SCDOT

SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION

Right of VPI ($x_2$ measured from VPT):

(a) $\text{TAN ELEV.} = \text{VPT ELEV.} - \left(\frac{G_2}{100}\right) x_2$ (Equation 12.5.14)

(b) $y_2 = x_2^{\,2} \frac{(G_2 - G_1)}{200\,L}$ (Equation 12.5.15)

At the VPI:

$y = E$ and $x = L/2$

(a) $\text{TAN ELEV.} = \text{VPC ELEV.} + \frac{G_1 L}{200}$

or $\text{TAN ELEV.} = \text{VPT ELEV.} - \frac{G_2 L}{200}$ (Equation 12.5.16)

(b) $E = \frac{L(G_2 - G_1)}{800}$ (Equation 12.5.17)

3. Calculating high or low point in the vertical curve:

(a) To determine distance "$x_T$" from VPC: $x_T = \frac{L\ G_1}{G_1 - G_2}$ (Equation 12.5.18)

(b) To determine high or low point stationing: VPC STA. + $x_T$ (Equation 12.5.19)

(c) To determine high or low point elevation on a vertical curve:

$\text{ELEV.}_{\text{HIGH OR LOW POINT}} = \text{VPC ELEV.} - \frac{L\ G_1^2}{(G_2 - G_1)\,200}$ (Equation 12.5.20)

**Revised Equation 12.5.18 and 12.5.19 for calculating high or low point in vertical curve – 9-2008**

**SYMMETRICAL VERTICAL CURVE EQUATIONS**
(Continued)

**Figure 12.5E**

**Example 12.5(1)**

Solution: (Continued)

| Station | Control Point | Tangent Elevation (feet) | x | $x^2$ | $y= x^2/60{,}000$ | Grade Elevation (feet) |
|---|---|---|---|---|---|---|
| 4+85 | VPC | 601.50 | 0 | 0 | 0.00 | 601.50 |
| 5+85 | | 599.75 | 100 | 10000 | 0.17 | 599.92 |
| 6+85 | | 598.00 | 200 | 40000 | 0.67 | 598.67 |
| 7+85 | | 596.25 | 300 | 90000 | 1.50 | 597.75 |
| 8+85 | | 594.50 | 400 | 160000 | 2.67 | 597.17 |
| 9+85 | | 592.75 | 500 | 250000 | 4.17 | 596.92 |
| 10+85 | VPI | 591.00 | 600 | 360000 | 6.00 | 597.00 |
| 11+85 | | 593.25 | 500 | 250000 | 4.17 | 597.42 |
| 12+85 | | 595.50 | 400 | 160000 | 2.67 | 598.17 |
| 13+85 | | 597.75 | 300 | 90000 | 1.50 | 599.25 |
| 14+85 | | 600.00 | 200 | 40000 | 0.67 | 600.67 |
| 15+85 | | 602.25 | 100 | 10000 | 0.17 | 602.42 |
| 16+85 | VPT | 604.50 | 0 | 0 | 0.00 | 604.50 |

4. Calculate the low point using Equations 12.5.18, 12.5.19 and 12.5.20:

$$x_T = \frac{1200\ (-1.75)}{-1.75 - 2.25} = \frac{-2100}{-4.00} = 5 + 25 \text{ ft from VPC}$$

therefore, the Station at the low point is:

$$VPC_{STA} + x_T = (4 + 85) + (5 + 25) = 10 + 10.00$$

Elevation at the low point on curve is:

$$\text{Elev. Of low point} = 601.50 - \frac{1200\ (-1.75)^2}{(2.25 - (-1.75))\,200} = 601.50 - 4.59 = 596.91 \text{ feet}$$

**Corrected low point calculation – 9-2008**

**VERTICAL CURVE COMPUTATIONS**
**(Example 12.5(1))**
(Continued)

**Figure 12.5F**

## 15.5.2 Design of Turn Lanes

### 15.5.2.1 Widths

The following will apply to auxiliary turn lane widths:

1. Lane Widths. Typically, the width of any turn lanes at an intersection will be the same as that of the adjacent through lane. In restricted areas, it may be justified to provide a narrower width.

2. Shoulder. The designer should meet the following for shoulders adjacent to auxiliary lanes:

   a. On Facilities without Curbs. The shoulder width adjacent to the auxiliary lane should be the same as the normal shoulder width for the roadway. At a minimum, the width may be 6 feet, assuming the roadway has a shoulder width equal to or greater than 6 feet.

   b. On Facilities with Curbs. The offset between the auxiliary lane and face of curb should be the same as that for the normal roadway section, typically the gutter width.

3. Cross Slope. The cross slope for an auxiliary lane will depend on the number of lanes and cross slope of the adjacent traveled way. See Section 13.2.5 for information on auxiliary lane cross slopes.

### 15.5.2.2 Turn Lane Lengths

Desirably, the length of a right- or left-turn lane at an intersection should allow for both safe vehicular deceleration and storage of turning vehicles outside of the through lanes. The length of auxiliary lanes will be determined by a combination of its taper length, ~~deceleration length~~ and storage length. The following will apply:

1. Tapers. The entrance taper into the turn lane may be either a straight or a reverse curve taper. Typically, SCDOT uses reverse curves where the turn lane taper is painted. For other situations, straight tapers are commonly used (e.g., curb and gutter tapers). Figure 15.5H provides the recommended taper distances for straight- and reverse-curve tapers. Where the highway is on a curved alignment, the taper of the turn lane should be more pronounced than usual to insure that the through motorists are not inadvertently directed into the turn lane. This is accomplished by shortening the taper length.

2. Right-Turn Lanes. Figure 15.5I provides the minimum lengths for right-turn lanes.

3. Left-Turn Lanes. Figure 15.5J provides the minimum lengths for left-turn lanes.

**Revised section 15.5.2.2 to remove "deceleration length" as a component of turn lane lengths.**

1. General. Parallel parking is preferred to angle parking.

2. Existing Angle Parking. Angle parking will not be permitted on any Federal-aid or State highway unless the Department determines that the roadway is of sufficient width to permit angle parking without interfering with the free movement of traffic. A local authority may by ordinance permit angle parking on a roadway. SCDOT prefers to relocate parking off-site or to convert angle parking to parallel parking. Consult with the local community before selecting an option.

3. New Parking. Where new on-street parking will be introduced, only parallel parking will be acceptable.

### 21.1.1.1 Design

The following summarizes the design criteria for on-street parking:

1. Stall Width. All parallel parking stalls should be 8 to 12 feet wide. For parallel parking, stall widths are measured from the edge of traveled way to the gutter line. For angle parking, stall widths will generally range between 8.5 and 9 feet.

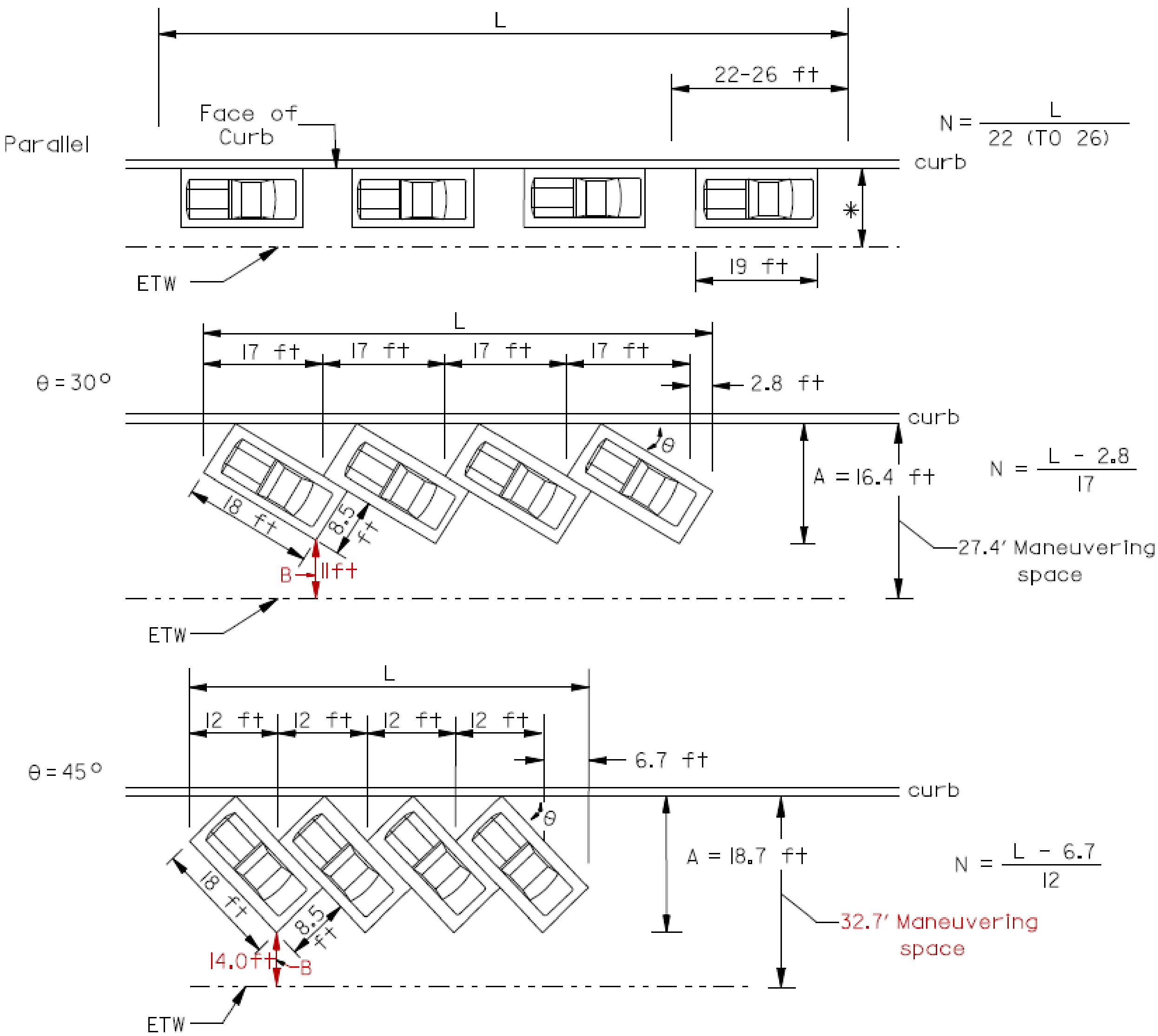
2. Stall Layout. Figure 21.2F provides the layout criteria for parking stalls for various configurations. The figure also indicates the number of stalls which can be provided for each parking configuration for a given curb length. For angle parking, desirably, the roadway width allocated to parking will be the maneuvering space as shown in Figure 21.2F exclusive of the through travel lane. The maneuvering space distance is that width needed by a parked vehicle to back onto the street when exiting the stall. However, in restricted areas a portion of the maneuvering dimension may be required for the through travel lane, thereby reducing the roadway width allocated to angle parking.

3. Cross Slope. The cross slope of the parking lane should match that of the adjacent through travel lane, typically 2.08 percent. However, exceptions are allowed for cross slopes between 2.08 percent and 4 percent to fit actual field conditions. The slope of the parking lane may not be flatter than that of the adjacent through lane.

4. Accessibility for Disabled Individuals. A certain number of on-street parking spaces must be provided for accessibility for the disabled. Their design must meet the accessibility design criteria discussed in Section 17.1.

5. Intersection Curb Radii. Parking may need to be restricted a certain distance from intersections to allow the design vehicle (typically a WB-62) to properly negotiate the right turn. See Section 15.3 for specific information.

**Revised Section 21.1.1.1 to reflect a general range for the stall width– 9-2008**




Key: L = given curb length with parking spaces, feet
N = number of parking spaces over distance L
A = required distance between face of curb and back of stall, assuming that bumper of parked car does not extend beyond curb face, feet
B = minimum clear distance needed for a parked vehicle to back out of stall while clearing adjacent parked vehicles, feet
ETW = Edge of Traveled Way

*See Figures 21.3A and 21.3C for parking lane widths

**Revised maneuvering space dimension for 45 degree parking – 9-2008**
**Added dimensions “B” and “B” to 30 and 45 degree parking 9-2008**

**PARKING CONFIGURATIONS**
**Figure 21.2F**