



Refer to Standard Drawings 203.20 and 203.21 for more clarity on the above graphic.

Definitions		
T.S. = Common point of tangent to spiral	S.C. = Common point of spiral to circular curve	C.S. = Common point of circular curve to spiral
S.T. = Common point of spiral to tangent	R_c = Radius of circular curve (arc definition)	D_c = Degree of circular curve
D = Degree of curvature at any point on the spiral	T_s = Tangent for entire curve (P.I. to T.S. or S.T.)	Δ = Total central angle of curve
Δ_c = Central angle of circular curve	θ_s = Intersection angle between the tangent of the complete curve and the tangent at the S.C., the spiral angle.	θ = Intersection angle between the tangent of the complete curve and the tangent at any point on the spiral, the spiral angle of any other point.
p = Offset distance from the tangent of P.C. of circular curve produced	k = Distance from T.S. to point on tangent opposite the P.C. of circular curve produced.	Φ_d = Deflection angle from tangent at T.S. to S.C.
Φ = Deflection angle from tangent at T.S. or any point on spiral to any other point on spiral	L.C. = Straight line chord distance T.C. to S.C.	L_s = Length of spiral transition
L_c = Length of circular curve	L = Length between T.S. and any other point on spiral	X_c, Y_c = Coordinates of S.C. from the T.S.

Formulas	
$R_c = 5728.58 / D_c$	L.C. = $X_c / (\cos \Phi_s) = Y_c / (\sin \Phi_s)$
$D = LD_1 / L_i$	$\Delta_c = \Delta - (L_s D_c / 100)$
$*X_c = L_s - (L_s^3 / 40R_c^2)$	$L_c = 100\Delta_c / D_c$
$*Y_c = X_c \tan \Phi_s$	$\theta_s = L_s D_c / 200$
$p = Y_c - R_c \text{ Vers } \theta_s$	$\theta = (L / L_s)^2 \times \theta_s$
$k = X_c - R_c \sin \theta_s$	$\Phi = (\theta_s / 3) - C$
$T_s = (R_c + p) [\tan(\Delta / 2)] + k$	$\Phi = (\theta / 3) - C$
$E_s = (R_c + p) [\text{Exsec}(\Delta / 2)] + p$	$\Phi = [(\theta / 3)(L / L_s)^2] - C$

* These formulas are closely approximate - the exact value is determined from a geometric series not given here.

** The correction C is obtained from the table below. C is less than one-half minutes for values of θ of 20° or less, and can in practically all cases, be disregarded.

θ in degrees	15	20	25	30	35	40	45	50
C in minutes	0.2	0.4	0.8	1.4	2.2	3.4	4.8	6.6