North American Datum 1983 (NAD83) - California Coordinate System 1983 (CCS83)

CALIFORNIA ZONE 2, CA02, ZONE# 0402

Meters			US Survey Feet		
B_s	=	38°20′N	B_s	=	38°20′N
B_n	=	39°50′N	B_n	=	39°50′N
B_b	=	37°40′N	B_b	=	37°40′N
L_o	=	122°00′W	L_o	=	122°00′W
N_b	=	500000.0000 m	N_b	=	1640416.667'
E_o	=	2000000.0000 m	E_o	=	6561666.667'
B_o	=	39.0846839219°N	B_o	=	39.0846839219°N
$SinB_o$	=	0.630468335285	$SinB_o$	=	0.630468335285
R_b	=	8019788.9307 m	R_b	=	26311590.850'
R_o	=	7862381.4027 m	R_o	=	25795162.985'
N_o	=	657407.5280 m	N_o	=	2156844.531'
K	=	12520351.6538 m	K	=	41077187.051'
k_o	=	0.999914672977	k_o	=	0.999914672977
M_o	=	6360268.3937 m	M_o	=	20866980.555'
r_o	=	6373169. m	r_o	=	20909305.294'
r_α	=	6,373,712.85m			
L_1	=	111007.6240	L_1	=	364197.5131
L_2	=	9.54628	L_2	=	31.3198
L_3	=	5.63874	L_3	=	18.4998
L_4	=	0.019988	L_4	=	0.065577
G_1	=	9.008390180E-06	G_1	=	2.745762818E-06
G_2	=	-6.97872E-15	G_2	=	-6.48347E-16
G_3	=	-3.71084E-20	G_3	=	-1.05080E-21
G_4	=	-1.0411E-27	G_4	=	-8.9858E-30
F_1	=	0.999914672977	F_1	=	0.999914672977
F_2	=	1.23106E-14	F_2	=	1.14370E-15
F_3	=	5.14E-22	F_3	=	1.46E-23

The customary limits of the zone are from 37°40′N to 40°30′N.

CEST 50B Plane Surveying
NAD83 REDUCING MEASURED DISTANCES TO GRID DISTANCES

Procedures Converting Ground Distances to Grid Distances.

1. Calculate the Radius of Curvature of the Ellipsoid (R_a)
2. Calculate the Elevation Factor (r_e)
3. Calculate the Scale Factor (k) *(Point or Line)*
4. Compute the Combination Factor (C_F)
5. Compute Grid Distance.
6. Compute Grid Azimuth.

1. Radius of Curvature of the Ellipsoid: (R_a)

$$R_a = r_o \div k_o$$

r_o = Radius of the Ellipsoid at projection origin, from Zone Tables
k_o = Grid Scale factor of the central parallel, from Zone Tables

2. Elevation Factor: (r_e)

$$r_e = R_a \div (R_a + N + H)$$

N = Geoid Separation or Height, (always a negative value)
H = Mean Sea Level Elevation

3. Point or Line Scale Factor: (k)

An approximate scale factor, may be interpolated from the projection tables of a specific zone. It is based on the latitude of the point, or the latitude of ends of the line.)

To calculate the precise *POINT* scale factor (k), use the following equation:

$$k = [\, F_1 + (F_2\, u^2) + (F_3\, u^3) \,]$$

To calculate the precise *LINE* scale factor, *(k)*, use the following equation:

$$k = (k_1 + 4k_m + k_2) \div 6$$

F_1, F_2, F_3 = Zone Constants
u = Radial Distance from Station to Central Parallel.
k_1, k_2 = point scale factor of ends of line
k_m = point scale factor of the midpoint of the line

4. Combination Factor: (C_F)

$$C_F = (r_e \times k)$$

5. Reducing Ground Distance to Grid Distance:

$$\text{Grid Distance} = \text{Ground Distance} \times C_F$$

6. Convert Geodetic Azimuth to Grid Azimuth:

$$\text{Grid Azimuth} = \text{Geodetic Azimuth} - (\gamma)$$

(γ) = Convergence Angle