

Town of Hillsborough

Street Manual



TOWN OF
HILLSBOROUGH

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1.1 INTRODUCTION

This document has been developed to provide basic standards for the design of new streets within the Town of Hillsborough and the Town’s planning jurisdiction, as well as for improvements to existing streets. Sections 1.2 and 1.3 provide information and links to relevant policies, standards, and requirements that have been previously developed by the Town of Hillsborough (1.2) and North Carolina Department of Transportation (1.3). This Street Design Standards document is not intended to replace these existing policies, but rather to supplement them. Section 1.4 provides information and links to a variety of adopted transportation plans that impact the street system in the Town of Hillsborough—these plans contain important information about proposed improvements.

Section 2.1 provides information on the process for approving street designs and dedication of streets and sidewalks to the town. In Section 3.1, a roadway classification system is defined that categorizes all streets in the Town into one of six categories. Standard cross-sections are provided for each category, including several categories with multiple optional cross-sections. Section 3.2 provides more detailed information on individual design elements of the transportation system, such as roadway lanes, sidewalks, lighting, and landscaping. Section 4 provides requirements for non-motorized travel and a checklist for greenway dedication.

In any cases of conflict between this document and the Unified Development Ordinance or Town Code of the Town of Hillsborough, the Unified Development Ordinance or Town Code shall have precedence.

The standards defined in this document are drawn from many sources but are most prominently based on the NCDOT Complete Streets Planning and Design Guidelines. The document was prepared by the Triangle J Council of Governments under contract to the Town of Hillsborough. The document was adopted by the Hillsborough Board of Commissioners on July 28, 2014.

1.2 RELATED TOWN OF HILLSBOROUGH REQUIREMENTS

The Town of Hillsborough has several existing requirements related to the design and construction of streets that are found within other ordinances and documents. These requirements are important to consider in relation to the information contained within this document. Links are provided to each of these resources.

It is important to note that the information in this document is intended to supplement the information found in these other policies and resources, not to replace them. Please refer to each of these documents as needed.

Town of Hillsborough Code of Ordinances, Part II, Chapter 7 – Streets and Sidewalks

Chapter 7 of the Town Code contains policies related to the construction on and maintenance of streets and sidewalks. In addition, Appendix A of Chapter 7 provides detailed information on the Town’s **Street Construction Standard Specifications**.

This document can be found online at

https://www.municode.com/library/nc/hillsborough/codes/code_of_ordinances.

Town of Hillsborough Engineering Department Checklist for Approval and Acceptance of Utilities Projects

This document provides a checklist of items that must be completed before the Town will accept the dedication of a utility system to the Town by a developer/contractor. The document outlines activities that must occur before, during, and after construction, as well as at the end of the warranty period, and on multiple-phase projects. The most recent version of the checklist can be found at.

<https://assets.hillsboroughnc.gov/media/documents/public/developerengineer-checklist-for-projects-involving-water-and-sewer-utilities.pdf>

Town of Hillsborough Unified Development Ordinance

The Unified Development Ordinance contains numerous policies related to the development of the street system.

The Unified Development Ordinance can be found online at

<https://www.hillsboroughnc.gov/government/departments-and-divisions/planning/unified-development-ordinance>.

Town of Hillsborough Traffic Calming Policy

The Town has established this policy to govern the use of traffic calming measures that are intended to reduce speeding, excessive traffic volumes, improve dangerous intersections, or address other public safety concerns.

The policy can be found in **Appendix B** at the end of this document.

1.3 RELATED NCDOT POLICIES

The following policies are used by the North Carolina Department of Transportation to regulate the design and construction of roads that are on the state road system or are intended to be dedicated to the state in the future. Several Town of Hillsborough policies also reference these state policies. These and other NCDOT policies can be found online at

<https://connect.ncdot.gov/projects/Roadway/Pages/Guidelines--Standards.aspx>.

NCDOT Roadway Design Manual

The Roadway Design Manual provides standards and guidelines for roadway design on state-owned roads. The standards are based on factors such as design speed, functional classification, traffic volumes, and terrain classifications, and the manual provides additional guidance regarding cost reduction measures, selection of an appropriate cross-section, appropriate slopes and drainage, lane width, shoulder design, clear zones and other similar features/issues. The manual is updated frequently, and

information on updates can be found at the website listed above. This manual incorporates standards from the AASHTO *Green Book* of 2011. All state roadway projects must conform with this manual or seek a design exception.

<https://connect.ncdot.gov/projects/Roadway/pages/roadway-design-manual.aspx>

NCDOT Policies & Procedures for Accommodating Utilities on Highway Rights-of-Way

This document contains the policies for working with utilities in state highway rights-of-way, including sections on encroachment agreements, utilities in freeway rights-of-way, pipelines, overhead power and communication lines, underground electric power and communication lines, plowed-in cable, lighting, utilities located on or near highway structures, and utility agreements. The document contains a section specifically dealing with residential subdivision streets (beginning on Page 81).

<https://connect.ncdot.gov/municipalities/Utilities/UtilitiesDocuments/20210301%20NCDOT%20UAM%20Ver%201-1.pdf>

NCDOT Bridge Policy

The bridge policy establishes the controlling design elements of new and reconstructed bridges on the state-owned highway system. The primary factors governing the design of the bridge are functional classification, traffic volume, design speed, safety/crash history, and bicycle/pedestrian elements. Box culverts are not considered part of this policy.

<https://connect.ncdot.gov/projects/Roadway/RoadwayDesignAdministrativeDocuments/Bridge%20Policy.pdf>

NCDOT Guidelines for Agreement Process and Reimbursement to NCDOT by Municipality/Developer

This document provides guidance on the process for incorporating changes into current NCDOT construction projects to accommodate proposed development. Any additional cost that results is borne by the developer.

<https://connect.ncdot.gov/projects/Roadway/RoadwayDesignAdministrativeDocuments/Guideline%20for%20Agreement%20Process%20and%20Reimbursement%20to%20NCDOT%20by%20Municipality%20or%20Developer.pdf>

NCDOT Guidelines for Planting Within Highway Right-of-Way

This document provides information about the process and design requirements for planting trees and shrubs within the state highway right-of-way. It outlines the process for obtaining a permit for this activity, including maintenance responsibilities. It also provides sample cross-sections showing proper placement of trees and shrubs and provides an extensive list of recommended plant types.

<https://connect.ncdot.gov/resources/roadside/AestheticEngineeringDocuments/PlantingGuidelines.pdf>

NCDOT Manual for Construction Layout

This manual provides instructions for contract surveyors regarding the proper construction layout and staking procedures.

<https://connect.ncdot.gov/projects/construction/Construction%20%20Stakeout%20Manual/Construction%20Stakeout%20Manual.pdf>

NCDOT Municipal/Developer Submittals Guidelines for Plan Reviews and Encroachments

This document provides information to municipalities and developers on the requirements for obtaining an Encroachment Permit from NCDOT. Generally speaking, an encroachment permit is required any time that construction, installation, activity, or operation will take place within NCDOT's right-of-way. The document includes a form to be completed when requesting an encroachment permit, as well as a detailed list of the information that will potentially be required for submittal as part of the plan review process.

<https://connect.ncdot.gov/projects/Roadway/RoadwayDesignAdministrativeDocuments/Municipal-Developer%20Submittals%20Guideline.pdf>

NCDOT Policy on Street and Driveway Access to North Carolina Highways

This policy provides detailed information on the requirements for connecting driveways and streets with the state highway system. It outlines the procedure and requirements for requesting a street/driveway access permit, the required coordination with other agencies, the conditions and limitations that apply to these permits, requirements for site plans and studies (including traffic impact studies, traffic signal studies, and drainage studies), the permit appeals process, and the detailed design criteria for streets and driveways that access the state highway system. The District Engineer of NCDOT is responsible for the review of applications and approval or denial of permits. The District Engineer for the Hillsborough area is based in Graham.

<https://connect.ncdot.gov/projects/Roadway/RoadwayDesignAdministrativeDocuments/Policy%20on%20Street%20and%20Driveway%20Access.pdf>

NCDOT Traditional Neighborhood Development Street Design Guidelines

Traditional Neighborhood Development (TND) is a type of development that features a denser, more-interconnected street network, a higher-than-typical density of development, and a mixture of land uses. These types of developments generally have lower transportation impacts than typical developments due to the greater potential for bicycling and walking to capture mode share and the greater potential for internal trips within the development reducing the overall volume of traffic entering and leaving the site. NCDOT has developed this document with criteria for streets within these TND projects, which supersede the design criteria in other documents where applicable. In general, the TND street design guidelines allow for narrower streets with smaller turning radii.

<https://connect.ncdot.gov/projects/Roadway/RoadwayDesignAdministrativeDocuments/Traditional%20Neighborhood%20Development%20Manual.pdf>

NCDOT Best Management Practices for Construction and Maintenance Activities

This document provides information on best management practices for controlling erosion and sedimentation from transportation projects, in order to maintain/improve water quality.

<https://connect.ncdot.gov/resources/roadside/FieldOperationsDocuments/Best%20Management%20Practices%20for%20Construction%20and%20Maintenance%20Activities.pdf>

NCDOT Complete Streets Planning and Design Guidelines

NCDOT adopted a “complete streets” policy in 2009 and developed this document in 2012 to provide guidance for implementation of the policy. The document provides an overview of the complete streets concept and the need for this type of approach and discusses how complete streets fit into the existing transportation planning, programming, and project development process. The document defines nine “area types” and eleven “street types” for the purpose of classifying roadways. For each street type, the document provides a sample plan view and cross-section of the street, as well as dimensional guidelines. Dimensions are defined for a number of “zones” within the cross-section, such as the “sidewalk/multi-use path zone” and the “motor vehicle zone.” Following the chapter on street types, additional chapters discuss intersection treatments (including plan drawings and information on standard intersections, roundabouts, interchanges, mid-block crossings, greenway crossings, and rail crossings), transit, and bicycle/pedestrian facilities on structures. The document can be found online at http://www.completestreetsnc.org/wp-content/themes/CompleteStreets_Custom/pdfs/NCDOT-Complete-Streets-Planning-Design-Guidelines.pdf.

NCDOT Standard Specifications and Provisions

All of NCDOT’s standard specifications and provisions can be found online at <https://connect.ncdot.gov/resources/Specifications/Pages/Specifications-and-Special-Provisions.aspx>.

NCDOT Roadway Standard Drawings

All of NCDOT’s standard drawings for roadway design can be found online at <https://connect.ncdot.gov/resources/Specifications/Pages/2012-Roadway-Drawings.aspx>.

1.4 RELATED TRANSPORTATION PLANS

The Town of Hillsborough has a number of existing plans that relate to the transportation system. This is a summary of these plans; for more information please refer to the plan documents, many of which can be found at <https://www.hillsboroughnc.gov/government/departments-and-divisions/planning>.

Please note: several of these plan documents may no longer reflect the plans or policies of the town – all plans are presented here for informational purposes only and those that are most at risk of

containing outdated information are marked with a ‡ symbol. Please consult with town staff regarding the currency of planning documents before using them for decision-making purposes.

Durham-Chapel Hill-Carrboro Metropolitan Planning Organization (DCHC MPO) Metropolitan Transportation Plan

The Metropolitan Transportation Plan (MTP) is a long-range regional transportation plan that identifies major transportation projects that are planned for construction within the next 20 to 30 years. A project must be identified in the MTP in order to receive funding in the Transportation Improvement Program (see below). The DCHC MPO, of which the Town of Hillsborough is a member, is responsible for developing and approving this plan, which must be updated every four years. The most recent MTP at the time of this document's writing was adopted in 2013. In addition to identifying projects for which available funding is anticipated within the next 20-30 years, the MTP also identifies other projects that are needed, but for which funding has not been identified – these are sometimes referred to as CTP projects (for “Comprehensive Transportation Plan”). In addition to highway projects, the MTP also includes a listing of planned bicycle and pedestrian projects. More information on the MTP can be found at www.dchcmo.org.

DCHC MPO Transportation Improvement Program & North Carolina Statewide Transportation Improvement Program

The Transportation Improvement Program (TIP) is the document that determines which transportation projects will receive federal and state funding for construction. Because Hillsborough is within the DCHC MPO, its projects must be listed in both the DCHC MPO TIP and the North Carolina Statewide TIP, which must be in agreement with each other. The TIP is usually updated every two years. The most recent TIP at the time of this document's writing was adopted in 2011. Projects selected for funding in the TIP must be drawn from the list of projects included in the MTP (discussed above). The most up-to-date version of the Statewide Transportation Improvement Program (STIP) can be found at <https://connect.ncdot.gov/projects/planning/Pages/>.

DCHC MPO Collector Street Plan

The DCHC MPO is in the process of developing a Collector Street Plan, which is intended to serve as a plan for the development of roads that may be too minor to appear on the Metropolitan Transportation Plan, which focuses on major facilities. A draft collector street map for Hillsborough was developed in 2012 and can be found at <http://www.dchcmo.org/dmdocuments/CSPHillsboroughMPOonlyAug20DraftRevised.pdf>. Typically, roads proposed on a collector street plan include those that might be constructed by developers as properties become developed.

Town of Hillsborough Community Connectivity Plan

In 2009, the Town of Hillsborough adopted this plan that addresses the needs of non-motorized modes of transportation within the Town. An update to this plan was developed in 2013. Following an

extensive analysis of existing safety data, destinations, existing bicycle and pedestrian facilities, barriers to connectivity, existing plans, pedestrian and bicycle amenities, and public input, the plan was developed to provide design policies, recommended facilities, and a program for implementation. Among the recommendations are maps showing high-priority and low-priority locations for sidewalk improvements, recommended curb cuts, recommended striped bicycle lane locations, and a recommended marked bicycle route through the Town. The 2009 and 2013 plans can be found at <https://www.hillsboroughnc.gov/government/departments-and-divisions/planning/comprehensive-plan>.

Town of Hillsborough Churton Street Corridor Strategic Plan ‡

In 2006, the Town adopted a plan for the Churton Street corridor between the I-40 interchange and the NC 86-57 split. This road functions as the “Main Street” of the Town of Hillsborough, and therefore has some characteristics that are unique to it among roadways within the Town. The plan identified several key issues to be addressed, including walkability and pedestrian safety, buried utilities, traffic flow and congestion, sign clutter, building design and signage guidelines, landscaping, redevelopment, and transportation links.

Specifically, the plan calls for a four-lane divided cross-section with a planted median on Churton Street between I-40 and I-85; and for a two-lane divided cross-section with a planted median on Churton Street between I-85 and the railroad crossing, and between Corbin Street and NC 57. The town continues to support these cross-sections, but implementation of the remaining aspects of the plan has been suspended.

A copy of the plan can be found at <https://www.hillsboroughnc.gov/government/departments-and-divisions/planning/comprehensive-plan>.

Town of Hillsborough US 70/Cornelius Street Corridor Strategic Plan ‡

In 2007, the Town adopted a plan for the US 70/Cornelius Street corridor, between Churton Street and Lakeshore Drive/Holiday Park Road. This plan examines issues including land use, transportation, crime, code enforcement, and site planning/design. The plan anticipates a need to widen US 70 through this area in the future based on growing traffic volumes and identifies a preferred cross-section for the widened facility as a four-lane divided roadway, including a multi-use sidepath on each side of the road. The plan also recommends the connection of several side streets that are currently unconnected to each other, and the closure of some intersections with minor side streets. The plan also includes recommendations related to future development within the corridor. This plan may be found at <https://www.hillsboroughnc.gov/government/departments-and-divisions/planning/comprehensive-plan>.

Town of Hillsborough Downtown Access Study ‡

The Downtown Access Study was developed in 2012, in response to a decision to remove the planned Elizabeth Brady Road Extension from the region’s Metropolitan Transportation Plan. The study examined the section of Churton Street between US 70 Bypass and US 70 Business and developed specific recommendations to improve congestion and traffic flow, improve the pedestrian environment,

allow for loading zones in the downtown area, and generally improve the safety of the area and enhance the experience of traveling through and around Downtown Hillsborough. Some key recommendations included lane striping changes, intersection improvements, on-street and off-street parking changes, construction of sidewalks and crosswalks, and designation of an alternate bike route. The plan can be requested from the Planning Division.

Town of Hillsborough Downtown Parking Study ‡

In 2010, the Town conducted a study on parking in the downtown historic area, including an examination of on-street parking. This resulted in recommendations about parking time limits, the marking of “No Parking” zones and striping of on-street parking spaces, changes in signage, and removal of some parallel parking spaces on Margaret Lane to allow construction of a sidewalk. There were several specific recommendations with an impact on the transportation system. The plan can be found here: <https://assets.hillsboroughnc.gov/media/documents/public/downtown-parking-study.pdf>

Town of Hillsborough Downtown Appearance Improvements Plan ‡

This plan was developed in 1998 and recommended several streetscape items to improve the overall appearance of the downtown area, including street trees, planters, litter receptacles, and lighting. This was followed up by a “Streetscape Feasibility Report” in 2001, which developed more detailed recommendations. The plan can be requested from the Planning Division.

Town of Hillsborough Wayfinding Signage Plan ‡

This plan was developed in 2009 and recommends a coordinated and consistent system of signs to guide travelers to various points of interest in the town. The plan includes design and location details for a wide variety of signs, including highway directional signs, town limit signs, “Welcome to Hillsborough” signs, trailblazing signs, proximity signs, destination signs, historic district identification signs, parking directional and identification signs, route markers, and pedestrian kiosks. Maps showing the locations of proposed signs are also available. The plan can be found here:

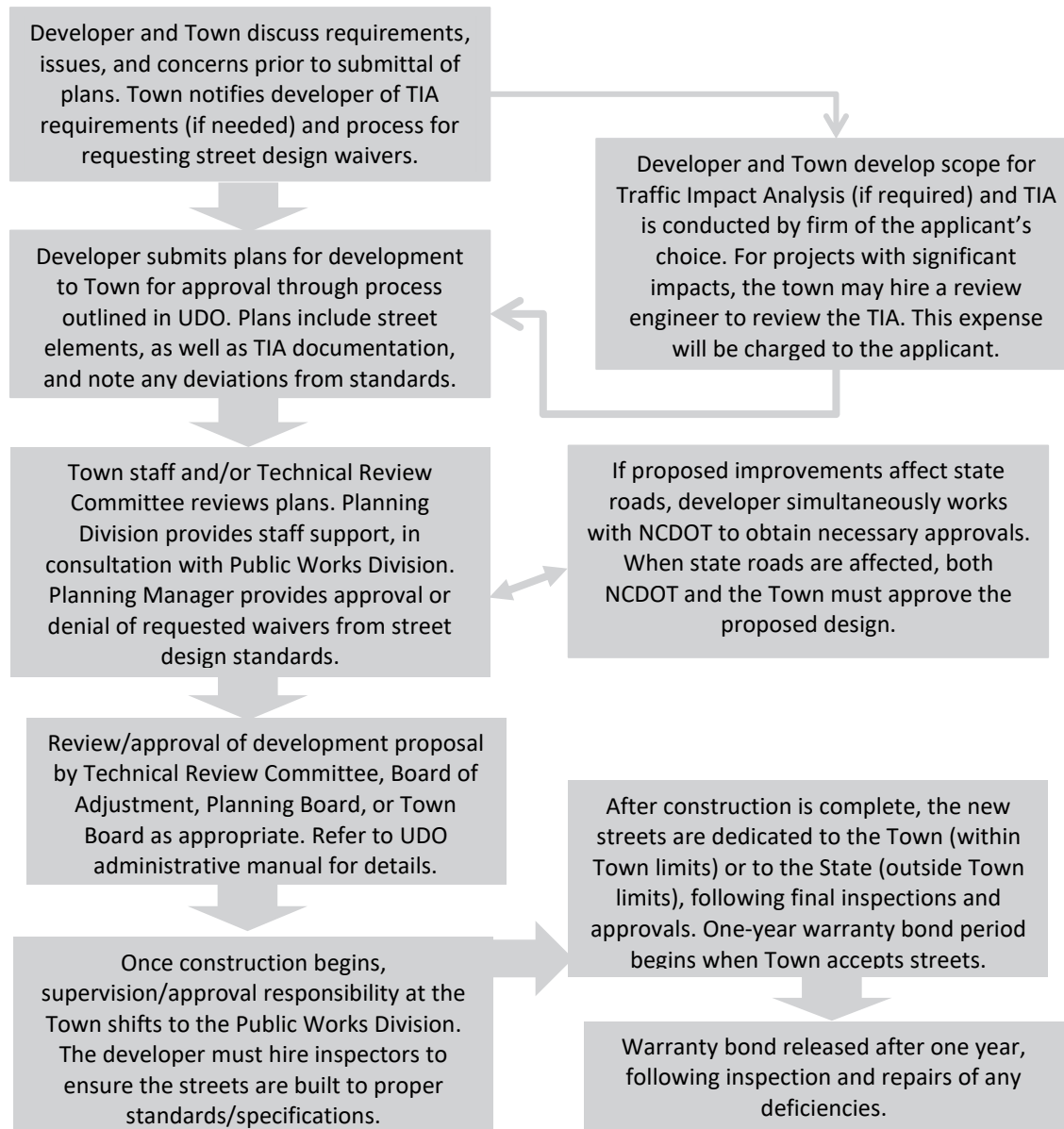
<https://assets.hillsboroughnc.gov/media/documents/public/wayfinding-signage-plan.pdf>

2.1 APPROVAL PROCESS

The process for approving street designs is interwoven with the overall process for approving new developments within the Town of Hillsborough. However, there are a few procedural matters that are specific to street design, and these are highlighted below.

Process Flowchart

The following flowchart shows the typical process for approval of street design.



For information on the general approval process for a development, refer to the Unified Development Ordinance Administrative Manual, found at <https://www.hillsboroughnc.gov/government/departments-and-divisions/planning/unified-development-ordinance>.

Traffic Impact Analysis (TIA)

A Traffic Impact Analysis (TIA) is a document that analyzes the impacts that a proposed development will have on the nearby transportation network, primarily due to increased traffic generated by the development. The TIA will identify necessary improvements to the transportation network in order to ensure that the new development does not adversely impact traffic flow and congestion. The TIA is generally performed by an engineer hired by the developer and is reviewed by the Town for approval. Any study requiring NCDOT concurrence must be prepared in accordance with the current NCDOT Congestion Management Capacity Analysis Guidelines.

The threshold for developments requiring the completion of a Traffic Impact Analysis is whether the development will generate 800 or more vehicle trips on an average weekday. The following table provides guidelines for the types of developments that will generally rise above this threshold and require completion of a TIA.

Any project of a smaller size seeking a special use permit, site plan, major subdivision, or conditional zoning may be required to have a traffic analysis completed if 1) 75 percent or more of the properties being notified of the project public hearing are already developed or 2) a majority of the properties being notified of the project public hearing are of the different zoning category than the site requesting development or 3) staff or NCDOT identify potential negative impacts to nearby intersections with high crash rates, significant turning movement delays, or level of service concerns.

Estimated TIA Requirement Thresholds¹

Land Use	Size of Development
Single-family Residential	75 units
Apartments	110 units
Condominiums/Townhouses	130 units
Mobile Home Parks	150 units
General Retail	4,000 square feet
Fast Food Restaurant	2,000 square feet
Gas Station/Convenience Store	Service for 6 or more vehicles concurrently
Bank	3,000 square feet
Hotel/Motel	130 rooms
General Office	50,000 square feet

¹ Estimated using *ITE Trip Generation, 7th Edition*. Fitted curve equations were used where available (all except fast food restaurant, day care center, and school, which use average rates). General retail is based on the Shopping Center category since a general retail category is not available in the manual.

Medical/Dental Office	25,000 square feet
Research & Development	75,000 square feet
Light Industrial	120,000 square feet
Manufacturing	210,000 square feet
Day Care Center	10,000 square feet
School	60,000 square feet

Construction Inspection

During street construction, the developer (or developer's contractor) is responsible for hiring a firm to provide inspection services. The firm should be selected from the list of pre-approved firms that is maintained by the Town of Hillsborough Public Works Division and must be a different firm than the one used by the developer for design and engineering work in the development.

Responsibility for Maintenance

The developer is responsible for maintenance of all streets and street-related infrastructure until such time as the street is accepted for dedication by the Town or the NCDOT. See below for additional requirements related to warranty bonds.

Coordination with NCDOT

Improvements that will impact state-owned roadways, or new streets that will be dedicated to the state (generally outside the Town limits) must be approved by both the Town and the NCDOT. While efforts have been made to ensure that the requirements contained in this document are compatible with NCDOT requirements, there may be cases when the requirements differ. When there are conflicts, the state's requirements have precedence, but the Town's requirements should still be followed to the extent possible.

Dedication of Streets to Town

Before the Town will accept any street for dedication, the developer must complete the Town of Hillsborough Public Street or Sidewalk Construction Acceptance Checklist.



Public Street or Sidewalk Construction Acceptance Checklist

1. Prior to Construction

Before construction of a public street or sidewalk begins:

- ☐ Utilities plans must be approved and all agencies signed off
- ☐ Lighting plans must be approved and all agencies signed off
- ☐ Pavement marking plans must be approved and all agencies signed off
- ☐ Signage plans must be approved and all agencies signed off
- ☐ All permits and approvals must be granted
- ☐ A pre-construction meeting has been held

Before construction of structures begins in a development with new street construction:

- ☐ Street name signs shall be installed. Names and speed limits shall be adopted into the town code.
- ☐ Stop signs shall be installed. Stop sign locations shall be adopted into the town code.
 - Both must be maintained throughout construction for emergency service provision. -
- ☐ Addresses for individual parcels or proposed buildings shall be assigned by the planning department and entered in the county database (properly associated with the Parcel Identification Number and Street segment) prior to permitting for vertical construction.

Projects using performance bonds shall provide detailed, sealed engineer's estimates to determine the bond amount and allow the town at least five full working days to review and agree with the estimates prior to presenting the bonds. Estimates must clearly indicate the bonded components without overlap as follows: street (including curb and gutter), in-street drainage, sidewalk, street lighting, pavement marking and signage, landscaping and street trees, utilities (water and sewer), stormwater control mechanisms, and greenways. Requirements for utilities and stormwater control mechanisms are specified by these departments, not this document.

Phased projects may request a reduction in bond amounts over the life of the project if the detailed, sealed engineer's estimates provide values for each phase.

2. During Construction

2a. Regular Progress meetings & submittal of documentation

The developer/contractor must maintain regular communication with the town's public works division throughout the construction process to facilitate the dedication of infrastructure at the appropriate time. This may include regular progress meetings on a weekly or monthly basis, as determined by the town and developer/contractor based on the scale and scope of the development. During progress meetings, the developer/contractor shall provide the town with testing, asphalt quality documentation, delivery ticket, and change order information as detailed below.

Testing:

The developer is required to perform, at a minimum, the tests listed in the chart below. All tests shall be performed by certified inspection personnel and results submitted to the Town of Hillsborough on a **monthly basis**.

	Project	Type of test	Frequency/Timing	Requirements for Passing
<input type="checkbox"/>	Embankment	Sample	1 sample per material source, per project	Standard proctor ASTM D689, gradation ASTM D4042, particle size ASTM 422, moisture content ASTM D2216, and Ataberg ASTM D4318
<input type="checkbox"/>	Embankment	Density Test	1 test per 3000 sf for every 12" lift – Provide test reports to town prior to placing ABC stone base	≥ 95% compaction
<input type="checkbox"/>	Subgrade	Sample	1 sample per material source, per project	Standard proctor ASTM D689, gradation ASTM D4042, particle size ASTM 422, moisture content ASTM D2216, and Ataberg ASTM D4318
<input type="checkbox"/>	Subgrade	Density Test	1 test per 2000 sf within 0" to 12" of subgrade – Provide test reports to town prior to placing ABC stone base	≥ 95% compaction
<input type="checkbox"/>	Subgrade	Proof-roll	Proof-rolling shall be repeated until there is no evidence of "pumping" or displacement	No observable "pumping" or displacement.
<input type="checkbox"/>	Subgrade (ABC)	Sample	1 sample per 5,000 sf or a minimum of 1 sample per project	Standard proctor ASTM D689, gradation ASTM D4042
<input type="checkbox"/>	Subgrade (ABC)	Density Test	1 test per 250 LF or a minimum of 1 test on the final lift	100% compaction under streets and parking ≥ 90% under general non-structure areas
<input type="checkbox"/>	Subgrade (ABC)	Proof-roll	Proof-rolling shall be repeated until there is no evidence of "pumping" or displacement	No observable "pumping" or displacement
<input type="checkbox"/>	Pipe/Utility Backfill	Density Test	1 test per utility or drainage pipe within edge of pavements or curb and gutters. 1 test performed on any other utility over 200 LF	≥ 95% compaction
<input type="checkbox"/>	Concrete (Class A 4000 PSI)	Sample: Slump test and air entrainment	Minimum set of 4 cylinders per 50 cubic yards or one set per day of placement	Slump test: 3 - 5 inches Air entrainment: 1.5 - 6%
<input type="checkbox"/>	Concrete (Class A 4000 PSI)	Strength Test	Minimum set of 4 cylinders per 50 cubic yards or one set per day of placement	-1 cylinder at 7-days Strength ≥ 2,800 psi -2 cylinders at 28-days Strength ≥ 4,000 psi. -1 cylinder HOLD

Asphalt quality documentation for the construction of public streets paved with asphalt (refer to NCDOT Standard Specifications):

- ☐ Proof of Asphalt Lab Certification.
- ☐ Approved Job Mix Formulas.
- ☐ Field verification test results with Gyratory Compactor printout for each asphalt mix design utilized.
- ☐ QC-11 Form for each production day.
- ☐ QA/QC—One form with binder content for each mixture sample tested.
- ☐ M&T 605 Form for each production day.
- ☐ QC-5 Form for each day when core samples are obtained.
- ☐ Most recent nuclear gauge calibration (if applicable).
- ☐ M&T 514 QA/QC Form for each nuclear strip.
- ☐ M&T 516 QC Form for each day nuclear density testing is performed.

Delivery Tickets for all of the following materials and certify that the material has been used in the construction of the project on a *monthly basis*:

- ☐ Aggregate base course (ABC)
- ☐ Binder course asphalt
- ☐ Surface course asphalt

Change Orders must be received by the town prior to starting the change order work.

2b. Inspections

During construction the developer/contractor is required to have third-party construction inspections performed at specified intervals. The town does not provide construction inspection services. The design engineer or other qualified inspector shall schedule the following inspections prior to proceeding to the next phase of construction. The town will be invited to participate in or observe each inspection session. The developer/contractor is required to provide 48 hours' notice to the town in advance of each inspection. The following are the stages of construction that shall require inspection:

- ☐ Preconstruction
- ☐ BMP (erosion control) construction
- ☐ Rough Grading
- ☐ Major Drainage Structures (36-inch RCP or greater)
- ☐ Sub-grade (to include pavement, curbing and sidewalks)
- ☐ Sub-base
- ☐ Seeding & Mulching
- ☐ Final Pavements
- ☐ Final inspection

3. Final Inspection

- ☐ The developer/contractor may request a preliminary inspection by the town when at least 75% of houses/structures have Certificate of Occupancy.
- ☐ The developer/contractor must request a final inspection by the town prior to submitting the request for dedication.

- ☐ The developer/contractor must offer infrastructure to the town within 30 days of the final certificate of occupancy being issued. For phased projects, this can occur within 30 days of the final certificate of occupancy being issued within that phase. The town may not accept infrastructure still subject to construction damage and may defer any offer until construction is complete.
- ☐ The inspection is required to review streets, sidewalks, stormwater infrastructure, and accessibility requirements. Hillsborough utilities staff must participate in the inspection to verify continued compliance with utility acceptance issues. Any items noted by utilities staff that impact streets, sidewalks, stormwater infrastructure or accessibility requirements must be corrected prior to acceptance of those items.
- ☐ Town staff will inspect trees and landscaping, signage, and pavement markings for plan compliance

4. Before Final Acceptance of a Public Street or Sidewalk:

- ☐ Developer must provide certification of plan compliance (Engineer must sign and seal document)
- ☐ Developer must provide certification of ADA compliance (Engineer must sign and seal document)
- ☐ Developer must provide certification that all roads are constructed to NCDOT and Town of Hillsborough standards (Engineer must sign and seal document)
- ☐ Developer must clean and conduct video assessment installed stormwater drainage lines/pipes located in the public right of way in accordance with the Town of Hillsborough Stormwater Video CCTV Requirements in Appendix D of the street standards.
- ☐ All change orders must be documented and reported to town
- ☐ Scaled as-built drawings must be provided to the town showing all utilities and total linear footage of streets and sidewalks (hard copy and electronic copies)
- ☐ As-built stormwater infrastructure information must be submitted electronically in accordance with the current version of The Town of Hillsborough As-Built Submittal Requirements document.
- ☐ Substantial completion certificate must be provided to town
- ☐ Inspection reports must be provided to town
- ☐ Schedule of values for road and sidewalk construction costs must be provided to town
- ☐ Maintenance agreements must be in place (landscaping, custom signage etc.)
- ☐ Compliance with checklists must be established
- ☐ Easements and plats must be recorded
- ☐ A written offer of dedication (notarized) from the property owner is submitted. Once all required documentation is received, staff will place the request on the next town board agenda as a consent agenda item with a resolution documenting acceptance. Only after town board action is the infrastructure accepted by the town. Staff has no authority to accept dedications.

5. Warranty Period:

- ☐ One-year warranty period begins once the Town Board accepts streets
- ☐ A street infrastructure warranty inspection will occur ten months after street acceptance. A punch list of items to be repaired will be provided to the developer/owner.

3.1 ROADWAY CLASSIFICATIONS

For the purpose of defining design standards for different types of roadways within the Town of Hillsborough, this document breaks roads into six basic categories, three of which are further divided into options with and without closed drainage. Each of these categories is discussed below, followed by more detailed information on the applicable standards and cross-section and plan-view illustrations.

Category	Closed Drainage (C&G)	Open Drainage (Swale)
Residential Local	✓	✓
Residential Collector	✓	✓
Commercial/Industrial Local	✓	
Commercial/Industrial Collector	✓	
Two-lane Arterial	✓	✓
Multi-lane Boulevard	✓	

Residential Local

This street type includes the majority of streets within the Town, which are low-volume, low-speed streets in primarily residential areas. These streets should be designed to encourage low speeds and a safe environment for automobiles, bicycles, parked vehicles, and the occasional truck to share the available pavement. In general, these streets should usually be designed with curbs and gutters, but in some cases topographic, hydrologic, or policy considerations may make the design option with drainage swales more appropriate. If on-street parking is anticipated, then the curb and gutter design is more appropriate to use. Local streets typically carry less than 800 vehicles per day.

Residential Collector

Collectors are moderate-speed, moderate-volume roadways that “collect” traffic from local streets and connect with the larger roadway network of the community. In residential areas, collector streets often provide access to individual homes in addition to their role in the connectivity of the street network. It is appropriate to provide markings on the roadway to separate the spaces designated for automobiles and trucks, bicycles, and parked vehicles on a collector street. The default cross-section assumes the use of curbs and gutters and provides on-street parking on one side of the street². An alternate design with open drainage swales is also available, although it does not allow for on-street parking. Collector streets typically carry more than 800 vehicles per day.

² In cases where it can be reasonably shown that on-street parking is unnecessary, the on-street parking lane width may be omitted.

Commercial/Industrial Local

Local streets in commercial or industrial areas are similar to their residential counterparts, although they are wider to allow for easier navigation by trucks. These streets generally have low speeds and low traffic volumes, and are able to accommodate automobiles, trucks, bicycles, and parked vehicles within a shared space. There are generally center line and stop bar markings on the roadway. The standard design for these streets includes curbs and gutters. Local streets typically carry less than 800 vehicles per day.

Commercial/Industrial Collector

Like their residential counterparts, collector streets in commercial and industrial areas are designed to carry moderate levels of traffic at moderate speeds and to connect local streets to the larger roadway network. The lane widths on residential and commercial/industrial collector streets are the same, but in commercial/industrial areas the design allows for on-street parking on both sides of the road. Alternatively, the design also allows for the presence of a dedicated left-turn lane or two-way left-turn lane in lieu of on-street parking. The decision for which of these two design options is most appropriate within a given site should be based on the characteristics of the site and whether it would be more appropriate to provide on-street parking or to provide a dedicated left-turn lane³. All streets in this category are assumed to use curbs and gutters for drainage. Collector streets typically carry more than 800 vehicles per day.

Two-lane Arterial

An arterial is a higher-volume, higher-speed roadway that serves a primary purpose as a long-distance through-route connecting different communities. These are typically state primary highways or major secondary highways and are typically located in more suburban and rural areas (major roads through downtown areas, such as Churton Street, typically function more similarly to collector streets). Two-lane arterials can be designed either with curbs and gutters (more appropriate in developed areas) or with open drainage swales (more appropriate in undeveloped areas). These roads can also be designed with a left-turn lane when needed, which is appropriate in areas with a high number of driveways or a high volume of left-turning traffic. Arterial streets carry more than 1200 vehicles per day, often significantly more.

It is important to note that the difference between a collector and an arterial is primarily based on the function of the roadway, not on the volume alone—collectors are designed to connect local neighborhoods to the larger roadway system and also serve as local access routes, whereas arterials are designed to carry higher volumes of traffic at higher speeds with fewer interruptions of traffic flow.

³ In cases where it can be reasonably shown that both on-street parking and left-turn lanes are unnecessary along a street (or a portion of a street), these may be omitted, and the overall roadway width narrowed accordingly.

Multi-lane Boulevard

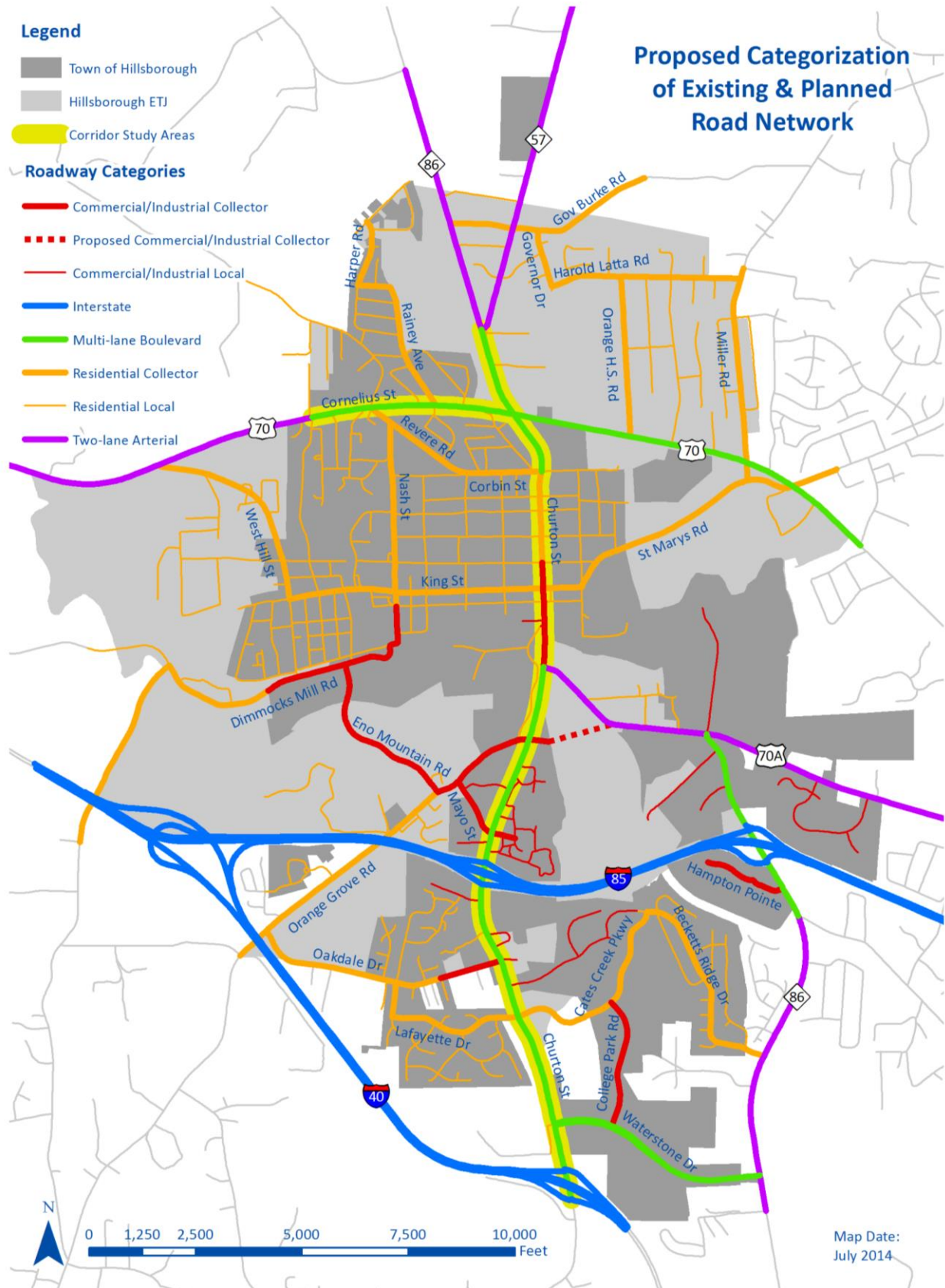
In general, any road with four or more lanes should be designed as a divided “boulevard” with a grass and/or landscaped median. This type of design has multiple benefits over an undivided or “5-lane” design, including improved safety, traffic flow, and aesthetics. These roads should be designed with curbs and gutters and should have separate lanes for motor vehicles and bicycles. On-street parking is generally not recommended on this type of roadway, due to the higher volumes of traffic.

A multi-lane boulevard may be used on either a collector street or an arterial street, with similar design features; however, in general the median width and planting strip width for a collector-type boulevard should be on the shorter end of the provided range and the median width and planting strip width for an arterial-type boulevard should be on the longer end of the provided range, due to the higher volumes and speeds on an arterial roadway versus a collector roadway. An example of a collector-type boulevard is Waterstone Drive. An example of an arterial-type boulevard is the proposed future widening of South Churton Street.

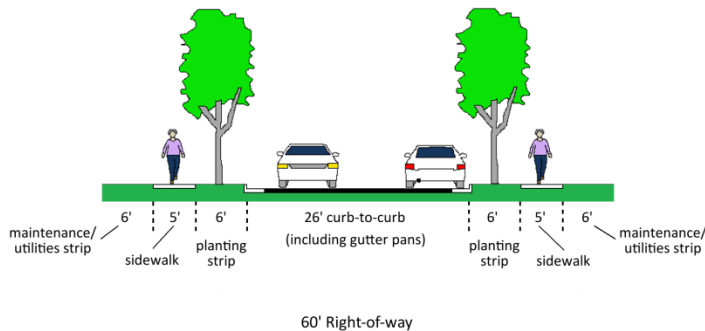
Map of Existing Roadway Classifications

On the next page you will find a map showing recommended classifications for all streets currently within the Town of Hillsborough and its Extraterritorial Planning Jurisdiction. This map is intended to provide guidance regarding improvements that may be undertaken along existing streets in connection with development activity—for more information on retrofitting existing streets, see Section 2.2. Please note that it is not the intention of the Town of Hillsborough to bring all existing streets up to the standards outlined in this document. Please note that the map incorporates planned roadway improvements from the DCHC MPO Metropolitan Transportation Plan and the Churton Street and Cornelius Street corridor plans.

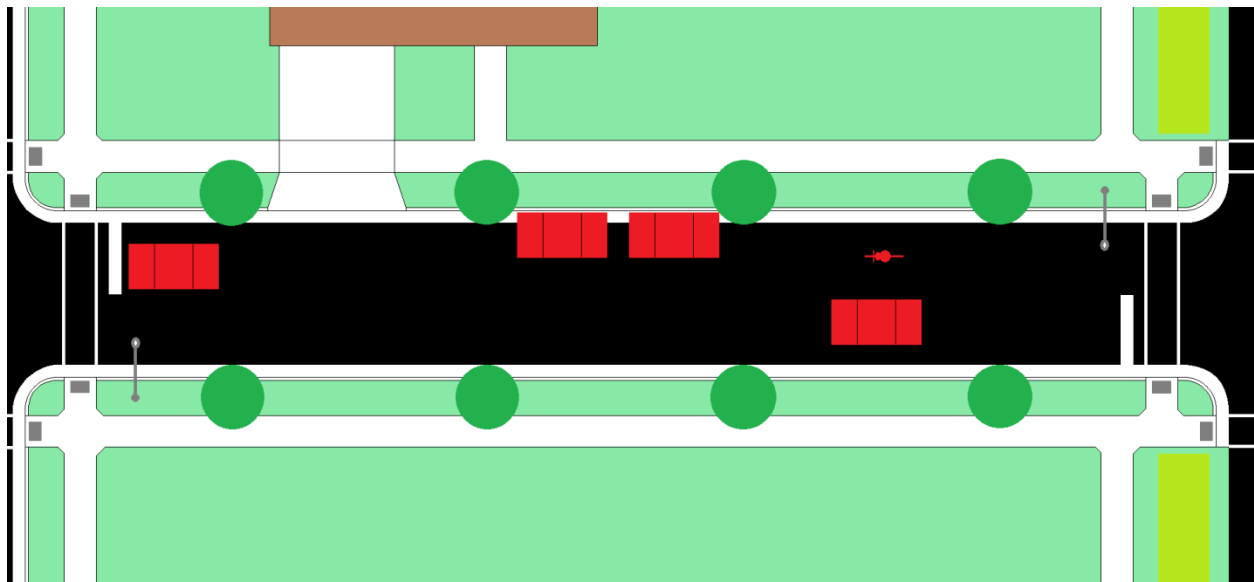
On the pages that follow the map you will find diagrams showing the proposed cross-section and plan view for each of the nine roadway classifications, as well as a summary of the design elements for each. These drawings are meant to be illustrative of the “typical” design for streets and are not engineering drawings. In some situations, particularly retrofits of existing streets, there may be variations from these typical sections. There is additional information available regarding each of the design elements in Section 2.2.



RESIDENTIAL LOCAL STREET

**Residential Local Streets**

are the primary type of street found within residential neighborhoods. These are low-volume, low-speed streets, where it is appropriate for bicycles, automobiles, and parked vehicles to share space within the roadway. By default, most new residential local streets should be designed with curb and gutter, although there may be exceptions – a separate design is provided for streets without curb and gutter.

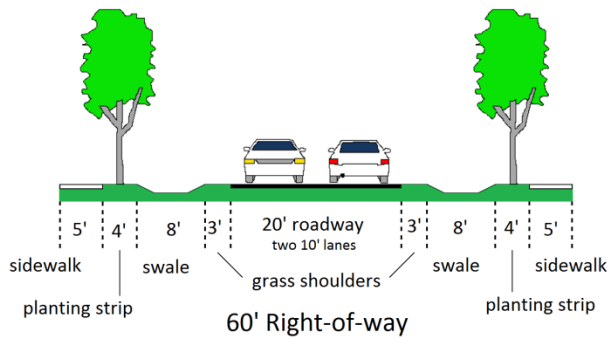
**Summary of Design Elements**

Right-of-way width	60 feet
Roadway width (face of curb to face of curb)	26 feet
Planting strip width	6 feet on each side of street
Sidewalk width	5 feet on each side of street
Maintenance/utilities strip width	6 feet on each side of street
Curb radius at intersections	5 feet recommended, 10 feet maximum
Street trees (within planting strip)	every 40 feet
Street lighting (within planting strip)	at intersections, and at least every 175 feet
Speed limit	20-25 miles per hour
Lane striping	none
Crosswalk striping	standard
On-street parking	allowed

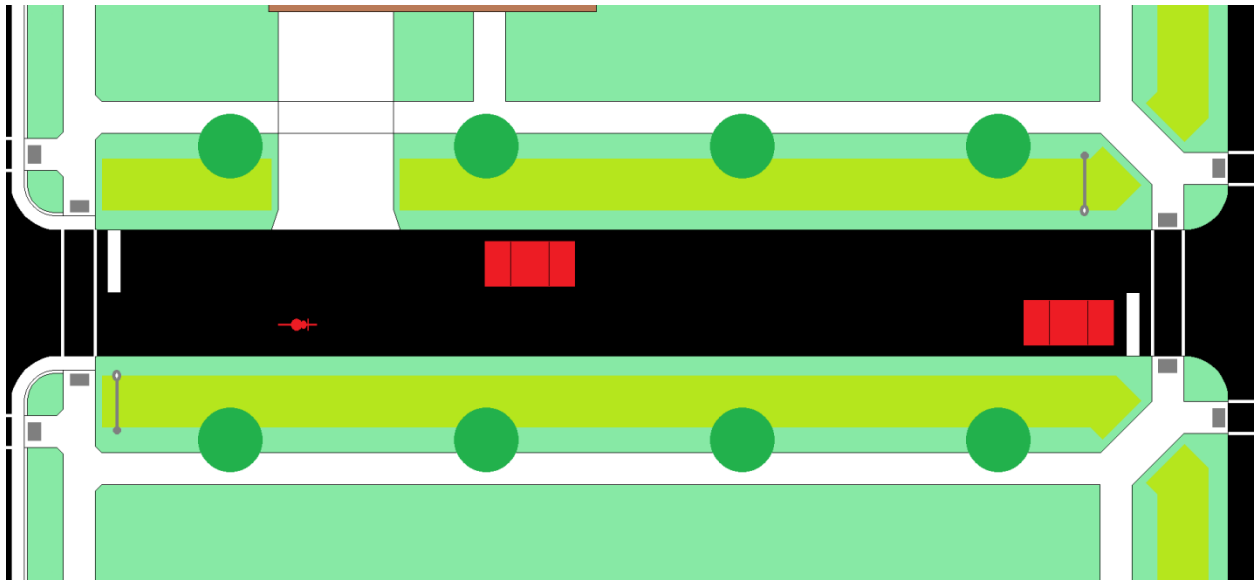
Please see next page for information on Residential Local Streets without curb and gutter treatments.

RESIDENTIAL LOCAL STREET

Without Curb & Gutter



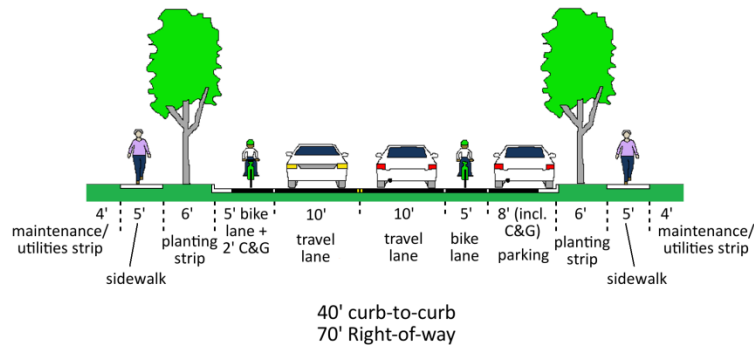
Residential Local Street (option without curb & gutter) – this street type is appropriate in locations with low traffic volumes and speeds, very low usage of on-street parking, and geographic conditions that make open drainage preferable. This design should only be used sparingly in new developments. The design is not able to accommodate on-street parking. Sidewalks are located on the rear side of drainage swales.



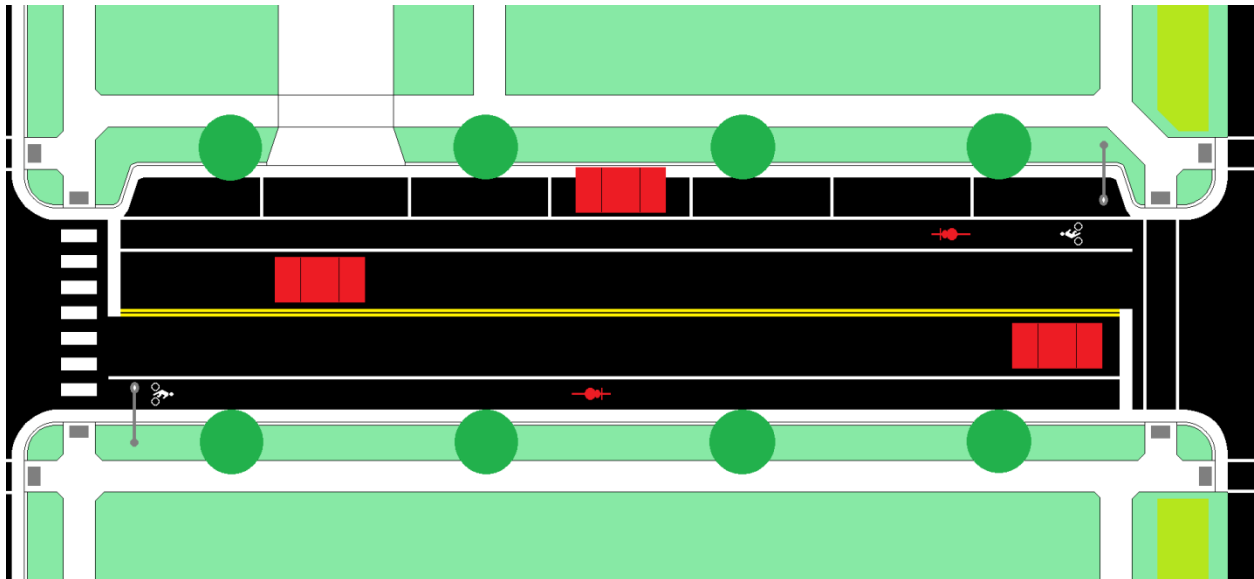
Summary of Design Elements

Right-of-way width	60 feet
Roadway width (to edge of pavement)	20 feet
Grass shoulder width	3 feet
Drainage swale width	8 feet on average (may vary)
Planting strip width	4 feet, located behind drainage swale
Sidewalk width	5 feet, located behind drainage swale
Curb radius at intersections	5 feet recommended, 10 feet maximum
Street trees (within planting strip)	every 40 feet
Street lighting (within planting strip)	at intersections, and at least every 175 feet
Speed limit	20-25 miles per hour
Lane striping	none
Crosswalk striping	standard
On-street parking	not recommended

RESIDENTIAL COLLECTOR STREET

**Residential Collector Streets**

are the streets that “collect” traffic from local streets and connect to the larger transportation network. These are medium-speed, medium-volume streets, and as such include separated lanes for motor vehicle traffic, bicycle traffic (optional as appropriate), and parked vehicles. By default, most new residential collector streets should be built with curb and gutter, although there may be exceptions – a separate design is provided for streets without curb and gutter.

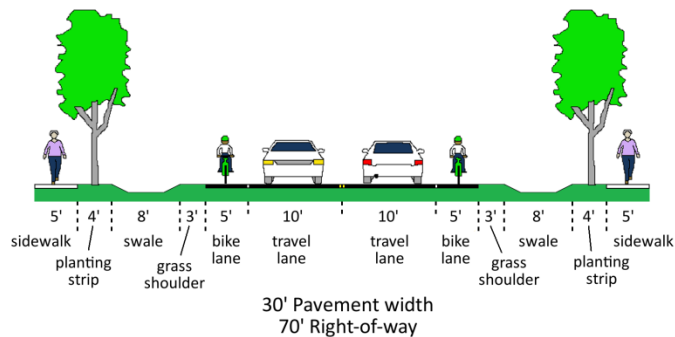
**Summary of Design Elements**

Right-of-way width	70 feet
Roadway width (face of curb to face of curb)	40 feet (34 feet at crosswalk bulbouts)
Planting strip width	6 feet on each side of street
Sidewalk width	5 feet on each side of street
Curb radius at intersections	5 feet recommended, 10 feet maximum
Street trees (within planting strip)	every 40 feet
Street lighting (within planting strip)	at intersections, and at least every 175 feet
Speed limit	25-35 miles per hour
Lane striping	travel lanes, bicycle lanes (opt.), parking lane
Crosswalk striping	standard (minor crossings) or high-visibility (major crossings or poor-visibility crossings)
On-street parking	allowed on one side only (marked)

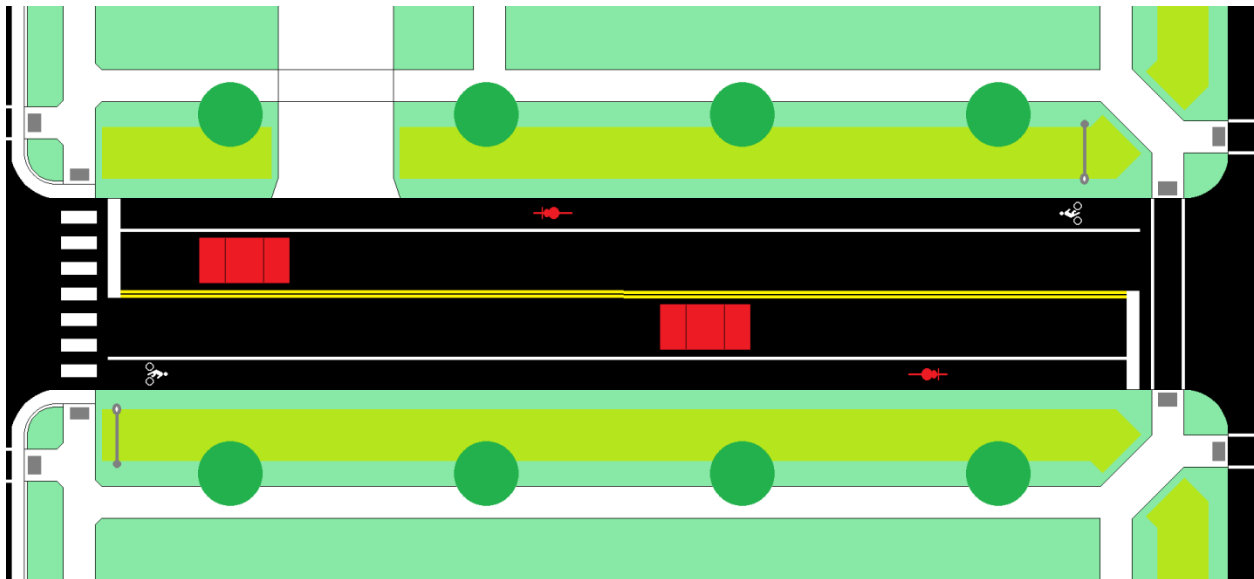
Please see next page for information on Residential Collector Streets without curb & gutter treatments.

RESIDENTIAL COLLECTOR STREET

Without Curb & Gutter



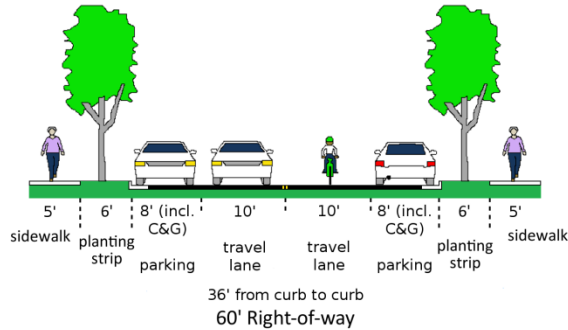
Residential Collector Street (option without curb & gutter) – this street type is appropriate in locations where a residential collector street is desired but geographic conditions make open drainage preferable. This design should only be used sparingly in new developments. The design is not able to accommodate on-street parking and should not be used in areas where on-street parking is desirable. Sidewalks are located on the rear side of drainage swales.



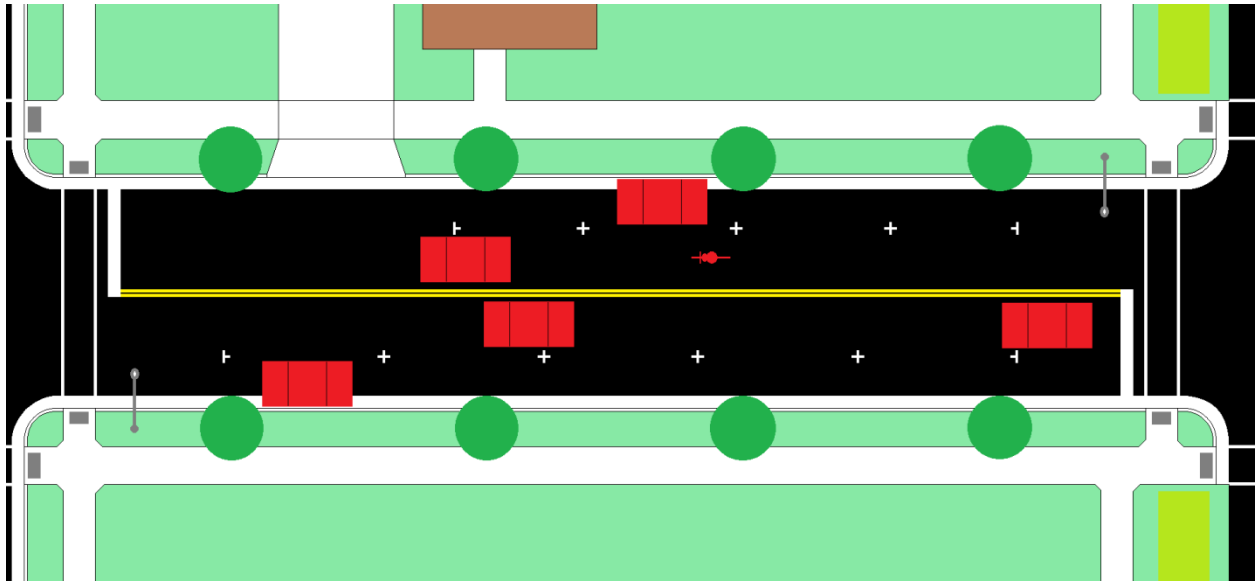
Summary of Design Elements

Right-of-way width	70 feet
Roadway width (to edge of pavement)	30 feet
Grass shoulder width	3 feet
Drainage swale width	8 feet on average (may vary)
Planting strip width	4 feet, located behind drainage swale
Sidewalk width	5 feet, located behind drainage swale
Curb radius at intersections	5 feet recommended, 10 feet maximum
Street trees (within planting strip)	every 40 feet
Street lighting (within planting strip)	at intersections, and at least every 175 feet
Speed limit	25-35 miles per hour
Lane striping	travel lanes, bicycle lanes (or paved shoulders)
Crosswalk striping	standard (minor crossings) or high-visibility (major crossings or poor-visibility crossings)
On-street parking	not allowed

COMMERCIAL/INDUSTRIAL LOCAL STREET

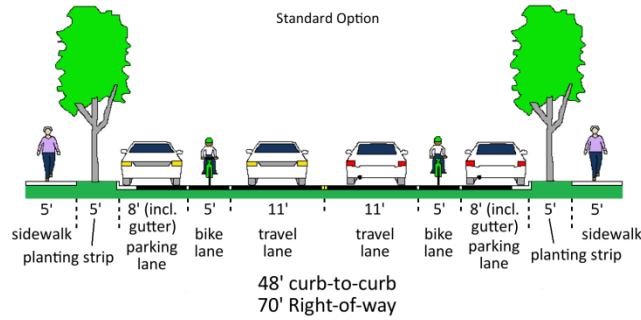
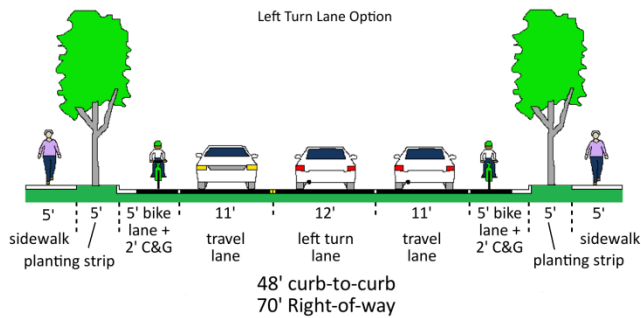


Commercial/Industrial Local Streets are the standard type of streets found within business and industrial districts. These are low-speed streets intended to provide access to businesses and are appropriate for mixed traffic. All commercial/industrial streets should be designed with curb and gutter as the standard design. These streets are intended to allow on-street parking and provide room for truck movements.

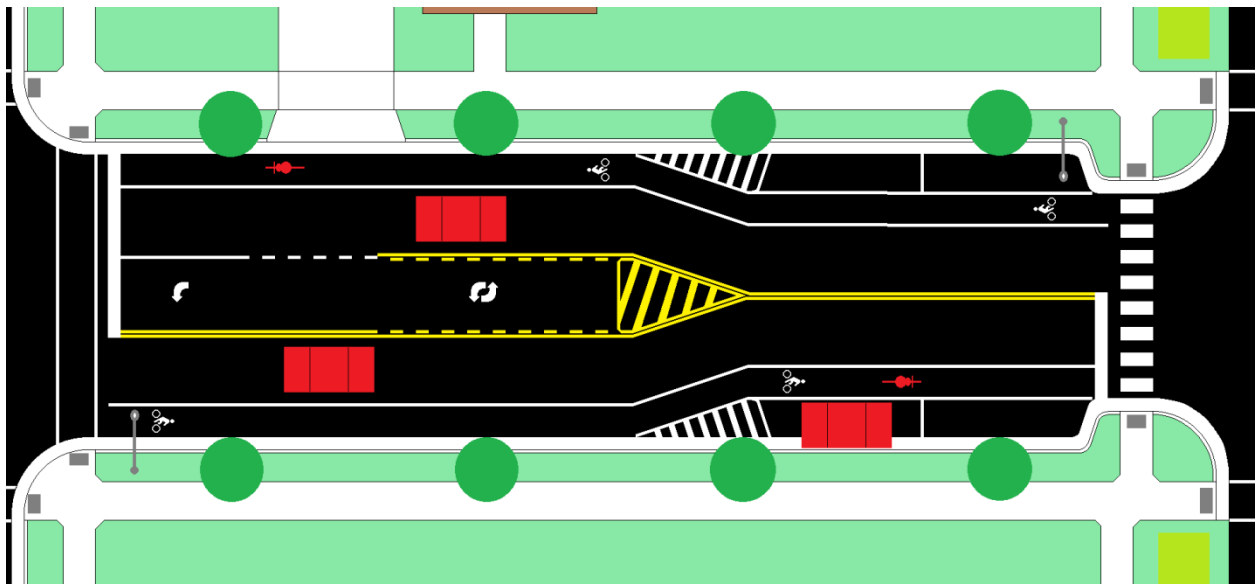


Summary of Design Elements

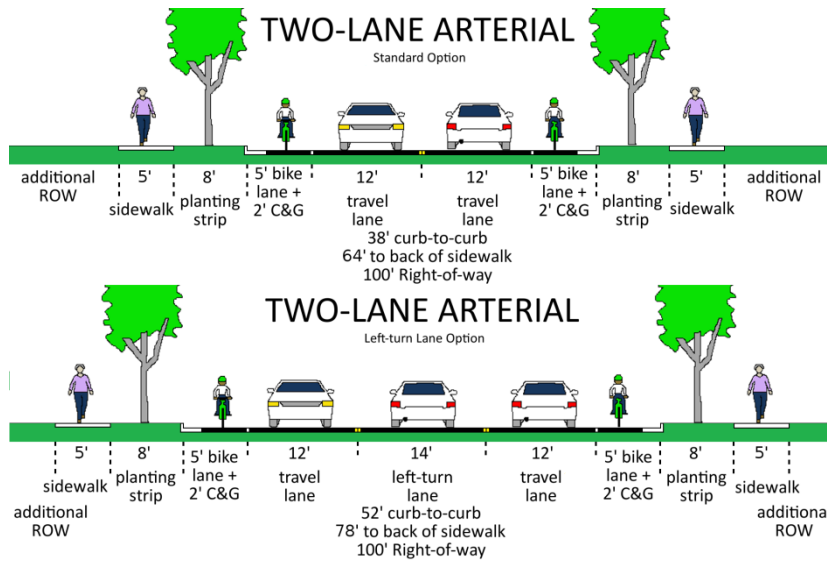
Right-of-way width	60 feet
Roadway width (face of curb to face of curb)	36 feet
Planting strip width	6 feet on each side of street
Sidewalk width	5 feet on each side of street
Curb radius at intersections	10 feet
Street trees (within planting strip)	every 40 feet
Street lighting (within planting strip)	at intersections, and at least every 175 feet
Speed limit	20-25 miles per hour
Lane striping	marked center line, parking stalls
Crosswalk striping	standard
On-street parking	allowed

COMMERCIAL/INDUSTRIAL COLLECTOR STREET**COMMERCIAL/INDUSTRIAL COLLECTOR STREET****Commercial/Industrial**

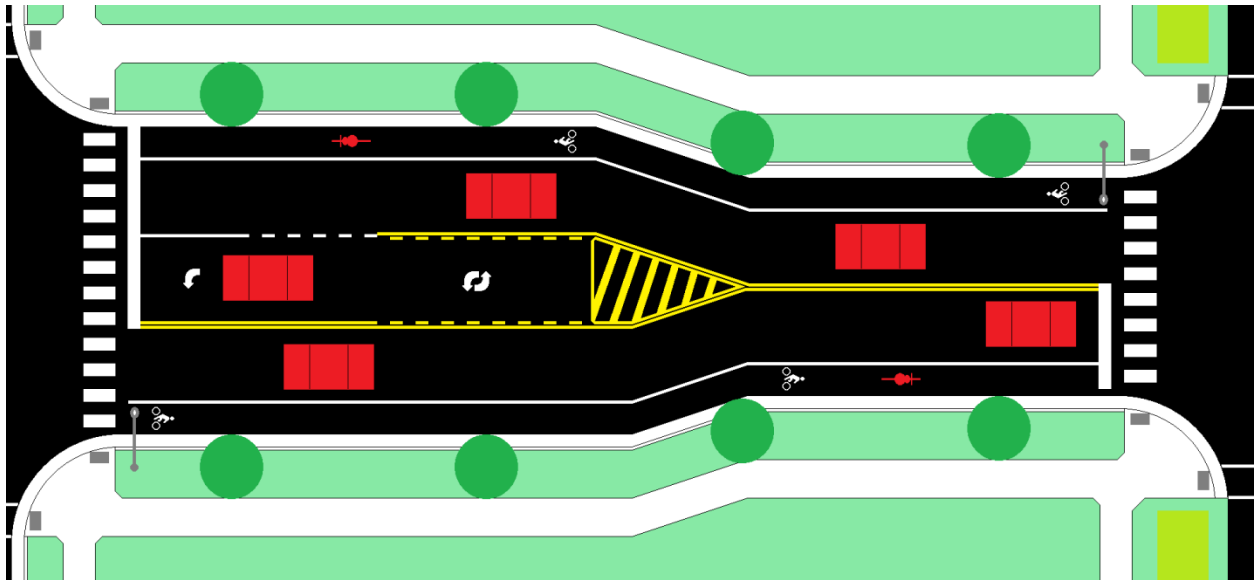
Collector Streets are the network of streets within business/industrial areas that connect local streets with the larger highway network. These are generally medium-speed, medium-volume streets, and as such should have separate marked lanes for motor vehicle traffic, bicycle traffic, and parked vehicles. All commercial/industrial streets should be designed with curb and gutter as the standard design. The standard cross-section should be used in areas with little turning traffic or where on-street parking is desirable. The left-turn lane cross-section should be used in areas with heavy left-turn volumes and can be either a standard turn lane or a two-way left turn lane.

**Summary of Design Elements**

Right-of-way width	70 feet	Roadway width (FOC to FOC)	48 feet (36' at bulbouts)
Planting strip width	5 feet (each side)	Sidewalk width	5 feet (each side)
Curb radius at intersections	10 feet	Street trees (in planting strip)	every 40 feet
Street lighting (in planting strip)	at intersections, and at least every 175 feet	On-street parking	allowed in marked areas
Speed limit	25-35 miles per hour	Crosswalk striping	standard (high visibility at major/poor-visibility crossings)
Lane striping	travel lanes (11'), turn lanes (12'), bike lanes (opt., 5'), parking lanes (8')		



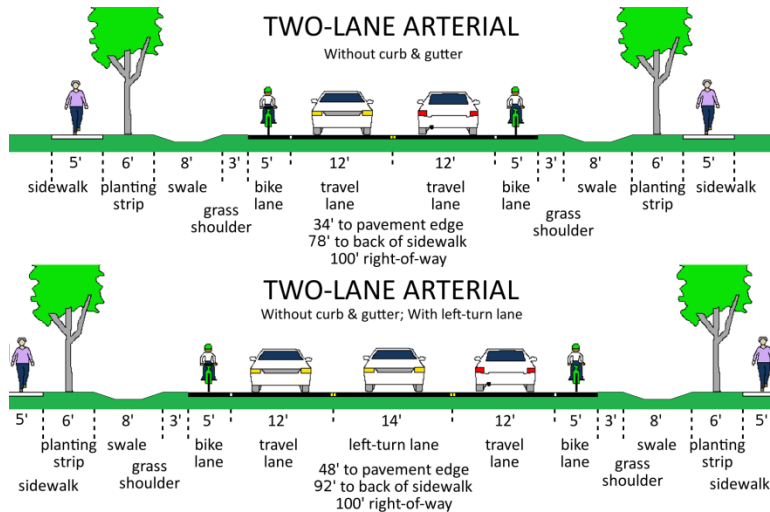
Two-lane Arterial – this category includes major streets whose primary function is to move higher volumes of traffic over longer distances. Many of these streets are maintained by the NCDOT. These cross-sections are intended to complement the NCDOT Complete Streets Planning and Design Guidelines. Two options are provided, with and without a left-turn lane. Curb and gutter drainage treatments are assumed by default.



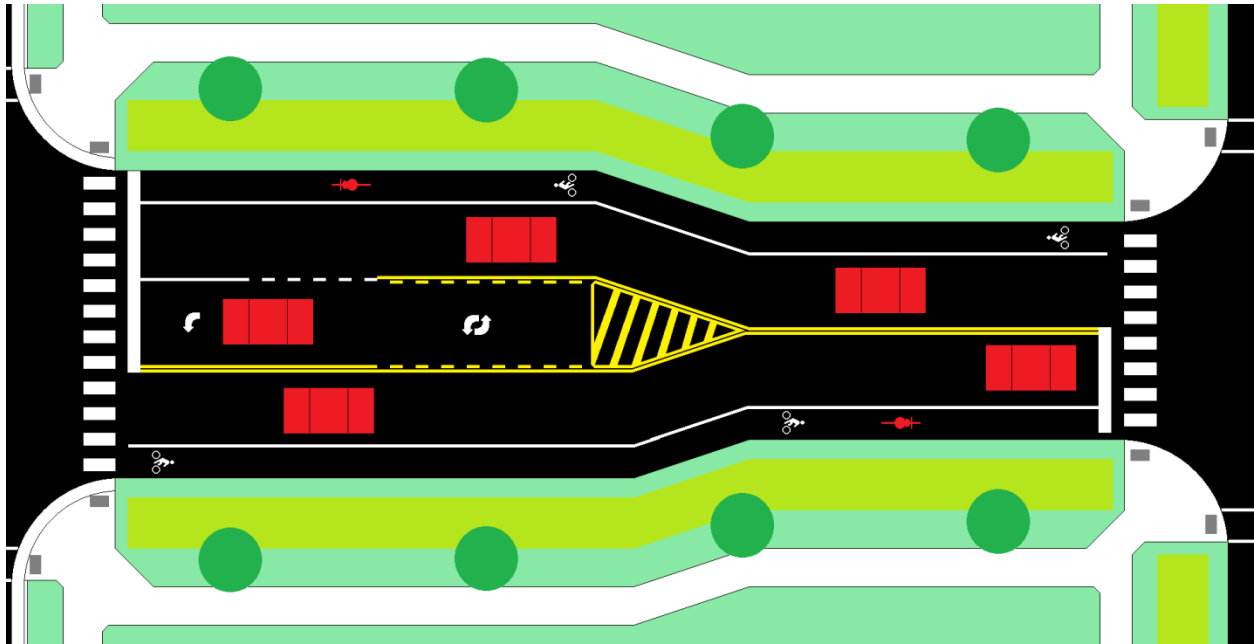
Summary of Design Elements

Right-of-way width	100 feet
Roadway width (face of curb to face of curb)	38 feet (52 feet with left turn lane)
Planting strip width	8 feet on each side of street
Sidewalk width	5 feet on each side of street
Curb radius at intersections	15 feet
Street trees (within planting strip)	every 40 feet
Street lighting (within planting strip)	at intersections, and at least every 175 feet
Speed limit	35-55 miles per hour
Lane striping	travel lanes (12'), left turn lane (14'), bike lane (opt., 5', not including gutter)
Crosswalk striping	high visibility
On-street parking	not recommended

See next page for an example without curb & gutter treatments.



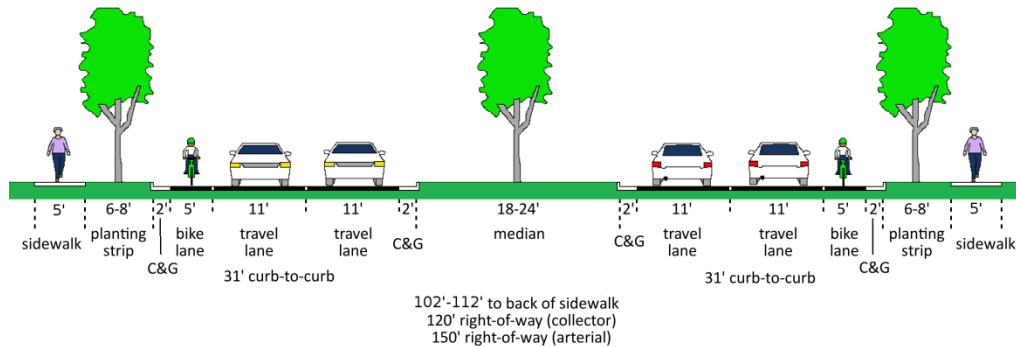
Two-lane Arterial (option without curb & gutter) – in some cases, it may be necessary to design arterial streets with open drainage due to site-specific reasons. This optional cross-section has been developed for those cases and has similar characteristics to the standard arterial cross-section. Two options are provided, with and without a turn lane (which may be a directional turn lane or a two-way left turn lane).



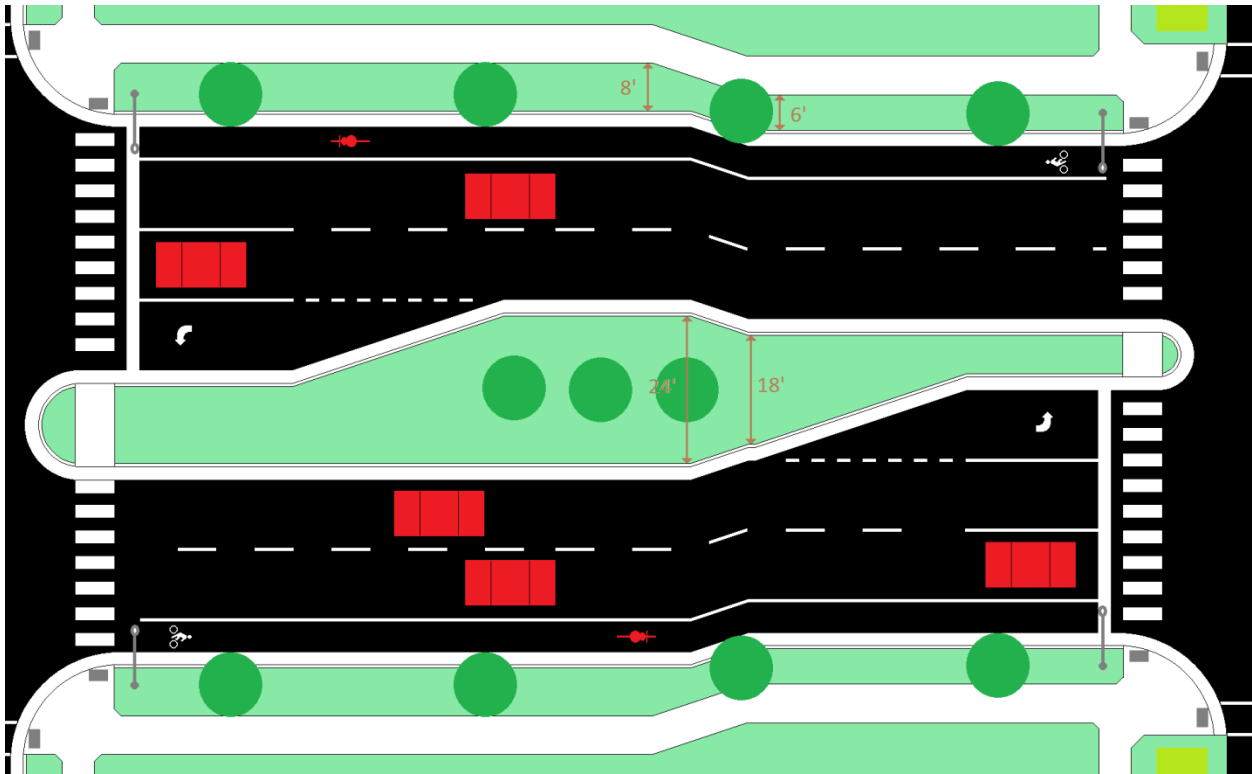
Summary of Design Elements

Right-of-way width	100 feet
Roadway width	34 feet (48 feet with left turn lane)
Grass shoulder width	3 feet on each side of street
Drainage swale width	8 feet on average (may vary)
Planting strip width	6 feet on each side of street
Sidewalk width	5 feet on each side of street
Curb radius at intersections	15 feet
Street trees (within planting strip)	every 40 feet
Street lighting (within planting strip)	at intersections, and at least every 175 feet
Speed limit	35-55 miles per hour
Lane striping	travel lanes (12'), left turn lane (14'), bike lane or paved shoulder (5')
Crosswalk striping	high visibility
On-street parking	not recommended

MULTI-LANE BOULEVARD

**Multi-lane
Boulevard**

All multilane roadways should be designed as boulevards, with grassy and/or landscaped medians. This type of design may be appropriate on collector or arterial streets.

**Summary of Design Elements**

Right-of-way width	120 feet (collector) 150 feet (arterial)	Roadway width (FOC to FOC)	31 feet (one side) (42' at LT lanes)
Planting strip width	6-8 feet (each side)	Sidewalk width	5 feet (each side)
Curb radius at intersections	15 feet	Street trees (in planting strip)	every 40 feet
Street lighting (in planting strip, both sides)	at intersections, and at least every 175 feet	Street trees (in median)	when median is wider than 15'
On-street parking	not recommended	Median width	18-24 feet
Speed limit	25-55 miles per hour	Crosswalk striping	high visibility
Lane striping	travel lanes (11'), turn lanes (11'), bike lanes (opt., 5')		

3.2 ROADWAY DESIGN ELEMENTS

There are a number of elements that must be considered in the design and construction of streets. This section provides more detailed information about these design elements, including potential variations and notes of caution.

Note: All measurements involving curbs are taken from the face of the curb, not the back!

Motor Vehicle Travel Lanes

The main travel lanes of a street are generally designed to be between 10 feet and 12 feet wide, with narrower lanes on minor, low-speed streets, and wider lanes on major, high-speed streets. This document calls for the following lane widths within each roadway classification:

Residential Local streets – no striped lanes; roadways are generally wide enough to accommodate 9-10 feet of space for each of two cars to pass each other when cars are parked on one side of street and 12 feet of space for a single car to pass between cars parked on both sides of street

Commercial/Industrial Local streets – no striped lanes; roadways are generally wide enough to accommodate 11 feet of space for each of two cars to pass each other when cars are parked on both sides of street

Residential Collector streets – 10 feet

Commercial/Industrial Collector streets – 11 feet

Two-lane Arterial streets – 12 feet

Multi-lane Boulevards – 11 feet

It is important to note that when travel lanes are adjacent to the curb, the width of the gutter pan *does not* count as part of the travel lane, so the effective width of the lane (including the gutter pan) would be two feet wider.

Bicycle Lanes

Bicycle lanes are required on streets that are designated for bicycle lanes in the Town's Community Connectivity Plan, and are recommended but optional on all other collectors, arterials, and boulevards. These lanes should be 5 feet wide, not including the width of any adjacent gutter pan (the effective width when including the gutter pan is 7 feet). In general, bicycle lanes should always be placed to the right of the main travel lanes and to the left of any on-street parking lane. On streets with curbs and gutters, the bicycle lane should contain pavement markings and/or signage to indicate that it is a bicycle lane, so it is not confused with an on-street parking lane. On streets without curbs and gutters, the bicycle lane can be marked as such *or* it can simply be left unmarked as a paved shoulder. For information on bicycle lane signage and pavement markings, please refer to the Manual on Uniform Traffic Control Devices (MUTCD).

The Community Connectivity Plan calls for bicycle lanes on US 70/Cornelius Street; Churton Street between US 70 and Corbin Street; Churton Street south of US 70A near the Eno River; US 70A east of Churton Street; and NC 86 south of US 70A.

See the sections below on Right-turn Lanes and Roundabouts for additional information on accommodating bicycle lanes at intersections.

Parking Lanes

Parking lanes may be provided on residential and commercial/industrial collector streets. On-street parking is also permitted on local streets, although a specific parking lane is not striped on residential local streets. Spaces are marked on commercial/industrial local streets but are not striped as a “lane.” Parking lanes are 8 feet wide, which *does include* the width of the gutter pan (unlike the other categories of lanes)—this means that the edge of the parking lane should be striped 6 feet from the edge of the gutter pan. In most areas, individual parking stalls should be marked within these parking lanes; however, in some lower-use areas it may be possible to stripe the parking lane without marking individual stalls to allow more flexible use of the space. Spaces should be between 22 and 26 feet in length, depending on the space available; spaces that are at the beginning or end of a line and which have room to maneuver straight in and out without encroaching on other parking spaces may be a minimum of 20 feet in length.

When approaching an intersection or mid-block crosswalk on a collector street, the parking lane should end before reaching the crosswalk, allowing for a pedestrian “bulb-out” at the location of the pedestrian crossing. This improves safety by shortening the distance that pedestrians must cross in the street and improving visibility between pedestrians and motorists. On local streets, where bulb-outs are not required, parking spaces should not be marked within 20 feet of a crosswalk.

In some areas, there may not be a need to provide on-street parking on a collector street (for example, if the street is passing through a protected open space where there are no nearby buildings, or if the neighboring land uses all have adequate off-street parking lots).

Left-turn Lanes

Left-turn lanes are permissible on Commercial/Industrial Collector streets, Two-lane Arterial streets, and Multi-lane Boulevards. On boulevards, left-turn lanes should be provided at all median breaks where left turns and/or U-turns are permitted. On commercial/industrial collector and arterial streets, left-turn lanes should be provided at locations where (1) there are many intersections or driveways in close proximity or (2) there is an intersection or driveway with a heavy left-turn volume. Left-turn lanes can serve vehicles in a single direction (typically at an intersection or major driveway) or with a two-way left-turn lane (TWLTL). The need for left-turn lanes will typically be determined through a Traffic Impact Analysis.

Left-turn lanes should have the following widths within each roadway classification:

Commercial/Industrial Collector streets – 12 feet

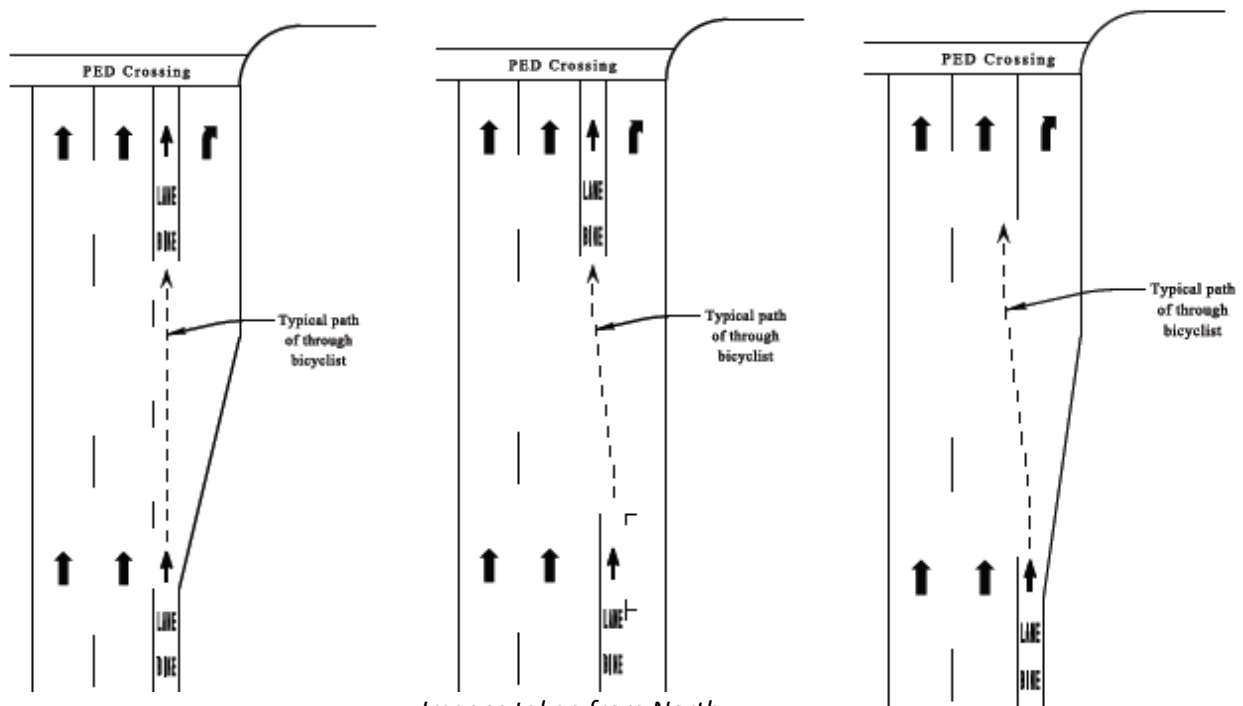
Two-lane Arterial streets – 14 feet

Multi-lane Boulevards – 11 feet (13 feet effective width when including gutter pan)

Right-turn Lanes

The provision of dedicated right-turn lanes is generally discouraged unless a completed Traffic Impact Analysis indicates a demonstrated need for one. Otherwise, right-turn traffic should use the right-most motor vehicle travel lane. When right-turn lanes are provided, they should have the same dimensions as the nearest motor vehicle travel lane (not including the width of the gutter pan as part of the lane). The right-turn lane should be adjacent to the curb or edge of pavement, to the right of the bicycle lane.

The diagram below provides an illustration of the location and marking of bicycle lanes in relation to right-turn lanes. **When the bicycle lane continues straight through the intersection:** At the beginning of the right-turn lane, the bicycle lane marking should transition to a dashed line indicating the space where bicycle traffic will cross over the path of the right-turning motor vehicle traffic. At the intersection, the bicycle lane should be located between the main travel lane(s) and the right-turn lane. A sign at the beginning of the right-turn lane should indicate that turning vehicles must yield to bicycles in the bicycle lane. **When the bicycle lane ends at the intersection:** The bicycle lane should end shortly before the beginning of the right-turn lane and there should be a sign indicating that bicycles must merge into the travel lane.



Images taken from North Carolina Complete Streets Planning & Design Guidelines

Intersection Curb Radius and Approach Angle

The curb radius (or edge-of-pavement radius for a street without curbs) at an intersection has an impact on the ease of making turns in large vehicles and the ease of crossing the intersection for pedestrians and bicycles. Larger curb radii make it easier for vehicles to turn, but smaller curb radii make it easier and safer for pedestrians to cross the street. In general, streets that are more likely to have truck traffic or have higher speeds will need larger curb radii. The following curb radii are recommended for each roadway category:

Residential Local – 5 feet recommended, but up to 10 feet allowed

Residential Collector – 5 feet recommended, but up to 10 feet allowed

Commercial/Industrial Local – 10 feet

Commercial/Industrial Collector – 10 feet

Two-lane Arterial – 15 feet

Multi-lane Boulevard – 15 feet

When a dedicated right-turn lane is provided, a larger curb radius may be necessary for truck movements, since the lane is located directly adjacent to the curb.

In addition to curb radius, another major consideration at intersections is the approach angle of intersecting streets. Streets should intersect at as close to a 90-degree angle as possible. Approach angles less than 60 degrees are not permitted.

Roundabouts

Roundabouts are growing in popularity as an alternative way to design intersections. There are several special considerations that must be addressed when designing roundabouts. The following information is taken from the North Carolina Complete Streets Planning and Design Guidelines:

Roundabouts are a type of yield-controlled intersection characterized by a generally circular shape and design features that create a low-speed environment. A roundabout requires entering traffic to yield the right of way to traffic already in the roundabout. This yield control keeps traffic flowing and can prevent traffic backups as well as delays for motorists, bicyclists, and pedestrians. When operating within their capacity, roundabout intersections typically operate with shorter vehicle delays than other intersections, especially during non-peak traffic times. For this reason, roundabouts support motor vehicle capacity objectives and, when properly designed, also support bicycle and pedestrian travel.

The size, geometry, and applicability of a roundabout is determined by many variables, including street and area type, available space, layout of the existing intersection, intended objectives, traffic volume, the sizes of the vehicles using the roundabout, and the need to design appropriately for speeds that provide safe accommodation for all users.

Roundabouts can help address safety and congestion concerns at intersections. They are designed to enhance traffic efficiency, safety, and aesthetics, and minimize delay for all users including motorists, bicyclists, and pedestrians. The benefits to bicyclists and pedestrians are easiest to obtain with single-

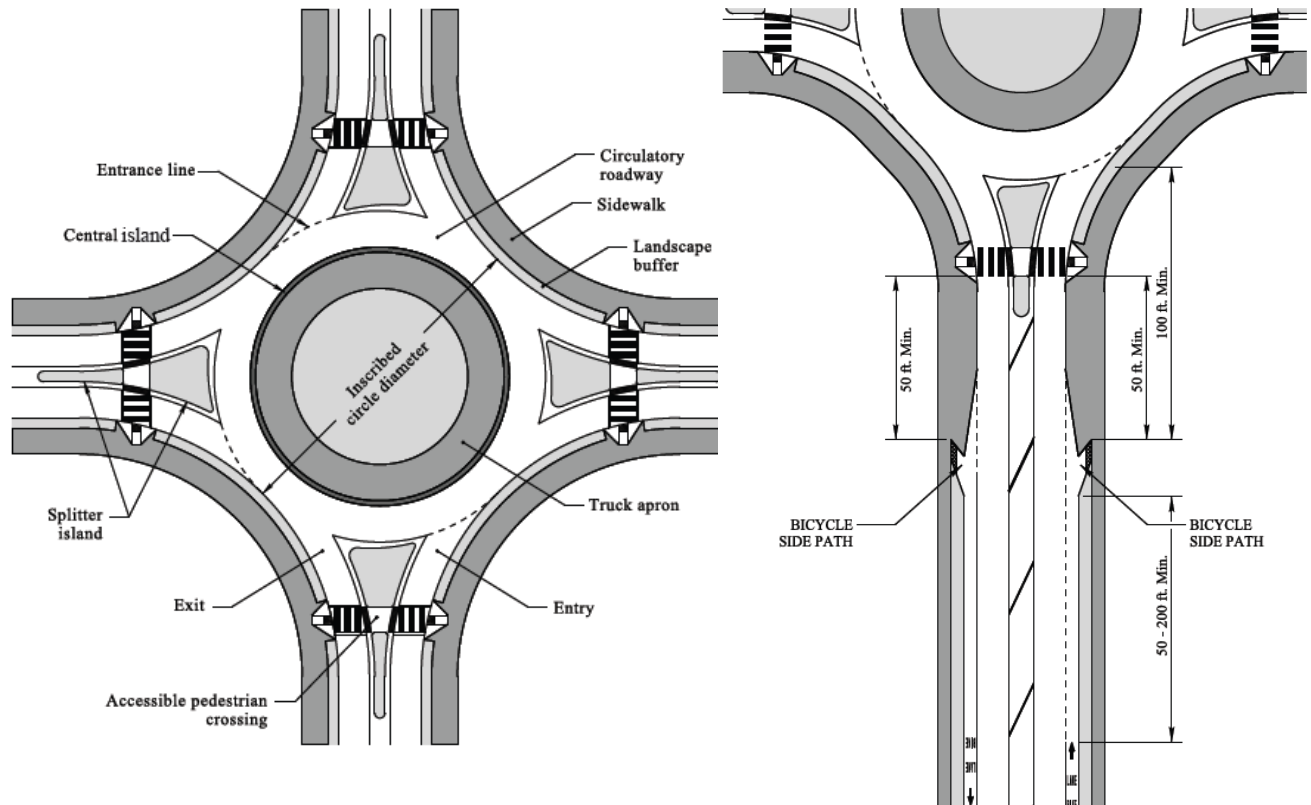
lane roundabouts. Multiple-lane roundabouts can provide difficulties for pedestrians and bicyclists and are not recommended in most situations. When designing a roundabout, the design team should consider the following:

- Apply roundabouts where the context and design objectives allow, but avoid their use for capacity improvements where there are very unequal traffic volumes between the intersecting streets (particularly where one has a very high volume)
- Construct crosswalks (and pedestrian refuges) at least one car length from the roundabout entrance
- Construct the smallest diameter roundabout necessary, with the minimum number of lanes to meet the capacity needs, with single-lane roundabouts preferred
- Construct roundabouts to keep the internal circulation speed low enough to minimize the speed differential between motor vehicles and bicycles
- Construct splitter islands at all entrances, and design them to slow vehicle speeds through deflection, guide motorists and cyclists properly into the roundabout, and to be wide enough to serve as pedestrian refuge islands at crosswalks
- On high-volume roundabouts, provide a separate bike path to allow bicyclists to leave the street prior to the roundabout and re-enter after the roundabout – design carefully to avoid bicycle and pedestrian conflicts at these points; and note that in all roundabouts bicyclists may “take the lane” and travel through the roundabout as a vehicle
- For most roundabouts, the bicyclist should generally “take the lane”, so provide for a transition out of the bike lane prior to entering the roundabout
- Consider reducing entrance speeds by providing speed tables at crosswalks (see Traffic Calming discussion below)
- Provide for large vehicle movements by constructing a mountable apron for the roadway center – ensure that the apron is not comfortably mounted by passenger cars

The illustrations on the next page show the general features of a roundabout and the treatment of bicycle lanes as they approach roundabouts. Additional information about roundabout design can be found at http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_rpt_672.pdf.

The Federal Highway Administration makes the following recommendations regarding the sizing of roundabouts (inscribed circle diameter), based on the area type and design vehicle:

- Mini-roundabouts (design vehicle is Single Unit Truck) – 45-80 feet
- Urban compact (design vehicle is Single Unit Truck/Bus) – 80-100 feet
- Urban single lane (design vehicle is WB-50 truck) – 100-130 feet
- Rural single lane (design vehicle is WB-67 truck) – 115-130 feet



Images taken from North Carolina Complete Streets Planning & Design Guidelines

Bridges & Culverts

Bridges and culverts should be designed in accordance with applicable NCDOT standards and should be designed to accommodate bicycle lanes and sidewalks as indicated in the appropriate cross-section for the category of roadway involved. Bridge railings should be designed at an appropriate pedestrian scale when located adjacent to a sidewalk.

Driveways & Access Management

The Unified Development Ordinance for the Town of Hillsborough and the NCDOT Policy on Street and Driveway Access to North Carolina Highways provide rules regarding the design and location of driveways. In general, on Commercial/Industrial Collectors, Two-lane Arterials, and Multi-lane Boulevards it is recommended to limit the number of direct driveway access points and encourage access management concepts such as shared driveways and improved internal circulation within and between development sites.

Curbs & Gutters

It is expected that most new or improved streets within the Town of Hillsborough will be designed with curbs and gutters for stormwater drainage. These should be designed in accordance with the standards of the Town of Hillsborough and the NCDOT. The standard design will include a gutter pan that is 2 feet wide and a curb that is 6 inches wide (for a total width of 2.5 feet).

All measurements that are provided in the cross-sections within this document measure from the face of the curb. This means that the effective width of any features located behind the curb will actually be 6 inches shorter when measured from the back of the curb. For example, the Residential Local street cross-section includes a 6-foot planting strip adjacent to the curb—the effective width of this planting strip, after accounting for the width of the curb, will only be 5.5 feet.

Gutter pans are generally not included in the calculation of the width of an adjacent lane, with the exception of parking lanes. This is because motorists and bicyclists do not generally treat the gutter as part of the travel lane.

Drainage Swales

It is anticipated that most new or improved streets in the Town of Hillsborough will be designed with curbs and gutters, but in some cases there may be topographic, hydrologic, or policy reasons for designing streets with open drainage for stormwater. This is permissible on Residential Local, Residential Collector, and Two-lane Arterial streets. The cross-sections provided in this document assume an average width of 8 feet for drainage swales, but in reality, the necessary width of these swales would be determined by site conditions and topography. Changes in the right-of-way width may be necessary to accommodate swales greater than 8 feet wide. The width of the grass shoulder, planting strip, and sidewalk on these streets should not be modified.

Street Trees

Street trees should generally be planted within the planting strip that is located between the street and the sidewalk and should be spaced approximately every 40 feet. Street trees should not be placed within 20 feet of an intersection, in order to ensure visibility for motor vehicles. The trees should generally be placed at the center of the planting strip, or at minimum 2.5 feet from the edge of the sidewalk (center of tree)—on some cross-sections with narrow (4 foot) planting strips next to drainage swales this means that the trees should be placed closer to the swale rather than at the center of the planting strip.

When retrofitting existing streets, it may not be possible to place the street trees in a planting strip between the sidewalk and the road. In this case, the street trees may be placed behind the sidewalk, and a narrower planting strip (minimum 3 feet) may be used between the street and sidewalk. It may also be impermissible to place trees in the planting strip between a street and sidewalk on certain NCDOT-maintained streets based on NCDOT regulations, in which case the street trees should be placed behind the sidewalk and a narrower planting strip (minimum 3 feet) may be used between the street and sidewalk.

On divided boulevards, street trees *may* also be provided in the median in any location where the median width exceeds 15 feet (face of curb to face of curb). These trees should be located at the center of the median and should be spaced approximately every 40 feet. Street trees should not be placed within 20 feet of an intersection, and by default should not be placed in areas with left-turn lane pockets (since the median width in these areas will be less than 15 feet).

The types of trees permitted are governed by the Town of Hillsborough, as well as the NCDOT (on state-owned roadways). A list of recommended and prohibited trees may be found in the Hillsborough Unified Development Ordinance Administrative Manual at

<https://www.hillsboroughnc.gov/government/departments-and-divisions/planning/unified-development-ordinance>.

Street Lighting

Street lighting must be provided along all new or improved streets within the town limits. Proposed development outside the city limits that are not seeking annexation are not subject to these standards. Lights should be provided at all intersections, and at least every 175 feet along a street. On multi-lane boulevards, lights should be provided along both sides of the street. LED fixtures are required.

Location and purpose

Poles must be located within the public street right of way if the town is to accept responsibly for the lights. Poles must be located so the light from the fixture predominately lights the traveled portion of the roadway. Typically, this requires placement between the roadside and sidewalk. Poles installed behind the sidewalk must be evaluated by the town prior to installation to determine if the location is adequate for future acceptance. Poles installed behind a sidewalk or otherwise oriented to not illuminate the roadway may not be accepted by the town at the time of street dedication.

Standard fixture

The micro roadway LED fixture, type II, 50-watt, 3000 K is the town's standard road fixture. Installation with underground service on a wood pole is preferred. Applicants may upgrade the pole to style A, provided they arrange to pay all the full additional cost with the electric provider prior to acceptance by the town.

Applicants may also select another fixture type, provided they arrange to pay all the full additional cost with the electric provider prior to acceptance by the town OR they clearly inform buyers within the development that the town will not accept dedication of the fixtures and full responsibility for lighting will remain a responsibility of the property owners association.

Process

Duke Energy is the primary electric provider in the town's jurisdiction although some areas are served by Piedmont Electric. While only Duke Energy is referred to in the following paragraphs, the same process is required if Piedmont Electric is the provider.

Duke Energy will design and install street lighting upon request. During project review, applicants should discuss lighting with public works staff so the town can support the preparation of a design by Duke. The applicant is responsible to begin this process in adequate time to have a design ready for their

construction drawing review. Once the design (layout and fixture selection) has been approved by the town during construction drawing review phase, the applicant will enter into a private three-year Outdoor Lighting agreement with Duke Energy, consistent with town requirements. Hillsborough requires the applicant to pay Duke Energy up front any additional costs above those for standard streetlights on standard wooden poles. A fully signed copy of the lighting agreement must be returned to the town so staff can release the work order for construction by Duke Energy.

At the end of the three-year term for the OL contract, the developer will need to submit a request to the town to take over the monthly operation cost of the street lighting. This should generally coincide with street dedication. If funding is available, the town will enter into a public lighting (PL) service agreement with Duke Energy to take over the monthly operation costs of the public street lighting. If this occurs, the applicant's and property owners association's responsibility for the public street lighting will end at that time.

If this process is not followed or the town does not accept the lights for some reason, the applicant and/or the property owner association will remain responsible for public street lighting until it is accepted by the town.

Signage & Street Naming

All signs placed along streets must conform to the requirements of the Manual on Uniform Traffic Control Devices (MUTCD), which can be found at <http://mutcd.fhwa.dot.gov/>. Customized signs that differ from the standard street signs used within the Town of Hillsborough are permitted, but must conform to MUTCD requirements, which can also be found in **Appendix C**. The developer, property owner, or homeowners' association (as applicable) will be responsible for maintenance of any non-standard or customized signage. The Town will assume maintenance responsibility for standard signs.

Street names must not duplicate or be similar to the names of streets elsewhere within Orange County. For example, Hampton and Hampden or Frazier and Fraser are too similar to each other. Evergreen Court and Evergreen Drive are also too similar, as are Howard Road and Howard School Road, and would not be allowed. All street naming must be done in coordination with Orange County Emergency Services.

Signals

All traffic signals should be designed according to the design criteria of the NCDOT. Currently all signals within the Town are maintained by NCDOT as they are all located on state roads, but any future signals that may be located exclusively on town-maintained roads would be maintained by the Town.

Street Spacing and Layout

Section 6.21 of the Town's Unified Development Ordinance provides detailed requirements on the minimum spacing between intersections, maximum block length, provision of stub-outs, and connection of streets between parcels. These requirements can be found at

<https://www.hillsboroughnc.gov/government/departments-and-divisions/planning/unified-development-ordinance>.

Traffic Calming

Traffic calming treatments may be appropriate on some new streets, particularly on residential collector streets where there is a desire to strike a balance between the needs of residents on a street and the traffic passing through the neighborhood. The Town has a Traffic Calming Policy (included in **Appendix B**) that includes a discussion of a number of potential traffic calming treatments that could be appropriate to apply to a new street. Any proposed traffic calming treatments should take care to ensure pedestrians and bicyclists are not impeded by the proposed treatment. While a petition is not necessary when proposing traffic calming treatments on a new street, the proposed treatments must still be reviewed and approved by the Town. Traffic calming measures may only be used on streets classified as Residential Local or Residential Collector and only on town-maintained streets (not on NCDOT-maintained streets), in accordance with Town policy.

Right-of-Way

Minimum rights-of-way are defined in this document for each category of roadway. In some areas, topographic conditions may require that additional right-of-way be provided, particularly if large amounts of earthwork will be required. The minimum rights-of-way are:

- Residential Local – 60 feet⁴
- Residential Collector – 70 feet
- Commercial/Industrial Local – 60 feet
- Commercial/Industrial Collector – 70 feet
- Two-lane Arterial – 100 feet
- Multi-lane Boulevard (collector-type) – 120 feet
- Multi-lane Boulevard (arterial-type) – 150 feet

Special Considerations when Retrofitting Existing Streets

The standards in this document are intended primarily for use in designing new streets, but they can also be useful in designing improvements to existing streets. For example, these standards can be used to design off-site street improvements that are necessitated by new developments. When applied to existing streets that are being retrofitted, these standards should be viewed as guidelines rather than requirements—it is understood that it may not be possible or desirable bring all existing roads up to these design standards, but they do establish a baseline level of expectation regarding necessary improvements. In retrofit situations, the developer and town will need to negotiate regarding the appropriate design of improvements.

⁴ The Unified Development Ordinance allows a 50-foot minimum right-of-way on cul-de-sac streets. The Residential Local cross-section can be accommodated on a 50-foot right-of-way by placing the utility strip outside the public right-of-way. However, a 60-foot right-of-way is still recommended on these streets.

Example:

A developer is proposing a 200-unit apartment complex along an existing commercial collector street. The complex will also have a rear access point along an existing narrow residential local street. A Traffic Impact Analysis is completed and suggests the need for a left-turn lane on the collector street. Due to right-of-way constraints on the existing collector street, the lanes on the street are narrowed to 10 feet instead of 11 or 12 feet, in order to accommodate the turn-lane with minimal impacts to neighboring properties. Town staff also requests improvements to a 300-foot section of the residential local street between the apartment complex entrance and a nearby collector street. The local street currently has open drainage, no sidewalks, and a 40-foot right-of-way. In order to remain within the existing right-of-way, the developer proposes to modify the standard cross-section by installing curb and gutter and not constructing a planting strip or street trees between the street and the sidewalk.

Private Streets

The Town of Hillsborough Unified Development Ordinance (UDO) includes regulations regarding the design, location, and permissible application of private streets—refer to Section 6.21.4 of the UDO and **Appendix A** of this document for more information. In general, private streets located in multi-family developments must conform to the same design standards as public streets. Private streets are also permitted in minor subdivisions in single-family residential areas when four or fewer homes will have access/frontage on the street, and the design of these streets is governed by the UDO.

4.1 *Pedestrian and Bicycle Paths*

Sidewalks

Generally, sidewalks are required on both sides of all new or improved streets. Sidewalks on new streets should be located behind a planting strip containing street trees. New development on a parcel that fronts a street segment must do one of the following:

1. Construct the sidewalk along the designated frontage.
2. Make a payment to the town in lieu of constructing a sidewalk.
3. Complete a combination of the first two options. All payments received must be deposited into the town's sidewalk construction capital fund.

Sidewalk Design Standards

- Sidewalks shall be at least five (5) feet wide and constructed of concrete at least five (5) inches thick, or such other material as may be approved by the permit issuing authority
- Sidewalks must include a curb and gutter
- Minimum strength 3000 psi concrete
- Minimum 1% cross-slope for drainage, maximum 2% cross-slope
- New sidewalks are required to meet NCDOT standards
- For non-residential lots with existing sidewalks or for sidewalks constructed as part of a new development, shade trees shall be located in the parcel front yard so as to shade the walkway without damaging it. The shade trees shall be installed 10' behind the sidewalk and be spaced no greater than 40' on center. This requirement shall not be applied to non-residential buildings built within 10' of the ROW or with a front courtyard or other site features that provide similar shading.
- For non-residential buildings built within 10' of the right-of-way shade trees shall be installed between the curb and sidewalk in accordance with town planting and right-of-way standards.
- Expansion joints every 30 feet
- The running grade of a sidewalk may not exceed 5% or the running grade of the adjacent roadway, whichever is greater—in areas where a steeper grade is necessary, the sidewalk should be designed as a ramp, which may not have a slope greater than 1:12.
- Sidewalks and walkways shall be constructed to meet Accessible Design Standards set by the Americans with Disabilities Act

ADA Requirements for Sidewalks, shared-use paths, and curb cuts

The ADA Standards for Accessible Design list the following requirements, which apply to sidewalks, greenways, shared-use paths, and curb cuts in Hillsborough.

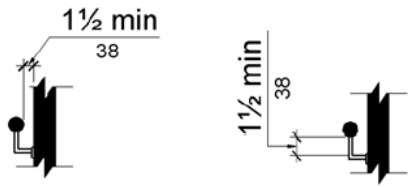
- Surfaces along accessible routes shall be stable, firm, and slip resistant.
- The maximum slope for an ADA sidewalk is 1:20; any part of an accessible route with a slope greater than 1:20 shall be considered a ramp.

- The least possible slope shall be used for any ramp. The maximum slope of a ramp in new construction shall be 1:12. The maximum rise for any run shall be 30 inches.
- Curb ramps and interior or exterior ramps constructed on sites or in existing buildings or facilities where space limitations prohibit the use of a 1:12 slope or less may have slopes and rises as follows:
 - A slope between 1:10 and 1:12 is allowed for a maximum rise of 6 inches.
 - A slope between 1:8 and 1:10 is allowed for a maximum rise of 3 inches.
 - If a ramp run has a rise greater than 6 inches or a horizontal projection greater than 72 inches, then it shall have handrails on both sides. Handrails are not required on curb ramps. Handrails shall be provided along both sides of ramp segments. The inside handrail on switchback or dogleg ramps shall always be continuous.
- Curb ramps shall be provided wherever an accessible route crosses a curb.
- The minimum width of a curb ramp shall be 36 inches, exclusive of flared sides.
- If a curb ramp is located where pedestrians must walk across the ramp, or where it is not protected by handrails or guardrails, it shall have flared sides; the maximum slope of the flare shall be 1:10.
- Transitions from ramps to walks, gutters, or streets shall be flush and free of abrupt changes. Maximum slopes of adjoining gutters, road surface immediately adjacent to the curb ramp, or accessible route shall not exceed 1:20.
- Curb ramps at marked crossings shall be wholly contained within the markings.
- To align crosswalks, fan-shaped ramps are encouraged to retrofit existing intersections.

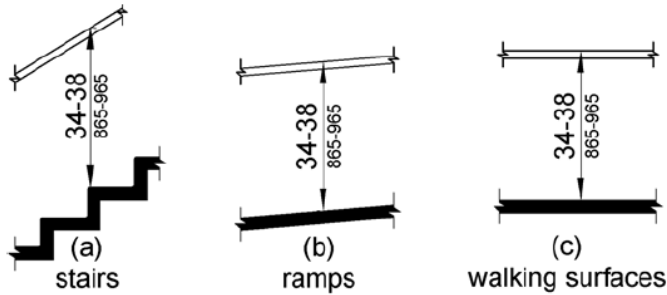
All sidewalks must meet the requirements of the Americans with Disabilities Act (ADA), including the provision of curb ramps and detectable domes at intersections. In the downtown historic district, the detectable domes should be black and set in concrete, with paver or stamped paver walkways; outside downtown, the detectable domes should be yellow. For more information on potential curb ramp designs, refer to Appendix D of the North Carolina Complete Streets Planning and Design Guidelines at <http://www.completestreetsnc.org>.

Handrails

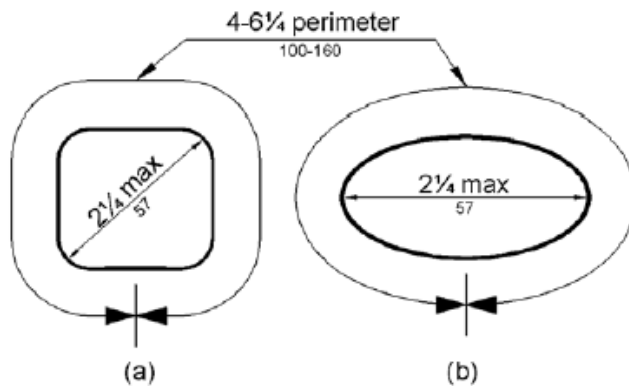
Handrails are necessary on sidewalks that are adjacent to a slope or retaining wall, as well as on ramps (other than standard curb ramps) and stairs. Handrails must be placed between 34 and 38 inches above the sidewalk and the handrail posts should be located no more than 8 feet apart. There must be at least 1.5 inches clearance between the handrail and an adjacent wall or obstacle. Handrails must have a continuous gripping surface that is not obstructed along the top or sides of the rail—no more than 20% of the bottom of the rail may be obstructed. Circular handrails are preferred and must be between 1.25 and 2 inches in diameter. At each end of a ramp or sidewalk section with a handrail and at the top of a flight of stairs, the rail must extend for an additional 12 inches beyond the required distance and then return to a wall, guard, or landing surface. At the bottom of a flight of stairs the rail must extend at the same slope as the stairs for a distance of at least one tread depth and then return to a wall, guard or landing surface. For more information, see <http://www.ada.gov/regs2010/2010ADASTandards/2010ADASTandards.htm#pgfld-1006316>. The following drawings are taken from the ADA standards and provided for reference.



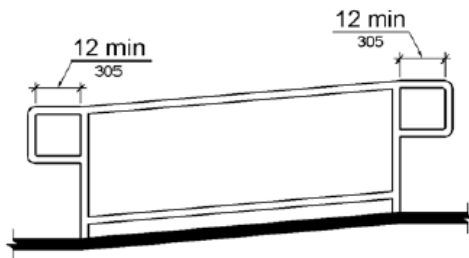
Clearance requirements around handrails



Handrail height requirements



Handrail shape/diameter requirements



Handrail extension requirements at top/bottom of ramp

While this document does not prescribe a specific brand or product design for handrails, it is recommended that any handrails constructed under these guidelines be black or brown metal. Additionally, within the Historic District, handrails should be designed to be consistent with the wrought-iron style handrails used elsewhere within the district. An example from downtown Hillsborough is shown on the next page. This style of handrail (or comparable) is *recommended* for use throughout the community but is *required* in the historic district. Available brands in this type of style include Specrail Bridgeport with ADA handrail and Alumi-guard Handrails, but other similar-looking styles or custom designs are also acceptable.



These pictures from the stairway between E Margaret Lane and the Orange County Sheriff's Office show a railing that combines vertical elements similar to a wrought-iron fence with an ADA-compliant handrail attached.

Crosswalks

Crosswalks are required at all intersections where there are sidewalks on both sides to connect with (for example, if a new road with a sidewalk ends at an intersection with an existing road without sidewalks, then it is not necessary to stripe a crosswalk across the existing road since there is not a sidewalk to connect to on the far side of the road). There are three types of crosswalks: standard, high visibility, and stamped concrete. A standard crosswalk is simply marked with a white line running along each edge of the crosswalk. Standard crosswalks are appropriate for crossings of local streets and lower-volume collector streets. High visibility crosswalks are marked with a “zebra” pattern of alternating 2-foot-wide white stripes perpendicular to the crosswalk, and are appropriate on higher-volume collector streets, arterial streets, and multi-lane boulevards, as well as any location with poor visibility or where a crosswalk might be unexpected (such as mid-block crossings). Stamped concrete crosswalks use colored and textured concrete (typically designed to resemble a brick pattern) to demarcate the crosswalk location and are typically located in historic districts or other areas with special streetscape designs. All crosswalks should have a minimum width of 6 feet, with wider crosswalks appropriate in areas of high pedestrian activity.

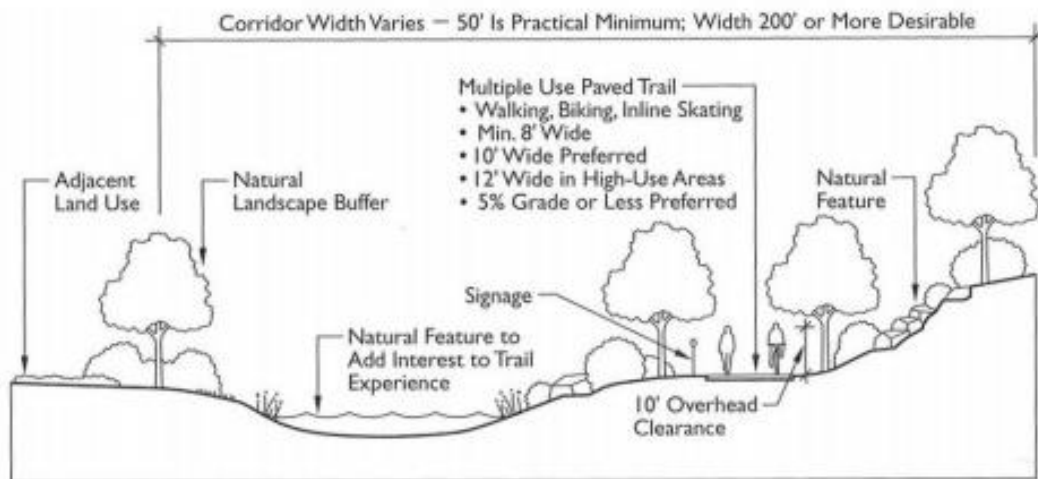
Safety signage appropriate to crosswalks shall be installed, consistent with the MUTCD. The town will consider requests for pedestrian signals in the following circumstances:

- The location requires the crossing of more than two lanes of traffic or more than fifty feet (with or without a center pedestrian refuge) whichever is less.
- The location is not at an intersection of streets already regulated with traffic signals or all way stop signs.
- The town receives a request from a resident, property owner, or business owner for this treatment and the public works manager agrees the sign is necessary for pedestrian safety in the requested location.
- The signal and related sign can be installed consistent with the MUTCD.

Greenways

Public greenways accepted by the Town of Hillsborough must be built to the following standards (see Public Greenway Construction Checklist on page 45):

- Minimum 8' wide path on primary routes
- Greenways built in urban areas or high-traffic areas should have a minimum of 10' wide path
- Minimum 2' wide grassed shoulders on each side of path
- Maximum side slopes of 3:1 beyond 2' grassed shoulders
- Minimum 2" thick hot mix asphalt surface course or 6" thick 3000 psi concrete
- If concrete, then control joints every 5'
- Minimum 1% and maximum 2% cross-slope
- 6" compacted ABC subbase extended 1' beyond each side of path
- ABC subbase shall be proof-rolled prior to placement of asphalt or concrete
- Woven geotextile fabric underneath ABC subbase
- Subgrade shall be proof-rolled prior to placing of ABC stone base
- Maximum Longitudinal slope of 5% except where terrain makes 5% impractical
- 10' overhead clearance within 5' of each side of the trail
- Easements should be a minimum of 20' with minimum 5' shoulder on each side of trail



Destination trails emphasize recreational experience in a natural open space or parklike setting. They are located within a greenway, natural area, parkway, or designated trail corridor and typically accommodate walkers, bicyclists, and inline skaters.

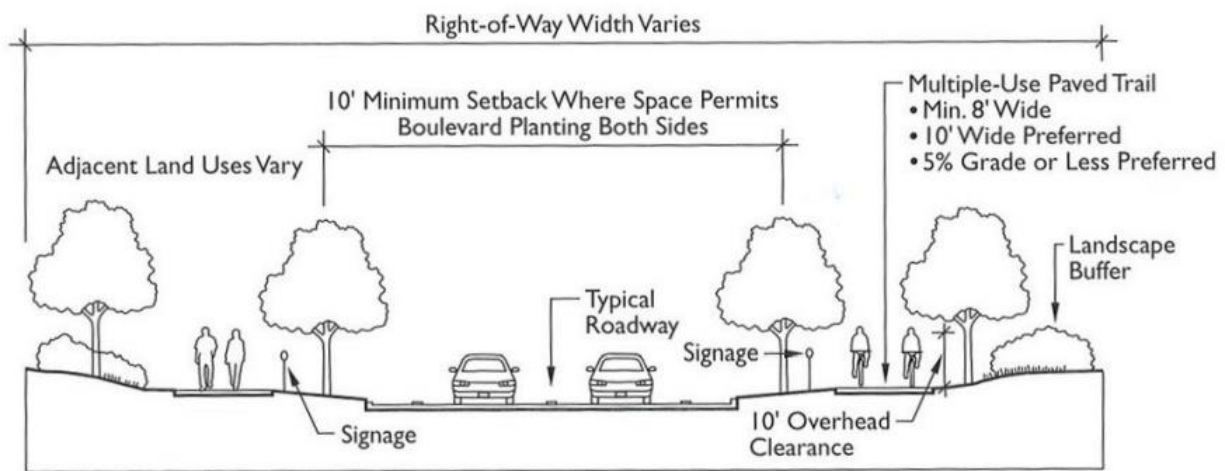
DESTINATION TRAIL

Source: Brauer & Associates, Ltd.

Shared-use Paths

Shared-use paths can be placed in the right-of-way, can have different lanes for bicyclists and pedestrians, and should be separated from the roadway by a planting strip or median that contains plantings and/or guardrails. Some requirements for shared-use paths include:

- Minimum 8' wide path (10' preferred)
- Minimum 10' setback
- Asphalt or concrete paths
- Maximum Longitudinal slope of 5% except where terrain makes 5% impractical
- 10' overhead clearance within 5' of each side of the trail
- Must be ADA compliant (see requirements on page 40)



Linking trails emphasize safe travel for pedestrians to and from parks and around the community. They are generally located within road right-of-ways or utility easements, but can also be through parkland.

LINKING TRAIL

Source: Brauer & Associates, Ltd.



Public Greenway Construction Acceptance Checklist

1. Prior to Construction

Before construction of a greenway begins:

- ☐ Utilities plans must be approved and all agencies signed off
- ☐ Lighting plans must be approved and all agencies signed off
- ☐ Pavement marking plans must be approved and all agencies signed off
- ☐ Signage plans must be approved and all agencies signed off
- ☐ All permits and approvals must be granted

2. During Construction

Testing:

The developer is required to perform, at a minimum, the tests listed in the chart below. All tests shall be performed by certified inspection personnel and results submitted to the Town of Hillsborough on a **monthly basis**.

	Project	Type of test	Frequency/Timing	Requirements for Passing
<input type="checkbox"/>	Subgrade	Sample	1 sample per material source, per project	Standard proctor ASTM D689, gradation ASTM D4042, particle size ASTM 422, moisture content ASTM D2216, and Ataberg ASTM D4318
<input type="checkbox"/>	Subgrade	Density Test	1 test per 2000 sf within 0" to 12" of subgrade – Provide test reports to town prior to placing ABC stone base	≥ 95% compaction
<input type="checkbox"/>	Subgrade	Proof-roll	Proof-rolling shall be repeated until there is no evidence of "pumping" or displacement	No observable "pumping" or displacement.
<input type="checkbox"/>	Subgrade (ABC)	Sample	1 sample per 5,000 sf or a minimum of 1 sample per project	Standard proctor ASTM D689, gradation ASTM D4042
<input type="checkbox"/>	Subgrade (ABC)	Density Test	1 test per 250 LF or a minimum of 1 test on the final lift	100% compaction
<input type="checkbox"/>	Subgrade (ABC)	Proof-roll	Proof-rolling shall be repeated until there is no evidence of "pumping" or displacement	No observable "pumping" or displacement
<input type="checkbox"/>	Pipe/Utility Backfill	Density Test	1 test per utility or drainage pipe within edge of pavements or curb and gutters.	≥ 95% compaction

			1 test performed on any other utility over 200 LF	
<input type="checkbox"/>	Concrete	Sample: Slump test and air entrainment	Minimum set of 4 cylinders per 50 cubic yards or one set per day of placement	Slump test: 3 - 5 inches Air entrainment: 1.5 - 6%
<input type="checkbox"/>	Concrete	Strength Test	Minimum set of 4 cylinders per 50 cubic yards or one set per day of placement	-1 cylinder at 7-days Strength \geq 2,800 psi -2 cylinders at 28-days Strength \geq 4,000 psi. -1 cylinder HOLD

The developer must provide the following documentation to the Town of Hillsborough for the construction of greenways paved with asphalt (refer to NCDOT Standard Specifications):

- ☐ Proof of Asphalt Lab Certification.
- ☐ Approved Job Mix Formulas.
- ☐ Field verification test results with Gyratory Compactor printout for each asphalt mix design utilized.
- ☐ QC-11 Form for each production day.
- ☐ QA/QC—One form with binder content for each mixture sample tested.
- ☐ M&T 605 Form for each production day.
- ☐ QC-5 Form for each day when core samples are obtained.
- ☐ Most recent nuclear gauge calibration (if applicable).
- ☐ M&T 514 QA/QC Form for each nuclear strip.
- ☐ M&T 516 QC Form for each day nuclear density testing is performed.

The developer must provide copies to the Town of Hillsborough of all delivery tickets for the following materials and certify that the material has been used in the construction of the project on a monthly basis:

- ☐ Aggregate base course (ABC)
- ☐ Surface course asphalt

☐ The developer must contact the Town of Hillsborough regarding any change orders prior to starting the change order work.

Inspections

During construction the town shall conduct the following inspections prior to the Developer/Contractor proceeding to the next phase of construction. The Developer/Contractor is required to make a request for inspection to the town 48 hours in advance. The following are the stages of construction that shall require inspection:

- ☐ Preconstruction
- ☐ BMP (erosion control) construction
- ☐ Rough Grading
- ☐ Major Drainage Structures (36-inch RCP or greater)
- ☐ Sub-grade

- ☐ Sub-base
- ☐ Seeding & Mulching
- ☐ Final Pavements
- ☐ Final inspection

3. Final Inspection

- ☐ A final inspection will be conducted by the town when a minimum of 75% of houses/structures have Certificate of Occupancy
- ☐ Construction inspection is required for streets, sidewalks, stormwater infrastructure, and accessibility requirements
- ☐ Town staff will inspect trees and landscaping, signage, and pavement markings for plan compliance

4. Before Final Acceptance of a Public Greenway:

- ☐ Developer must provide certification of plan compliance
- ☐ Developer must provide certification of ADA compliance
- ☐ Developer must provide certification that all greenways are constructed to NCDOT and Town of Hillsborough standards (Engineer must sign and seal document)
- ☐ All change orders must be documented and reported to town
- ☐ Scaled as-built drawings must be provided to the town showing all utilities and total linear footage of streets and sidewalks (hard copy and electronic copies)
- ☐ Substantial completion certificate must be provided to town
- ☐ Inspection reports must be provided to town
- ☐ Schedule of values for pathway construction costs must be provided to town
- ☐ Maintenance agreements must be in place (landscaping, custom signage etc.)
- ☐ Compliance with checklists must be established
- ☐ Easements and plats must be recorded

5. Warranty Period:

- ☐ One-year warranty period begins once the Town Board accepts greenways and shared-use paths
- ☐ A warranty inspection will occur ten months after acceptance. A punch list of items to be repaired will be provided to the developer/owner

5.1 Street and Park Amenities

Benches and Trashcans

High quality, historically appropriate materials are recommended. Plastic and resins should be avoided because they are not compatible with the historic character of the town. Low-maintenance materials are recommended. The Butler bench by Urbanscape in a black or brown vertical-metal slat is recommended as the standard bench for downtown Hillsborough and town-owned facilities, parks and greenways. The Butler trashcan is recommended as the standard trashcan for town-owned parks and highly visible locations. Victor Stanley dual waste and recycling container is recommended for downtown Hillsborough



6' Black or Brown
Metal Bench
153 lbs.



Matching Metal
Trashcan
111 lbs.



Dog Waste Containers

The Parks and Recreation Board recommends that all new dog waste containers be coordinated with the existing ones installed in River Park and Gold Park. The existing containers are called the Aluminum Complete Dog Waste Station, are made of dark green metal and are available from multiple retailers

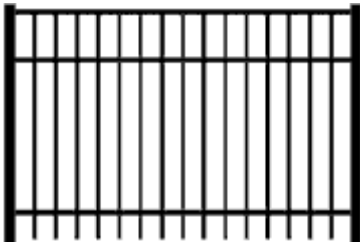


Bicycle Racks

Spiral and U-style bike racks are recommended for use around town because they are well-suited for a variety of bicycle lock styles and provide stability for the bicycle frame. Bicycle racks that allow the frame of the bicycle to rest and be locked are preferred to those that only support the wheel.

Fencing

In cases where fencing is necessary along a street frontage, a style similar to that used for handrails is recommended (see page 31), but without the need to attach a handrail. One such style is the Specrail Saybrook (see picture below). Fencing along a street frontage should be black or brown metal and should be similar to this style. When the fencing will also serve as a handrail for a sidewalk, refer to Page 29 on handrail requirements.



Saybrook fencing by Specrail

Picnic Tables

The Arbor picnic table by Timberform—which is a sturdy, solid wood, A-frame table available in a handicap accessible model—is recommended for parks and facilities.



Appendix A – Private Road Standards

1.1 Private Road Standards

- A. Private roads meeting the following standards may be used in minor subdivisions designed for single-family use, as defined in the Town of Hillsborough Unified Development Ordinance.
- B. These standards are the minimum set forth by the Town, and do not meet Town of Hillsborough or NCDOT (North Carolina Department of Transportation) criteria for acceptance into the Town or State road system, as the situation applies.
- C. No private road will be accepted for maintenance by either the Town or NCDOT (as applicable) unless and until all Town or NCDOT standards (as applicable) for public street acceptance are met.

1.2 Number of Lots or Dwelling Units Served

- A. A private road shall serve no more than four lots (including the residual acreage) or dwelling units.
- B. Private roads serving no more than two lots (including the residual acreage or dwelling units) are not required to be constructed to these standards or inspected before recordation of a Final Plat; however, the right-of-way width requirements do apply. The Town recommends that these roads be constructed to these standards in order to provide adequate access, especially for emergency vehicles requiring the clearances and turn areas as shown in the private road specifications.
- C. Private roads serving a subdivision resulting in three to four lots or dwelling units (including the residual acreage) shall be constructed to these standards.
- D. Private roads serving more than four lots or dwelling units (including existing private roads that are having additional lots or dwelling units over four added with access to the existing private road proposed), shall be built to public street standards, including dedication as such.

1.3 Right-of Way and Travelway Lengths and Widths

- A. The right-of-way width shall be 20 feet in width. The Planning Director may approve a right-of-way width of 18 feet if the lot arrangement, the surrounding development pattern, zoning and existing Town plans indicate conversion to a public street is unlikely. A 50-foot right-of-way may be required if the land and lots are arranged to allow the conversion of the private road to a public street.
- B. Bends in the right-of-way shall be at angles that will permit the construction of curves with a 125-foot minimum curve radius.
- C. The maximum length allowed for a private road shall be 1,000 feet. The distance shall be measured from the point where the private road right-of-way intersects with the public street right-of-way and to the center point of the right-of-way of the proposed private road turnaround.

- D. All private roads in excess of 500 feet shall provide a 10-foot by 20-foot (10' X 30') turnout. The exact location of the turnout shall be determined by the Town Fire Marshal in consultation with the Hillsborough Fire Department and Orange County Emergency Services Department (see Figure 0-0: Turnout for Emergency Vehicles).
- E. Travelway widths for private roads shall be no less than 12 feet; however, a width of 16 feet is preferable.

Table 1: General Standards and Specifications for Private Roads

	Private Road Standard	
	Number of Lots Served	
Total Number of Lots/Dwelling Units Served by Road ¹	3-4	1-2
Right-of-Way Width	20 Ft. ²	20 Ft. ²
Travelway Width	12 Ft.	No Standard
Professional Surveyor Certification of Road in Platted Right-of-Way Required	Yes	Yes ³
Professional Engineer Certification of Road Construction Required	Yes	No

¹ Total number of lots served shall include the residual acreage of the tract being subdivided, where such residual acreage will be accessed by the private road.

² Right-of-way width may be reduced to 18 feet if the lot arrangement, the surrounding development pattern, zoning and existing Town plans indicate conversion to a public street is unlikely. A 50-foot right-of-way may be required if the land and lots are arranged to allow the conversion of the private road to a public street.

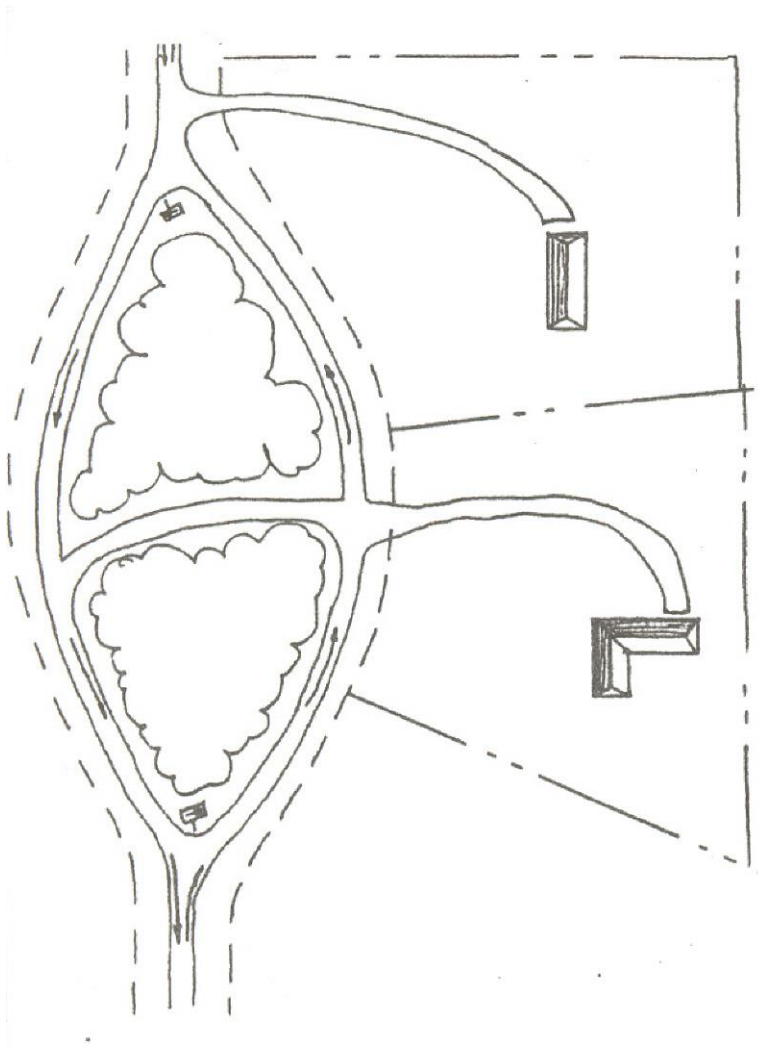
³ Required only if road is constructed to serve lots.

1.4 Two-way Traffic

- A. Two-way traffic shall be provided in order to prevent conflict of vehicles meeting head-on.
- B. Two-way traffic can be accomplished by widening the travelway at prescribed locations to at least 16 feet to allow vehicles to pass or to pull over and stop while another vehicle passes.
- C. Medians may be permitted between travel lanes when such design is desirable for the preservation of natural resources or that excessive cut and fill would be required to construct a roadway to the standard width.
- D. Medians may be permitted only in accordance with the following:
 - 1. Each lane shall contain a minimum of 14 feet of vertical and horizontal clearance.
 - 2. Each lane shall contain a minimum travelway width of 8 feet.
 - 3. No lots shall access directly onto any divided portion of the road unless there is adequate cross-access provided through the median, or some other acceptable means of access and turnaround for emergency vehicles.

4. Both lanes shall be contained within a single right-of-way easement.
5. A standard travelway of required width for the private road shall be constructed where the private road intersects with another private or public road.
6. Signs indicating "One Way" shall be provided where the lanes diverge.

Figure 1: Example of Use of Two-way Traffic Median to Protect Stands of Mature Trees



1.5 Turnarounds

- A. Vehicle turnaround areas shall be provided at the end of all dead-end roads. This can be accomplished by ending the road in a "T" turnaround, "L" turnaround or cul-de-sac.
- B. A "T" turnaround shall conform to the dimensions in Figure 4-21 ("T" Turnaround Dimensions).
- C. An "L" turnaround shall conform to the dimensions in Figure 4-22 ("L" Turnaround Dimensions).

- D. The “T” and “L” turnarounds are preferred.
- E. Culs-de-sac shall have a minimum turnaround travelway diameter of 70 feet and be located within a right-of-way with a diameter of 100 feet.
- F. The location of the turnaround will depend on the arrangement of the lots in the subdivision.
- G. If the private road serves only one lot, the turnaround should be located near the building site.
- H. In a subdivision with several lots, the turnaround shall be at the end of the road and the necessary right-of-way provided.

Figure 2: “T” Turnaround Dimensions

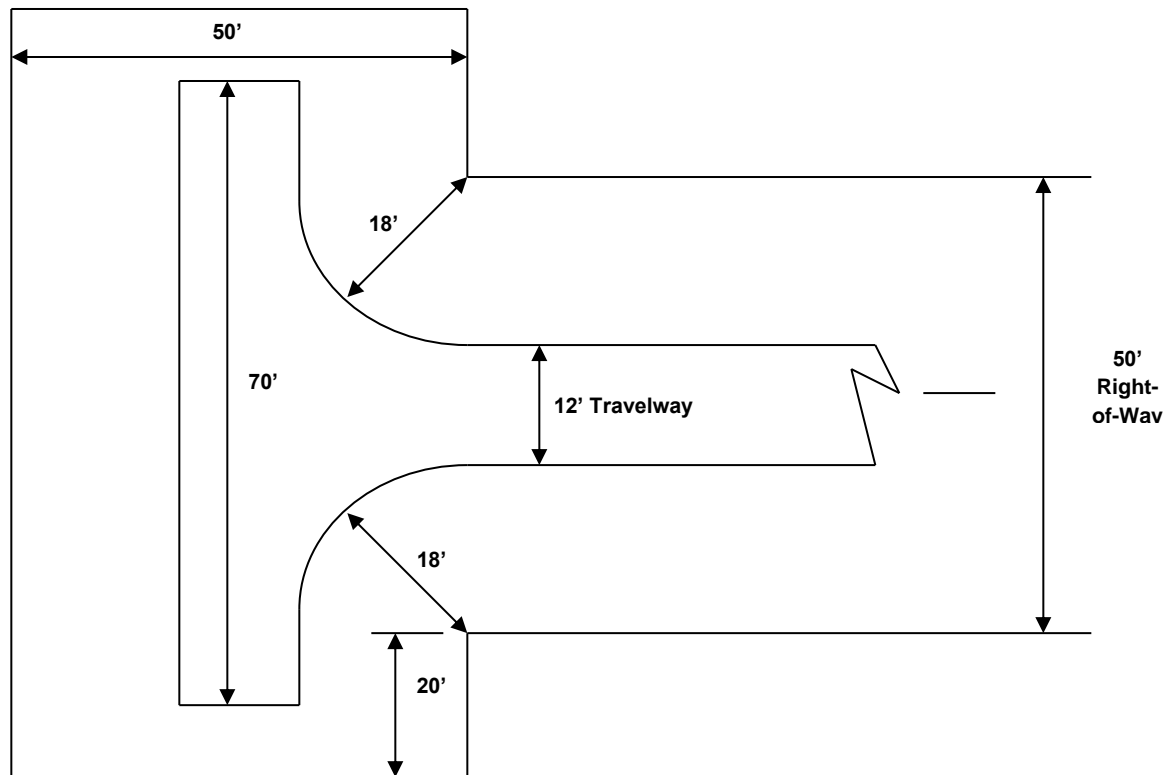
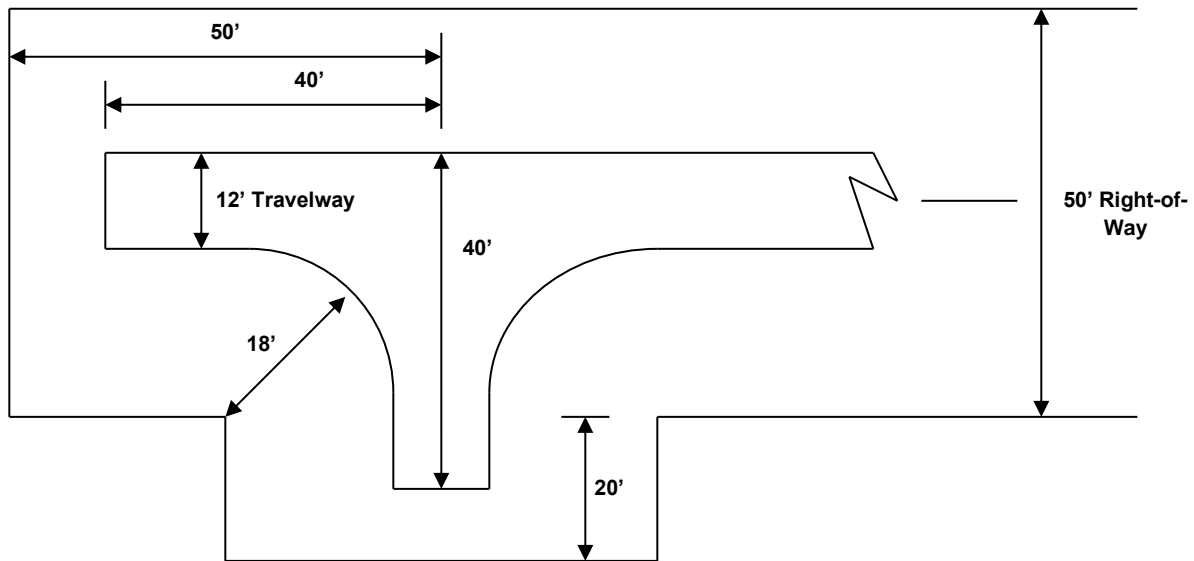


Figure 3: "L" Turnaround Dimensions



1.6 Minimum and Maximum Curve Radius

- A. New curves shall be constructed with a minimum centerline radius of 125 feet, but no greater than 150 feet.
- B. The right-of-way shall be designed with bends that will provide sufficient width to construct the road to this minimum radius. For example, a 90° bend in a 20-foot wide right-of-way will not provide enough area to construct a road with a 12-foot wide travelway.
- C. The right-of-way shall include sufficient width for the travelway and the necessary shoulders, ditches, and slopes.
- D. A curve radius of less than 125 feet may be approved if all of the following conditions are met:
 1. The road existed prior to the adoption and/or enforcement of subdivision regulations in the Town or was approved as part of an earlier subdivision;
 2. Reconstruction of the existing road to meet a 125-foot curve radius is not feasible due to the extent of earthwork that would be required and/or the inability to reconfigure the existing right-of-way location due to ownership or the location of existing structures, wells, or septic systems;
 3. Standards pertaining to road width and grade will be met;
 4. Documentation is received from a professional engineer stating that the proposed curve radius will provide for adequate vehicular access and circulation; and

5. Documentation is received from the Town Fire Marshal and the Orange County Emergency Services Department stating that the proposed curve radius will provide access for the largest emergency vehicle that will use the road.
- E. Figure 4-23 (Example of Unacceptable Curve Radius) illustrates how a curve with a 125-foot centerline radius cannot be contained in a 90° bend of a 20-foot wide right-of-way. Figure 4-24 (Acceptable Curve Radii) illustrates alternative bends that will contain a curve of the minimum centerline radius.

Figure 4: Example of Unacceptable Curve Radius

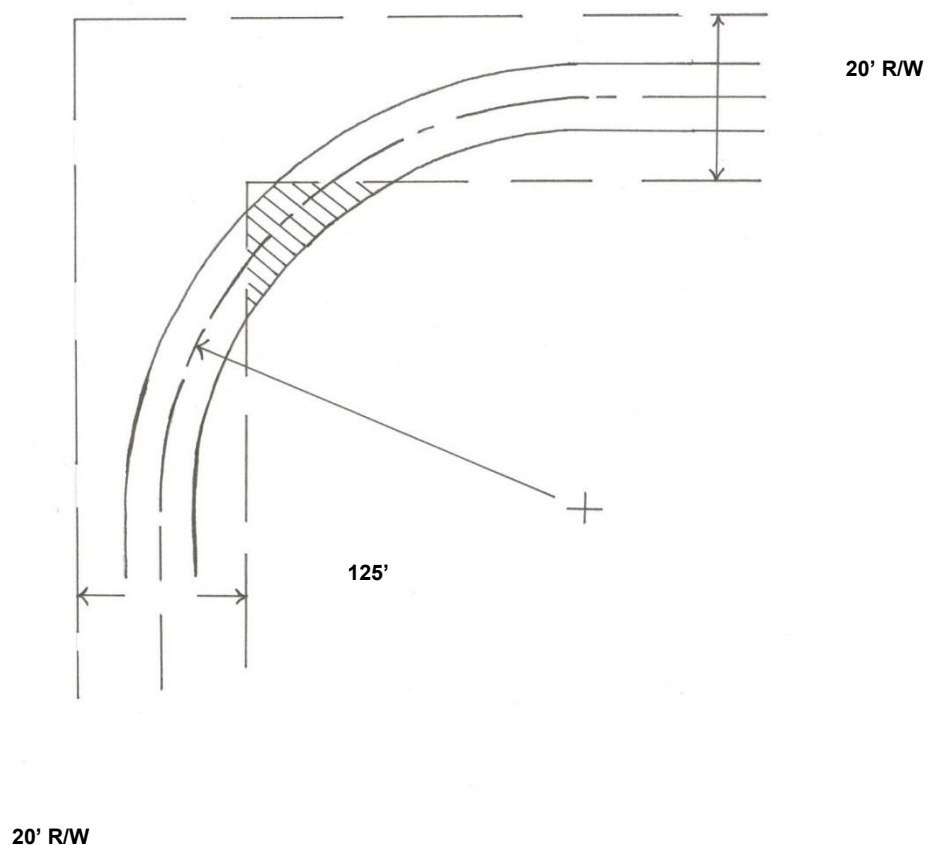
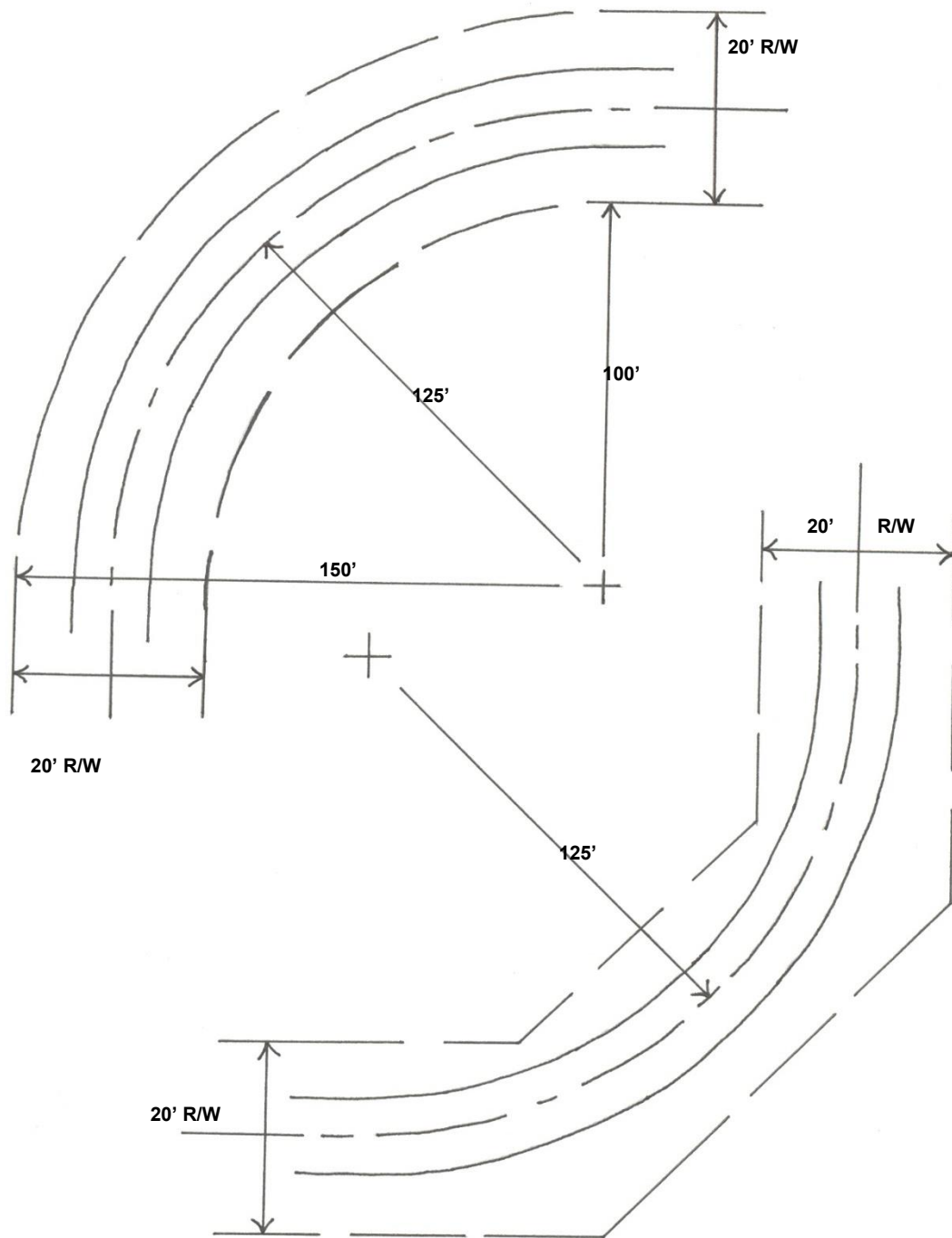


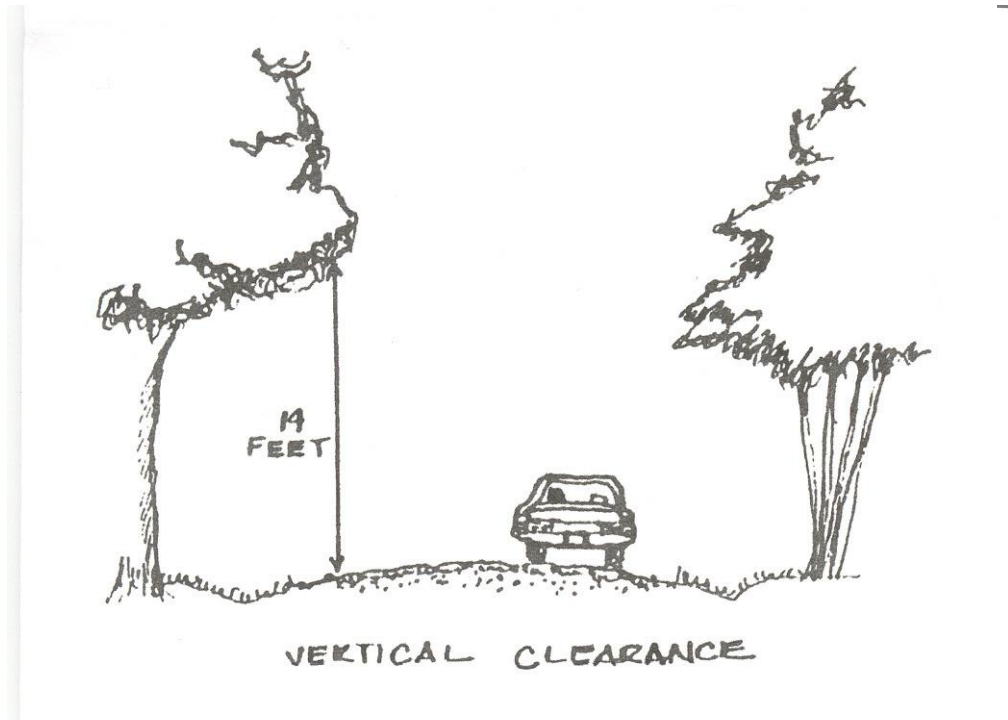
Figure 5: Acceptable Curve Radii



1.7 Vertical Clearance

A minimum 14-foot vertical clearance shall be provided above the travelway to permit the passage of large vehicles under power lines and tree limbs.

Figure 6: Vertical Clearance



1.8 Construction Standards

1.8.1 North Carolina Department of Transportation Driveway Permit

The subdivider proposing to construct a private road that connects with a State-maintained road is responsible for obtaining the required permit for access. The permit may be obtained from the NCDOT District Engineer's Office in Graham, North Carolina.

1.8.2 Compliance with Erosion and Sedimentation Control Regulations

Private road construction shall conform to the Orange County erosion and sedimentation control provisions as found in the Orange County Unified Development Ordinance.

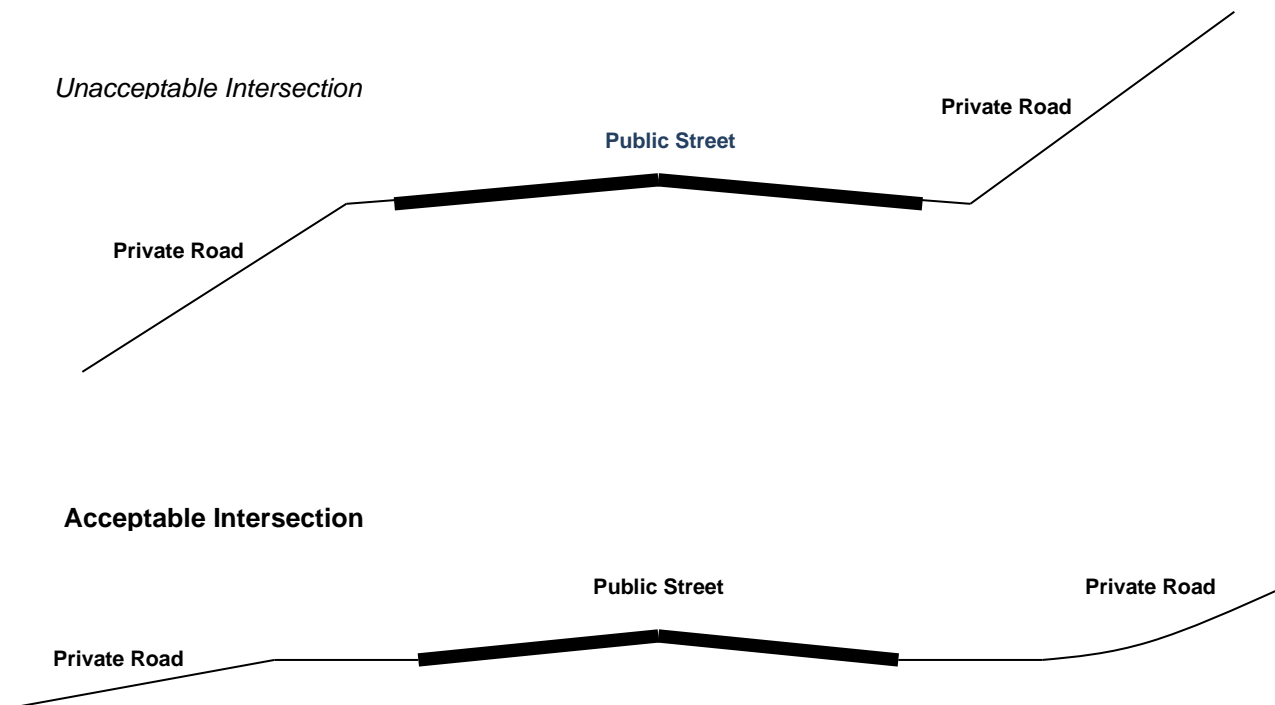
1.8.3 Compliance with Stormwater Management Regulations

Private road construction shall conform to the stormwater management provisions of the Town of Hillsborough Unified Development Ordinance.

1.8.4 Intersections with Public Roads

- A. The intersection of the private road with the existing public street shall permit a safe entrance and exit.
- B. Adequate sight distances along the public street shall be provided by choosing a good location for the right-of-way and clearing sight triangles when building the road.
- C. The intersection of a private road with a public street shall provide an adequate place for cars to stop before entering the public road. Figure 4-26 (Unacceptable/Acceptable Intersections) gives an example of this principle.

Figure 7: Unacceptable/Acceptable Intersections



- D. The private road must flare at the intersection with the public street in order to permit a vehicle to enter the private road when another vehicle is waiting to exit on the private road. The dimensions of the required flare are shown in Figure 4-28 (Private Road Construction Standards Cross Section).

1.8.5 Travelway Design

- A. The travelway must be surfaced and compacted to the required width of the road with a material acceptable to the Town of Hillsborough.
- B. A crown shall be built into the travelway so that water will drain from the road surface into the side ditches on both sides of the road (see Figure 4-28 (Private Road Construction Standards Cross

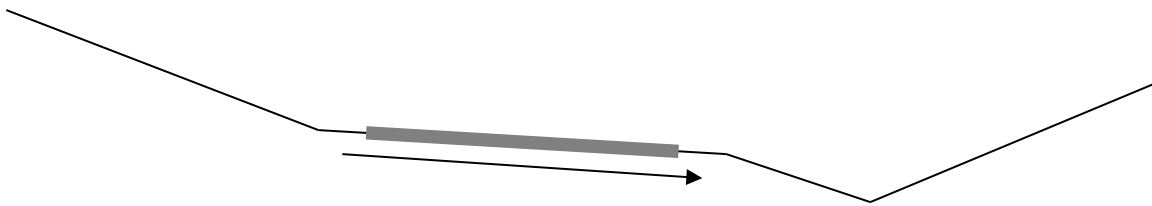
Section)). The crown shall not be so great as to cause vehicles to slide off the travelway when ice or snow is on the road.

- C. In some situations, it may be desirable not to crown the road but to have the travelway sloped to a single ditch as shown in Figure 4-27 (Travelway Pitch for Private Roads with Single Drainage Ditch). This is applicable in four situations:

1. where it is necessary to cut down on the length of a ditch in order to reduce the erosion potential by decreasing the volume of run-off;
2. where it is difficult to construct ditches due to rock;
3. to provide for super-elevation; or
4. in curves.

Such a single slope shall always drain toward the inside of a curve. The crown slope of the road and shoulder should be approximately one-half to one-inch per foot.

Figure 8: Travelway Pitch for Private Roads with Single Drainage Ditch



1.8.6 Travelway Surface Materials

- A. Acceptable material for surfacing the travelway is Aggregate Base Course (commonly called “crusher run”).
- B. Soil type base materials (commonly called “Chapel Hill Gravel” or “Chapel Hill Grit”) will be acceptable under the following conditions:
1. The material originates from a quarry approved by NCDOT.
 2. The grade of the road is less than 8%.
 3. Where the grade of the road is greater than 8%, a layer of crusher run stone will be placed over the Chapel Hill Gravel before compaction.
 4. Sources of surface material shall be verified with the certifying professional engineer, if applicable, before placement.

1.8.7 Grade

- A. The grade of the road shall not exceed 12% because of the difficulty of operating vehicles on such a steep road and the high potential for erosion of the travelway and side ditches.
- B. Where possible, the road shall be constructed along the contour of the land to avoid steep grades.
- C. In exceptional circumstances, a waiver from this requirement may be granted for a grade greater than 12%, as may be approved by the Board of Adjustment prior to construction. Circumstances where a waiver will be considered are:
 - 1. there is no other reasonable access or location for the road; and/or
 - 2. relocating the road would create other, more serious problems with drainage, stabilization, or environmental impact; and/or
 - 3. the length of the segment with a grade greater than 12% is no longer than 100 feet.

1.8.8 Fill Material

- A. Where filling is necessary to raise the roadbed, cross watercourses or fill stump holes, it shall be done with suitable material that is free of roots or other organic matter.
- B. The fill shall be firmly compacted to reduce settlement that will cause ruts or holes in the finished road.

1.8.9 Drainage

- A. Ditches shall be constructed to provide drainage from the road and adjacent areas.
- B. The ditches shall be built with sufficient depth and width to carry the expected volume of water.
- C. The side slopes shall be graded so that they can be stabilized and to prevent vehicles from becoming stuck if they slide into the ditch.
- D. Where the road crosses streams or minor watercourses, culverts shall be installed to prevent ponding and washouts of the road for the five-year design storm.
- E. On streams where it is not economical to install a large culvert of the required size, the Planning Director, in consultation with the Orange County Division of Erosion Control, may allow the installation of a smaller culvert if engineering equivalent provisions are made to protect the road surface and fill slopes from erosion when runoff tops the road.

1.8.10 Permanent Vegetation

- A. All areas disturbed by the construction of the road, including the shoulders, ditch, banks, cut-and-fill slopes, and any borrow areas, shall be seeded in permanent vegetation to stabilize the soil and prevent erosion.

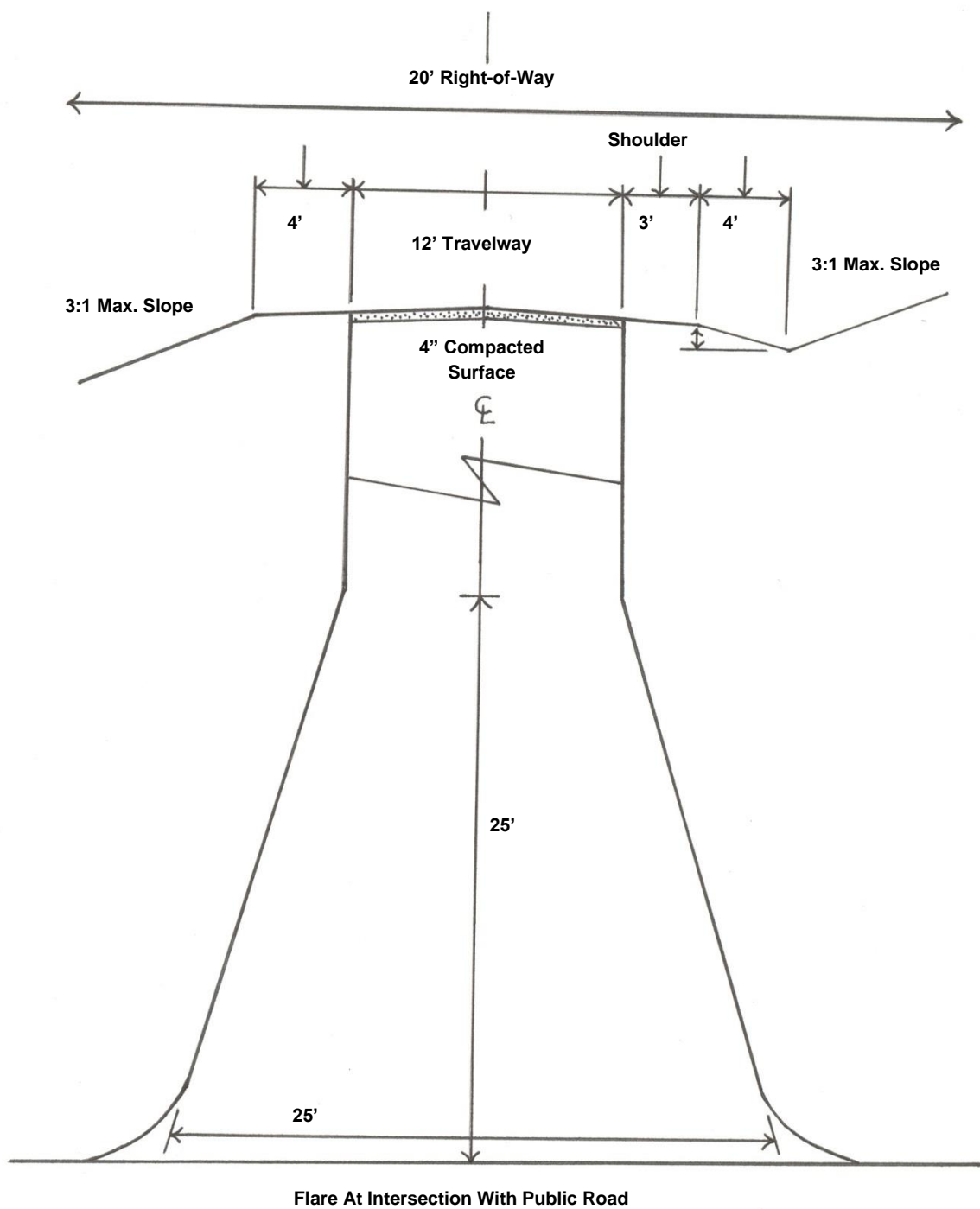
- B. Seeding shall be done immediately after grading is completed and before the final inspection by the Planning Director.
- C. The disturbed area shall be smoothed and lightly harrowed to break up the soil and prepare a good seedbed. The materials listed in Table 4-9 (Seed and Mulch per 1,000 Square Feet of Disturbed Area) are recommended per 1,000 square feet of disturbed area.

Table 2: Seed and Mulch Required Per 1,000 Square Feet of Disturbed Area

Recommended Materials	Amount in Pounds (lbs.)
Fescue Grass Seed	1.4
German or Browntop Millet (to provide temporary cover until the grass becomes established)	0.4
Lime	90
10-10-10 Fertilizer	23
Bales of Straw for Mulch (use enough to cover 75% of the ground surface)	Two 40 lb. bales

- D. Other types of permanent vegetation may be substituted as long as they provide adequate cover to prevent erosion.

Figure 9:



1.8.11 Inspections and Certifications

- A. The location of the travelway within the right-of-way must be certified to be within the platted right-of-way by a North Carolina Licensed professional land surveyor. This is not required for private roads serving two or fewer lots (including the residual acreage).
- B. Private road construction must be inspected and the construction certified in writing to the Planning Director by a North Carolina professional engineer. This is not required for private roads serving two or fewer lots (including the residual acreage).
- C. The private road must be inspected during construction so that any changes or improvements necessary to insure approval can be made before the stone is placed and the shoulders and ditches seeded and mulched.
- D. The subdivider or his/her representative must inform the professional making the certification prior to the start of construction and at intervals during construction when inspections are needed so that they can be scheduled.
- E. Inspections by the Planning Director are made only to insure the following:
 - 1. That the private road is built to the required dimensions;
 - 2. That the stone travelway is provided to the required width;
 - 3. That adequate drainage is required;
 - 4. That any disturbed areas are seeded and mulched to establish permanent vegetation; and
 - 5. To verify that the required road sign is in place.
- F. The subdivider is responsible for supervising construction and for quality control inspections for clearing and grubbing of the right-of-way, compaction of fill, construction materials and so forth.
- G. The subdivider or their representative should employ a qualified grading contractor (and supervisor if necessary) to insure that the road is in the correct location and that acceptable methods and materials are used.
- H. Financial securities posted to cover costs of construction will not be released until completion of the road is certified. Arrangements for payment between the subdivider and contractor are not the responsibility of the Town of Hillsborough.

1.8.12 Certification of Construction

- A. Before a Final Plat of subdivision where any lot or dwelling unit will be served by a private road can be recorded, the private road must be built and approved. A financial security instrument in the amount of 125% of a professional engineer's sealed estimate as to the cost of road construction or

completion may be posted with the Town in cases where the applicant desires to record the Final Plat before the private road is constructed.

- B. A professional land surveyor must certify in writing to the Planning Director that the travelway of the private road, either existing, upgraded or newly constructed, is within the platted right-of-way in cases where the private road is required to be constructed or the applicant chooses to construct the private road (e.g., a private road serving only two lots (including the residual acreage)).
- C. A professional engineer must certify in writing to the Planning Director that a private road, either existing, upgraded or newly constructed, meets the standards for the private road serving the lots (e.g., where three to four lots (including the residual acreage) are being created. The following shall be inspected and certified by the certifying engineer:
 - 1. The proper material has been used in the travelway and it is built to the required width and thickness;
 - 2. The shoulders are the correct width and the typical cross section is in place;
 - 3. The road is on the proper grade;
 - 4. Ditches are in place where necessary to provide adequate drainage, in accordance with sound engineering practice;
 - 5. Needed storm pipes of proper size, materials, and construction are in place and energy dissipaters installed, in accordance with sound engineering practices;
 - 6. All disturbed areas are properly stabilized;
 - 7. An adequate turnaround is in place at the end of the road;
 - 8. Required vertical and horizontal clearance is provided; and
 - 9. Sight distance and construction at the intersection with a public road has been approved by NCDOT (if applicable).

The road shall be inspected during construction so that any changes or necessary improvements necessary to insure approval can be made before the stone is placed and the shoulders and ditches are seeded and mulched.

- D. The Planning Director shall inspect the road prior to release of the Final Plat for recordation to insure that the street sign is in place and to make an overall visual inspection of the road.

1.9 Private Road Maintenance

- A. Maintenance of the private road must be provided by the lot owners that are served by the private road or an established homeowners association.
- B. A Road Maintenance Agreement between the lot owners is required to insure that the cost is shared equally and a mechanism for maintenance is set up.

- C. The responsibility for maintenance is the property owners of the lots accessing the private road, and neither the State, Orange County nor the Town of Hillsborough will maintain the road.
- D. Regular attention shall be given to the following items in order to assure that the road will remain in good condition:

- 1. ***Vegetation***

The vegetation shall be mowed, limed, and fertilized as needed. Areas that erode or where seeding is unsuccessful shall be reseeded.

- 2. ***Drainage***

Culverts shall be kept clear of trash and other obstructions that could prevent or reduce the culvert's function. If culverts are not kept clear, it will cause runoff to flow over the road and may cause flooding upstream. Ditch banks and bottoms shall be protected from erosion by maintaining good vegetation.

- 3. ***Travelway***

The travelway shall be maintained by grading the surface material to fill any potholes that develop and to evenly spread the surface material where the soil has been uncovered because of erosion.

- 4. ***Road Name and Sign***

- a. The road name shall be verified with the Planning Director to insure that the proposed name does not duplicate an existing name.
- b. Private roads of any length are required to be named and have road name signs posted.
- c. The road name sign shall meet Town of Hillsborough street sign standards.
- d. The road name sign shall be kept visible and legible so that visitors and emergency personnel can easily locate the road.

1.9.1 Road Maintenance Agreement

- A. The subdivider shall have an instrument recorded contemporaneously with the Final Plat substantially in the form of the Town's Standard Road Maintenance Agreement entitled "Declaration of Restrictions and Provisions for Private Road Maintenance", guaranteeing the following:
 - 1. right of access to any private road in the subdivision by all lots served by the road and by law enforcement and emergency vehicles;

2. right of access for the proposed private road to a State or Town-maintained road by way of direct access or other private roads;
 3. perpetual maintenance of any private road serving the subdivision at the standards set for approval; and
 4. provide record notice of the probability that future development dependent on the private road for access will require upgrading of the road to a higher private road standard or public dedication and upgrading of the road to Town or North Carolina Department of Transportation standards, as applicable. The Road Maintenance Agreement shall include a provision that if the road is dedicated for public use at a later date, then the lot boundaries will be revised to extend only to the edge of the right-of-way.
- B. The instrument shall also note acceptance by the owner(s) of all liability related to the use of the road, and agreement to hold both the Town and State, as applicable, harmless from such liability, and acknowledge that some public services may not be provided due to the private nature of the road. The guarantees of right of access and maintenance of the subdivision roads shall run with the land and shall be disclosed to any prospective purchaser of land in the subdivision as provided by NCGS 136-102.6 (Compliance of Subdivision Streets With Minimum Standards of the Board of Transportation Required of Developers). Upon recordation, the deed book and page number of the recorded document shall be referenced on the Final Plat.
- C. The Planning Director shall prepare the document entitled "Declaration of Restrictions and Provisions for Private Road Maintenance". The document shall include a statement that further subdivision of any of the lots in the subdivision may require that the private road be upgraded to a higher private road standard, or to public street standards, and that the cost of the upgrade will be the responsibility of the person requesting subdivision approval at the time the upgrade is required.
- D. The following certificate shall be placed and endorsed on the final plat where a subdivision will be served by a private road, indicating the recordation of the Road Maintenance Agreement required by these regulations:

Certificate of Private Road Maintenance and Disclosures

I, _____, certify that an instrument will be recorded contemporaneously with the recordation of this approved Final Plat that acknowledges and guarantees:

- a. Right of access to any private road in the subdivision by all lots served by the road and law enforcement and emergency vehicles;
- b. Right of access for the private road to a State or municipally maintained road by way of direct access or other private roads;
- c. Perpetual maintenance of any private road serving the subdivision at the standards set for approval;
- d. Record notice will be provided of the probability that future development dependent on the private road for access will require upgrading of the road to a higher private road standard or public dedication and upgrading of the road to Town of Hillsborough or North Carolina Department of Transportation standards, whichever is applicable;
- e. Acceptance by the owner(s) of all liability related to the use of the road, and agreement to hold both the Town, County and State harmless from such liability; and
- f. Some public services may not be provided due to the private nature of the road.

These guarantees of right of access and maintenance of the subdivision roads shall run with the land and shall be disclosed to any purchaser of land in the subdivision as provided by NCGS 136-102.6.

Owner(s)

Date

Appendix B – Traffic Calming

B.1 Policy Statement

The Town of Hillsborough wishes to have a procedure whereby its' residents can petition the Town to incorporate traffic calming devices and systems on town owned residential streets to alleviate speeding, excessive traffic volume, dangerous intersections or other conditions that are of a public safety nature.

The purpose of this document is to present ways in which residents can find solutions to residential traffic problems as approved by the Hillsborough Town Board. Consideration is given to a variety of residential traffic concerns and to the characteristics of these concerns on a case-by-case basis. Each situation is reviewed with respect to the available traffic control measures that have been, or could be, found effective in alleviating the neighborhood traffic concern.

The following outlines these guidelines and procedures which can be used to develop the optimum solution or solutions to each particular situation. There are many factors taken into consideration when reviewing residential traffic concerns to determine the most feasible traffic control measure. These factors include the surrounding roadway network, resident access, speeds and/or volume of traffic, accident history, neighborhood response and budget considerations.

Most commercial development has direct access to state-maintained roads. The devices discussed in this section generally will not be approved by NCDOT on state-maintained roads. The town continues to work closely with NCDOT to provide safe traveling conditions for vehicles, pedestrian, and bicyclists on the state network.

Note: Public health and safety concerns are always the overriding consideration when installing or removing traffic control devices.

B.2 Evaluation Criteria for Residential Streets

1. The street must be classified as a two-lane residential street.
2. The street must be a municipality-maintained roadway that receives Powell Bill funding. State roadways are excluded under this policy.
3. The posted speed limit on the affected length of the street must be 25 miles per hour which is the standard speed limit for residential streets.
4. Vehicle speeds (for at least 85% of the vehicles, established by radar or equivalent method) must exceed 35 MPH (+ 10 MPH over posted speed limit).
5. Actual traffic volume will be based on traffic counts conducted by the Town of Hillsborough Public Works staff or its designee. Guidelines reviewed by staff as received from the Institute of Transportation Engineers (ITE) that is appropriate for town streets.
6. A positive recommendation for installation must be received from Police, Fire, and EMS.

B.3 Petition Requirements

1. Those parties requesting the installation of a Traffic Calming Device must demonstrate sufficient support for the installation of the device in the affected area; support shall be shown by signatures obtained on the standard Petition for Traffic Control Devices provided by the Town.
2. Only one signature per household can be obtained.
3. Signatures must be of the current residents within the defined study area.

4. Residents must provide their address in the space allotted.
5. Signatures will be checked by Town Hall staff using property tax records.
6. Signatures that do not adhere to these requirements will be considered invalid.
7. The number of valid signatures either for or against installation must meet or exceed 65% of the total number of residents of the impacted area.

B.4 Procedure for Obtaining Approval

1. The process is initiated when the Public Works Director receives a request for installation of a traffic control device. A preliminary investigation into the first five qualifying criteria will be completed. If these criteria are met, the Public Works Director or his designee will conduct a field investigation of the impacted area. A petition package containing the Town of Hillsborough Traffic Calming Policy and a Petition Form will be mailed to the requesting party.
2. The requesting party is responsible for obtaining signatures on the petition form and returning it to Town Hall. If the number of valid signatures equals or exceeds 65% of the total number of residents of the impacted area; Police, Fire, and EMS will be contacted for recommendations.
3. Traffic monitoring devices will be used to determine average daily traffic, vehicle speeds, and vehicle types.
4. When all qualifying criteria are met, a report will be prepared for the Board of Commissioners outlining all relevant information and any extenuating circumstances concerning the characteristics of a requested street.
5. The Board of Commissioners will approve or disapprove installations for the requested street based on the "finding of fact" report provided by the Public Works Director.

B.5 Funding

The Town of Hillsborough has not identified any special funding source for traffic calming projects. Nor has the Town set-aside any existing funds to be used exclusively on traffic calming projects. Funding options available are special assessments, operating funds, and private funding. The Town of Hillsborough Board of Commissioners will determine the appropriate funding mechanism for the installation of traffic calming devices on a case-by-case basis.

Special Assessments:

Installation of traffic calming devices is considered a street improvement and are eligible for special assessments in accordance with North Carolina General Statute § 160A-216 (1).

Powell Bill (Operating Budget):

The Town of Hillsborough will cover the cost of activities associated with the development, construction, and installation of traffic calming devices dependent upon the availability of funding.

Private Funding:

Residents of an existing neighborhood wishing to accelerate the process may choose to fund all or part of the development, construction, and installation of their requested traffic calming device.

Powell Bill (Operating Budget)/Private Funding:

The Town of Hillsborough and residents of an existing neighborhood will share the cost of activities associated with the development, construction, and installation of traffic calming devices. The Town's participation in any cost sharing venture is dependent on the availability of funding.

B.6 Traffic Calming Measures

Generally, traffic calming measures fall into 4 types: non-physical, vertical, horizontal, and diversion. Non-physical options generally don't directly impact the street design but can influence driver behavior. Vertical measures change the vertical smoothness of the driving surface to impact driver behavior. Horizontal measures impact the straightness of the driving path to impact driver behavior. Diversion measures change the available road network to re-route drivers.

B.6.1 Non-Physical Traffic Calming Measures

1. **Speed Enforcement**- Temporary targeted speed limit enforcement in areas where residents are concerned.
2. **Radar Trailers** - A radar trailer can be placed adjacent to a roadway to measure and display a passing vehicle's speed. Providing the posted speed limit on the device reminds drivers to slow down if they are traveling too fast.
3. **Lane Striping** - Lane striping can be used to visually narrow travel lanes in a given area. By using highly visible stripes, vehicles are encouraged to slow down.
4. **Signage**- Placing appropriate warning and information signs and additional regulatory signs reminds motorists of the various roadway conditions and hazards of the area.
5. **Pavement Marking Legends**- The speed limit or other driver information can be painted onto the street to remind drivers of the speed limit or other area conditions that warrant special attention.
6. **High Visibility Crosswalk**- High intensity paint or plastic can be used in a dense pattern to clearly delineate a crosswalk. Crosswalk should be accompanied by appropriate signage.
7. **On-Street Parking**- Designates area along a street to store vehicles. On-street parking may be used along one or both sides of the street. May also be a revenue generator through permit, meter, or other methods.
8. **Raised Pavement Markers**- Raised pavement markers are plastic reflectors installed in the pavement that, when installed in series, alert the driver when they are deviating from the travel lane. They can be installed on the centerline and edge line of a roadway or across a roadway to function as a rumble strip. They are often used on curves.
9. **Streetscaping** - Streetscaping can incorporate many different ideas and approaches. Typically, Streetscaping includes planting street trees and other landscaping along the roadway. Streetscaping also usually involves establishing a planting area between the street and the sidewalk.
10. **Multi-Way Stops**- Multi-way stops involve placing stop signs on all approaches to an intersection. Considerations for Multi-way stops should follow guidelines as described in the Manual on Uniform Traffic Control Devices (MUTCD).
11. **Turn Prohibitions and Other Restrictions** - Turn prohibition signs are posted to restrict movement through a given area and to limit travel in certain directions. Other restrictions, such as "No Trucks", can also help reduce cut-through traffic. Speed limit reductions can be used in areas where existing speed limits are higher than desired; however, speed limit changes alone are generally not effective in significantly reducing travel speeds on local residential streets.
12. **Gateways/Entryways** - Gateways include decorative signing and/or landscaping to visually identify the entrance to a neighborhood or commercial district. This measure helps to make the area appear as a destination rather than a connection to another area. Gateways are often incorporated into a median island.
13. **Colored Pavements**- Pavement can be installed with many colors and patterns. These unique properties can slow drivers by forcing them to process different patterns as they approach an area. Colored pavement can also help delineate the separation between a travel lane and lanes that accommodate other modes of transportation.

B.6.2 Vertical Traffic Calming Measures

1. **Textured Pavement**- Textured pavements can alert motorists to special conditions through sound and/or vibration. Rumble strips are typical example of how textured pavement can produce a sound to warn a driver approaching a hazardous condition. Textured pavements combined with colored pavements can delineate a special area, such as a historic district. Brick pavers are a form of textured pavement.
2. **Speed Humps** - Raised hump (pavement undulation) in the roadway with a parabolic top which exceeds across the road at right angles to the direction of traffic flow. Most effective if used in a series; spaced 300'-500' apart
3. **Speed Lumps**- Speed lumps are a variation of speed humps that add two cut-outs for tires of larger vehicles. The cut-outs are designed so that wider vehicles, such as emergency vehicles, can fit through with little slowing but a standard vehicle must pass at least one side of its wheels over the hump.
4. **Speed Tables** - Speed tables are elongated speed humps with flat tops that usually allow for the entire wheelbase of a standard vehicle to be on the top flat part. Usually, a textured pavement or alternative design is used to distinguish the speed table from the rest of the roadway.
5. **Raised Crosswalks** - Raised crosswalks are equivalent to speed tables with crosswalk markings. Should be accompanied by appropriate signage.
6. **Raised Intersections** - Raised intersections are equivalent to speed tables, only they are applied over the entire intersection with ramps on all sides. They are normally at or near the same elevation as the sidewalk. Often include textured and/or colored pavements.

B.6.3 Horizontal Traffic Calming Measures

1. **Traffic Circles**- Provides circular, counterclockwise operations at intersections by placing a raised island in the middle of the intersection. Vehicles on the 'thru' street must change their travel path to maneuver around the circle. Entry into the intersection is often controlled by Yield signs on all approaches.
2. **Roundabouts** - Similar to traffic circles but larger and with "splitter" islands on each approach that flare entry into the circle.
3. They are more typically used as a substitute for a traffic signal. Traffic on the approaches must yield to vehicles within the circle.
4. **Curb Extensions** - Used to make pedestrian crossing movements shorter and easier. Used to narrow the roadway cross-section at particular points (intersection, mid-block, etc.) but still maintains separate lanes for opposing traffic flows. Often used in combination with a raised crosswalk.
5. **Chicanes**- Physical constriction built at the curbside of the roadway to create bends in a formerly straight road. Vehicles are forced to negotiate the narrowed street in a serpentine fashion. Retrofitting an existing street typically allows one lane through the chicane so that opposing traffic must alternate passage through the constraints.
6. **Lateral Shifts** - A lateral shift is a curb extension which shifts the roadway horizontally. A second shift downstream may move the roadway back to the original alignment. These are also frequently called two-lane chicanes.
7. **Neckdowns** - Neckdowns are used to make streets more pedestrian-friendly by shortening the crossing distance and reduce speed by narrowing the travel lanes.
8. **Realigned Intersections** - Realigned intersections are changes in alignment that cover T-intersections with straight approaches into curving streets that meet at right angles. A former "straight-through movement along the top of the T becomes a turning movement. This is one of the few traffic calming measures available for T-intersections.
9. **Bulb outs** - Similar to curb extensions at intersections. Used to narrow the street width to help

facilitate pedestrian movements and reduce speeds on one or more approaches.

10. **Two-Lane Chokers**-Two-lane chokers are used at mid-block points to reduce the overall cross section of the street providing a natural slow down point.
11. **One-Lane Chokers** - Curb extensions toward the center of the roadway that reduce the street from two lanes to one lane. This requires vehicles to come to a stop and yield to oncoming traffic.
12. **Center Island Narrowing**- Narrowing of the roadway with a raised center island, typically planted, between the travel lanes. They also provide a pedestrian refuge thereby allowing pedestrians to cross one travel lane at a time.
13. **Medians**- Used to separate lane movements and provide a visual cue along the roadway. Medians can be especially effective along curves. Medians can also be used as a diversion device by restricting access at intersections and to adjacent properties.

B.6.4 Diversion Traffic Calming Measures

1. **Street Closures**- Barrier or pavement removal intended to block all vehicle access on a street. Pedestrian and bicycle access is typically maintained. Often designed to allow emergency vehicles to 'break-through' the closure. Cul-de-sacs are a common form of this measure.
2. **Diagonal Diverters** – Diagonal diverters bisect an intersection diagonally, disconnecting the legs of the intersection and creating two separate roadways. This can be accomplished with a simple barrier such as guardrail or through pavement removal and landscaping. Pedestrian and bicycle access is typically maintained. Can be designed to allow emergency vehicles to 'break-through' the barrier.
3. **Semi-diverters**- A semi-diverter is a barrier, usually a landscaped island, on one side of a street at an intersection that permits traffic on the opposite direction to pass through; thereby creating a one-way street at the intersection but maintaining two-way traffic for the rest of the block.

Comparison of Speed Control Devices			
DEVICES	ADVANTAGES	DISADVANTAGES	COSTS
Speed Enforcement	<ul style="list-style-type: none"> - May be implemented immediately with little planning - No impact to emergency response times - Secondary benefits include reduced crime and higher sense of security 	<ul style="list-style-type: none"> - Expensive to maintain for an extended period of time - May only be effective for a short time - May only be effective for short distances 	Varies
Radar Trailers	<ul style="list-style-type: none"> - In the long-term, less expensive than police enforcement - May be implemented immediately with little planning - No impact on emergency response times - Effective for reducing speeds in a short span 	<ul style="list-style-type: none"> - Only effective for one direction of travel at a time - May only be effective for a short time - May only be effective for short distances 	Varies
Lane Stripping	<ul style="list-style-type: none"> - Inexpensive - May be implemented quickly with little planning - No impact to emergency response times 	<ul style="list-style-type: none"> - Increases maintenance costs 	\$0.15-\$1.00 per lineal foot (paint) \$1.00-\$5.00 per lineal foot (plastic)
Signage	<ul style="list-style-type: none"> - Inexpensive - No impact to emergency response times 	<ul style="list-style-type: none"> - Increases maintenance costs - Signs typically considered unsightly – most people do not want them in their yard 	\$50-\$100 per sign
Pavement Marking Legends	<ul style="list-style-type: none"> - Inexpensive - May be implemented immediately with little planning - No impact to emergency vehicle response times 	<ul style="list-style-type: none"> - Increased maintenance costs - Has not been proven to reduce speed 	\$25-\$50 per letter or number \$100-\$200 per symbol
High Visibility Crosswalk	<ul style="list-style-type: none"> - Inexpensive - No impact to emergency vehicle response time - Helps collect and distribute pedestrians along the street - Increases visibility of pedestrians 	<ul style="list-style-type: none"> - Requires more maintenance than normal crosswalk - May provide pedestrians with false sense of security, especially when used at mid-block location or 	\$200 per crosswalk lane

		uncontrolled approaches to an intersection	
On-Street Parking	<ul style="list-style-type: none"> - Provides more vehicle storage - Narrows street width to encourage slower vehicular travel - Shortens pedestrian crossing distance - Encourages pedestrian activity in an area 	<ul style="list-style-type: none"> - May be ineffective if parking is not adequately utilized - May reduce sight distance for both drivers and pedestrians - May increase certain types of vehicular crashes - May restrict bicycle movements - Traffic volumes may increase especially in areas of high demand and low availability of off-street parking - May impede emergency response vehicles and solid waste collection 	Dependent on frequency of spaces, enforcement costs, etc.
Raised Pavement Markers	<ul style="list-style-type: none"> - Inexpensive - May be implemented immediately with little planning - No impact to emergency vehicle response times - Secondary benefits include increased delineation and roadway safety 	<ul style="list-style-type: none"> - Noise - May be unintentionally removed during snow removal - Increased maintenance costs 	\$2-\$7 per marker
Streetscaping	<ul style="list-style-type: none"> - May reduce speed and volumes - Positive aesthetic effects - Good functionality - Increases pedestrian safety - Improves quality of life for neighborhood - No impact to emergency response times 	<ul style="list-style-type: none"> - Can create vehicular hazards - Can create poor visibility conditions if installed too dense - Possibly increased maintenance costs 	Varies depending upon materials, length, and width of application area, and availability of right-of-way
Multi-Way Stops	<ul style="list-style-type: none"> - If traffic signals are warranted, can be used as temporary measure - Can reduce intersection collisions - Little impact to emergency response times - May be implemented quickly with little planning 	<ul style="list-style-type: none"> - Speeds between intersections often decrease - Increases noise and air pollution - Can cause read-end accidents - Requires enforcement 	\$300-\$600 per intersection

	<ul style="list-style-type: none"> - May provide a safer crossing for pedestrians 	<ul style="list-style-type: none"> - If stop signs are warranted, disregard for measure can create dangerous situations 	
Turn Prohibitions and Other Restrictions	<ul style="list-style-type: none"> - Inexpensive to install - No impact to emergency response time - May increase pedestrian traffic - Transit and school buses can be exempted - Restrictions can be “part-time” 	<ul style="list-style-type: none"> - Deliberate violation could create a hazard - May divert problem onto another street - Requires enforcement - Requires approval of an enabling ordinance - Not effective for reducing speeds 	\$100-\$200 enforcement costs
Gateways/Entryways	<ul style="list-style-type: none"> - May reduce volumes - Positive aesthetic effects - Good functionality - Improves quality of life for neighborhood - No impact to emergency response times 	<ul style="list-style-type: none"> - Can increase vehicular hazards - Can create poor visibility conditions - Can be expensive 	Varies depending on materials, length, and width of application area
Colored Pavements	<ul style="list-style-type: none"> - May reduce speeds and volumes - Positive aesthetic effect - Good functionality - Increases pedestrian safety - Improves quality of life for neighborhood - No impact to emergency response times 	<ul style="list-style-type: none"> - Can create vehicular hazards - Can make roadway features difficult to see if installed too densely - Increased maintenance - Surface can be slick – hazardous to pedestrians and cyclists 	Varies depending on materials, length, and width of application area
Textured Pavement	<ul style="list-style-type: none"> - May reduce vehicle speeds - May add aesthetic value - If used at an intersection can calm two streets at once - Little or no impact to emergency response times 	<ul style="list-style-type: none"> - Textured materials are expensive - Increased noise - Difficult for physically challenged individuals to maneuver - Increased maintenance costs 	Varies with material and area of installation
Speed Humps	<ul style="list-style-type: none"> - Effective in reducing speed - Compatible with pedestrians and bicycle movement - May also decrease cut-through traffic by increasing travel time - Inexpensive 	<ul style="list-style-type: none"> - Increased noise when vehicles travel over them - Increased maintenance costs - Slows emergency vehicles and buses - Aesthetics - Can be very uncomfortable to vehicle occupants with certain disabilities 	\$1,500-\$2,000

Speed Lumps	<ul style="list-style-type: none"> - Effective in reducing speeds - Maintains rapid response time - Inexpensive - Relatively easy for bicyclists to cross if installed correctly 	<ul style="list-style-type: none"> - Aesthetics - Private vehicles with large wheel bases can avoid the humps - Increased noise - Increased maintenance costs - Can be very uncomfortable to vehicle occupants with certain disabilities 	\$1,800-\$2,000
Speed Tables	<ul style="list-style-type: none"> - Smoother than humps for larger vehicles - Effective in reducing speeds - Compatible with pedestrian and bicycle movements - May also decrease cut-through traffic by increasing travel time 	<ul style="list-style-type: none"> - Aesthetics, if decorative surface material is not used - Decorative materials are expensive - Increased noise - Increased maintenance costs - Slows emergency vehicles and buses - Can be very uncomfortable to vehicle occupants with certain disabilities 	\$1,500-\$4,000 (depending on materials)
Raised Crosswalks	<ul style="list-style-type: none"> - Smoother than humps for larger vehicles - Effective in reducing speeds - Increases visibility for pedestrians - Slows vehicular traffic at conflict point with pedestrians - Better than simple crosswalk for visually impaired pedestrians - May also decrease cut-through traffic by increasing travel time 	<ul style="list-style-type: none"> - Aesthetic, if decorative surface material is not used - Decorative materials are expensive - Increased noise - Increased maintenance costs - Slows emergency vehicles and buses - Can be very uncomfortable to vehicle occupants with certain disabilities 	\$1,800-\$4,000 (depending on materials)
Raised Intersections	<ul style="list-style-type: none"> - Smoother than humps for larger vehicles - Effective in reducing speeds - Increases visibility for pedestrians - Slows vehicular traffic at conflict point with pedestrians 	<ul style="list-style-type: none"> - Aesthetics, if decorative surface material is not used - Decorative materials are expensive - Increased noise - Increased maintenance costs - Slows emergency vehicles and buses 	Varies by materials used and intersection size

	<ul style="list-style-type: none"> - May also decrease cut-through traffic by increasing travel time 	<ul style="list-style-type: none"> - Can be very uncomfortable to vehicle occupants with certain disabilities 	
Traffic Circles	<ul style="list-style-type: none"> - May significantly reduce speeds on “thru” streets - Reduces intersection collisions - Provides additional street aesthetics - May be used as a volume control device without limiting access 	<ul style="list-style-type: none"> - May require removal of parking near intersection - May cause sight distance problems for vehicles - Depending on size and location, may have high installation costs - May impact emergency response times - May impede large vehicles 	\$5,000-\$10,000
Roundabouts	<ul style="list-style-type: none"> - Reduces vehicles speeds - Eliminates typical left-turn conflicts - In the long run, more economical to maintain than traffic signal - Adds to street aesthetics - Reduces crash severity at intersections 	<ul style="list-style-type: none"> - Often requires a large amount of right of way - May require additional lighting to lessen driver confusion at night - Not a typical traffic calming measure for local streets (used for collections and minor thoroughfares) - Initial costs are high 	Single lane roundabout \$20,000-\$120,000 (depending on Right-of-Way requirements)
Curb Extensions	<ul style="list-style-type: none"> - Narrows street width to encourage slower vehicle traffic at specific points - Shortens pedestrian crossing distance and makes pedestrians more visible - May facilitate more on-street parking spaces - Intended to reduce vehicle speeds 	<ul style="list-style-type: none"> - Conflicts with flow of bicycle lanes - Requires removal of some on-street parking 	\$7,000-\$10,000
Chicanes	<ul style="list-style-type: none"> - Typically results in lower speeds - One lane chicanes can significantly reduce cut-through traffic - Can be aesthetically pleasing 	<ul style="list-style-type: none"> - May lead to an increase in head-on collisions - Higher maintenance costs - Can severely impact emergency response vehicles - Should not always be used in areas with frequent driveways - Loss of on street parking 	\$4,000-\$8,000 (depends on length of road affected)

Lateral Shifts	<ul style="list-style-type: none"> - Is an effective tool for slowing traffic on high volume streets - Easy functionality for large vehicles 	<ul style="list-style-type: none"> - Less effective for reducing speeds than a one lane chicane - Proper design is crucial to avoid lane changing by vehicles - Loss of on street parking - May require additional right-of-way 	Varies by length, width, and shift distance
Neckdowns	<ul style="list-style-type: none"> - Increased pedestrian safety and range - Reduces speeds 	<ul style="list-style-type: none"> - May require bicyclists to merge with traffic - May slow emergency vehicles - Loss of on-street parking 	\$4,000-\$5,000
Realigned Intersections	<ul style="list-style-type: none"> - Reduces speeds at T-intersections - Can reduce cut-through traffic by reassigning right of way at intersection 	<ul style="list-style-type: none"> - Typically requires additional right of way on one corner - Construction can be costly - May have minor impacts on emergency response times 	Varies with magnitude of the project
Bulb outs	<ul style="list-style-type: none"> - Reduces vehicle speeds near intersection - Makes pedestrian crossing safer and easier - Improve sight line between vehicles and pedestrians - May accommodate pedestrians with disabilities - May facilitate more on-street parking 	<ul style="list-style-type: none"> - Does not accommodate bicycle paths - May affect turning movements (especially for large trucks) 	\$4,000-\$5,000 per corner
Tow-Lane Chokers	<ul style="list-style-type: none"> - May reduce speeds - May reduce volumes - Positive aesthetic effect - Good functionality - Provides safer pedestrian crossings - May encourage more use of on-street parking - No impact on emergency response times 	<ul style="list-style-type: none"> - No vertical and little or no horizontal deflection - Loss of on-street parking - Bicyclists may have to merge with traffic 	\$7,000-\$10,000
One-Lane Chokers	<ul style="list-style-type: none"> - Reduces speed and volumes - Positive aesthetic effect - Good functionality - Safer pedestrian crossings 	<ul style="list-style-type: none"> - Loss of on-street parking - Bicyclists may have to merge with traffic - Opposing vehicles trying to use same space - Can significantly delay emergency vehicles 	\$7,000-\$10,000

Center Island Narrowing	<ul style="list-style-type: none"> - May reduce speeds and volumes - Positive aesthetic effect - Good functionality - Increases pedestrian safety 	<ul style="list-style-type: none"> - Loss of on-street parking - Can impact emergency response vehicles if lanes are made too narrow - Should not be used in areas with frequent driveways 	Varies depending on size and material
Medians	<ul style="list-style-type: none"> - Prevents passing maneuvers along roadway - Provide area for street landscaping - Reduces vehicle speeds along a curve - Provides pedestrians refuge area and aids crossing maneuvers - Can be used to restrict movements at intersections 	<ul style="list-style-type: none"> - May require parking removal - May be costly - May limit access depending on length of median section - May reduce sight distance depending on roadway alignment, size of median - May impact emergency response times 	Varies depending on size and material
Street Closures	<ul style="list-style-type: none"> - Eliminates through traffic - Reduces speeds - Improves safety for all modes of transportation 	<ul style="list-style-type: none"> - Limits access - Creates problems for emergency vehicles - Often need to construct turn-arounds or cul-de-sacs near the closure point 	\$20,000 (dependent on size)
Diagonal Diverters	<ul style="list-style-type: none"> - Reduces speeds and volumes - Can be aesthetic enhancement - Good functionality - Increases pedestrian safety - Improves quality of life for neighborhood 	<ul style="list-style-type: none"> - Can create vehicular hazards - Can create poor visibility conditions - Can be expensive - Potentially severe impacts on emergency response times 	Varies depending on size and materials
Semi-Diverters	<ul style="list-style-type: none"> - Reduces volumes - Positive aesthetic effect - Increases pedestrian safety - Improves quality of life for neighborhood - Limits cut-through traffic 	<ul style="list-style-type: none"> - Can create vehicular hazards - Restricts access at all times – not just during peak periods - Can create poor visibility conditions - Can be expensive - Does not control speed - May impact emergency vehicle response times 	Varies with application size

B.7 Radar “Your Speed” signs

Solar powered signs that display the travel speed of on-coming traffic may be considered in non-residential areas. These signs will only be considered along high-volume state roads where targeted enforcement is unlikely to be effective due to drivers being from outside the community or the problem is intermittent. The speeding issue must be verified by a town traffic study.

B.7.1 Petition

Any resident or business owner may submit a written request to the Public Works Manager requesting the investigation for a radar sign in a location in the city limits along a state-maintained road. A traffic study will be conducted for any a request contain the signatures of at least ten addresses located within ½ mile section of a state road with a reported ADT above 10,000 VPD. All other requests will be taken to the Town Board to determine if a study is desired.

B.7.2 Study results

The results of a traffic study related to a radar sign request will be presented to the town board at the next available meeting and everyone signing the request will be notified of the meeting date and time.

B.7.3 Evaluation Criteria

The Town Board will consider the results of the traffic study, details of the issues raised by the petitioners, available funding, and the recommendation of the Public Works Manager and Police Chief regarding the potential impact and viability of the requested sign. Signs must be located in the state right of way and receive an encroachment arrangement prior to installation. The funding sources listed in B.5 also apply to this type of request.



TOWN OF
HILLSBOROUGH

PETITION FOR
TRAFFIC CONTROL
DEVICES

We, the undersigned residents, hereby petition the Board of Commissioners to approve the traffic control devices described below upon indicated street or part thereof.

THE STREET OR PART THEREOF DESIRED TO BE AMENDED IS:

THAT PART OF _____ STREET

FROM _____ STREET TO _____ STREET.

WITH RESPECT TO THE TRAFFIC CONTROL DEVICE PETITIONED FOR, WE REQUEST:

1) _____

2) _____

3) _____

[Please note: a maximum of three (3) traffic calming devices may be requested]

Resident's signatures	Street address (mailing if different)

*The addresses of properties that will be directly affected by the proposed change have been determined by the Hillsborough Planning Division. By policy, the Board of Commissioners has stated that it would prefer to entertain request for changes in street regulations proposed by citizens only where 75% of the occupants of the properties directly affected by the proposed change have signed a petition requesting the changes.

**CERTIFICATE AS TO
SUFFICIENCY OF PETITION
FOR TRAFFIC CONTROL DEVICE**

TO THE MAYOR AND BOARD OF COMMISSIONERS OF THE TOWN OF HILLSBOROUGH:

I, _____, Town Clerk of the Town of Hillsborough, North Carolina do hereby certify that the attached "Petition for Traffic Control Devices" was presented to me on the ____ day of _____, 20____; that I have investigated the sufficiency of the petition; and that the result of my investigation is as follows:

The total number of properties directly affected by the requested change is _____.

With respect to the signatures on the attached petition, _____ signatures are those of residents of the affected area which is _____% of the residents on the project street.

This the _____ day of _____, 20____

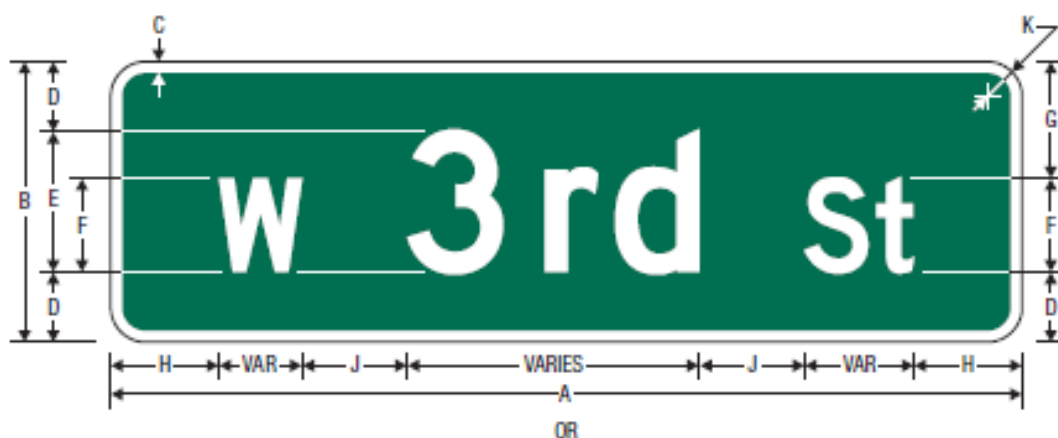
SEAL

Town Clerk

THIS FORM MUST BE ATTACHED TO THE
"PETITION FOR TRAFFIC CONTROL DEVICES" AFTER ALL PETITIONERS'
SIGNATURES HAVE BEEN OBTAINED.

Appendix C – MUTCD Street Sign Requirements

This appendix includes the section of the 2012 Supplement to the Standard Highway Signs element of the Manual on Uniform Traffic Control Devices that discusses the requirements for street name signs. This is provided for informational purposes. Refer to the FHWA Manual on Uniform Traffic Control devices website at <http://mutcd.fhwa.dot.gov/> for future updates to this information.



D3-1
STREET NAME SIGN



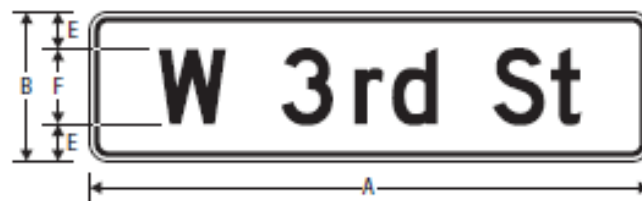
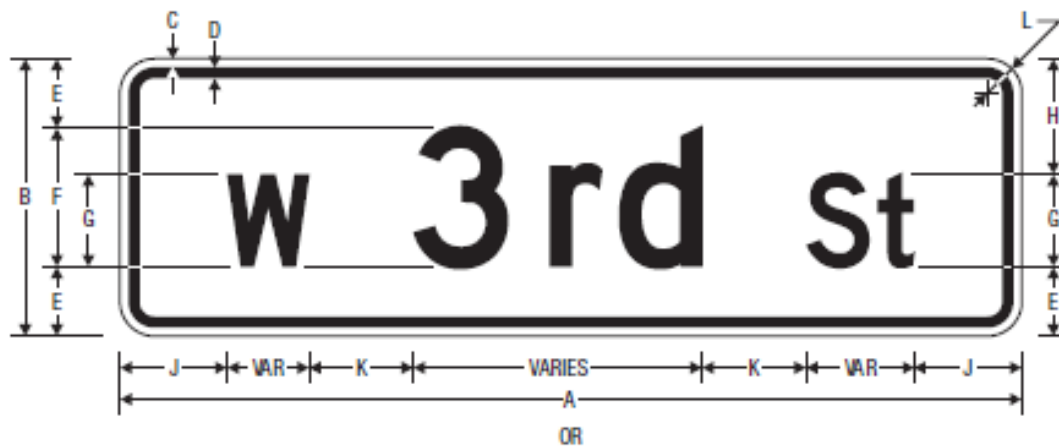
D3-1 – PRINCIPAL LEGEND WITH DESCENDING STROKES



D3-1 – WITHOUT BORDER, PRINCIPAL LEGEND WITH OR WITHOUT DESCENDING STROKES

A	B	C	D	E	F	G	H	J	K	L	M	N
VAR	8	0.375	2	4 D	3 D	3	3 (MIN)	3	1	1.75	2.25	2.75
VAR	12	0.5	3	6 D	4 D	5	4.5 (MIN)	4.5	1.5	2.75	3.25	4.75
VAR	18	0.75	5	8 D	5.33 D	7.67	5.33 (MIN)	6	1.875	5	5	7.67
VAR	24	1	6	12 D	8 D	10	9 (MIN)	9	2.25	5.5	6.5	9.5

COLORS: LEGEND, BORDER – WHITE (RETROREFLECTIVE)
BACKGROUND – GREEN (RETROREFLECTIVE)
BACKGROUND (ALTERNATE) – BLUE OR BROWN (RETROREFLECTIVE)



D3-1

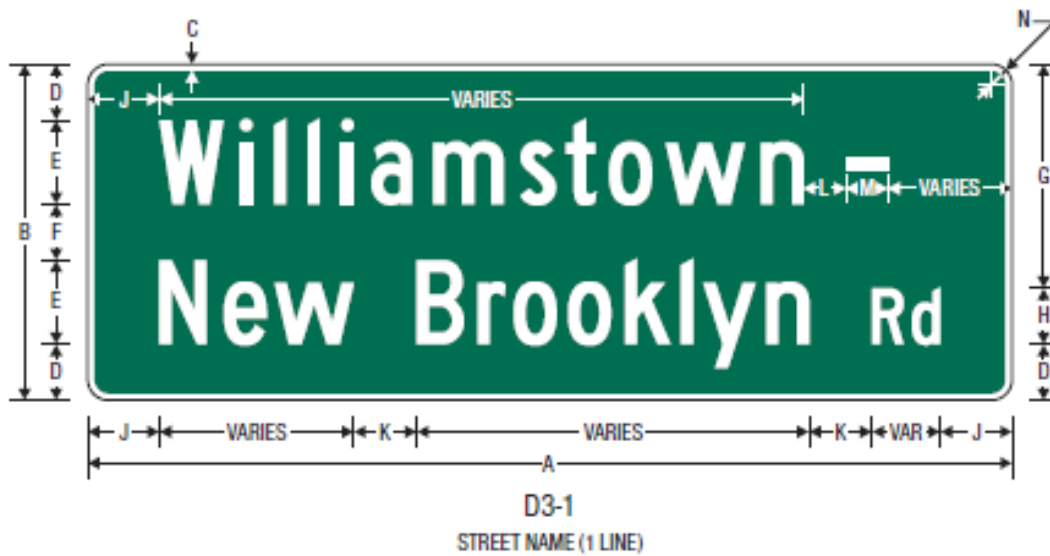
STREET NAME (1 LINE, ALTERNATE COLOR ARRANGEMENT)



D3-1 — PRINCIPAL LEGEND WITH DESCENDING STROKES
(ALTERNATE COLOR ARRANGEMENT)

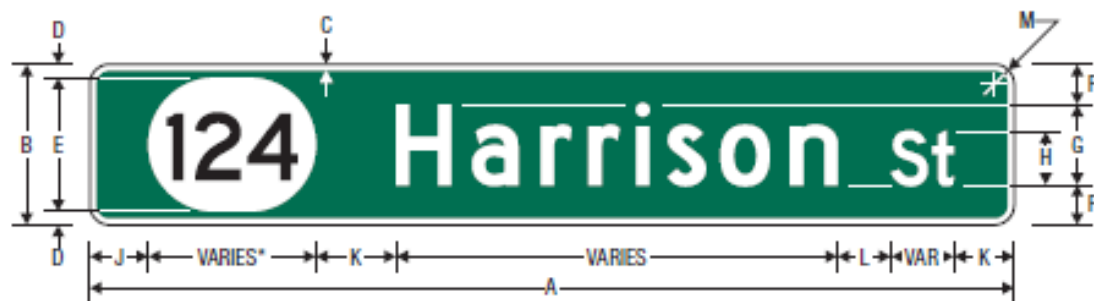
A	B	C	D	E	F	G	H	J	K	L	M	N	P
VAR	8	0.25	0.375	2	4 D	3 D	3	3 (MIN)	3	1	1.5	2.5	2.5
VAR	12	0.375	0.5	3	6 D	4 D	5	4.5 (MIN)	4.5	1.5	2.5	3.5	4.5
VAR	18	0.5	0.75	5	8 D	6 D	7	5.33 (MIN)	6	1.875	4.5	5.5	6.5
VAR	24	0.625	0.875	6	12 D	8 D	10	9 (MIN)	9	2.25	5	7	9

COLORS: LEGEND, BORDER — BLACK (NON-RETROREFLECTIVE)
BACKGROUND — WHITE (RETROREFLECTIVE)



A	B	C	D	E	F	G	H	J	K	L	M	N
VAR	15	0.375	2.25	4 C	2.5	9.75	3 C	3 (MIN)	3	2	2	1
VAR	24	0.5	4	6 C	4	16	4 C	4.5 (MIN)	4.5	3	3	1.5
VAR	33	0.75	5.5	8 C	6	22.17	5.33 C	5.33 (MIN)	6	4	4	1.875
VAR	48	1	8	12 C	8	32	8 C	9 (MIN)	9	6	6	2.25

COLORS: LEGEND, BORDER — WHITE (RETROREFLECTIVE)
 BACKGROUND — GREEN (RETROREFLECTIVE)
 BACKGROUND (ALTERNATE) — BLUE OR BROWN (RETROREFLECTIVE)



D3-1a
STREET NAME WITH ROUTE SIGN

* See M1-1 through M1-6 sign details. Scale dimensions proportionally.

A	B	C	D	E	F	G	H	J	K	L	M
VAR	8	0.375	0.75	6.5"	2	4 D	3 D	2	3 (MIN)	3	1
VAR	12	0.5	1	10"	3	6 D	4 D	3	4.5 (MIN)	4.5	1.5
VAR	18	0.75	1.5	15"	5	8 D	5.33 D	4	5.33 (MIN)	6	1.875
VAR	24	1	2	20"	6	12 D	8 D	6	9 (MIN)	9	2.25

COLORS: LEGEND, BORDER — WHITE (RETROREFLECTIVE)
 BACKGROUND — GREEN (RETROREFLECTIVE)
 BACKGROUND (ALTERNATE) — BLUE OR BROWN (RETROREFLECTIVE)
 ROUTE SIGN — SEE M1-1 THROUGH M1-6 SIGN DETAILS

Appendix D – Stormwater Video CCTV Requirements

General Requirements

Prior to acceptance of any development with public storm drainage infrastructure, the utility contractor shall arrange a camera inspection of all public storm drainage lines with a 3rd party camera service and then coordinate the results with the Public Works Manager. Any discrepancies found in violation of these Specifications shall be repaired to the satisfaction of the Public Works Manager prior to acceptance by the Town of Hillsborough (Town).

When inspection indicates possible excessive deflection in CPP, CSP, or CAP, the contractor shall complete a deflection test by mandrel using a rigid device approved by the Public Works Manager. The mandrel size shall be clearly labeled and shall be sized so as to provide a diameter of at least 95% of the inside pipe diameter. If deflection exceeds 5%, the pipe shall be evaluated to determine what corrective measures are required.

Video Assessment and Cleaning

As a final measure required for acceptance the contractor/developer shall clean and televise all newly installed public stormwater drainage lines. Standards to be followed include:

- a) Clean/televise stormwater drainage lines installed from the upstream to downstream manhole/catch basin with no reverse setups or cutaways.
- b) Throughout shooting, the camera shall be panned and tilted for a complete view of the line.
- c) Lighting shall be adequate to view the entire storm drain line from beginning to end. Lighting for the camera shall be sufficient to yield a clear picture of the entire periphery of the pipe.
- d) The camera shall be advanced at a uniform rate not to exceed 20 feet per minute that allows a full and thorough inspection of the new storm drain line.
- e) The camera shall be a color, pan and tilt camera capable of producing a five-hundred-line resolution picture. The picture quality shall be acceptable and sufficient to allow a complete inspection with no lapses in coverage.
- f) The length of the storm drain line shall be measured and recorded on the video screen. The distance counter shall be calibrated before shooting the inspection video.
- g) The contractor/developer shall clean the storm drain lines ahead of video inspection with a high-velocity water jet. All construction debris shall be collected in the downstream manhole and shall not be released into the storm drain system.
- h) The Town shall be present throughout the cleaning and televising of the storm drain lines to verify that the video work complies with the Specifications. The camera operator shall stop, reverse, pan, and tilt the camera to view any area of interest during the inspection as directed from the Town. The video inspection shall take place within 2-hours of cleaning operations as witnessed by the Town.

- i) It is recommended that site grading and all utilities be installed and complete prior to final inspection to ensure that damages to the storm drain lines do not occur. Damages found after final inspection would require re-inspection by the Town.
- j) The video inspection shall be submitted to the Town on a CD/DVD and formatted with software compatible and readable by the Town. The Town shall not be responsible for purchasing additional software necessary to view the CD/DVD.
- k) Prior to submitting the CD/DVD to the Town, the contractor/developer shall label the CD/DVD with the following information:
 - Name of the Project/Development.
 - Name and contact information of responsible party.
 - Date of televising.
 - Manhole identification as shown on the design plans.