

### Ülesanne 3.4 Tsentrilise vertikaalkoormusega üksikvundament dreenitud tingimustes

täitepinnase mahukaal  $\gamma_{\text{täide}} = 17 \text{ kN/m}^3$ ,

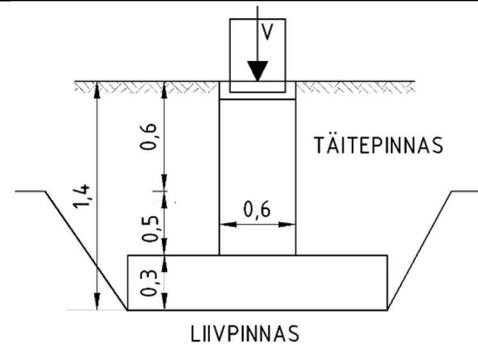
{gamma}

liiva mahukaal  $\gamma_{\text{liiv}} = 19 \text{ kN/m}^3$ , {gamma}

sisehõõrdenurk  $\varphi_k' = 34^\circ$ , {fii}

nidusus  $c_k' = 2 \text{ kPa}$ .

Arvutuskoormud  $V_d = 2800 \text{ kN}$  {V1}



$$N_q = e^{\pi \cdot \tan \varphi} \tan^2 \left( 45 + \frac{\varphi}{2} \right)$$

$$N_q = 29,44$$

$$\left( \text{pow} \left( \tan \left( \text{deg2rad} \left( 45 + \frac{\text{fii}}{2} \right) \right), 2 \right) \cdot \exp \left( \tan \left( \text{deg2rad} \left( \text{fii} \right) \right) \cdot \pi \right) \right)$$

$$N_\gamma = 2(N_q - 1) \tan \varphi$$

$$N_\gamma = 38,37$$

$$2 \cdot \left( \left( \text{pow} \left( \tan \left( \text{deg2rad} \left( 45 + \frac{\text{fii}}{2} \right) \right), 2 \right) \cdot \exp \left( \tan \left( \text{deg2rad} \left( \text{fii} \right) \right) \cdot \pi \right) \right) - 1 \right) \cdot \tan \left( \text{deg2rad} \left( \text{fii} \right) \right)$$

$$N_c = (N_q - 1) \cot \varphi$$

$$N_c = 42,16$$

$$\left( \left( \text{pow} \left( \tan \left( \text{deg2rad} \left( 45 + \frac{\text{fii}}{2} \right) \right), 2 \right) \cdot \exp \left( \tan \left( \text{deg2rad} \left( \text{fii} \right) \right) \cdot \pi \right) \right) - 1 \right) / \tan \left( \text{deg2rad} \left( \text{fii} \right) \right)$$

Tippige võrrand siia.

Ruudukujulise talla puhul on kujutegurid

$$s_\gamma = 1 - 0,3 \frac{B'}{L'}$$

$$s_\gamma = 0,7;$$

0,7

$$s_q = 1 + \frac{B'}{L'} \sin \phi$$

$$s_q = 1 + \sin 34^\circ = 1,56;$$

$$1 + \sin(\text{deg2rad}(\{fii\}))$$

$$s_c = \frac{s_q N_q - 1}{N_q - 1}$$

$$s_c = (1,56 \cdot 29,44 - 1) / (29,44 - 1) = 44,9 / 28,44 = 1,58.$$

$$\frac{((1 + \sin(\text{deg2rad}(\{fii\}))) * (\text{pow}(\tan(\text{deg2rad}(45 + \{fii\}/2)), 2) * \exp(\tan(\text{deg2rad}(\{fii\})) * \pi))) - 1}{(\text{pow}(\tan(\text{deg2rad}(45 + \{fii\}/2)), 2) * \exp(\tan(\text{deg2rad}(\{fii\})) * \pi)) - 1}$$

1. Ruudukujulise talla puhul on kujutegurid

3. Pinnasesurve talla tasapinnas

$$q' = 0,6 \cdot 17 + 0,8 \cdot 19 = 25,4 \text{ kN/m}^2.$$

$$0,6 * \{\text{gammat}\} + 0,8 * \{\text{gamma}\}$$

4. Abisuurused

$$a_3 = 0,5 \gamma' N_\gamma s_\gamma / \gamma_R$$

$$a_3 = 0,5 \cdot 19 \cdot 38,37 \cdot 0,7 / 1,5 = 170 \text{ kN/m}^3,$$

$$\frac{(0,5 * \{\text{gamma}\} * (2 * ((\text{pow}(\tan(\text{deg2rad}(45 + \{fii\}/2)), 2) * \exp(\tan(\text{deg2rad}(\{fii\})) * \pi)) - 1) * \tan(\text{deg2rad}(\{fii\}))) * 0,7) / 1,5$$

$$a_4 = (q' N_q s_q + c' N_c s_c) / \gamma_R - d_k \gamma_k \gamma_G$$

$$a_4 = (25,4 \cdot 29,44 \cdot 1,56 + 2 \cdot 42,16 \cdot 1,58) / 1,5 - 1,4 \cdot 22 \cdot 1,2 = 840 \text{ kN/m}^2$$

$$\frac{((0,6 * \{\text{gammat}\} + 0,8 * \{\text{gamma}\}) * ((\text{pow}(\tan(\text{deg2rad}(45 + \{fii\}/2)), 2) * \exp(\tan(\text{deg2rad}(\{fii\})) * \pi))) * (1 + \sin(\text{deg2rad}(\{fii\}))) + \{c\} * (((\text{pow}(\tan(\text{deg2rad}(45 + \{fii\}/2)), 2) * \exp(\tan(\text{deg2rad}(\{fii\})) * \pi)) - 1) / \tan(\text{deg2rad}(\{fii\}))) * (((1 + \sin(\text{deg2rad}(\{fii\}))) * (\text{pow}(\tan(\text{deg2rad}(45 + \{fii\}/2)), 2) * \exp(\tan(\text{deg2rad}(\{fii\})) * \pi))) - 1) / ((\text{pow}(\tan(\text{deg2rad}(45 + \{fii\}/2)), 2) * \exp(\tan(\text{deg2rad}(\{fii\})) * \pi)) - 1)) / 1,5 - 1,4 * 22 * 1,2$$

$$B_1 = \sqrt{\frac{V_1}{a_4}}$$

$$B_1 = \sqrt{\frac{2800}{840}} = 1,83$$

$$\text{sqrt}(\{V1\})/(((0.6*\{\text{gammat}\}+0.8*\{\text{gamma}\})*((\text{pow}(\tan(\text{deg2rad}(45+\{\text{fii}\}/2)),2)*\exp(\tan(\text{deg2rad}(\{\text{fii}\}))*\text{pi}()))*(1+\sin(\text{deg2rad}(\{\text{fii}\})))+\{c\}*(((\text{pow}(\tan(\text{deg2rad}(45+\{\text{fii}\}/2)),2)*\exp(\tan(\text{deg2rad}(\{\text{fii}\}))*\text{pi}()))-1)/\tan(\text{deg2rad}(\{\text{fii}\}))))*((1+\sin(\text{deg2rad}(\{\text{fii}\}))*(\text{pow}(\tan(\text{deg2rad}(45+\{\text{fii}\}/2)),2)*\exp(\tan(\text{deg2rad}(\{\text{fii}\}))*\text{pi}()))-1)/((\text{pow}(\tan(\text{deg2rad}(45+\{\text{fii}\}/2)),2)*\exp(\tan(\text{deg2rad}(\{\text{fii}\}))*\text{pi}()))-1))/1.5-1.4*22*1.2))$$

$$B_{i+1} = \sqrt{\frac{V_1}{a_3 B_i + a_4}}$$

$$B_2 = \sqrt{\frac{2800}{170 \cdot 1,83 + 840}} = \sqrt{\frac{2800}{1151}} = 1,56\text{m}$$

$$\text{sqrt}(\{V1\})/(((0.5*\{\text{gamma}\})*(2*((\text{pow}(\tan(\text{deg2rad}(45+\{\text{fii}\}/2)),2)*\exp(\tan(\text{deg2rad}(\{\text{fii}\}))*\text{pi}()))-1)*\tan(\text{deg2rad}(\{\text{fii}\}))*0.7)/1.5)*(\text{sqrt}(\{V1\})/(((0.6*\{\text{gammat}\}+0.8*\{\text{gamma}\})*((\text{pow}(\tan(\text{deg2rad}(45+\{\text{fii}\}/2)),2)*\exp(\tan(\text{deg2rad}(\{\text{fii}\}))*\text{pi}()))*(1+\sin(\text{deg2rad}(\{\text{fii}\})))+\{c\}*(((\text{pow}(\tan(\text{deg2rad}(45+\{\text{fii}\}/2)),2)*\exp(\tan(\text{deg2rad}(\{\text{fii}\}))*\text{pi}()))-1)/\tan(\text{deg2rad}(\{\text{fii}\}))))*((1+\sin(\text{deg2rad}(\{\text{fii}\}))*(\text{pow}(\tan(\text{deg2rad}(45+\{\text{fii}\}/2)),2)*\exp(\tan(\text{deg2rad}(\{\text{fii}\}))*\text{pi}()))-1)/((\text{pow}(\tan(\text{deg2rad}(45+\{\text{fii}\}/2)),2)*\exp(\tan(\text{deg2rad}(\{\text{fii}\}))*\text{pi}()))-1))/1.5-1.4*22*1.2)))+((0.6*\{\text{gammat}\}+0.8*\{\text{gamma}\})*((\text{pow}(\tan(\text{deg2rad}(45+\{\text{fii}\}/2)),2)*\exp(\tan(\text{deg2rad}(\{\text{fii}\}))*\text{pi}()))*(1+\sin(\text{deg2rad}(\{\text{fii}\})))+\{c\}*(((\text{pow}(\tan(\text{deg2rad}(45+\{\text{fii}\}/2)),2)*\exp(\tan(\text{deg2rad}(\{\text{fii}\}))*\text{pi}()))-1)/\tan(\text{deg2rad}(\{\text{fii}\}))))*((1+\sin(\text{deg2rad}(\{\text{fii}\}))*(\text{pow}(\tan(\text{deg2rad}(45+\{\text{fii}\}/2)),2)*\exp(\tan(\text{deg2rad}(\{\text{fii}\}))*\text{pi}()))-1)/((\text{pow}(\tan(\text{deg2rad}(45+\{\text{fii}\}/2)),2)*\exp(\tan(\text{deg2rad}(\{\text{fii}\}))*\text{pi}()))-1))/1.5-1.4*22*1.2))$$

$$B_{i+1} = \sqrt{\frac{V_1}{a_3 B_i + a_4}}$$

$$B_3 = \sqrt{\frac{2800}{170 \cdot 1,56 + 84}} = \sqrt{\frac{2800}{1105}} = 1,59 \text{ m}$$

Valime talla laiuseks 1,6 m.

```
ROUND(sqrt({V1})/(((0.5*{gamma}*(2*(( pow
(tan(deg2rad(45+{fii}/2)),2)*exp(tan(deg2rad({fii}))*pi()))-1)* tan(deg2rad({fii}))*0.7)/1.5)*(
sqrt({V1})/(((0.6*{gammata}+0.8*{gamma})*((pow
(tan(deg2rad(45+{fii}/2)),2)*exp(tan(deg2rad({fii}))*pi()))*(1+sin(deg2rad({fii}))) +{c}*((pow
(tan(deg2rad(45+{fii}/2)),2)*exp(tan(deg2rad({fii}))*pi()))-
1)/tan(deg2rad({fii}))*(((1+sin(deg2rad({fii})))*( pow
(tan(deg2rad(45+{fii}/2)),2)*exp(tan(deg2rad({fii}))*pi()))-1)/(( pow
(tan(deg2rad(45+{fii}/2)),2)*exp(tan(deg2rad({fii}))*pi()))-1 ))/1.5-1.4*22*1.2 )))+(
((0.6*{gammata}+0.8*{gamma})*((pow
(tan(deg2rad(45+{fii}/2)),2)*exp(tan(deg2rad({fii}))*pi()))*(1+sin(deg2rad({fii}))) +{c}*((pow
(tan(deg2rad(45+{fii}/2)),2)*exp(tan(deg2rad({fii}))*pi()))-
1)/tan(deg2rad({fii}))*(((1+sin(deg2rad({fii})))*( pow
(tan(deg2rad(45+{fii}/2)),2)*exp(tan(deg2rad({fii}))*pi()))-1)/(( pow
(tan(deg2rad(45+{fii}/2)),2)*exp(tan(deg2rad({fii}))*pi()))-1 ))/1.5-1.4*22*1.2 ))),1)
```

.Koormus kokku

taldmiku kaal

$$G_{\text{tald}} = 0,3 \cdot 1,6 \cdot 1,6 \cdot 25 = 19,2 \text{ kN}$$

```
POW((ROUND(sqrt({V1})/(((0.5*{gamma}*(2*(( pow
(tan(deg2rad(45+{fii}/2)),2)*exp(tan(deg2rad({fii}))*pi()))-1)* tan(deg2rad({fii}))*0.7)/1.5)*(
sqrt({V1})/(((0.6*{gammata}+0.8*{gamma})*((pow
(tan(deg2rad(45+{fii}/2)),2)*exp(tan(deg2rad({fii}))*pi()))*(1+sin(deg2rad({fii}))) +{c}*((pow
(tan(deg2rad(45+{fii}/2)),2)*exp(tan(deg2rad({fii}))*pi()))-
1)/tan(deg2rad({fii}))*(((1+sin(deg2rad({fii})))*( pow
(tan(deg2rad(45+{fii}/2)),2)*exp(tan(deg2rad({fii}))*pi()))-1)/(( pow
(tan(deg2rad(45+{fii}/2)),2)*exp(tan(deg2rad({fii}))*pi()))-1 ))/1.5-1.4*22*1.2 )))+(
((0.6*{gammata}+0.8*{gamma})*((pow
(tan(deg2rad(45+{fii}/2)),2)*exp(tan(deg2rad({fii}))*pi()))*(1+sin(deg2rad({fii}))) +{c}*((pow
(tan(deg2rad(45+{fii}/2)),2)*exp(tan(deg2rad({fii}))*pi()))-
1)/tan(deg2rad({fii}))*(((1+sin(deg2rad({fii})))*( pow
(tan(deg2rad(45+{fii}/2)),2)*exp(tan(deg2rad({fii}))*pi()))-1)/(( pow
(tan(deg2rad(45+{fii}/2)),2)*exp(tan(deg2rad({fii}))*pi()))-1 ))/1.5-1.4*22*1.2 ))),2)*0.3*25
```

post taldmikul

$$G_{\text{post}}=0,6 \cdot 0,6 \cdot 1,1 \cdot 25 = 9,90 \text{ kN}$$

pinnas taldmikul

$$G_{\text{pinnas}}=(1,1 \cdot 1,6 \cdot 1,6 - 1,1 \cdot 0,6 \cdot 0,6) \cdot 17=41,1 \text{ kN}$$

$$\begin{aligned} & \text{POW}(\text{ROUND}(\text{sqrt}(\{V1\})/(((0.5 \cdot \{\text{gamma}\} * (2 * (\text{pow} \\ & (\tan(\text{deg2rad}(45 + \{\text{fii}\}/2)), 2) * \exp(\tan(\text{deg2rad}(\{\text{fii}\}) * \text{pi}())) - 1) * \tan(\text{deg2rad}(\{\text{fii}\}))) * 0.7)/1.5) * \\ & \text{sqrt}(\{V1\})/(((0.6 \cdot \{\text{gammat}\} + 0.8 \cdot \{\text{gamma}\}) * ((\text{pow} \\ & (\tan(\text{deg2rad}(45 + \{\text{fii}\}/2)), 2) * \exp(\tan(\text{deg2rad}(\{\text{fii}\}) * \text{pi}())) * (1 + \sin(\text{deg2rad}(\{\text{fii}\}))) + \{c\} * ((\text{pow} \\ & (\tan(\text{deg2rad}(45 + \{\text{fii}\}/2)), 2) * \exp(\tan(\text{deg2rad}(\{\text{fii}\}) * \text{pi}())) - \\ & 1) / \tan(\text{deg2rad}(\{\text{fii}\}))) * ((1 + \sin(\text{deg2rad}(\{\text{fii}\}))) * (\text{pow} \\ & (\tan(\text{deg2rad}(45 + \{\text{fii}\}/2)), 2) * \exp(\tan(\text{deg2rad}(\{\text{fii}\}) * \text{pi}())) - 1) / ((\text{pow} \\ & (\tan(\text{deg2rad}(45 + \{\text{fii}\}/2)), 2) * \exp(\tan(\text{deg2rad}(\{\text{fii}\}) * \text{pi}())) - 1) )) / 1.5 - 1.4 * 22 * 1.2))) + ( \\ & ((0.6 \cdot \{\text{gammat}\} + 0.8 \cdot \{\text{gamma}\}) * ((\text{pow} \\ & (\tan(\text{deg2rad}(45 + \{\text{fii}\}/2)), 2) * \exp(\tan(\text{deg2rad}(\{\text{fii}\}) * \text{pi}())) * (1 + \sin(\text{deg2rad}(\{\text{fii}\}))) + \{c\} * ((\text{pow} \\ & (\tan(\text{deg2rad}(45 + \{\text{fii}\}/2)), 2) * \exp(\tan(\text{deg2rad}(\{\text{fii}\}) * \text{pi}())) - \\ & 1) / \tan(\text{deg2rad}(\{\text{fii}\}))) * ((1 + \sin(\text{deg2rad}(\{\text{fii}\}))) * (\text{pow} \\ & (\tan(\text{deg2rad}(45 + \{\text{fii}\}/2)), 2) * \exp(\tan(\text{deg2rad}(\{\text{fii}\}) * \text{pi}())) - 1) / ((\text{pow} \\ & (\tan(\text{deg2rad}(45 + \{\text{fii}\}/2)), 2) * \exp(\tan(\text{deg2rad}(\{\text{fii}\}) * \text{pi}())) - 1) )) / 1.5 - 1.4 * 22 * 1.2 \\ & ))) , 1), 2) * 1.1 * \{\text{gammat}\} - 0.396 * \{\text{gammat}\} \end{aligned}$$

Arvuta kogu koormus  $V_d$

$$V_d = 2800 + 70,2 \cdot 1,2 = 2880 \text{ kN}$$

$$\begin{aligned} & \{V1\} + 1.2 * ((\text{POW}(\text{ROUND}(\text{sqrt}(\{V1\}))/((0.5 * \{\text{gamma}\} * (2 * (\text{pow} \\ & (\text{tan}(\text{deg2rad}(45 + \{\text{fii}\}/2)), 2) * \exp(\text{tan}(\text{deg2rad}(\{\text{fii}\}) * \text{pi}())) - 1) * \text{tan}(\text{deg2rad}(\{\text{fii}\})) * 0.7) / 1.5) * \\ & \text{sqrt}(\{V1\}) / ((0.6 * \{\text{gammat}\} + 0.8 * \{\text{gamma}\}) * (\text{pow} \\ & (\text{tan}(\text{deg2rad}(45 + \{\text{fii}\}/2)), 2) * \exp(\text{tan}(\text{deg2rad}(\{\text{fii}\}) * \text{pi}())) * (1 + \sin(\text{deg2rad}(\{\text{fii}\}))) + \{c\} * ((\text{pow} \\ & (\text{tan}(\text{deg2rad}(45 + \{\text{fii}\}/2)), 2) * \exp(\text{tan}(\text{deg2rad}(\{\text{fii}\}) * \text{pi}())) - \\ & 1) / \text{tan}(\text{deg2rad}(\{\text{fii}\}))) * ((1 + \sin(\text{deg2rad}(\{\text{fii}\}))) * (\text{pow} \\ & (\text{tan}(\text{deg2rad}(45 + \{\text{fii}\}/2)), 2) * \exp(\text{tan}(\text{deg2rad}(\{\text{fii}\}) * \text{pi}())) - 1) / ((\text{pow} \\ & (\text{tan}(\text{deg2rad}(45 + \{\text{fii}\}/2)), 2) * \exp(\text{tan}(\text{deg2rad}(\{\text{fii}\}) * \text{pi}())) - 1) )) / 1.5 - 1.4 * 22 * 1.2))) + ( \\ & ((0.6 * \{\text{gammat}\} + 0.8 * \{\text{gamma}\}) * (\text{pow} \\ & (\text{tan}(\text{deg2rad}(45 + \{\text{fii}\}/2)), 2) * \exp(\text{tan}(\text{deg2rad}(\{\text{fii}\}) * \text{pi}())) * (1 + \sin(\text{deg2rad}(\{\text{fii}\}))) + \{c\} * ((\text{pow} \\ & (\text{tan}(\text{deg2rad}(45 + \{\text{fii}\}/2)), 2) * \exp(\text{tan}(\text{deg2rad}(\{\text{fii}\}) * \text{pi}())) - \\ & 1) / \text{tan}(\text{deg2rad}(\{\text{fii}\}))) * ((1 + \sin(\text{deg2rad}(\{\text{fii}\}))) * (\text{pow} \\ & (\text{tan}(\text{deg2rad}(45 + \{\text{fii}\}/2)), 2) * \exp(\text{tan}(\text{deg2rad}(\{\text{fii}\}) * \text{pi}())) - 1) / ((\text{pow} \\ & (\text{tan}(\text{deg2rad}(45 + \{\text{fii}\}/2)), 2) * \exp(\text{tan}(\text{deg2rad}(\{\text{fii}\}) * \text{pi}())) - 1) )) / 1.5 - 1.4 * 22 * 1.2))) + ( \\ & ((0.6 * \{\text{gammat}\} + 0.8 * \{\text{gamma}\}) * (\text{pow} \\ & (\text{tan}(\text{deg2rad}(45 + \{\text{fii}\}/2)), 2) * \exp(\text{tan}(\text{deg2rad}(\{\text{fii}\}) * \text{pi}())) * (1 + \sin(\text{deg2rad}(\{\text{fii}\}))) + \{c\} * ((\text{pow} \\ & (\text{tan}(\text{deg2rad}(45 + \{\text{fii}\}/2)), 2) * \exp(\text{tan}(\text{deg2rad}(\{\text{fii}\}) * \text{pi}())) - \\ & 1) / \text{tan}(\text{deg2rad}(\{\text{fii}\}))) * ((1 + \sin(\text{deg2rad}(\{\text{fii}\}))) * (\text{pow} \\ & (\text{tan}(\text{deg2rad}(45 + \{\text{fii}\}/2)), 2) * \exp(\text{tan}(\text{deg2rad}(\{\text{fii}\}) * \text{pi}())) - 1) / ((\text{pow} \\ & (\text{tan}(\text{deg2rad}(45 + \{\text{fii}\}/2)), 2) * \exp(\text{tan}(\text{deg2rad}(\{\text{fii}\}) * \text{pi}())) - 1) )) / 1.5 - 1.4 * 22 * 1.2 \\ & ))), 1), 2) * 1.1 * \{\text{gammat}\} - 0.396 * \{\text{gammat}\} \\ & ) + 9.9) \end{aligned}$$

Kandevõime kontroll

$$R_d = B^2(0,5B\gamma N_{\gamma} s_{\gamma} + q'N_{q} s_{q} + c'N_{c} s_{c})/\gamma_R$$

$$R_d = \frac{1,6^2(0,5 \cdot 19 \cdot 1,6 \cdot 38,37 \cdot 0,7 + 25,4 \cdot 29,44 \cdot 1,56 + 2 \cdot 42,16 \cdot 1,58)}{1,5} = \frac{2,56 \cdot 1708}{1,5}$$

$$= 2915kN$$

```
(POW((ROUND(sqrt({V1}))/((0.5*{gamma}*(2*(( pow
(tan(deg2rad(45+{fii}/2)),2)*exp(tan(deg2rad({fii}))*pi()))-1)* tan(deg2rad({fii}))*0.7)/1.5)*(
sqrt({V1}))/((0.6*{gammat}+0.8*{gamma})*((pow
(tan(deg2rad(45+{fii}/2)),2)*exp(tan(deg2rad({fii}))*pi()))*(1+sin(deg2rad({fii}))) + {c}*((pow
(tan(deg2rad(45+{fii}/2)),2)*exp(tan(deg2rad({fii}))*pi()))-
1)/tan(deg2rad({fii}))))*((1+sin(deg2rad({fii})))*( pow
(tan(deg2rad(45+{fii}/2)),2)*exp(tan(deg2rad({fii}))*pi()))-1)/(( pow
(tan(deg2rad(45+{fii}/2)),2)*exp(tan(deg2rad({fii}))*pi()))-1 ))/1.5-1.4*22*1.2 )))+(
((0.6*{gammat}+0.8*{gamma})*((pow
(tan(deg2rad(45+{fii}/2)),2)*exp(tan(deg2rad({fii}))*pi()))*(1+sin(deg2rad({fii}))) + {c}*((pow
(tan(deg2rad(45+{fii}/2)),2)*exp(tan(deg2rad({fii}))*pi()))-
1)/tan(deg2rad({fii}))))*((1+sin(deg2rad({fii})))*( pow
(tan(deg2rad(45+{fii}/2)),2)*exp(tan(deg2rad({fii}))*pi()))-1)/(( pow
(tan(deg2rad(45+{fii}/2)),2)*exp(tan(deg2rad({fii}))*pi()))-1 ))/1.5-1.4*22*1.2
)),1),2))*((0.5*{gamma})*( ROUND(sqrt({V1}))/((0.5*{gamma}*(2*(( pow
(tan(deg2rad(45+{fii}/2)),2)*exp(tan(deg2rad({fii}))*pi()))-1)* tan(deg2rad({fii}))*0.7)/1.5)*(
sqrt({V1}))/((0.6*{gammat}+0.8*{gamma})*((pow
(tan(deg2rad(45+{fii}/2)),2)*exp(tan(deg2rad({fii}))*pi()))*(1+sin(deg2rad({fii}))) + {c}*((pow
(tan(deg2rad(45+{fii}/2)),2)*exp(tan(deg2rad({fii}))*pi()))-
1)/tan(deg2rad({fii}))))*((1+sin(deg2rad({fii})))*( pow
(tan(deg2rad(45+{fii}/2)),2)*exp(tan(deg2rad({fii}))*pi()))-1)/(( pow
(tan(deg2rad(45+{fii}/2)),2)*exp(tan(deg2rad({fii}))*pi()))-1 ))/1.5-1.4*22*1.2
)))+( ((0.6*{gammat}+0.8*{gamma})*((pow
(tan(deg2rad(45+{fii}/2)),2)*exp(tan(deg2rad({fii}))*pi()))*(1+sin(deg2rad({fii}))) + {c}*((pow
(tan(deg2rad(45+{fii}/2)),2)*exp(tan(deg2rad({fii}))*pi()))-
1)/tan(deg2rad({fii}))))*((1+sin(deg2rad({fii})))*( pow
(tan(deg2rad(45+{fii}/2)),2)*exp(tan(deg2rad({fii}))*pi()))-1)/(( pow
(tan(deg2rad(45+{fii}/2)),2)*exp(tan(deg2rad({fii}))*pi()))-1 ))/1.5-1.4*22*1.2
)),1)
)* ( 2*(( pow (tan(deg2rad(45+{fii}/2)),2)*exp(tan(deg2rad({fii}))*pi()))-1)* tan(deg2rad({fii})))
)*(0.7))+(( 0.6*{gammat}+0.8*{gamma}
)*( (pow (tan(deg2rad(45+{fii}/2)),2)*exp(tan(deg2rad({fii}))*pi()))
)*( 1+sin(deg2rad({fii})))
))+({c})*((pow (tan(deg2rad(45+{fii}/2)),2)*exp(tan(deg2rad({fii}))*pi()))-1)/tan(deg2rad({fii})))
)*(((1+sin(deg2rad({fii}))))*( (pow (tan(deg2rad(45+{fii}/2)),2)*exp(tan(deg2rad({fii}))*pi()))-1)/((
(pow (tan(deg2rad(45+{fii}/2)),2)*exp(tan(deg2rad({fii}))*pi()))-1)
)))/1.5
```

