




## Výzkum mazání okolků kolejových vozidel - Spolupráce s aplikační sférou

**M. Omasta; P. Šperka**

 Institute of Machine  
and Industrial Design

## Výzkum mazacího filmu Experimentální studium

**Institute of Machine and Industrial Design**  
Faculty of Mechanical Engineering  
Brno University of Technology



## Profil kola SN1 (?)

■ Zatížení:

$$F_n = 7,5 \text{ kN}$$

■ Velikost kontaktní oblasti (2a x 2b) :

$$10 \times 2,5 \text{ mm}$$

■ Kontaktní tlak:

$$p_h = 0,58 \text{ Gpa}$$

■ Úklon kolejnice:

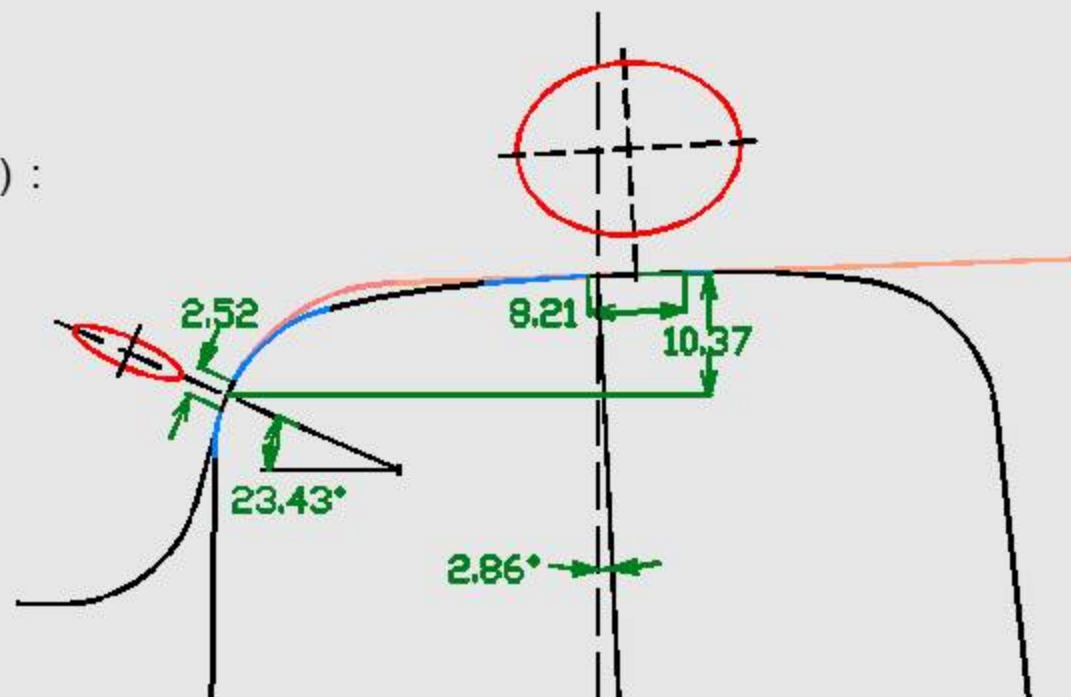
$$1:20$$

■ Vzdálenost středu kontaktu:

$$r_s = 10,4 \text{ mm}$$

■ Sklon normály kontaktu:

$$\alpha_n = 23,5^\circ$$



## Profil kola ORE S1002

### ■ Zatížení:

$$F_n = 7,5 \text{ kN}$$

### ■ Velikost kontaktní oblasti ( $2a \times 2b$ ):

? částečně lineární

### ■ Kontaktní tlak:

?

### ■ Úklon kolejnice:

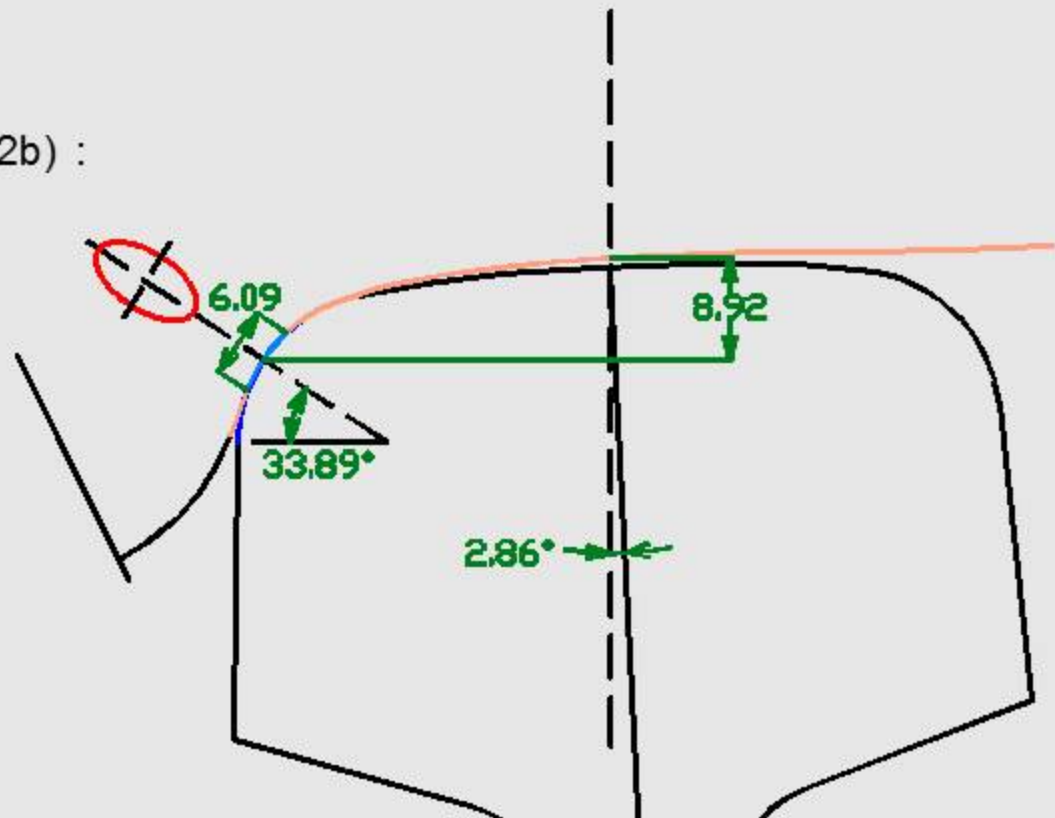
1:20

### ■ Vzdálenost středu kontaktu:

$$r_s = 8,92 \text{ mm}$$

### ■ Sklon normály kontaktu:

$$\alpha_n = 33,89^\circ$$



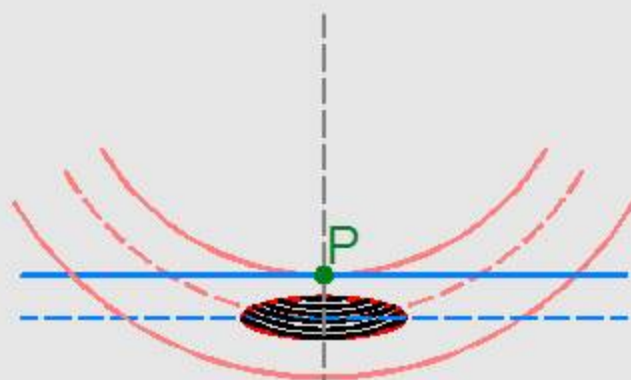
# Poloha kontaktu a rychlostní profily

■ Rychlost kola:  $v_k = 60 \text{ km/h}$

■ Střední skluzová rychlost:  $v_s = 0,42 \text{ m/s}$

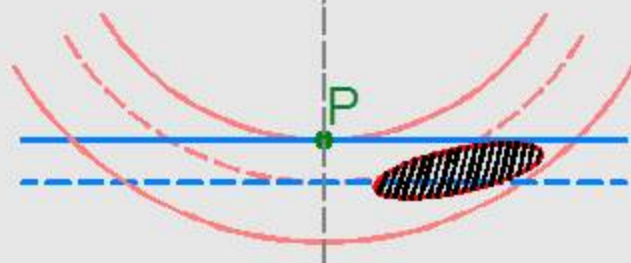
Reálná situace

Úhel náběhu:  
 $0^\circ$

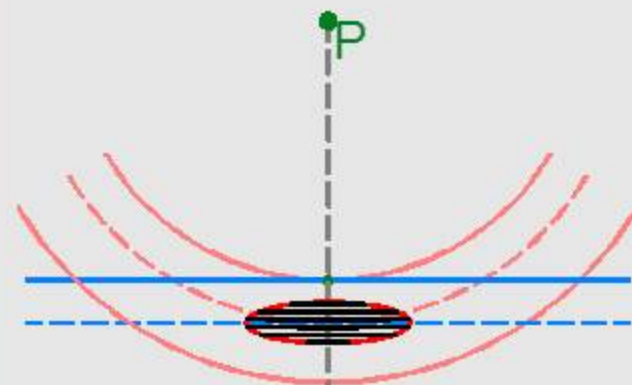


$r_v = r_s = 10,4 \text{ mm}$   
 $n_k = 380 \text{ min}^{-1}$

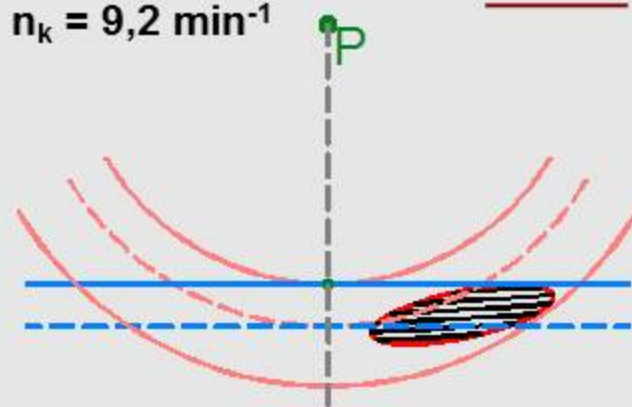
Úhel náběhu:  
 $5^\circ$



Modelová situace

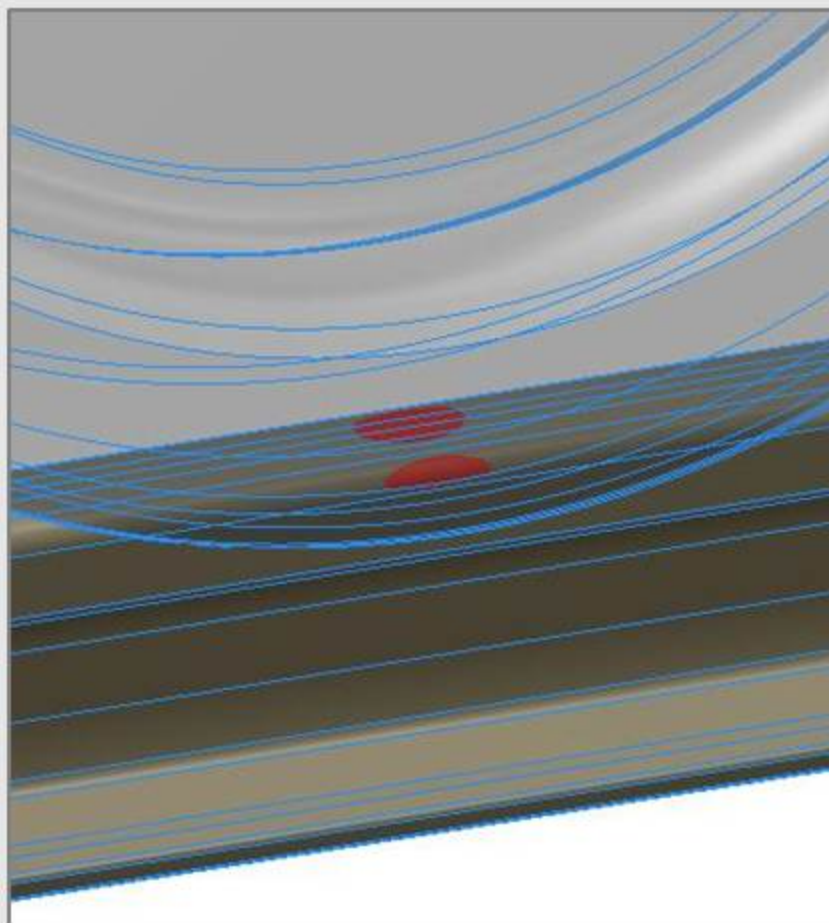


$r_v = r_k + r_s = 430,4 \text{ mm}$   
 $n_k = 9,2 \text{ min}^{-1}$

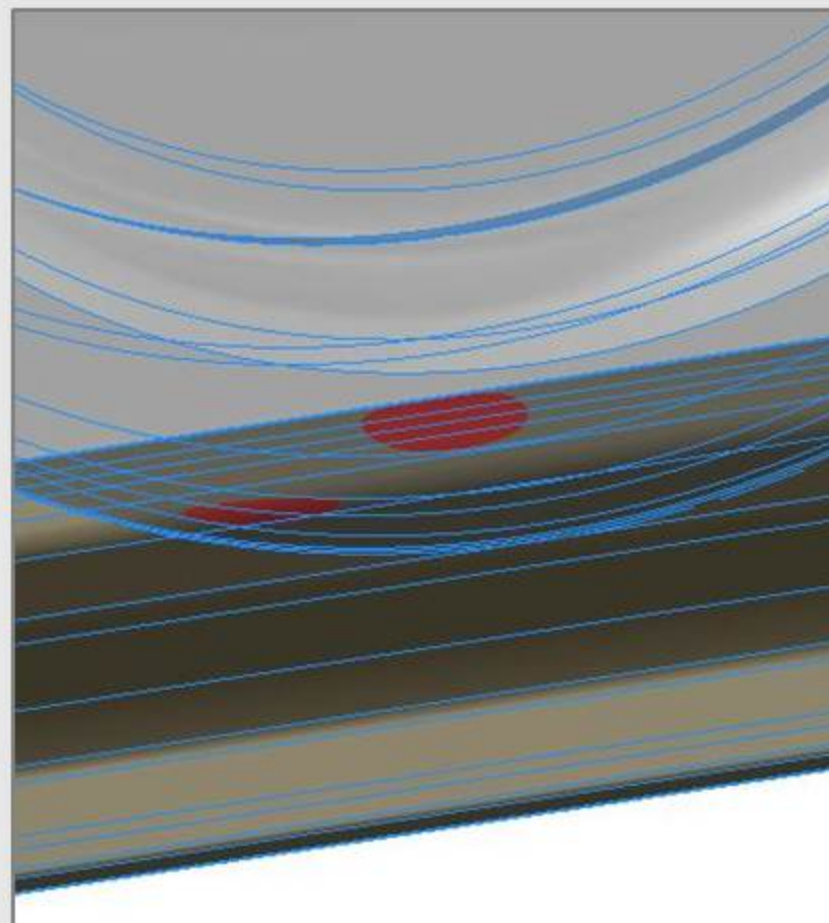




Úhel náběhu:  $0^\circ$



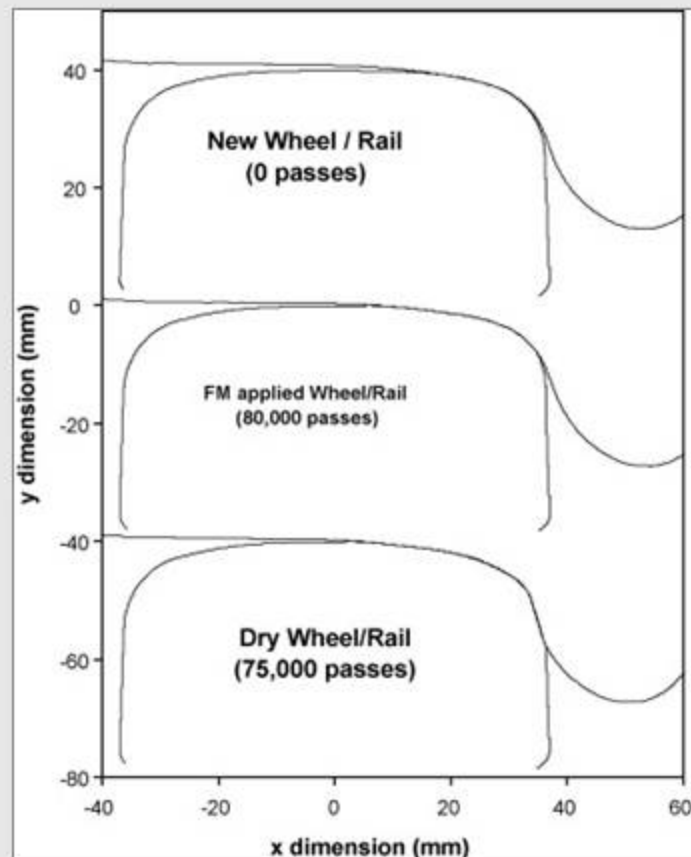
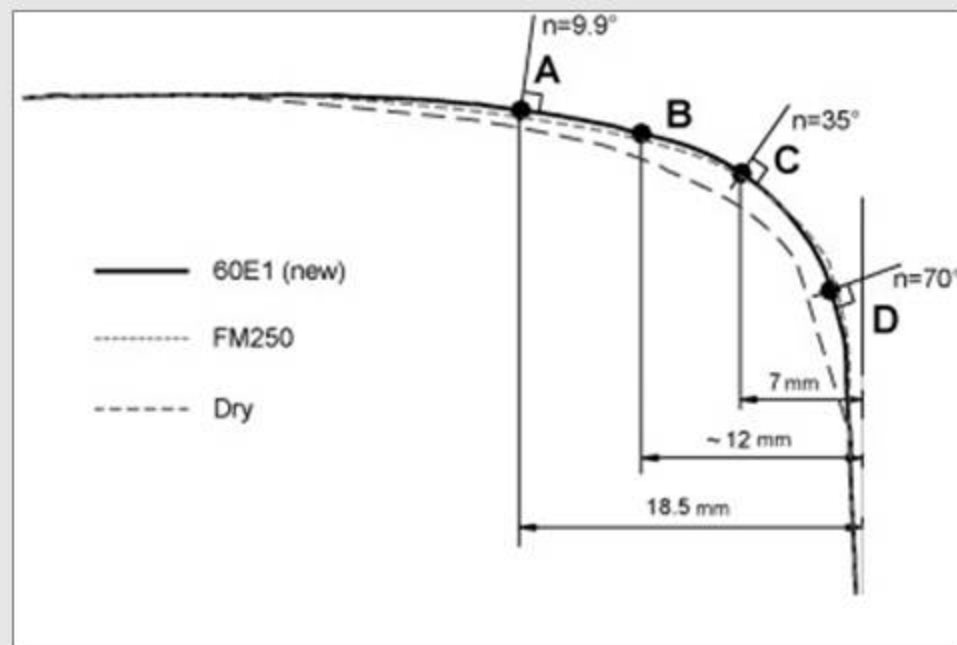
Úhel náběhu:  $5^\circ$



**Eadie, et al.** The effects of top of rail friction modifier on wear and rolling contact fatigue: Full-scale rail-wheel test rig evaluation, analysis and modelling

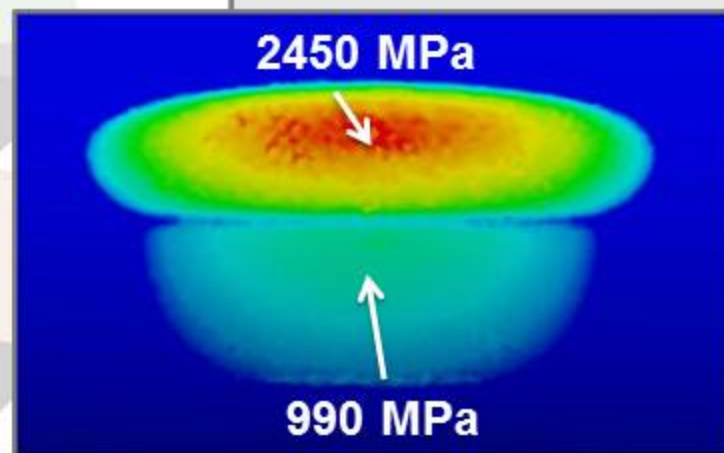
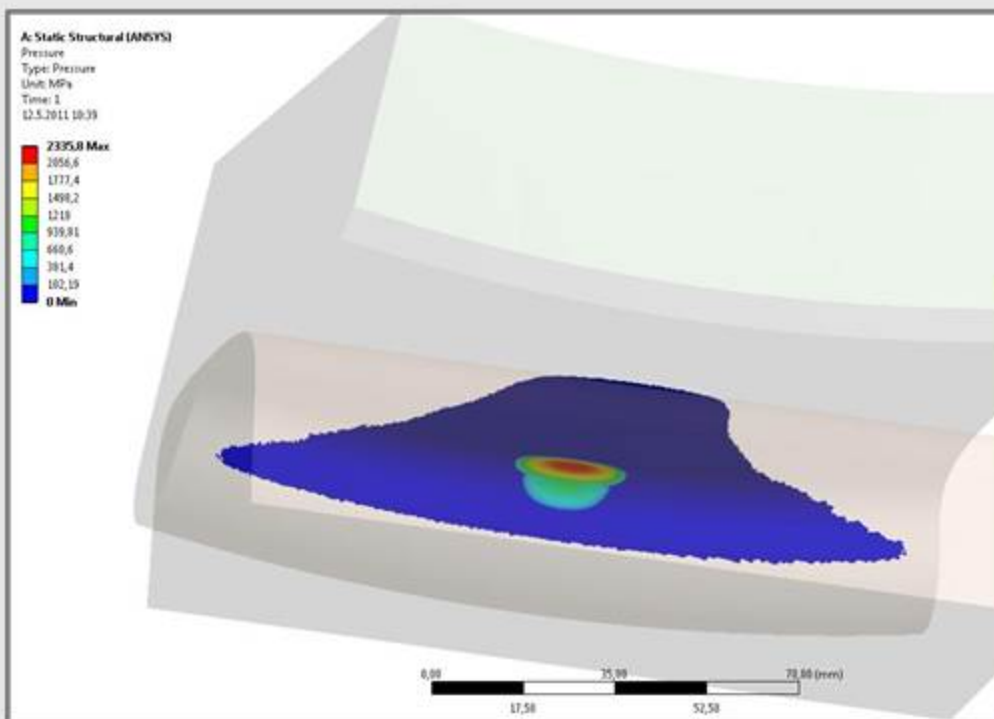
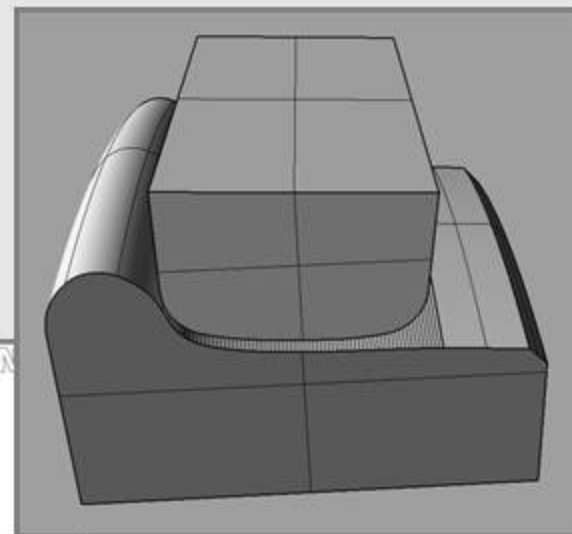
■ Kolo: **UIC/ORE S1002**

■ Kolejnice: **UIC 60**



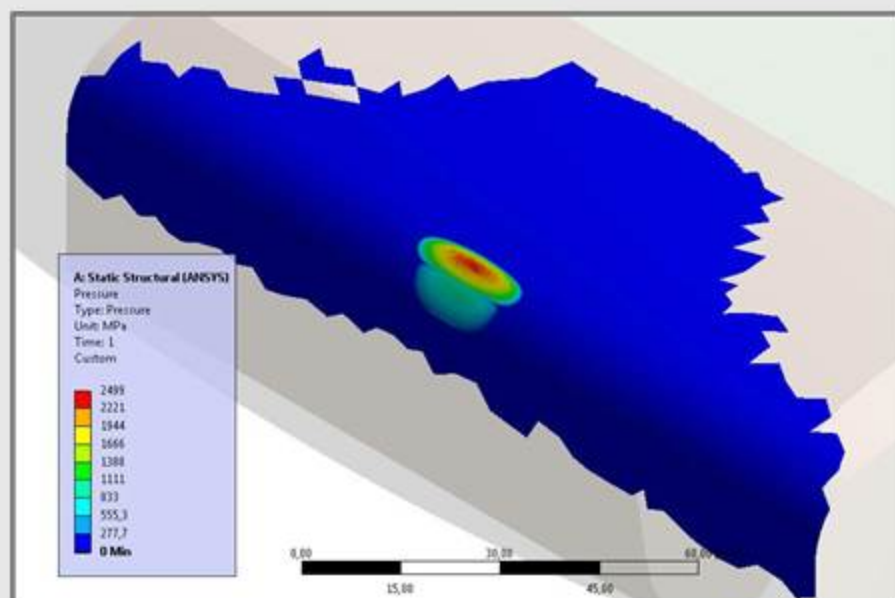
# Výsledky - FEA

- Kolo: **UIC/ORE S1002**
- Kolejnice: **UIC 60**
- Vertikální zatížení: **230 000 N**
- Laterální zatížení: **40 000 N**

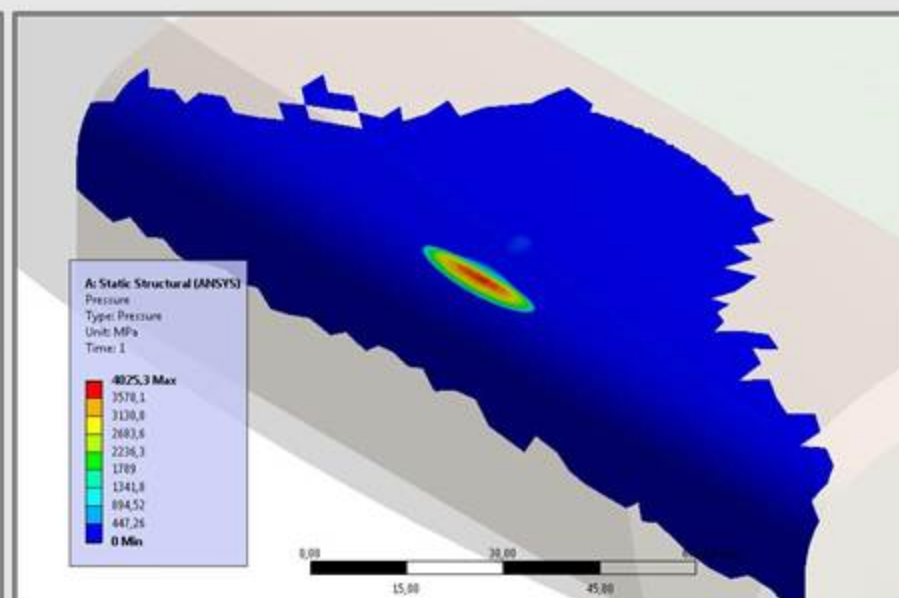


## Vliv součinitele tření

Součinitel tření 0,5



Součinitel tření 0,3

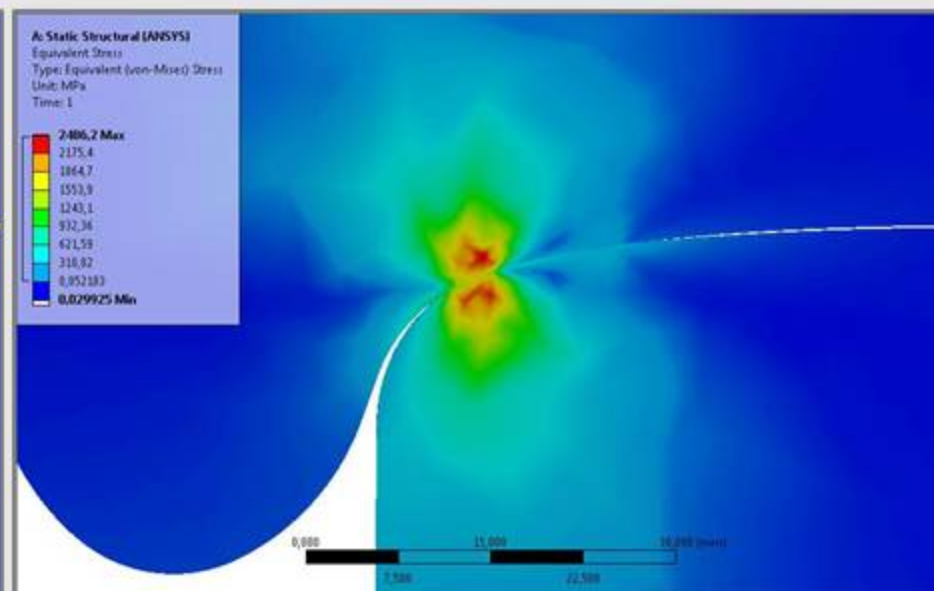
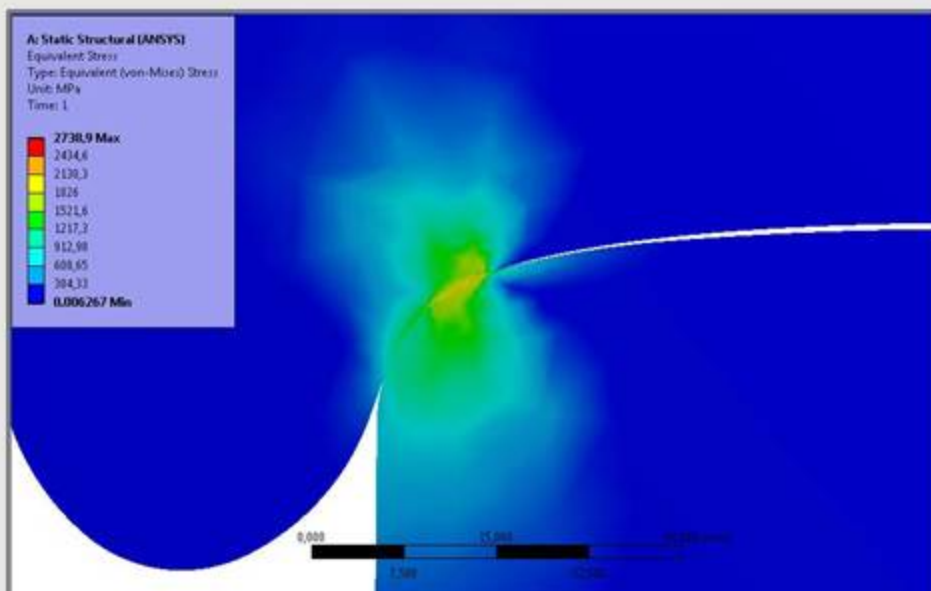




## Vliv součinitele tření

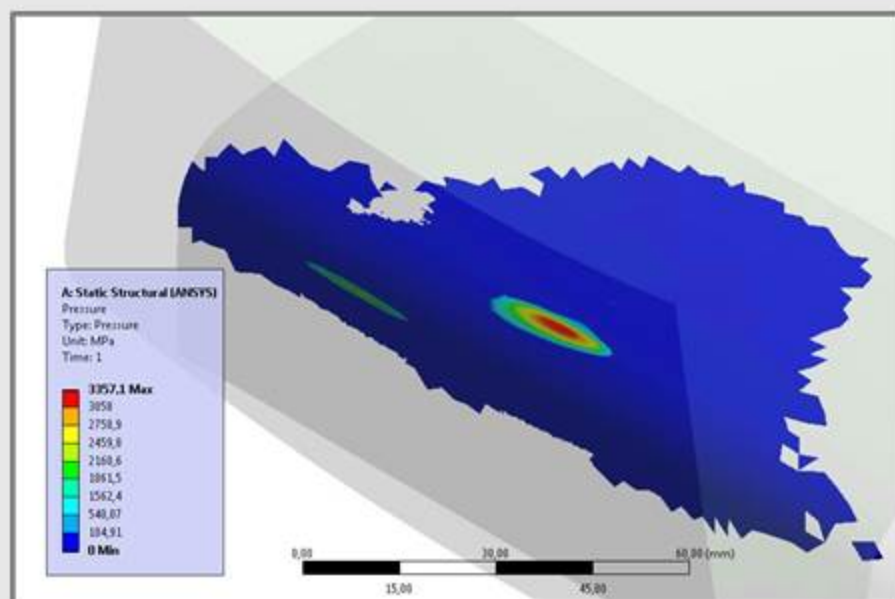
Součinitel tření 0,5

Součinitel tření 0,3

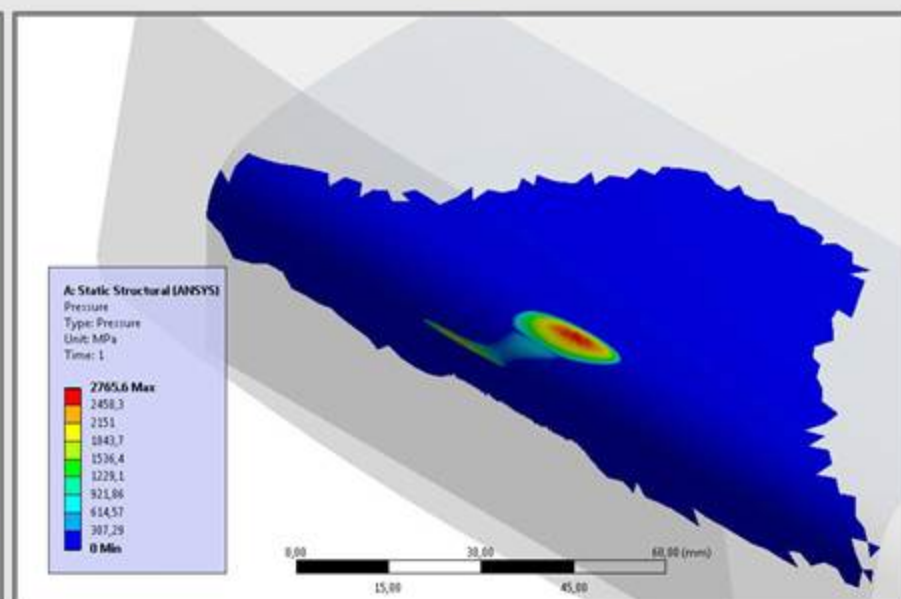


## Vliv úhlu náběhu

Úhel náběhu 2°



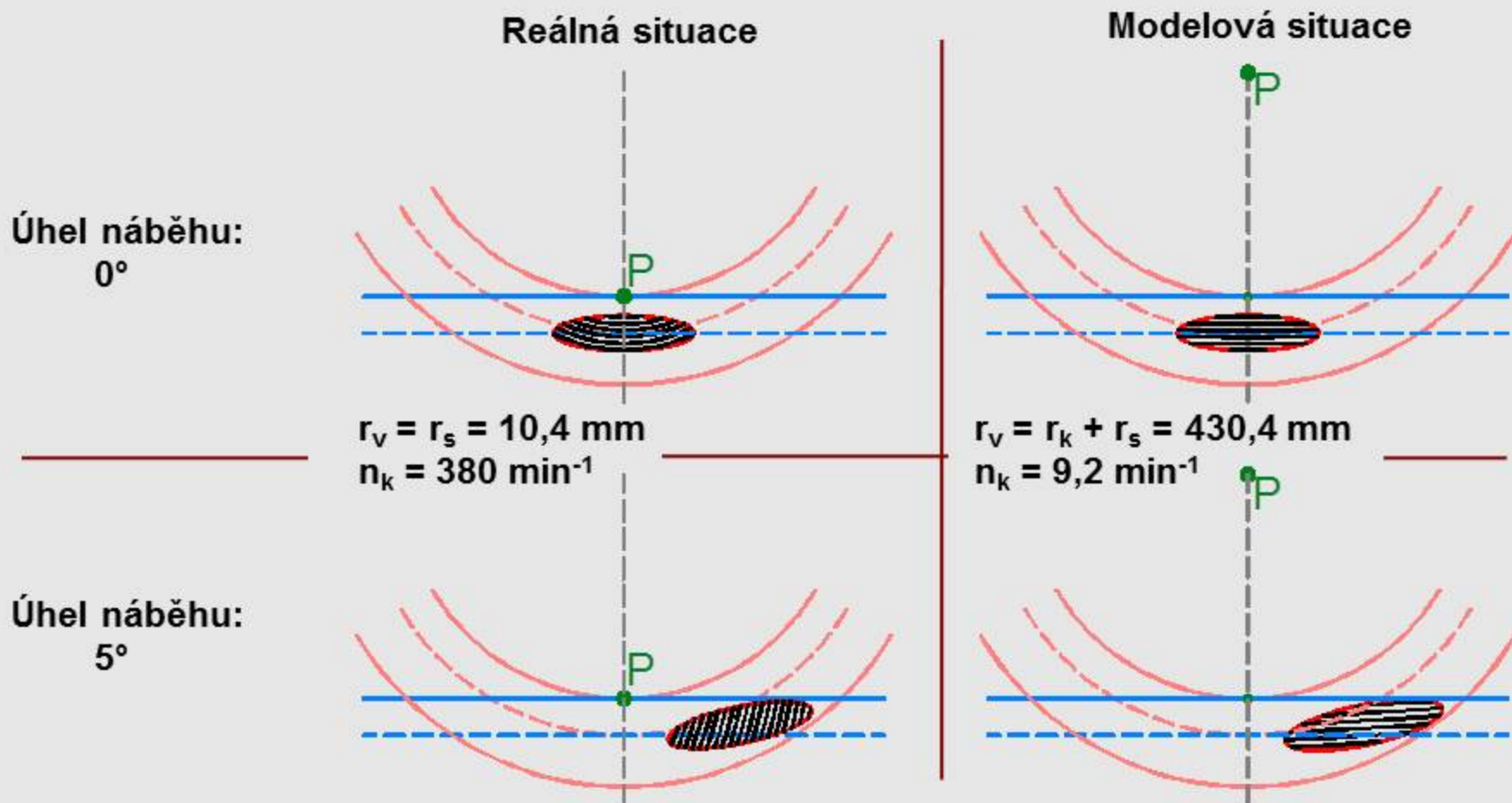
Úhel náběhu 1°



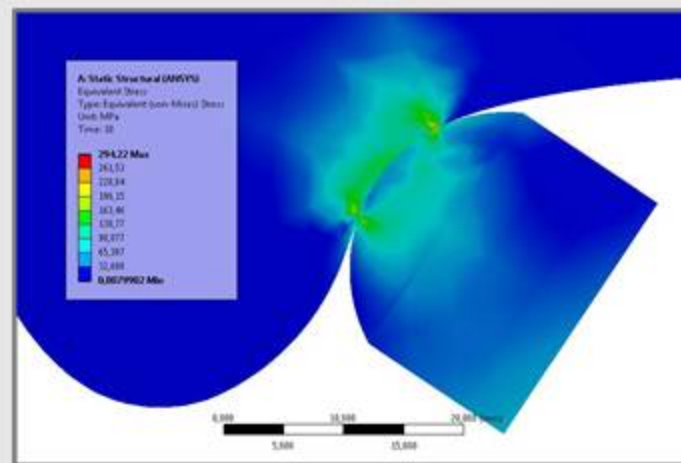
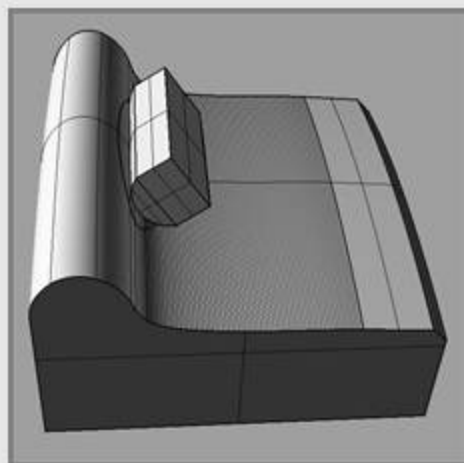
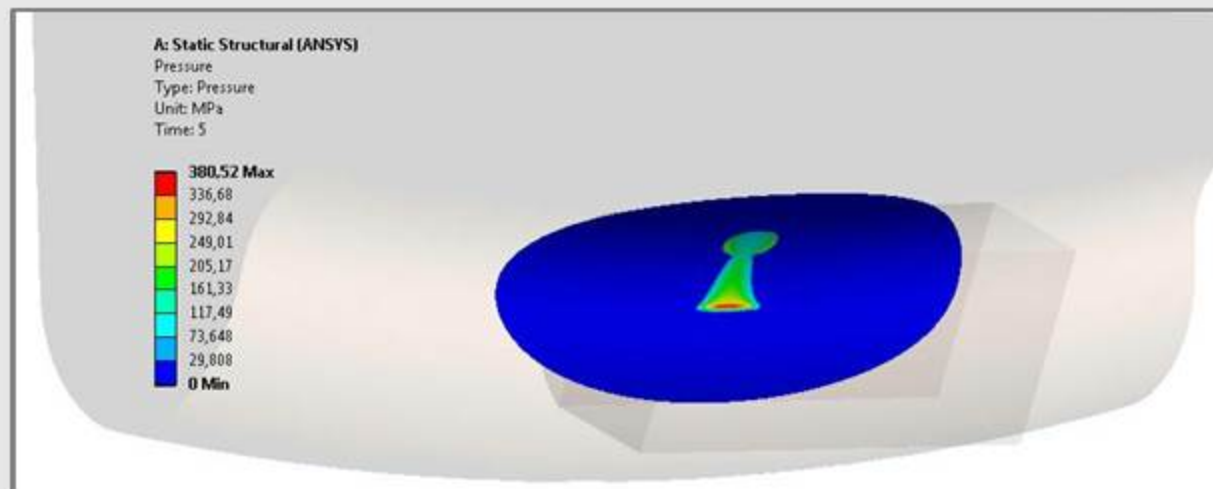
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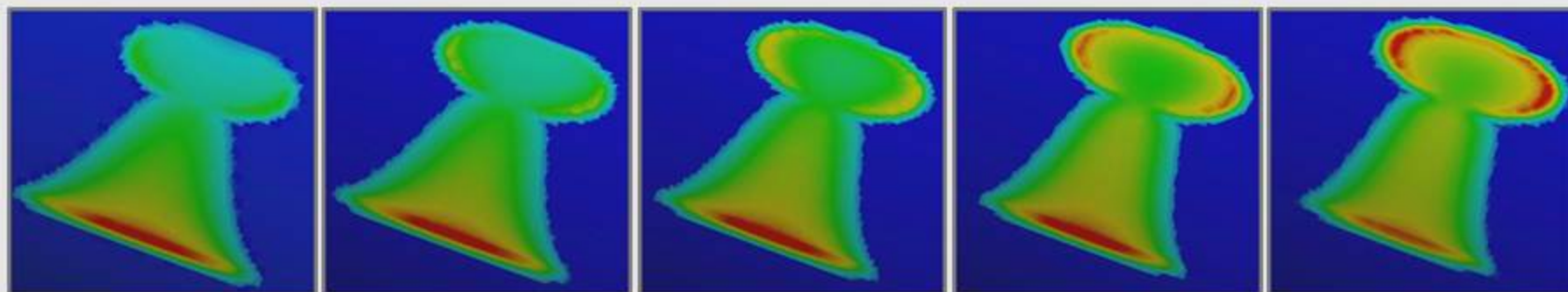


## Simulace - slider

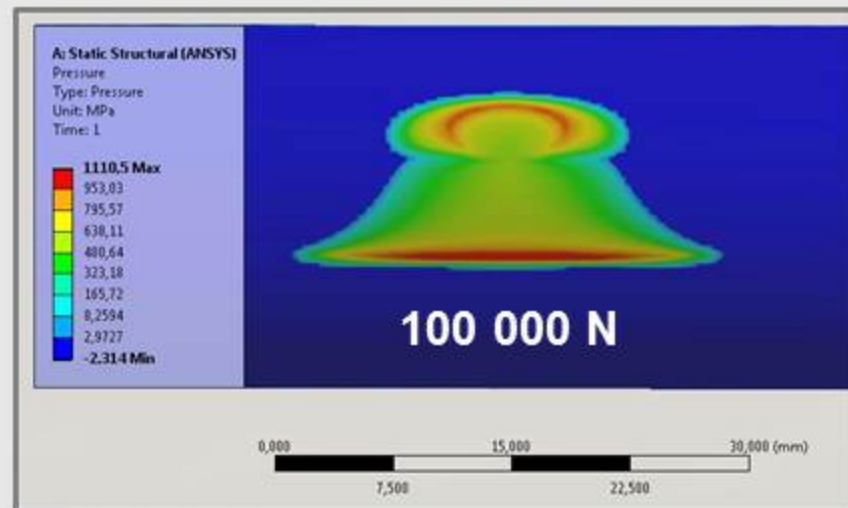
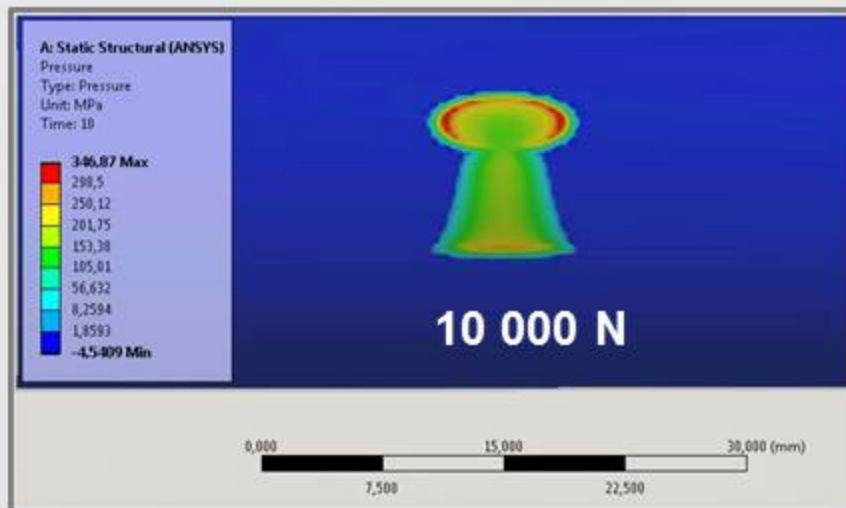


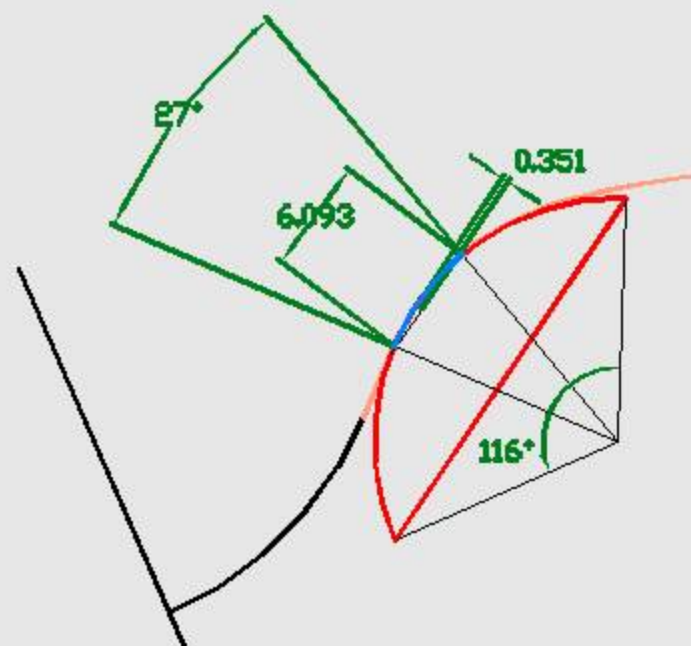
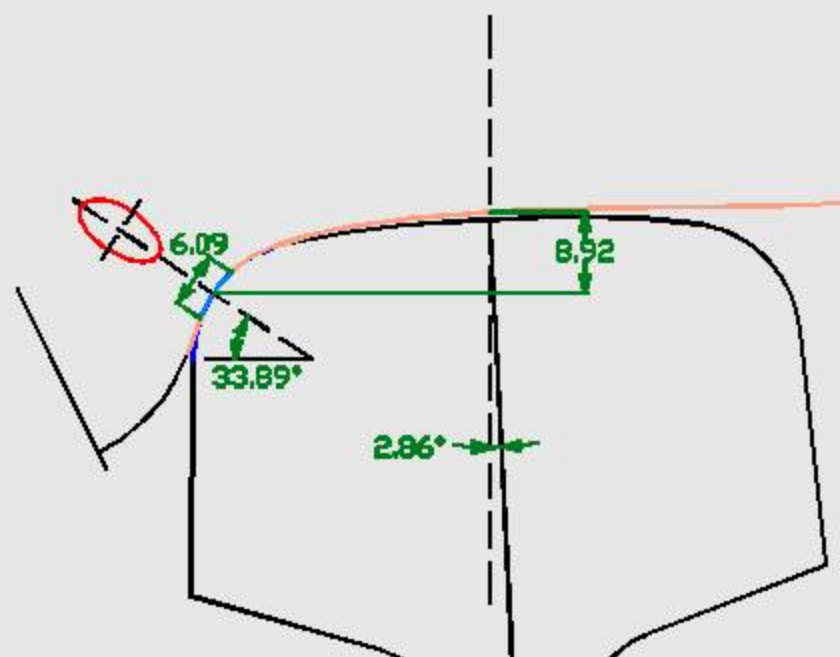


## Vliv směru zatížení




## Vliv velikosti zatížení







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