

## 060 STREETS

### 060.01 GENERAL

#### 060.01.01 Other References

060.01.01.01 The latest revision of the Standard Specifications for Roads and Structures of the NCDOT shall apply unless otherwise specified herein.

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

060.01.01.02.01 “State” or “Commission” shall be replaced by “Town of Fuquay-Varina.”

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

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

060.01.01.02.04 “Inspection by Commission” shall be replaced by “Inspection by Construction Inspector.”

060.01.02 All streets (private and public) shall be designed and fully constructed to the Standard Specifications and Details and in accordance with all ordinances and policies of the Town. Refer to the Town Code for requirements for improving existing streets. NCDOT standards shall be used on all existing State roads, extensions of existing State roads, or roads to be maintained by NCDOT. Refer to Standard Specifications for Roads and Structures as published by the NCDOT, Roadway Design Manual as published by the NCDOT, or the Town Standard Specifications and Details, whichever, in the opinion of the ENGINEER.

060.01.03 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 ROW 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 ROW widths, except for street and ROW widths adopted in the Community Transportation Plan. The following are intended to be recommended street and ROW widths for suburban-type developments. Specific information and documentation on development and/or product types to be serviced by roadways shall be provided for consideration of street widths, and such information may be incorporated into development and/or plan approval conditions.

#### 060.01.04 Roadway Connectivity

060.01.04.01 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 shall 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 shall provide cross access and construction easements and construct to the project boundary 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 shall be designed and installed to allow for extension onto or into the adjacent properties with the supporting engineering design and calculations being provided.

060.01.04.02 For roadways that stub-out to adjacent properties, sufficient information shall be provided to demonstrate the feasibility of extending the roadway onto the adjacent properties. This shall include both plan and profile information for the extensions a minimum of 100-feet beyond the adjacent property line. In the event that the roadway, when extended, will cross a stream or creek, the vertical and horizontal alignment design shall be provided for a minimum distance of 300 feet beyond the project property line, and culvert calculations 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.

060.01.04.03 Internal access drives shall 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.

060.01.04.04 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 and Section 140-Fire Protection. This shall apply to each individual phase of the Subdivision unless construction of the adjoining phase is imminent. In that case, the turnaround may be deleted with approval from the Director of Engineering.

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

#### 060.01.05 Phased Construction

060.01.05.01 Any development with 200 dwelling units or more shall have a secondary means of access during all phases of construction. Roadway construction shall not be phased in such a manner to create a dead-end roadway or roadway network exceeding 2000 feet in length, or serving 150 dwelling units or more. 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.

## **060.02 TRAFFIC IMPACT ANALYSIS**

060.02.01 This Section is intended to be a tool help mitigate impacts of new development. It seeks to do so by providing a standard set of analytic tools and format that can be used to identify a development's expected traffic impacts on the road system, any traffic problems associated with access to and from the development site, and any improvements or site design modifications needed to solve potential adverse traffic impacts and access problems.

### 060.02.02 When Required

060.02.02.01 A traffic impact analysis is required at the time of application for approval of preliminary subdivision or site plan, planned compliance permit, special use permit, or general use permit.

060.02.02.01.01 The proposed development, or phases of development, or contiguous tracts under the same ownership, would accommodate or could be expected to generate 100 or more added vehicle trips to or from the site during the peak traffic hour (based on the proposed development or the adjacent roads and intersections); or

060.02.02.01.02 The proposed development, or phases of development, or contiguous tracts under the same ownership, would accommodate or could be expected to generate 1,000 or more added vehicle trips to or from the site during a 24-hour period (based on the proposed development or the adjacent roads and intersections).

060.02.02.02 In calculating the number of added vehicle trips expected to be generated, trip generation rates must be obtained from the most recent editions of Trip Generation and Trip Generation Handbook, published by the Institute of Transportation Engineers (ITE). Only new vehicle trips will be counted; no pass-by or internal trip capture will be used in calculating "added vehicle trips".

060.02.02.03 The Director of Engineering may waive the requirement for a traffic impact analysis when the applicant shows that the proposed development's impact on adjacent roads and intersections will be minimal and insignificant, or will be no greater than those projected by a traffic impact analysis prepared and submitted within the past two (years) for the same site under the same or similar background conditions.

### 060.02.03 Level of Service Standards

060.02.03.01 The traffic impact analysis must demonstrate that the proposed development would not cause build-out-year, peak-hour levels of service on any arterial or collector road or intersection within the study area to fall below Level of Service (LOS) "D" as defined by the latest edition of the highway capacity manual, or, where the existing level of service is already LOS "E" that the proposed development would not cause the LOS to fall to the next lower letter grade.

060.02.03.02 If the road segment or intersection is already LOS "F" the traffic impact analysis must demonstrate that the proposed development, with any proposed

improvements, would not cause build-out year peak-hour operation to degrade more than 5% of the total delay on any intersection approach.

060.02.03.03 To the extent that application proposes specific access points, the analysis must also demonstrate that the proposed development would avoid unsafe conditions on adjacent roads.

060.02.03.04 Failure to meet these standards may serve as a basis for provision of improvements or other mitigation measures needed to correct deficiencies due to the proposed development's impacts.

060.02.04 Study Area: The traffic impact analysis must address the proposed development's traffic impacts on at least:

060.02.04.01 Roads and intersections within the development site, as designated by Director of Engineering or review consultant;

060.02.04.02 Road segments and intersections abutting the development site as designated by the Director of Engineering or review consultant; and

060.02.04.03 Off-site road segments and intersections where traffic from the proposed development is expected to account for at least 10% of the road's or intersection approach leg's average daily traffic.

060.02.05 Qualifications: Traffic impact analyses must be prepared by a licensed professional engineer.

060.02.06 Study Contents

060.02.06.01 Traffic impact analyses must include charts, graphics, and narrative presenting at least the following information:

060.02.06.01.01 A description of existing land uses and development intensities in the study area, the location and characteristics (functional classification, number of lanes, speed limit, signalization, etc.) of roads and intersections in the study area, and the existing traffic volumes and conditions (including levels of service) of those roads and intersections;

060.02.06.01.02 A description of the location and traffic-related characteristics (land use, intensity, expected date of full build-out and occupancy, vehicular access points and characteristics, etc.) of the proposed development and other developments in the study area that are under construction, approved, or pending approval, as well as roadway and other transportation facilities and improvements in the study area that are under construction, programmed, or planned (Transportation Plan, Collector Street Plan, etc.);

060.02.06.01.03 Projections of future background traffic (existing traffic volumes forecasted to build-out year levels based on agreed upon traffic growth rate) plus traffic generated by other development in the study area that is under construction, approved, or pending approval, future site traffic and total future traffic (the sum of future background traffic and future site traffic)

060.02.06.01.04 Future background and site traffic projections must be made for the peak hours (as identified by Director of Engineering or review consultant) of the adjacent road segments and intersections and for the development's expected full build-out and occupancy date, and must include trip generation, trip distribution (using pre- approved distribution by Director of Engineering or review consultant), and traffic assignment estimates;

060.02.06.01.05 Analyses of the proposed development's incremental impacts on:

060.02.06.01.05.01 Road capacity during peak hours at all site access points and at road segments and intersections in the study area (including determination of the level of service for the road segments and intersections, queuing vs. existing/proposed storage);

060.02.06.01.05.02 The need for signalization of intersections in the study area; and

060.02.06.01.05.03 Existing or potential high accident areas (as referenced in the adopted transportation plan or determined by Director of Engineering)

060.02.06.01.06 A qualitative analysis/review of sight distance at access points, when required by Director of Engineering or the review consultant;

060.02.06.01.07 A description of the location, nature, and extent of site access and transportation improvements and other measures recommended to mitigate any failure to meet traffic operation standards due to the proposed development's traffic impacts, including the expected effectiveness of each mitigation measure in addressing deficiencies, the feasibility of implementing the measures, suggested allocation of responsibility for funding and implementing the measures, the measures' relationship to planned public transportation improvements, and a suggested time schedule for the implementation of the measures;

060.02.06.01.08 Résumés of the preparers of the analysis, demonstrating specific education, training, and professional experience in traffic-related analyses and, if the analysis involves roadway or traffic signal design, traffic engineering; and

060.02.06.01.09 Identification of all assumptions and data sources used in its projections, analyses, and recommendations.

## **060.03 STREET CLASSIFICATIONS**

### 060.03.01 General

060.03.01.01 Early communication (in preliminary design) with the Director of Engineering to determine the appropriate street and ROW width for the particular development is encouraged. The following street cross sections comprise the most typically utilized sections for the Town. Please see Table 060.01 for a tabular presentation of the differences between street classifications. The details at the end of this Section include additional cross sections that are utilized when other factors are considered.

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

060.03.02 Type 1: Alleys

060.03.02.01 Typical width of alley shall be 20 feet (pavement) on a 25-foot private easement. Maximum length shall be 500 feet.

060.03.02.02 Alleys shall have clear shoulders with a minimum width of 4.5 feet along each side. A minimum 8" ABC and 2" "Superpave" pavement design and proof roll inspection shall be required. A drainage system shall be provided and shall conform to all public street design drainage standards as outlined in these Standard Specifications and Details.

060.03.02.03 All alleys are private. They may be used in OSDs, in neotraditional and mixed use developments, and adjacent to limited-access facilities. The purpose of an alley is to provide non-Town utility and vehicular access along the rear or side of new residential and non-residential structures as a means of reducing or eliminating individual driveway accesses. All alleys are to be privately maintained with measures to ensure the travel way is not obstructed in any manner, including parking or loading.

060.03.02.04 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 an "Access and Indemnification Agreement" shall be executed between the Owner/Developer and Town removing any liability from the Town for normal and general use and ware to provide the Town services. This document shall be recorded with the Wake County Register of Deeds and the Homeowner Association covenants for the development shall clearly state this. 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.

060.03.03 Type 2: Residential Cul-de-sac

060.03.03.01 Typical width of Type 2 shall be 29' feet (BOC to BOC) on a 50 foot ROW.

060.03.03.02 Type 2 streets serve abutting residential land uses, terminate in a turnaround, and originate at the intersection with another street. The only street type allowed to intersect with a street of Type other than the entrance intersection is another street of Type 2. Streets of Type 2 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 or environmental constraints. Where the design accommodates on-street parking the Director of Engineering shall be consulted for the minimum width. Additional pavement marking and signage may be required where on-street parking is prohibited.

060.03.04 Type 3: Non-Residential Cul-de-sac

060.03.04.01 Typical width: 35 feet back to back on 60-foot right of way - no on-street parking permitted.

060.03.04.02 A Type 3 street serves abutting non-residential land uses and terminates in a turnaround and originates at the intersection with another street. The only street type allowed to intersect with a street of Type 3 other than the entrance intersection is another street of Type 3. This street may require additional turn lanes on either of the intersecting streets at the street intersection. Where the design accommodates on-street parking the Director of Engineering shall be consulted for the minimum width. Additional pavement marking and signage may be required where on-street parking is prohibited.

060.03.05 Type 4: Residential Loop Street

060.03.05.01 Typical width of Type 4 shall be 29 feet (BOC to BOC) on a 50 foot ROW.

060.03.05.02 A Type 4 street serves abutting residential land uses and terminates on the same street from which it originates. Streets of Type 2 may be permitted to intersect onto this street classification segment. Where the design accommodates on-street parking the Director of Engineering shall be consulted for the minimum width. Additional pavement marking and signage may be required where on-street parking is prohibited.

060.03.06 Type 5: Access Street

060.03.06.01 Typical width of Type 5 shall be 29 feet (BOC to BOC) on a 50 foot ROW.

060.03.06.02 A Type 5 street serves a dual function of providing access to adjacent property as well as providing through or connection services between other local roads.

060.03.07 Type 6: Minor Residential Street

060.03.07.01 Typical width of Type 6 shall be 29 feet (BOC to BOC) on a 50 foot ROW.

060.03.07.02 A Type 6 street's 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. In this classification, traffic volumes flowing from other intersecting residential streets shall not exceed the traffic volumes generated by the land use abutting the street, and this street classification shall not serve more than 100 dwelling units. Where the design accommodates on-street parking the Director of Engineering shall be consulted for the minimum width. Additional pavement marking and signage may be required where on-street parking is prohibited.

060.03.08 Type 7: Residential Collector Street

060.03.08.01 Typical width of Type 7 shall be 31 feet (BOC to BOC) on a 52 foot ROW.

060.03.08.02 A Type 7 street serves various land use classifications, and its primary function is traffic service (collecting traffic from streets intersecting it and funneling it to streets of greater Type). A street of Type 7 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 accommodates on-street parking the Director of

Engineering shall be consulted for the minimum width. Additional pavement marking and signage may be required where on-street parking is prohibited.

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

060.03.09 Type 8: Thoroughfare Collector Street

060.03.09.01 Typical width of Type 8 shall be 35 feet (BOC to BOC) on a 60 foot ROW.

060.03.09.02 A Type 8 street serves various land use classifications, and its primary function is traffic service (collecting traffic from streets intersecting it and funneling it to streets of greater Type). Streets of Type 8 serve more than 500 dwelling units and/or are indicated on the Community Transportation Plan. Streets of Type 8 shall have no individual driveway accesses, and no on-street parking.

060.03.10 Roundabouts for Type 7 or 8 Streets

060.03.10.01 Roundabouts on Type 7 or 8 streets are acceptable provided they are in accordance with Standard Detail 060.04.

060.03.10.02 Minimum internal circle shall be 30' radius.

060.03.10.03 Minimum circle lane width shall be 24' back to back.

060.03.11 Type 9: Major Thoroughfare/Boulevard/Parkway

060.03.11.01 Typical width of Type 9 shall be as required on the Transportation Plan

060.03.11.02 A Type 9 street serves as a primary traffic carrier for 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 shall 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. Streets of Type 9 or greater 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. On-street parking is prohibited.

060.03.11.03 A slope easement of 20 feet in width shall be required adjoining each side of the ROW 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.

060.03.11.04 If a 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 ROW, then the Director of Engineering may permit the proposed improvement to occur with an approved plan.



060.03.11.05 If project frontage is within 1000 feet of a major intersection, additional turn lanes and ROW width may be required, as determined by the Director of Engineering.

060.03.12 Type 10: Arterials/Limited Access Roadways

060.03.12.01 Typical width of Type 10 shall be as required on the Transportation Plan.

060.03.12.02 A Type 10 street is an urban roadway with limited or controlled access (i.e. freeways and expressways) where its 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 streets of Type 9 or greater 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. There are also grade separations occurring on streets of this Type as identified in the Community Transportation Plan. The highest practical level of design shall be incorporated into facilities of this classification. On-street parking is prohibited.

060.03.12.03 A slope easement of 20 feet in width shall be required adjoining each side of a street ROW 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.

060.03.12.04 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 ROW then the Director of Engineering may permit the proposed improvement to occur with an approved plan.

060.03.12.05 If project frontage is within 1000 feet of a major intersection, additional turn lanes and ROW width may be required, as determined by the Director of Engineering.

060.03.13 Type 11: Controlled Access Highway/Freeways

060.03.13.01 Typical width of Type 11 shall be as required by Federal Highway Administration and AASHTO.

060.03.13.02 A street of Type 11 is an Inter-State or 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. On-street parking is prohibited.

060.03.13.03 A slope easement of 20 feet in width shall be required adjoining each side of a street ROW 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.

060.03.13.04 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 ROW then the Director of Engineering may permit the proposed improvement to occur with an approved plan.

060.03.13.05 If project frontage is within 1000 feet of a major intersection, additional turn lanes and ROW width may be required, as determined by the Director of Engineering.

060.03.14 Form Based Code Streets

060.03.14.01 The Land Development Ordinance (LDO) has optional street layouts and designs for Form Based Development. Requirements not specified in the LDO shall defer to these specifications. The LDO street requirements are included in Section 180 - Appendix for reference.

## **060.04 STREET DESIGN**

060.04.01 Horizontal Street Design

060.04.01.01 All streets shall conform to the Community Transportation Plan and shall be designed and located in proper relation to existing streets and environment. Streets of Type 7 or greater shall be as directional as possible but consistent with topography and preserving developed properties and community values. Streets of Type 6 or less 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.

060.04.01.02 The design of streets shall conform to the horizontal curve controls in Table 060.02 at the end of this chapter.

060.04.01.03 A minimum tangent of 150 feet is required between reverse curves for streets of Type 7 or greater. 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 streets of Type 7 or less. All intersections of streets of Type 8 or greater shall have a tangent section not less than 100 feet approaching the intersection.

060.04.01.04 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 degrees. At no time shall a street intersect any other street at less than 75 degrees.

060.04.01.05 Streets of Type 7 or greater shall be superelevated. Superelevation shall only be utilized on major thoroughfares except when widening NCDOT streets. Superelevation shall conform to Table 060.02 at the end of this chapter and shall conform to NCDOT and AASHTO standards. Superelevation for shoulder sections shall not exceed 0.08 feet/foot of width. For curb and gutter sections, superelevation shall not be less than 0.02 feet/foot of width or more than 0.06 feet/foot of width. 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.

060.04.01.06 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:

$L = WS$  for posted speeds of 45 mph and greater

$L = WS^2/60$  for posted speeds of 40 mph or less

L = Length in feet

S = Speed in miles per hour

W = Lateral offsets in feet

060.04.01.07 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 of Type 8 or less. Storage lengths for the turn bays shall be calculated using an acceptable method.

060.04.01.08 Residential streets shall not have large arcs of pavement outside the normal traffic-way (commonly called "bubbles" or "eyebrows"). These are often used to assist in lot layout and accessing certain portions of a development. Either the street alignment or lot layout shall be altered, or a full cul-de-sac or loop street provided, if street access is to be provided to those areas.

#### 060.04.02 Vertical Design

060.04.02.01 Street grades shall be established wherever practicable in such a manner as to avoid excessive grading, the promiscuous removal of ground cover and tree growth, and general leveling of the topography.

060.04.02.02 The minimum grade allowed on any street shall be ½%. The maximum grade allowed on any street shall be 12%. Streets to be maintained by the North Carolina Department of Transportation shall not exceed seven (7%) percent or their most recent standard.

060.04.02.03 Commercial and Industrial driveways or entrance roads tying to a public roadway facility accessible to emergency fire apparatus: Approach grades shall not exceed 8% or as otherwise allowed or permitted by the Fire Marshall. See NC Fire Code Sections D102 and D103 of Appendix D, Fire Apparatus Access Road. K values shall be as directed by either the Town's Engineer or Fire Marshall but at a minimum shall be sufficient to prevent front or rear bumper drag.

060.04.02.04 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.

060.04.02.05 The vertical curve controls found in Table 060.02 at the end of this chapter shall also be utilized in street design.

060.04.03 Geometrics-Radii

060.04.03.01 A minimum radius of 25 feet to the back of curb shall be required where streets of Type 1, 2, 4, 5, 6, or 7 intersect.

060.04.03.02 A minimum radius of 30 feet measured to the back of curb shall be required where a street of Type 1, 2, 4, 5, 6, or 7 intersects with a street of Type 3, 8, 9, 10, or 11. It is recommended that the designer consider larger radii or 3-centered compound curves where needed to provide for turning movements of larger vehicles.

060.04.03.03 A minimum radius of 40 feet shall be required where streets of Type 7 or greater intersect streets of Type 9 or greater.

060.04.04 Cul-de-sacs (Type 2 and Type 3 streets)

060.04.04.01 The length of a cul-de-sac shall be measured along the centerline of the cul-de-sac from the edge of the ROW of the last connecting street providing through service, to the center of the bulb.

060.04.04.02 The maximum allowable length of a Type 2 street shall be 800 feet. A maximum length of 1200 feet may be permitted where all the lots on the street are greater than 10-feet wide measured along the front property lines and lots on the cul-de-sac bulb shall have a minimum width of 90-feet measured along the front setback line between property lines. Regardless of the length of Type 2 street it shall serve no more than 26 dwelling units (including corner lots) where only one public access point is proposed to serve the subdivision. Providing a public access stub-out to adjacent property may constitute multiple access and the length of the Type 2 street and number of dwelling units may be determined from the proposed street stub-out. Where multiple Type 2 streets are connected to one through street the maximum length of any one Type 2 street shall not exceed that permitted above. Some adjustments to these lengths may be made in accordance with the LDO.

060.04.04.03 The maximum allowable length of a Type 3 street shall be 500 feet, except as provided by Town Code. Where multiple Type 3 streets are connected to one through street the maximum length of any one Type 3 street shall not exceed 500 feet. Some adjustments to these lengths may be made in accordance with the LDO.

060.04.04.04 The minimum length of a Type 2 or Type 3 street shall be 100 feet.

060.04.04.05 Cul-de-sacs shall have a minimum bulb radius of 40 feet to BOC.

060.04.04.06 No intersections of other streets are allowed in the bulb area of a cul-de-sac.

060.04.05 Medians and Islands

060.04.05.01 Medians and/or islands may be allowed on streets with prior approval from the Town. In areas where an entrance median is desired, the width of the median shall be in addition to required cross sections as specified.

060.04.05.02 Streets with medians and/or islands shall be designed to allow for proper turning movements according to the Fire Department apparatus turning template. AASHTO guidelines shall be utilized for the actual median design and median opening dimension.

060.04.05.03 Any section of street (including a cul-de-sac bulb) that contains a median or island shall be designated one-way traffic on each side of the median or island (including around the cul-de-sac bulb island).

060.04.05.04 The medians and/or islands in a Type 7 street or less shall be a minimum of 10' in width measured from the BOC to BOC, and shall consist of a minimum of 200 SF of soil surface area.

060.04.05.05 No median shall be allowed in a 40-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. The minimum radius of an island on a cul-de-sac shall be 20 feet measured to the BOC.

060.04.05.06 Medians or islands placed outside the center of the normal traffic-way of a street, thereby creating a small side-loop portion of the street (commonly called "bubbles" or "eyebrows") shall be minimized to the maximum extent practicable. These are often used to assist in lot layout and accessing certain portions of a development. Either the street alignment or lot layout shall be altered, or a full cul-de-sac or loop street provided, if street access is to be provided to those areas. The Design shall minimize open asphalt next to the travel lane

060.04.05.07 Raised median sections shall be a minimum of 16' feet wide measured from the back of curb to the back of curb to provide 12 feet for left-turning vehicles and 6 feet for the placement of signs and separation of traffic at median openings. It is desirable to have continuous median sections on thoroughfare roadways. In no case shall plantings within a median obstruct required sight distance.

060.04.06 Stub and Dead-End Streets

060.04.06.01 Streets designed to be permanently dead-end shall terminate in a paved circular turnaround with a minimum radius of 40 feet measured to the BOC. Streets designed to be dead-end temporarily (such as in a phased development or where a street is to be extended) can terminate in a paved circular turnaround or a "T" turnaround of adequate size to accommodate all emergency vehicles and other Town vehicles expected to use the street. Alternative designs may be approved by the Town. Under special circumstances, a "T" turnaround may be acceptable as a permanent improvement. Please see Appendices and Detail 140.01 for more information on turnaround design for stub and dead-end streets.

060.04.07 Fire Department Access

060.04.07.01 For additional Fire Department access road requirements please refer to Section 140 Fire Protection. Additional requirements may be found for fire lanes, access roads with gates, commercial and industrial developments, single and multi-family residential developments, and aerial fire apparatus access roads.

060.04.08 Shoulder Sections

060.04.08.01 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.

060.04.08.02 Street cross sections shall tie to existing grade so as to leave a slope that is suitable for maintenance. Slopes > 3:1 shall require approval by the Director of Engineering. Additional means of reinforcement/prevention control shall be required for slope > 3:1.

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

060.04.08.04 Shoulder sections without curb and gutter shall be a minimum of 6 feet wide and meet all of the following requirements:

060.04.08.04.01 Swales shall carry the 10 year storm in a non-erosive manner

060.04.08.04.02 Driveway pipes shall pass the 10 year storm

060.04.08.04.03 Driveway pipes shall have flared end sections or headwalls on both ends

060.04.09 Bridge Design

060.04.09.01 All public or private bridges shall be designed to withstand HS-20 highway loading and shall be properly signed and sealed by a North Carolina Professional Engineer.

**060.05 ACCESS AND INTERSECTION DESIGN**

060.05.01 Access Management

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

060.05.01.02 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, not more than two driveways shall be permitted for any single property frontage.

060.05.01.03 The arrangement of driveways shall be related to adjacent driveways and nearby street intersections. Non-residential driveways accessing streets of Type 7 or less shall be at least 100 feet from the point of tangency of the radius curvature of the next intersecting street. Non-residential driveways serving traffic volumes in excess of 300 ADT or accessing streets of Type 8 or greater shall be located a minimum of 250 feet from the point of tangency of the radius of curvature of the intersecting street.

060.05.01.04 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 determined by the type of vehicles which utilize the driveway on a daily basis. 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 is provided in accordance with AASHTO Standards.

060.05.01.05 Non-residential 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 16-foot entrance lane, excluding curb and gutter. A 14-foot wide 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.

060.05.01.06 Where two non-residential driveways are proposed along a single property frontage to facilitate operations, the minimum distance between the centerlines of the drives shall be 250 feet. The minimum distance between the centerlines of driveways into shopping centers or facilities generating in excess of 300 ADT shall be a minimum of 600 feet. Full access driveways open to signalization shall be 1200' apart. Non-residential driveways which access streets of Type 8 or greater and serve more than 1500 ADT shall provide deceleration lanes in approach to the driveway. Non-residential driveways that are unpaved shall have a minimum 30-foot paved surface strip measured from the back of the driveway apron.

060.05.01.07 Residential driveways shall be located a minimum of 10 feet from the point of tangency of curb radii of street intersections. Additional distance may be required for streets of Type 7 or greater.

060.05.01.08 Residential driveways shall be a minimum of 12' wide and a maximum of 18' wide in the public ROW.

060.05.01.09 All lots shall be served off the more minor classification of roadway, and there shall be only one driveway per residential lot in R-15 or denser zoning.

060.05.01.10 For all public, private, or charter schools, onsite school stacking shall be determined using the site appropriate tab in NCDOT's MSTSA School Calculator or 1200 feet, whichever is greater. Additional stacking may be required by the Director of Engineering depending upon proposed traffic impacts. In all cases, stacking shall be contained on the school site and stacking within public streets is not allowed.

060.05.02 Intersection Design

060.05.02.01 An intersection of a Type 7 or greater street with a Type 9 or greater street shall be deemed a “major intersection” as used in these Standard Specifications and Details.

060.05.02.02 Intersections with streets of Type 9 or greater without medians shall be at least 800 feet apart. Intersections with streets of Type 9 or greater with medians shall meet NCDOT requirements for full access median crossover spacing based on posted speed limit. Speed limit reductions to allow for closer median crossover spacing shall not be considered.

060.05.02.03 There shall be a minimum of 200 feet between centerlines of street jogs on streets of Type 7 or 8. Streets of Type 6 or less shall not be offset less than 125 from their centerlines.

060.05.03 Pedestrian Crossings

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

**060.06 SIGHT DISTANCE**

060.06.01 General

060.06.01.01 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, and all driveway intersections from a multi-family or non-residential property.

060.06.01.02 It shall be the responsibility of the Design Professional for all proposed developments, including site, subdivision, landscape, infrastructure, and sign plans to meet these requirements as a part of the project design and approval process. Between the latest version of AASHTO “Policy on Geometric Design of Highways and Streets” (Green Book) or as approved by the Director of Engineering.

060.06.01.03 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 shall be located to minimize visual obstruction. Other objects 12 inches in diameter and smaller, such as tree trunks and sign posts, may be allowed within sight distance areas if located individually or in combination so as to not substantially restrict the driver’s view. The determination of what objects, if any, may be located within sight distance areas shall be made by the Director of Engineering. Trees greater than 12 inches in diameter and located in the street right of way shall be evaluated in



accordance with other applicable Town policies and requirements. Shrubs and ground cover less than 42 inches tall may be permitted within the sight distance areas. Limbs on trees located within the sight distance areas shall be removed if they hang lower than 6 feet above the finished grade.

060.06.01.04 It is recognized that in some cases conditions may exist that prevent the attainment of desirable sight distance due to social, economic or environmental consideration. In such cases, the maximum practical sight distance, up to the desirable values, 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 may be imposed. In all cases, unless otherwise provided by the Town Code or granted as an exemption by the Town, the minimum provision of adequate stopping sight distance shall be required.

060.06.01.05 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.

060.06.01.06 The information and tabular data for sight distance calculations provided within this document are provided as a guideline. The Design Professional shall ultimately be responsible to determine the design criteria and design.

060.06.01.07 The Town shall remove sight distance obstructions located within Town right of way. The Town will notify the NCDOT of sight distance obstructions located within their right of way. The Town 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.

## 060.06.02 Intersection Sight Distance

### 060.06.02.01 General

060.06.02.01.01 In order for vehicles to safely maneuver into or through an intersection, sufficient sight distance shall be provided so as to avoid collisions. 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 the travelway. If this line of sight is impeded by any obstructions, either the obstruction shall 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 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. If this line of sight is impeded by any obstructions, either the obstruction shall be moved or the alignment adjusted.

060.06.02.01.02 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 is measured along the centerline of the major street between the drivers of the two opposing vehicles.

060.06.02.01.03 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.

060.06.02.02 Yield Sign Control

060.06.02.02.01 This type of design requires that the side street be posted with yield signs. The sight distance for the driver on the side street shall 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. 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.

060.06.02.03 Stop Sign Control

060.06.02.03.01 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 shall 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 060.03.

060.06.02.03.02 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. 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 is dependent on the classification of the intersecting streets. For all intersections where the through street is a street of Type 8 or greater, 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 of Type 7 or less, 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 for left or right turns from and onto the through street are dependent on the design speed of the roadway and are presented in the most current version of AASHTO "Green Book" guidelines.

060.06.02.04 Traffic Signal Control

060.06.02.04.01 At intersections controlled by traffic signals, the minimum sight distance shall be stopping sight distance (Table 060.04) 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 shall be restricted.

060.06.02.04.02 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".

060.06.03 Stopping Sight Distance

060.06.03.01 At minimum, stopping sight distance shall 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. A more detailed explanation of the measurement of stopping sight distance is included in the latest edition of the 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 060.04 presents the minimum stopping sight distances for various design speeds on level terrain. Table 060.05 presents adjustment factors for stopping sight distance on grades. Variable situations may require a greater length of stopping sight distance.

## **060.07 MATERIALS AND PAVEMENT DESIGN**

060.07.01 Materials

060.07.01.01 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.

060.07.01.02 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.

060.07.01.03 Bituminous Concrete Base Course, Type B25.0B, shall conform to the general, material, and construction specifications as specified in 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.

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

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

060.07.01.06 Joint Filler shall be a non-extruding joint material conforming to ASTM C1751.

060.07.01.07 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.

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

060.07.01.09 Concrete Pavers may be used on privately maintained streets or as approved by the Director of Engineering for pedestrian crossings in urban areas. The Town will not maintain decorative type paved street surfaces such as pavers or imprinted designs within public ROW, unless approved by the Town Board.

060.07.01.10 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.

060.07.01.11 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 of fabric specified.

060.07.01.12 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.

#### 060.07.02 Pavement Design

060.07.02.01 A pavement design shall be required for all streets of Type 8 or greater. The pavement design and traffic analysis shall be signed and sealed by a Design Professional. 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 Design Professional 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.

060.07.02.02 A pavement design may also be required in other areas as specified by the Director of Engineering.

060.07.02.03 The pavement thickness of any street shall, at a minimum, equal the design shown in Details 060.02 through 060.06 for the various street widths.

060.07.02.04 Approved pavement design methods include those as proposed by NCDOT, the 1993 AASHTO Guidelines and the 1981 Asphalt Institute MS 1 document.

060.07.02.05 The AASHTO method shall require use of a terminal serviceability index of 2.0 for street Types 7 and 8 and 2.5 for street Types 9 and greater,  $S_o = 0.49$  for flexible pavement and  $S_o = 0.39$  for rigid pavements, and a reliability of 98% for street Types 9 and greater and a reliability of 95% for street Types 7 and 8.

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

## **060.08 CONSTRUCTION AND INSPECTION**

060.08.01 No construction of the roadway shall take place until all underground utilities located within the roadway, including gas, telecommunications, and electrical utilities which are either located within or cross the roadway, and other appurtenances have been inspected and meet the requirements of the Standard Specifications and Details.

060.08.02 The subgrade shall be compacted and inspected 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  $1\frac{3}{4}$ " S9.5B and the second lift be a minimum of  $1\frac{1}{4}$ " S9.5A or S9.5B. 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 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  $1\frac{1}{2}$  inch shall occur at both tie-in stations to insure a smooth connection.

060.08.03 Once underground work is complete, the subgrade shall be fine graded to the required grade and compacted as described in Section 040 General Provisions. The subgrade shall then be proof-rolled by using a fully loaded tandem dump truck with a minimum gross weight of 20 tons. A current weight ticket shall be provided to the

Construction Inspector. Should any "pumping" or displacement be observed during the proof-rolling, the defective area(s) shall be repaired by replacing defective material with suitable material, alternative stabilization methods such as fabric, Geo-Grid, lime, etc., or any combination thereof to the satisfaction of the Town, and thoroughly compacted. The proof rolling shall be repeated until there is no evidence of "pumping" or displacement. Stone base course shall be placed within 48 hours of the proof-roll or the proof-roll shall be redone. The proof-roll shall also be redone if rain occurs prior to the placement of stone base course.

060.08.04 Upon completion of the proof-rolling, the Contractor shall furnish to the Construction Inspector a report from a certified soils testing laboratory. The report shall present the results of a Proctor analysis demonstrating that the subgrade compaction is acceptable in accordance with standard requirements of NCDOT in all of the significant fill areas. The cost of laboratory testing of subgrade compaction shall be borne by the Contractor. The subgrade shall then be inspected by the Construction Inspector with a level or string line to ensure that the prepared subgrade has been constructed to the proper grade and transverse slope, and upon its acceptance and approval, the stone base course may be placed. However, no stone base shall be placed prior to backfilling behind the curb.

060.08.05 The Town reserves the right to require that quarry tickets be presented to the Construction Inspector to enable a check for yield at the specified final thickness. 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 Construction Inspector, and also inspection with a level or string line to ensure that the prepared base course has been constructed to the proper grade and transverse slope. Asphalt shall be placed within 48-hours of the proof-roll, or the proof-roll shall be redone. The proof-roll shall also be redone if rain occurs prior to the placement of asphalt. Upon acceptance and approval, the bituminous surface course may be placed.

060.08.06 The Construction Inspector may also require field density testing of the asphalt mix formula before it is inspected or approved. Bituminous surface course material shall be placed and compacted in accordance with NCDOT requirements. Copies of delivery tickets shall be furnished to the Construction Inspector to enable a check for yield at the specified final thickness.

060.08.07 Should there be a question as to the final thickness of Aggregate Base Course or bituminous surface course, the Construction Inspector reserves the right to require the Contractor to provide random core samples by an independent testing laboratory to demonstrate actual thickness of base and surface courses. A certified testing laboratory shall take core samples and the results shall be presented to the Construction Inspector. Should the cores reveal insufficient thickness, the Contractor shall provide additional surface course as may be required or shall furnish other remedial measures as may be acceptable to the Director of Engineering

060.08.08 The cost of compaction testing and coring work shall be borne by the Contractor.

060.08.09 When street widening takes place, the existing edge line of the travel lane shall be sawcut. Achieve an overlap of the final inch 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 ensure a smooth connection.

060.08.10 Valve boxes and manholes shall initially be set at an elevation to be flush with the first course of asphalt, and then raised when the final course is placed.

060.08.11 The final course of surface asphalt shall be placed prior to final plat recordation. A separate 1-year warranty for the asphalt shall be required. Upon installation of asphalt, no additional open cuts of the pavement shall be allowed except under unusual circumstances. In those cases where open cuts are allowed after the placement of asphalt, the asphalt shall be milled a minimum of ten feet on either side of the open cut and new asphalt placed to provide a uniform surface.

Table 060.01 – Street Classifications (sheet 1 of 2)			
Type	Description	Pavement Width (feet) (BOC-BOC)	ROW / Easement Width (feet)
1	Alley	20	25
2	Res. Cul-de-sac	29	50
3	Non-Res. Cul-de-sac	35	60
4	Res. Loop Street	29	50
5	Access Street	29	50
6	Minor Res. Street	29	50
7	Res. Collector Street	31	52
8	Thoroughfare Collector Street	35	60
9	Major Thoroughfare/ Boulevard/Parkway	Transportation Plan	Transportation Plan
10	Arterial	Transportation Plan	Transportation Plan
11	Controlled Access Highway	Fed. Highway Admin.	Fed. Highway Admin.



<b>Table 060.01 – Street Classifications (sheet 2 of 2)</b>				
Type	On-Street Parking Permitted?	Individual Driveway Access Permitted?	Sidewalk Required? (0, 1, 2 sides of street)	Type of Curb & Gutter Allowed
1	No	Yes	0	Combination or Valley
2	Yes (1 side only, No Parking in Bulb)	Yes	0	Combination or Valley
3	Yes (No Parking in Bulb)	Yes	0	Combination or Valley
4	Yes	Yes	1	Combination or Valley
5	Yes	Yes	1	Combination or Valley
6	Yes	Yes	1	Combination or Valley
7	Yes	Yes	1	Combination Only
8	No	No	2	Combination Only
9	No	No	2	Combination Only
10	No	No	2	Combination Only
11	No	No	2	Fed. Highway Comm.

\*Represents typical sidewalk requirements. The Town Code of Ordinances, Part 9 – Land Development Ordinance may

<b>Table 060.02 – Curve Controls</b>							
Street Type	Horizontal Curve Controls			Vertical Curve Controls			
	Minimum Design speed (mph) <sup>1</sup>	Maximum Super-elevation (foot/foot) <sup>2</sup>	Minimum Radii (feet)	Maximum Grade <sup>3</sup>	Length Crest	Length Sag	Minimum Tangent Length (feet)
1	15	Normal crown	100	12%	18A	18A	50
2	25	Normal crown	100	12%	18A	18A	75
3	25	Normal crown	205	10%	18A	26A	100
4	25	Normal crown	150	12%	18A	18A	75
5	25	Normal crown	205	10%	28A	28A	100
6	30	Normal crown	205	10%	28A	35A	100
7	40	0.04	565	9%	29A	49A	150
8	40	0.04	565	9%	44A	64A	150
9	50	0.04	930	7%	84A	96A	150
10	Design standards to be determined for each case individually by the Director of Engineering						
11	Design standards set by the Federal Highway Commission						
<p><sup>1</sup> Design speed shall be at least 5 mph greater than posted speed.</p> <p><sup>2</sup> The super-elevation 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.</p> <p><sup>3</sup> Design criteria can vary on a case-by-case basis if approved by the Director of Engineering.</p> <p>Note: At the discretion of the Department of Engineering, the K-values in sags may be adjusted with additional street lighting.</p> <p>A = Algebraic difference in grades.</p>							

<b>Table 060.03 – Sight Distances for Street Crossing</b>				
Vehicle Type	Sight Distance (feet) per 10 mph of Design Speed per Listed Crossing Width			
	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>Table 060.04 – Stopping Sight Distances for Level and Wet Conditions</b>	
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

<b>Table 060.05 – Adjustment Factors for Stopping Sight Distances on Grades</b>						
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.