

**CHARLOTTE LAND DEVELOPMENT STANDARDS
SPECIFICATIONS AND SPECIAL PROVISION NOTES
Includes ETJ**

The following specifications and special provisions are intended to be used in conjunction with Charlotte Land Development Standard Drawings, NCDOT Roadway Standard Drawings, and NCDOT Standard Specifications for Roads and Structures for all development within the City of Charlotte and the City of Charlotte ETJ unless otherwise directed by the City 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 City 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 City. 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 City.
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 to prevent sedimentation damage to all adjacent properties and streams in accordance with the appropriate City of Charlotte Erosion and Sedimentation Control Ordinance.

B. STANDARDS OF STREET DESIGN

Note: Use of Hilly Terrain criteria is NOT permitted without PRIOR approval of the City Engineer.

Note: Design standards that apply for the ETJ are taken from the January 1, 2000, edition of the NCDOT design manual *Subdivision Roads*. Any revisions to *Subdivision Roads* will supersede the design standards given in the Charlotte Land Development Standards for ETJ streets. However, under no circumstances shall an NCDOT/ETJ standard be less restrictive than what is required by the City of Charlotte.

1. STREETS (PUBLIC and PRIVATE):

	ALL LOCAL STREETS (Except Industrial & Collector)		LOCAL INDUSTRIAL AND COLLECTOR ONLY	
	<u>Level/Rolling</u>	<u>Hilly</u>	<u>Level/Rolling</u>	<u>Hilly</u>
a. Terrain Classification	0-15%	15% +	0-15%	15%+
b. Maximum Grade	10%	12%	8%	10%
c. Design Speed (mph)	25	20	30	25

d. Minimum Radius (ft.)					
Public Street	150	90	250	175	
Private Street	50	50	150	150	
e. Min. Tangent between Reverse Curves (ft.)					
Horiz. And Vert.	50	50	100	100	
f. K Values (crest/sag)	20/20	15/20	28/35	20/20	

Note: Provisions of adequate stopping sight distance may require use of larger K values than the minimums listed above. The Charlotte Department of Transportation, under Section 19-245 of City Code, reserves the right to prescribe more stringent sight distance standards and/or means to achieve adequate sight distance than these listed above.

2. INTERSECTIONS:

- a. PUBLIC STREET: Vertical Alignment is 5% maximum within 100 feet of intersection.
PRIVATE STREET: Vertical Alignment is 5% maximum within 40 feet of intersection.
- b. Minimum Angle of Intersection is 75 degrees.
- c. Minimum Curb & R/W Radius = Taken from Appendix C (Curb Return Radii Guidelines) of USDG

Table 4 - Curb Radii for Local Street Intersections

From\To	R/Narrow	R/Medium	R/Wide	C/Narrow	C/Wide	Industrial
R/Narrow	35					
R/Medium	20	15				
R/Wide	15	15	10			
C/Narrow	20	15	25	35		
C/Wide	15	15	15	30	10	
Industrial	30	25	15	40	25	50

R = Residential
C = Commercial

d. Minimum Intersection Separation.

Along local streets	125 feet
Along collector streets	200 feet
Along thoroughfares	To be determined by CDOT

Intersection offsets/separation from a thoroughfare, at signalized intersections, or at intersections that may become signalized in the future may need to be greater than these minimums and will be determined by CDOT on a case by case basis.

3. Design criteria for arterial streets shall be established jointly by the City 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.
4. Intersection corner – A minimum 35' x 35' sight triangle (measured along right-of-way lines) shall be provided at each intersection corner. An additional 10' x 70' sight triangle shall be provided at intersections connecting to NCDOT maintained roadways. Other sight distance requirements may be required by the NCDOT or CDOT.
5. Refer to the NCDOT Subdivision Roads Minimum Construction Manual for development criteria for sites located within the City of Charlotte Extraterritorial Jurisdiction (ETJ) within these areas governed by Charlotte 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 City Engineer. Embankments over and around all pipe culverts shall be of select material, placed and thoroughly tamped and compacted as directed by the City Engineer or his representative.

D. ROADWAY BASE

1. All roadways shall be constructed with a base course as described on the appropriate Charlotte 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 City of Charlotte 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 (1) one inch lift of asphalt surface course for Residential Subdivision Streets shall be withheld until a minimum of (75%) Seventy-Five Percent of the Development is occupied (occupied means a certificate of occupancy has been issued) or at least (1) one year has lapsed from the application of the intermediate course layer (All documentation to be provided by the developer and approved by the City Inspector). All known base failures shall be repaired prior to application of the final one inch lift of asphalt surface course.
4. The City 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 City Inspector and accepted prior to application of final layer.
5. City inspectors shall be notified prior to using recycled plant mixes.
6. Failure to meet the above requirements may result in the delay or prevention of street acceptance by the City of Charlotte 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 1/4 inch per foot (min.) up to 1 1/4 inch per foot (max.), except where excessive natural grades make this requirement impractical. In such cases, the City Engineer may authorize a suitable grade.
3. Sidewalk widths shall be a minimum of four (4) feet unless otherwise specified. A 5' x 5' sidewalk is required at least every 200' as required by ADA for a passing zone unless otherwise provided by residential driveways, intersecting sidewalk, etc.
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 (4) four 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 Mecklenburg 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.
6. For City projects only: On Commercial Type II and Residential Type I drop curb driveways with sidewalk abutting the curb (CLDS #10.24A/B/C) – the curb and gutter across the front of the driveway shall be measured and paid for under 2'-6" Curb and Gutter. The curb and gutter is to be measured per linear foot along the surface of the top of the curb. The concrete driveway apron is to be measured per square yard.

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. High Density Polyethylene Pipe (HDPE) may be substituted for pipe diameters of 48 inches or less. 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 City 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 City 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 City Engineer on a case by case basis.

B. HIGH DENSITY POLYETHYLENE PIPE (HDPE)

1. The Product used shall be corrugated exterior/smooth interior pipe (Type S), conforming to the requirements of AASHTO Specification M294 (latest edition) for Corrugated Polyethylene Pipe.
2. Bell and spigot joints shall be required on all pipes inside the right-of-way. Bells shall cover at least two full corrugations on each section of pipe. The bell and spigot joint shall have an “O” ring rubber gasket meeting ASTM F477 with the gasket factory installed, placed on the spigot end of the pipe. Pipe joints shall meet all requirements of AASHTO M294.
3. All HDPE pipe installed must be inspected and approved by the City’s Inspector prior to any backfill being placed. The City inspector must be present during the backfilling operation as well.
4. Backfill material used to install HDPE pipe within the street right-of-way shall be Select Material, Class II-IV, as defined by Section 1016-3 of the North Carolina Department of Transportation Standard Specifications for Roads and Structures. Upon submittal of written certification of material suitability by a licensed geotechnical engineer, NCDOT Class I Select Material may be used. All backfill material shall be approved by the City inspector prior to placement of the material within the street right-of-way.
5. The minimum length of HDPE pipe permitted for use shall be four (4) feet. HDPE flared end sections are not allowed.
6. All HDPE pipe installed shall be third party certified and shall bear the Plastic Pipe Institute’s (PPI) certificate sticker.

C. REINFORCED CONCRETE

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 City 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 (eighteen (18) inches minimum on cross drain culverts within the ETJ). Installation of Class IV or higher concrete pipe shall be identified on the As-Built Plan and the City 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. Performed 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.

D. 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.

E. 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, Charlotte 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 City Engineer, to carry all storm water in its drainage area.
3. In accordance with Section 12.603 of the City Zoning Ordinance, the City Engineer shall review the drainage plan for compliance with the standards contained in the current edition of the Charlotte Land Development Standards Manual and the Charlotte-Mecklenburg Storm Water Design Manual and all other relevant and appropriate standards established by the City Engineering Department.
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 City of Charlotte and City of Charlotte ETJ. See standard #20.00A, B, and C of this manual for a table listing the standards accepted. These standard drawings shall be referenced by NCDOT number or shown on all plans submitted to the City of Charlotte for approval.

III. PLAN REQUIREMENTS

A. GENERAL NOTES

1. All erosion control measures shall conform to the standards set forth in the Charlotte Land Development Standards Manual, State of North Carolina Erosion and Sediment Control Planning and Design Manual, 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, Charlotte Land Development Standards Manual, or the more restrictive of any standards that conflict.
3. In areas where the Floodway Regulations are applicable, the Future Conditions Flood Fringe Line, FEMA Flood Fringe Line, Community Encroachment Line, and FEMA Encroachment Line shall be shown on the preliminary plan and the final plat. An application for a Floodlands Development Permit shall be submitted to Mecklenburg County Engineering in accordance with the requirements set forth in the City/County Floodway Regulations.
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 Charlotte Land Development Standards Manual.

B. SUBDIVISIONS -PRELIMINARY PLAN

1. The preliminary plan must include, at a minimum, the information described in Section 6.400 of the City of Charlotte Subdivision 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

<u>Diameter</u>	<u>Width</u>
15" – 24"	15'
30" – 36"	20'
42" – 48"	25'
54" +	30'

CHANNELS

<u>Drainage Area (Ac)</u>	<u>Channel Easement Width (feet)</u>
1 – 45	20'
45 – 120	30'
120 – 500	40'
500 +	see std. 20.30

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

C. BOND POLICY – SUBDIVISION IMPROVEMENTS

1. Release of the final subdivision plat will not occur until the improvements required for the area of the final plat are constructed and a final inspection has been performed and found to be in conformance with the plans approved by the

Charlotte-Mecklenburg Planning Commission., or a security has been posted with the Land Development Bond Coordinator of the applicable department and all required documents are received in their entirety.

2. The security shall be posted and remain in force until the construction is complete and found to be in conformance with the plans approved by the Charlotte-Mecklenburg Planning Commission. The security will be reevaluated after one year from the date of posting.
3. The Applicant shall notify the City Engineer or his assigns that construction is complete according to the appropriate subdivision ordinance and the Charlotte Land Development Standards Manual before any security will be released. A final inspection will be made to check completeness of the project upon notification.
4. One type of security may be replaced by another type of security in certain situations. The amount of the replacement security will be based on the City's Engineer Estimate of the work remaining. If the estimate of work results in a lower amount, the replacement security will be treated as a reduction. Certain situations will require an increase in a security and in such cases the replacement security shall be required to equal the higher amount.
5. A one-time reduction in security will be allowed if requested in writing by the principal party of the security. However, the security shall never be less than \$10,000 for the City of Charlotte unless approved by the City Engineer.

IV. APPROVED PLANT SPECIES

The following list of trees and shrubs represent the approved plant species that may be used to comply with code sections 12.302 and 12.303 of the City of Charlotte Zoning Ordinance and Chapter 21 ("Tree Ordinance") of the City of Charlotte Code.

Trees		Max Height	City Tree Ordinance Approved	City Zoning Approved (Large or Small Maturing)	Duke Transmission Border Zone Approved	Duke Transmission Peripheral Zone Approved	Duke Outside Transmission Peripheral Zone Approved	Duke Distribution Line Approved†	Shade Tolerant	Tolerates Poor Drainage	Native	Blooming	Mature Height (Small, Medium, or Large)	Foliage (Deciduous, Semi-deciduous, or Evergreen)
Common Name	Scientific Name													
Arborvitae, 'Green Giant'	Thuja 'Green Giant'	50'							No	Yes	No	No	L	E
Arborvitae, American	Thuja occidentalis	30'				*			No	Yes	Yes	No	M	E
Arborvitae, Emerald Green	Thuja occidentalis 'Emerald Green'	15'			*				No	No	No	No	S	E
Ash, Green	Fraxinus pennsylvanica	70'		L					Yes	No	Yes	No	L	D
Ash, White	Fraxinus americana	90'		L			*		No	No	Yes	No	L	D
Baldcypress	Taxodium distichum	70'	*	L					No	Yes	Yes	No	L	S
Beech, American	Fagus grandiflora	80'	*	L					No	No	Yes	No	L	D
Birch, River	Betula nigra	50'	*	L					Yes	Yes	Yes	No	L	D
Black Gum	Nyssa sylvatica	70'	*	L					No	No	Yes	No	L	D
Buckeye, Bottlebrush	Aesculus parviflora	10'			*				Yes	No	Yes	Yes	S	D
Buckeye, Ohio	Aesculus glabra	75'							No	No	Yes	Yes	L	D
Camellia, Sasanqua	Camellia sasanqua	20'		S	*	*			Yes	No	No	Yes	S	E
Carolina Silverbell	Halesia carolina	30'	*	S					Yes	No	Yes	Yes	M	D
Cedar, Deodar	Cedrus deodara	50'	*	L					No	No	No	No	L	E
Cedar, Eastern Red	Juniperus virginiana	50'		L					No	No	Yes	No	L	E
Cherry, Kwanzan	Prunus serrulata 'Kwanzan'	18'	*	S		*			No	No	No	Yes	S	D
Cherry, 'Okame'	Prunus X 'Okame'	25'							No	No	No	Yes	M	D
Cherry, Weeping	Prunus subhirtella pendula	25'		S					No	No	No	Yes	M	D
Cherry, Yoshino	Prunus X yedoensis	40'	*	S			*		No	No	No	Yes	S	D
Cherry laurel, Carolina	Prunus caroliniana	40'		S					Yes	Yes	Yes	Yes	S	E
Chestnut, Chinese	Castanea mollissima	50'							No	No	No	Yes	L	D
Chestnut, Ruby Red Horse	Aesculus X carnea 'Briotii'	40'				*			No	Yes	Yes	Yes	S	D
Chinese Flame Tree	Koelreuteria bipinnata	30'							No	No	No	Yes	M	D
Chinese Pistache	Pistacia chinensis	40'	*						Yes	Yes	No	No	M	D
Crabapple, Japanese Flowering	Malus floribunda	25'		S	*		*		No	No	No	Yes	S	D
Cryptomeria, Japanese	Cryptomeria japonica	45'	*						No	Yes	No	No	L	E
Dawn Redwood	Metasequoia glyptostroboides	80'	*						No	No	No	No	L	S
Dogwood, Flowering	Cornus florida	30'	*	S	*	*	*		Yes	No	Yes	Yes	M	D
Dogwood, Kousa	Cornus kousa	30'	*	S	*	*	*		Yes	No	Yes	Yes	M	D
Dogwood, redtwig	Cornus sericea f. baileyi	10'			*		*		No	Yes	Yes	Yes	S	D
Dogwood, Rutgers Hybrid	Cornus kousa X florida	20'					*		Yes	Yes	No	Yes	S	D
Elm, Lacebark	Ulmus parvifolia	50'	*	L					Yes	Yes	No	No	L	D
Flasecypress, Hinoki	Chanaecyparis obtusa 'Filicoides'	30'							No	No	No	No	M	E

Trees

Common Name	Scientific Name	Max Height	City Tree Ordinance Approved	City Zoning Approved (Large or Small Maturing)	Duke Transmission Border Zone Approved	Duke Transmission Peripheral Zone Approved	Duke Outside Transmission Peripheral Zone Approved	Duke Distribution Line Approved#	Shade Tolerant	Tolerates Poor Drainage	Native	Blooming	Mature Height (Small, Medium, or Large)	Foliage (Deciduous, Semi-deciduous, or Evergreen)
Filbert, American	<i>Corylus americana</i>	20'			*				Yes	No	Yes	No	S	D
Fringetree	<i>Chionanthus virginiana</i>	15'							No	Yes	Yes	Yes	S	D
Fringetree, Chinese	<i>Chionanthus retusus</i>	30'	*						Yes	No	No	Yes	M	D
Gingko	<i>Gingko biloba</i>	60'	*	L			*	*	Yes	Yes	No	No	L	D
Golden Raintree	<i>Koelreuteria paniculata</i>	30'		S		*			No	No	No	Yes	M	D
Hackberry, Common	<i>Celtis occidentalis</i>	60'	*	L			*		Yes	Yes	Yes	No	L	D
Hackberry, Sugar	<i>Celtis laevigata</i>	50'	*						Yes	Yes	Yes	No	L	D
Hawthorne, Green	<i>Crataegus viridis 'Winter King'</i>	30'	*						No	Yes	Yes	Yes	M	D
Hawthorne, Washington	<i>Crataegus phaenopyrum</i>	25'	*	S					No	Yes	Yes	Yes	S	D
Hemlock, Carolina	<i>Tsuga caroliniana</i>	60'							Yes	No	Yes	No	L	E
Hemlock, Eastern	<i>Tsuga canadensis</i>	80'		L					Yes	No	Yes	No	L	E
Hickory, Bitternut	<i>Carya cordiformis</i>	100'		L					No	No	Yes	No	L	D
Hickory, Pignut	<i>Carya glabra</i>	90'		L					No	No	Yes	No	L	E
Hickory, Shagbark	<i>Carya ovata</i>	90'		L					No	No	Yes	No	L	E
Holly, American	<i>Ilex opaca</i>	50'		S					Yes	No	Yes	No	L	E
Holly, 'Emily Brunner'	<i>Ilex X 'Emily Brunner'</i>	25'			*				Yes	No	No	No	M	E
Holly, Foster	<i>Ilex X attenuata 'Fosteri'</i>	25'	*	S	*				No	Yes	Yes	No	S	E
Holly, Greenleaf	<i>Ilex opaca 'Greenleaf'</i>	25'			*				No	Yes	Yes	No	S	E
Holly, Hume	<i>Ilex X attenuata 'Hume #2'</i>	25'			*				No	Yes	No	No	S	E
Holly, 'Nellie R. Stevens'	<i>Ilex X 'Nellie R. Stevens'</i>	25'			*				Yes	No	No	No	M	E
Holly, Savannah	<i>Ilex X attenuata 'Savannah'</i>	25'	*	S	*				No	Yes	Yes	No	M	E
Holly, Yaupon	<i>Ilex vomitoria</i>	20'		S	*				Yes	No	Yes	No	S	E
Honeylocust, Shademaster**	<i>Gleditsia tricanthos inermis 'Shademaster'</i>	50'					*		No	No	Yes	No	L	D
Hophornbeam	<i>Ostrya virginiana</i>	30'							Yes	No	Yes	No	M	D
Hornbeam, American	<i>Carpinus caroliniana</i>	35'		S			*		Yes	Yes	Yes	No	M	D
Hornbeam, European	<i>Carpinus betulus</i>	60'	*	S			*		Yes	Yes	No	No	L	D
Kentucky Coffeetree	<i>Gymnocladus dioicus</i>	75'	*						Yes	No	Yes	No	L	D
Linden, Little Leaf	<i>Tilia cordata</i>	70'	*			*	*	*	Yes	Yes	No	Yes	L	D
Magnolia, Cucumber	<i>Magnolia acuminata</i>	100'							No	No	Yes	Yes	L	D
Magnolia, Lily Flowered	<i>Magnolia liliiflora</i>	20'							Yes	No	No	Yes	S	D
Magnolia, 'Little Gem'	<i>Magnolia grandiflora 'Little Gem'</i>	25'	*						No	Yes	Yes	Yes	S	E
Magnolia, 'Merrill'	<i>Magnolia X loebneri 'Merrill'</i>	25'							No	Yes	Yes	Yes	M	D
Magnolia, Saucer	<i>Magnolia X soulangiana</i>	25'	*	S			*		No	Yes	Yes	Yes	M	D

Trees

Common Name	Scientific Name	Max Height	City Tree Ordinance Approved	City Zoning Approved (Large or Small Maturing)	Duke Transmission Border Zone Approved	Duke Transmission Peripheral Zone Approved	Duke Outside Transmission Peripheral Zone Approved	Duke Distribution Line Approved#	Shade Tolerant	Tolerates Poor Drainage	Native	Blooming	Mature Height (Small, Medium, or Large)	Foliage (Deciduous, Semi-deciduous, or Evergreen)
Magnolia, Southern	Magnolia grandiflora	50'	*	L				*	No	Yes	Yes	Yes	L	E
Magnolia, Star	Magnolia stellata	20'	*	S	*				No	Yes	Yes	Yes	S	D
Maple, Armur 'Flame'	Acer tataricum ginnala 'Flame'	25'			*				No	Yes	No	No	M	D
Maple, Freeman	Acer x fremanii	65'	*						Yes	No	Yes	No	L	D
Maple, Hedge	Acer campestre	30'		S		*			No	Yes	No	No	M	D
Maple, Japanese	Acer palmatum	25'	*		*				Yes	No	No	No	S	D
Maple, Paperbark	Acer griseum	30'							No	No	No	No	M	D
Maple, Purplebow	Acer truncatum	25'							No	No	No	No	M	D
Maple, Red	Acer rubrum	60'	*	L		*	*	*	Yes	Yes	Yes	No	L	D
Maple, Sugar	Acer saccharum	70'	*	L			*	*	Yes	No	Yes	No	L	D
Maple, Trident	Acer buergeranum	30'	*						Yes	No	No	No	M	D
Oak, Black	Quercus velutina	60'		L					Yes	No	Yes	No	L	D
Oak, Fastigiante English	Quercus robur 'Fastigiata'	75'					*		No	No	No	No	L	D
Oak, Laurel	Quercus laurifolia	70'	*	L					Yes	No	Yes	No	L	D
Oak, Live	Quercus virginiana	50'	*	L					Yes	Yes	Yes	No	L	E
Oak, Northern Red*	Quercus rubra	80'		L			*	*	Yes	No	Yes	No	L	D
Oak, Nuttall	Quercus nuttallii	80'							Yes	No	Yes	No	L	D
Oak, Overcup	Quercus lyrata	50'	*						Yes	Yes	Yes	No	L	D
Oak, Pin**	Quercus palustris	80'							No	Yes	Yes	No	L	D
Oak, Post	Quercus stellata	50'							No	No	Yes	No	L	D
Oak, Scarlet**	Quercus coccinea	80'		L					No	No	Yes	No	L	D
Oak, Shumard	Quercus shumardii	60'	*	L					Yes	No	Yes	No	L	D
Oak, Southern Red	Quercus falcata	70'	*	L					Yes	No	Yes	No	L	D
Oak, Swamp White	Quercus bicolor	70'		L					Yes	Yes	Yes	No	L	D
Oak, Water	Quercus nigra	75'		L					No	Yes	Yes	No	L	D
Oak, White	Quercus alba	90'		L			*	*	Yes	No	Yes	No	L	D
Oak, Willow	Quercus phellos	60'	*	L				*	Yes	Yes	Yes	No	L	D
Paw Paw	Asimina triloba	30'							Yes	Yes	Yes	No	M	D
Pecan	Carya illinoensis	100'		L					No	No	Yes	No	L	D
Persimmon	Diospyros virginiana	50'		L					Yes	No	Yes	No	L	D
Pine, Austrian	Pinus nigra	55'	*	L					No	Yes	No	No	L	E
Pine, Japanese Black	Pinus thunbergi	45'		L					No	No	No	No	L	E
Pine, Loblolly	Pinus taeda	60'	*	L					No	Yes	Yes	No	L	E
Pine, Shortleaf	Pinus echinata	100'		L					No	No	Yes	No	L	E

Trees		Max Height	City Tree Ordinance Approved	City Zoning Approved (Large or Small Maturing)	Duke Transmission Border Zone Approved	Duke Transmission Peripheral Zone Approved	Duke Outside Transmission Peripheral Zone Approved	Duke Distribution Line Approved†	Shade Tolerant	Tolerates Poor Drainage	Native	Blooming	Mature Height (Small, Medium, or Large)	Foliage (Deciduous, Semi-deciduous, or Evergreen)
Common Name	Scientific Name													
Pine, Virginia	<i>Pinus virginiana</i>	40'	*	L					No	No	Yes	No	S	E
Plum, Purpleleaf	<i>Prunus cerasifera 'Atropurpurea'</i>	25'	*	S					No	No	No	Yes	S	D
Poplar, Tulip	<i>Liriodendron tulipifera</i>	80'	*	L					Yes	Yes	Yes	Yes	L	D
Redbud, Chinese	<i>Cercis chinensis</i>	30'	*		*			*	Yes	No	No	Yes	M	D
Redbud, Eastern	<i>Cercis canadensis</i>	25'	*	S	*	*		*	Yes	Yes	Yes	Yes	M	D
Serviceberry	<i>Amelanchier arborea</i>	25'	*			*			No	No	Yes	Yes	S	D
Serviceberry, Shadbush	<i>Amelanchier canadensis</i>	20'		L	*	*			Yes	No	Yes	Yes	S	D
Smoketree	<i>Cotinus coggyria</i>	20'				*			No	No	No	Yes	S	D
Sourwood	<i>Oxydendrum arboreum</i>	35'		S					Yes	No	Yes	Yes	M	D
Spruce, Bakeri	<i>Picea pungens 'Bakeri'</i>	20'				*			No	No	Yes	No	S	E
Spruce, Black Hills	<i>Picea glauca densata</i>	30'				*			No	No	Yes	No	M	E
Sweetgum, Fritless	<i>Liquidambar styraciflua 'Rotundiloba'</i>	75'	*	L				*	Yes	Yes	Yes	No	L	D
Umbrella Tree	<i>Magnolia tripetala</i>	30'							No	No	Yes	Yes	M	D
Waxmyrtle	<i>Myrica cerifera</i>	25'	*	S					No	Yes	No	No	S	E
Willow, Pussy	<i>Salix discolor</i>	30'			*	*			No	Yes	Yes	No	M	D
Zelkova, Japanese	<i>Zelkova serrata</i>	70'	*	L				*	Yes	No	No	No	L	D

* - Not allowed for required city planting.

** - Not recommended for required city planting.

† - Cultivars under 15' tall only.

‡ - Trees <25' mature height can be planted directly under power lines.

Trees 25'- 40' mature height can be planted at least 20' from power lines.

Trees 40'> mature height can be planted at least 40' from power lines.

Other species may be allowed with staff approval

List subject to change



SHRUBS

Common Name	Scientific Name
Burford holly *	<i>Ilex cornuta burfordi</i>
Camellia *	<i>Camellia japonica</i>
Convex Japanese holly *	<i>Ilex crenata `convexa'</i>
Dwarf burford holly *	<i>Ilex cornuta burfordi nana</i>
Emily brunner holly *	<i>Ilex "Emily Brunner"</i>
English holly *	<i>Ilex aquifolium</i>
Evergreen euonymus *	<i>Euonymus japonicus</i>
Flowering quince	<i>Chaenomeles speciosa</i>
Forsythia	<i>Forsythia intermedia</i>
Glenn dale azalea *	<i>Azalea hybrida</i>
Glossy abelia *	<i>Abelia grandiflora</i>
Hetzi Japanese holly *	<i>Ilex crenata `hetzi'</i>
Hetzi jumper *	<i>Jumperus chinesis hetzi</i>
Indian azalea *	<i>Azalea indica</i>
Inkberry holly *	<i>Ilex glabra</i>
Japanese aucuba *	<i>Aucuba japonica</i>
Kaempferi azalea *	<i>Azalea obtusum Kaempferi</i>
Laurel *	<i>Laurus nobilis</i>
Loropetalum *	<i>Loropetalum chinense</i>
Lusterleaf holly *	<i>Ilex latifolia</i>
Oakleaf hydrangea	<i>Hydrangea quercifolia</i>
Perny holly *	<i>Ilex pernyi</i>
Pfizer juniper *	<i>Juniperus chinensis pfizeriana</i>

Common Name	Scientific Name
Roundleaf Japanese holly *	<i>Ilex crenata `rotundifolia'</i>
Sasanqua Camellia *	<i>Camellia sasanqua</i>
Witch-hazel	<i>Hammamelis virginiana</i>
Yaupon holly *	<i>Ilex vomitoria</i>
Wax myrtle *	<i>Myrica cerifera</i>
Wild olive *	<i>Osmanthus americana</i>
Chinese photinia *	<i>Photinia serrulata</i>
Mountain andromeda *	<i>Pieris floribunda</i>
Japanese andromeda *	<i>Pieris japonica</i>
Pittosporum *	<i>Pittosporum tobira</i>
English laurel *	<i>Prunus laurocerasus</i>
Podocarpus *	<i>Podocarpus macrophyllus maki</i>
Narrow leafed English laurel *	<i>Prunus laurocerasus angustifolia</i>
Scarlet firethorn	<i>Pyracantha coccinea</i>
Yeddo-hawthorn *	<i>Raphiolepis umbellata</i>
Reeves spirea	<i>Spirea cantoniensis</i>
Thunberg spirea	<i>Spirea thunbergii</i>
Bridalwreath spirea	<i>Spirea prunifolia plena</i>
Vanhoutte spirea	<i>Spirea vanhouttei</i>
Japanese yew *	<i>Taxus cuspidata</i>
Leatherleaf viburnum *	<i>Viburnum rhytidophyllum</i>
Laurestinus viburnum *	<i>Viburnum tinus</i>

* denotes evergreen

Other species may be allowed with staff approval

List subject to change

REFERENCES

1. North Carolina Department of Transportation, most recent edition, Standard Specifications for Roads and Structures.
2. North Carolina Department of Transportation, most recent edition, Roadway Standards Drawings.
3. City of Charlotte Department of Transportation, most recent edition, Work Area Traffic Control Handbook (WATCH)
4. City of Charlotte Storm Water Services-Mecklenburg County Storm Water Services most recent edition, Charlotte-Mecklenburg Storm Water Design Manual
5. American Association of State Highway and Transportation Officials most recent edition, A Policy on Geometric Design of Highways and Streets
6. North Carolina Department of Transportation, Roadway Design Manual, latest edition
7. North Carolina Department of Environment and Natural Resources most recent edition, Erosion and Sediment Control Planning and Design Manual
8. NCDENR, Storm Water Best Management Practices, latest edition.
9. Charlotte-Mecklenburg BMP Design Manual, latest edition.
10. CDOT Pavement Marking Standards, latest edition.
11. The City of Charlotte Urban Street Design Guidelines, adopted by City Council October 22, 2007.