



# TRANSPORTATION SYMPOSIUM

2019

## New Sidewalks and Existing Trees

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E Sciences





# New Sidewalks and Existing Trees



Complete Streets

Reduces Heat Island Effect

Increased Property Values

Blue Zones

**Intercepts stormwater runoff**

INCREASES FEELINGS OF WELLBEING

**Lowers Heart Rate**

*Lower Blood Pressure*

**Reduces Stress**

*Enhance Economic Stability*

Tree City USA

## **BENEFITS OF TREES**

*Boosts the immune system*

**Improves Mental Health**

Green Infrastructure

*Promotes Physical Activity*

**Forest Bathing**

*Aesthetic Benefit*

Improved Air Quality

**I-Trees**

INCREASES CONCENTRATION

*Removes Carbon Dioxide*

IMPROVED WATER QUALITY

*Wildlife Habitat*

**ENERGY CONSERVATION**



# New Sidewalks and Existing Trees



Geoffrey Donovan



Ed Gillman



# New Sidewalks and Existing Trees





# New Sidewalks and Existing Trees





# New Sidewalks and Existing Trees





# New Sidewalks and Existing Trees



Federal Register / Vol. 80, No. 194 / Wednesday, October 7, 2015 / Notices

60733

approvals and related responsibilities and oversight activities. The FHWA also intends to clarify when design exceptions are required and the documentation that is expected to support such requests.

Comments received through this Notice will be considered by FHWA when revising the controlling criteria for the design of projects on the NHS, as well as design exception documentation and application.

## Background

As codified in 23 CFR 625.3 and 625.4, the geometric design standards for projects on the NHS are A Policy on Geometric Design of Highways and Streets (2001) and A Policy on Design Standards Interstate System (2005), published by the American Association of State Highway and Transportation Officials (AASHTO). Rulemaking is underway to adopt the current (2011) edition of A Policy on Geometric Design of Highways and Streets. These design standards are comprehensive in nature, covering a multitude of design characteristics, while allowing flexibility in application. As codified in 23 CFR 625.3(f), and in accordance with the delegated authority provided by FHWA Order M1100.1A, exceptions may be approved on a project basis for designs that do not conform to the minimum or limiting criteria set forth in the standards, policies, and standard specifications adopted in 23 CFR part 625.

The FHWA issued a policy memorandum on April 15, 1985, available on the docket for this notice, and on FHWA's Web site at <http://www.fhwa.dot.gov/design/standards/RS0413.cfm>, which identified 13 criteria contained in A Policy on Geometric Design of Highways and Streets and designated them as controlling criteria. The policy required formal design exceptions when any of the 13 controlling criteria were not met.

The FHWA proposes to streamline the 13 controlling criteria to refine the focus on criteria with the greatest impact on road safety and operation. This streamlined application of the controlling criteria is consistent with the industry's move toward a modified design approach, often referred to as performance based practical design (PBPD), and will reduce the instances when a design exception must be prepared when applicable design standards are not met for projects on the NHS. The controlling design criteria set forth in 1985 are: Design speed, lane width, shoulder width, bridge width, horizontal alignment, superelevation, vertical alignment, grade, stopping sight

distance, cross slope, vertical clearance, horizontal clearance, and structural capacity. The term 'horizontal clearance' was initially interpreted as the 'clear zone' described in the AASHTO Roadside Design Guide (<http://www.fhwa.dot.gov/design/standards/RS0415.cfm>), but in the early 1990s was clarified to mean 'lateral offset to obstruction' as described in the AASHTO geometric design policies (<http://www.fhwa.dot.gov/design/standards/RS0525.cfm>). Recent research, culminating in publications of the most recent Highway Capacity Manual (2010, Transportation Research Board) and the Highway Safety Manual (2010, AASHTO), developed much greater knowledge of the traffic operational and safety effects of the controlling criteria than was available when they were established. The NCHRP Report 783 "Evaluation of the 13 Controlling Criteria for Geometric Design" (2014) specifically examined the safety and operational effects of the existing controlling criteria.

The PBPD is an approach to decisionmaking that encourages engineered solutions rather than relying on minimum, maximum, or limiting values found in design criteria. The PBPD is grounded in an analytic framework that enables transportation agencies to utilize existing design flexibility and analytical tools in a way that maximizes benefits while minimizing costs. The PBPD does not disregard engineering guidance or standards. Rather, flexibility in design typically requires more information and a higher level of analysis when defining and deciding on the most appropriate design value for a particular location. Consistent with FHWA's efforts regarding PBPD and to ensure that design exceptions are only required for criteria with significant safety or operational effects, FHWA intends to streamline the controlling criteria based on the findings of recent research. Since 1985, the controlling criteria have been applied to all projects, regardless of roadway type or context. The NCHRP Report 783 found that the 13 controlling criteria had minimal influence on the safety or operations on urban streets. On rural roadways, freeways, and high-speed urban/suburban roadways, a stronger connection to safety and operations was found for some of the criteria than for others.

## Proposed Revisions to Controlling Criteria

Based on the findings of NCHRP Report 783 and FHWA's own assessment and experience, FHWA

proposes to eliminate the following controlling criteria:

- Bridge Width.
  - Vertical Alignment.
  - Lateral Offset to Obstruction.
- To improve clarity, FHWA proposes to rename the following existing controlling criteria:
- Horizontal Alignment to be renamed Horizontal Curve Radius.
  - Grade to be renamed Maximum Grade.
  - Structural Capacity to be renamed Design Loading Structural Capacity.
- The resulting controlling criteria for design are proposed as follows:

- Design Speed.
- Lane Width.
- Shoulder Width.
- Horizontal Curve Radius.
- Superelevation.
- Stopping Sight Distance.
- Maximum Grade.
- Cross Slope.
- Vertical Clearance.
- Design Loading Structural Capacity.

The FHWA also proposes a revision to the application of the controlling criteria. Most controlling criteria would apply only in high-speed [design speed  $\geq 50$  mph (80 km/h)] roadways. Only design loading structural capacity and design speed would continue to be applied in all NHS facility types. Research indicates that the current controlling criteria are less influential on the traffic operational and safety performance of low-speed urban and suburban arterials than other features such as intersection design and access management strategies. Therefore, consistent with FHWA's risk-based approach to stewardship and oversight, FHWA intends to focus application of the controlling criteria on high-speed NHS roadways [design speed  $\geq 50$  mph (80 km/h)]. On low-speed NHS roadways [design speed  $< 50$  mph (80 km/h)], design exceptions are proposed to only be required by FHWA for deviations from the design speed or design loading structural capacity criteria. Exceptions to the controlling criteria must be carefully evaluated and approved by FHWA or on behalf of FHWA if an STA has assumed the responsibility through a Stewardship and Oversight agreement.

While all of the criteria contained in the adopted standards are important design considerations, they do not all affect the safety and operations of a roadway to the same degree, and therefore should not require the same level of administrative control. Based on the findings of recent research and FHWA's assessment and experience, a brief discussion on each of the proposed changes to the controlling criteria is provided below.

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# New Sidewalks and Existing Trees





# New Sidewalks and Existing Trees



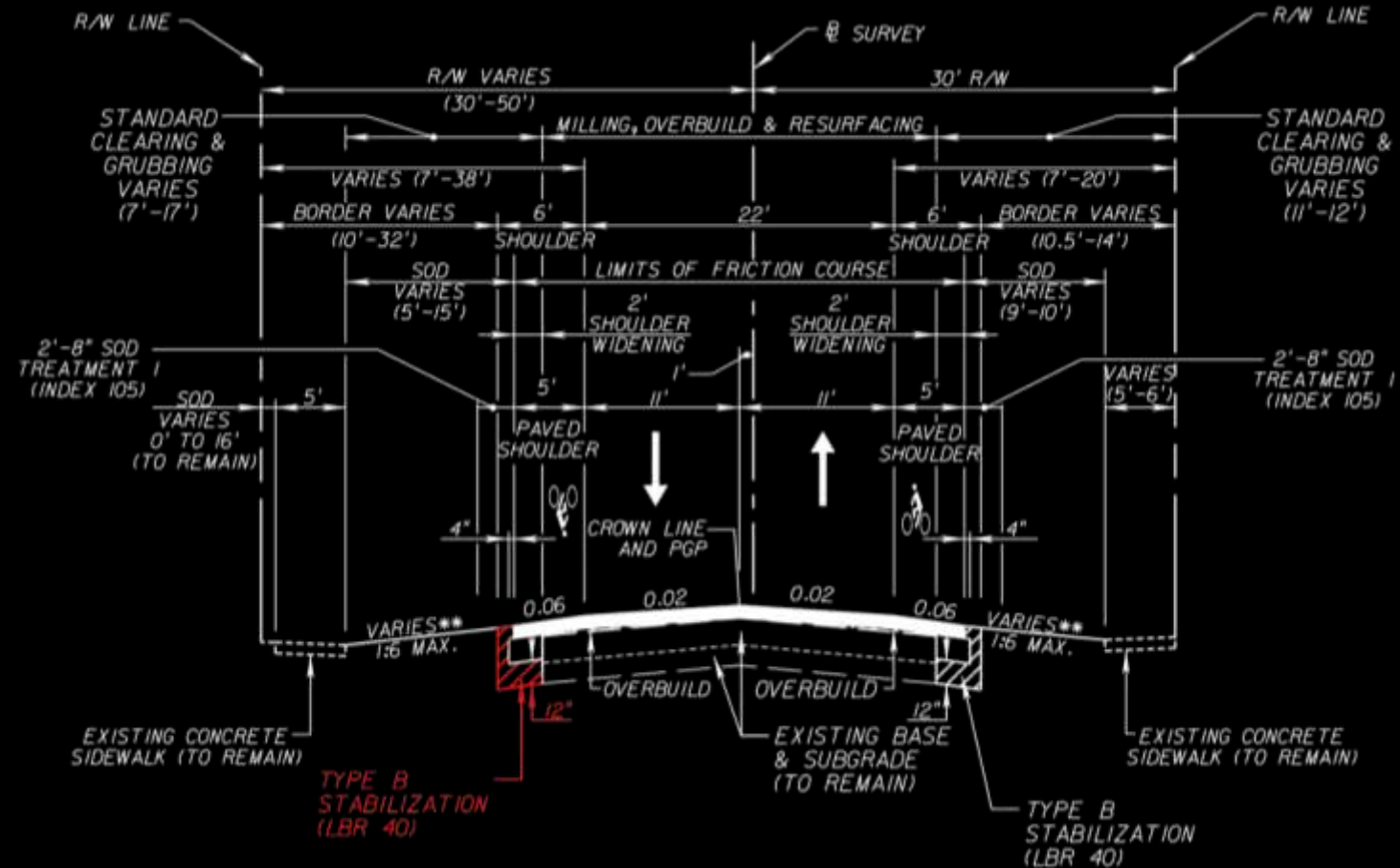
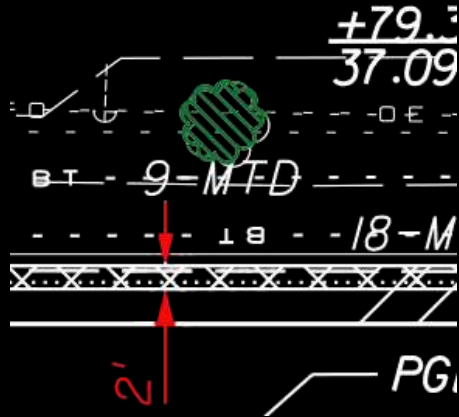


# New Sidewalks and Existing Trees





# New Sidewalks and Existing Trees





# New Sidewalks and Existing Trees





# New Sidewalks and Existing Trees





# New Sidewalks and Existing Trees





# New Sidewalks and Existing Trees





# New Sidewalks and Existing Trees





# New Sidewalks and Existing Trees





# New Sidewalks and Existing Trees





# New Sidewalks and Existing Trees





# New Sidewalks and Existing Trees





# New Sidewalks and Existing Trees





# New Sidewalks and Existing Trees





New Sidewalks and Existing Trees

# ***Who owns the roots?***





# New Sidewalks and Existing Trees



First, the plaintiff alleges in her complaint that the branches and roots of the Hellers' Ficus and Melaleuca trees have encroached onto the plaintiff's property, causing certain damages, to wit: (a) the tree branches have damaged the plaintiff's roof and house, (b) the tree roots have caused the plaintiff's cement walkway to crack, (c) the leaves of the Melaleuca tree have dropped on the plaintiff's property causing plaintiff's pet Afghan hound to contract a severe allergy, (d) the trees' branches have shaded the plaintiff's property causing certain of the plaintiff's vegetation to die.

Second, the rule at common law and the majority rule in this country, which is followed in Florida, is that a possessor of land is not liable to persons outside the land for a nuisance resulting from trees and natural vegetation growing on the land. The adjoining property owner to such a nuisance, however, is privileged to trim back, at the adjoining owner's own expense, any encroaching tree roots or branches and other vegetation which has grown onto his property.

*Gallo v. Heller*, 512 So. 2d 215, 216 (Fla. Dist. Ct. App. 1987)



# New Sidewalks and Existing Trees



In *Scott v. McCarty*, a property owner brought action against a neighbor alleging that overhanging branches and roots from the neighbor's tree caused damage to his property (41 So.3d 989, 989 [Fla. 4th DCA 2010]). The Court affirmed the trial court's dismissal with prejudice of appellant's complaint for damages based upon *Gallo v. Heller*, 512 So. 2d 215, 216 (Fla. 3d DCA 1987), which explained the common law rule:

[A] possessor of land is not liable to persons outside the land for a nuisance resulting from trees and natural vegetation growing on the land. The adjoining property owner to such a nuisance, however, is privileged to trim back, at the adjoining owner's own expense, any encroaching tree roots or branches and other vegetation which has grown onto his property.

*Scott*, 41 So. 3d at 989 (quoting *Gallo*, 512 So. 2d at 216) (alterations in original).



# New Sidewalks and Existing Trees





# New Sidewalks and Existing Trees





# New Sidewalks and Existing Trees





# New Sidewalks and Existing Trees





# New Sidewalks and Existing Trees





# New Sidewalks and Existing Trees





# New Sidewalks and Existing Trees



Dead/decaying  
leader





# New Sidewalks and Existing Trees



**Tree abuse.** Any action or inaction which does not follow acceptable trimming practices as established by the American National Standards Institute, A-300 standards or other accepted standards as published. Abuse also includes, but is not limited to, damage inflicted upon the roots by machinery, changing the natural grade within the drip line, destruction of the natural shape or any action which causes infection, infestation or decay.

**Tree removal.** To change the location of a tree, or to cause damage to or destruction of a tree or root system so as to cause a tree to die.



# New Sidewalks and Existing Trees



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***Tree removal.*** To change the location of a tree, or **to cause damage to or destruction of a tree or root system** so as to cause a tree to die.



# New Sidewalks and Existing Trees



It shall be unlawful for any person, unless otherwise permitted by the terms of this section, to do tree removal work or to effectively destroy any tree, or to effectively destroy any understory in a natural forest community, without first obtaining a permit from the Department.



# New Sidewalks and Existing Trees



It shall be unlawful for any person, unless otherwise permitted by the terms of this section, to do tree removal work or to **effectively destroy any tree**, or to effectively destroy any understory in a natural forest community, without first obtaining a permit from the Department.



# New Sidewalks and Existing Trees





# New Sidewalks and Existing Trees





# New Sidewalks and Existing Trees



Poorly attached  
"sprout" – higher  
likelihood of  
failure

Roots  
damaging  
wall





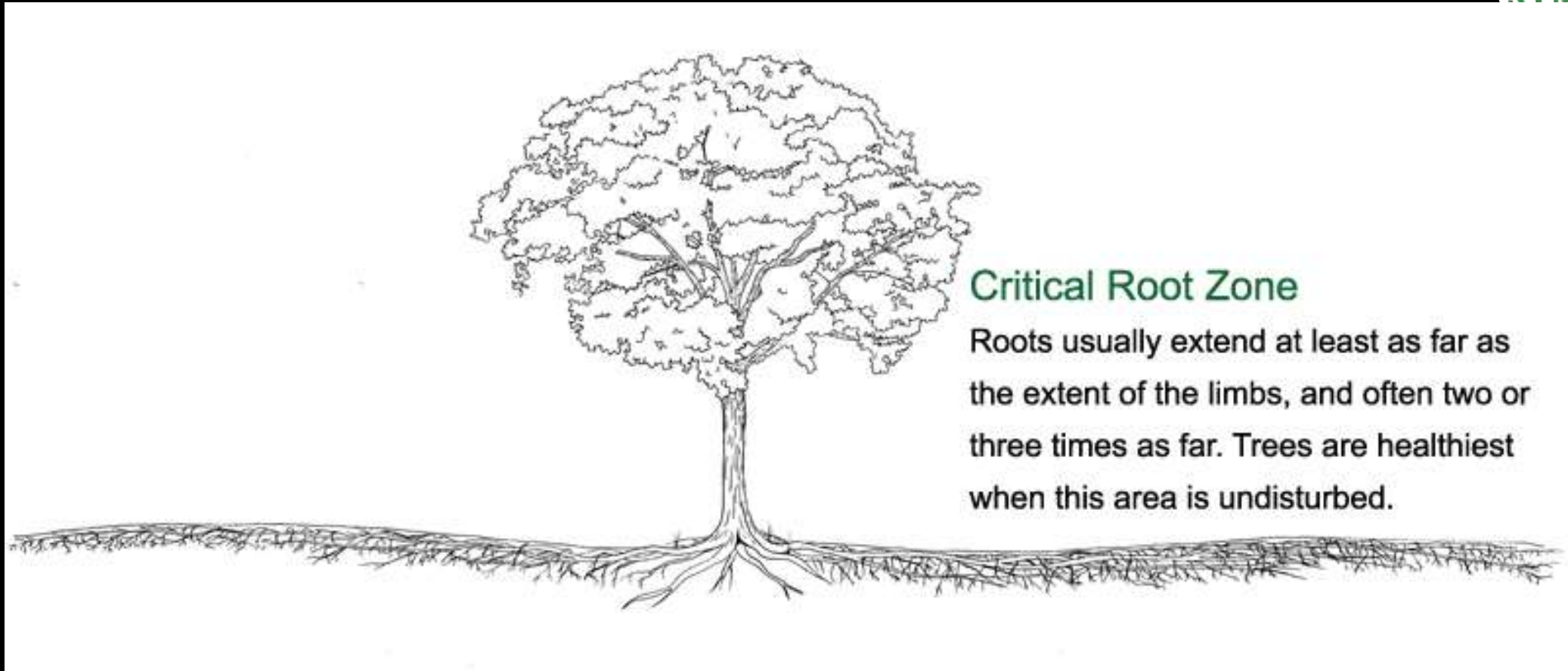
# *Conditions for Urban Florida Trees*

- Urban trees tend to have shorter life spans than trees in natural areas
- Stressors for urban trees include:
  - Removal from their natural forest condition
  - Poor water quality or limited water
  - Mechanical damage from humans, cars and other equipment
  - Limited space, soil volume
  - Poor soil condition – low nutrients and compaction
- Trees in Florida also contend with poorly drained soils and a high water table
  - This results in shallow root systems that are susceptible to additional damage





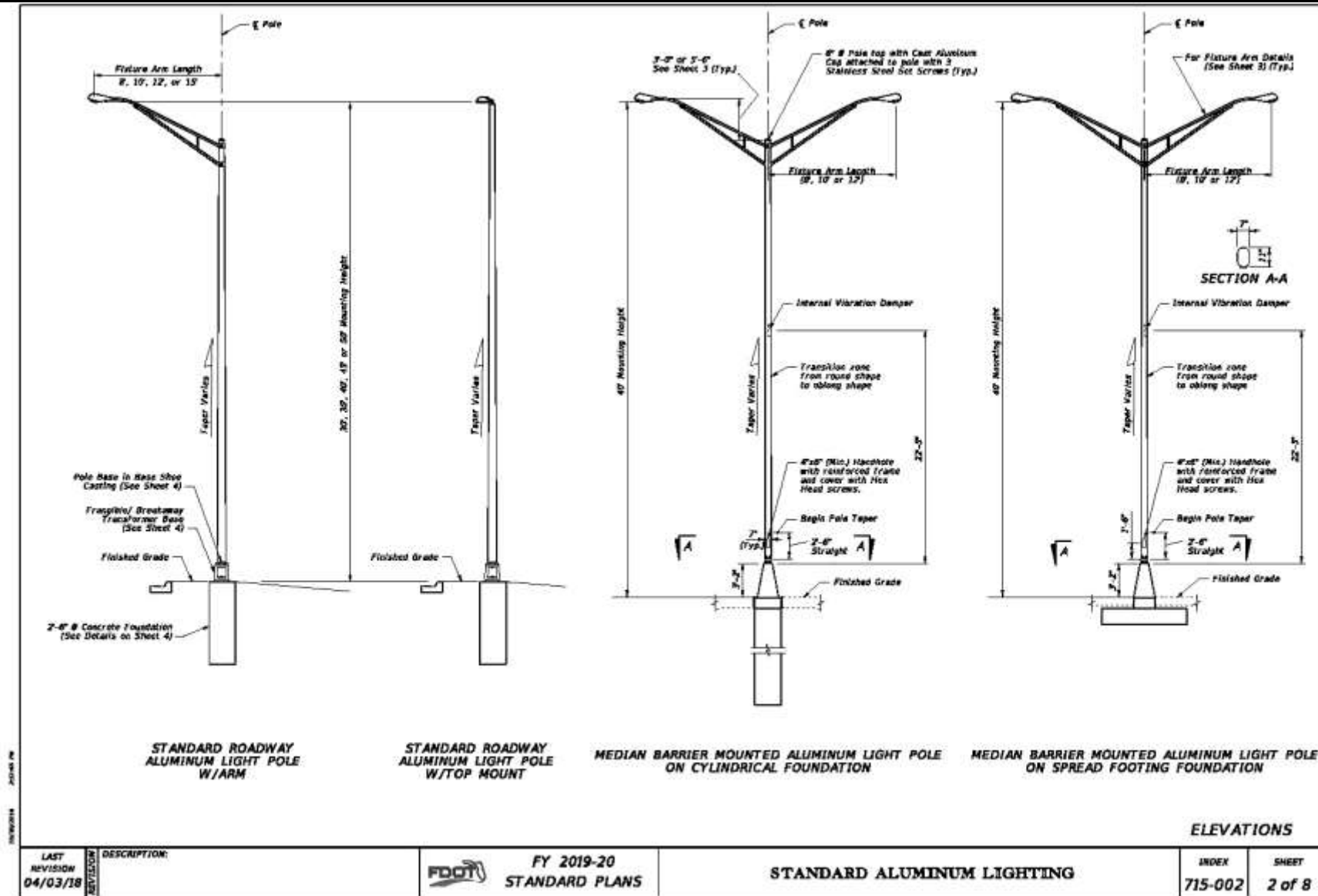
# New Sidewalks and Existing Trees



Source: Atlanta Tree Commission

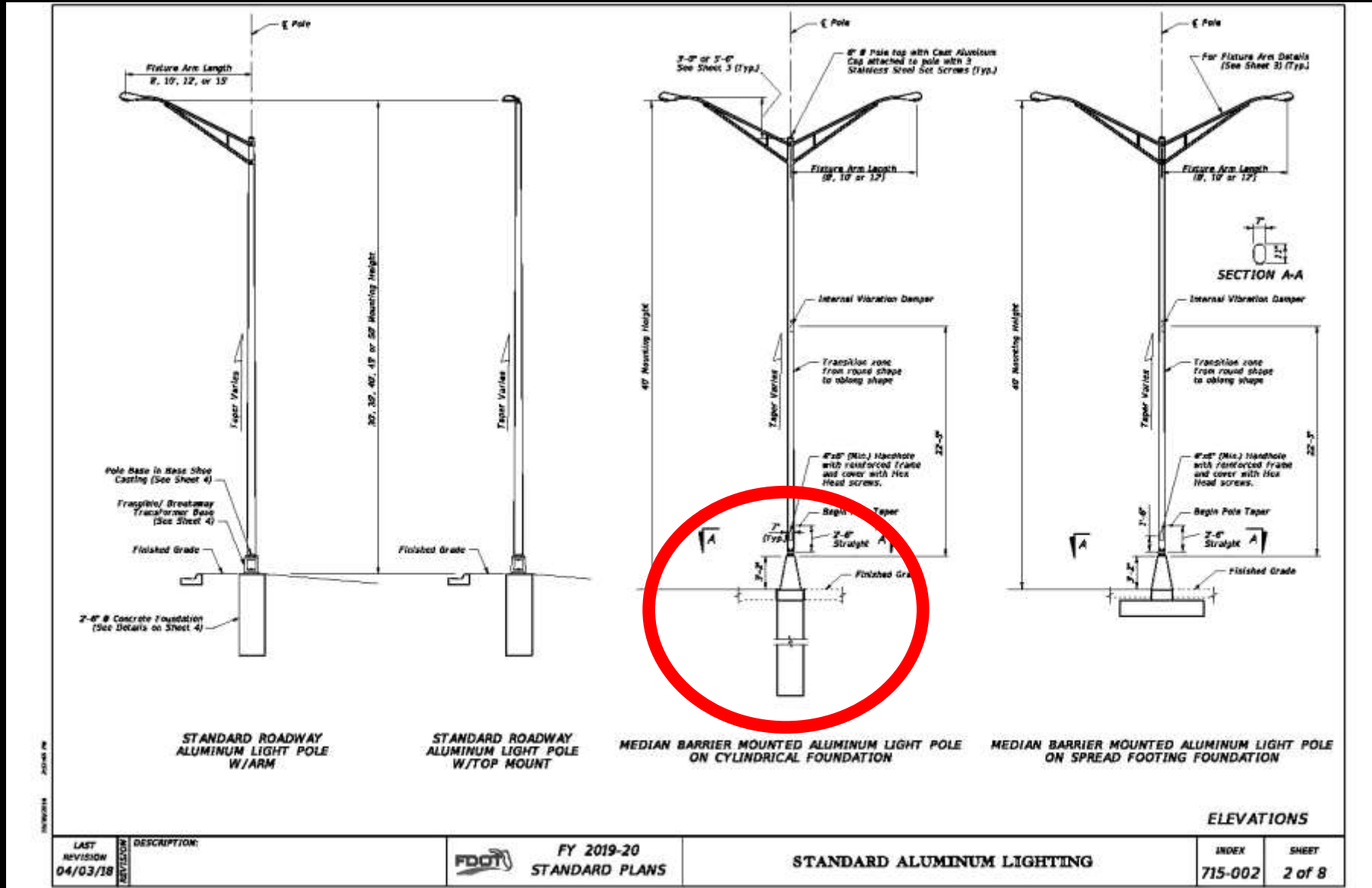


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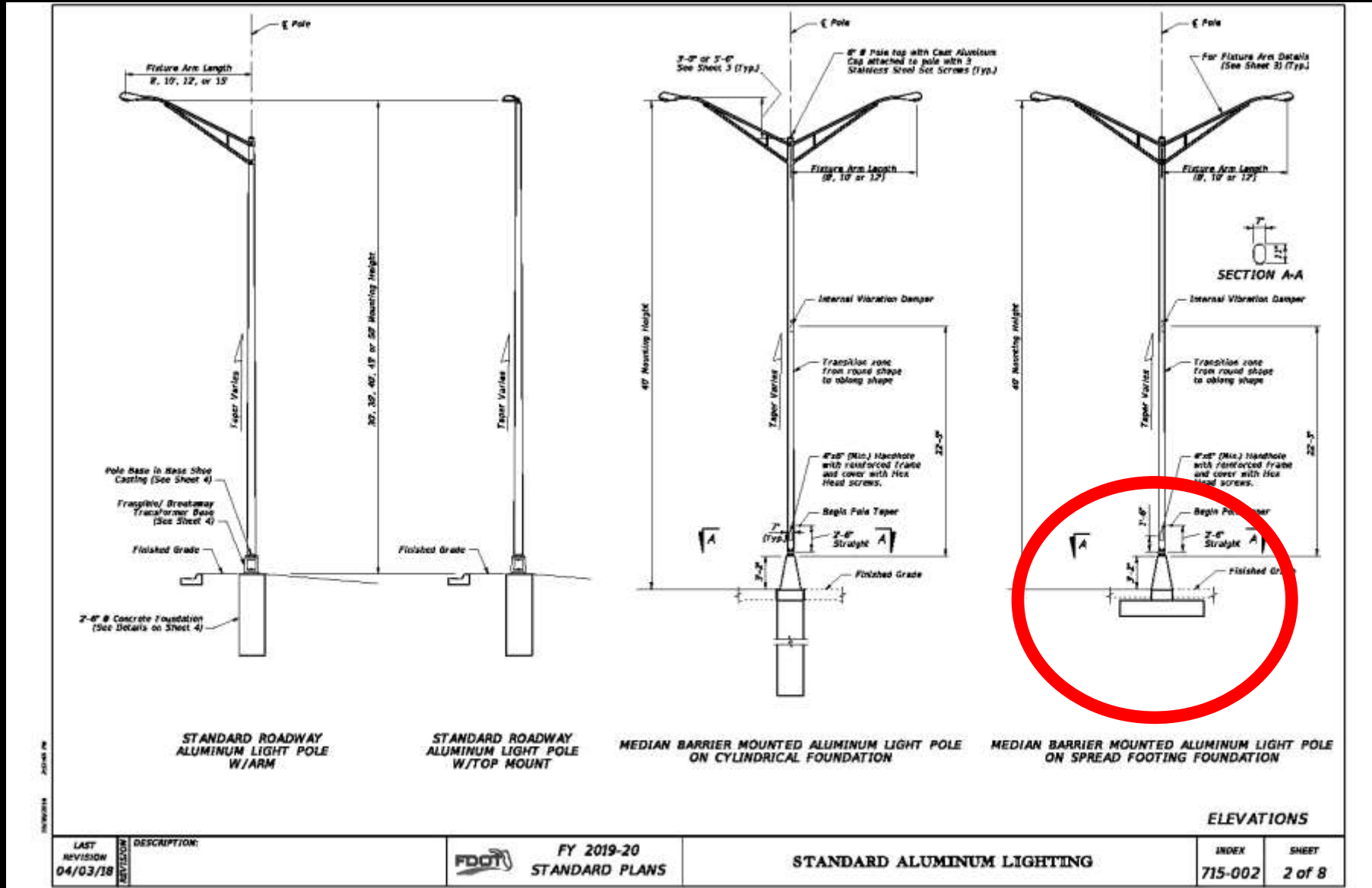


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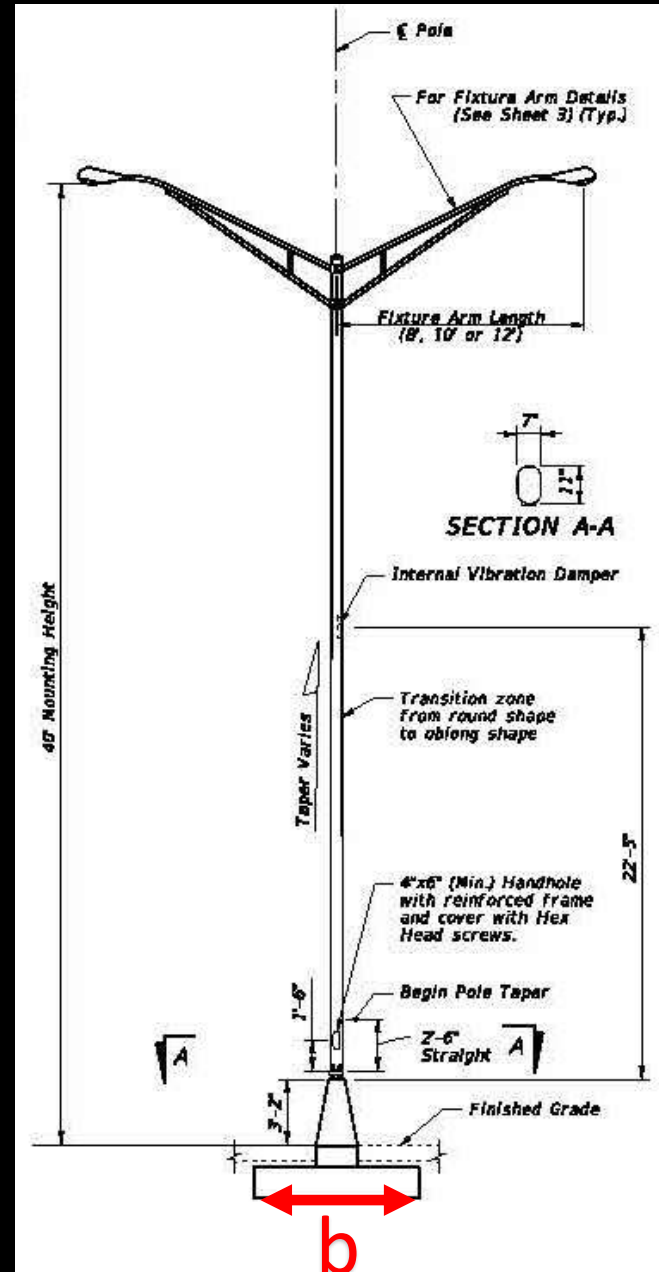


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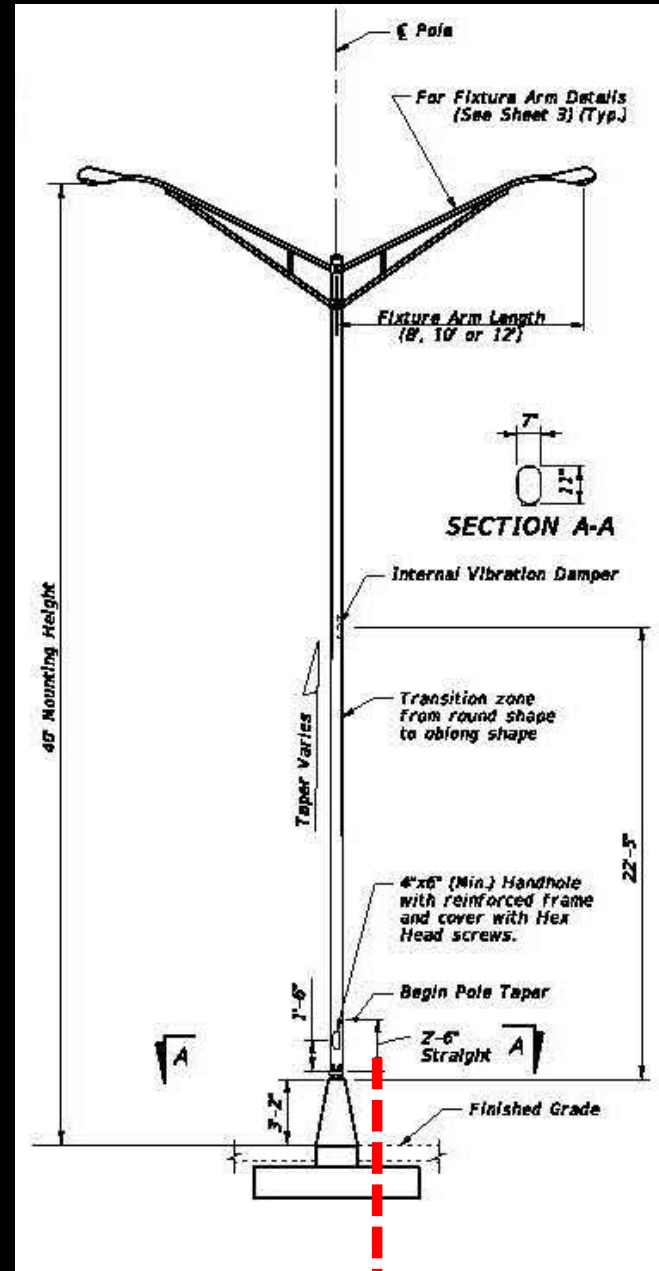


# New Sidewalks and Existing Trees





# New Sidewalks and Existing Trees





# New Sidewalks and Existing Trees





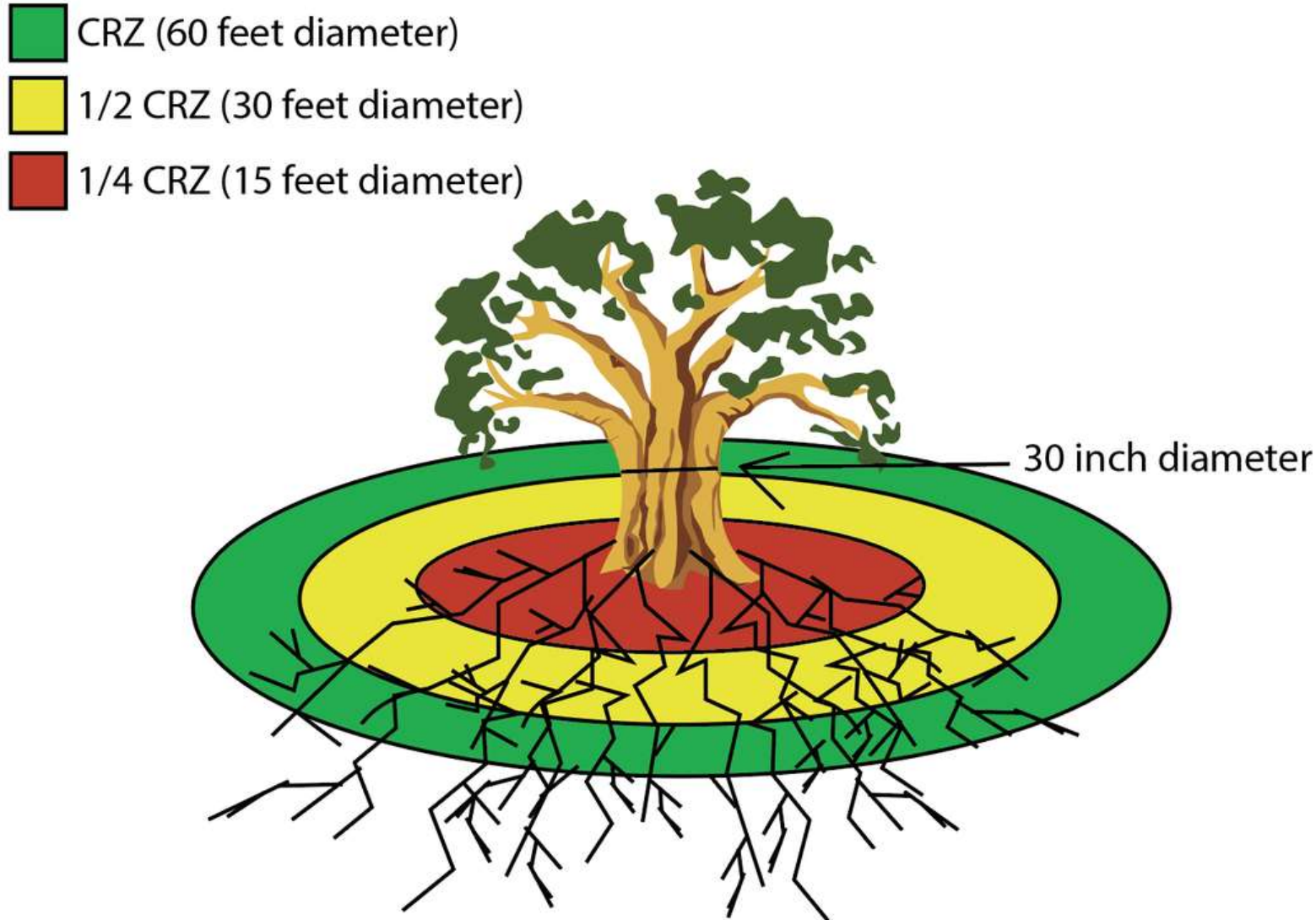


## ***Critical Root Zone Guidance***

Guidance	Source	Example
12 inches per diameter inch	International Society of Arboriculture Best Management Practices	For a 30-inch tree, do not cut within 30 feet of the trunk
9 inches per diameter inch	Matheny and Clark; <i>Trees and Development: A Technical Guide to Preservation of Trees During Land Development</i>	For a 30-inch tree, do not cut within 22.5 feet of the trunk
6 inches per diameter foot	Watson 1998a; Forster 2002	For a 30-inch tree, do not cut within 15 feet of the trunk
5.5 inches per diameter foot	Dr. Ed Gilman, University of Florida	For a 30-inch tree, do not cut within 13.75 feet of the trunk
5 times diameter preferred, minimum 3 times	Smiley, Fraedrich, and Henderson 2002	For a 30-inch tree, do not cut within 7.5 to 12.5 feet



# New Sidewalks and Existing Trees



Source: Austin Texas Tree Protection Code





# ***Root Pruning***

- Trenching soil near trees (e.g. to install a sidewalk or pipe) may cut roots, and this can result in damage the tree which will manifest over time
- Root pruning should be done deliberately and thoughtfully to preserve the tree
- Cutting roots may destabilize a tree, especially when larger (e.g. cutting roots two to three inches in diameter or greater is often prohibited)
- The larger the more encroachment into the CRZ the more destabilizing
- Cutting roots increases liability – destabilized trees can fall over in a storm or decline over time and fail
- Use sharp tools and cut cleanly – shredding roots increases potential for further damage, including longer healing times, fewer new roots developed and increased likelihood of pathogens entering the cut area





## ***Factors Affecting Root Pruning Response***

- **root size:** larger roots may generate few new roots
- **number of cut roots:** more roots cut means more tree stress
- **proximity of cuts to the trunk:** the closer cuts are to the trunk the bigger the impact
- **species:** some species tolerate it better than others
- **tree age:** old trees are more likely to stress and die
- **tree condition:** trees in poor health should not be root pruned
- **tree lean:** leaning trees should not be root pruned
- **soil type and site drainage:** shallow soils mean stay farther from the trunk

<http://hort.ufl.edu/woody/root-prune-guidelines.shtml>



# New Sidewalks and Existing Trees

## *Air Spade*





## ***Root Barriers***



- Prevent or delay conflicts
- Three types
  - Deflectors – panels, sheets or rolls that redirect roots down or to the side
  - Inhibitors - includes chemical component that suppresses root growth
  - Traps – screens, sheets or fabrics “trap” roots within and inhibit radial growth



# New Sidewalks and Existing Trees

## ***Root Barrier Study***

Edward F. Gilman

1996

Root barriers affect root distribution

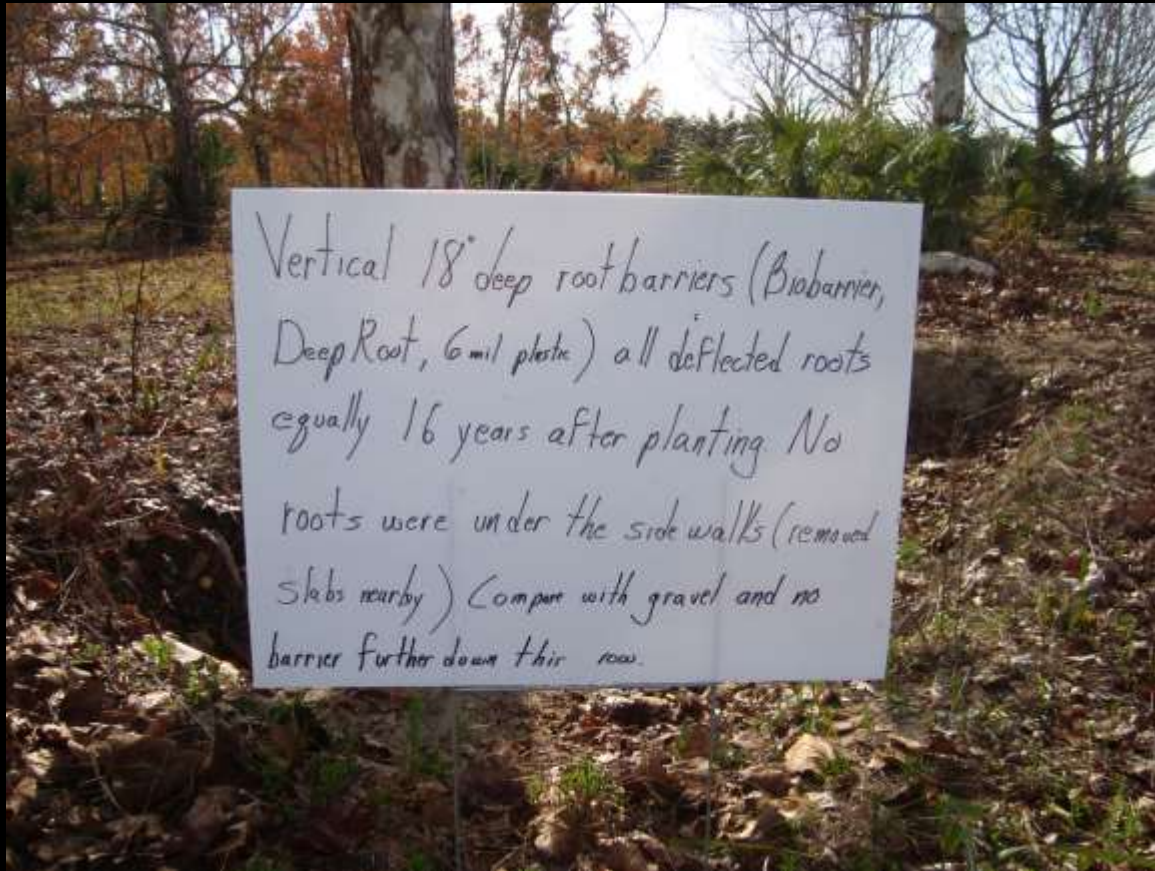
Journal of Arboriculture 22(3): 151-154



No roots of live oak (*Quercus virginiana*) or sycamore (*Platanus occidentalis*) went through Biobarrier™ during a 3-year period after planting. Most roots on both species without a barrier were located in the top 30 cm (12 in) of soil, and root number decreased with increasing soil depth. Roots were located at deeper soil depths beyond the Biobarrier. The roots 15cm (6 in) from the Biobarrier were mostly 30 to 45 cm (12-18 in) below the soil surface. Eighty percent of oak roots and 72% of sycamore roots greater than 3 mm in diameter 0.9 m (3 ft) from the trunk without a barrier were in the top 30 cm (12 in) of soil, whereas, only 42% (oak) and 38% (sycamore) of roots were in the top 30 cm (12 in) for trees with the root barrier. Biobarrier forced roots deeper in the soil but in the high water table in this study, many roots returned to the soil surface by the time they had grown 1.2 m (4 ft) away from the barrier.



# New Sidewalks and Existing Trees



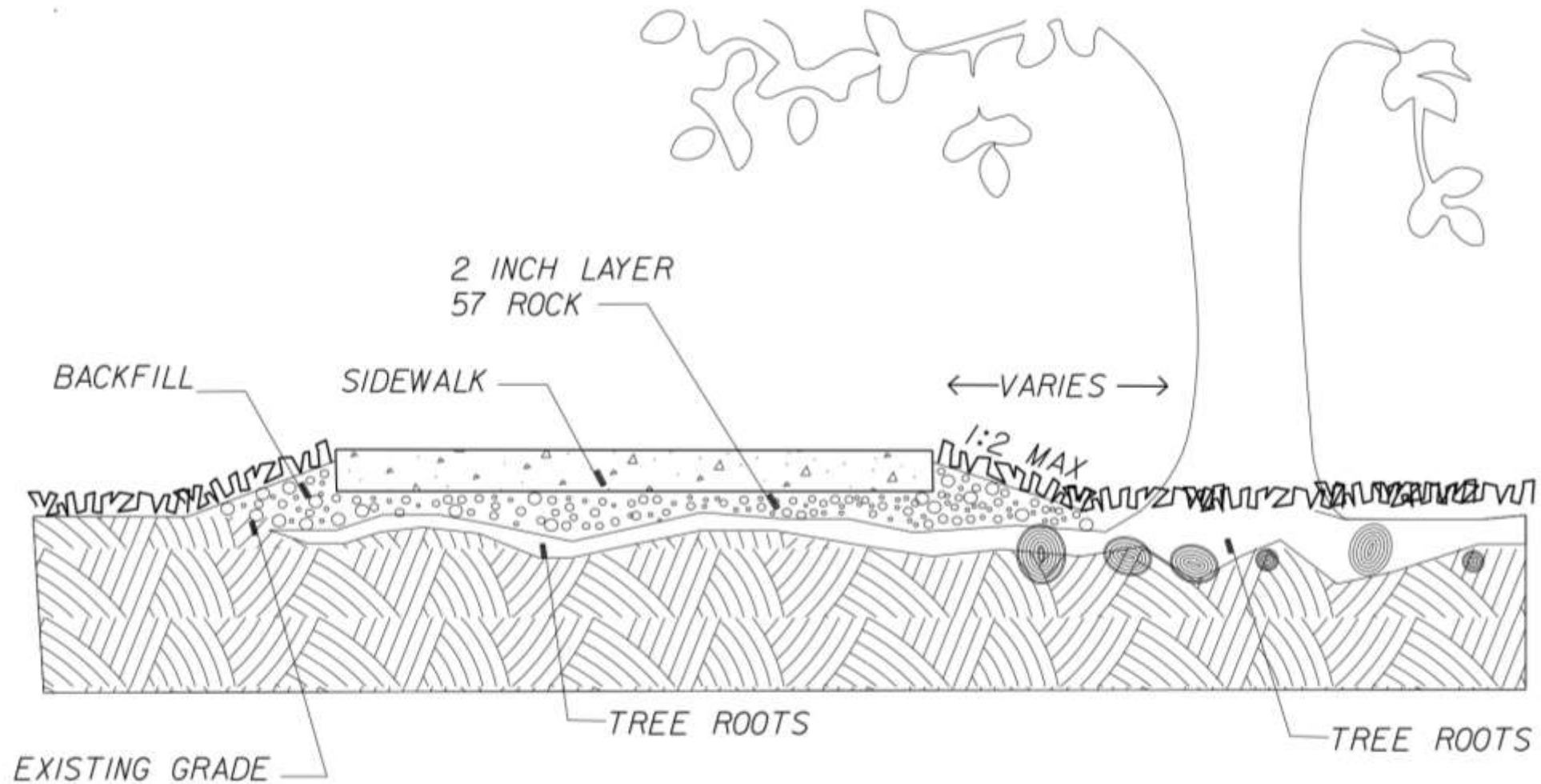


# New Sidewalks and Existing Trees





# New Sidewalks and Existing Trees





# New Sidewalks and Existing Trees



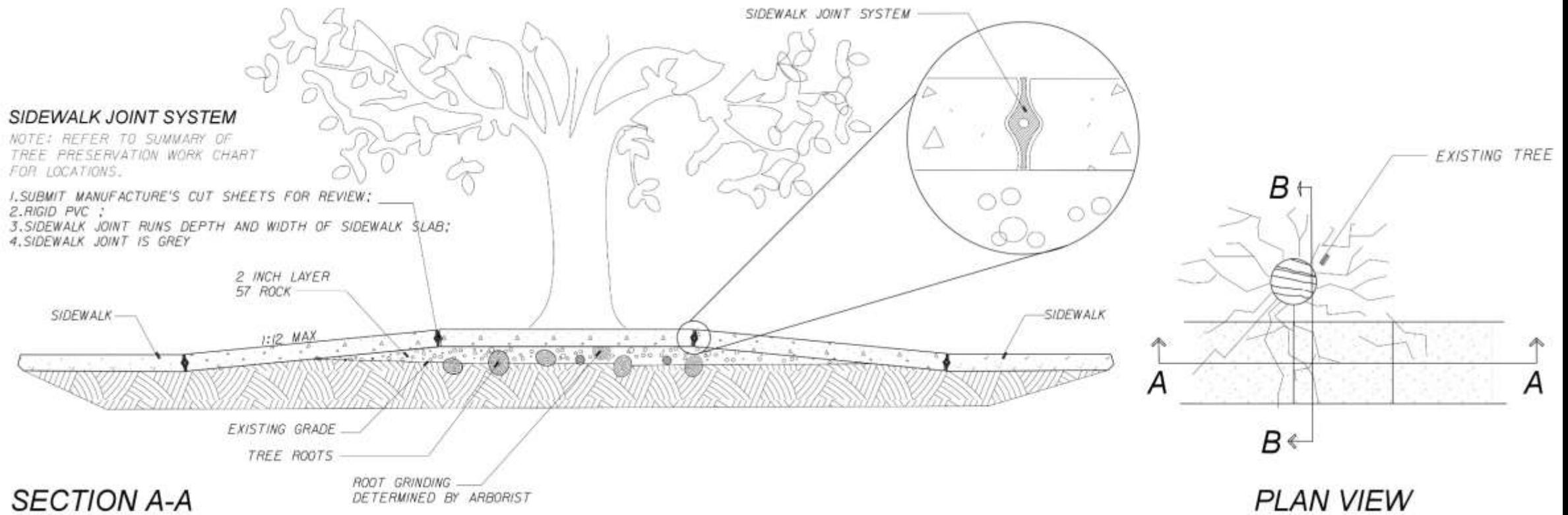


# New Sidewalks and Existing Trees





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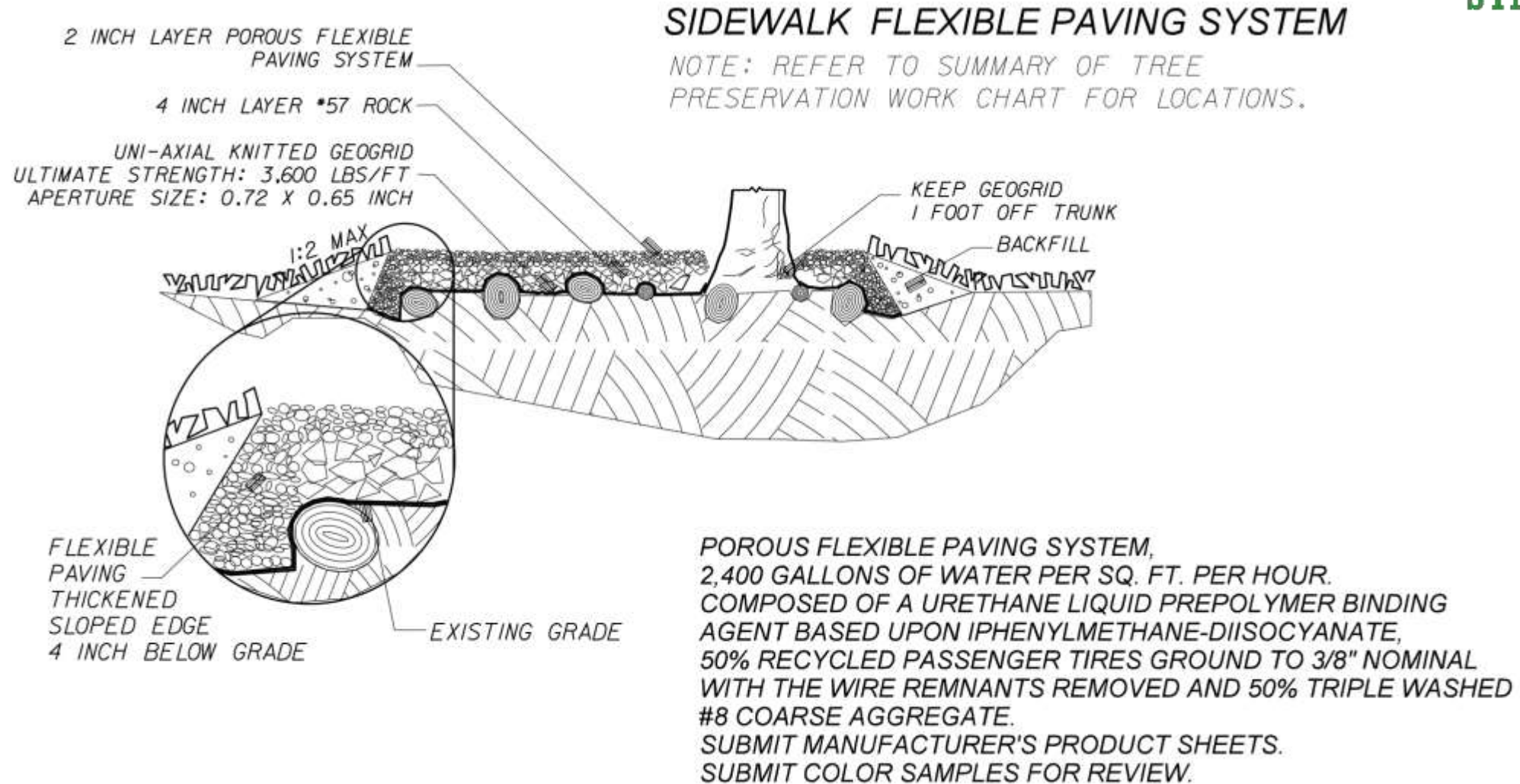


# New Sidewalks and Existing Trees





# New Sidewalks and Existing Trees





# New Sidewalks and Existing Trees





# New Sidewalks and Existing Trees





# New Sidewalks and Existing Trees



Topic #625-000-002  
FDOT Design Manual

January 1, 2019

## 229 Selective Clearing and Grubbing Design

### 229.1 General

Selective clearing and grubbing includes the removal of undesirable vegetation, areas of plant preservation, and tree protection fencing. Trees and palms along transportation corridors should be properly preserved and should not be unnecessarily removed. Consideration should be given to existing desirable trees and palms that are healthy and structurally sound. Removal or relocation should be considered only if preservation is impractical. Existing vegetation may be larger, established vegetation that serves buffering, ecological, or aesthetic functions. Protection of existing vegetation may result in cost savings by minimizing standard clearing and grubbing areas, and by reducing the quantity of new nursery material.

Preservation of existing trees and palms is intended to:

- Improve aesthetics along Florida's transportation corridors
- Preserve legacy vegetation or landscape material previously installed with transportation funding
- Minimize adverse ecological impacts

Topic #625-000-002  
FDOT Design Manual

January 1, 2019

## 323 Selective Clearing and Grubbing Plans

### 323.1 General

Selective Clearing and Grubbing Plan sheets are developed when existing vegetation, trees, and palms are to be protected, relocated, or removed. **FDM 229** contains the criteria to determine the type and the limits of selective clearing and grubbing.

Place Selective Clearing and Grubbing Plan sheets in accordance with **FDM 302**.

### 323.2 Selective Clearing and Grubbing Plan Sheet

Selective Clearing and Grubbing Plan sheets include the following information, as applicable:

- Extent and type of type of clearing operation required within the project R/W limits
- Root pruning and branch pruning
- Plant preservation areas
- Tree protection barriers



# New Sidewalks and Existing Trees



## 110-3 Selective Clearing and Grubbing.

**110-3.1 General:** Remove and dispose of vegetation, obstructions, etc., as shown in the Plans. Provide acceptable fill material, and grade and compact holes or voids created by the removal of the stumps. Perform all selective clearing and grubbing in accordance with ANSI A300.

No staging, storing, stockpiling, parking or dumping will be allowed in selective clearing and grubbing areas. Only mechanical equipment related to selective clearing and grubbing activities will be allowed in selective clearing and grubbing areas. Protect trees to remain from trunk, branch and root damage.

**110-3.2 Trees to Remain:** Protect trees as shown in the Plans or directed by the Engineer.

At the driplines of areas designated as trees to remain, construct a tree protection barrier in accordance with Standard Plans, Index 110-100.

When pruning cuts or root pruning to existing trees is shown in the Plans, work is to be supervised on site by an International Society of Arboriculture (ISA) Certified Arborist performed in accordance with ANSI A300.

**110-3.3 Protection of Plant Preservation Areas:** Areas to remain natural may be designated in the Plans. Protect these areas with a tree protection barrier in accordance with Standard Plans, Index 110-100. No clearing and grubbing, staging, storage, stockpiling, parking or dumping is allowed in these areas. Do not bring equipment into these areas.

## Basis of Estimates Chapter Index 000 - 199

110- 2- A	Selective Clearing and Grubbing		
	Unit	Plan Quantity	Yes
Notes	Effective July 2017 lettings: Refer to Program Management Bulletin 16-05		
Details	Intended for landscape areas, where selective work is needed, including root trimming and arborist work.  Areas with Trees to Remain: may include tree barriers and some vegetation removal and root pruning. Designer MUST show where tree barrier(s) is/are needed.  Plant Preservation Area: Designer MUST show where barrier is to be located; no further work or clearing is required.		



# New Sidewalks and Existing Trees





# New Sidewalks and Existing Trees





# New Sidewalks and Existing Trees



## THANK YOU



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