



Note how valid (non-excessive) values for \hat{f} , \check{f} occur for any -20° to 140° - i.e. a wide solution window.

Furthermore, slip cannot occur as \hat{f}/\check{f} is always < 1.78 .

So select $\phi = 60^\circ$ for which \check{f} , \hat{f} & \hat{f}/\check{f} are all relatively flat - i.e. insensitive to ϕ -variations.

From a) with $\phi = 60^\circ$, $h_x = 250\text{mm}$
 $S = 350\text{mm}$ $t = 226\text{mm}$

Solving b), c) simultaneously with $P/Wv = 0.25$ yields

$\hat{f} = 0.586$; $\check{f} = 0.336$; $\hat{f}/\check{f} = 1.74$
 This seems satisfactory.

The belt tensions follow:

$$\hat{F} = \hat{f}W/2 + p v^2 = 0.586 \times 170 \times 9.81/3 + 0.09682 \times 9.4^2 = 334\text{ N}$$

$$\check{F} = \check{f}W/2 + p v^2 = 195\text{ N}$$

from which belt life may be predicted via (ii) and Miner, if desired.