Radius of curvature

Basic gear formulas:

$$D_p = \frac{Z}{d_0}$$

$$d_b = d_0 * \cos\phi \ [in.]$$

$$t = \frac{\pi}{2D_p} \ [in.]$$

Conversion from degrees to radians:

$$\hat{\phi} = \frac{\pi\phi}{180} \ [rad.]$$

Where:
$Z - number\ of\ teeth$
$d_0 - \ pitch\ diameter\ [in.]$
$d_b - base\ diameter\ [in.]$
$D_p - diametral\ pitch\ [dimensionless]$
$\phi - pressure\ angle\ [degree]$
$t - CTT, circular\ tooth\ thickness\ [in.]$

General form of an involute function:

$$\hat{\Theta} = inv\phi = \tan\phi - \hat{\phi}$$

Where:
$\hat{\Theta} - polar\ angle\ [radians]$
$\Theta - polar\ angle\ [degree]$
$inv\phi - \ involute\ function\ of\ an\ angle\ [rad.]$
$\phi - involute\ pressure\ angle\ [degree]$
$\hat{\phi} - involute\ pressure\ angle\ [radians]$

Radius of curvature at an arbitrary point on the involute curve:

$$\rho_A = (R_A^2 - R_b^2)^{0.5}$$

Where:
$\rho_A - \ radius\ of\ curvature, at\ point$ "A" $on\ the\ involute$
$R_A - \ radius\ to\ point\ "A"$
$R_b - \ base\ radius$

This could be expressed as a function of the pressure angle:

$$\rho_A = R_A * \sin\phi_A$$

Where:
$\phi_A - \ pressure\ angle\ at\ point\ "A"$

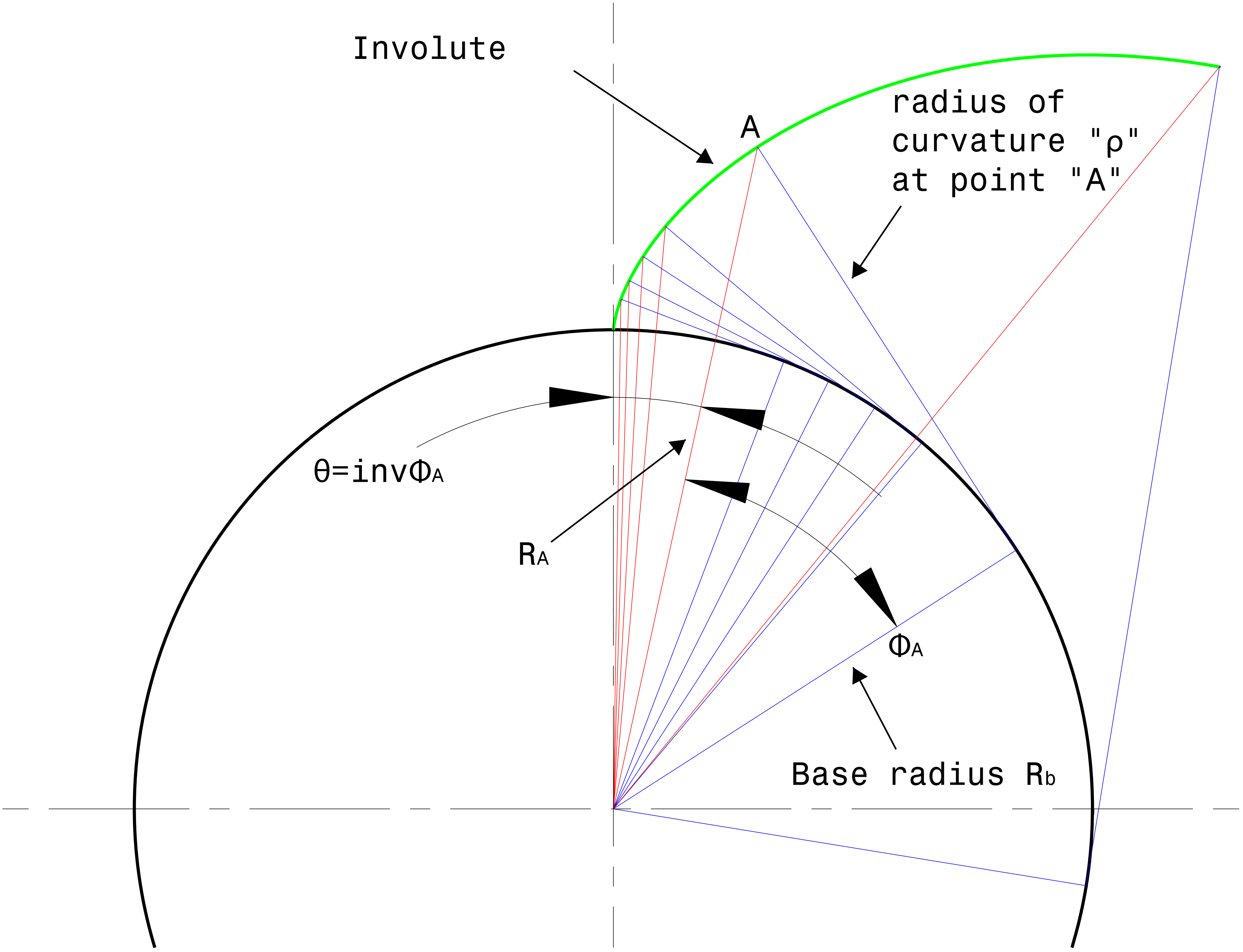
Radius of curvature at pitch diameter:

$$\rho = \frac{d * \sin\phi}{2}$$

Where: $\rho -$ *radius of curvature*
$d -$ *pitch diameter*
$\phi -$ *pressure angle at pitch diameter*

NOTE:

As $R_b \to \infty$ *the* $\rho \to \infty$ *and therefore the tooth shape becomes a straight line as in the basic involute rack*



Involute
A
radius of
curvature "ρ"
at point "A"
θ=invΦA
RA
ΦA
Base radius Rb