ΚΑΜΠΥΛΕΣ ΟΡΙΖΟΝΤΙΟΓΡΑΦΙΑΣ

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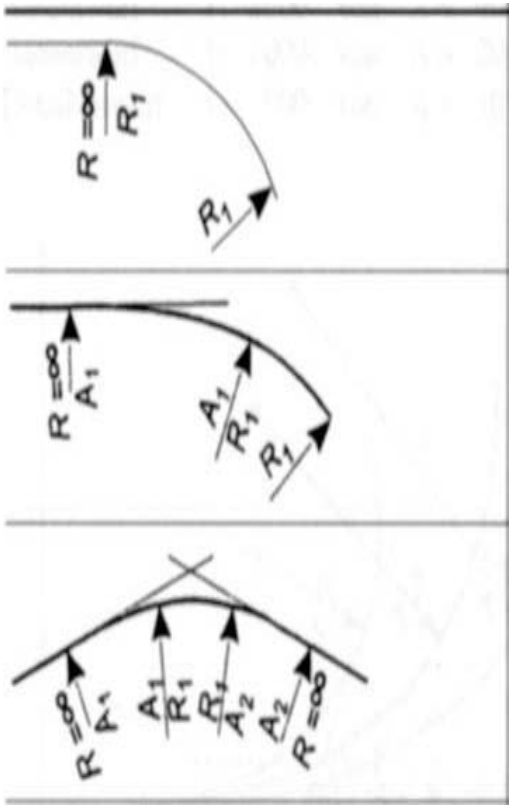
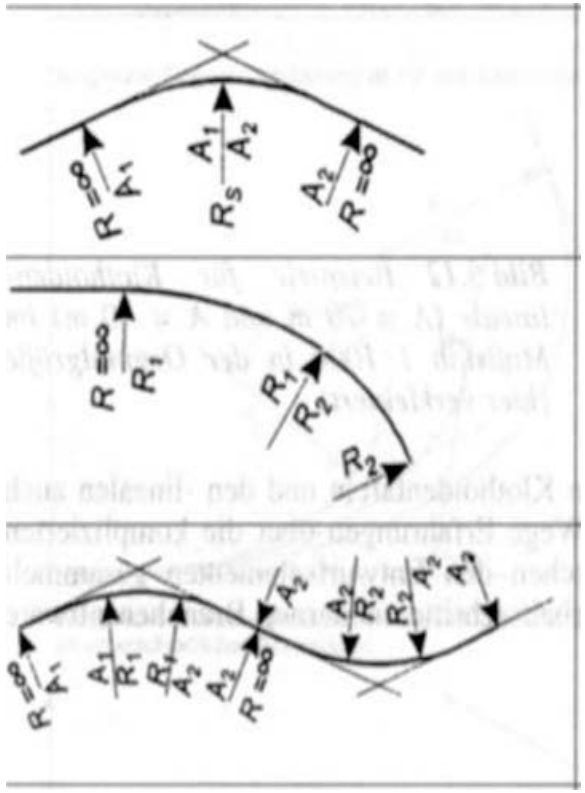
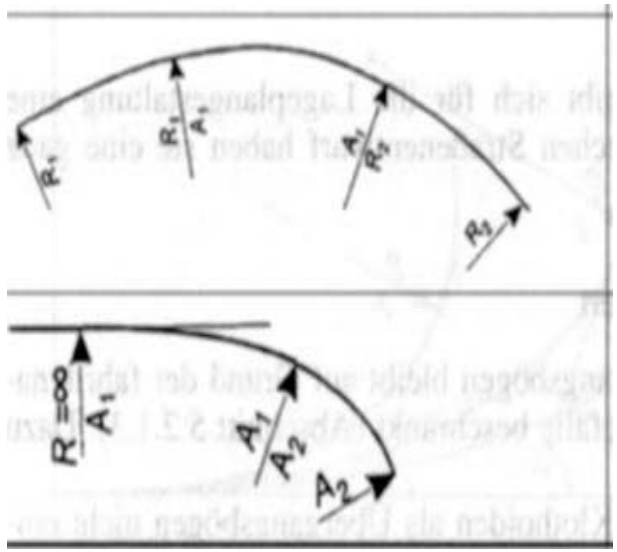
Σχολή Αγρονόμων – Τοπογράφων Μηχανικών

Εργαστήριο Συγκοινωνιακής Τεχνικής

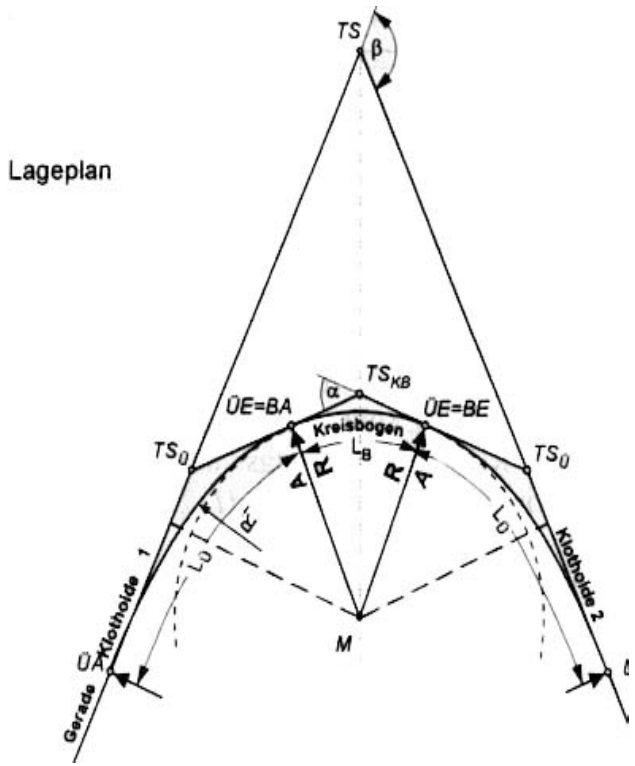
Μορφές Οριζοντίων Καμπυλών

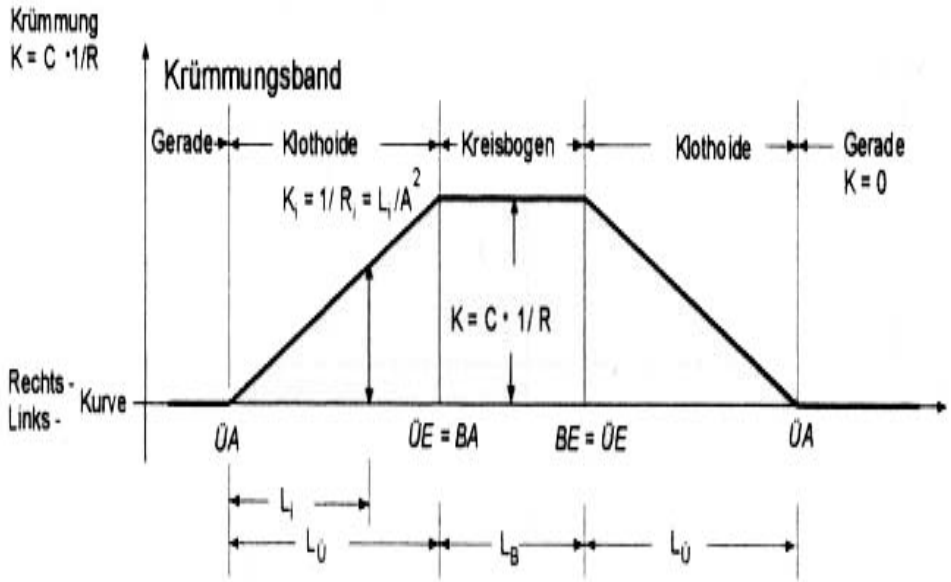




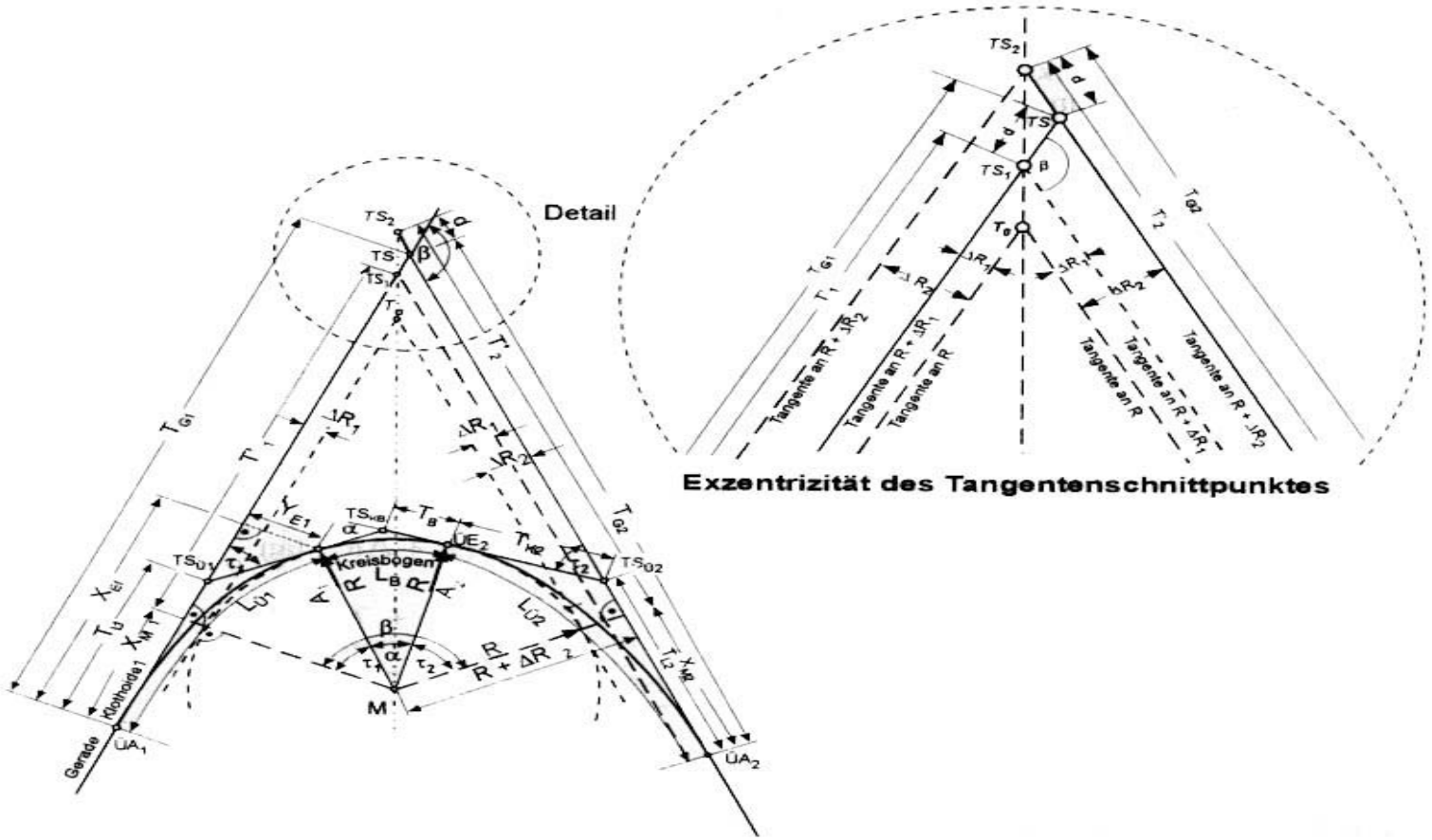


Τυπική Καμπύλη Οδοποιίας





Υπολογισμός Τυπικής Καμπύλης



Εξισώσεις Τυπικής Καμπύλης

$$\sin\beta = \frac{\Delta R_2 - \Delta R_1}{d}, \Delta R_2 > \Delta R_1$$

$$d = \frac{\Delta R_2 - \Delta R_1}{\sin\beta}$$

$$T_1' = (R + \Delta R_1) \cdot \tan\frac{\beta}{2}$$

$$T_2' = (R + \Delta R_2) \cdot \tan\frac{\beta}{2}$$

$$T_{G1} = X_{M1} + T_1' + d$$

$$T_{G2} = X_{M2} + T_2' - d$$

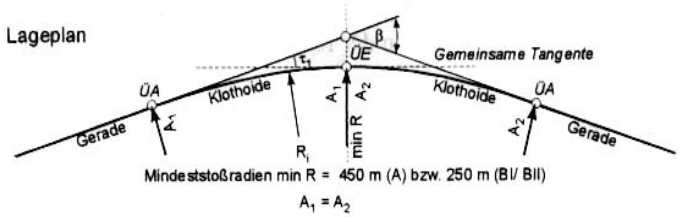
$$\alpha = \beta - (\tau_1 + \tau_2)$$

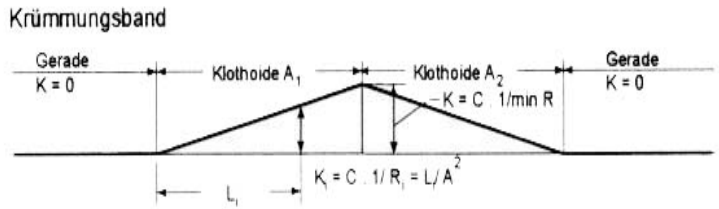
$$L_G = L_B + L_{U1} + L_{U2}$$

$$\min L_B \geq \frac{V_e \cdot 2}{3.6}[m]$$

$$\min\alpha \geq \frac{\min L_b \cdot 200}{\pi \cdot R}$$

Κλωθοειδής Κορυφής





$$A_1 = A_2 = A$$

$$T_1 = T_2 = T$$

$$T_G = X + Y \cdot \tan\tau$$

$$T_G = T' + X_M$$

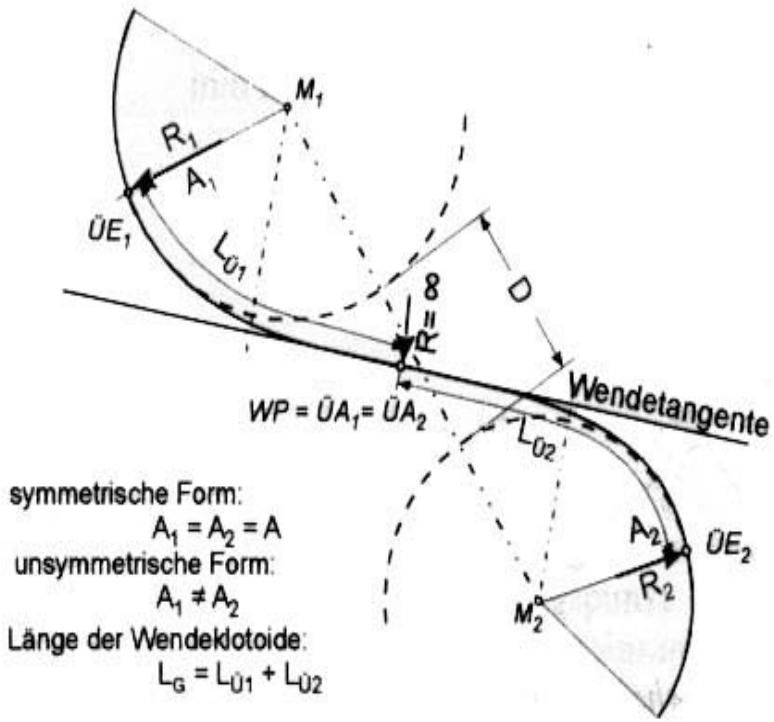
$$T' = (R + \Delta R) \cdot \tan\frac{\beta}{2}$$

$$\beta = \tau_1 + \tau_2 = 2 \cdot \tau$$

$$L_G = L_{U1} + L_{U2} = 2 \cdot L_U$$

$$\min R = \sqrt{\frac{(A_1^2 + A_2^2) \cdot 63.662}{\beta[gon] \cdot 2}}[m]$$

Κλωθοειδής Καμπής

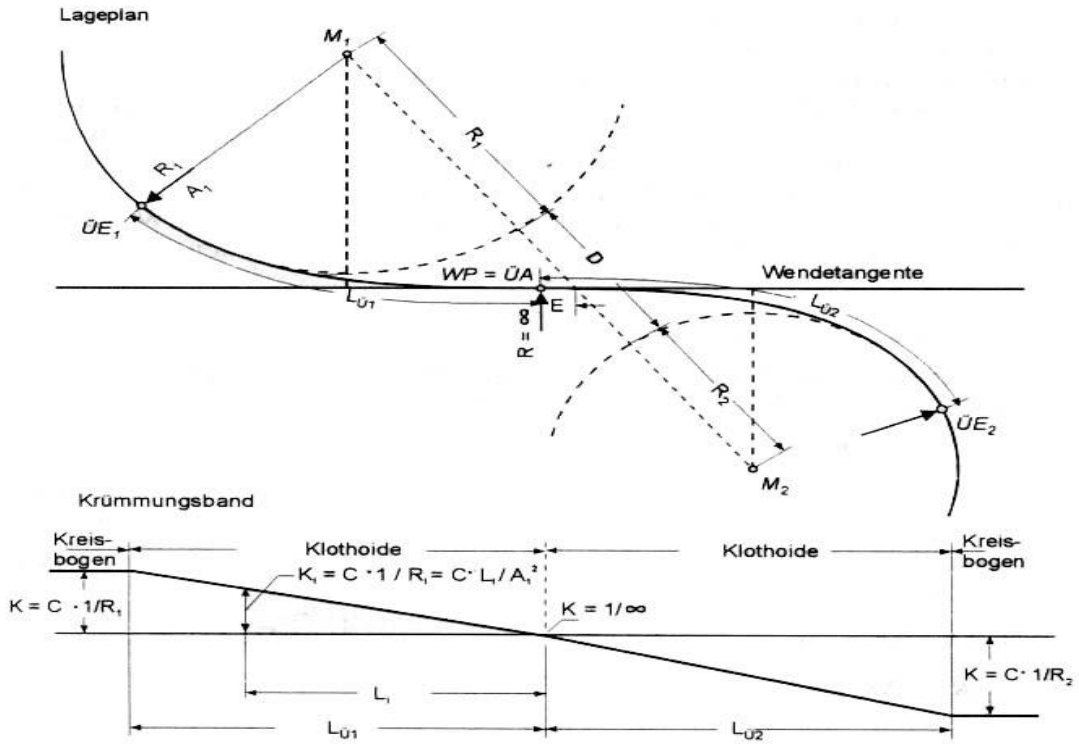


$$R' = \frac{R_1 \cdot R_2}{R_1 + R_2}$$

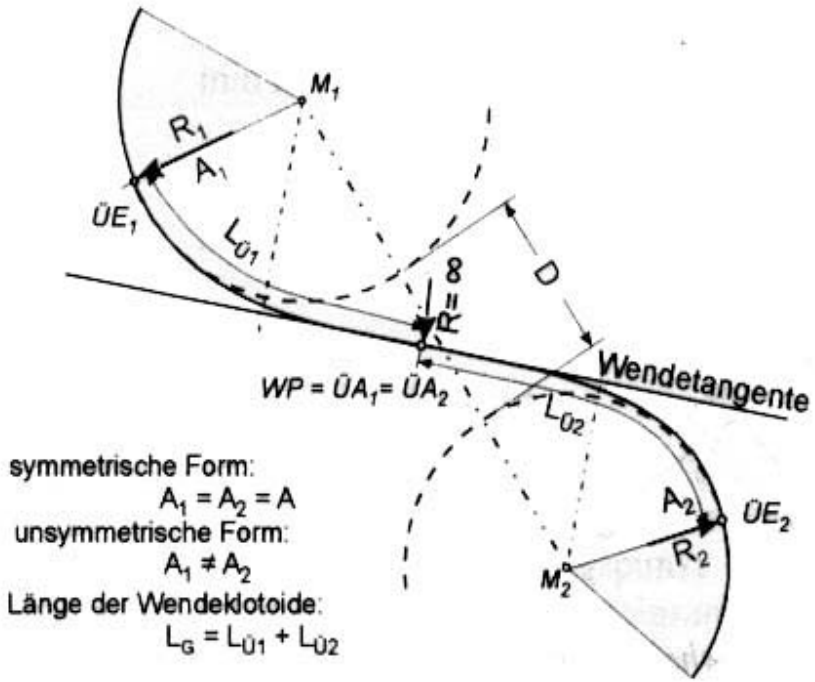
$$D = \overline{M_1 M_2} - R_1 - R_2$$

$$D = \sqrt{(R_1 + R_2)^2 + T^2} - (R_1 + R_2)$$

Συμμετρική Κλωθοειδής Καμπής



Υπολογισμός Κλωθοειδούς Καμπής



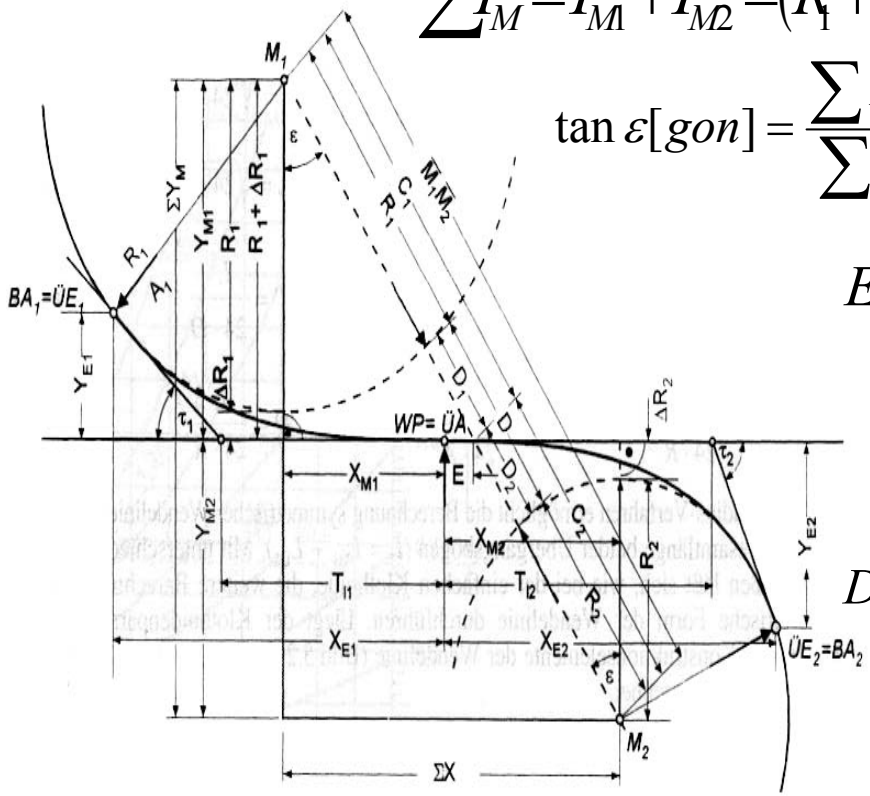
$$A=\sqrt{R\cdot L} \qquad A=\sqrt[4]{24\cdot D\cdot R'^3} \qquad A=\sqrt{\frac{L^3}{24\cdot D}}$$

$$L=\frac{A^2}{R'} \qquad L=\sqrt{24A^2\cdot D} \qquad L=\sqrt{24\cdot D\cdot R'}$$

$$R'=\frac{A^2}{L} \qquad R'=\sqrt[3]{\frac{A^4}{24\cdot D}} \qquad R'=\frac{L^2}{24\cdot D}$$

$$D=\frac{A^4}{24\cdot R'^3} \qquad D=\frac{L^3}{24\cdot A^2} \qquad D=\frac{L^2}{24\cdot R'}$$

Κατασκευή Κλωθοειδούς Καμπής



$$\sum Y_M = Y_{M1} + Y_{M2} = (R_1 + \Delta R_1) + (R_2 + \Delta R_2) \qquad \sum X_M = X_{M1} + X_{M2}$$

$$\tan \varepsilon[gon] = \frac{\sum X_M}{\sum Y_M} \qquad E = (R_1 + \Delta R_1) \cdot \tan \varepsilon - X_{M1}$$

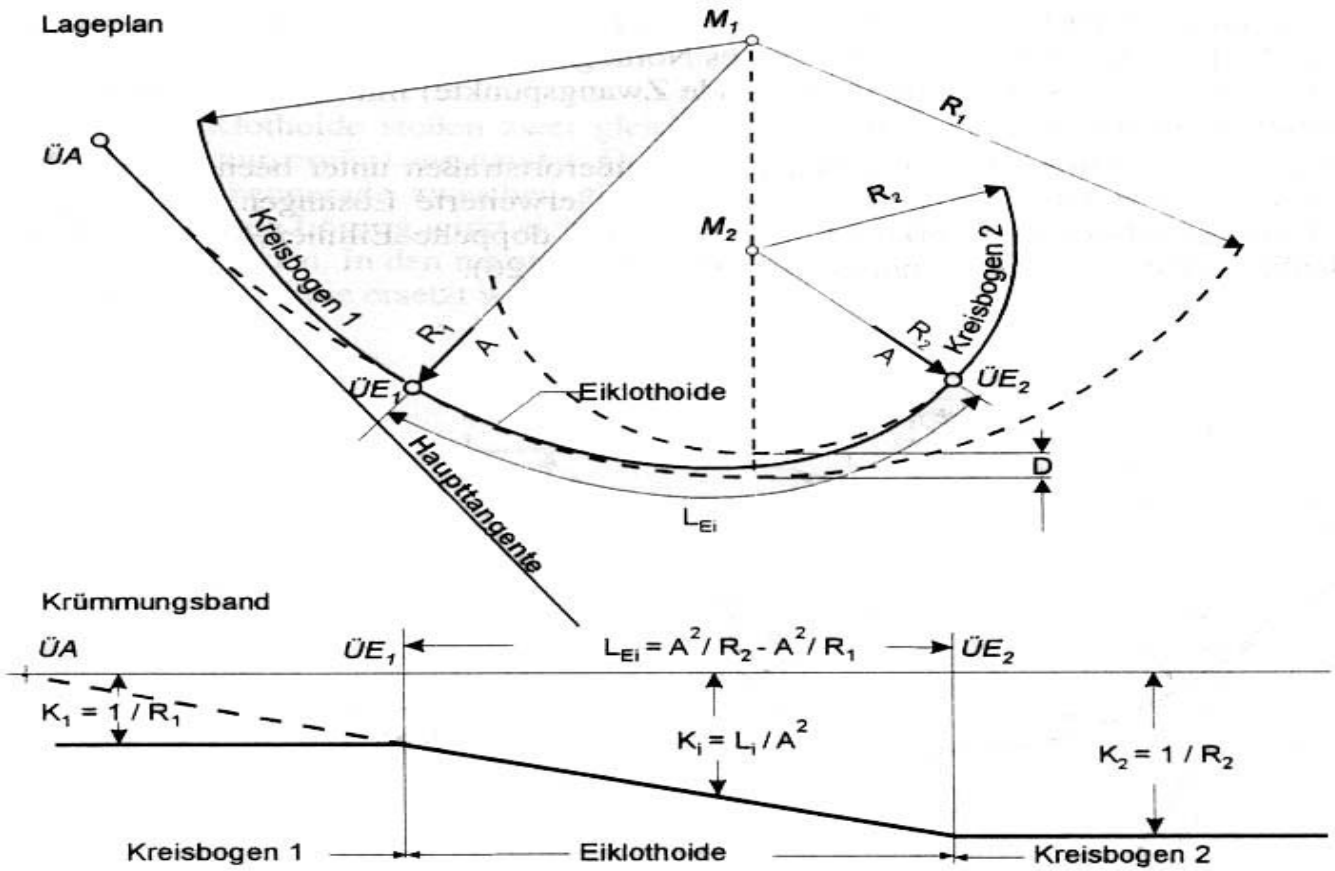
$$E = X_{M1} - (R_2 + \Delta R_2) \cdot \tan \varepsilon$$

$$\overline{M_1 M_2} = \frac{\sum X_M}{\sin \varepsilon}$$

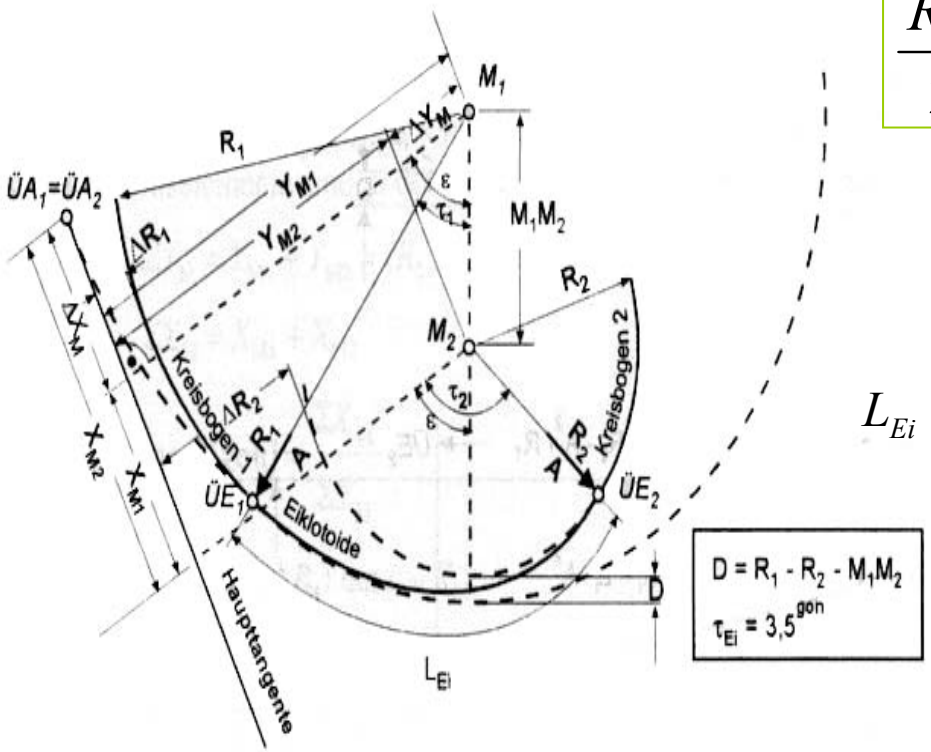
$$D = \overline{M_1 M_2} - (R_1 + R_2) \qquad D = D_1 + D_2$$

$$D_1 = \frac{X_{M1} + E}{\sin \varepsilon} - R_1 \qquad D_2 = \frac{X_{M2} + E}{\sin \varepsilon} - R_2$$

Ωοειδής Καμπύλη



Κατασκευή Ωοειδούς Καμπύλης



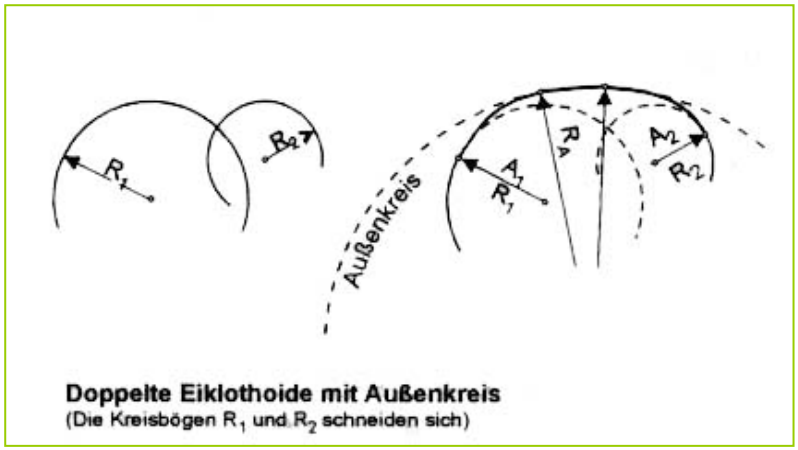
$$\frac{R_2}{2} \le A \le R_2, (R_1 < R_2)$$

$$L_{Ei} = L_{K1(R_1)} - L_{KL(R_2)}$$

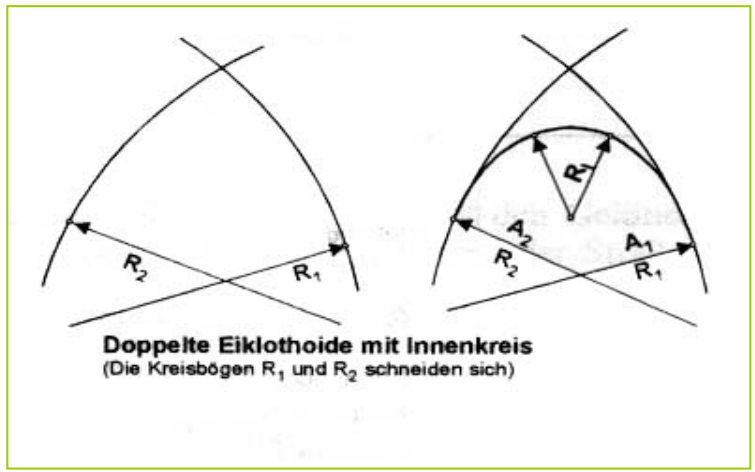
$$L_{Ei} = \frac{A^2}{R_1} - \frac{A^2}{R_2} = A^2 \cdot \left(\frac{1}{R_1} - \frac{1}{R_2}\right), (R_1 < R_2)$$

$$\tau_{Ei} = \tau_{K1(R_1)} - \tau_{K1(R_2)}$$

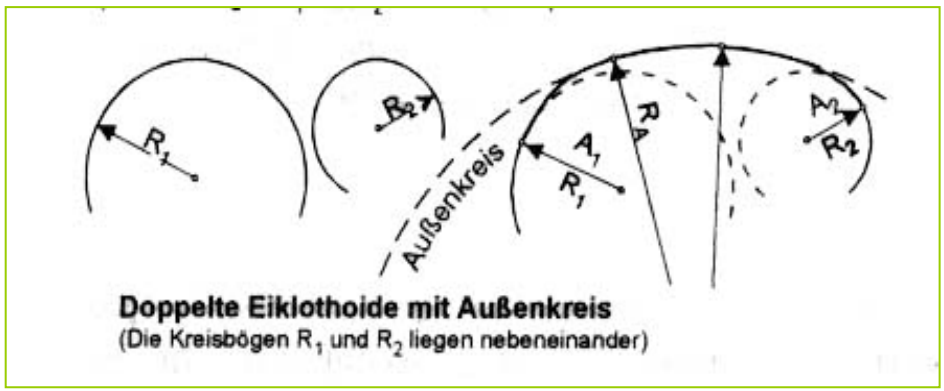
Συνδυασμοί Ωοειδών Καμπυλών



Doppelte Eiklothoide mit Außenkreis
(Die Kreisbögen R_1 und R_2 schneiden sich)

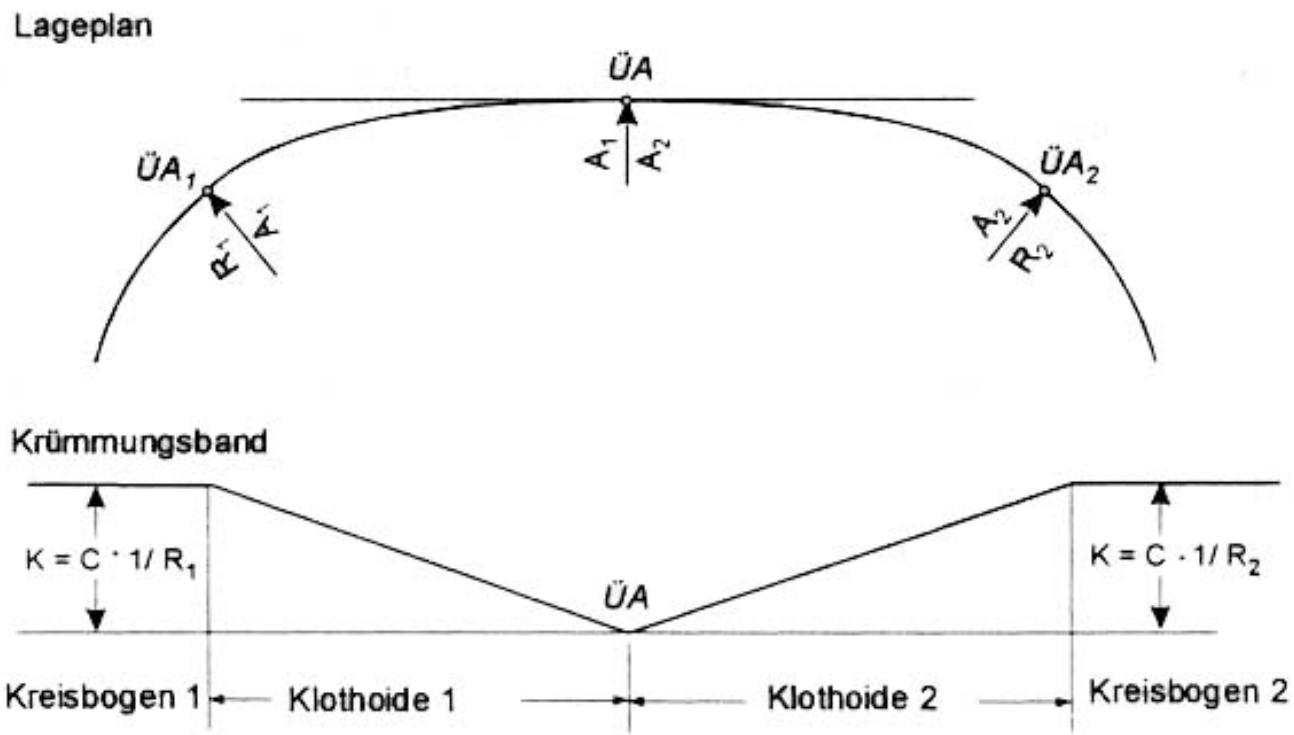


Doppelte Eiklothoide mit Innenkreis
(Die Kreisbögen R_1 und R_2 schneiden sich)

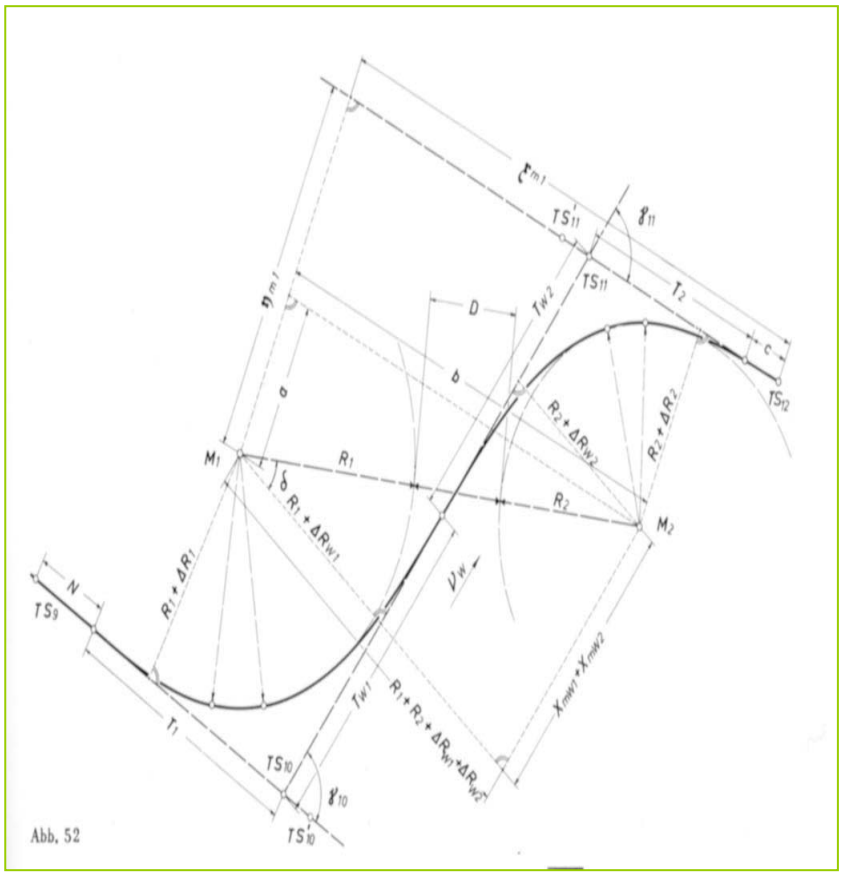


Doppelte Eiklothoide mit Außenkreis
(Die Kreisbögen R_1 und R_2 liegen nebeneinander)

Καμπύλη Μορφής “C”



ΕΦΑΡΜΟΓΗ 1



- Δίνονται
  - TS_9, TS_{12},
  - A_1, R_1,
  - A_w,
  - A_2, R_2,
  - N
- Ζητούνται
  - TS_{10}, TS_{11}
  - T_1, T_2, T_{w1}, T_{w2}
  - b_1, b_2

ΛΥΣΗ

$$\overline{M_1M_2} = \sqrt{\left(R_1 + R_2 + \Delta R_{w1} + \Delta R_{w2}\right)^2 + \left(X_{mw1} + X_{mw2}\right)^2}$$

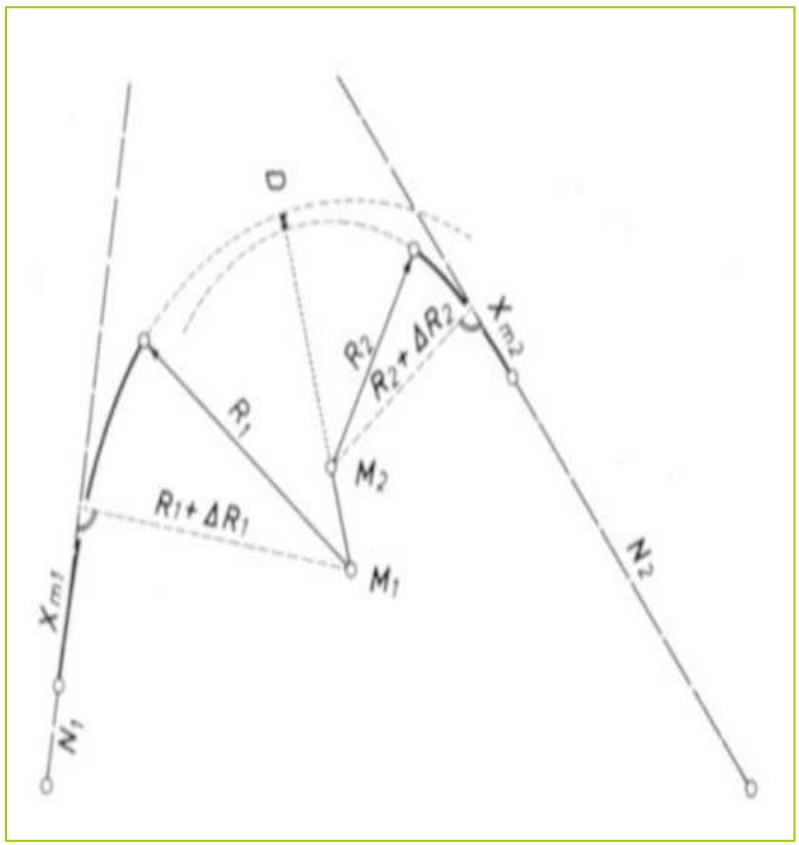
$$a = \left(R_2 + \Delta R_2\right) - \text{ψ}_{m\ 1} \qquad b = \sqrt{\overline{M_1M_2}^{\,2} - a^2}$$

$$c = \text{ϑ}_{\ m1} - b - X_{m2} \qquad \tan\delta = \frac{X_{mw1} + X_{mw2}}{R_1 + R_2 + \Delta R_{w1} + \Delta R_{w2}}$$

$$\nu_w = \nu_{M_1}^{M_2} \pm \delta - 100gon \qquad \alpha_1 = \gamma_{10} - \left(\tau_1 + \tau_{w1}\right)$$

$$\alpha_2 = \gamma_{11} - \left(\tau_2 + \tau_{w2}\right) \qquad \widehat{b}_1 = \frac{R_{\ 1}\pi\alpha_{\ 1}}{200} \qquad \widehat{b}_2 = \frac{R_2\pi\alpha_2}{200}$$

ΕΦΑΡΜΟΓΗ 2



- Δίνονται

$$\nu_{TS_{11}}^{TS_{12}}, \nu_{TS_{12}}^{TS_{13}}, N_1, N_2, A_1, R_1, A_2, R_2$$

- Ζητούνται
  - **A_{Ei}**
  - **b_1, b_2**
  - **L_{Ei}**

ΛΥΣΗ

$$\overline{M_1M_2} = \sqrt{\left(X_{mEi2} - X_{mEi1}\right)^2 + \left(R_1 + \Delta R_{Ei1`} - R_2 - \Delta R_{Ei2}\right)^2}$$

$$D = R_g - \left(\overline{M_1M_2} + R_k\right)$$

$$T_{KEi} = T_{KEi2} - \frac{\sin\tau_{Ei1}\left(T_{LEi2} - T_{LEi1}\right)}{\sin\tau_{Ei}}$$

$$T_{LEi} = \frac{\sin\tau_{Ei2}\left(T_{LEi2} - T_{LEi1}\right)}{\sin\tau_{Ei}} - T_{KEi1}$$

$$\tau_{Ei} = \tau_{Ei2} - \tau_{Ei1}$$

ΛΥΣΗ

$$\tan \nu_{M_1}^{M_2} = \frac{\Delta y}{\Delta x} \qquad \tan \delta = \frac{X_{mEi1} - X_{mEi2}}{R_1 + \Delta R_{Ei1`} - R_2 - \Delta R_{Ei2}}$$

$$\nu_{Ei} = \nu_{M_1}^{M_2} \pm \delta \pm 100 gon$$

$$\gamma_{12} = \nu_{12}^{13} - \nu_{11}^{12}$$

$$\varepsilon = \nu_{Ei} - \nu_{11}^{12}$$

2

ΛΥΣΗ

$$\alpha_1 = \varepsilon + \tau_{Ei1} - \tau_1$$

$$\alpha_2 = \gamma_{12} - \varepsilon - \tau_2 - \tau_{Ei2}$$

$$t_1 = R_1 \tan\frac{\alpha_1}{2}$$

$$t_2 = R_2 \tan\frac{\alpha_2}{2}$$

$$\widehat{b_1} = \frac{R_1 \pi \alpha_1}{200}$$

$$\widehat{b_2} = \frac{R_2 \pi \alpha_2}{200}$$

$$L_{Ei} = L_{Ei2} - L_{Ei1}$$

3