SECTION 3 - STREETS

3.01 General

Unless otherwise provided herein, all materials and street construction methods shall conform to the applicable requirements as outlined in the ***Standard Specifications for Roads & Structures***, latest edition, as published by NCDOT.

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

"State" or "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

a. General:

Street design shall conform to the standards set forth in the applicable sections of the Knightdale ***Unified Development Ordinance***. Streets shall be classified as follows:

STREET CLASSIFICATION[1]	
Category One	Alley Local Street
Category Two	Main Street Avenue Urban Avenue
Category Three	Boulevard Urban Boulevard Freeway

[1]As defined by the ***Unified Development Ordinance***

Intersection sight distances and ensuing sight triangles shall be in accordance with the ***Unified Development Ordinance***. When any part of any sight triangle falls outside the right-of-way of either street, a sight triangle easement shall preserve the sight distances. Such sight triangle easements shall be shown on the final plat for the subdivision. Plant materials placed inside the sight triangle shall be in accordance with the ***Unified Development Ordinance***.

b. Soils Evaluation & Pavement Design:

Pavement design for all new streets shall be based upon subgrade soil conditions, a 20-year (minimum) design life and projected traffic loadings (ADT and percent trucks).

The pavement design and subgrade soils evaluation procedure shall include the following as a minimum:

(1) Perform standard penetration test (SPT) borings to a depth of five feet below design subgrade, or, in the case of fill sections, to a depth of five feet below existing ground. The standard penetration test borings shall be obtained along the centerline of all roadways at intervals not greater than 300 feet.

(2) Perform classification tests of representative SPT soil samples.

(3) Obtain bag samples of prevalent soils and perform moisture-density tests.

(4) Select a soil type for pavement design - usually a weaker soil among those expected to be present at subgraded level. Re-mold a sample and perform a California Bearing Ratio (CBR) using soaked values at 0.1 inch as outlined in ASTM D1833.

(5) Prepare pavement design calculations based on the soaked CBR values and typical traffic loading as prescribed for the category of the affected street.

(6) The pavement design and traffic analysis for traffic loading shall be prepared by a Professional Engineer licensed to practice in the State of North Carolina and submitted to the Town in duplicate copies in a report format prior to placing of any curb and gutter or crushed aggregate base course.

Soils testing work shall be performed by a qualified geotechnical engineering firm. The pavement designs shall be performed by a qualified professional engineer using standard methods developed by NCDOT, AASHTO, The Asphalt Institute, or other similar methods approved by the Engineer.

The AASHTO method requires use of a serviceability index as follows:

SERVICEABILITY INDEX	
Street Classification[1]	**Index**
Category One	2.0
Category Two	2.0
Category Three	2.5

[1]As defined by the ***Unified Development Ordinance***

In addition, use $S_o = 0.49$ for flexible pavement and 0.39 for rigid pavement and reliability of 98 percent for Category Three and 95 percent for Category One and Category Two.

The final pavement thickness shall be the calculated thickness, but in no case shall the thickness be less than that shown in the standard street section details, or that required by NCDOT for streets to be maintained by the State.

3.03 Construction Requirements

a. General:

All roadway subgrade, storm sewer and utility construction shall be inspected and approved by the Town Representative prior to placement of the base course materials.

All streets shall be cleared and graded for the full width of the right-of-way.

b. Placement of Aggregate Base Course:

Aggregate base course shall be placed and compacted in strict conformance with the standard requirements of NCDOT. Each layer shall be compacted to a density equal to at least 98 percent of the nuclear target density as determined by AASHTO Method T-180 as modified by NCDOT. Category One and Two streets shall have a thickness of no less than eight (8) inches. Category Three streets shall conform to the standard requirements of NCDOT.

c. Placement of Bituminous Surface Course:

The Superpave bituminous surface course pavements (for Category One streets) shall be in accordance with Type S 9.5A with a total thickness of not less than 2½ inches as shown on the standard details. The bituminous surface course material shall be placed in two lifts, each in strict conformance with the requirements of NCDOT. The second lift shall be 1¼ inch nominal thickness, and shall be delayed during the period of initial residential construction activity to allow the intial course of asphalt and underlying structure to withstand a full season's freeze thaw cycle. (eg. an initial coarse laid in the Spring/Summer/Fall of a given year will not be allowed to have the final lift placed until the Spring of the subsequent year). The final lift of asphalt shall be placed at the conclusion of the seasonal freeze thaw cycle, typically March of the following year, or as approved by the Town Engineer.

For Category Two streets requiring a combination of Type I 19.0B and Type S 9.5B, the Town will require the asphalt intermediate course (I19.0B) to be installed in a single lift of 2½ inches and the asphalt surface course (S9.5B) in a single lift of 1½ inches. The asphalt surface course shall be delayed during the period of initial residential construction activity to allow the intermediate course of asphalt and underlying structure to withstand a full season's freeze thaw cycle. (eg. an intermediate coarse laid in the Spring/Summer/Fall of a given year will not be allowed to have the final lift placed until the Spring of the subsequent year). The final lift of asphalt shall be placed at the conclusion of the seasonal freeze thaw cycle, typically March of the following year, or as approved by the Town Engineer. All asphalt shall be installed in strict conformance with the requirements of NCDOT.

For Category Three streets requiring a combination of Type I 19.0B and Type S 9.5B, the Town may require the asphalt intermediate course to be initially sealed with a 1½ inch layer of the asphalt surface course followed by placement of the final asphalt surface course layer at a later date. Asphalt pavement thickness shall conform to the requirements of NCDOT. Geotechnical reports and traffic volumes may be required.

The contractor shall provide temporary drains through the concrete gutter at all low points to allow the first layer of asphalt to drain and eliminate ponding at the low points. Prior to placing the final layer of surface course, the initial course shall be thoroughly cleaned and repaired. Bituminous tack shall be applied prior to surfacing to assure bond between layers, along gutters and around castings.

3.04 Inspection

a. Proof-Rolling:

Street embankments and cut areas shall be graded and compacted as described in Section 2 of these Specifications. After all utilities and storm sewers have been installed, the subgrade shall be fine graded and restored to required grade, and then proof-rolled, utilizing a fully loaded tandem axle truck having a gross weight not less than 40,000 pounds and with the tires inflated to not less than 70 psi.

Should any "pumping" or displacement be observed during the proof-rolling, the defective area(s) shall be excavated to a depth no less than 18 inches below subgrade and backfilled with suitable material, thoroughly compacted in not less than eight (8) inch lifts of uncompacted fill. If deemed appropriate by a geotechnical engineer, geotextile fabric may be utilized below the base course material in lieu of additional excavation. The geotextile shall be installed in strict accordance to the manufacturer's recommendations with respect to overlap, depth of cover, etc. Prior to installing geotextile fabric, a copy of the manufacturer's literature shall be submitted to the Town along with the geotechnical engineer's recommendations. The locations of geotextile fabric shall be indicated on the Record Drawings.

Proof-rolling shall be repeated until there is no evidence of "pumping" or displacement.

b. Compaction Testing - Subgrade:

Upon completion of the proof-rolling, the Developer/Contractor shall furnish to the Town Representative 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. The subgrade shall then be inspected by the Town Representative, and upon its acceptance and approval, the stone base course may be placed. However, no stone base may be placed prior to backfilling behind the curb.

One field density (compaction) test shall be required for each 3,000 SY of street surface and for each lift of fill material placed into the roadway embankment.

The cost of laboratory testing of subgrade compaction shall be borne by the Developer/ Contractor.

c. Intermediate Course & Surface Course Inspection Requirements:

Prior to placement of bituminous surface course material, a Proctor analysis shall be furnished on the Aggregate Base Course placed in the roadway. The report shall be prepared by a certified testing laboratory and shall evidence compliance with the compaction requirements. Quarry tickets shall also be presented to the Town Representative to enable a check for yield at the specified final thickness. The base material shall then be inspected by the Town Representative, and upon acceptance and approval, the bituminous surface course may be placed. Bituminous intermediate course material shall be placed and compacted in accordance with NCDOT requirements. Copies of delivery tickets shall be furnished to the Town Representative to enable a check for yield at the specified final thickness.

The frequency and number of intermediate course field density tests shall be in accordance with requirements of NCDOT or as may otherwise be directed by the Town Representative or the Engineer.

Bituminous surface course material shall be placed and compacted in accordance with NCDOT requirements. Copies of delivery tickets shall be furnished to the Town Representative to enable a check for yield at the specified final thickness.

Should there be a question as to the final thickness of Aggregate Base Course, bituminous intermediate course or bituminous surface course, the Town Representative reserves the right to require the Developer/ Contractor to provide random corings by an independent testing laboratory to demonstrate actual thickness of base, intermediate and surface courses. Core samples shall be taken by a certified testing laboratory, and the results shall be presented to the Town Representative. Should the corings 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 Town Representative.

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

3.05 Pavement Marking & Signage

The Developer shall be responsible for furnishing and installing all street identification (name) and regulatory signs. The Developer shall also be responsible for striping on all public streets constructed with development as follows:

- Stop Bars and Crosswalks - all streets - per detail 4.06

- Continuous Centerline Striping - double yellow line on Category Two and Category Three streets.

- Parking Stalls – where applicable (on-street).

a. Pavement Markings:

All pavement markings including traffic control, stop bars fire lanes and cross walks shall be made with reflectorized thermoplastic striping with a minimum thickness in accordance with NCDOT Standard Specifications for Roads & Structures. All markings shall be 120 mil thick with the exception of symbols which shall be 90 mil thick. Parking stall striping in a private parking lot is exempt from use of thermoplastics. The thermoplastic striping type of marking material shall be applied by fusing to the pavement surface by application of heat. Materials shall comply fully with the requirements set forth in Section 1087 of the ***Standard Specifications for Roads & Structures***, latest edition, as published by NCDOT. Application of markings shall conform to the applicable requirements set forth in Section 1205 of the ***Standard Specifications for Roads & Structures***, latest edition, as published by NCDOT for permanent marking.

b. Street Identification Signs:

Street identification signs shall identify all streets at each intersection. Such signs shall be constructed of aluminum sheets, six (6) inch high, 0.063 inch thick and length as needed to have a two (2) inch margin before and after the lettering. The background shall be reflectorized green meeting the requirements set forth in Section 1093 the ***Standard Specifications for Roads & Structures***, latest edition, as published by NCDOT. Street name lettering shall be white, upper case, block letters four (4) inches in height. Street classification (i.e. street, avenue, etc.) shall be white, upper case block lettering, two (2) inches in height. Street signs shall be mounted at a nominal height of eight (8) feet above grade. The sign shall comply with the Town of Knightdale Standard Detail 3.16 and 17.

c. Regulatory Signs:

Regulatory signs shall meet the requirements of the ***Manual on Uniform Traffic Control Devices*** and any modifications thereto established by NCDOT. Materials shall meet the requirements set forth in Sections 1092 and 1093 of the ***Standard Specifications for Roads & Structures***, latest edition, as published by NCDOT. The location and types of regulatory signs shall be indicated on the construction drawings.

d. Sign Posts:

All signs shall be mounted on a galvanized steel square tube post with a minimum 14 gauge steel as specified in Section 1094 of the ***Standard Specifications for Roads & Structures***.

3.06 Private Irrigation Systems

Private irrigation systems proposed to be located within existing or proposed Town right-of-way shall be reviewed, and a permit to encroach upon Town right-of-way shall be issued by the Town prior to installation. The following requirements or features must be indicated on the construction drawings:

(1) All irrigation systems shall be equipped with an approved RPZ-type backflow preventer located in a freeze-proof enclosure and meeting the requirements of the City of Raleigh.

(2) All backflow preventers, control boxes, and other above ground devices shall be located outside of Town right-of-way. Only flush-type sprinkler heads and buried piping and control wiring may be located within the Town right-of-way. No sprinkler heads or other devices shall be installed within 5 feet of curbs or edges of pavement.

(3) Within the Town right-of-way, all control wiring shall be in PVC electrical conduit and installed with no less than 18" of cover, unless greater cover is required by the applicable electrical codes.

(4) All irrigation piping crossing beneath Town streets shall be encased in steel or ductile iron casing pipe, extending no less than 3 feet beyond curbs or edges of pavement with no less than 18" of cover.

(5) Sprinkler heads shall be located and adjusted so that the spray pattern does not enter the right-of-way or create a visual obstruction within sight triangles.

(6) The owner of the irrigation system shall be fully responsible for operation, maintenance and repair of the system. The owner of the irrigation system shall also be responsible for any damage to Town streets, sidewalks, landscaping or utilities resulting from failure of or repair to the irrigation system. The Town shall not be responsible for damage of any kind to private irrigation systems or components located within Town right-of-way for any reason.

(7) The owner of the irrigation system shall maintain accurate as-built information regarding the system and shall be responsible for providing this information to the Town or any other public entity. Ownership and contact information of the irrigation system shall be provided to the Town's Director of Public Works and permanently posted on the backflow preventer enclosure, visible to the roadway.

In the event that the Town's Director of Public Works deems that the owner of the irrigation system developer failed to properly install, operate or maintain a private irrigation system within Town right-of-way, the Director will immediately revoke permission for the encroachment upon Town right-of-way. Upon revocation of permission to encroach upon Town right-of-way, water service to the irrigation system will be terminated without further notice.

3.07 Mailboxes

Mailboxes located within Town right-of-way for the purpose of receiving delivery from the US Postal Service shall conform to the requirements set forth by the US Postal Service. All portions of the mailbox, support, or any appurtenance thereto shall be no less than 12" from the back of curb with a minimum height from pavement to mailbox of 42-inches. The Town shall reserve the right to review mailbox location with respect to site triangle, and require relocation accordingly.