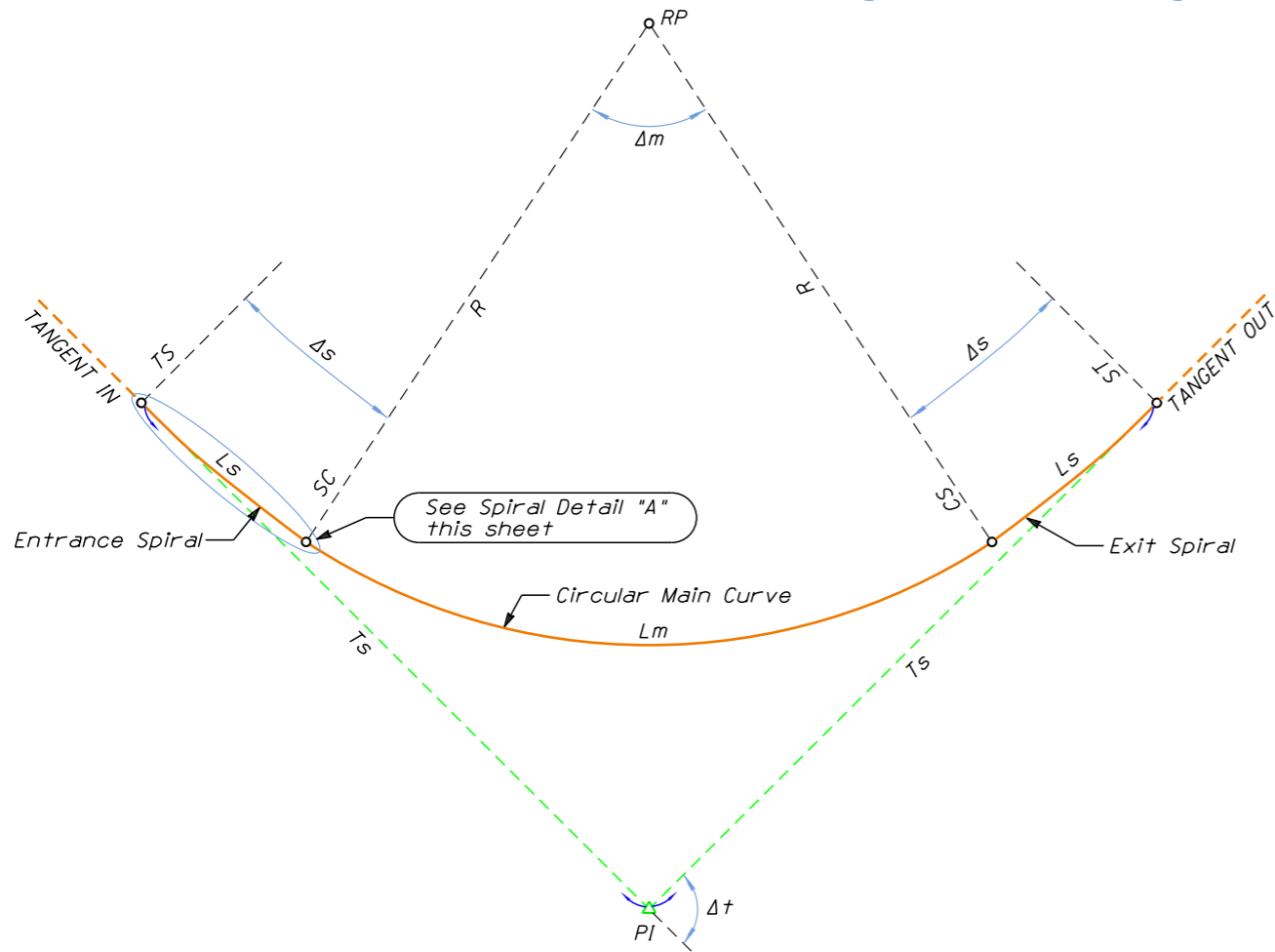
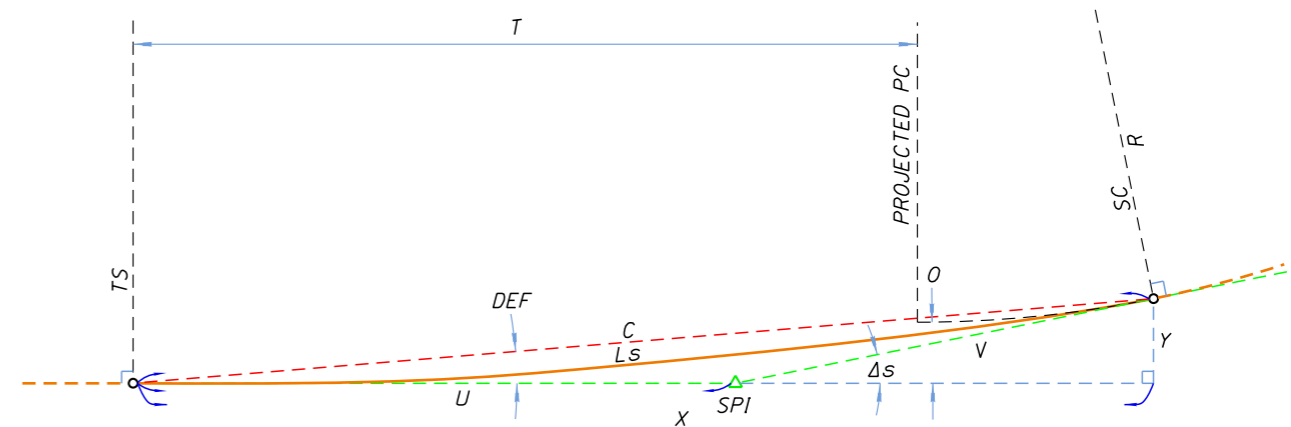


# FULL TRANSITION SPIRAL CURVE



**TYPICAL HIGHWAY SPIRAL-MAIN-SPIRAL CURVE**  
Not to scale



**SPIRAL DETAIL "A"**  
Not to scale

Highway Spiral Curve where  $\Delta s < 16^\circ$

## FORMULAS

$$R = 5729.57795 / D$$

$$a = (D * 100) / Ls$$

$$O = 0.0727 * a * ((Ls / 100)^3)$$

$$T = (Ls / 2) - (0.000127 * a^2 * (Ls / 100)^5)$$

$$Ts = (\tan(\Delta t / 2) * (R + O)) + T$$

$$C = Ls - (0.00034 * a^2 * (Ls / 100)^5)$$

$$DEF = (a * Ls^2) / 60000$$

$$\Delta s = 0.005 * D * Ls$$

$$U = C * \sin(\Delta s * 2 / 3) / \sin(\Delta s)$$

$$V = C * \sin(\Delta s * 1 / 3) / \sin(\Delta s)$$

$$\Delta m = \Delta t - \Delta s - \Delta s$$

$$Lm = (\Delta m * R * \pi) / 180$$

$$X = C * \cos(DEF)$$

$$Y = C * \sin(DEF)$$

$$SC(Sta) = TS(Sta) + Ls$$

$$CS(Sta) = SC(Sta) + Lm$$

$$ST(Sta) = CS(Sta) + Ls$$

$$PI(Sta) = TS(Sta) + Ts$$

## EXAMPLE

Given:  $\Delta t = 36^\circ 29' 16''$ ;  $D = 2^\circ 00' 00''$ ;  $Ls = 200$ ;  $TS(Sta) = 2180+84.70$

$$R = 5729.57795 / 2.0000^\circ = 2864.78898$$

$$a = (2.0000^\circ * 100) / 200 = 1.00$$

$$O = 0.0727 * 1 * ((200 / 100)^3) = 0.58160$$

$$T = (200 / 2) - (0.000127 * 1^2 * (200 / 100)^5) = 99.99594$$

$$Ts = (\tan(36.48777777^\circ / 2) * (2864.78898 + 0.58160)) + 99.99594 = 1044.51462$$

$$C = 200 - (0.00034 * 1^2 * (200 / 100)^5) = 199.98912$$

$$DEF = (1 * 200^2) / 60000 = 0.666667^\circ \text{ or } 0^\circ 40' 00''$$

$$\Delta s = 0.005 * 2.0000^\circ * 200 = 2.0000^\circ \text{ or } 2^\circ 00' 00''$$

$$U = 199.98912 * \sin(2.0000^\circ * 2 / 3) / \sin(2.0000^\circ) = 133.34112$$

$$V = 199.98912 * \sin(2.0000^\circ * 1 / 3) / \sin(2.0000^\circ) = 66.67508$$

$$\Delta m = 36^\circ 29' 16'' - 2^\circ 00' 00'' - 2^\circ 00' 00'' = 32^\circ 29' 16'' \text{ or } 32.48777777^\circ$$

$$Lm = (32.48777777^\circ * 2864.78898 * 3.141592654) / 180 = 1624.38889$$

$$X = 199.98912 * \cos(0.666667^\circ) = 199.97558$$

$$Y = 199.98912 * \sin(0.666667^\circ) = 2.32693$$

$$SC(Sta) = 2180+84.70 + 200 = 2182+84.70$$

$$CS(Sta) = 2182+84.70 + 1624.39 = 2199+09.09$$

$$ST(Sta) = 2199+09.09 + 200 = 2201+09.09$$

$$PI(Sta) = 2180+84.70 + 1044.51 = 2191+29.21$$

## DEFINITIONS

$\Delta t$  = Total Delta Deflection  
 $D$  = Degree of Curvature  
 $Ls$  = Length of Spiral  
 $TS(Sta)$  = Tangent to Spiral  
 $R$  = Radius  
 $a$  = Rate of change per 100'  
 $O$  = Radial Offset  
 $T$  = Projected curve P.C.  
 $Ts$  = Tangent Length  
 $C$  = Spiral Chord  
 $DEF$  = Deflection angle at  $TS(Sta)$   
 $\Delta s$  = Spiral Delta  
 $U$  = Distance to Spiral PI  
 $V$  = Distance to  $SC(Sta)$   
 $\Delta m$  = Main Curve - Delta  
 $Lm$  = Main Curve - Length  
 $X$  = Distance along X axis  
 $Y$  = Distance along Y axis  
 $SC(Sta)$  = Spiral to Curve  
 $CS(Sta)$  = Curve to Spiral  
 $ST(Sta)$  = Spiral to Tangent  
 $PI(Sta)$  = Point of Intersection  
 $RP$  = Radius Point of Main Curve  
 $SPI$  = Spiral Point of Intersection  
 $POS$  = Point on Spiral

FULL TRANSITION SPIRAL CURVE  
EQUAL ENTRANCE & EXIT SPIRALS

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