

# AUDIT OF PAVEMENT STANDARDS IN SPARTANBURG AND ANDERSON COUNTIES

Mitigating the Impacts of Impervious Surfaces in the Upstate Region of South Carolina





**Funding for this study was generously provided by:**



The V. Kann Rasmussen Foundation  
c/o WilmerHale  
60 State Street  
Boston, MA 02109  
(617) 526-6610  
[www.vkrf.org](http://www.vkrf.org)



**The study was commissioned and coordinated by  
Upstate Forever on behalf of the Saluda-Reedy  
Watershed Consortium**

Saluda-Reedy Watershed Consortium  
c/o Upstate Forever  
P.O. Box 2308  
Greenville, SC 29602  
(864) 250-0500  
[www.upstateforever.org](http://www.upstateforever.org)



Project Managers: Jason Van Driesche,  
Director of Clean Air and Water Program  
Heather Bergerud Nix,  
Urban Rivers Project Manager



**The study was prepared by:**

The Lawrence Group  
Town Planners & Architects  
PO Box 1836  
108 S. Main Street, Suite B  
Davidson, NC 28036  
(704) 896-1696  
[www.thelawrencegroup.com](http://www.thelawrencegroup.com)

Project Team: John Cock, AICP  
Megan Duskocil

© 2007 by Upstate Forever. Upstate Forever retains all rights to modify or publish this document; however, permission is granted to the public at large to print and/or distribute this document, provided that: a) no modifications are made to the document; and b) no profit is realized from its printing or distribution.

# ACKNOWLEDGEMENTS

The following individuals kindly lent their time and expertise to this project, providing direction and support as the audit of pavement standards took shape:

<i>John Darrohn</i>	<i>Senior Engineer, Seamon, Whiteside and Associates</i>
<i>Scott Johnston</i>	<i>President, Johnston Design Group</i>
<i>JD Martin</i>	<i>President, Arbor Engineering</i>
<i>Rita McKinney</i>	<i>Former Chair, Department of Labor, Licensing, and Regulation</i>
<i>Steve Navarro</i>	<i>President, Furman Company</i>
<i>Tony Niemeyer</i>	<i>President, The Reserve at Lake Keowee</i>
<i>Jeff Randolph</i>	<i>President, The Randolph Group</i>
<i>Bob Strother</i>	<i>Executive Director, Appalachian Council of Governments</i>
<i>Mike Taylor</i>	<i>Senior Partner, DP3 Architects</i>

# TABLE OF CONTENTS

## **I INTRODUCTION**

2 *Report Methodology*

3 *Focus Group*

## **5 STREET DESIGN**

7 *Street Width*

11 *Curb Radii*

12 *Cul-de-Sac Design*

13 *Vegetated Open Channels/Swales*

14 *Planting Strips and Street Trees*

15 *Sidewalks*

## **17 PARKING**

19 *Parking Requirements*

22 *Parking Lot Design*

24 *Parking Lot Landscaping*

## **27 DRIVEWAYS, SETBACKS, & ALLEYS**

**A-1 APPENDIX A:** *Anderson County Audit of Pavement Standards*

**B-1 APPENDIX B:** *Spartanburg County Audit of Pavement Standards*

## **R-1 REFERENCES/RESOURCES**

*This page intentionally left blank*

Upstate Forever retained the Lawrence Group to conduct an audit of paving requirements in the codes and ordinances of Anderson and Spartanburg counties, South Carolina and the municipalities therein as part of the Saluda-Reedy Watershed Consortium's (SRWC) Low Impact Development Project. This project was undertaken with two goals in mind: reducing the amount of stormwater runoff in the Saluda-Reedy watershed and surrounding watersheds, and minimizing the infrastructure costs associated with development. The objective of this assessment is to identify opportunities for introducing flexibility into the local regulations governing street width, parking ratios, sidewalk and driveway specifications, and other aspects of paving in the land development process. The ultimate intent is to limit the amount of impervious cover generated by new development and redevelopment in Anderson and Spartanburg counties.

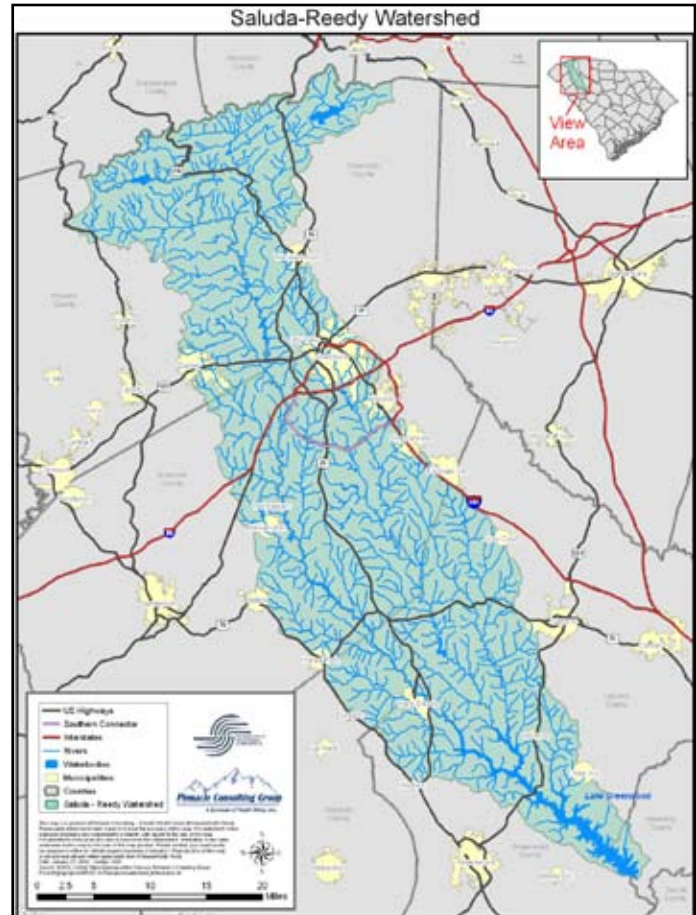
## State of the Upstate Waters

Non-point source pollution — sediment, nutrients and waste carried by stormwater — is now the chief threat to the rivers in the Upstate. Non-point source pollution primarily results from poor land-use practices and unplanned growth and consists mainly of erosion from construction sites and poor management of stormwater from developed areas. Non-point source pollution has the potential to undo all the gains in water quality achieved in the last thirty years. It will take a concerted effort by community leaders across the Upstate to effectively address the threats of non-point source pollution.

## Impacts of Impervious Cover on Water Quality and Quantity

According to a 2001 EPA report entitled *Our Built and Natural Environment*, many of the nation's waterways are suffering fates similar to the rivers of the Upstate: "Water quality...is degraded to a point where those water bodies can no longer support basic uses such as fishing and swimming, and cannot be relied upon as sources of clean drinking water" (p. 19). The report goes on to detail the impacts of land development on water quality and quantity, including:

- *Impervious cover increases the **volume and rate of stormwater runoff.***
- *Increased runoff causes "**larger and more frequent incidents of local flooding.**"*



- **Flooding in turn results in "decreased [stream] stability"** which may affect the ability of streams and rivers to "dilute toxic spills."
- The net result is "**increased costs for water treatment, accumulation of pollutants, and adverse effects**" on aquatic life.
- In addition, these changes can lead to "**reduce[d] residential and municipal water supplies**" through groundwater recharge loss.

## Sources of Imperviousness

Imperviousness in new development has two primary sources: roofs of commercial, residential, and industrial structures; and surfaces related to transportation, specifically streets and parking areas. Sixty to seventy percent of impervious cover is thought to be attributable to this transportation-related infrastructure (Schueler). The focus of this report is on transport-related imperviousness and is broadly divided into categories related to street design; parking lot design; and driveways, setbacks, and alleys.

# INTRODUCTION

## Report Methodology

The basis for the Pavement Audit is a detailed review of the various land development regulations and requirements related to paved surfaces — streets, parking lots, sidewalks, and driveways — for Anderson and Spartanburg Counties and the incorporated municipalities therein. The review includes the following communities:

### Anderson County

City of Anderson  
Town of Pendleton  
Town of Williamston

### Spartanburg County

City of Inman  
City of Landrum  
City of Spartanburg

For each locale, the review covers zoning and land development regulations and other development standards, where applicable. Tables detailing the regulatory review for each county and each community are included in the Appendices.

The review methodology is adapted from the “Code and Ordinance Worksheet” questionnaire from the Builders for the Bay program, a watershed protection effort in the Chesapeake Bay area sponsored by Center for Watershed Protection, the National Association of Home Builders (NAHB), and the Chesapeake Bay Alliance.



See: [http://www.cwp.org/builders\\_for\\_bay.htm](http://www.cwp.org/builders_for_bay.htm)



Parking lots and streets are one of the largest sources of impervious cover in urbanized areas (Spartanburg County, SC).

## County Pavement Audits

The Anderson and Spartanburg County pavement audits consider ten major topic areas and more than 30 specific standards related to pavement requirements for each of the subject locales.

The major topic areas of the audit include:

1. Street width
2. Right-of-Way width
3. Cul-de-sac design standards
4. Street drainage standards
5. Parking requirements
6. Shared parking provisions
7. Parking lot design
8. Parking lot landscaping
9. Sidewalk standards
10. Driveway standards

Points are assigned to each standard for the purpose of comparing existing regulatory requirements to model low impact development standards and to provide an objective point of comparison between the communities in the audit. The highest possible score is 100, which indicates that a community is applying very good regulatory practices for reducing impervious surfaces in new development.

Overall scores in the audit ranged from a low of 29 (City of Anderson) to 60 (City of Landrum). Across the board, Spartanburg County communities scored higher than Anderson County communities on total audit scores. (See the Appendices for detailed scoring for each county and community.)

### Total Pavement Audit Points (out of 100 possible)

Anderson County	Anderson	Pendleton	Williamston
36	29	34	34.5
Spartanburg County	Inman	Landrum	Spartanburg
47	52	60	40



## Focus Group

In January 2006, Upstate Forever convened a focus group meeting with representatives of various stakeholder interests from the region, including elected and appointed officials, consulting engineers, county staff, fire officials, and developers.

Comments from the focus group are listed below and organized by topic area. The bulleted items reflect comments by individuals and not necessarily the consensus of the group on a given issue.

## Focus Group Comments

### Streets

- Width for **fire/emergency access is a key factor** in determining minimum street widths. The requirements in Appendix D of the International Fire Code tend to make streets wider, and in the absence of other regulations, fire chiefs point to state codes. Local communities can provide alternatives to state fire codes via local ordinances, and this will be the key to success.
- **Small curb radii can be subject to run-over damage.** One solution is mountable curbs, which allow for emergency vehicle access while maintaining small radii.
- Gross right-of-way width is not in itself a major issue. The important thing is to focus on what is in that right-of-way – and on **how much of the right-of-way is impervious.**
- “Off-street” on-street parking – that is, **pervious parking areas outside of the paved area of a narrow street** – is an interesting approach to reducing street width dramatically while still allowing for parking.

Source: Upstate Forever



An example of a narrow street with no curb and gutter (Spartanburg County, SC).

### Cul-de-Sacs

- There are many opportunities for reducing pavement by employing **alternatives to standard cul-de-sacs.** Hammerheads are one option that works for fire access, provided fire vehicles are willing to do three-point turns.
- **Cul-de-sac islands also help,** particularly if the cul-de-sac drains to the island. However, islands can create problems for fire vehicle access, necessitating rolled curbs or offset islands. Therefore, the issue of islands in cul-de-sacs issue has to be closely coordinated with fire chiefs.

### Swales

- **Swales** are already being used in low-density development. They **should be allowed by-right** if certain conditions are met.
- **It is important to consider disabled access when not using curb and gutter.** A concrete strip (known as a flat curb) at the edge of asphalt is useful in this regard.

### Sidewalks and Street Trees

- Sidewalks are required in places where they really aren't needed. **Sidewalks should really be focused on collector streets** and on places where people really walk.
- **Sidewalk standards are overly rigid.** They should be based on street type rather than density.

### Parking Ratios

- **Retailers often want more parking than minimums,** and none want fewer than 5 spaces per 1,000 square feet. Clients often see this as non-negotiable, which puts developers in a tough spot.
- The challenge is that, while developers don't want to pay for more pavement than they need, they don't want to constrain future uses by having too few parking spaces. **Long-term value requires flexibility.**
- One option is to require that **some land be set aside as a reserve** for additional parking if needed in the future.

# INTRODUCTION

## *Parking Lot Landscaping*

- **Major developers in the area use curb and gutter on parking lot landscape** islands; smaller ones will do whatever is cheapest.
- **Soils are not very pervious in the Upstate**, so pervious pavement requires special preparation.

## *Cost Savings of Reduced Impervious Surface*

- **It would be very useful to track cost savings of changes** as well as reduction in impervious cover. Should also work up specifics as to cost savings and impervious cover reduction up front. Perhaps a student group could model impervious cover and costs generated by various scenarios on particular sites.
- It is necessary to ensure that reduced pavement – which can result in increased density of housing – **takes into account increased demand for emergency response.**
- It's also **important to think in terms of trade-offs as well** as cost savings — i.e., getting a better development for the money.

Source: Upstate Forever



*Parking area landscaping with no curbing would allow for more effective infiltration of stormwater if it were at grade or below (Anderson County, SC).*

# STREET DESIGN

***“Research and experience show that compact street layouts, narrower street widths, and alternative pavement edge treatments can minimize clearing and grading, reduce stormwater runoff and protect water quality while providing ample access for emergency vehicles, residential vehicles, and parking” (HUD, p. 81).***



*This page intentionally left blank*

# STREET DESIGN: Street Width

## Residential Street Widths

What is minimum pavement width for local streets?

Anderson County	Anderson	Pendleton	Williamston
20 ft	not specified	22 ft	20 ft
Spartanburg County	Inman	Landrum	Spartanburg
16-20 ft	16-20 ft	16-20 ft	24 ft

By national standards, the minimum street widths required for low density, residential development in the subject communities are laudably narrow. The current required widths are generally the minimum necessary to allow for occasional on-street parking on low-volume, low-speed streets.

*“Considering the cost of paving a road averages \$15 per square yard, shaving even four feet from existing street widths can yield cost savings of more than \$35,000 per mile of residential street” (EPA 2005, 77).*

Based on accepted practices from around the Carolinas and the U.S., however, the communities with higher street widths could be narrowed even further. Widths for local streets can be as narrow as 16-18 feet (including gutter, if required) based on the density of development, the type of street, and the need for

on-street parking. To facilitate emergency access on the narrowest streets, communities may consider: restricting parking to one side; requiring staging areas every 200 to 300 feet with parking restrictions, allowing double driveways, and/or bulb-outs; and encouraging multiple points of access, including alleys (LGC, p. 24-38).



An approximately 24-foot wide street accommodates occasional parking on both sides (Anderson County, SC).

Residential Street Width Standards from Around the U.S.

Minimum Width	Source
18 to 20 ft	U.S. Fire Administration
24 ft (on-street parking) 16 ft (no on-street parking)	Baltimore County, MD
18 ft (minimum)	Virginia Fire Marshall
18 ft (parking one side) 24 ft (parking both sides)	Portland, OR

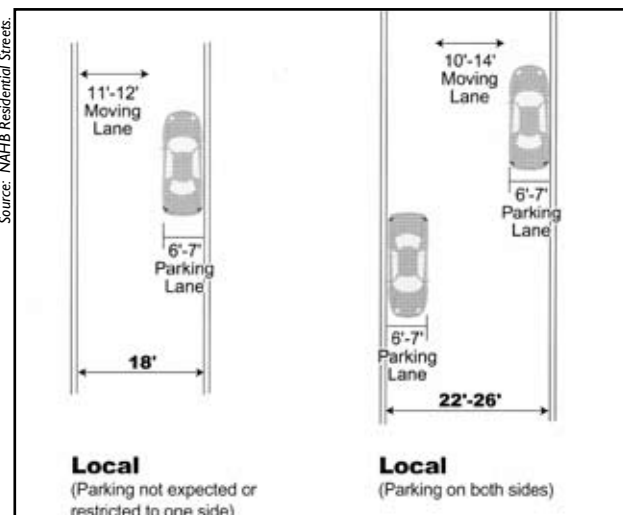
Source: Center for Watershed Protection, 1998 as cited in HUD

### Benefits of Narrow Streets

- Reduced costs for developers
- Additional land for development or open space
- Lower speed, more pedestrian-friendly streets (narrower streets have fewer pedestrian accidents)

### Potential Trade-offs of Narrow Streets

- Need to coordinate with emergency and other service providers for adequate access
- Some may perceive conflicts with the National Fire Code standards



A 20-foot wide street with parking on one side does not compromise access by emergency responders or other large vehicles (Huntersville, NC).

# STREET DESIGN: Street Width

## Cul-de-sac Street Widths

What is minimum pavement width for cul-de-sac streets?

Anderson County	Anderson	Pendleton	Williamston
20 ft	not specified	24 ft	20 ft

Spartanburg County	Inman	Landrum	Spartanburg
16-20 ft	16-20 ft	16-20 ft	24 ft

Cul-de-sac streets should use the narrowest possible street width, as low as 16 to 18 feet wide. Some of the audit communities allow for this width, but most do not. Cul-de-sac streets are, by nature, low volume streets. The National Association of Home Builders' (NAHB) *Residential Streets* recommends that cul-de-sacs should not serve more than 20-25 houses (p. 36). As these streets serve low-density, single family houses — which typically have sufficient off-street parking space on each individual lot — there is rarely need to require additional width on these streets for on-street parking.

Source: Upstate Forever



On this cul-de-sac street, pavement could easily be narrowed by 4 to 6 feet (Spartanburg County, SC).

## Manufactured Home Park Street Widths

What is the minimum pavement width for manufactured home park streets?

Anderson County	Anderson	Pendleton	Williamston
not specified	not specified	24 ft	not specified

Spartanburg County	Inman	Landrum	Spartanburg
20-24 ft	20-24 ft	20-24 ft	not specified

Unlike cul-de-sac streets, manufactured home park streets are held to a higher standard than other residential streets in some communities in the audit. As indicated above, one-side parking can easily be accommodated on streets as narrow as 18 feet, so this additional width requirement is unnecessary. Manufactured home park streets should be held to the

same design standards as other residential streets and should not be expected to provide for more width. Like other residential land uses, manufactured housing is required to provide off-street parking spaces for residents.

## Alley Widths

What is the minimum pavement width for residential/commercial alleys?

Anderson County	Anderson	Pendleton	Williamston
not specified	not allowed/ 20 ft	18 ft/18 ft	not specified

Spartanburg County	Inman	Landrum	Spartanburg
not specified	not specified	not specified	not allowed

The majority of the audit communities do not specify whether they do or do not allow alleys. The City of Spartanburg is the only community that specifically prohibits alleys. Pendleton is the only community that specifically permits residential *and* commercial alleys. Only commercial alleys are allowed in the City of Anderson. Generally, commercial alley widths are appropriate, but residential alleys should be specified as much narrower.

NAHB's *Residential Streets* states that residential alleys of "12-foot pavement width with a 16-foot right-of-way will easily accommodate the widest of truck bodies (eight feet) with room to spare on both sides" (p. 28). The minimum width for residential alleys can even be as low as ten feet — a dimension that is used in many communities in the Carolinas and nationwide. When lot widths are 50 feet or less, alleys may provide less pavement than individual driveways. (See section on *Driveways, Setbacks, and Alleys* for further discussion of alleys.)



A 12-foot alley with trees and no curbs serves houses on approximately 40-foot wide lots (Gaithersburg, MD).

Source: The Lawrence Group

# STREET DESIGN: Street Width

## Collector Street Widths

What is minimum collector street pavement width?

Anderson County	Anderson	Pendleton	Williamston
24 ft	not specified	32 ft	24 ft
Spartanburg County	Inman	Landrum	Spartanburg
24 ft	24 ft	24 ft	36 ft

Most communities in the audit require an appropriate minimum collector street pavement width of 24 feet. Spartanburg requires the widest collector streets with a minimum width of 36 feet. A 32 to 34-foot street (face-of-curb to face-of-curb) will easily accommodate full-time on-street parking on both sides of the street and two travel lanes. However, “where houses do not front on the residential collector street and parking is not normally needed, two moving lanes of pavement are adequate” (NAHB 2001, p. 25). Based on design speed and expected volume, collector streets could be as narrow as 20 to 22 feet. The NAHB’s “Green Land Development” recommends a 20-foot minimum width for collector streets where no on-street parking is allowed.

*“The NAHB’s ‘Green Land Development’ cites a recommended 20-foot minimum width for collector streets where no on-street parking is allowed” (EPA 2005, 77).*

Other factors to consider in defining minimum widths for collector streets is the need for bicycle accommodations such as bike lanes (minimum four feet of pavement in each direction) or shared bicycle/motor vehicle lanes (typically 13 to 14

feet) based on a bicycle network plan. The need for on-street parking, design speed, projected motor vehicle volumes, and the need for bicycle accommodations should all be considered in defining the widths for collector streets. Communities should allow a range of collector street cross-sections with conditions established for each.



A 30 to 32-foot wide collector street with bike lanes (location unknown).

Source: Michael Rankin



This 30 to 32-foot wide collector street may be appropriate given the frequent on-street parking (Mt Pleasant, SC).

Source: The Lawrence Group



An example of a collector street that has infrequent on-street parking and too much pavement, which likely encourages speeding (Spartanburg County, SC).

Source: Upstate Forever

# STREET DESIGN: Street Width

## WHAT IS THE COST OF AN EXCESSIVELY WIDE STREET?

“Not only do excessive street widths affect the livability of a community, but they also give rise to additional costs that must be paid by homeowners. The figures cited here are for 2001 based on unit costs of contractor services for a project in northern California. For this project, a section of street 100 feet long would cost about \$9,500 to build to a width of 24 feet compared with \$13,500 for a 36-foot wide street. Paving widths are 20 feet and 32 feet, respectively, with an additional two-foot gutter on each side. Moreover, in this area where lots sell for \$300,000 per acre, land costs exceed street construction costs, even for narrower streets. Total land and construction costs for a 100-foot section of a 36-foot wide street amount to almost \$40,000 compared with \$26,000 for a narrower 24-foot wide street” (HUD, p. 80).

Cost per 100 Feet of Street		
	24-foot street	36-foot street
5-inch asphalt paving/6-inch base	\$6,800	\$10,880
6-inch curb and gutter	\$1,265	\$1,265
4-inch sidewalk	\$1,400	\$1,400
<b>Total Construction Costs</b>	<b>\$9,465</b> (\$499,752 per mile)	<b>\$13,545</b> ( \$715,176 per mile)
Land (at \$300,000 per acre)	\$16,800	\$25,200
<b>Total Cost</b>	<b>\$26,265</b> (\$1,386,792 per mile)	<b>\$38,745</b> (\$2,045,736 per mile)

Adapted from HUD, p. 80

While these costs do not correspond directly to the current cost of road building and land in the study area, the case study above does provide a rough estimate of cost savings that can be realized by reducing street widths. The primary potential savings are in the areas of paving and land costs. According to the EPA, “[if the] cost of paving a road averages \$15 per square yard, shaving even four feet from existing street widths can yield cost savings of more than \$35,000 per mile of residential street” (EPA 2005, p. 77). Some local street widths in the audit communities can be narrowed by two to six feet, depending on the circumstances, yielding significant saving in paving costs — not to mention land and other costs.



Source: Upstate Forever

An example of a street that is approximately 40 feet wide. The amount of unused pavement represents a missed cost savings opportunity for the developer of at least 8 to 10 feet (Spartanburg County, SC).



# STREET DESIGN: Curb Radii

## Curb Radii

What are minimum curb radii for residential streets?

Anderson County	Anderson	Pendleton	Williamston
not specified	25 ft	not specified	not specified
Spartanburg County	Inman	Landrum	Spartanburg
25 ft	25 ft	25 ft	not specified

Standards for minimum curb radii — the radius of the curb at an intersection of a street — provide another opportunity to reduce impervious area in new developments. The minimum curb radii specified for residential streets in the audit communities not only require more pavement than is necessary, but also make the pedestrian environment less safe and comfortable.

*“Smaller, tighter radii can slow turning traffic and make the intersection safer for pedestrians while limiting the expanse of impervious surface” (HUD 2003).*

The American Association of State Highway & Transportation Officials (AASHTO) recommends curb radii of 10 to 25 feet depending on the type of street intersection (NAHB, 2001 and

HUD, 2003). “Reducing the overall size and width of intersections can decrease the volume of stormwater runoff. . . The larger the curb radii, the larger the intersection. . . Smaller, tighter radii can slow turning traffic and make the intersection safer for pedestrians while limiting the expanse of impervious surface” (HUD, p. 83).



Small radius curb intersection (Celebration, FL).

### Recommended Minimum Curb Radii

Type of Intersection	Curb Radius
local/local	10 to 15 ft
local/collector	15 to 20 ft
collector/collector	15 to 25 ft

Source: AASHTO as cited in HUD, 2003

### Benefits of Smaller Curb Radii

- Reduced impervious surface
- Slower traffic turning speed
- Safer, more comfortable pedestrian intersections

### Potential Trade-offs of Smaller Curb Radii

- Some large vehicles may not be able to easily negotiate small curb radii on narrower streets
- May require mountable curbs in some locations



Small radii with mountable curbing on a residential street. Note tire tracks across the ramp apron (Celebration, FL).



A large truck successfully turning around a small radius curb (Miami, FL).

# STREET DESIGN: Cul-de-Sac Design

## Cul-de-Sac Radius

What is minimum cul-de-sac radius allowed?

Anderson County	Anderson	Pendleton	Williamston
35 ft	not specified	40 ft	35 ft
Spartanburg County	Inman	Landrum	Spartanburg
35 ft	35 ft	50 ft*	37 ft

\* landscaped island allowed

The standards for cul-de-sacs in the audit communities are generally good by national standard. However, they still provide significant opportunities to reduce impervious surface and development costs.

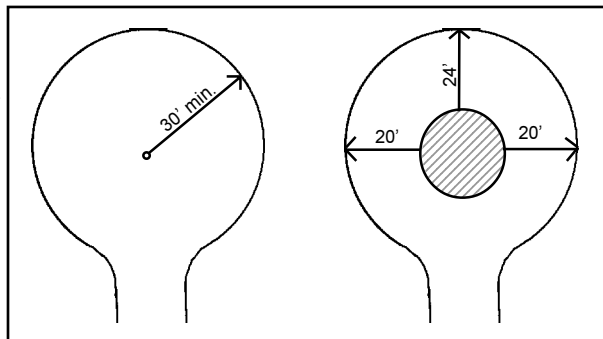
### Benefits of Small Cul-de-Sacs

- Cul-de-sacs with a radius of 30 feet can reduce the paved area by almost 50% as compared to a cul-de-sac with a 40-foot radius (Shueler, p. 144; see graph at right)
- Allowing a landscaped island in the center of the cul-de-sac can reduce the impervious area even further

### Potential Trade-offs of Small Cul-de-Sacs

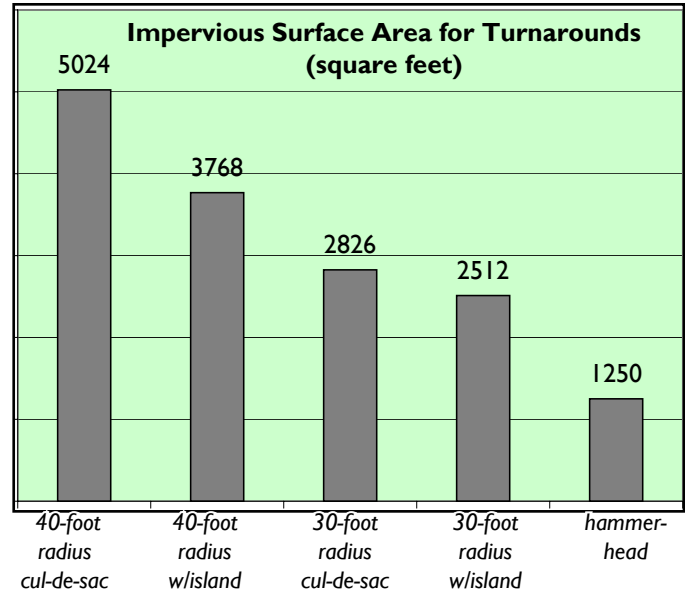
- Reducing cul-de-sac radii from 40 to 30 feet may require larger service vehicles to back up to complete a turn, however, increasing the pavement width at the end of the cul-de-sac by offsetting the island can make turning easier (see below)

Source: Metropolitan Council



A 30-foot radius will accommodate most vehicles and reduce pavement.

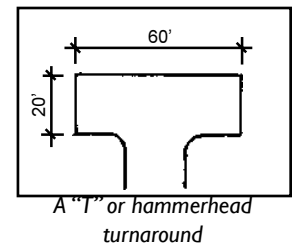
An island can be placed to allow wider lanes in rear, making turning easier.



Adapted from Schueler

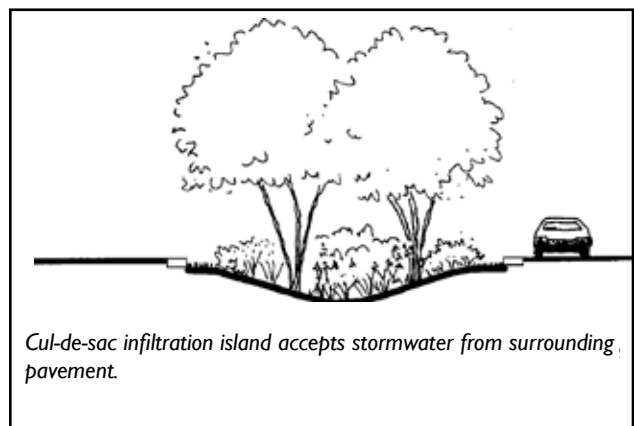
### Other Turnaround Options

Other turnaround options can reduce impervious surface even further. These include “T” (also known as “hammerhead”) or “Y” turnarounds. “A standard 60-foot by 20-foot T or Y turnaround yields a paved area only 43% as large as the smallest (30-foot radius) circular turnaround” (HUD, p. 85).



Source: Metropolitan Council

Very few of the audit communities encourage the use of such options. T and Y turnarounds are allowed in Spartanburg County, but are not allowed in most Anderson County communities. NAHB’s *Residential Streets* suggests that such turnarounds are most appropriate for dead-end streets with ten or fewer homes (p. 34) and that streets with five houses or fewer may not need a turnaround at all (p. 32).



Cul-de-sac infiltration island accepts stormwater from surrounding pavement.

Source: Metropolitan Council

# STREET DESIGN: Vegetated Open Channels/Swales

## Vegetated Open Channels/Swales

Are open channels/swales allowed?

Anderson County	Anderson	Pendleton	Williamston
yes	not specified	yes	yes
Spartanburg County	Inman	Landrum	Spartanburg
yes	yes	yes	not specified

Vegetated open channels or swales offer efficient and cost effective means of handling stormwater runoff from streets and can be a significant part of a development's overall storm drainage system, providing cost savings versus typical curb and gutter and other conventional storm drainage infrastructure. Most of the communities in this audit do allow for the use of open channels on some streets. However, none of the communities provide guidance on where such drainage is appropriate based on factors of density, topography or soil types.

“...The elimination of one mile of curb and gutter can decrease infrastructure and storm conveyance costs by approximately \$230,000” (HUD, p. 31).

In the book *Site Planning for Urban Stream Protection* — one of the most cited sources on watershed protection measures in new development — Tom Schueler argues that developers should have to show that a street is not appropriate for open channels before a plan

is approved with curb and gutter (p. 153). He lists five factors that should be used in determining when open channels are *not* appropriate:

- Longitudinal slopes greater than five percent
- Computed runoff velocities for the two year design storm event in excess of four to five feet per second
- Local climate or soils make it impossible to establish dense turf throughout the year
- Less than one foot between the water table and the proposed channel bottom
- Housing density exceeding three dwelling units per acre (although, per the Metropolitan Council, open channels may be appropriate at up to six to eight dwelling units per acre)



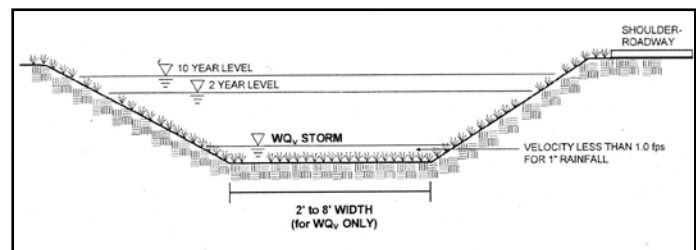
Grassed swale in an older, large-lot neighborhood. The gentle slope of the swale on the right side of the street makes for an easily maintained area that can be mowed (Spartanburg County, SC).

### Benefits of Swales versus Curb and Gutter

- Reduced infrastructure costs compared to curbing and traditional gutter and stormwater inlets (see text box; assumes \$45 per linear foot for conventional stormwater infrastructure)
- Reduced stormwater detention capacity required, since swales provide some natural infiltration
- Swales can be mowed like a lawn (as compared to ditches, which need to be maintained with machinery)

### Potential Trade-offs of Swales versus Curb and Gutter

- If not designed correctly, effectiveness for stormwater conveyance and retention may be lost
- Homeowners may fill in swales
- May require wider right-of-ways if sidewalks are to be included in the street section
- Can appear less “tidy” than curb and gutter sections if not maintained properly
- Public works departments may prefer the ease of maintenance of curb and gutter sections



The cross-section of a grassed swale from the “Maryland 2000 Stormwater Design Manual.” According to the Manual, “The side slopes shall be 3:1 or flatter; and the channel slope shall be less than or equal to 4.0%.”

# STREET DESIGN: Planting Strips and Street Trees

## Planting Strips

Are planting strips required? If so, what is the minimum width?

Anderson County	Anderson	Pendleton	Williamston
not required	not required	2 ft	not required
Spartanburg County	Inman	Landrum	Spartanburg
5 ft	6 ft	6 ft	5-10 ft

In Anderson County, only Pendleton requires a planting strip between the sidewalk and the curb and the 2-foot requirement is nominal, at best. Spartanburg County communities have good requirements for planting strips, but the requirements are somewhat arbitrary. For example, Spartanburg County requires five-foot planting strips for commercial, industrial, office and institutional uses. However, the County does not specifically require sidewalks. In the City of Landrum and the City of Inman, planting strips are only required in certain zoning districts. Most of the regulatory documents reviewed for the audit do not require or even encourage street trees. Where street trees are installed, planting strip widths should be at least six to eight feet to allow trees to thrive.

## Benefits of Street Trees

Street trees have many benefits, not the least of which is reduction of stormwater runoff and filtration of pollutants. According to the Center for Urban Forest Research, trees provide the following stormwater benefits:

- Interception of rainfall and reduction of erosion
- Increasing soil capacity for holding rainwater

In addition, trees provide several other benefits to developers, homeowners, local governments, and the environment, including:

- Shade for parked cars and pedestrians
- Protection of pedestrians from moving cars
- Reduced ground-level ozone
- Improved aesthetics (which contributes to economic value of homes and neighborhoods)
- Prolonged asphalt life due to shading of pavement, reducing the need to resurface (McPherson, et al)
- Reduced temperatures

*A typical medium-sized tree can intercept as much as 2,380 gallons of rainfall per year (Center for Urban Forestry Research).*

## Potential Trade-offs of Street Trees

- Trees planted in public right-of-ways become the responsibility of local governments or HOAs
- Roots of certain trees may heave sidewalks and asphalt over time
- Trees planted in planting strips may affect the ability to use or gain access to utilities buried in the same area

Source: Upstate Forever



A two-foot planting strip along a sidewalk is barely wide enough for grass, much less street trees, and provides little buffer from the street (Anderson County, SC).

## Benefits of Planting Strips

- Capture sheet flow from lots and sidewalks
- Provide potential location for underground utilities
- Help separate pedestrian area from street

## Potential Trade-offs of Planting Strips

- Planting strips add to right-of-way width, which can add to grading/clearing area and cost of development



Street trees in an eight-foot planting strip (Germantown, TN)

Source: The Lawrence Group

## Sidewalk Requirements

Where are sidewalks required?

Anderson County	Anderson	Pendleton	Williamston
not specified	in PD's	all subdivisions	not specified
Spartanburg County	Inman	Landrum	Spartanburg
not specified	not specified	not specified	not specified

Sidewalks are another element of street infrastructure that can be modified to reduce stormwater runoff and promote infiltration. However, like roads, determining when to provide sidewalks should be based first and foremost on transportation needs (EPA, 2005 p. 78). Also, like other transportation infrastructure, sidewalk requirements should be based on the development context including density, street type and proximity to destinations. On certain streets, a sidewalk on one side of a street may suffice. Other streets may need sidewalks on both sides. Still other streets may need no sidewalks at all. The key to reducing the impervious surface impact

*The key to reducing the impervious surface impact of sidewalks is ensuring that they are not placed in areas where they may not be warranted; and that they provide safe, comfortable, and direct pedestrian connectivity.*

of sidewalks is ensuring that they are *not* placed in areas where they may not be warranted; that they provide safe, comfortable, and direct pedestrian connectivity; and, finally, that the width of the sidewalk is appropriate to the development context.

In the City of Pendleton and the City of Anderson, sidewalk requirements are only required in new residential areas. In Anderson sidewalks are only required in Planned Developments. In Pendleton they are required in all new subdivisions on both sides of the street, regardless of density or street type. The other audit communities do not specify whether sidewalks are required.

In nearby Greenville and Pickens Counties, alternative pedestrian networks — paths that serve destinations within neighborhoods, but do not necessarily follow the street network — may be used as an alternative to sidewalks. This is a good alternative for reducing impervious surfaces while providing opportunities for walking and biking.



Source: The Lawrence Group

Pedestrian paths may supplement sidewalks or be used instead, as in this crushed-gravel walkway serving mailboxes and an alley (Mt. Pleasant, SC).

### Sidewalk Requirements Based on Street Type

Sidewalk requirements may be tied to the function of each street rather than to density, as density may not reflect the differences among streets in a development. This approach is used in Clemson, SC, where the sidewalk requirements are based on street type — cul-de-sac, residential access, residential subcollector, collector — which is related to traffic volume and the number of houses served by a given street.

#### Clemson Sidewalk Requirements

Street Type	# of Dwelling Units	Sidewalk Requirement
Cul-de-sac	5 or fewer	none
Cul-de-sac	25 single-family/43 multi-family	one side
Access	25 single-family/43 multi-family	one side
Sub-collector	62 single-family or multi-family	both sides
Collector	125 +	both sides

Source: City of Clemson Land Development Regulations

# STREET DESIGN: Sidewalks

## Sidewalk Requirements Based on Density

If development density is the desired basis for sidewalk requirements, various threshold categories should be considered to reflect the greater need for sidewalks at higher densities and in different land use contexts.

The following sidewalk guidelines based on density and land use are from a Federal Highway Administration study:

Street Type/density	Sidewalk Requirement
< 1 dwelling units/acre	none
1-4 dwelling units/acre	one side
> 4 dwelling units/acre	both sides
Commercial areas	both sides
Arterials/collectors	both sides

Source: Ewing, R. *Best Development Practices*, p. 78

## Benefits of Sidewalk Requirements

- Street-type based requirements accurately reflect the transportation context of a sidewalk
- Density/land use-type requirements can work well in developments that are fairly uniform throughout

## Potential Trade-offs of Sidewalk Requirements

- Neither type of requirement considers the proximity to key destinations or connectivity
- Typical requirements do not holistically provide for pedestrian connectivity in an area
- A hybrid approach to sidewalk requirements will be more complex to design and administer

## Sidewalk width

Sidewalk width is another issue that should be approached based on development context. Appropriately sized sidewalks in some areas are better than sub-standard sidewalks on all streets that are not as likely to be used. On streets where traffic volumes are low, pedestrians will walk in the street rather than walk on sidewalks that are too narrow. The communities in this audit that require sidewalks mandate four-foot wide sidewalks, but include no guidance for when wider dimensions should be used.



Source: Michael Rankin

A narrow sidewalk — four feet or less in this case — does not typically provide enough space for two adults to comfortably walk side by side (location unknown).

Five feet is the typical width needed for two adults to comfortably walk side by side. The Institute of Traffic Engineers (ITE) and the Federal Highway Administration (FHWA) recommend five feet as a minimum sidewalk width. Wider sidewalks are necessary in areas where higher volumes of pedestrian activity is expected, such as near schools, commercial centers and other major destinations.

While the notion of wider sidewalks appears to contradict the goal of reducing impervious surfaces, the provision of high quality pedestrian facilities that will actually attract and encourage pedestrian travel as a substitute for automobile trips is consistent with the goals of low impact development. Every motor vehicle trip that can be replaced with another mode of travel will ultimately have water quality benefits because fewer pollutants will end up in the local waterways and because less parking and street infrastructure will be required.

*The provision of high quality pedestrian facilities that will encourage the replacement of some automobile trips is consistent with the goals of low impact development.*

Sidewalks and pedestrian paths can also be paved with permeable materials to decrease the overall impervious cover in new development. “When properly maintained, alternative materials such as brick, compacted stone dust, and wood chips all accommodate safe passage of pedestrians and bicycles, and in most cases, still meet the American with Disabilities Act (ADA) requirements” (HUD, p. 92).

# PARKING

***“There is no other kind of surface in a watershed that produces more runoff and delivers it faster than a parking lot. . . Given the prevalence of parking lots in our urban landscape and the environmental harm they cause, we need to fundamentally change the way that parking lots are sized and designed” (Zielinski).***



Source: Upstate Forever

*This page intentionally left blank*



# PARKING: Parking Requirements

## Parking Ratios

Minimum Parking Ratios for Professional Offices (per 1,000 sq. ft.)

Anderson County	Anderson	Pendleton	Williamston
3.3	4	3.3	3.3-5
Spartanburg County	Inman	Landrum	Spartanburg
2.8	2.8	2.8	1.3

Minimum Parking Ratios for Shopping Centers (per 1,000 sq. ft.)

Anderson County	Anderson	Pendleton	Williamston
3.3	4	5.5	5
Spartanburg County	Inman	Landrum	Spartanburg
4	5	5	4-5

The size of parking lots begins with minimum parking requirements that specify the number of parking spaces that must be provided based on the size of the building served. While the requirements in the audit communities are commendably low, there is wide variation in the parking requirements across the two adjacent counties and even within each county.

For example, professional office minimum parking requirements range from approximately four spaces per thousand square feet in Anderson up to just over one per thousand in the City of Spartanburg. This difference could result in parking lots almost three times as large in Anderson as they would be in Spartanburg. The requirements for shopping centers are more consistent among the audit communities (generally around four to five spaces per thousand square feet), but even that range exhibits a 20% difference from one town to another. Between Anderson County and the Town of Pendleton, there is a 40% difference in required parking for shopping centers.

Is it possible that parking utilization at offices and shopping centers differs that dramatically (and that specifically) from one community to the next? More likely, the variation in requirements is simply a product of the wide variation in formulas and models used to determine parking needs, none of which are anything more than rough “guesstimates.”

Donald Shoup, a nationally respected economist and pre-eminent researcher on the topic of parking demand, has noted serious problems with such estimates. First, one of the most commonly used sources for parking demand — the Institute of Transportation Engineers’ trip generation standards — are based on a one-size-fits-all scenario that does not take into account the unique locational characteristics of businesses in the suburbs versus those in urban areas. In addition, these standards ignore the fact that, depending on the use and the location, a significant portion of trips may be made using a mode that does not require parking (such as mass transit, bicycle or pedestrian travel).

“[4-4.5 spaces per 1000 sq. ft.] provide for a surplus of parking spaces during all but 19 hours of the more than 3,000 hours per year during which a shopping center is open” (ULI/ICSC).

Second, trip generation estimates are based on peak demand, which logically ought to be used to set *maximum* rather than minimum requirements. The Urban Land Institute (ULI) and the International Council of Shopping Centers (ICSC), for example, recommend 4 to 4.5 spaces per thousand square feet for shopping centers, depending on the size of the center. These numbers are based on *peak* demand at centers across the country (p. 3). According to their own analyses, the ULI/ICSC parking ratios “provide for a *surplus* of parking spaces during all but 19 hours of the more than 3,000 hours per year during which a shopping center is open” (p. 3; emphasis added).



Unused parking at a big-box store (Anderson County, SC).

# PARKING: Parking Requirements

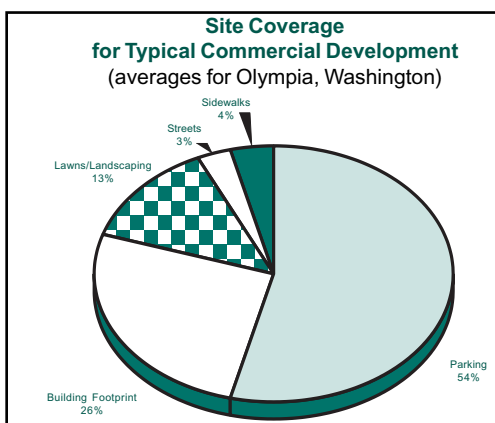
Shoup suggests leaving the issue of estimating parking demand to the people who have the most financial stake in the process: the people who own, manage and develop property.

*If cities de-require off-street parking, developers, property owners, and businesses can judge for themselves how much off-street parking they want to provide for their employees and customers. They will have every reason to make the right decision because they will pay for their own mistakes—and will prosper if they choose wisely. Urban planners who establish off-street parking requirements, in contrast, have no financial incentive to get things right [and, therefore, often over estimate demand in an effort to play it safe]. . . Urban planners simply do not know how many parking spaces each business, apartment house, or church in each different location needs. . .” (p. 497)*

The City of Spartanburg recognizes this issue to a certain degree because they waive the parking requirements in their B-2 business district. In this case, planners and elected officials have decided to let businesses themselves decide how much parking to provide.

Setting parking minimums that are generally below market standards as well as maximums helps limit the overbuilding of parking areas. To use the shopping center example, a town or county might set a minimum of two and a maximum of four spaces per thousand square feet of building for shopping centers. In most cases, the audit communities' current established parking *minimums* would serve as appropriate parking space maximum ratios.

Source: EPA, 2006



For typical commercial development, parking occupies more than half of development sites — sometimes as much as twice the amount of area devoted to buildings.

## Benefits of Reduced Parking Requirements

- Reduced impervious cover
- Increased development and/or open space potential
- Reduced infrastructure and maintenance costs
- Easier redevelopment of vacant structures that may not meet existing parking requirements

## Potential Trade-offs of Reduced Parking Requirements

- Some tenants may not provide enough parking resulting in spillover to adjacent businesses and neighborhoods
- Some businesses may provide excess parking even if minimums reduced; maximums may also be needed
- Marketability of property for future uses may be limited if flexibility in parking is limited

## Other Options for Reducing Parking Requirements

- Reduce parking requirements in mixed-use, pedestrian-oriented, and/or transit-served areas
- In certain districts, use parking maximums only and no minimums
- Allow on-street parking to count towards minimum parking requirements, especially in non-residential, mixed-use, and multi-family developments
- Reduce parking requirements for residential uses serving senior, disabled, and low-income tenants



Source: Upstate Forever

Unused parking at a local strip mall (Spartanburg County, SC).

# PARKING: Parking Requirements

## Shared parking

Is shared parking allowed? What percent may be shared?

Anderson County	Anderson	Pendleton	Williamston
yes; 50%	yes; 100%	no	no
Spartanburg County	Inman	Landrum	Spartanburg
yes; 50%	yes; 50%	yes; 100%	yes; 100%

Another way to reduce the extent of paved areas for parking is to allow and encourage shared parking among uses that have different parking needs at various times of the day. For example, restaurants and theaters tend to need more parking at nights. These types of uses can share parking with uses such as offices which tend to have peak parking needs during the day.

Almost every community in the audit (the exceptions being Pendleton and Williamston) allows shared parking to some degree. The differences in the various communities' regulations on shared parking have to do with the amount that may be shared. About half of the communities allow 100% of a complementary land use's parking to be shared. The other half only allow up to 50% to be shared. While some sharing is better than none at all, this is another instance where the determination of how much parking may be shared might be better left up to the business owners and developers rather than the planners.

A very simple and straightforward regulation on shared parking is used by Anderson, Landrum and Spartanburg: If activities sharing combined parking are not in operation at the same time, each parking space may be counted for each activity.

While almost all of the audit communities *allow* shared parking, none of them encourage it through incentives. Incentives to utilize shared parking could include reducing minimum requirements, priority processing of permits, or other development incentives. For example, the City of Tualatin, Oregon provides a reduction in required parking of up to 25% if parking spaces are shared (EPA, 2005, p. 69).

## Benefits of Shared Parking

- Reduced impervious cover
- Increased development and/or open space potential
- Reduced infrastructure and maintenance costs
- Easier infill development and redevelopment of vacant structures that may not meet existing parking requirements or have space for on-site parking

## Potential Trade-offs of Shared Parking

- On-going maintenance may be problematic if parties do not share responsibilities as required
- Some tenants may be hesitant about sharing parking

## On-street Parking as Shared Parking

On-street parking is one of the most widely available and most efficient ways to share parking, yet is also one of the most underutilized parking resources. None of the audit communities allow on-street parking to count towards required minimum parking ratios.

*“Providing on-street parking makes use of an asset that is technically paid for and shared, and thus adds no additional cost to the developer or user” (EPA, 2005).*

On-street parking can reduce the amount of parking that each individual developer has to provide on-site. It is also an effective and economical means of utilizing pavement resources and sharing parking among adjacent and complementary land uses:

*...supplying parking in a lot requires more impervious surface to provide drive aisles, entrances and ramps. On-street parking does not require this extra infrastructure, thus lowering the amount of land, and thus the cost, to provide parking (EPA, 2005, p. 68).*

On-street parking can be encouraged by allowing it to count towards parking requirements as mentioned above, or even by requiring it in appropriate locations. It is an especially useful tool on arterials or other streets that may have excess width and/or excess speeds, since on-street parking has also been shown to reduce traffic speeds.

# PARKING: Parking Lot Design

In addition to parking ratios, there are several aspects of parking lot design that can affect the size and the amount of impervious area devoted to parking. These include the dimensions of parking spaces and parking aisles, the use of pervious paving materials, and the utilization of landscaping for stormwater detention.

## Parking Stalls

What is the minimum allowed parking stall width?

Anderson County	Anderson	Pendleton	Williamston
8.5-9 ft	9 ft	9 ft	8.5-9 ft

Spartanburg County	Inman	Landrum	Spartanburg
8.5-9 ft	9 ft	9 ft	9 ft

Parking stall widths in the audit communities are fairly consistent, with most requiring a minimum of nine feet — a reasonable dimension that will accommodate most private motor vehicles in a variety of parking contexts. However, this minimum dimension can be safely reduced by over 5% to 8.5 feet, especially when parking is expected to have lower turnover, such as parking for residents, students, and employees.

The Parking Consultants Council recommends the following minimum parking stall dimensions:

Typical Parking Characteristics	Stall width
Low turnover for employees, students, etc.	8.5 ft
Low- to moderate-turnover visitor spaces (offices, regional center retail, long-term parking at airports, etc.)	8.5 to 8.75 ft
Moderate- to higher-turnover visitor parking: community retail, medical visitors, etc.	8.75 to 9.0 ft

Source: Dimensions of Parking, 4th Edition

## Benefits of Smaller Parking Stalls

- Less land used up for parking
- Increased pervious areas and/or more built area
- Reduced infrastructure cost

## Potential Trade-offs of Smaller Parking Stalls

- Assigning various stall widths to different uses is more complex for regulation and enforcement than a one-size fits all approach
- Parking lots may have to be redesigned if the usage pattern of a development changes

## Parking Module

What is the minimum allowed parking module width?

Anderson County	Anderson	Pendleton	Williamston
60-62 ft	62 ft	not specified	61-63 ft

Spartanburg County	Inman	Landrum	Spartanburg
60 ft	64 ft	64 ft	60 ft

Parking module width — the width of two parking rows plus the access/drive aisle — is another parking lot dimension that can be varied to reduce parking lot area and thus impervious cover related to parking. Some of the audit communities require a minimum of 60 feet for a 90 degree (vs. angle parking) module, while others require up to 64 feet.

Sixty feet is a nationally accepted width for parking modules and is the minimum width recommended by the Urban Land Institute and the National Parking Association (2001, p. 46). A 60-foot parking module width represents a more than six percent reduction over a 64-foot width, space that can be devoted to increased landscaped/pervious areas and/or more development potential on a project site.

*Parking areas can be reduced by up to 16% by decreasing the minimum dimensions required for parking stalls and parking drive aisles to nationally accepted standards.*

Parking modules can even be as narrow as 58 feet if vehicles are allowed to overhang into planted areas between parking rows using wheel stops and at grade landscaping.

## Benefits of Smaller Parking Modules

- Parking areas can be smaller, thus reducing cost and possibly increasing development potential
- Space savings can be used for pervious areas

## Potential Trade-offs of Smaller Parking Modules

- The 60-foot module is designed to accommodate vehicles up to 17 feet long, so longer vehicles will have to maneuver more carefully (the longest SUVs and pickup trucks are 18 to 21 feet long).

# PARKING: Parking Lot Design

## Pervious Pavement for Parking Areas

Are pervious paving materials allowed/required for parking areas?

Anderson County	Anderson	Pendleton	Williamston
not specified	in certain cases	allowed	no
Spartanburg County	Inman	Landrum	Spartanburg
no	no	not specified	not specified

When parking ratios and parking dimensions have been reduced as far as possible, pervious paving is another tool for mitigating the stormwater impact of paved parking areas.

*“Porous pavements’ ability to substitute for storm drains can make them 12-38% less expensive than conventional pavements” (Ewing, p.109).*

Only the City of Anderson and the Town of Pendleton specifically allow pervious paving for parking areas. In the case of Anderson, grass may be used for the surface when parking facilities are constructed for outdoor athletic facilities

or outdoor theaters with 1,500 or more permanent seats. Also, alternative surfaces which allow for greater water infiltration are permitted in floodplain areas. In Pendleton, gravel is allowed as a surface in all off-street parking spaces except for one and two-family dwelling units and in those instances where residential dwelling units are being converted to commercial uses which require less than five (5) parking spaces. None of the communities included in the audit actually require pervious materials for parking surfaces.

The SC Department of Health and Environmental Control recommends the following criteria for using pervious pavement (p. 151):

- Not recommended on slopes greater than five percent and best with slopes as flat as possible
- Minimum setback from water supply wells: 100 feet
- Minimum setback from building foundations: 10 feet down gradient, 100 feet upgradient
- Not recommended where wind erosion supplies significant amounts of sediment
- Use on drainage areas less than 15 acres
- Minimum soil infiltration rate: 0.3-0.5 inches/hour

Given these criteria, the applicability of pervious pavement is somewhat limited in the Upstate, as the clay soils tend to be fairly impervious. Therefore, effective use of pervious pavement in this region will often require some excavation of native soil and replacement with a pervious substrate. Pervious pavement will be most viable in areas where land is expensive, as the value of land freed up by the detention function of pervious pavement can, under such circumstances, offset the extra cost of substrate preparation.



A parking lot with Grasscrete™ interlocking pavers. Bordered by a stream and with no option for piped drainage, this parking lot has been draining naturally for 20 years (location unknown).

Source: Bomanite Corporation

### Benefits of Pervious Pavement for Parking Areas

- Increases stormwater infiltration capacity
- Reduces the amount of and cost for conventional stormwater infrastructure required on a site

### Potential Trade-offs of Pervious Pavement for Parking Areas

- Requires more on-going maintenance than conventional asphalt or concrete pavements
- May not be suitable in high-traffic or high turnover areas
- May require excavation with certain soil types, especially soils with high clay content
- May have higher up-front costs (up to 10% more than conventional impervious pavements (Ewing, p.109))

# PARKING: Parking Lot Landscaping

## Parking Lot Landscaping

Under what conditions is parking lot landscaping required?

Anderson County	Anderson	Pendleton	Williamston
new lots	new lots; 25+ spaces	new lots	new lots

Spartanburg County	Inman	Landrum	Spartanburg
new lots; 20+ spaces	new lots; 20+ spaces	new lots	new lots; 4+ spaces

What is the amount (and/or area) of landscaping required?\*

Anderson County	Anderson	Pendleton	Williamston
1 tree/20 spaces (~180 sq ft/tree)	1 tree/7.5 spaces (not specified)	1 tree/15 spaces (50 sq ft/tree)	1 tree/20 spaces (not specified)

Spartanburg County	Inman	Landrum	Spartanburg
1 tree/20 spaces (not specified)	not specified (10% of area)	not specified (10% of area)	1 tree/12 spaces (180 sq ft/tree)

\*Area required is specified in parenthesis

All of the communities in the audit require parking lot landscaping. The circumstances under which landscaping is required and the amount specified vary greatly from community to community, with some communities requiring landscaping for all new parking lots and others mandating it only when parking lots exceed a certain size. These thresholds range from four spaces in the City of Spartanburg to twenty-five spaces for

the City of Anderson. (Approximately 300 square feet of pavement is required for each parking space and its attendant drive aisles. Therefore, a parking lot of 25 spaces is about 7,500 square feet or almost 0.2 acres.)

*A one acre asphalt parking lot produces 16 times as much stormwater runoff in a one-inch rainstorm as a one acre meadow (Scheuler).*

The amount of landscaping required across the audit communities varies from 1 tree per 7.5 spaces in Anderson to 1 tree per 20 spaces in Williamston. A 60-space parking lot would require three to eight trees depending on the community in which it was built. The metric used to require landscaping also differs, however, with some communities requiring a minimum area. A 60-space parking lot in Pendleton, for example, would only require 200 square feet of landscaping whereas Inman and Landrum would require roughly 1,800 square feet. One tree per 10-12 spaces with at least 81 square feet of area per tree are considered good standards nationally.



Source: Upstate Forever

Limited landscaping as well as grading that slopes away from landscaped areas provides little opportunity for natural infiltration of stormwater (Anderson County, SC).

### Benefits of Parking Lot Landscaping

- Increased pervious areas in parking lots
- Reduction in the amount and cost of other stormwater infrastructure (if designed to capture stormwater)
- Increased attractiveness of developments, potentially increasing revenues
- Lower temperature for stormwater runoff due to shade provided by trees
- Extended asphalt life and reduced maintenance and repaving costs
- Cooling relief for cars



Source: Upstate Forever

While increased parking lot landscaping provides many benefits, the curbed islands result in limited storm water retention potential (Spartanburg County, SC).

# PARKING: Parking Lot Landscaping

## Potential Trade-offs of Parking Lot Landscaping

- Adds costs for design, construction and maintenance (if designed to capture stormwater, these costs may be offset by a reduction in the amount of additional stormwater infrastructure required)
- If not maintained correctly, may reduce visibility into developments and create safety concerns
- Landscaping requirements may necessitate additional land or reduce development potential on a site
- Stormwater and other benefits are dependant on the type of landscaping provided; while large mature trees provide the most benefit in terms of shade and water retention, they are more expensive, and not all ordinances specify or require the most beneficial types of landscaping
- Parking lot landscaping that is fully curbed provides limited stormwater retention benefit



Source: Unknown

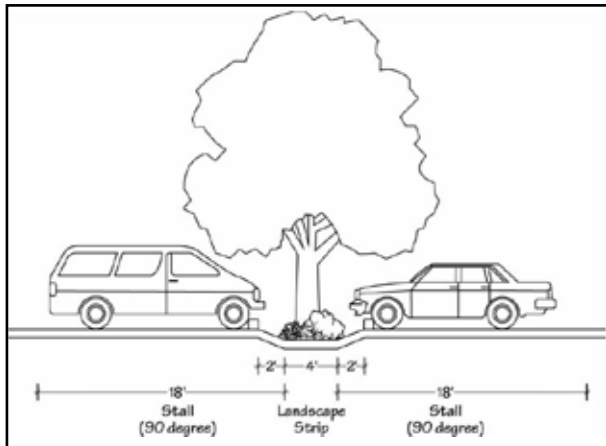
Parking lot landscape island retrofitted as a rain garden. Note curbing that has been cut to allow sheet flow into the landscaped area (Landover, MD).

## Benefits of Bio-retention Landscape Areas

- Capture stormwater runoff from paved areas
- Reduced stormwater infrastructure costs
- Require less maintenance and water than conventional landscaped areas, which may require irrigation
- Can be retrofitted as bio-retention areas from existing landscaped areas (Metro Council, p. 3-182)

## Potential Trade-offs of Bio-retention Landscape Areas

- Increased costs for design and construction (these costs may be offset by reduction in the amount of additional stormwater infrastructure required)
- May require additional landscape maintenance in the initial years of operation
- Susceptible to clogging by sediment if pre-treatment, such as filter strips, is not part of initial design (Metro Council, p. 3-182)



Source: City of Portland, OR

An example of curbless parking lot landscaping that allows for the retention of water while allowing two feet to count towards stall length thus limiting impervious area and stormwater runoff.

## Bio-retention Areas in Parking Lots

None of the audit communities require or provide incentives for bio-retention areas in parking lots. At the same time, none of the audit communities require curbed landscaped areas. Uncurbed landscaped islands potentially provide for informal retention areas that can capture sheet flow of stormwater.



Source: The Lawrence Group

A bio-retention parking lot median. Note the curbless edges that allow sheet flow run off to enter the retention area (Huntersville, NC).

*This page intentionally left blank*



# DRIVEWAYS, SETBACKS & ALLEYS

***“Driveways can account for as much as 20% of the impervious cover in a typical residential subdivision” (CWP).***

***“By specifying narrower driveways, promoting permeable paving materials, and allowing two-track driveways or gravel and grass surfaces, communities can sharply reduce the typical 400 to 800 square feet of impervious cover created by each driveway” (Kwon).***

Source: The Lawrence Group



Narrow alley with permeable edges (Low Country, SC)

*This page intentionally left blank*

# DRIVEWAYS, SETBACKS & ALLEYS

Driveways can account for as much as 20% of the impervious cover in a typical residential subdivision (Center for Watershed Protection, as cited in HUD p. 91). There are several means to reduce the amount of impervious surface created by driveways and to mitigate the stormwater impact of driveways. These include reducing required building setbacks, allowing and encouraging pervious driveway pavements and other driveway alternatives such as shared driveways and alleys.

## Residential Setbacks

What are minimum setbacks for local street/collector streets?

Anderson County	Anderson	Pendleton	Williamston
20/40 ft	15-50* ft	25-40* ft	15-35* ft
Spartanburg County	Inman	Landrum	Spartanburg
20/30 ft	20-40* ft	10-30* ft	15-40* ft

\*Indicates a range, which is dependent upon zoning

Driveways should provide at least 20 feet of length beyond the right of way so that parked cars do not hang into the public realm, especially where sidewalks are present. However, the front facades of houses (not including garages) can be as close as 10 to 15 feet from the right of way. Houses fronting on collectors may need to be set back further, but, if collector streets are designed to be low speed and do not carry excessive volumes, residential setbacks can be the same as on lower level streets. Half of the communities in the audit require setbacks of 20 feet or more on local streets and up to 40 feet for collector streets.

*Driveways can account for as much as 20 percent of the impervious cover in a typical residential subdivision (Center for Watershed Protection).*

## Benefits of Reduced Setbacks

- Allows for shorter driveways, which reduce impervious cover and costs
- Allows for shorter sidewalk lengths between house and street, which also reduces impervious cover and costs
- Creates more intimate, pedestrian friendly streets
- Allows more private area in rear yards for recreation
- If front facades (not including garages) are set back less than 20 feet, the appearance of “garage-

dominated” streetscapes can be avoided

- Where no sidewalks are required, driveways can be even shorter

## Potential Trade-offs of Reduced Setbacks

- Shorter driveways may mean that cars and garages will be closer to the public realm of the sidewalk and street
- Double-stacked cars in a shorter driveway may result in cars hanging into the right-of-way and potentially over the sidewalk



Source: The Lawrence Group

A 10-foot setback makes for a short front walk, an intimate and pedestrian-friendly streetscape, and more private space in the rear yard. Note the grass strip in the driveway (Mt. Pleasant, SC).

## Pervious Driveway Alternatives

Are pervious pavements allowed/required for residential driveways?

Anderson County	Anderson	Pendleton	Williamston
not specified	not specified	not specified	not specified
Spartanburg County	Inman	Landrum	Spartanburg
not specified	not specified	not specified	not specified

Pervious paving can reduce the stormwater impact of driveways by capturing water from the driveway (as well as from rooftops). While none of the communities specifically prohibit pervious pavements, none require or encourage them as an option.

Pervious surfaces for driveways can range from grass strips in the center of the driveway (known as “two-track” driveways) to gravel or stone. These options have varying levels of installation cost, maintenance cost and permeability.

# DRIVEWAYS, SETBACKS & ALLEYS

## Cost/Benefits of Various Pavement Options

Material	Initial Cost	Maintenance Cost	Water Quality Benefits
asphalt/concrete	medium	low	low
pervious concrete	high	high	high
porous asphalt	high	high	high
turf block	medium	high	high
brick	high	medium	medium
natural stone	high	medium	medium
two-track drive	medium	low	medium
concrete paver	medium	medium	medium
cobbles	low	medium	medium
gravel	low	medium	high
wood mulch	low	medium	high

Adapted from: Bay Area Stormwater Management Agencies Association as cited in HUD, p. 93.

## Benefits of Pervious Driveways

- More groundwater recharge from reduced driveway runoff
- Reduced runoff of pollutants such as motor oil
- Can be cheaper than conventional pavements
- Reduction in stormwater infrastructure

## Potential Trade-offs of Pervious Driveways

- Pervious pavements require more on-going maintenance than impervious ones

## Shared Driveways and Alleys

### Are residential alleys permitted?

Anderson County	Anderson	Pendleton	Williamston
not specified	no	yes	not specified
Spartanburg County	Inman	Landrum	Spartanburg
not specified	not specified	not specified	no

Shared driveways and alleys create efficiencies in paved surfaces because they allow one paved area to serve more than one building. None of the audit communities specifically mention shared driveways, but none specifically prohibit them either. They are not encouraged with incentives.

Alleys are specifically mentioned in three of the audit communities. However, of the three communities that regulate alleys, only Pendleton permits them in residential development.



A shared driveway in the Redfearn development (Simpsonville, SC).

Source: Upstate Forever

## Benefits of Shared Driveways and Alleys

- Provide efficiencies in land and infrastructure, allowing greater development potential, reduced costs, and reduced impervious surface
- When lots are 50 feet wide or less, alleys provide more buildable area per parcel and require no more paved area than individual driveways on each lot
- Alleys provide additional emergency access to lots

## Potential Trade-offs of Shared Driveways and Alleys

- Communities may not want to accept alleys as public streets
- Some home buyers are leery of the shared easements required for private alleys or shared driveways



An alley with grass median and pervious parking pads (Vancouver, BC).

Source: Puget Sound Action Team

# **APPENDIX A: Anderson County Audit of Pavement Standards**

*This page intentionally left blank*

**ANDERSON COUNTY AUDIT OF PAVEMENT STANDARDS: SUMMARY**

Development Feature/Standard	ANDERSON COUNTY		ANDERSON		PENDLETON		WILLIAMSTON	
	Measure	Points	Measure	Points	Measure	Points	Measure	Points
<b>Street Width</b> (17 points)								
Minimum pavement width in low-density residential development ( $\leq 22 = 2pts$ ; $\leq 20 = 4pts$ )	20 ft	4	-	-	22 ft	2	20 ft	4
Cul-de-sac street minimum pavement width ( $\leq 22 = 2pts$ )	20 ft	2	-	-	24 ft	0	20 ft	2
Manufactured Home Park street minimum pavement width ( $\leq 22 = 2pts$ )	-	0	-	0	24 ft	0	-	0
Alley minimum pavement width (residential/commercial) ( $\leq 15 = 3pts$ ; $\leq 20 = 1pt$ )	-	0	20 ft	1	18 ft	1	-	0
Residential alleys permitted? (yes = 2 pts)	-	0	No	0	Yes	2	-	0
Collector street minimum pavement width ( $\leq 24 = 3pts$ )	24 ft	3	-	0	32 ft	0	24 ft	3
Curb radii for residential streets ( $\leq 20 = 1pt$ ; $\leq 15 = 3pts$ )	-	0	25 ft	0	-	0	-	0
<b>Right-of-Way Width</b> (5 points)								
Minimum ROW width for residential street? ( $\leq 45 = 3pts$ ; $\leq 50 = 1pt$ )	50 ft	1	40 ft	3	50 ft	1	50 ft	1
Utilities allowed under paved section of street? (yes = 2 pts)	Yes	2	-	0	-	0	Yes	2
<b>Cul-de-Sacs</b> (9 points)								
Minimum radius allowed for cul-de-sacs? ( $\leq 35 = 3pts$ )	35 ft	3	-	0	40 ft	0	35 ft	3
Can landscaped island be created within cul-de-sac? (yes = 3 pts)	-	0	-	0	-	0	-	0
Are alternative turnarounds such as "hammerheads" allowed? (yes = 3 pts)	-	0	-	0	In certain cases	1	-	0
<b>Vegetated Open Channels/Swales</b> (4 points)								
Are open channels/swales allowed for some residential streets? (yes = 3 pts)	Yes	3	-	0	Yes	3	Yes	3
Design criteria for swales (dry swales, biofilters, or grass)? (yes = 1 pts)	Yes	1	-	0	No	0	Yes	1
<b>Parking Ratios</b> (18 points)								
Minimum parking ratio for professional office building (per 1000 sf) ( $\leq 3 = 4pts$ ; $\leq 4 = 2pts$ ; $< 5 = 1pt$ )	3.3	2	4	2	3.3	2	3.3-5	1.5
Minimum parking ratio for shopping centers (per 1000 sf) ( $\leq 3 = 4pts$ ; $\leq 4 = 2pts$ ; $< 5 = 1pt$ )	3.3	2	4	2	5.5	0	5	0
Minimum parking ratio for multifamily dwellings (per unit)? ( $< 2 = 3pts$ )	2	0	1-2.5	3	2	0	2	0
Are parking requirements set as maximums? (yes = 4 pts)	No	0	No	0	No	0	No	0
Are parking requirements reduced/waived in CBD? (yes = 3 pts)	N/A	0	No	0	No	0	Yes	3
<b>Shared Parking</b> (6 points)								
Is shared parking allowed? (yes = 3 pts)	Yes	3	Yes	3	Yes	3	No	0
What percentage of parking may be shared? (100% = 3 pts; $\leq 100\% = 1pt$ )	50%	1	100%	3	100%	3	-	0
<b>Parking Lot Design</b> (8 points)								
What is the minimum stall width for a standard parking space? ( $\leq 9 = 1pt$ )	8.5-9 ft	1	9 ft	1	9 ft	1	8.5-9 ft	1
Minimum width for 2 rows of parking and drive aisle? ( $\leq 60 = 3pts$ )	60-62 ft	0	62 ft	0	60 ft	3	61-63	0
Smaller dimensions allowed for compact cars? What % of spaces? (yes = 1 pts)	Yes; 30%	1	No	0	No	0	Yes; 10%	1
Are pervious materials allowed/required for parking areas? (req'd: 3 pts; allowed: 1 pt)	-	0	Allowed in certain cases	1	Yes	1	No	0
<b>Parking Lot Landscaping</b> (17 points)								
Parking lot landscaping required? (yes = 3 pts)	Yes	3	Yes	3	Yes	3	Yes	3
Applicability of above (new lot and/or expanded lots) (all = 4pts; $\leq 15 spaces = 2pts$ ; $> 15 spaces = 1pt$ )	-	1	25	1	All	4	-	1
Required planting areas ( $< 1 tree / 10 spaces = 4pts$ ; $\leq 1/15 = 2pts$ ; $> 1/15 = 1pt$ )	20	1	See Comments	1	15	2	20	1
Are planting areas required to be curbed? (no = 3 pts)	-	0	-	0	-	0	-	0
Bioretention or other stormwater practices required/ encouraged? (yes = 3 pts)	-	0	-	0	-	0	-	0
<b>Sidewalks and Planting Strips</b> (9 points)								
Are sidewalk requirements context sensitive? (yes = 1 pt)	-	0	Yes	1	Yes	1	No	-
Planting strip required between sidewalk and curb? ( $> 6 ft = 4pts$ ; $< 6 ft = 2pts$ ; $< 4 ft = 1pt$ )	-	0	-	0	2	1	No	-
Are street trees required in the planting strip? (yes = 3 pts)	-	0	No	0	-	0	No	-
Can alternate pedestrian networks be substituted for sidewalks? (yes = 1 pt)	-	0	-	0	-	0	-	0
<b>Driveways</b> (7 points)								
Pervious paving material for residential driveways (required = 3 pts; allowed = 1 pt)	-	0	-	0	-	0	No	0
Residential front setbacks (minimum) ( $< 20 = 4pts$ ; $= 20 = 2pts$ )	20 ft	2	15 ft	4	25 ft	0	15	4
<b>TOTAL POINTS</b> (100 possible points)		<b>36</b>		<b>29</b>		<b>34</b>		<b>34.5</b>

# **Anderson County: Individual Audits**



*This page intentionally left blank*

## Anderson County

Development Feature/Standard	Measure or Yes/No	Points	Comments
<b>Street Width (Land Use Ordinance Sec. 38-374)</b>			
Minimum pavement width in low-density residential development ( $\leq 22 = 2pts$ ; $\leq 20 = 4pts$ )	20 ft	4	Minimum width could be as low as 16-18 feet. Streets as narrow as 18 feet (pavement only or 20-22 ft with curb and gutter) can accommodate one side parking.
Cul-de-sac street minimum pavement width ( $\leq 22 = 2pts$ )	20 ft	2	
Manufactured Home Park street minimum pavement width ( $\leq 22 = 2pts$ )	-	0	Not specified
Alley minimum pavement width (residential/commercial) ( $\leq 15 = 3pts$ ; $\leq 20 = 1pt$ )	-	0	Not specified
Residential alleys permitted? (yes = 2 pts)	-	0	Not specified
Collector street minimum pavement width ( $\leq 24 = 3pts$ )	24 ft	3	Good narrow dimensions, however, does not allow for on-street parking or bike lanes.
Curb radii for residential streets ( $\leq 20 = 1pt$ ; $\leq 15 = 3pts$ )	-	0	Not specified
<b>Right-of-Way Width (LUO Sec. 38-625)</b>			
Minimum ROW width for residential street? ( $\leq 45 = 3pts$ ; $\leq 50 = 1pt$ )	50 ft	1	
Utilities allowed under paved section of street? (yes = 2 pts)	Yes	2	
<b>Cul-de-Sacs (LUO Sec. 38-624)</b>			
Minimum radius allowed for cul-de-sacs? ( $\leq 35 = 3pts$ )	35 ft	3	
Can landscaped island be created within cul-de-sac? (yes = 3 pts)	-	0	Not specified
Are alternative turnarounds such as "hammerheads" allowed? (yes = 3 pts)	-	0	Not specified
<b>Vegetated Open Channels/Swales (LUO Sec. 38-632)</b>			
Are open channels/swales allowed for some residential streets? (yes = 3 pts)	Yes	3	
Design criteria for swales (dry swales, biofilters, or grass)? (yes = 1 pts)	Yes	1	
<b>Parking Ratios (LUO Sec. 38-210)</b>			
Minimum parking ratio for professional office building (per 1000 sf) ( $\leq 3 = 4pts$ ; $< 4 = 2pts$ ; $< 5 = 1pt$ )	3.3	2	1 space per 300 sq. ft.
Minimum parking ratio for shopping centers (per 1000 sf) ( $\leq 3 = 4pts$ ; $\leq 4 = 2pts$ ; $< 5 = 1pt$ )	3.3	2	1 space per 300 sq. ft.
Minimum parking ratio for multifamily dwellings (per unit)? ( $< 2 = 3pts$ )	2	0	
Are parking requirements set as maximums? (yes = 4 pts)	No	0	
Are parking requirements reduced/waived in CBD? (yes = 3 pts)	N/A	0	
<b>Shared Parking (LUO Sec. 38-215)</b>			
Is shared parking allowed? (yes = 3 pts)	Yes	3	"The required parking space for any number of separate uses may be combined in one lot, but the required space assigned to one use may not be assigned to another use, except that one-half of the parking space required for churches, theatres, or other uses whose peak attendance will be at night or on Sundays may be assigned to a use which will be closed at night or on Sundays."
What percentage of parking may be shared? ( $100\% = 3pts$ ; $< 100\% = 1pt$ )	50%	1	

Appendix A: Anderson County Audit of Pavement Standards

Development Feature/Standard	Measure or Yes/No	Points	Comments
<b>Parking Lot Design (LUO Sec. 6.9)</b>			
What is the minimum stall width for a standard parking space? ( $<9 = 1 \text{ pt}$ )	8.5-9 ft	1	Only 30% of total parking spaces allotted may be 8.5 ft, all others must be 9ft.
Minimum width for 2 rows of parking and drive aisle? ( $\leq 60 = 3 \text{ pts}$ )	60-62 ft	0	30% of parking may have stall lengths of 18 ft, all others must have 19 ft length + 24 ft drive aisle width.
Smaller dimensions allowed for compact cars? What % of spaces? ( $\text{yes} = 1 \text{ pts}$ )	Yes; 30%	1	30% of parking may be 8.5 ft by 18 ft
Are pervious materials allowed/required for parking areas? ( $\text{req'd}: 3 \text{ pts}$ ; $\text{allowed}: 1 \text{ pt}$ )	-	0	Not specified
<b>Parking Lot Landscaping (LUO Sec. 38-214)</b>			
Parking lot landscaping required? ( $\text{yes} = 3 \text{ pts}$ )	Yes	3	
Applicability of above (new lot and/or expanded lots) ( $\text{all} = 4 \text{ pts}$ ; $\leq 15 \text{ spaces} = 2 \text{ pts}$ ; $>15 \text{ spaces} = 1 \text{ pt}$ )	-	1	Not specified
Required planting areas ( $\leq 1 \text{ tree} / 10 \text{ spaces} = 4 \text{ pts}$ ; $\leq 1/15 = 2 \text{ pts}$ ; $>1/15 = 1 \text{ pt}$ )	20	1	
Are planting areas required to be curbed? ( $\text{no} = 3 \text{ pts}$ )	-	0	Not specified
Bioretention or other stormwater practices required/ encouraged? ( $\text{yes} = 3 \text{ pts}$ )	-	0	This issue is not specifically addressed in the ordinance. If curbs are used, this would likely preclude bioretention.
<b>Sidewalks and Planting Strips</b>			
Are sidewalk requirements context sensitive? ( $\text{yes} = 1 \text{ pt}$ )	-	0	Not specified
Planting strip required between sidewalk and curb? ( $\geq 6 \text{ ft} = 4 \text{ pts}$ ; $< 6 \text{ ft} = 2 \text{ pts}$ ; $< 4 \text{ ft} = 1 \text{ pt}$ )	-	0	Not specified
Are street trees required in the planting strip? ( $\text{yes} = 3 \text{ pts}$ )	-	0	Not specified
Can alternate pedestrian networks be substituted for sidewalks? ( $\text{yes} = 1 \text{ pt}$ )	-	0	Not specified
<b>Driveways (LUO Sec. 38-120)</b>			
Pervious paving material for residential driveways ( $\text{required} = 3 \text{ pts}$ ; $\text{allowed} = 1 \text{ pt}$ )	-	0	Not specified
Residential front setbacks (minimum) ( $< 20 = 4 \text{ pts}$ ; $= 20 = 2 \text{ pts}$ )	20 ft	2	Setback promotes shorter driveways. If done in conjunction with reducing building setbacks for primary facades to 10-15 feet, this would ensure that garages would remain behind primary residential facades.
<b>TOTAL POINTS (100 possible points)</b>		36	

## City of Anderson

Development Feature/Standard	Measure or Yes/No	Points	Comments
<b>Street Width (Zoning Ordinance Article 9)</b>			
Minimum pavement width in low-density residential development ( $\leq 22 = 2$ pts; $\leq 20 = 4$ pts)	24-28 ft	0	
Cul-de-sac street minimum pavement width ( $\leq 22 = 2$ pts)	-	0	ROW = 50 ft, does not specify min. pavement width
Manufactured Home Park street minimum pavement width ( $\leq 22 = 2$ pts)	-	0	Not specified
Alley minimum pavement width (residential/commercial) ( $\leq 15 = 3$ pts; $\leq 20 = 1$ pt)	20 ft	1	Only allowed in commercial/industrial areas
Residential alleys permitted? (yes = 2 pts)	No	0	
Collector street minimum pavement width ( $\leq 24 = 3$ pts)	40 ft	0	
Curb radii for residential streets ( $\leq 20 = 1$ pt; $\leq 15 = 3$ pts)	25 ft	0	
<b>Right-of-Way Width (ZO Article 9)</b>			
Minimum ROW width for residential street? ( $\leq 45 = 3$ pts; $\leq 50 = 1$ pt)	40 ft	3	
Utilities allowed under paved section of street? (yes = 2 pts)	-	0	Not specified
<b>Cul-de-Sacs (ZO Article 9)</b>			
Minimum radius allowed for cul-de-sacs? ( $\leq 35 = 3$ pts)	-	0	ROW radius 40ft, does not specify min. pavement width
Can landscaped island be created within cul-de-sac? (yes = 3 pts)	-	0	Not specified
Are alternative turnarounds such as "hammerheads" allowed? (yes = 3 pts)	-	0	Not specified
<b>Vegetated Open Channels/Swales (ZO Article 9)</b>			
Are open channels/swales allowed for some residential streets? (yes = 3 pts)	-	0	Not specified
Design criteria for swales (dry swales, biofilters, or grass)? (yes = 1 pt)	-	0	Not specified
<b>Parking Ratios (ZO Sec. 11.1.4)</b>			
Minimum parking ratio for professional office building (per 1000 sf) ( $\leq 3 = 4$ pts; $\leq 4 = 2$ pts; $\leq 5 = 1$ pt)	4	2	
Minimum parking ratio for shopping centers (per 1000 sf) ( $\leq 3 = 4$ pts; $\leq 4 = 2$ pts; $\leq 5 = 1$ pt)	4	2	
Minimum parking ratio for multifamily dwellings (per unit)? ( $\leq 2 = 3$ pts)	1-2.5	3	Based on the number of bedrooms in the unit (Efficiency is 1 space per unit, 1-bedroom is 1.5 spaces, 2-bedroom is 2 spaces and 3-bedroom is 2.5 spaces)
Are parking requirements set as maximums? (yes = 4 pts)	No	0	
Are parking requirements reduced/waived in CBD? (yes = 3 pts)	No	0	
<b>Shared Parking (ZO Sec. 11.1.3)</b>			
Is shared parking allowed? (yes = 3 pts)	Yes	3	Parking must be used at alternate hours of business
What percentage of parking may be shared? ( $100\% = 3$ pts; $\leq 100\% = 1$ pt)	100%	3	Businesses must not be in operation during the same hours. Does not specify what percentage, so potentially 100% may be shared.
<b>Parking Lot Design (ZO Sec. 11.1.3)</b>			
What is the minimum stall width for a standard parking space? ( $\leq 9 = 1$ pt)	9 ft	1	
Minimum width for 2 rows of parking and drive aisle? ( $\leq 60 = 3$ pts)	62 ft	0	

Development Feature/Standard	Measure or Yes/No	Points	Comments
Smaller dimensions allowed for compact cars? What % of spaces? (yes = 1 pts)	No	0	
Are pervious materials allowed/required for parking areas? (req'd:3 pts; allowed: 1pt)	Allowed in certain cases	1	In floodplain and with parking facilities for outdoor athletic facilities or outdoor theaters with 1,500 or more permanent seats.
<b>Parking Lot Landscaping (ZO Sec. 11.1.3)</b>			
Parking lot landscaping required? (yes = 3 pts)	Yes	3	
Applicability of above (new lot and/or expanded lots) (all= 4pts; ≤ 15 spaces = 2 pts; >15 spaces = 1pt)	25	1	
Required planting areas (≤1 tree /10 spaces = 4pts; ≤ 1/15 = 2 pts; >1/15 = 1pt)	See Comments	1	1 tree per 2,225 sq. ft., 1 shrub per 600 sq ft for lots between 10-75 spaces and anything over 75 spaces must be 1 tree per 2,000 sq ft and 1 shrub per 500 sq ft
Are planting areas required to be curbed? (no = 3 pts)	-	0	Not specified; states "Trees and shrubs must be fully protected from potential damage by vehicles." Retention of storm water could be encourages with wheel stops.
Bioretention or other stormwater practices required/ encouraged? (yes = 3 pts)	-	0	This issue is not specifically addressed in the ordinance.
<b>Sidewalks and Planting Strips (ZO Sec. 10.2)</b>			
Are sidewalk requirements context sensitive? (yes = 1 pt)	Yes	1	Sidewalks are required in Planned Developments (PD) only
Planting strips required between sidewalk and curb? (≥ 6 ft = 4 pts; < 6 ft = 2pts; <4 ft = 1pt)	-	0	Not specified
Are street trees required in the planting strip? (yes = 3 pts)	No	0	
Can alternate pedestrian networks be substituted for sidewalks? (yes = 1 pt)	-	0	Not specified
<b>Driveways (ZO Sec. 3)</b>			
Pervious paving material for residential driveways (required = 3 pts; allowed = 1 pt)	-	0	Not specified
Residential front setbacks (minimum) (< 20 = 4 pts; =20 = 2pts)	15 ft	4	
<b>TOTAL POINTS (100 possible points)</b>		29	

### Town of Pendleton

Development Feature/Standard	Measure or Yes/No	Points	Comments
<b>Street Width (Land Development Regulations Sec. 6)</b>			
Minimum pavement width in low-density residential development ( $\leq 22 = 2pts$ ; $\leq 20 = 4pts$ )	22 ft	2	
Cul-de-sac street minimum pavement width ( $\leq 22 = 2pts$ )	24 ft	0	
Manufactured Home Park street minimum pavement width ( $\leq 22 = 2pts$ )	24 ft	0	As stated in the Mobile Home District
Alley minimum pavement width (residential/commercial) ( $\leq 15 = 3pts$ ; $\leq 20 = 1pt$ )	18 ft	1	For both commercial and residential alleys
Residential alleys permitted? (yes = 2 pts)	Yes	2	To provide access to parking
Collector street minimum pavement width ( $\leq 24 = 3pts$ )	32 ft	0	Narrower collector street cross-sections should be allowed. Could be narrowed to 24 ft if parking and/or bike lanes are not required, necessary.
Curb radii for residential streets ( $\leq 20 = 1pt$ ; $\leq 15 = 3pts$ )	-	0	Not specified
<b>Right-of-Way Width (LDR Sec. 6)</b>			
Minimum ROW width for residential street? ( $\leq 45 = 3pts$ ; $\leq 50 = 1pt$ )	50 ft	1	
Utilities allowed under paved section of street? (yes = 2 pts)	-	0	Not specified
<b>Cul-de-Sacs (LDR Sec. 6.2)</b>			
Minimum radius allowed for cul-de-sacs? ( $\leq 35 = 3pts$ )	40 ft	0	
Can landscaped island be created within cul-de-sac? (yes = 3 pts)	-	0	Not specified
Are alternative turnarounds such as "hammerheads" allowed? (yes = 3 pts)	In certain cases	1	Only where topo conditions do not allow turnaround
<b>Vegetated Open Channels/Swales (LDR Sec. 6.6)</b>			
Are open channels/swales allowed for some residential streets? (yes = 3 pts)	Yes	3	
Design criteria for swales (dry swales, biofilters, or grass)? (yes = 1 pts)	No	0	
<b>Parking Ratios (ZO Sec. 903)</b>			
Minimum parking ratio for professional office building (per 1000 sf) ( $\leq 3 = 4pts$ ; $\leq 4 = 2pts$ ; $\leq 5 = 1pt$ )	3.3	2	1 space per 300 sq. ft., 4 space minimum
Minimum parking ratio for shopping centers (per 1000 sf) ( $\leq 3 = 4pts$ ; $\leq 4 = 2pts$ ; $\leq 5 = 1pt$ )	5.5	0	
Minimum parking ratio for multifamily dwellings (per unit)? ( $\leq 2 = 3pts$ )	2	0	
Are parking requirements set as maximums? (yes = 4 pts)	No	0	
Are parking requirements reduced/waived in CBD? (yes = 3 pts)	No	0	
<b>Shared Parking (ZO Sec. 903)</b>			
Is shared parking allowed? (yes = 3 pts)	Yes	3	Must obtain approval from Planning Commission and prove that grouping of uses is warranted
What percentage of parking may be shared? ( $100\% = 3pts$ ; $\leq 100\% = 1pt$ )	100%	3	Businesses must not be in operation during the same hours. Does not specify what percentage, so potentially 100% may be shared.
<b>Parking Lot Design (ZO Sec. 903)</b>			
What is the minimum stall width for a standard parking space? ( $\leq 9 = 1pt$ )	9 ft	1	

Appendix A: Anderson County Audit of Pavement Standards

<b>Development Feature/Standard</b>	<b>Measure or Yes/No</b>	<b>Points</b>	<b>Comments</b>
Minimum width for 2 rows of parking and drive aisle? ( $\leq 60 = 3$ pts)	60 ft	3	Drive aisle not specified, space lengths are to be 20 ft
Smaller dimensions allowed for compact cars? What % of spaces? (yes = 1 pts)	No	0	
Are pervious materials allowed/required for parking areas? (req'd: 3 pts; allowed: 1 pt)	Yes	1	All off-street parking spaces shall be paved with concrete, asphalt, tar gravel, or gravel except the following: (1) one and two family dwelling units; (2) those instances where residential dwelling units are being converted to commercial uses which require less than five (5) parking and loading spaces or more in order to meet the terms of this Ordinance.
<b>Parking Lot Landscaping (ZO Sec. 903.4)</b>			
Parking lot landscaping required? (yes = 3 pts)	Yes	3	
Applicability of above (new lot and/or expanded lots) (all= 4pts; $\leq 15$ spaces = 2 pts; $>15$ spaces = 1pt)	All	4	
Required planting areas ( $\leq 1$ tree /10 spaces = 4pts; $\leq 1/15 = 2$ pts; $>1/15 = 1$ pt)	15	2	
Are planting areas required to be curbed? (no = 3 pts)	-	0	Not specified
Bioretention or other stormwater practices required/ encouraged? (yes = 3 pts)	-	0	Not specified
<b>Sidewalks and Planting Strips (LDR Sec. 6.11)</b>			
Are sidewalk requirements context sensitive? (yes = 1 pt)	Yes	1	Sidewalks are required on both sides of the street, unless there are no homes proposed on one side of the street.
Planting strip required between sidewalk and curb? ( $\geq 6$ ft = 4 pts; $< 6$ ft = 2pts; $< 4$ ft = 1pt)	2	1	Section 6.11 states, "There shall be a minimum distance of 24 inches between the back of curbing to the edge of sidewalk to provide an area for a planting strip and buffer from vehicular traffic.
Are street trees required in the planting strip? (yes = 3 pts)	-	0	Not specified, see above
Can alternate pedestrian networks be substituted for sidewalks? (yes = 1 pt)	-	0	Not specified
<b>Driveways (ZO Sec. 1203)</b>			
Pervious paving material for residential driveways (required = 3 pts; allowed = 1 pt)	-	0	Not specified
Residential front setbacks (minimum) ( $< 20 = 4$ pts; $= 20 = 2$ pts)	25 ft	0	
<b>TOTAL POINTS</b> (100 possible points)		34	

## Town of Williamston

Development Feature/Standard	Measure or Yes/No	Points	Comments
<b>Street Width</b> (Anderson County Land Use Ordinance Sec. 38-374)			
Minimum pavement width in low-density residential development ( $\leq 22 = 2$ pts; $\leq 20 = 4$ pts)	20 ft	4	Minimum width could be as low as 16-18 feet. Streets as narrow as 18 feet (pavement only or 20-22 ft with curb and gutter) can accommodate one side parking.
Cul-de-sac street minimum pavement width ( $\leq 22 = 2$ pts)	20 ft	2	
Manufactured Home Park street minimum pavement width ( $\leq 22 = 2$ pts)	-	0	Not specified
Alley minimum pavement width (residential/commercial) ( $\leq 15 = 3$ pts; $\leq 20 = 1$ pt)	-	0	Not specified
Residential alleys permitted? (yes = 2 pts)	-	0	Not specified
Collector street minimum pavement width ( $\leq 24 = 3$ pts)	24 ft	3	Good narrow dimensions, however, does not allow for on-street parking or bike lanes.
Curb radii for residential streets ( $\leq 20 = 1$ pt; $\leq 15 = 3$ pts)	-	0	Not specified
<b>Right-of-Way Width</b> (Anderson County LUO Sec. 38-625)			
Minimum ROW width for residential street? ( $\leq 45 = 3$ pts; $\leq 50 = 1$ pt)	50 ft	1	
Utilities allowed under paved section of street? (yes = 2 pts)	Yes	2	
<b>Cul-de-Sacs</b> (Anderson County LUO Sec. 38-624)			
Minimum radius allowed for cul-de-sacs? ( $\leq 35 = 3$ pts)	35 ft	3	
Can landscaped island be created within cul-de-sac? (yes = 3 pts)	-	0	Not specified
Are alternative turnarounds such as "hammerheads" allowed? (yes = 3 pts)	-	0	Not specified
<b>Vegetated Open Channels/Swales</b> (Anderson County LUO Sec. 38-632)			
Are open channels/swales allowed for some residential streets? (yes = 3 pts)	Yes	3	
Design criteria for swales (dry swales, biofilters, or grass)? (yes = 1 pt)	Yes	1	
<b>Parking Ratios</b> (Town of Williamston Zoning Ordinance Sec. 4-102)			
Minimum parking ratio for professional office building (per 1000 sf) ( $\leq 3 = 4$ pts; $\leq 4 = 2$ pts; $\leq 5 = 1$ pt)	3.3-5	1.5	Parking requirements unclear, varies by zoning designation. For instance, in the Office Commercial (OC) zoning designation, professional offices require 1 space per 300 sq ft. However, with Highway Commercial (HC), uses such as real estate and insurance offices require 1 space per 200 sq ft.
Minimum parking ratio for shopping centers (per 1000 sf) ( $\leq 3 = 4$ pts; $\leq 4 = 2$ pts; $\leq 5 = 1$ pt)	5	0	
Minimum parking ratio for multifamily dwellings (per unit)? ( $\leq 2 = 3$ pts)	2	0	
Are parking requirements set as maximums? (yes = 4 pts)	No	0	
Are parking requirements reduced/waived in CBD? (yes = 3 pts)	Yes	3	In Core Commercial (CC) zoning designation most uses do not require parking spaces be added
<b>Shared Parking</b> (ZO Sec. 5-401)			
Is shared parking allowed? (yes = 3 pts)	No	0	Section 5-401(c) states, "Combined parking areas serving two or more principal uses shall contain spaces equal in number to the total of spaces required for all principal uses served."
What percentage of parking may be shared? (100% = 3 pts; $\leq 100\% = 1$ pt)	-	0	



Development Feature/Standard	Measure or Yes/No	Points	Comments
<b>Parking Lot Design (ZO Sec. 5-402)</b>			
What is the minimum stall width for a standard parking space? (<9 = 1 pt)	8.5-9 ft	1	10% may be 8.5 ft
Minimum width for 2 rows of parking and drive aisle? (≤60 = 3 pts)	61-63 ft	0	
Smaller dimensions allowed for compact cars? What % of spaces? (yes = 1 pts)	Yes; 10%	1	10% may be 8.5 ft by 18 ft
Are pervious materials allowed/required for parking areas? (req'd: 3 pts; allowed: 1pt)	No	0	Sec. 5-402 states, A parking area, including driveways, containing 10 or more parking spaces shall be surfaced with an all weather impervious material, and spaces shall be marked with painted lines.
<b>Parking Lot Landscaping (ZO Sec. 5-302)</b>			
Parking lot landscaping required? (yes = 3 pts)	Yes	3	One evergreen or deciduous tree for each 20 parking spaces
Applicability of above (new lot and/or expanded lots) (all= 4pts; ≤ 15 spaces = 2 pts; >15 spaces = 1pt)	-	1	Not specified
Required planting areas (≤1 tree /10 spaces = 4pts; ≤ 1/15 = 2 pts; >1/15 = 1pt)	20	1	
Are planting areas required to be curbed? (no = 3 pts)	-	0	Not specified
Bioretention or other stormwater practices required/ encouraged? (yes = 3 pts)	-	0	Not specified
<b>Sidewalks and Planting Strips (ZO Sec. 5-301)</b>			
Are sidewalk requirements context sensitive? (yes = 1 pt)	No	-	Ordinances do not include anything regarding sidewalks
Planting strip required between sidewalk and curb? (≥ 6 ft = 4 pts; < 6 ft = 2pts; <4 ft = 1pt)	No	-	Section 5-301, which includes where Buffer Areas are required along rights-of-way states, "Multi-family complex, manufactured home park, non-residential use not adjacent to residential district, and all surface parking lots.
Are street trees required in the planting strip? (yes = 3 pts)	No	-	Only in the above instances are street trees required
Can alternate pedestrian networks be substituted for sidewalks? (yes = 1 pt)	-	0	Not specified
<b>Driveways (ZO Sec. 4-102)</b>			
Pervious paving material for residential driveways (required = 3 pts; allowed = 1 pt)	-	0	Not specified
Residential front setbacks (minimum) (< 20 = 4 pts; =20 = 2pts)	15	4	
<b>TOTAL POINTS (100 possible points)</b>		<b>34.5</b>	

# **APPENDIX B: Spartanburg County Audit of Pavement Standards**

*This page intentionally left blank*

**SPARTANBURG COUNTY AUDIT OF PAVEMENT STANDARDS: SUMMARY**

Development Feature/Standard	SPARTANBURG COUNTY		INMAN		LANDRUM		SPARTANBURG	
	Measure	Points	Measure	Points	Measure	Points	Measure	Points
<b>Street Width</b> (17 points)								
Minimum pavement width in low-density residential development (<22 = 2pts; <20 = 4pts)	16-20 ft	4	16-20 ft	4	16-20 ft	4	24 ft	0
Cul-de-sac street minimum pavement width (<22 = 2 pts)	16-20 ft	2	16-20 ft	2	16-20 ft	2	24 ft	0
Manufactured Home Park street minimum pavement width (<22 = 2pts)	20-24 ft	2	20-24 ft	2	20-24 ft	2	-	0
Alley minimum pavement width (residential/commercial) (<15 = 3 pts; <20 = 1 pt)	-	0	-	0	-	0	-	0
Residential alleys permitted? (yes = 2 pts)	-	0	-	0	-	0	No	0
Collector street minimum pavement width (<24 = 3 pts)	24 ft	3	24 ft	3	24 ft	3	36 ft	0
Curb radii for residential streets (<20 = 1 pt; <15 = 3 pts)	25 ft	0	25 ft	0	25 ft	0	-	0
<b>Right-of-Way Width</b> (5 points)								
Minimum ROW width for residential street? (<45 = 3pts; <50 = 1 pt)	50 ft	1	50 ft	1	50 ft	1	50 ft	1
Utilities allowed under paved section of street? (yes = 2 pts)	Yes	2	Yes	2	Yes	2	-	0
<b>Cul-de-Sacs</b> (9 points)								
Minimum radius allowed for cul-de-sacs? (<35 = 3 pts)	20 ft	3	20 ft	3	20 ft	3	37 ft	2
Can landscaped island be created within cul-de-sac? (yes = 3 pts)	-	0	-	0	-	0	No	0
Are alternative turnarounds such as "hammerheads" allowed? (yes = 3 pts)	Yes	3	Yes	3	Yes	3	No	0
<b>Vegetated Open Channels/Swales</b> (4 points)								
Are open channels/swales allowed for some residential streets? (yes = 3 pts)	Yes	3	Yes	3	Yes	3	-	0
Design criteria for swales (dry swales, biofilters, or grass)? (yes = 1 pt)	No	0	No	0	No	0	-	0
<b>Parking Ratios</b> (18 points)								
Minimum parking ratio for professional office building (per 1000 sf) (<3 = 4 pts; <4 = 2 pts; <5 = 1 pt)	2.8	4	2.8	4	2.8	4	1.3	4
Minimum parking ratio for shopping centers (per 1000 sf) (<3 = 4 pts; <4 = 2 pts; <5 = 1 pt)	4	2	5	0	5	0	4-5	2
Minimum parking ratio for multifamily dwellings (per unit)? (<2 = 3 pts)	-	0	1.75	3	1.75	3	2	0
Are parking requirements set as maximums? (yes = 4 pts)	No	0	No	0	No	0	No	0
Are parking requirements reduced/waived in CBD? (yes = 3 pts)	N/A	0	Yes	3	Yes	3	Yes	3
<b>Shared Parking</b> (6 points)								
Is shared parking allowed? (yes = 3 pts)	Yes	3	Yes	3	Yes	3	Yes	3
What percentage of parking may be shared? (100% = 3 pts; <100% = 1 pt)	50%	1	50%	1	100%	3	100%	3
<b>Parking Lot Design</b> (8 points)								
What is the minimum stall width for a standard parking space? (<9 = 1 pt)	8.5-9 ft	1	9 ft	1	9 ft	1	9 ft	1
Minimum width for 2 rows of parking and drive aisle? (<60 = 3 pts)	60 ft	3	64 ft	0	64 ft	0	60 ft	3
Smaller dimensions allowed for compact cars? What % of spaces? (yes = 1 pt)	Yes; 30%	1	No	0	No	0	No	0
Are pervious materials allowed/required for parking areas? (req'd: 3 pts; allowed: 1 pt)	No	0	No	0	-	0	-	0
<b>Parking Lot Landscaping</b> (17 points)								
Parking lot landscaping required? (yes = 3 pts)	Yes	3	Yes	3	Yes	3	Yes	3
Applicability of above (new lot and/or expanded lots) (all= 4pts; <15 spaces = 2 pts; >15 spaces = 1pt)	20	1	20	1	All	4	4	2
Required planting areas (<1 tree /10 spaces = 4pts; <1/15 = 2 pts; >1/15 = 1pt)	20	1	10% of area	1	10% of area	2	12	2
Are planting areas required to be curbed? (no = 3 pts)	Yes	0	Yes	0	-	0	Yes	0
Bioretention or other stormwater practices required/ encouraged? (yes = 3 pts)	No	0	No	0	-	0	No	0
<b>Sidewalks</b> (9 points)								
Are sidewalk requirements context sensitive? (yes = 1 pt)	-	0	No	0	-	0	No	0
Planting strips required between sidewalk and curb? (>6 ft = 4 pts; <6 ft = 2pts; <4 ft = 1pt)	5 ft	2	Yes	4	Yes	4	Yes	4
Are street trees required in the planting strip? (yes = 3 pts)	-	0	Yes	3	Yes	3	Yes	3
Can alternate pedestrian networks be substituted for sidewalks? (yes = 1 pt)	-	0	-	0	-	0	No	0
<b>Driveways</b> (7 points)								
Pervious paving material for residential driveways (required = 3 pts; allowed = 1 pts)	-	0	-	0	-	0	-	0
Residential front setbacks (minimum) (< 20 = 4 pts; =20 = 2pts)	20 ft.	2	20	2	10 ft	4	15 ft	4
<b>TOTAL POINTS</b> (100 possible points)		<b>47</b>		<b>52</b>		<b>60</b>		<b>40</b>

# **Spartanburg County: Individual Audits**

*This page intentionally left blank*

## Spartanburg County

Development Feature/Standard	Measure or Yes/No	Points	Comments
<b>Street Width (Unified Land Management Ordinance Sec. 2)</b>			
Minimum pavement width in low-density residential development ( $\leq 22 = 2$ pts; $\leq 20 = 4$ pts)	16-20 ft	4	Good minimum pavement widths; generally narrow. In a minor subdivision the minimum width is 16 ft., it is 20ft. in a major subdivision.
Cul-de-sac street minimum pavement width ( $\leq 22 = 2$ pts)	16-20 ft	2	In a private cul-de-sac the minimum width is 16 ft., it is 20ft. otherwise.
Manufactured Home Park street minimum pavement width ( $\leq 22 = 2$ pts)	20-24 ft	2	Streets as narrow as 18 feet (pavement only) can accommodate one side parking. Entrance & exit streets must be a minimum of 24ft; however, internal streets need 50' ROW.
Alley minimum pavement width (residential/commercial) ( $\leq 15 = 3$ pts; $\leq 20 = 1$ pt)	-	0	Not specified
Residential alleys permitted? (yes = 2 pts)	-	0	Not specified
Collector street minimum pavement width ( $\leq 24 = 3$ pts)	24 ft	3	Good narrow dimensions, however, does not allow for on-street parking or bike lanes.
Curb radii for residential streets ( $\leq 20 = 1$ pt; $\leq 15 = 3$ pts)	25 ft	0	Could be as low as 15-20 feet for low volume residential and collector streets. Allows narrower intersections and is better for pedestrian crossing and lowering vehicle turning speeds.
<b>Right-of-Way Width (ULMO Sec. 2)</b>			
Minimum ROW width for residential street? ( $< 45 = 3$ pts; $< 50 = 1$ pt)	50 ft	1	
Utilities allowed under paved section of street? (yes = 2 pts)	Yes	2	
<b>Cul-de-Sacs (ULMO Sec. 2.05-2)</b>			
Minimum radius allowed for cul-de-sacs? ( $\leq 35 = 3$ pts)	20 ft	3	
Can landscaped island be created within cul-de-sac? (yes = 3 pts)	-	0	Not specified
Are alternative turnarounds such as "hammerheads" allowed? (yes = 3 pts)	Yes	3	Ordinance states that you may choose from a few cul-de-sac designs, which includes a hammerhead type design.
<b>Vegetated Open Channels/Swales (County Code, Section 62-56(b)(3))</b>			
Are open channels/swales allowed for some residential streets? (yes = 3 pts)	Yes	3	
Design criteria for swales (dry swales, biofilters, or grass)? (yes = 1 pts)	No	0	
<b>Parking Ratios (ULMO Sec. 2.05-2)</b>			
Minimum parking ratio for professional office building (per 1000 sf) ( $\leq 3 = 4$ pts; $\leq 4 = 2$ pts; $< 5 = 1$ pt)	2.8	4	1 space per 350 sq. ft.
Minimum parking ratio for shopping centers (per 1000 sf) ( $\leq 3 = 4$ pts; $\leq 4 = 2$ pts; $< 5 = 1$ pt)	4	2	
Minimum parking ratio for multifamily dwellings (per unit)? ( $< 2 = 3$ pts)	-	0	ULMO says "see attached Multi-plex dwelling projects" but does not specify in that area of the ordinance
Are parking requirements set as maximums? (yes = 4 pts)	No	0	On street parking should be allowed to count towards minimums in all cases.
Are parking requirements reduced/waived in CBD? (yes = 3 pts)	N/A	0	
<b>Shared Parking (ULMO Sec. 2.02-2)</b>			
Is shared parking allowed? (yes = 3 pts)	Yes	3	Only if both businesses are not in operation at the same time
What percentage of parking may be shared? ( $100\% = 3$ pts; $\leq 100\% = 1$ pt)	50%	1	
<b>Parking Lot Design (ULMO Sec. 2.02-2)</b>			
What is the minimum stall width for a standard parking space? ( $\leq 9 = 1$ pt)	8.5-9 ft	1	Only 30% of total parking spaces allotted may be 8.5 ft, all others must be 9ft.

Appendix B: Spartanburg County Audit of Pavement Standards

Development Feature/Standard	Measure or Yes/No	Points	Comments
Minimum width for 2 rows of parking and drive aisle? ( $\leq 60 = 3$ pts)	60 ft	3	
Smaller dimensions allowed for compact cars? What % of spaces? (yes = 1 pts)	Yes; 30%	1	30% may be 8.5 by 18 ft
Are pervious materials allowed/required for parking areas? (req'd: 3 pts; allowed: 1 pt)	No	0	
<b>Parking Lot Landscaping (ULMO Sec. 2.02-3)</b>			
Parking lot landscaping required? (yes = 3 pts)	Yes	3	Above 20 spaces
Applicability of above (new lot and/or expanded lots) (all= 4pts; $\leq 15$ spaces = 2 pts; $>15$ spaces = 1pt)	20	1	Only new lots above 20 spaces
Required planting areas ( $\leq 1$ tree /10 spaces = 4pts; $\leq 1/15 = 2$ pts; $>1/15 = 1$ pt)	20	1	
Are planting areas required to be curbed? (no = 3 pts)	Yes	0	"All landscaped areas in or adjacent to parking areas shall be protected from vehicular damage by a raised concrete curb or an equivalent barrier of six (6) inches in height. <u>The barrier need not be continuous.</u> " Should provide incentives for breaks in curbs.
Bioretention or other stormwater practices required/ encouraged? (yes = 3 pts)	No	0	
<b>Sidewalks and Planting Strips (ULMO Sec. 9.4)</b>			
Are sidewalk requirements context sensitive? (yes = 1 pt)	-	0	Standards for sidewalks are included, however, it does not say anywhere that they are required
Planting strip required between sidewalk and curb? ( $\geq 6$ ft = 4 pts; $< 6$ ft = 2pts; $<4$ ft = 1pt)	5 ft	2	Only required in commercial, industrial, office and institutional uses and it only needs to be grassed; trees and/or shrubs are not required. Also, sidewalks are not required, just a grassed strip.
Are street trees required in the planting strip? (yes = 3 pts)	-	0	Not specified
Can alternate pedestrian networks be substituted for sidewalks? (yes = 1 pt)	-	0	Not specified
<b>Driveways (ULMO Sec. 2.02-1)</b>			
Pervious paving material for residential driveways (required = 3 pts; allowed = 1 pt)	-	0	Not specifically mentioned, but not prohibited either. Should be encouraged with incentives.
Residential front setbacks (minimum) ( $< 20 = 4$ pts; $=20 = 2$ pts)	20 ft.	2	
<b>TOTAL POINTS</b> (100 possible points)		47	



## City of Spartanburg

Development Feature/Standard	Measure or Yes/No	Points	Comments
<b>Street Width (LDR Sec. 7)</b>			
Minimum pavement width in low-density residential development ( $\leq 22 = 2$ pts; $\leq 20 = 4$ pts)	24 ft	0	Minimum width could be as low as 16-18 feet. Streets as narrow as 18 feet (pavement only or 20-22 ft with curb and gutter) can accommodate one side parking.
Cul-de-sac street minimum pavement width ( $\leq 22 = 2$ pts)	24 ft	0	
Manufactured Home Park street minimum pavement width ( $\leq 22 = 2$ pts)	-	0	No specific width
Alley minimum pavement width (residential/commercial) ( $\leq 15 = 3$ pts; $\leq 20 = 1$ pt)	-	0	Not allowed
Residential alleys permitted? (yes = 2 pts)	No	0	7.31 Alleys shall not be permitted in a residential subdivision
Collector street minimum pavement width ( $\leq 24 = 3$ pts)	36 ft	0	Wide dimension, could be narrowed to 24 ft.
Curb radii for residential streets ( $\leq 20 = 1$ pt; $\leq 15 = 3$ pts)	-	0	Not specified
<b>Right-of-Way Width (LDR Sec. 7)</b>			
Minimum ROW width for residential street? ( $\leq 45 = 3$ pts; $\leq 50 = 1$ pt)	50 ft	1	
Utilities allowed under paved section of street? (yes = 2 pts)	-	0	
<b>Cul-de-Sacs (LDR Sec. 7.2212)</b>			
Minimum radius allowed for cul-de-sacs? ( $\leq 35 = 3$ pts)	37 ft	2	
Can landscaped island be created within cul-de-sac? (yes = 3 pts)	No	0	
Are alternative turnarounds such as "hammerheads" allowed? (yes = 3 pts)	No	0	
<b>Vegetated Open Channels/Swales (LDR Sec. 7)</b>			
Are open channels/swales allowed for some residential streets? (yes = 3 pts)	-	0	Not specified
Design criteria for swales (dry swales, biofilters, or grass)? (yes = 1 pts)	-	0	Not specified
<b>Parking Ratios (ZO Sec. 7:9.6)</b>			
Minimum parking ratio for professional office building (per 1000 sf) ( $\leq 3 = 4$ pts; $\leq 4 = 2$ pts; $\leq 5 = 1$ pt)	1.3	4	1 space per 750 sq. ft.
Minimum parking ratio for shopping centers (per 1000 sf) ( $\leq 3 = 4$ pts; $\leq 4 = 2$ pts; $\leq 5 = 1$ pt)	4-5	2	4 spaces per 1,000 sq. ft. for shopping centers 60,000-399,999 sq. ft.; 4.5 for 400,000-599,999; and 5 for 600,000 sq. ft. and up
Minimum parking ratio for multifamily dwellings (per unit)? ( $\leq 2 = 3$ pts)	2	0	
Are parking requirements set as maximums? (yes = 4 pts)	No	0	
Are parking requirements reduced/waived in CBD? (yes = 3 pts)	Yes	3	Parking regulations do not apply to B-2 Business District
<b>Shared Parking (ZO Sec. 7:9.2)</b>			
Is shared parking allowed? (yes = 3 pts)	Yes	3	Parking must be used at alternate hours of business
What percentage of parking may be shared? ( $100\% = 3$ pts; $\leq 100\% = 1$ pt)	100%	3	
<b>Parking Lot Design (ZO Sec. 7:9.5)</b>			
What is the minimum stall width for a standard parking space? ( $\leq 9 = 1$ pt)	9 ft	1	

Appendix B: Spartanburg County Audit of Pavement Standards

Development Feature/Standard	Measure or Yes/No	Points	Comments
Minimum width for 2 rows of parking and drive aisle? ( $\leq 60 = 3$ pts)	60 ft	3	
Smaller dimensions allowed for compact cars? What % of spaces? (yes = 1 pts)	No	0	
Are pervious materials allowed/required for parking areas? (req'd: 3 pts; allowed: 1 pt)	-	0	Not specified
<b>Parking Lot Landscaping (ZO Sec. 505.62)</b>			
Parking lot landscaping required? (yes = 3 pts)	Yes	3	
Applicability of above (new lot and/or expanded lots) (all= 4pts; $\leq 15$ spaces = 2 pts; $>15$ spaces = 1 pt)	4	2	Parking lot is considered to be 4 or more spaces; does not specify if you are expanding
Required planting areas ( $\leq 1$ tree /10 spaces = 4pts; $\leq 1/15 = 2$ pts; $>1/15 = 1$ pt)	12	2	1 tree per 12 spaces
Are planting areas required to be curbed? (no = 3 pts)	Yes	0	
Bioretention or other stormwater practices required/ encouraged? (yes = 3 pts)	No	0	This issue is not specifically addressed in the ordinance.
<b>Sidewalks and Planting Strips (LDR Sec. 9.4)</b>			
Are sidewalk requirements context sensitive? (yes = 1 pt)	No	0	Sidewalks are never specifically mentioned as required. In PDD section of ordinance it says to include them on plans but never does it say they are required.
Planting strips required between sidewalk and curb? ( $\geq 6$ ft = 4 pts; $< 6$ ft = 2pts; $<4$ ft = 1 pt)	Yes	4	Sidewalks are never specifically called out as required, however, planting strips are... "The area to be landscaped along road/street frontages shall have an average depth of at least ten feet and a minimum depth of five feet and shall extend the full length of such frontage except for driveways or points of ingress or egress to and from the building site and in the visibility triangles" (Sec. 505.61)
Are street trees required in the planting strip? (yes = 3 pts)	Yes	3	a.) Lots with street frontage of 100 feet or less shall have 3 ornamental or small trees and 4 large evergreen shrubs (or 8 small evergreen shrubs) per 100 linear feet or percentage thereof. b.) Lots with street frontage of 101 feet or more of street frontage shall require 1 large canopy tree and 2 ornamental or small trees and 4 large evergreen shrubs (or 8 small evergreen shrubs) per 100 feet or percentage thereof.
Can alternate pedestrian networks be substituted for sidewalks? (yes = 1 pt)	No	0	Not specified
<b>Driveways (ZO Sec. 401)</b>			
Pervious paving material for residential driveways (required = 3 pts; allowed = 1 pt)	-	0	Not specifically mentioned, but not prohibited either. Should be encouraged with incentives.
Residential front setbacks (minimum) ( $< 20 = 4$ pts; $=20 = 2$ pts)	15 ft	4	
<b>TOTAL POINTS (100 possible points)</b>		<b>40</b>	

## City of Inman

Development Feature/Standard	Measure or Yes/No	Points	Comments
<b>Street Width (Spartanburg County Standards LDR Sec. 8.1)</b>			
Minimum pavement width in low-density residential development ( $\leq 22 = 2pts$ ; $\leq 20 = 4pts$ )	16-20 ft	4	In a minor subdivision the minimum width is 16 ft., it is 20ft. in a major subdivision.
Cul-de-sac street minimum pavement width ( $\leq 22 = 2 pts$ )	16-20 ft	2	In a private cul-de-sac the minimum width is 16 ft., it is 20ft. otherwise.
Manufactured Home Park street minimum pavement width ( $\leq 22 = 2pts$ )	20-24 ft	2	Entrance & exit streets must be a minimum of 24ft; however, internal streets need 50' ROW.
Alley minimum pavement width (residential/commercial) ( $\leq 15 = 3 pts$ ; $\leq 20 = 1 pt$ )	-	0	Not specified
Residential alleys permitted? (yes = 2 pts)	-	0	Not specified
Collector street minimum pavement width ( $\leq 24 = 3 pts$ )	24 ft	3	Good narrow dimensions, however, does not allow for on-street parking or bike lanes. Wider dimension could be narrowed to 24 ft if on-street parking or bike lanes are not provided for or necessary.
Curb radii for residential streets ( $\leq 20 = 1 pt$ ; $\leq 15 = 3 pts$ )	25 ft	0	Could be as low as 15-20 feet for low volume residential and collector streets. Allows narrower intersections and is better for pedestrian crossing and lowering vehicle turning speeds.
<b>Right-of-Way Width (Spartanburg County Standards LDR Sec. 8.1)</b>			
Minimum ROW width for residential street? ( $\leq 45 = 3pts$ ; $\leq 50 = 1 pt$ )	50 ft	1	
Utilities allowed under paved section of street? (yes = 2 pts)	Yes	2	
<b>Cul-de-Sacs (Spartanburg County Standards LDR Sec. 8.1)</b>			
Minimum radius allowed for cul-de-sacs? ( $\leq 35 = 3 pts$ )	20 ft	3	
Can landscaped island be created within cul-de-sac? (yes = 3 pts)	-	0	Not specified
Are alternative turnarounds such as "hammerheads" allowed? (yes = 3 pts)	Yes	3	
<b>Vegetated Open Channels/Swales (Spartanburg County Standards LDR Sec. 8.1)</b>			
Are open channels/swales allowed for some residential streets? (yes = 3 pts)	Yes	3	
Design criteria for swales (dry swales, biofilters, or grass)? (yes = 1 pts)	No	0	
<b>Parking Ratios (ZO Sec. 6:9.6)</b>			
Minimum parking ratio for professional office building (per 1000 sf) ( $\leq 3 = 4 pts$ ; $\leq 4 = 2 pts$ ; $\leq 5 = 1 pt$ )	2.8	4	1 space per 350 sq. ft.
Minimum parking ratio for shopping centers (per 1000 sf) ( $\leq 3 = 4 pts$ ; $\leq 4 = 2 pts$ ; $\leq 5 = 1 pt$ )	5	0	1 space per 200 sq. ft.; grocery is 1 space per 300 sq. ft.
Minimum parking ratio for multifamily dwellings (per unit)? ( $\leq 2 = 3 pts$ )	1.75	3	
Are parking requirements set as maximums? (yes = 4 pts)	No	0	
Are parking requirements reduced/waived in CBD? (yes = 3 pts)	Yes	3	
<b>Shared Parking (ZO Sec. 12:2.2)</b>			
Is shared parking allowed? (yes = 3 pts)	Yes	3	". . . 1/2 of the parking space required for churches, theatres, or other uses whose peak attendance will be at night or on Sundays may be assigned to a use which will not be closed at night or on Sundays."

Appendix B: Spartanburg County Audit of Pavement Standards

Development Feature/Standard	Measure or Yes/No	Points	Comments
What percentage of parking may be shared? (100% = 3 pts; ≤ 100% = 1 pt)	50%	1	
<b>Parking Lot Design (ZO Article V)</b>			
What is the minimum stall width for a standard parking space? (≤9 = 1 pt)	9 ft	1	
Minimum width for 2 rows of parking and drive aisle? (≤60 = 3 pts)	64 ft	0	
Smaller dimensions allowed for compact cars? What % of spaces? (yes = 1 pts)	No	0	
Are pervious materials allowed/required for parking areas? (req'd:3 pts; allowed: 1pt)	No	0	Parking lots over 10 spaces must be paved
<b>Parking Lot Landscaping (ZO Sec. 6:9.11)</b>			
Parking lot landscaping required? (yes = 3 pts)	Yes	3	
Applicability of above (new lot and/or expanded lots) (all= 4pts; ≤ 15 spaces = 2 pts; >15 spaces = 1pt)	20	1	
Required planting areas (≤1 tree /10 spaces = 4pts; ≤ 1/15 = 2 pts; >1/15 = 1pt)	10% of area	1	
Are planting areas required to be curbed? (no = 3 pts)	Yes	0	
Bioretention or other stormwater practices required/ encouraged? (yes = 3 pts)	No	0	
<b>Sidewalks and Planting Strips (ZO Sec. 802)</b>			
Are sidewalk requirements context sensitive? (yes = 1 pt)	No	0	
Planting strip required between sidewalk and curb? (≥ 6 ft = 4 pts; < 6 ft = 2pts; <4 ft = 1pt)	Yes	4	Section 802: In all front yards in the NBD, CBD, GBD and GI districts, a planting strip not less than six (6) feet side shall be provided along the street line on the property, which shall be planted and maintained in grass or other suitable ground cover with street trees or in scrub planting or as may be required in approval of the site plans. This is only required in the CBD if there is a front yard. However, it does not say that sidewalks are required.
Are street trees required in the planting strip? (yes = 3 pts)	Yes	3	
Can alternate pedestrian networks be substituted for sidewalks? (yes = 1 pt)	-	0	
<b>Driveways (ZO Sec. 4)</b>			
Pervious paving material for residential driveways (required = 3 pts; allowed = 1 pt)	-	0	Not specifically mentioned, but not prohibited either. Should be encouraged with incentives.
Residential front setbacks (minimum) (< 20 = 4 pts; =20 = 2pts)	20	2	
<b>TOTAL POINTS (100 possible points)</b>		52	

## City of Landrum

Development Feature/Standard	Measure or Yes/No	Points	Comments
<b>Street Width (Spartanburg County Standards LDR Sec. 8.1)</b>			
Minimum pavement width in low-density residential development ( $\leq 22 = 2pts$ ; $\leq 20 = 4pts$ )	16-20 ft	4	In a minor subdivision the minimum width is 16 ft., it is 20ft. in a major subdivision.
Cul-de-sac street minimum pavement width ( $\leq 22 = 2pts$ )	16-20 ft	2	In a private cul-de-sac the minimum width is 16 ft., it is 20ft. otherwise.
Manufactured Home Park street minimum pavement width ( $\leq 22 = 2pts$ )	20-24 ft	2	Entrance & exit streets must be a minimum of 24ft; however, internal streets need 50' ROW.
Alley minimum pavement width (residential/commercial) ( $\leq 15 = 3pts$ ; $\leq 20 = 1pt$ )	-	0	Not specified
Residential alleys permitted? (yes = 2 pts)	-	0	Not specified
Collector street minimum pavement width ( $\leq 24 = 3pts$ )	24 ft	3	Good narrow dimensions, however, does not allow for on-street parking or bike lanes. Wider dimension could be narrowed to 24 ft if on-street parking or bike lanes are not provided for or needed.
Curb radii for residential streets ( $\leq 20 = 1pt$ ; $\leq 15 = 3pts$ )	25 ft	0	Could be as low as 15-20 feet for low volume residential and collector streets. Allows narrower intersections and is better for pedestrian crossing and lowering vehicle turning speeds.
<b>Right-of-Way Width (Spartanburg County Standards LDR Sec. 8.1)</b>			
Minimum ROW width for residential street? ( $\leq 45 = 3pts$ ; $\leq 50 = 1pt$ )	50 ft	1	
Utilities allowed under paved section of street? (yes = 2 pts)	Yes	2	
<b>Cul-de-Sacs (Spartanburg County Standards LDR Sec. 8.1)</b>			
Minimum radius allowed for cul-de-sacs? ( $\leq 35 = 3pts$ )	20 ft	3	
Can landscaped island be created within cul-de-sac? (yes = 3 pts)	-	0	Not specified
Are alternative turnarounds such as "hammerheads" allowed? (yes = 3 pts)	Yes	3	
<b>Vegetated Open Channels/Swales (Spartanburg County Standards LDR Sec. 8.1)</b>			
Are open channels/swales allowed for some residential streets? (yes = 3 pts)	Yes	3	
Design criteria for swales (dry swales, biofilters, or grass)? (yes = 1 pts)	No	0	
<b>Parking Ratios (ZO 5-2-26.1)</b>			
Minimum parking ratio for professional office building (per 1000 sf) ( $\leq 3 = 4pts$ ; $\leq 4 = 2pts$ ; $\leq 5 = 1pt$ )	2.8	4	
Minimum parking ratio for shopping centers (per 1000 sf) ( $\leq 3 = 4pts$ ; $\leq 4 = 2pts$ ; $\leq 5 = 1pt$ )	5	0	One (1) space per 200 square feet of gross floor space for all stores other than grocery stores. One (1) space per 100 square feet of gross floor space for grocery stores
Minimum parking ratio for multifamily dwellings (per unit)? ( $\leq 2 = 3pts$ )	1.75	3	
Are parking requirements set as maximums? (yes = 4 pts)	No	0	
Are parking requirements reduced/waived in CBD? (yes = 3 pts)	Yes	3	
<b>Shared Parking (ZO 5-2-26.5)</b>			
Is shared parking allowed? (yes = 3 pts)	Yes	3	Businesses must be in operation at different hours
What percentage of parking may be shared? ( $100\% = 3pts$ ; $\leq 100\% = 1pt$ )	100%	3	
<b>Parking Lot Design (ZO 5-2-26.2)</b>			
What is the minimum stall width for a standard parking space? ( $\leq 9 = 1pt$ )	9 ft	1	

Appendix B: Spartanburg County Audit of Pavement Standards

Development Feature/Standard	Measure or Yes/No	Points	Comments
Minimum width for 2 rows of parking and drive aisle? ( $\leq 60 = 3$ pts)	64 ft	0	
Smaller dimensions allowed for compact cars? What % of spaces? (yes = 1 pts)	No	0	
Are pervious materials allowed/required for parking areas? (req'd: 3 pts; allowed: 1 pt)	-	0	Not specified
<b>Parking Lot Landscaping (ZO 5-2-26.8.08)</b>			
Parking lot landscaping required? (yes = 3 pts)	Yes	3	
Applicability of above (new lot and/or expanded lots) (all= 4pts; $\leq 15$ spaces = 2 pts; $>15$ spaces = 1 pt)	All	4	
Required planting areas ( $\leq 1$ tree /10 spaces = 4pts; $\leq 1/15 = 2$ pts; $>1/15 = 1$ pt)	10% of area	2	
Are planting areas required to be curbed? (no = 3 pts)	-	0	Not specified
Bioretention or other stormwater practices required/ encouraged? (yes = 3 pts)	-	0	Not specified
<b>Sidewalks and Planting Strips (ZO Sec. 5-2-25.6)</b>			
Are sidewalk requirements context sensitive? (yes = 1 pt)	-	0	Not specified
Planting strip required between sidewalk and curb? ( $\geq 6$ ft = 4 pts; $< 6$ ft = 2pts; $< 4$ ft = 1pt)	6 ft	4	Only required in the RM-8, RM-16, MHP, NBD, CBD, GBD, RLI and GI districts
Are street trees required in the planting strip? (yes = 3 pts)	Yes	3	
Can alternate pedestrian networks be substituted for sidewalks? (yes = 1 pt)	-	0	Not specified
<b>Driveways (ZO Sec. 5-2-25.6)</b>			
Pervious paving material for residential driveways (required = 3 pts; allowed = 1 pt)	-	0	Not specified
Residential front setbacks (minimum) ( $< 20 = 4$ pts; $= 20 = 2$ pts)	10 ft	4	
<b>TOTAL POINTS (100 possible points)</b>		<b>60</b>	

# **RESOURCES/REFERENCES**

*This page intentionally left blank*



## RESOURCES/REFERENCES

- Center for Urban Forest Research (CUFR), "Fact Sheet #4: Control Stormwater Runoff with Trees." Davis, CA: Pacific Southwest Research Station, USDA Forest Service. July 2002. Accessed January 2006. <[http://cufr.ucdavis.edu/products/CUFR\\_182\\_UFfactsheet4.pdf](http://cufr.ucdavis.edu/products/CUFR_182_UFfactsheet4.pdf)>
- Environmental Protection Agency, U.S. (EPA), *Our Built and Natural Environments: A Technical Review of the Interactions between Land Use, Transportation, and Environmental Quality*. Washington, DC: EPA. January 2001. Accessed January 2006. <<http://www.epa.gov/smartgrowth/pdf/built.pdf>>
- Environmental Protection Agency, U.S. (EPA), *Parking Spaces/Community Places: Finding the Balance through Smart Growth Solutions*. Washington, DC: EPA. January 2006. Accessed January 2006. <<http://www.epa.gov/smartgrowth/pdf/EPAParkingSpaces06.pdf>>
- Environmental Protection Agency, U.S. (EPA), *Using Smart Growth Techniques as Stormwater Management Best Practices*. Washington, DC: EPA. December 2005. Accessed February 2006. <[http://www.epa.gov/smartgrowth/pdf/sg\\_stormwater\\_BMP.pdf](http://www.epa.gov/smartgrowth/pdf/sg_stormwater_BMP.pdf)>
- Ewing, Reid. *Best Development Practices: Doing the Right Thing and Making Money at the Same Time*. Washington, DC: Planners Press, 1996.
- Institute of Transportation Engineers, *Design and Safety of Pedestrian Fatalities*, March 1998.
- Kirschbaum, J. et al., *Designing Sidewalks and Trails for Access, Part II of II: Best Practices Design Guide*, Washington, DC: Federal Highway Administration, September 2001.
- Kwon, Hye Yeong. "An Introduction to Better Site Design." *The Practice of Watershed Protection*. Ed. Thomas R. Schueler and Heather K. Holland. Ellicott City, MD: Center for Watershed Protection, 2000.
- Local Government Commission Center for Livable Communities. *Emergency Response: Traffic Calming and Traditional Neighborhood Streets*. Sacramento, CA: LGC, 2001.
- Maryland Department of the Environment (MDE), 2000. *2000 Maryland Stormwater Design Manual, Volumes I & II*. Baltimore, MD: Center for Watershed Protection and the Maryland Department of the Environment, Water Management Administration.
- McPherson, E. Gregory and Jules Muchnick. "Effects of Street Tree Shade on Asphalt Concrete Pavement Performance." *Journal of Arboriculture* 31(6): November 2005
- Metropolitan Council. "Minnesota Urban Small Sites BMP Manual." St. Paul, MN: Metropolitan Council Environmental Services, 2001. Accessed January, 2006. <<http://www.metrocouncil.org/environment/Watershed/BMP/manual.htm>>
- National Association of Homebuilders (NAHB). *Green Land Development: Save Money and the Environment*. May 2000. Accessed January, 2006. <<http://www.toolbase.org/tertiaryT.asp?TrackID=&CategoryId=18&DocumentID=2249>>
- National Association of Homebuilders (NAHB), American Society of Civil Engineers, Institute of Transportation Engineers, and Urban Land Institute, *Residential Streets*, Third Edition. Washington, DC: ULI – The Urban Land Institute, 2001.
- Puget Sound Action Team. *Puget Sound On-line: "Natural Approaches to Storm Water Management"*. Olympia, WA: Accessed February, 2006. <[http://www.psat.wa.gov/Publications/LID\\_studies/permeable\\_pavement.htm](http://www.psat.wa.gov/Publications/LID_studies/permeable_pavement.htm)>
- Saluda-Reedy Watershed Consortium (SRWC), "Watershed Insights Report No. 5: A Brief History of the Saluda-Reedy Watershed" ([http://www.saludareedy.org/research/watershed\\_ins\\_reports/WIR5.pdf](http://www.saludareedy.org/research/watershed_ins_reports/WIR5.pdf),

## REFERENCES/RESOURCES

Greenville, SC: October, 2005).

Schueler, Tom. *Site Planning for Urban Stream Protection*. Silver Spring, MD: Center for Watershed Protection, 1995. (Out of print. Available on-line at: <http://www.cwp.org/SPSP/TOC.htm>)

Seattle Public Utility. "Street Edge Alternatives (SEA Streets) Project." Accessed January 2006. [http://www.ci.seattle.wa.us/util/About\\_SPU/Drainage\\_&\\_Sewer\\_System/Natural\\_Drainage\\_Systems/Street\\_Edge\\_Alternatives/SPU\\_001805.asp](http://www.ci.seattle.wa.us/util/About_SPU/Drainage_&_Sewer_System/Natural_Drainage_Systems/Street_Edge_Alternatives/SPU_001805.asp)

South Carolina Department of Health and Environmental Control (SCDHEC). *South Carolina DHEC Storm Water Management BMP Handbook*. Columbia, SC: August, 2005. Accessed February 2006. [http://www.scdhec.net/environment/ocrm/pubs/tech\\_docs\\_water.htm](http://www.scdhec.net/environment/ocrm/pubs/tech_docs_water.htm)

Shoup, Donald. *The High Cost of Free Parking*. Chicago, IL: Planners Press, 2005.

The Urban Land Institute (ULI) and the The International Council of Shopping Centers (ICSC). *Parking Requirements for Shopping Centers*, Second Edition. Washington, DC: ULI, 2000.

ULI and the National Parking Association (NPA). *The Dimensions of Parking*. Fourth Edition. Washington, DC: ULI, 2001.

U.S. Department of Housing and Urban Development (HUD). "The Practice of Low Impact Development." Washington, D.C., July 2003.

Zielinski, Jennifer. "The Benefits of Better Site Design in Commercial Development." *The Practice of Watershed Protection*. Ed. Thomas R. Schueler and Heather K. Holland. Ellicott City, MD: Center for Watershed Protection, 2000.

*This page intentionally left blank*

**Produced for:**



c/o Upstate Forever  
P.O. Box 2308  
Greenville, SC 29602  
(864) 250-0500  
<http://www.saludareedy.org>



**By:**



Town Planners & Architects  
P.O. Box 1836  
108 S. Main Street, Suite B  
Davidson, NC 28036  
(704) 896-1696  
[www.thelawrencegroup.com](http://www.thelawrencegroup.com)

**December 2007**