Public Works Department

Hillsborough County Florida

Hillsborough County Transportation Design Manual

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ACCOMMODATION STATEMENT

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HILLSBOROUGH COUNTY

TRANSPORTATION DESIGN MANUAL

APPROVED

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11/01/23

Effective Date

PREFACE

The Hillsborough County Transportation Design Manual (HCTDM) contains information and guidance regarding the County's specific standards and design procedures for designing and submitting transportation plans for arterial, collector, and local roads within the County's public right-of-way. The manual is created to improve ease in the coordination of projects, and when applicable, facilitate the design and construction of projects in conformance to the County's required standards and preferences.

As material specifications, technical criteria and County polices change to meet new needs and changing technology, it will become necessary to revise and update this manual. The County's procedure for making revisions includes issuing technical bulletins, to be incorporated into the manual annually, and performing a biannual manual update on odd-numbered years. The biannual update procedure, *Technical Publications Update and Revision Procedures*, requesting public comments, can be previewed on the County's website. In addition, comments and suggestions for revisions to the HCTDM can be submitted using the online "*Comment on Public Utilities/Public Works Technical Publications*" form located on the County's website.

Technical bulletins incorporated into HCTDM are inserted in several different ways. Some bulletins are incorporated into their own section word for word, and others may have modifications due to comments received. Some bulletins documenting design criteria may be included directly into tables about the design criteria. Appendix A identifies where and how the bulletins have been inserted into the HCTDM and if modifications were made to the original bulletin. The standards in the HCTDM supersede all previously posted bulletins.

TABLE OF CONTENTS

ACRONYMS AND ABBREVIATIONS

AADT	Annual Average Daily Traffic
AASHTO	American Association of State Highway and Transportation Officials
ADA	Americans with Disabilities Act
BCA	Benefit-Cost Analysis
BL	Bike Lane
BOCC	Board of County Commissioners
C1&C2	Rural Context Classification
C3	Suburban Context Classification
C3R	Suburban Residential Context Classification
C3C	Suburban Commercial Context Classification
C3T	Suburban Town Context Classification
C4	Urban General Context Classification
CADD	Computer-Aided Design and Drafting
CDMS	Crash Data Management System
CIP	Capital Improvement Program
CMF	Crash Modification Factors
CRF	Comment Review Form
DDM	Design Deviation Memorandum
EMS	Emergency Medical Service
EOR	Engineer of Record
EV	Emergency Vehicle
FC	Friction Course
FDM	FDOT Design Manual
FDOT	Florida Department of Transportation
FHWA	Federal Highway Administration
FL	Florida
FPDM	Flexible Pavement Design Manual
FSAG	FDOT Safety Analysis Guidebook for PD&E Studies
GIS	Geographic Information System
HART	Hillsborough Area Regional Transit Authority
HAWK	High-Intensity Activated Crosswalk
HC	Hillsborough County
HCTDM	Hillsborough County Transportation Design Manual
HSM	Highway Safety Manual
IESNA	Illuminating Engineering Society of North America
ITE	Institute of Transportation Engineers
LDC	Land Development Code
MPH	miles per hour
MUTCD	Manual on Uniform Traffic Control Devices
NACTO	National Association of City Transportation Officials
NCHRP	National Cooperative Highway Research Program
OD	Open Drainage
OH	Overhead
PER	Preliminary Engineering Report
PM	Project Manager
PW	Public Works
RPM	Raised Pavement Markers

RRFB	Rectangular Rapid Flashing Beacon
RRR	Resurfacing, Restoration, and Rehabilitation
SWFWMD	Southwest Florida Water Management District
SPF	Safety Performance Function
SUP	Shared Use Path
TECO	Tampa Electric Company
TEM	Traffic Engineering Manual
TPO	Transportation Planning Organization
TSD	Technical Service Division
TSP	Typical Section Package
TTC	Temporary Traffic Control
TTM	Transportation Technical Manual for Subdivision and Site Development Projects

PART 1: INTRODUCTION AND PROCESSES

SECTION 1.1 INTRODUCTION

1.1.1 PURPOSE OF MANUAL

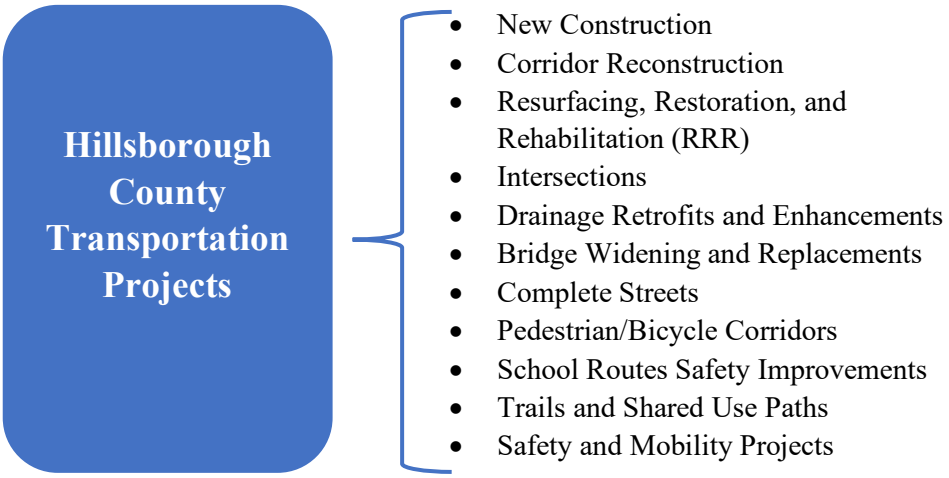
The Hillsborough County Transportation Design Manual (HCTDM) identifies Hillsborough County's (County) adopted design criteria and provides guidance and design procedures for arterial roads, collector roads, local roads, and other transportation projects within the County's public right-of-way. The adopted Hillsborough County design criteria includes all the Florida Department of Transportation's (FDOT) design criteria and the latest versions of Hillsborough County Public Work's design manuals:

- Public Works Standard Specifications for Construction
- Stormwater Management Technical Manual
- Utility Accommodation Guide and Rights-of-Way Use Procedures Manual
- Utility Coordination Procedures for Hillsborough County Construction Projects within County Rights-of-Way

Hillsborough County's criteria takes precedence over the FDOT design criteria. The HCTDM will specifically designate County standards that supersede the adopted FDOT design criteria. The HCTDM is not a comprehensive design manual, it is a supplement to the adopted FDOT criteria and identifies new processes and plan submittal requirements.

The intended audience for the HCTDM are professional engineers and other professionals participating in the planning and design of Hillsborough County infrastructure. The HCTDM should be used by professionals as a design resource and is intended to assist professional engineering judgment.

Transportation projects include CIP projects and all other transportation related improvements performed within the County's existing and proposed right-of-way.



As material specifications, technical criteria and County polices change to meet new needs and changing technology, it will become necessary to revise and update the HCTDM. The County's procedure for making revisions includes issuing design bulletins and accepting public comments. Design bulletins can be reviewed on the *County's Public Utilities and Public Works Technical Bulletins* website. In addition, comments and suggestions for revisions to the HCTDM can be submitted using the online *Comment on Public Utilities/Public Works Technical Publications* form. All Hillsborough County Technical manuals will be updated on a biannual basis, on odd-numbered years, beginning with a request for comments sent out in April of every odd year.

THREE RESOURCES WORKING TOGETHER

The HCTDM is one of three resources to guide the planning and design of Hillsborough County's transportation projects consistent with the County's Comprehensive Plan.

- First, planners and engineers should consult the *Hillsborough County Context Based Classification Map (GIS)* and *Roadways Functional Classification Map (GIS)* to confirm the road's context classification and functional classification.
- Second, planners and engineers should consult the County's *Complete Streets Guide* for the expected road users, their anticipated modes of travel, and what road elements are needed to accommodate these users based on the verified context classification.
- Third, engineers will utilize the HCTDM for guidance and requirements for County plans standards and production. The HCTDM will provide guidance on how to perform design analyses to reduce fatalities and high-injury crashes, how to manage speed to improve public safety, and how to implement elements and finalize the design of a road improvement.

These documents work together to guide investments in the County's transportation system, while creating the innovative, multimodal transportation system necessary to foster sustainable growth and development.

1.1.2 HCTDM PRINCIPLES: SAFE SYSTEMS, CONTEXT SENSITIVITY, MULTI MODAL CONNECTIVITY

The County's goal is to improve transportation safety for all road users, including pedestrians, bicyclists, transit riders, micromobility users, and drivers, by reducing crashes through design. This will be accomplished through designs that are intuitive, foster speed management, provide appropriate separation of vulnerable road users, and include access and accommodation for emergency vehicles.

The HCTDM is part of the County's systemic approach to enhance transportation systems through design that prioritizes safety, is context sensitive, and integrates multimodal transportation. The HCTDM provides design concepts for complete roads and livable communities that encourage sustainable transportation modes through safe, convenient, and complete networks for all users. The County requires planners and designers to incorporate these concepts when developing transportation projects.

In Hillsborough County, there are various types of roadways and contexts that require tailored designs to enhance safety, mobility, and connectivity. For example, rural roadways with higher motorist speeds require different designs than urban roads with lower speeds. The HCTDM's intent, along with the Complete Streets Guide, is to implement a context based, safe systems approach to planning and designing roads in Hillsborough County. The HCTDM will encourage planners and engineers to approach transportation projects in a different way. This will enable transportation decision makers to envision transportation projects as an opportunity to improve public spaces, foster placemaking, and to prioritize people movement over vehicle movement where appropriate.

The HCTDM will support public health through road designs which facilitate low stress multi-modal transportation options, decrease undesirable transportation impacts on underserved communities, and create multimodal connections to destinations for all residents.

HCTDM PRINCIPLES

Safety Goals	Design roads that optimize safety by accommodating human errors and reducing the impact energy on the human body to tolerable levels.
	Prioritize the safety of vulnerable road users including pedestrian, bicyclist, children, elderly, and persons with disabilities by implementing speed management strategies and separating time and physical space between vulnerable road users and vehicles.
	Design for safe road user behaviors through implementing proven countermeasures and introducing new technologies.
	Promote improvements that focus on reducing both existing high-injury crash locations and locations that have risk factors that could potentially lead to high-injury crashes.
Context Goals	Create designs which respond to community needs and support community identity.
	Engage in community outreach to understand the context and needs of the community.
	Prioritize sustainable transportation modes.
	Promote development of underutilized urban spaces which enhance community quality of life.
Multi-Modal Goals	Design pedestrian and bicycle networks based upon context which prioritize safety, provide functionality, and support efficient travel.
	Implement designs which decreases bicycle and pedestrian stress and enhance comfort for micromobility users.
	Design multimodal networks to make seamless connections to existing networks and support the appropriate level of traffic stress based on user vulnerability.
	Design facilities which are convenient, accessible, and provide access to destinations which enhance quality of life.
	Build a transportation system that supports the needs of all users with respect to ability, income, identity, or mode choice.

1.1.3 DESIGN STANDARDS AND SPECIFICATIONS

The HCTDM supplements and/or substitutes existing engineering standards, requirements, and guidelines in the following engineering manuals:

- FDOT Design Manual for the County's arterial and collector roads.
- FDOT Manual of Uniform Minimum Standards for Design, Construction and Maintenance for Streets and Highways (also known as the Florida Greenbook) for the County's local roads.
- All other FDOT design manuals that address civil engineering disciplines' design criteria.

Manuals not altered by instructions given in this manual and must be complied with are typically national manuals as follows:

- ADA Standards for Accessible Design
- Manual on Uniform Traffic Control Devices
- Others identified herein (the latest editions).

Other County Public Work manuals to reference for transportation projects are the latest versions of the:

- *"Public Works Standard Specifications for Construction"*
- *"Stormwater Management Technical Manual"*
- *"Utility Accommodation Guide and Rights-of-Way Use Procedures Manual"*
- *"Utility Coordination Procedures for Hillsborough County Construction Projects within County Rights-of-Way"*

1.1.3.1 HIERARCHY OF CONTRACT DOCUMENTS

Special Provisions, Plans, Specifications, and supplementary documents are integral parts of the Contract Documents. All parts of the Contract Documents are complementary and provide a complete description of work to build a project.

In case of discrepancy, the governing order of Contract Documents is as follows:

1. Special Provisions
2. Technical Special Provisions
3. Plans
4. Hillsborough County Standard Plans
5. FDOT Standard Plans
6. Hillsborough County Supplemental Specifications
7. Hillsborough County Public Works Standard Specifications for Construction
8. FDOT Developmental Specifications
9. FDOT Supplemental Specifications
10. FDOT Standard Specifications

Computed dimensions govern over scaled dimensions.

1.1.4 PUBLIC INVOLVEMENT

Public Involvement or Engagement is an approach to decision-making that prioritizes inclusion of the community through information-sharing and relationship-building. The County's Customer Service & Support Department is responsible for scheduling and coordinating all public involvement activities and meetings held for all departments under the County Administrator. The Customer Service & Support Department will determine and manage all Customer Engagement Plans to support the Project Manager's transportation project. The Customer Service & Support Department will also work closely with the County's Communications & Digital Media Public Relations team and/or the EOR for messaging and design of all aspects of communications (including support materials for meetings) that will support the Customer Engagement Plan.

The Transportation project's PM must coordinate with the Customer Service and Support Department to determinate the required public outreach materials and public meetings to assist with the Community Engagement Plan.

SECTION 1.2 PLANS DEVELOPMENT PROCESSES

1.2.1 CIP TRANSPORTATION PROJECT RESOURCES

The Technical Services Division has created a CIP Project Resources website. The website provides links to resources needed for transportation projects and other improvement projects within the Hillsborough County right-of-way. The links to the following resources can be found on the County's *CIP Project Resources* website.

- Capital Improvement Programs: Architectural, Engineering, and Construction
- CIP Resource Maps
- County Capital Improvement Projects
- FDOT Publications
- Hillsborough County 2017 Lidar (Digital Elevation Model)
- Public Utilities & Public Works Technical Bulletins
- Public Works Publications
- Review Process for Capital Improvement Program Projects
- Hillsborough County Transportation Design Manual
- Temporary Traffic Control Permits
- Traffic Engineering Information

1.2.1.1 REVIEW PROCESS FOR TRANSPORTATION PROJECTS

The following documents are to be used for the Review Process for Capital Improvement Program Projects:

- *Review Process SharePoint Flow Chart*
- *Deliverable Checklist for Design Phase*
- *Deliverable Checklist for Project Development and Environment Phase*
- *Standard File Naming Convention for Project Deliverables*
- *CRF SharePoint Instructions*

1.2.1.2 LAND DEVELOPMENT TRANSPORTATION PROJECTS

The *Transportation Technical Manual for Subdivision and Site Development Projects* (TTM) provides guidance on the designing and submitting transportation plans for proposed Subdivision and Site Development Projects to be constructed in unincorporated Hillsborough County. Any land development transportation improvements affecting Hillsborough County arterial or collector roads must adhere to the requirements in Section 12 of the TTM.

1.2.2 MULTIMODAL SAFETY ANALYSIS

Hillsborough County has developed a Multimodal Safety Analysis methodology with the goal of reducing fatalities and serious injuries on County roads and at intersections for all transportation projects. The methodology provides a comprehensive and consistent multimodal safety approach that uses the most current safety practices.

In 2021, the US Department of Transportation (US DOT) developed the National Roadway Safety Strategy (NRSS) to address the growing issue of serious and fatal injury crashes on our roadways. As part of the NRSS, US DOT has committed to the Safe System Approach (SSA) which understands that humans make mistakes and humans can only withstand a certain level of kinetic energy before serious and fatal injuries occur. Hillsborough County is committed to the SSA and has introduced the pillars of Safe Roads, Safe Speeds, and Safe People, into the multimodal safety methodology. The remaining two pillars, Safe Vehicles and Post-Crash Care, are outside of the scope of the Multimodal Safety Analysis.

The Multimodal Safety Analysis methodology is based on the most recent (as September 2023) versions of:

- AASHTO Highway Safety Manual (HSM 1st Edition, 2013 with Errata),
- FHWA Signalized Intersections Informational Guide (2nd Edition, 2013),
- FDOT Design Manual (FDM 2023),
- FDOT Safety Analysis Guidebook for PD&E Studies (FSAG, 2019),
- FDOT Traffic Engineering Manual (2023), and
- FDOT Manual on Uniform Traffic Studies (MUTS, 2022).

The safety methodology will be based on the most recent versions of the aforementioned publications, should any updated versions of the above referenced manuals or guides be published.

The Multimodal Safety Analysis methodology provides for:

- Understanding of each crash by the examination of events before, during, and after the crash.
- Understanding of the road users and potential safety issues through the application of Context Based Classification, multimodal needs, and future community needs.
- Data-driven approach that provides quantitative differences in safety performance between alternatives.

A Multimodal Safety Analysis is required for all transportation projects, except for drainage retrofit and drainage enhancement projects, and must be signed and sealed by a Professional Engineer registered in the State of Florida.

1.2.2.1 PREVIOUS SAFETY ANALYSES

A Safety Analysis is typically required for all project development tasks including PD&E Reports and PERs. The most recent Safety Analysis should be reviewed to determine if an updated Safety Analysis is required based on changes of land use, adverse user behavior, increased crash rate, or increased fatal/serious injury rate. Recommendations to use the previous Safety Analysis must show that no significant changes have occurred with land use, behavior, crash rates or fatal/serious injury rates. The Safety Analysis procedure in Section 1.2.2.2 must be performed if significant changes have occurred. The Engineer of Record must submit a memorandum for review indicating

why the previous Safety Analysis should be accepted or why a new Safety Analysis should be performed. Final approval to proceed must be obtained from the County's Technical Service Division.

1.2.2.2 MULTIMODAL SAFETY ANALYSIS OUTLINE

The Multimodal Safety Analysis procedure is outlined into four sections. The Multimodal Safety Analysis report should follow the outline as described below:

- Crash Data Collection and Review
    i. Crash Data Collection
    ii. Crash Data Summary
    iii. Collision Diagram
- Multimodal Safety Diagnosis
    i. Review of Supporting Documents
    ii. Assessment of Field Conditions
    iii. Crash Contributing Factors (Haddon Matrix) and Potential Safety Concerns
- Selection of Countermeasures
    i. Develop Countermeasures
    ii. Safety Effect Evaluation
    iii. Benefit-Cost Analysis
- Recommendations
    i. Recommended Countermeasures/Solutions
    ii. Consideration of Innovative Solutions Beyond Countermeasure Selection
    iii. Countermeasure Implementation Plan

1.2.2.2.1 CRASH DATA COLLECTION AND REVIEW

Crash Data Collection:

Crash data is the basis for the Multimodal Safety Analysis. Crash data should be collected following the requirements below:

1) Analysis Area:
The study limits of a Multimodal Safety Analysis should be the project limits and the adjacent areas of influence that may extend beyond the project limits. The adjacent area of influence should consider all users (for example: vehicles, bicyclists, pedestrians) and their exposure to the project. The influence area proposed by the Engineer of Record should be coordinated with the County PM to obtain documented approval from the County's Technical Services Division, Traffic Engineering Section.

2) Analysis Period:
Multimodal Safety Analysis will be performed by analyzing the most current five years of complete historical crash data.

3) Crash Data Source:
For facilities owned or maintained by the County, crash data should be obtained from CDMS. If other crash data sources are used, including University of Florida's Signal Four Analytics or FDOT's Safety Office CDMS Crash Analysis Record, the crash data must be coordinated with the County PM to obtain documented approval from the County's Technical Services Division, Traffic Engineering Section.

Documentation:

The results of Crash Data Collection and Review must include:

- A Crash Data Summary Table for Roadway Segments and a Crash Data Summary Table for Intersections. The Crash Data Summary Tables for Roadway Segments and Intersections can be found in Excel format at the following link: *Hillsborough County Public Work Crash Data Summary Table*.

- A collision diagram to provide a visual representation of crash patterns and help identify crash clusters by crash location. The collision diagram should follow the requirements in the current version of FDOT's MUTS. A historical aerial reflecting the conditions during the crash data analysis period is recommended to be used as the collision diagram background for correlating roadway conditions with crashes.

- A summary of identified crash patterns from the crash data summary table and the collision diagram.

1.2.2.2.2 MULTIMODAL SAFETY DIAGNOSIS

A Multimodal Safety Diagnosis must be performed to identify contributing factors and potential safety concerns. The diagnosis will involve reviewing supporting documentation and assessing field conditions, which provides an additional perspective to the Crash Data Collection and Review.

Supporting Documentation:

Reviewing supporting documentation can provide additional information that can explain the observed crash patterns from the Crash Data Collection and Review. Supporting documentation can also assist in identifying road user needs and safety concerns for newly planned developments near the project location. Supporting documentation includes, but is not limited to, Hillsborough County Context Based Classification, community plan needs as identified in the Comprehensive Plan's Livable Communities Element, recent transportation studies within the project limits, and current traffic data for all vehicular, pedestrian, bicycle and micromobility travel modes.

Assessment of Field Observation:

Field observations can serve to validate the safety concerns in the Crash Data Collection and Review and the supporting document assessment. Field observation should also identify potential safety concerns associated with driver behavior, roadway design, and field conditions (e.g. speeding at curves, near-miss crashes if any). The required field review should address how users of different modes travel through the project limits, particularly those more vulnerable in crashes. Vulnerable users within the project context should include the elderly, children, disabled populations, pedestrians, bicyclists, and motorcyclists. The criteria and conditions experienced within the decision sight distance limits must be identified. Field observations must be conducted for both daytime and nighttime conditions. An assessment of field conditions includes considerations of, but not limited to, traffic operations, geometric conditions, physical conditions, weather, traveler behavior, transit, pedestrian, bicycle and other vulnerable road user activity, and heavy vehicle activity. A form for the field assessment is provided on *Safety Analysis Field Assessment Form*.

Crash Contributing Factors (Haddon Matrix) and Potential Safety Concerns:

Crash contributing factors are distributed into three categories: human, vehicle, and roadway/environment, and they should be examined in three crash phases, including:

1) Before the Crash: Phase includes vehicle movements and dynamics between movements and roadway conditions and geometry, as well as the critical event immediately prior to a crash. (For example: motorist behavior, pavement condition, sight obstructions, weather and lighting conditions).

2) During the Crash: Phase includes the crash description about critical event (for example, vehicle direction, location), crash type, and road and weather physical conditions when each crash occurred (for example: crash time, pavement condition, sight obstructions, roadway geometry - horizontal and vertical, weather, and lighting condition).

3) After the Crash: Phase includes the results of a crash (for example: vehicle positions, crash severity, injuries, and fatalities).

The three-phase analysis of crash contributing factors, or commonly referred to as the Haddon Matrix, can be conducted for each crash by reviewing crash data, field assessment, and project historical aerials when the crash occurred (for example: Google Earth Historical Imagery or FDOT Aerial Photo Look Up System). The detailed evaluation factors for developing Haddon Matrix are included in Table 1 below. Due to data availability issue, vehicle factors for the phase of after the crash, such as integrity of fuel system, ease of access and fire risk, and roadway/environmental factors, such as distance from trauma center, incident management, roadway congestion, are not applicable for transportation improvement projects.

Table 1: Example Haddon Matrix for Identifying Contributing Factors

PHASES	HUMAN FACTORS	VEHICLE FACTORS	ROADWAY/ENVIRONMENTAL FACTORS
BEFORE THE CRASH	• Driver vision • Driver and non-motorist Impairment • Driver attention • Driver age	• Speed of vehicle	• Road design and markings • Intersection configuration • Roadway lighting • Speed limit
DURING THE CRASH	• Use of restraints/ Child restraint use • Airbag use • Driver and non-motorist action • Non-Motorist action	• Vehicle size • Vehicle year	• Presence of fixed objects near roadside • Roadside embankments • Guard rails and median barriers • Crash light condition
AFTER THE CRASH	• Severity of injuries • Age of occupant	Not Applicable	Not Applicable

The key contributing factors should be identified in each crash and summarized for each crash pattern and safety concern. Examples of contributing factors are provided in the Section of 6.2.2 of HSM (1st Edition, 2010) and discussed in detail in NCHRP Report 500. If the three-phase crash data review (Haddon Matrix) is not conducted for all crashes, a justification should be submitted

to the County PM to obtain documented approval from the County's Technical Services Division, Traffic Engineer Section.

Documentation:

The results of the Multimodal Safety Diagnosis should include:

- Summary of supporting documents and potential safety concerns.
- Summary of field observations and potential safety concerns. (*Safety Analysis Field Assessment Form.)*
- A condition diagram is required when an aerial cannot convey or capture the current safety concerns identified in the field review.
- Haddon Matrix development and key contributing factors for each crash.
- Crash contributing factors summary for identified crash patterns and for any safety concerns identified above.

1.2.2.2.3 SELECTION OF COUNTERMEASURES

Countermeasure selection must be conducted after completing the Data Collection and Review and Multimodal Safety Diagnosis.

Develop Countermeasures:

Countermeasures must be developed after identifying the contributing factors based on the crash data analysis results derived from the Data Collection and Review, and identification of existing and potential safety concerns from the Multimodal Safety Diagnosis. When evaluating the SSA elements of Safe Roads, Safe Speeds and Safe People, more than one countermeasure may be applied to address each of the identified contributing factors and safety concerns. Innovative countermeasures based on analyses of human behavior are encouraged but must be documented before application. Countermeasure resources include but are not limit to: AASHTO HSM, FHWA Proven Safety Countermeasures initiative, FHWA CMF Clearinghouse, FHWA technical publications and NCHRP reports for safety-related treatments.

Evaluate Crash Reduction Effectiveness:

The crash reduction effectiveness of all potential countermeasures should be evaluated quantitatively by calculating the potential changes of crash frequencies before selecting the final countermeasures to be incorporated into a project. Some countermeasures proposed may not have available or sufficient data to evaluate crash reduction effectiveness; thus, these recommended improvements must be coordinated with the County PM to obtain documented approval from the County's Technical Services Division, Traffic Engineering Section. The potential changes of crash frequencies can be calculated using either of the two methods discussed below:

1) Crash Modification Factors Method:

   CMFs can be obtained from the FHWA *CMF Clearinghouse* (star quality rating should be at least 3 stars). Details for selecting an appropriate CMF, applying multiple CMFs, and comparison of CMFs can be found in Section of 5 in the FSAG (FDOT, 2019).

2) HSM Predictive Method:

This method can be used to evaluate current and future safety performance of road projects. Details for applying the predictive method in Florida and available calculation tools can be found in Section of 6 in the FSAG (FDOT, 2019).

The appropriate method depends on many issues, including the type of project proposed, safety issues and availability of Safety Performance Functions (SPFs), calibration factors, and data. The suggested recommendation for selecting the appropriate method for different transportation projects is provided in Table 2. If the selected methodology differs from the table, coordinate with the County PM to obtain documented approval from the County's Technical Services Division, Traffic Engineering Section.

Table 2: Methodology Selection

PROJECT TYPE	CMF METHOD	HSM PREDICTIVE METHOD
New Construction		✓
Corridor Reconstruction		✓
Resurfacing, Restoration, and Rehabilitation (RRR)	✓	
Intersections[1]	✓	✓
Bridge Widening and Replacements	✓	
Complete Streets	✓	✓
Pedestrian/Bicycle Corridors	✓	✓
School Routes Safety Improvements	✓	
Trails and Shared Use Paths Crossings	✓	
Safety and Mobility Projects [2]	✓	✓

[1] For Intersections, the HSM Predictive Method will be required where there are major differences, including changes in: traffic control, number of thru lanes, number of turn lanes (dual or triple), right-of-way needs and future land use.

[2] Examples include: Midblock Crossings, Access Management Improvements, Safety Lighting, Safe Route to Transit, Corridor Speed Management.

Benefit-Cost Analysis:

A Benefit-Cost Analysis must be performed to rank the selected countermeasure or combination of countermeasures by monetizing safety benefits associated with the projected reduction in crash frequencies. Ranking the societal costs is a summary of the construction, operation, maintenance, and other costs anticipated over the life of the project. Detailed BCA parameters, methods, and crash cost data are included in FDM, Chapter 122. Either Net Present Value or Benefit-Cost Ratio can be the measurement to compare benefits to costs and prioritize the countermeasures. Some consideration factors cannot be monetized, including community vision and environment, public demand, public perception and acceptance, road user needs, and other non-measurable community concerns. To determine the recommended countermeasure or combination of countermeasures, a

benefit-cost analysis in monetary terms may serve as the primary decision-making tool, with secondary consideration of qualitative (non-monetized) factors.

Documentation:

The results of the countermeasure selection should include:

- List of countermeasures selected for the identified contributing factors and potential safety concerns.
- Evaluation method and results of crash reduction effectiveness for each countermeasure or combination of countermeasures.
- BCA results and qualitative factor considerations.

1.2.2.2.4 RECOMMENDATIONS

Recommendations of a countermeasure or a combination of countermeasures with supporting explanation of how it will improve safety must be provided based on the BCA and qualitative evaluation results. Innovative solutions beyond countermeasure selection are encouraged, but the effectiveness of reducing fatal/severe injury crashes and implementation concerns should be documented. The implementation plan for recommended countermeasures should be discussed and documented.

1.2.3 ALTERNATIVE INTERSECTION EVALUATIONS

The use of Intersection Control Evaluation process (ICE) is optional for alternative intersection evaluations. If required, include alternative intersection evaluations during the PD&E and PER phase of a project or prior to any design phase submittal.

1.2.4 ROUNDABOUT EVALUATION

Hillsborough County requires consideration of a roundabout as an alternative for all intersections and signalization projects. Roundabouts promote community enhancement, traffic calming, safety, and improve operational conditions. The guidance for evaluating and designing roundabouts is provided in NCHRP Report 1043 – Guide for Roundabouts.

Roundabout, Westchase, Fl

1.2.5 DRIVEWAY CLOSURE PROCEDURE

Any driveway closure proposed in Hillsborough County within the public right-of-way must be substantiated by an engineering study signed and sealed by a Professional Engineer registered in the State of Florida. The study must consider the following:

1) The County must identify sufficient justification for recommending closure of any property owner's driveway. Justifications for closing a driveway may include:
   - Abandoned/Unused driveway.
   - Noncompliant driveway with respect to the Americans with Disabilities Act (ADA) and cannot be brought up to compliance without acquiring right-of-way.
   - Proximity to an intersection.
   - Poses a current or potential safety or operational problem.
   - Adherence to the County's access management standards.

   The determination of sufficient justification must reference previous land use conditions of approval and traffic circulation impacts related to the driveway closure.

2) The engineering justification for the driveway closure process must be submitted for review and approved and signed by the Technical Services Division Director.

3) The County will provide reasonable notice to the impacted property owner and lessee(s) once the recommended driveway closure is identified with sufficient justification.
   - A *Notice of Intended County Action – Closure of Driveways* letter must be sent to the impacted property owner and lessee(s) on any action to close a driveway. The letter will establish the notification of the driveway closure and the justification, as well as an explanation of their right to be heard regarding any objections to the intended closure.
   - The letter must be reviewed and approved by the County Attorney's office prior to sending to the property owner and lessee(s). The letter must be sent via certified U.S. mail return receipt requested or hand-delivery. See example *Notice of Intended County Action – Closure of Driveways* letter attached, also the letter can be found in word format at the following link: *Notice of Intended County Action – Closure of Driveways*.

4) The property owner and lessee(s) can appeal to the County's Driveway Access Review Committee to request an informal administrative hearing if the property owner or lessee(s) do not agree to the driveway closure. The Driveway Access Review Committee members should be unaffiliated with the property involved with the driveway closure to avoid a conflict of interest. The Committee will evaluate the appeal and render a decision. The Property owner or lessee(s) will have thirty (30) calendar days to contact the County Project Manager to request an appeal.

5) The Driveway Access Review Committee will be composed of the individuals in the following County positions:
   - County Engineer
   - Engineering & Operations Department Director
   - Development Services Department Director

   A Committee member that has a conflict of interest may be replaced by the remaining Committee members. The County Engineer will chair the committee.

SECTION 1.3 PLANS PRODUCTION AND SUBMITTAL

1.3.1 DESIGN SUBMITTALS AND REVIEWS

1.3.1.1 SEQUENCE OF PLANS PREPARATION

Refer to the FDM, Chapter 301, *Sequence of Plans Preparation,* for new construction or corridor reconstruction transportation projects. Separate components plan sets should not be included for other transportation projects.

1.3.1.2 PROJECT DELIVERABLES

The Engineer of Record must fill out the County's Project Deliverable Check list form for *Design Projects* or *PERs / PD&E Reports* for each phase submittal for all project submittals. All design documents (plans, reports, calculations, etc.) must be submitted using the County's standard file *Naming Convention*

1.3.1.3 PROJECT REVIEWS

All project phase reviews will be accomplished on a single SharePoint review form. The *Review Process Flow Chart* provides a detailed over-view of the review process. Reviewers and EORs may contact *PW-CIPTransportationReview@hillsboroughcounty.org* for training on how to fill out the SharePoint review form.

1.3.2 SUPPORTED CADD PLATFORMS

The County supports both Autodesk's AutoCAD/Civil 3D and Bentley's OpenRoads Designer platforms.

The County uses the FDOT's CADD Software, commonly known as the FDOT Connect State Kit workspace, that includes standard design libraries/templates to propagate the CADD Standards definitions of levels/layers and symbology, multi-line styles, text styles, dimension styles, cells, element templates, menu customizations, customized tools, tool boxes, and tasks for OpenRoads Designer and AutoCAD platforms. The FDOT Connect State Kit workspace must be used on all County transportation projects to help facilitate reviews and reading of construction plans. Maintaining the commonality among line symbology, cell configuration, and text styles makes it easier for design and construction personnel to read and review plans.

Projects must be designed, delivered, signed, and sealed in compliance with FDOT's CADD Manual.

1.3.3 PROJECT PLAN SHEET TEMPLATES

Project Plan Sheet Templates provide information to aid in the design and submittal of transportation projects. Plan Sheet Templates are provided to use as base sheets for all plans produced for the County.

This information is available at the following link: *Standard Details and Plan Sheet Templates.*

1.3.4 DESIGN CRITERIA TABLE

Design Criteria must be provided in a table format for all Project Development and Environment Studies, Preliminary Engineering Reports, Typical Section Packages, Construction Plans, and other reports and analyses requiring a selection of design criteria. The Design Criteria Table must be included in the Notes to Reviewers Sheet, included in section 1.3.8.2 Notes to Reviewers Sheet.

The Design Criteria Table must cover all applicable design features involved with the project. The labeled columns shown in this table must be provided. The EOR should add any additional design elements to the table that are applicable to the project. "N/A" should be placed in the Design Criteria column for those design elements that are not applicable. The EOR should not remove a design element from the table if it is not applicable, so reviewers will know that the design element was not overlooked.

The Design Criteria Table is provided in Excel format and can be found at the following link: *Hillsborough County Public Work Design Criteria Table.*

1.3.5 DESIGN EXCEPTIONS AND DESIGN DEVIATION MEMORANDUMS

A Design Exception or Design Deviation Memorandum is required when Hillsborough County's standards and criteria are not met. When it becomes necessary to deviate from Hillsborough County's criteria, early documentation and approval are required. The level of detail for Design Exceptions or Design Deviation Memorandums should be commensurate with the complexity of the design element and the relevance of information to engineering decisions. Sufficient detail and explanation must be provided to those reviewing the request in order to justify approval.

Each Design Exception and Design Deviation Memorandum request must be submitted independently unless the controlling elements work in concert with one another. Each approved Design Exception or Design Deviation Memorandum submittal must be included in the project file to clearly document the action taken and the approval given.

Design Exceptions and Design Deviation Memorandums must be identified as early as possible in the study or design process. Early submittal allows time to research alternatives and begin the analysis and documentation activities to avoid major changes in the final phases of the project. This is preferably done during the PD&E and PER phase of a project or as soon as possible prior to the initial design phase submittal. Design Exceptions and Design Deviation Memorandums should be submitted prior to the 60% Phase Design submittal to avoid major changes to the design that would affect changes to the scope.

When the EOR determines a need for a Design Exception or Design Deviation Memorandum, the EOR must coordinate with the Hillsborough County Project Manager and the Technical Services Division Director or Designee to obtain conceptual concurrence. Once agreement is received from the County representatives to move forward with the Design Exception or Design Deviation Memorandum, the EOR will need to formally submit the necessary documentation described below for approval by the County.

Design Exceptions or Design Deviation Memorandums must use the *Signature Page* template, found on the County website forms page, as the cover sheet for submitting the document. The EOR must fill out the Signature Page template with relevant project information, place the seal in the

area indicated, and then attach the cover page as the first page of Design Exception or Design Deviation Memorandum.

Design Exceptions:

Design Exceptions are required when existing or proposed design elements do not meet both the Hillsborough County Standards and AASHTO new construction criteria for the twelve (12) Controlling Design Elements. Sufficient detail and justification for each Design Exception must be documented by the EOR and submitted to the Technical Services Division Director and County Engineer for approval.

The twelve (12) Controlling Design Elements below will apply to all Hillsborough County arterial roads and collector roads inclusive of all Design Speeds:

1. Design Speed
2. Lane Widths
3. Shoulder Widths
4. Clear Zone
5. Horizontal Curve Radius
6. Superelevation Rate
7. Stopping Sight Distance
8. Maximum Grade
9. Cross Slope
10. Vertical Clearance
11. Design Loading Structural Capacity
12. American with Disabilities Act

Hillsborough County local roads will require Design Exceptions for the following two (2) Controlling Design Elements:

1. Design Speed
2. Design Loading Structural Capacity

Design Deviation Memorandums:

Design Deviation Memorandums are required when existing or proposed design elements, other than the twelve (12) Controlling Design Elements, do not meet the Hillsborough County Standards. Sufficient detail and justification for the deviation must be documented, as described in Section 1.3.5.2 Submittal Requirements for Design Deviation Memorandums and submitted by the EOR to the Technical Services Division Director for approval.

1.3.5.1 SUBMITTAL REQUIREMENTS FOR DESIGN EXCEPTIONS

Design Exceptions must be organized in the following manner: signature page, design exception approval cover letter, and items 3 to 11 presented as sections in the design exceptions document.

1) *Signature Page for Design Exception and Deviation Methodology*

2) *Complete Design Exception Approval Cover Letter*

3) Project Description: General project information, location map, project limits, Context Based Classification, functional classification, Design Speed, design vehicle, existing road characteristics, objectives of the exception, and obstacles to the exception. Include any associated or future limitations that exist as a result of public or legal commitments.
4) Project Schedule and Lifespan: Include the expected date that plans are to be completed and the proposed date that construction is to begin. Explain why the proposed Design Exceptions are either a temporary or permanent condition. Include any future work planned or programmed to address the condition.

5) Design Exception Documentation:
   a) All documentation is to be provided in one comprehensive report that is signed and sealed.
   b) Detailed explanation of why the criteria or standard cannot be complied with or is not applicable.
   c) Provide the following data in a table format:
      - Manual name and specific chapter or section that states the design criteria:
        i. Value of the design criteria that will not be met (Hillsborough County Standards and AASHTO standards).
        ii. Value of the existing design element.
        iii. Value of the proposed design element.
      - Location(s) of all instances of the Design Exception by station and offset (including left/right side). Include all locations individually.
   d) Explanation of why the proposed value is appropriate.
   e) A plan view, plan sheet, or aerial photo of the Design Exception location, showing the posted speed, right-of-way lines, and property lines of adjacent property.
   f) A photo(s) of the area(s) of the deficiency.
   g) Typical section and/or cross-sections of the Design Exception location(s).

6) Alternative Designs Considered: Designs meeting County and AASHTO criteria, partial correction, and the no-build (existing) condition are alternative designs that could be considered.

7) Impacts of the Exceptions:
   a) Safety Performance:
      - Summary of the most recent complete five year crash history including any pertinent crash reports related to the Design Exception element.
      - Description of the anticipated impact on safety, both long-term and short-term effects. Description of any anticipated cumulative effects.
      - For nonexistent or proposed conditions, a comparison of the predicted or expected crash frequency should be included along with a discussion of the five-year crash history. Some resources that are available for this comparison include:
        i. Clearing house crash modification factors
        ii. Highway Safety Manual
        iii. Interactive Highway Safety Design Model
        iv. Roadside Safety Analysis Program
        v. Roadway Safety Fundamentals
   b) Operational Performance:
      - Description of the anticipated impact on operations, both long-term and short-term effects. Description of any anticipated cumulative effects.
      - Traffic information: Current and Design Year AADT and 24-hour truck volume.

- Compatibility of the design with adjacent sections of road.
- Effects on capacity (proposed criteria vs. AASHTO) using an acceptable capacity analysis procedure and calculate reduction for design year, level of service.

c) Right-of-way Impacts
d) Community Impacts
e) Environment Impacts
f) Impacts on all transportation modes

8) Costs: Description of the anticipated costs associated with the Design Exceptions. Provide a benefit-to-cost (B/C) ratio.

9) Mitigation Measures: Description and explanation of practical mitigation measures or alternatives that were considered. Describe why the selected treatments were recommended for the projects.

10) Summary of Conclusions.

11) Recommendations.

1.3.5.2 SUBMITTAL REQUIREMENTS FOR DESIGN DEVIATION MEMORANDUMS

Design Deviation Memorandums must be organized in the following manner: signature page, design deviation memorandum approval cover letter, and items 3 to 8 presented as sections in the design deviation document.

1) *Signature Page for Design Exception and Deviation Methodology*

2) *Complete Design Deviation Memorandum Approval Cover Letter*

3) Project Description: General project information, location map, project limits, Context Based Classification, functional classification, Design Speed, design vehicle, existing road characteristics, and explanation of required criteria versus proposed criteria.

4) Design criteria versus proposed criteria:
   a) Description of applicable criteria presented in a table format:
      - Manual name and specific chapter or section that states the design criteria:
        i. Value of the design criteria that will not be met
        ii. Value of the existing design element
        iii. Value of the proposed design element
      - Location(s) of all instances of the Design Deviation by station and offset (including left/right side). Include all locations individually.
   b) Explanation of why the proposed value is appropriate.
   c) A plan view or plan sheet of the Design Deviation location, showing right-of-way lines and property lines of adjacent property.
   d) Typical section and/or cross-sections of the Design Deviation location(s).

5) Criteria Compliance: Explanation of why the criteria or standard cannot be complied with and is not appropriate.

6) Impact of the Deviation:
   a) The Design Deviation's anticipated long-term and short-term effects on safety and potential compromises to the safety and welfare of the travelling public
      - Review and evaluate the most recent complete five years of crash history (location, type, severity, relation to the Design Deviation element).

7) Criteria Justification: Why the proposed design criteria is appropriate.

8) Recommendations.

1.3.6 TYPICAL SECTION PACKAGE

Typical Section Package is required for all Hillsborough County transportation projects to obtain approval of any modification of the road's cross-sectional elements. The TSP must be submitted prior to the layout of the project geometry. This approval must be obtained for PD&E studies and PER.

For design projects that are not preceded by a PD&E or PER, the TSP must be submitted and approved as early as possible after receiving notice to proceed and prior to design and development of Construction Plans.

The TSP approval process must follow the procedure outlined below. *Index TSC-001* must be used to submit the Typical Section Package. It includes a Cover Sheet for signatures and example Typical Section Sheets with required information:

1) TSP must include:
   a) Cover Sheet containing the following information:
      - Project Identification
      - Project Location Map
      - Engineer of Record Signature Block
      - Typical Section Approval Block
   b) Typical Section Sheet containing the following information:
      - Project Controls
        i. Context Classification
        ii. Functional Classification
        iii. Access Classification
        iv. Criteria
      - Potential Design Exceptions and Design Deviations
      - Traffic Data
        1. "CURRENT YEAR" Annual Average Daily Traffic
        2. "ESTIMATED OPENING YEAR" Annual Average Daily Traffic
        3. "ESTIMATED DESIGN YEAR" Annual Average Daily Traffic
        4. "K" factor, which represents the proportion of annual average daily traffic occurring at the peak hour
        5. "D" factor, which represents directional distribution during the peak hour
        6. "T (24 HOUR)" factor, which represents the percentage of trucks accounting for overall traffic volume

7. "DESIGN HOUR T" factor, which represents the percentage of heavy vehicles in a design hour, this factor is typically estimated as one-half the T (24 HOUR) factor.
8. "DESIGN SPEED," which will be equal to the posted speed
9. "TARGET SPEED" speed that vehicles should operate in a specific context.

- Roadway or Bridge Typical Section Drawing(s)

c) Design Speed Selection Report. See Section 2.1.3.2.1 Target Speed and Design Speed Selection Process.

2) The TSP must be submitted to the County Project Manager and forwarded to the Technical Services Division for review and approval.

1.3.7 PLANS REQUIREMENTS

1.3.7.1 KEY SHEET AND STANDARD DETAILS

Applicable Hillsborough County Standard Details must be attached to the end of Construction Plans. Details are to be used "As-Is" without modifications. Identify all County Details used in the project at the end of the plan sheet list under the Key Sheet's Index of Roadway Plans. The Index of Roadway Plans should include the Standard Detail's Sheet Index numbers and the first line of the Standard Detail's Sheet Description.

Location of details are referenced on the Standard County Key Sheet in the lower left-hand corner immediately below the Governing Design Standards Statements. A Key Sheet is provided on the County's website with the following statement and website: "Hillsborough County Standard Details and General Notes are available at the following website: *https://www.hillsboroughcounty.org/en/government/county-projects/consultant-cip-project-resources/standard-details-and-project-plan-sheet-templates*."

The Standard County Key Sheet with the above notes, and the County Standard Details are provided on the Hillsborough County Website at the following location: *Hillsborough County Public Works Standard Details and Project Plan Sheet Templates*.

1.3.7.2 NOTES TO REVIEWERS SHEET

Notes to Reviewers are required in transportation project plan submittals. The Notes to Reviewers Sheet will help facilitate informing members of the review team, management, and other County Departments about information pertinent to design criteria and special project requirements, as well as other details or notes that call the reviewer's attention to issues and features unique to the project design. The Design Criteria Table, Section 1.3.4, also must be included in the Notes to Reviewer Sheet.

The Notes to Reviewers Sheet will be incorporated in all plan sets and placed after the Key Sheet, and labeled as sheet 1B. The sheet is to be used only during the review process and should not be included in the final plans. Sheet 1B will be removed prior to final plans submittal without having to renumber the plan set.

1.3.7.3 GENERAL NOTES SHEET AND TRAFFIC GENERAL NOTES SHEET

The General Notes Sheet provides information and direction to aid the contractor by clarifying design details or construction procedures. The County has specific Roadway and Traffic General Notes required in transportation plan submittals. The Roadway General Notes Sheet will be incorporated in all plan sets and placed before the first roadway plan sheet. The Traffic General Notes Sheet will be incorporated in all plan sets and placed before the first traffic plan sheet. The general notes are available at the following link: *County's General Notes*.

1.3.7.4 PLAN NOTES

Plan notes provide additional information clarifying design details or construction procedures. These notes must be added to the plans when the stated conditions apply to the construction of the project.

1.3.7.4.1 NOTE REQUIRED FOR TEMPORARY TRAFFIC CONTROL PERMIT

The EOR must add a note to the roadway construction plans under Temporary Traffic Control to inform the contractor to apply for a TTC permit if the project will impede traffic in any way or for any work done within 15-feet from the edge of the road. If the transportation project meets these conditions, the following note must be added:

> "A Temporary Traffic Control (TTC) permit is required for any work or event lasting longer than two hours. Refer to *Apply for a TTC Permit website* for the County's TTC permit. For road closures up to seven (7) consecutive days (private applicants), and up to thirty (30) consecutive days (public agency) coordinate with the County's Engineer and Operation Department for approval. For road closures of more than seven (7) consecutive days (private applicants), and more than thirty (30) consecutive days (public agency) Board of County Commissioners (BOCC) approval is required, refer to *BOCC Policy 09.01.01.01* for more details."

1.3.7.4.2 TEMPORARY LIGHTING NOTE

Existing road lighting must be maintained throughout the duration of a construction project for County transportation projects. Temporary road lighting must be provided and maintained when existing lighting is removed to construct any portion of the project. Typically, road lighting along County roads is installed and maintained by TECO. Coordination with TECO must be accomplished prior to removing or relocating existing lighting.

The EOR must add the following pay item note to the Maintenance of Traffic pay item to address maintaining existing lighting:

> "Coordinate with the Tampa Electric Company (TECO) before removing or relocating existing lighting. Maintain the existing road lighting in service during all phases of construction, or provide temporary lighting when any portion of the existing lighting is removed. Existing or temporary lighting must be maintained until new lighting is installed and placed in service. All temporary lighting must meet the FDM lighting design criteria and the Illuminating Engineering Society of North America (IESNA) criteria."

1.3.7.5 TYPICAL SECTION SHEET TRAFFIC DATA REQUIREMENTS

County transportation projects must incorporate traffic data on the typical section plan sheets to identify key design criteria. Specific Traffic Data required on the Typical Section Sheet includes:

- "CURRENT YEAR" Annual Average Daily Traffic.
- "ESTIMATED OPENING YEAR" Annual Average Daily Traffic.
- "ESTIMATED DESIGN YEAR" Annual Average Daily Traffic.
- "K" factor representing the proportion of annual average daily traffic occurring at the peak hour.
- "D" factor representing directional distribution during the peak hour.
- "T (24 HOUR)" factor representing the percentage of trucks accounting for overall traffic volume.
- "DESIGN HOUR T" factor representing the percentage of heavy vehicles in a design hour.
- "DESIGN SPEED" will be equal to the posted speed.
- "CONTEXT CLASSIFICATION" is the manner which vehicles should operate in relationship to the surrounding characteristics of future land uses along the corridor.

If a traffic analysis was not included within the project scope, then obtain existing plans or utilize current traffic information available from Florida Department of Transportation's Florida Traffic Online website or Hillsborough Transportation Planning Organization website.

1.3.7.6 DESIGN DOCUMENTS REQUIRED FOR SIGNALIZATION PLANS

Documents listed below are required to be submitted for review at each phase submittal beginning at the 60% submittal, and all updated documents will be required to be submitted at each subsequent phase until the project is released for construction:

- Signalization Plans (to include all applicable sheets and ITS plans)
- Approved Signal Warrant Analysis
- Signed and Sealed Traffic Analysis Report (Obtain report from TSD Traffic Engineering Section if one was not performed as part of the design contract.)
- Clearance intervals calculation
- Signed and Sealed Mast Arm Structural Calculations
- Signed and Sealed Geotechnical Report
- Subsurface Utility Exploration information at the mast arm locations
- Signed and Sealed Critical Elevations Certification Letter for Traffic Signals and Overhead Sign Structures
- Signal meeting minutes and coordination emails
- Intersection lighting documentation of coordination with Hillsborough County Traffic Engineering Section and Tampa Electric Company
- Other Construction Plan component sets (Roadway, Signing and Pavement Marking, and TECO Lighting)

Transportation projects are to provide a Hillsborough County approved signal warrant analysis prior to submitting Traffic Signal Construction Plans for review. Transportation projects that do not have a Traffic Signal Warrant Analysis included in their Scope of Services can obtain the Traffic Signal Warrant Analysis from TSD's Traffic Engineering Section. A Traffic Signal Warrant

Analysis must be included as part of the CIP project's documentation when submitting Traffic Signal Construction Plans.

1.3.7.7 DESIGN DOCUMENTS REQUIRED FOR BRIDGE PLANS

Documents listed below are required at each phase submittal when bridge plans are required. All updated documents will be required to be submitted at each subsequent phase until the project is released for construction. If a document listed below is not applicable to the project, provide a note in the "Notes to Reviewers Sheet" explaining why the document is not applicable.

- Roadway and Bridge Plans
- Structural Calculations
- Geotechnical Report - this includes Sampler Penetration Tests borings, bearing capacity, and corrosivity tests
- Bridge Hydraulics Report - this includes scour analysis
- Drainage Report
- Southwest Florida Water Management District Preapplication Meeting Notes
- SWFWMD Permit - this includes no-rise certification
- Typical Section Package
- Notes to Reviewers Sheet
- Utility Coordination Documentation
- Hillsborough County's Floodplain Manager Coordination for Documentation at Bridges on Regulated Floodways

1.3.8 PRELIMINARY SUBMITTAL REQUIREMENTS FOR ROUNDABOUTS

Provide conceptual signing and pavement marking plan sheet(s) with preliminary roundabout plans for PD&E, PER, and construction plans. The concept should include a graphic representation of striping, along with conceptual signage. Location callouts and similar labeling are not necessary. Refer to NCHRP Report 1043 – Guide for Roundabouts for evaluating and designing roundabouts.

Preliminary roundabout submittals must also include the following performance checks:

- Fastest Path Alignments and Calculations
- Sight Distance and Visibility Diagrams at all approaches
- Turning Movement Swept Paths for the Design Vehicle
- Vehicle Path Alignments at all approaches to avoid lane imbalance causing vehicles to converge

PART 2: DESIGN GUIDELINES

SECTION 2.1 CONTEXT BASED DESIGN

Context Based Design considers a road project as more than moving vehicles by examining the project, corridor, and surrounding area in a holistic way. The Context Based Design approach will help create resilient and sustainable transportation infrastructure to satisfy the needs of each community and maintain aesthetic consistency within neighborhoods and corridors.

Context Based Design recognizes that a road itself, and how the road is integrated within the community, can have impacts beyond its traffic or transportation function. Therefore, selecting the appropriate design elements to match the surrounding context and unique character of the natural and built environment of a location is recommended.

ROADS MUST RELATE TO THE LAND USE AND COMMUNITY NEEDS - ROADS MUST MATCH THE CONTEXT.

BEFORE DESIGNING A ROAD, TAKE INTO CONSIDERATION PLACEMAKING, WHETHER PEOPLE WILL WALK OR BIKE, THE TARGET SPEED, AND WILL THERE BE SHADE AND COMFORT FOR ALL USERS.

IF AN EXISTING ROAD IS MODIFIED, THEN UNDERSTAND THE CURRENT AND FUTURE CONTEXT AND THEN DESIGN THE ROAD SO THAT IT ENHANCES AND SERVES AS A CATALYST.

The County has developed a Context Based Design approach to determine key design criteria. Context Based Design, functional classification and integrating a safe systems approach should be considered collectively when determining the road's role and function, establishing design speeds, prioritizing multi-modal facilities, and selecting speed management strategies. The design criteria included in this section are based on the following fundamentals:

Context Based Classification
Functional Classification
Speed Management

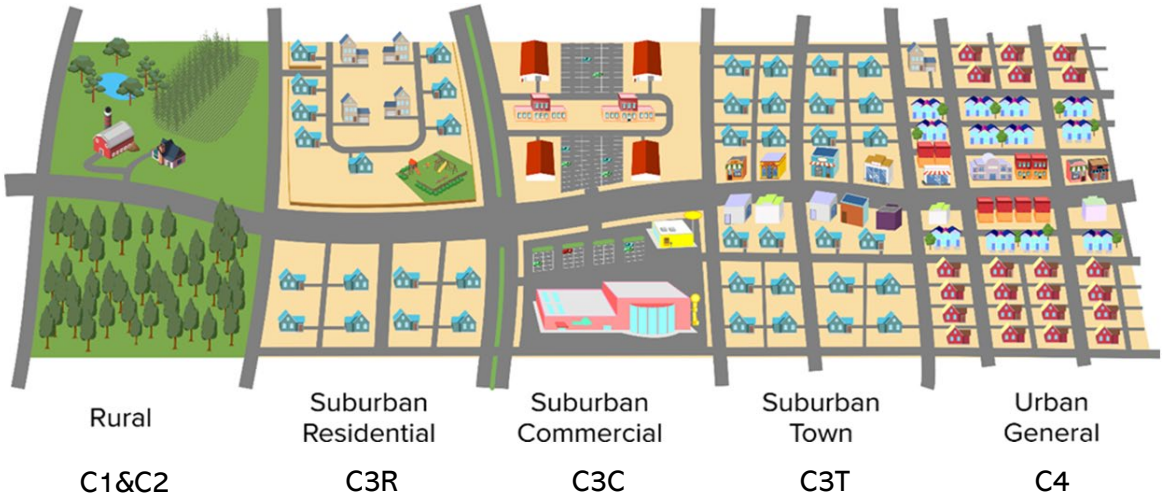
2.1.1 CONTEXT BASED CLASSIFICATION

Hillsborough County's Comprehensive Plan Context Classification Map 3 identifies the Context Classifications for all County arterial and collector roads. The context classification system is based on the general characteristic of the adjacent future land uses and planned development patterns along a corridor. This system is comprised of five Context Based Classifications:

1. Rural (C1&C2)
2. Suburban Town (C3T)
3. Suburban Residential (C3R)
4. Suburban Commercial (C3C)
5. Urban General (C4)

Hillsborough County's C1&C2 is not two different context classification. C1&C2 is one context classification.

The Context Based Classifications can be found in Geographic Information System (GIS) format at the following link: *Hillsborough County Context Based Classification Map (GIS).* Refer to *The Hillsborough County Comprehensive Plan* for context classification description and future land use characteristics.



2.1.2 FUNCTIONAL CLASSIFICATION

Functional classification describes the role that a particular roadway plays in serving the flow of vehicle traffic through the network. Hillsborough County's functional classification system consist of arterials, collectors, and local roads.

This classification must be in accordance with the Hillsborough County's *Roadways Functional Classification Map (GIS).* To obtain the functional classification for roads not shown on the map, contact the Public Works Standards team utilizing the following email: *PW-Standards Inquiry*.

The HCTDM provides design criteria and standards based on both context classification and functional classification.

2.1.3 SPEED MANAGEMENT

The purpose of managing speed is to improve safety by reducing speed related crashes and resulting injuries and fatalities. Increased travel speeds reduce the field of vision and limit the time available for drivers to receive and process information. The likelihood of pedestrian and bicycle crashes resulting in a fatality or serious injury increases as vehicle speeds increase. Therefore, speed is a principal design control that regulates the selection of many standards and criteria used for design (FDM). Speed management strategies should be implemented to achieve the desired Context Based speeds and create self-enforcing roads.

HILLSBOROUGH COUNTY'S SPEED MANAGEMENT ACTION PLAN GOAL:
IMPROVE SAFETY BY REDUCING ROAD FATALITIES AND SERIOUS INJURIES.

2.1.3.1 SPEED DEFINITIONS

Speed definitions used by Hillsborough County are described below:

Target Speed: The desired maximum speed at which vehicles should operate on a corridor in a specific context. The Target Speed must be consistent with the level of multimodal activity generated by adjacent future land uses and the roadway function, to provide both mobility for vehicles and a safe environment for pedestrians, bicyclists, micromobility users, and public transit users. Target Speed serves as the future "target or goal" for design and operating speed. Target Speed must be identified in the project development phase or early in the design process. Speed management strategies should be established to achieve the desired Target Speed.

Design Speed: A selected speed used to determine geometric design elements of the road. Select an appropriate Design Speed to establish a safe and high-quality path for the pedestrians, bicyclists, micromobility users, public transit, and vehicles on a specific road. Design Speeds must be identified in the project development phase or early in the design process. The HCTDM recognizes a range of Design Speeds for each context classification.

FOR HILLSBOROUGH COUNTY TRANSPORTATION PROJECTS, THE POSTED SPEED WILL BE SET EQUAL TO THE SELECTED DESIGN SPEED.

Operating Speed: The speed at which drivers are observed traveling during free-flow conditions.

Posted Speed: A Posted Speed limit sign notifies the driver of the maximum operating legal speed that is considered reasonably safe in optimum weather and visibility conditions.

2.1.3.2 SPEED SELECTION

Hillsborough County's Functional and Context Classifications provide detailed information about a road, including potential users, multimodal needs, environmental features, future land use patterns, and social and demographic factors. This detailed road information is part of setting the appropriate speed. Speed selection increases safety while retaining reasonable mobility.

Project specific Target Speeds are established to provide a goal for the maximum desired operating speed, accounting for physical corridor elements, and to meet the future land use and context. Target Speed serves as the future goal for Design/Posted Speed. The County's Complete Streets Guide provides guidance on Target Speed by Context.

When the current posted or operating speed is higher than the Target Speed, design strategies should be selected that reinforce the desired operating speed. Operating speeds will often take time to change, and Design/Posted Speeds may need to be lowered incrementally over the course of several projects and design interventions. Design Speeds should be chosen based on the type of project, context classification, and multimodal activity. For example, a RRR project has significant potential for design strategies and improvements to help promote slower speeds to meet the Target Speed, while a drainage or intersection modification project may have less opportunity for improvements.

2.1.3.2.1 TARGET SPEED AND DESIGN SPEED SELECTION PROCESS

The selection of Target Speed and Design Speed is an important step in a transportation project to meet the context of the corridor and promote a safe environment for all users. The selection process is preferably done during the PD&E and PER phases of a project or 60 days after notice to proceed during design if no preceding PD&E or PER was performed.

The speed selection process must be performed for the following transportation projects:

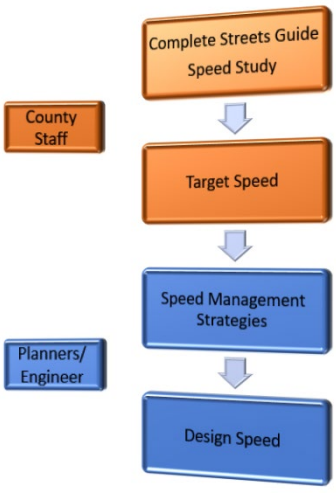
- New Construction
- Corridor Reconstruction
- Resurfacing, Restoration, and Rehabilitation (RRR)
- Intersections
- Bridge Widening and Replacements
- Complete Streets
- School Routes Safety Improvements
- Safety and Mobility Projects

Guidance on the process of speed selection is provided below:

For new construction:
The selected Project Target Speed and Design Speed will be the same. Design elements and speed management strategies along the corridor must be developed to support the selected Design Speed.

For existing corridors:

- A speed study per the FDOT Speed Zoning Manual will be performed to determine the 85th percentile speed, 50th percentile speed, and the 10-mph pace. The speed study is typically performed by the County.
- A selected Project Target Speed will be provided by the County. The County's Complete Streets Guide provides guidance on Target Speed.
    i. A selected Target Speed reduction of more than 10 mph should be accomplished incrementally over several projects or through implementation of aggressive speed management strategies that significantly changes the character or context of the corridor.



- A proposed Design Speed should be recommended as follows:
    ii. The Design Speed will be determined by reviewing the required speed study, crash history, the additional factors outlined below, and the application of speed management strategies to help promote a lower operating speed closer to the Project Target Speed. The Posted Speed will be set equal to the proposed Design Speed.
- A Design Speed Selection Report is required. The Report should include the speed study results, Project Target Speed, crash history, proposed Design Speed, speed management strategies applied to support the selected Design Speed, and recommendations.
- The Design Speed Selection Report must be included with the Typical Section Package for approval.

Additional factors used to support selected speeds include:

- Context and functional classifications
- Existing and future land uses adjacent to the corridor
- Vulnerable users
- Context of transitional areas
- Transit service
- Pedestrian and bicycle generators
- Safety data including crash types, severity, and Vision Zero high-crash corridors
- Access management and cross-section elements

2.1.3.3 SPEED MANAGEMENT STRATEGIES

Speed management involves engineering measures to balance safety and mobility. Speed management should influence motorists to operate vehicles reasonably in concert with prevailing conditions and within speed limits through engineering interventions. To achieve a safe, Context Based target speed or to lower the operating speed along a road, multiple speed management strategies could be applied following three basic concepts (FDM):

- **Enclosure:** The sense that the road is contained in an "outside room" rather than in a limitless expanse of space.
- **Engagement:** The visual and audial input connecting the driver with the surrounding environment.
- **Deflection:** The horizontal or vertical movement of the driver from the intended path of travel.

Tables 3a, 3b and 3c identify the County's library of proven speed management design techniques and strategies. Incorporating a combination of strategies is often necessary to achieve the desired operating speeds. Detailed description, applicable conditions, and design considerations are developed based on the FDM, FHWA's Traffic Calming ePrimer, FHWA's Speed Management Toolkit and the ITE Traffic Calming Measures. Other documents referenced include the TPO's Vision Zero Speed Management Action Plan and the County's Complete Street Guide.

The Engineer of Record should be aware that some of the speed management design considerations have the potential to increase noise pollution. Noise is more than an inconvenience, but rather a potential distraction to all users of the road and a disturbance to the occupants of adjacent land uses. Therefore, the EOR should ensure that proposed improvements meet local and state decibel thresholds as referenced in the rules of the *Environmental Protection Commission of Hillsborough County, Chapter 1-10 Noise Pollution*.

Table 3a: Geometric Features
Speed Management Strategies to Achieve Desired Operating Speed[1]

GEOMETRIC FEATURES	*Context Based Classification*									
	Rural (C1&C2)				*Suburban (C3R, C3C)*			*Suburban Town, Urban General (C3T, C4)*		
	Desired Operating Speed (mph)									
	25-30	*35*	*40-45*	*50*	*25-30*	*35*	*40-45*	*25-30*	*35*	*40*
Chicanes	●				●			●		
Corner Radius Reduction					●	●	●	●	●	●
Curb Extensions (Bulb-Out)					●	●		●	●	
Hardened Centerlines					●	●	●	●	●	●
Horizontal Deflection	●	●	●		●	●	●	●	●	●
Island at Crossing	●	●	●	●	●	●	●	●	●	●
Lane Narrowing	●	●	●		●	●	●	●	●	●
Lane Repurposing					●	●	●	●	●	●
Roundabout	●	●	●		●	●	●	●	●	●
Short Blocks					●			●	●	
Raised Pedestrian Crosswalks	●				●			●		

[1] A detailed description of each speed management strategy and application is provided below. Click the strategies in the table to go directly to the strategy description.

Table 3b: Traffic Device Features
Speed Management Strategies to Achieve Desired Operating Speed[1]

TRAFFIC FEATURES	*Context Based Classification*									
	Rural (C1&C2)				*Suburban (C3R, C3C)*			*Suburban Town, Urban General (C3T, C4)*		
	Desired Operating Speed (mph)									
	25-30	*35*	*40-45*	*50*	*25-30*	*35*	*40-45*	*25-30*	*35*	*40*
PAVEMENT MARKING SPEED CONTROL										
Converging Chevrons/Optical Speed Bars		●	●			●	●		●	●
Pavement Speed Limit Marking	●	●	●		●	●	●	●	●	●
Raised Pavement Markers					●	●	●	●	●	●
SIGN SPEED CONTROL										
Advisory Speed Sign	●	●	●	●	●	●	●	●	●	●
Speed Feedback Sign	●	●	●	●	●	●	●	●	●	●
TRAFFIC SIGNAL										
Traffic Signal Operation	●	●	●		●	●	●	●	●	●
Pedestrian Crossing Treatment	●	●	●		●	●	●	●	●	●

[1] A detailed description of each speed management strategy and application is provided below. Click the strategies in the table to go directly to the strategy description.

Table 3c: Physical Features
Speed Management Strategies to Achieve Desired Operating Speed[1]

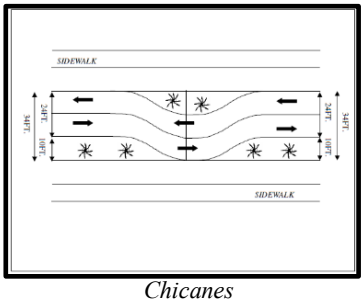
PHYSICAL FEATURES	*Context Based Classification*									
	Rural (C1&C2)				*Suburban (C3R, C3C)*			*Suburban Town, Urban General (C3T, C4)*		
	Desired Operating Speed (mph)									
	25-30	*35*	*40-45*	*50*	*25-30*	*35*	*40-45*	*25-30*	*35*	*40*
Gateway Treatment	●	●			●	●		●	●	
On-street Parking					●	●		●	●	
Street Trees	●	●			●			●	●	

Chicanes:

Purpose: Appropriate for local roads or low volume collectors, a chicane is a variation of a lateral shift where the alignment is shifted more than once. The effectiveness of reducing speed depends on the length of the alignment shift and the volume and distribution of traffic. Sufficient width should be retained to allow for the continued easy flow of emergency vehicles, school buses and maintenance vehicles.

Relevant Speed Management Concepts:

- Deflection: A chicane deflects a driver from their normal path of travel twice on the same section of road.



Chicanes
Source: Hillsborough County Traffic Calming Handbook

Corner Radius Reduction:

Purpose: Provides a tighter right or left turn movement, resulting in decreased turning speed and shortening the pedestrian crossing distance. Emergency vehicles, school buses and public maintenance vehicles must be considered.

Relevant Speed Management Concepts:

- Enclosure: The reduced corner radius has the effect of a channel that the driver must follow and the perception of speed that will allow him to maintain his course.
- Engagement: The reduced corner radius requires the driver to recognize that he must slow down, or excessive speed will force him into the oncoming lane on the side street.
- Deflection: The reduced corner radius requires the driver to slow down before the turn to be able to navigate the corner radius and stay in the intended receiving lane.

Corner Radius Reduction

Curb Extensions (Bulb-Outs):

Purpose: Commonly used with on-street parking at intersections or midblock locations where there is a crosswalk.

Relevant Speed Management Concepts:

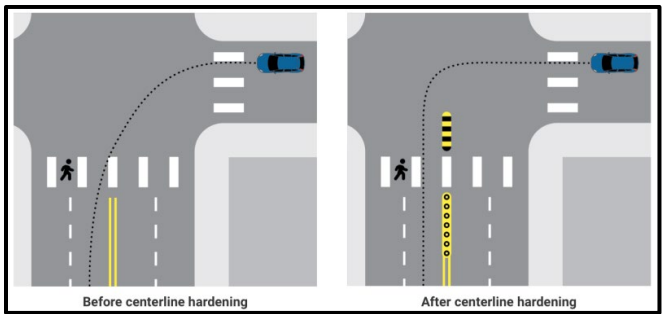
- Enclosure: The curb extensions act as a bookend for parking lanes, ensuring drivers do not mistake the parking lanes for travel lanes.
- Engagement: Curb extensions provide more space for pedestrians to gather, reduce the time and the distance pedestrians are exposed to traffic, and improve the ability of pedestrians and drivers to see each other.

Hardened Centerlines:

Purpose: Centerline hardening is a technique to make intersections safer for pedestrians by encouraging drivers to make left turns at slower speeds. Delineators and curb systems can be used to control the diagonal path through an intersection. Examples of centerline hardening treatment are shown below.

Relevant Speed Management Concepts:

- Enclosure: Centerline hardening creates a tighter turning path slowing vehicles and create more awareness in the intersection.
- Engagement: Centerline hardening creates a visual impact to the turning movement forcing vehicles to reduce their speed.



Centerline Hardening (Source: Green Car Congress)

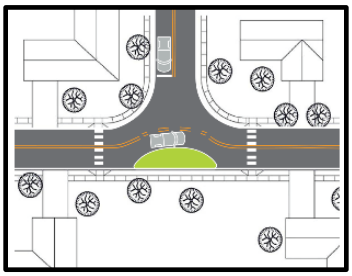
Horizontal Deflection:

Purpose: Horizontal deflection creates a lateral shift of the driving path. Intersection realignment is another lateral shift method to reduce speed as can be seen in the diagram to the right.

Relevant Speed Management Concepts:

- Deflection: Horizontal movement of the driver from the intended straight path of travel.

Lateral Shift (Source: NACTO)



Intersection Realignment (Source: FHWA ePrimer)

Island at Crossing:

Purpose: Islands are placed at midblock locations or on the approach to an intersection. Sufficient lane width should be retained to allow for the continued easy flow of emergency vehicles, school buses and maintenance vehicles.

Relevant Speed Management Concepts:

- Enclosure: Island at intersection approaches or midblock locations create a visible barrier that extend into both the vertical and horizontal plane.
- Engagement: Islands create a physical barrier that manage operating speed, direct drivers, and create a refuge space for pedestrian activity.

Island at Midblock and Intersection Crossing

Lane Narrowing:

Purpose: Minimum Lane width criteria for Context Based Classifications are included in this manual. To maximize effectiveness, lane narrowing should be used in conjunction with other low speed strategies (e.g., introduction of parking, creation of a median, beginning a chicane).

Relevant Speed Management Concepts:

- Enclosure: The narrowed lanes provide a greater sense of enclosure for the driver, making the driver slow down.
- Engagement: The narrowed lanes require drivers to reduce their speeds, especially at curved portions of the road.

Lane Repurposing:

Purpose: Previously referred to as road diet, lane elimination or reduction (repurposing) is a way to removing travel lanes from a road and utilizing the space for other uses and travel modes (FHWA Road Diet Informational Guide). Lane repurposing is common on a four-lane undivided road with a maximum peak hour volume of 1,000 vehicles (FHWA Traffic Calming ePrimer) or AADT maximum value of 20,000 (FDM). For additional design consideration and lane repurposing anticipated effects on safety and mobility, see *FHWA Road Diet Informational Guide* and *FDOT Lane Repurposing Guidebook 2020*.

Relevant Speed Management Concepts:

- Enclosure: Lane repurposing promotes a sense of enclosure which discourages speeding by the reduction of the number of through traffic lanes.

Roundabout:

Purpose: An alternative intersection that is configured to slow traffic through geometric control at the approaches to the entrances to the roundabout and speed control by the combination of radii creating the paths through the roundabout.

Roundabout, Riverview, Fl

Relevant Speed Management Concepts:

- Enclosure: Roundabouts create defined outer and inner boundaries that control speed and reduce conflict points.
- Engagement: Roundabouts require drivers to adjust to a new traffic pattern by merging into the roundabout traffic at a reduced speed.
- Deflection: Roundabouts by nature deflect drivers from a straight path to a curved path.

Short Blocks:

Purpose: A road grid system with short blocks (330 – 400 feet) can help reduce speed by limiting driver acceleration distance between intersections. Short blocks planned for C4 roads also provide pedestrian friendly conditions to encourage pedestrian activities. Marked or mid-block crosswalks can reinforce the presence of short blocks.

Relevant Speed Management Concepts:

- Engagement: Shorter blocks and more frequent interactions with intersections require more attention from the driver to start and stop completely more often, as well as deal with increased pedestrian activity at a crossing.

Raised Pedestrian Crosswalks:

Purpose: Application includes a raised crosswalk, either in a series or single application. Raised crosswalks are appropriate on collector or local roads. FDM recommends considering raised crosswalks for Design Speeds of 30 mph or less. Coordinate with Technical Services Division, Traffic Engineering Section on the use of raised pedestrian crosswalks.

Relevant Speed Management Concepts:

- Engagement: Pedestrian Crossing Treatment improvements require drivers to reduce their speeds before interacting with the crosswalks.
- Deflection: Pedestrian Crossing Treatment improvements cause a vertical deflection that command the driver's attention.

Converging Chevrons/Optical Speed Bars:

Converging Chevrons/Optical Speed Bars

Purpose: Optical Speed Bars are transverse pavement markings with a progressively reduced spacing pattern to give drivers the impression that their speed is increasing. Typically, they are installed transversely along the lane lines.

Relevant Speed Management Concepts:

- Engagement: The progressively reduced spacing pattern with these applications creates the illusion that the vehicle is traveling faster than the vehicle's actual speed and that the road is narrowing, which causes the driver to slow down.

Pavement Speed Limit Markings:

Pavement Speed Limit Marking

Purpose: Pavement Speed Limit Markings identify the posted speed limit on the pavement and is used to provide additional notification of the speed limit. It is recommended to be adjacent to the Posted Speed sign. This strategy could be considered when a Posted Speed reduction may be unexpected or when additional speed limit notification is needed.

Relevant Speed Management Concepts:

- Engagement: Pavement speed limit markings engage the drivers by reinforce and warning the driver of the current posted speed of the road causing the driver to check the current speed to adjust and slow down if necessary.

Raised Pavement Markers:

Purpose: Raised Pavement Markers are retroreflective pavement markers (RPMs) that are used to identify narrow travel lanes and reduce speeds.

Relevant Speed Management Concepts:

- Enclosure: Raised Pavement Markers delineate the required travel lane width creating a sense of enclosure which will slow down the speed.

Advisory Speed Sign:

Purpose: Advisory Speed Signs should be used to warn road users of an advisory speed for a roadway condition. This strategy can be a cost effective measure to reduce speeding.

Relevant Speed Management Concepts:

- Engagement: Advisory Speed Signs are installed to warn drivers to indicate the advisory speed for a condition. These signs attract the attention of drivers, obtaining a response to slow down and pay extra attention.

Speed Feedback Sign:

Purpose: Effective in speed transition areas speed feedback signs identify the change of vehicle operating speed. The effectiveness of speed feedback signs is diminished if used too frequently.

Relevant Speed Management Concepts:

- Engagement: Feedback signs provide external confirmation of the speed limit which can remind or influence drivers to obey the speed limit.

Traffic Signal Operation:
Purpose: Traffic operation improvements include protected left turn signal phases, signal coordination to assist with achieving Target Speed, lead pedestrian intervals, short cycle lengths.
Relevant Speed Management Concepts:

- Engagement: Traffic operation improvements forces a driver to be more alert and aware that they may have to stop.

Pedestrian Crossing Treatment:
Purpose: Rectangular Rapid Flashing Beacons, pedestrian signals, Pedestrian Hybrid Beacons (or HAWK) enhanced pedestrian crosswalks and lighting are considered as approved pedestrian crossing treatments in Hillsborough County. RRFBs, pedestrian signals and HAWK can be used to establish short block lengths when combined with marked crosswalks. Enhancement considerations include painted or raised crosswalks, pedestrian crossing lighting and other approved treatments. Marked crosswalks can be installed without meeting the minimum pedestrian volume thresholds as established in FDOT's TEM in C4 roads with a Design Speed of 35 mph or less.
Relevant Speed Management Concepts:

- Engagement: Flashing beacons, pedestrian signals, enhanced pedestrian crosswalks and lighting draw the attention of drivers, eliciting a response to slow down and pay extra attention.

RRFB Application

Gateway Treatment:
Purpose: A physical or geometric landmark or landscape used to create an expectation for motorists to drive more slowly. It is used to attract the drivers' attention to context change and help communicate a sense of neighborhood identity.
Relevant Speed Management Concepts:

- Enclosure: Signage, pavement marking, landscaping, public art, monuments, roundabouts and raised median island or other treatments alongside travel lanes that extend into the vertical space, creating a textured street wall that provides a feeling of envelopment for drivers.
- Engagement: The gateway treatment integrates the driver with the surrounding context.

Gateway Treatment

On-Street Parking:
Purpose: On-street parking narrows the road travel lanes by adding side friction to the traffic flow. On-street Parking is appropriate for Design Speeds of 35 mph or less.
Relevant Speed Management Concepts:

- Enclosure: Cars parked alongside a travel lane create an enhanced street wall.
- Engagement: Cars pulling in and out of parking spaces requires drivers to pay additional attention to the activity on the road.

Street Trees:

Street Trees

Purpose: When trees are present along a road, there is a change in driver's behavior in reducing speed. Street trees are perceived to be safer in both urban and suburban conditions. Provide clear sight triangles to assure drivers maintain a sufficient view along a road where pedestrians and bicyclists might enter the pavement and drivers can decide when it is safe to proceed.

Conflicts with street trees and proposed street signage (which can include regulatory, warning, no parking, transit, and other signs) must be avoided. Street trees must:

- not block proposed street signage from driver's line of sight
- not interfere with the driver's stopping distance visibility of any signage
- not be placed closer than 30-feet in front of a proposed street sign
- not block the driver's view of signage at maturity.

Relevant Speed Management Concepts:

- Enclosure: Trees planted alongside travel lanes extend into the vertical space, creating an enclosed feeling.

2.1.3.4 TRANSITIONAL CONTEXT DESIGN ELEMENTS

The road design characteristics will change as the context and mobility transition along the corridor. These context transition areas should consider design elements and countermeasures to support the changes in mobility and land use.

TRANSITIONAL CONTEXT DESIGN ELEMENTS SHOULD BE COORDINATED DURING THE SPEED SELECTION PROCESS

Transitional design strategies should be applied to all context transitions. FDM, Chapter 202, Speed Management includes additional information on Transition Zones. The strategies should be implemented prior to the context change at intersections or along roadway segments.

Some examples of transitional design elements between context include visual and physical engagement features such as: gradual speed transition, speed feedback signs, horizontal deflection (e.g., roundabouts, splitter islands), narrower lanes, landscaping/streetscaping, lighting, pedestrian crossing treatments, and treatments that foster increased multimodal activities.

2.1.4 VISION ZERO HIGH-CRASH CORRIDORS

COUNTY ROADS CAN BE DESIGNED IN WAYS THAT ENCOURAGE SAFER BEHAVIOR IN PEOPLE DRIVING, PEOPLE WALKING, AND PEOPLE BIKING.

The Hillsborough County Board of County Commissioners committed to the goal of Vision Zero - that no loss of life is acceptable on County roads. The Vision Zero resolution establishes a commitment to the continued support of the Vision Zero effort to reduce traffic fatalities and serious injuries. Corridors with the greatest occurrences of severe crashes per mile are identified as the Top 20 Vision Zero Severe-Crash Corridors. The full list of Top 20 Severe-Crash Corridors and the Next 30 High-Injury Corridors were identified by the Hillsborough Transportation Planning Organization (TPO), with the list provided on the *Vision Zero website*.

Each transportation project must identify if the road is included in the Top 20 Severe-Crash Corridors or the Next 30 High-Injury Corridors. Once identified, effective design countermeasures and strategies must be provided for reducing fatalities and severe crashes and improving the safety of all users.

Any updates to the Severe-Crash Corridors, the High-Injury Corridors or other newly defined Vision Zero documents should be reviewed and referenced.

2.1.5 ARTERIAL AND COLLECTOR ROADS

DESIGN ELEMENTS NOT IDENTIFIED IN THE HCTDM FOR COUNTY ARTERIAL AND COLLECTOR ROADS MUST FOLLOW THE FLORIDA DESIGN MANUAL (FDM) CRITERIA

This section describes Context Based Design elements for Hillsborough County arterial and collector roads. Controlling factors for selection of Context Based Design elements include designated users, Design Speed, and design vehicle. These elements provide the basis to encourage a holistic road design providing fundamentals that will redefine County roads as mobility mechanisms for pedestrians, bicycles, and vehicles, and amenities that encourage safety, comfort, and sociability. Selection of design elements must consider existing and future land uses and transportation multi-modal needs. Design elements not identified in the HCTDM for County arterial and collector roads must follow the FDM criteria.

2.1.5.1 TYPICAL SECTIONS

Hillsborough County's Context Based Classification establishes the preferred typical sections for County arterial and collector roadways. Typical sections are grouped by context classifications consisting of rural, suburban commercial, suburban residential, suburban town, and urban general. Typical sections are then grouped into various sub-sections based on a variety of design elements, including posted speed, traffic volumes, number of lanes, and drainage type, while considering multimodal needs such as pedestrians, bicycle facilities, and transit.

The Typical Sections illustrate ideal and unconstrained conditions. Refer to Sections 2.1.5.2 for typical section standard design elements and 2.1.5.3 for retrofit design elements details.

Hillsborough County's Typical Sections for arterials and collectors are provided in Appendix B. Table 4 summarizes key components of the County typical sections.

Table 4: Arterials & Collectors Typical Section Summary

Functional Classification	Context	Type	Speed (mph)	Drainage Type	Pedestrian Facility	Bicycle Facility	Typical Section Title	Sheet No
Arterials and Collectors	Rural (C1&C2)	2U	25 - 55	Open	Shared Use Path		C1&C2-2U	1
		4D					C1&C2-4D	2
	Suburban (C3)	2U	≤30	Closed	Sidewalk	Shared Lane	C3-2U-SL	3
			≤45		Shared Use Path		C3-2U	4
		2D					C3-2D	5
		4D					C3-4D	6
		6D					C3-6D	7
		4D		Open			C3-4D-OD	8
	Suburban Town (C3T)	2U	≤30	Closed	Sidewalk	Shared Lane	C3T-2U-SL	9
			≤35			Bike Lane	C3T-2U-BL	10
		2D					C3T-2D-BL	11
		4D					C3T-4D-BL	12
	Urban General (C4)	2D	≤35	Closed	Sidewalk	Bike Lane	C4-2D-BL	13
		4D					C4-4D-BL	14

2.1.5.2 MINIMUM TYPICAL SECTION DESIGN ELEMENTS

Table 5 provides the County's minimum standard design elements for typical sections by context. All other design elements not listed must follow the FDM criteria. The County's design elements and the FDM criteria must be used on transportation projects. Utilize the Rural (C2) FDM design standards for Rural (C1&C2) Hillsborough County Context Classification. Utilize the Urban (C4) FDM design standards for Suburban Town (C3T) Hillsborough County Context Classification.

USE THE RURAL (C2) FDM DESIGN STANDARD FOR RURAL (C1&C2) CONTEXT CLASSIFICATION

USE THE URBAN (C4) FDM DESIGN STANDARD FOR SUBURBAN TOWN (C3T) CONTEXT CLASSIFICATION

Table 5 applies to all transportation projects except for RRR projects and projects with clear and convincing budgetary and/or documented physical or right-of-way constraints.

Minimum Retrofit Design Elements identified in Section 2.1.5.3 should only be used for RRR projects, and for projects with clear and convincing budgetary and/or documented physical or right-of-way constraints. Any exception or deviation from the County's design elements and the FDM criteria must obtain documented approval through the Design Exceptions and Design Deviation Memorandums process.

Table 5: Minimum Typical Section Design Elements by Context[1]

DESIGN ELEMENTS	C1&C2 (Rural)		C3 (Suburban)		C3T (Suburban Town)	C4 (Urban General)
Design Speed	25-45 mph	50 mph	25-35 mph	40-45 mph	25-35 mph	25-35 mph
Lane Widths	11 ft	12 ft	10 ft	11 ft	10 ft	10 ft
Median Widths	22 ft	40 ft	22 ft		22 ft	22 ft
Shoulder Widths	Outside: 10 ft Median: 8 ft		-		-	-
Sidewalk Widths	-		6 ft		≥ 6 ft	≥ 8 ft
Bicycle Lane Widths	-		7 ft buffered		7 ft buffered	7 ft buffered
			8 ft[2]		8 ft[2]	8 ft[2]
Shared Use Path	12 ft		12 ft		-	-

[1] The detailed information provided below should be used in making design element decisions.
[2] With Parallel Parking for Design Speeds 35 mph or less.

Lane Widths:

All Contexts: Minimum 11-feet travel lanes are required when truck volumes exceed 10% or when transit is present.

See Section 2.1.5.5 for Emergency Vehicles pavement width requirements.

C1&C2: 10-feet lane width can be provided for speeds of 25-35 mph when transit is not present or the truck volume is less than 10%.

C3, C3T,C4: The placement and distribution of travel lane(s) within the emergency vehicle envelopes, as required by Section 2.1.5.5 Emergency Vehicles, can be modified to meet the corridor needs and context. Modifications should be based on the specific corridor conditions, adjacent land uses, and speed. Alternative considerations for the extra pavement width can be developed and could include: placing adjacent to the median, creating a chicane, placing audible and vibratory treatments along the edge lines or other innovative treatments. Raised separator or vertical treatments will not be acceptable. These modifications will be presented in the Typical Section Package for approval.

Median Widths:

C1&C2: A median is required for divided multilane roads.

Shoulder Widths:

C1&C2: A 12-foot, outside full-width shoulder is required when truck volumes exceed 10%.

Sidewalk Widths:

All Contexts: The standard thickness for all concrete sidewalks must be six-inches (6″). This requirement is for all replacement and new sidewalks. See Section 2.3.1.3 Sidewalks.

C1&C2: Within one mile of the Urban Service Boundary or where there is demand (example: two miles from an education facility), sidewalks or shared use paths must be provided.

C3: Sidewalks are required when SUPs are not selected.

Shared Use Path (SUP):

C1&C2: SUPs are appropriate applications in a rural context as a minimum on one side of the roadway.

C3: SUP is the standard bicycle facility on C3 roads. A buffered bicycle lane may be considered in addition to the SUP if justified by the context.

Bicycle lanes are required when SUPs cannot be provided.

A minimum 10-feet width is allowed when a SUP is provided on both sides of the road.

Short, 8-feet-wide sections may be considered where there are physically constrained conditions, such as a utility features or bus stop locations.

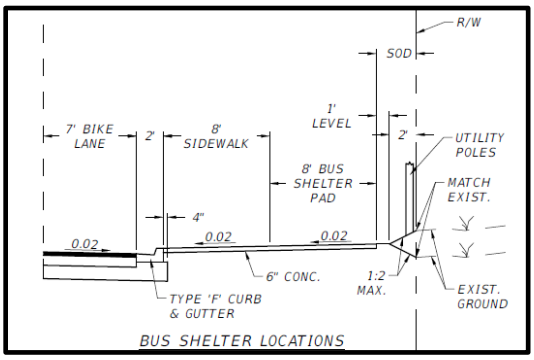
Drainage Considerations:

All Contexts: Refer to the Hillsborough County Stormwater Management Technical Manual for drainage channel side slopes and bottom widths, when applicable.

Transit Considerations:

All Contexts: Bus stop locations and design requirements must be coordinated with Hillsborough Area Regional Transit Authority. Sidewalk connectivity must be provided to the bus stop shelter or landing.

Bus shelter locations and configurations must follow guidance provided by HART. Bus shelters must be clearly visible from roads and buildings and must be designed to ensure that there is no hiding space in or around the shelter. See detail below for bus shelter urban design locations. Connectivity to nearby sidewalks must be provided to all bus shelters.



Bus Shelter Detail for Urban Design Locations
Example Project Scenario is Context C3T and C4

Landscape Considerations:

All Contexts: Strategically place trees within the planting areas to provide shade from the sun at places like bus stops, sidewalks, shared use paths, and street parking and micromobility parking areas. This provides a feeling of comfort and safety for the user.

LANDSCAPING CREATES A SENSE OF NEIGHBORHOOD COHESION PROVIDING SAFE AND COMFORTABLE ALTERNATIVE MODES OF TRANSPORTATION.

Parallel Parking Considerations:

C3T,C4: Parallel parking is a key element for C3T and C4 context roads. Parallel parking is allowed on facilities with posted speeds of 35 mph or less. A 3-foot buffer is required on both sides of the parallel parking lane between the travel lane and the bicycle lane. A buffer on both sides of the parallel parking allows for passenger loading and to prevent door zone conflicts. See Section 2.1.5.4 Bicycle Lanes for bicycle lane buffer.

2.1.5.3 MINIMUM TYPICAL SECTION RETROFIT DESIGN ELEMENTS

Minimum retrofit design elements for typical sections are only applicable for the following project scenarios:

- Resurfacing, Restoration, and Rehabilitation (RRR) projects.
- Transportation projects on existing roads with clear and convincing budgetary and/or documented physical or right-of-way constraints.

New construction, corridor reconstruction, and all other transportation projects must use the design elements identified in Table 5 Minimum Typical Section Design Elements by Context.

Table 6 provides the County's standards for minimum retrofit design elements by context. Any use of these minimum retrofit design elements must obtain written documented approval from the County's Technical Services Division thru the Typical Section Package process and usage of the Design Criteria Table. The documentation must include a detailed explanation of why the design elements reported in Table 5 cannot be complied with, and a strong explanation of the clear and convincing budgetary and/or physical right-of-way constraints. Any exception or deviation from these minimum retrofit design elements must obtain documented approval through the Design Exception and Design Deviation Memorandum process.

Minimum retrofit design elements not shown in Table 6 are required to follow the design elements in Table 5.

Table 6: Minimum Typical Section Retrofit Design Elements by Context[1]

DESIGN ELEMENTS	C1&C2 (Rural)			C3 (Suburban)			C3T (Suburban Town)	C4 (Urban General)
Design Speed	25-40 mph	45 mph	50 mph	25-35 mph	40 mph	45 mph	25-35 mph	25-35 mph
Lane Widths	11 ft		12 ft	10 ft	11 ft		10 ft	10 ft
Median Widths	15.5 ft	19.5 ft		15.5 ft		19.5 ft	15.5 ft	15.5 ft
Shoulder Widths	Outside: 6 ft Median: 4 ft			-			-	-
Sidewalk Widths	-			6 ft			6 ft	6 ft
Bicycle Lane Widths	-			Refer to section 2.1.5.4 Bicycle Lanes				
Shared Use Path	10 ft			10 ft			-	-

[1] The detailed information provided below should be used in making design element decisions.

Median Widths:

C1&C2: A median is not required if a median does not exist and is not programmed for the project.

Shoulder Widths:

C1&C2: A 10-foot, outside, full width shoulder must be required when truck volumes exceed 10% or when transit is present. Shoulder may be paved or unpaved to be determined through the Typical Section Package submittal process.

Share Use Path Widths:

C1&C2: SUPs are appropriate applications in a rural context as a minimum on one side of the roadway.

A Short 8-foot-wide sections may be considered where there are physically constrained conditions, such as a utility features or bus stop locations.

C3: SUP is the standard bicycle facility on C3 roads. A buffered bicycle lane may be considered in addition to the SUP if justified by the context. Bicycle lanes are required when SUPs cannot be provided.

2.1.5.4 BICYCLE LANES

2.1.5.4.1 BICYCLE LANE SELECTION

Bicycle lane selection in design is a Context Based decision. The quality of the bicycle lane will impact the level of comfort and the amount of people that will use the bicycle facility. The higher the speed, volume, and number of roadway lanes, the more protective the recommended bicycle facility.

C1&C2: The typical bicyclist type in a rural context area is the recreational user. Shared use paths are appropriate applications in C1&C2 roads. SUPs are an important consideration for attracting bicyclists due to scenic views or routes that serve key bicycle network connections. Sufficient paved shoulder width is an important consideration when a SUP is not possible due to physical, right-of-way, or budgetary constraints

C3: The typical bicyclist type in a suburban context area is an interested but concerned user. These types of bicyclists prefer a more protected and comfortable environment. The physical separation provided by SUP can significantly increase comfort and safety for vulnerable cyclists in suburban context. It can also maximize the potential for bicycling as viable transportation options. Therefore, a SUP should be considered on C3 roads. A buffered bicycle lane may be considered in addition to the SUP when justified by the context. Buffered bicycle lanes are required when SUPs cannot be provided due to physical, right-of-way, or budgetary constraints.

C3T and C4: The typical bicyclist type in a suburban town and urban context area is an interested but concerned user. A 7-foot buffered bicycle lane is recommended due to the more intense land uses and the multi-modal activity. Bicyclists can be integrated within the roadway with appropriate sharrow markings when Design Speeds are ≤ 30 mph and the AADT is ≤ 5,000.

An 8-foot bicycle lane should be considered when parallel parking is a selected design element. The additional buffer area is provided between the bike lane striping and the parking boundary to reduce vehicle door zone conflicts with bicyclists. Hillsborough County's standard placement of a bike lane adjacent to parallel parking is between the curb and the parallel parking spaces.

BICYCLE LANE SELECTION WIDTH REQUIREMENTS:

The County standards for bicycle lanes are:

1. 7-feet buffered bicycle lane which includes a 5-foot bicycle lane width and a 2-foot buffer, or
2. 8-feet buffered bicycle lane when adjacent to parallel parking which includes 5-feet bicycle lane width and a 3-foot buffer.

Project scenarios that meet the minimum retrofit design definition or where it is not practical to move the existing curb should follow the below listed order of priority when selecting a bicycle lane:

1. 6-feet buffered bicycle lane which includes a 5-foot bicycle lane width and a 1-foot buffer.

2. 5-feet bicycle lane.

Other considerations not listed above will require a Design Deviation Memorandum.

2.1.5.4.2 TRAFFIC SEPARATOR FOR BICYCLE LANES

A 7-foot buffered bicycle lane is a design element requirement for C3T and C4 context roads. The 7-feet lane includes a 5-foot bicycle lane width and a 2-foot buffer area. A separator concept is required within the buffer area.

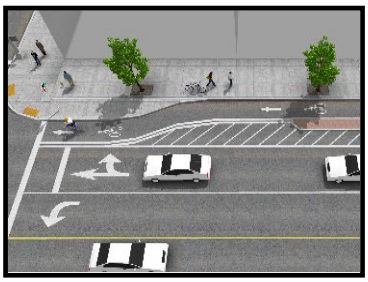
When parallel parking is selected within a road design, a 3-foot width buffer separator with 6″ diagonal hatching is required next to the parallel parking.

The selected design, alignment, and spacing of the separator must be project specific based on adjacent land uses and access management. Driveway access and other modes of transportation should be considered when aligning and spacing separators.

Alternative buffer area designs include striping, concrete separators, delineator posts, curbed delineators, or other approved curb systems. Other alternative buffer options could be developed based on community input or specific project needs.

2.1.5.4.3 BICYCLE LANE APPROACH TO AN INTERSECTION

A bicycle lane approach to an intersection should be designed to reduce vehicle-bicycle conflicts. This is typically achieved by shifting the bicycle lane closer to the adjacent motor vehicle lane. This improves the visibility between the bicyclists and motorists and avoids a possible “left or right hook” bicycle crash with turning vehicles. For additional design consideration techniques for turning movements of vehicles and bicycles at intersections, see *FHWA Separated Bike Lane Planning and Design Guide*.



Bicycle Approach to an Intersection, Source: NACTO

2.1.5.4.4 GREEN COLORED CONTRAST BLOCK FOR BICYCLIST SYMBOL AND BIKE LANE ARROW

Green colored contrast block for bicyclist symbol and bike lane arrow must be provided for all marked bicycle lanes on County roads. This contrast block provides an enhanced visibility for bicycle lanes.

Green Colored Contrast

The guidance for green colored bicyclist lanes is provided in FDM, Chapter 223 Bicycle Facilities. In addition to the FDM guidance, The County requires the following applications of the green colored contrast block:

- Place a green colored contrast block for the bicyclist symbols and bike lane arrows as shown in *Index GCB-001.*
- The maximum target spacing of the bicyclist symbol and bicycle lane arrow is 660 feet for Design Speeds of 45 mph and less, and 1,320 feet for Design Speed greater than 45 mph.

2.1.5.4.5 DETERMINATION IF BICYCLE LANES CAN BE ADDED TO RESURFACING, RESTORATION, AND REHABILITATION PROJECTS

RRR projects on arterial and collector roads must include an analysis to determine if bicycle lanes can be added through adjustments to the roadway striping without reducing the number of existing travel lanes. Roadway width dimensions are to be field verified by the EOR.

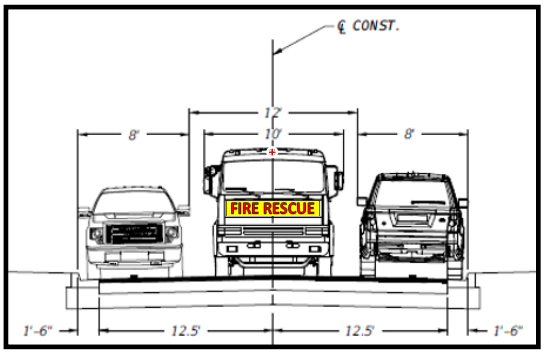
Proposed recommendations should be presented to Technical Services Division for approval through the Typical Section Package submittal.

2.1.5.5 EMERGENCY VEHICLES

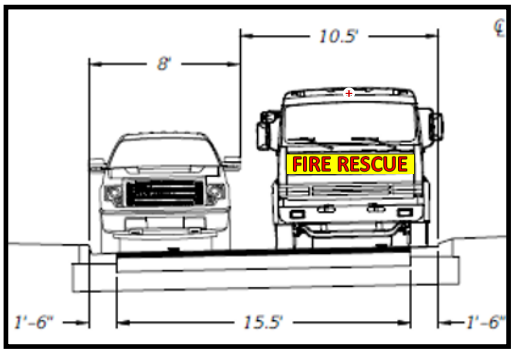
Emergency services, such as police, fire, and EMS/ambulance services, are critical to the safety of the residents of Hillsborough County. The transportation system, most notably the highway system and the roads, are essential to the operations of these emergency services. The needs of emergency vehicles must be considered when developing typical road cross-sections throughout the County. By statute, drivers are required to pull over to the side of the road to allow emergency vehicles to bypass. A typical road cross-section for each transportation improvement project must take this maneuver into account, ensuring there is enough space for drivers to pull over and for emergency vehicles to pass through.

A "design vehicle" is a vehicle with representative weight, dimensions, and operating characteristics used to establish road and highway design controls for accommodating vehicles of designated classes. For geometric design, special service vehicles such as fire equipment and emergency vehicles must have reasonable access along the road. Thus, design modifications must be made to accommodate these vehicles. Required criteria were developed in coordination with Hillsborough County Fire Rescue.

A design EV on confined roads with a curb and gutter requires a 12-foot window to travel through traffic on two-lane and four-lane roads. This width is comprised of a 10-foot vehicle width and 1-foot of clearance on both sides of the emergency vehicle to pass between two rows of vehicles pulled over to the left and right. In situations where the traffic does not exist on both sides, as on two-lane divided roads, the EV clear envelope is reduced to 10.5-feet. Examples of minimum lane widths required for EV on two-lane undivided and divided roads sections are shown below.



Two-Lane Undivided Roads
Minimum Lane Widths Required for EV



Two-Lane Divided Roads
Minimum Lane Width Required for EV

The Minimum Pavement Width to Accommodate Emergency Vehicles applies to all transportation projects except for Retrofit Projects as described in Section 2.1.5.3 Minimum Typical Section Retrofit Design Elements.

Table 7 provides the minimum pavement widths for C3, C3T, and C4 two-lane and four-lane roads with curb and gutter.

Table 7: Two-Lane and Four-Lane Minimum Pavement Width to Accommodate Emergency Vehicles

	Minimum Pavement Width
Two-Lane Undivided Streets (Two Directions)	12.5 ft
Two-Lane Divided Streets (One Direction)	15.5 ft
Four-Lane Divided Streets (One Direction)	25 ft

2.1.6 LOCAL ROADS

All local roads conveyed to the County must be designed in accordance with the current edition of the Florida Greenbook.

2.1.7 SHARED USE PATHS

This section describes the design elements for a Hillsborough County two-directional shared use path (SUP) corridor with independent right-of-way. The design elements encourage a safe and comfortable recreational environment for all users. Design elements not identified in the HCTDM for SUPs must follow the FDOT criteria as provided in FDM Chapter 224. SUPs within the road right-of-way should refer to the HCTDM's Arterial and Collector Roads Design Elements section for selection and placement within the road right-of-way.

2.1.7.1 TYPICAL SECTION AND DESIGN ELEMENTS

Hillsborough County's Typical Sections for SUPs are provided in Appendix B. Table 8 summarizes the County SUP typical section. The County's design elements and the FDM criteria must be used on all SUP designs.

Table 8: Shared Use Path Typical Section Summary[1]

Design Element	Width	Clear Area	Landscape Area	Optional	Typical Section Title	Sheet No
Shared Use Path	12-15 ft	4 ft	4 ft	8 ft Horse Path with 3 ft Clear Area	SUP	15

[1]SUP Corridors with independent right-of-way

2.1.8 GREEN INFRASTRUCTURE GUIDELINES

This section provides general information about the benefits of Green Infrastructure within a road right-of-way. If applicable, Green Infrastructure techniques to manage stormwater runoff should be considered for Hillsborough County's transportation projects. For more information about the County Green Infrastructure Techniques see Hillsborough County's *Green Infrastructure Manual*.

2.1.8.1 GREEN INFRASTRUCTURE DEFINITION AND BENEFITS

Green Infrastructure is defined as an interconnected network of open spaces and green spaces that provide a range of ecosystem services. Its elements are planned and managed primarily for stormwater control, but also exhibit social, economic, and environmental benefits. When looking at stormwater control measures, they are commonly categorized within a gray-green infrastructure spectrum.

Traditional "gray infrastructure" is designed to move urban stormwater away from the built environment and includes curbs, gutters, drains, piping, and collection systems. "Green Infrastructure" enhances the natural environment to manage rainwater where it falls, allowing water to soak into the ground, evaporate into the air, or collect in storage units. Green Infrastructure reduces and treats stormwater at its source while also providing the following community benefits:

Environmental Benefits:

- Reduces flooding and erosion
- Improves water quality
- Recharges and improves quality of ground and surface waters
- Provides natural stormwater management
- Reduces urban heat island effect
- Improves air quality

Social Benefits:

- Improves aesthetics and livability of urban communities
- Increases recreational opportunities
- Fosters environmental education opportunities

Economic Benefits:

- Reduces existing and potential future costs of gray infrastructure
- Increases property values

2.1.8.2 SOLVING PROBLEMS WITH GREEN INFRASTRUCTURE

When it rains, stormwater runs off rooftops, streets, and sidewalks eventually into wetlands, ponds, lakes, and bays. As impervious surface becomes more prevalent, it equates to more runoff because water cannot absorb into the ground. This has the potential to overwhelm existing stormwater systems and cause flooding or pooling in undesired locations. Another problem with the increase in runoff is that the runoff is untreated. As rain is transported over the surface, rain picks up and spreads pollutants along the way. To solve this problem, Green Infrastructure is applied on different scales. At a smaller scale, Green Infrastructure practices include rain gardens, permeable pavements, infiltration planters, trees, and rainwater harvesting systems. Techniques can be integrated into whole treatment systems such as ponds, wetlands, and forests on a larger scale.

2.1.8.3 EXAMPLES OF SMALL-SCALE GREEN INFRASTRUCTURE

Roadside Bioretention: Infiltration and Storage

A bioretention system (bioswale) is a landscaped, shallow depression that captures, filters, and infiltrates stormwater runoff. This is partially achieved by the curb cut and concrete flow pad designed to help redirect stormwater runoff to the bioswale system. The bioswale removes nonpoint source pollutants from stormwater runoff while recharging groundwater. Before and after examples of roadside bioretention and rain garden systems are shown in the adjacent photographs.

Roadside Bioretention

Rain Garden System: Infiltration

A rain garden is planted with a variety of grasses, wildflowers, and woody plants that are adapted to the soil, precipitation, and other site conditions. Rain gardens are an important tool for communities and neighborhoods to create diverse, attractive landscapes while protecting the health of the natural environment.

Rain Garden System

2.1.9 DESIGN FOR MICROMOBILITY STORAGE FACILITIES

Parking and storage for micromobility devices such as bicycles, scooters, e-bikes, or other lightweight vehicles operating at speeds below 15 mph should be considered where possible. Beneficial areas for bicycle and micromobility storage are adjacent to shared use paths, trails, transit stops, schools, employment centers, retail, apartment complexes, and other key destinations that may attract micromobility devices.

Any micromobility storage facility located within the sidewalk right-of-way must allow for appropriate navigable sidewalk space for pedestrians clear of the micromobility storage facility. Designers should consider the ingress and egress areas immediately abutting on-sidewalk and on-road micromobility storage to ensure safe operations. Access between dedicated micromobility travel facilities and storage areas should be clear of obstacles and hazards.

Examples of bicycle storage facilities on-sidewalk and on-street are shown.

On-Sidewalk Bicycle Storage Example (City of Tampa, FL)

On-Street Bicycle Storage Example (City of Clearwater, FL)

SECTION 2.2 ACCESS MANAGEMENT SYSTEM FOR ARTERIAL AND COLLECTOR ROADS

(SECTION RESERVED FOR FUTURE UPDATES)

SECTION 2.3 ROAD DESIGN STANDARDS

The road design guidelines in this section supplements or substitutes the existing engineering standards in the *FDM*, *Florida Greenbook*, *FDOT Standard Plans*, *Hillsborough County's Public Works Standard Specifications for Construction*, *and* *FDOT Standard Specification for Road and Bridge Construction*. The guidelines presented in the following sections are County specific preferences.

2.3.1 ARTERIAL AND COLLECTOR ROADS

2.3.1.1 NO-PASSING ZONES

No-Passing Zones

All two-lane arterial and collector undivided roads within the County's Urban Service Area Boundary will be striped with double yellow lines indicating No-Passing Zones. Passing zones are not allowed.

The County's Urban Service Area Boundary is illustrated on the *Hillsborough County Roadways Functional Classification Map*. Access to this map is also available through the Resource Maps button on the *CIP Project Resource web page*. An arterial or collector road that abuts or intersects with the Urban Service Area Boundary line is considered within the boundary.

2.3.1.2 RIGHT TURN LANES

A right turn acceleration lane provides an opportunity for vehicles to complete a right turn unimpeded by conflicting vehicles and then accelerate parallel to the crossing traffic prior to merging. However, the use of a right turn acceleration lane does not provide a safe condition for pedestrians at an intersection. Design practices are encouraged to lower turning speeds and improve drivers view of pedestrians waiting to cross.

The County will not allow an intersection, side street, or driveway design that provides an acceleration lane for a right turn maneuver. A right turn maneuver must turn directly onto the receiving through lane.

2.3.1.3 MINIMUM RETURN RADII REQUIREMENTS

Minimum return radii are largely dependent upon the design vehicle. The designer must verify and confirm the turning movement of the design vehicle in consideration for the intersection that is being designed. Verify selected design vehicle can negotiate turning movement without encroachment onto adjacent curbs and sidewalks.

Minimum return radii all context classifications are 50-feet. 35-feet can be used as a minimum control radii when it can be demonstrated that the design vehicle is a passenger car (P) or single unit truck (SU) in a residential context area.

Table 9: Minimum Return Radii

Context	Type of Design Vehicle	Roadway Classification	Minimum Radius
Residential	P, SU	Collector Road	35’
	P, SU, WB-40, WB-50	Arterial Road	50’
Commercial	P, SU, WB-40, WB-50	Collector Road	50’
	P, SU, WB-40, WB-50	Arterial Road	50’

2.3.1.4 AUXILIARY LANES

Auxiliary lanes and tapers at intersections must be designed based on the criteria in the FDM, Chapter 212.14 Auxiliary Lanes.

Queue lengths for required turn lanes must be based on a traffic analysis. Use Table 10 Minimum Queue when the analysis queue lengths results are less than values shown in the table.

Table 10: Minimum Queue Lengths[1]

Turn Lane Type	Project Location	
	Within Urban Service Area	Within Rural Service Area
Left	100’	50’
Right	50’	50’
Free flow Right	0	0

[1]Unless otherwise required by analysis

2.3.1.5 SIDEWALKS

The standard thickness for all concrete sidewalks on Hillsborough County arterial and collector roads must be six inches (6″). This requirement is for all new and replaced sidewalks.

2.3.1.6 SIDEWALK RAMPS

All proposed pedestrian ramps at intersections on arterials and collectors are to be designed in compliance with ADA criteria and according to FDOT Standard Plans Index 522-002. Hillsborough County does not allow pedestrian ramps angled at 45 degrees toward the center of the intersection.

Hillsborough County will not allow the use of “Option A” for curb CR-L (Index 522-002, Sheet 5 of 7) since this option may direct a pedestrian towards the center of the intersection. Case “Option B” must be used.

2.3.1.7 BOARDWALKS

A boardwalk may be necessary to provide continuity to sidewalks and shared use paths over environmental or natural landscapes.

The cross slope of the boardwalk should generally be flat, but must not exceed two percent, and must meet ADA requirements.

Boardwalks must have a minimum railing height of 3-feet 6-inches. Boardwalks to be used by both pedestrians and bicyclists must have a minimum railing height of 4-feet.

Boardwalks must be constructed of concrete or steel materials. Wood or composite plastic materials will not be accepted.

2.3.1.8 CONCRETE TRAFFIC SEPARATORS

Concrete traffic separator requirements:

- Traffic separators designed to accommodate a refuge area for pedestrians must be 6-feet-wide or greater.
- Traffic separators not designed as a pedestrian refuge area must be 4-feet wide.
- Traffic separators designed to be placed in the buffer area for bike lanes may be 2-feet wide.
- It is preferred that all traffic separators be either Type I or Type II with Type "E" curb in lieu of Type IV or Type V separators with Type "F" curb. All designs and construction methods must be per the FDOT Standard Plan 520-020.

The design of the proposed traffic separators must include the following:

- maintain the County's minimum lane widths,
- not interfere with adjacent turn lane configurations,
- be striped with transitions that meet design criteria, and
- be marked with appropriate delineators, raised pavement markers, and painted island noses.

2.3.1.9 SPEED HUMP REPLACEMENT POLICY

Existing speed humps on arterials and collector roadways must follow Section 2.3.2.1 Speed Hump Replacement Policy.

2.3.2 COUNTY LOCAL ROADS

2.3.2.1 SPEED HUMP REPLACEMENT POLICY

Speed Hump

Speed humps were placed in residential neighborhoods and on other area roadways through the public involvement process. Speed humps removed during construction of any County transportation project must be replaced at their exact pre-existing location. However, it is permitted to move a speed hump a limited distance with approval by the County Engineer if the speed hump is creating a safety issue, such as blocking a driveway. Permanent removal of any speed hump must be addressed through the public involvement process engaging the concerned neighborhood as outlined in Hillsborough County's *Residential Traffic Calming Handbook.* Coordination with the County PM is required prior to any changes.

The standard County speed hump replacement detail is provided in *Index SSH-001.*

2.3.2.2 SIDEWALK RAMPS

All proposed sidewalks on local roads are to have ADA compliant pedestrian ramps connecting the pedestrian path to the crossing road. Curbs will be designed according to FDOT Standard Plans Index 522-002 so that the slope from the gutter line to the back of curb matches the slope of the ramp. The curb slope and the ramp slope must not exceed 1:12. The sidewalk ramps must be oriented, so the centerline of the pedestrian ramp is perpendicular to the road traversed. Ramps angled at 45 degrees into the intersection will not be allowed.

Hillsborough County will not allow the use of "Option A" for curb CR-L (Index 522-002, Sheet 5 of 7) since this option may direct a pedestrian towards the center of the intersection. Case "Option B" must be used.

The pedestrian crossing must also occur between the stop sign and the edge of pavement on the intersecting road.

Index PRC-001 illustrates sidewalk curb ramp configurations at "4-Leg" intersections and "3-Leg" intersections.

2.3.3 ROUNDABOUTS

The design of a roundabout must comply with FDM, Chapter 213 Modern Roundabouts and the *National Cooperative Highway Research Program (NCHRP) Report 1043, Guide for Roundabouts*.

2.3.3.1 ROUNDABOUT DESIGN CRITERIA

Design of a roundabout must follow the National Cooperative Highway Research Program (NCHPR) Research Report 1043 Guide for Roundabouts and the Florida Design Manual (FDM). In Addition, the following specific design criteria and elements must be included in the design of all roundabouts:

- A minimum 5-foot wide landscape buffer must be provided between the curb and the sidewalk outside the limits of the inscribed circle diameter and must extend at a minimum to the bicycle ramp or 25-feet beyond the accessible pedestrian crossings.

- Roundabout sidewalk width:
  - Where ramps provide sidewalk access to bicyclists, the sidewalk minimum width must be 10-feet to accommodate shared use by pedestrians and bicyclists.
  - Sidewalk width must be a minimum of 8-feet for Urban (C4) context classification roads.
  - Sidewalk width must be a minimum of 6-feet for all other context classification roads without bicyclists.

- Place conduits for future electric (2-2" Schedule 40 PVC) and water (3" Schedule 40 PVC). Determine where the electric and water can be supplied from outside the limits of the inscribed circle diameter and provide the conduits from these locations to 3 feet beyond the truck apron into the grass area of the central island. The beginning and end of electrical conduit must be placed in a pull box and the electrical conduits must have pull strings. The ends of the water conduits must be marked with a concrete survey monument and placed in a grassed area for future access. The electrical and water conduits must be capped to prevent filling with soil. The conduits will be located in the construction plan set. Additional conduits for electric and water maybe required as directed by the Engineer of Record.

- Central Island grading for collectors and arterials:
  - A mounded grassed area must be created in the central island with a minimum elevation of 3.5-feet and a maximum elevation of 6-feet above the back of the truck apron curb.
  - Slopes to achieve the height must not exceed 1:4 to maintain recoverable and transversal terrain.
  - The highest elevation and grades must be specified on the construction plan set.
  - Mini roundabouts may have elevations less than 3.5-feet and may have relatively flat slopes.

2.3.3.2 ROUNDABOUTS TRUCK APRON DESIGN

Roundabout truck aprons are to be designed as shown in *Index TAD-001*. Truck aprons should be concrete or brick on concrete pavement.

2.3.4 PAVEMENT DESIGN

Pavement Design must satisfy the *FDOT Flexible Pavement Design Manual* (FPDM) unless otherwise specified in this section.

2.3.4.1 BASE COURSE FOR FLEXIBLE PAVEMENT

The County minimum Base Group must be equal to number 9 unless a pavement analysis design outputs indicates higher values.

2.3.4.2 FRICTION COURSE LAYER THICKNESS POLICY

The final Friction Course layer for all County arterial and collector roadways must be FC-12.5 and 1.5 inches thick for roads requiring friction course.

2.3.4.3 SHOULDER PAVEMENT STRUCTURE FOR SCHOOL SHOULDER QUEUING LOCATIONS

New shoulders are being constructed as queuing locations under the School Safety Circulation Access Program. *Index SPS-001* provides the standard detail requirements for shoulders used as queuing locations. This requirement includes the shoulder pavement design, shoulder pavement width, and the required treatment of the adjacent travel lane.

SECTION 2.4 TRAFFIC DESIGN STANDARDS

The traffic design guidelines in this section supplements or substitutes the existing engineering standards in the *FDM*, *FDOT Standard Plans, FDOT Standard Specification for Road and Bridge Construction, FDOT Traffic Engineering Manual , FDOT Manual on Uniform Traffic Studies , Hillsborough County's Public Works Standard Specifications for Construction* and the *MUTCD*. Traffic design elements includes Signing and Pavement Markings, Lighting, and Signalization. The guidelines presented in the following sections are County specific preferences.

2.4.1 SIGNING AND PAVEMENT MARKING

2.4.1.1 REMOVAL OF EXISTING PAVEMENT MARKING

Construction Plans and Temporary Traffic Control Operations:

Hillsborough County Construction Plans and Specifications must not specify the use of grinding, water blasting, or other pavement marking removal methods to change or remove permanent pavement markings on final flexible pavement surfaces. When pavement removal is warranted to remove unsuitable, permanent pavement markings, mill a minimum 1.5-inch depth for the entire affected lane width to place a new surface course, and then apply new permanent pavement markings per the plans.

A note has been added to the County Capital Improvement Program (CIP) Project Standard General Notes (Roadway) sheet that instructs the Contractor to:

> *"Pre-mark pavement marking placement and notify the County Engineer of the time and date of placement of temporary and permanent pavement markings one week prior to installation. County Construction Engineering and Inspection personnel must be on site to inspect pavement marking placement and installation in accordance with the County's Contract Documents, Specifications, and Construction Plans."*

Grinding, water blasting, or other nondestructive methods, as approved by the Engineer, will be allowed for removal of existing pavement markings on existing pavement surfaces during Temporary Traffic Control Operations only when the construction plans specify the existing pavement is to be replaced with new permanent pavement. Where construction exceeds three working days, safety measures such as retroreflective raised pavement markers (RPM's) must be used in conjunction with the new temporary striping. This process will only be allowed during Temporary Traffic Control Operations.

THE USE OF BLACK PAINT TO MASK EXISTING PAVEMENT MARKING IS PROHIBITED ON ALL HILLSBOROUGH COUNTY'S ROADS.

A note has been added to the CIP Project Standard General Notes (Roadway) sheet that states:

> *"Pavement markings placed on existing pavement for Temporary Traffic Control, beyond the limits of new permanent construction shown in the plans, must be removed by milling and resurfacing. Limits of milling and resurfacing will extend to the limits of all temporary pavement markings placed on the existing pavement. Pavement marking plans for temporary traffic control extending beyond the limits of new permanent construction shown in the plans must be approved by the Engineer."*

Pavement Marking Errors During Construction:

Permanent pavement markings incorrectly constructed by Contractors working within County right-of-way, or on projects where right-of-way will be turned over to the County, must be corrected by milling, resurfacing and restriping at no cost to the County. The Contractor has the option to submit a proposal for an alternative pavement marking removal method, in lieu of the milling and resurfacing method. The proposal must be submitted for review and approval to Construction Services of the Capital Programs Department in accordance with the governing Contract Documents. A form for requesting an alternative pavement marking removal method proposal is provided on the Hillsborough County website at the following location, *Alternative Pavement Marking Removal Method Proposal Form*.

Pavement Marking Removal Method Criteria:

The use of black paint to mask existing pavement markings is prohibited on all Hillsborough County roads. The proposed pavement marking removal methods stipulated above for "Construction Plans and Temporary Traffic Control Operations" and "Pavement Marking Errors During Construction" must achieve complete removal of conflicting existing pavement markings and must not leave scarring, remnant markings, or discoloration that may mislead or cause confusion for drivers in wet, dry, daytime, nighttime, or any other adverse driving conditions. If the removal method results in ghost markings that may create a safety concern or damages in the pavement, then additional corrective action may need to be taken that may require milling and resurfacing.

2.4.1.2 PEDESTRIAN CROSSWALKS AT SIGNALIZED INTERSECTIONS

Marked crosswalks and pedestrian signal equipment must be provided on all legs of signalized intersections. See the most current MUTCD requirements and FDOT Standard Plans for details on crosswalk pavement markings.

Use special emphasis crosswalk markings at all signalized intersections. When separated right-turn lanes are used, locate crosswalks and ramps so that an approaching motorist has a clear view of a pedestrian within or entering the intersection.

If there is no existing or planned sidewalk at a corner, a concrete landing pad must be provided meeting FDOT and ADA requirements. Grading adjacent to the landing pad must be provided to eliminate drop-offs that would be hazardous for all pedestrians. Level areas 2-feet beyond the landing pad must be provided before the introduction of slopes.

2.4.1.3 ADVANCE STREET NAME SIGNS FOR SIGNALIZED INTERSECTIONS

Advance Street Name Signs are required to be provided on all the approaches prior to a signalized intersection on all County Roads. Advance Street Name Signs should be installed in advance of the signalized intersection in accordance with the distances shown in "Condition A" of Table 2C-4 of MUTCD. Advance Street Name Signs must be placed in locations free of potential conflicts that will block the sight distance visibility of the sign. The sight distance identified in the MUTCD may need to be adjusted to eliminate visibility issues caused by above grounds utilities, landscaping, embankments, bridge abutments, and horizontal or vertical geometry. Adjusted locations of the Street Name Signs must not be less than the distances provided in the MUTCD. Advance Street Name Sign foundations must not be placed in ditch bottoms or where foundations will impact underground utilities.

The street names must be coordinated in advance with the County's Street Names and Addresses Department at *addressing@hillsboroughcounty.org*. Street names must be verified for accuracy.

Additional guidance for Advance Street Name Signs for signalized intersections is found in the current FDOT TEM.

2.4.1.4 REQUIREMENTS FOR SCHOOL SPEED ZONES

Projects that include an existing or proposed school zone must provide the design for school pavement markings, signs, and signal equipment identified in the current version of the FDOT Speed Zoning Manual. This is a requirement for all transportation projects, County school projects (public or charter), and private school projects.

Construction plans that include a school speed zone that are submitted through the Development Services Department will be forwarded to the Technical Services Division, Traffic Engineering Section for review and concurrence with this requirement.

School developers for both public and private schools are responsible for construction of the school speed zone pavement markings, signs, and signal equipment.

All school speed zones must be determined based on an engineering study of the specific site. The study must confirm justification for the need of a school speed zone and must be reviewed and approved by Technical Services Division, Traffic Engineering Section. This study must be provided by the applicant and approved before any construction plans are reviewed. Engineering study guidance for establishing school zones is found in the FDOT Speed Zoning Manual.

2.4.2 SIGNALIZATION

2.4.2.1 CLEAR AREA FOR PEDESTRIAN SIGNALS

A pedestrian maneuvering landing clear area measuring 30″ x 48″ is required at each signal pushbutton location. The signalization plans must show a "shaded area" to illustrate this landing at each pushbutton location.

2.4.2.2 SIGNAL OPERATION PLAN OVERLAP PHASES

Overlap phases must be clearly defined on the signalization design. Provide a phasing diagram or signal operating plan (SOP) showing vehicle overlap phases when the geometric design of a signalized intersection requires an overlap phase.

Display the SOP in the signalization plan sheet. If the SOP conforms to the FDOT Standard Plans, Index 671-001, then only a reference to the index is required.

2.4.2.3 RETROREFLECTIVE SIGNAL BACKPLATES

All traffic signal heads must have backplates with reflective yellow borders installed in all approaches.

2.4.2.4 OVERHEAD STREET NAME SIGN DETAILS

All internally illuminated and aluminum static Overhead Street Name Signs installed within the County must follow the standard street name sign panel worksheet details provided in *Index OSN-001*.

Block numbers and the street names must be coordinated in advance with the County's Street Names and Addresses Department at *addressing@hillsboroughcounty.org.* Block numbers and street names must be verified for accuracy.

FDOT TEM and the FDM Chapter 230 provide additional guidance about the format and placement of the street name and block numbers on Overhead Street Name Signs, including the required lettering type and maximum sign sizes.

Overhead private road signs must follow the standard private road street name worksheet provided in *Index OSN-001*. These signs have a blue background color and need to state, "Private Road".

2.4.2.5 PROPOSED ELEVATIONS FOR OVERHEAD SIGNS AND MAST ARM SIGNALS

Signalization plan submittals must show the required elevations on the proposed signalization plan sheets and on the mast arms/strain poles tabulation sheets. Overhead signs and dynamic message signs must show the elevations on the sign cross-section sheets. The required elevations are:

- Proposed highest ground elevation at the mast arm, strain pole, or overhead sign pole foundation locations.
- Proposed top of foundation elevation at the mast arm or overhead sign pole foundation locations. The top of foundation elevation is not applicable for strain poles.
- Proposed pavement surface elevation on the traffic lane or shoulder directly below the lowest point on the traffic signal or overhead sign structure, creating the minimum required vertical clearance to the pavement or shoulder surface.
- Proposed elevation of the lowest point on the traffic signal or overhead sign structure, resulting in the minimum required vertical clearance to the proposed pavement surface of the traffic lane or shoulder directly below the lowest point on the structure.

These elevations must be documented in the *Critical Elevations Certification Letter for Traffic Signals and Overhead Sign Structures*. The letter must be provided at 60%, 90% and 100% plan submittals, and electronically signed and sealed.

2.4.2.6 SIGNAL STRUCTURE

Refer to HCTDM, Section 2.5 for traffic signal structure requirements.

2.4.2.7 SIGNAL INTERCONNECT COMMUNICATION

All signalization plans must include interconnect communications. Fiber optic cable is the standard required by Hillsborough County Technical Services Division, Traffic Engineering Section.

2.4.3 LIGHTING

2.4.3.1 GENERAL

Roadway lighting is an important feature to consider along sidewalks, roads, and intersections to enhance nighttime visibility for pedestrians, bicyclists, motorist, and all other modes of transportation. The Engineer of Record should notify the County Project Manager if there is a safety condition that would warrant a need for lighting.

Roadway lighting on County roads will be designed, constructed, operated, and maintained by TECO. Lighting locations and need will be identified and directed by Hillsborough County Traffic Engineering Section. The Engineer of Record should coordinate with the County's Utility Coordinator to identify the responsibilities involving coordination with Traffic Engineering Section and TECO.

Lighting must not be placed on the signal mast arm structure. Signalized intersections must include street lighting on separate poles.

SECTION 2.5 STRUCTURE DESIGN STANDARDS

The structure design guidelines in this section supplements or substitutes the existing engineering standards in the *FDOT Structure Manual , FDM, FDOT Standard Plans, FDOT Standard Specification for Road and Bridge Construction,* the *Hillsborough County's Public Works Standard Specifications for Construction* and the AASHTO Standard Specifications for Highway Bridges. The guidelines presented in the following sections are County specific preferences.

2.5.1 DEFINITIONS

Hillsborough County maintains and designates two bridge classifications:

Qualifying bridges with a span greater than or equal to 20-feet, as defined by the National Bridge Inspection Standards (NBIS), are inspected by the FDOT. Qualifying bridge structures are standard bridges, arch spans, concrete box culverts, and parallel series of pipe culverts, as described in the FDOT Bridge Management System Coding Guide, latest edition.

Non-qualifying bridges with spans less than 20-feet are inspected by the County and only include standard bridges and arch spans. Concrete box culverts and parallel series of pipe culverts with a span less than 20 feet are not considered as non-qualifying bridges.

2.5.2 APPROACH SLABS ON BRIDGES

County bridges will require approach slabs to be 30-feet-long. This requirement will be applied to approach slab replacement and new approach slabs except as noted below.

Local Roads with less than 5,000 Average Daily Traffic (ADT) may have 20-feet long approach slabs. See FDOT Developmental Standard Plans, Index D400-093 Approach Slab (20 ft).

2.5.3 STRUCTURE MAST ARM POLICY

The County requires all permanent signal structures installed within the County to be mast arms except when the maximum arm length of 78 feet is exceeded.

Steel strain poles must be utilized when the mast arm maximum length is exceeded. All signal heads will be supported by two-point span wire assemblies with adjustable hangers. Span wire assemblies are to be either box spans, perpendicular spans, or drop box spans. The box span is the preferred configuration. Diagonal span assemblies may only be used when all other alternatives have been proven to not meet the dimensional and structural requirements. Diagonal spans will require approval by the Technical Services Division, Traffic Engineering Section.

2.5.4 STRUCTURE MAST ARM DESIGN

Structural mast arm design to assume wind loading due to backplates on all traffic signal heads, an additional signal head for future left-turn phases and one additional traffic sign. The additional equipment must be placed to create the worst case load on the mast arm structure.

SECTION 2.6 LANDSCAPE DESIGN STANDARDS

(SECTION RESERVED FOR FUTURE UPDATES)

REFERENCES

1. American Association of State Highway and Transportation Officials (AASHTO)

    a. ***A Policy on Geometric Design of Highways and Streets***, 7th Edition. (The Green Book) (2018)
    b. ***Guide for the Development of Bicycle Facilities***. (2012)
    c. ***Highway Safety Manual*** (HSM), 1st Edition (2013 with Errata)
    d. ***Standard Specifications for Highway Bridges*****,** 17th Edition (2002)

2. Federal Highway Administration (FHWA)

    a. ***Bikeway Selection Guide*****.** (2019), available at *https://safety.fhwa.dot.gov/ped_bike*
    b. ***Federal Highway Administration. Signalized Intersections Informational Guide*****,** 2nd Edition (2013), available at *https://safety.fhwa.dot.gov/intersection/signal*
    c. ***Manual on Uniform Traffic Control Devices for Streets and Highways***. (MUTCD) (2009 Edition Including Revision 1, 2 and 3 July 2022), available at *https://mutcd.fhwa.dot.gov/*
    a. ***Pedestrian Access to Roundabouts: Assessment of Motorist' Yielding to Visually Impaired Pedestrians and Potential Treatments to Improve Access*****,** (May 2006) available at *https://www.fhwa.dot.gov/publications/research/safety/pedbike/05080/01.cfm*
    b. ***Road Diet Informational Guide***. (2014), available at *https://safety.fhwa.dot.gov/road_diets/guidance/info_guide/*
    c. ***Road Safety Fundamentals. Concepts, Strategies, and Practices that Reduce Fatalities and Injuries on the Road***. (2017), available at *https://rspcb.safety.fhwa.dot.gov/RSF*
    d. ***Separated Bike Lane Planning and Design Guide.*** (2015), available at *https://www.fhwa.dot.gov/environment/bicycle_pedestrian/publications*
    e. ***Speed Limit Basics*****,** FHWA-SA-16-076. (undated).
    f. ***Speed Management Toolkit*****,** available at https://safety.fhwa.dot.gov/speedmgt/ref_mats/docs/speedmanagementtoolkit_final.pdf
    g. ***Traffic Calming ePrimer*****,** *a*vailable at *https://safety.fhwa.dot.gov/speedmgt*
    h. ***USLIMITS2. A tool to Aid Practitioners in Determining Appropriate Speed Limit Recommendations***, available at *https://safety.fhwa.dot.gov/uslimits/*

3. Florida Department of Transportation (FDOT)

    a. ***Florida Design Manual*** (FDM) (2023), available at *https://www.fdot.gov/roadway/fdm/default.shtm*
    b. ***Manual of Uniform Minimum Standards for Design, Construction and Maintenance for Streets and Highways***. (Florida Greenbook) (2018), available at *https://www.fdot.gov/roadway/floridagreenbook/fgb.shtm*
    c. ***Manual on Uniform Traffic Studies*** (MUTS) (2021), available at *https://www.fdot.gov/traffic/trafficservices/studies/muts/muts.shtm*
    d. ***Lane Repurposing Guidebook***. (2020), available at *https://www.fdot.gov/planning/systems/programs/sm/lanerepurposing/default.htm*
    e. **Safety Analysis Guidebook for PD&E Studie***s* (FSAG) (2023), available at *https://www.fdot.gov/environment/pubs/pdeman/pdeman-current*
    f. ***Speed Zoning for Highways, Roads and Streets in Florida***. (2018), available at *https://www.fdot.gov/traffic/speedzone/speed-zone-manual.shtm*
    g. ***Traffic Engineering Manual*** (TEM) (2023), available at *https://www.fdot.gov/traffic/trafficservices/studies/tem/tem.shtm*

4. Hillsborough County Community and Infrastructure Planning Department

    a. **Complete Street Guide**, (May 2023), available at *https://www.hillsboroughcounty.org/en/government/county-projects/land-use-and-infrastructure-studies/land-use-infrastructure-other-publications*
    b. **Context Based Classification Tech Memo,** (March 2021), available at https://www.hillsboroughcounty.org/en/government/county-projects/land-use-and-infrastructure-studies/land-use-infrastructure-other-publications

5. Hillsborough Metropolitan Planning for Transportation (TPO)

    a. **Plan Hillsborough's Comprehensive Plan Mobility Element**, (last updated April 25, 2023), available at *https://www.planhillsborough.org/hillsborough-county-comprehensive-plan/*
    b. **Vision Zero Speed Management Action Plan.** (2020), available at *https://planhillsborough.org/vision-zero/*

6. Institute of Transportation Engineers (ITE)

    a. ***Designing Walkable Urban Thoroughfares: A Context Sensitive Approach. RP-036A.*** (2010)
    b. ***Noteworthy Speed Management Practices***. (2020), available at *https://safety.fhwa.dot.gov/speedmgt/ref_mats/fhwasa20047/index.cfm*
    c. ***Traffic Calming Measures,*** available at *https://www.ite.org/traffic-calming*

7. National Association of City Transportation Officials (NACTO)

    a. ***Global Street Design Guide***. (2016)
    b. ***Urban Bikeway Design Guide.*** (2011), available at *https://nacto.org/wp-content/uploads/2011/03/NACTO_UrbanBikeway*
    c. ***Urban Bikeway Design Guide,*** 2nd Edition (2012)

8. National Cooperative Highway Research Program (NCHRP)

    a. ***Research Report 318. Expert System for Recommending Speed Limits in Speed Zones***. (2006), available at *https://safety.fhwa.dot.gov/speedmgt*
    b. ***Research Report 855. An Expanded Functional Classification System for Highways and Streets***. (2018), available at *http://www.trb.org/Main/Blurbs/176004.aspx*
    c. ***Research Report 966. Posted Speed Limit Setting Procedure and Tool: User Guide***. (2021), available at *http://www.trb.org/Publications/Blurbs/182038.aspx*
    d. ***Research Report 1043. Guide for Roundabout.*** (2023), available at https://www.trb.org/Publications
    e. ***Project 15-76 [RFP]: "Designing for Target Speed."*** (Research in Progress)

9. Other Publications

    a. ***Crime Prevention Through Environmental Design Guidebook, National Crime Prevention Council.*** *(October 2003)*
    b. ***The IESNA Lighting Handbook Reference and Application***, 9th Edition *(January 2000)*
    c. ***World Health Organization. Speed Management. A Road Safety Manual for Decision-Makers and Practitioners***. (2008), available at *https://cdn.who.int/media/docs/default-source/documents*

Appendix A:
DESIGN BULLETINS POSTED DURING THE PREVIOUS BIANNUAL UPDATE

Bulletin Number	Subject	HCTDM Location	Modifications
20-01	Hillsborough County Capital Improvement Program Resources	1.2.1 CIP Transportation Project Resources	None
20-02	Adoption of Design Criteria for County Arterial Collectors and Local Roads	1.1.3 Design Standards and Specifications	None
20-03	Hierarchy of Contract Documents	1.1.3.1 Hierarchy of Contract Documents	Revised Contract documents list and order
20-04	Notes to Reviewers	1.3.7.2 Notes to Reviewers	Revised Language
20-05	No Passing Zones Within the County's Urban Service Area Boundary	2.3.1.1. No-Passing Zones	None
20-06	Six-Inch Thick Concrete Sidewalk Required on all Arterial and Collector Roadways	2.3.1.5. Sidewalks	None
20-07	Determination if Bicycle Lanes Can Be Added to Resurfacing Projects	2.1.5.4.5 Determination if Bicycle Lanes Can Be Added to Resurfacing Projects	None
20-08	Signalization Plans to Show a Clear Area at Pushbutton Locations	2.4.2.1 Clear Area for Pedestrian Signals	None
20-09	Approach Slabs Length is 30 Feet for All HC Bridges	2.5.2 Approach Slabs on Bridges	Revised Language and Heading to allow 20' approach slabs
20-10	Hillsborough County Traffic Signal Mast Arm Policy	2.5.3 Structure Mast Arm Policy	None
20-11	Elimination of Acceleration Lanes at Right Turn Movements	2.3.1.2 Right Turn Lanes	None
21-01	HC Adoption of Design Speed to be set to equal Posted Speed	2.1.3.1 Speed Definitions	Revised Speed Definitions, added Operating Speed
21-02	Typical Section Sheet Requirements	1.3.7.5 Typical Section Sheet Traffic Data Requirements	Revised Language to remove "Target Speed" added "Context Classification"
21-03	Temporary Lighting During Construction	1.3.7.4.2 Temporary Lighting Note	None
21-04	Green Colored Contrast Block for Bicyclist Symbol and Bike Lane Arrow	2.1.5.4.4 Green Colored Contrast Block	None
21-05	Speed Hump Replacement Policy	2.3.2.1 Speed Hump Replacement Policy	None
21-06	Pavement Markings Removal by Grinding or Water Blasting	2.4.1.1 Removal of Existing Pavement Marking	Replaced by Bulletin 23-01
21-07	Requirement of Marked crosswalks and ped equipment on signalized intersections	2.4.1.2 Pedestrian Crosswalks at Signalized Intersections	None
21-08	Shoulder Pavement Structure for School Shoulder Queueing Locations	2.3.4.3 Shoulder Pavement Structure for School Shoulder	None
21-09	Roundabout Truck Apron Pavement Design	2.3.3.2 Roundabouts Truck Apron Design	None
21-10	Friction Course Layer Thickness Policy	2.3.4.2 Friction Course Layer Thickness Policy	None
21-11	Proposed Elevations for Overhead Signs & Signals To Be Incorporated in Plans	2.4.2.5 Proposed Elevations for OH signs and Mast Arms	None
21-12	Design Documents Required for Signalization Plans	1.3.7.6 Documents Required for Signalization Plans	None
21-13	Design Exception and Deviation Methodology	1.3.5 Design Exception and DDM	Revised Language
21-13S	Signature Page for Design Exceptions and Deviation Methodology	1.3.5 Design Exception and DDM	None
21-14	Design Documents Required for Bridge Plans	1.3.7.7 Documents Required for Bridge Plans	Revised Language
21-15	SPM for Roundabouts in Preliminary Stage	1.3.8 Preliminary Submittal Requirements for Roundabout	Revised Language and Heading

Bulletin Number	Subject	HCTDM Location	Modifications
21-16	Prohibition of Phosphogypsum in Road Construction	Not in HCTDM	Bulletin is incorporated under County's Specification Manual
22-01	Pavement Marking Removal	2.4.1.1 Removal of Existing Pavement Marking	Replaced by Bulletin 23-01
22-02	HC 2021 Context Classification Map for Arterials and Collectors Roads	2.1.1 Context Based Classification	None
22-03	Submit Approved Warrant analysis prior to signal construction plans	1.3.7.6 Documents Required for Signalization Plans	None
22-04	Hillsborough County Standard Details	1.3.7.1 Key Sheet and Standard Details	None
22-05	Typical Section Package Approval Process	1.3.6 Typical Section Package	Revised Language
22-06	Minimum Lane Widths Preference for Undivided 2lane 2way Roadways	2.1.5.2 Minimum Typical Section Design Elements	None
22-07	Advance Street Name Signs for Signalized Intersections	2.4.1.3 Advance Street Name Signs for Signalized Intersections	None
22-08	Requirements for School Zones	2.4.1.4 Requirements for School Speed Zones	None
22-09	Overhead Street Name Sign Panel Details	2.4.2.4 OH Street Name Signs Detail	Revised Bulletin 22-09R
22-10	Design Criteria Table Submittal Requirements	1.3.4. Design Criteria Table	None
23-01	Pavement Marking Removal	2.4.1.1 Removal of Existing Pavement Marking	None
23-02	Sidewalk Configuration for Local Roads	2.3.2.2 Sidewalk Ramps	None
23-03	Multimodal Safety Analysis Guidance for County Transportation Projects	1.2.2 Multimodal Safety Analysis	Revised Language
23-04	Pedestrian Ramps at Arterial and Collector Road Intersections	2.3.1.6 Sidewalk Ramps	None
23-05	Raised Island Placement	2.3.1.8 Concrete Traffic Separator	None
23-06	Design Guidance for Suburban Town (C3T) Context Classified Roads	2.1.5.2 Minimum typical Section Design Elements	None
23-07	Driveway Closure Procedure	1.2.5 Driveway Closure Procedure	None
23-08	Roundabout Design Criteria	2.3.3.1 Roundabout Design Criteria	None
22-09R	Overhead Street Name Sign Panel Details	2.4.2.4 OH Street Name Signs Details	None

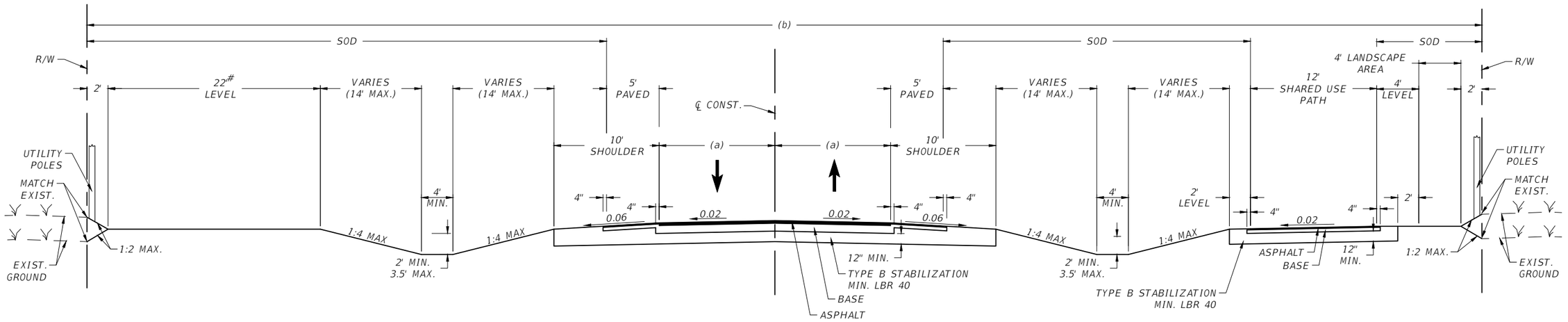
Appendix B:

HILLSBOROUGH COUNTY TYPICAL SECTIONS

LIST OF TYPICAL SECTIONS

NOTE: The County Typicals Sections listed below are provided in the following pages.

C1&C2-2U	Rural 2 Lane Undivided
C1&C2-4D	Rural 4 Lane Divided
C3-2U-SL	Suburban 2 Lane Undivided - Share Lane
C3-2U	Suburban 2 Lane Undivided
C3-2D	Suburban 2 Lane Divided
C3-4D	Suburban 4 Lane Divided
C3-6D	Suburban 6 Lane Divided
C3-4D-OD	Suburban 4 Lane Divided - Open Drainage
C3T-2U-SL	Suburban Town 2 Lane Undivided
C3T-2U-BL	Suburban Town 2 Lane Undivided - Bike Lane
C3T-2D-BL	Suburban Town 2 Lane Divided - Bike Lane
C3T-4D-BL	Suburban Town 4 Lane Divided - Bike Lane
C4-2D-BL	Urban General 2 Lane Divided - Bike Lane
C4-4D-BL	Urban General 4 Lane Divided - Bike Lane
SUP	Shared Use Paths



DIMENSION LEGEND

DESIGN SPEED+	LANE WIDTH (a)	RIGHT OF WAY WIDTH (b)
25-45 MPH	11'*	154'
50 MPH	12'	156'

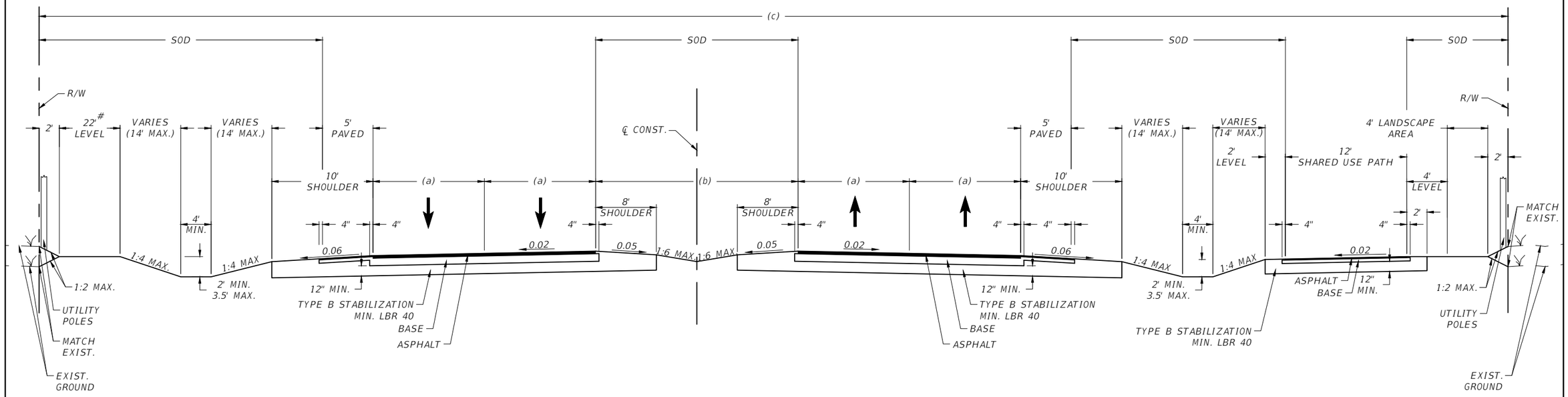
NOTES:

+*DESIGN SPEED = POSTED SPEED*

**10' LANES CAN BE PROVIDED FOR DESIGN SPEEDS OF 25 - 35 MPH UNLESS TRANSIT IS PRESENT OR TRUCK VOLUME EXCEEDS 10%.*

#*WITHIN ONE MILE OF THE URBAN SERVICE BOUNDARY OR WHERE THERE IS DEMAND (EX.: 2 MILES FROM AN EDUCATION FACILITY), A SIDEWALK OR SHARED USE PATH MUST BE PROVIDED ON THE OPPOSITE SIDE OF THE SHARED USE PATH.*

REVISION DATE					
10/2023	TRANSPORTATION DESIGN MANUAL	Hillsborough County Florida	RURAL 2 LANE UNDIVIDED TYPICAL SECTION	DRAWING NO.	SHEET NO.
				C1&C2-2U	1 OF 15



DIMENSION LEGEND

DESIGN SPEED+	LANE WIDTH (a)	MEDIAN WIDTH (b)	RIGHT OF WAY WIDTH (c)
25-45 MPH	11'*	22'	198'
50 MPH	12'	40'	220'

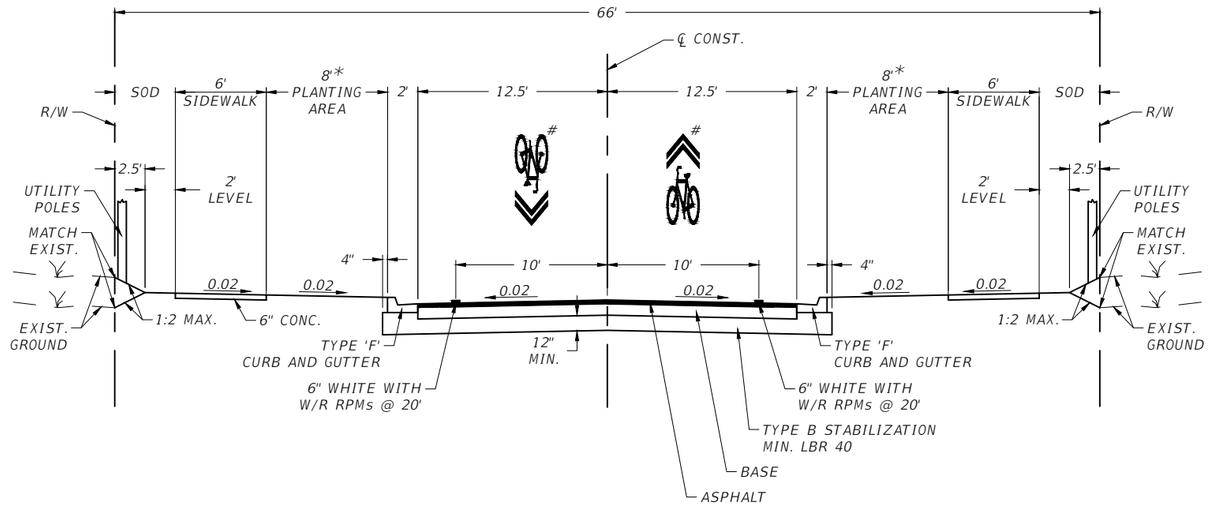
NOTES:

+DESIGN SPEED = POSTED SPEED

*10' LANES CAN BE PROVIDED FOR DESIGN SPEEDS OF 25 - 35 MPH UNLESS TRANSIT IS PRESENT OR TRUCK VOLUME EXCEEDS 10%.

#WITHIN ONE MILE OF THE URBAN SERVICE BOUNDARY OR WHERE THERE IS DEMAND (EX.: 2 MILES FROM AN EDUCATION FACILITY), A SIDEWALK OR SHARED USE PATH MUST BE PROVIDED ON THE OPPOSITE SIDE OF THE SHARED USE PATH.

REVISION DATE					
10/2023	TRANSPORTATION DESIGN MANUAL	Hillsborough County Florida	RURAL 4 LANE DIVIDED TYPICAL SECTION	DRAWING NO.	SHEET NO.
				C1&C2-4D	2 OF 15



NOTES:

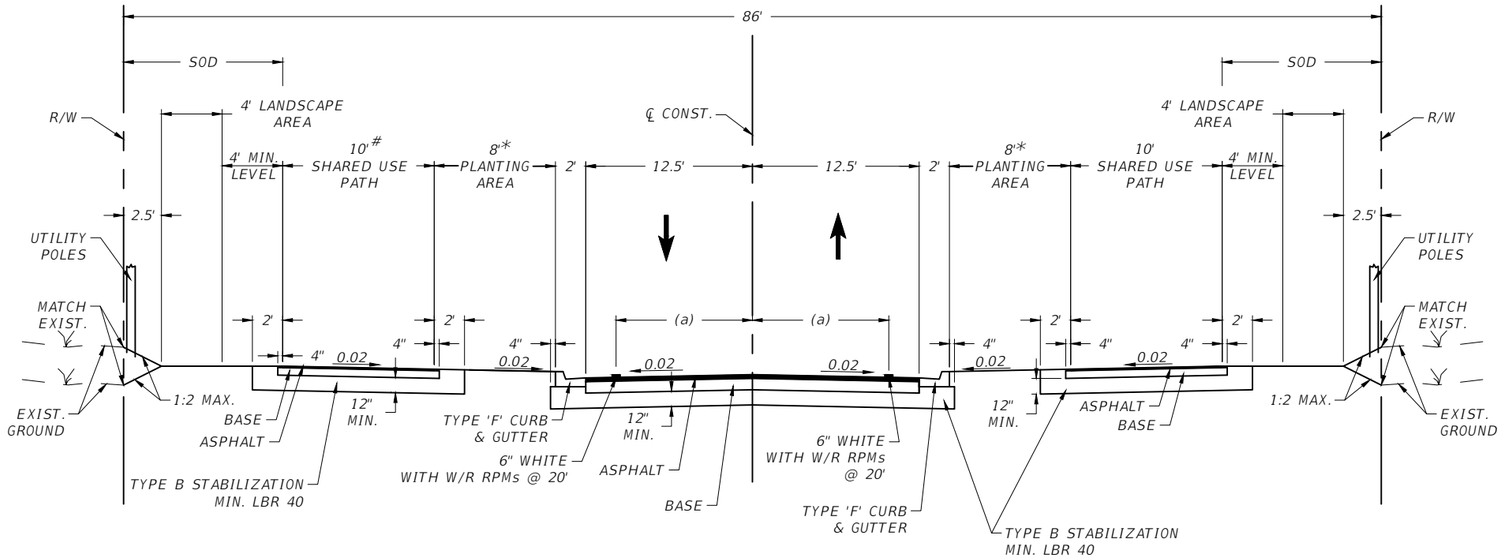
DESIGN SPEED = POSTED SPEED

FOR DESIGN SPEED ≤30 MPH AND MAXIMUM 5,000 AADT.

ILLUSTRATION ONLY. ALL PAVEMENT MARKINGS FOLLOW MUTCD.

* POTENTIAL AREA TO CONSIDER GREEN INFRASTRUCTURE TECHNIQUES. SEE HCTDM FOR GREEN INFRASTRUCTURE SECTION.

REVISION DATE					
10/2023	TRANSPORTATION DESIGN MANUAL	Hillsborough County Florida	SUBURBAN 2 LANE UNDIVIDED TYPICAL SECTION	DRAWING NO.	SHEET NO.
				C3-2U-SL	3 OF 15



DIMENSION LEGEND

DESIGN SPEED+	LANE WIDTH (a)
25-35 MPH	10'
40-45 MPH	11'

NOTES:

+DESIGN SPEED = POSTED SPEED

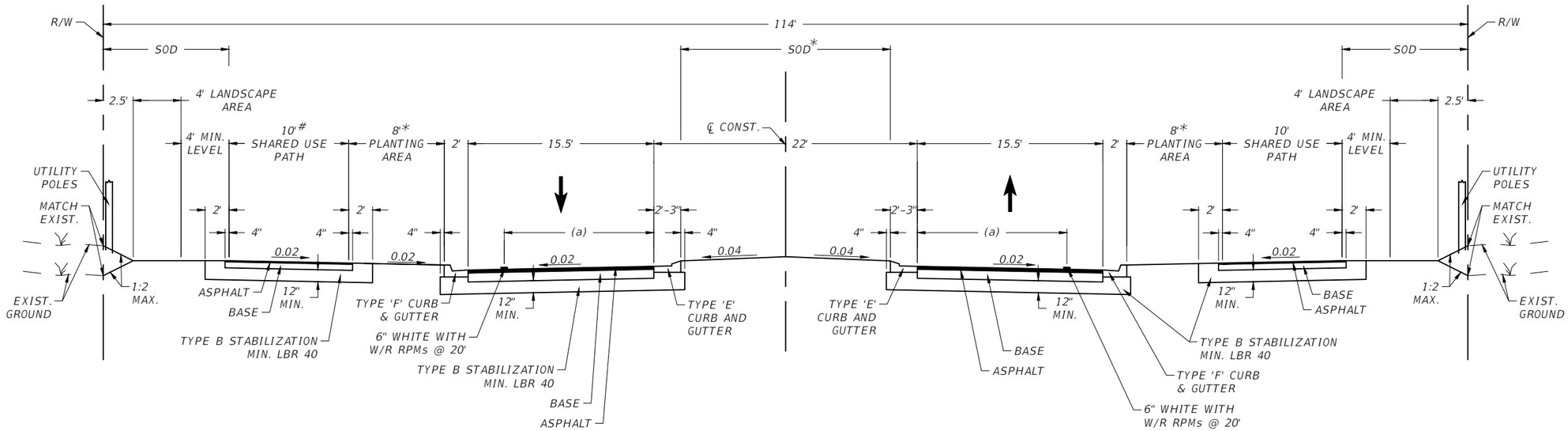
BIKES CAN BE INTEGRATED WITHIN THE ROADWAY FOR ROADWAYS WITH DESIGN SPEED ≤30 MPH AND AADT ≤5,000.

THIS TYPICAL SECTION APPLIES TO C3R AND C3C CONTEXT CLASSIFICATIONS ONLY.

#FOR C3C INDUSTRIAL USES, A SECOND SHARED USE PATH IS OPTIONAL. BUT A SIDEWALK MUST BE PROVIDED.

*POTENTIAL AREA TO CONSIDER GREEN INFRASTRUCTURE TECHNIQUES. SEE HCTDM FOR GREEN INFRASTRUCTURE SECTION.

REVISION DATE					
10/2023	TRANSPORTATION DESIGN MANUAL	Hillsborough County Florida	SUBURBAN 2 LANE UNDIVIDED TYPICAL SECTION	DRAWING NO.	SHEET NO.
				C3-2U	4 OF 15



DIMENSION LEGEND

DESIGN SPEED+	LANE WIDTH (a)
25-35 MPH	10'
40-45 MPH	11'

NOTES:

+DESIGN SPEED = POSTED SPEED

BIKES CAN BE INTEGRATED WITHIN THE ROADWAY FOR ROADWAYS WITH DESIGN SPEED ≤30 MPH AND AADT ≤5,000.

THIS TYPICAL SECTION APPLIES TO C3R AND C3C CONTEXT CLASSIFICATIONS ONLY.

#FOR C3C INDUSTRIAL USES, A SECOND SHARED USE PATH IS OPTIONAL. BUT A SIDEWALK MUST BE PROVIDED.

*POTENTIAL AREA TO CONSIDER GREEN INFRASTRUCTURE TECHNIQUES. SEE HCTDM FOR GREEN INFRASTRUCTURE SECTION.

REVISION DATE					
10/2023	TRANSPORTATION DESIGN MANUAL	Hillsborough County Florida	SUBURBAN 2 LANE DIVIDED TYPICAL SECTION	DRAWING NO.	SHEET NO.
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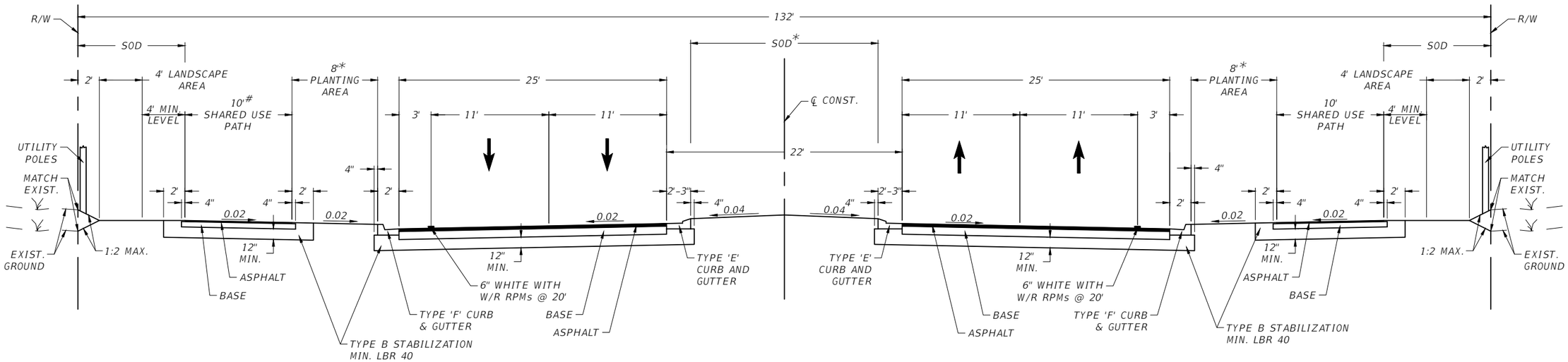


NOTES:

DESIGN SPEED = POSTED SPEED

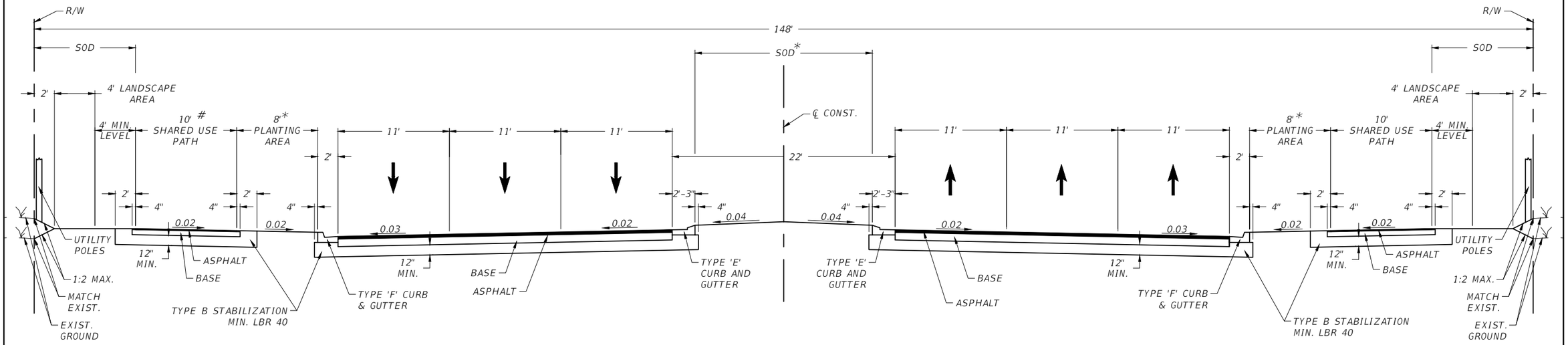
FOR DESIGN SPEED ≤45 MPH.

THIS TYPICAL SECTION APPLIES TO C3R AND C3C CONTEXT CLASSIFICATIONS ONLY.

FOR C3C INDUSTRIAL USES, A SECOND SHARED USE PATH IS OPTIONAL. BUT A SIDEWALK MUST BE PROVIDED.

* POTENTIAL AREA TO CONSIDER GREEN INFRASTRUCTURE TECHNIQUES. SEE HCTDM FOR GREEN INFRASTRUCTURE SECTION.

REVISION DATE					
10/2023	TRANSPORTATION DESIGN MANUAL	Hillsborough County Florida	SUBURBAN 4 LANE DIVIDED TYPICAL SECTION	DRAWING NO.	SHEET NO.
				C3-4D	6 OF 15



NOTES:

DESIGN SPEED = POSTED SPEED

FOR DESIGN SPEED ≤45 MPH.

THIS TYPICAL SECTION APPLIES TO C3R AND C3C CONTEXT CLASSIFICATIONS ONLY.

FOR C3C INDUSTRIAL USES, A SECOND SHARED USE PATH IS OPTIONAL, BUT A SIDEWALK MUST BE PROVIDED.

* POTENTIAL AREA TO CONSIDER GREEN INFRASTRUCTURE TECHNIQUES. SEE HCTDM FOR GREEN INFRASTRUCTURE SECTION.

REVISION DATE					
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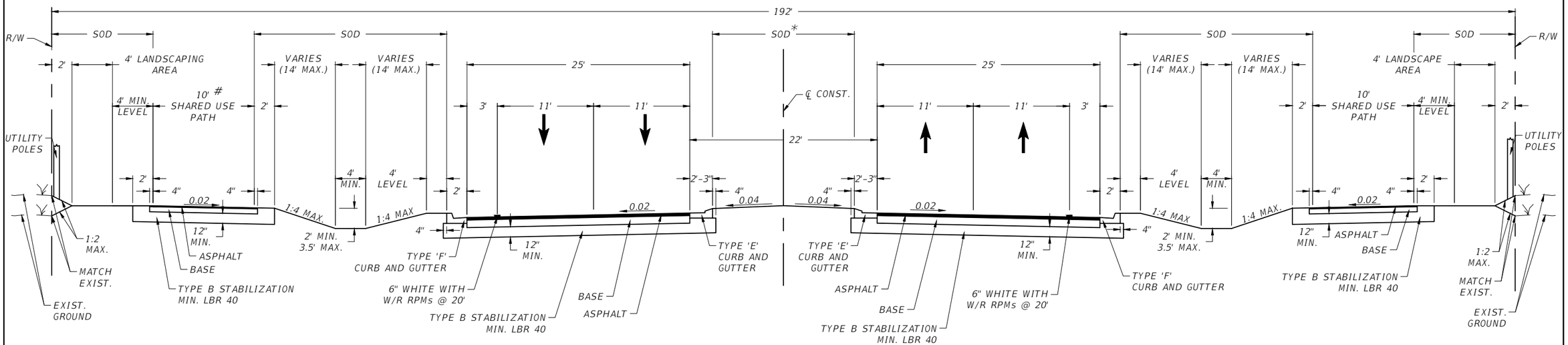
				C3-6D	7 OF 15



NOTES:

DESIGN SPEED = POSTED SPEED

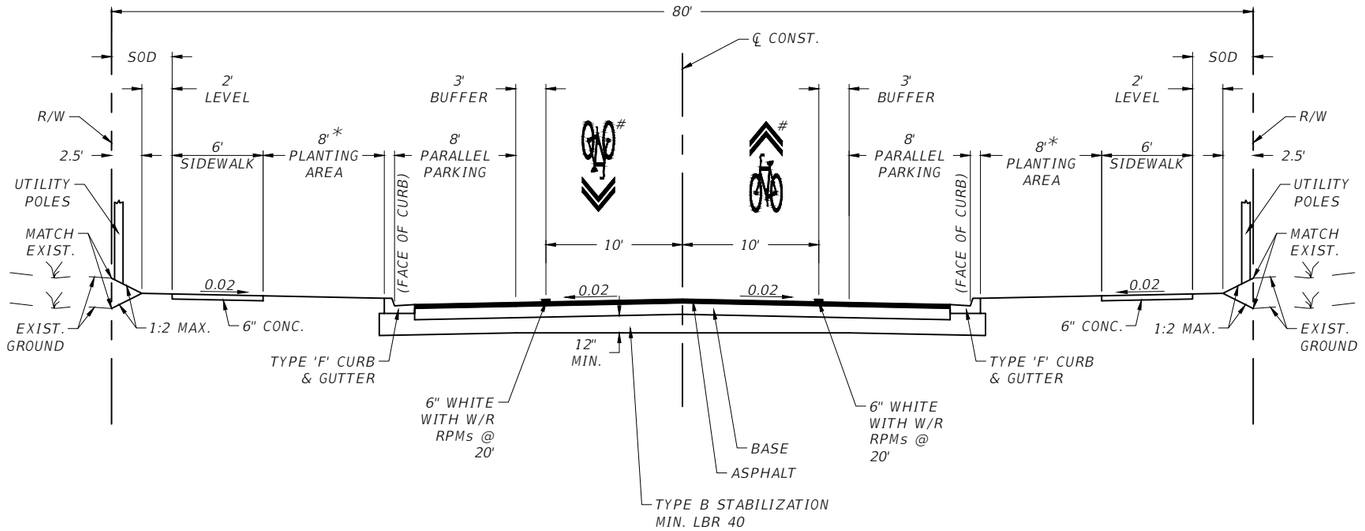
FOR DESIGN SPEED ≤45 MPH.

THIS TYPICAL SECTION APPLIES TO C3R AND C3C CONTEXT CLASSIFICATIONS ONLY.

FOR C3C INDUSTRIAL USES, A SECOND SHARED USE PATH IS OPTIONAL. BUT A SIDEWALK MUST BE PROVIDED.

* POTENTIAL AREA TO CONSIDER GREEN INFRASTRUCTURE TECHNIQUES. SEE HCTDM FOR GREEN INFRASTRUCTURE SECTION.

REVISION DATE					
10/2023	TRANSPORTATION DESIGN MANUAL	Hillsborough County Florida	SUBURBAN 4 LANE DIVIDED - OPEN DRAINAGE TYPICAL SECTION	DRAWING NO.	SHEET NO.
				C3-4D-0D	8 OF 15



NOTES:

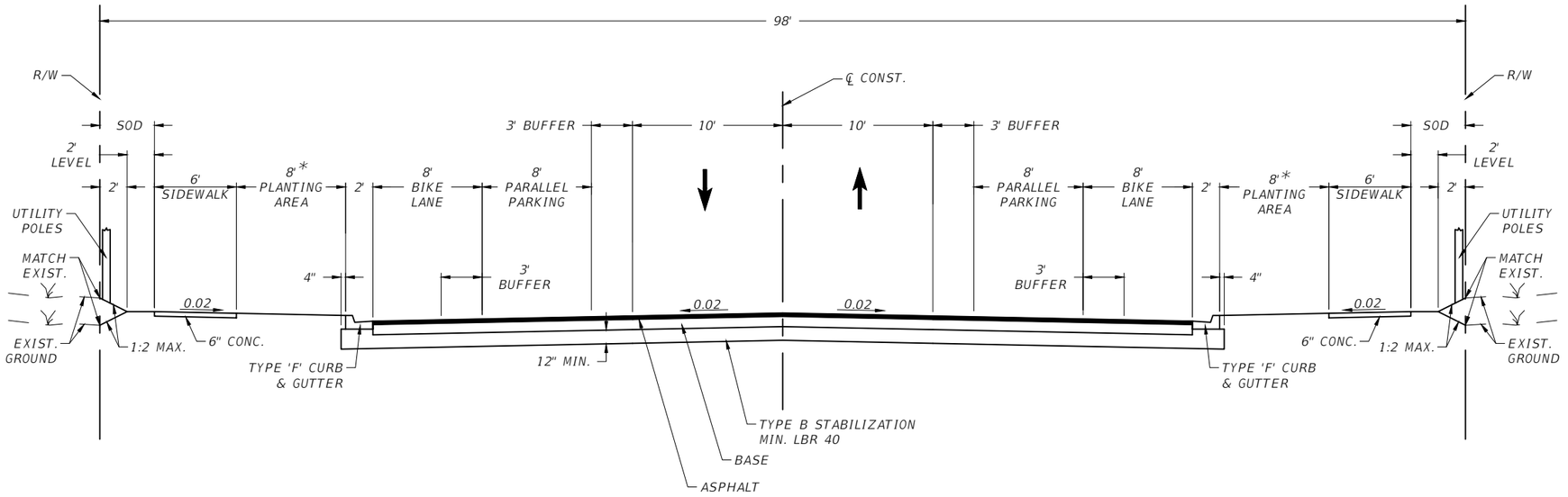
DESIGN SPEED = POSTED SPEED

FOR DESIGN SPEED ≤30 MPH, AND MAXIMUM 5,000 AADT.

ILLUSTRATION ONLY. ALL PAVEMENT MARKINGS FOLLOW MUTCD.

* POTENTIAL AREA TO CONSIDER GREEN INFRASTRUCTURE TECHNIQUES. SEE HCTDM FOR GREEN INFRASTRUCTURE SECTION.

REVISION DATE					
10/2023	TRANSPORTATION DESIGN MANUAL	Hillsborough County Florida	SUBURBAN TOWN 2 LANE UNDIVIDED TYPICAL SECTION	DRAWING NO.	SHEET NO.
				C3T-2U-SL	9 OF 15



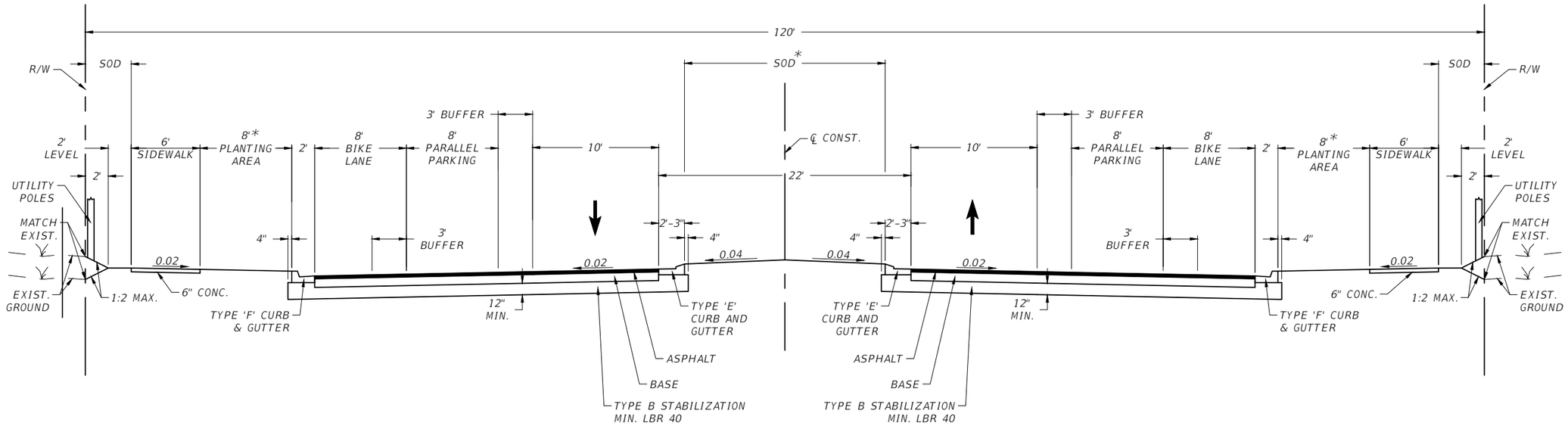
NOTES:

DESIGN SPEED = POSTED SPEED

FOR DESIGN SPEED ≤35 MPH.

*POTENTIAL AREA TO CONSIDER GREEN INFRASTRUCTURE TECHNIQUES. SEE HCTDM FOR GREEN INFRASTRUCTURE SECTION.

REVISION DATE					
10/2023	TRANSPORTATION DESIGN MANUAL	Hillsborough County Florida	SUBURBAN TOWN 2 LANE UNDIVIDED - BIKE LANE TYPICAL SECTION	DRAWING NO.	SHEET NO.
				C3T-2U-BL	10 OF 15



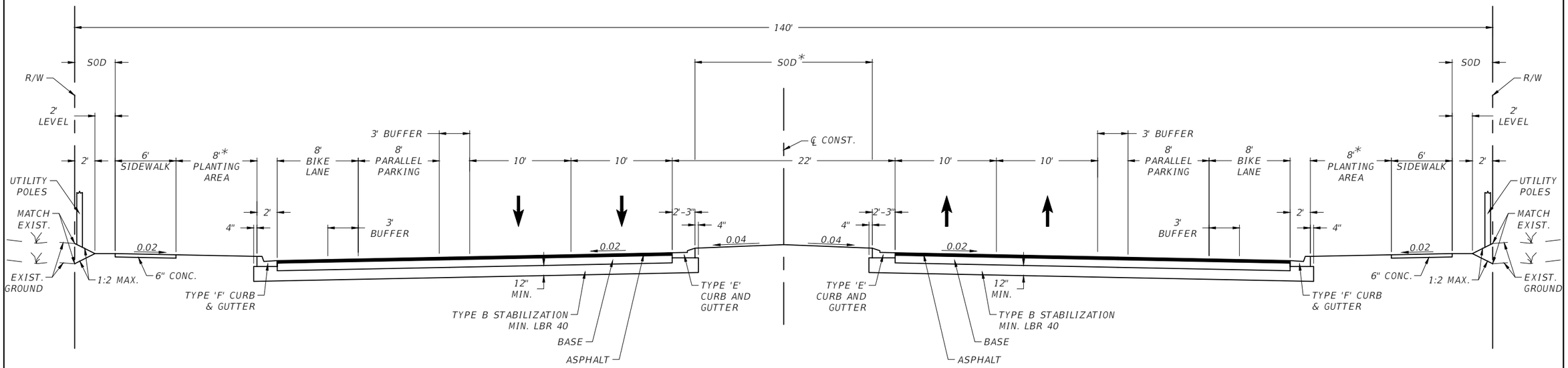
NOTES:

DESIGN SPEED = POSTED SPEED

FOR DESIGN SPEED ≤35 MPH.

*POTENTIAL AREA TO CONSIDER GREEN INFRASTRUCTURE TECHNIQUES. SEE HCTDM FOR GREEN INFRASTRUCTURE SECTION.

REVISION DATE					
10/2023	TRANSPORTATION DESIGN MANUAL	Hillsborough County Florida	SUBURBAN TOWN 2 LANE DIVIDED - BIKE LANE TYPICAL SECTION	DRAWING NO.	SHEET NO.
				C3T-2D-BL	11 OF 15



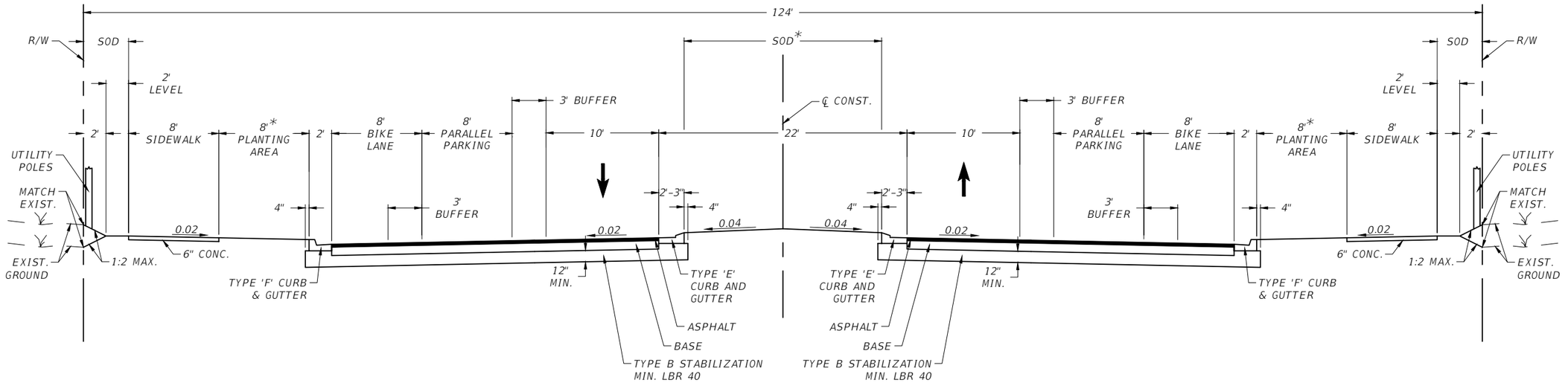
NOTES:

DESIGN SPEED = POSTED SPEED

FOR DESIGN SPEED ≤35 MPH.

*POTENTIAL AREA TO CONSIDER GREEN INFRASTRUCTURE TECHNIQUES. SEE HCTDM FOR GREEN INFRASTRUCTURE SECTION.

REVISION DATE					
10/2023	TRANSPORTATION DESIGN MANUAL	Hillsborough County Florida	SUBURBAN TOWN 4 LANE DIVIDED - BIKE LANE TYPICAL SECTION	DRAWING NO.	SHEET NO.
				C3T-4D-BL	12 OF 15



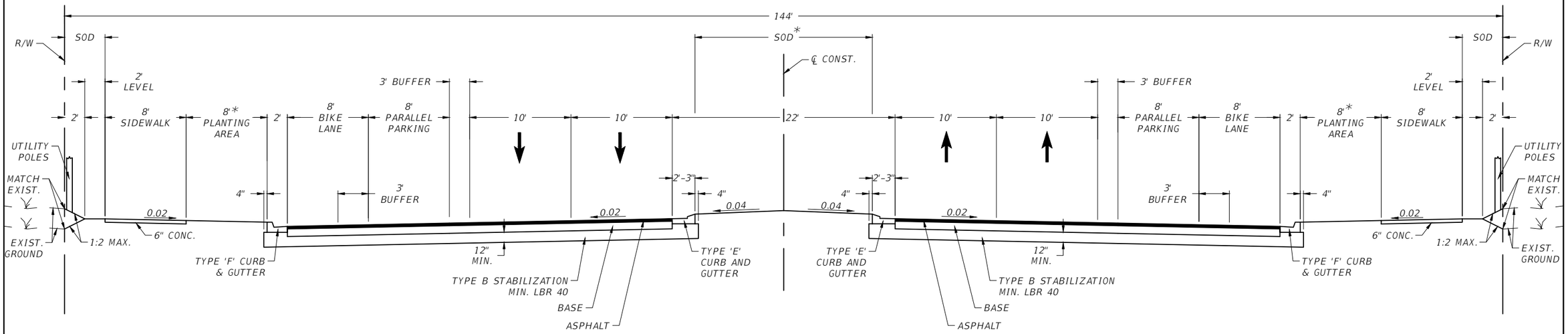
NOTES:

DESIGN SPEED = POSTED SPEED

FOR DESIGN SPEED ≤35 MPH.

* POTENTIAL AREA TO CONSIDER GREEN INFRASTRUCTURE TECHNIQUES. SEE HCTDM FOR GREEN INFRASTRUCTURE SECTION.

REVISION DATE					
10/2023	TRANSPORTATION DESIGN MANUAL	Hillsborough County Florida	URBAN GENERAL 2 LANE DIVIDED - BIKE LANE TYPICAL SECTION	DRAWING NO.	SHEET NO.
				C4-2D-BL	13 OF 15



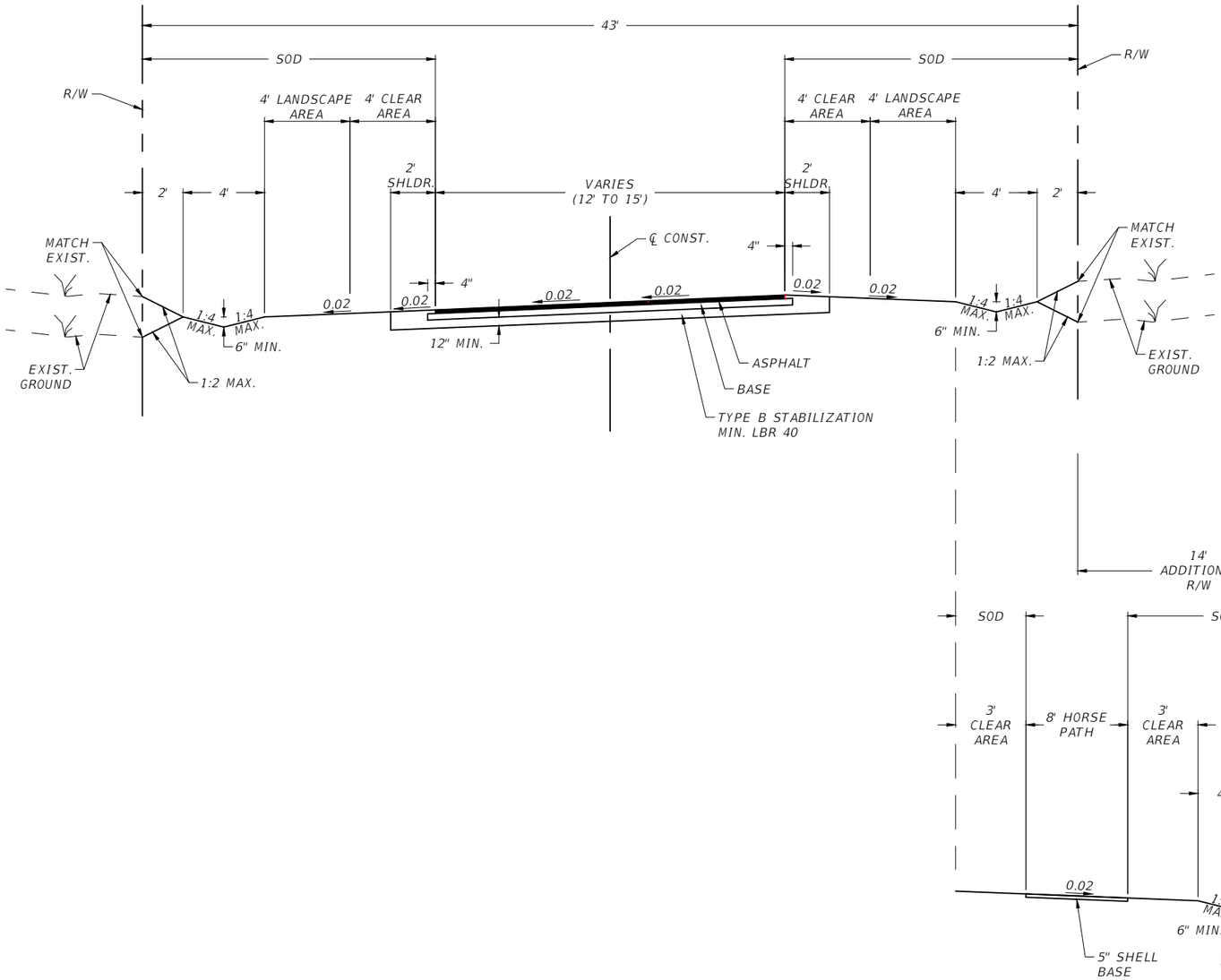
NOTES:

DESIGN SPEED = POSTED SPEED

FOR DESIGN SPEED ≤35 MPH.

*POTENTIAL AREA TO CONSIDER GREEN INFRASTRUCTURE TECHNIQUES. SEE HCTDM FOR GREEN INFRASTRUCTURE SECTION.

REVISION DATE					
10/2023	TRANSPORTATION DESIGN MANUAL	Hillsborough County Florida	URBAN GENERAL 4 LANE DIVIDED - BIKE LANE TYPICAL SECTION	DRAWING NO.	SHEET NO.
				C4-4D-BL	14 OF 15



OPTIONAL HORSE PATH

REVISION DATE					
10/2023	TRANSPORTATION DESIGN MANUAL	Hillsborough County Florida	SHARED USE PATH TYPICAL SECTION	DRAWING NO.	SHEET NO.
				SUP	15 OF 15