STALLINGS LAND DEVELOPMENT STANDARDS
SPECIFICATIONS AND SPECIAL PROVISION NOTES

The following specifications and special provisions are intended to be used in conjunction with the Town of Stallings (TOS) Land Development Standard Drawings, NCDOT Roadway Standard Drawings, and NCDOT Standard Specifications for Roads and Structures for all development within the Town of Stallings unless otherwise directed by the Town Engineer.

I. STREETS

A. GENERAL NOTES

1. All work and materials shall conform to the latest edition of the North Carolina Department of Transportation Standard Specifications for Roads and Structures unless otherwise specified in this manual.

2. All asphalt cuts shall be made with a saw when preparing street surfaces for patching or widening strips.

3. Paper joints shall be used to seal the ends of an asphalt pour so that future extensions can be made without causing rough joints.

4. When placing asphalt against existing surfaces, a straight edge shall be used to prevent “humping” at that location.

5. Stone shall be primed if paving is not complete within seven days following stone base approval.

6. Surfaces shall be tacked when asphalt is being placed over existing asphalt streets or adjoining concrete, storm drain and sanitary sewer structures.

7. In rolling and hilly terrains, sweeping of the stone base and/or application of a tack coat may be required near intersections. These requirements will be established by the Town Inspector based on field conditions.

8. ALL concrete used for streets, curb and gutter, sidewalks and drainage structures, etc. shall have a minimum compressive strength of 3600 PSI at 28 days. This requirement shall be provided regardless of any lesser compressive strength specified in the North Carolina Department of Transportation Standard Specifications for Roads and Structures. The contractor shall prepare concrete test cylinders in accordance with Section 1000 of the North Carolina Department of Transportation Standard Specifications for Roads and Structures at the direction of the project inspector. All equipment and cylinder molds shall be furnished by the contractor. It shall be the responsibility of the contractor to protect the cylinders until such time as they are transported for testing. Testing for projects shall be performed by an independent testing lab, at no cost to the Town. The contractor shall provide equipment and perform tests on concrete for a maximum slump and air content as defined in Section 1000 of the North Carolina Department of Transportation Standard Specifications for Roads and Structures. These tests shall be performed at a frequency established by the inspector. Materials failing to meet specifications shall be removed by the contractor.

9. All concrete shall be cured with 100% Resin Base, white pigmented curing compound which meets ASTM Specifications C- 309, Type 1, applied at a uniform rate at one (1) gallon to 400 square feet within 24 hours of placement of the concrete.

10. All curb and gutter shall be backfilled with soil approved by the Inspector within 48 hours after construction to prevent erosion.

11. All backfill shall be non-plastic in nature, free from roots, vegetative matter, waste, construction material or other objectionable material. Said material shall be capable of being compacted by mechanical means and the material shall have no tendency to flow or behave in a plastic manner under the tamping blows or proof rolling.

12. Materials deemed by the Inspector as unsuitable for backfill purposes shall be removed and replaced with select backfill material.

13. All trenches in the street right-of-way shall be backfilled with suitable material immediately after the pipe is laid. The fill around all pipe shall be placed in layers not to exceed six (6) inches and each layer shall be compacted thoroughly.

14. Under no circumstances shall water be permitted to rise in un-backfilled trenches after the pipe has been placed.

15. Compaction requirements shall be attained by the use of mechanical compaction methods. Each six (6) inch layer of backfill shall be placed loose and thoroughly compacted into place.

16. Straight forms shall not be used for forming curb and gutter in curves.

17. All excess concrete on the front edge (lip) of gutter shall be removed when curb and gutter is poured with a machine.

18. All subgrade shall be compacted to 100% of the maximum density obtainable with the Standard Proctor Test to a depth of eight (8) inches, and a density of 95% Standard Proctor for depths greater than eight (8) inches. All tests shall be performed by developer at no cost to the Town.

19. A canvas cover or other suitable cover shall be required for transporting plant mix asphalt during cool weather when the following conditions are present:

    a. Air temperature is below 60 degrees F.
    b. Length of haul from plant to job is greater than five (5) miles.
    c. Other occasions at the Inspector's discretion when a combination of factors indicates that material should be covered in order to assure proper placement temperature.

20. Concrete or asphalt shall not be placed until the air temperature measured at the location of the paving operation is at 35 degrees F and rising by 10:00 a.m. Concrete or paving operations should be suspended when the air temperature is 40 degrees F and descending. The contractor shall protect freshly placed concrete or asphalt in accordance with Sections 420 (Concrete Structures), 600 (Asphalt Bases And Pavements), and 700 (Concrete Pavements And Shoulders) of the North Carolina Department of Transportation Standard Specifications when the air temperature is at or below 35 degrees F and the concrete has not obtained an age of 72 hours.

21. The contractor shall maintain two-way traffic at all times when working within existing streets. The contractor shall place and maintain signs, danger lights, and barricades and furnish watchmen or flagmen to direct traffic in accordance with the latest edition Work Area Traffic Control Handbook (WATCH). Work in the right-of-way of State System Streets may require additional traffic control provisions.

22. The contractor shall do that which is necessary to control erosion and prevent sedimentation damage to all adjacent properties and streams in accordance with the appropriate NCDENR Erosion and Sedimentation Erosion Control Ordinance.

B. STANDARDS OF STREET DESIGN

1. Minimum street right-of-way widths shall not be less than the following:

Street Type	Right-of-Way Width
Major Thoroughfare	120 feet
Residential Collector	96 feet
Minor Thoroughfare	80 feet
Main Street	75 feet
Major Collector/Industrial	70 feet
Residential	60 feet
Commercial	70 feet

2. Minimum Design Criteria for Local Residential Streets:

Terrain Classification: Terrain classification falls under two categories: 1) Level – natural slope range of 0% to 8% and 2) Rolling – natural slope range of 8.1% to 15%.

		LEVEL	ROLLING
Pavement Width Curb and Gutter Section		*22' EP-EP	*22' EP-EP
Maximum Cut and Fill Slopes		2:1	2:1
Design Speed		30 mph	25 mph
Min. Sight Distance and Vertical Curves		200'	150'
Minimum Centerline Radius		230'	150'
Maximum Grade*		9%	12%
K=Rate of Vertical Curvature for Minimum Sight Distance**	Crest	30	20
	SAG	30	20
	STOP	14	9
Minimum Cul-de-Sac Radius Right of Way	Curb and Gutter Section	45'	45'
Minimum Cul-de-Sac Radius	Curb and Gutter Section	36' to EP	36' to EP

*Grades for 100' each way from intersection exceeding 5% may be reviewed by Town Engineer for consideration. Grades less than 0.5% should not be used unless reviewed individually by the Town Engineer to determine potential maintenance problems.

**Formula for determination of length of vertical curve required to provide minimum site distance: [L=KA] L = length of vertical curve in feet; K = Rate of vertical curvature in feet per percent of A; A = Algebraic difference in grades in percent.

3. Minimum Design Criteria for Residential Collector Streets

Terrain Classification: Terrain classification falls under two categories 1) Level – natural slope range of 0% to 8% and 2) Rolling – natural slope range of 8.1% to 15%.

		LEVEL	ROLLING
Right of Way Width Curb and Gutter Section		60’	60’
Maximum Cut and Fill Slopes		2:1	2:1
Design Speed		35 mph	30 mph
Minimum Sight Distance and Vertical Curves		250’	200’
Minimum Centerline Radius		310’	230’
Maximum Grade*		6%	9%
K=Rate of Vertical Curvature for Minimum Sight Distance**	Crest	45	30
	SAG	45	30
	STOP	20	14

*Grades for 100’ each way from intersection exceeding 5% may be reviewed by Town Engineer for consideration. Grades less than 0.5% should not be used unless reviewed individually by the Town engineer to determine potential maintenance problems.

**Formula for determination of length of vertical curve required to provide minimum site distance: [L=KA] L = length of vertical curve in feet; K = Rate of vertical curvature in feet per percent of A; A = Algebraic difference in grades in percent.

4. Pavement widths shall be in accordance with the standards of the NCDOT for the street type of the Town of Stallings whichever is more restrictive.

5. Proposed streets shall conform to grade standards adopted by the NC Department of Transportation for public streets of the Town of Stallings whichever is more restrictive.

6. All vertical curves shall have a length as necessary to provide safe sight distance.

7. a. Streets shall be laid out so as to intersect as nearly as possible at right angles, and no street shall intersect any other street at an angle less than 75 degrees.

b. Property lines at street intersections shall be round with a minimum radius of 20 feet. At an angle of intersection of less than 75 degrees, a greater radius may be required. Where a street intersects an NCDOT maintenance right of way, the design standards of the NCDOT, Division of Highways shall apply.

c. Offset intersections are to be avoided unless exception is granted. Intersections which cannot be aligned should be separated by a minimum length of 200 feet between survey center lines.

d. Intersections with major or minor thoroughfares should be at least 1,000 feet apart measured from centerline to centerline.

8. Permanent dead-end streets shall not exceed 500 feet in length, and shall be provided with a turnaround of a diameter meeting NCDOT standards.

9. Block Length and Width

a. Blocks shall not exceed a perimeter length of 5,000 feet, perimeter length being the shortest perimeter measurement along the abutting right-of-way line.

b. Blocks shall be at least wide enough to allow two tiers of lots of minimum depth, except where prevented by topographical conditions or the size of the property. A single tier of lots may be used adjoining a major thoroughfare where access is provided from a minor interior street.

10. Design criteria for arterial streets shall be established jointly by the Town Engineer and the Director of the Department of Transportation on a case by case basis using the latest edition of the American Association of State Highway and Transportation Officials (AASHTO) A Policy on Geometric Design of Highway and Streets and/or NCDOT Roadway Design Manual.

11. Intersection corner – A minimum 10' x 70' sight triangle (measured along right-of-way lines) shall be provided at each intersection corner. Other sight distance requirements may be required by the NCDOT or the TOS.

12. Refer to the NCDOT Subdivision Roads Minimum Construction Manual for development criteria for sites located within the Town of Stallings Extraterritorial Jurisdiction (ETJ) within these areas governed by TOS Land Development Standards Manual and the NCDOT Subdivision Roads Minimum Construction Standards Manual. The more restrictive standard shall apply.

C. GRADING

1. Proposed street rights-of-way shall be graded to their full width for ditch type streets and a minimum of eight (8) feet behind the curb for curb and gutter sections.

2. Fill embankments shall be formed of suitable material placed in successive layers not to exceed more than six (6) inches in depth for the full width of the cross-section, including the width of the slope area. No stumps, trees, brush, rubbish or other unsuitable materials or substances shall be placed in the embankment. Each successive six (6) inch layer shall be thoroughly compacted by the sheepsfoot tamping roller, 10-ton power roller, pneumatic-tired roller, or other methods approved by the Town Engineer. Embankments over and around all pipe culverts shall be of select material, placed and thoroughly tamped and compacted as directed by the Town Engineer or his representative.

D. ROADWAY BASE

1. All roadways shall be constructed with a base course as described on the appropriate TOS Land Development Standard Detail Drawing.

2. The material for stone base course shall conform to the requirements of Section 1010, Aggregate for Non-Asphalt Flexible Type Base, and Section 520, Aggregate Base course of the North Carolina Department of Transportation Standard Specifications for Roads and Structures.

3. The stone base shall be compacted to 100% of the maximum density obtainable with the Modified Proctor Test (AASHTO- T180) by rolling with ring or tamping roller or with a pneumatic tired roller with a minimum weight of ten tons. When completed, the base course shall be smooth, hard, dense, unyielding and well bonded.

4. A bituminous concrete base course, as specified on the Standard Detail Drawing may be substituted in lieu of a stone base course.

5. Asphalt base course will only be allowed within widening strips less than five (5) feet in width.

E. ROADWAY INTERMEDIATE AND SURFACE COURSE

1. All public roadways shall be constructed with an intermediate and surface course as described on the appropriate Town of Stallings Land Development Standard Detail Drawing.

2. Plant mixed asphalt shall conform in all respects to Section 610 of the North Carolina Department of Transportation Standard Specifications for Roads and Structures.

3. The final lift of asphalt surface course for Residential Subdivision Streets shall be withheld until a minimum of (80%) for local residential and (90%) for residential collector, commercial and industrial roads within an occupied Development (occupied means a certificate of occupancy has been issued). All known base failures shall be repaired prior to application of the final lift of asphalt surface course.

4. The Town inspector shall be given a (24) twenty-four hour notification to inspect the intermediate course deficiencies. All deficiency repairs are to be monitored by a Town Inspector and accepted prior to application of final layer.

5. Recycled plant mixes are not allowed on new roadways.

6. Failure to meet the above requirements may result in the delay or prevention of street acceptance by the Town of Stallings or NCDOT.

F. SIDEWALKS AND DRIVEWAYS

1. Sidewalks shall be constructed of not less than 3600 P.S.I. concrete and shall be four (4) inches thick, constructed on an adequately graded base, except where a sidewalk crosses a driveway it shall be six (6) inches thick. Subgrade shall be compacted to 95% of the maximum density obtainable with the Standard Proctor Test. The surface of the sidewalk shall be steel trowel and light broom finished and cured with an acceptable curing compound. Tooled joints shall be provided at intervals of not less than five (5) feet and expansion joints at intervals of not more than forty-five (45) feet. The sidewalk shall have a lateral slope of one-quarter (1/4) inch per foot.

2. Planting strip adjacent to sidewalk shall be graded to ¼ inch per foot (min.) up to 1 ¼ inch per foot (max.), except where excessive natural grades make this requirement impractical. In such cases, the Town Engineer may authorize a suitable grade.

3. Sidewalk widths shall be a minimum of five (5) feet unless otherwise specified.

4. Approval of sidewalk construction plans must be obtained as part of the plan review process. Except in unusual circumstances, sidewalk must be located a minimum of (6) six feet from the back of the curb or at the back of the right-of-way. A recorded public sidewalk easement is required for all sidewalk located outside public right-of-way; the width shall be equal to the distance from the right-of-way line to the back of the sidewalk plus two feet or to the face of building, whichever is less. The sidewalk easement must be recorded with the Union County Register of Deeds prior to issuance of a certificate of occupancy for the corresponding building(s).

5. Accessible ramps are required where sidewalks intersect curbing at any street intersection and at Type III driveway connections.

II. **STORM DRAINAGE**

A. GENERAL NOTES

1. All work and materials shall conform to the latest edition of the NCDOT Standard Specifications *unless otherwise specified in this manual*. ALL concrete used for drainage structures shall have a minimum compressive strength of 3600 PSI at 28 days. This requirement shall be provided regardless of any lesser compressive strength specified in the North Carolina Department of Transportation Standard Specifications for Roads and Structures.

2. Reinforced concrete pipe may be used in all storm drain applications. Culverts 60 inches in diameter or greater may be Corrugated Aluminized Metal Pipe (CAMP) or aluminum with a minimum 14 gauge metal.

3. All pipe shall be laid with the bell or groove upgrade and the joint entirely interlocking.

4. The minimum cover for all pipes is two (2) feet measured from the final surface. Special applications for less than two (2) feet of cover will be reviewed and approved by the Town Engineer individually. The maximum cover for storm drainage pipes shall at a minimum comply with the requirements of the North Carolina Department of Transportation Highway Design Branch Roadway Design Manual, Part I, Section 5, and "Drainage Design". Storm pipe design that exceeds these criteria may be approved at the discretion of the Town Engineer.

5. All pipes in storm drain structures shall be flush with the inside wall.

6. All storm drain structures over three (3) feet and six (6) inches in height must have steps in accordance with standard details set forth in this manual.

7. The interior surfaces of all storm drainage structures shall be pointed up and smoothed to an acceptable standard using mortar mixed to manufacturer's specifications.
8. All frames, grates, rings, covers, etc., must conform to the standards set forth in this manual.
9. All graded creek banks and slopes shall be at a maximum of two (2) feet horizontal to one (1) foot vertical (2:1) and not to exceed 10' without terracing or the slopes shall be designed by a Professional Geotechnical Engineer and approved by the Town Engineer on a case by case basis.

B. REINFORCED CONCRETE PIPE.

1. All concrete shall be at least 3600 PSI. Prior approval shall be obtained in order to use pre-cast storm drainage structures in any street right-of-way by Town Engineer.
2. Concrete pipe used within the street right-of-way shall be a minimum of Class III Reinforced Concrete Pipe, with a minimum diameter of fifteen (15) inches. Installation of Class IV or higher concrete pipe shall be identified on the As-Built Plan and the Town inspector shall be given documentation and notification of this information prior to construction.
3. Concrete mortar joints shall be used for joining all concrete pipes. The pipe shall be clean and moist when mortar is applied. The lower portions of the bell or groove shall be filled with mortar sufficient to bring the inner surface flush and even when the next joint is fitted into place. The remainder of the joint shall then be filled with mortar and a bead or ring of mortar formed around the outside of the joint. The application of mortar may be delayed until fill is completed when the pipe is larger than thirty (30) inches.
4. Preformed joint sealer, which conforms to AASHTO specification M-198 for Type B flexible plastic gaskets, may be used in lieu of the mortar joining method.

C. INSTALLATION OF REINFORCED CONCRETE AND CORRUGATED METAL PIPE.

1. All backfill shall be non-plastic in nature, free from roots, vegetative matter, waste, construction material or other objectionable material. Said material shall be capable of being compacted by mechanical means and shall have no tendency to flow or behave in a plastic manner under the tamping blows or proof rolling.
2. Materials deemed by the Engineer as unsuitable for backfill purposes shall be removed and replaced with select backfill material.
3. Backfilling of trenches shall be accomplished immediately after the pipe is laid. The fill around the pipe shall be placed in layers not to exceed eight (8) inches, each layer shall be thoroughly compacted to 95% of the maximum density obtainable with the Standard Proctor Test (a density of 100% Standard Proctor is required for the top eight (8) inches).

4. Compaction requirements shall be attained by the use of mechanical compaction methods. Each layer of backfill shall be placed loose and thoroughly compacted in place.
5. Under no circumstances shall water be permitted to rise in un-backfilled trenches after the pipe has been placed.

D. STANDARDS FOR DESIGN

1. All storm drainage design shall conform to the standards and specifications as provided in the Charlotte-Mecklenburg Storm Water Design Manual, North Carolina Department of Transportation Standards Specifications for Roads and Structures, TOS Land Development Standards Manual, or the more restrictive of any standards that conflict.

2. Adequate storm drainage shall be provided throughout the development by means of storm drainage pipes or properly graded channels. All pipes shall be of adequate size and capacity, as approved by the Town Engineer, to carry all storm water in its drainage area.

3. The Town Engineer shall review the drainage plan for compliance with the standards contained in the current edition of the TOS Land Development Standards Manual and the Charlotte-Mecklenburg Storm Water Design Manual and all other relevant and appropriate standards established by the Town Engineer.

4. Sub-surface drainage shall be provided where the ground water level is likely to be near the surface. In capillary soils, the water level should be four (4) to six (6) feet below the surface to prevent the rise of moisture into the subgrade. Subdrains shall be used to lower ground water in low areas in the street.

5. The NCDOT Standard Drawings have been accepted as approved standards to be specified for Land Development projects in the Town of Stallings.

III. PLAN REQUIREMENTS

A. GENERAL NOTES

1. All erosion control measures shall conform to the standards set forth in the North Carolina Erosion and Sediment Control Planning and Design, or the more restrictive of any standards that conflict.

2. All storm drainage design shall conform to the standards and specifications as provided in the Charlotte-Mecklenburg Storm Water Design Manual, Stallings Land Development Standards Manual, or the more restrictive of any standards that conflict.

3. In areas where the Floodway Regulations are applicable, the FEMA Flood Fringe Line and FEMA Encroachment Line shall be shown on the preliminary plan and the final plat.

4. Cite all appropriate standard detail numbers for any structures or specifics used within the plans in reference to the most current copy of the TOS Land Development Standards Manual.

B. SUBDIVISION PRELIMINARY PLAN

1. The preliminary plan must include, at a minimum, the information described in the Town of Stallings Unified Development Ordinance.

2. Storm Drainage Easements shall be provided for all storm drainage pipe and shown on site plans, construction plans and plats with widths specified below. The following note shall be placed on all grading plans and plats; "The purpose of the storm drainage easement (SDE) is to provide storm water conveyance. Buildings are not permitted in the easement area. Any other objects which impede storm water flow or system maintenance are also prohibited."

PIPES		CHANNELS	
Diameter	Width	Cfs for Q_{100} (CFS)	Channel Easement Width (feet)
15” and smaller	15’ centered	5-16	30’ centered
18” – 33”	20’ centered	17-70	60’ centered
36” and larger	30’ centered	71 or greater	100’ + width of channel centered

3. Overlapping of storm drainage easements shall be approved by the Town Engineer.

IV. REFERENCES

- North Carolina Department of Transportation, most recent edition, Standard Specifications for Roads and Structures.
- North Carolina Department of Transportation, most recent edition, Roadway Standards Drawings.
- City of Charlotte Department of Transportation, most recent edition, Work Area Traffic Control Handbook (WATCH)
- Charlotte - Mecklenburg Storm Water Design Manual
- American Association of State Highway and Transportation Officials most recent edition, A Policy on Geometric Design of Highways and Streets
- North Carolina Department of Transportation, Roadway Design Manual, latest edition
- North Carolina Department of Environment and Natural Resources most recent edition, Erosion and Sediment Control Planning and Design Manual
- NCDENR, Storm Water Best Management Practices, latest edition.
- City of Charlotte Land Development Standards Manual, latest edition.