CHAPTER 2 STREETS

General Requirements, Standards of Street Design, Grading, Roadway Base, Roadway Intermediate and Surface Course, Sidewalks and Ramps, Driveways, Parking, Street Lighting, NCDOT Coordination, Retaining Walls, Bridges, Greenways

A. GENERAL REQUIREMENTS

1. All work and materials shall conform to the latest edition of the NCDOT Standard Specifications for Roads and Structures unless otherwise specified in this manual.
2. Depending on the proposed construction activities, a surety may be required for possible damage to City streets and shall be in an amount established by the City.
3. Street cuts and sidewalks should be completely repaired in an expedient manner. Unless otherwise noted in construction documents, cuts must be filled per Standard Details, with flowable fill or suitable material (asphalt, concrete or approved equal) to within 1.5" of finished grade within 3 days of initial work. Finished roadway surfaces, sidewalks and curbs must be restored within 30 days of initial work.
4. Contractor is responsible for keeping streets and driveways adjacent to the project free of mud and debris at all times. Contractor shall clean up and remove all loose material resulting from construction operations and shall take all available precautions to control dust.
5. **Subgrade Requirements**:
   a. All subgrades shall be compacted to a depth of 8" below the finished surface to a 100% density in accordance with AASHTO T 99 as modified by NCDOT. All embankments shall be compacted to 95% density in accordance with AASHTO T 99 as modified by NCDOT for depths > 8".
   b. All manholes, junction boxes, water valve boxes and other appurtenances shall be covered at subgrade level with a steel plate until the first lift of surface course asphalt is placed. At that time, the utility may be raised to the finished grade.
   c. A tolerance for grading the subgrade shall be ± ½" from the established grade will be permitted after the subgrade has been graded to a uniform surface. A tolerance of ± ¼" will be permitted under concrete pavement mainline lanes. Perform the grading operation such that the maximum difference between the established grade and the graded subgrade within any 100' section is ½" for normal subgrade and ¼" for subgrade for concrete pavement.
   d. A proof roll shall be required prior to placing curb and gutter, ABC, and asphalt. Equipment to be used for the proof rolls includes a loaded tandem dump truck or a loaded water truck.
   e. Proof rolls will not be performed on frozen subgrades and inclement weather will void any proof roll if the associated work has not been completed.
   f. A motor grader may be used in some circumstances for a proof roll on curb and gutter only. Prior approval by the Engineering Technician is required for use of a motor grader.
   g. Weight requirements for equipment:
      i. Motor Grader 30,000 lbs
      ii. Water Truck 30,000 lbs
      iii. Tandem Truck 45,000 lbs
6. **Concrete/Asphalt Placement Requirements**:
   a. Concrete or asphalt shall not be placed in inclement weather. The contractor shall protect freshly placed concrete or asphalt in accordance with Section 420 (Concrete Structures), Division 6 (Asphalt Pavements), and Division 7 (Concrete Pavements and Shoulders) of NCDOT Standard Specifications. Prior to any concrete being placed, a pre-pour meeting shall be required. Schedule the pre-pour meeting with the inspector.
   b. All concrete used for streets, curb and gutter, sidewalks, and drainage structures, etc. shall be approved NCDOT mixes, unless otherwise directed by the Director of Engineering or project special provisions. Concrete testing shall follow requirements and frequency set forth by NCDOT and ACI.
   c. The concrete temperature at the time of placement shall be between 50°F and 95°F except where other temperatures are required by NCDOT Specifications, Section 420. Do not place concrete without permission when the air temperature measured at the location of the concrete operation in the shade away from artificial heat is below 35°F. When such permission is granted, uniformly

heat the aggregates and/or water to a temperature not higher than 150°F. Heated concrete shall be between 55°F and 80°F at the time of placement.

d. All concrete curb and gutter shall be backfilled with soil approved by the Engineering Technician within 7 days after construction, but not before 3 curing days have elapsed. Do not place ABC or pavement adjacent to the curb before the 3 curing days has elapsed.
e. All excess concrete on the front edge (lip) of gutter shall be removed when curb and gutter is poured with a machine.
f. Straight forms shall not be used for forming curb and gutter in curves.
g. Contraction joints, expansion joints and joint sealer shall follow NCDOT Specifications and Kannapolis Standard Details.
h. All concrete shall be cured with curing compound. Use white pigmented curing compound which meets ASTM C 309, as required by NCDOT Section 825 and Section 1026, applied at a uniform rate per manufacturer's instructions. Apply the membrane curing compound after the surface finishing is complete and immediately after the free surface moisture disappears, but at no point, more than 24 hours of after placement of the concrete.
i. Prior to any asphalt being placed, a pre-pave meeting shall be required. Schedule the pre-pave meeting with the Engineering Technician.
j. Asphalt shall not be placed unless the minimum temperatures are met in NCDOT Specifications, Section 610. Do not place surface course material that is to be the final layer of pavement between December 15 and March 16 of the next year if it is 1" or greater in thickness, or between November 15 and April 1 of the next year if it is less than 1" in thickness, unless otherwise approved by the Engineering Technician. Do not place plant mix base course that will not be covered with surface or intermediate course during the same calendar year or within 15 days of placement if the plant mix is placed in January or February.
k. Drainage shall be maintained on the streets between the first lift of S9.5B and the final lift of S9.5B. Use Kannapolis Standard Detail 201 to accommodate drainage in low areas.
l. Surfaces shall be tacked when asphalt is being placed over existing asphalt streets or adjoining concrete, storm drain and sanitary sewer structures. In the event more than 1 lift of asphalt is placed in a single day, tack is still required between lifts.
m. All asphalt cuts shall be made with a saw when preparing street surfaces for patching or widening strips. Milling is an acceptable alternative to saw cuts when applicable.
n. Paper joints shall be used to seal the ends of an asphalt pour so that future extensions can be made without causing rough joints.
o. When placing asphalt against existing surfaces, a straight edge shall be used to provide a smooth and consistent transition between the two surfaces at that location.

7. **Trench Backfill Requirements**:
   a. All backfill shall be non-plastic in nature, free from roots, vegetative matter, waste, construction material or other objectionable material. Materials deemed by the Inspector as unsuitable for backfill purposes shall be removed and replaced with select backfill material.
   b. All trenches in the street right-of-way shall be backfilled immediately after the pipe is laid. No more trench than necessary shall be opened in advance of pipe laying. One block or 200' (whichever is less) shall be the maximum length of open trench on any line under construction. All fill shall be placed and compacted in 6" layers.
   c. All trench backfill, subgrade, embankment fill, and ABC shall require density tests be performed at a frequency as referenced in each respective section of NCDOT Specifications. Test reports shall be conveyed to the Engineering Technician on a weekly basis.
8. **Traffic Control, Striping, Signing**:
   a. The contractor shall maintain two-way traffic at all times when working within existing streets in accordance with the latest edition Manual for Uniform Traffic Control Devices (MUTCD) and NCDOT.
   b. During phasing of residential developments temporary turnarounds are required for fire apparatus access. The temporary turnaround is required for streets 150' + from the intersecting street without a designed cul-de-sac.
   c. All permanent striping shall conform to NCDOT Specifications, and MUTCD standards and specifications. Temporary striping may be paint and conform to NCDOT specifications for the duration of time in which the striping can be installed prior to installing the permanent striping.

d. Dead-end streets without cul-de-sacs shall be required to install object signs designating the dead-end.
e. Traffic Calming Devices are prohibited unless approved by the fire code official (ref current edition NC Fire Code).
f. All street signage on publicly and privately maintained roadways shall be purchased from the City of Kannapolis. Contact the Planning Department for the street sign quote and payment.

B. STANDARDS OF STREET DESIGN

1. **Streets** (Public and Private): Refer to Appendix A for Street Classifications.
2. **Intersections:**
   a. Maximum Street Grade at Intersections (See Appendix A):
      i. STOP or YIELD condition: vertical alignment is 2% maximum through the crosswalk areas (marked or unmarked). Outside of the crosswalk areas, the vertical alignment is 5% maximum within 100' of an intersection.
      ii. THROUGH MOVEMENT condition: vertical alignment is 5% maximum through the crosswalk areas. Where feasible, it is recommended that the vertical alignment for a through movement street also be set at 2% maximum through the crosswalk areas (marked or unmarked).
      iii. Insofar as practical, streets shall intersect at an angle of 90° for a minimum of 50' from the roadway intersection. In no case shall the angle be less than 75°. Intersections having more than 4 corners shall be prohibited. Proposed streets which intersect opposite sides of another street (either existing or proposed) shall be laid out to intersect directly opposite each other.
      iv. A roundabout may be constructed at any intersection location where it may be desired to enhance intersection capacity, reduce vehicle speeds along a corridor, or enhance intersection aesthetics. Roundabouts shall be designed in accordance with the criteria set forth in Roundabouts: An Informational Guide (Federal Highway Administration Publication No. FHWA-RD-00-067). Care should be taken in order to ensure roundabouts are not located in close proximity to adjacent stop or signal controlled intersections where long queues may back up into the roundabout.
3. **Intersection Sight Distance:**
   a. Minimum sight triangles shall be provided at each intersection corner to provide the driver an unobstructed view of the roadway.
   b. Sight distance triangles shall be designed in accordance with Kannapolis Standard Detail 110.
   c. Sight triangles shall contain no fence, structure, earth bank, hedge, planting, wall or other obstruction between a height greater than 2' above the property line grade as established by the Director of Engineering. The following may be exempted from this provision with approval from the Director of Engineering:
      i. Public utility poles.
      ii. Other plant species of open growth habit that are not planted in the form of a hedge and which are so planted and trimmed as to leave in all seasons a clear and unobstructed cross-view.
      iii. Official warning signs or signals.
4. **Stopping Sight Distance:** stopping sight distances may need to be shown on the design plans. See Appendix A for minimum sight distances.
5. **Vertical Curves:** Provide vertical curves at grade breaks > 0.5. When designing intersection streets, low points should not occur in intersections. Design of vertical curves shall follow AASHTO design standards.
6. **Cul-de-sac Streets**
   a. A maximum of 20 equivalent residential units (ERUs) may take access from a cul-de-sac. ERUs are determined in the KDO. Temporary cul-de-sacs on stub streets are exempted from this limitation.
      i. The preliminary and final site plan shall show a stub connecting the cul-de-sac to adjoining areas or parcels where future roadways are delineated on a recorded subdivision or site plan (provided reasonable connection can be achieved without the need for a bridge or other

feature to negate substantial topography). The stub shall be improved as pedestrian walkway, trail or bikeway.

ii. The radius for the circular terminus, or turnaround, shall be not less than 48'.

7. **Stub Streets:**
   a. All stub streets intended as a future connection to the adjacent property shall be properly signed to designate the future connection per Kannapolis Standard Detail 416.
8. **Driveways**
   a. See Chapter 2 Section G.
9. **Design Vehicles**
   a. Site designs and/or street designs shall evaluate the minimum turning radius for the vehicular traffic intended for use to support the proposed improvement. The evaluation of the vehicular turning radius shall include, but not be limited to, parcel delivery trucks, garbage trucks, semi-truck and trailers and current Kannapolis Fire Department fire apparatus vehicles. See Appendix A for appropriate design vehicles.
   b. Regardless of the street classification or design vehicle, radii may need to be adjusted to meet the requirements of the proposed usage and vehicle. The Director of Engineering may request the additional requirements based on the proposed usage warrants.
10. **A Traffic Impact Analysis:** A traffic impact analysis (TIA) may be required to identify impacts on the City's roads from proposed development, and ensure those impacts are mitigated before or at the time the development occurs. The TIA will identify access improvements, near-site improvements, and on-site and off-site improvements that are needed to accommodate the proposed development and maintain the established level of service standards (LOS) on the roads in the City. Please see KDO Article 5 Chapter 13 for information on TIAs.
11. **Turn lanes:** dedication and construction of turn lanes shall be required in any conditional use, special use, or driveway permit, or subdivision approval for a use or development which is adjacent to a two-lane public street with average daily traffic (ADT) exceeding 5000 vehicles per day (vpd), or a four-lane or larger public street with ADT exceeding 10,000 vpd, if any one of the following conditions are also present:
    a. The use of development requires 50 or more off-street parking spaces.
    b. The use of development consists of at least 50 attached or detached residential dwelling units.
    c. The use of development will generate more than 100 trips during the peak hours of 7:00am-9:00am, 11:00am-1:00pm, and 4:00pm-6:00pm. Data shall be based on ITE's "Trip Generation" and based upon the highest land use permitted by the zoning classification.
    d. The use of development, as it may be affected by such restrictions, is reasonably expected to generate more than 25 truck (13,000 G.V.W.) trips per day through a single driveway.
    e. The use or development, as it may be affected by such restrictions, creates special safety or traffic conditions due to limited sight distance and/or posted speeds more than 35 miles per hour along the adjacent public street. Such conditions shall be determined in writing by the Director of Engineering.

TABLE A-1 STANDARDS OF STREET DESIGN

Street Type		Alley	Local	Collector	Thoroughfare
Average Daily Traffic (ADT)		100	250	3000 Major 1000 Minor	8000 Major 4000 Minor
Longitudinal Grade	Min	1%	1%	1%	See Thoroughfare Plan
	Max: level/rolling	10 %	10 %	8 %	
	hilly	10 %	10 %	10 %	
	(stop/yield) at intersection	5 %	2 %	2 %	
	(through movement) at intersection	5 %	5 %	5 %	
	Within 100' of an intersection	5 %	5 %	5 %	
Min Horizontal Centerline Curve Radius			150'	230'	
Min Tangent between Reverse Curves			50'	100'	
Street Intersection Radius[6]		20'	30'	30'	
Design Speed	Min	15 mph	25 mph	25 mph	
	Max	15 mph	35 mph	35 mph	
Design Vehicle		**Alley**	**Local**	**Collector**	**Thoroughfare**
	Residential	SU-30	SU-30	Bus-45 & SU-30	WB-62
	Non-Residential	SU-30	SU-30	WB-62 or WB-40	WB-62
Separation [1][2][3]	driveway - driveway	40'	40'	120'	400'
	driveway - intersection	25'	60'	120'	250'
	driveway - residential prop. line	5'	5'	5'	5'
	driveway - non-residential prop. line	10'	10'	10'	10'
	intersection - intersection	N/A	200'	200'	600'-1000'
Pavement Schedule [4][5]		**Alley**	**Local**	**Collector**	**Thoroughfare**
	surface course (S9.5C)	2"	2-1" Lifts	2-1" Lifts	See NCDOT Roadway Design Standards
	intermediate course (I19.0C)	0"	2.5"	2.5"	
	base course (residential)	8" ABC or 4" B25.0C			
	base course (non-residential)	N/A	10" ABC or 5" B25.0C		
Max Cul-de-sac Lengths					
	Zoning	R4, R8	AG, R1, R2	CD, LI, HI	MU, O-I, C-1, GC, PD
		800'	1000'	1500'	500'
		R18, CC			
		300'			
Dead-End Fire Apparatus Access Roads					
	Length	0-150'	150'-500'	500'-750'	750'+
	Width	20'	20'	26'	Special Approval Required
	Vertical clearance	13.5'	13.5'	13.5'	
	Maximum grade	10 %	10 %	10 %`	
	Turnaround required	None	60' "Y" 96' ø Cul-De-Sac 120' Hammerhead (Temporary)		

Notes:

1. Single-family dwellings and duplex dwellings on individual lots shall be exempt from the minimum separation between driveways as shown in the table above. However, such driveways shall maintain a minimum of 5' of side clearance from residential property lines and 10' for all others.
2. City streets: proposed streets which intersect opposite sides of another street (either existing or proposed) shall be laid out to intersect directly opposite each other. Intersections which cannot be aligned shall be separated by a minimum length of **200**' between survey centerlines.
3. For state-maintained streets, reference the NCDOT Policy on Street and Driveway Access to North Carolina Highways.
4. Non-residential street pavement design shall be evaluated on a case-by-case basis.
5. Prior to substituting B25.0C, approval shall be obtained from the Director of Engineering.
6. Radius measured from edge of pavement.

C. GRADING

1. The maximum slope for cuts and fill embankments is 3:1, unless authorized by the Director of Engineering. Fill embankment materials shall be placed and thoroughly compacted in successive layers less than 10” 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.
2. Longitudinal grades shall have a minimum grade of 1% and a maximum grade of 10%.
3. Transverse grade or crown shall be ¼”/ft.

D. ROADWAY BASE

1. Stone base course shall conform in all respects to Section 520 (Aggregate Base Course), Section 1006 (Aggregate Quality Control/Quality Assurance), Section 1010 (Aggregate for Non-Asphalt Type Bases) of the NCDOT Standard Specifications for Roads and Structures.
2. The stone base shall be compacted to 100% in accordance with AASHTOT180 as modified by NCDOT when conventional density test #3 is used. When nuclear density testing is performed, a nuclear target density of at least 98% shall be obtained. In addition, the nuclear density of any single test location shall be at least 95% of the nuclear target density.
3. ABC will not be allowed within widening strips less than 5’ in width.

E. ROADWAY INTERMEDIATE AND SURFACE COURSE

1. Plant mixed asphalt shall conform in all respects to Section 610 (Asphalt Concrete Plant Mix Pavements) of the NCDOT Specifications for Roads and Structures.
2. A pre-pave meeting with the Engineering Technician shall be required prior to placing any asphalt.
3. An approved NCDOT Job Mix Formula shall be required to be submitted to the Engineering Technician for each mix to be used prior to paving.
4. The contractor shall have a QMS Roadway Technician on-site during the paving operation.
5. The final lift of asphalt surface course for residential subdivision streets shall be withheld until a minimum of 85% of the portion platted is occupied (occupied means a certificate of occupancy has been issued), or two years from recordation of the final plat. If, after two years from recordation, less than 85% of the development is occupied, the developer may be required to provide additional maintenance bonds.
6. After placement of the final asphalt, the Contractor may request final inspection for the roadway, and upon approval, the 1-year warranty of the roadway begins.
7. In the event construction traffic must be routed on newly paved streets, a bond shall be provided to the City until construction activities are completed.
8. Prior to placing the final layer of surface course asphalt, the Engineering Technician shall be given notice a minimum of two business days in advance to inspect the roadway for deficiencies. All deficiencies noted in the walk-through inspection shall be addressed prior to application of final layer.
9. Cores or nuclear density may be used on base, intermediate and first lift of surface course mixes. Cores will not be permitted on the final lift of surface course. Only nuclear density testing shall be used on the final lift of surface course.
10. Access must be maintained during the paving operation. Access for residents, emergency vehicles, solid waste collection and mail delivery will need to be addressed during the pre-pave meeting.

F. SIDEWALKS AND RAMPS

1. Where sidewalks and pedestrian routes within street crossings (including marked and unmarked crosswalks) are provided, they must be constructed so they are accessible to all potential users, including those with disabilities and conform to Americans Disability Act and follow Public Right-of-Way Accessibility Guidelines.

2. Sidewalks shall be constructed of not less than NCDOT, Class B concrete, and shall be 4" thick, constructed on an adequately graded and compacted base, except where a sidewalk crosses a driveway or public easement access it shall be 6" thick. Subgrade shall be compacted to 95% of the maximum density obtainable in accordance with AASHTO T 99 as modified by NCDOT. 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 5', and ½" expansion joints at intervals of not more than 50'. ½" expansion joints will be required where the sidewalk joins any rigid structure. The sidewalk shall have a maximum lateral slope of 2% toward the street.
3. All expansion joints shall be filled with joint sealer.
4. Planting strip adjacent to sidewalk shall be graded to ¼"/ft, except where excessive natural grades make this requirement impractical. In such cases, the Director of Engineering may authorize a suitable grade.
5. Sidewalk widths shall be a minimum of 5' unless otherwise specified.
6. A recorded public sidewalk easement is required for all sidewalks located outside public R/W; 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 Cabarrus County or Rowan County Register of Deeds prior to issuance of a certificate of occupancy for the corresponding building(s).
7. Curb ramps are required where sidewalks intersect curbing at any street intersection and at Type III driveway connections. Running slope of directional ramps shall be a maximum of 1:12 (8.3%). If a 1:12 (8.3%) running slope is not achievable within 15 feet, the slope may exceed 8.3% and shall be uniform for the length of the ramp.
8. Truncated domes shall be Federal Standard Color Code number 20109, "Red Brown".
9. Refer to the MUTCD (latest edition) for construction zone pedestrian routes and signalization and controls for actuators. Curb ramps shall be designed and constructed in accordance with the American Disability Act.
10. Where pedestrian routes are contained within a street or right-of-way, the grade of pedestrian access routes shall not exceed 5%, or the general grade established for the adjacent street or highway.

G. DRIVEWAYS

1. An approved Engineering Inspection Permit (Appendix A) from the City of Kannapolis is required prior to making a connection to a City street. Refer to the Kannapolis Standard details for driveway layout requirements.
    a. Inspections of proposed street connections are required. Inspections shall be scheduled through Accela.
2. Depending on the type of connection to streets or roadways, additional right of way, dedicated to the City, may be required for improvements to the existing roadway. The cost of the right of way acquisition and street improvements are the responsibility of the Developer.
3. All driveway approaches shall be a concrete apron section, except that Type III driveway entrances may be required to public or private developments that have parking spaces for greater than 200 vehicles or when determined by the Director of Engineering. They shall be installed to the right-of-way line or at least 10' from the edge of the roadway and/or back of curb.
4. Medians or islands may be permitted for street type driveways and private street entrances only, upon approval of the Director of Engineering and subject to the following conditions:
    a. The raised median or island shall be constructed on private property to the rear of the right-of-way line.
    b. The minimum width of the median or island as measured nearest the right-of-way line (excluding the nose) shall be 15', the minimum length shall be 50'.
    c. For street type driveways with a median or island, the combined width of pavement of the separated driveway segments shall not exceed 48'.

H. PARKING

1. Off-street parking spaces shall be provided in accordance with the requirements in the KDO. The Planning Department reviews and approves the parking requirements and the Planning Director shall be authorized to approve any alternate parking plans for developments.
2. Parking spaces for handicapped or disabled persons shall comply with Chapter 4 of the North Carolina Accessibility Code and the following:
   a. Single non-van: 14’ x 18’ (9’ width + 5’ access aisle).
   b. Single van: 17’ x 18’ (9’ width + 8’ access aisle).
   c. Double van, non-van, and van double: 26’ x 18’ (9’ width for each space + 8’ access aisle).
3. Reference Kannapolis Standard Details for parking dimensions.
4. Bumper Overhang dimensions for parking spaces include the front/rear of the parking space.
5. Parking lot drive-isle widths are measured from edge of pavement to edge of pavement.

I. STREET LIGHTING

1. **Requests for Street Lighting:** Requests for street lighting may be submitted to the Engineering Department. Each request will be considered in accordance with approved standards and any special conditions of merit such as pedestrian activity, traffic volumes, accident history, crime rate, vertical and horizontal street alignment, and hazardous traffic conditions. Any extensions of the lighting system will be subject to the limitations of appropriation of funds by the City Council.
2. **Standards for Street Lighting**
   a. Street lighting shall meet current engineering standards.
   b. Light fixtures on public right-of-way for the purpose of illuminating the roadway by private citizens will not be permitted.
   c. Private lighting fixtures mounted on the back of poles located on public right-of-way for the purpose of illumining private property may be permitted with permission of the City of Kannapolis. All costs will be borne by the applicant and contractual arrangements made directly with the utility company.
   d. The City of Kannapolis will not be responsible for any lighting fixtures installed for the purpose of illuminating private property.
   e. A combination of street lighting fixtures and pedestrian lighting fixtures may be utilized to meet minimum lighting levels.
      i. **Street lighting fixtures** shall be standard cobra head, minimum 110-Watt Roadway LED placed on twenty-five (25) foot metal. Street lighting on major thoroughfares may require higher wattage.
      ii. **Pedestrian lighting fixtures** shall be mounted to a heigh of twelve (12) feet. The City reserves the right to approve or deny decorative lighting style options.
   f. Where multiple street or pedestrian lights are required to meet lighting standards, lights shall alternate on both sides of the street.
   g. Street and Pedestrian Lights shall be placed within the right of way on property lines unless approved by the City.
   h. All new lighting shall utilize underground power.
   i. The table below provides the required minimum levels of illumination (expressed in average maintained horizontal foot-candles).:

Street Classification	Illumination Levels (foot-candles)		Uniformity Ratio
	Commercial	Residential	
Major Arterial	1.3	0.8	3:1
Minor Arterial	1.6	0.8	3:1
Collector	1.1	0.6	4:1
Local	0.9	0.4	6:1
Alley	0.6	0.3	6:1
Sidewalk	0.9	0.3	6:1

3. **Lighting Plan Required**
   For new development, a lighting Plan shall be prepared by a qualified lighting designer. Lighting plans shall be submitted to the City for approval along with subdivision utility plans in accordance with applicable City ordinances, policy and regulations.
4. **Lighting Installation Process**
   a. The lighting design is completed by the service provider and approved by the City of Kannapolis.
   b. Contract with service provider is signed by the City of Kannapolis.
   c. The customer responsibility / site readiness form is signed by the developer.
   d. Developer pays the full decorative adder fee to the Service Provider.
   e. Service Provider orders materials and installs streetlights per the approved lighting design.

J. NCDOT COORDINATION

1. Any connection or potential impact to a NCDOT roadway shall require approval by NCDOT. It is recommended coordination meetings take place early in the development process with the developer, NCDOT and City of Kannapolis discussing potential requirements for roadway improvements, access to the site and right of way dedications. NCDOT has the ultimate authority for any work in NCDOT right of way.
2. It is the sole responsibility of the requesting party to determine if a street is State maintained or not.
3. Plan submittals, review and approvals should be coordinated concurrently with both NCDOT and the City of Kannapolis, to avoid conflicting requirements. The coordination should consider the review process of the two agencies may not coincide and communication of submittals from the requesting party is essential in avoiding delays. In situations where an agency's regulation differs from that of the other agency, the more restrictive of the two shall govern.
4. NCDOT and the City of Kannapolis require approvals for connections to existing roadways. The City of Kannapolis will approve any connections to City streets. Prior to obtaining Construction Plan approval, the requesting party shall provide the City of Kannapolis an approved driveway permit from NCDOT allowing access to the site from an NCDOT street.
5. During construction of the project, both NCDOT and the City of Kannapolis have enforcement authority to ensure safety in the right of way is not being compromised. Both agencies can affect the project's progress if there is reason to believe proper construction practices are not being adhered to and/or if unsuitable materials are being used in the right of way. Failure to comply with permits and the approved plans may result in revocation of permits.
6. The City of Kannapolis has the authority to request that Cabarrus County or Rowan County Code Enforcement withhold the issuance of a Certificate of Occupancy until all work is completed and in compliance with the approved permits.

K. RETAINING WALLS

1. Retaining walls or retaining wall systems providing cumulative vertical relief greater than 5’ in height within a horizontal separation distance of 50’ or less shall be designed under the responsible charge of a registered design professional per the latest edition of the North Carolina Building Code, Section 1807.2 and NCDOT retaining wall design guidelines. Allowable systems include but are limited to; cast-in-place walls, soil nailing, modular retaining wall system, mechanically stabilized earth (MSE) retaining walls, H-beam retaining wall system, boulder retaining walls and gabions. Design submittals shall include copies of foundation reports, design load assumptions, and retaining wall design calculations.
2. Building Permit approval and inspection of retaining walls shall be conducted by Cabarrus County or Rowan County Code Enforcement as applicable.
3. The developer is required to provide the approved wall designs to the City of Kannapolis prior to plan approval.
4. The developer shall be responsible for providing geotechnical testing, engineering oversight, and construction observation of wall construction by a qualified individual. Copies of the inspection reports and the design engineer’s wall certification shall be provided with the as-built drawings for the retaining wall.
5. For retaining walls impacting City of Kannapolis easements, utilities, and right of ways, County approval of proper construction of the completed walls and completion of the City’s Retaining Wall Certification form is required prior to the issuance of a Final Plat or Certificate of Occupancy, as applicable. If the retaining walls are used to assist with ingress/egress of City easements, the City will also be included in the approval process.
6. Cast in place concrete retaining walls are the only wall type that may be considered within the theoretical 1:1 of the roadway on a case-by-case basis.
7. When geo-grid is approved in the right-of-way and conflicts with a utility trench, the wall design shall include design calculations to allow the geo-grid to be interrupted within the utility trench. Clearances shall be provided between the geo-grid and conflicting utility to allow City personnel to maintain the utility without damage to the geo-grid or wall.

L. BRIDGES

1. The use of a bridge for a publicly maintained project shall require prior approval by the Director of Engineering.
2. The layout and design of bridges shall follow the current applicable NCDOT policies and manuals and shall be designed under the responsible charge of a registered design professional.
3. The bridge shall be designed to include support for lighting, public water lines and other public utilities. Private utility lines are not allowed to be attached to the structure.
4. Design submittals shall include copies of foundation reports, design load assumptions, and bridge design calculations for structural components.
5. The developer shall be responsible for providing geotechnical testing, engineering oversight and construction observation of the bridge and associated structures by a qualified individual. Copies of the inspection reports and the design engineer’s as-built certification shall be provided with the as-built drawings for the bridge.

M. GREENWAYS

1. Greenways constructed in the jurisdiction of the City of Kannapolis shall follow current guidelines by NCDOT, NCDOT Greenway Specification Z-200, MUTCD, AASHTO, FHWA, ADA and include all required permits (e.g., NCDOT, FEMA Conditional Letter of Map Revision (CLOMR/LOMR), U. S. Army Corps of Engineers, DWQ, and NCDEQ).
2. Reference the AASHTO Guide for the Development of Bicycle Facilities for stopping sight distance design guidelines.
3. Horizontal radii shall be a minimum 90’ centerline radius.
4. Radii at greenway intersections shall be a minimum 20’ to accommodate maintenance vehicles.

5. Greenway intersections should be aligned at 90° angles when possible.
6. Shared-use trails shall be constructed to a minimum width of 10'. Trails to be used for pedestrians only shall be constructed to a minimum width of 5'.
7. Shoulders for all trails shall have a minimum 2' width on each side of the trail. 5' shoulders shall be required in fill areas and 3' shoulders in cut areas.
8. A clear, unobstructed, space from the edge of pavement of 10' shall be required. Trees greater than 15" in diameter may remain, provided they are at least 2' clear of the trail.
9. Greenways and trails shall not be constructed with a crown. All greenways and trails shall be constructed with cross-slopes between 1% - 2%.
10. Longitudinal slope shall be less than 5% unless existing contours prohibit. In the event grades are steeper than 5%, an 8.33% grade shall not be longer than 200', a 10% grade shall not exceed 30' and a 12.5% grade shall not exceed 10' without a rest area.
11. Rest areas shall be greater than 5' in length, have a width greater than the width of the trail segment to and from the rest area, have a grade less than 5%, have a cross-slope that exceeds 2%, have a minimal change of grade and cross-slope on the segment connecting the rest area with the main pathway and have accessible designs for amenities such as benches, where provided.
12. The typical section for greenways shall include:
    a. Geotextile fabric for soil stabilization placed on subgrade compacted to a density of 92% in accordance with AASHTO T99 as modified by NCDOT.
    b. ABC shall be placed at a 6" compacted depth with a density of 92% in accordance with AASHTO T180 as modified by NCDOT for both nuclear and ring test.
    c. **Asphalt Option**: place asphalt, 2" of S9.5C placed in one lift, in accordance with Section 610 of the Standard Specifications, compacted to at least 85%. Coring of the final surface course will not be allowed.
    d. **Concrete Option**: place 6" of Class AA concrete in accordance with NCDOT and ACI specifications. The concrete shall be reinforced with 6"x6"x1.4x1.4 WWF with non-structural fiber. The concrete will include ½" expansion joints at 40' spacing and control joints at 10' spacing.
13. Provide a 54" safety rail when the following is within 6' of the edge of pavement:
    a. Slope ≥ 3:1 & drop of 6'
    b. Slope ≥ 2:1 & drop of 4'
    c. Slope ≥ 1:1 & drop of 1'
14. Retaining walls should be avoided but kept to a height of 4' or less where required.
15. The current North Carolina Building Code requires handrails where the distance from the top of boardwalk deck to the bottom of the creek/top of ground is ≥ 30". Where < 30", use a 6" toe board.
16. Bridges shall have at least 10' clear inside dimensions. For bridges 10' in width, a design load of H5 shall be required. For bridges 12' in width, a design load of H10 shall be required.
17. Overhead clearance shall be 8' minimum of vertical height for pedestrian trails and 10' of vertical height for multi-use trails.
18. During paving operations, dump truck loads shall be prohibited to 15 tons to prevent damage to the compacted ABC.
19. In environmentally sensitive areas, alternative seeding specifications may be required.
20. All public greenway entrances should provide removable bollards at entrances from roadways.
21. Public greenways may require safety and wayfinding signage as determined by the Director of Parks and Recreation.