

**Pavement Design and Construction Issues for Florida Green Book**  
**Teleconference Meeting: Bridge No. 850-410-4976**  
**January 10, 2011 (9:30am – 11:30am)**  
**Dolphin Conference Room – District Seven Headquarters**  
**Agenda**

**Attendees:**

**Quigley, Robert; 'agarganta@cte.cc'; 'clmpe@aol.com'; 'jim.burnside@tampagov.net';  
'dcerlanek@alachuacounty.us'; 'kbryant@baycountyfl.gov'; 'Ty Mullis'; Dietrich, Bruce;  
OHagan, David; Prasad, Ananth; Blanchard, Brian; Ogilby, Judy; D7-HQ, Planning**

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**1. Unpaved Roads (30 minutes)**

Design Considerations (ADT, Design Speed, Land Use, Etc.):

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**2. Safety Edge (30 minutes)**

See handout for discussion:

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**3. Additional Chapter 5 Enhancements (30 minutes)**

- A. RRR
- B. Pavement Type Selection
- C. Skid Resistance



## **Summary Meeting Minutes:**

Pavement Design and Construction Issues for Florida Greenbook

Teleconference Meeting: Bridge No. 850-410-5666

**November 16, 2010 (9:00am – 10:30am)**

Tarpon Conference Room – District Seven Headquarters

Agenda

**Attendees:** Ty Mullis, Resident of Spring Hill, Florida, Keith Bryant, P.E., Bay County, Jim Burnside, P.E., City of Tampa, David O'Hagan, P.E., FDOT; Jim Mills, P.E., FDOT; Bruce Dietrich, P.E., FDOT; John Minnick, Esq., FDOT; Robert Quigley, P.E., FDOT; Ronald Chin, P.E., FDOT;

**Purpose:** The purpose of the meeting was to discuss potential enhancements to Chapter 5 of the Florida Greenbook (Manual of Uniform Minimum Standards for Design, Construction, and Maintenance for Streets and Highways) specifically regarding: (1) Unpaved Roads; (2) Roadside Safety Edge; and (3) Any additional language to enhance clarification of Pavement Type Selection; Structural Design; Drainage; Shoulder Treatment and Pavement Construction throughout the Chapter.

Meeting began at approximately 9:10am with Mr. Chin greeting all and having each person introduce themselves. Mr. Chin opened discussion to focus on the first topic of "Unpaved Roads" which was brought to the Greenbook subcommittee as an issue of concern by Mr. Ty Mullis, a resident of Spring Hill, Florida. The following summarizes discussion for the topics discussed in the order that they were presented:

### **Unpaved Roads (60 minutes):**

Mr. Chin asked Mr. Mullis to introduce the issue of his concern regarding "unpaved" roads in Florida. Mr. Mullis' primary quest appears to be finding an authority to enforce EPA/DEP rules regarding pollution limits attributed to the dust and runoff caused by motor vehicles operating on unpaved roads. (i.e. predominantly limerock where much is used where he lives - Hernando County) As he did not prevail with that pursuit against DEP; his secondary quest is pursuing the Florida Greenbook to: (1) exclude the use of certain materials for construction and maintenance – even if materials are not listed by type or source, a preclusion of using materials that significantly contribute to violation of air quality standards or pollution regulations would be a betterment; (2) provide maintenance strategies to control dust and runoff for existing "unpaved" roads His request is based on the premise that under the auspices of Section 336.045 Florida Statutes; Uniform minimum standards for design, construction, and maintenance; advisory committees; The "department" shall develop and adopt uniform minimum standards and criteria for the design, construction, and maintenance of all public streets, roads, highways, bridges, sidewalks, etc. Since many unpaved are also public roads, Mr. Mullis believes that the FDOT has not comprehensively fulfilled its obligations with regards to setting criteria for them. Mr. Mullis provided handouts of excerpts for Sections 336 and 403 of the Florida Statutes to participants in District Seven for information. Deliberation pursued on: (1) Should the Florida Greenbook stipulate materials used for unpaved roads; (2) should the subcommittee establish minimum criteria for unpaved roads to include design speed and ADT; (3) should guidance be included on maintenance strategies for unpaved roads; and (4) should additional language be included to refer to Section 403 of the Florida Statutes for Operation permits for major sources of air pollution. The subcommittee mutually agreed that these items would require soliciting other local jurisdictions for additional data and feedback to be presented at the next Greenbook meeting in Orlando. All changes must go before the Advisory Committee. Mr. Bryant was emphatic that items (1), (2) and (3) would have a tremendous economic impact on Bay County and could affect many other cities/counties in Florida. Mr. O'Hagan suggested we solicit FACERS (Florida Association of County Engineers and Road Superintendents) and Mr. Bryant suggested we solicit APWA (American Public Works Association) for additional data to summarize design and maintenance practices for unpaved roads. Mr., Chin will also solicit and record the miles of unpaved roads for responding local municipalities in District Seven and other participating FACERS and APWA members. Mr. Mullis ended this discussion with volunteering to assist in research of data from local municipalities or other and thanking the committee members for his invitation to participate in the meeting.

### **Safety Edge (15 minutes)**

A handout was provided via .pdf of FHWA's brochure on the Safety Edge by Mr. Chin. Discussion began with Mr. O'Hagan indicating the need to include this feature on all roads resurfaced with emphasis on those without paved shoulders as the benefit is tremendous. Mr. Chin asked if Bay County and the City of Tampa used the same performance measure of deficiency similar to the FDOT which is 3". Both local agencies appear to use the similar criteria. Mr. Bryant asked if the cost of the typical Safety Edge could be calculated and shared at the next Greenbook meeting. Mr. O'Hagan requested that the Safety Edge be illustrated in drawing for upcoming January, 2011 Pavement Design Subcommittee follow-up meeting and also for March 29, 2011 Florida Greenbook meeting where we would solicit approval for Greenbook inclusion.

### **Additional Chapter 5 Enhancements (15 minutes)**

Mr. Chin initiated that Resurfacing Restoration and Rehabilitation was discussed at previous Greenbook meeting-with the committee agreeing that this would be addressed and included under Chapter 10. All agreed. Mr. Quigley asked that we look at the additional suggested language enhancement under Pavement Type Selection, Structural Design, Drainage, Shoulder Treatment and Pavement Construction to gather consensus to present at the upcoming March 29, 2010 Greenbook meeting. Mr. Chin agreed to review all sections in detail for the January 2011 follow-up meeting. Mr. Chin also asked Mr. Burnside to share his experience with grooving on a project in Tampa where they had a slick surface issue on concrete pavement. Mr. Burnside indicated that the City of Tampa has used both grinding and grooving with success.

### **Action Items:**

1. Mr. Chin will solicit District Seven Counties, FACERS, and APWA for number of miles of unpaved roads and for any design and maintenance criteria for unpaved road.
2. Mr. Chin will set up following meeting in January, 2011 for subcommittee members only.
3. Mr. Chin will seek assistance to establish a CADD drawing of Safety Edge and estimate quantity per mile with estimated construction cost.
4. Mr. Chin will share meeting minutes with all attendees as well as persons invited and include all handouts discussed and/or referenced.
5. Mr. Chin will seek assistance from Mr. Mullis as required to gather additional data.
6. Mr. Quigley will invite all participants to the next Greenbook meeting including public announcement for public attendance.

**RELATED LAWS:**

1. FS 336.045 requires that the Florida Department of Transportation develop and adopt minimum standards and criteria for the maintenance of *all public roads*.

**CHAPTER 336**

**COUNTY ROAD SYSTEM**

**336.045**

**Uniform minimum standards for design, construction, and maintenance; advisory committees.**

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(1)

The department shall develop and adopt uniform minimum standards and criteria for the design, construction, and maintenance of all public streets, roads, highways, bridges, sidewalks, curbs and curb ramps, crosswalks, where feasible, bicycle ways, underpasses, and overpasses used by the public for vehicular and pedestrian traffic. In developing such standards and criteria, the department shall consider design approaches which provide for the compatibility of such facilities with the surrounding natural or manmade environment; the safety and security of public spaces; and the appropriate aesthetics based upon scale, color, architectural style, materials used to construct the facilities, and the landscape design and landscape materials around the facilities. The department shall annually provide funds in its tentative work program to implement the provisions of this subsection relating to aesthetic design standards. The minimum standards adopted must include a requirement that permanent curb ramps be provided at crosswalks at all intersections where curbs and sidewalks are constructed in order to give handicapped persons and persons in wheelchairs safe access to crosswalks.

**336.01**

**Designation of county road system.**

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The county road system shall be as defined in s.334.03(8).

**334.03**

**Definitions.**

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When used in the Florida Transportation Code, the term:

...

(8) "County road system" means all collector roads in the unincorporated areas of a county and all extensions of such collector roads into and through any incorporated areas, all local roads in the unincorporated areas, and all urban minor arterial roads not in the State Highway System.

**403.031**

**Definitions.**

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In construing this chapter, or rules and regulations adopted pursuant hereto, the following words, phrases, or terms, unless the context otherwise indicates, have the following meanings:

(1) "Contaminant" is any substance which is harmful to plant, animal, or human life.

(2) "Department" means the Department of Environmental Protection.

...

(4) "Installation" is any structure, equipment, or facility, or appurtenances thereto, or operation which may emit air or water contaminants in quantities prohibited by rules of the department.

(5) "Person" means the state or any agency or institution thereof, the United States or any agency or institution thereof, or any municipality, political subdivision, public or private corporation, individual, partnership, association, or other entity and includes any officer or governing or managing body of the state, the United States, any agency, any municipality, political subdivision, or public or private corporation.

...

(7) "Pollution" is the presence in the outdoor atmosphere or waters of the state of any substances, contaminants, noise, or manmade or human-induced impairment of air or waters or alteration of the chemical, physical, biological, or radiological integrity of air or water in quantities or at levels which are or may be potentially harmful or injurious to human health or welfare, animal or plant life, or property or which unreasonably interfere with the enjoyment of life or property, including outdoor recreation unless authorized by applicable law.

...

(10) "Source" is any and all points of origin of the item defined in subsection (1), whether privately or publicly owned or operated.

...

(19) "Regulated air pollutant" means any pollutant regulated under the federal Clean Air Act.

**403.0872**

**Operation permits for major sources of air pollution; annual operation license fee.**

—  
Provided that program approval pursuant to 42 U.S.C. s. 7661a has been received from the United States Environmental Protection Agency, beginning January 2, 1995, each major source of air pollution, including electrical power plants certified under s. 403.511, must obtain from the department an operation permit for a major source of air pollution under this section. This operation permit is the only department operation permit for a major source of air pollution required for such source; provided, at the applicant's request, the department shall issue a separate acid rain permit for a major source of air pollution that is an affected source within the meaning of 42 U.S.C. s. 7651a(1). Operation permits for major sources of air pollution, except general permits issued pursuant to s. 403.814, must be issued in accordance with the procedures contained in this section and in accordance with chapter 120; however, to the extent that chapter 120 is inconsistent with the provisions of this section, the procedures contained in this section prevail.

(1)

For purposes of this section, a major source of air pollution means a stationary source of air pollution, or any group of stationary sources within a contiguous area and under common control, which emits any regulated air pollutant and which is:

(a)

A major source within the meaning of 42 U.S.C. s. 7412(a)(1);

(b)

A major stationary source or major emitting facility within the meaning of 42 U.S.C. s. 7602(j) or 42 U.S.C. subchapter I, part C or part D;

TITLE 42 > CHAPTER 85 > SUBCHAPTER III > § 7602

§ 7602. Definitions

When used in this chapter—

...

**(g)** The term “air pollutant” means any air pollution agent or combination of such agents, including any physical, chemical, biological, radioactive (including source material, special nuclear material, and byproduct material) substance or matter which is emitted into or otherwise enters the ambient air. Such term includes any precursors to the formation of any air pollutant, to the extent the Administrator has identified such precursor or precursors for the particular purpose for which the term “air pollutant” is used.

...

**(j)** Except as otherwise expressly provided, the terms “major stationary source” and “major emitting facility” mean any stationary facility or source of air pollutants which directly emits, or has the potential to emit, one hundred tons per year or more of any air pollutant (including any major emitting facility or source of fugitive emissions of any such pollutant, as determined by rule by the Administrator).

...

**(t) PM-10.**— The term “PM-10” means particulate matter with an aerodynamic diameter less than or equal to a nominal ten micrometers, as measured by such method as the Administrator may determine.

...

**(z) Stationary Source.**— The term “stationary source” means generally any source of an air pollutant except those emissions resulting directly from an internal combustion engine for transportation purposes or from a nonroad engine or nonroad vehicle as defined in section 7550 of this title.

**EPA AP-42 Dust Generation Estimate**

| Value  | Variable | Description   |
|--------|----------|---|
| 0.1789 | E        | Emission Factor (lb/VMT)  |
| 0.36   | k        | Particle Size Multiplier, equals 1.0 for PM30, 0.36 for PM10, and 0.095 for PM2.5 (Dimensionless) |
| 20     | s        | Silt Content of Road Surface Material (%)   |
| 30     | S        | Mean Vehicle Speed (mph)  |
| 2      | W        | Mean Vehicle Weight (tons)  |
| 4      | w        | Mean Number of Wheels   |
| 120    | p        | Number of days per year with at least 0.01 inches of precipitation                                |

$$E = 0.1789k \left( \frac{s}{12} \right) \left( \frac{S}{30} \right) \left( \frac{W^3}{3} \right) \left( \frac{w}{4} \right)^{3.5} \left( \frac{365 - p}{365} \right)$$

|              |        |  |
|--------------|--------|--|
| 6,549        | Count  | Number of Residences on unpaved roads in Hernando County |
| 1            | Length | Average Vehicle Trip Length on unpaved roads             |
| 9.57         | Trip   | Trip generation for Residentail from ITE 7th Ed          |
| 22,875,984   | AVM    | Annual VMT   |
| <b>2,046</b> |        | Annual PM10 Dust Generation Estimate in tons             |
| <b>540</b>   |        | Annual PM2.5 Dust Generation Estimate in tons            |

Summary of Unpaved Roads in Florida - District Seven

| Questions  | Hillsborough County Response  | Citrus County Response  | Pasco County Response   | Pinellas County Response  | Hernando County Response   |
|--|---|---|---|---------------------------|--|
| How many miles of unpaved roads are there in that county?                  | Total of 318 unpaved roads - total of 56.60 miles- study was conducted about 10-15 years ago  | 241.66 (Based off 08/09 FDOT Mileage Report)  | 521.87 miles, of which 190.03 is maintained by Pasco County         | 4.8 miles unincorporated  | There are approximately 638 miles of unpaved roads in Hernando County. This includes County Maint., Privately Maint., Forestry Maint., etc.                                |
| Can the county construct a new unpaved road?                               | yes   | Yes - with a lot if's   | We never have   | No                        | Hernando County generally does not construct unpaved roads. Our standard for new roadways require paving to County standards. There are some exceptions to our Development |
| Do they have pavement design requirements for unpaved road; what are they? | County does not build unpaved dirt roads. They can but the Planning & Growth Management office handles that. Public Works office does not really get a lot involved in that.  | No, they do not have requirements for unpaved roads but the standard used is Limerock base 6" | Not to my knowledge   | No requirements           | No   |
| Are there maintenance requirements they have for unpaved roads?            | There are two types of classification for unpaved roads- either (D) or (E) E classification means that the county must maintain the road for a minimul of two years or just for passibility and only covers the driving surface D classification means that they maintain as many times as needed and includes drainage and mowing. | Grade four (4) to six (6) times a year  | Nothing formal, maintain (grade) to keep in best condition possible | Will grade to keep smooth | 4 - 6 week grading cycle for accepted unpaved roads.   |
| If they construction an unpaved road, what materials do they use, typical? | Dirt  | Limerock base if they were to construct an unpaved road                                       | Most unpaved roads are either limerock or a clay/dirt mixture       | used to be shells, dirt   | Lime Rock  |
| Responses provided by:   | Tony Craparot   | David Whitewall   | Richard Ziegler   | Paul Hagler               | Darrell Davis  |



Summary of Unpaved Roads in Florida - Select Counties

| Questions  | Escambia County  | Santa Rosa County   | Orange County  | Madison County  |
|--|--|---|--|---|
| How many miles of unpaved roads are there in that county?                  | 114.26 miles of dirt roads remaining to be paved.  | 128 miles   | 65 miles   | 450 miles   |
| Can the county construct a new unpaved road?                               | Escambia county does not construct new unpaved roads.  | Yes, but we rarely do since we typically do not construct new roads but rather accept new roads from others that meet County Standards which includes the requirement to be a paved road. Also, if the County constructs a new road, we will generally pave it. | No, they do not construct unpaved roads  | Any new roadways constructed within the county, either by the county or by developers, are required to paved (Since September of 2007).   |
| Do they have pavement design requirements for unpaved road; what are they? | Escambia county does not construct new unpaved roads; therefore they do not have a standard or detail for the construction of an unpaved road.           | Santa Rosa county have certain design standards for dirt roads. Design standards for paving dirt roads include a 6 1/2 inches S-1 or SP 12.5 Asphalt.   | No. Most of the unpaved roads within the county only serve as private driveways for access to the adjacent lots, and not for thru traffic. | Our subdivision regulations require as a minimum, 1½" of asphalt over 6" of limerock (LBR 100) with 12" of Type B stabilization (LBR 40). The requirements increase depending upon the classification of the roadway; a collector road requires 2" of asphalt over 8" of limerock with 12" of Type B stabilization. We sometimes use limerock to stabilize soft or wet areas on a well travelled roadway currently being maintained by the County, but we are slowly paving these types of roadways, especially when we can obtain TRIP, CIGP, SCRAP or SCOP dollars from FDOT. |
| Are there maintenance requirements they have for unpaved roads?            | Unpaved roads are graded once a month. Interval maintenance is done on an as needed basis. Fill is brought in as needed (local sand/clay base material). | No, but the unwritten rule is to grade dirt roads every 3 to 6 weeks and add sand/clay and perform drainage work as needed.   |  | The County tries to keep the maintenance of the roadways on a three week cycle, and generally includes grading the roadway at each interval. Mowing and tree cutting/trimming are at much greater intervals depending on the workload of the maintenance personnel and the budget we are working under at the time, as well as the season of the year. Right now staff is at a bare minimum.  |
| If they construction an unpaved road, what materials do they use, typical? | Escambia county does not construct new unpaved roads; therefore they do not have a standard or detail for the construction of an unpaved road.           | Sand/Clay and in rare instances limerock base if there are environmental concerns.  | We do not construct unpaved roads; however they typical methodologies to improve unpaved roads are with porous asphalt or flex pave.       | When we did construct unpaved roadways, or allow developers to construct them, they were composed of 6" of limerock (LBR 100) over Type B stabilization (LBR 40).   |
| Responses provided by:   | Kirk Kassebaum   | Roger Blaylock  | Maricela Torres, P.E.  | Bill Steves, PE (General Engineer consultant for Madison Co.)   |

Summary of Unpaved Roads in Florida - Select Counties

| Questions  | Volusia County           | Nassau County  | Sumter County  | Highlands County   | Palm Beach County  |  |  |
|--|--------------------------|--|--|--|--|--|--|
| How many miles of unpaved roads are there in that county?                  | A little over 200 miles  | 404 miles  | 19 miles   | 206 +/- miles<br>Non County maintained unpaved roads:<br>544+/- miles  | 53.52 centerline miles   |  |  |
| Can the county construct a new unpaved road?                               | No                       | Not with in house staff unless they use millings as the "pavement"   | Yes the county has the manpower and equipment to construct an unpaved road.  | Do not construct new unpaved roads if the roads are not already in existance. The only unpaved roads constructed are pare of 10 (ten) acre parcels which are exempt from the subdivisions requirements per Section 12.04.205,B of Highlands County Code of Ordinances Land Development Regulations. These unpaved roads are constructed by developers. | Yes, but the criteria must include providing adequate drainage for the road, and many of these roads are classified as courtesy maintained which limits the amount of maintenance that can be performed, and no improvements are allowed. Palm Beach is restricted to add 100 yards of shell per mile per year on the courtesy roads. Prior to the budget/economic downfall, Pam Beach County has a "street improvement program" which required a shared cost from the residents to improve the courtesy unpaved roads. Programs has been suspended at the current time. |  |  |
| Do they have pavement design requirements for unpaved road; what are they? | No                       | Yes, they use FDOT Flexible Pavement Manual Criteria and must meet a certain structural number depending on the classification. Most are local roads and the SN = 2.77   | Back in the day....When we built these types of roads the requirements where, pull the ditches up onto the road way, add cross drain if needed. Use ditch material to construct the road way. Different roads either had limerock or mill placed on roadway.   | If a developer constructs unpaved roads within a subdivision, the typical section for paved roads is used in accordance with the HC Technical Standards Manual. The unpaved roads are constructed to these specifications less the asphalt requirment.   | Yes, follow the standard FDOT design criteria, for pavement, and drainage design.  |  |  |
| Are there maintenance requirements they have for unpaved roads?            | Yes, graded once a month | They grade most unpaved roads no less than once a quarter. Some roads require more frequent maintenance depending on weather, traffic volume, etc.   | Yes....All of the counties unpaved roads are inspected regularly, in this inspection we look to make sure the crown of the road is enough to make sure the rain water will drain properly. We also look to make sure the edges are scraped back to allow the run off of the rain water. Also the condition of the road is checked for potholes and repaired as needed. | Unpaved roads are maintained as needed by the Highlands County Road and Bridge Department.   | Provides grading maintenance on continuous route, the current cycle provides grading about one time every 4 weeks. This includes adding the allowed amount of shell rock as needed.  |  |  |
| If they construction an unpaved road, what materials do they use, typical? | No                       | Typically use a traditional stabilized subgrade subgrade and limerock base with Hot Mix asphalt. However, they have used cold porous paving successfully if the un-paved road has in-situ soils and bearing capacity that make that option feasible. | The dirt from the construction of the ditches, we have three types of material we have used for the road base...limerock-mill-shell material.  | If Highlands County were to construct any unpaved roads they would refer to Section 12.04.205,B of Code of Ordinances Land Development Regulations and the Technical Standards Manual.   | Standard design criteria recommended by FDOT standards are used. Typical sections would have rough shell rock/lime rock sub base, screened shell rock/limerock compacted base, and a minimum of 11/2 inches of S-1, or S-3 asphalt.  |  |  |
| Responses provided by:   | Todd Buckles             | Johnathan Page, P.E.   | Jackey Jackson   | Elius F. Nortelus, M.S.C.E., P.E.  | John Brand   |  |  |

Select Year:  

## The 2010 Florida Statutes

[Title XXIX](#)  
PUBLIC HEALTH

[Chapter 403](#)  
ENVIRONMENTAL CONTROL

[View Entire Chapter](#)

**PART I**  
**POLLUTION CONTROL**

- [403.011](#) Short title.
- [403.021](#) Legislative declaration; public policy.
- [403.031](#) Definitions.
- [403.051](#) Meetings; hearings and procedure.
- [403.061](#) Department; powers and duties.
- [403.0611](#) Alternative methods of regulatory permitting; department duties.
- [403.0615](#) Water resources restoration and preservation.
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- [403.0623](#) Environmental data; quality assurance.
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- [403.085](#) Sanitary sewage disposal units; advanced and secondary waste treatment; industrial waste treatment.
- [403.086](#) Sewage disposal facilities; advanced and secondary waste treatment.
- [403.08601](#) Leah Schad Memorial Ocean Outfall Program.
- [403.0861](#) Scallop processing; discharge standards.
- [403.0862](#) Discharge of waste from state groundwater cleanup operations to publicly owned treatment works.
- [403.087](#) Permits; general issuance; denial; revocation; prohibition; penalty.
- [403.0871](#) Florida Permit Fee Trust Fund.
- [403.0872](#) Operation permits for major sources of air pollution; annual operation license fee.
- [403.0873](#) Florida Air-Operation License Fee Account.
- [403.08735](#)

Air emissions trading.

- [403.0875](#) Citation of rule.
- [403.0876](#) Permits; processing.
- [403.0877](#) Certification by professionals regulated by the Department of Business and Professional Regulation.
- [403.088](#) Water pollution operation permits; conditions.
- [403.0881](#) Wastewater or reuse or disposal systems or water treatment works; construction permits.
- [403.0882](#) Discharge of demineralization concentrate.
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- [403.08852](#) Clarification of requirements under rule 62-302.520(2), F.A.C.
- [403.0891](#) State, regional, and local stormwater management plans and programs.
- [403.0893](#) Stormwater funding; dedicated funds for stormwater management.
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- [403.1835](#) Water pollution control financial assistance.
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- [403.191](#) Construction in relation to other law.
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- [403.351](#) Contents of notice of intention.
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- [403.4132](#) Litter pickup and removal.
- [403.4133](#) Adopt-a-Shore Program.
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- [403.4153](#) Federal preemption.
- [403.4154](#) Phosphogypsum management program.
- [403.4155](#) Phosphogypsum management; rulemaking authority.
- [403.42](#) Florida Clean Fuel Act.
- [403.44](#) Florida Climate Protection Act.



American Association of  
State Highway and  
Transportation Officials

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**Guidelines for  
Geometric  
Design of Very  
Low-Volume  
Local Roads  
(ADT  $\leq$  400)**

**2001**

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## UNPAVED ROADS

Many low-volume local roads have unpaved surfaces. Unpaved roads are generally appropriate for all functional subclasses of very low-volume local roads. Major access roads often have paved surfaces because they serve higher traffic volumes, but this is not considered mandatory. In particular, resource recovery (e.g., logging) roads and agricultural access roads in rural areas are frequently unpaved. Provision of an unpaved surface is an economic decision that is appropriate for many very low-volume local roads for which the cost of constructing and maintaining a paved surface would be prohibitive.

The safety of unpaved roads has been addressed in NCHRP Report 362 (5). This research established that crash rates are generally higher for unpaved roads than for paved roads for traffic volumes of 250 vehicles per day or more. The risk assessment by Neuman (3) found that roads in rural areas generally reach the threshold at which paving the road would be expected to result in one less severe crash every 10 to 15 years in the traffic volume range between 300 to 350 vehicles per day. However, there are no specific guidelines that indicate the maximum traffic volume level for which unpaved surfaces are appropriate.

NCHRP Report 362 (5) found crash rates for unpaved roads to be lower for narrower roadway widths. Therefore, existing unpaved roads should not generally be widened as a safety measure unless there is evidence of a site-specific safety problem that may be corrected by widening.

Unpaved roads are intended to operate at low to moderate speeds. Design speeds for unpaved roads should normally be 70 km/h [45 mph] or less, but may occasionally be as high as 80 km/h [50 mph] in situations the designer considers appropriate.

Provision of roadside clear zones, flatter slopes, or traffic barriers is generally inconsistent with the economic decision to build and maintain an unpaved surface and is not generally necessary for the low-speed environment of an unpaved road.

Design of horizontal alignment on unpaved roads differs from paved roads because paved and unpaved roads have different surface friction characteristics and because unpaved roads are typically designed for low-speed operation.

Exhibit 16 presents guidelines for the minimum radius of curvature for unpaved surfaces with no superelevation for application on very low-volume local roads. The exhibit is based on the design criteria of the United States Forest Service (11), which operates many unpaved roads. The minimum radius of curvature is a function of traction coefficient, which in turn is a function of the surface type (earth, gravel, crushed rock, packed snow, etc.) and the surface condition (dry, wet, ice, etc.) as shown in Exhibit 17. The recommended minimum curve radii in Exhibit 16 are based on use of a side friction factor,  $f$ , in Equation (2) that is 0.2 less than the traction coefficients shown in Exhibit 17. Use of high values of friction coefficient for design allows the designer to select smaller curve radii than would otherwise be used. Of course, the selection of a high traction coefficient is consistent with a higher surface type, and/or with an assumption that poor surface conditions such as snow, ice, or wet pavement are not sufficiently frequent for use as

a design control. The choice of the appropriate surface condition from Exhibit 17 should be based on the engineering judgment of the designer based on site-specific conditions.

Smaller curve radii than those shown in Exhibit 16 may be used where superelevation is provided. The minimum radius of curvature for such cases can be determined with Equation (2).

When an existing unpaved road is to be paved, a review of all geometric design elements of the road should be undertaken to assess their suitability for the higher speeds that are likely on a paved road.

| Metric                 |  |     |     |     |      |  |
|------------------------|--|-----|-----|-----|------|--|
| Design speed<br>(km/h) | Minimum radius (m) for specified traction coefficient  |     |     |     |      |  |
|                        | 0.7  | 0.6 | 0.5 | 0.4 | 0.3  |  |
| 20                     | 15   | 15  | 15  | 20  | 35   |  |
| 30                     | 15   | 20  | 25  | 40  | 75   |  |
| 40                     | 30   | 35  | 45  | 65  | 130  |  |
| 50                     | 40   | 50  | 70  | 100 | 200  |  |
| 60                     | 60   | 75  | 95  | 145 | 285  |  |
| 70                     | 80   | 100 | 130 | 195 | 385  |  |
| US Customary           |  |     |     |     |      |  |
| Design speed<br>(mph)  | Minimum radius (ft) for specified traction coefficient |     |     |     |      |  |
|                        | 0.7  | 0.6 | 0.5 | 0.4 | 0.3  |  |
| 15                     | 50   | 50  | 50  | 75  | 150  |  |
| 20                     | 55   | 70  | 90  | 135 | 270  |  |
| 25                     | 85   | 105 | 140 | 210 | 420  |  |
| 30                     | 120  | 150 | 200 | 300 | 600  |  |
| 35                     | 165  | 205 | 275 | 410 | 820  |  |
| 40                     | 215  | 270 | 360 | 535 | 1070 |  |
| 45                     | 270  | 340 | 450 | 675 | 1350 |  |

Source: Adapted from USFS Preconstruction Handbook (11)

**Exhibit 16. Guidelines for Minimum Radius of Curvature for New Construction of Unpaved Surfaces with No Superelevation (11)**

| Material                         | Surface Condition |             |             |
|----------------------------------|-------------------|-------------|-------------|
|                                  | Dry               | Wet         | Other       |
| Gravel, packed, oiled            | 0.50 - 0.85       | 0.40 - 0.80 | —           |
| Gravel, loose                    | 0.40 - 0.70       | 0.36 - 0.75 | —           |
| Rock, crushed                    | 0.55 - 0.75       | 0.55 - 0.75 | —           |
| Earth <sup>a</sup>               | 0.55 - 0.65       | 0.40 - 0.50 | —           |
| Dry, packed snow                 | —                 | —           | 0.20 - 0.55 |
| Loose snow                       | —                 | —           | 0.10 - 0.60 |
| Snow, lightly salted             | —                 | —           | 0.29 - 0.31 |
| Snow, lightly salted with chains | —                 | —           | 0.34        |
| Ice, without chains              | —                 | —           | 0.07 - 0.12 |

<sup>a</sup> reduce earth values by 50 percent for wet clays

Source: USFS Road Preconstruction Handbook (11)

**Exhibit 17. Traction Coefficients Used in Design of Horizontal Alignment on Unpaved Roads (11)**



## **TWO-WAY SINGLE-LANE ROADS**

Two-way single-lane roads may be used in constrained locations, where traffic volumes are extremely low. Such cross sections are normally used on local roads where traffic volumes are less than 50 vehicles per day. On resource recovery roads used by professional drivers who are often in contact with one another by radio, two-way single-lane roads may be used for traffic volumes up to 100 vehicles per day. Two-way single-lane roads are designed to operate at low speeds, typically no more than 50 km/h [30 mph].

Two-way single-lane roads are often unpaved and normally have widths in the range from 3.5 to 4.0 m [11.5 to 13.0 ft]. Design values of stopping sight distance for two-way single-lane roads should be twice the stopping sight distance for a comparable two-lane road, as shown in Exhibit 8. USFS guidelines recommend that turnouts be provided at regular intervals on two-way single-lane roads to allow opposing vehicles to pass one another safely (11). The location of turnouts should consider topography and horizontal and vertical alignment. In some cases, particularly where increased sight distances are impractical, widening of the roadway at crests should be considered.

**Section 336.045, Florida Statutes. Uniform minimum standards for design, construction, and maintenance; advisory committees.**

**(1)** The department shall develop and adopt uniform minimum standards and criteria for the design, construction, and maintenance of all public streets, roads, highways, bridges, sidewalks, curbs and curb ramps, crosswalks, where feasible, bicycle ways, underpasses and overpasses used by the public for vehicular and pedestrian traffic. In developing such standards and criteria, the department shall consider design approaches which provide for the compatibility of such facilities with the surrounding natural or manmade environment; the safety and security of public spaces; and the appropriate aesthetics based upon scale, color, architectural style, materials used to construct the facilities, and the landscape design and landscape materials around the facilities....

**(4)** All design and construction plans for projects that are to become part of the county road system and are required to conform with the design and construction standards established pursuant to subsection (1) must be certified to be in substantial conformance with the standards established pursuant to subsection (1) that are then in effect by a professional engineer who is registered in this state.

These standards are intended to provide basic guidance for developing and maintaining a highway system with reasonable operating characteristics and a minimum number of hazards.

Standards established by this Manual are intended for use on all new construction projects off the state highway and federal aid systems. It is understood that the standards herein cannot be applied completely to all reconstruction and maintenance type projects. However, the standards shall be applied to the extent that economic and environmental considerations and existing development will allow.

When this Manual refers to guidelines and design standards given by current American Association of State Highway and Transportation Officials (AASHTO) publications, these guidelines and standards shall generally be considered as minimum criteria. The Department may have standards and criteria that differ from the minimum presented in this Manual or by AASHTO for streets and highways under its jurisdiction. A county or municipality may substitute standards and criteria adopted by the Department for some or all portions of design, construction, and maintenance of their facilities. Department standards, criteria, and manuals must be used when preparing projects on the state highway system or the national highway system.

Criteria and standards set forth in other manuals, which have been incorporated by reference, shall be considered as requirements within the authority of this Manual.

This Manual is intended for use by qualified engineering practitioners for the communication of standards and criteria (including various numerical design values and use conditions). The design, construction, and maintenance references for the infrastructure features contained in this Manual recognize many variable and often complex process considerations. The engineering design process, and hence the associated use of this Manual, ~~incorporates aspects of engineering judgment, design principles, science, and recognized standards towards matters involving roadway infrastructure.~~

Users of this Manual are cautioned that the strict application of exact numerical values, conditions or use information taken from portions of the text may not be appropriate for all circumstances. Individual references to design values or concepts should not be used out of context or without supporting engineering judgment.

The contents of this Manual are reviewed annually by the Florida "Greenbook" Advisory Committee. Membership of this committee is established by the above referenced Section 336.045(2), Florida Statutes. Notification of revisions or additions to the Manual will be distributed to all registered Manual holders and dated. Comments, suggestions, or questions may be directed to any committee member.

336.045 Uniform minimum standards for design, construction, and maintenance; advisory committees.

(1) The department shall develop and adopt uniform minimum standards and criteria for the design, construction, and maintenance of all public streets, roads, highways, bridges, sidewalks, curbs and curb ramps, crosswalks, where feasible, bicycle ways, underpasses, and overpasses used by the public for vehicular and pedestrian traffic. In developing such standards and criteria, the department shall consider design approaches which provide for the compatibility of such facilities with the surrounding natural or manmade environment; the safety and security of public spaces; and the appropriate aesthetics based upon scale, color, architectural style, materials used to construct the facilities, and the landscape design and landscape materials around the facilities. The department shall annually provide funds in its tentative work program to implement the provisions of this subsection relating to aesthetic design standards. The minimum standards adopted must include a requirement that permanent curb ramps be provided at crosswalks at all intersections where curbs and sidewalks are constructed in order to give handicapped persons and persons in wheelchairs safe access to crosswalks.

CURB

(2) An advisory committee of professional engineers employed by any city or any county in each transportation district to aid in the development of such standards shall be appointed by the head of the department. Such committee shall be composed of: one member representing an urban center within each district; one member representing a rural area within each district; one member within each district who is a professional engineer and who is not employed by any governmental agency; and one member employed by the department for each district.

(3) Notwithstanding the provisions of any general or special law to the contrary, all plans and specifications for the construction of public streets and roads by any municipality or county shall provide for permanent curb ramps at crosswalks at all intersections where curbs and sidewalks are constructed in order to give handicapped persons and persons in wheelchairs safe access to crosswalks.

PERMANENT CURB RAMP

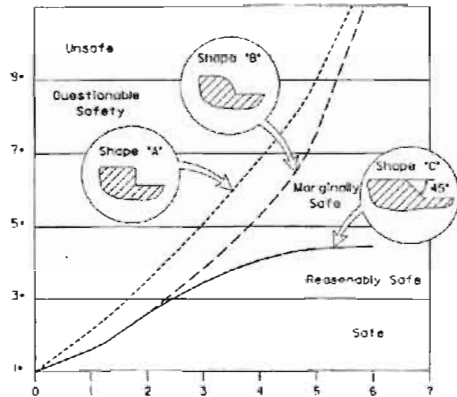
(4) All design and construction plans for projects that are to become part of the county road system and are required to conform with the design and construction standards established pursuant to subsection (1) must be certified to be in substantial conformance with the standards established pursuant to subsection (1) that are then in effect by a professional engineer who is registered in this state.

(5) Curb ramps which are required by subsections (1) and (3) to be provided at all intersections of curbs and sidewalks on public streets and roads shall be constructed to be in substantial conformance with the Uniform Federal Accessibility Standards published by the General Services Administration, Department of Housing and Urban Development, Department of Defense, and United States Postal Service. The provisions of this subsection apply to curb ramps let to contract on or after July 1, 1986.

(6) If the governing body of a county or municipality has adopted a design element as part of its comprehensive plan pursuant to part II of chapter 163, the department shall consider such element during project development of transportation facilities. The design of transportation facilities constructed by the department within the boundaries of that county or municipality must be consistent with that element to the maximum extent feasible.

## Relative Safety of Various Edge Elevations and Shapes

The chart below shows how various edge shapes relate to safety.



Longitudinal Edge Elevation Change (inches)

\* These numbers are subjective severity levels.

[Zimmer and Ivey, Texas Transportation Institute, 1982]



Asphalt pavement contractors can use a special edging device on resurfacing equipment to install the "Safety Edge" while resurfacing. The roadway shown above was placed by the Georgia DOT using the "Safety Edge."

## Call FHWA for More Information about the "Safety Edge"

The Georgia Department of Transportation working with the FHWA has demonstrated the ability to construct the "Safety Edge" with no impact on production and at less than 1% additional material costs. Based on the successful performance after one year in service, GDOT intends to incorporate the "Safety Edge" design into all resurfacing projects beginning in 2005. Local city and county governments in Georgia, such as Gwinnet County, are also making the safety edge part of their routine overlay design. Other state SHA's, such as Indiana DOT and the NY DOT, are implementing the safety edge on several pilot projects in 2005.

### Contact

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FHWA, Office of Safety Design  
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[Harry.Taylor@fhwa.dot.gov](mailto:Harry.Taylor@fhwa.dot.gov)

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U.S. Department of Transportation  
Federal Highway Administration

Pbu. No. FHWA-SA-05-003

You Can Prevent Crashes  
Caused by Unsafe Pavement  
Edge Drop-offs

# THE SAFETY EDGE

Pavement Edge Treatment

- Saves Lives
- Reduces Tort Liability
- Reduces Maintenance Expense
- Costs Less than 1% of Pavement Resurfacing Budget



## **Unsafe Pavement Edges are a Serious Safety Problem**

*An estimated 11,000 Americans suffer injuries and 160 die each year in crashes related to unsafe pavement edges, at a cost of \$1.2 billion. The true extent of the problem is difficult to assess because the role of the hazardous pavement edge in the sequence of events leading to a crash often is not documented.*

### **What is the Definition of an Unsafe Pavement Edge?**



*Unsafe edge drop-offs cause crashes.*

An edge dropoff of four or more inches is considered unsafe if the roadway edge is at a 90° angle to the shoulder surface. Near vertical edge dropoffs of less than four inches are still considered a safety hazard to the driving public and may cause difficulty

upon reentry to the paved surface.

### **How do Unsafe Edges Cause Crashes?**

Drivers who slip off a resurfaced road onto an unimproved shoulder are likely to lose control as they attempt to climb onto the roadway. The pavement edge creates a "scrubbing" condition

that must be overcome through over-steering. As drivers over-steer to reenter the roadway, they are prone to lose control of the vehicle. Compounding the danger, the rear wheel may catch the edge of the shoulder, swinging the car around. These actions may cause the car to veer into the adjacent lane, where it may collide or sideswipe oncoming cars, overturn, or run off the road and crash.

### **PAVEMENT EDGE HAZARDS AND TORT LIABILITY**

Tort liability claims resulting from pavement edge drop-offs cost highway agencies millions each year. In one case, the court awarded \$6 million for injuries caused by a low, defective shoulder drop-off.

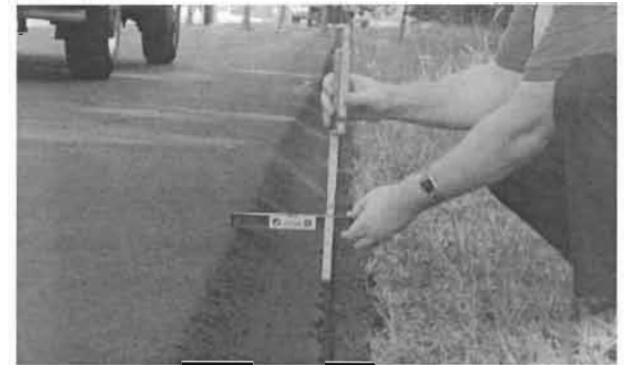
### **Be Part of the Solution by Specifying the "Safety Edge"**

*Adopting a standard contract specification requiring a 30-35° angle asphalt fillet along each side of the roadway in all resurfacing projects is a simple and cost-effective way to assure pavement edge safety.*

### **Solutions to the pavement edge drop-off hazard are to:**

- Require a **30-35° angle asphalt fillet** "Safety Edge" as a contract specification in all pavement resurfacing projects; and
- **Routinely resurface shoulders** when roadways are resurfaced.

The asphalt fillet provides a safer roadway edge, and a stronger interface between the roadway and the shoulder. The cost of an asphalt fillet is minimal in comparison to the total amount of the resurfacing contract, and pays back in countless dollars saved from reduction of fatalities, injuries, property damage and lawsuits.



*An inexpensive way to assure pavement edge safety is to specify a 30°- 35° angle asphalt fillet "Safety Edge."*

The fillet ties the existing shoulder into the resurfaced roadway and allows a vehicle to reenter the roadway safely. Highway agencies are able to restore the shoulder after the resurfacing project is completed.

## CHAPTER 5

### PAVEMENT DESIGN AND CONSTRUCTION

|   |                                   |                      |
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| C | PAVEMENT CONSTRUCTION .....       | <del>5-95-95-4</del> |

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## CHAPTER 5

# PAVEMENT DESIGN AND CONSTRUCTION

## A INTRODUCTION

### ~~General comments:~~

- ~~Address Safety Edge?~~
- ~~Address resurfacing (RRR)?~~
- ~~Address standards for unpaved roads?~~

The function of the pavement or roadway surface is to provide a safe and efficient travel path for vehicles using the street or highway. The pavement should provide a good riding surface with a minimum amount of distraction to the driver. The pavement friction characteristics should be such that adequate longitudinal and lateral forces between the vehicle tires and the pavement can be developed to allow a margin of safety for required vehicle maneuvers. These characteristics should be provided at the highest reasonable level for the expected pavement surface, weather conditions, and the anticipated operational characteristics of the facility. Resurfacing Rehabilitation and Restoration of existing pavements are discussed and included under CHAPTER 10- MAINTENANCE of the manual.

In order for the pavement to perform its function properly, the following objectives shall be used to guide the design and construction of the pavement:

- Provide sufficient pavement structure and the proper pavement material strength to prevent pavement distress prior to the end of the design period.
- Develop and maintain adequate skid resistance qualities to allow for safe execution of braking, cornering, accelerating, and other vehicle maneuvers.
- Provide drainage to promote quick drying and to reduce the likelihood of hydroplaning and splashing.

- Provide adequate edge support or a “safety-edge” to resist vertical drop-offs and provide a safe roadside.

## **B PAVEMENT DESIGN**

### **B.1 Pavement Type Selection**

For new construction and major reconstruction projects, the designer should determine the type of pavement to be constructed utilizing formal analysis of existing and anticipated conditions. Heavily trafficked roadways where there is significant truck traffic (>10% traffic) may warrant consideration for special asphaltic pavement designs and/or rigid pavement designs. —The Department has a documented procedure patterned after the ~~1986~~ 1993 AASHTO Guide for Design of Pavement Structures, Appendix B. This procedure may be found in Department's ~~Flexible~~ Pavement Type Selection Design Manual.

### **B.2 Structural Design**

The pavement shall be designed and constructed so the required surface texture is maintained and its structure retains an adequate level of serviceability for the design period. The strength of the pavement materials shall be sufficient to maintain the desired roadway cross section without the formation of ruts or other depressions which would impede drainage. Subgrade strength and subgrade drainage are major factors to be considered in pavement design.

The Department's pavement design manuals are recommended as a guide for both flexible and rigid pavement design. Other design procedures are available including the AASHTO Guide for Design of Pavement Structures, ~~1986~~ 1993; ~~the AASHTO Interim Guide for Design of Pavement Structures, 1972~~; and procedures which have been developed by the Portland Cement Association, the American Concrete Pavement Association, and the Asphalt Institute. The selection of the design procedure and the development of the design data must be managed by professional personnel competent to make these evaluations.

### **B.3 Skid Resistance**

Pavements shall be designed and constructed so as to maintain adequate skid resistance for as long a period as the available materials, technology, and economic restraints will permit, thus eliminating cost and hazardous maintenance operations.

The results of relevant experience and testing (i.e., tests conducted by the Department's Materials Office) should be used in the selection of aggregate and

other materials, the pavement mix design, the method of placement, and the techniques used for finishing the pavement surface. The design mixes should be monitored by continuous field testing during construction. Changes to the design mix or construction procedures must be made by qualified pavement designers and laboratory personnel ONLY.

The use of grooving (across the roadway) in concrete pavements may improve wet weather skid resistance and decrease the likelihood of hydroplaning. This technique should be considered for locations requiring frequent vehicle maneuvers (curves, intersections, etc.) or where heavy traffic volumes or high speeds will be encountered. The depth, width, and spacing of the grooves should be such that vehicle operations are not hindered.

## **B.4 Drainage**

Adequate drainage of the roadway and shoulder surfaces should be provided. Factors involved in the general pavement drainage pattern include: pavement longitudinal and cross slopes, shoulder slopes and surface texture, curb placement, and the location and design of collection structures. The selection of pavement cross slopes should receive particular attention to achieve the proper balance between drainage requirements and vehicle operating requirements. The use of curbs or other drainage controls adjacent to the roadway surface should be avoided, particularly on high speed facilities. Specific requirements for cross slopes and curb placement are given in CHAPTER 3 - GEOMETRIC DESIGN.

~~The use of grooving (across the roadway) in concrete pavements frequently improves the wet weather skid resistance and decreases the likelihood of hydroplaning. This technique should be considered for locations requiring frequent vehicle maneuvers (curves, intersections, etc.) or where heavy traffic volumes or high speeds will be encountered. The depth, width, and spacing of the grooves should be such that vehicle operations are not hindered.~~

## **B.5 Shoulder Treatment**

The primary function of the shoulder is to provide an alternate travel path for vehicles in an emergency situation and preferred path for bicyclists. Shoulders should be capable of providing a safe path for vehicles traveling at roadway speed,

and should be designed and constructed to provide a firm and uniform surface capable of supporting vehicles in distress. Particular attention ~~should~~ shall be given to providing a smooth transition from pavement to shoulder and avoiding hazardous "drop-offs." ~~(Safety Edge?)~~ Adequate edge support shall be provided to include shoulder stabilization and or a safety edge must be constructed. Details for the Safety Edge are included in Figures I, II, and III with asphalt quantity requirements.

~~Paved shoulders~~ Shoulder pavement may be provided to improve drainage of the roadway, to serve bicycles and transit users, and to minimize shoulder maintenance.

# DRAFT

Topic # 625-000-015 May - 2011  
Manual of Uniform Minimum Standards  
for Design, Construction and Maintenance  
for Streets and Highways

May - 2011

FIGURE 1  
2 LANE ROAD WITH SAFETY EDGE

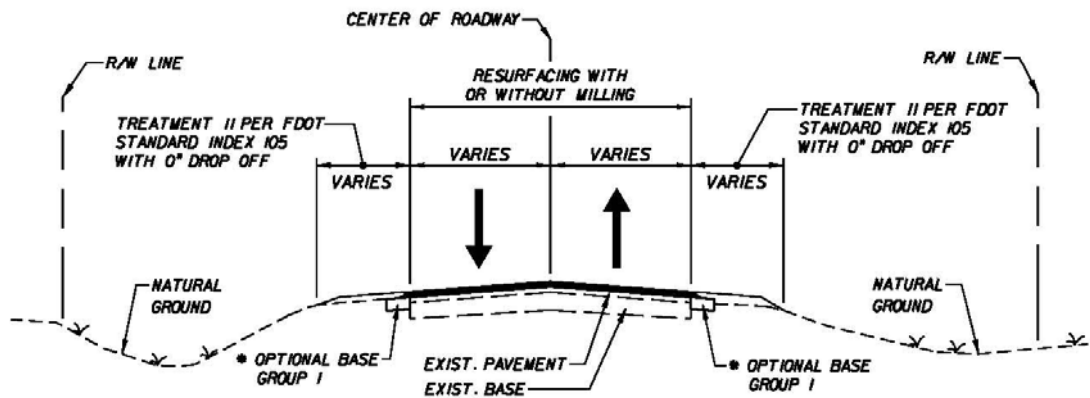
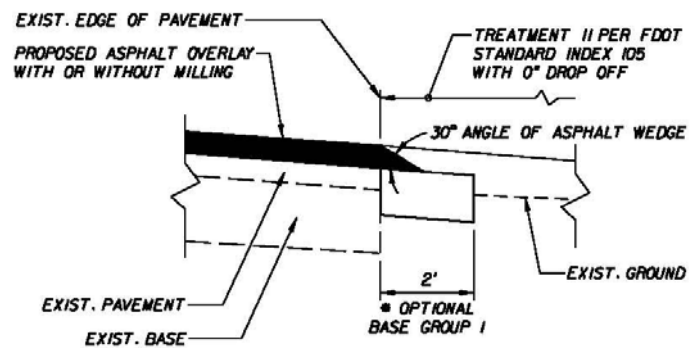


FIGURE 2  
SAFETY EDGE DETAIL



\* THE OPTIONAL BASE GROUP I MAY BE OMITTED IF THE EXISTING SHOULDER MATERIAL IS IN STABLE CONDITION AND PROVIDES A FIRM AND UNYIELDING PLATFORM WHICH WILL SUPPORT THE SAFETY EDGE AND WILL NOT DETERIORATE.

# DRAFT

Topic # 625-000-015 May - 2011  
 Manual of Uniform Minimum Standards  
 for Design, Construction and Maintenance  
 for Streets and Highways

May - 2011

FIGURE 3  
 SAFETY EDGE QUANTITIES

| SAFETY EDGE ASPHALT AND BASE QUANTITIES |                                |  |  |                  |                        |
|---|--------------------------------|--|--|------------------|------------------------|
| OVERLAY THICKNESS (INCHES)              | AREA OF SAFETY EDGE WEDGE (SF) | QUANTITY OF ASPHALT FOR SAFETY EDGE - BOTH SIDES (TONS PER MILE) | QUANTITY OF OBG I FOR SAFETY EDGE - BOTH SIDES (SY PER MILE) | COST PER MILE    |                        |
|   |                                |  |  | SAFETY EDGE ONLY | SAFETY EDGE WITH OBG I |
| 1                                       | 0.006                          | 4.65   | 2346.7   | \$450.72         | \$11,973.02            |
| 2                                       | 0.024                          | 18.59  | 2346.7   | \$1,801.93       | \$13,324.23            |
| 3                                       | 0.054                          | 41.82  | 2346.7   | \$4,053.61       | \$15,575.91            |
| 4                                       | 0.096                          | 74.34  | 2346.7   | \$7,205.78       | \$18,728.07            |
| 5                                       | 0.150                          | 116.16   | 2346.7   | \$11,259.39      | \$22,781.69            |
| 6                                       | 0.217                          | 168.05   | 2346.7   | \$16,289.09      | \$27,811.38            |

NOTE:  
 QUANTITIES FOR TREATMENT 11 PER FDOT STANDARD INDEX 105 WILL VARY DEPENDING ON SHOULDER WIDTH. SEE FDOT STANDARD INDEX 105 FOR DETAILS.

## C PAVEMENT CONSTRUCTION

A regular program of inspection and evaluation should be conducted to ensure the pavement criteria are satisfied during the construction process. Any regular inspection program should include the following:

- The use of standard test procedures, such as AASHTO and the American Society for Testing and Materials (ASTM).
- The use of qualified personnel to perform testing and inspection.
- The use of an independent assurance procedure to validate the program.

After construction, the pavement surface shall be inspected to determine the required surface texture and smoothness was achieved and the surface has the specified slopes. Spot checking of skid resistance by approved methods should be considered. ~~Inspection of the roadway during wet weather conditions should be carried out as soon as possible to quickly locate drainage problems such as depressions in the pavement surface.~~ Periodic reinspection should be undertaken in conformance with the guidelines described in CHAPTER 10 – MAINTENANCE, Section F.4 Pavement Maintenance.

{We have received several comments in the past regarding criteria for unpaved roads. Is this something the subcommittee feels needs to be addressed in more detail?}