

**SECTION 3.00  
STREETS, DRIVEWAYS, AND PARKING LOTS**

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### **3.01 GENERAL**

The latest revision of the *Standard Specifications for Roads and Structures* of the North Carolina Department of Transportation shall apply unless otherwise specified herein.

Whenever the following terms are used in above said specifications the intended meaning of such terms shall be as follows:

“State” or “Commission” shall be replaced by “Town of Holly Springs.”

“Resident Engineer” shall be replaced by the words “Director of Engineering.”

“Sampling and testing by Commission” shall be replaced by the words “sampling and testing by the Town or its authorized testing agent.”

“Inspection by Commission” shall be replaced by “Inspection by Town or its duly authorized representative.”

### **3.02 DESIGN**

All streets (private and public) shall be designed and fully constructed to the Town of Holly Springs Engineering Design and Construction Standards in accordance with all ordinances and policies of the Town. Refer to the Town of Holly Springs UDO for requirements for improving existing Thoroughfares and streets. NCDOT standards shall be used on all existing State roads, extensions of existing State roads, or roads to be maintained by NCDOT.

Street design is based primarily on criteria dictated by the street classification, design speed, surrounding terrain, and traffic volumes. The following factors shall also be considered in determining street and right-of-way widths: urban-type development, on-street parking, alley-loaded units, zoning, depth of lots (length of driveways), garages, street trees, street network, setbacks, street classification, speed limit, and sidewalks. The Director of Engineering shall make the final approval for necessary street and right of way widths. The following are intended to be recommended street and right of way widths for suburban-type developments. Specific information and documentation on development and/or product types to be serviced by roadways should be provided for consideration of street widths, and such information may be incorporated into development and/or plan approval conditions. Streets shall be designed to accommodate all movements necessary for WB50 designed vehicle. Turning templates may be required to verify WB50 movements.

Note that a Transportation Impact Analysis (TIA) may be required to accompany plans submitted to the Town, or required as early as rezoning petition submittal, for consideration of traffic impacts due to development.

In special circumstances, the Town may elect to require payment of a fee-in-lieu of installation of roadway improvements.

**A. Street Classifications for Town Specifications**

\*See above paragraph regarding factors that determine street cross-section and right-of-way section. Early communication (in preliminary design) with the Director of Engineering to determine the appropriate street and right-of-way width for the particular development is encouraged. The following street cross sections comprise the most typically utilized sections for the Town. The details at the end of these design and construction standards include additional cross sections that are utilized when other factors are considered. Note that reduced roadway cross sections may be permitted for streets serving areas for which a master land use plan is approved, with approval of the Director of Engineering.

In areas where an entrance median is desired, the width of the median shall be in addition to required cross sections as specified.

**Alleys**

*Typical width: 16 feet on 25-foot private easement*

All alleys are private. They are encouraged in the Town Village (TV) and Neighborhood Village Districts (NVD), in neotraditional and mixed use developments, and adjacent to limited-access facilities. The purpose of an alley is to provide utility and vehicular access along the rear or side of new residential and non-residential structures. All alleys are to be privately maintained with measures to ensure the travel way is not obstructed in any manner, including by parking or loading. A minimum 8" ABC and 2" 9.5B pavement design and proof roll inspection shall be required for an alley that will be used for public services (e.g., sanitation, fire protection). A drainage system shall be provided and shall conform with all public street design drainage standards as outlined in this Manual.

The Town shall not be responsible for damage occurring to the pavement structure due to use of the private alley for access in providing public services. When alleys are used for the provision of these services, the Homeowner Association covenants for the development shall clearly state this. Alleys shall be constructed on a 25-foot private easement with a paved travel lane of 16 feet, and clear shoulders of a minimum width 4.5 feet along each side. Alley driveway entrance shall be as per TOHS Detail HS311.

Under unique, site-specific circumstances, including such factors as the absence of utility lines in the alley and/or lack of real property, consideration of a reduction of rights of way and travel lane widths may be made.

**Residential Cul-de-sac (1000 feet or less)**

*Typical width: 27 feet back to back on 51-foot right of way – Single side parallel on-street parking*

A street which serves abutting residential land use and which terminates in a turnaround and originates at the intersection with another street. With the exception of cul-de-sacs, other street types shall not intersect onto this street classification segment. Cul-de-sacs shall only be permitted on a case-by-case basis where extreme topographical or environmental concerns exist, or where future connection to other streets is impossible due to pre-existing development. Where the design will accommodate double sided on-street parking the Director of Engineering shall determine the minimum width. Additional pavement marking and signage may be required where on-street parking is to be prohibited (TOHS Detail HS303).

**Residential Street**

*Typical width: 31 feet back to back on 55-foot right of way – single side parallel on-street parking*  
*27 feet back to back on 51-foot right of way – no on-street parking*

A street where the primary function is to serve the immediately abutting residential land use (i.e. only local traffic generated by the residents in proximity of the street). If traffic volumes flowing from other intersecting residential streets exceeds the traffic volumes generated by the land use abutting the street or this street classification serves more than 150 dwelling units, a different street classification shall be used. Where the design will accommodate double sided on-street parking the Director of Engineering shall determine the minimum width. Additional pavement marking and signage may be required where on-street parking is to be prohibited (TOHS Detail HS302).

**Non-Residential 2-Lane Collector Street or Cul-de-sac (1000 feet or less)**

*Typical width: 35 feet back to back on 59-foot right of way - no on-street parking permitted*  
*43 feet back to back on 67 feet of right-of-way – single side parallel on-street parking*  
*49 feet back to back on 73 feet of right-of-way – single side parallel on-street parking and shared bike lanes*

A street which serves various land use classifications, and whose primary function is traffic service, collecting traffic from streets intersecting it and funneling it to major thoroughfares. Design shall accommodate the vehicle type generally expected to use the roadway facility which is typically larger than a passenger car, for example WB-50 and SU type vehicles. Where the design will accommodate double sided on-street parking the Director of Engineering shall determine the minimum width. Additional pavement marking and signage may be required where on-street parking is to be prohibited.

### **Residential 2-Lane Collector Street – No Load**

*Typical width: 29 feet back to back on 53 feet of right of way – no on-street parking*  
*37 feet back to back on 61 feet of right of way – single side parallel on-street parking*  
*35 feet back to back on 59 feet of right of way – no on-street parking, shared bike lane*  
*43 feet back to back on 67 feet of right of way – single side on-street parking, shared bike lane*  
*39 feet back to back on 63 feet of right of way – no on-street parking, dedicated bike lane*  
*47 feet back to back on 71 feet of right of way – single side on-street parking, dedicated bike lane*

A street which serves various land use classifications, and whose primary function is traffic service, collecting traffic from streets intersecting it and funneling it to major thoroughfares. A residential collector street shall be provided when the roadway is the sole traffic route for more than 150 dwelling units, collects traffic from a commercial area of 20 acres or more, or contains other land uses which would account for similar traffic volumes. Where the design will accommodate double sided on-street parking the Director of Engineering shall determine the minimum width. Additional pavement marking and signage may be required where on-street parking is to be prohibited. This type of roadway shall have no individual driveway accesses (TOHS Detail HS305).

If project frontage is within 500 feet of a major intersection, additional turn lanes and right of way widths may be required as determined by the Director of Engineering.

### **Non-Residential 3-Lane Collector Street**

*Typical width: 41 feet back to back on 65-foot right of way*  
*no on-street parking permitted*  
*43 feet back to back on 67-foot right of way*

*no on-street parking permitted  
49 feet back to back on 73-foot right of way  
with shared bike lanes  
53 feet back to back on 77 feet of right-of-way – with dedicated  
bike*

A street which serves various land use classifications, and whose primary function is traffic service, collecting traffic from streets intersecting it and funneling it to major thoroughfares. Design shall accommodate the vehicle type generally expected to use the roadway facility which is typically larger than a passenger car, for example WB-50 and SU type vehicles. Where the design will accommodate double sided on-street parking the Director of Engineering shall determine the minimum width. Additional pavement marking and signage may be required where on-street parking is to be prohibited.

### **Thoroughfare**

*Typical width: as required on Town Comprehensive Transportation Plan*

A street which serves as a primary traffic artery of the urban area, serving the major centers of activity and carrying traffic between such centers at moderate speeds. Access to abutting property may be permitted by the Director of Engineering only on a very limited, controlled basis and in cases of a divided roadway will be limited to right in/right out unless a median and turn lanes are approved. However, the primary function of this street is to carry traffic having origin and destination removed from the street proper. The thoroughfare classifications carry the majority of trips entering and leaving the urban area as well as the through trips. Access is primarily provided by at-grade intersections which may be signal controlled. Where the design will accommodate double sided on-street parking the Director of Engineering shall determine the minimum width. Additional pavement marking and signage may be required where on-street parking is to be prohibited.

A slope easement of 20 feet in width shall be required adjoining each side of the right of way for this type of facility unless the complete facility is being constructed as part of the adjoining property development. The Director of Engineering may reduce or increase the slope easement width if necessary due to terrain.

If property owner submits to the Director of Engineering (prior to construction drawing or preliminary plan approval) sufficient information to show that improvements to be located in the slope easement do not interfere with the right of the public to construct within adjoining right of way, then the Director of Engineering may permit the proposed improvement to occur.

If project frontage is within 1000 feet of a major intersection, additional turn lanes and right of way widths may be required as determined by the Director of Engineering (TOHS Detail HS307).

### **Limited Access Thoroughfare**

*Typical width: as required on Comprehensive Transportation Plan no on-street parking permitted*

An urban major roadway where sole function is to carry large volumes of traffic safely and expediently through the urban area. Access onto the facility is controlled to occur only at intersections with major streets or in some cases limited to right-in/right-out access subject to approval by the Director of Engineering. Such intersections are spaced at intervals which promote traffic progression with the absolute minimal delays incurred. The highest practical level of design shall be incorporated into facilities of this classification.

A slope easement of 20 feet in width shall be required adjoining each side of a street right of way unless the complete facility is being constructed as part of the adjoining property development. The Director of Engineering may reduce or increase the slope easement width if necessary due to terrain.

If property owner submits to the Director of Engineering (prior to construction drawing or preliminary plan approval) sufficient information to show that improvements to be located in the slope easement do not interfere with the right of the public to construct within adjoining right of way then the Director of Engineering may permit the proposed improvement to occur.

If project frontage is within 1000 feet of a major intersection, as determined by the Director of Engineering, then additional turn lanes and right of way widths may be required.

### **Controlled Access Highway**

*Typical width: as required by Federal Highway Administration and AASHTO  
no on-street parking permitted*

A State highway, or section of State highway, especially designed for through traffic, from or to which highway owners or occupants of abutting property, or others, shall have only a controlled right or easement of access.

A slope easement of 20 feet in width shall be required adjoining each side of a street right of way unless the complete facility is being constructed as part of the adjoining property development. The Director of Engineering may reduce or increase the slope easement width if necessary due to terrain.

If property owner submits to the Director of Engineering (prior to construction drawing or preliminary plan approval) sufficient information to show that improvements to be located in the slope easement do not interfere with the right of the public to construct within adjoining right of way then the Director of Engineering may permit the proposed improvement to occur.

If project frontage is within 1000 feet of a major intersection as determined by the Director of Engineering, then additional turn lanes and right of way widths may be required.

## **B. Horizontal Street Design**

All streets shall conform to the Town of Holly Springs Comprehensive Transportation Plan and shall be designed and located in proper relation to existing streets and environment. Collector streets, thoroughfares, and boulevards shall be as directional as possible but consistent with topography and preserving developed properties and community values. Residential streets shall be designed to minimize cuts and fills, and emphasis shall be placed on encouraging slower speeds in order to protect pedestrians using the facility and minimize persistent cut through traffic.

In addition to the Town of Holly Springs Comprehensive Transportation Plan, the Town maintains “Small Area Plans” to guide the development of various areas in Town. These Plans are for the purpose of master-planning various critical areas. Schematics include general roadway configurations and/or connections that are desirable and shall be used as a guideline for development of the areas and are approved in a Town Policy Statement. For development planned in those areas, the developer is encouraged to meet with Town Staff to review the “Small Area Plans” approved by the Town for that area, and to develop plans consistent with that information.

The design of streets shall conform to the horizontal curve controls in Figure 1 at the end of this chapter.

A minimum tangent of 150 feet is required between reverse curves for major streets, highways, boulevards, and collector and other non-residential streets. The tangent shall be extended as necessary to provide the minimum runoff lengths for the superelevated curves per AASHTO guidelines. The minimum tangent length approaching an intersection is 30 feet for residential streets. All intersections of streets classified as collector or greater shall have a tangent section not less than 100 feet approaching the intersection.

Compound horizontal curves with the same direction of curvature shall have the radius of the flatter circular arc no more than 1½ times the radius of the sharper

circular arc. Streets shall intersect each other at right angles whenever possible. The minimum desirable intersection angle is 80°. At no time shall a street intersect any other street at less than 75°.

Intersections with thoroughfares, boulevards, or highways shall be at least 800 feet apart. Note that median spacing will require NCDOT and Town approval and shall require greater spacing. There shall be a minimum of 200 feet between centerlines of street jogs on collectors, boulevards, and major streets. Residential and marginal access streets shall not be offset less than 125 from their centerlines.

Thoroughfares, boulevards, and collectors shall be super elevated. Super elevation shall conform to Figure 1 at the end of this chapter and shall conform to NCDOT and AASHTO standards.

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

$$L = WS \text{ for posted speeds of 45 mph and greater}$$
$$L = WS^2 \text{ for posted speeds of 40 mph or less}$$

L = Length in feet  
S = Speed in miles per hour  
W = Lateral offsets in feet

Turn bay tapers shall be at least 15:1 for posted speeds of 45 miles per hour and more. The minimum turn bay taper allowed is 8:1. Symmetrical reverse curve tapers are recommended for streets classified as collector or less. Storage lengths for the turn bays shall be calculated using an acceptable method.

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

### C. **Vertical Design**

Street grades shall be established with respect to existing topography to avoid excessive grading and the removal of existing trees and vegetation whenever practical.

The minimum grade allowed on any street shall be ½%.

The maximum grade allowed when approaching an intersection is 5% for the last 100 feet of pavement before the intersection unless otherwise approved by the Director of Engineering.

The vertical curve controls found in Figure 1 at the end of this chapter shall also be utilized in street design.

**D. Geometrics-Radii**

A minimum radius of 25 feet to the back of curb shall be required where residential streets intersect.

A minimum radius of 30 feet measured to the back of curb shall be required where a residential street intersects with a non-residential street. It is recommended that the designer consider larger radii or 3-centered compound curves where needed to provide for turning movements of larger vehicles.

A minimum radius of 40 feet shall be required where collectors intersect thoroughfare or boulevard streets.

**E. Cul-de-sacs**

The minimum allowable cul-de-sac radius is 37.5 feet. The maximum allowable length of a cul-de-sac is 1000 feet, measured from the last point of alternate access within the subdivision. See 3.02, Section O for more information on phased construction requirements.

No median shall be allowed in a 37.5-foot radius cul-de-sac. A median may be permitted where the cul-de-sac radius is increased and it can be demonstrated that all emergency and service vehicles can be readily accommodated.

**F. Driveways/Access**

**General**

In the interest of public safety and convenience, the Town of Holly Springs may restrict the placement of a driveway to a particular location along the property owner's frontage. Driveways will not generally be allowed along acceleration or deceleration lanes and associated tapers. No driveway will be allowed within the intersection of radii of intersecting roadways.

**Non-residential**

Standard concrete driveway aprons as shown in the Standard Detail Section of these Standards shall be used when the ADT for the driveway is less than 500 vehicles.

Street type turnouts shall be used when the driveway ADT is greater than 500 vehicles or when access by larger trucks must be accommodated. The minimum

radius for street type turnouts shall be designed to accommodate a WB40 design vehicle and meet a minimum of 25' radius. Documentation using WB40 templates will be required. The maximum vertical grade allowable for a distance of 25 feet into the site from the right of way line shall be 8%. In addition, the designer shall insure that adequate sight distance for all driveways are provided in accordance with AASHTO Standards.

Non-residential driveways that are unpaved shall have a minimum 30-foot paved surface strip measured from the back of the driveway apron.

Driveways without islands shall be a minimum of 22 feet wide, excluding curb and gutter or 27' back-to-back with standards curb and gutter. Driveways with islands shall have a 21-foot back to back of curb entrance lane. A 21-foot wide back to back curb exit lane shall be required when only one lane is specified, and a 22-foot wide exit lane shall be used when two exit lanes are specified (all minimum measurements stated exclude curb and gutter). A minimum throat distance of 80 feet shall be required at all egress and ingress points from thoroughfares.

The number of street and driveway connections permitted serving a single property frontage or commercial development shall be the minimum deemed necessary by the Director of Engineering for reasonable service to the property without undue impairment of safety, convenience, and utility of the roadway. Normally, one driveway shall be permitted for any single property frontage. The use of shared driveways and joint access easements may be required for new accesses to "managed access" roadways.

The arrangement of driveways should be related to adjacent driveways and nearby street intersections. Driveways close to street intersections shall be at least 25 feet from the point of tangency of the radius of curvature of the intersecting street. All driveways serving shopping center and other high volume generators shall be located a minimum of 200 feet from the intersection of public roads unless otherwise approved by the Director of Engineering.

Where two driveways are proposed and approved along a single property frontage to facilitate operations, the minimum distance between the centerlines of the drives shall be 100 feet. The minimum distance between the centerlines of driveways into shopping centers and other high volume generators shall be 400 feet.

For all median divided roadways, all driveways shall be limited to right in/right out unless located at approved planned median breaks.

### **Residential**

Residential driveways shall measure 12 feet wide from the curb cut to the right of way for a single car garage/driveway, shall measure 16 feet wide from the curb cut to the right of way for a double or greater car garage/driveway, and shall conform to the applicable TOHS Detail HS320 for concrete driveway aprons. A minimum driveway length of 25 feet shall be provided between any building and the right of way line. Triple-width parking areas shall require a site plan review and approval and may require additional length.

All lots shall be served off the more minor classification of roadway, and there shall be only one driveway per residential lot.

Residential driveways shall be located a minimum of 10 feet from the point of tangency of curb radii at street intersections. Additional distance will be required for roadways classified as collectors and higher.

#### **G. Curb and Gutter**

Curb and gutter shall be required on all streets and parking lots (including loading areas), unless otherwise approved by the Director of Engineering. Exceptions may be granted by the Director of Engineering in instances where:

1. The curb and gutter will only be temporary in nature;
2. There are environmental restrictions;
3. Drainage problems will be created;
4. In non-gateway Industrial areas per the UDO.

Streets without curb and gutter may also be approved in very low density, wide-frontage lots. They must meet all of the following requirements and be approved by the Director of Engineering:

1. Minimum 50-foot rights of way;
2. 5% maximum vertical grade and 0.5% minimum grade;
3. Adequate swale system to carry the 10 year storm in a non-erosive manner – this must be demonstrated by performance during the one-year warranty period or a change in the material of swales will be required;
4. Driveways across swales shall be constructed to provide for the passage of the 10 year storm;
5. All driveway pipes shall have flared end sections or headwalls on inlet and outlet ends of the pipe.

Exceptions for curb and gutter may not be issued for streets classified as collector or greater, all streets located in multi family developments, and the Town Village District (TVD). In these areas, standard 2'6" curb and gutter shall be used. For other streets, 2'6" standard or 2'6" valley curb and gutter may be used. Median curb shall be a minimum width of 1'6" standard mountable curb or 1'6", 2'0" of

2'6" standard curb and gutter. In parking lots, curb and gutter may be 1'6", 2'0", or 2'6" standard curb and gutter. When flat curb is permitted, refer to Holly Spring Detail HS364.

Where 2' 6" standard curb and gutter is used, driveway and utility service locations shall be shown in detail on construction drawings.

A minimum 5-foot section of curb and gutter shall remain when removing any section of 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 full section of curb shall be removed to the next joint. Full removal of both the curb and gutter is required when installing a driveway.

For parking lots, cut and fill slopes shall not begin immediately at the back of curb, instead a minimum 4 foot shoulder for fill slopes or 2 foot shoulder for cut slopes is required behind the back of curb. For roadways, cut and fill slopes shall begin outside a minimum 10' or 12' shoulder as shown on the details.

On streets a minimum depth of 3.5 inches of ABC shall be placed under the curb and gutter.

#### **H. Parking Lots/Off Street Parking**

Parking lots shall be designed to provide safe maneuverability of vehicles. A minimum parking stall dimension of 9' x 18' shall be provided. Refer to TOHS Detail HS350 for more information on parking dimensions. An aisle width of 24 feet is required for two-way traffic aisles. Handicap parking spaces shall reserve a minimum dimension of 8' wide with a 5' wide lane adjacent to the space, properly marked with signage in accordance with the N.C. Building Code. All parking facilities shall have dimensions per TOHS Detail HS350. All minimum stall depths and module widths shall be measured to the face of curb when curb and gutter is used. Parking bumpers, when used, shall be placed 2 feet from the face of the curb.

At locations where sidewalk and/or walkway abuts an 18-foot deep parking bay, the sidewalk shall be a minimum of 6 feet wide.

A minimum pavement structure consisting of 8 inches of ABC and 3 inches of S9.5B asphalt shall be used along the travel aisle on parking facilities for multi-family (excluding duplex and triplex development) and non-residential developments. Access drives for these facilities shall also meet this minimum pavement standard.

All paved parking facilities shall be striped in accordance with the MUTCD with 4-inch white lines, other than fire lanes which shall be yellow.

On all parking facilities, cut and fill slopes shall not begin immediately at the back of curb, instead a minimum 4 foot shoulder for fill slopes and 2 foot shoulder for cut slopes is required behind the back of curb.

Minimum throat distance of 80 feet shall be required for parking lot entrances off thoroughfares. Parking lots that exceed 1500 spaces will require a permit from NCDENR.

Refer to Section G for additional parking lot requirements.

## **I. Sidewalks**

Sidewalks shall be constructed within the street right of way in accordance with these standards at locations as specified in the Town ordinances. Sidewalks shall be installed at the time of roadway construction or widening unless otherwise approved by the Director of Engineering. The minimum thickness of a sidewalk shall be 4 inches. At locations where a driveway crosses a sidewalk, a 6-inch depth is required. (Sidewalks shall have a uniform slope toward the roadway of  $\frac{1}{4}$  inch per foot.) The utility strip between the sidewalk and the back of curb shall not be less than  $\frac{1}{4}$  inch per foot nor greater than  $\frac{1}{2}$  inch per foot toward the roadway.

Sidewalks shall be located a minimum distance of 5 feet off the back of curb. In some cases, where street trees are to be located between the curb and the sidewalk, this distance shall be increased to be a minimum of 7 feet. Refer to approved construction drawings for each project to determine this setback. This minimum requirement may not be varied without the approval of the Director of Engineering.

Where sidewalks and/or greenways intersect any section of curb and gutter, a wheelchair ramp shall be installed.

## **J. Pavement Design**

A pavement design shall be required for all thoroughfares, boulevards, and collector streets. The pavement design and traffic analysis shall be signed and sealed by a North Carolina Professional Engineer. Pavement design shall be based on subgrade conditions, a 20-year design life and projected traffic loading. Subgrade conditions shall be based upon corrected soaked CBR values at 0.1 inch penetration as per ASTM D1883. Soil samples used for these CBR tests shall be obtained at intervals not greater than 500 feet. Should a Professional Engineer with expertise in geotechnical engineering certify that the soil in question is of the same type with similar engineering properties this spacing may be increased to a 700-foot maximum spacing. Boring logs and scaled drawings designating boring

locations with CBR tests and other pertinent data shall accompany the pavement design.

In streets and utilities located in the Triassic Basin as shown in TOHS Detail HS356 (where Triassic soils on compressible miniature Triassic sedimentary rock-like material exists) there will be certain special criteria required for roadway construction.

The following minimums will be required of developers:

1. Pre-qualified geo-technical firm approved by the town must be on site full time while the utilities and roadways are being constructed.
2. Documentation of moisture content, compaction, density, geogrid design criteria, etc. must be provided to town inspector.
3. All Roadways will have to be proof-rolled at both sub grade and stone grade by town inspector as well.
4. The standard roadway cross-section will be woven geo-fabric design criteria HP 270 or equal on entire road (and must be approved by the Town of Holly Springs), 8" ABC stone, 3" of S9.5B asphalt, plus a 1 ¼ " of S9.5A asphalt overlay.
5. Initial one-year warranty with an additional year extension starting after final overlay-shall be required for roadways. For the extended warranty period, it will be required to post a bond, LOC, or cash for 50% of actual cost of roadway (storm drainage, curb & gutter, sidewalk and pavement).
6. Where manholes are located in streets it will be required to have suitable off-site structural material or ABC stone to backfill around excavation of manholes up to subgrade.
7. An additional foot of stone will be required 10' either side of manhole for entire width of roadway.

Additional measures may be deemed necessary by the Town pending severity of the soils.

The pavement thickness of any street shall, at a minimum, equal the design shown in the Standard Details section of these standards for the various street widths.

Approved pavement design methods include those as proposed by NCDOT, the 1986 AASHTO Guidelines and the 1981 Asphalt Institute MS 1 document.

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

All streets maintained by the NCDOT must receive approval of the pavement design from NCDOT prior to the beginning of construction. Normal crown for the pavement section shall be 1/4"/foot, except as approved for superelevated cross-sections.

**K. Pavement Markings and Signage**

All roadways shall be marked and signed in accordance with the latest revisions of the MUTCD unless otherwise approved by the Director of Engineering. Pavement markings and signage shall be shown on roadway and subdivision plans and shall be installed prior to the issuance of Certificates of Occupancy for the development or final acceptance of the roadway. The pavement markings for all collector streets, thoroughfares, and boulevards, shall be thermoplastic.

The pavement markings along thoroughfares or boulevards shall be installed such that the outside lanes are 14 feet in width to accommodate bicycle traffic unless otherwise approved by the Director of Engineering.

At any time prior to 1 year warranty additional pavement markings and/or signage may be required by the Director of Engineering, at the developer's expense.

**L. Bridge Design**

All public or private bridges shall be designed to withstand HS-20 highway loading unless otherwise approved by the Director of Engineering and shall be properly signed and sealed by a North Carolina Professional Engineer.

**M. Shoulder Sections**

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

Shoulder sections without sidewalk shall be 12 feet wide on all streets with a cross section of 35 feet and greater.

Shoulder sections without curb and gutter must be a minimum of 6 feet wide.

**N. Roadway Network**

Developments shall provide at least one vehicular access to each abutting property. This shall be accomplished via a public street and/or by joining adjacent parking lots and sharing driveways, at the discretion of the Director of Engineering. Development plans accomplishing this with parking lots and/or sharing driveways should provide a cross-access easement and complete the

connection if an immediate benefit can be derived by completing the link. If no immediate benefit can be derived, development plans should provide cross access and construction easements and arrange the site design so when the adjoining property owner extends the connection to the property line, the link will be completed. If the link is to be completed in the future, the grade of the connection, parking, landscaping and/or other improvements must be designed and installed to allow for extension onto or into the adjacent properties in the supporting engineering design and calculations being provided.

For roadways that stub-out to adjacent properties, sufficient information shall be provided to demonstrate the feasibility of extending the roadway to the adjacent properties. This shall include both plan and profile information for the extensions. In the event that the roadway, when extended, will cross a stream or creek, the vertical and horizontal alignment design for a minimum distance of 200 feet, plus Town culvert report shall be completed. Design shall be per Town geometric standards. Information on State and Federal regulatory permit ability shall also be provided to further demonstrate feasibility of the extension. In some instances, these permits may be required.

All street stubs to adjacent properties or stubs to future phases that exceed 150' shall provide an all-weather turn around suitable for fire and rescue equipment as required in Fire Code Appendix D.

Whenever possible, internal access drives should be located to join together at existing public streets and/or connect to adjacent private drives so that the internal circulation functions as an integral part of the surrounding transportation network.

Where street networks have been approved with master plans of nearby developments, streets shall be designed for interconnection with those plans.

Any development with more than 150 dwelling units must have a secondary means of access and with each additional 300 units, another access must be added.

During all phases of construction roadway network construction may not be phased in such a manner to create a dead-end roadway or roadway network exceeding 2000 feet in length, or serving more than 150 dwelling units. Where a development plan or master plan has been approved and a development schedule can be provided that documents completion of future phases to eliminate the dead-end exceeding 2000 feet within a reasonable time frame, the Director of Engineering may approve an exception to this requirement if an alternate emergency access is approved and provided in the interim period. The Director of Engineering reserves the right to mandate more restrictive requirements after consultation with the other Department Directors or for other extenuating circumstances.

No subdivision sub-phase shall consist of less than 25 contiguous lots. All phasing will require that utility and roadway network will meet necessary standards.

Intersections shall be spaced no more than 1200 feet to 1500 feet in each direction.

### **3.03 SIGHT DISTANCE**

#### **General**

Sight distance triangles shall be shown on roadway layout sheet and the landscape sheet within the plant set.

Sight distance requirements, including but not limited to intersection, stopping, shall be subject to design standards for the preferred intersection sight distance as specified in the latest version of the AASHTO Policy on Geometric Design of Highways and Streets (Green Book) or as approved by the Director of Engineering

Sight distance shall mean the length of roadway visible to the driver traveling along the roadway or waiting to enter or cross the roadway. The sight triangle shall include both the horizontal and vertical plane and shall exist at all street intersections, multi-family, site, and non-residential driveway intersections.

It shall be the responsibility of the designer for all proposed developments, including site, subdivision, landscape, infrastructure, and sign plans to meet these requirements as a part of the plan project design and approval process. Between the latest version of the AASHTO Green Book AASHTO and the Standard's stated herein, the more restrictive standard shall apply.

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 should be located to minimize visual obstruction. No plantings allowed within the sight distance triangles.

**A sight distance easement will be required for any area that is within a sight distance triangle and is not within the right-of-way.**

The information and tabular data herein are provided as a guideline. The registered engineer shall ultimately be responsible to determine the design criteria and design.

## A. Intersection Sight Distance

In order for vehicles to safely maneuver into or through an intersection, sufficient sight distance must be provided so as to avoid collisions. The horizontal line of sight as shown in TOHS Detail HS334 is a visual line connecting the driver's eye and the approaching vehicle, both of which are in the center of the travelway as shown in TOHS Detail HS334. If this line of sight is impeded by any obstructions, either the obstruction should be moved or the alignment adjusted. The vertical stopping sight distance is measured along the centerline of the major street between the drivers of the two opposing vehicles. The vertical line of sight as shown in TOHS Detail HS337 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 4.25 feet above the roadway surface as shown in TOHS Detail HS337. If this line of sight is impeded by any obstructions, either the obstruction should be moved or the alignment adjusted.

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.

### 1. Yield Sign Control

This type of design requires that the side street be posted with yield signs. The sight distance for the driver on the side street must be sufficient for the driver to observe a vehicle on the through street approaching from either the left or the right and bring his/her vehicle to a stop prior to reaching the intersection as shown in TOHS Detail HS336. The assumed operating speed approaching the yield sign is 10 mph resulting in a stopping sight distance of 45 feet. Where proper sight distance cannot be achieved for the driver on the side street at the design speed of the roadway, it may be necessary to have a posted speed reduction on the approach to the intersection or to replace the yield sign with a stop sign. Due to the possibility that a vehicle must stop at the yield sign, adequate sight distance at the intersection shall be provided for safe departure from a stopped condition as required by the section on stop sign controlled intersections.

### Stop Sign Control

At approaches to intersections that are controlled by stop signs or at driveways and alleys where the driver is required to stop before entering the street by the Town Code, the driver must have an unobstructed view of the entire intersection and adequate sight distance for any of the various

vehicular movements allowed upon departure of the intersection. These movements may include crossing the street, turning left or turning right onto the street. Where the through street is either undivided or divided with a median narrower than 20 feet, the crossing or left turn movements are treated as a single operation. Where the median can provide storage for the design vehicle (20 feet wide for a passenger car), the crossing or left turn movement may be considered in two phases of operation. The measurement method for determining the sight line for left, right, and through movements from the side street is based on values listed in Table 3.1 on the following page and illustrated per detail.

An obstruction to the driver's view shall not be located within the sight triangles as defined herein to permit adequate view of the intersection. In addition, there shall be no sight obstruction located in the triangular areas shown in TOHS Detail HS333 to allow for safe departure through the intersection. The measurement of intersection sight distance is along the centerline of the appropriate lane of the roadway and is measured from an eye height of 3.5 feet above the surface of the roadway to an object 4.25 feet above the surface of the roadway. The location of the driver's eye (d1) is dependent on the classification of the intersecting streets. For all intersections where the through street is a thoroughfare, the driver's eye location shall be 18 feet back from the face of curb extended through the intersection or the edge of pavement if there is no curb. At all intersections where the through street is a local or collector street, and for ramp type driveways, the driver's eye shall be located 15 feet behind the face of curb extended, or the edge of pavement if there is no curb. The sight distance lengths d2 and d3 shown in TOHS Detail HS333 for left or right turns onto the through street are dependent on the design speed of the roadway and are presented in Table 3.1 or the most current version of AASHTO guidelines. TOHS Detail HS335 shows the measurement method for determining the sight line for left turns from the through street and are presented in Table 3.1 or the most current version of AASHTO guidelines.

## **2. Traffic Signal Control**

At intersections controlled by traffic signals, the minimum sight distance will be stopping sight distance (Tables 3.1) for all side street movements except for the right turn movement. The right turn movement shall have intersection sight distance to allow right turn on red, except where it is economically impractical due to existing major features such as permanent buildings and existing, large, mature trees. The minimum sight distance for the right turn movement limited by existing major features shall be stopping sight distance. Where intersection sight distance cannot be achieved, right turn on red will be restricted

**TABLE 3.1**

Vehicle Crossing the Roadway	Sight Distance (ft) per 10 mph of Design Speed for Appropriate Width of Crossing			
	2-Lanes	4-Lanes	6-Lanes	8-Lanes
Passenger	100	120	130	140
Single Unit Truck	130	150	170	190
Large TTST	170	200	210	220

**B. Stopping Sight Distance**

At minimum, stopping sight distance must be available to the driver at all locations along roadways. Stopping sight distance applies to horizontal as well as vertical alignments. Stopping sight distance on horizontal curves is measured along the centerline of the inside lane around the curve and the line of sight is a straight line between two points on the centerline of the lane. On vertical curves, stopping sight distance is measured on a straight line between the driver's eye and an object on the roadway surface. The height of the driver's eye shall be measured at 3.5 feet above the roadway surface and the object shall be 2.0 feet above the roadway surface. TOHS Detail HS334 and HS337 illustrate the measurement of stopping sight distance horizontally and vertically, respectively. A more detailed explanation of the measurement of stopping sight distance is included in *A Policy on Geometric Design of Highways and Streets*, 2001, by AASHTO (AASHTO Green Book). The minimum stopping sight distance required is based on wet pavements and depends on the design speed and the grade of the roadway. Table 3.2 presents the minimum stopping sight distances for various design speeds on level terrain. Table 3.3 presents adjustment factors for stopping sight distance on grades. Variable situations may require a greater length of stopping sight distance. Lengths in Table 3.2 and 3.3 are a guide and the registered engineer shall ultimately be responsible for the design criteria.

**TABLE 3.2**  
**MINIMUM STOPPING SIGHT DISTANCE**  
**FOR LEVEL AND WET CONDITIONS**

Design speed (MPH)	Stopping sight distance (feet)
10	45
15	80
20	115
25	155
30	200
35	250
40	305
45	360
50	425
55	495
60	570

Source: AASHTO Green Book, 2001.

**TABLE 3.3**  
**ADJUSTMENT FACTORS FOR**  
**STOPPING SIGHT DISTANCE ON GRADES**

Design speed (MPH)	Increase for downgrades correction in stopping sight distance (feet)			Decrease for upgrades* correction in stopping sight distance (feet)		
	3%	6%	9%	3%	6%	9%
20	1	5	11	-6	-8	-11
25	3	10	18	-8	-12	-15
30	5	15	27	0	-16	-21
35	7	21	37	-13	-21	-28
40	10	28	49	-16	-27	-36
45	18	40	67	-16	-29	-40
50	21	49	82	-20	-37	-50
55	25	58	98	-26	-45	-62
60	28	68	116	-32	-55	-75

\*Assumed speed is lower than the design speed since vehicles normally travel at a slower speed on an upgrade.

Source: AASHTO Green Book, 2001.

### 3.04 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 yard, an air entrainment of 5 to 7%, and a maximum water-cement ratio of 0.532.

**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 shall meet Section 926 of NCDOT Standard Specifications for Roads and Structures.

**Aggregate** for portland cement concrete shall meet the requirements for fine and coarse aggregate of Section 1014 of the NCDOT Standard Specifications for Roads and Structures.

**Portland Cement and Admixtures** shall meet the requirements of Section 1000 of the NCDOT Standard Specifications for Roads and Structures.

**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 an approved coarse aggregate produced in accordance with the requirements indicated for either Type A, B, or C aggregate as described in Section 910 of the NCDOT Standard Specifications for Roads and Structures.

**Bituminous Surface Course**, Type S9.5A and S9.5B, shall consist of a mixture of coarse and fine aggregates, and asphalt cement, and shall meet the requirements of Section 645 of the NCDOT Standard Specifications for Roads and Structures. For NCDOT project the requirements of NCDOT for other types of asphalt (Superpave) shall apply

**Bituminous Concrete Base Course**, Type HB, shall conform to the general, material, and construction specifications as specified in Section 610 and Section 640 of the NCDOT Standard Specifications for Roads and Structures. For NCDOT project the requirements of NCDOT for other types of asphalt (Superpave) shall apply.

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

**Concrete Pavement** shall meet Section 700 of the NCDOT Standard Specifications for Roads and Structures.

**Concrete Pavers** may be used on privately maintained streets or as approved by the Director of Engineering for pedestrian crossings in urban areas, in accordance with the applicable Standard Detail. The Town of Holly Springs will not maintain decorative type paved street surfaces such as pavers or imprinted designs within public right of way, unless approved by the Director of Engineering.

**Geotextile Fabric** may be used to stabilize a roadway, subgrades, slopes, and for other uses as necessary. At least one week prior to using this fabric, a sample and its associated engineering data shall be submitted to the Director of Engineering for approval. Areas stabilized with fabric shall be indicated on “as-built” drawings with the manufacturer name and type fabric specified.

### **3.05 CONSTRUCTION AND INSPECTION**

No construction shall commence until the following applicable items have been obtained:

- All required permits and approvals
- Town of Holly Springs development plan approval
- Town of Holly Springs Construction Drawing approval
- Land Disturbance Permit

#### **A. Streets**

No base material shall be placed on a roadway until the storm sewer, subgrade, utilities, and all appurtenances have been inspected and meet Town of Holly Springs Engineering Design and Construction Standards.

The Construction Inspector may require field density testing of subgrade soils from a certified soils laboratory. The soils laboratory shall perform sufficient Proctors to evaluate the compaction characteristics of various soils used in the roadbed. The Construction Inspector may also require field density testing of the ABC used and an asphalt mix formula before either is inspected or approved. The final course of surface asphalt shall not be placed until the end of the warranty period.

The subgrade shall be compacted as described in Section 2.05 Earthwork. Inspection of the subgrade prior to the placement of base course, and inspection of the base course prior to placement of asphalt, shall be performed by proofrolling and/or field density testing at the direction of the Construction Inspector. All streets shall have asphalt be placed in 2 lifts with the first being a minimum of 1 ¾" S9.5B and the second lift be a minimum of 1 ¼" S9.5A. The final course of surface asphalt shall not be placed until the end of the warranty period.

When thoroughfare widening takes place, the existing edge line of the travel lane shall be sawcut. Achieve an overlap of the final lift of new asphalt by at least 6" onto the existing roadway cross-section. The objective is to have the joint between new and old asphalt to be offset from the joint between subgrades (this overlap shall exclude the overlay). In addition, whenever an overlay is required, milling of 1 ½ inch shall occur at both tie-in stations to insure a smooth connection.

Roadway patch shall be at a minimum of 4" I-19 and 2" of 9.5B asphalt. If deemed necessary by Inspector, additional asphalt may be required.

#### **B. Curb and Gutter, Driveways, and Sidewalks**

No concrete shall be placed until all forms and subgrades have been approved by the Construction Inspector. The surface of sidewalks shall be finished to grade and cross section with a float, troweled smooth, and finished with a broom.

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 ½ 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 construction 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. A 1/2-inch expansion joint filled with joint filler shall be 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.

### **3.06 FIRE LANES**

Fire lanes shall be installed and inspected in accordance with the public street requirements of Section 3.05 A and 3.05 B of these standards. The general requirement designates that any building located more than 150 feet from a public road, or which exceeds 30 feet in height and is set back more than 50 feet from a public road, shall have a fire lane.

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 inches of S9.5B asphalt.

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

1. Continuously painted yellow 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 painted yellow curb with “No Parking - Fire Lane” along the fire lane, and 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.

### **3.07 TRAFFIC CONTROL AND STREET NAME SIGNS**

Traffic control and street name signs within subdivisions which will be maintained by the Town of Holly Springs shall be consistent with the MUTCD. All specialty traffic control and street name signs and posts must be approved by the Town Board.

All temporary stub outs for future interconnectivity shall have proper MUTCD barricade and signage in addition to the proper street extension per detail. Any right of way and construction easements that are necessary for future connection shall be dedicated at the time of the construction of the stub out. All public streets shall conform to Town Policy Statement No. P-011 for standard street signs, which shall be provided by the Town of Holly Springs Public Works Department at the expense of the developer. Any time prior to 1 year warranty, additional signage may be required by the Director of Engineering, at the expense of the developer.

### **3.08 TRAFFIC CALMING DEVICES**

The Town shall not allow the obstruction of any public street, private street or fire lane unless otherwise stipulated by the Town Board. This requirement is in accordance with the 1992 edition of the North Carolina State Fire Prevention Code. The reference to an “obstruction” shall include parking, speed bumps or any other device which may obstruct the free passage of emergency vehicles.

All traffic control devices must be shown and approved as a part of a site plan prior to installation and must be in conformance with the Town Standard Specifications. The traffic control devices and all related signs and pavement markings shall be maintained by the Owner as a part of the approval of the plan.

### **3.09 PEDESTRIAN CROSSINGS**

All locations which are designated for pedestrian traffic crossings shall be designated as a crosswalk with pavement marking and signage (including advanced signage) in accordance with MUTCD.

### **3.10 STREET TREES**

See Street Tree Maintenance and Enforcement Policy P-39

Street tree shields shall be installed wherever street trees are required. Please refer to root guard detail HS816. Street trees may not be planted in a location to conflict with sight distance requirements. The Town shall trim or remove any street trees or limbs that conflict with sight distance requirements.

### **3.11 THOROUGHFARE/MEDIAN PLANTINGS**

With the construction of streets in the Thoroughfare classification and above, landscaping of medians and shoulders shall be per the thoroughfare median planting detail and requirements of Section 3.03 Sight Distance. In addition, all landscaped medians shall be installed with a minimum of six inches of topsoil with Tifway 419 Bermuda sod along with any required median plantings. Thoroughfare median plantings shall be maintained by the Town of Holly Springs once the developers’ one-year warranty period has been deemed complete and the road widening has been accepted by the Town of Holly Springs.

An exception may be granted to allow a fee in lieu of median plantings if it is determined that only the first half of the ultimate median is required to be constructed.

### **3.12 GREENWAY SPECIFICATIONS**

Greenway locations and alignments shall be as directed and approved by the Director of Parks and Recreation. Greenways alignment shall be finalized with the Director of Parks and Recreation prior to preliminary plan approval, with full construction plans and all permits provided prior to construction drawings approval for any project on which greenways are required.

Where greenway trails are required, the following guidelines shall be followed.

- Maximum cross slope grade shall be 2%. The maximum cross slope grade shall be across the entire width of the greenway easement.
- Maximum grade shall be 8%, unless approved by the Director of Parks and Recreation.
- Positive drainage shall be established.
- Concentrated flow across a greenway is not allowed. All areas of concentrated flow must be conveyed via approved storm drainage.
- At all drainage crossings, a Professional Engineer shall provide properly sized drainage pipe with supporting calculations.
- Bridge crossings may be required in some locations. If a bridge is required, it must carry a 10,000 lb load and shall be designed by a registered engineer and approved by the Town of Holly Springs and appropriate agencies.
- Greenways shall be 10 feet wide with an easement of 20 feet.
- At greenway and roadway intersections, a pedestrian tunnel may be warranted as determined by the Director of Parks and Recreation and Director of Engineering.
- At greenway and roadway intersections, a pedestrian tunnel may be warranted as determined by the Director of Parks and Recreation and Director of Engineering.
- When an at-grade intersection is permitted, a 10' wide, 6" thick concrete pad will be required extending from the back of curb to the right of way line, or 18', whichever is less. There shall be a handicap curb cut as shown in Town of Holly Springs details. At the end of the pad, concrete bollards will be required per Town of Holly Springs detail.
- Where the greenway trail intersects a roadway, pedestrian crosswalk striping and signage will be required. In addition, in cases where the greenway trail

intersects a roadway and sidewalk is on opposite sides of road then handicap ramps will be required for accessibility

- Greenways shall be located and constructed so as to prevent damage from floodwaters.
- The minimum material must be 2 ½” of approved asphalt base material I-19 and 1 ½ ” S9.5B.
- Documentation of required permits, approvals, etc. shall be provided for greenways prior to construction drawing approval of the project on which the greenway is required.
- Greenways shall be subject to the same construction inspections, performance, and warranty requirements as roadway infrastructures.
- All stormwater shall be captured and conveyed below the greenway trail/bridge.

**Figure 1  
CURVE CONTROLS**

	Horizontal Curve Controls			Vertical Curve Controls			
	Minimum Design speed (mph) <sup>1</sup>	Maximum Super-elevation (ft./ft.) <sup>2</sup>	Minimum Radii (ft.)	Maximum Grade <sup>3</sup> (percent)	Length Crest	Length Sag	Minimum Length (ft.)
Limited Access Thoroughfare	Design standards to be determined for each case individually by the Director of Engineering						
Thoroughfare, Boulevard, Parkway	Design standards to be determined for each case individually by the Director of Engineering						
Non-Residential Collector	40	0.04	565	9%	44A	64A	120
Residential Collector Streets & No Load Residential Collector	25	0.04	300	9%	29A	49A	120
Residential streets	30	Normal crown	205	10%	12A	26A	75
Cul-de-sacs 1000' or less	30	Normal crown	150	10%	12A	26A	75

Loop road 1500' or less	30	Normal crown	150	10%	12A	26A	75
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<sup>1</sup> Design speed shall be at least 5 mph greater than posted speed.

<sup>2</sup> The superelevation tables found in *A Policy on Design of Urban Highways and Arterial Streets - 2001* published by the American Association of State Highway Officials will be used for determining the actual “e” for various radii.

<sup>3</sup> Design criteria can vary on a case-by-case basis if approved by the Director of Engineering.

<sup>4</sup> Note: At the discretion of the Department of Engineering, the Kvalues in sags may be adjusted with additional street lighting

A - Algebraic difference in grades.

**END OF SECTION 3.00**

