

3 Materiaal- en grondgegevens

3.1 Materiaalgegevens

Voor de materiaaleigenschappen van de verschillende constructieonderdelen zijn de onderstaande gegevens aangehouden (tenzij anders aangegeven).

Beton:

| Onderdeel | Betonkwaliteit | Milieuklasse | Zijde | Dekking [mm] |
|---------------------------|----------------|--------------|-----------------------|--------------|
| i.h.w. gestorte fundering | C20/25 | XC2 | bovenkant | 30 |
| | | XC2 | zijanten en onderkant | 35 |

Overige materialen:

| Onderdeel | Kwaliteit | |
|---------------|-------------------|-------------------------|
| Wapening | B500B | |
| Staal | S235 | |
| Bevestigingen | bouten | 8.8 |
| | ingestorte ankers | 4.6 |
| | | Thermisch verzinkt |
| | | Thermisch verzinkt |
| Hout | C24 | |
| Kalkzandsteen | CS12 | Minimaal voegmortel M10 |

3.2 Grondgegevens

Voor de berekening van grond- en waterdrukken tegen het bouwwerk wordt uitgegaan van:

| | | |
|-------------------------------|-------------|------------------------|
| Waterdruk | = | 10,0 kN/m ³ |
| Gewicht grond droog | = | 18,0 kN/m ³ |
| Gewicht grond nat | = | 20,0 kN/m ³ |
| Neutrale gronddrukcoëfficiënt | λ_n | = 0,5 - |

Voor de berekening van grond- en waterdrukken tegen damwanden wordt uitgegaan van de grondparameters welke in het rekenrapport zijn omschreven. Deze parameters zijn bepaald op basis van het grondonderzoek en getoetst aan NEN 9997-1.

4 Belastingen

4.1 Permanente en Opgelegde belasting

| Plaats: | onderdelen: | d of h in mm | | volgens: NEN-EN 1990 en 1991-1-1 |
|-------------------|--|-----------------|------|----------------------------------|
| Dak | 16: dak - sporenkap/gording dakdoos incl. pannen | | 0,70 | |
| | ---- | | 0,00 | |
| | ---- | | 0,00 | |
| | ---- | | 0,00 | |
| | ---- | | 0,00 | |
| | ---- | | 0,00 | |
| | | | 57 | |
| Platdak | 01: dak - bitumenlagen: glasvlies twee lagen | | 0,07 | |
| | 14: dak - isolatieplaten | 140 | 0,06 | |
| | 13: dak - houten balklaag + beschot | | 0,30 | |
| | ---- | | 0,00 | |
| | ---- | | 0,00 | |
| | ---- | | 0,00 | |
| | | | | |
| Zolder | 56: vloer - houten balklaag + beschot | | 0,30 | |
| | 35: plafond - gipsplafon op regels | | 0,15 | |
| | ---- | | 0,00 | |
| | ---- | | 0,00 | |
| | ---- | | 0,00 | |
| | ---- | | 0,00 | |
| | | | | |
| Verdieping | 59: vloer - kanaalplaatvloer A200 | | 3,03 | |
| | 55: vloer - cementdekvloer | 70 | 1,40 | |
| | ---- | | 0,00 | |
| | ---- | | 0,00 | |
| | ---- | | 0,00 | |
| | ---- | | 0,00 | |

| | | | | |
|-----------------|-------------------------------------|---------------------------|-------------|--|
| BG-vloer | 59: vloer - kanaalplaatvloer A200 | 3,03 kN/m ² | ULS: | 6.10a = 6,60 kN/m ² $\psi_0 = 0,40$ |
| permanent: | 55: vloer - cementdekvloer | 70 1,40 kN/m ² | | 6.10b = 7,83 kN/m ² |
| | ---- | 0,00 kN/m ² | | |
| | ---- | 0,00 kN/m ² | SLS: | 6.14b = 6,68 kN/m ² |
| | ---- | 0,00 kN/m ² | | 6.15b = 5,56 kN/m ² $\psi_1 = 0,50$ |
| | ---- | 0,00 kN/m ² | | 6.16b = 5,11 kN/m ² $\psi_2 = 0,30$ |
| | Totaal $G_{k,j}$ | 4,43 kN/m ² | | |
| veranderlijk: | | | | |
| | 2 e.g. $\leq 1,0$ kN/m wandlengte | 0,50 kN/m ² | | |
| | A2: niet-gemeenschappelijke vloeren | 1,75 kN/m ² | | |
| | Totaal $Q_{k,1}$ | 2,25 kN/m ² | | |
| | | | Puntlast = | 3,00 kN |
| | | | Oppervlak = | 0,5 x 0,5 |

4.2 Sneeuwbelasting

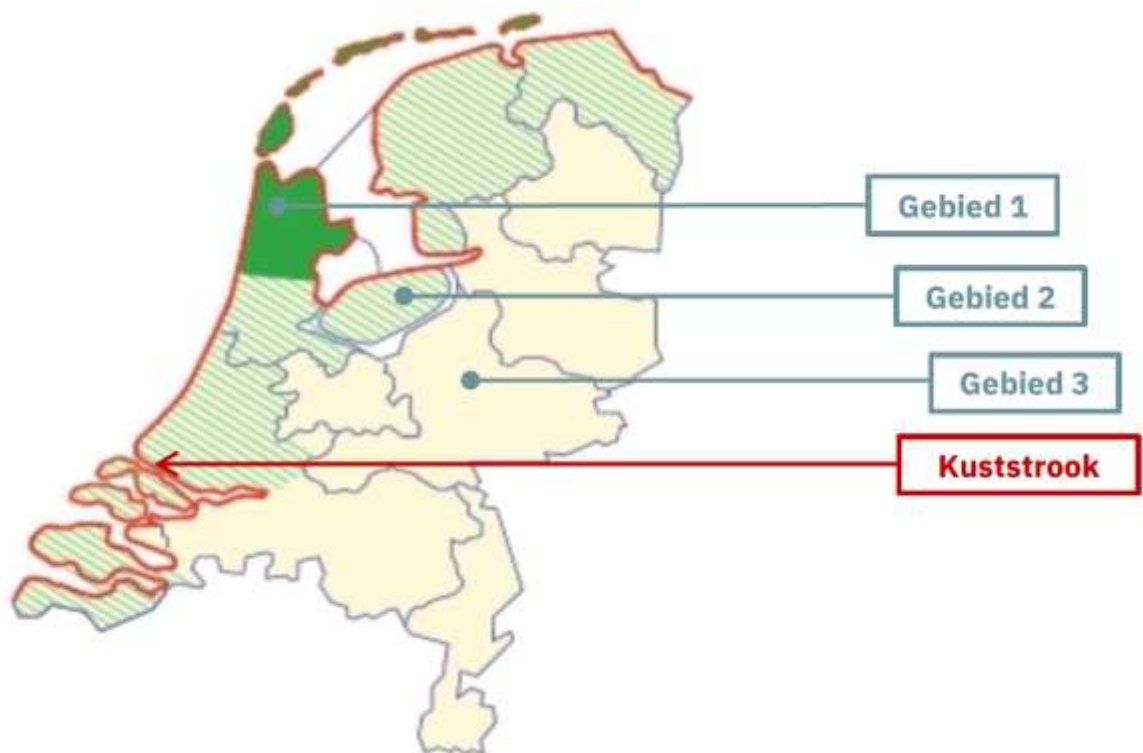
$$s = \mu_i \cdot C_e \cdot C_t \cdot s_k$$

| | | |
|---------------------------------|---------|--------------------------------|
| Karakteristieke sneeuwbelasting | $s_k =$ | 0,70 kN/m ² 50 jaar |
| Blootstellingscoëfficiënt | $C_e =$ | 1,0 |
| Warmtecoëfficiënt | $C_t =$ | 1,0 |

Vormcoëfficiënt (μ_i) afhankelijk van situatie:

| Locatie | Dakhelling (α) | μ_1 | μ_2 | Sneeuwbelasting (s) | |
|-------------------------------------|-------------------------|---------|---------|------------------------|------------------------|
| | | | | t.p.v μ_1 | t.p.v μ_2 |
| Plat dak | 0° | 0,80 | - | 0,56 kN/m ² | - |
| Hellend dak | 57° | 0,08 | - | 0,06 kN/m ² | - |
| Daken met meer dan één overspanning | 57° (aangrenzend dak) | 0,08 | 1,60 | 0,06 kN/m ² | 1,12 kN/m ² |

4.3 Windbelasting



| | |
|----------------------------------|------------|
| Windgebied | II |
| Terreincategorie | Onbebebouw |
| Jaarlijkse overschrijdingskans p | 50 jaar |

| Locatie | Hoogte gebouw (m) | Windbelasting ($q_p(z)$) |
|---------|-------------------|----------------------------|
| Woning | 9,3 | 0,831 kN/m ² |

Windbelasting volgens NEN-EN 1991-1-4/NB, tabel NB.5 ($C_0 = 1$)

4.4 Belastingfactoren en belastingcombinaties

| Ultimate Limit States (ULS) CC1 | | Blijvende belasting $\gamma_{G,j}$ | | Veranderlijke belasting $\gamma_{Q,i}$ | |
|------------------------------------|-------|---------------------------------------|-----------|---|-------------------|
| | | ongunstig | gunstig | overheersende | overig |
| (EQU) Groep A | 6.10 | 1,1 G_k | 0,9 G_k | 1,5 $Q_{k,1}$ | 1,5 $\psi_0 Q_k$ |
| (STR/GEO) Groep B | 6.10a | 1,22 G_k | 0,9 G_k | | 1,35 $\psi_0 Q_k$ |
| (STR/GEO) Groep B | 6.10b | 1,08 G_k | 0,9 G_k | 1,35 $Q_{k,1}$ | 1,35 $\psi_0 Q_k$ |
| (STR/GEO) Groep C | 6.10 | 1,0 G_k | 1,0 G_k | 1,3 $Q_{k,1}$ | 1,3 $\psi_0 Q_k$ |

Tabel 4-1: Belastingcombinaties

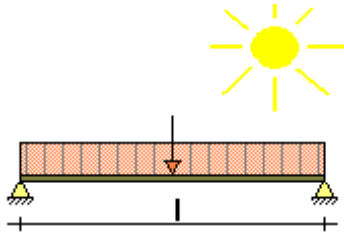
| Serviceability Limit States (SLS) CC1/2/3 | | Blijvende belasting $\gamma_{G,j}$ | | Veranderlijke belasting $\gamma_{Q,i}$ | |
|--|-------|---------------------------------------|-----------|---|------------------|
| | | ongunstig | gunstig | overheersende | overig |
| Karakteristiek | 6.14b | 1,0 G_k | 1,0 G_k | 1,0 $Q_{k,1}$ | 1,0 $\psi_0 Q_k$ |
| Frequent | 6.15b | 1,0 G_k | 1,0 G_k | 1,0 $\psi_1 Q_{k,1}$ | 1,0 $\psi_2 Q_k$ |
| Quasi-blijvend | 6.16b | 1,0 G_k | 1,0 G_k | 1,0 $\psi_2 Q_{k,1}$ | 1,0 $\psi_2 Q_k$ |

Tabel 4-2: Belastingcombinaties

5 Berekening

5.1 Hout

5.1.1 Platdak bestaand wordt verd.vloer (NEN-EN1995:2011/NB:2013)



Profielgegevens: CLS 38 x 235

| | | | | | | | |
|--------------------------|---------------------|----------|-------------------|---------------------------|--------------------|----------|-------------------|
| Breedte | b | 38 | mm | Oppervlak | A | 8930 | mm ² |
| Hoogte | h | 235 | mm | | | | |
| | | | | Traagheidsmoment | I _{tor} | 3860e+03 | mm ⁴ |
| Weerstandsmoment | W _y | 3498e+02 | mm ³ | Traagheidsmoment | I _y | 4110e+04 | mm ⁴ |
| Weerstandsmoment | W _z | 5656e+01 | mm ³ | Traagheidsmoment | I _z | 1075e+03 | mm ⁴ |
| Sterkte klasse | | C24 | | | | | |
| | f _{m,0,k} | 24.0 | N/mm ² | | f _{c,0,k} | 21.0 | N/mm ² |
| | f _{t,0,k} | 14.5 | N/mm ² | | f _{v,0,k} | 4.0 | N/mm ² |
| Elasticiteitsmodulus | E _{0,mean} | 11000.0 | N/mm ² | | G _{mean} | 690.0 | N/mm ² |
| Gebruiksklasse | I | | | I (Permanent) | k _{mod} | 0.60 | |
| Betrouwbaarheidsklasse | 1 | | | II (Lange termijn) | k _{mod} | 0.70 | |
| Ontwerplevensduur | 50 | Jaar | | III (Middellange termijn) | k _{mod} | 0.80 | |
| | | | | IV (Korte termijn) | k _{mod} | 0.90 | |
| | | | | V (Onmiddellijk) | k _{mod} | 1.10 | |
| Staaflengte | L _{sys} | 4.000 | m | Beschot kwaliteit | C18 | | |
| hoh afstand | L _t | 0.610 | m | Beschot dikte | 20 | mm | |
| Zeeg | | 0 | mm | | | | |
| Doorbuigingen beschouwen | | Ja | | | | | |
| Stootbelasting | | Nee | | | | | |
| Reductiefactor spreiding | | 0.74 | | | | | |
| | γ _M | 1.300 | | | k _{mod} | 0.800 | |
| | k _{h,y} | 1.000 | | | k _{h,z} | 1.300 | |
| | k _h | 1.000 | | | k _{cr} | 1.000 | |
| | k _m | 0.700 | | | | | |

Lastengenerator opties

Gebouwtype: Eengezinswoningen met 1, 2 of 3 bouwlagen

Referentieperiode: 50

Betrouwbaarheidsklasse: 1

Combinatieregels:

Geen

NEN-EN 1990 NB.4-A1.2(B) (6.10a+6.10b)

NEN-EN 1990 NB.7-A1.3 (Brand) (6.11 a/b)

Gewichts berekening

Winddruk + onderdruk

| | | | |
|-------|--|-------|-------------------|
| Qp1 | Pieksnelheids druk (Qp voor referentieperiode 50) NEN-EN1991-1-4#4(Z=9.30, Terrein=Onbebouwd, Regio=2, C0=1.00) | 0.83 | kN/m ² |
| CsCd1 | Constructie factor (CsCd) 1.00 | 1.00 | |
| Cpe1 | Druk coefficient (Cpe) NEN-EN1991-1-4#7.2(Dak=Plat, Zone=I) | 0.20 | |
| Cpi1 | Druk coefficient (Cpi) EN1991-1-4#7.2.9(Cpe=-0.50, Openingen=0.00, Over=False) | -0.30 | |

Windzuiging + overdruk

| | | | |
|------|---|-------|--|
| Cpe1 | Druk coefficient (Cpe) NEN-EN1991-1-4#7.2(Dak=Plat, Zone=F) | -1.80 | |
| Cpi1 | Druk coefficient (Cpi) EN1991-1-4#7.2.9(Cpe=0.80, Openingen=0.00, Over=True) | 0.20 | |

Sneeuw

| | | | |
|-----|---|------|-------------------|
| Sk1 | Karakteristiek waarde van de sneeuwlast op de grond (Sk) NEN-EN1991-1-3#4.1(Zone=1) | 0.70 | kN/m ² |
| μ1 | Sneeuwbelasting coefficient (μ) EN1991-1-3#5.3(Dak=Afglijden en opwaaien, Hoek=57.00, μ=μ1, B2=4.00, Sk=0.70) | 0.80 | |
| μ2 | Sneeuwbelasting coefficient (μ) EN1991-1-3#5.3(Dak=Afglijden en opwaaien, Hoek=57.00, μ=μ2, h=0.00, B1=8.00, B2=4.00, Sk=0.70) | 0.00 | |

Belastingen

| | | | | |
|------------|---|------------|-------------------|-----------------------------|
| Permanent | Eigen gewicht | 0.06 | kN/m ² | |
| | beschot | 0.58 | kN/m ² | |
| | overig | 0.45 | kN/m ² | |
| | Totaal | 1.09 | kN/m ² | |
| Opgelegd | q _k | 1.00 | kN/m ² | (C _{prob} = 1.000) |
| | ψ ₀ | 0.00 | | |
| | ψ ₁ | 0.00 | | |
| | ψ ₂ | 0.00 | | |
| | Q _k | 1.50 | kN | |
| | | | | |
| Wind | Winddruk (c _s c _d = 1.000) | 0.42 | kN/m ² | (C _{prob} = 1.000) |
| | Windzuiging (c _s c _d = 1.000) | -1.66 | kN/m ² | |
| Sneeuw | p _{sneeuw} | 0.57 | kN/m ² | (C _{prob} = 0.000) |
| | p _{c,sneeuw} | 0.57; 0.59 | kN/m ² | (C _{prob} = 0.000) |
| Regenwater | Niveau dhw | 0.000 | m | |
| Bijzonder | F _{bijzonder} | 0.00 | kN | |
| | p _{bijzonder} | 0.00 | kN/m ² | |

Belastingscombinaties voor uiterste grenstoestand (6.10a + 6.10b)

| | | | | |
|--------|---|---------------------------|------|-------------------|
| Fu.C.1 | p = γG + G _{rep} | 1.22 • 1.09 | 1.33 | kN/m ² |
| Fu.C.2 | p = γG + G _{rep} | 0.90 • 1.09 | 0.98 | kN/m ² |
| Fu.C.3 | p = γG + G _{rep} + γQ + Q _{rep} | 1.08 • 1.09 + 1.35 • 1.00 | 2.53 | kN/m ² |

| | | | | |
|--------|---|--|-------|-------------------|
| Fu.C.4 | $p = \gamma G \cdot G_{rep} + \gamma Q \cdot Q_{wind_druk}$ | $1.08 \cdot 1.09 + 1.35 \cdot 0.42$ | 1.74 | kN/m ² |
| Fu.C.5 | $p = \gamma G \cdot G_{rep} + \gamma Q \cdot Q_{wind_zuiging}$ | $0.90 \cdot 1.09 + 1.35 \cdot (-1.66)$ | -1.26 | kN/m ² |
| Fu.C.6 | $p = \gamma G \cdot G_{rep}$ | $1.08 \cdot 1.09$ | 1.18 | kN/m ² |
| | $pc(0.00m) = \gamma Q \cdot Q_{sneeuw}$ | $1.35 \cdot 0.57$ | 0.77 | kN/m ² |
| | $pc(4.00m) = \gamma Q \cdot Q_{sneeuw}$ | $1.35 \cdot 0.59$ | 0.79 | kN/m ² |
| Fu.C.7 | $p = \gamma G \cdot G_{rep}$ | $1.08 \cdot 1.09$ | 1.18 | kN/m ² |
| | $F = \gamma Q \cdot F_{rep}$ | $1.35 \cdot 1.50$ | 2.03 | kN |
| Bi.C.1 | $p = \gamma G \cdot G_{rep}$ | $1.00 \cdot 1.09$ | 1.09 | kN/m ² |
| Bi.C.2 | $p = \gamma G \cdot G_{rep} + \gamma Q \cdot Q_{wind_druk}$ | $1.00 \cdot 1.09 + 0.20 \cdot 0.42$ | 1.17 | kN/m ² |
| Bi.C.3 | $p = \gamma G \cdot G_{rep} + \gamma Q \cdot Q_{wind_zuiging}$ | $1.00 \cdot 1.09 + 0.20 \cdot (-1.66)$ | 0.76 | kN/m ² |

Maatgevende snedekrachten

| Comb. | $N_{c,Ed} \mid N_{t,Ed}$ | $V_{y,Ed}$ | $V_{z,Ed}$ | $M_{y,Ed}$ | $M_{z,Ed}$ |
|--------|--------------------------|------------|------------|------------|------------|
| Fu.C.1 | 0.00 | 0.00 | -1.62 | 1.62 | 0.00 |
| Fu.C.2 | 0.00 | 0.00 | -1.20 | 1.20 | 0.00 |
| Fu.C.3 | 0.00 | 0.00 | -3.09 | 3.09 | 0.00 |
| Fu.C.4 | 0.00 | 0.00 | -2.12 | 2.12 | 0.00 |
| Fu.C.5 | 0.00 | 0.00 | -1.54 | -1.54 | 0.00 |
| Fu.C.6 | 0.00 | 0.00 | -2.40 | 2.39 | 0.00 |
| Fu.C.7 | 0.00 | 0.00 | 3.46 | 2.93 | 0.00 |
| Bi.C.1 | 0.00 | 0.00 | -1.33 | 1.33 | 0.00 |
| Bi.C.2 | 0.00 | 0.00 | -1.43 | 1.43 | 0.00 |
| Bi.C.3 | 0.00 | 0.00 | -0.93 | 0.93 | 0.00 |
| | kN | kN | kN | kNm | kNm |

Max UC snedekracht

| Comb. | $N_{c,Ed} \mid N_{t,Ed}$ | $V_{y,Ed}$ | $V_{z,Ed}$ | $M_{y,Ed}$ | $M_{z,Ed}$ |
|--------|--------------------------|------------|------------|------------|------------|
| Fu.C.1 | 0.00 | 0.00 | -0.00 | 1.62 | 0.00 |
| Fu.C.2 | 0.00 | 0.00 | -0.00 | 1.20 | 0.00 |
| Fu.C.3 | 0.00 | 0.00 | -0.00 | 3.09 | 0.00 |
| Fu.C.4 | 0.00 | 0.00 | -0.00 | 2.12 | 0.00 |
| Fu.C.5 | 0.00 | 0.00 | -0.00 | -1.54 | 0.00 |
| Fu.C.6 | 0.00 | 0.00 | -0.00 | 2.39 | 0.00 |
| Fu.C.7 | 0.00 | 0.00 | -0.75 | 2.93 | 0.00 |
| Bi.C.1 | 0.00 | 0.00 | -0.00 | 1.33 | 0.00 |
| Bi.C.2 | 0.00 | 0.00 | -0.00 | 1.43 | 0.00 |
| Bi.C.3 | 0.00 | 0.00 | -0.00 | 0.93 | 0.00 |
| | kN | kN | kN | kNm | kNm |

Rekenspanning

| Comb. | $\sigma_{c,0,d} \mid \sigma_{t,0,d}$ | $\sigma_{m,y,d}$ | $\sigma_{m,z,d}$ | $\tau_{v,y,d}$ | $\tau_{v,z,d}$ |
|--------|--------------------------------------|-------------------|-------------------|-------------------|-------------------|
| Fu.C.1 | 0.00 | 4.64 | 0.00 | 0.00 | 0.00 |
| Fu.C.2 | 0.00 | 3.43 | 0.00 | 0.00 | 0.00 |
| Fu.C.3 | 0.00 | 8.82 | 0.00 | 0.00 | 0.00 |
| Fu.C.4 | 0.00 | 6.07 | 0.00 | 0.00 | 0.00 |
| Fu.C.5 | 0.00 | 4.40 | 0.00 | 0.00 | 0.00 |
| Fu.C.6 | 0.00 | 6.84 | 0.00 | 0.00 | 0.00 |
| Fu.C.7 | 0.00 | 8.38 | 0.00 | 0.00 | 0.13 |
| Bi.C.1 | 0.00 | 3.81 | 0.00 | 0.00 | 0.00 |
| Bi.C.2 | 0.00 | 4.10 | 0.00 | 0.00 | 0.00 |
| Bi.C.3 | 0.00 | 2.65 | 0.00 | 0.00 | 0.00 |
| | N/mm ² | N/mm ² | N/mm ² | N/mm ² | N/mm ² |

Rekensterkte

| Comb. | $f_{v,0,d}$ | $f_{m,y,d}$ | $f_{m,z,d}$ | $f_{c,0,d}$ | $f_{t,0,d}$ | Belasting duurklasse |
|--------|-------------------|-------------------|-------------------|-------------------|-------------------|---------------------------|
| Fu.C.1 | 1.85 | 11.08 | 14.40 | 9.69 | 6.69 | I (Permanent) |
| Fu.C.2 | 1.85 | 11.08 | 14.40 | 9.69 | 6.69 | I (Permanent) |
| Fu.C.3 | 2.46 | 14.77 | 19.20 | 12.92 | 8.92 | III (Middellange termijn) |
| Fu.C.4 | 2.77 | 16.62 | 21.60 | 14.54 | 10.04 | IV (Korte termijn) |
| Fu.C.5 | 2.77 | 16.62 | 21.60 | 14.54 | 10.04 | IV (Korte termijn) |
| Fu.C.6 | 2.77 | 16.62 | 21.60 | 14.54 | 10.04 | IV (Korte termijn) |
| Fu.C.7 | 2.46 | 14.77 | 19.20 | 12.92 | 8.92 | III (Middellange termijn) |
| Bi.C.1 | 1.85 | 11.08 | 14.40 | 9.69 | 6.69 | I (Permanent) |
| Bi.C.2 | 2.77 | 16.62 | 21.60 | 14.54 | 10.04 | IV (Korte termijn) |
| Bi.C.3 | 2.77 | 16.62 | 21.60 | 14.54 | 10.04 | IV (Korte termijn) |
| | N/mm ² | N/mm ² | N/mm ² | N/mm ² | N/mm ² | |

UC doorsnede per belastingscombinatie

| | | | | |
|--------|---------------------------------|---|------|----|
| Fu.C.1 | NEN-EN1995-1-1 (6.11) | $4.645 / 11.077 + 0.700 \cdot 0.000 / 14.400$ | 0.42 | OK |
| Fu.C.2 | NEN-EN1995-1-1 (6.11) | $3.427 / 11.077 + 0.700 \cdot 0.000 / 14.400$ | 0.31 | OK |
| Fu.C.3 | NEN-EN1995-1-1 (6.11) | $8.821 / 14.769 + 0.700 \cdot 0.000 / 19.200$ | 0.60 | OK |
| Fu.C.4 | NEN-EN1995-1-1 (6.11) | $6.069 / 16.615 + 0.700 \cdot 0.000 / 21.600$ | 0.37 | OK |
| Fu.C.5 | NEN-EN1995-1-1 (6.11) | $4.401 / 16.615 + 0.700 \cdot 0.000 / 21.600$ | 0.26 | OK |
| Fu.C.6 | NEN-EN1995-1-1 (6.11) | $6.839 / 16.615 + 0.700 \cdot 0.000 / 21.600$ | 0.41 | OK |
| Fu.C.7 | NEN-EN1995-1-1 (6.11) | $8.385 / 14.769 + 0.700 \cdot 0.000 / 19.200$ | 0.57 | OK |
| | NEN-EN1995-1-1 (6.13) (V_z) | $0.126 / 2.462$ | 0.05 | OK |
| Bi.C.1 | NEN-EN1995-1-1 (6.11) | $3.807 / 11.077 + 0.700 \cdot 0.000 / 14.400$ | 0.34 | OK |
| Bi.C.2 | NEN-EN1995-1-1 (6.11) | $4.097 / 16.615 + 0.700 \cdot 0.000 / 21.600$ | 0.25 | OK |
| Bi.C.3 | NEN-EN1995-1-1 (6.11) | $2.648 / 16.615 + 0.700 \cdot 0.000 / 21.600$ | 0.16 | OK |

Belastingscombinaties voor bruikbaarheidsgrenstoestand

| | | | | |
|------------------------|---|--|-------|-------------------|
| Ka.C.1 | $p = \gamma G \cdot G_{rep}$ | $1.00 \cdot 1.09$ | 1.09 | kN/m ² |
| Ka.C.2 | $p = \gamma G \cdot G_{rep} + \gamma Q \cdot Q_{rep}$ | $1.00 \cdot 1.09 + 1.00 \cdot 1.00$ | 2.09 | kN/m ² |
| Ka.C.3 | $p = \gamma G \cdot G_{rep} + \gamma Q \cdot Q_{wind_druk}$ | $1.00 \cdot 1.09 + 1.00 \cdot 0.42$ | 1.51 | kN/m ² |
| Ka.C.4 | $p = \gamma G \cdot G_{rep} + \gamma Q \cdot Q_{wind_zuiging}$ | $1.00 \cdot 1.09 + 1.00 \cdot (-1.66)$ | -0.57 | kN/m ² |
| Ka.C.5 | $p = \gamma G \cdot G_{rep}$ | $1.00 \cdot 1.09$ | 1.09 | kN/m ² |
| | $p_{c(0.00m)} = \gamma Q \cdot Q_{sneeuw}$ | $1.00 \cdot 0.57$ | 0.57 | kN/m ² |
| | $p_{c(4.00m)} = \gamma Q \cdot Q_{sneeuw}$ | $1.00 \cdot 0.59$ | 0.59 | kN/m ² |
| Qu.C.1 | $p = \gamma G \cdot G_{rep}$ | $1.00 \cdot 1.09$ | 1.09 | kN/m ² |
| Ka.C.(w ₁) | $p = \gamma G \cdot G_{rep}$ | $1.00 \cdot 1.09$ | 1.09 | kN/m ² |

UC doorbuigingen per belastingscombinatie

| | | | | | | | |
|------------------------|--------------------|-----------|-------------------|--------------------------|--------------------|--------------------|-------------------|
| L/250 | Limiet w_{max} | 16.0 | mm | L/250 | Limiet $w_2 + w_3$ | 16.0 | mm |
| E_{mean} | $E_{0,ser,d,inst}$ | 11000.0 | N/mm ² | E_{mean} / k_{def} | $E_{0,ser,d,cr}$ | 18333.3 | N/mm ² |
| | | | | $E-Mod / E_{0,ser,d,cr}$ | | 0.60 | |
| Ka.C.(w ₁) | w_1 | 4.9 | mm | | w_c | 0.0 | mm |
| Qu.C.1 | w_2 | 2.9 | mm | | | | |
| Comb. | w_3 | w_{tot} | w_{max} | $w_2 + w_3$ | UC (w_{max}) | UC ($w_2 + w_3$) | |
| Ka.C.1 | 0.0 | 7.9 | 7.9 | 2.9 | 0.49 | 0.18 | |
| Ka.C.2 | 4.5 | 12.4 | 12.4 | 7.4 | 0.77 | 0.47 | |
| Ka.C.3 | 1.9 | 9.7 | 9.7 | 4.8 | 0.61 | 0.30 | |
| Ka.C.4 | -7.5 | 0.4 | 0.4 | -4.5 | 0.02 | 0.28 | |

| | | | | | | | |
|-------------------------------|------------|-------|------|------------------------------------|---------------------------------------|------|----|
| Ka.C.5 | 2.6 | 10.5 | 10.5 | 5.6 | 0.65 | 0.35 | |
| | mm | mm | mm | mm | | | |
| Maatgevende krachten (Fu.C.3) | | | | Maatgevende doorbuigingen (Ka.C.2) | | | |
| Normaalkracht | $N_{t,Ed}$ | 0.00 | kN | Ka.C.(w ₁) | w ₁ | 4.9 | mm |
| Dwarskracht | $V_{y,Ed}$ | 0.00 | kN | Qu.C.1 | w ₂ | 2.9 | mm |
| Dwarskracht | $V_{z,Ed}$ | -0.00 | kN | Ka.C.2 | w ₃ | 4.5 | mm |
| Torsie | $M_{x,Ed}$ | 0.00 | kNm | | w _{tot} | 12.4 | mm |
| Moment | $M_{y,Ed}$ | 3.09 | kNm | | w _{max} | 12.4 | mm |
| Moment | $M_{z,Ed}$ | 0.00 | kNm | | w ₂ +w ₃ | 7.4 | mm |
| | | | | | Limiet w _{max} | 16.0 | mm |
| | | | | | Limiet w ₂ +w ₃ | 16.0 | mm |
| | | | | | UC (w _{max}) | 0.77 | |
| | | | | | UC (w ₂ +w ₃) | 0.47 | |

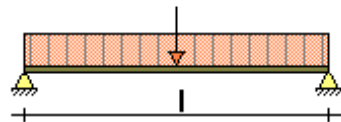
uitgevoerde controles

| | | | | |
|---------------|--|---|------|----|
| Doorsnede | NEN-EN1995-1-1 (6.13) (V _z) | 0.582 / 2.462 | 0.24 | OK |
| Doorsnede | NEN-EN1995-1-1 (6.11) | 8.821 / 14.769 + 0.700 · 0.000 / 19.200 | 0.60 | OK |
| Doorbuigingen | NEN-EN1995 #7.2 NEN-EN1990 #A1.4.3 (4) | 12.4 / 16.0 | 0.77 | OK |

Ligger gecontroleerd op sterkte en doorbuiging

Ligger OK

5.1.2 Vloer conform bestaande dak (NEN-EN1995:2011/NB:2013)



Profielgegevens: CLS 38 x 235

| | | | | | | | |
|------------------------|---------------------|----------|-------------------|---------------------------|--------------------|----------|-------------------|
| Breedte | b | 38 | mm | Oppervlak | A | 8930 | mm ² |
| Hoogte | h | 235 | mm | | | | |
| | | | | Traagheidsmoment | I _{tor} | 3860e+03 | mm ⁴ |
| Weerstandsmoment | W _y | 3498e+02 | mm ³ | Traagheidsmoment | I _y | 4110e+04 | mm ⁴ |
| Weerstandsmoment | W _z | 5656e+01 | mm ³ | Traagheidsmoment | I _z | 1075e+03 | mm ⁴ |
| Sterkte klasse | | C24 | | | | | |
| | f _{m,0,k} | 24.0 | N/mm ² | | f _{c,0,k} | 21.0 | N/mm ² |
| | f _{t,0,k} | 14.5 | N/mm ² | | f _{v,0,k} | 4.0 | N/mm ² |
| Elasticiteitsmodulus | E _{0,mean} | 11000.0 | N/mm ² | | G _{mean} | 690.0 | N/mm ² |
| Gebruiksklasse | I | | | I (Permanent) | k _{mod} | 0.60 | |
| Betrouwbaarheidsklasse | 1 | | | II (Lange termijn) | k _{mod} | 0.70 | |
| Ontwerplevensduur | 50 | Jaar | | III (Middellange termijn) | k _{mod} | 0.80 | |
| | | | | IV (Korte termijn) | k _{mod} | 0.90 | |
| | | | | V (Onmiddellijk) | k _{mod} | 1.10 | |

| | | | | | | |
|--------------------------|------------|-------|----|-------------------|-------|----|
| Staaflengte | L_{sys} | 4.000 | m | Beschot kwaliteit | C18 | |
| hoh afstand | L_t | 0.610 | m | Beschot dikte | 20 | mm |
| Zeeg | | 0 | mm | | | |
| Doorbuigingen beschouwen | | Ja | | | | |
| Stootbelasting | | Nee | | | | |
| Reductiefactor spreiding | | 0.74 | | | | |
| | γ_M | 1.300 | | k_{mod} | 0.800 | |
| | $k_{h,y}$ | 1.000 | | $k_{h,z}$ | 1.300 | |
| | k_h | 1.000 | | k_{cr} | 1.000 | |
| | k_m | 0.700 | | | | |

Lastengenerator opties

Gebouwtype: Eengezinswoningen met 1, 2 of 3 bouwlagen

Referentieperiode: 50

Betrouwbaarheidsklasse: 1

Combinatieregels:

Geen

NEN-EN 1990 NB.4-A1.2(B) (6.10a+6.10b)

NEN-EN 1990 NB.7-A1.3 (Brand) (6.11 a/b)

Gewichts berekening

Veranderlijk

qk1 Opgelegde belastingen (qk) 1.75 kN/m²

NEN-EN1991-1-1#6.3(Cat=A, SubCat=2)

fk1 Opgelegde belastingen (fk) 3.00 kN

NEN-EN1991-1-1#6.3(Cat=A, SubCat=2)

Belastingen

| | | | | |
|-----------|------------------------|------|-------------------|-----------------------------|
| Permanent | Eigen gewicht | 0.06 | kN/m ² | |
| | beschot | 0.45 | kN/m ² | |
| | Totaal | 0.51 | kN/m ² | |
| Opgelegd | q _k | 1.75 | kN/m ² | (c _{prob} = 1.000) |
| | ψ ₀ | 0.40 | | |
| | ψ ₁ | 0.50 | | |
| | ψ ₂ | 0.30 | | |
| | Q _k | 3.00 | kN | |
| Bijzonder | F _{bijzonder} | 0.00 | kN | |
| | p _{bijzonder} | 0.00 | kN/m ² | |

Belastingscombinaties voor uiterste grenstoestand (6.10a + 6.10b)

| | | | | |
|--------|---|-------------------------------------|------|-------------------|
| Fu.C.1 | $p = \gamma_G \cdot G_{rep} + \gamma_Q \cdot Q_{rep}$ | $1.22 \cdot 0.51 + 0.54 \cdot 1.75$ | 1.57 | kN/m ² |
| Fu.C.2 | $p = \gamma_G \cdot G_{rep} + \gamma_Q \cdot Q_{rep}$ | $1.08 \cdot 0.51 + 1.35 \cdot 1.75$ | 2.91 | kN/m ² |
| Fu.C.3 | $p = \gamma_G \cdot G_{rep}$ | $1.22 \cdot 0.51$ | 0.62 | kN/m ² |
| | $F = \gamma_Q \cdot F_{rep}$ | $0.54 \cdot 3.00$ | 1.62 | kN |
| Fu.C.4 | $p = \gamma_G \cdot G_{rep}$ | $1.08 \cdot 0.51$ | 0.55 | kN/m ² |
| | $F = \gamma_Q \cdot F_{rep}$ | $1.35 \cdot 3.00$ | 4.05 | kN |
| Bi.C.1 | $p = \gamma_G \cdot G_{rep} + \gamma_Q \cdot Q_{rep}$ | $1.00 \cdot 0.51 + 0.30 \cdot 1.75$ | 1.04 | kN/m ² |

Maatgevende snedekrachten

| | | | | | | |
|-------|------------|------------|------------|------------|------------|------------|
| Comb. | $N_{c,Ed}$ | $N_{t,Ed}$ | $V_{y,Ed}$ | $V_{z,Ed}$ | $M_{y,Ed}$ | $M_{z,Ed}$ |
|-------|------------|------------|------------|------------|------------|------------|

| | | | | | |
|--------|------|------|------|------|------|
| Fu.C.1 | 0.00 | 0.00 | 1.91 | 1.91 | 0.00 |
| Fu.C.2 | 0.00 | 0.00 | 3.56 | 3.56 | 0.00 |
| Fu.C.3 | 0.00 | 0.00 | 2.38 | 1.96 | 0.00 |
| Fu.C.4 | 0.00 | 0.00 | 4.72 | 3.66 | 0.00 |
| Bi.C.1 | 0.00 | 0.00 | 1.26 | 1.26 | 0.00 |
| | kN | kN | kN | kNm | kNm |

Max UC snedekracht

| Comb. | $N_{c,Ed}$ $N_{t,Ed}$ | $V_{y,Ed}$ | $V_{z,Ed}$ | $M_{y,Ed}$ | $M_{z,Ed}$ |
|--------|-------------------------|------------|------------|------------|------------|
| Fu.C.1 | 0.00 | 0.00 | 0.00 | 1.91 | 0.00 |
| Fu.C.2 | 0.00 | 0.00 | 0.00 | 3.56 | 0.00 |
| Fu.C.3 | 0.00 | 0.00 | 0.60 | 1.96 | 0.00 |
| Fu.C.4 | 0.00 | 0.00 | 1.49 | 3.66 | 0.00 |
| Bi.C.1 | 0.00 | 0.00 | 0.00 | 1.26 | 0.00 |
| | kN | kN | kN | kNm | kNm |

Rekenspanning

| Comb. | $\sigma_{c,0,d}$ $\sigma_{t,0,d}$ | $\sigma_{m,y,d}$ | $\sigma_{m,z,d}$ | $\tau_{v,y,d}$ | $\tau_{v,z,d}$ |
|--------|-------------------------------------|-------------------|-------------------|-------------------|-------------------|
| Fu.C.1 | 0.00 | 5.47 | 0.00 | 0.00 | 0.00 |
| Fu.C.2 | 0.00 | 10.17 | 0.00 | 0.00 | 0.00 |
| Fu.C.3 | 0.00 | 5.59 | 0.00 | 0.00 | 0.10 |
| Fu.C.4 | 0.00 | 10.47 | 0.00 | 0.00 | 0.25 |
| Bi.C.1 | 0.00 | 3.62 | 0.00 | 0.00 | 0.00 |
| | N/mm ² | N/mm ² | N/mm ² | N/mm ² | N/mm ² |

Rekensterkte

| Comb. | $f_{v,0,d}$ | $f_{m,y,d}$ | $f_{m,z,d}$ | $f_{c,0,d}$ | $f_{t,0,d}$ | Belasting duurklasse |
|--------|-------------------|-------------------|-------------------|-------------------|-------------------|---------------------------|
| Fu.C.1 | 2.46 | 14.77 | 19.20 | 12.92 | 8.92 | III (Middellange termijn) |
| Fu.C.2 | 2.46 | 14.77 | 19.20 | 12.92 | 8.92 | III (Middellange termijn) |
| Fu.C.3 | 2.46 | 14.77 | 19.20 | 12.92 | 8.92 | III (Middellange termijn) |
| Fu.C.4 | 2.46 | 14.77 | 19.20 | 12.92 | 8.92 | III (Middellange termijn) |
| Bi.C.1 | 2.46 | 14.77 | 19.20 | 12.92 | 8.92 | III (Middellange termijn) |
| | N/mm ² | N/mm ² | N/mm ² | N/mm ² | N/mm ² | |

UC doorsnede per belastingscombinatie

| | | | | |
|--------|---------------------------------|--|------|----|
| Fu.C.1 | NEN-EN1995-1-1 (6.11) | 5.473 / 14.769 + 0.700 · 0.000 / 19.200 | 0.37 | OK |
| Fu.C.2 | NEN-EN1995-1-1 (6.11) | 10.168 / 14.769 + 0.700 · 0.000 / 19.200 | 0.69 | OK |
| Fu.C.3 | NEN-EN1995-1-1 (6.11) | 5.595 / 14.769 + 0.700 · 0.000 / 19.200 | 0.38 | OK |
| | NEN-EN1995-1-1 (6.13) (V_z) | 0.100 / 2.462 | 0.04 | OK |
| Fu.C.4 | NEN-EN1995-1-1 (6.11) | 10.472 / 14.769 + 0.700 · 0.000 / 19.200 | 0.71 | OK |
| | NEN-EN1995-1-1 (6.13) (V_z) | 0.251 / 2.462 | 0.10 | OK |
| Bi.C.1 | NEN-EN1995-1-1 (6.11) | 3.615 / 14.769 + 0.700 · 0.000 / 19.200 | 0.24 | OK |

Belastingscombinaties voor bruikbaarheidsgrenstoestand

| | | | | |
|------------------------|--|---------------------------|------|-------------------|
| Ka.C.1 | $p = \gamma G + \gamma Q + \gamma Q_{rep}$ | 1.00 · 0.51 + 0.40 · 1.75 | 1.21 | kN/m ² |
| Ka.C.2 | $p = \gamma G + \gamma Q + \gamma Q_{rep}$ | 1.00 · 0.51 + 1.00 · 1.75 | 2.26 | kN/m ² |
| Qu.C.1 | $p = \gamma G + \gamma Q + \gamma Q_{rep}$ | 1.00 · 0.51 + 0.30 · 1.75 | 1.04 | kN/m ² |
| Ka.C.(w ₁) | $p = \gamma G + \gamma G_{rep}$ | 1.00 · 0.51 | 0.51 | kN/m ² |

UC doorbuigingen per belastingscombinatie

| | | | | | | | |
|------------|--------------------|---------|-------------------|--------------------------|--------------------|---------|-------------------|
| L/250 | Limiet w_{max} | 16.0 | mm | L/333 | Limiet $w_2 + w_3$ | 12.0 | mm |
| E_{mean} | $E_{0,ser,d,inst}$ | 11000.0 | N/mm ² | E_{mean} / k_{def} | $E_{0,ser,d,cr}$ | 18333.3 | N/mm ² |
| | | | | $E-Mod / E_{0,ser,d,cr}$ | | 0.60 | |

| | | | | | | | |
|-------------------------------|-------------------|------------------|------------------|------------------------------------|---------------------------------------|--------------------------------------|----|
| Ka.C.(w ₁) | w ₁ | 2.3 | mm | | w _c | 0.0 | mm |
| Qu.C.1 | w ₂ | 2.8 | mm | | | | |
| Comb. | w ₃ | w _{tot} | w _{max} | w ₂ +w ₃ | UC (w _{max}) | UC (w ₂ +w ₃) | |
| Ka.C.1 | 3.1 | 8.2 | 8.2 | 5.9 | 0.52 | 0.49 | |
| Ka.C.2 | 7.9 | 13.0 | 13.0 | 10.7 | 0.81 | 0.89 | |
| | mm | mm | mm | mm | | | |
| Maatgevende krachten (Fu.C.4) | | | | Maatgevende doorbuigingen (Ka.C.2) | | | |
| Normaalkracht | N _{t,Ed} | 0.00 | kN | Ka.C.(w ₁) | w ₁ | 2.3 | mm |
| Dwarskracht | V _{y,Ed} | 0.00 | kN | Qu.C.1 | w ₂ | 2.8 | mm |
| Dwarskracht | V _{z,Ed} | 1.49 | kN | Ka.C.2 | w ₃ | 7.9 | mm |
| Torsie | M _{x,Ed} | 0.00 | kNm | | w _{tot} | 13.0 | mm |
| Moment | M _{y,Ed} | 3.66 | kNm | | w _{max} | 13.0 | mm |
| Moment | M _{z,Ed} | 0.00 | kNm | | w ₂ +w ₃ | 10.7 | mm |
| | | | | | Limiet w _{max} | 16.0 | mm |
| | | | | | Limiet w ₂ +w ₃ | 12.0 | mm |
| | | | | | UC (w _{max}) | 0.81 | |
| | | | | | UC (w ₂ +w ₃) | 0.89 | |

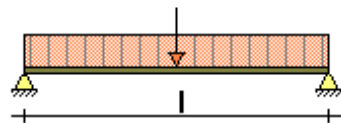
uitgevoerde controles

| | | | | |
|---------------|--|--|------|----|
| Doorsnede | NEN-EN1995-1-1 (6.13) (V _z) | 0.793 / 2.462 | 0.32 | OK |
| Doorsnede | NEN-EN1995-1-1 (6.11) | 10.472 / 14.769 + 0.700 · 0.000 / 19.200 | 0.71 | OK |
| Doorbuigingen | NEN-EN1995 #7.2 NEN-EN1990 #A1.4.3 (4) | 10.7 / 12.0 | 0.89 | OK |

Ligger gecontroleerd op sterkte en doorbuiging

Ligger OK

5.1.3 Vloer versterkt i.v.m. estrichvloer (NEN-EN1995:2011/NB:2013)



Profielgegevens: CLS 38 x 235

| | | | | | | | |
|----------------------|---------------------|----------|-------------------|------------------|--------------------|----------|-------------------|
| Breedte | b | 38 | mm | Oppervlak | A | 8930 | mm ² |
| Hoogte | h | 235 | mm | | | | |
| | | | | Traagheidsmoment | I _{tor} | 3860e+03 | mm ⁴ |
| Weerstandsmoment | W _y | 3498e+02 | mm ³ | Traagheidsmoment | I _y | 4110e+04 | mm ⁴ |
| Weerstandsmoment | W _z | 5656e+01 | mm ³ | Traagheidsmoment | I _z | 1075e+03 | mm ⁴ |
| Sterkte klasse | | C24 | | | | | |
| | f _{m,0,k} | 24.0 | N/mm ² | | f _{c,0,k} | 21.0 | N/mm ² |
| | f _{t,0,k} | 14.5 | N/mm ² | | f _{v,0,k} | 4.0 | N/mm ² |
| Elasticiteitsmodulus | E _{0,mean} | 11000.0 | N/mm ² | | G _{mean} | 690.0 | N/mm ² |

| | | | | | | |
|--------------------------|------------|-------|---------------------------|-------------------|-------|----|
| Gebruiksklasse | I | | I (Permanent) | k_{mod} | 0.60 | |
| Betrouwbaarheidsklasse | 1 | | II (Lange termijn) | k_{mod} | 0.70 | |
| Ontwerplevensduur | 50 | Jaar | III (Middellange termijn) | k_{mod} | 0.80 | |
| | | | IV (Korte termijn) | k_{mod} | 0.90 | |
| | | | V (Onmiddellijk) | k_{mod} | 1.10 | |
| Staaflengte | L_{sys} | 4.000 | m | Beschot kwaliteit | C18 | |
| hoh afstand | L_t | 0.305 | m | Beschot dikte | 20 | mm |
| Zeeg | 0 | mm | | | | |
| Doorbuigingen beschouwen | Ja | | | | | |
| Stootbelasting | Nee | | | | | |
| Reductiefactor spreiding | 0.49 | | | | | |
| | γ_M | 1.300 | | k_{mod} | 0.800 | |
| | $k_{h,y}$ | 1.000 | | $k_{h,z}$ | 1.300 | |
| | k_h | 1.000 | | k_{cr} | 1.000 | |
| | k_m | 0.700 | | | | |

Lastengenerator opties

Gebouwtype: Eengezinswoningen met 1, 2 of 3 bouwlagen

Referentieperiode: 50

Betrouwbaarheidsklasse: 1

Combinatieregels:

Geen

NEN-EN 1990 NB.4-A1.2(B) (6.10a+6.10b)

NEN-EN 1990 NB.7-A1.3 (Brand) (6.11 a/b)

Belastingen

| | | | | |
|-----------|------------------------|------|-------------------|-----------------------------|
| Permanent | Eigen gewicht | 0.12 | kN/m ² | |
| | beschot | 0.45 | kN/m ² | |
| | overig | 0.25 | kN/m ² | |
| | Totaal | 0.82 | kN/m ² | |
| Opgelegd | q _k | 2.25 | kN/m ² | (c _{prob} = 1.000) |
| | ψ ₀ | 0.40 | | |
| | ψ ₁ | 0.50 | | |
| | ψ ₂ | 0.30 | | |
| | Q _k | 3.00 | kN | |
| Bijzonder | F _{bijzonder} | 0.00 | kN | |
| | p _{bijzonder} | 0.00 | kN/m ² | |

Belastingscombinaties voor uiterste grenstoestand (6.10a + 6.10b)

| | | | | |
|--------|---|-------------------------------------|------|-------------------|
| Fu.C.1 | $p = \gamma G + G_{rep} + \gamma Q + Q_{rep}$ | $1.22 \cdot 0.82 + 0.54 \cdot 2.25$ | 2.22 | kN/m ² |
| Fu.C.2 | $p = \gamma G + G_{rep} + \gamma Q + Q_{rep}$ | $1.08 \cdot 0.82 + 1.35 \cdot 2.25$ | 3.93 | kN/m ² |
| Fu.C.3 | $p = \gamma G + G_{rep}$ | $1.22 \cdot 0.82$ | 1.00 | kN/m ² |
| | $F = \gamma Q + F_{rep}$ | $0.54 \cdot 3.00$ | 1.62 | kN |
| Fu.C.4 | $p = \gamma G + G_{rep}$ | $1.08 \cdot 0.82$ | 0.89 | kN/m ² |
| | $F = \gamma Q + F_{rep}$ | $1.35 \cdot 3.00$ | 4.05 | kN |
| Bi.C.1 | $p = \gamma G + G_{rep} + \gamma Q + Q_{rep}$ | $1.00 \cdot 0.82 + 0.30 \cdot 2.25$ | 1.50 | kN/m ² |

Maatgevende snedekrachten

| Comb. | $N_{c,Ed}$ | $N_{t,Ed}$ | $V_{y,Ed}$ | $V_{z,Ed}$ | $M_{y,Ed}$ | $M_{z,Ed}$ |
|--------|------------|------------|------------|------------|------------|------------|
| Fu.C.1 | 0.00 | 0.00 | 0.00 | -1.35 | 1.35 | 0.00 |

| | | | | | |
|--------|------|------|-------|------|------|
| Fu.C.2 | 0.00 | 0.00 | -2.40 | 2.40 | 0.00 |
| Fu.C.3 | 0.00 | 0.00 | 2.23 | 1.41 | 0.00 |
| Fu.C.4 | 0.00 | 0.00 | 4.59 | 2.54 | 0.00 |
| Bi.C.1 | 0.00 | 0.00 | -0.91 | 0.91 | 0.00 |
| | kN | kN | kN | kNm | kNm |

Max UC snedekracht

| Comb. | $N_{c,Ed}$ | $N_{t,Ed}$ | $V_{y,Ed}$ | $V_{z,Ed}$ | $M_{y,Ed}$ | $M_{z,Ed}$ |
|--------|------------|------------|------------|------------|------------|------------|
| Fu.C.1 | 0.00 | 0.00 | 0.00 | -0.00 | 1.35 | 0.00 |
| Fu.C.2 | 0.00 | 0.00 | 0.00 | -0.00 | 2.40 | 0.00 |
| Fu.C.3 | 0.00 | 0.00 | 0.00 | -0.40 | 1.41 | 0.00 |
| Fu.C.4 | 0.00 | 0.00 | 0.00 | -1.00 | 2.54 | 0.00 |
| Bi.C.1 | 0.00 | 0.00 | 0.00 | -0.00 | 0.91 | 0.00 |
| | kN | kN | kN | kN | kNm | kNm |

Rekenspanning

| Comb. | $\sigma_{c,0,d}$ | $\sigma_{t,0,d}$ | $\sigma_{m,y,d}$ | $\sigma_{m,z,d}$ | $\tau_{v,y,d}$ | $\tau_{v,z,d}$ |
|--------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|
| Fu.C.1 | 0.00 | 0.00 | 3.87 | 0.00 | 0.00 | 0.00 |
| Fu.C.2 | 0.00 | 0.00 | 6.85 | 0.00 | 0.00 | 0.00 |
| Fu.C.3 | 0.00 | 0.00 | 4.04 | 0.00 | 0.00 | 0.07 |
| Fu.C.4 | 0.00 | 0.00 | 7.27 | 0.00 | 0.00 | 0.17 |
| Bi.C.1 | 0.00 | 0.00 | 2.61 | 0.00 | 0.00 | 0.00 |
| | N/mm ² | N/mm ² | N/mm ² | N/mm ² | N/mm ² | N/mm ² |

Rekensterkte

| Comb. | $f_{v,0,d}$ | $f_{m,y,d}$ | $f_{m,z,d}$ | $f_{c,0,d}$ | $f_{t,0,d}$ | Belasting duurklasse |
|--------|-------------------|-------------------|-------------------|-------------------|-------------------|---------------------------|
| Fu.C.1 | 2.46 | 14.77 | 19.20 | 12.92 | 8.92 | III (Middellange termijn) |
| Fu.C.2 | 2.46 | 14.77 | 19.20 | 12.92 | 8.92 | III (Middellange termijn) |
| Fu.C.3 | 2.46 | 14.77 | 19.20 | 12.92 | 8.92 | III (Middellange termijn) |
| Fu.C.4 | 2.46 | 14.77 | 19.20 | 12.92 | 8.92 | III (Middellange termijn) |
| Bi.C.1 | 2.46 | 14.77 | 19.20 | 12.92 | 8.92 | III (Middellange termijn) |
| | N/mm ² | N/mm ² | N/mm ² | N/mm ² | N/mm ² | |

UC doorsnede per belastingscombinatie

| | | | | |
|--------|---------------------------------|---|------|----|
| Fu.C.1 | NEN-EN1995-1-1 (6.11) | $3.870 / 14.769 + 0.700 \cdot 0.000 / 19.200$ | 0.26 | OK |
| Fu.C.2 | NEN-EN1995-1-1 (6.11) | $6.848 / 14.769 + 0.700 \cdot 0.000 / 19.200$ | 0.46 | OK |
| Fu.C.3 | NEN-EN1995-1-1 (6.11) | $4.039 / 14.769 + 0.700 \cdot 0.000 / 19.200$ | 0.27 | OK |
| | NEN-EN1995-1-1 (6.13) (V_z) | $0.067 / 2.462$ | 0.03 | OK |
| Fu.C.4 | NEN-EN1995-1-1 (6.11) | $7.270 / 14.769 + 0.700 \cdot 0.000 / 19.200$ | 0.49 | OK |
| | NEN-EN1995-1-1 (6.13) (V_z) | $0.168 / 2.462$ | 0.07 | OK |
| Bi.C.1 | NEN-EN1995-1-1 (6.11) | $2.613 / 14.769 + 0.700 \cdot 0.000 / 19.200$ | 0.18 | OK |

Belastingscombinaties voor bruikbaarheidsgrenstoestand

| | | | | |
|------------------------|---|-------------------------------------|------|-------------------|
| Ka.C.1 | $p = \gamma G \cdot G_{rep} + \gamma Q \cdot Q_{rep}$ | $1.00 \cdot 0.82 + 0.40 \cdot 2.25$ | 1.72 | kN/m ² |
| Ka.C.2 | $p = \gamma G \cdot G_{rep} + \gamma Q \cdot Q_{rep}$ | $1.00 \cdot 0.82 + 1.00 \cdot 2.25$ | 3.07 | kN/m ² |
| Qu.C.1 | $p = \gamma G \cdot G_{rep} + \gamma Q \cdot Q_{rep}$ | $1.00 \cdot 0.82 + 0.30 \cdot 2.25$ | 1.50 | kN/m ² |
| Ka.C.(w ₁) | $p = \gamma G \cdot G_{rep}$ | $1.00 \cdot 0.82$ | 0.82 | kN/m ² |

UC doorbuigingen per belastingscombinatie

| | | | | | | | |
|------------------------|--------------------|---------|-------------------|--------------------------|--------------------|---------|-------------------|
| L/250 | Limiet w_{max} | 16.0 | mm | L/333 | Limiet $w_2 + w_3$ | 12.0 | mm |
| E_{mean} | $E_{0,ser,d,inst}$ | 11000.0 | N/mm ² | E_{mean} / k_{def} | $E_{0,ser,d,cr}$ | 18333.3 | N/mm ² |
| | | | | $E-Mod / E_{0,ser,d,cr}$ | | 0.60 | |
| Ka.C.(w ₁) | w_1 | 1.9 | mm | w_c | | 0.0 | mm |

| | | | | | | | |
|-------------------------------|------------|-----------|-----------|------------------------------------|------------------|------------------|----|
| Qu.C.1 | w_2 | 2.0 | mm | | | | |
| Comb. | w_3 | w_{tot} | w_{max} | w_2+w_3 | UC (w_{max}) | UC (w_2+w_3) | |
| Ka.C.1 | 2.0 | 5.9 | 5.9 | 4.0 | 0.37 | 0.34 | |
| Ka.C.2 | 5.1 | 8.9 | 8.9 | 7.1 | 0.56 | 0.59 | |
| | mm | mm | mm | mm | | | |
| Maatgevende krachten (Fu.C.4) | | | | Maatgevende doorbuigingen (Ka.C.2) | | | |
| Normaalkracht | $N_{t,Ed}$ | 0.00 | kN | Ka.C.(w_1) | w_1 | 1.9 | mm |
| Dwarskracht | $V_{y,Ed}$ | 0.00 | kN | Qu.C.1 | w_2 | 2.0 | mm |
| Dwarskracht | $V_{z,Ed}$ | -1.00 | kN | Ka.C.2 | w_3 | 5.1 | mm |
| Torsie | $M_{x,Ed}$ | 0.00 | kNm | | w_{tot} | 8.9 | mm |
| Moment | $M_{y,Ed}$ | 2.54 | kNm | | w_{max} | 8.9 | mm |
| Moment | $M_{z,Ed}$ | 0.00 | kNm | | w_2+w_3 | 7.1 | mm |
| | | | | | Limiet w_{max} | 16.0 | mm |
| | | | | | Limiet w_2+w_3 | 12.0 | mm |
| | | | | | UC (w_{max}) | 0.56 | |
| | | | | | UC (w_2+w_3) | 0.59 | |

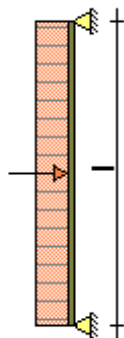
uitgevoerde controles

| | | | | |
|---------------|--|---|------|----|
| Doorsnede | NEN-EN1995-1-1 (6.13) (V_z) | 0.771 / 2.462 | 0.31 | OK |
| Doorsnede | NEN-EN1995-1-1 (6.11) | 7.270 / 14.769 + 0.700 · 0.000 / 19.200 | 0.49 | OK |
| Doorbuigingen | NEN-EN1995 #7.2 NEN-EN1990 #A1.4.3 (4) | 7.1 / 12.0 | 0.59 | OK |

Ligger gecontroleerd op sterkte en doorbuiging

Ligger OK

5.1.4 Vert. elem. bestand (NEN-EN1995:2011/NB:2013)



Profielgegevens: CLS 38 x 89

| | | | | | | | |
|----------------------|--------------|----------|-------------------|------------------|-------------|----------|-------------------|
| Breedte | b | 38 | mm | Oppervlak | A | 3382 | mm ² |
| Hoogte | h | 89 | mm | | | | |
| | | | | Traagheidsmoment | I_{tor} | 1191e+03 | mm ⁴ |
| Weerstandsmoment | W_y | 5017e+01 | mm ³ | Traagheidsmoment | I_y | 2232e+03 | mm ⁴ |
| Weerstandsmoment | W_z | 2142e+01 | mm ³ | Traagheidsmoment | I_z | 4070e+02 | mm ⁴ |
| Sterkte klasse | | C24 | | | | | |
| | $f_{m,0,k}$ | 24.0 | N/mm ² | | $f_{c,0,k}$ | 21.0 | N/mm ² |
| | $f_{t,0,k}$ | 14.5 | N/mm ² | | $f_{v,0,k}$ | 4.0 | N/mm ² |
| Elasticiteitsmodulus | $E_{0,mean}$ | 11000.0 | N/mm ² | | G_{mean} | 690.0 | N/mm ² |
| Gebruiksklasse | | I | | I (Permanent) | k_{mod} | 0.60 | |

| | | | | | | |
|--------------------------|------------|-------|---------------------------|-------------------|-------|----|
| Betrouwbaarheidsklasse | 1 | | II (Lange termijn) | k_{mod} | 0.70 | |
| Ontwerplevensduur | 50 | Jaar | III (Middellange termijn) | k_{mod} | 0.80 | |
| | | | IV (Korte termijn) | k_{mod} | 0.90 | |
| | | | V (Onmiddellijk) | k_{mod} | 1.10 | |
| Staaflengte | L_{sys} | 2.400 | m | Beschot kwaliteit | C18 | |
| hoh afstand | L_t | 0.500 | m | Beschot dikte | 12 | mm |
| Zeeg | | 0 | mm | | | |
| Doorbuigingen beschouwen | | Ja | | | | |
| Reductiefactor spreiding | | 0.74 | | | | |
| | γ_M | 1.300 | | k_{mod} | 0.900 | |
| | $k_{h,y}$ | 1.110 | | $k_{h,z}$ | 1.300 | |
| | k_h | 1.110 | | k_{cr} | 1.000 | |
| | k_m | 0.700 | | | | |

Lastengenerator opties

Gebouwtype: Eengezinswoningen met 1, 2 of 3 bouwlagen

Referentieperiode: 50

Betrouwbaarheidsklasse: 1

Combinatieregels:

Geen

NEN-EN 1990 NB.4-A1.2(B) (6.10a+6.10b)

NEN-EN 1990 NB.7-A1.3 (Brand) (6.11 a/b)

Gewichts berekening

Winddruk + onderdruk

| | | | | |
|-------|---|-------|-------------------|---|
| Qp1 | Pieksnelheids druk (Qp voor referentieperiode 50) | 0.79 | kN/m ² | NEN-EN1991-1-4#4(Z=8.10, Terrein=Onbebouwd, Regio=2, C0=1.00) |
| CsCd1 | Constructie factor (CsCd) | 1.00 | | 1.00 |
| Cpe1 | Druk coefficient (Cpe) | 0.80 | | NEN-EN1991-1-4#7.2(Dak=Wand, Zone=D, h/d=90.00) |
| Cpi1 | Druk coefficient (Cpi) | -0.30 | | EN1991-1-4#7.2.9(Cpe=-0.50, Openingen=0.00, Over=False) |

Windzuiging + overdruk

| | | | | |
|------|------------------------|-------|--|---|
| Cpe1 | Druk coefficient (Cpe) | -1.20 | | NEN-EN1991-1-4#7.2(Dak=Wand, Zone=A, h/d=90.00) |
| Cpi1 | Druk coefficient (Cpi) | 0.20 | | EN1991-1-4#7.2.9(Cpe=0.80, Openingen=0.00, Over=True) |

Belastingen

| | | | | |
|-----------|-----------------------------------|-------|-------------------|------------------------|
| Wind | Winddruk ($c_s c_d = 1.000$) | 0.87 | kN/m ² | ($c_{prob} = 1.000$) |
| | Windzuiging ($c_s c_d = 1.000$) | -1.11 | kN/m ² | |
| Bijzonder | $F_{bijzonder}$ | 0.00 | kN | |
| | $p_{bijzonder}$ | 0.00 | kN/m ² | |

Belastingscombinaties voor uiterste grenstoestand (6.10a + 6.10b)

| | | | | |
|--------|--|----------------------|-------|-------------------|
| Fu.C.1 | $p = \gamma_Q \cdot Q_{wind_druk}$ | $1.35 \cdot 0.87$ | 1.17 | kN/m ² |
| Fu.C.2 | $p = \gamma_Q \cdot Q_{wind_zuiging}$ | $1.35 \cdot (-1.11)$ | -1.50 | kN/m ² |
| Bi.C.1 | $p = \gamma_Q \cdot Q_{wind_druk}$ | $0.20 \cdot 0.87$ | 0.17 | kN/m ² |

$$\text{Bi.C.2} \quad p = \gamma Q \cdot Q_{\text{wind_zuiging}} \quad 0.20 \cdot (-1.11) \quad -0.22 \quad \text{kN/m}^2$$

Maatgevende snedekrachten

| Comb. | $N_{c,Ed}$ | $N_{t,Ed}$ | $V_{y,Ed}$ | $V_{z,Ed}$ | $M_{y,Ed}$ | $M_{z,Ed}$ |
|--------|------------|------------|------------|------------|------------|------------|
| Fu.C.1 | 0.00 | | 0.00 | 0.70 | 0.42 | 0.00 |
| Fu.C.2 | 0.00 | | 0.00 | 0.90 | -0.54 | 0.00 |
| Bi.C.1 | 0.00 | | 0.00 | 0.10 | 0.06 | 0.00 |
| Bi.C.2 | 0.00 | | 0.00 | 0.13 | -0.08 | 0.00 |
| | kN | | kN | kN | kNm | kNm |

Max UC snedekracht

| Comb. | $N_{c,Ed}$ | $N_{t,Ed}$ | $V_{y,Ed}$ | $V_{z,Ed}$ | $M_{y,Ed}$ | $M_{z,Ed}$ |
|--------|------------|------------|------------|------------|------------|------------|
| Fu.C.1 | 0.00 | | 0.00 | 0.00 | 0.42 | 0.00 |
| Fu.C.2 | 0.00 | | 0.00 | 0.00 | -0.54 | 0.00 |
| Bi.C.1 | 0.00 | | 0.00 | 0.00 | 0.06 | 0.00 |
| Bi.C.2 | 0.00 | | 0.00 | 0.00 | -0.08 | 0.00 |
| | kN | | kN | kN | kNm | kNm |

Rekenspanning

| Comb. | $\sigma_{c,0,d}$ | $\sigma_{t,0,d}$ | $\sigma_{m,y,d}$ | $\sigma_{m,z,d}$ | $\tau_{v,y,d}$ | $\tau_{v,z,d}$ |
|--------|-------------------|------------------|-------------------|-------------------|-------------------|-------------------|
| Fu.C.1 | 0.00 | | 8.43 | 0.00 | 0.00 | 0.00 |
| Fu.C.2 | 0.00 | | 10.73 | 0.00 | 0.00 | 0.00 |
| Bi.C.1 | 0.00 | | 1.25 | 0.00 | 0.00 | 0.00 |
| Bi.C.2 | 0.00 | | 1.59 | 0.00 | 0.00 | 0.00 |
| | N/mm ² | | N/mm ² | N/mm ² | N/mm ² | N/mm ² |

Rekensterkte

| Comb. | $f_{v,0,d}$ | $f_{m,y,d}$ | $f_{m,z,d}$ | $f_{c,0,d}$ | $f_{t,0,d}$ | Belasting duurklasse |
|--------|-------------------|-------------------|-------------------|-------------------|-------------------|----------------------|
| Fu.C.1 | 2.77 | 18.44 | 21.60 | 14.54 | 11.14 | IV (Korte termijn) |
| Fu.C.2 | 2.77 | 18.44 | 21.60 | 14.54 | 11.14 | IV (Korte termijn) |
| Bi.C.1 | 2.77 | 18.44 | 21.60 | 14.54 | 11.14 | IV (Korte termijn) |
| Bi.C.2 | 2.77 | 18.44 | 21.60 | 14.54 | 11.14 | IV (Korte termijn) |
| | N/mm ² | N/mm ² | N/mm ² | N/mm ² | N/mm ² | |

UC doorsnede per belastingscombinatie

| | | | | |
|--------|-----------------------|--|------|----|
| Fu.C.1 | NEN-EN1995-1-1 (6.11) | $8.430 / 18.444 + 0.700 \cdot 0.000 / 21.600$ | 0.46 | OK |
| Fu.C.2 | NEN-EN1995-1-1 (6.11) | $10.729 / 18.444 + 0.700 \cdot 0.000 / 21.600$ | 0.58 | OK |
| Bi.C.1 | NEN-EN1995-1-1 (6.11) | $1.249 / 18.444 + 0.700 \cdot 0.000 / 21.600$ | 0.07 | OK |
| Bi.C.2 | NEN-EN1995-1-1 (6.11) | $1.589 / 18.444 + 0.700 \cdot 0.000 / 21.600$ | 0.09 | OK |

Belastingscombinaties voor bruikbaarheidsgrenstoestand

$$\text{Ka.C.1} \quad p = \gamma Q \cdot Q_{\text{wind_druk}} \quad 1.00 \cdot 0.87 \quad 0.87 \quad \text{kN/m}^2$$

$$\text{Ka.C.2} \quad p = \gamma Q \cdot Q_{\text{wind_zuiging}} \quad 1.00 \cdot (-1.11) \quad -1.11 \quad \text{kN/m}^2$$

UC doorbuigingen per belastingscombinatie

| | | | | | | | |
|-------------------|----------------------------------|------------------|-------------------|---|--------------------------------|--------------------|-------------------|
| L/225 | Limiet w_{\max} | 10.7 | mm | L/0 | Limiet $w_2 + w_3$ | 0.0 | mm |
| E_{mean} | $E_{0,\text{ser},d,\text{inst}}$ | 11000.0 | N/mm ² | $E_{\text{mean}} / k_{\text{def}}$ | $E_{0,\text{ser},d,\text{cr}}$ | 18333.3 | N/mm ² |
| | | | | $E\text{-Mod} / E_{0,\text{ser},d,\text{cr}}$ | | 0.60 | |
| | w_1 | 0.0 | mm | | w_c | 0.0 | mm |
| | w_2 | 0.0 | mm | | | | |
| Comb. | w_3 | w_{tot} | w_{\max} | $w_2 + w_3$ | UC (w_{\max}) | UC ($w_2 + w_3$) | |
| Ka.C.1 | 7.7 | 7.7 | 7.7 | 0.0 | 0.72 | 0.00 | |
| Ka.C.2 | -9.7 | -9.7 | -9.7 | 0.0 | 0.91 | 0.00 | |

| | mm | mm | mm | mm | | | |
|-------------------------------|------------|-------|-----|------------------------------------|------------------|------|----|
| Maatgevende krachten (Fu.C.2) | | | | Maatgevende doorbuigingen (Ka.C.2) | | | |
| Normaalkracht | $N_{t,Ed}$ | 0.00 | kN | | w_1 | 0.0 | mm |
| Dwarskracht | $V_{y,Ed}$ | 0.00 | kN | | w_2 | 0.0 | mm |
| Dwarskracht | $V_{z,Ed}$ | 0.00 | kN | Ka.C.2 | w_3 | -9.7 | mm |
| Torsie | $M_{x,Ed}$ | 0.00 | kNm | | w_{tot} | -9.7 | mm |
| Moment | $M_{y,Ed}$ | -0.54 | kNm | | w_{max} | -9.7 | mm |
| Moment | $M_{z,Ed}$ | 0.00 | kNm | | w_2+w_3 | 0.0 | mm |
| | | | | | Limiet w_{max} | 10.7 | mm |
| | | | | | Limiet w_2+w_3 | 0.0 | mm |
| | | | | | UC (w_{max}) | 0.91 | |
| | | | | | UC (w_2+w_3) | 0.00 | |

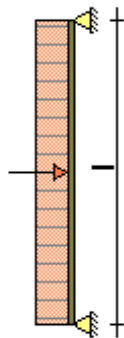
uitgevoerde controles

| | | | | |
|---------------|--|--|------|----|
| Doorsnede | NEN-EN1995-1-1 (6.13) (V_z) | 0.398 / 2.769 | 0.14 | OK |
| Doorsnede | NEN-EN1995-1-1 (6.11) | 10.729 / 18.444 + 0.700 • 0.000 / 21.600 | 0.58 | OK |
| Doorbuigingen | NEN-EN1995 #7.2 NEN-EN1990 #A1.4.3 (4) | -9.7 / 10.7 | 0.91 | OK |

Ligger gecontroleerd op sterkte en doorbuiging

Ligger OK

5.1.5 Vert. elem. versterkt (NEN-EN1995:2011/NB:2013)



Profielgegevens: CLS 38 x 89

| | | | | | | | |
|------------------------|--------------|----------|-------------------|---------------------------|-------------|----------|-------------------|
| Breedte | b | 38 | mm | Oppervlak | A | 3382 | mm ² |
| Hoogte | h | 89 | mm | | | | |
| | | | | Traagheidsmoment | I_{tor} | 1191e+03 | mm ⁴ |
| Weerstandsmoment | W_y | 5017e+01 | mm ³ | Traagheidsmoment | I_y | 2232e+03 | mm ⁴ |
| Weerstandsmoment | W_z | 2142e+01 | mm ³ | Traagheidsmoment | I_z | 4070e+02 | mm ⁴ |
| Sterkte klasse | | C24 | | | | | |
| | $f_{m,0,k}$ | 24.0 | N/mm ² | | $f_{c,0,k}$ | 21.0 | N/mm ² |
| | $f_{t,0,k}$ | 14.5 | N/mm ² | | $f_{v,0,k}$ | 4.0 | N/mm ² |
| Elasticiteitsmodulus | $E_{0,mean}$ | 11000.0 | N/mm ² | | G_{mean} | 690.0 | N/mm ² |
| Gebruiksklasse | I | | | I (Permanent) | k_{mod} | 0.60 | |
| Betrouwbaarheidsklasse | 1 | | | II (Lange termijn) | k_{mod} | 0.70 | |
| Ontwerplevensduur | 50 | Jaar | | III (Middellange termijn) | k_{mod} | 0.80 | |
| | | | | IV (Korte termijn) | k_{mod} | 0.90 | |
| | | | | V (Onmiddellijk) | k_{mod} | 1.10 | |
| Staaflengte | L_{sys} | 2.400 | m | Beschot kwaliteit | | C18 | |

| | | | | | | |
|--------------------------|------------|-------|----|---------------|-------|----|
| hoh afstand | L_t | 0.250 | m | Beschot dikte | 12 | mm |
| Zeeg | | 0 | mm | | | |
| Doorbuigingen beschouwen | | Ja | | | | |
| Reductiefactor spreiding | | 0.54 | | | | |
| | γ_M | 1.300 | | k_{mod} | 0.900 | |
| | $k_{h,y}$ | 1.110 | | $k_{h,z}$ | 1.300 | |
| | k_h | 1.110 | | k_{cr} | 1.000 | |
| | k_m | 0.700 | | | | |

Lastengenerator opties

Gebouwtype: Eengezinswoningen met 1, 2 of 3 bouwlagen

Referentieperiode: 50

Betrouwbaarheidsklasse: 1

Combinatieregels:

Geen

NEN-EN 1990 NB.4-A1.2(B) (6.10a+6.10b)

NEN-EN 1990 NB.7-A1.3 (Brand) (6.11 a/b)

Gewichts berekening

Winddruk + onderdruk

| | | | |
|-------|---|-------|-------------------|
| Qp1 | Pieksnelheids druk (Qp voor referentieperiode 50) | 0.79 | kN/m ² |
| | NEN-EN1991-1-4#4(Z=8.10, Terrein=Onbebouwd, Regio=2, C0=1.00) | | |
| CsCd1 | Constructie factor (CsCd) | 1.00 | |
| | 1.00 | | |
| Cpe1 | Druk coefficient (Cpe) | 0.80 | |
| | NEN-EN1991-1-4#7.2(Dak=Wand, Zone=D, h/d=90.00) | | |
| Cpi1 | Druk coefficient (Cpi) | -0.30 | |
| | EN1991-1-4#7.2.9(Cpe=-0.50, Openingen=0.00, Over=False) | | |

Windzuiging + overdruk

| | | | |
|------|---|-------|--|
| Cpe1 | Druk coefficient (Cpe) | -1.20 | |
| | NEN-EN1991-1-4#7.2(Dak=Wand, Zone=A, h/d=90.00) | | |
| Cpi1 | Druk coefficient (Cpi) | 0.20 | |
| | EN1991-1-4#7.2.9(Cpe=0.80, Openingen=0.00, Over=True) | | |

Belastingen

| | | | | |
|-----------|-----------------------------------|-------|-------------------|------------------------|
| Wind | Winddruk ($c_s c_d = 1.000$) | 0.87 | kN/m ² | ($c_{prob} = 1.000$) |
| | Windzuiging ($c_s c_d = 1.000$) | -1.11 | kN/m ² | |
| Bijzonder | $F_{bijzonder}$ | 0.00 | kN | |
| | $p_{bijzonder}$ | 0.00 | kN/m ² | |

Belastingscombinaties voor uiterste grenstoestand (6.10a + 6.10b)

| | | | | |
|--------|------------------------------|----------------------|-------|-------------------|
| Fu.C.1 | $p = \gamma Q \cdot Q_{rep}$ | $1.35 \cdot 0.87$ | 1.17 | kN/m ² |
| Fu.C.2 | $p = \gamma Q \cdot Q_{rep}$ | $1.35 \cdot (-1.11)$ | -1.50 | kN/m ² |
| Bi.C.1 | $p = \gamma Q \cdot Q_{rep}$ | $0.20 \cdot 0.87$ | 0.17 | kN/m ² |
| Bi.C.2 | $p = \gamma Q \cdot Q_{rep}$ | $0.20 \cdot (-1.11)$ | -0.22 | kN/m ² |

Maatgevende snedekrachten

| | | | | | |
|--------|-------------------------|------------|------------|------------|------------|
| Comb. | $N_{c,Ed}$ $N_{t,Ed}$ | $V_{y,Ed}$ | $V_{z,Ed}$ | $M_{y,Ed}$ | $M_{z,Ed}$ |
| Fu.C.1 | 0.00 | 0.00 | 0.35 | 0.21 | 0.00 |

| | | | | | |
|--------|------|------|------|-------|------|
| Fu.C.2 | 0.00 | 0.00 | 0.45 | -0.27 | 0.00 |
| Bi.C.1 | 0.00 | 0.00 | 0.05 | 0.03 | 0.00 |
| Bi.C.2 | 0.00 | 0.00 | 0.07 | -0.04 | 0.00 |
| | kN | kN | kN | kNm | kNm |

Max UC snedekracht

| Comb. | $N_{c,Ed}$ $N_{t,Ed}$ | $V_{y,Ed}$ | $V_{z,Ed}$ | $M_{y,Ed}$ | $M_{z,Ed}$ |
|--------|-------------------------|------------|------------|------------|------------|
| Fu.C.1 | 0.00 | 0.00 | 0.00 | 0.21 | 0.00 |
| Fu.C.2 | 0.00 | 0.00 | 0.00 | -0.27 | 0.00 |
| Bi.C.1 | 0.00 | 0.00 | 0.00 | 0.03 | 0.00 |
| Bi.C.2 | 0.00 | 0.00 | 0.00 | -0.04 | 0.00 |
| | kN | kN | kN | kNm | kNm |

Rekenspanning

| Comb. | $\sigma_{c,0,d}$ $\sigma_{t,0,d}$ | $\sigma_{m,y,d}$ | $\sigma_{m,z,d}$ | $\tau_{v,y,d}$ | $\tau_{v,z,d}$ |
|--------|-------------------------------------|-------------------|-------------------|-------------------|-------------------|
| Fu.C.1 | 0.00 | 4.21 | 0.00 | 0.00 | 0.00 |
| Fu.C.2 | 0.00 | 5.36 | 0.00 | 0.00 | 0.00 |
| Bi.C.1 | 0.00 | 0.62 | 0.00 | 0.00 | 0.00 |
| Bi.C.2 | 0.00 | 0.79 | 0.00 | 0.00 | 0.00 |
| | N/mm ² | N/mm ² | N/mm ² | N/mm ² | N/mm ² |

Rekensterkte

| Comb. | $f_{v,0,d}$ | $f_{m,y,d}$ | $f_{m,z,d}$ | $f_{c,0,d}$ | $f_{t,0,d}$ | Belasting duurklasse |
|--------|-------------------|-------------------|-------------------|-------------------|-------------------|----------------------|
| Fu.C.1 | 2.77 | 18.44 | 21.60 | 14.54 | 11.14 | IV (Korte termijn) |
| Fu.C.2 | 2.77 | 18.44 | 21.60 | 14.54 | 11.14 | IV (Korte termijn) |
| Bi.C.1 | 2.77 | 18.44 | 21.60 | 14.54 | 11.14 | IV (Korte termijn) |
| Bi.C.2 | 2.77 | 18.44 | 21.60 | 14.54 | 11.14 | IV (Korte termijn) |
| | N/mm ² | N/mm ² | N/mm ² | N/mm ² | N/mm ² | |

UC doorsnede per belastingscombinatie

| | | | | |
|--------|-----------------------|---|------|----|
| Fu.C.1 | NEN-EN1995-1-1 (6.11) | $4.215 / 18.444 + 0.700 \cdot 0.000 / 21.600$ | 0.23 | OK |
| Fu.C.2 | NEN-EN1995-1-1 (6.11) | $5.364 / 18.444 + 0.700 \cdot 0.000 / 21.600$ | 0.29 | OK |
| Bi.C.1 | NEN-EN1995-1-1 (6.11) | $0.624 / 18.444 + 0.700 \cdot 0.000 / 21.600$ | 0.03 | OK |
| Bi.C.2 | NEN-EN1995-1-1 (6.11) | $0.795 / 18.444 + 0.700 \cdot 0.000 / 21.600$ | 0.04 | OK |

Belastingscombinaties voor bruikbaarheidsgrenstoestand

| | | | | |
|--------|------------------------------|----------------------|-------|-------------------|
| Ka.C.1 | $p = \gamma Q \cdot Q_{rep}$ | $1.00 \cdot 0.87$ | 0.87 | kN/m ² |
| Ka.C.2 | $p = \gamma Q \cdot Q_{rep}$ | $1.00 \cdot (-1.11)$ | -1.11 | kN/m ² |

UC doorbuigingen per belastingscombinatie

| | | | | | | | |
|------------|--------------------|---------|-------------------|--------------------------|------------------|---------|-------------------|
| L/300 | Limiet w_{max} | 8.0 | mm | L/0 | Limiet w_2+w_3 | 0.0 | mm |
| E_{mean} | $E_{0,ser,d,inst}$ | 11000.0 | N/mm ² | E_{mean} / k_{def} | $E_{0,ser,d,cr}$ | 18333.3 | N/mm ² |
| | | | | $E-Mod / E_{0,ser,d,cr}$ | | 0.60 | |
| | w_1 | 0.0 | mm | | w_c | 0.0 | mm |
| | w_2 | 0.0 | mm | | | | |

| Comb. | w_3 | w_{tot} | w_{max} | w_2+w_3 | UC (w_{max}) | UC (w_2+w_3) |
|--------|-------|-----------|-----------|-----------|------------------|------------------|
| Ka.C.1 | 3.8 | 3.8 | 3.8 | 0.0 | 0.48 | 0.00 |
| Ka.C.2 | -4.9 | -4.9 | -4.9 | 0.0 | 0.61 | 0.00 |
| | mm | mm | mm | mm | | |

Maatgevende krachten (Fu.C.2)

Maatgevende doorbuigingen (Ka.C.2)

| | | | | | | | |
|---------------|------------|------|----|--------|-------|------|----|
| Normaalkracht | $N_{t,Ed}$ | 0.00 | kN | | w_1 | 0.0 | mm |
| Dwarskracht | $V_{y,Ed}$ | 0.00 | kN | | w_2 | 0.0 | mm |
| Dwarskracht | $V_{z,Ed}$ | 0.00 | kN | Ka.C.2 | w_3 | -4.9 | mm |

| | | | | | | |
|--------|------------|-------|-----|------------------|------|----|
| Torsie | $M_{x,Ed}$ | 0.00 | kNm | w_{tot} | -4.9 | mm |
| Moment | $M_{y,Ed}$ | -0.27 | kNm | w_{max} | -4.9 | mm |
| Moment | $M_{z,Ed}$ | 0.00 | kNm | w_2+w_3 | 0.0 | mm |
| | | | | Limiet w_{max} | 8.0 | mm |
| | | | | Limiet w_2+w_3 | 0.0 | mm |
| | | | | UC (w_{max}) | 0.61 | |
| | | | | UC (w_2+w_3) | 0.00 | |

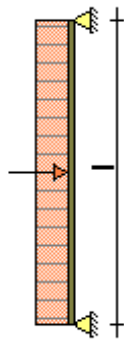
uitgevoerde controles

| | | | | |
|---------------|--|---|------|----|
| Doorsnede | NEN-EN1995-1-1 (6.13) (V_z) | 0.199 / 2.769 | 0.07 | OK |
| Doorsnede | NEN-EN1995-1-1 (6.11) | 5.364 / 18.444 + 0.700 · 0.000 / 21.600 | 0.29 | OK |
| Doorbuigingen | NEN-EN1995 #7.2 NEN-EN1990 #A1.4.3 (4) | -4.9 / 8.0 | 0.61 | OK |

Ligger gecontroleerd op sterkte en doorbuiging

Ligger OK

5.1.6 Vert. elem. vernieuwd (NEN-EN1995:2011/NB:2013)



Profielgegevens: CLS 38 x 140

| | | | | | | | |
|--------------------------|--------------|----------|-------------------|---------------------------|-------------|----------|-------------------|
| Breedte | b | 38 | mm | Oppervlak | A | 5320 | mm ² |
| Hoogte | h | 140 | mm | | | | |
| | | | | Traagheidsmoment | I_{tor} | 2123e+03 | mm ⁴ |
| Weerstandsmoment | W_y | 1241e+02 | mm ³ | Traagheidsmoment | I_y | 8689e+03 | mm ⁴ |
| Weerstandsmoment | W_z | 3369e+01 | mm ³ | Traagheidsmoment | I_z | 6402e+02 | mm ⁴ |
| Sterkte klasse | | C24 | | | | | |
| | $f_{m,0,k}$ | 24.0 | N/mm ² | | $f_{c,0,k}$ | 21.0 | N/mm ² |
| | $f_{t,0,k}$ | 14.5 | N/mm ² | | $f_{v,0,k}$ | 4.0 | N/mm ² |
| Elasticiteitsmodulus | $E_{0,mean}$ | 11000.0 | N/mm ² | | G_{mean} | 690.0 | N/mm ² |
| Gebruiksklasse | I | | | I (Permanent) | k_{mod} | 0.60 | |
| Betrouwbaarheidsklasse | 1 | | | II (Lange termijn) | k_{mod} | 0.70 | |
| Ontwerplevensduur | 50 | Jaar | | III (Middellange termijn) | k_{mod} | 0.80 | |
| | | | | IV (Korte termijn) | k_{mod} | 0.90 | |
| | | | | V (Onmiddellijk) | k_{mod} | 1.10 | |
| Staaflengte | L_{sys} | 2.400 | m | Beschot kwaliteit | | C18 | |
| hoh afstand | L_t | 0.500 | m | Beschot dikte | | 12 | mm |
| Zeeg | | 0 | mm | | | | |
| Doorbuigingen beschouwen | | Ja | | | | | |
| Reductiefactor spreiding | | 0.74 | | | | | |
| | γ_M | 1.300 | | | k_{mod} | 0.900 | |

| | |
|-----------|-------|
| $k_{h,y}$ | 1.014 |
| k_h | 1.014 |
| k_m | 0.700 |

| | |
|-----------|-------|
| $k_{h,z}$ | 1.300 |
| k_{cr} | 1.000 |

Lastengenerator opties

Gebouwtype: Eengezinswoningen met 1, 2 of 3 bouwlagen

Referentieperiode: 50

Betrouwbaarheidsklasse: 1

Combinatieregels:

Geen

NEN-EN 1990 NB.4-A1.2(B) (6.10a+6.10b)

NEN-EN 1990 NB.7-A1.3 (Brand) (6.11 a/b)

Gewichts berekening

Winddruk + onderdruk

| | | | |
|-------|---|-------|-------------------|
| Qp1 | Pieksnelheids druk (Qp voor referentieperiode 50) | 0.79 | kN/m ² |
| | NEN-EN1991-1-4#4(Z=8.10, Terrein=Onbebouwd, Regio=2, C0=1.00) | | |
| CsCd1 | Constructie factor (CsCd) | 1.00 | |
| | 1.00 | | |
| Cpe1 | Druk coefficient (Cpe) | 0.80 | |
| | NEN-EN1991-1-4#7.2(Dak=Wand, Zone=D, h/d=90.00) | | |
| Cpi1 | Druk coefficient (Cpi) | -0.30 | |
| | EN1991-1-4#7.2.9(Cpe=-0.50, Openingen=0.00, Over=False) | | |

Windzuiging + overdruk

| | | | |
|------|---|-------|--|
| Cpe1 | Druk coefficient (Cpe) | -1.20 | |
| | NEN-EN1991-1-4#7.2(Dak=Wand, Zone=A, h/d=90.00) | | |
| Cpi1 | Druk coefficient (Cpi) | 0.20 | |
| | EN1991-1-4#7.2.9(Cpe=0.80, Openingen=0.00, Over=True) | | |

Belastingen

| | | | | |
|-----------|-----------------------------------|-------|-------------------|------------------------|
| Wind | Winddruk ($c_s c_d = 1.000$) | 0.87 | kN/m ² | ($c_{prob} = 1.000$) |
| | Windzuiging ($c_s c_d = 1.000$) | -1.11 | kN/m ² | |
| Bijzonder | $F_{bijzonder}$ | 0.00 | kN | |
| | $p_{bijzonder}$ | 0.00 | kN/m ² | |

Belastingscombinaties voor uiterste grenstoestand (6.10a + 6.10b)

| | | | | |
|--------|------------------------------|----------------------|-------|-------------------|
| Fu.C.1 | $p = \gamma Q \cdot Q_{rep}$ | $1.35 \cdot 0.87$ | 1.17 | kN/m ² |
| Fu.C.2 | $p = \gamma Q \cdot Q_{rep}$ | $1.35 \cdot (-1.11)$ | -1.50 | kN/m ² |
| Bi.C.1 | $p = \gamma Q \cdot Q_{rep}$ | $0.20 \cdot 0.87$ | 0.17 | kN/m ² |
| Bi.C.2 | $p = \gamma Q \cdot Q_{rep}$ | $0.20 \cdot (-1.11)$ | -0.22 | kN/m ² |

Maatgevende snedekrachten

| Comb. | $N_{c,Ed} \mid N_{t,Ed}$ | $V_{y,Ed}$ | $V_{z,Ed}$ | $M_{y,Ed}$ | $M_{z,Ed}$ |
|--------|--------------------------|------------|------------|------------|------------|
| Fu.C.1 | 0.00 | 0.00 | 0.70 | 0.42 | 0.00 |
| Fu.C.2 | 0.00 | 0.00 | 0.90 | -0.54 | 0.00 |
| Bi.C.1 | 0.00 | 0.00 | 0.10 | 0.06 | 0.00 |
| Bi.C.2 | 0.00 | 0.00 | 0.13 | -0.08 | 0.00 |
| | kN | kN | kN | kNm | kNm |

Max UC snedekracht

| Comb. | $N_{c,Ed}$ $N_{t,Ed}$ | $V_{y,Ed}$ | $V_{z,Ed}$ | $M_{y,Ed}$ | $M_{z,Ed}$ |
|--------|-------------------------|------------|------------|------------|------------|
| Fu.C.1 | 0.00 | 0.00 | 0.00 | 0.42 | 0.00 |
| Fu.C.2 | 0.00 | 0.00 | 0.00 | -0.54 | 0.00 |
| Bi.C.1 | 0.00 | 0.00 | 0.00 | 0.06 | 0.00 |
| Bi.C.2 | 0.00 | 0.00 | 0.00 | -0.08 | 0.00 |
| | kN | kN | kN | kNm | kNm |

Rekenspanning

| Comb. | $\sigma_{c,0,d}$ $\sigma_{t,0,d}$ | $\sigma_{m,y,d}$ | $\sigma_{m,z,d}$ | $\tau_{v,y,d}$ | $\tau_{v,z,d}$ |
|--------|-------------------------------------|-------------------|-------------------|-------------------|-------------------|
| Fu.C.1 | 0.00 | 3.41 | 0.00 | 0.00 | 0.00 |
| Fu.C.2 | 0.00 | 4.34 | 0.00 | 0.00 | 0.00 |
| Bi.C.1 | 0.00 | 0.50 | 0.00 | 0.00 | 0.00 |
| Bi.C.2 | 0.00 | 0.64 | 0.00 | 0.00 | 0.00 |
| | N/mm ² | N/mm ² | N/mm ² | N/mm ² | N/mm ² |

Rekensterkte

| Comb. | $f_{v,0,d}$ | $f_{m,y,d}$ | $f_{m,z,d}$ | $f_{c,0,d}$ | $f_{t,0,d}$ | Belasting duurklasse |
|--------|-------------------|-------------------|-------------------|-------------------|-------------------|----------------------|
| Fu.C.1 | 2.77 | 16.85 | 21.60 | 14.54 | 10.18 | IV (Korte termijn) |
| Fu.C.2 | 2.77 | 16.85 | 21.60 | 14.54 | 10.18 | IV (Korte termijn) |
| Bi.C.1 | 2.77 | 16.85 | 21.60 | 14.54 | 10.18 | IV (Korte termijn) |
| Bi.C.2 | 2.77 | 16.85 | 21.60 | 14.54 | 10.18 | IV (Korte termijn) |
| | N/mm ² | N/mm ² | N/mm ² | N/mm ² | N/mm ² | |

UC doorsnede per belastingscombinatie

| | | | | |
|--------|-----------------------|---|------|----|
| Fu.C.1 | NEN-EN1995-1-1 (6.11) | $3.407 / 16.846 + 0.700 \cdot 0.000 / 21.600$ | 0.20 | OK |
| Fu.C.2 | NEN-EN1995-1-1 (6.11) | $4.336 / 16.846 + 0.700 \cdot 0.000 / 21.600$ | 0.26 | OK |
| Bi.C.1 | NEN-EN1995-1-1 (6.11) | $0.505 / 16.846 + 0.700 \cdot 0.000 / 21.600$ | 0.03 | OK |
| Bi.C.2 | NEN-EN1995-1-1 (6.11) | $0.642 / 16.846 + 0.700 \cdot 0.000 / 21.600$ | 0.04 | OK |

Belastingscombinaties voor bruikbaarheidsgrenstoestand

| | | | | |
|--------|------------------------------|----------------------|-------|-------------------|
| Ka.C.1 | $p = \gamma_Q \cdot Q_{rep}$ | $1.00 \cdot 0.87$ | 0.87 | kN/m ² |
| Ka.C.2 | $p = \gamma_Q \cdot Q_{rep}$ | $1.00 \cdot (-1.11)$ | -1.11 | kN/m ² |

UC doorbuigingen per belastingscombinatie

| | | | | | | | |
|------------|--------------------|---------|-------------------|--------------------------|------------------|---------|-------------------|
| L/300 | Limiet w_{max} | 8.0 | mm | L/0 | Limiet w_2+w_3 | 0.0 | mm |
| E_{mean} | $E_{0,ser,d,inst}$ | 11000.0 | N/mm ² | E_{mean} / k_{def} | $E_{0,ser,d,cr}$ | 18333.3 | N/mm ² |
| | | | | $E-Mod / E_{0,ser,d,cr}$ | | 0.60 | |
| | w_1 | 0.0 | mm | | w_c | 0.0 | mm |
| | w_2 | 0.0 | mm | | | | |

| Comb. | w_3 | w_{tot} | w_{max} | w_2+w_3 | UC (w_{max}) | UC (w_2+w_3) |
|--------|-------|-----------|-----------|-----------|------------------|------------------|
| Ka.C.1 | 2.0 | 2.0 | 2.0 | 0.0 | 0.25 | 0.00 |
| Ka.C.2 | -2.5 | -2.5 | -2.5 | 0.0 | 0.31 | 0.00 |
| | mm | mm | mm | mm | | |

Maatgevende krachten (Fu.C.2)

| | | | |
|---------------|------------|-------|-----|
| Normaalkracht | $N_{t,Ed}$ | 0.00 | kN |
| Dwarskracht | $V_{y,Ed}$ | 0.00 | kN |
| Dwarskracht | $V_{z,Ed}$ | 0.00 | kN |
| Torsie | $M_{x,Ed}$ | 0.00 | kNm |
| Moment | $M_{y,Ed}$ | -0.54 | kNm |
| Moment | $M_{z,Ed}$ | 0.00 | kNm |

Maatgevende doorbuigingen (Ka.C.2)

| | | |
|------------------|------|----|
| w_1 | 0.0 | mm |
| w_2 | 0.0 | mm |
| w_3 | -2.5 | mm |
| w_{tot} | -2.5 | mm |
| w_{max} | -2.5 | mm |
| w_2+w_3 | 0.0 | mm |
| Limiet w_{max} | 8.0 | mm |
| Limiet w_2+w_3 | 0.0 | mm |

| | |
|--------------------|------|
| UC (w_{\max}) | 0.31 |
| UC ($w_2 + w_3$) | 0.00 |

uitgevoerde controles

| | | | | |
|---------------|--|---|------|----|
| Doorsnede | NEN-EN1995-1-1 (6.13) (V_z) | 0.253 / 2.769 | 0.09 | OK |
| Doorsnede | NEN-EN1995-1-1 (6.11) | 4.336 / 16.846 + 0.700 · 0.000 / 21.600 | 0.26 | OK |
| Doorbuigingen | NEN-EN1995 #7.2 NEN-EN1990 #A1.4.3 (4) | -2.5 / 8.0 | 0.31 | OK |

Ligger gecontroleerd op sterkte en doorbuiging

Ligger OK

5.1.7 Houtkolom Bestaand naast raam (NEN-EN1995:2011/NB:2013)

Profielgegevens: R76x89

| | | | | | | | |
|--|---------------------|----------|-------------------|------------------|-------------------|----------|-------------------|
| Breedte | b | 76 | mm | Oppervlak | A | 6764 | mm ² |
| Hoogte | h | 89 | mm | | | | |
| | | | | Traagheidsmoment | I_{tor} | 6327e+03 | mm ⁴ |
| Weerstandsmoment | W_y | 1003e+02 | mm ³ | Traagheidsmoment | I_y | 4465e+03 | mm ⁴ |
| Weerstandsmoment | W_z | 8568e+01 | mm ³ | Traagheidsmoment | I_z | 3256e+03 | mm ⁴ |
| Staaflengte | L_{sys} | 2.400 | m | Sterkte klasse | | C24 | |
| | $f_{m,0,k}$ | 24.0 | N/mm ² | | $f_{c,0,k}$ | 21.0 | N/mm ² |
| | $f_{t,0,k}$ | 14.5 | N/mm ² | | $f_{v,0,k}$ | 4.0 | N/mm ² |
| | $E_{0.05}$ | 7400.0 | N/mm ² | | $G_{0.05}$ | 0.0 | N/mm ² |
| | $E_{0,\text{mean}}$ | 11000.0 | N/mm ² | | G_{mean} | 690.0 | N/mm ² |
| Elasticiteitsmodulus | | 11000.0 | N/mm ² | Gebruiksklasse | | I | |
| Zijdelingse steun in druk- of neutrale zone: | Ja | | (6.3.3(5)) | | | | |

Krachten

| Krachten en momenten | In knooppunt A | In knooppunt B |
|----------------------|-----------------------------------|----------------|
| Dwarsbelasting | q_d 2.1 kN/m | 0.0 kN/m |
| Normaalkracht | $N_{c,Ed}$ -31.2 kN | -31.2 kN |
| Dwarskracht | $V_{z,Ed}$ 1.6 kN | -0.8 kN |
| Moment | $M_{y,Ed}$ 0.0 kNm | 0.0 kNm |
| Max veld moment | $M_{y,Ed,\text{max}}$ x = 1.014 m | 0.8 kNm |

Belasting duurklasse: III (Middellange termijn)

stabiliteitsgegevens

| | | | | | | |
|------------|------------------|-----------|-----------|-------|-----------|-------|
| γ_M | k_{mod} | $k_{h,y}$ | $k_{h,z}$ | k_h | β_c | k_m |
| 1.300 | 0.800 | 1.110 | 1.146 | 1.110 | 0.200 | 0.700 |

| | | | | | | | | | |
|----------------|-----------------|------------------|------------------|-----------------|-------------|--------------------------|-------------------|-------|-----------|
| Belastingstype | Excentriciteit | L_{sys} | I_{tor} | L_{ef} | λ_z | $\lambda_{\text{rel},z}$ | k_{crit} | k_z | $k_{c,z}$ |
| Moment | Belasting boven | 2.400 | 6327e+03 | 2.578 | 22.790 | 0.386 | 1.000 | 0.583 | 0.980 |
| | | m | mm ⁴ | m | | | | | |

| | | | | | | | | |
|------------|-----------|------------------|-----------------------|--|-----------|------------------------|-------|-------|
| Resultaten | Methode | L_{sys} | $L_{\text{eff,knik}}$ | $L_{\text{eff,knik}} / L_{\text{sys}}$ | λ | λ_{rel} | k | k_c |
| Y-as | Geschoord | 2.400 | 2.400 | 1.000 | 93.414 | 1.584 | 1.883 | 0.345 |
| Z-as | Gebruiker | 2.400 | 0.500 | 0.208 | 22.790 | 0.386 | 0.583 | 0.980 |
| | | m | m | | | | | |

Rekenwaarden van spanning en sterkte

| $\sigma_{c,0,d}$ | $\sigma_{m,y,d}$ | $\sigma_{m,z,d}$ | $f_{c,0,d}$ | $f_{m,y,d}$ | $f_{m,z,d}$ |
|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|
| 4.6 | 7.6 | 0.0 | 12.9 | 16.4 | 16.9 |
| N/mm ² | N/mm ² | N/mm ² | N/mm ² | N/mm ² | N/mm ² |

uitgevoerde controles

Doorsnede in knooppunt A

NEN-EN1995-1-1 (6.2) $4.617 / 12.923$ 0.36 OK

NEN-EN1995-1-1 (6.13) (V_z) $0.364 / 2.462$ 0.15 OK

Doorsnede in $M_{y,max}$

NEN-EN1995-1-1 (6.19) $(4.617 / 12.923)^2 + 7.563 / 16.394 + 0.700 \cdot 0.000 / 16.921$ 0.59 OK

Doorsnede in knooppunt B

NEN-EN1995-1-1 (6.2) $4.617 / 12.923$ 0.36 OK

NEN-EN1995-1-1 (6.13) (V_z) $0.182 / 2.462$ 0.07 OK

Stabiliteit

NEN-EN1995-1-1 (6.23) $4.617 / (0.345 \cdot 12.923) + 7.563 / 16.394 + 0.700 \cdot 0.000 / 16.921$ 1.50 Niet OK

NEN-EN1995-1-1 (6.24) $4.617 / (0.980 \cdot 12.923) + 0.700 \cdot 7.563 / 16.394 + 0.000 / 16.921$ 0.69 OK

NEN-EN1995-1-1 (6.35) $(7.563 / (1.000 \cdot 16.394))^2 + 4.617 / (0.980 \cdot 12.923)$ 0.58 OK

Profiel gecontroleerd op sterkte en stabiliteit

Profiel Niet OK

Houtkolom Bestaand naast raam Momentlijnen

gram van moment rond Y'- en Z

Systeemplengte = 2.400 m

