Purpose of Florida Greenbook

• Section 334.044, F.S. Florida Statutes
  • Provide uniform minimum standards and criteria
  • Covers design, construction, and maintenance
  • Applies to all streets, roads, highways, bridges, sidewalks, curbs and curb ramps, crosswalks, bicycle facilities, underpasses and overpasses traveled by the public
Florida Greenbook Advisory Committee

• 4 members per FDOT District (28 total)
  • Professional engineers representing rural and urban local governments
  • Professional engineer not employed by a government agency
  • FDOT’s District Design Engineer

Florida Greenbook

• 2016 Florida Greenbook is the current edition
  • Was effective June 19, 2017
• 2018 Florida Greenbook is drafted and has begun rulemaking
  • Expect to be adopted fall 2019
• Draft 2018 Florida Greenbook posted on FDOT’s web page:
  ✓ http://www.fdot.gov/roadway/
• 2020 Florida Greenbook is being drafted now
Rulemaking Process

- Committee Drafts and Approves Changes
- Department Legal Review
- Publish “Notice of Rule Development”
- Prepare Statement of Estimated Regulatory Costs (SERC)
- Conduct Rule Development Workshop if Requested
- Publish Notice of Proposed Rule
- Review by Joint Administrative Procedures Committee (JAPC)
- Conduct Hearing if Requested
- Rule Filed for Adoption

Contact Mailer

- How can I find out when its effective?
- “Self Service” web page where you can register to receive information from FDOT
- Options include information on design criteria and standard changes, specifications and estimates updates, training opportunities, and Greenbook!
- [http://www.dot.state.fl.us/projectmanagementoffice/ContactDatabase.shtm](http://www.dot.state.fl.us/projectmanagementoffice/ContactDatabase.shtm)
Draft

2018 Florida Greenbook

- [https://www.fdot.gov/roadway/floridagreenbook/fgb.shtm](https://www.fdot.gov/roadway/floridagreenbook/fgb.shtm)

2011 AASHTO Greenbook

- Effective November 12, 2015
- FHWA published the Final Rule to Title 23, Code of Federal Regulations Part 625
- The rule modifies regulations governing new construction, reconstruction, resurfacing (except for maintenance resurfacing), restoration, and rehabilitation projects on the NHS
On or Off the State Highway System (SHS)?

- Intended for use on all streets and highways OFF the SHS
- Unless using federal funds and project is:
  - On the National Highway System (NHS),
  - Has a construction value ≥ $10 million, or
  - Includes a vehicular bridge, pedestrian bridge over a roadway, certain box culverts.
- Then use FDOT’s Design Manual (FDM) and Standard Plans

What Criteria To Use?

✓ Check Table 1: Project Classifications in Chapter 19 of Local Agency Program (LAP) Manual

<table>
<thead>
<tr>
<th>Project Classifications</th>
<th>Design Criteria and Standards*</th>
<th>Specifications*</th>
<th>Materials Testing*</th>
<th>Qualifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class C</td>
<td>1) For structures components, use the FDOT Design Manual and FDOT Standard Plans 2) For all other components, use the Florida Greenbook</td>
<td>Task 1: For the structures components, use the FDOT Standard Specifications 2) For all other components, LAP Big 4 or approved Local Agency Standards</td>
<td>1) For structures components, use the Samples Testing and Reporting Guide and FDOT Materials Manual 2) For all other components, use Local Agency materials testing process</td>
<td>FDOT Prequalified Consultants and Contractors</td>
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<td>Class D</td>
<td>Florida Greenbook - Or- Approved Minimum Design Standards chosen by local agency which conform to the minimum criteria provided in Florida Greenbook</td>
<td>LAP Big 4 or approved Local Agency Standards</td>
<td>Local Agency materials testing process</td>
<td>Local Agency qualified consultants and contractors</td>
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</table>
New Construction or RRR?

- New construction and reconstruction projects
  - Introduction and Definition of Terms, Planning, Geometric Design, Roadside Design, Lighting, Rail Highway Crossings, Pedestrian and Bicycle Facilities, Transit, Drainage
- Maintenance and resurfacing projects
  - Maintenance and Resurfacing, Pedestrian and Bicycle Facilities
- All projects
  - Design Exceptions… and Variations

Introduction

- Context-based planning and design policies and objectives
- Statutory Authority
- Florida Greenbook Committee
- Intended Use (new, reconstruction, resurfacing, maintenance)
- When exceptions and variations are required
- Definitions
- Adoption of 2009 MUTCD and Revisions 1 and 2
Introduction – Policies and Objectives for Context Based Design

• Specifies all users
• Applies to all projects
• Procedure for exceptions and variations
• Creates a network
• Adoptable by all agencies
• Latest and best design criteria
• Context-sensitive
• Establishes performance measures
• Includes specific next steps for implementation

Introduction - Definitions

• New definitions for –
  • Border Area
  • Bridge
  • Clear Zone
  • Context Classification System
  • Cross Slope
  • Design User
  • Lateral Offset
  • Low Speed
  • Reconstruction
  • Shared Street
  • Shared Use Path/Multi-Use Trail
  • Traveled Way
Chapter 1 – Planning

• The Florida Greenbook’s Context-Based Design policy captures three core concepts:
  • Serve the needs of transportation system users of all ages and abilities, including pedestrians, bicyclists, transit riders, motorists, and freight handlers.
  • Design streets and highways based on local and regional land development patterns and reflect existing and future context.
  • Promote safety, quality of life, and economic development.

<table>
<thead>
<tr>
<th>Functional Classification</th>
<th>Primary Characteristics</th>
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<tbody>
<tr>
<td>Limited Access Facilities</td>
<td>• Limited access</td>
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<tr>
<td></td>
<td>• Through traffic movements</td>
</tr>
<tr>
<td></td>
<td>• Primary freight routes</td>
</tr>
<tr>
<td></td>
<td>• Guided by FHWA Design Standards for Highways (NHS)</td>
</tr>
<tr>
<td>Principal Arterial</td>
<td>• Through traffic movements</td>
</tr>
<tr>
<td></td>
<td>• Longer distance traffic movements</td>
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<tr>
<td></td>
<td>• Primary freight routes</td>
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<td></td>
<td>• Access to public transit</td>
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<td></td>
<td>• Pedestrian and bicycle travel</td>
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<td>Minor Arterial</td>
<td>• Connections between local areas and network principal arterials</td>
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<tr>
<td></td>
<td>• Connections for through traffic between arterial streets or highways</td>
</tr>
<tr>
<td></td>
<td>• Access to public transit and through movements</td>
</tr>
<tr>
<td></td>
<td>• Pedestrian and bicycle travel</td>
</tr>
<tr>
<td>Collector</td>
<td>• Carry traffic with trips ending in a specific area</td>
</tr>
<tr>
<td></td>
<td>• Access to commercial and residential centers</td>
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<tr>
<td></td>
<td>• Access to public transit</td>
</tr>
<tr>
<td></td>
<td>• Pedestrian and bicycle travel</td>
</tr>
<tr>
<td>Local Roads</td>
<td>• Direct property access—residential and commercial</td>
</tr>
<tr>
<td></td>
<td>• Pedestrian and bicycle travel</td>
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</table>
Context Based Design

Chapter 1 – Planning

- Design should be based upon existing and proposed land uses and development patterns
- Terms rural and urban are based upon population density
- Urban Area 1-Mile Buffer Maps
Chapter 2 – Land Development

• Defines road users as pedestrians, bicyclists, transit and motor vehicle operators and passengers
• Provide desirable geometry that supports appropriate cross sections and sight distance
• Provide sufficient right of way for stormwater, utilities, pedestrian features
• Design for target speed

Chapter 3 – Geometric Design

• Revised table for stopping sight distance to include grades
• New tables for:
  • Decision sight distance
  • Deflections thru intersections
  • Min. length of horizontal curves
  • Length of compound curves in turning roadways
• Superelevation criteria revised
  • Two types – a) rural highways, urban freeways, and high speed urban highways
    b) low speed urban arterials and collectors
  • New tables for superelevation rates, minimum radii, and transition slope rates
• Values for traveled way widening revised to reflect a WB-62 as base vehicle.
Chapter 3 – Geometric Design (con.)

- Revised notes for maximum grade table
- Revised notes in lane widths table to allow 11-14’ lanes on 3- and 5-lane typical sections
- Reduced the min. shoulder widths for multi-lane divided highways
- New table for median widths which allows for narrower medians in constrained sections
- New section for islands for channelization, division, and refuge (painted and raised)
- Roadside slopes, clear zone, and lateral offset moved to Chapter 4
Chapter 3 – Geometric Design (con.)

- Revised section for auxiliary lanes at intersections (turn lanes)
- New table for pavement widths for turning roadways
- Clarified that accessibility requirements apply to sidewalks, shared use paths, transit boarding and alighting areas

Union Station, Denver, CO
Chapter 4 – Roadside Design

- New chapter - 33% of all crashes are lane departures, but 50% of fatalities
- Added definitions for recoverable, non-recoverable and traversable slopes
- New table for clear zone widths
  - Considers cost, terrain, right-of-way, social and environmental impacts
- New section for lateral offset, requirements for above ground objects, drop offs, drainage features
- New section for barriers, crash test criteria, safety hardware upgrades

Chapter 4 – Roadside Design (con.)

- New section for offset requirements for signs, signals, lighting supports, utility poles, trees and similar features
  - Performance requirements for breakaway devices
  - Miscellaneous section for fire hydrants, railroad warning devices, mailbox supports, bus benches and shelters
- New section for barriers, end treatments and crash cushions
  - Performance requirements
  - Warrants (including median barriers)
  - Work Zones
Chapter 4 – Roadside Design (con.)

- Barrier Types (guardrail, concrete barrier, high tension cable barrier, and temporary barrier)
  - Selection guidelines
  - Placement
  - Location relevant to other features (e.g. shared use paths and guardrails)
  - Deflection space and zone of intrusion
  - Grading
  - Curbs
  - Flare rate
  - Length of need
- End treatments and crash cushions
- Bridge Rails

Chapter 6 – Lighting

- New definitions for LED, HPS, and MH luminaires
- Explanation of the lighting methods
  - Luminance – straight roadways, based upon surface type
  - Horizontal and vertical illuminance – pedestrian areas
  - Horizontal illuminance – intersections and interchanges, includes variable for surface type
- New requirements for underpasses
  - Use wall mounted luminaire attached to pier, pier cap or wall copings
  - Daytime and nighttime requirements
- Requirements for decorative and architectural lighting
Chapter 6 – Lighting

- Midblock Crosswalks
  - Provide 2.0 foot candles of maintained vertical illumination
  - Measured at 5 feet from the road surface
  - Calculate the vertical illuminance on each near side approach.

Chapter 7 – Rail-Highway Crossings

- Requires sidewalks and shared use paths be continued through at grade street crossings
Chapter 7 – Rail-Highway Crossings

• Figure 7 – 3 Pedestrian Crossings
Chapter 8 – Pedestrian Facilities

• Sidewalks have a min. width of 5’ (6’ back of curb)
• Graded area ≥ 1 foot with 1:6 cross slope, flush with the sidewalk
• Buffer strips ≥ 2 feet if sidewalk separated from curb
• Cross slope ≤ 2%
• Include an evaluation of existing driveways for accessibility

Chapter 8 – Pedestrian Facilities

• Grades ≤ 5%, unless accessible ramps and landings provided
  • In a right of way, grades are allowed to equal the general grade of the roadway
• Requires at least a 5’ wide connection between an accessible transit stop and the sidewalk
• New sidewalks need to connect to existing sidewalks, shared use paths and crosswalks on the adjoining project
Chapter 8 – Pedestrian Facilities

- Guidance for evaluation of existing driveways for accessibility and placement of new utility poles
- Revised section for curb ramps and blended transitions
- Clarifications of when to place detectable warnings

Accessibility

- United States Access Board
  - Public Rights of Way
  - Shared Use Paths
  - https://www.access-board.gov/guidelines-and-standards/streets-sidewalks
Chapter 9 – Bicycle Facilities

- Updated placement of bicycle lane markings and figures
- Added example of obstruction pavement marking
- Added requirement to redistribute pavement width to provide bicycle facilities with new table for lane widths
- New section on buffered bike lanes and green bike lanes
- Revised shared lane marking section to place in middle of lane
Chapter 9 – Shared Use Paths

• Minimum standard width for a two-way path is 10 feet
• Can be 10 - 14 feet (wider trails with high use, variety of users, steep grades, SUN Trail)
• Rarely, 8 feet if:
  • Bicycle traffic is low, even on peak days or hours
  • Only occasional pedestrians expected
  • Frequent passing and resting opportunities
  • Infrequent maintenance vehicle loading
  • Available on-street facility such as bike lanes
  • Short distance due to a physical constraint (environmental feature, bridge abutment, utility structure, or fence)

Chapter 9 - Shared Use Paths

• Require a separation from the roadway (horizontal space of at least 5’ or barrier)
• Fixed objects should not be permitted to protrude within the vertical or horizontal clearance
• Running grade, cross slope and curb ramp requirements same as sidewalks
• Include an evaluation of existing driveways for accessibility
Chapter 9 – Shared Use Paths

- Graded shoulder ≥ 2 feet with 1:6 slope
  - 3 feet or more desirable (clearance from trees, poles, walls, fences, guardrails, etc.)
  - Adjacent to canals, ditches, or slopes steeper than 1:3, a wider separation recommended
- Separation from edge of path to top of slope ≥ 5 feet
  - Depending on height of embankment and condition at the bottom, a barrier may be needed
- Vertical clearance of 8 feet
  - 10 feet is desirable, especially if emergency vehicles need to pass through
- Clear width on structures same as approach path, plus ≤ 2 foot shoulders

Chapter 9 – Shared Use Paths

- For paths in relatively flat areas (grades ≤ 4%), use design speed of 18 mph
- For sustained downgrades greater than 4% exists, refer to the AASHTO Guide for the Development of Bicycle Facilities (2012, 4th Edition) for further guidance
Chapter 9 – Shared Use Paths

- Permission for grade to match slope of roadway in constrained rights of way extended to shared use paths
  - US Access Board Guidelines and Standards for Shared Use Paths

Accessibility

- Curb ramps should be parallel to and the full width of the path
- Pull boxes, manholes, etc. in the curb ramp or detectable warning area should be relocated when feasible
- Specify an appropriate detectable warning system compatible with path surface
- Push buttons within reach range (10”) of sidewalk/path and 42” high
Chapter 9 – Shared Use Paths

- Transition towards the roadway at intersections to provide a more functional crossing location

Figure 9-27 Sign Placement on Shared Use Paths
Chapter 11 – Work Zone Safety

• Applies to any activity within the right of way
• Temporary Traffic Control Plan (TTC) must address all road users (pedestrians, cyclists, drivers, transit, trucks)
• Follow Part 6 D of the MUTCD

Chapter 11 – Work Zone Safety

• Added requirements for clear zone in traffic control plans
• Guidance for the use of transverse rumble strips
• Requirements for barrier selection and placement
MUTCD

- Manual on Uniform Traffic Control Devices
  - Part 6 – Temporary Traffic Control
  - Interim Approvals

Chapter 11 – Work Zone Safety

- Provide safe passageways for pedestrians through, in, and/or around construction or maintenance work zones, including persons with disabilities in compliance with the:
  - 2006 Americans with Disabilities Act Standards for Transportation Facilities as required by 49 C.F.R 37.41 – Construction of Transportation Facilities by Public Entities, or
  - 37.43 - Alteration of Transportation Facilities by Public Entities, and
Chapter 14 – Design Exceptions & Variations

- Revised controlling criteria to be consistent with FHWA (published May 2016)
- Required when not possible to meet the min. standards
- Recommended by PE, signed by maintaining authority’s PE or designee
- If project is on SHS or NHS, follows process in FDM, signed by DDE

Shalls

- Examples of shall conditions
  - Design speed
  - Stopping and passing sight distance
  - Lane widths
  - Cross slope
  - Shoulders
  - Medians
  - Shielding
  - Rail crossings
  - Sidewalks, bike lanes, shared use paths
  - Design exceptions
Design Exceptions

- Historically based on 13 controlling elements
- FHWA published a notice of revisions for criteria May 2016
- Established 2 categories based upon design speed
  - High Speed is ≥ 50 mph and has 10 Controlling Criteria
  - Low Speed is ≤ 45 mph and has 2 Controlling Criteria

High Speed (≥ 50 mph)

- 10 Controlling Criteria
  - Design Speed
  - Lane Width
  - Shoulder Width
  - Horizontal Curve Length
  - Superelevation Rate
  - Stopping Sight Distance (SSD)
  - Maximum Grade
  - Cross Slope
  - Vertical Clearance
  - Design Loading Structural Capacity
Low Speed (≤ 45 mph)

• 2 Controlling Criteria
  • Design Speed
  • Design Loading Structural Capacity

Changes in Controlling Criteria

• The Silent 3 Controlling Criteria
  • Vertical Alignment
    • Associated with Stopping Sight Distance
  • Horizontal Clearance
    • Addressed in Shoulder Width, Lateral Offset and Clear Zone Requirements
  • Bridge Width
    • Addressed in Lane and Shoulder Width Requirements
Design Speed

- Consider the anticipated operating speed, topography, land use, bicycle and pedestrian traffic, and functional classification
  - Shall not be less than the posted speed
  - Compatible with terrain, local development, safety and funding
  - Consistent over a given section of street or highway
  - Values in Chapter 3, Table 3 – 1 Minimum and Maximum Design Speed

Pavement (Lane) Width

- Minimum lane widths for travel, speed change, turn and passing lanes provided in Chapter 3, Table 3 – 18 Minimum Lane Widths
- On multilane urban streets where there is insufficient space for bike lanes, consider unequal lane widths
Shoulder Width

- Width of outside and median shoulders for two-lane, two-way roadways shall not be less than the values in Chapter 3, Table 3 – 18 Minimum Shoulder Widths for Flush Shoulder Highways
  - Two lane roadways - dependent on volume
  - Multilane divided roadways – dependent on # of lanes (decreased from 2016 to 2018)
  - Paved outside shoulders required for rural, high speed, multilane highways

Horizontal Curve Length

- The minimum lengths that should be used in establishing horizontal alignment are shown in Table 3 – 7 Minimum Lengths of Horizontal Curves
  - Based upon design speed and deflection angle
  - Should be the greater of the lengths (design speed and deflection angle)
  - If curve lengths cannot be attained, provide greatest length possible but not less than 400’
Superelevation Rates

- Values for two types of roadways:
  - Rural highways, urban freeways and high speed urban freeways are found in Table 3 – 9 Superelevation Rates for Rural Highways, Urban Freeways, and High Speed Urban Highways (e max = 0.10)
  - Low speed urban freeways are found in Table 3 – 10 Superelevation Rates for Low Speed Arterials and Collectors (e max = 0.05)
  - Terms rural and urban reflect the location of the roadway

Stopping Sight Distance

- Safe stopping and passing sight distance shall be provided
- Distances determined by:
  - Vehicle speed
  - Driver’s total reaction time
  - Characteristics and condition of the vehicle
  - Friction capabilities
  - Vertical and horizontal alignment
- Minimum values in Chapter 3, Table 3 – 3 Minimum Stopping Sight Distance
Maximum Grade

- Should be as flat as practical and not greater than the values in Chapter 3, Table 3 – 15 Maximum Grades
- Notes:
  - Grades 1% steeper may be provided in urban areas
  - Short lengths of grade, one-way downgrades, and grades on low-volume collectors may be 2% steeper
  - Residential street grades should be < 15%, commercial and industrial areas < 8%

Traveled Way Cross Slope

- Cross slope of the traveled way should be a compromise between meeting drainage requirements and smooth vehicle operation
  - Recommended slope is 0.02 feet per foot
  - The outside lane in a 3 lane section should be 0.03 feet per foot
  - Shall not be less than 0.015 feet or greater than 0.04 feet per foot
  - Found in Section C.7.b.2 Traveled Way Cross Slope
Shoulder Cross Slope

• The cross slope of shoulders should be within the range given in Chapter 3, Table 3 – 20 Shoulder Cross Slopes
  • Paved – 2 to 6%
  • Gravel/Crushed Rock – 4 to 6%
  • Turf – 6 – 8%
  • Existing shoulder cross slopes (paved and unpaved) ≤ 12% may remain

Roadside Slopes

• Side slope adjacent to the shoulder of the roadway
• Shall not be steeper than 1:3
  • Should be 1:4
  • Should be flatter on the outside of horizontal curves
• Backslopes on ditches or cuts should not exceed 1:3 if within the clear zone
  • Should be 1:4
Vertical Clearance

- Freeways and arterials shall have a vertical clearance of at least 16 and ½ feet
- Other streets and highways should have a clearance of 16 feet
- Pedestrian or shared use path bridges require at least 17 feet clearance
- Bridges over railroads require at least 23 feet
- Found in Chapter 3, Section C.7.j.4(b) Vertical Clearance

Design Loading Structural Capacity

  - Uses notional (HL – 93) design load
  - Bridges also require a FL 120 permit load rating greater than 1 as defined in the Department’s Structures Manual, Volume 1 – Structures Design Guidelines, 2018 (SDG)
    - Allows for a more consistent load rating comparison
Design Exceptions and Variations

• Design Exceptions
  • Required when proposed controlling design elements are below both AASHTO’s new construction criteria and the criteria in Florida Greenbook

• Design Variations
  • Required when proposed features other than controlling design elements do not meet Florida Greenbook criteria

• Sample Letter
  • Can use Exhibit 14-A to submit request or Design Exception and Variation Sample Letter on Greenbook web page

Chapter 17 – Bridges and Other Structures

• Updated references to AASHTO Manuals
  • Structures Manual, Volume 1 – Structures Design Guidelines, 2018 (SDG)

• Edited sections for:
  • Navigational aids and vessel collisions
  • Routine maintenance and inspection
Chapter 18 – Signing and Marking

• Added reference to the Manual on Speed Zoning for Highways, Roads, and Streets in Florida
  • http://www.fdot.gov/traffic/speedzone/Speed_Zone_Manual.shtm
• Established minimum levels of maintained reflectivity for overhead street name signs
• Expanded guidance on audible and vibratory markings to improve effectiveness
• Added guidance on transverse rumble strips (crash history, roadway geometry, land use)

Questions?
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