Velocity pressure
ANSI/TIA-222-G

2.6.5.2 Velocity Pressure Coefficient

Hight above ground level: $z := 0 \cdot m$

TIA 222 G Table 2-4

$z_g := 274 \cdot m$ $\alpha := 9.5$ $K_{zmin} := 0.85$ *Exposure (terrain) category: "C"*

$$K_z := \begin{cases} 0.85 & \text{if } 2.01 \cdot \left(\frac{z}{z_g}\right)^{\frac{2}{\alpha}} < 0.85 \\ 2.01 & \text{if } 2.01 \cdot \left(\frac{z}{z_g}\right)^{\frac{2}{\alpha}} > 2.01 \\ \left[2.01 \cdot \left(\frac{z}{z_g}\right)^{\frac{2}{\alpha}}\right] & \text{otherwise} \end{cases}$$

$K_z = 0.85$

2.6.6.4 Topographic factor

$f := 1.25$ $H := 400 \cdot m$

$K_e := 1$ $K_t := 0.43$ $K_h := e^{\left(\frac{f \cdot z}{H}\right)}$

$K_h = 1$

$Topographic_cat := 2$

$$K_{zt} := \begin{cases} 1 & \text{if } Topographic_cat = 1 \\ \left(1 + \frac{K_e \cdot K_t}{K_h}\right)^2 & \text{otherwise} \end{cases}$$

$K_{zt} = 2.045$

2.6.7 Gust Effect Factor

2.6.7.1 Self-Supporting Latticed Structures

Structure hight: $h := 35.8m$

$$G_h := \begin{cases} 1.00 & \text{if } h > 183m \\ 0.85 & \text{if } h < 137m \\ \left[0.85 + 0.15 \cdot \left(\frac{h}{45.7 \cdot m} - 3.0\right)\right] & \text{otherwise} \end{cases}$$

$G_h = 0.850$

2.6.9.6 Velocity Pressure

$K_d := 0.85$ *Wind Direction Probability Factor*

$V := 45.00$ *The basic wind speed in* $\left(\frac{m}{s}\right)$

$I := 1$ Importance Factors $\begin{pmatrix} \text{windload_no_ice} \\ \text{windload_ice} \\ \text{ice_thickness} \\ \text{earthquake} \end{pmatrix}$ *See table 2-3*

$q_z := 0.613 \cdot K_z \cdot K_{zt} \cdot K_d \cdot V^2 \cdot I \cdot Pa$ *Velocity Pressure:* $q_z = 1.83 \cdot \frac{kN}{m^2}$

2.6.9.1 Design Wind Force on Structure

Effective Projected Area of Latticed Structures

Projected area of flat structural components: $A_f := (0.985 \quad 0.169 \quad 1.313)$

Projected area of round components: $A_r := (0 \quad 0 \quad 0)$

Gross area of one face as if the face were solid: $A_g := (1.500 \quad 8.700 \quad 10.150)$

Solidity ratio: $\varepsilon := \frac{\left(\sum A_f + \sum A_r\right)}{\sum A_g}$ $\varepsilon = 0.121$

Cross section:

$CS := 1$

$$C_f := \begin{cases} \left(4.0\cdot\varepsilon^2 - 5.9\varepsilon + 4.0\right) & \text{if } CS = 1 \\ \left(3.4\cdot\varepsilon^2 - 4.7\cdot\varepsilon + 3.4\right) & \text{otherwise} \end{cases}$$

Square cross sec.

Triangular cross s.

$C_f = 3.344$

Wind direction factor for flat structural components: $D_f := 1$

Wind direction factor for flat structural components: $D_r := 1$

Reduction factor for a round element: R_r

Outside diameter of the structural component without ice (m) $D := 0.0889$

$$C := \left(I\cdot K_z\cdot K_{zt}\right)^{\frac{1}{2}}\cdot V\cdot D$$

$C = 5.274$

Reduction factor for a round element

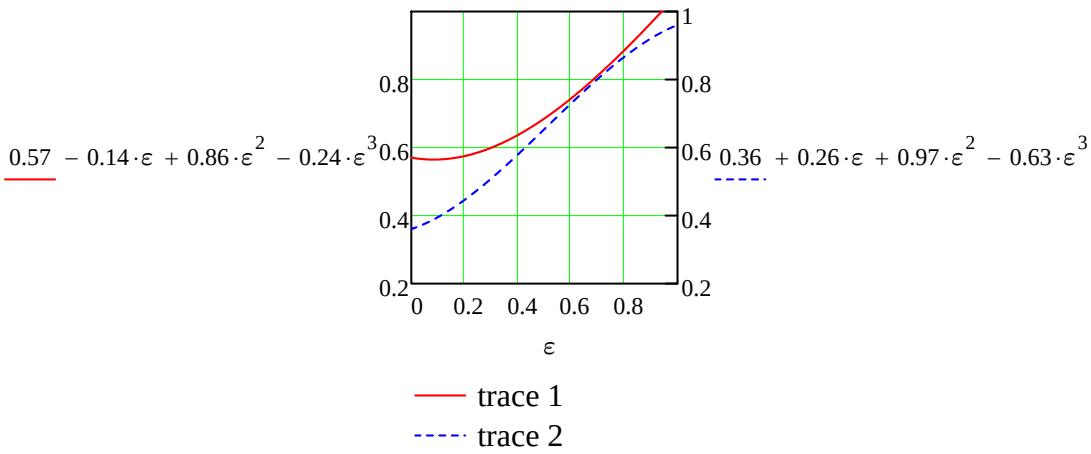
$$x := 0.57 - 0.14\cdot\varepsilon + 0.86\cdot\varepsilon^2 - 0.24\cdot\varepsilon^3$$

$$y := 0.36 + 0.26\cdot\varepsilon + 0.97\cdot\varepsilon^2 - 0.63\cdot\varepsilon^3$$

$$R_r := \begin{cases} 0.57 - 0.14\cdot\varepsilon + 0.86\cdot\varepsilon^2 - 0.24\cdot\varepsilon^3 & \text{if } C < 32 \\ 0.36 + 0.26\cdot\varepsilon + 0.97\cdot\varepsilon^2 - 0.63\cdot\varepsilon^3 & \text{if } C > 64 \\ x - \left(\frac{x - y}{64 - 32}\right)\cdot(C - 32) & \text{otherwise} \end{cases}$$

$R_r = 0.565$

$\varepsilon := 0, 0.001 .. 1$



$$EPA_s := C_f \cdot \left[D_f \cdot \sum A_f + D_r \cdot \sum \left(A_r \cdot R_r \right) \right] \cdot m^2$$

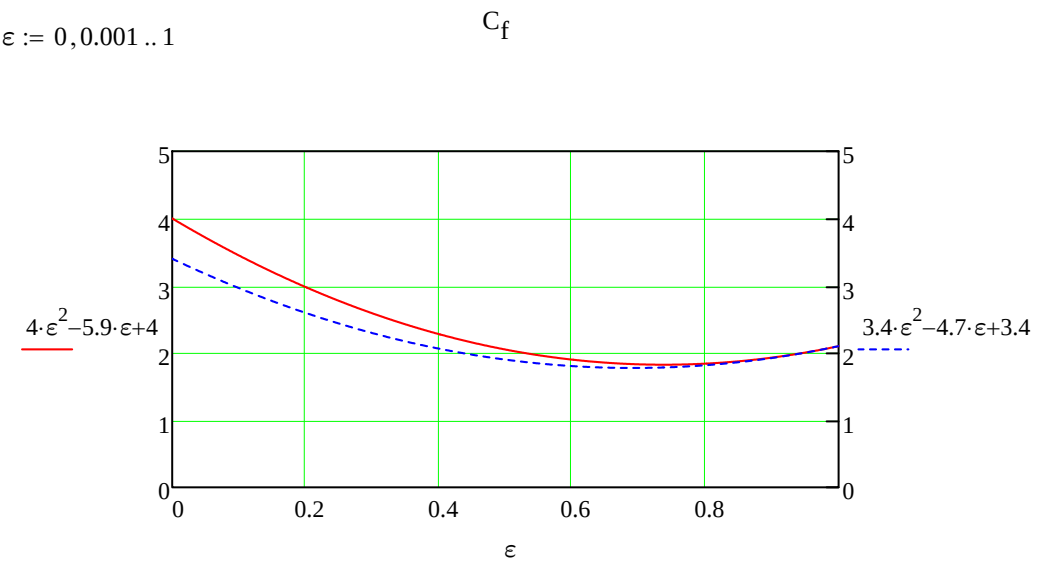
$$EPA_s = 8.25\,m^2$$

Desig wind force on Structure:

$$F_{ST} := q_z \cdot G_h \cdot EPA_s$$

$$F_{ST} = 12.86 \cdot kN$$

$\varepsilon := 0, 0.001 .. 1$



2.6.8 Design Ice Thickness

$z = 0 \cdot m$

$t_i := 6mm$

$K_{iz} := \min\left[1.4, \left(\frac{z}{10}\right)^{0.1}\right]$ $\boxed{K_{iz} = 0}$

$t_{iz} := 2.0 \cdot t_i \cdot I \cdot K_{iz} \cdot \left(K_{zt}\right)^{0.35}$ $\boxed{t_{iz} = 0\,m}$