehicles.

The horizontal line of sight is a visual line connecting the driver’s eye and the approaching vehicle, both of which are in the center of their respective travel lanes. If this line of sight is impeded by any obstructions, either the obstruction should be moved or the alignment adjusted. The vertical intersection sight distance is measured along the centerline of the major street between the drivers of the two opposing vehicles. The vertical line of sight is a visual line connecting the driver’s eye, which is located 3.5 feet above the roadway surface, with the approaching vehicle, which is located 3.5 feet above the roadway surface. If this line of sight is impeded by any obstructions, either the obstruction should be

moved or the alignment adjusted.

Parking shall not be allowed within intersection sight triangles. Driveways should be located to avoid obstructing sight triangles and if driveway is located within a sight distance triangle, parking shall be located entirely outside of the sight distance triangle.

Where driveway aprons are in sag locations, catch basins need to be installed to alleviate drainage problems. Cary shall not be responsible for the maintenance of residential driveways.

c. Sight Distance Easements

Where sight distance lines fall outside of the public right-of-way, a sight distance easement shall be shown on the development site plans and be recorded. This easement shall allow for the maintenance of and potential removal of any and all sight obstructions that may develop within the sight distance required. To prevent parking from exacerbating the sight distance obstructions for these areas, No Parking signs shall be placed along the limits of the Sight Distance Easement. The No Parking restriction shall be recorded with Cary Clerk's office through a Staff Report approval by Cary Council before enforcement may begin.

B. PARKING LOTS

Parking lots shall be designed to provide safe maneuverability of vehicles. A minimum parking stall dimension of 9 feet by 18 feet shall be provided. Handicap parking spaces shall be dimensioned and properly marked with signage in accordance with the North Carolina Building Code. All parking facilities shall have minimum dimensions, as outlined on Figure 2. The measurement of said dimensions shall be to the face of curb, or edge-of-pavement if no curb and gutter is used. If curb stops are provided, then the curb stop shall be located within 2' of end of parking stall.

If compact spaces are allowed in accordance with the Land Development Code, then the dimensional standards of the compact spaces must be approved by the Director of Transportation.

Sidewalk shall be a minimum width of 6 feet at locations where sidewalk abuts a parking bay (except for parallel parking spaces).

All required parking spaces and accessible spaces must be paved. The minimum pavement structures for private streets, accessways, alleys, and parking areas for multi-family and non-residential developments are as follows:

1. Drive Aisles – 3” of S-9.5(B) or (C) and 8” of ABC stone
2. Parking Stalls – 3” of S-9.5 (B) or (C) and 6” of ABC stone

If approved by the Director of Transportation, gravel materials may be used in parking areas in excess of the required parking. A specific road bed design that shall be provided by a registered geotechnical engineer that shows road bed will be sufficient to support all potential apparatus using the site.

All paved parking facilities shall be striped with 4-inch white lines. In parking areas where concrete paving is used, consideration for striping parking spaces with 4” yellow lines may be considered if requested in writing.

On all parking lot facilities, cut and fill slopes shall not begin immediately at the back of curb, instead a minimum 4-foot shoulder is required behind the back of curb.

C. FIRE LANE

Fire Lanes shall be installed and inspected in accordance with the public street requirements and the fire code. The Fire Official shall have the authority to designate fire lanes as deemed necessary for Fire Department access. The requirements for installation of a fire lane shall be subject to the fire code.

Fire lanes shall be a minimum width of 20 feet and shall be properly marked and signed to designate the access as a "FIRE LANE" as specified by the Fire Marshal. The surface of the fire lane shall be paved with a minimum of 8 inches of ABC stone and 3.0 inches of Asphalt Concrete Surface Course

All fire lanes shall be marked in accordance with one of the following requirements:

1. Continuously marked with yellow paint striping along the fire lane with "NO PARKING FIRE LANE" printed with minimum 8-inch high letters at 40-foot intervals or as directed by the Fire Marshal;

2. Continuously marked with yellow painted curb with "NO PARKING - FIRE LANE" along the fire lane with "NO PARKING - FIRE LANE" printed with minimum 8-inch high letters at 40-foot intervals or as directed by the Fire Marshal:

3. The installation of the MUTCD standard sign showing "No Parking - Fire Lane" placed at each end of the fire lane and at 50-foot intervals with arrows on the signs or a continuously painted yellow strip along the designated fire lane.

D. CENTRAL MAIL DELIVERY

1. Purpose

In April of 2012, the United States Postal Service (USPS) revised its regulations to clarify options for delivery and to provide the USPS greater autonomy in determining how deliveries are added to the Postal Service network. While curbside and sidewalk delivery remain viableand approved modes of delivery, the USPS determines how and when to approve these modes of delivery. The USPS now allows a new type of mail delivery option referred to as central delivery. Cary has established the following minimum standards in order to achieve the safe, logical placement and arrangement of central mail delivery in our community.

2. Central Mail Delivery

The local postal manager will work with builders and developers to determine what the best mode of delivery is for the area prior to establishing or extending delivery service. This will include the review of site and subdivision plans and consideration of lot size and locations of housing relative to existing delivery infrastructure and to customer travel. Central delivery service in the form of Cluster Box Units (CBU) may be considered for use at one or more central delivery points in a residential housing community.

3. Cluster Box Unit Requirements

Cluster Box Units (CBUs) may be allowed along both public and private streets and shall adhere to the following design standards:

a. Arrangement

i. The location of CBU(s) is preferred to be located outside the public right- of-way and located in a centralized common area(s) of the development. Sufficient off-street parking should be provided to serve the location.

ii. CBU(s) with **13** or less mail receptacles may be located along a street, other than collector or thoroughfare, between the back of curb & sidewalk, provided all of the following are met:

1) Posted speed limit on street is 25 mph or less.

2) Sidewalk must be located on the same side of the street as the CBU.

3) Access to the mailbox by the residents must be from the sidewalk side and not the street side of the CBU.

iii. CBU units or combination of **26** or less mail receptacles may be located along a street, other than a thoroughfare, provided a separate pull-off area is

provided and all of the following are met:

1) Posted speed limit on the street is 30 mph or less.
2) Sidewalk must be located on the same side of street as the CBU.
3) Access to the mailbox by the residents must be from the sidewalk side and not the street side of the CBU.
4) A separate pull-off or parallel parking area is provided with an appropriate amount of parking spaces.
5) CBU units shall not be located adjacent to street side trails.
6) Cary will work with developers and USPS for suitable and safe locations within the street right-of-way for streets without curb and gutter and sidewalk.

iv. For Townhouse developments, CBU units of 30 or less mail receptacles may be located adjacent to perpendicular parking spaces in a common area to serve surrounding dwellings, provided all of the following are met:

1) Posted speed limit on the street is 25 mph or less.
2) A minimum of three perpendicular parking spaces are provided (one of which must be a van-accessible handicap space with an ADA accessible isle).
3) Sidewalk must be located on the same side of the street as the CBU with access to the CBU via a striped ADA accessible isle that is a minimum of 5’ wide.

b. Location

All cluster style mailboxes must be erected:

i. No case closer than 100 feet measured from the curb-line of the intersecting streets.
ii. Away from any location whereby reason of the position of, shape or color, it may interfere with or obstruct the view of, or be confused with any authorized traffic sign, signal or device.
iii. So as to not obstruct sight distance along the

roadway and at intersecting streets, major driveways, or greenway trail facilities.

iv. No closer than 10 feet away from a residential driveway serving a detached, semi-attached or townhome dwelling.

v. In common areas or near property lines rather than directly in front of a residence.

vi. Outside of Town of Cary utility easements, private storm drainage easements, and at least 10 feet awayfrom water meters and cleanouts.

c. Lighting

When lighting plans are being developed, CBU locations that may have been previously developed during site or subdivision plan approval should be considered to ensure that suitable and sufficient lighting can be provided to the CBU locations.

d. Signs & Markings

In areas where parking is provided for CBU(s), permissible parking signs shall be installed on both ends of the defined parking area and designated specifically for mail parking. Signs R7-21a, shall be used that states" MAIL PARKING, 15 MINUTE LIMIT". Reserved accessible spaces shall be clearly marked with an international accessibility symbol marked on the pavement and signs R7-8 and R7-8a installed. All pavement markings and signs shall be in accordance with the Manual on Uniform Traffic Control Devices (MUTCD).

e. Maintenance

Cary does not have any responsibility for mail delivery; therefore, Cary does not own or maintain CBU(s) but does allow CBU(s) as an allowable encroachment in Cary right-of-way.

f. Snow and Trash Removal

Cary will not be responsible for clearing snow and accumulations from the sidewalk, designated parking areas (if applicable), and pad around the CBU. In addition, the area around the CBU(s) is to be kept clean from trash and debris and clear from any obstacles that could impede mail delivery or retrieval. Theseresponsibilities must be provided by mailbox users or a homeowner's association.

g. Signs on CBU

Signage affixed to CBU(s) is prohibited.

h. Construction of CBU

Materials and specifications for the installation of CBU(s) and concrete pads are to be in accordance with USPS requirements and their approved manufacturer list.

i. Standard Drawing Details for CBU

See standard drawing 3300.06 – 3300.09 for design details for CBU(s) desiring to be placed along a street. CBU(s) located outside the public or private right-of-way, shall be in compliance with other land development ordinance (LDO) requirements, as applicable.

4. Exceptions

The Director of Transportation has authority to grant modifications to the design requirements upon collaboration and concurrence with the local postal manager.

E. TRANSIT INFRASTRUCTURE

The latest edition of the AASHTO Guide for Geometric Design of Transit Facilities on Highways and Streets should be used as the main reference guide for the design and construction of transit facilities. Other transit-related guidelines like NACTO and TRB publications may be used where appropriate and which result in a safer condition for passengers and transit vehicles. Transit infrastructure located within the public right-of-way shall be approved by the Transit Director or designee. If required transit access locations and infrastructure cannot be accommodated within the public-right-of-way a public transit easement will be required.

1. Transit Vehicle Geometric Considerations

All street design, including street reconfigurations, should consider the existing or future presence of transit vehicles in the traffic stream. Additionally, all major passenger destinations and sites proposed for internal transit vehicle circulation should be designed for the horizontal and vertical clearance requirements, weight, and turning radii necessary to accommodate the presence of transit vehicles.

The critical dimensions for local and regional transit vehicles are consistent with the AASHTO City Transit Bus (CITY-BUS), therefore this Design Vehicle shall be used in determining transit-related geometric design requirements.

2. Bus Stop Locations

Decisions regarding bus stop frequency, location, and length, call for careful analysis. When evaluating bus stop locations, the impact on street operations, dwell time, bike lane and travel lane disruption, transit vehicles ability to enter and exit the flow of traffic, convenience and safety of passengers, and convenience and safety of pedestrians accessing the bus stop shall be considered. These factors are often dependent upon land-use development along the corridor and street typology.

a. The following are general design guidelines for the locations of bus stops:

   i. Stop spacing is related to ridership density. In dense commercial or mixed-use areas stops may be spaced 700 to 1,000 feet apart, in lower density or residential areas stops may be spaced 1,000 to 1,500 feet apart.

   ii. Stops are located in areas where passengers have a safe and direct access to sidewalks, walkways and waiting areas.

iii. Stops on both sides of a two-way street should be paired up whenever possible to provide passengers boarding and alighting points near one another.

iv. Passengers have access to an accessible pedestrian route to and from the bus stop and onto the bus.

v. Ability to accommodate passenger comfort amenities while waiting for the bus if warranted.

vi. Analysis and design of safe pedestrian crossings of the streets are incorporated into transit access locations.

vii. A properly developed and located bus stop allows for safe movement by the bus in to and out of the main traffic flow.

viii. All necessary NCDOT right-of-way guidelines, encroachment permits, or agreements shall be secured for transit access improvements located within NCDOT rights- of-way.

b. Types of Bus Stop Locations

i. Far-side: A far-side bus stop is a stop that is located immediately following an intersection and is recommended when:

1. The intersection is controlled by signals, stop, or yield signs;
2. Traffic is heavier on the approach side than on the departure side of the intersection;
3. There is high demand for right turns in the direction the bus is traveling;
4. Where route alignment requires a left turn at the intersection
5. The crossing street is a one-way street where traffic flows from left to right;
6. The location is one that offers a clear advantage for transit riders by providing improved access to a major destination or to other intersecting bus routes;
7. Priority control at the traffic signal is utilized to maintain bus schedules;
8. There is a need to increase pedestrian visibility while crossing the street by encouraging pedestrians to cross behind the bus.
9. Sign placement is generally 80 feet from the intersecting curb line for far-side on-street stops.

ii. Near-side: A near-side bus stop is a stop that is located immediately before an intersection and is

recommended when:

1. Traffic in the direction the bus is traveling is heavier leaving the intersection than approaching the intersection;
2. The cross street is one-way where traffic flows from the right to left;
3. The location is one the offers a clear advantage for transit riders by providing improved access to a major destination or to other intersecting bus routes.

iii. Mid-block: A mid-block bus stop is a stop that is generally located 100 feet or more before or beyond an intersection and is recommended when:

1. The distance between intersections far exceed the standard for bus stop spacing;
2. Traffic or physical street characteristics prevent siting a stop close to an intersection;
3. The bus stop serves large businesses, housing developments, or other significant trip generators.

iv. Roundabouts: Transit considerations at a roundabout are similar to those at a conventional intersection. If the roundabout has been designed using the appropriate design vehicle, a bus should have no physical difficulty negotiating the intersection.

1. Bus stops should be located carefully to minimize the probability of vehicle queues spilling back into the circulatory street. This typically means that bus stops located on the far side of the intersection need to have pullouts or be further downstream than the splitter island.
2. Bus stops situated on an entrance leg should be positioned 50 feet or greater before the splitter island and crosswalk.
3. Pedestrian access routes to transit should be designed for safety, comfort, and convenience. If demand is significant, such as near a transit/transfer facility, pedestrian crossing capacity should be accounted for.

v. Outside the Public Right-of-Way: Bus stops located on private property or outside the public right-of-way may be considered.

1. Major transit trip generators may, by mutual agreement, locate a transit access location internal to the site in addition to any other required transit access locations. Where a transit access location is located internal to a site, the site shall be designed to minimize conflicts between transit vehicles and

off-street parking areas and shall be located on the site to minimize pedestrian travel distance between the transit access location and principal building entrances. A transit easement or access agreement in a form acceptable to Cary shall be dedicated to Cary.

2. If the transit access location or infrastructure is located outside the public right-of-way, a permanent transit easement dedicated to Cary in a form acceptable to Cary shall be required. Easements shall be recorded prior to request for the issuance of a first (or only, if applicable) Certificate of Occupancy for the development.

3. <u>Bus Stop Design</u>

The location and design of new bus stops shall be accessible to persons with disabilities and provide for safe and full deployment of lifts and/or ramps on transit vehicles as much as is structurally practicable. It is noted that cost is not a factor in determining structural practicability in new construction. For the rehabilitation or improvement of existing bus stops, the provision of access to persons with disabilities and adequate area for the safe deployment of lifts and/or ramps is required as much as is structurally practicable.

a. Bus Stop Pullouts: Bus stop pullouts are not standard for thoroughfares and collector streets. Design standard deviations review shall consider the following criteria:

   i. Vehicle speed (85th percentile) exceeding 40 MPH and curb lane vehicle volume exceeding 250 vehicles during peak hour;

   ii. Bus dwell time, especially for stop locations with passenger boardings exceeding 30 boardings per hour.

   iii. Dwell time impact on bicyclists for high bike use areas; and

   iv. Width of street, including number of lanes, and impact of following vehicles on the ability of the bus to rejoin the traffic flow safely and without major delays.

   v. History of high rate of accidents, particularly rear-end accidents.

   vi. Stops are located in areas where passengers have a safe and direct access to sidewalks, walkways and waiting areas.

vii. When approved, bus pull-outs shall be designed in accordance with the current standards set forth in AASHTO.

b. Bus Stop Infrastructure: Transit facilities shall be designed to incorporate roadside safety features by locating benches and shelters away from the traveled edge of the street, as close to the right-of-way line as possible while adhering to NCDOT clear zone guidance. Deviations in sidewalk alignment to facilitate the installation of transit facilities shall be designed with horizontal alignment. Consideration should be given to using breakaway support features to reduce the crash severity of vehicle run off the road events when elements cannot be located with adequate clearance to the traveled way. No commercial adverting shall be permitted at any bus stop.

i. Bus Landing Pads: Bus landing pads that provide a minimum clear space for deploying a lift and ramp from a transit vehicle shall be developed for all bus stops. The improved stop should include adequate area and clearance for passenger access to buses, bus stop amenities, and connecting sidewalks and trails. Where feasible, the pad shall be a paved area with the following minimum dimensions:

1. Twenty (20.0) feet long, as measured parallel to the street, and 8.0 feet wide as measured perpendicular from the back of curb or street shoulder. Length should be thirty (30.0) feet at any stop served by a regional transit provider and/or by more than one transit provider (Cary staff to confirm in writing).
2. Landing pads shall fill the entire depth between the back of the curb and the public sidewalk. In cases where the depth of this area exceeds 8 feet, or in cases where curb does not exist, special accommodations may be considered on a case-by-case basis.
3. For landing pads that will have amenities such as benches, trash receptacles, and lights, a width of 10 feet is desirable.
4. For bus stop locations with site constraints limiting the space available, the clear space shall be a minimum of 5 feet by 8 feet at the bus door.

5. Assuming the bus dwells with its front approximately even with the transit sign, the pad should be placed at the front door of the bus where the lifts and ramps are deployed. A pad at the rear door location is also desirable. Optimally the boarding pad should extend from the front door to the rear door of the bus.

ii. Benches: Benches are installed at stops based upon citizen request/complaint, projected development density, and/or the average number of boardings at the stop. Benches should be placed no closer than five feet from the curb to avoid conflict with bus doors, and to allow passengers to pass people sitting on the bench. At least 60 inches of clearance for wheelchairs should be provided on either the front or backside of the bench. Seating should be placed no closer than five feet and no further than 15 feet from a bus stop signpost. For consistency throughout Cary, bench design should adhere to features of the Cary Standard 9300.01 bench or approved equivalent, unless in an area covered under an already-established Cary streetscape plan, in which case bench design should adhere to features of the standard bench or approved equivalent in that specific streetscape area.

iii. Trash Receptacles: Trash receptacles are installed at stops based on citizen request/complaint, projected development density, and/or the average number of boardings at the stop. Bus stops with shelters should have stand-alone trash receptacles. Stand-alone trash receptacle design should adhere to features of the Streetscape 35G series model or approved equivalent. All other sites may have pole-mounted trash cans, designs of which should adhere to features of the black 10-gallon Landscape Series model or approved equivalent.

iv. Shelters: Cary encourages construction of shelters that provide protection from rain, wind and sun for transit passengers. Bus shelter designs shall provide for ready use by individuals in wheelchairs. For consistency throughout Cary, shelter design should adhere to features of the Brasco SL-512 model or approved equivalent, painted to Cary specifications. Shelters can also be designed into the architectural theme of a building. Shelters integrated into building facades can vary

considerably depending on the purpose and style of the building. There should, however, be at least 30 inches of roof overhang to protect waiting passenger.

v. Bus Stop Signs: All bus stops should be conspicuously signed. Unlike most street signage, bus stop signs serve both informational and marketing functions and are designed to be viewed both by drivers and pedestrians. Signs are intended to be immediately identifiable as transit stops in order to make the system easier to use for existing riders and to attract new users. GoCary bus stop signs are produced by Cary. Regular bus stop signs are placed at all authorized bus stops. Sign placement for bus turnouts should be 60 feet from the end of the entrance taper. Sign placement is generally 80 feet from the intersecting curb line for far-side on-street stops. The sign face should be mounted at a 93° to 97° angle to the direction of travel. When a sign must overhang an accessible pathway, it shall be mounted at least 80 inches (6.7 feet) above the ground. Bus stop solar lighting may be co-located with bus stop signs. Sign poles should not be closer than 19 inches from back of curb to avoid contact with bus mirrors. Signs should not be obstructed by trees, buildings or other signs,. If there is a sidewalk or adjacent bike trail, the sign should be placed outside the sidewalk or bike trail, unless the distance is more than 10 feet from the curb line. Poles should consist of a U-channel frame and be 10” in height. Signs are designed to be read from both directions.

vi. Lighting: Passenger safety is enhanced by adequate lighting of the stop; and riders feel more comfortable waiting for a bus at a lighted stop. Direct illumination of waiting passengers by a streetlight located near the start of the bus stop allows the bus driver to easily see waiting passengers. Where there is insufficient street lighting to illuminate the bus stop, supplemental lighting should be provided. Cary recommends 1.5 – 2 foot candles of light around the bus stop area. Installing a supplemental light at the sign location provides light to read schedules and the bus stop sign and light can be collocated. A further recommendation is that the illumination level on the surface of the sign not be significantly exceeded by a visible bright lighting source behind or in front of the sign. The bus

stop area should have a maximum light uniformity ratio of 3:1. Solar lighting should be used where practicable.

vii. Vegetation within a distance of fifteen (15) feet of the transit access location shall not exceed thirty (30) inches in height at full maturity in order to promote passenger visibility, safety, and security.

viii. Information Panels: All bus stops served by GoCary require an 8.5″x14″ metal or plastic panel (Transit Information Products RCH-14 model or approved equivalent) affixed to the sign pole that can securely contain a laminated route and schedule information sheet for that stop. If the stop serves more than one route, the corresponding number of panels should be installed. Panels are to be installed at eye level, roughly 4′ to 5′ above the ground.

c. Accessible Routes: Bus stops shall be connected with an accessible route to all streets, sidewalks, and/or trails within the site boundary. Accessible routes shall comply with all federal ADA guidelines, including but not limited to, width, clearances, surfaces, grades, and cross slopes. Exterior accessible routes may include parking access aisles, curb ramps, crosswalks at vehicular ways, walks, ramps and lifts. Where a bus stop is the closest stop to an intersection, major generator or other private development, it is necessary to extend the accessible route to the intersection, and desirable to extend to the generator or development. In the case of a mid-block stop with no adjacent sidewalk or trail, it is desirable to provide an accessible route to the nearest intersection or signal-protected crosswalk.

4. Applicability

The following transit infrastructure elements will be required:

a. All transit access locations:

i. A concrete landing pad (Cary Standard 3700.01) shall be installed adjacent to the back of the subject corridor street curb along corridors identified in the Comprehensive Transportation Plan, Cary Community Plan, or Wake Transit Plan for current or planned transit service.

ii. Landing pads must meet Americans With Disabilities Act (ADA) specifications.

iii. The landing pad shall be connected to the nearest sidewalks or pedestrian paths, or in the absence of sidewalks, to the nearest public street intersection, local commercial development, or other passenger

destination.

iv. For commercial development the landing pad shall be connected by pedestrian facilities to one (1) of the main entrances to the principal building(s).

v. A new transit stop shall not be required if there is a nearby alternate transit stop or facility that serves the same function as a transit access location and that satisfies a transit stop spacing pattern of approximately 1,000 feet along the same side of the street on the subject corridor. This exemption shall not apply to major transit trip generators.

vi. If the stop is on an existing transit route, installation of a 10' U-channel sign pole shall be required.

vii. Concrete shall meet Cary standard detail 3700.04 specifications.

b. Existing transit access locations with ten or more boardings per day, new development proposed with greater than 6 DU/acre, minor transit trip generators, or along corridors with transit headways greater than 30 minutes during peak periods:

i. For commercial development the landing pad shall be connected by pedestrian facilities to one (1) of the main entrances to the principal building(s).

ii. An amenity pad with approved bench, bike rack, and trash receptacle (Cary Standard Detail 3700.02) shall be provided in addition to the required landing pad.

c. Existing transit access locations with twenty or more boardings per day, new development proposed with a minimum of 18 DU/acre, or major transit trip generators:

i. An amenity pad with approved transit shelter with solar lighting (Cary Standard Detail 3700.03) shall be provided in addition to the above requirements.

d. The Transit Director or designee shall make a final determination of stop location suitability and design in accordance with this section and in consideration of the following:

i. Appropriate bus stop spacing.

ii. Curb clearance.

iii. Placement in relation to the street.

iv. Abutting property owner/tenant parking restrictions and regulations at and near the stop.

v. Vehicle turning radii and street lane width and surfaces.

vi. Intersection design topography and other physical constraints; and

vii. Existing and projected demand.

5. Maintenance Responsibility and Costs of Associated Signage

Cary will be responsible for maintaining the shelter, solar lighting, and other amenities that may be added after installation, to include emptying the trash receptacle if installed. Cary may install a bus stop sign adjacent to the shelter or benches.

6. Construction and Temporary Stops

a. Cary transit staff must be notified a minimum of 5 business days in advance if a street or site construction will require the temporary closure of an existing transit access location(s). A temporary transit access location(s) shall be identified and installed by the developer or applicant, subject to Cary transit staff approval.
b. All transit amenities present prior to construction, including but not limited to a bus stop shelter, bench, trash receptacle, solar lighting, and bike rack, must be reinstalled at the completion of construction.
c. Any Cary transit signage that is removed during construction must be reinstalled at completion of construction.

3055 DRIVEWAY ACCESS REQUIREMENTS

A. CARY DRIVEWAY CONNECTION PERMIT

A Cary driveway connection permit is required for new driveway construction, modification of an existing driveway, or replacement of an existing driveway for all driveway construction on Cary maintained streets.

In addition, a new driveway connection permit will be required for non-residential change of use development projects if they meet any of the following criteria.

1. The current driveway is in disrepair and does not meet the Cary minimum design;
2. The change of use results in an additional 50 peak hour trips above the existing use;
3. The existing driveway does not meet current ADA accessibility requirements; or
4. There are significant changes to the parking layout, circulation patterns, or on-site vehicle storage associated with the change in use.

B. NCDOT DRIVEWAY PERMIT

Six copies of the approved plans and NCDOT Driveway Permit applications will be required for driveways on the North Carolina Department of Transportation System Streets.

C. INSPECTION

Driveway inspections will be provided by Cary in accordance with Standards & Specifications, Section 2030.

D. WORK ZONE TRAFFIC CONTROL

Work zone traffic control plans and implementation thereof will be required in accordance with the Standards & Specifications, Section 2060.

E. DRIVEWAY DESIGN CRITERIA

1. General Requirements

An overarching goal of the driveway access requirements is to provide an access pattern that helps link the operational needs of each site to the public street system and Cary's overall growth framework. This means that the appropriate/permitted driveway types, quantities, and appropriate spacing will vary based on land-use, the site's geography, and the type of street upon which access is desired.

The choice of proper location for a driveway(s) must involve consideration of vehicular and pedestrian conflicts, which can be expected both within the parking area and on the abutting street(s). The overriding principle to be applied is one which seeks to reduce the number of driveways to a practical minimum, thus providing fewer locations where conflict exists.

2. Access Location

Access location is generally defined as the location(s) where Cary desires or will permit access along a site's public street frontage relative to other driveways on-site, across the public/private street, and / or adjacent to the proposed driveway. Cary will permit site access in a manner that limits the amount of closely spaced driveways across a given street frontage and favors the use of a more centralized driveway(s) that can be shared by multiple uses. Where feasible, shared access will be encouraged; however, individual parcel access will be permitted provided all the minimum driveway requirements (i.e. sight distance, property line separation, separation distance from adjacent driveways) are met.

3. Access Amount

Access amount is generally defined as the quantity of driveways that will be permitted along a site's public frontage. Cary reserves the right to permit no direct access to the applicant's preferred public street; in some cases, all access will need to be provided via a lower volume side street, and /or a shared driveway that consolidates multiple land-uses. No more than one driveway per site frontage will generally be permitted unless the applicant can demonstrate, to Cary's satisfaction that the circulation or operations of the site do not work with a single access. An additional access may also be permitted if the site meets all other applicable requirements for access (i.e. sight distance, property line separation, separation distance from adjacent driveways).

4. Access Restrictions & Traffic Mitigations

As part of permit approval, access may be restricted to vehicular movement less than full movement. Associated public infrastructure (medians, turn lanes, traffic signals) may be required as a condition of the driveway permit.

Refer to Access Management section of this document for detailed description of when both access restrictions will be implemented and traffic mitigations will be considered.

5. Standard Driveway Types

The following section of this document entitled "Standard Driveway Types" will provide a brief definition of each driveway type, its general applicability, and specific design considerations for each respective driveway type.

a. Type I (Standard Drawing Detail 3200.01 & 3200.02)
Definition: Any driveway that provides access to a single-family residence, duplex, or triplex. Type I uses a standard concrete ramp driveway apron and sidewalks do not change grade when crossing Type I driveways.

Application & Land Use: This driveway type shall be used for all single-family residential driveways.

Design Considerations: Type I driveways must be designed with sufficient length to accommodate the anticipated number of vehicles such that no parked vehicles will overhang the sidewalk.

b. Type II (Standard Drawing Detail 3200.01 & 3200.02)
Definition: Any driveway that provides access to small office, multi-family, small retail, recreational, industrial, or institutional buildings. Types II uses a standard concrete ramp driveway apron and sidewalks do not change grade when crossing Type II driveways.

Application & Land Use: This driveway should be used for any facilities that generate a low to moderate volume of vehicle trips (less than 100 vehicles per day). Type II driveways are also preferred for urban or highly commercialized areas where high numbers of pedestrians can be expected to travel along the intersecting sidewalk and where too many driveways are present to allow for the spacing necessary to accommodate Type III driveways. Type II driveways are also appropriate for sites with un-channelized vehicular circulation or where it is otherwise important that entering vehicles decelerate significantly to maneuver on site.

Design Considerations: Type II driveways shall always be designed to the minimum width that effectively accommodates the vehicles entering and exiting the site.

c. Type III (Standard Drawing Detail 3200.03)
Definition: A street-type driveway with radius returns. Intersecting sidewalks are interrupted across Type III driveway, but wheel-chair accessible ramps are present to provide continuous passage across the driveway.
Application & Land Use: This driveway is suitable for facilities with moderate to high number of vehicle turning movements, or where a substantial number of truck movements are expected to occur.

Because Type III driveways allow for higher capacity, they are ideal for consolidating access to multiple land uses. This is desirable as a means of increasing the efficiency of vehicles entering and exiting the roadway, and reducing the total number of driveways along a roadway. Type III driveways must be used whenever a dedicated left-turn lane is required in order to facilitate the turns.

Because of the higher vehicle entry and exit speeds and the interruptions they cause to pedestrians, proper spacing is critical for Type III driveways.

Design Considerations: Type III driveways are to be designed to the minimum width that effectively accommodates the vehicles entering and exiting the site. The overall driveway width and the radius returns are to be designed to accommodate the actual wheel paths of the turning vehicle. Since larger radius returns increased the distance required for pedestrians to cross, they are to be designed to the smallest radius which still accommodates the anticipated entering and exiting traffic and which still allows for a reasonable turning speed. Type III driveways are to be located on the site where the highest vehicular utilization can occur and where proper channelization can be provided.

Since Type III driveways tend to serve higher volumes of entering and exiting traffic, the driveway stem must also be designed to provide an adequate amount of internal channelization, thereby reducing the potential for entering traffic to back-up into the public right-of-way.

Table 2 describes the general access provisions for a variety of different land use designated areas in Cary.

Table 2: General Access Provisions by Site Location

Site Location	Street Type	Access Location	Access Amount	Preferred Driveway Type	Access Restrictions	Traffic Mitigations
Town Center Activity Plan (TCAP)	Major Thoroughfare	Intermediate Spacing	Permit Additional Access	Type II	Low	Low
	Minor Thoroughfare	Intermediate Spacing	Permit Additional Access	Type II	Low	Low
	Major Collector	Intermediate Spacing	Permit Additional Access	Type II	Low	Low
	Minor Collector	Minimal Spacing	Permit Additional Access	Type II	Low	Low
	Local	Minimal Spacing	Permit Additional Access	Type II	Low	Low
Mixed-Use Activity Centers, Shopping Centers, General Corridors	Major Thoroughfare	Maximize Spacing	Limited Direct Access	Type III	High	High
	Minor Thoroughfare	Maximize Spacing	Minimize Additional Access	Type III	Medium - High	High
	Major Collector	Intermediate Spacing	Permit Additional Access	Type III	Medium	Medium
	Minor Collector	Intermediate Spacing	Permit Additional Access	Type II	Low	Low
	Local	Minimal Spacing	Permit Additional Access	Type II	Low	Low

Table 2 Continued

Site Location	Street Type	Access Location	Access Amount	Preferred Driveway	Access Restrictions	Traffic Mitigations
Industrial Centers	Major Thoroughfare	Maximize Spacing	Limited Direct Access	Type III	High	High
	Minor Thoroughfare	Maximize Spacing	Minimize Additional Access	Type III	Medium – High	High
	Major Collector	Intermediate Spacing	Permit Additional Access	Type III	Medium	Medium
	Minor Collector	Intermediate Spacing	Permit Additional Access	Type III	Low	Low
	Local	Minimal Spacing	Permit Additional Access	Type III	Low	Low
Residential / Neighborhood Areas	Major Thoroughfare	Maximize Spacing	No Direct Access	Type III	High	High
	Minor Thoroughfare	Maximize Spacing	No Direct Access	Type III	Medium – High	High
	Major Collector	Intermediate Spacing	No Direct Access	Type III	Medium	Medium
	Minor Collector	Intermediate Spacing	Permit Additional Access	Type I, II	Low	Low
	Local	Minimal Spacing	Permit Additional Access	Type I, II	Low	Low

F. ACCESS DESIGN PARAMETERS

Driveway width, radius return, and design vehicle requirements are shown in Table 3 below.

Table 3: Typical Design Values for Driveway Types

Driveway Type	Typical Land Use	Design Vehicle	Recommended Width (1)	Minimum Radius Return	Key Consideration	Standard Drawing Detail
Type I	Low Density Single-Family Residential	P-20	12-18'	3.5'	Low volume/ no large trucks	3200.01 3200.02
Type II	Low-Medium Residential, Single Occupant Commercial	SU-30	24-30'	3.5'	Urban context / High Pedestrian Activity	3200.01 3200.02
Type III	High Trip Generating Commercial, Shopping Centers & Industrial	WB-62	24-40'	25' Based on vehicle turning needs	Low Pedestrian Volume, high traffic intensity, high truck usage	3200.03

(1) measure the width from the edge of pavement, not face of curb

1. Driveway Connections with Entrance Islands

Entrance islands are only permitted when a Type III driveway is used. The minimum entrance and exit lane widths are to be at least 14 feet (edge of pavement dimensions) for a single lane. If additional lanes are desired, then the entrance width should increase by 11-12 feet per lane. The one-way pavement width must be increased to at least 20 feet in width if entrance islands are greater than 100 feet in length.

2. Design Vehicle

Curb radii should be designed to satisfy the turning radius of the predominant design vehicle using the roadway. Minimum radii are listed in Table 2.

Driveways with medians shall be designated to allow for proper turning movements for a predominant design vehicle. AASHTO guidelines are to be followed for the actual median design and median opening dimension.

3. Driveway Alignment

Driveways shall intersect streets at right angles whenever

possible. The desirable intersection angle is 90 degrees. At no time shall a driveway intersect any other street at less than 75 degrees.

4. Offset Driveways

Avoid creating incorrectly offset left turn conditions. Opposite side driveways should be aligned directly across from existing/proposed opposite side streets and driveways. When it is necessary to offset driveways, provide adequate separation for vehicle storage or queuing and maneuvering between access points. If adequate separation cannot be achieved, then access restrictions may be imposed.

5. Shared & Cross Access Driveways

Adjacent commercial property owners are encouraged to construct a shared driveway by written mutual agreement to serve both properties. Joint access provides improved internal circulation and parking capabilities, as well as reduces conflict points and increases distance between driveways. All requirements of this manual shall be met with the exception that the side clearance to property lines shall not apply. Joint driveways are required in the event separation requirements cannot be met.

6. Driveway Grades

For Type III driveways, the maximum grade allowed when approaching a street is five percent (5%) for the last 30 feet of pavement before the edge of the intersection. The maximum grade allowed when approaching a street with a traffic signal is 2% for the last 100 feet of pavement before the edge of the intersection. Driveway grades shall be established such that drivers can negotiate in adverse weather.

The minimum grade allowed on any driveway shall be one-half of one percent (1/2%).

Driveway grades at pedestrian crossing locations shall meet the following criteria or the latest approved Federal Access Board standards whichever is more stringent.

a. 2% maximum cross slope for crossings located at approaches with a stop or yield condition
b. 5% maximum cross slope for crossings located at approaches without stop control
c. Midblock crossing may equal street grade

7. Sight Distance

Minimum sight distance for driveways intersecting streets must be

provided. See Section 3050 for sight distance requirements that applies to driveways as well.

8. Driveway Aligning with Traffic Signals

Upon approval by Cary or the North Carolina Department of Transportation (where applicable), a private driveway may be approved to align opposite an existing or proposed signalized intersection. The developer or landowner will be responsible for all costs associated with the installation of any new signal or modification thereof. The developer or landowner will also be responsible for providing and obtaining all on- site and off-site easements to be provided to Cary or NCDOT to encompass traffic signal equipment, loop detectors, pull boxes, poles, mast arms, markings, signage, etc. The deed of easement will be required to be executed prior to receiving any certificate of occupancy for the site.

9. Pavement Markings & Signs

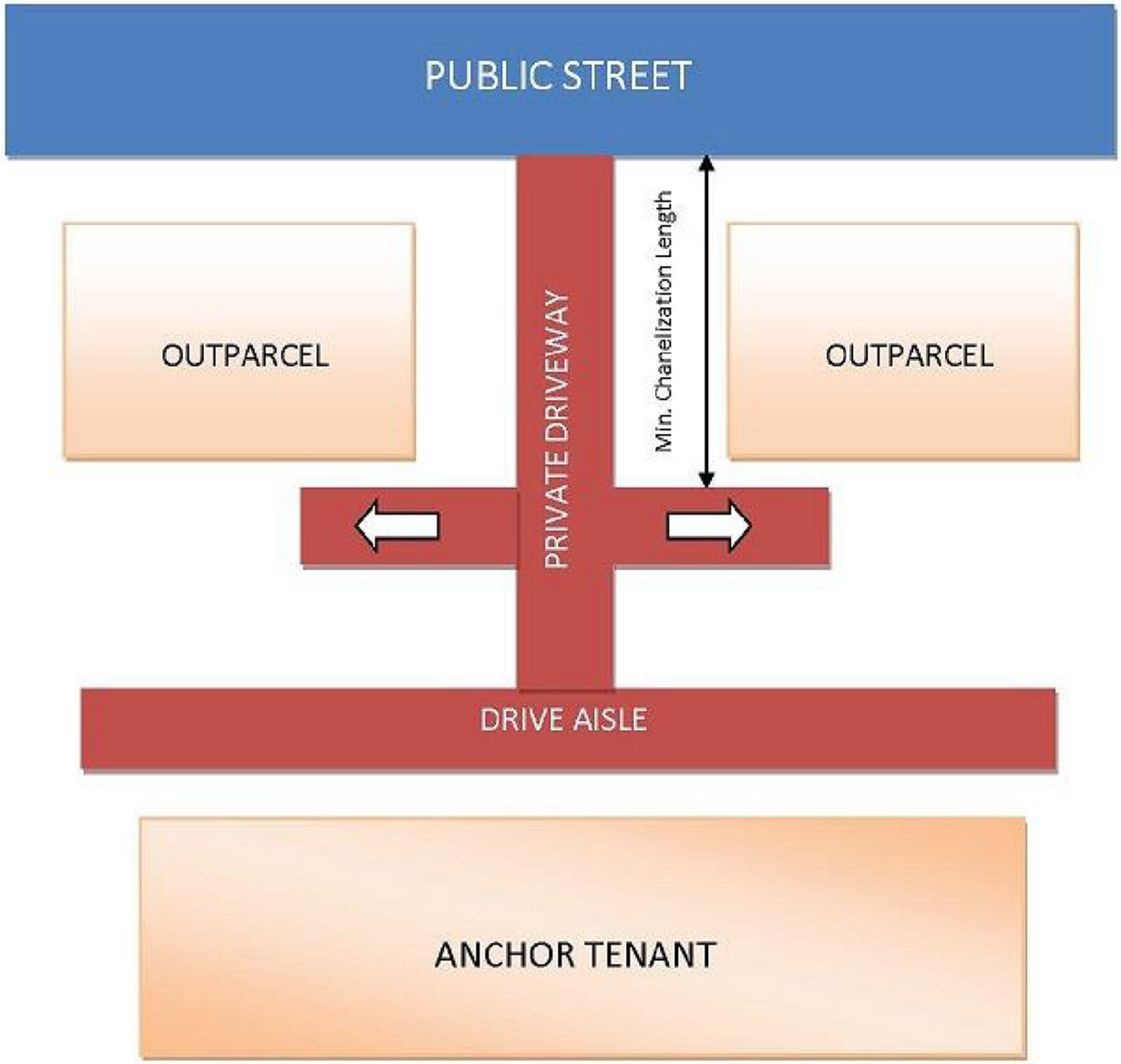
Where a Type II or III driveway meets a public roadway and signalization is not warranted, a stop bar and stop sign shall be used on the driveway approach. Crosswalks will also be required for use with Type III driveways only.

G. ACCESS MANAGEMENT

1. Channelization & Internal Driveway Access

Appropriate driveway channelization length aides in the effectiveness of commercial driveways (Type III) by helping to organize entering and exiting traffic without introducing excessive maneuvering within the function area of the driveway. In all circumstances, fifty feet (50') will be considered the minimum channelization for commercial site access to the public street. This dimension will be measured from the edge of nearest travel lane. For larger commercial shopping centers, and higher intensity mixed-use developments, one-hundred feet (100') will be the minimized channelization (see Figure 6). No internal driveway will be permitted within the channelized portion of the subject driveway that accesses the public street system. Where a commercial driveway provides access to a signalized intersection, two-hundred feet (200') will be the minimum internal channelization dimension.

Figure 6: Driveway Channelization



2. <u>Arrangement of Driveways</u>

The spatial arrangement of driveways should be related to the distance to adjacent driveways and nearby street intersections.

a. <u>Separation from an Un-Signalized Intersection (Corner Clearance)</u>
Table 4 shows the minimum separation a driveway should have from an unsignalized intersection. Cary will evaluate the site specific conditions when the property frontage is less than the required corner clearance distance or determine if greater corner clearance distance is necessary to mitigate safety and/or operational concerns that may be present within the public street, (Figure 7).

Table 4: Functional Requirements for Access Separation

Functional Requirement	Street Classification		
	Thoroughfare	Collector	Local
Corner Clearance from an Unsignalized Intersection (1)	200'	100'	50'
Corner Clearance from an Signalized Intersection (1)	300'	200'	100'
Separation from Adjacent Driveway - On-Site (2)	200'	200'	20'
Separation from Adjacent Driveway - Off-Site (2)	50'	25'	10' or 7′ (4)
Minimum Driveway Separation from Property Line (3)	10'	10'	5' or 3.5' (5)

Notes:
(1) Corner Clearance distance measured from outside edge of travel lane for intersection streets and driveway.

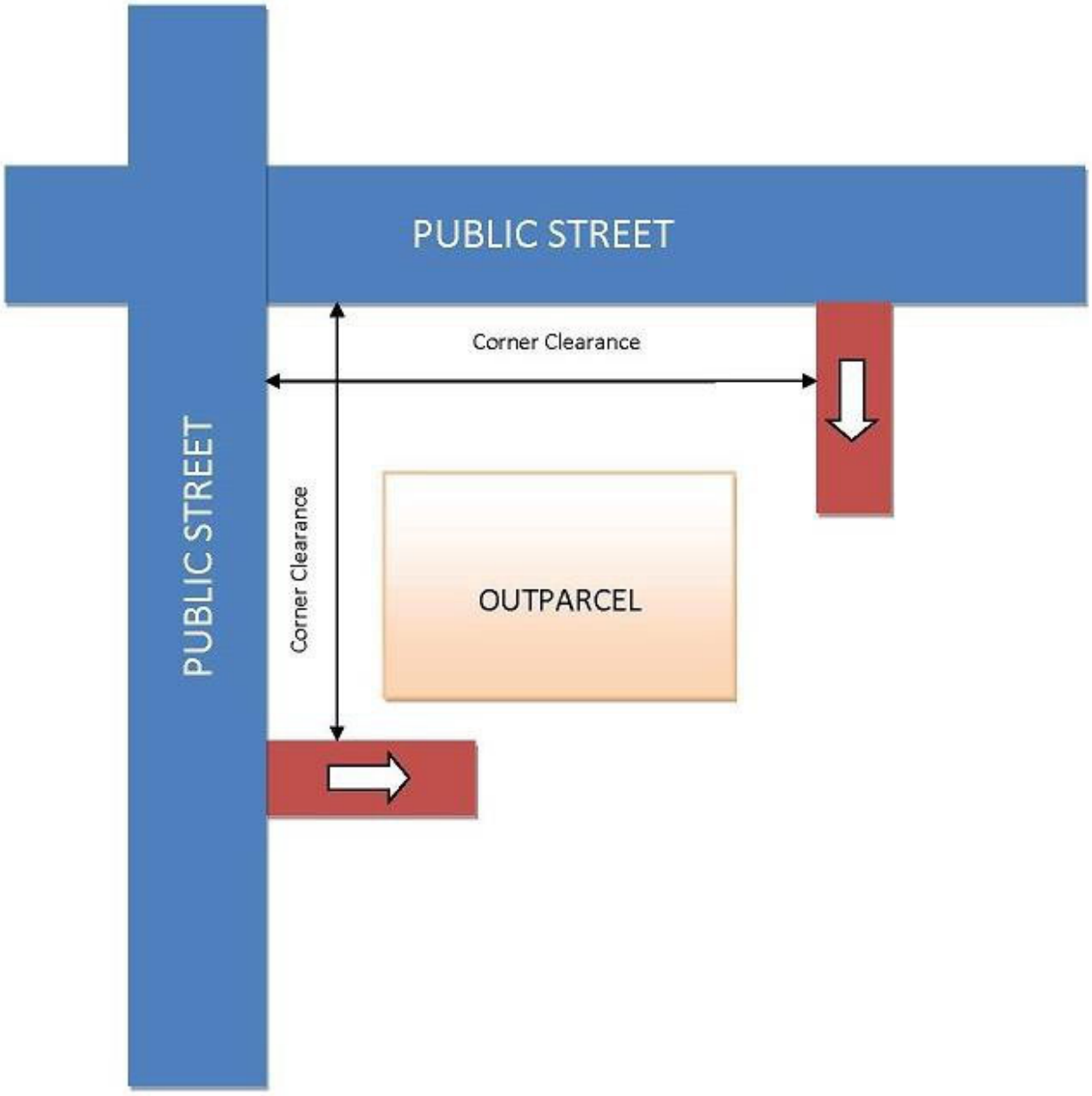
(2) Separation distance from adjacent driveway measured from outside edge of travel lane for each driveway.

(3) Separation distance from property line is measured from the property line to the edge of pavement for Type I and II driveways. For Type III driveways, the separation distance from property line is measured form the property line to the radius point of the driveway.

(4) Separation distance from adjacent driveways for detached dwelling units shall be a minimum of 10 feet. Separation distance from adjacent driveways for subdivided attached, semi-attached, duplexes and townhouses shall be a minimum of 7 feet.

(5) Separation distance for detached dwelling units shall be a minimum of 5 feet from the property line. The separation distance for subdivided attached, semi-attached, duplexes and townhouses shall be a minimum of 3.5 feet from the property line.

Figure 7: Driveway Placement from an Unsignalized Intersection



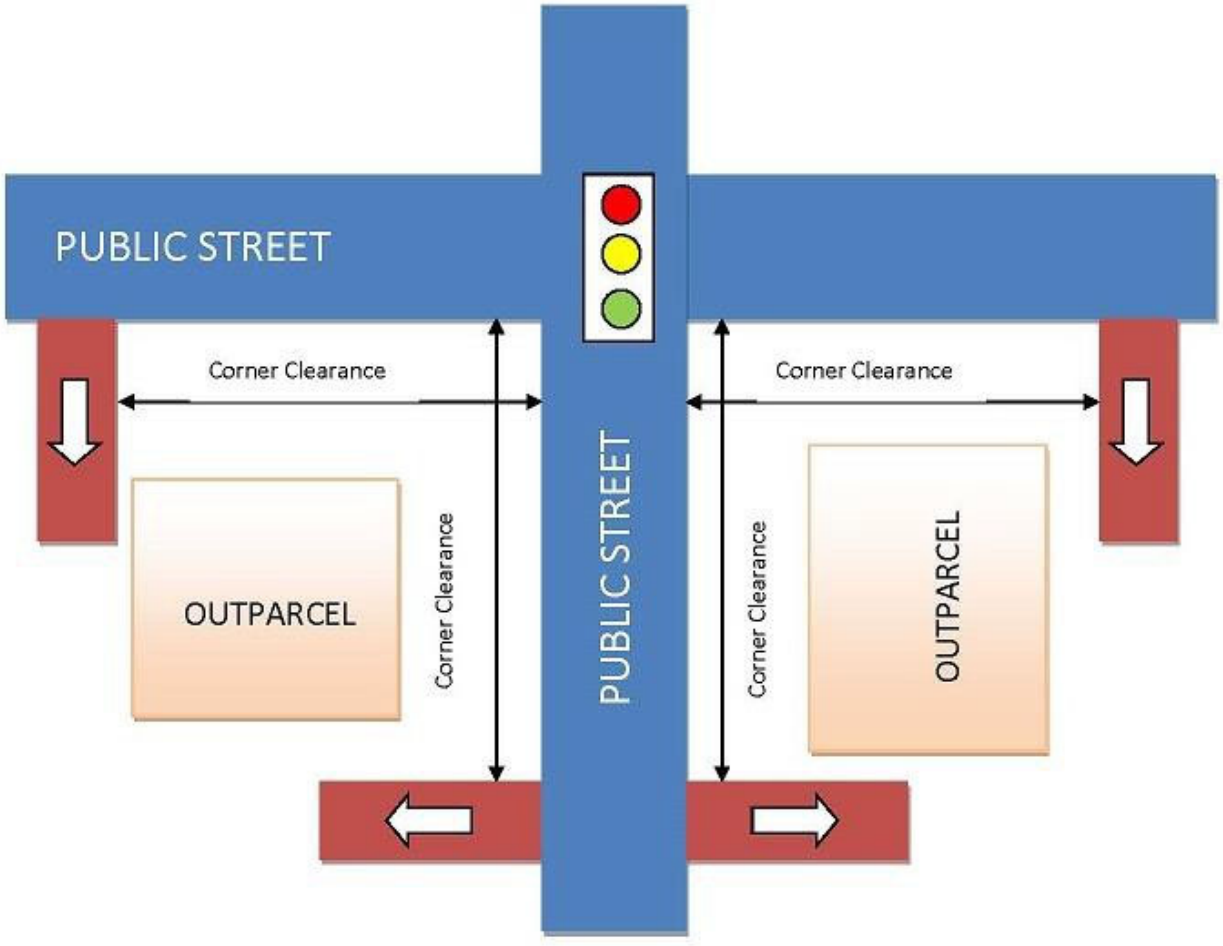
b. Separation from a Signalized Intersection

Traffic signals are a critical component of the transportation system. Traffic signals aide in alleviating congestion, metering traffic movements, and organizing the various transportation demands that motorists, pedestrians, bicyclists, and transit users place on the public street system. Introducing driveways in close proximity to signalized intersections can degrade the intersections capacity, safety, and operations. Therefore, special consideration will always be given to driveways that are proposed in a location that could affect an existing or proposed traffic signal.

Table 3 shows the minimum separation (approach and departure side) a driveway should have from a signalized intersection. Driveway placement will be evaluated on a site-specific basis when a site is adjacent to a traffic signal and determination will be made as to whether full access can be provided or whether access restrictions must occur.

Where dual left turns are present at signalized intersections, any new driveway proposed within the function area of the intersection will be restricted to right turn-in, right turn-out (commonly referred to as “right-in/right-out”) vehicular movements. This will be accomplished via the installation of a raised concrete median island (Figure 8).

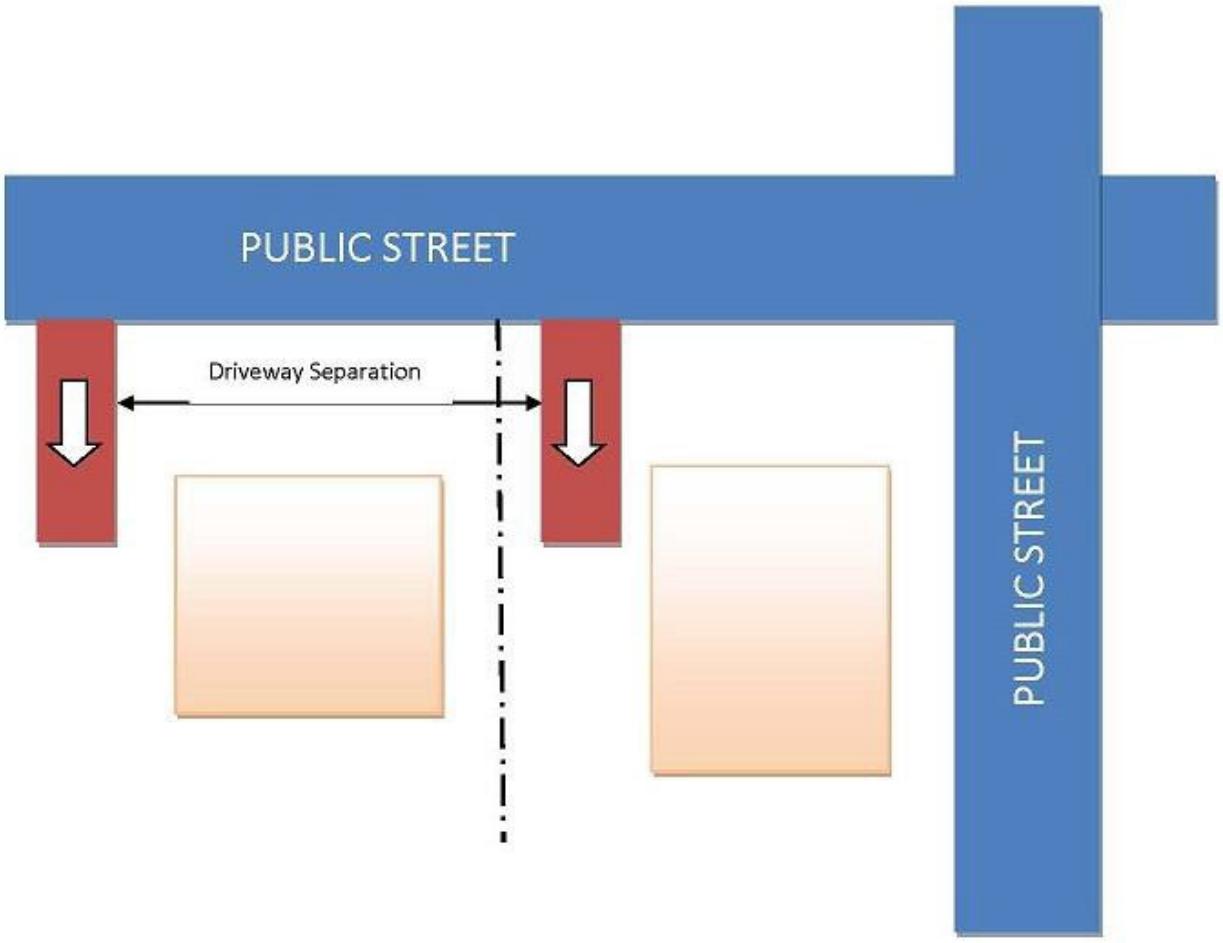
Figure 8: Driveway Placement from a Signalized Intersection



c. Separation from Adjacent Driveways

Driveways too closely spaced to one another have the ability to create sight distance problems and introduce unnecessary conflicts within the public street network (Figure 9). Table 3 shows the minimum separation a driveway should have from an adjacent driveway.

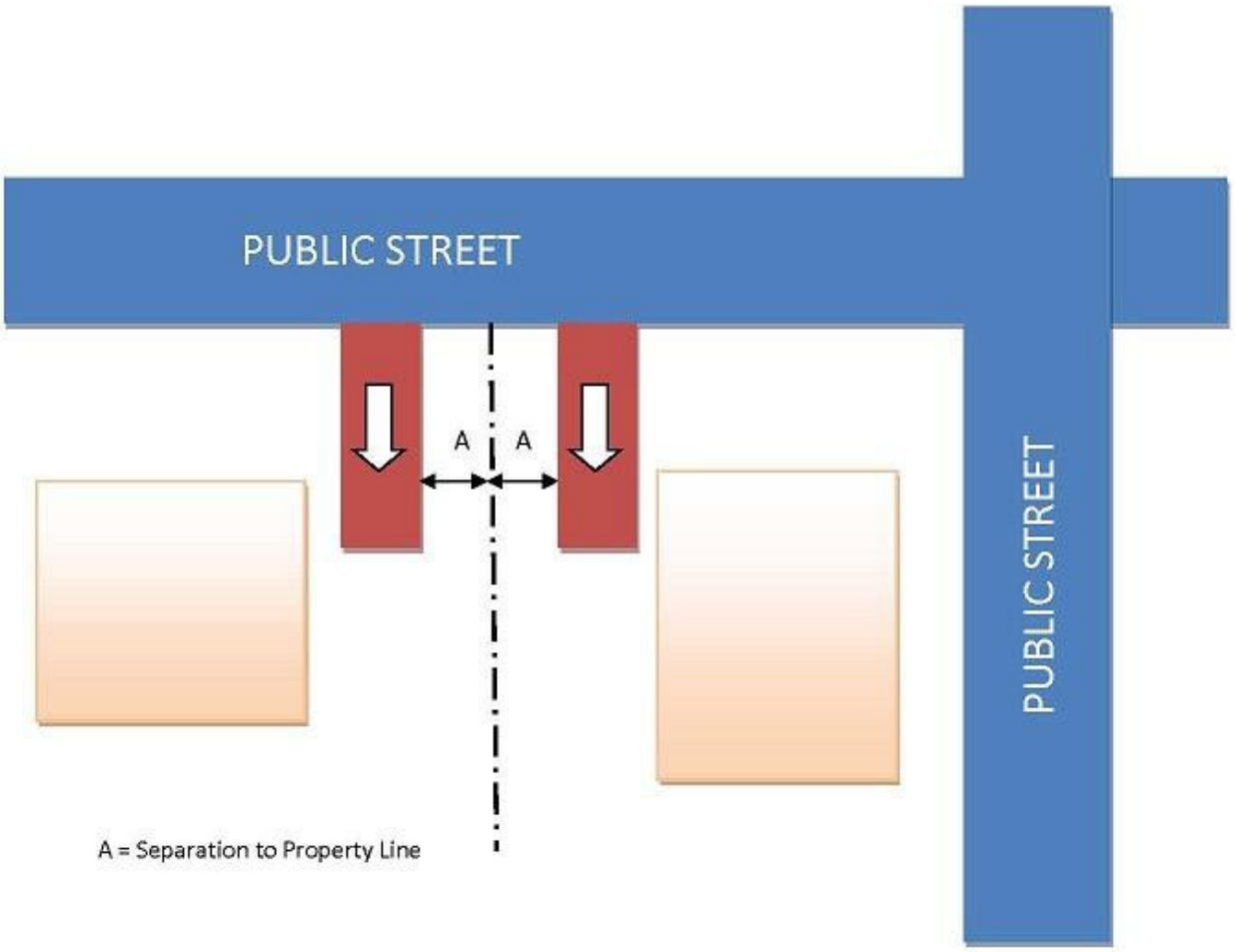
Figure 9: Driveway Separation from Adjacent Driveways



d. Separation from a Property Line

Table 3 shows the minimum separation a driveway should have from a property line (Figure 10). In cases where the separation distance cannot be achieved, Cary will encourage the use of shared/joint driveways.

Figure 10: Driveway Separation from Property Lines



3. <u>Turn Lanes</u>

1) Left turn- lane
Generally, a left-turn lane will be required for sites that generate 50 or more left turns from a thoroughfare or major collector streets during the peak hour. Left-turn lanes will generally not be required for streets classified as minor collector or local streets; but exceptions may include these streets that have known operational, safety, or sight distance deficiencies. Within the Town Center Activity Plan (TCAP), a left-turn lane may not be required even if the subject site exceeds the 50 peak hour threshold.

2) Right turn-lane
Generally, Cary will not require mid-block right-turn deceleration lane. Right-turn lanes provided at mid-block locations have the potential to degrade the pedestrian and cyclists experience due to the frequent interruptions in the

continuous bike bath and the higher entry speeds that exclusive right-turn lanes allow into the respective developments.

Right turn lanes may be required along thoroughfare or major collector streets if the following are present:

1) At driveways or adjacent street intersections where an existing or proposed traffic signal is needed to avoid congestion or unsafe road conditions;
2) large projects where the right turning traffic is expected to be more than 100 vehicles per hour in the peak hour;
3) Industrial projects where there is an anticipated higher volume of industrial truck traffic that will access the property; or
4) A traffic study identifies the need for an auxiliary lane or taper to serve the driveway.

b. Turn Lane Design
Left and right turn lanes shall be designed (storage, tapers, etc.) in accordance with the North Carolina Department of Transportation manual "Policy on Street and Driveway Access to North Carolina Highway".

4. Access Restrictions

While providing adequate public safety and ensuring efficient street operations will be the overarching criteria in determining whether or not Cary restricts site access, there are a few specific criteria where a property owner and/or private developer should expect for their respective site access to be restricted to vehicular movements less than full movement.

a. When the site proposes access to an existing public street cross-section of four lanes or greater;
b. Within 200 feet (approach or departure) of a signalized intersection;
c. Whenever site access is proposed where dual left turn lanes are present;
d. Locations where known accident or traffic operational problems exist; or
e. Where sight distance is not adequate.

The criteria above are not intended to represent a comprehensive list of every situation where Cary will restrict access; however, it provides a general framework of the most common situations where property owners and/or private developers should expect limited site access.

5. Channelization

When access restrictions are required, raised channelization to physically prevent improper or illegal turns into and out of a driveway will be required. Channelization may include medians and raised traffic islands with curbs.

6. Median Crossovers

Where a divided street has been constructed with medians or planned for medians, no new crossovers in the median for driveways will be permitted unless it is in conformance with the spacing guidelines within this manual. New median openings should not encroach on the functional area of an existing median opening or intersection. Preservation of a full width median with landscaping should be a priority.

Left-turn access into property should be by use of entrances along side streets adjacent to the property or by U-turn at downstream and upstream median openings.

3060 MATERIALS

Portland cement concrete for curb and gutter, driveways, and sidewalks shall have a minimum 28-day compressive strength of 3000 psi, a non-vibrated slump between 2.5 and 4 inches, a minimum cement content of 564 pounds per cubic yards, an air entrainment of between 5 and 7%, and a maximum water-cement ratio of 0.532. (Also see Section 2070 "Concrete") Joint filler shall be a non-extruding joint material conforming to ASTM C1751.

Concrete Curing Agents shall be free from any impurities which may be detrimental to the
concrete and meet Section 1026 of the NCDOT Standard Specifications.

Aggregate for portland cement concrete shall meet the requirements for fine and course aggregate of Section 1014 of the NCDOT Standard Specifications.

Portland Cement and admixtures shall meet the requirements of Section 1000 of the NCDOT Standard Specifications.

Water for mixing or curing the concrete shall be free from injurious amounts of oil, salt acid, or other products injurious to the finished product.

Aggregate Base Course shall consist of coarse aggregate produced in accordance with Section 1010 of the NCDOT Standards for either Type A, B, or C aggregate.

Superpave – Asphalt Concrete Surface, Intermediate and Base Course, shall. conform to the general, material and construction specifications of the most current version of Division 6, Asphalt Pavements, in the NCDOT Standard Specifications for Roads and Structures.

Tack Coat shall be asphalt or asphalt cement and shall meet the general, material, and construction specifications of Section 605 of NCDOT Standard Specifications for Roads and Structures.

Concrete Pavement shall meet the general, material, and construction specifications of Section 700 of the NCDOT Standard Specifications for Roads and Structures.

Concrete Pavers may be used on privately maintained streets. Cary will not maintain decorative type paved street surfaces such as pavers or imprinted designs within public right of way.

Geotextile Fabric may be used to stabilize roadways, subgrades, slopes, and for other uses as necessary. The material must be approved by the Director of Transportation prior to installation. Areas stabilized with fabric shall be indicated on "as-built" drawings with the manufacturer name and type fabric indicated.

Prismatic Sheeting shall be a micro-prismatic lens reflective sheeting, classified using ASTM D4956-04. Sheeting types to be used are ASTM Type III, IV, and VI-X.

3070 CONSTRUCTION AND INSPECTION

A. STREETS

No base material shall be placed on a roadway until the storm sewer, subgrade, utilities, and all appurtenances have been inspected and approved by the Inspector.

The Inspector may require field density testing of the subgrade soils by a certified testing firm. The firm shall perform sufficient Proctors to evaluate the compaction characteristics of various soils used in the roadbed. The Inspector may also require field density testing of the ABC used and an asphalt mix formula before either is inspected or approved.

The subgrade shall be compacted as described in Section 2050 Earthwork. Inspection of the subgrade prior to placement of base course, and inspection of the base course prior to placement of asphalt shall be performed by proof rolling and/or field density testing at the direction of the Inspector. Proof roll shall be conducted with a loaded tandem axel dump truck with 15 tons loaded on truck or equivalent as approved by the inspector. Weight ticket may be

required by the inspector.

Only lap joints are allowed. All pavement edges shall be saw cut to provide a good longitudinal joint. Mill a minimum 1.5 feet of existing pavement to1.25 inches deep to minimum to provide a lap joint for final surface layer at all existing asphalt tie-in locations. No milling shall be left for a period of time greater than 48 hours before a street is to be paved/resurfaced.

B. CURB AND GUTTER, AND SIDEWALKS

No concrete shall be placed until the forms and subgrades have been approved by the Inspector.

The surface of sidewalks shall be finished to grade and cross section with a float, troweled smooth and finished with a broom. Sidewalks must be satisfactorily installed before issuance of CO.

- Subgrade shall be excavated to the required depth and shaped to the proper cross-section. Where tree roots are encountered, they shall be removed to a depth of 1 foot for the full width of the excavation. The subgrade shall be stable and thoroughly compacted.

- Forms shall be set and maintained true to the required lines, grades, and dimensions. Forms shall be constructed with material of such strength and rigidity to prevent any appreciable deflection between supports. Straight forms shall be within a tolerance of 1/2 inch in 10 feet from a true line horizontally or vertically. Forms shall be thoroughly cleaned of all dirt, mortar and foreign material before being used. All inside form surfaces shall be thoroughly coated with commercial quality form oil.

- Grooved Contraction Joints shall be cut to a depth equal to at least 1/3 of the total slab thickness. The joint shall be no less than 1/8 inch in width and cut at intervals equal to the width of the sidewalk.

- Expansion Joints shall be a 1/2 inch joint filled with joint filler and placed between all rigid objects and placed no farther than 50 feet apart for sidewalks and curb and gutter, extending the full depth of the concrete with top of the filler 1/2 inch below the finished surface.

END OF SECTION 3000 Text

FIGURE 1: Geometric Design Standards for Streets

			Horizontal Curve Controls			Vertical Curve Controls			
Street Classifications	**Posted Speed**	**Design Speed (MPH)**	**Maximum Desirable Superelevation Rate (ft/ft)**	**Minimum Radii (ft)**	**Curb Return Radius***	**Maximum Grade**	**Length Crest (K x A)**	**Length Sag (K x A)**	**Minimum Length**
Collector Avenues	35	40	NC** 0.04	762 533	30’	8%	44A	64A	120’
Minor Collector Streets	30	35	NC** 0.04	510 371	20’	8%	29A	49A	105’
Major Local Streets	25	25	NC **	200	20’	9%	12A	26A	75’
Minor Local Streets	25	25	NC **	200	20’	12%	12A	26A	75’
Townhouse Streets ****	25	25	NC **	200	20’	12%	12A	26A	75’
Private Streets ******	25	25	NC **	200	20’	12%	12A	26A	75’
Public Alley (residential)	N/A	***	***	***	10’	12%	***	***	
Private Alley (commercial)	N/A	***	***	***	10’	12%	***	***	
Private Access Ways	N/A	***	***	***	20’	12%	***	***	

A = Algebraic difference in grades

* Intersections between different roadway classification shall use the curb radius required for the higher classification

** Normal crown (NC) shall be 0.02’ per foot.

*** Designed to allow emergency vehicles to maneuver through the site comfortably and safely.

**** For Low-Volume Townhouse and/or Private Streets, consideration may be given to modifying the above design standards in accordance with AASHTO standards if justified based on severe topography or avoidance of environmental features.

Thoroughfares shall be designed using the latest AASHTO Policy on Geometric Design of Highways and Streets.

FIGURE 2
PARKING LOT STALL DIMENSIONS

MINIMUM DIMENSIONS FOR 90-DEGREE PARKING

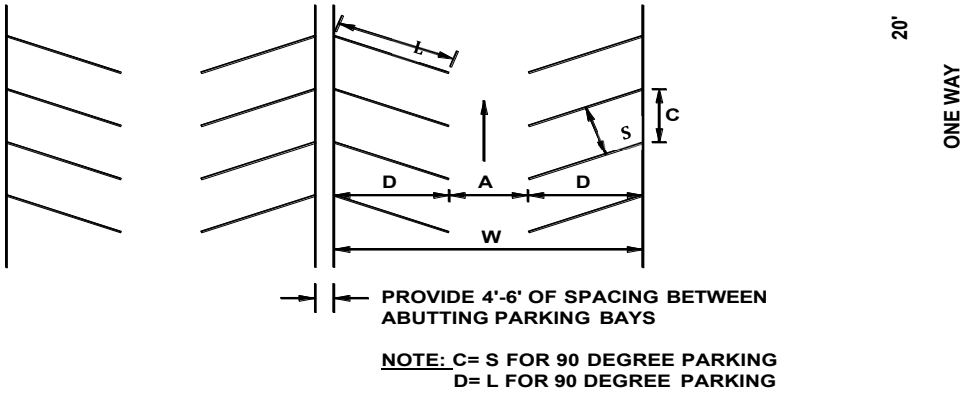
APPLICATION	(S) STALL WIDTH (feet)	(C) STALL LENGTH (feet)	(D) STALL DEPTH (feet)	(L) LINEAR DEPTH (feet)	(A) AISLE WIDTH (feet)	(W) MODULE WIDTH (feet)
	9	9	18	18	24	60

MINIMUM DIMENSIONS FOR 60-DEGREE PARKING

	(S) STALL WIDTH (feet)	(C) STALL LENGTH (feet)	(D) STALL DEPTH (feet)	(L) LINEAR DEPTH (feet)	(A) AISLE WIDTH (feet)	(W) MODULE WIDTH (feet)
	9	10.4	20.1	18	17	57

MINIMUM DIMENSIONS FOR 45-DEGREE PARKING

	(S) STALL WIDTH (feet)	(C) STALL LENGTH (feet)	(D) STALL DEPTH (feet)	(L) LINEAR DEPTH (feet)	(A) AISLE WIDTH (feet)	(W) MODULE WIDTH (feet)
	9	12.7	19.1	18	11	49.2



Reverse angled parking may be utilized on a case by case basis and must be approved by Transportation and Facilities Director

If compact spaces are allowed in accordance with the Land Development Code, then the dimensional standards of the compact spaces must be approved by the Transportation and Facilities Director.

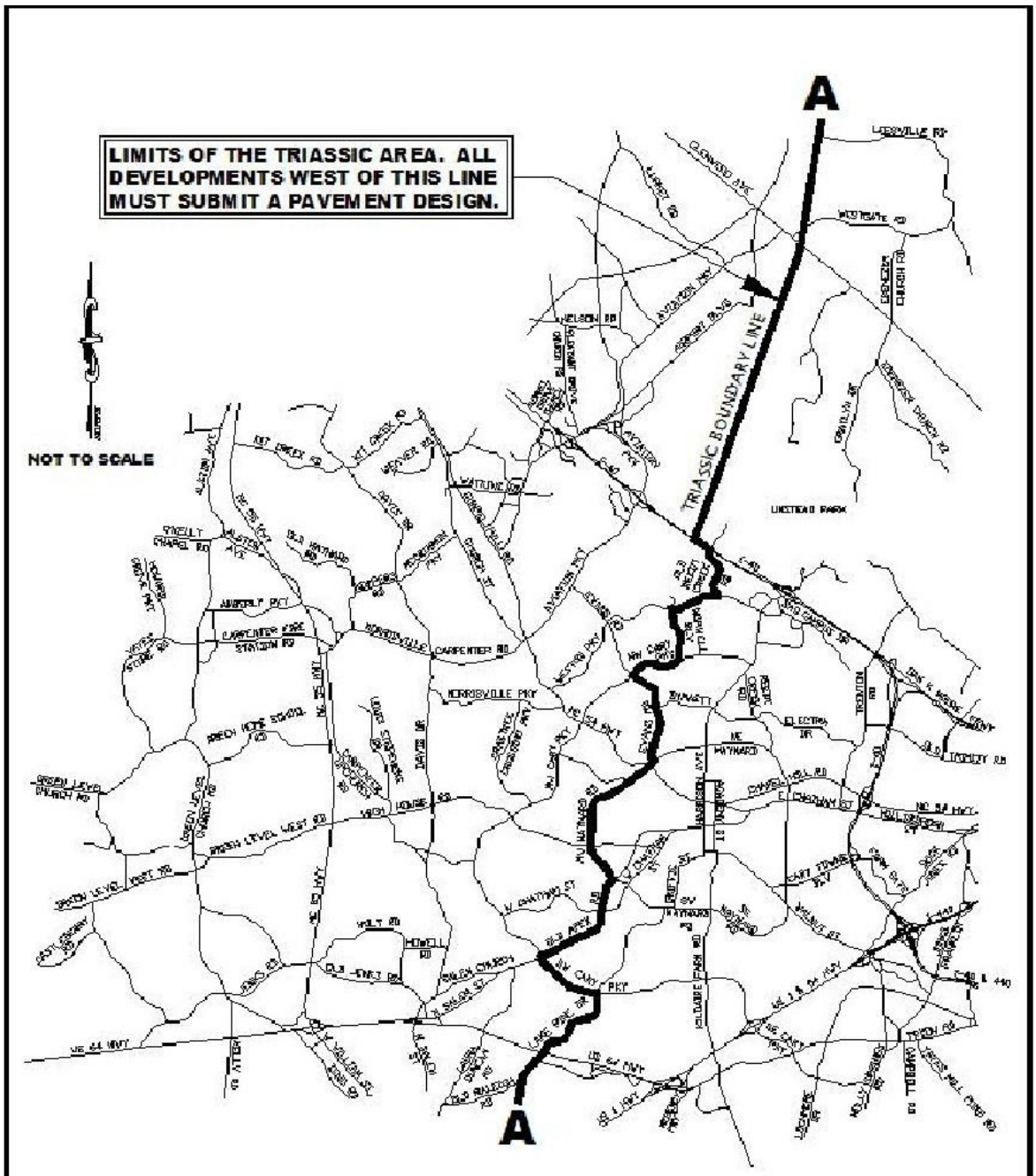
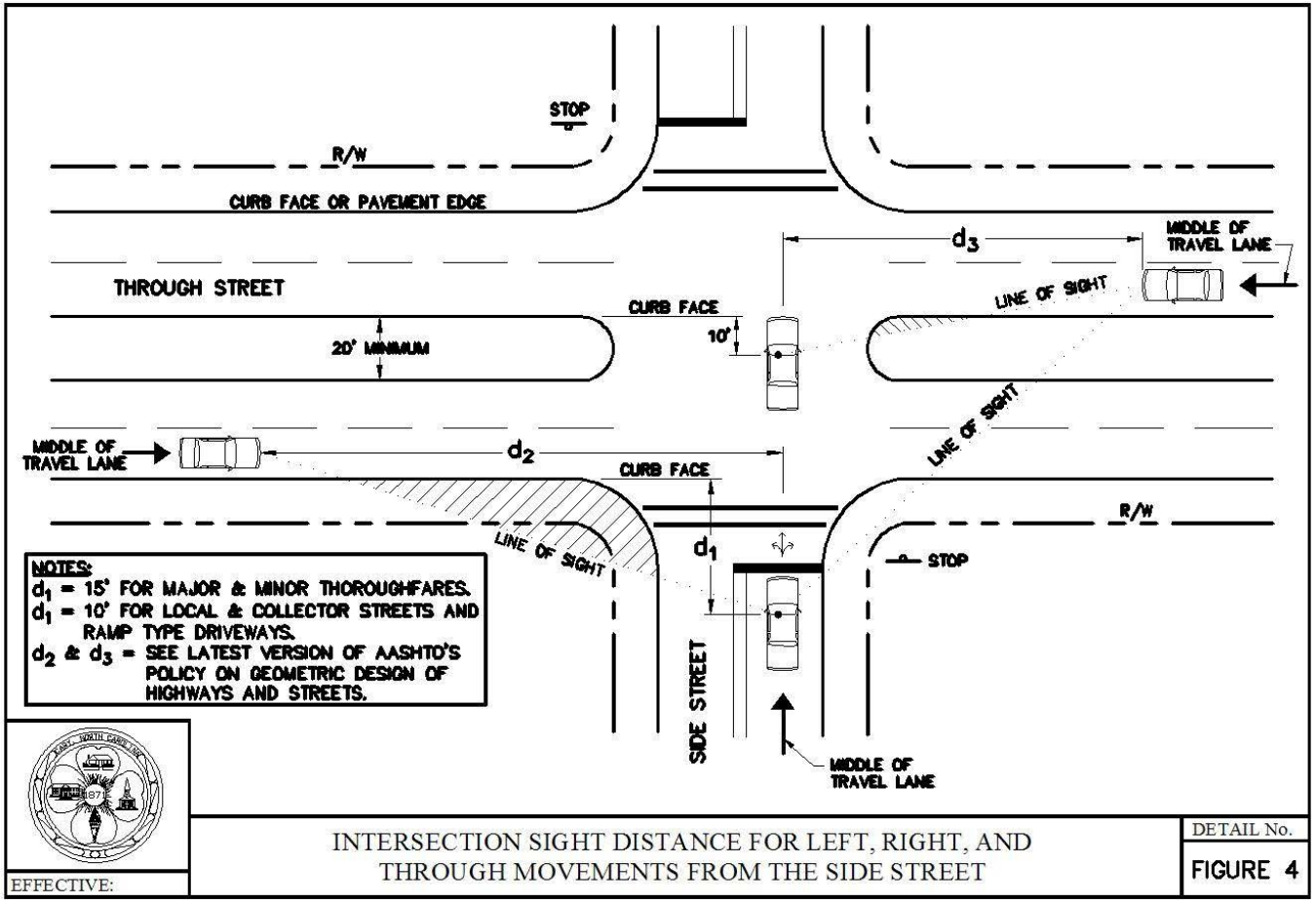
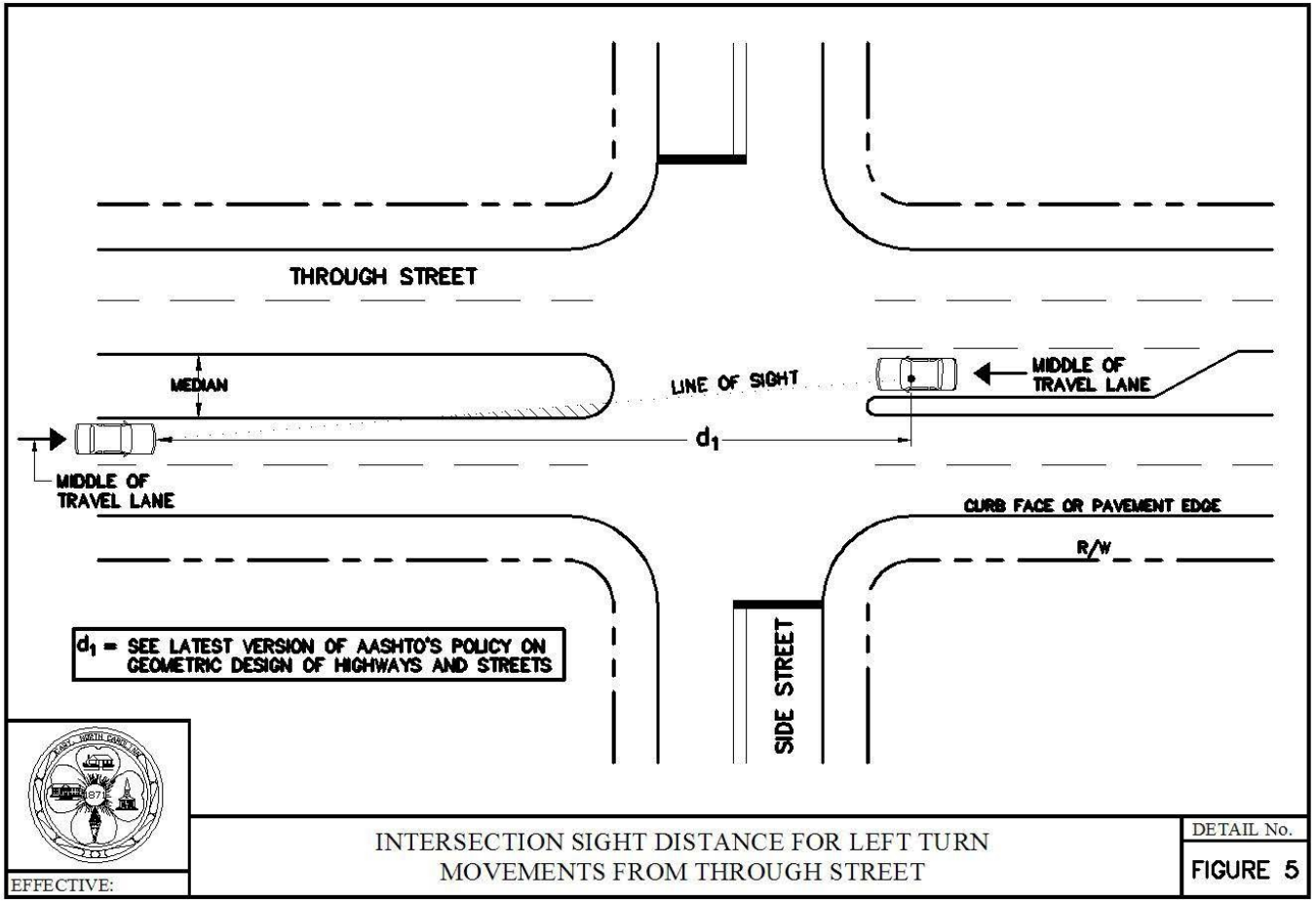


FIGURE 3

TRIASSIC BOUNDARY MAP FOR WESTERN WAKE COUNTY

INFORMATION ADAPTED FROM THE U.S. DEPARTMENT OF AGRICULTURE SOIL SURVEY MANUAL - NOVEMBER 1970


STOP
R/W
CURB FACE OR PAVEMENT EDGE
THROUGH STREET
20' MINIMUM
CURB FACE
10'
d_3
MIDDLE OF TRAVEL LANE
LINE OF SIGHT
MIDDLE OF TRAVEL LANE
d_2
CURB FACE
LINE OF SIGHT
LINE OF SIGHT
R/W
d_1
STOP
SIDE STREET
MIDDLE OF TRAVEL LANE
NOTES:
d_1 = 15' FOR MAJOR & MINOR THOROUGHFARES.
d_1 = 10' FOR LOCAL & COLLECTOR STREETS AND RAMP TYPE DRIVEWAYS.
d_2 & d_3 = SEE LATEST VERSION OF AASHTO'S POLICY ON GEOMETRIC DESIGN OF HIGHWAYS AND STREETS.
EFFECTIVE:
INTERSECTION SIGHT DISTANCE FOR LEFT, RIGHT, AND THROUGH MOVEMENTS FROM THE SIDE STREET
DETAIL No.
FIGURE 4


THROUGH STREET
MEDIAN
LINE OF SIGHT
MIDDLE OF TRAVEL LANE
d_1
MIDDLE OF TRAVEL LANE
CURB FACE OR PAVEMENT EDGE
R/W
d_1 = SEE LATEST VERSION OF AASHTO'S POLICY ON GEOMETRIC DESIGN OF HIGHWAYS AND STREETS
SIDE STREET
EFFECTIVE:
INTERSECTION SIGHT DISTANCE FOR LEFT TURN MOVEMENTS FROM THROUGH STREET
DETAIL No.
FIGURE 5