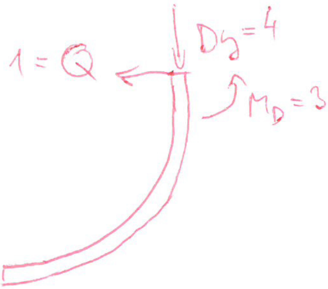

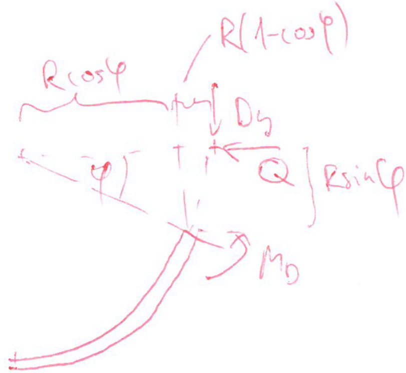

$$M_h(\varphi) = M_D + Q R \sin\varphi - D_y R (1-\cos\varphi)$$

$$N(\varphi) = -Q \cdot \sin\varphi - D_y \cdot \cos\varphi$$

$$V(\varphi) = -Q \cdot \cos\varphi + D_y \cdot \sin\varphi$$

$$-\int_0^{\varphi} V(s)\,ds + \sum M_i$$

$$\| \quad \int V(\psi) R\,d\psi$$

$$\rightarrow \int V(\psi) \cdot R\,d\psi = -Q \cdot R \cdot \sin\psi - D_y R \cdot \cos\psi$$

$$\int_0^{\varphi} V(\psi) R\,d\psi = \left[-QR\sin\psi - D_y R\cos\psi\right]_0^{\varphi} =$$

$$\left(-QR \cdot \sin\varphi - D_y R\cos\varphi\right) - \left(\underbrace{-QR\sin 0}_{=0} - D_y R \underbrace{\cos 0}_{=1}\right) =$$

$$= -QR\sin\varphi - D_y R\cos\varphi + D_y R = -QR\sin\varphi + D_y R(1-\cos\varphi)$$

előjel konvenció miatt ⊖ szorzó + konc. nyomaték

$$QR\sin\varphi - D_y R \cdot (1-\cos\varphi) \quad + M_D$$