| COMPANY NAME | Calculation No. |
|---|---|
| CALCULATION SHEET | CALCULATION NO. |
| onlinestructuraldesign.com | Project No. PROJECT NUMBER |

| Project Title: | Project Name | Calc. By | Date | Rev. |
|---|---|---|---|---|
| | | Author | Date | 0 |
| Subject/Feature: | Wind reference pressure calculation - Eurocode 1 (EN 1991-1-4) | Checked By | Date | |
| | | Checker | Date | |

$q_p(z) = c_e(z) * q_b$ — per EN 1991-1-4 Section 4.5 (1) Expression (4.8)

The National Annex may give other rules for the determination of $q_{p(z)}$.

**Air density** — per EN 1991-1-4 Section 4.5 Note 2 - Reccomended value is 1.25

$\rho$ = 1.25 kg/m$^3$ — Other values may be specified by the National Annex

**Fundamental value of the basic wind velocity**

$v_{b,0}$ = 30 m/sec — Value specified in the National Annex

**Basic wind velocity calculation**

$c_{dir}$ = 1 directional factor — per EN 1991-1-4 Section 4.2 Note 2 - Reccomended value is 1.0

Other values may be specified by the National Annex

$c_{season}$ = 1 season factor — per EN 1991-1-4 Section 4.2 Note 3 - Reccomended value is 1.0

Other values may be specified by the National Annex

$v_b = c_{dir} * c_{season} * v_{b,0}$ = **30** **m/sec** — per EN 1991-1-4 Section 4.2 (1)P Expression (4.1)

**Basic velocity pressure**

$q_b = 1/2 * \rho * v_b^2$ = **562.5** **N / m$^2$** — per EN 1991-1-4 - Section 4.5 (1) Expression (4.10)

**Terrain category:** III — per EN 1991-1-4 - Table 4.1

=> $z_0$ = 0.3 m ; roughness lengths

$z_{min}$ = 5 m

**Terrain roughness:** — per EN 1991-1-4 Section 4.3.2

$c_r(z) = k_r * \ln(z/z_0)$ for $z_{min} < z < z_{max}$ — per EN 1991-1-4 Section 4.3.2 (1) Expression (4.4)

$c_r(z) = c_r(z_{min})$ for $z < z_{min}$

$z_{0,II}$ = 0.05 m — per EN 1991-1-4 Section 4.3.2 Expression (4.5) - roughness length for terrain cat. II

$z_{max}$ = 200 m — per EN 1991-1-4 Section 4.3.2 Expression (4.5) - max. roughness length to be taken as 200m

$k_r = 0.19*(z_0/z_{0,II})^{0.07}$ = **0.2154** — per EN 1991-1-4 Section 4.3.2 Expression (4.5) terrain factor depending on $z_0$

**Terrain orography:** — per EN 1991-1-4 Section 4.3.1 Note 1

$c_o(z)$ = 1 — for flat terrain $c_o(z) = 1.0$ for other types of terrain see section 4.3.3 & Annex A.3

**Wind turbulence** — per EN 1991-1-4 Section 4.4 (1)

$k_I$ = 1 - turbulence factor; — recommended value is 1.0, other values may be specified by the National Annex

$I_v(z) = k_I / (c_0(z)*\ln(z/z_0))$ for $z_{min} < z < z_{max}$ — per EN 1991-1-4 Section 4.4 (1) Expression (4.7)

$I_v(z) = I_v(z_{min})$ for $z < z_{min}$

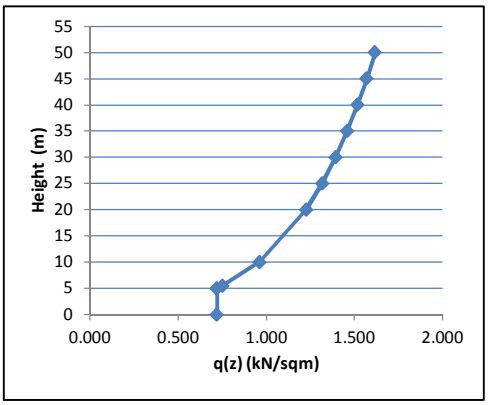
**Mean wind velocity**

$v_m(z) = c_r(z)*c_0(z)*v_b$ — per EN 1991-1-4 Section 4.4 (1) Expression (4.7)

**Peak velocity pressure** — per EN 1991-1-4 Section 4.4 (1) Expression (4.7)

$q_p(z) = c_e(z)*q_b$ where $c_e(z) = [1+7*I_v(z)]*c_r(z)*c_o(z)$

| z (m) | $I_v(z)$ | $c_o(z)$ | $c_r(z)$ | $c_e(z)$ | $q_p(z)$ (kN/sqm) |
|---|---|---|---|---|---|
| 0 | - | - | - | - | 0.720 |
| 5 - Zmin | 0.355 | 1 | 0.606 | 1.281 | 0.720 |
| 5.5 | 0.344 | 1 | 0.627 | 1.337 | 0.752 |
| 10 | 0.285 | 1 | 0.755 | 1.709 | 0.961 |
| 20 | 0.238 | 1 | 0.905 | 2.182 | 1.227 |
| 25 | 0.226 | 1 | 0.953 | 2.344 | 1.318 |
| 30 | 0.217 | 1 | 0.992 | 2.479 | 1.395 |
| 35 | 0.210 | 1 | 1.025 | 2.596 | 1.460 |
| 40 | 0.204 | 1 | 1.054 | 2.700 | 1.519 |
| 45 | 0.200 | 1 | 1.079 | 2.792 | 1.570 |
| 50 | 0.195 | 1 | 1.102 | 2.876 | 1.618 |




References:

EN 1991-1-4:2005 - Eurocode 1: Actions on structures - Part 1-4: General actions - Wind actions