

# Statische berekening

Veldschuur

Opdrachtnr. 19.071

Projekt: Veldschuur  
Sint Lambertusdijk 2  
5953 TH Reuver

Opdrachtgever:

Constructeur: HK Statica, bouwconstructies  
Harold Kleukers PMSE

Architect:

16-07-2019

06-08-2019

Aanpassen Luifelgrote zie en vergelijk na pag. 154

## 1. Algemene project informatie.

### 1.1 Toegepaste normen

- NEN-EN 1990:2002 Eurocode 0 - Grondslagen
- NEN-EN 1991-1-1:2002 Eurocode 1 - Belastingen op constructies
- NEN-EN 1992 Eurocode 2 - Ontwerp en berekeningen van Betonconstructies
- NEN-EN 1993-1-1:2006 Eurocode 3 - Ontwerp en berekeningen van Staalconstructies
- NEN-EN 1995-1-1:2005 Eurocode 5 - Ontwerp en berekeningen van Houtconstructies
- NEN-EN 1996-1-1 Eurocode 6 - Ontwerp en berekeningen van Metselwerkconstructies
- NEN-EN 1997-1 Eurocode 7 - Ontwerp en berekeningen van Funderingsconstructies

#### **Eurocode CC1**

$$1,22 \times PB + 1,35 \cdot 0,2 (= \psi_0) \times VB$$

(0,2 bij daken en sneeuw/windlast)

$$1,08 \times PB + 1,35 \times VB$$

#### **NEN 8700 van toepassing, toegepast indien noodzakelijk en gerechtvaardigd**

$$1,15 \times PB + 1,1 \cdot 0,2 (= \psi_0) \times VB$$

(0,2 bij daken en sneeuw/windlast)

$$1,05 \times PB + 1,2 \times VB$$

Gerekend in CC1, excl. NEN 8700

Na aanpassing diverse zaken, voldoet

$$Q_{p(z) III,0} h = 7 \text{ m}; = 0,62 \text{ kN/m}^2$$

$$PB = 0,15 + 0,50 = 0,20 \text{ kN/m}^2$$

$$\text{Spantafstand max. } 5,50 \text{ m, gerekend met } 1,05 \times 5,50 = 5,75 \text{ m}$$

De opdrachtgever staat een forse verplaatsing van de Spanten toe, is immers altijd zo geweest en heeft zicht bewezen.

## 1.1 Constructieve opzet en geconstateerd.

Gordingen 71x221 hoh. 1,40 m

Wandregels 71x221-1,45 m lg 5,45 m

Wandregels 69x189-1,45 m lg 5,15 m

Bovenstaande Voldoen

**Aan te passen is 1x Plat 71 x 221 aan de achterzijde** daar aan de bovenzijde bij wind tegen de gevel, er geen Wandregels is en de gording hoog kant staat. Tevens is er geen Afschuifvoorziening aanwezig.

NIEUW: Voorzijde ~~8x71x221~~ en 1x plat 71x221 + Muurplaat 71x221  
4x71x221 (71x221-1,35 m)

Aanpassingen Staalconstructie:

Voet Voorzijde:

Voet HE 200A, minimaal 4M12 aanwezig

**Voet IPE 240 met "balkje" minimaal 4M12 met L 150x100x10 maken, aanpassen.**

Voet Achterzijde, minimaal 4M12 aanwezig, anders aanpassen.

NOK, Knie voorzijde; aanwezig 6M12, VOLLEDIG aflassen en Opdikplaat t=12 toepassen

NOK, achterzijde voldoet.

Spant 1; IPE 240 Voorregel en IPE 270 Dakregel en Achterbalk

Spant 2; HE 200A Voorregel en verder als Spant 1

De achterregel is op 1,50 m opgedeeld, dit is niet toegestaan, VOLLEDIG aflassen.

In de voorzijde is minimaal 1 VV nodig.

Kies 1x IPE 270 welk volledig is af te lassen.

1M16 schoor met drukkoker B 88,9x4

Dakverband 1M12 met Buis 88,9x4

VV Achterzijde 1M12 met Buis 88,9x4

Neem Nieuwe Poer 0,8x0,8x0,4

$F_g = (6,4 + 3,9) = 10,3$  kN weerstand opwaarts = 9,25 kN

$F_{opw. NEN 8700} = -9,6 \cdot 1,2 / 1,35 = 8,55$  kN Voldoet

### Materialen:

Hout C22/C18, droogteklasse I

Staal S235, Bouten Kwal. 8.8, ankers kwal. 4.6

Beton C20/25

Dekking OZ = 55 mm

Dekking BZ = 55 mm

Staal FeB500 (435)

Afwijkingen dient men te allen tijde te melden.

Op alle opdrachten gelden de voorwaarden van de DNR 2011.

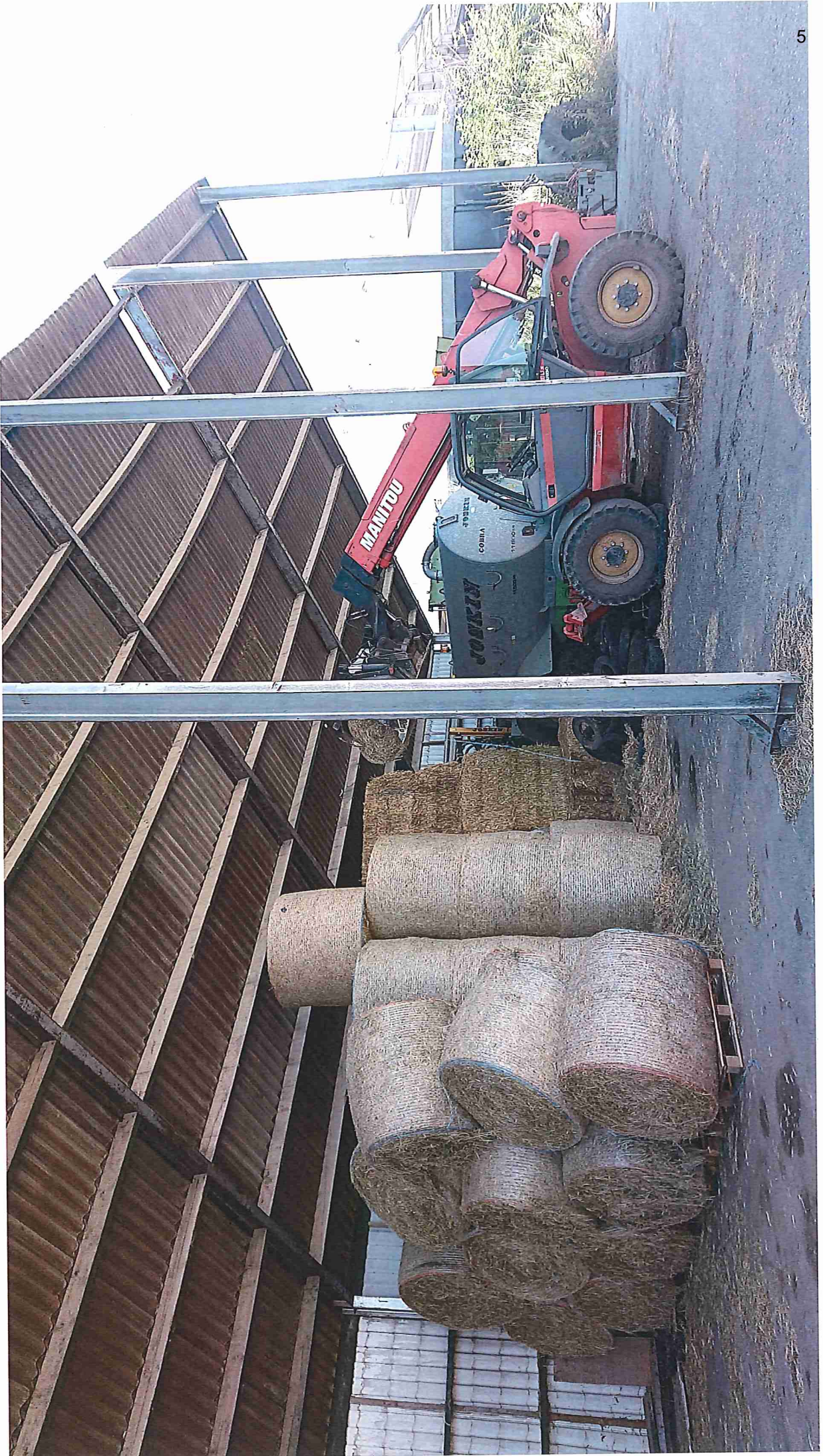
~~xxxx alle openingen moeten passen xxxxt kantplank~~

~~Boven Ramen BT-Buis L 150x100x10 x VS~~

~~xxxxxxx 2x L 200x100x10 xxx~~

~~Op: 150mm xxxxxxxxxxxxxxxxxxxxxxx~~





























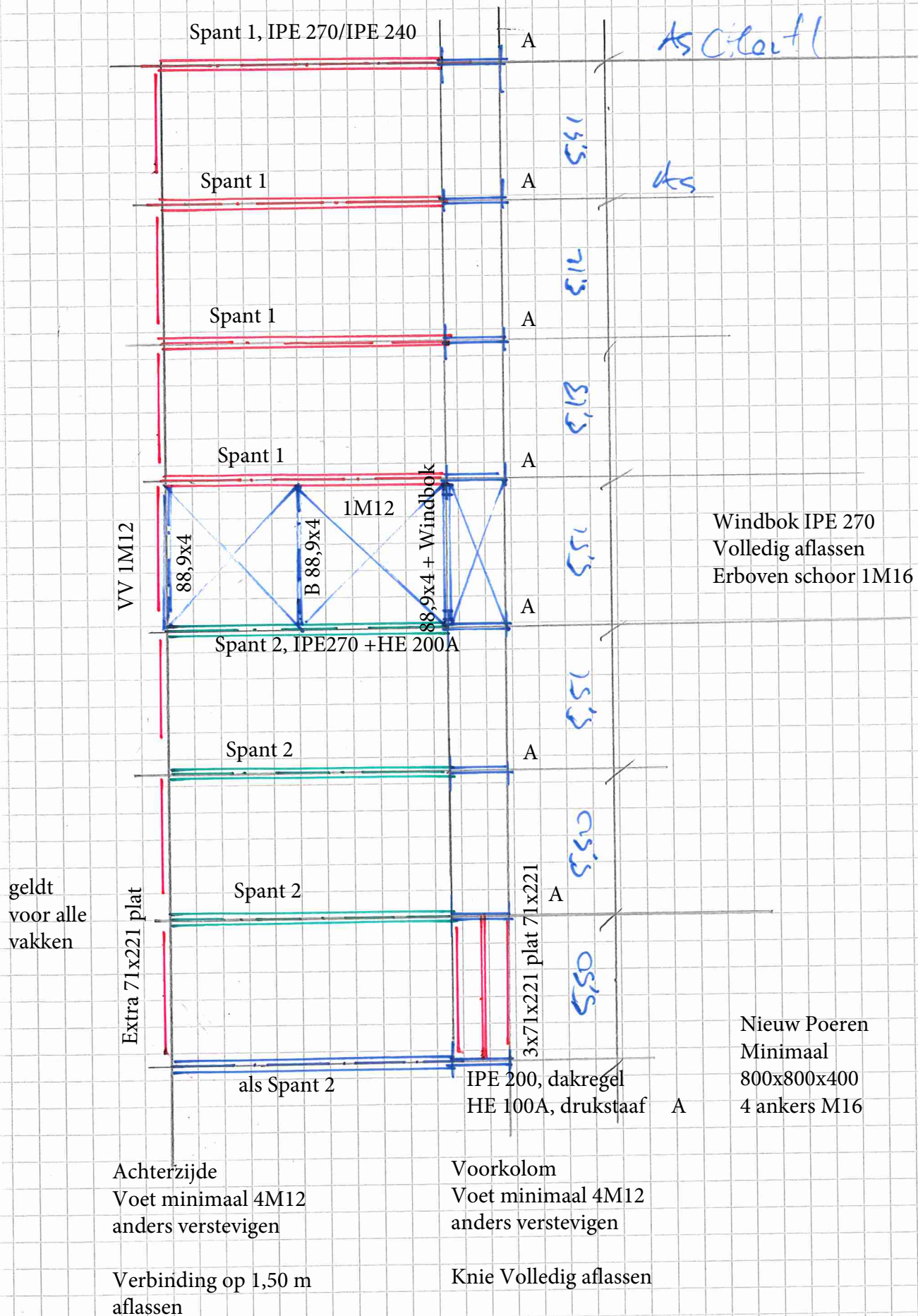




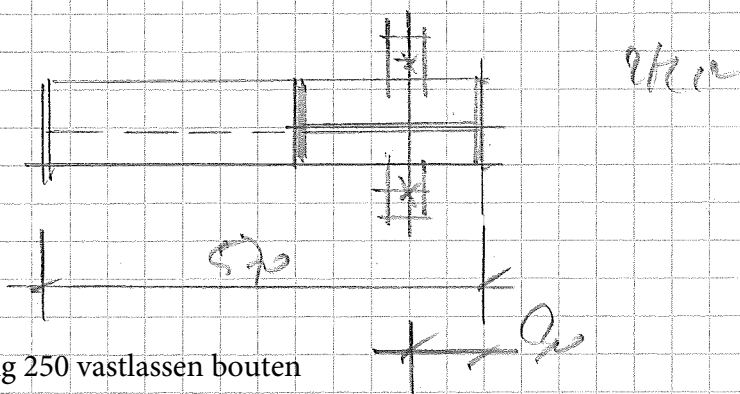
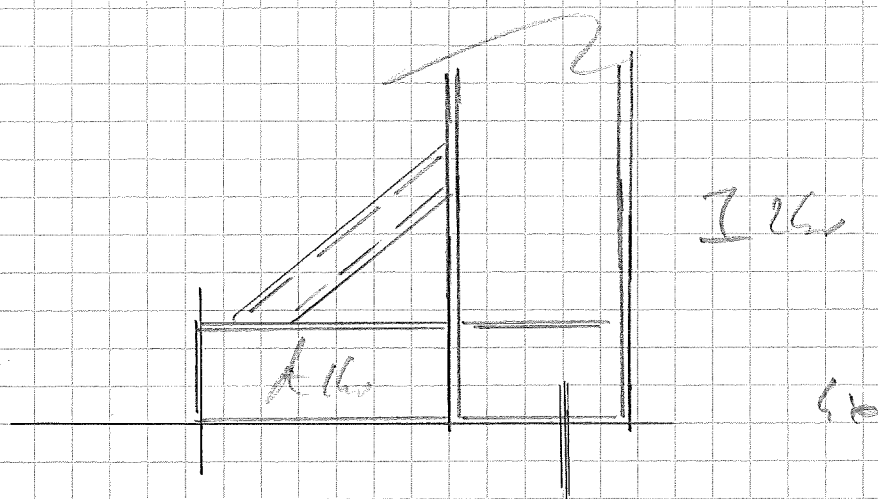




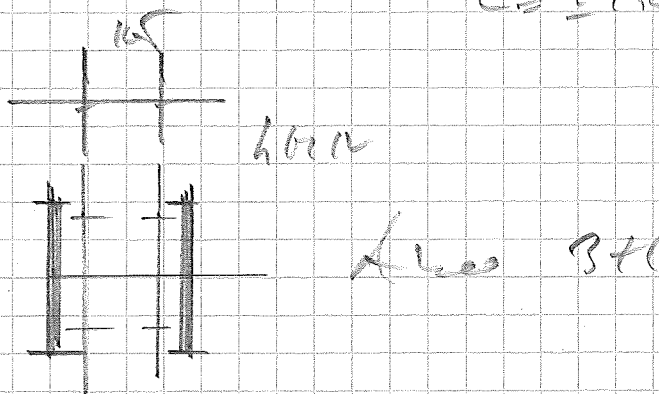
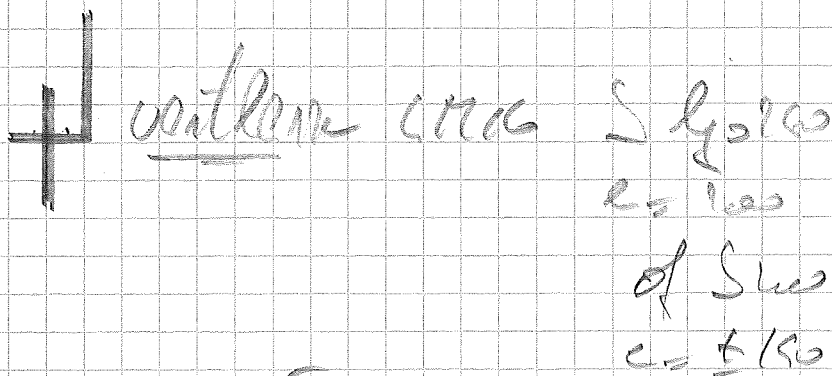






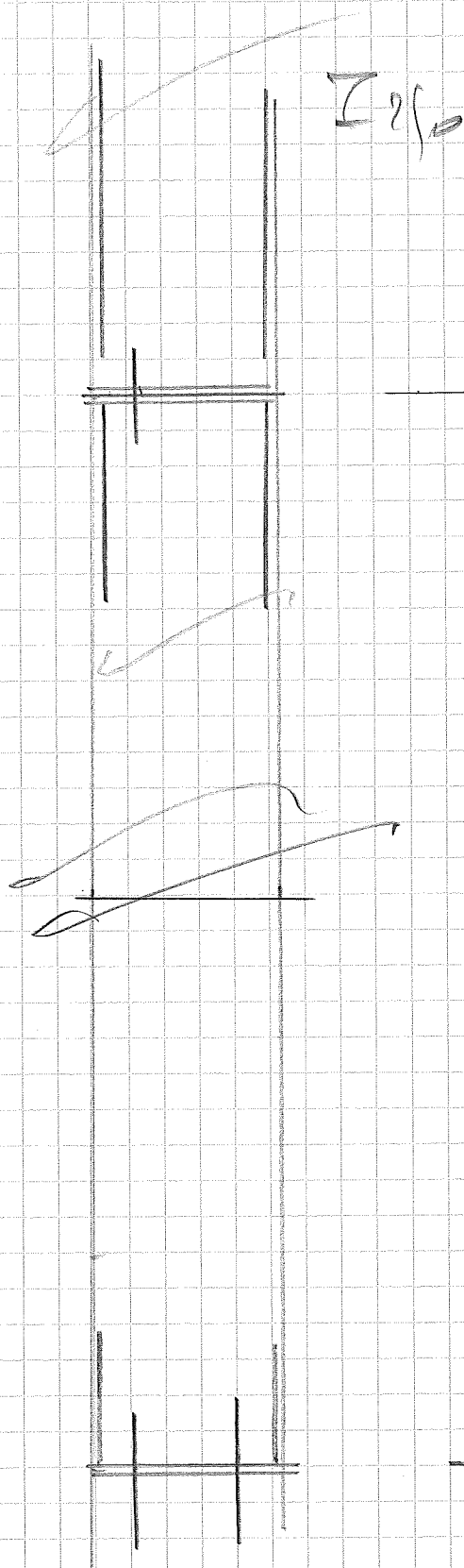


Verstevigen bij 2 ankers  
met 4M12 L 150x100x10 lg 250 vastlassen bouten  
hoh. 110 mm



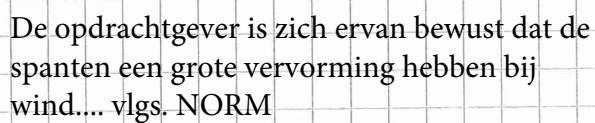


Achterzijde  
volledig  
aflassen



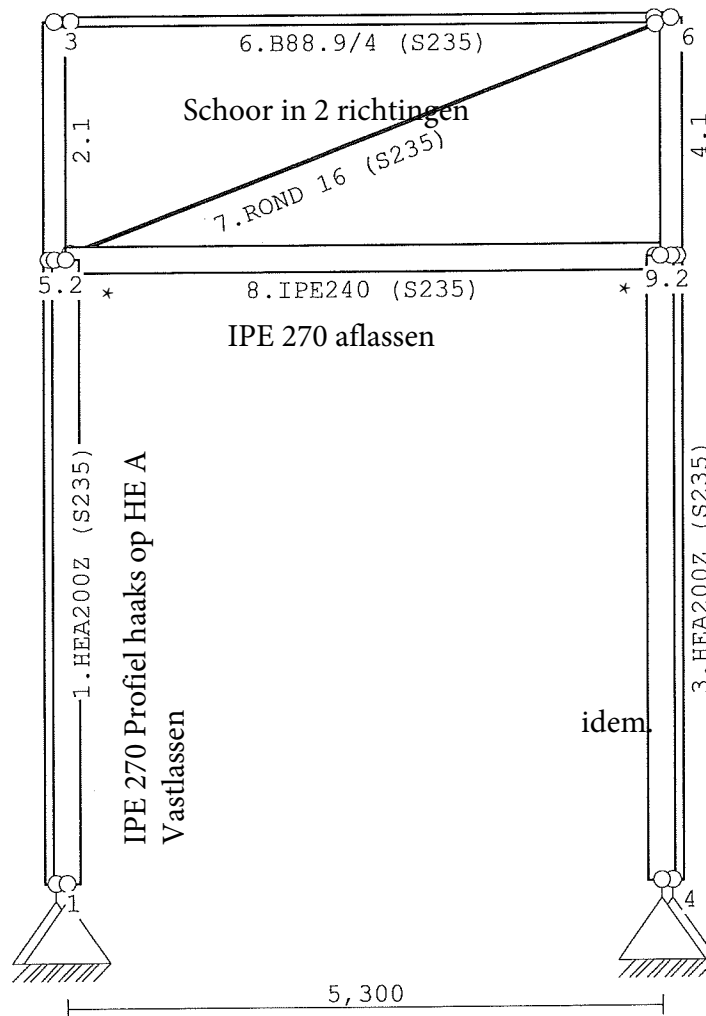
minimaal 4M12 aanwezig anders  
verstevigen







## GEOMETRIE





# Wahlregel

$$WR \quad B = 1,5$$

$$0,1 + 1,1 \cdot (0,66 - 1) = 0,66$$

$$Q_{\text{Wahl}} = 1,5 \cdot 0,66 \cdot (0,9 + 0,31) = 0,96$$

$$70 \cdot 1,1 = 77$$

$$60 \cdot 0,96 = 57,6$$

Stechte Ka



Onderdeel : 69x196-1,45 m lg 5,15 m Sterkte  
 Datum : 11/07/2019  
 Eenheden : kN/m/rad

### Toegepaste normen volgens Eurocode met Nederlandse NB

|             |                      |                  |             |
|-------------|----------------------|------------------|-------------|
| Belastingen | NEN-EN 1990:2002     | C2:2010          | NB:2011(nl) |
|             | NEN-EN 1991-1-1:2002 | C1:2009          | NB:2011(nl) |
| Hout        | NEN-EN 1995-1-1:2005 | A1:2011, C1:2006 | NB:2013(nl) |
|             | NEN-EN 14080:2013    |                  |             |

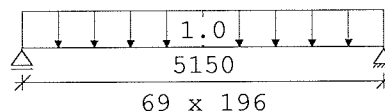
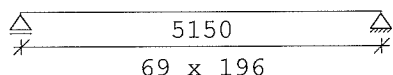
### Berekening willekeurige staaf. (H)

#### Algemene gegevens

|                  |        |           |                          |       |
|------------------|--------|-----------|--------------------------|-------|
| B x H            | [mm] : | 69 x 196  | Referentie periode [j] : | 50    |
| $l_{sys}$        | [mm] : | 5150      |                          |       |
| $l_{buc;y}$      | [mm] : | 5150      | Toelaatbare doorbuiging  |       |
| $l_{buc;z}$      | [mm] : | 1200      | Bijkomend [* l] :        | 0.003 |
| Plaats kipsteun  | :      | Bovenkant |                          |       |
| Steunpunt links  | :      | Rol       | Eind [* l] :             | 0.004 |
| Steunpunt rechts | :      | Scharnier |                          |       |
| Sterkteklasse    | :      | C18       | Klimaatklasse :          | I     |

#### Belastingen

|                |          | Permanent | Veranderlijk |
|----------------|----------|-----------|--------------|
| $q_z$          | [kN/m] : | 0.00      | -0.96        |
| $\Psi_0$       | [ - ] :  |           | 0.00         |
| $\Psi_2$       | [ - ] :  |           | 0.20         |
| $F_z$          | [kN] :   | 0.00      | 0.00         |
| Vanaf links    | [mm] :   | 1100      |              |
| $N_x$          | [kN] :   | 0.00      | 0.00         |
| $M_{y;links}$  | [kNm] :  | 0.00      | 0.00         |
| $M_{y;rechts}$ | [kNm] :  | 0.00      | 0.00         |



#### Belastingfactoren (NEN-EN 1990)

|                |                 |      |              |      |
|----------------|-----------------|------|--------------|------|
| Formule 6.10a: | $\gamma_G$ :    | 1.22 | $\gamma_Q$ : | 1.35 |
| Formule 6.10b: | $\xi\gamma_G$ : | 1.08 | $\gamma_Q$ : | 1.35 |

Partiële factor (Tabel 2.3 NEN-EN 1995-1-1)

$\gamma_M[-]$  : 1.30

#### Stabiliteit

1.Toetsing knikstabiliteit volgens par. 6.3.2. is n.v.t.:  
 - geen axiale druk aangebracht op de staaf.

2.Factoren t.b.v. toetsing kipstabiliteit volgens par. 6.3.3.:

Fundamentele combinatie (6.10b):

$\kappa_{crit,y}$  [-] : 1.00 frm(6.34)



Onderdeel : 69x196-1,45 m lg 5,15 m Sterkte  
 Datum : 11/07/2019  
 Eenheden : kN/m/rad

| Fundamentele combinatie (6.10a)  |     |                  |                      |      | u.c.                        | 0.00 |
|----------------------------------|-----|------------------|----------------------|------|-----------------------------|------|
| Normaalkracht [kN]               | 0.0 | $\sigma_{c,0,d}$ | [N/mm <sup>2</sup> ] | 0.00 |                             |      |
| Dwarskracht [kN]                 | 0.0 | $\tau_{v,d}$     | [N/mm <sup>2</sup> ] | 0.00 |                             |      |
| Moment [kNm]                     | 0.0 | $\sigma_{m,y,d}$ | [N/mm <sup>2</sup> ] | 0.00 |                             |      |
| $f_{m,y,d}$ [N/mm <sup>2</sup> ] | 8.3 | $f_{c,0,d}$      | [N/mm <sup>2</sup> ] | 8.31 | $b_{ef}$ 69[mm] frm(6.13a)  |      |
| $f_{t,0,d}$ [N/mm <sup>2</sup> ] | 5.1 | $f_{v,d}$        | [N/mm <sup>2</sup> ] | 1.57 | $k_{mod}$ 0.60 [-] tab(3.1) |      |

| Fundamentele combinatie (6.10b)  |      |                  |                      |       | frm(6.11)                   | u.c. | 0.88 |
|----------------------------------|------|------------------|----------------------|-------|-----------------------------|------|------|
| Normaalkracht [kN]               | 0.0  | $\sigma_{c,0,d}$ | [N/mm <sup>2</sup> ] | 0.00  |                             |      |      |
| Dwarskracht [kN]                 | -3.3 | $\tau_{v,d}$     | [N/mm <sup>2</sup> ] | 0.37  |                             |      |      |
| Moment [kNm]                     | -4.3 | $\sigma_{m,y,d}$ | [N/mm <sup>2</sup> ] | 9.73  |                             |      |      |
| $f_{m,y,d}$ [N/mm <sup>2</sup> ] | 11.1 | $f_{c,0,d}$      | [N/mm <sup>2</sup> ] | 11.08 | $b_{ef}$ 69[mm] frm(6.13a)  |      |      |
| $f_{t,0,d}$ [N/mm <sup>2</sup> ] | 6.8  | $f_{v,d}$        | [N/mm <sup>2</sup> ] | 2.09  | $k_{mod}$ 0.80 [-] tab(3.1) |      |      |

| Doorbuiging   |   |               |      | u.c.        |
|---------------|---|---------------|------|-------------|
| $u_{bij}$     | = | 25.27 < 15.45 | [mm] | <u>1.64</u> |
| $u_{net,fin}$ | = | 25.27 < 20.60 | [mm] | <u>1.23</u> |

Onderdeel : 69x196-1,45 m lg 5,15 m Red. 15 jaar 0,84  
 Datum : 11/07/2019  
 Eenheden : kN/m/rad

### Toegepaste normen volgens Eurocode met Nederlandse NB

|             |                      |                  |             |
|-------------|----------------------|------------------|-------------|
| Belastingen | NEN-EN 1990:2002     | C2:2010          | NB:2011(nl) |
|             | NEN-EN 1991-1-1:2002 | C1:2009          | NB:2011(nl) |
| Hout        | NEN-EN 1995-1-1:2005 | A1:2011, C1:2006 | NB:2013(nl) |
|             | NEN-EN 14080:2013    |                  |             |

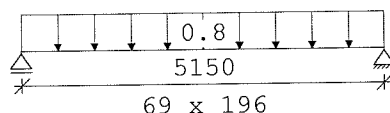
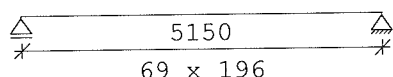
### Berekening willekeurige staaf. (H)

#### Algemene gegevens

|                  |        |           |                          |       |
|------------------|--------|-----------|--------------------------|-------|
| B x H            | [mm] : | 69 x 196  | Referentie periode [j] : | 50    |
| $l_{sys}$        | [mm] : | 5150      |                          |       |
| $l_{buc;y}$      | [mm] : | 5150      | Toelaatbare doorbuiging  |       |
| $l_{buc;z}$      | [mm] : | 1200      | Bijkomend [* l] :        | 0.003 |
| Plaats kipsteun  | :      | Bovenkant |                          |       |
| Steunpunt links  | :      | Rol       | Eind [* l] :             | 0.004 |
| Steunpunt rechts | :      | Scharnier |                          |       |
| Sterkteklasse    | :      | C18       | Klimaatklasse :          | I     |

#### Belastingen

|                |          | Permanent | Veranderlijk |
|----------------|----------|-----------|--------------|
| $q_z$          | [kN/m] : | 0.00      | -0.80        |
| $\Psi_0$       | [ - ] :  |           | 0.00         |
| $\Psi_2$       | [ - ] :  |           | 0.20         |
| $F_z$          | [kN] :   | 0.00      | 0.00         |
| Vanaf links    | [mm] :   | 1100      |              |
| $N_x$          | [kN] :   | 0.00      | 0.00         |
| $M_{y;links}$  | [kNm] :  | 0.00      | 0.00         |
| $M_{y;rechts}$ | [kNm] :  | 0.00      | 0.00         |



#### Belastingfactoren (NEN-EN 1990)

|                |                 |      |              |      |
|----------------|-----------------|------|--------------|------|
| Formule 6.10a: | $\gamma_G$ :    | 1.22 | $\gamma_Q$ : | 1.35 |
| Formule 6.10b: | $\xi\gamma_G$ : | 1.08 | $\gamma_Q$ : | 1.35 |

Partiële factor (Tabel 2.3 NEN-EN 1995-1-1)

$\gamma_M[-]$ : 1.30

#### Stabiliteit

1.Toetsing knikstabiliteit volgens par. 6.3.2. is n.v.t.:  
 - geen axiale druk aangebracht op de staaf.

2.Factoren t.b.v. toetsing kipstabiliteit volgens par. 6.3.3.:  
 Fundamentele combinatie (6.10b):

$K_{crit,y}$  [-] : 1.00 frm(6.34)



Onderdeel : 69x196-1,45 m lg 5,15 m Red. 15 jaar 0,84

Datum : 11/07/2019

Eenheden : kN/m/rad

**Fundamentele combinatie (6.10a)** **u.c.** 0.00Normaalkracht [kN] 0.0  $\sigma_{c,0,d}$  [N/mm<sup>2</sup>] 0.00Dwarskracht [kN] 0.0  $\tau_{v,d}$  [N/mm<sup>2</sup>] 0.00Moment [kNm] 0.0  $\sigma_{m,y,d}$  [N/mm<sup>2</sup>] 0.00 $f_{m,y,d}$  [N/mm<sup>2</sup>] 8.3  $f_{c,0,d}$  [N/mm<sup>2</sup>] 8.31  $b_{ef}$  69[mm] frm(6.13a) $f_{t,0,d}$  [N/mm<sup>2</sup>] 5.1  $f_{v,d}$  [N/mm<sup>2</sup>] 1.57  $k_{mod}$  0.60 [-] tab(3.1 )**Fundamentele combinatie (6.10b)** **frm(6.11)** **u.c.** 0.73Normaalkracht [kN] 0.0  $\sigma_{c,0,d}$  [N/mm<sup>2</sup>] 0.00Dwarskracht [kN] -2.8  $\tau_{v,d}$  [N/mm<sup>2</sup>] 0.31Moment [kNm] -3.6  $\sigma_{m,y,d}$  [N/mm<sup>2</sup>] 8.10 $f_{m,y,d}$  [N/mm<sup>2</sup>] 11.1  $f_{c,0,d}$  [N/mm<sup>2</sup>] 11.08  $b_{ef}$  69[mm] frm(6.13a) $f_{t,0,d}$  [N/mm<sup>2</sup>] 6.8  $f_{v,d}$  [N/mm<sup>2</sup>] 2.09  $k_{mod}$  0.80 [-] tab(3.1 )**Doorbuiging** **u.c.** $u_{bij}$  = 21.06 < 15.45 [mm] 1.36 $u_{net,fin}$  = 21.06 < 20.60 [mm] 1.02

Onderdeel : 71x221-1,45 m lg 5,50 m excl. red.  
 Datum : 11/07/2019  
 Eenheden : kN/m/rad

### Toegepaste normen volgens Eurocode met Nederlandse NB

|             |                      |                  |             |
|-------------|----------------------|------------------|-------------|
| Belastingen | NEN-EN 1990:2002     | C2:2010          | NB:2011(nl) |
|             | NEN-EN 1991-1-1:2002 | C1:2009          | NB:2011(nl) |
| Hout        | NEN-EN 1995-1-1:2005 | A1:2011, C1:2006 | NB:2013(nl) |
|             | NEN-EN 14080:2013    |                  |             |

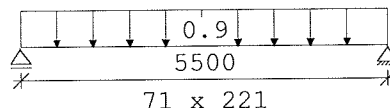
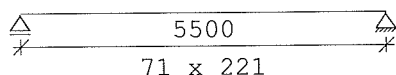
### Berekening willekeurige staaf. (H)

#### Algemene gegevens

|                  |        |           |                          |       |
|------------------|--------|-----------|--------------------------|-------|
| B x H            | [mm] : | 71 x 221  | Referentie periode [j] : | 50    |
| $l_{sys}$        | [mm] : | 5500      |                          |       |
| $l_{buc;y}$      | [mm] : | 5500      | Toelaatbare doorbuiging  |       |
| $l_{buc;z}$      | [mm] : | 1200      | Bijkomend [* l] :        | 0.003 |
| Plaats kipsteun  | :      | Bovenkant |                          |       |
| Steunpunt links  | :      | Rol       | Eind [* l] :             | 0.004 |
| Steunpunt rechts | :      | Scharnier |                          |       |
| Sterkteklasse    | :      | C18       | Klimaatklasse :          | I     |

#### Belastingen

|                |          | Permanent | Veranderlijk |
|----------------|----------|-----------|--------------|
| $q_z$          | [kN/m] : | 0.00      | -0.94        |
| $\Psi_0$       | [ - ] :  |           | 0.00         |
| $\Psi_2$       | [ - ] :  |           | 0.20         |
| $F_z$          | [kN] :   | 0.00      | 0.00         |
| Vanaf links    | [mm] :   | 1100      |              |
| $N_x$          | [kN] :   | 0.00      | 0.00         |
| $M_{y,links}$  | [kNm] :  | 0.00      | 0.00         |
| $M_{y,rechts}$ | [kNm] :  | 0.00      | 0.00         |



#### Belastingfactoren (NEN-EN 1990)

|                |                  |      |              |      |
|----------------|------------------|------|--------------|------|
| Formule 6.10a: | $\gamma_G$ :     | 1.22 | $\gamma_Q$ : | 1.35 |
| Formule 6.10b: | $\xi \gamma_G$ : | 1.08 | $\gamma_Q$ : | 1.35 |

Partiële factor (Tabel 2.3 NEN-EN 1995-1-1)

$\gamma_M[-]$ : 1.30

#### Stabiliteit

1.Toetsing knikstabiliteit volgens par. 6.3.2. is n.v.t.:  
 - geen axiale druk aangebracht op de staaf.

2.Factoren t.b.v. toetsing kipstabiliteit volgens par. 6.3.3.:  
 Fundamentele combinatie (6.10b):

$\kappa_{crit,y}$  [-] : 1.00 frm(6.34)



Onderdeel : 71x221-1,45 m lg 5,50 m excl. red.

Datum : 11/07/2019

Eenheden : kN/m/rad

**Fundamentele combinatie (6.10a)** **u.c.** **0.00**

|                    |     |                  |                      |      |
|--------------------|-----|------------------|----------------------|------|
| Normaalkracht [kN] | 0.0 | $\sigma_{c,0,d}$ | [N/mm <sup>2</sup> ] | 0.00 |
| Dwarskracht [kN]   | 0.0 | $\tau_{v,d}$     | [N/mm <sup>2</sup> ] | 0.00 |
| Moment [kNm]       | 0.0 | $\sigma_{m,y,d}$ | [N/mm <sup>2</sup> ] | 0.00 |

|             |                      |     |             |                      |      |           |          |            |
|-------------|----------------------|-----|-------------|----------------------|------|-----------|----------|------------|
| $f_{m,y,d}$ | [N/mm <sup>2</sup> ] | 8.3 | $f_{c,0,d}$ | [N/mm <sup>2</sup> ] | 8.31 | $b_{ef}$  | 71 [mm]  | frm(6.13a) |
| $f_{t,0,d}$ | [N/mm <sup>2</sup> ] | 5.1 | $f_{v,d}$   | [N/mm <sup>2</sup> ] | 1.57 | $k_{mod}$ | 0.60 [-] | tab(3.1 )  |

**Fundamentele combinatie (6.10b)** **frm(6.11)** **u.c.** **0.75**

|                    |      |                  |                      |      |
|--------------------|------|------------------|----------------------|------|
| Normaalkracht [kN] | 0.0  | $\sigma_{c,0,d}$ | [N/mm <sup>2</sup> ] | 0.00 |
| Dwarskracht [kN]   | -3.5 | $\tau_{v,d}$     | [N/mm <sup>2</sup> ] | 0.33 |
| Moment [kNm]       | -4.8 | $\sigma_{m,y,d}$ | [N/mm <sup>2</sup> ] | 8.30 |

|             |                      |      |             |                      |       |           |          |            |
|-------------|----------------------|------|-------------|----------------------|-------|-----------|----------|------------|
| $f_{m,y,d}$ | [N/mm <sup>2</sup> ] | 11.1 | $f_{c,0,d}$ | [N/mm <sup>2</sup> ] | 11.08 | $b_{ef}$  | 71 [mm]  | frm(6.13a) |
| $f_{t,0,d}$ | [N/mm <sup>2</sup> ] | 6.8  | $f_{v,d}$   | [N/mm <sup>2</sup> ] | 2.09  | $k_{mod}$ | 0.80 [-] | tab(3.1 )  |

**Doorbuiging** **u.c.**

|               |   |       |   |            |             |
|---------------|---|-------|---|------------|-------------|
| $u_{bij}$     | = | 21.82 | < | 16.50 [mm] | <u>1.32</u> |
| $u_{net,fin}$ | = | 21.82 | < | 22.00 [mm] | 0.99        |

Onderdeel : 71x221-1,45 m lg 5,50 m red. 15 jaar  
 Datum : 11/07/2019  
 Eenheden : kN/m/rad

### Toegepaste normen volgens Eurocode met Nederlandse NB

|             |                      |                 |             |
|-------------|----------------------|-----------------|-------------|
| Belastingen | NEN-EN 1990:2002     | C2:2010         | NB:2011(nl) |
|             | NEN-EN 1991-1-1:2002 | C1:2009         | NB:2011(nl) |
| Hout        | NEN-EN 1995-1-1:2005 | A1:2011,C1:2006 | NB:2013(nl) |
|             | NEN-EN 14080:2013    |                 |             |

### Berekening willekeurige staaf. (H)

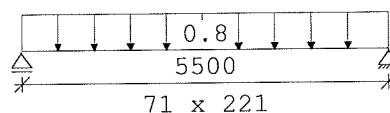
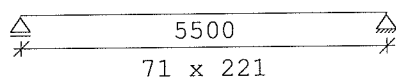
#### Algemene gegevens

|                  |        |           |                         |       |
|------------------|--------|-----------|-------------------------|-------|
| B x H            | [mm] : | 71 x 221  | Referentie periode [j]: | 50    |
| $l_{sys}$        | [mm] : | 5500      |                         |       |
| $l_{buc;y}$      | [mm] : | 5500      | Toelaatbare doorbuiging |       |
| $l_{buc;z}$      | [mm] : | 1200      | Bijkomend [* 1] :       | 0.003 |
| Plaats kipsteun  | :      | Bovenkant |                         |       |
| Steunpunt links  | :      | Rol       | Eind [* 1] :            | 0.004 |
| Steunpunt rechts | :      | Scharnier |                         |       |
| Sterkteklasse    | :      | C18       | Klimaatklasse :         | I     |

#### Belastingen

|  | Permanent | Veranderlijk |
|--|-----------|--------------|
|--|-----------|--------------|

|                |          |      |       |
|----------------|----------|------|-------|
| $q_z$          | [kN/m] : | 0.00 | -0.80 |
| $\Psi_0$       | [ - ] :  |      | 0.00  |
| $\Psi_2$       | [ - ] :  |      | 0.20  |
| $F_z$          | [kN] :   | 0.00 | 0.00  |
| Vanaf links    | [mm] :   | 1100 |       |
| $N_x$          | [kN] :   | 0.00 | 0.00  |
| $M_{y;links}$  | [kNm] :  | 0.00 | 0.00  |
| $M_{y;rechts}$ | [kNm] :  | 0.00 | 0.00  |



#### Belastingfactoren (NEN-EN 1990)

|                |                  |      |              |      |
|----------------|------------------|------|--------------|------|
| Formule 6.10a: | $\gamma_G$ :     | 1.22 | $\gamma_Q$ : | 1.35 |
| Formule 6.10b: | $\xi \gamma_G$ : | 1.08 | $\gamma_Q$ : | 1.35 |

Partiële factor (Tabel 2.3 NEN-EN 1995-1-1)  
 $\gamma_M[-]$ : 1.30

#### Stabiliteit

1.Toetsing knikstabiliteit volgens par. 6.3.2. is n.v.t.:  
 - geen axiale druk aangebracht op de staaf.

2.Factoren t.b.v. toetsing kipstabiliteit volgens par. 6.3.3.:  
 Fundamentele combinatie (6.10b):

$\kappa_{crit,y}$  [-] : 1.00 frm(6.34)



Onderdeel : 71x221-1,45 m lg 5,50 m red. 15 jaar

Datum : 11/07/2019

Eenheden : kN/m/rad

**Fundamentele combinatie (6.10a)** u.c. 0.00Normaalkracht [kN] 0.0  $\sigma_{c,0,d}$  [N/mm<sup>2</sup>] 0.00Dwarskracht [kN] 0.0  $\tau_{v,d}$  [N/mm<sup>2</sup>] 0.00Moment [kNm] 0.0  $\sigma_{m,y,d}$  [N/mm<sup>2</sup>] 0.00 $f_{m,y,d}$  [N/mm<sup>2</sup>] 8.3  $f_{c,0,d}$  [N/mm<sup>2</sup>] 8.31  $b_{ef}$  71 [mm] frm(6.13a) $f_{t,0,d}$  [N/mm<sup>2</sup>] 5.1  $f_{v,d}$  [N/mm<sup>2</sup>] 1.57  $k_{mod}$  0.60 [-] tab(3.1)**Fundamentele combinatie (6.10b)** frm(6.11) u.c. 0.64Normaalkracht [kN] 0.0  $\sigma_{c,0,d}$  [N/mm<sup>2</sup>] 0.00Dwarskracht [kN] -3.0  $\tau_{v,d}$  [N/mm<sup>2</sup>] 0.28Moment [kNm] -4.1  $\sigma_{m,y,d}$  [N/mm<sup>2</sup>] 7.07 $f_{m,y,d}$  [N/mm<sup>2</sup>] 11.1  $f_{c,0,d}$  [N/mm<sup>2</sup>] 11.08  $b_{ef}$  71 [mm] frm(6.13a) $f_{t,0,d}$  [N/mm<sup>2</sup>] 6.8  $f_{v,d}$  [N/mm<sup>2</sup>] 2.09  $k_{mod}$  0.80 [-] tab(3.1)**Doorbuiging** u.c. $u_{bij}$  = 18.57 < 16.50 [mm] 1.13 $u_{net,fin}$  = 18.57 < 22.00 [mm] 0.84

Onderdeel : Gordingen 71x221-1,40 m  
 Datum : 11/07/2019  
 Eenheden : kN/m/rad

### Toegepaste normen volgens Eurocode met Nederlandse NB

|             |                      |                 |             |
|-------------|----------------------|-----------------|-------------|
| Belastingen | NEN-EN 1990:2002     | C2:2010         | NB:2011(nl) |
|             | NEN-EN 1991-1-1:2002 | C1:2009         | NB:2011(nl) |
|             | NEN-EN 1991-1-3:2003 | C1:2009         | NB:2011(nl) |
|             | NEN-EN 1991-1-4:2005 | C2:2011         | NB:2011(nl) |
| Hout        | NEN-EN 1995-1-1:2005 | A1:2011,C1:2006 | NB:2013(nl) |
|             | NEN-EN 14080:2013    |                 |             |

### Gording berekening. (H)

zadeldak enkele buiging

#### Algemene gegevens

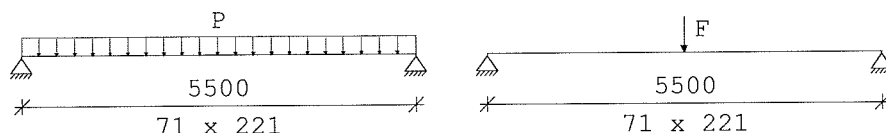
|                       |      |                        |                        |                      |           |
|-----------------------|------|------------------------|------------------------|----------------------|-----------|
| B x H                 | [mm] | : 71 x 221             | Sterkteklasse          | :                    | C18       |
| Overspanning          | [mm] | : 5500                 | Klimaatklasse          | :                    | I         |
| Aantal zijdl. steunen | :    | -                      | Referentie periode [j] | :                    | 50        |
| Oplegglengte          | [mm] | : 100                  |                        |                      |           |
| Hoh in het dakvlak    | [mm] | : 1400                 |                        |                      |           |
| Helling               | :    | 18.00                  |                        |                      |           |
| Beschot sterkteklasse | :    | C18                    |                        |                      |           |
| Dikte beschot         | [mm] | : 18                   | $E_{0,mean} \times I$  | [Nm <sup>2</sup> /m] | : 4374.0  |
| Windgebied            | :    | 3                      | Terrein                | :                    | Onbebouwd |
| Gebouw L x B x H      | [m]  | : 35.00 x 11.00 x 6.50 |                        |                      |           |

#### Permanente belastingen $G_{rep}$

|                             |   |      |
|-----------------------------|---|------|
| EG balklaag                 | : | 0.06 |
| Isolatie                    | : | 0.00 |
| Extra gewicht               | : | 0.14 |
| Totaal [kN/m <sup>2</sup> ] | : | 0.20 |

#### Veranderlijke belastingen

|                           |                      |                                                |
|---------------------------|----------------------|------------------------------------------------|
| $F_{rep}$                 | [kN]                 | : 1.50                                         |
| $F_{rep}$ oppervlak       | [m <sup>2</sup> ]    | : 0.50 x 0.50                                  |
| Reductiefactor            | :                    | 1.00                                           |
| Wind $Q_{p,prob}$         | [kN/m <sup>2</sup> ] | : 0.60 (= $C_{prob}^2 * Q_p = 1.00^2 * 0.60$ ) |
| Sneeuw vormfactor $\mu_1$ | :                    | 0.80                                           |



Belastingfactoren (NEN-EN 1990 - Bijlage A1.3)

|                   |                |        |            |        |
|-------------------|----------------|--------|------------|--------|
| Formule 6.10a:    | $\gamma_G$     | : 1.22 | $\gamma_Q$ | : 1.35 |
| Formule 6.10b:    | $\xi \gamma_G$ | : 1.08 | $\gamma_Q$ | : 1.35 |
| Perm.bel. gunstig | :              | 0.90   |            |        |

Partiële factor (Tabel 2.3 NEN-EN 1995-1-1)

$\gamma_M[-]$ : 1.30



Onderdeel : Gordingen 71x221-1,40 m  
 Datum : 11/07/2019  
 Eenheden : kN/m/rad

| Meegenomen combinaties in de berekening : | $k_{mod} [-]$ | $b_{ef} [mm]$ | $k_{c,90,q}$ | $k_{c,90,F}$ |
|-------------------------------------------|---------------|---------------|--------------|--------------|
| * Permanent                               | 0.60          | 71            | 1.00         |              |
| * Permanent + sneeuw                      | 0.80          | 71            | 1.00         |              |
| * Permanent + geconcentreerde belasting   | 1.10          | 71            | 1.00         | 1.50         |
| * Permanent + wind                        | 0.90          | 71            | 1.00         |              |
| * Permanent gunstig + wind omhoog         | 0.90          | 71            | 1.00         |              |
| * Permanent gunstig + wind loodr.         | 0.90          | 71            | 1.00         |              |

## Tussenresultaten m.b.t. wind

|                            |   |       |                              |   |       |
|----------------------------|---|-------|------------------------------|---|-------|
| $C_{pi\_onderdruk}$        | : | -0.30 | $C_{pi\_overdruk}$           | : | 0.20  |
| $C_{pe\_onderdruk}$ (druk) | : | 0.30  | $C_{pe\_overdruk}$ (zuiging) | : | -1.32 |
| $C_{index\_onderdruk}$     | : | 0.60  | $C_{index\_overdruk}$        | : | -1.52 |
| $C_{scd}$                  | : | 1.00  |                              |   |       |
| $C_f$                      | : | 1.00  |                              |   |       |

## Tussenresultaten m.b.t. belastingen

| Belastinggeval    | $Q_{rep\_LR}$<br>[kN/m] | $F_{rep\_LR}$<br>[kN] | $Q_{rep\_EW}$<br>[kN/m] | $F_{rep\_EW}$<br>[kN] |
|-------------------|-------------------------|-----------------------|-------------------------|-----------------------|
| Permanent         | : 0.27                  |                       | 0.09                    |                       |
| Sneeuw            | : 0.71                  |                       | 0.23                    |                       |
| Geconc. belasting | :                       | 1.43                  |                         | 0.46                  |
| Wind              | : 0.50                  |                       |                         |                       |
| Wind omhoog       | : -1.28                 |                       |                         |                       |
| Wind loodrecht    | : -0.17                 |                       |                         |                       |

## Tussenresultaten m.b.t. doorbuiging

|                                     |   |           |                                     |   |          |
|-------------------------------------|---|-----------|-------------------------------------|---|----------|
| Traagheidsmom. Y [mm <sup>4</sup> ] | : | 6386.37e4 | Traagheidsmom. Z [mm <sup>4</sup> ] | : | 659.15e4 |
| $E_{0,mean}$ [N/mm <sup>2</sup> ]   | : | 9000      | $\Psi_2$ [-]                        | : | 0.00     |
| $u_{perm,ogenbl.}$ [mm]             | : | 5.52      | $k_{def}$ [-]                       | : | 0.60     |
| $u_c$ (zeeg) [mm]                   | : | 0.00      |                                     |   |          |

## Doorbuigingen loodrecht [mm]

| Belastingcombinatie      | $u_{inst}$ | $u_{creep}$ | $u_{bij}$ | $u_{net,fin}$ |
|--------------------------|------------|-------------|-----------|---------------|
| Permanent                | : 5.52     | 3.31        | 3.31      | 8.83          |
| Permanent + sneeuw       | : 20.22    | 3.31        | 18.01     | 23.53         |
| Permanent + geconc.      | : 14.12    | 3.31        | 11.92     | 17.44         |
| Permanent + wind         | : 15.97    | 3.31        | 13.76     | 19.28         |
| Permanent + wind omhoog: | -20.95     | 3.31        | -23.16    | -17.64        |
| Permanent + wind loodr.: | 2.04       | 3.31        | -0.17     | 5.35          |

Onderdeel : Gordingen 71x221-1,40 m

Datum : 11/07/2019

Eenheden : kN/m/rad

De doorbuiging is als volgt bepaald (art. 2.2.3(5) van NEN-EN 1995-1-1:2004):  
doorbuiging m.b.t. belastingcombinatie permanent

$$u_{inst} = u_{perm, oogenblikkelijk}$$

$$u_{net, fin} = u_{inst} (1 + k_{def})$$

$$u_{creep} = w_{net, fin} - u_{inst}$$

$$u_{bij} = u_{creep}$$

doorbuiging m.b.t. belastingcombinatie veranderlijk

$$u_{inst} = u_{perm, oogenblikkelijk} + u_{ver, oogenblikkelijk}$$

$$u_{net, fin} = u_{inst, G} (1 + k_{def}) + u_{inst, Q} (1 + \Psi_2 k_{def})$$

$$u_{creep} = u_{net, fin} - u_{inst}$$

$$u_{bij} = u_{net, fin} - u_{inst, G}$$

Maatg. comb. m.b.t. bijk. doorbuiging : Permanent + wind omhoog

Mtg. comb. m.b.t. einddoorb. : Permanent + sneeuw

**Stabiliteit**1. Toetsing kipstabiliteit m.b.t. montagefase volgens par. 6.3.3. is n.v.t.:  
- u hebt het belastingsgeval 'Uitvoering' niet toegepast.2. Factoren t.b.v. toetsing kipstabiliteit m.b.t. gebruiksfase volgens par. 6.3.3:  
Belastingcombinatie wind omhoog (opbuigend moment):

$$\sigma_{my, crit} [N/mm^2] : 21.79 \text{ frm}(6.32) \quad l_{ef, y} [mm] : 4899.50 \text{ tab}(6.1)$$

$$\lambda_{rel, my} [-] : 0.91 \text{ frm}(6.30) \quad k_{crit, y} [-] : 0.88 \text{ frm}(6.34)$$

**Tussenresultaten (per combinatie)**

Factoren t.b.v. toetsing ULS:

$$k_m [-] : 0.70 \text{ par}(6.1.6)$$

|                   |                                                                                                                                    | eis                                 | u.c. |
|-------------------|------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|------|
| Permanent         | frm(6.13) $\tau_{v, d}$                                                                                                            | = 0.08 < 1.57 [N/mm <sup>2</sup> ]  | 0.05 |
|                   | frm(6.3) $\sigma_{c, 90, q, d} / (k_{c, 90, q} * f_{c, 90, d}) +$<br>$\sigma_{c, 90, F, d} / (k_{c, 90, F} * f_{c, 90, d}) < 1.00$ | = 0.13 / 1.02 + 0.00 / 1.52 =       | 0.12 |
|                   | frm(6.11) $\sigma_{m, y, d}$                                                                                                       | = 2.13 < 8.31 [N/mm <sup>2</sup> ]  | 0.26 |
|                   |                                                                                                                                    |                                     |      |
| Sneeuw            | frm(6.13) $\tau_{v, d}$                                                                                                            | = 0.30 < 2.09 [N/mm <sup>2</sup> ]  | 0.14 |
|                   | frm(6.3) $\sigma_{c, 90, q, d} / (k_{c, 90, q} * f_{c, 90, d}) +$<br>$\sigma_{c, 90, F, d} / (k_{c, 90, F} * f_{c, 90, d}) < 1.00$ | = 0.48 / 1.35 + 0.00 / 2.03 =       | 0.36 |
|                   | frm(6.11) $\sigma_{m, y, d}$                                                                                                       | = 8.14 < 11.08 [N/mm <sup>2</sup> ] | 0.74 |
|                   |                                                                                                                                    |                                     |      |
| Geconc. belasting | frm(6.13) $\tau_{v, d}$                                                                                                            | = 0.23 < 2.88 [N/mm <sup>2</sup> ]  | 0.08 |
|                   | frm(6.3) $\sigma_{c, 90, q, d} / (k_{c, 90, q} * f_{c, 90, d}) +$<br>$\sigma_{c, 90, F, d} / (k_{c, 90, F} * f_{c, 90, d}) < 1.00$ | = 0.11 / 1.86 + 0.27 / 2.79 =       | 0.16 |
|                   | frm(6.11) $\sigma_{m, y, d}$                                                                                                       | = 6.46 < 15.23 [N/mm <sup>2</sup> ] | 0.42 |
|                   |                                                                                                                                    |                                     |      |
| Wind              | frm(6.13) $\tau_{v, d}$                                                                                                            | = 0.23 < 2.35 [N/mm <sup>2</sup> ]  | 0.10 |
|                   | frm(6.3) $\sigma_{c, 90, q, d} / (k_{c, 90, q} * f_{c, 90, d}) +$<br>$\sigma_{c, 90, F, d} / (k_{c, 90, F} * f_{c, 90, d}) < 1.00$ | = 0.37 / 1.52 + 0.00 / 2.28 =       | 0.25 |
|                   | frm(6.11) $\sigma_{m, y, d}$                                                                                                       | = 6.33 < 12.46 [N/mm <sup>2</sup> ] | 0.51 |
|                   |                                                                                                                                    |                                     |      |



Onderdeel : Gordingen 71x221-1,40 m  
 Datum : 11/07/2019  
 Eenheden : kN/m/rad

Wind omhoog frm(6.13)  $\tau_{v,d} = 0.35 < 2.35$  [N/mm<sup>2</sup>] 0.15  
 $\sigma_{t,90,d} = -0.57$  reactie omhoog is niet getoetst!  
 frm(6.33)  $\sigma_{m,y,d} = -9.71 < 10.95$  [N/mm<sup>2</sup>] 0.89

Wind loodrecht frm(6.13)  $\tau_{v,d} = 0.00 < 2.35$  [N/mm<sup>2</sup>] 0.00  
 frm(6.3)  $\sigma_{c,90,q,d} / (k_{c,90,q} * f_{c,90,d}) +$   
 $\sigma_{c,90,F,d} / (k_{c,90,F} * f_{c,90,d}) < 1.00$   
 $= 0.00 / 1.52 + 0.00 / 2.28 = 0.00$   
 frm(6.11)  $\sigma_{m,y,d} = 0.08 < 12.46$  [N/mm<sup>2</sup>] 0.01

**Resultaten (maatgevende combinaties)****eis****u.c.**

Wind omhoog frm(6.13)  $\tau_{v,d} = 0.35 < 2.35$  [N/mm<sup>2</sup>] 0.15

Sneeuw frm(6.3)  $\sigma_{c,90,q,d} / (k_{c,90,q} * f_{c,90,d}) +$   
 $\sigma_{c,90,F,d} / (k_{c,90,F} * f_{c,90,d}) < 1.00$   
 $= 0.48 / 1.35 + 0.00 / 2.03 = 0.36$

Wind omhoog frm(6.33)  $\sigma_{m,y,d} = -9.71 < 10.95$  [N/mm<sup>2</sup>] 0.89

Let op: bij 1 of meerdere belastingcombinaties wind treedt een opwaartse oplegreactie op. Houdt hiermee rekening in het ontwerp van de oplegverbinding.

Wind omhoog  $u_{bij} = -23.16 < 22.00$  [mm] 1.05  
 Sneeuw  $u_{net,fin} = 23.53 < 22.00$  [mm] 1.07

Onderdeel : Gordingen 71x221-1,40 m  
 Datum : 11/07/2019  
 Eenheden : kN/m/rad

### Toegepaste normen volgens Eurocode met Nederlandse NB

|             |                      |                  |             |
|-------------|----------------------|------------------|-------------|
| Belastingen | NEN-EN 1990:2002     | C2:2010          | NB:2011(nl) |
|             | NEN-EN 1991-1-1:2002 | C1:2009          | NB:2011(nl) |
|             | NEN-EN 1991-1-3:2003 | C1:2009          | NB:2011(nl) |
|             | NEN-EN 1991-1-4:2005 | C2:2011          | NB:2011(nl) |
| Hout        | NEN-EN 1995-1-1:2005 | A1:2011, C1:2006 | NB:2013(nl) |
|             | NEN-EN 14080:2013    |                  |             |

### Gording berekening. (H)

zadeldak enkele buiging

#### Algemene gegevens

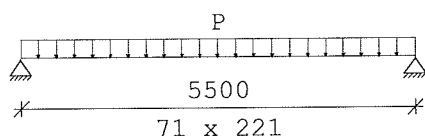
|                       |        |                      |                          |     |
|-----------------------|--------|----------------------|--------------------------|-----|
| B x H                 | [mm] : | 71 x 221             | Sterkteklasse :          | C18 |
| Overspanning          | [mm] : | 5500                 | Klimaatklasse :          | I   |
| Aantal zijdl. steunen | :      | -                    | Referentie periode [j] : | 50  |
| Opleglengte           | [mm] : | 100                  |                          |     |
| Hoh in het dakvlak    | [mm] : | 1400                 |                          |     |
| Helling               | :      | 18.00                |                          |     |
| Gebouw L x B x H      | [m] :  | 35.00 x 11.00 x 6.50 |                          |     |

#### Permanente belastingen $G_{rep}$

|                             |   |      |
|-----------------------------|---|------|
| EG balklaag                 | : | 0.06 |
| Isolatie                    | : | 0.00 |
| Extra gewicht               | : | 0.14 |
| Totaal [kN/m <sup>2</sup> ] | : | 0.20 |

#### Veranderlijke belastingen

|                                        |   |                                              |
|----------------------------------------|---|----------------------------------------------|
| Wind $Q_{p,prob}$ [kN/m <sup>2</sup> ] | : | 0.45 (= $C_{prob}^2 * Q_p = 1.00^2 * 0.45$ ) |
| Sneeuw vormfactor $\mu_1$              | : | 0.60                                         |



Belastingfactoren (NEN-EN 1990 - Bijlage A1.3)

Formule 6.10a:  $\gamma_G$  : 1.22  $\gamma_Q$  : 1.35

Formule 6.10b:  $\xi\gamma_G$  : 1.08  $\gamma_Q$  : 1.35

Perm.bel. gunstig : 0.90

Partiële factor (Tabel 2.3 NEN-EN 1995-1-1)

$\gamma_M[-]$ : 1.30

#### Stabiliteit

1.Toetsing kipstabiliteit m.b.t. montagefase volgens par.6.3.3. is n.v.t.:  
 - u hebt het belastingsgeval 'Uitvoering' niet toegepast.

2.Factoren t.b.v. toetsing kipstabiliteit m.b.t. gebruiksfase volgens par.6.3.3:  
 Belastingcombinatie wind omhoog (opbuigend moment):

$\kappa_{crit,y} [-]$  : 0.88 frm(6.34)



Onderdeel : Gordingen 71x221-1,40 m

Datum : 11/07/2019

Eenheden : kN/m/rad

**Resultaten (maatgevende combinaties)**

Factoren t.b.v. toetsing ULS:

 $k_m$  [-] : 0.70 par(6.1.6)

|                                                                                                                                                         |                                                                                                                 | eis | u.c. |
|---------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|-----|------|
| Sneeuw                                                                                                                                                  | $frm(6.13) \tau_{v,d} = 0.24 < 2.09 \text{ [N/mm}^2]$                                                           |     | 0.11 |
| Sneeuw                                                                                                                                                  | $frm(6.3) \sigma_{c,90,q,d} / (k_{c,90,q} * f_{c,90,d}) + \sigma_{c,90,F,d} / (k_{c,90,F} * f_{c,90,d}) < 1.00$ |     |      |
|                                                                                                                                                         | $= 0.39 / 1.35 + 0.00 / 1.35 = 0.29$                                                                            |     |      |
| Wind omhoog                                                                                                                                             | $frm(6.33) \sigma_{m,y,d} = -6.89 < 10.95 \text{ [N/mm}^2]$                                                     |     | 0.63 |
| Let op: bij 1 of meerdere belastingcombinaties wind treedt een opwaartse oplegreactie op. Houdt hiermee rekening in het ontwerp van de oplegverbinding. |                                                                                                                 |     |      |
| Wind omhoog                                                                                                                                             | $u_{bij} = -16.54 < 22.00 \text{ [mm]}$                                                                         |     | 0.75 |
| Sneeuw                                                                                                                                                  | $u_{net,fin} = 19.86 < 22.00 \text{ [mm]}$                                                                      |     | 0.90 |

Onderdeel : Gordingen 71x221-1,40 m PB+Sneeuw  
 Datum : 11/07/2019  
 Eenheden : kN/m/rad

### Toegepaste normen volgens Eurocode met Nederlandse NB

|             |                      |                 |             |
|-------------|----------------------|-----------------|-------------|
| Belastingen | NEN-EN 1990:2002     | C2:2010         | NB:2011(nl) |
|             | NEN-EN 1991-1-1:2002 | C1:2009         | NB:2011(nl) |
|             | NEN-EN 1991-1-3:2003 | C1:2009         | NB:2011(nl) |
| Hout        | NEN-EN 1995-1-1:2005 | A1:2011,C1:2006 | NB:2013(nl) |
|             | NEN-EN 14080:2013    |                 |             |

### Gording berekening. (H)

zadeldak enkele buiging

#### Algemene gegevens

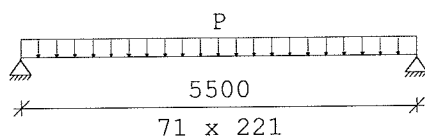
|                        |                 |                        |   |     |
|------------------------|-----------------|------------------------|---|-----|
| B x H                  | [mm] : 71 x 221 | Sterkteklasse          | : | C18 |
| Overspanning           | [mm] : 5500     | Klimaatklasse          | : | I   |
| Aantal zijdl. steunen  | :               | Referentie periode [j] | : | 50  |
| Opleglengte            | [mm] : 100      |                        |   |     |
| Hoh in het dakvlak[mm] | : 1400          |                        |   |     |
| Helling                | : 18.00         |                        |   |     |

#### Permanente belastingen $G_{rep}$

|                             |        |
|-----------------------------|--------|
| EG balklaag                 | : 0.06 |
| Isolatie                    | : 0.00 |
| Extra gewicht               | : 0.14 |
| Totaal [kN/m <sup>2</sup> ] | : 0.20 |

#### Veranderlijke belastingen

Sneeuw vormfactor  $\mu_1$  : 0.80



Belastingfactoren (NEN-EN 1990 - Bijlage A1.3)

Formule 6.10a:  $\gamma_G$  : 1.22  $\gamma_Q$  : 1.35

Formule 6.10b:  $\xi\gamma_G$  : 1.08  $\gamma_Q$  : 1.35

Partiële factor (Tabel 2.3 NEN-EN 1995-1-1)

$\gamma_M[-]$ : 1.30

Onderdeel : Gordingen 71x221-1,40 m PB+Sneeuw  
 Datum : 11/07/2019  
 Eenheden : kN/m/rad

Meegenomen combinaties in de berekening :  $k_{mod}[-]$   $b_{ef}[mm]$   $k_{c,90,q}$   $k_{c,90,F}$   
 \* Permanent 0.60 71 1.00  
 \* Permanent + sneeuw 0.80 71 1.00

#### Tussenresultaten m.b.t. belastingen

| Belastinggeval | $Q_{rep\_LR}$<br>[kN/m] | $F_{rep\_LR}$<br>[kN] | $Q_{rep\_EW}$<br>[kN/m] | $F_{rep\_EW}$<br>[kN] |
|----------------|-------------------------|-----------------------|-------------------------|-----------------------|
| Permanent      | : 0.27                  |                       | 0.09                    |                       |
| Sneeuw         | : 0.71                  |                       | 0.23                    |                       |

#### Tussenresultaten m.b.t. doorbuiging

|                                     |             |                                     |            |
|-------------------------------------|-------------|-------------------------------------|------------|
| Traagheidsmom. Y [mm <sup>4</sup> ] | : 6386.37e4 | Traagheidsmom. Z [mm <sup>4</sup> ] | : 659.15e4 |
| $E_{0,mean}$ [N/mm <sup>2</sup> ]   | : 9000      | $\Psi_2$ [-]                        | : 0.00     |
| $u_{perm,ogenbl.}$ [mm]             | : 5.52      | $k_{def}$ [-]                       | : 0.60     |
| $u_c(zee)$ [mm]                     | : 0.00      |                                     |            |

#### Doorbuigingen loodrecht [mm]

| Belastingcombinatie | $u_{inst}$ | $u_{creep}$ | $u_{bij}$ | $u_{net,fin}$ |
|---------------------|------------|-------------|-----------|---------------|
| Permanent           | : 5.52     | 3.31        | 3.31      | 8.83          |
| Permanent + sneeuw  | : 20.22    | 3.31        | 18.01     | 23.53         |

De doorbuiging is als volgt bepaald (art. 2.2.3(5) van NEN-EN 1995-1-1:2004):  
 doorbuiging m.b.t. belastingcombinatie permanent

$$u_{inst} = u_{perm,ogenblikkelijk}$$

$$u_{net,fin} = u_{inst}(1 + k_{def})$$

$$u_{creep} = u_{net,fin} - u_{inst}$$

$$u_{bij} = u_{creep}$$

doorbuiging m.b.t. belastingcombinatie veranderlijk

$$u_{inst} = u_{perm,ogenblikkelijk} + u_{ver,ogenblikkelijk}$$

$$u_{net,fin} = u_{inst,G}(1 + k_{def}) + u_{inst,Q}(1 + \Psi_2 k_{def})$$

$$u_{creep} = u_{net,fin} - u_{inst}$$

$$u_{bij} = u_{net,fin} - u_{inst,G}$$

Mtg. doorbuiging : Permanent + sneeuw

#### Stabiliteit

1.Toetsing kipstabiliteit m.b.t. montagefase volgens par.6.3.3. is n.v.t.:  
 - u hebt het belastingsgeval 'Uitvoering' niet toegepast.

#### Tussenresultaten (per combinatie)

Factoren t.b.v. toetsing ULS:

$k_m$  [-] : 0.70 par(6.1.6)

|           |                                                                                                                   | eis                                  | u.c. |
|-----------|-------------------------------------------------------------------------------------------------------------------|--------------------------------------|------|
| Permanent | frm(6.13) $\tau_{v,d}$                                                                                            | = 0.08 < 1.57 [N/mm <sup>2</sup> ]   | 0.05 |
|           | frm(6.3) $\sigma_{c,90,q,d}/(k_{c,90,q} \cdot f_{c,90,d}) +$<br>$\sigma_{c,90,F,d}/(k_{c,90,F} \cdot f_{c,90,d})$ | < 1.00<br>= 0.13/ 1.02+ 0.00/ 1.02 = | 0.12 |
|           | frm(6.11) $\sigma_{m,y,d}$                                                                                        | = 2.13 < 8.31 [N/mm <sup>2</sup> ]   | 0.26 |



Onderdeel : Gordingen 71x221-1,40 m PB+Sneeuw

Datum : 11/07/2019

Eenheden : kN/m/rad

Sneeuw frm(6.13)  $\tau_{v,d} = 0.30 < 2.09$  [N/mm<sup>2</sup>] 0.14
$$\text{frm(6.3) } \sigma_{c,90,q,d} / (k_{c,90,q} * f_{c,90,d}) + \sigma_{c,90,F,d} / (k_{c,90,F} * f_{c,90,d}) < 1.00$$

$$= 0.48 / 1.35 + 0.00 / 1.35 = 0.36$$
frm(6.11)  $\sigma_{m,y,d} = 8.14 < 11.08$  [N/mm<sup>2</sup>] 0.74

## Resultaten (maatgevende combinaties)

eis

u.c.

Sneeuw frm(6.13)  $\tau_{v,d} = 0.30 < 2.09$  [N/mm<sup>2</sup>] 0.14
$$\text{Sneeuw frm(6.3) } \sigma_{c,90,q,d} / (k_{c,90,q} * f_{c,90,d}) + \sigma_{c,90,F,d} / (k_{c,90,F} * f_{c,90,d}) < 1.00$$

$$= 0.48 / 1.35 + 0.00 / 1.35 = 0.36$$
Sneeuw frm(6.11)  $\sigma_{m,y,d} = 8.14 < 11.08$  [N/mm<sup>2</sup>] 0.74Sneeuw  $u_{bij} = 18.01 < 22.00$  [mm] 0.82Sneeuw  $u_{net,fin} = 23.53 < 22.00$  [mm] 1.07L 6.85  
com 44

## Tabelle 2.

Fix m = 1.5

$$q_{51} = 1.5 / (0.0 / 0.56 / 0.75 / 0.90) = 0.21 / 0.56$$

$$q_{51} = 1.5 \quad M_{51} = 0.75$$

$$\sigma_{hyd} = 6.85$$

$$M_{51} = 46.71 \text{ m} \cdot (11.05 - 5.5) / 10^6 = 0.18$$

$$q_{51} = 0.21 / 6.85$$

12. 92

$$q_{51} = 11.25 \cdot 0.02 \cdot 10^6 = 0.70$$

$$= 11.25 \cdot (0.56 / 0.75 / 1.00 / 1.00) = 1.89$$

$$q_{51} = 1.89$$

$$q_{51} = 1.89 \cdot 0.02 = 1.89$$

$$\left. \begin{array}{l} q_{51} = 1.89 \\ q_{51} = 1.89 \end{array} \right\} q_{51} = 0.75$$

$$\underline{0.20 / 0.56}$$

$$q_{51} = 0.70$$

$$\sigma_{hyd} = 6.85$$

$$M_{51} = 0.75 \cdot 0.56 \cdot 1.1 \cdot 0.90 = 0.60$$

$$M_{51} = 1.89 \cdot 0.56 \cdot 1.1 \cdot 0.90 = 1.00$$

07

$$Q_1 = 3,1.0,4. \cos 45^\circ = 0,45$$

$$Q_2 = 3,1.0,56.0,78. \cos 45^\circ \sin 45^\circ = 0,65$$



Onderdeel : Plat = MP  
 Datum : 11/07/2019  
 Eenheden : kN/m/rad

### Toegepaste normen volgens Eurocode met Nederlandse NB

|             |                      |                 |             |
|-------------|----------------------|-----------------|-------------|
| Belastingen | NEN-EN 1990:2002     | C2:2010         | NB:2011(nl) |
|             | NEN-EN 1991-1-1:2002 | C1:2009         | NB:2011(nl) |
| Hout        | NEN-EN 1995-1-1:2005 | A1:2011,C1:2006 | NB:2013(nl) |
|             | NEN-EN 14080:2013    |                 |             |

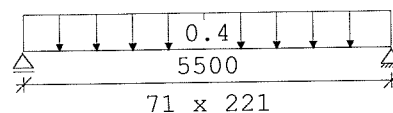
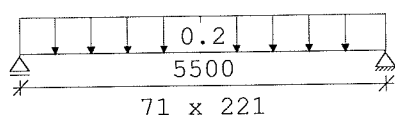
### Berekening willekeurige staaf. (H)

#### Algemene gegevens

|                  |        |           |                          |       |
|------------------|--------|-----------|--------------------------|-------|
| B x H            | [mm] : | 71 x 221  | Referentie periode [j] : | 50    |
| $l_{sys}$        | [mm] : | 5500      |                          |       |
| $l_{buc;y}$      | [mm] : | 5500      | Toelaatbare doorbuiging  |       |
| $l_{buc;z}$      | [mm] : | 1200      | Bijkomend [* 1] :        | 0.003 |
| Plaats kipsteun  | :      | Bovenkant |                          |       |
| Steunpunt links  | :      | Rol       | Eind [* 1] :             | 0.004 |
| Steunpunt rechts | :      | Scharnier |                          |       |
| Sterkteklasse    | :      | C18       | Klimaatklasse :          | I     |

#### Belastingen

|                | Permanent      | Veranderlijk |
|----------------|----------------|--------------|
| $q_z$          | [kN/m] : -0.20 | -0.40        |
| $\Psi_0$       | [ - ] : 0.00   | 0.00         |
| $\Psi_2$       | [ - ] : 0.20   | 0.00         |
| $F_z$          | [kN] : 0.00    | 0.00         |
| Vanaf links    | [mm] : 1100    |              |
| $N_x$          | [kN] : 0.00    | 0.00         |
| $M_{y;links}$  | [kNm] : 0.00   | 0.00         |
| $M_{y;rechts}$ | [kNm] : 0.00   | 0.00         |



#### Belastingfactoren (NEN-EN 1990)

|                |                 |      |              |      |
|----------------|-----------------|------|--------------|------|
| Formule 6.10a: | $\gamma_G$ :    | 1.22 | $\gamma_Q$ : | 1.35 |
| Formule 6.10b: | $\xi\gamma_G$ : | 1.08 | $\gamma_Q$ : | 1.35 |

Partiële factor (Tabel 2.3 NEN-EN 1995-1-1)  
 $\gamma_M[-]$ : 1.30

#### Stabiliteit

1.Toetsing knikstabiliteit volgens par. 6.3.2. is n.v.t.:  
 - geen axiale druk aangebracht op de staaf.

2.Factoren t.b.v. toetsing kipstabiliteit volgens par. 6.3.3.:  
 Fundamentele combinatie (6.10a):  
 $\kappa_{crit,y} [-]$  : 1.00 frm(6.34)  
 Fundamentele combinatie (6.10b):  
 $\kappa_{crit,y} [-]$  : 1.00 frm(6.34)

Onderdeel : Plat = MP  
 Datum : 11/07/2019  
 Eenheden : kN/m/rad

| Fundamentele combinatie (6.10a)  |                      |                  |                      | frm(6.11) | u.c.               | 0.19       |
|----------------------------------|----------------------|------------------|----------------------|-----------|--------------------|------------|
| Normaalkracht [kN]               | 0.0                  | $\sigma_{c,0,d}$ | [N/mm <sup>2</sup> ] | 0.00      |                    |            |
| Dwarskracht [kN]                 | -0.7                 | $\tau_{v,d}$     | [N/mm <sup>2</sup> ] | 0.06      |                    |            |
| Moment [kNm]                     | -0.9                 | $\sigma_{m,y,d}$ | [N/mm <sup>2</sup> ] | 1.60      |                    |            |
| $f_{m,y,d}$ [N/mm <sup>2</sup> ] | 8.3                  | $f_{c,0,d}$      | [N/mm <sup>2</sup> ] | 8.31      | $b_{ef}$ 71[mm]    | frm(6.13a) |
| $f_{t,0,d}$ [N/mm <sup>2</sup> ] | 5.1                  | $f_{v,d}$        | [N/mm <sup>2</sup> ] | 1.57      | $k_{mod}$ 0.60 [-] | tab(3.1)   |
| Fundamentele combinatie (6.10b)  |                      |                  |                      | frm(6.11) | u.c.               | 0.45       |
| Normaalkracht [kN]               | 0.0                  | $\sigma_{c,0,d}$ | [N/mm <sup>2</sup> ] | 0.00      |                    |            |
| Dwarskracht [kN]                 | -2.1                 | $\tau_{v,d}$     | [N/mm <sup>2</sup> ] | 0.20      |                    |            |
| Moment [kNm]                     | -2.9                 | $\sigma_{m,y,d}$ | [N/mm <sup>2</sup> ] | 4.95      |                    |            |
| $f_{m,y,d}$ [N/mm <sup>2</sup> ] | 11.1                 | $f_{c,0,d}$      | [N/mm <sup>2</sup> ] | 11.08     | $b_{ef}$ 71[mm]    | frm(6.13a) |
| $f_{t,0,d}$ [N/mm <sup>2</sup> ] | 6.8                  | $f_{v,d}$        | [N/mm <sup>2</sup> ] | 2.09      | $k_{mod}$ 0.80 [-] | tab(3.1)   |
| Doorbuiging                      |                      |                  |                      | u.c.      |                    |            |
| $u_{bij}$                        | = 11.77 < 16.50 [mm] |                  |                      | 0.71      |                    |            |
| $u_{net,fin}$                    | = 15.92 < 22.00 [mm] |                  |                      | 0.72      |                    |            |

Onderdeel : Plat = MP  
 Datum : 11/07/2019  
 Eenheden : kN/m/rad

### Toegepaste normen volgens Eurocode met Nederlandse NB

|             |                      |                 |             |
|-------------|----------------------|-----------------|-------------|
| Belastingen | NEN-EN 1990:2002     | C2:2010         | NB:2011(nl) |
|             | NEN-EN 1991-1-1:2002 | C1:2009         | NB:2011(nl) |
| Hout        | NEN-EN 1995-1-1:2005 | A1:2011,C1:2006 | NB:2013(nl) |
|             | NEN-EN 14080:2013    |                 |             |

### Berekening willekeurige staaf. (H)

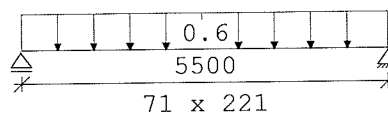
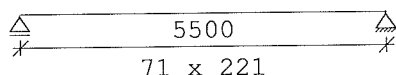
#### Algemene gegevens

|                  |        |           |                         |       |
|------------------|--------|-----------|-------------------------|-------|
| B x H            | [mm] : | 71 x 221  | Referentie periode [j]: | 50    |
| $l_{sys}$        | [mm] : | 5500      |                         |       |
| $l_{buc;y}$      | [mm] : | 5500      | Toelaatbare doorbuiging |       |
| $l_{buc;z}$      | [mm] : | 1200      | Bijkomend [* 1] :       | 0.003 |
| Plaats kipsteun  | :      | Bovenkant |                         |       |
| Steunpunt links  | :      | Rol       | Eind [* 1] :            | 0.004 |
| Steunpunt rechts | :      | Scharnier |                         |       |
| Sterkteklasse    | :      | C18       | Klimaatklasse :         | I     |

#### Belastingen

|  | Permanent | Veranderlijk |
|--|-----------|--------------|
|--|-----------|--------------|

|                |          |      |       |
|----------------|----------|------|-------|
| $q_z$          | [kN/m] : | 0.00 | -0.60 |
| $\Psi_0$       | [ - ] :  |      | 0.00  |
| $\Psi_2$       | [ - ] :  |      | 0.20  |
| $F_z$          | [kN] :   | 0.00 | 0.00  |
| Vanaf links    | [mm] :   | 1100 |       |
| $N_x$          | [kN] :   | 0.00 | 0.00  |
| $M_{y;links}$  | [kNm] :  | 0.00 | 0.00  |
| $M_{y;rechts}$ | [kNm] :  | 0.00 | 0.00  |



#### Belastingfactoren (NEN-EN 1990)

|                |                 |      |              |      |
|----------------|-----------------|------|--------------|------|
| Formule 6.10a: | $\gamma_G$ :    | 1.22 | $\gamma_Q$ : | 1.35 |
| Formule 6.10b: | $\xi\gamma_G$ : | 1.08 | $\gamma_Q$ : | 1.35 |

Partiële factor (Tabel 2.3 NEN-EN 1995-1-1)

$\gamma_M[-]$ : 1.30

#### Stabiliteit

1.Toetsing knikstabiliteit volgens par. 6.3.2. is n.v.t.:  
 - geen axiale druk aangebracht op de staaf.

2.Factoren t.b.v. toetsing kipstabiliteit volgens par. 6.3.3.:  
 Fundamentele combinatie (6.10b):

$\kappa_{crit,y}$  [-] : 1.00 frm(6.34)



Onderdeel : Plat = MP  
 Datum : 11/07/2019  
 Eenheden : kN/m/rad

| Fundamentele combinatie (6.10a)  |     |                                  |                      |                    | u.c.       | 0.00 |
|----------------------------------|-----|----------------------------------|----------------------|--------------------|------------|------|
| Normaalkracht [kN]               | 0.0 | $\sigma_{c,0,d}$                 | [N/mm <sup>2</sup> ] | 0.00               |            |      |
| Dwarskracht [kN]                 | 0.0 | $\tau_{v,d}$                     | [N/mm <sup>2</sup> ] | 0.00               |            |      |
| Moment [kNm]                     | 0.0 | $\sigma_{m,y,d}$                 | [N/mm <sup>2</sup> ] | 0.00               |            |      |
| $f_{m,y,d}$ [N/mm <sup>2</sup> ] | 8.3 | $f_{c,0,d}$ [N/mm <sup>2</sup> ] | 8.31                 | $b_{ef}$ 71 [mm]   | frm(6.13a) |      |
| $f_{t,0,d}$ [N/mm <sup>2</sup> ] | 5.1 | $f_{v,d}$ [N/mm <sup>2</sup> ]   | 1.57                 | $k_{mod}$ 0.60 [-] | tab(3.1)   |      |

| Fundamentele combinatie (6.10b)  |      |                                  |                      | frm(6.11)          | u.c.       | 0.48 |
|----------------------------------|------|----------------------------------|----------------------|--------------------|------------|------|
| Normaalkracht [kN]               | 0.0  | $\sigma_{c,0,d}$                 | [N/mm <sup>2</sup> ] | 0.00               |            |      |
| Dwarskracht [kN]                 | -2.2 | $\tau_{v,d}$                     | [N/mm <sup>2</sup> ] | 0.21               |            |      |
| Moment [kNm]                     | -3.1 | $\sigma_{m,y,d}$                 | [N/mm <sup>2</sup> ] | 5.30               |            |      |
| $f_{m,y,d}$ [N/mm <sup>2</sup> ] | 11.1 | $f_{c,0,d}$ [N/mm <sup>2</sup> ] | 11.08                | $b_{ef}$ 71 [mm]   | frm(6.13a) |      |
| $f_{t,0,d}$ [N/mm <sup>2</sup> ] | 6.8  | $f_{v,d}$ [N/mm <sup>2</sup> ]   | 2.09                 | $k_{mod}$ 0.80 [-] | tab(3.1)   |      |

| Doorbuiging   |                      |  |  | u.c. |
|---------------|----------------------|--|--|------|
| $u_{bij}$     | = 13.93 < 16.50 [mm] |  |  | 0.84 |
| $u_{net,fin}$ | = 13.93 < 22.00 [mm] |  |  | 0.63 |

Onderdeel : Pl 71x221 VZ  
 Datum : 11/07/2019  
 Eenheden : kN/m/rad

### Toegepaste normen volgens Eurocode met Nederlandse NB

|             |                      |                 |             |
|-------------|----------------------|-----------------|-------------|
| Belastingen | NEN-EN 1990:2002     | C2:2010         | NB:2011(nl) |
|             | NEN-EN 1991-1-1:2002 | C1:2009         | NB:2011(nl) |
| Hout        | NEN-EN 1995-1-1:2005 | A1:2011,C1:2006 | NB:2013(nl) |
|             | NEN-EN 14080:2013    |                 |             |

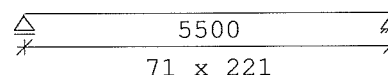
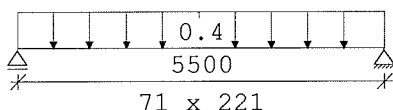
### Berekening willekeurige staaf. (H)

#### Algemene gegevens

|                  |        |           |                         |       |
|------------------|--------|-----------|-------------------------|-------|
| B x H            | [mm] : | 71 x 221  | Referentie periode [j]: | 50    |
| $l_{sys}$        | [mm] : | 5500      |                         |       |
| $l_{buc;y}$      | [mm] : | 5500      | Toelaatbare doorbuiging |       |
| $l_{buc;z}$      | [mm] : | 1200      | Bijkomend [* l] :       | 0.003 |
| Plaats kipsteun  | :      | Bovenkant |                         |       |
| Steunpunt links  | :      | Rol       | Eind [* l] :            | 0.004 |
| Steunpunt rechts | :      | Scharnier |                         |       |
| Sterkteklasse    | :      | C18       | Klimaatklasse :         | I     |

#### Belastingen

|                |          | Permanent | Veranderlijk |
|----------------|----------|-----------|--------------|
| $q_z$          | [kN/m] : | -0.45     | 0.00         |
| $\Psi_0$       | [ - ] :  |           | 0.00         |
| $\Psi_2$       | [ - ] :  |           | 0.20         |
| $F_z$          | [kN] :   | 0.00      | 0.00         |
| Vanaf links    | [mm] :   | 1100      |              |
| $N_x$          | [kN] :   | 0.00      | 0.00         |
| $M_{y;links}$  | [kNm] :  | 0.00      | 0.00         |
| $M_{y;rechts}$ | [kNm] :  | 0.00      | 0.00         |



#### Belastingfactoren (NEN-EN 1990)

|                |                 |      |              |      |
|----------------|-----------------|------|--------------|------|
| Formule 6.10a: | $\gamma_G$ :    | 1.22 | $\gamma_Q$ : | 1.35 |
| Formule 6.10b: | $\xi\gamma_G$ : | 1.08 | $\gamma_Q$ : | 1.35 |

Partiële factor (Tabel 2.3 NEN-EN 1995-1-1)

$\gamma_M[-]$ : 1.30

#### Stabiliteit

1.Toetsing knikstabiliteit volgens par. 6.3.2. is n.v.t.:  
 - geen axiale druk aangebracht op de staaf.

2.Factoren t.b.v. toetsing kipstabiliteit volgens par. 6.3.3.:

Fundamentele combinatie (6.10a):

$\kappa_{crit,y}$  [-] : 1.00 frm(6.34)

Fundamentele combinatie (6.10b):

$\kappa_{crit,y}$  [-] : 1.00 frm(6.34)

Onderdeel : Pl 71x221 VZ

Datum : 11/07/2019

Eenheden : kN/m/rad

**Fundamentele combinatie (6.10a)** **frm(6.11)** **u.c.** **0.43**Normaalkracht [kN] 0.0  $\sigma_{c,0,d}$  [N/mm<sup>2</sup>] 0.00Dwarskracht [kN] -1.5  $\tau_{v,d}$  [N/mm<sup>2</sup>] 0.14Moment [kNm] -2.1  $\sigma_{m,y,d}$  [N/mm<sup>2</sup>] 3.59 $f_{m,y,d}$  [N/mm<sup>2</sup>] 8.3  $f_{c,0,d}$  [N/mm<sup>2</sup>] 8.31  $b_{ef}$  71 [mm] frm(6.13a) $f_{t,0,d}$  [N/mm<sup>2</sup>] 5.1  $f_{v,d}$  [N/mm<sup>2</sup>] 1.57  $k_{mod}$  0.60 [-] tab(3.1)**Fundamentele combinatie (6.10b)** **frm(6.11)** **u.c.** **0.38**Normaalkracht [kN] 0.0  $\sigma_{c,0,d}$  [N/mm<sup>2</sup>] 0.00Dwarskracht [kN] -1.3  $\tau_{v,d}$  [N/mm<sup>2</sup>] 0.13Moment [kNm] -1.8  $\sigma_{m,y,d}$  [N/mm<sup>2</sup>] 3.18 $f_{m,y,d}$  [N/mm<sup>2</sup>] 8.3  $f_{c,0,d}$  [N/mm<sup>2</sup>] 8.31  $b_{ef}$  71 [mm] frm(6.13a) $f_{t,0,d}$  [N/mm<sup>2</sup>] 5.1  $f_{v,d}$  [N/mm<sup>2</sup>] 1.57  $k_{mod}$  0.60 [-] tab(3.1)**Doorbuiging** **u.c.** $u_{bij}$  = 5.60 < 16.50 [mm] 0.34 $u_{net,fin}$  = 14.93 < 22.00 [mm] 0.68



Phaenobar middel vel

$$7 \cdot 120,000 = 840$$

66 Exp.

$$G \times G_0, g = G_0$$

== Afcom

Аз

$$750,9 = 6,776$$

5.12

6  
405p  
400

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Project :

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Datum : woensdag 22 februari 2012

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**Inhoudsopgave**

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**Verbinding deel Voet**

Knoop 3 : geboute voetplaat verbinding

Volgens EC3, Annex L &amp; Revised Annex J

**1. Invoergegevens**

Kolom HEA200

| Part. veiligheidsfact. |      |
|------------------------|------|
| Gamma M0               | 1.10 |
| Gamma M1               | 1.10 |
| Gamma Mb               | 1.25 |
| Gamma Ms               | 1.25 |
| Gamma Mw               | 1.25 |
| Gamma c                | 1.50 |
| Gamma fr               | 2.00 |

| Betonblok    |       |     |
|--------------|-------|-----|
| fck_c        | 25.00 | MPa |
| griptoestand | zwak  |     |
| Beta_j       | 0.60  |     |
| kj           | 2.00  |     |
| kfr          | 0.25  |     |

| Voetplaat |        |     |
|-----------|--------|-----|
| h         | 180.00 | mm  |
| b         | 200.00 | mm  |
| t         | 15.00  | mm  |
| fy        | 235.00 | MPa |
| fu        | 360.00 | MPa |

| Ankers M12-4.6 (DIN601) |            |      |
|-------------------------|------------|------|
| type                    | recht      |      |
| staaf type              | goede grip |      |
| Kwaliteit               | 4.6        |      |
| fu                      | 400.00     | MPa  |
| As                      | 84.50      | mm^2 |
| do                      | 14.00      | mm   |
| S                       | 19.00      | mm   |
| e                       | 20.90      | mm   |
| h kop                   | 8.00       | mm   |
| h moer                  | 10.00      | mm   |

**Positie anker**

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| rij | y[mm]  | afstand[mm] |
|-----|--------|-------------|
| 1   | 140.00 | 115.30      |
| 2   | 40.00  | 115.30      |

**Interne krachten**

| Nummer ULS combinatie 1 |        |     |
|-------------------------|--------|-----|
| N                       | -16.54 | kN  |
| Vz                      | 0.00   | kN  |
| My                      | -0.01  | kNm |

Trek in linkerzijde.

Geprojecteerde krachten (Reacties)

|    |   |        |    |
|----|---|--------|----|
| N' | = | -16.54 | kN |
| T' | = | 0.00   | kN |

**2. Grenstoestand druk NRd,c**

Volgens EC3, Annex L

| NRd,c gegevens |        |    |
|----------------|--------|----|
| NRd,c          | 409.55 | kN |

**3. Grensmoment MRd**

Volgens EC3, Revised Annex J

**3.1 Grensterkte van basiscomponenten**

Voor individuele ankerrij:

Bt,Rd = 24.34 kN

| rij | Ft,ep,Rd |
|-----|----------|
| 1   | 48.67    |
| 2   | 48.67    |

| gegevens   |        |    |
|------------|--------|----|
| Fc,base,Rd | 133.22 | kN |
| Fc,fb,Rd   | 510.35 | kN |

**3.2 Bepaling van Mj,Rd**

| rij | h[mm]  | Ft[kN] |
|-----|--------|--------|
| 1   | 140.00 | 48.67  |
| 2   | 40.00  | 13.91  |

Mj,Rd = 7.37 kNm

Mj,Rd = 7.37 kNm(inclusief normaalkracht)

**4. Grenstoestand trek NRd,t**

Volgens EC3, Revised Annex J

NRd,t = 97.34 kN

**5. Grenstoestand afschuiving VRd**



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VRd            15.45            kN

**6. Berekening stijfheid****6.1 Ontwerp rotatiestijfheid**

| Sj gegevens |        |         |
|-------------|--------|---------|
| Sj          | 3.53   | MNm/rad |
| Sj,ini      | 3.53   | MNm/rad |
| z           | 117.78 | mm      |
| mu          | 1.00   |         |
| kc          | 8.29   | mm      |
| keq         | 1.42   | mm      |

**6.2 Classificatie stijfheid**

Niet toepasbaar.

**6.3 Controle van stijfheids vereiste**

Niet toepasbaar.

**6.4. Classificatie ductiliteit**

In de eindplaat hebben we het volgende:

 $t > 0.53 \sqrt{f_{ub}/f_y} d$ 

Dit resulteert in een niet-ductiele classificatie voor vervormbaarheid : klasse 3.

**7. Eenheidscontrole**

| Eenheidscontrole |      |
|------------------|------|
| NSd/NRd,c        | 0.04 |
| MSd/MjRd         | 0.00 |
| VSd/VRd          | 0.00 |

De verbinding voldoet.

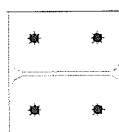
**8. Ontwerp berekening.****8.1 Verankeringslengte.**

| Ankers gegevens |        |    |
|-----------------|--------|----|
| l,anker         | 120.00 | mm |

**8.2. Berekening lasnaden**

| gegevens |      |    |
|----------|------|----|
| af       | 5.00 | mm |
| aw       | 4.00 | mm |

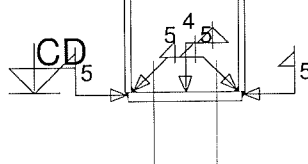
Snede CD



C

HEA200

D

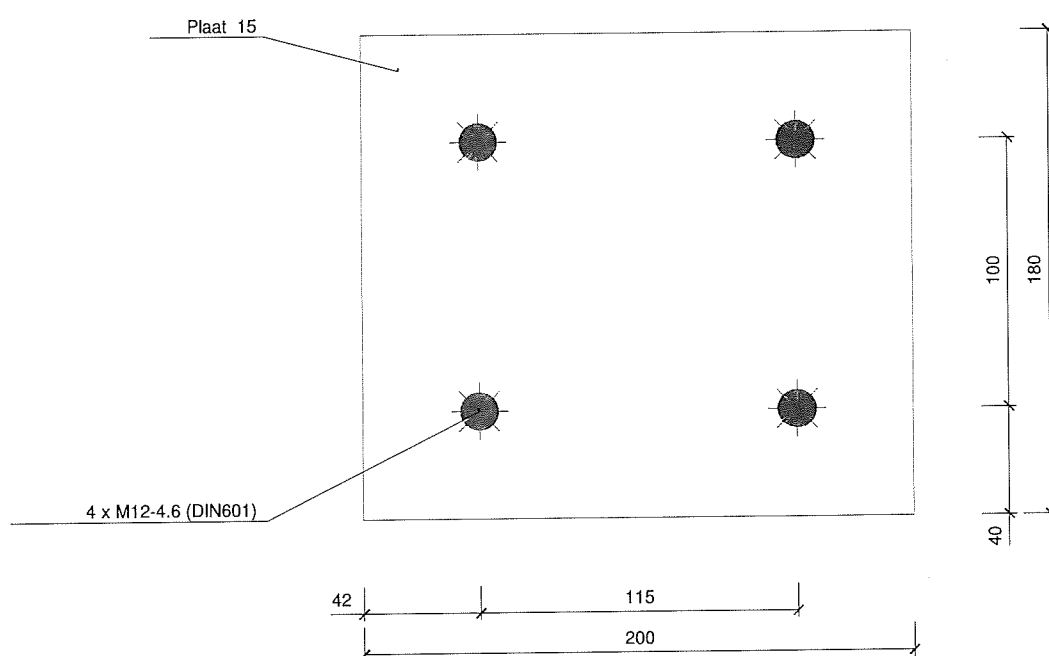


A

B

Knoop 3 - Geboute verbinding - Frame

## Voetplaat



Knoop 3 - Verbinding deel 1/2

**ESA-Prima Win versie 3.60.22**

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Auteur :

Datum : woensdag 22 februari 2012

**Verbinding deel KNIE voor**

Knoop 4 : geboute ligger-kolom verbinding zijde AB

Volgens EC3, Revised Annex J

**1. Invoergegevens**

Kolom HEA200

Verb. Staaf IPE270

| Part. veiligheidsfact. |      |
|------------------------|------|
| Gamma M0               | 1.10 |
| Gamma M1               | 1.10 |
| Gamma Mb               | 1.25 |
| Gamma Ms               | 1.25 |
| Gamma Mw               | 1.25 |

| eindplaat |        |     |
|-----------|--------|-----|
| h         | 290.00 | mm  |
| b         | 135.00 | mm  |
| t         | 15.00  | mm  |
| fy        | 235.00 | MPa |
| fu        | 360.00 | MPa |

| bouten M16-8.8 (DIN960) |         |                 |
|-------------------------|---------|-----------------|
| type                    | normaal |                 |
| Kwaliteit               | 8.8     |                 |
| fu                      | 800.00  | MPa             |
| As                      | 157.00  | mm <sup>2</sup> |
| do                      | 18.00   | mm              |
| S                       | 24.00   | mm              |
| e                       | 26.75   | mm              |
| h kop                   | 10.00   | mm              |
| h moer                  | 13.00   | mm              |

Bout positie

| rij | y[mm]  | afstand[mm] |
|-----|--------|-------------|
| 1   | 245.00 | 87.00       |
| 2   | 195.00 | 87.00       |
| 3   | 65.00  | 87.00       |

**Interne krachten**

| Nummer ULS combinatie 1 |       |    |
|-------------------------|-------|----|
| N                       | -0.00 | kN |
| Vz                      | -0.00 | kN |



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|                         |      |     |
|-------------------------|------|-----|
| Nummer ULS combinatie 1 |      |     |
| My                      | 0.00 | kNm |

Trek onder

**2. Grensmoment MRd****2.1. Grenssterkte van basiscomponenten**

Voor individuele boutrij:

Bt,Rd = 90.43 kN

| rij | Ft,fc,Rd | Ft,ep,Rd |
|-----|----------|----------|
| 3   | 124.37   | 146.49   |
| 2   | 124.37   | 142.29   |
| 1   | 113.48   | 146.49   |

| gegevens |        |    |
|----------|--------|----|
| Vwp,Rd   | 200.37 | kN |
| Fc,wc,Rd | 110.50 | kN |
| Fc,fb,Rd | 398.00 | kN |

**2.2. Bepalen van Mj,Rd**

| rij | h[mm]  | Ft[kN] |
|-----|--------|--------|
| 3   | 224.96 | 110.50 |
| 2   | 94.96  | 0.00   |
| 1   | 44.96  | 0.00   |

Mj,Rd = 24.86 kNm

Mj,Rd = 24.86 kNm(inclusief normaalkracht)

**3. Grenstoestand afschuiving VRd**

VRd = 273.00 kN

**4. Berekening stijfheid****4.1. Ontwerp rotatiestijfheid**

| Sj gegevens |        |         |
|-------------|--------|---------|
| Sj          | 8.51   | MNm/rad |
| Sj,ini      | 8.51   | MNm/rad |
| z           | 224.96 | mm      |
| mu          | 1.00   |         |
| k1          | 3.05   | mm      |
| k2          | 2.86   | mm      |
| keq         | 1.75   | mm      |

**4.2. Classificatie stijfheid**

| Stijfheidsgegevens |             |      |
|--------------------|-------------|------|
| E                  | 210000.00   | MPa  |
| Ib                 | 57900000.00 | mm^4 |

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| Stijfheidsgegevens |           |         |
|--------------------|-----------|---------|
| Lb                 | 11212.16  | mm      |
| type raamwerk      | geschoord |         |
| S1                 | 8.68      | MNm/rad |
| S2                 | 0.54      | MNm/rad |

Systeem VERVORMBAAR

**4.3 Controle vereiste stijfheid**

| Stijfheidsgegevens           |          |         |
|------------------------------|----------|---------|
| Fi y                         | oneindig | MNm/rad |
| Stijfheids aanpassings coef. | 2.00     |         |
| Sj,app                       | oneindig | MNm/rad |
| Sj, onderrand                | 8.68     | MNm/rad |
| Sj,bovenrand                 | oneindig | MNm/rad |

Sj,ini ligt niet binnen de grenzen.

De huidige knooppstijfheid is niet in overeenstemming met de berekende verbinding.

**4.4 Classificatie ductiliteit**

De bezwijkmode ligt niet in de afschuifzone van de kolom.

In de kolomflens hebben we het volgende:

 $t \leq 0.36 \sqrt{f_{ub}/f_y} d$ 

Dit resulteert in een ductiele classificatie voor vervormbaarheid : klasse 1.

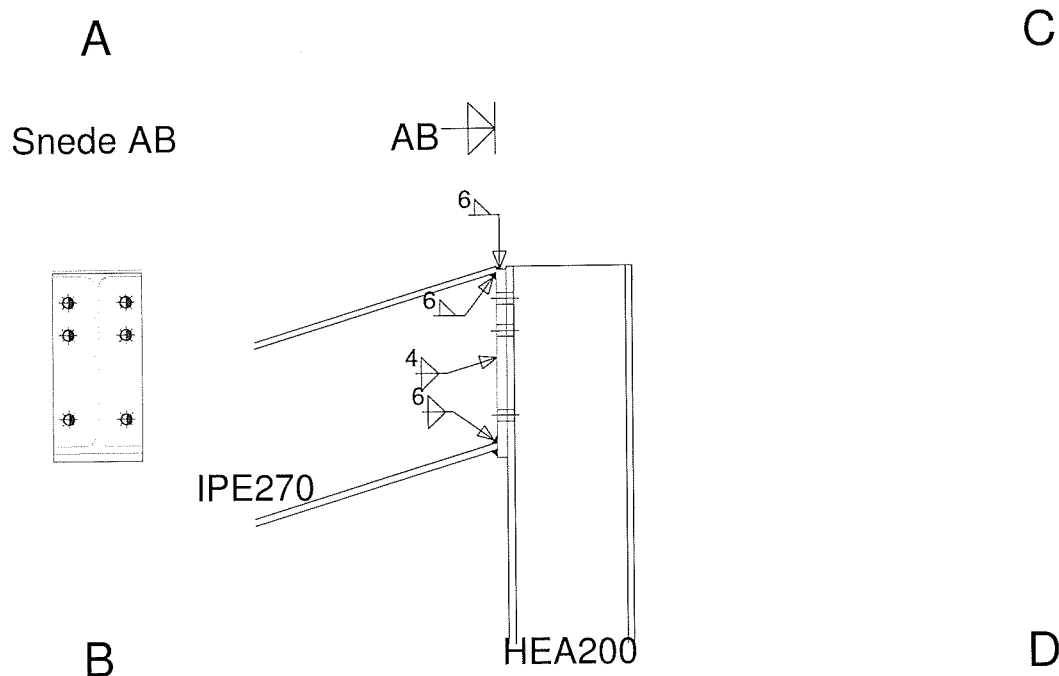
**5. Eenheidscontrole**

| Eenheidscontrole |      |
|------------------|------|
| MSd/MjRd         | 0.00 |
| VSd/VRd          | 0.00 |

De verbinding voldoet.

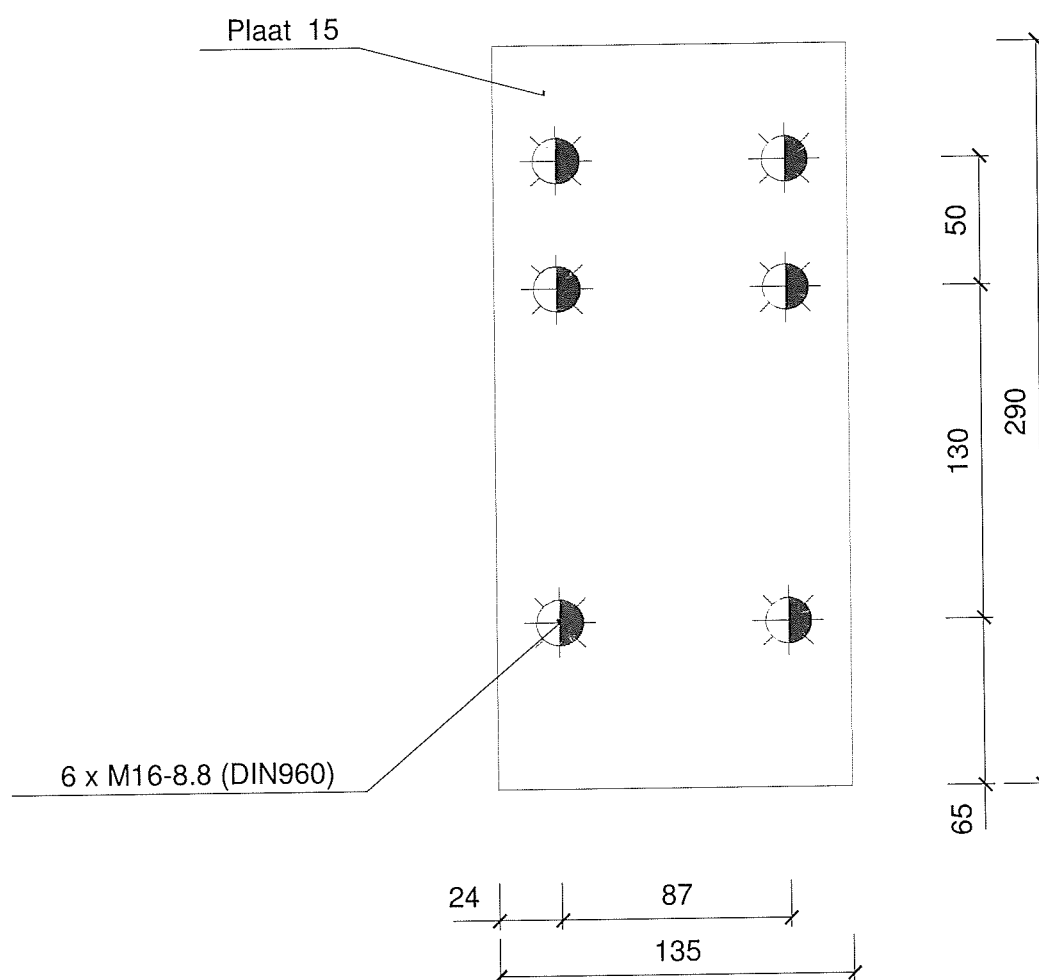
**6. Ontwerpberekeningen**

| gegevens       |      |    |
|----------------|------|----|
| af             | 6.00 | mm |
| aw             | 4.00 | mm |
| Minimale dikte | 4.43 | mm |



Knoop 4 - Geboute verbinding - Frame

## Kopplaat





**ESA-Prima Win versie 3.60.22**

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**Verbinding deel KNIE Nieuw**

Knoop 4 : gelaste ligger-kolom verbinding zijde AB  
Volgens EC3, Revised Annex J

**1. Invoergegevens**

Kolom HEA200

Verb. Staaf IPE270

| Part. veiligheidsfact. |      |
|------------------------|------|
| Gamma M0               | 1.10 |
| Gamma M1               | 1.10 |
| Gamma Mb               | 1.25 |
| Gamma Ms               | 1.25 |
| Gamma Mw               | 1.25 |

| Opdikplaat |        |     |
|------------|--------|-----|
| ls         | 351.58 | mm  |
| bs         | 118.00 | mm  |
| ts         | 8.00   | mm  |
| as         | 6.00   | mm  |
| fy         | 235.00 | MPa |

**verstijver**

Verstijver in trek-zone

Verstijver in druk-zone

| Nr. | pos.[mm] | fy[MPa] |
|-----|----------|---------|
| 1   | 271.58   | 235.00  |
| 2   | 0.00     | 235.00  |

**Interne krachten**

| Nummer ULS combinatie 1 |       |     |
|-------------------------|-------|-----|
| N                       | -0.00 | kN  |
| Vz                      | -0.00 | kN  |
| My                      | 0.00  | kNm |

Trek onder

**2. Grensmoment MRd****2.1. Grenssterkte van basiscomponenten**

|          | gegevens |    |
|----------|----------|----|
| Vwp,Rd   | 285.51   | kN |
| Fc,wc,Rd | 398.00   | kN |
| Fc,fb,Rd | 398.00   | kN |
| Ft,fc,Rd | 398.00   | kN |
| Ft,wc,Rd | 398.00   | kN |

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**2.2. Bepalen van  $M_{j,Rd}$** 

|                           | <b><math>M_{j,Rd}</math> gegevens</b> |     |
|---------------------------|---------------------------------------|-----|
| F                         | 285.51                                | kN  |
| h                         | 272.48                                | mm  |
| $M_{j,Rd}$                | 77.80                                 | kNm |
| $M_{j,Rd}$                | 77.80                                 | kNm |
| (inclusief normaalkracht) |                                       |     |

**3. Grenstoestand afschuiving  $V_{Rd}$** 

$V_{Rd} = 273.00$  kN

**4. Berekening stijfheid****4.1. Ontwerp rotatiestijfheid**

|             | <b><math>S_j</math> gegevens</b> |         |
|-------------|----------------------------------|---------|
| $S_j$       | 55.93                            | MNm/rad |
| $S_{j,ini}$ | 55.93                            | MNm/rad |
| z           | 272.48                           | mm      |
| $\mu$       | 1.00                             |         |
| k1          | 3.59                             | mm      |
| k2          | -                                |         |
| k2          | -                                |         |

**4.2. Classificatie stijfheid**

| <b>Stijfheidsgegevens</b> |             |                 |
|---------------------------|-------------|-----------------|
| E                         | 210000.00   | MPa             |
| I <sub>b</sub>            | 57900000.00 | mm <sup>4</sup> |
| L <sub>b</sub>            | 11212.16    | mm              |
| type raamwerk             | geschoord   |                 |
| S1                        | 8.68        | MNm/rad         |
| S2                        | 0.54        | MNm/rad         |

Systeem ONVERVORMBAAR

**4.3 Controle vereiste stijfheid**

| <b>Stijfheidsgegevens</b>    |          |         |
|------------------------------|----------|---------|
| $F_{iy}$                     | oneindig | MNm/rad |
| Stijfheids aanpassings coef. | 2.00     |         |
| $S_{j,app}$                  | oneindig | MNm/rad |
| $S_{j, onder rand}$          | 8.68     | MNm/rad |
| $S_{j, boven rand}$          | oneindig | MNm/rad |

$S_{j,ini}$  ligt binnen de grenzen.

De knooppstijfheid is in overeenstemming met de berekende verbinding.

**4.4 Classificatie ductiliteit**

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De bezwijkmode is gelegen in de afschuifzone van de kolom.  
Dit resulteert in een ductiele classificatie voor vervormbaarheid : klasse 1.

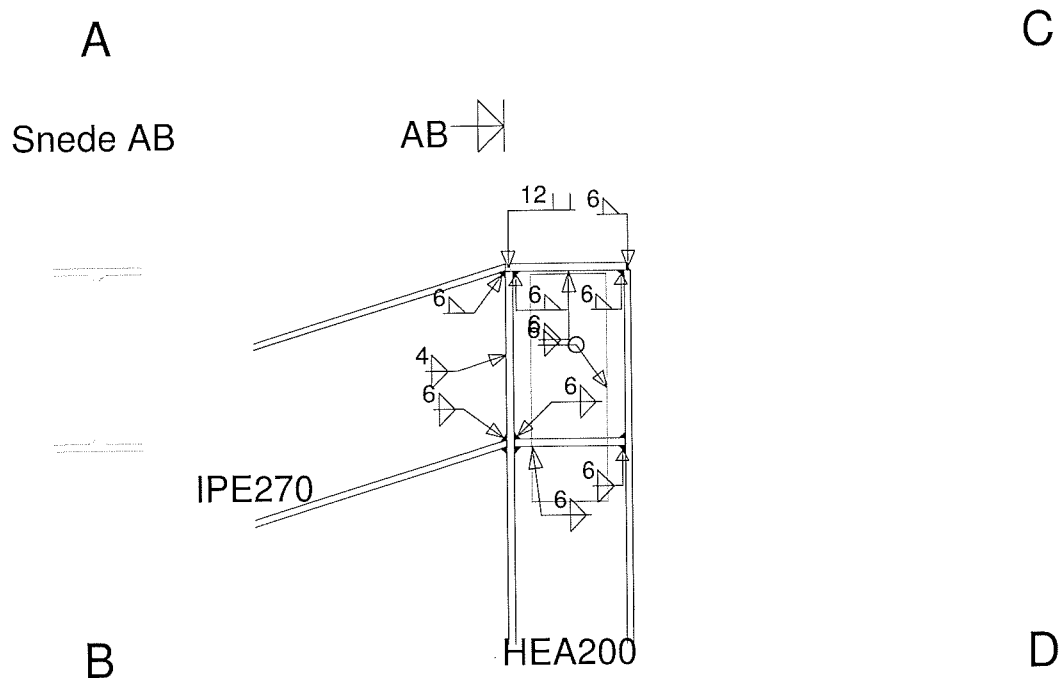
**5. Eenheidscontrole**

| Eenheidscontrole |      |
|------------------|------|
| MSd/MjRd         | 0.00 |
| VSd/VRd          | 0.00 |

De verbinding voldoet.

**6. Ontwerpberekeningen**

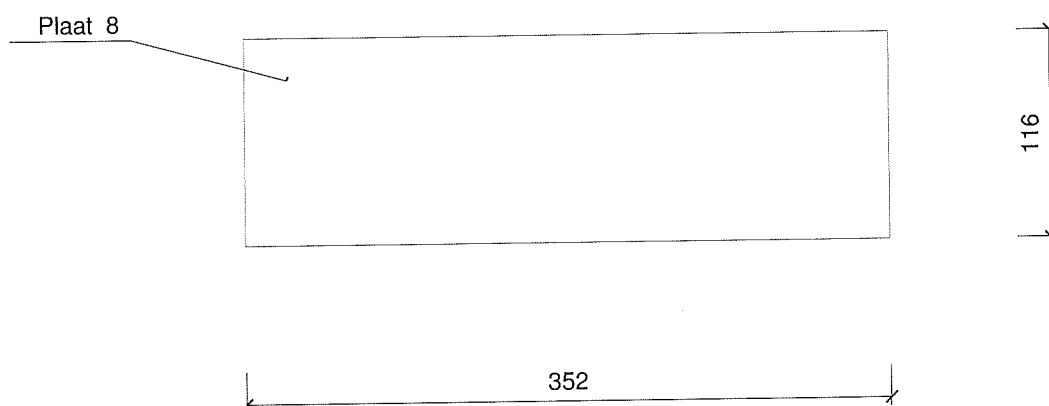
| gegevens       |       |    |
|----------------|-------|----|
| af             | 6.00  | mm |
| aw             | 4.00  | mm |
| Minimale dikte | 10.20 | mm |



Knoop 4 - Gelaste verbinding - Frame



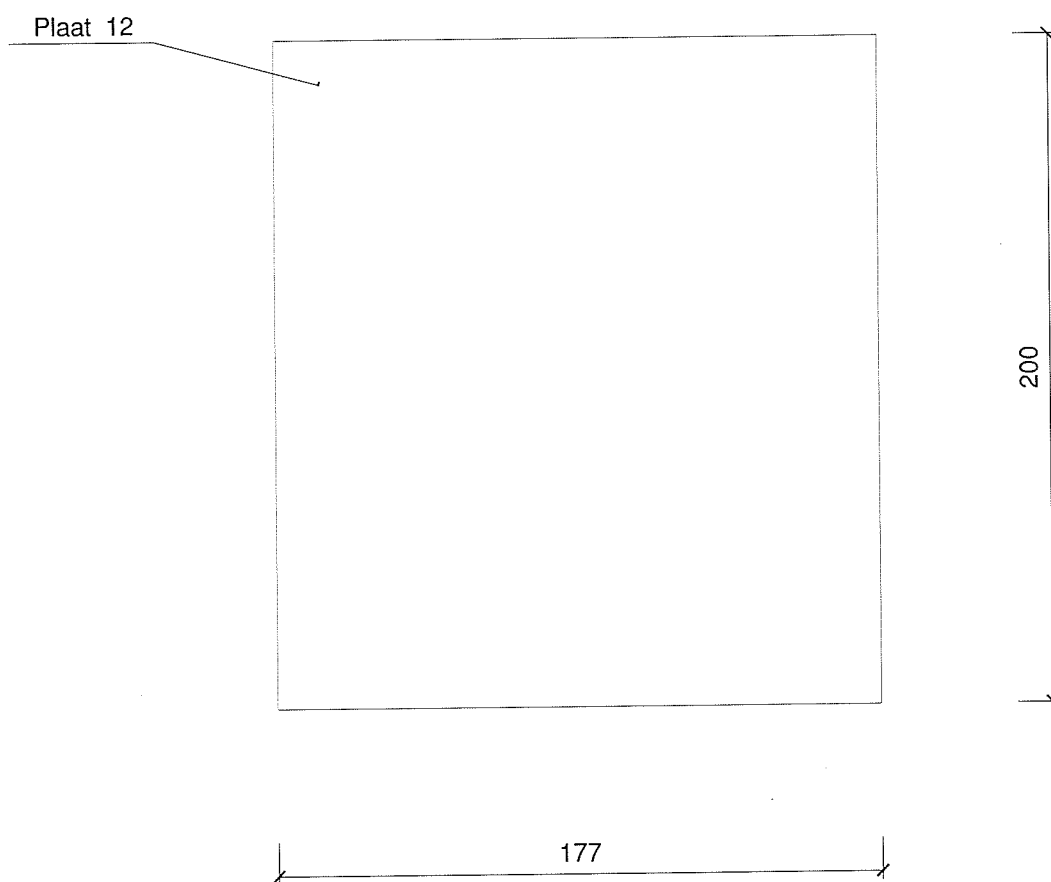
## Opdikplaat



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Knoop 4 - Verbinding deel 1/4

## Verstijver



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Auteur :

Datum : woensdag 22 februari 2012

**Verbinding deel KNIE AZ**

Knoop 2 : gelaste ligger-kolom verbinding zijde CD  
Volgens EC3, Revised Annex J

**1. Invoergegevens**

Kolom IPE270

Verb. Staaf IPE270

| Part. veiligheidsfact. |      |
|------------------------|------|
| Gamma M0               | 1.10 |
| Gamma M1               | 1.10 |
| Gamma Mb               | 1.25 |
| Gamma Ms               | 1.25 |
| Gamma Mw               | 1.25 |

**verstijver**

Verstijver in trek-zone

Verstijver in druk-zone

| Nr. | pos.[mm] | fy[MPa] |
|-----|----------|---------|
| 1   | 271.58   | 235.00  |
| 2   | 0.00     | 235.00  |

**Interne krachten**

| Nummer ULS combinatie 1 |       |     |
|-------------------------|-------|-----|
| N                       | -0.00 | kN  |
| Vz                      | 0.00  | kN  |
| My                      | -0.00 | kNm |

Trek boven

**2. Grensmoment MRd****2.1. Grensterkte van basiscomponenten**

|          | gegevens |    |
|----------|----------|----|
| Vwp,Rd   | 245.70   | kN |
| Fc,wc,Rd | 398.00   | kN |
| Fc,fb,Rd | 398.00   | kN |
| Ft,fc,Rd | 398.00   | kN |
| Ft,wc,Rd | 398.00   | kN |

**2.2. Bepalen van Mj,Rd**

|       | Mj,Rd gegevens |     |
|-------|----------------|-----|
| F     | 245.70         | kN  |
| h     | 272.48         | mm  |
| Mj,Rd | 66.95          | kNm |
| Mj,Rd | 66.95          | kNm |

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Auteur :

Datum : woensdag 22 februari 2012

|                           | Mj,Rd gegevens |  |
|---------------------------|----------------|--|
| (inclusief normaalkracht) |                |  |

**3. Grenstoestand afschuiving VRd**

VRd =273.00 kN

**4. Berekening stijfheid****4.1. Ontwerp rotatiestijfheid**

|        | Sj gegevens |         |
|--------|-------------|---------|
| Sj     | 48.13       | MNm/rad |
| Sj,ini | 48.13       | MNm/rad |
| z      | 272.48      | mm      |
| mu     | 1.00        |         |
| k1     | 3.09        | mm      |
| k2     | -           |         |
| k2     | -           |         |

**4.2. Classificatie stijfheid**

| Stijfheidsgegevens |             |         |
|--------------------|-------------|---------|
| E                  | 210000.00   | MPa     |
| Ib                 | 57900000.00 | mm^4    |
| Lb                 | 11212.16    | mm      |
| type raamwerk      | geschoord   |         |
| S1                 | 8.68        | MNm/rad |
| S2                 | 0.54        | MNm/rad |

Systeem ONVERVORMBAAR

**4.3 Controle vereiste stijfheid**

| Stijfheidsgegevens           |          |         |
|------------------------------|----------|---------|
| Fi y                         | oneindig | MNm/rad |
| Stijfheids aanpassings coef. | 2.00     |         |
| Sj,app                       | oneindig | MNm/rad |
| Sj, onderrand                | 8.68     | MNm/rad |
| Sj,bovenrand                 | oneindig | MNm/rad |

Sj,ini ligt binnen de grenzen.

De knooppstijfheid is in overeenstemming met de berekende verbinding.

**4.4 Classificatie ductiliteit**

De bezwijkmode is gelegen in de afschuifzone van de kolom.

Dit resulteert in een ductiele classificatie voor vervormbaarheid : klasse 1.

**5. Eenheidscontrole**

| Eenheidscontrole |      |
|------------------|------|
| MSd/MjRd         | 0.00 |
| VSd/VRd          | 0.00 |

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De verbinding voldoet.

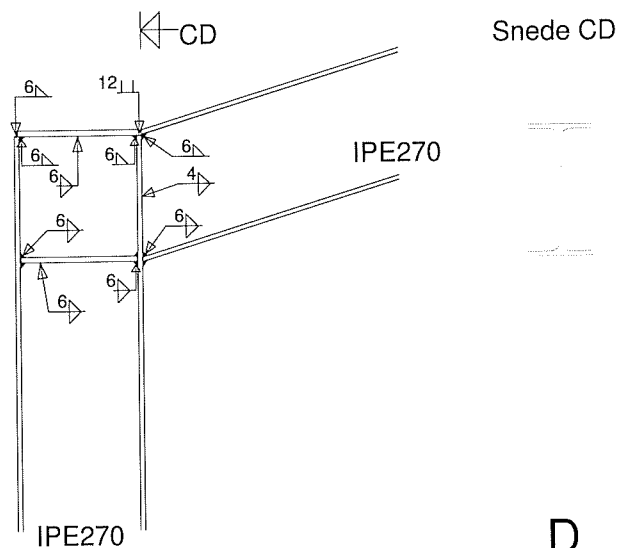
**6. Ontwerpberekeningen**

| gegevens       |       |    |
|----------------|-------|----|
| af             | 6.00  | mm |
| aw             | 4.00  | mm |
| Minimale dikte | 10.20 | mm |



A

C



B

D

Knoop 2 - Gelaste verbinding - Frame



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15/07/2019

Opmerkingen van de constructeur:

## 1 Ankerberekening

### 1.1 Invoergegevens

Ankertype en -afmeting:

HIT-HY 200-A + HIT-Z M12

Artikelnummer:

2018415 HIT-Z M12x196 (insert) / 2022696 HIT-HY 200-A (mortel)

Effectieve verankeringsdiepte:

 $h_{ef, opti} = 130,0 \text{ mm}$  ( $h_{ef, limit} = 144,0 \text{ mm}$ )

Materiaal:

DIN EN ISO 4042

Goedkeuring nr.:

ETA 12/0006

Uitgegeven | Geldig:

30/05/2017 | -

Aantoning:

rekenmethode ETAG methode voor lijmmankers; EOTA TR 029

Afstandsmontage:

 $e_b = 0,0 \text{ mm}$  (geen afstandsmontage);  $t = 12,0 \text{ mm}$ Voetplaat<sup>CBFEM</sup>: $l_x \times l_y \times t = 190,0 \text{ mm} \times 200,0 \text{ mm} \times 12,0 \text{ mm}$ 

Staalprofiel:

IPBi/HEA, IPBi 200 / HE 200 A;  $(L \times B \times D \times FD) = 190,0 \text{ mm} \times 200,0 \text{ mm} \times 6,5 \text{ mm} \times 10,0 \text{ mm}$ 

Ondergrond:

gescheurd beton, C20/25,  $f_{c, cube} = 25,00 \text{ N/mm}^2$ ;  $h = 250,0 \text{ mm}$ , Temp. kort/lang: 40/24 °C

Plaatsing:

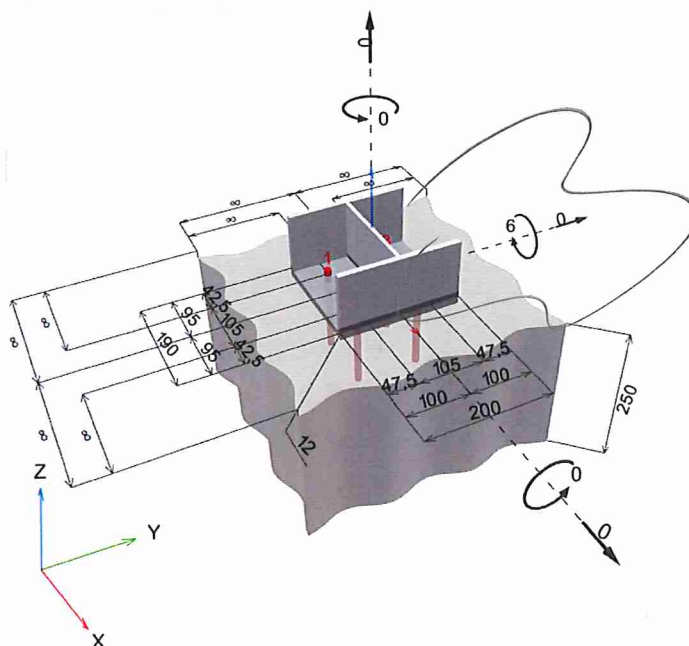
hamergeboord gat, plaatsingsconditie: droog

Wapening:

Geen wapening of wapening met staafafstand  $\geq 150 \text{ mm}$  (elke  $\emptyset$ ) of  $\geq 100$  ( $\emptyset \leq 10 \text{ mm}$ )  
geen rechte randwapening

CBFEM - De ankerberekening is gebaseerd op een eindige-elementenmethode op basis van componenten (CBFEM)

Geometrie [mm] &amp; Belastingen [kN, kNm]



Invoergegevens en resultaten moeten worden gecontroleerd op overeenstemming met de realiteit en op waarschijnlijkheid!  
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## 1.1.1 Belastingscombinatie

| Geval | Omschrijving | Lasten [kN] / Momenten [kNm]                                                       | Seismisch | Brand | Max. uitnutting Anker [%] |
|-------|--------------|------------------------------------------------------------------------------------|-----------|-------|---------------------------|
| 1     | Combinatie 1 | $N = 0,000; V_x = 0,000; V_y = 0,000;$<br>$M_x = 0,000; M_y = 6,000; M_z = 0,000;$ | Nee       | nee   | 100                       |

## 1.2 Belastingssituatie/Resulterende ankerlasten

Belastingssituatie: Rekenwaarden belasting

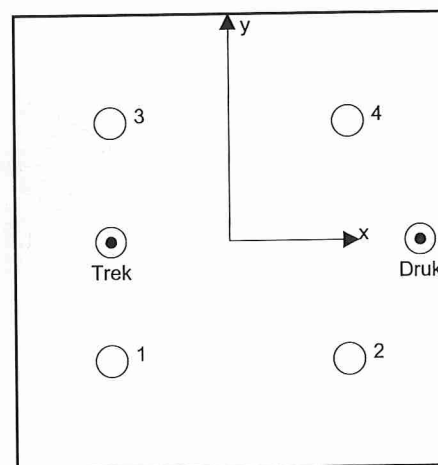
## Ankerreacties [kN]

Trekkracht: (+ Trek, - Druk)

| Anker | Trekkracht | Afschuifkracht | Afschuifkracht x | Afschuifkracht y |
|-------|------------|----------------|------------------|------------------|
| 1     | 22,471     | 0,042          | -0,024           | 0,034            |
| 2     | 0,000      | 0,025          | 0,024            | -0,007           |
| 3     | 22,473     | 0,042          | -0,024           | -0,034           |
| 4     | 0,000      | 0,025          | 0,024            | 0,007            |

resulterende trekkracht in (x/y)=(-52,5/0,0): 44,943 [kN]

resulterende drukkracht in (x/y)=(84,3/0,0): 45,381 [kN]



De ankerkracht wordt berekend op basis van een eindige-elementenmethode op basis van componenten (CBFEM)


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**1.3 Treklast (EOTA TR 029, paragraaf 5.2.2)**

|                                                             | Belasting [kN] | Capaciteit [kN] | Benutting $\beta_N$ [%] | Status |
|-------------------------------------------------------------|----------------|-----------------|-------------------------|--------|
| Staalbreuk*                                                 | 22,473         | 36,667          | 62                      | OK     |
| Gecombineerd bezwijken door uittrekken en betonkegelbreuk** | 44,943         | 52,526          | 86                      | OK     |
| Betonkegelbreuk**                                           | 44,943         | 45,150          | 100                     | OK     |
| Splijten**                                                  | 44,943         | 50,044          | 90                      | OK     |

\* ongunstigste anker    \*\*ankergroep (ankers onder trekbelasting)

**1.3.1 Staalbreuk**

$$N_{Sd} \leq N_{Rd,s} = \frac{N_{Rk,s}}{\gamma_{M,s}} \quad \text{EOTA TR 029, tabel 5.2.2.1}$$

| $N_{Rk,s}$ [kN] | $\gamma_{M,s}$ | $N_{Rd,s}$ [kN] | $N_{Sd}$ [kN] |
|-----------------|----------------|-----------------|---------------|
| 55,000          | 1,500          | 36,667          | 22,473        |


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**1.7 Plaatsingsgegevens**

Voetplaat staal: S 235;  $E = 210.000,00 \text{ N/mm}^2$ ;  $f_{yk} = 235,00 \text{ N/mm}^2$   
 Staalprofiel: IPBi/HEA, IPBi 200 / HE 200 A;  $(L \times B \times D \times FD) = 190,0 \text{ mm} \times 200,0 \text{ mm} \times 6,5 \text{ mm} \times 10,0 \text{ mm}$   
 Gatdiameter in voetplaat (voorstelling) :  $d_f = 14,0 \text{ mm}$   
 Gatdiameter in voetplaat (doorsteekmontage) :  $d_f = 16,0 \text{ mm}$   
 Voetplaatdikte (invoer):  $12,0 \text{ mm}$

Ankertype en -afmeting: HIT-HY 200-A + HIT-Z M12  
 Artikelnummer: 2018415 HIT-Z M12x196 (insert) / 2022696 HIT-HY 200-A (mortel)  
 Aandraaimoment: 40 Nm  
 Boorgatdiameter in het basismateriaal: 14,0 mm  
 Boorgatdiepte in ondergrond: 160,0 mm  
 Minimale dikte van de ondergrond: 190,0 mm

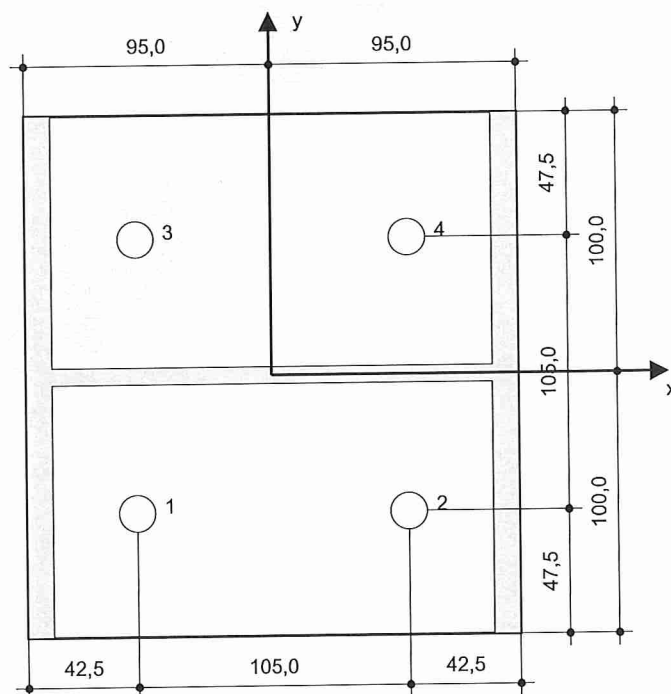
Boormethode: Hamergeboord

Boorgatreiniging: Boorgatreiniging is niet noodzakelijk

Hilti HIT-Z niet-reinigend geborgd spreidanker met HIT-HY 200 injectiemortel met 130 mm verankeringsdiepte  $h_{ef}$ , M12, Verzinkt staal, Hamerboren installatie volgens ETA 12/0006

**1.7.1 Vereiste toebehoren**

| Boren                                                                                               | Boorgatreiniging                                                             | Plaatsing                                                                                                            |
|-----------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> <li>• Hamerboormachine</li> <li>• Juiste boordiameter</li> </ul> | <ul style="list-style-type: none"> <li>• Geen toebehoren benodigd</li> </ul> | <ul style="list-style-type: none"> <li>• Dispenser inclusief cassette en mixtuit</li> <li>• Momentsleutel</li> </ul> |


**Ankercoördinaten mm**

| Anker | x     | y     | $c_{-x}$ | $c_{+x}$ | $c_{-y}$ | $c_{+y}$ |
|-------|-------|-------|----------|----------|----------|----------|
| 1     | -52,5 | -52,5 | -        | -        | -        | -        |
| 2     | 52,5  | -52,5 | -        | -        | -        | -        |
| 3     | -52,5 | 52,5  | -        | -        | -        | -        |
| 4     | 52,5  | 52,5  | -        | -        | -        | -        |

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## 2.4 Profiel/Verstevigingsribben/voetplaat

Profiel en verstevigingen zijn geverifieerd op het niveau van de verbinding van staal aan beton. Het verbindingsoptwerp vervangt niet het staalontwerp voor kritische doorsneden, dat moet worden uitgevoerd buiten PROFIS Engineering.

### 2.4.1 Equivalente spanning en plastische rek

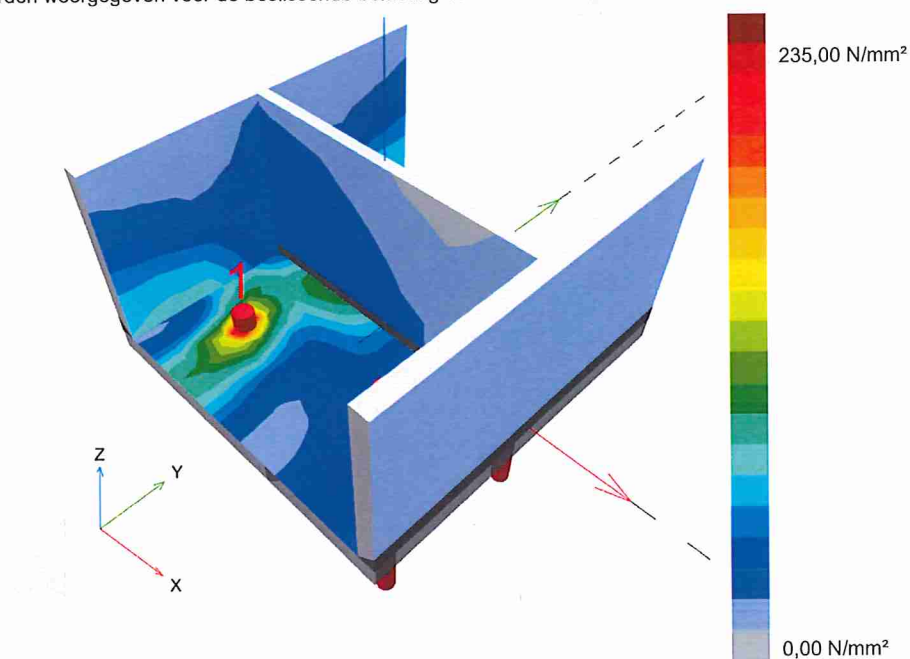
Criteria uiterste grenstoestand volgens EN1993-1-5 bijlage C.8, (1) 2.

#### Resultaten

| Deel    | Belastingscombinatie | Materiaal | $\sigma_{Ed}$ [N/mm <sup>2</sup> ] | $\epsilon_{Pl}$ [%] | $f_y$ [N/mm <sup>2</sup> ] | $\gamma_{M0}$ | $f_y/\gamma_{M0}$ [N/mm <sup>2</sup> ] | $\epsilon_{lim}$ [%] | Status |
|---------|----------------------|-----------|------------------------------------|---------------------|----------------------------|---------------|----------------------------------------|----------------------|--------|
| Plaat   | Combinatie 1         | S 235     | 197,52                             | 0,00                | 235,00                     | 1,00          | 235,00                                 | 5,00                 | OK     |
| Profiel | Combinatie 1         | S 235     | 80,74                              | 0,00                | 235,00                     | 1,00          | 235,00                                 | 5,00                 | OK     |

#### 2.4.1.1 Spanningsequivalent

Onderstaande resultaten worden weergegeven voor de beslissende belasting combinatie: 1 - Combinatie 1





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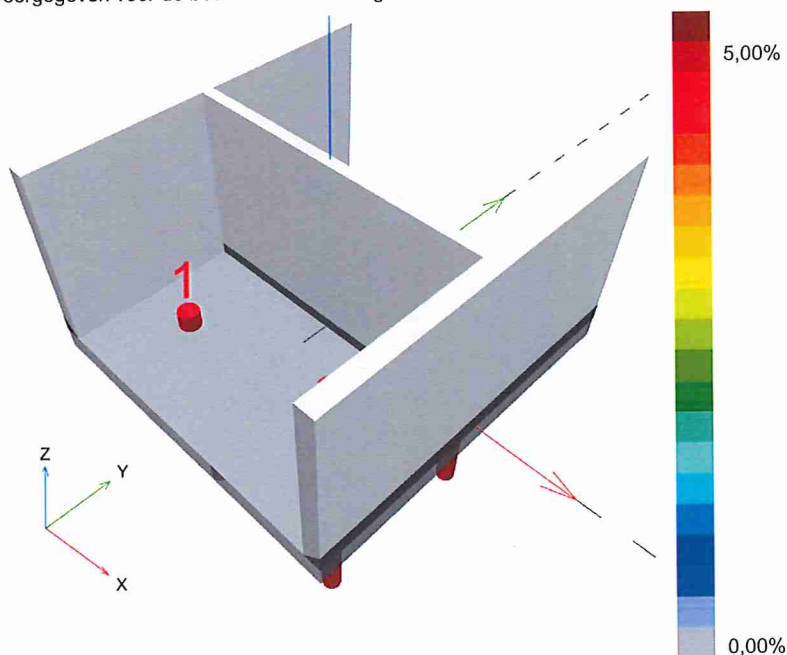
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#### 2.4.1.2 Plastische rek

Onderstaande resultaten worden weergegeven voor de beslissende belasting combinatie: 1 - Combinatie 1



#### 2.4.2 weerstand van de voetplaat ter plaatse van het gat

Maatgevende belastingscombinatie: 1 - Combinatie 1

Weerstand van de voetplaat ter plaatse van het gat, EN1993-1 - 8 section 3.6.1:

#### Vergelijkingen

$$F_{b,Rd} = \frac{k_1 a_b f_u d t}{\gamma_{M2}}$$

$$\text{Benutting} = \frac{V_{Ed}}{F_{b,Rd}}$$

#### Parameters

|         | $k_1$ | $a_b$ | $f_u$ [N/mm <sup>2</sup> ] | $d$ [mm] | $t$ [mm] | $\gamma_{M2}$ |
|---------|-------|-------|----------------------------|----------|----------|---------------|
| Anker 1 | 2,50  | 1,00  | 360,00                     | 12,0     | 12,0     | 1.25          |
| Anker 2 | 2,50  | 1,00  | 360,00                     | 12,0     | 12,0     | 1.25          |
| Anker 3 | 2,50  | 1,00  | 360,00                     | 12,0     | 12,0     | 1.25          |
| Anker 4 | 2,50  | 1,00  | 360,00                     | 12,0     | 12,0     | 1.25          |

#### Resultaten

|         | $V_{Ed}$ [kN] | $F_{b,Rd}$ [kN] | Benutting [%] | Status |
|---------|---------------|-----------------|---------------|--------|
| Anker 1 | 0,042         | 103,680         | 1             | OK     |
| Anker 2 | 0,025         | 103,680         | 1             | OK     |
| Anker 3 | 0,042         | 103,680         | 1             | OK     |
| Anker 4 | 0,025         | 103,680         | 1             | OK     |

Invoergegevens en resultaten moeten worden gecontroleerd op overeenstemming met de realiteit en op waarschijnlijkheid!  
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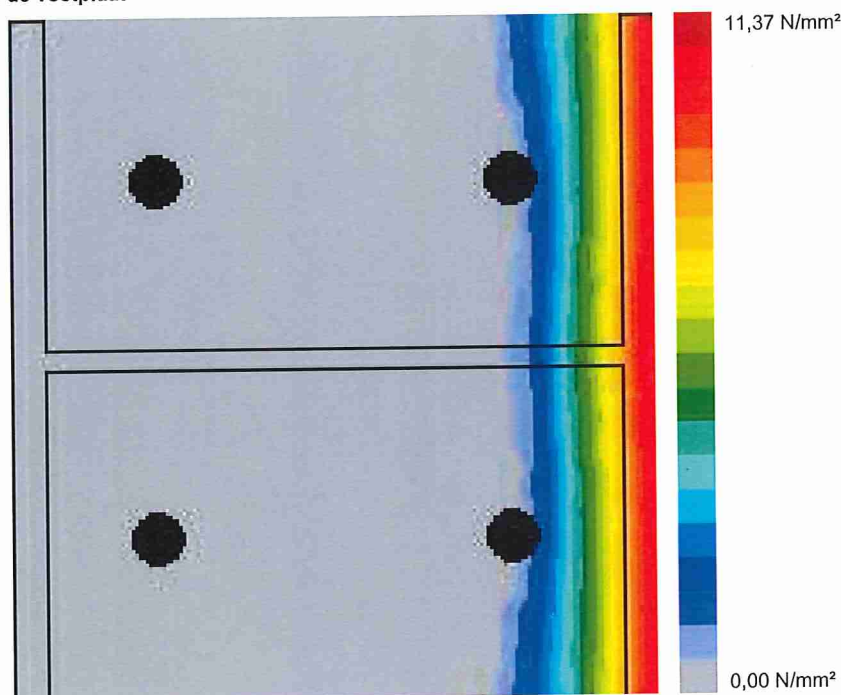
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## 2.5 Beton

Maatgevende belastingscombinatie: 1 - Combinatie 1

Conform EN1992-1-1 sectie 6.7(4) moet het beton voldoende wapening hebben om rekening te houden met de trekkrachten die ontstaan als gevolg van de bevestiging. De definitie van de wapening in het beton valt buiten het bereik van van PROFIS Engineering.

### 2.5.1 Compressie in beton onder de voetplaat



### 2.5.2 Verificatie van compressie in beton onder de voetplaat volgens EN1992-1 sectie 6,7 en EN1993-1-8, sectie 6.2.5

#### Vergelijkingen

$$f_{jd} = \frac{\beta_j k_j \alpha_{cc} f_{ck}}{\gamma_c}$$

$$\sigma = \frac{N}{A_{eff}}$$

$$\text{Benutting} = \frac{\sigma}{f_{jd}}$$

#### Parameters

| N [kN] | A <sub>eff</sub> [mm²] | β <sub>j</sub> | k <sub>j</sub> | α <sub>cc</sub> | f <sub>ck</sub> [N/mm²] | γ <sub>c</sub> |
|--------|------------------------|----------------|----------------|-----------------|-------------------------|----------------|
| 45,381 | 6.427                  | 0,67           | 3,00           | 1,00            | 20,00                   | 1,50           |

#### Resultaten

| σ [N/mm²] | f <sub>jd</sub> [N/mm²] | Benutting [%] | Status |
|-----------|-------------------------|---------------|--------|
| 7,06      | 26,80                   | 27            | OK     |

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### 3 Samenvatting van de resultaten

Ontwerp van de voetplaat, ankers, lassen en andere elementen zijn gebaseerd op CBFEM (component op basis van eindige elementenmethode) en Eurocode.

|           | Belastingscombinatie | Maximale uitnutting | Status |
|-----------|----------------------|---------------------|--------|
| Ankers    | Combinatie 1         | 100%                | OK     |
| Voetplaat | Combinatie 1         | 85%                 | OK     |
| Beton     | Combinatie 1         | 27%                 | OK     |
| Profiel   | Combinatie 1         | 35%                 | OK     |

**Verbinding is VEILIG!**



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Opmerkingen van de constructeur:

## 1 Ankerberekening

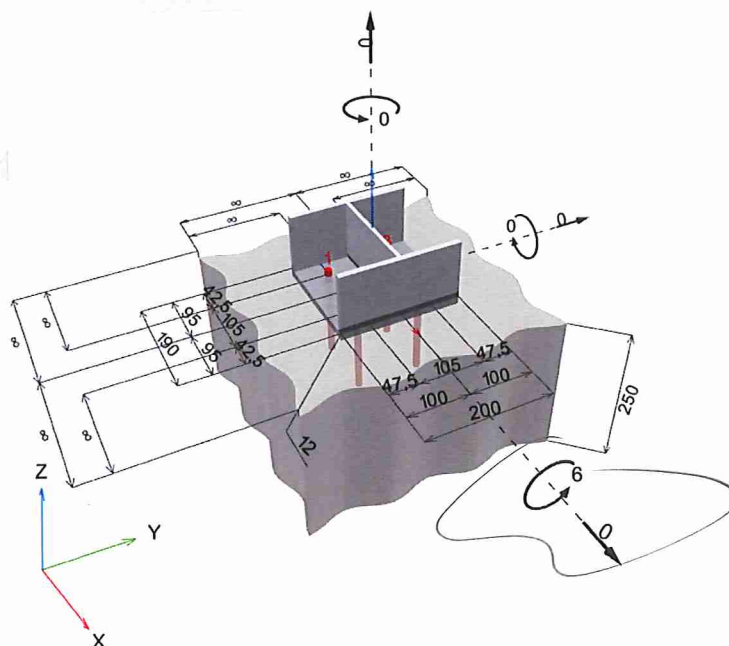
### 1.1 Invoergegevens

|                                |                                                                                                                                                                   |
|--------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Ankertype en -afmeting:        | HIT-HY 200-A + HIT-Z M12                                                                                                                                          |
| Artikelnummer:                 | 2018415 HIT-Z M12x196 (insert) / 2022696 HIT-HY 200-A (mortel)                                                                                                    |
| Effectieve verankeringsdiepte: | $h_{ef, opti} = 140,0 \text{ mm}$ ( $h_{ef, limit} = 144,0 \text{ mm}$ )                                                                                          |
| Materiaal:                     | DIN EN ISO 4042                                                                                                                                                   |
| Goedkeuring nr.:               | ETA 12/0006                                                                                                                                                       |
| Uitgegeven   Geldig:           | 30/05/2017   -                                                                                                                                                    |
| Aantoning:                     | rekenmethode ETAG methode voor lijmmankers; EOTA TR 029                                                                                                           |
| Afstandsmontage:               | $e_b = 0,0 \text{ mm}$ (geen afstandsmontage); $t = 12,0 \text{ mm}$                                                                                              |
| Voetplaat <sup>CBFEM</sup> :   | $l_x \times l_y \times t = 190,0 \text{ mm} \times 200,0 \text{ mm} \times 12,0 \text{ mm}$ ;                                                                     |
| Staalprofiel:                  | IPBi/HEA, IPBi 200 / HE 200 A; $(L \times B \times D \times FD) = 190,0 \text{ mm} \times 200,0 \text{ mm} \times 6,5 \text{ mm} \times 10,0 \text{ mm}$          |
| Ondergrond:                    | gescheurd beton, C20/25, $f_{c, cube} = 25,00 \text{ N/mm}^2$ ; $h = 250,0 \text{ mm}$ , Temp. kort/lang: 40/24 °C                                                |
| Plaatsing:                     | hamergeboord gat, plaatsingsconditie: droog                                                                                                                       |
| Wapening:                      | Geen wapening of wapening met staafafstand $\geq 150 \text{ mm}$ (elke $\emptyset$ ) of $\geq 100$ ( $\emptyset \leq 10 \text{ mm}$ )<br>geen rechte randwapening |



<sup>CBFEM</sup> - De ankerberekening is gebaseerd op een eindige-elementenmethode op basis van componenten (CBFEM)

### Geometrie [mm] & Belastingen [kN, kNm]







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## 1.1.1 Belastingscombinatie

| Geval | Omschrijving | Lasten [kN] / Momenten [kNm]                                                       | Seismisch | Brand | Max. uitnutting Anker [%] |
|-------|--------------|------------------------------------------------------------------------------------|-----------|-------|---------------------------|
| 1     | Combinatie 1 | $N = 0,000; V_x = 0,000; V_y = 0,000;$<br>$M_x = 6,000; M_y = 0,000; M_z = 0,000;$ | Nee       | nee   | 100                       |

## 1.2 Belastingssituatie/Resulterende ankerlasten

Belastingssituatie: Rekenwaarden belasting

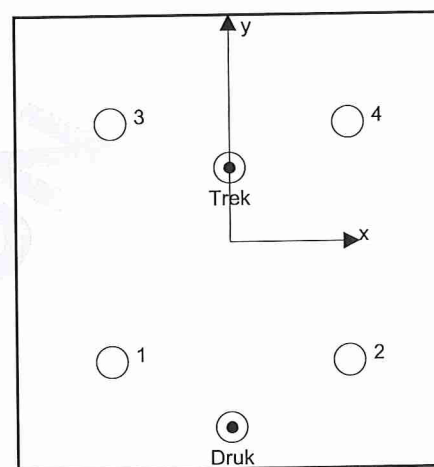
## Ankerreacties [kN]

Trekkraft: (+ Trek, - Druk)

| Anker | Trekkraft | Afschuifkracht | Afschuifkracht x | Afschuifkracht y |
|-------|-----------|----------------|------------------|------------------|
| 1     | 5,047     | 0,007          | 0,005            | -0,005           |
| 2     | 5,046     | 0,007          | -0,005           | -0,005           |
| 3     | 21,808    | 0,055          | -0,055           | 0,005            |
| 4     | 21,818    | 0,055          | 0,055            | 0,005            |

resulterende trekkraft in (x/y)=(0,0/32,8): 53,720 [kN]

resulterende drukkraft in (x/y)=(0,1/-81,7): 54,463 [kN]



De ankerkracht wordt berekend op basis van een eindige-elementenmethode op basis van componenten (CBFEM)



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### 1.7 Plaatsingsgegevens

Voetplaat staal: S 235;  $E = 210.000,00 \text{ N/mm}^2$ ;  $f_{yk} = 235,00 \text{ N/mm}^2$   
 Staalprofiel: IPBi/HEA, IPBI 200 / HE 200 A;  $(L \times B \times D \times FD) = 190,0 \text{ mm} \times 200,0 \text{ mm} \times 6,5 \text{ mm} \times 10,0 \text{ mm}$   
 Gatdiameter in voetplaat (voorstelling) :  $d_f = 14,0 \text{ mm}$   
 Gatdiameter in voetplaat (doorsteekmontage) :  $d_f = 16,0 \text{ mm}$   
 Voetplaatdikte (invoer):  $12,0 \text{ mm}$

Ankertype en -afmeting: HIT-HY 200-A + HIT-Z M12  
 Artikelnummer: 2018415 HIT-Z M12x196 (insert) / 2022696 HIT-HY 200-A (mortel)  
 Aandraaimoment:  $40 \text{ Nm}$   
 Boorgatdiameter in het basismateriaal:  $14,0 \text{ mm}$   
 Boorgatdiepte in ondergrond:  $170,0 \text{ mm}$   
 Minimale dikte van de ondergrond:  $200,0 \text{ mm}$

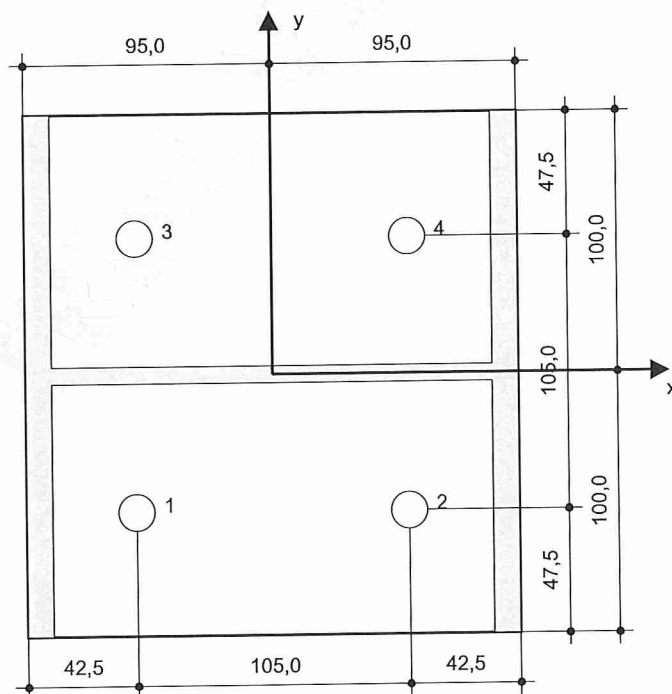
Boormethode: Hamergeboord

Boorgatreiniging: Boorgatreiniging is niet noodzakelijk

Hilti HIT-Z niet-reinigend geborgd spreidanker met HIT-HY 200 injectiemortel met  $140 \text{ mm}$  verankeringsdiepte  $h_{ef}$ , M12, Verzinkt staal, Hamerboren installatie volgens ETA 12/0006

#### 1.7.1 Vereiste toebehoren

| Boren                                                                                               | Boorgatreiniging                                                             | Plaatsing                                                                                                            |
|-----------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> <li>• Hamerboormachine</li> <li>• Juiste boordiameter</li> </ul> | <ul style="list-style-type: none"> <li>• Geen toebehoren benodigd</li> </ul> | <ul style="list-style-type: none"> <li>• Dispenser inclusief cassette en mixtuit</li> <li>• Momentsleutel</li> </ul> |



#### Ankercoördinaten mm

| Anker | x     | y     | c <sub>-x</sub> | c <sub>+x</sub> | c <sub>-y</sub> | c <sub>+y</sub> |
|-------|-------|-------|-----------------|-----------------|-----------------|-----------------|
| 1     | -52,5 | -52,5 | -               | -               | -               | -               |
| 2     | 52,5  | -52,5 | -               | -               | -               | -               |
| 3     | -52,5 | 52,5  | -               | -               | -               | -               |
| 4     | 52,5  | 52,5  | -               | -               | -               | -               |

Invoergegevens en resultaten moeten worden gecontroleerd op overeenstemming met de realiteit en op waarschijnlijkheid!  
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Bladzijde:  
 Constructeur:  
 E-mail:  
 Datum:

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## 2.4 Profiel/Verstevigingsribben/voetplaat

Profiel en verstevigingen zijn geverifieerd op het niveau van de verbinding van staal aan beton. Het verbindingsoptwerp vervangt niet het staalontwerp voor kritische doorsneden, dat moet worden uitgevoerd buiten PROFIS Engineering.

### 2.4.1 Equivalente spanning en plastische rek

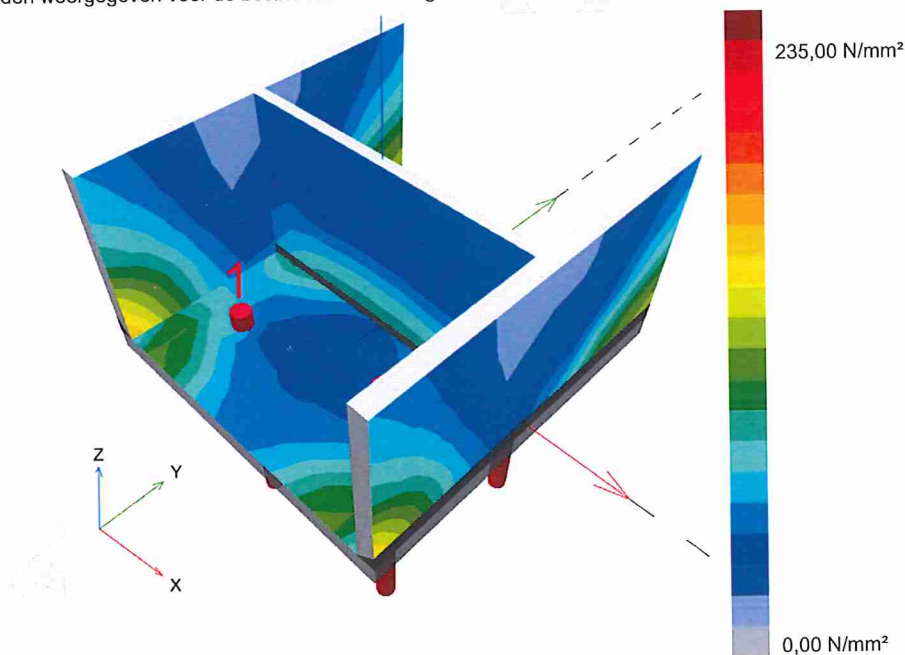
Criteria uiterste grenstoestand volgens EN1993-1-5 bijlage C.8, (1) 2.

#### Resultaten

| Deel    | Belastingscombinatie | Materiaal | $\sigma_{Ed}$ [N/mm <sup>2</sup> ] | $\epsilon_{Pl}$ [%] | $f_y$ [N/mm <sup>2</sup> ] | $\gamma_{M0}$ | $f_y/\gamma_{M0}$ [N/mm <sup>2</sup> ] | $\epsilon_{lim}$ [%] | Status |
|---------|----------------------|-----------|------------------------------------|---------------------|----------------------------|---------------|----------------------------------------|----------------------|--------|
| Plaat   | Combinatie 1         | S 235     | 217,09                             | 0,01                | 235,00                     | 1,00          | 235,00                                 | 5,00                 | OK     |
| Profiel | Combinatie 1         | S 235     | 147,04                             | 0,00                | 235,00                     | 1,00          | 235,00                                 | 5,00                 | OK     |

#### 2.4.1.1 Spanningsequivalent

Onderstaande resultaten worden weergegeven voor de beslissende belasting combinatie: 1 - Combinatie 1





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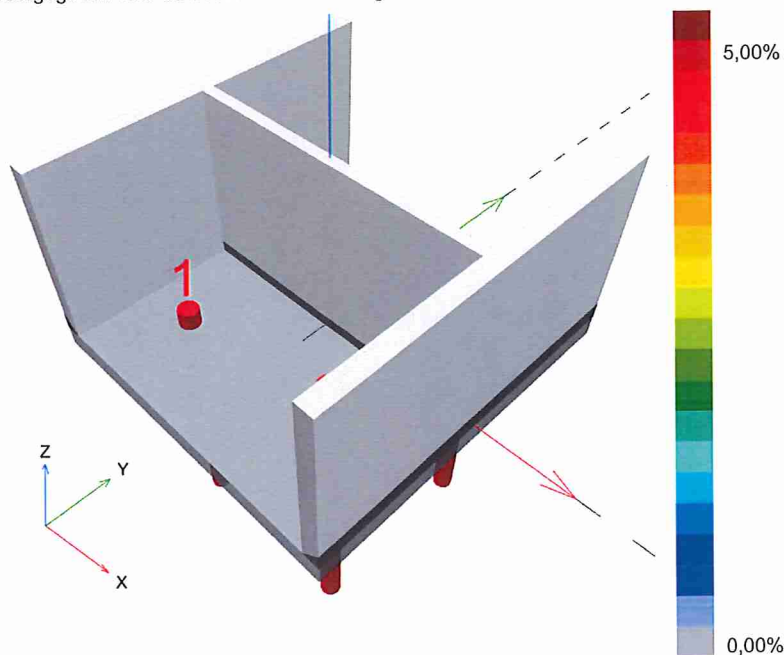
Bladzijde:  
 Constructeur:  
 E-mail:  
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13

15/07/2019

#### 2.4.1.2 Plastische rek

Onderstaande resultaten worden weergegeven voor de beslissende belasting combinatie: 1 - Combinatie 1



#### 2.4.2 weerstand van de voetplaat ter plaatse van het gat

Maatgevende belastingscombinatie: 1 - Combinatie 1

Weerstand van de voetplaat ter plaatse van het gat, EN1993-1 - 8 section 3.6.1:

##### Vergelijkingen

$$F_{b,Rd} = \frac{k_1 a_b f_u d t}{\gamma_{M2}}$$

$$\text{Benutting} = \frac{V_{Ed}}{F_{b,Rd}}$$

##### Parameters

|         | $k_1$ | $a_b$ | $f_u$ [N/mm <sup>2</sup> ] | $d$ [mm] | $t$ [mm] | $\gamma_{M2}$ |
|---------|-------|-------|----------------------------|----------|----------|---------------|
| Anker 1 | 2,50  | 1,00  | 360,00                     | 12,0     | 12,0     | 1.25          |
| Anker 2 | 2,50  | 1,00  | 360,00                     | 12,0     | 12,0     | 1.25          |
| Anker 3 | 2,50  | 1,00  | 360,00                     | 12,0     | 12,0     | 1.25          |
| Anker 4 | 2,50  | 1,00  | 360,00                     | 12,0     | 12,0     | 1.25          |

##### Resultaten

|         | $V_{Ed}$ [kN] | $F_{b,Rd}$ [kN] | Benutting [%] | Status |
|---------|---------------|-----------------|---------------|--------|
| Anker 1 | 0,007         | 103,680         | 1             | OK     |
| Anker 2 | 0,007         | 103,680         | 1             | OK     |
| Anker 3 | 0,055         | 103,680         | 1             | OK     |
| Anker 4 | 0,055         | 103,680         | 1             | OK     |

Invoergegevens en resultaten moeten worden gecontroleerd op overeenstemming met de realiteit en op waarschijnlijkheid!  
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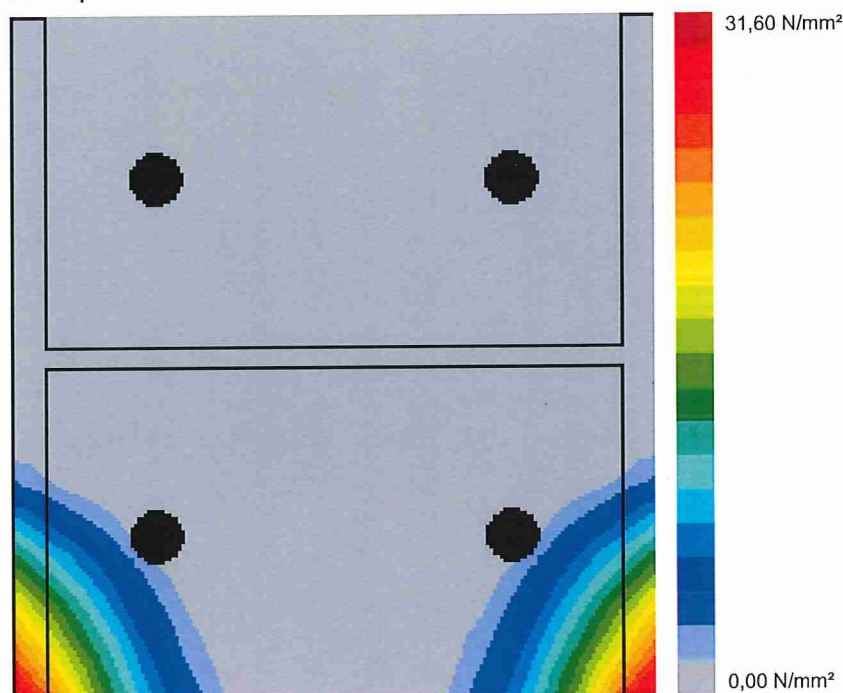
Bladzijde: 14  
 Constructeur:  
 E-mail:  
 Datum: 15/07/2019

## 2.5 Beton

Maatgevende belastingscombinatie: 1 - Combinatie 1

Conform EN1992-1-1 sectie 6.7(4) moet het beton voldoende wapening hebben om rekening te houden met de trekkrachten die ontstaan als gevolg van de bevestiging. De definitie van de wapening in het beton valt buiten het bereik van van PROFIS Engineering.

### 2.5.1 Compressie in beton onder de voetplaat



### 2.5.2 Verificatie van compressie in beton onder de voetplaat volgens EN1992-1 sectie 6,7 en EN1993-1-8, sectie 6.2.5

#### Vergelijkingen

$$f_{jd} = \frac{\beta_j k_j \alpha_{cc} f_{ck}}{\gamma_c}$$

$$\sigma = \frac{N}{A_{eff}}$$

$$Benutting = \frac{\sigma}{f_{jd}}$$

#### Parameters

| N [kN] | A <sub>eff</sub> [mm²] | β <sub>j</sub> | k <sub>j</sub> | α <sub>cc</sub> | f <sub>ck</sub> [N/mm²] | γ <sub>c</sub> |
|--------|------------------------|----------------|----------------|-----------------|-------------------------|----------------|
| 54,463 | 3.392                  | 0,67           | 3,00           | 1,00            | 20,00                   | 1,50           |

#### Resultaten

| σ [N/mm²] | f <sub>jd</sub> [N/mm²] | Benutting [%] | Status |
|-----------|-------------------------|---------------|--------|
| 16,05     | 26,80                   | 60            | OK     |

Invoergegevens en resultaten moeten worden gecontroleerd op overeenstemming met de realiteit en op waarschijnlijkheid!  
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Sub-Project I Pos. Nr.:

Bladzijde: 16  
Constructeur:  
E-mail:  
Datum: 15/07/2019

### 3 Samenvatting van de resultaten

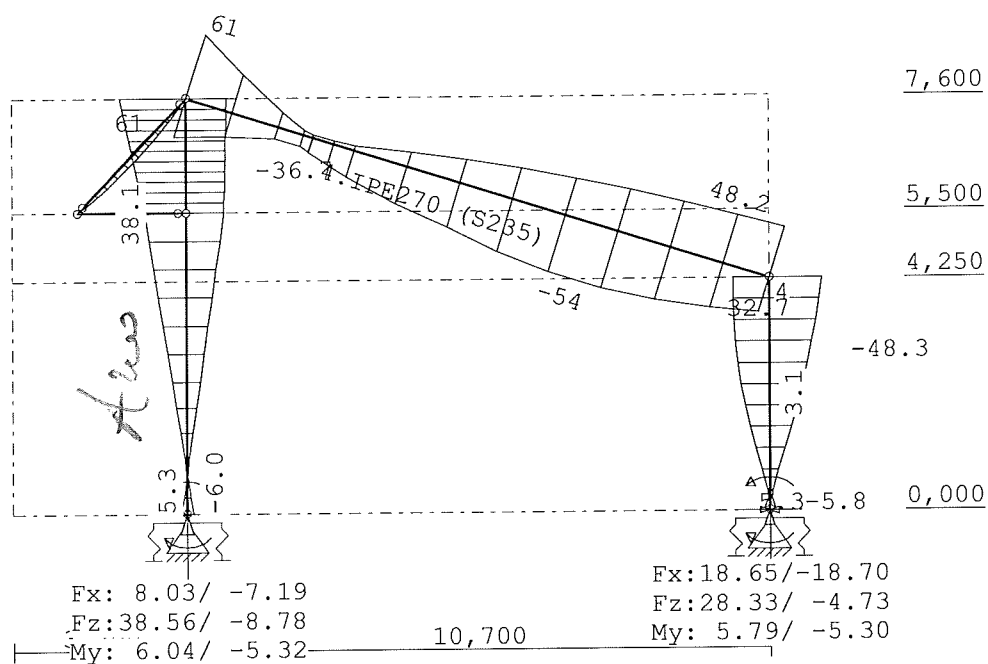
Ontwerp van de voetplaat, ankers, lassen en andere elementen zijn gebaseerd op CBFEM (component op basis van eindige elementenmethode) en Eurocode.

|           | Belastingscombinatie | Maximale uitnutting | Status |
|-----------|----------------------|---------------------|--------|
| Ankers    | Combinatie 1         | 100%                | OK     |
| Voetplaat | Combinatie 1         | 93%                 | OK     |
| Beton     | Combinatie 1         | 60%                 | OK     |
| Profiel   | Combinatie 1         | 63%                 | OK     |

**Verbinding is VEILIG!**

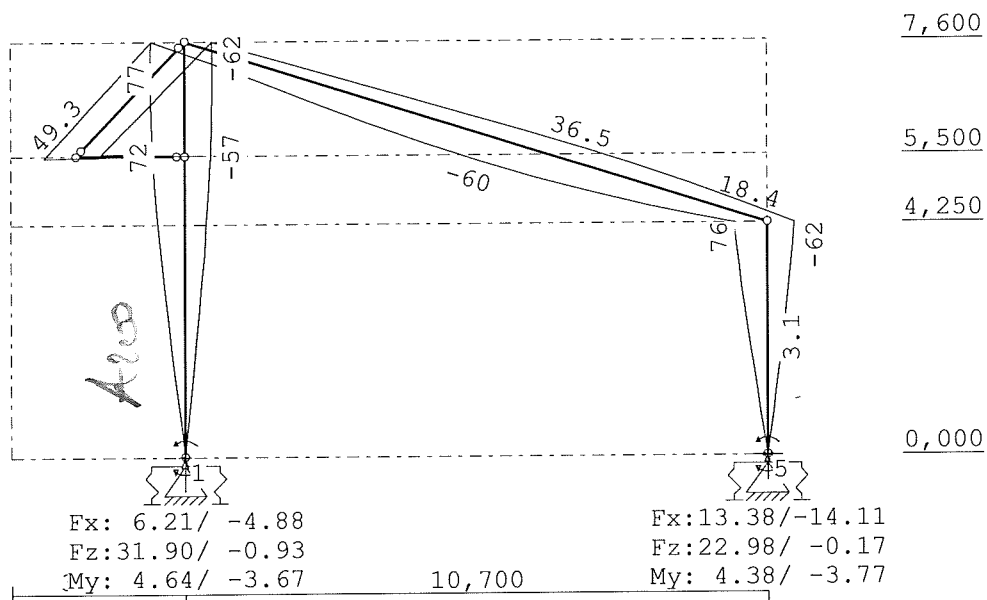
## MOMENTEN

Fundamentele combinatie



## VERPLAATSINGEN [mm]

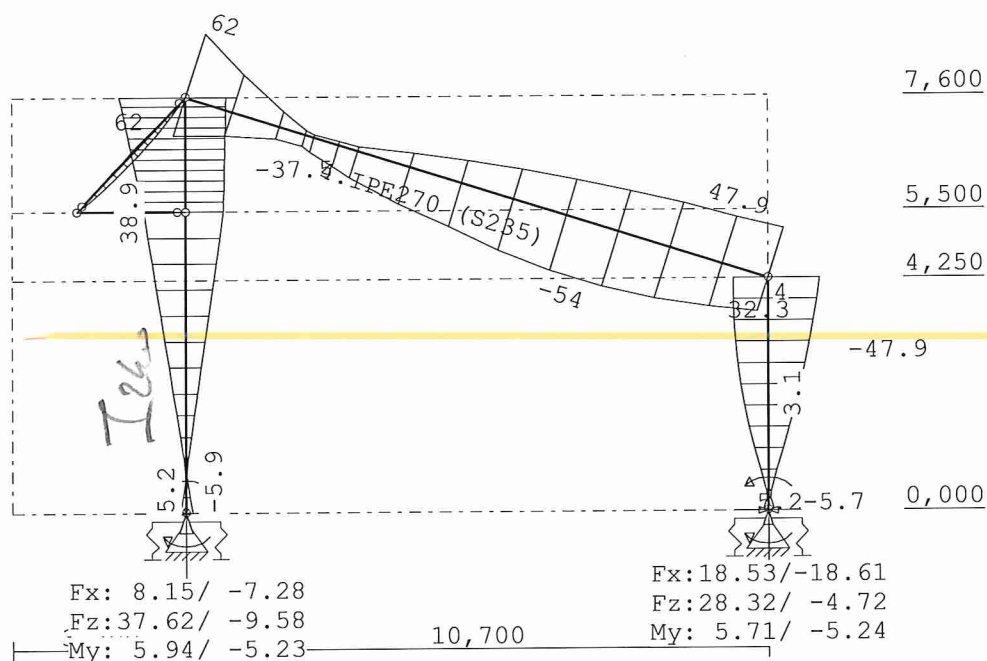
Karakteristieke combinatie



## MOMENTEN

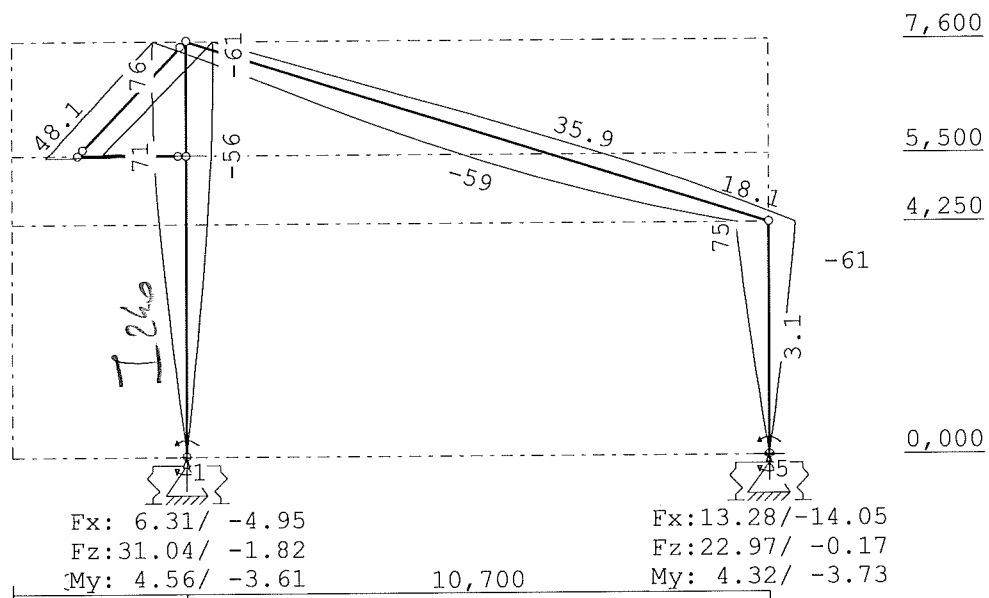
Moogelijkste Rikke

Fundamentele combinatie



## VERPLAATSINGEN [mm]

Karakteristieke combinatie





Project.:

Onderdeel:

Dimensies: kN;m;rad (tenzij anders aangegeven)

Datum....: 10/07/2019

Bestand...: z:\werk\2019\19-071-frenken-reuver-aelmans\werktuigb-1.rww

Belastingbreedte.: 5.750

```
Rekenmodel.....: 1e-orde-elastisch.
```

Theorie voor de bepaling van de krachtsverdeling:

Geometrisch lineair.

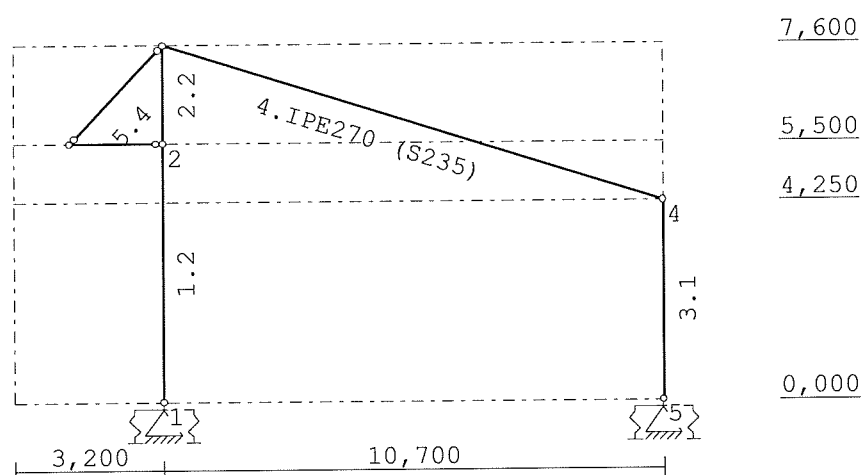
Fysisch lineair.

Gunstige werking van de permanente belasting wordt automatisch verwerkt.

Toegepaste normen volgens Eurocode met Nederlandse NB

|             |                      |                 |             |
|-------------|----------------------|-----------------|-------------|
| Belastingen | NEN-EN 1990:2002     | C2:2010         | NB:2011(nl) |
|             | NEN-EN 1991-1-1:2002 | C1:2009         | NB:2011(nl) |
|             | NEN-EN 1991-1-3:2003 | C1:2009         | NB:2011(nl) |
|             | NEN-EN 1991-1-4:2005 | C2:2011         | NB:2011(nl) |
| Staal       | NEN-EN 1993-1-1:2006 | C2:2011,A1:2016 | NB:2016(nl) |

# GEOMETRIE



## STRAMIENLIJNEN

| Nr. | X      | Z-min | Z-max |
|-----|--------|-------|-------|
| 1   | 0.000  | 0.000 | 7.600 |
| 2   | 10.700 | 0.000 | 7.600 |
| 3   | -3.200 | 0.000 | 7.600 |

## NIVEAUS

| Nr. | Z     | X-min  | X-max  |
|-----|-------|--------|--------|
| 1   | 0.000 | -3.200 | 10.700 |
| 2   | 7.600 | -3.200 | 10.700 |
| 3   | 4.250 | -3.200 | 10.700 |
| 4   | 5.500 | -3.200 | 10.700 |

Project..:

Onderdeel:

**MATERIALEN**

| Mt | Omschrijving | E-modulus[N/mm2] | S.G. | Pois. | Uitz. coëff |
|----|--------------|------------------|------|-------|-------------|
| 1  | S235         | 210000           | 78.5 | 0.30  | 1.2000e-05  |

**PROFIELEN [mm]**

| Prof. | Omschrijving | Materiaal | Oppervlak  | Traagheid  | Vormf. |
|-------|--------------|-----------|------------|------------|--------|
| 1     | IPE270       | 1:S235    | 4.5900e+03 | 5.7900e+07 | 0.00   |
| 2     | HEA200       | 1:S235    | 5.3800e+03 | 3.6920e+07 | 0.00   |
| 3     | HEA100       | 1:S235    | 2.1240e+03 | 3.4900e+06 | 0.00   |
| 4     | IPE200       | 1:S235    | 2.8480e+03 | 1.9430e+07 | 0.00   |

**PROFIELEN vervolg [mm]**

| Prof. | Staaftype | Breedte | Hoogte | e     | Type | b1 | h1 | b2 | h2 |
|-------|-----------|---------|--------|-------|------|----|----|----|----|
| 1     | 0:Normaal | 135     | 270    | 135.0 |      |    |    |    |    |
| 2     | 0:Normaal | 200     | 190    | 95.0  |      |    |    |    |    |
| 3     | 0:Normaal | 100     | 96     | 48.0  |      |    |    |    |    |
| 4     | 0:Normaal | 100     | 200    | 100.0 |      |    |    |    |    |

**PROFIELVORMEN [mm]**

1 IPE270



2 HEA200



3 HEA100



4 IPE200

**KNOPEN**

| Knoop | X      | Z     | Knoop | X      | Z     |
|-------|--------|-------|-------|--------|-------|
| 1     | 0.000  | 0.000 | 6     | -2.006 | 5.500 |
| 2     | 0.000  | 5.500 |       |        |       |
| 3     | 0.000  | 7.600 |       |        |       |
| 4     | 10.700 | 4.250 |       |        |       |
| 5     | 10.700 | 0.000 |       |        |       |

**STAVEN**

| St. | ki | kj | Profiel  | Aansl.i | Aansl.j | Lengte | Opm. |
|-----|----|----|----------|---------|---------|--------|------|
| 1   | 1  | 2  | 2:HEA200 | NDM     | NDM     | 5.500  |      |
| 2   | 2  | 3  | 2:HEA200 | NDM     | NDM     | 2.100  |      |
| 3   | 5  | 4  | 1:IPE270 | NDM     | NDM     | 4.250  |      |
| 4   | 3  | 4  | 1:IPE270 | NDM     | NDM     | 11.212 |      |
| 5   | 6  | 3  | 4:IPE200 | ND      | ND      | 2.904  |      |
| 6   | 6  | 2  | 3:HEA100 | NDM     | ND      | 2.006  |      |

Project..:

Onderdeel:

**VASTE STEUNPUNTEN**

| Nr. | knoop | Kode | XZR 1=vast 0=vrij | Hoek |
|-----|-------|------|-------------------|------|
| 1   | 1     | 110  |                   | 0.00 |
| 2   | 5     | 110  |                   | 0.00 |

**VEREN**

| Veer | Knoop | Richting  | Hoek | Veerwaarde | Type    | Ondergrens | Bovengrens |
|------|-------|-----------|------|------------|---------|------------|------------|
| 1    | 1     | 3:Rotatie | 0.00 | 3.000e+02  | Normaal | -1.000e+10 | 1.000e+10  |
| 2    | 5     | 3:Rotatie | 0.00 | 2.250e+02  | Normaal | -1.000e+10 | 1.000e+10  |

**BELASTINGGEVALLEN**

|   | B.G.                         | Omschrijving                   | Type       |
|---|------------------------------|--------------------------------|------------|
|   | 1                            | Permanente belasting EGZ=-1.00 | 1          |
| g | 2                            | Ver. bel. pers. ed. (p_rep)    | 2          |
| g | 3                            | Ver. bel. pers. ed. (F_rep)    | 3          |
| g | 4                            | Wind van links onderdruk A     | 7          |
| g | 5                            | Wind van links overdruk A      | 8          |
| g | 6                            | Wind van links onderdruk B     | 9          |
| g | 7                            | Wind van links overdruk B      | 10         |
| g | 8                            | Wind van links onderdruk C     | 37         |
| g | 9                            | Wind van links overdruk C      | 38         |
| g | 10                           | Wind van links onderdruk D     | 39         |
| g | 11                           | Wind van links overdruk D      | 40         |
| g | 12                           | Wind van rechts onderdruk A    | 11         |
| g | 13                           | Wind van rechts overdruk A     | 12         |
| g | 14                           | Wind van rechts onderdruk B    | 13         |
| g | 15                           | Wind van rechts overdruk B     | 14         |
| g | 16                           | Wind van rechts onderdruk C    | 41         |
| g | 17                           | Wind van rechts overdruk C     | 42         |
| g | 18                           | Wind van rechts onderdruk D    | 43         |
| g | 19                           | Wind van rechts overdruk D     | 44         |
| g | 20                           | Sneeuw A                       | 22         |
| g | 21                           | Sneeuw B                       | 23         |
| g | 22                           | Sneeuw C                       | 33         |
|   | 23                           | Knik                           | 0 Onbekend |
| g | = gegenereerd belastinggeval |                                |            |

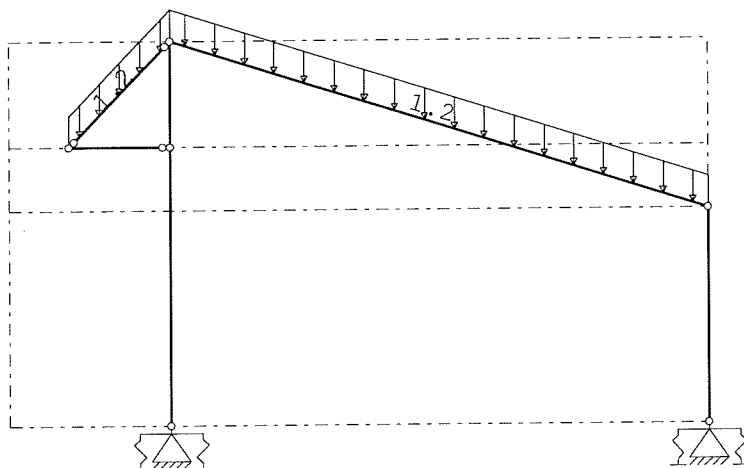
Project..:

Onderdeel:

**BELASTINGEN**

B.G:1 Permanente belasting

Eigen gewicht van alle staven is meegenomen in berekening. Richting:↓

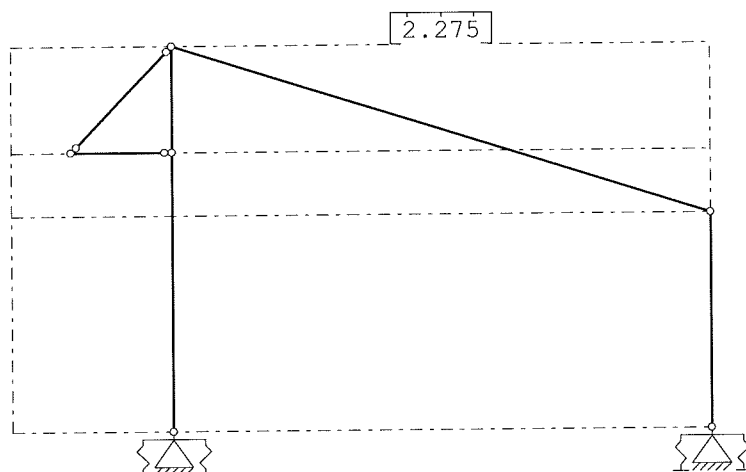
**STAAFBELASTINGEN**

B.G:1 Permanente belasting

| Staat | Type       | q1/p/m | q2    | A     | B     | $\psi_0$ | $\psi_1$ | $\psi_2$ |
|-------|------------|--------|-------|-------|-------|----------|----------|----------|
| 5     | 5:QZGloaal | -1.20  | -1.20 | 0.000 | 0.000 |          |          |          |
| 4     | 5:QZGloaal | -1.20  | -1.20 | 0.000 | 0.000 |          |          |          |

**BELASTINGEN**

B.G:2 Ver. bel. pers. ed. (p\_rep)

**STAAFBELASTINGEN**

B.G:2 Ver. bel. pers. ed. (p\_rep)

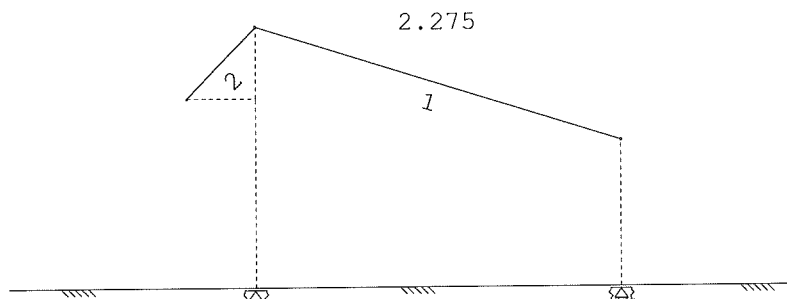
| Staat | Type        | q1/p/m | q2    | A     | B     | $\psi_0$ | $\psi_1$ | $\psi_2$ |
|-------|-------------|--------|-------|-------|-------|----------|----------|----------|
| 4     | 3:QZgeProj. | -2.28  | -2.28 | 4.350 | 4.350 | 0.0      | 0.0      | 0.0      |

Project...:

Onderdeel:

**SITUATIES BELAST/ONBELAST**

B.G:2 Ver. bel. pers. ed. (p\_rep)

**SITUATIES BELAST/ONBELAST**

Belastingtype: P-rep

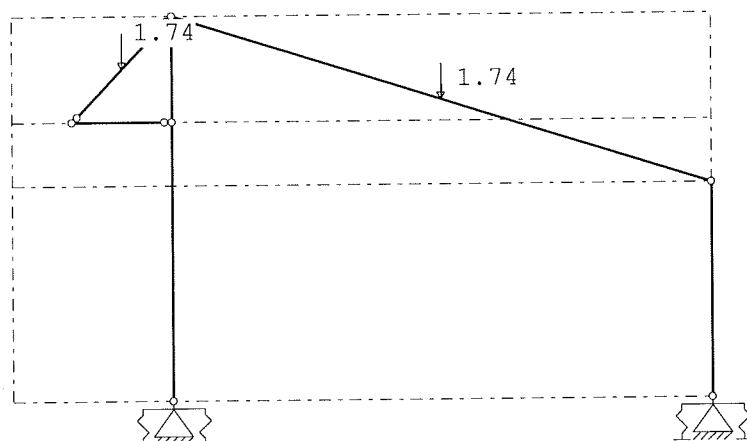
Nr Lastvelden belast

Lastvelden onbelast

1 1,2

**BELASTINGEN**

B.G:3 Ver. bel. pers. ed. (F-rep)

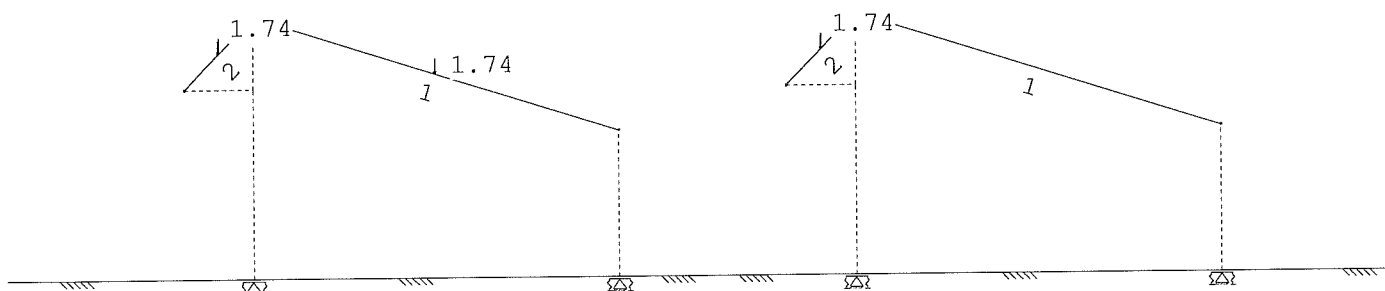
**STAAFBELASTINGEN**

B.G:3 Ver. bel. pers. ed. (F-rep)

| Staaftype | Type        | q1/p/m | q2 | A     | B | $\psi_0$ | $\psi_1$ | $\psi_2$ |
|-----------|-------------|--------|----|-------|---|----------|----------|----------|
| 4         | 10:PZGepro. | -1.74  |    | 5.606 |   | 0.0      | 0.0      | 0.0      |
| 5         | 10:PZGepro. | -1.74  |    | 1.452 |   | 0.0      | 0.0      | 0.0      |

**SITUATIES BELAST/ONBELAST**

B.G:3 Ver. bel. pers. ed. (F-rep)



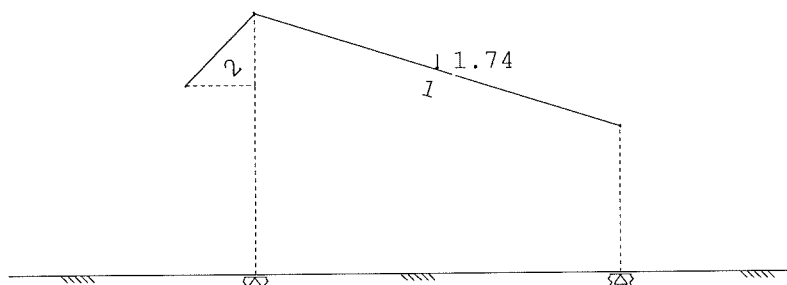


Project...:

Onderdeel:

**SITUATIES BELAST/ONBELAST**

B.G:3 Ver. bel. pers. ed. (F-rep)

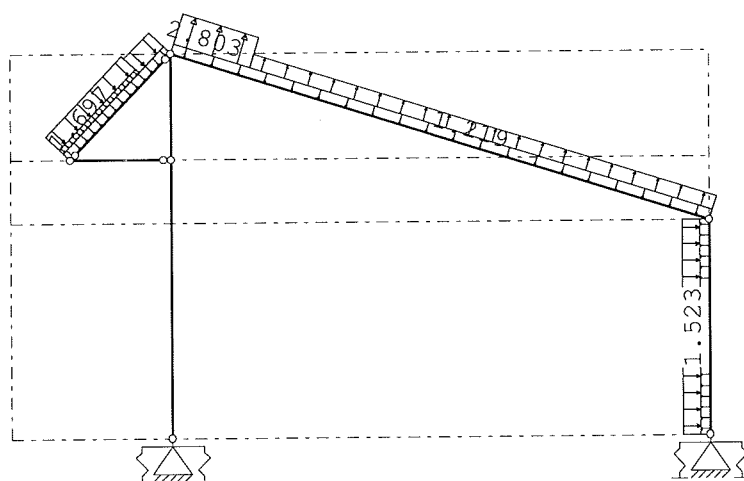
**SITUATIES BELAST/ONBELAST**

Belastingtype: F-rep

| Nr Lastvelden belast | Lastvelden onbelast |
|----------------------|---------------------|
| 1 1,2                |                     |
| 2 2                  | 1                   |
| 3 1                  | 2                   |

**BELASTINGEN**

B.G:4 Wind van links onderdruk A

**STAAFBELASTINGEN**

B.G:4 Wind van links onderdruk A

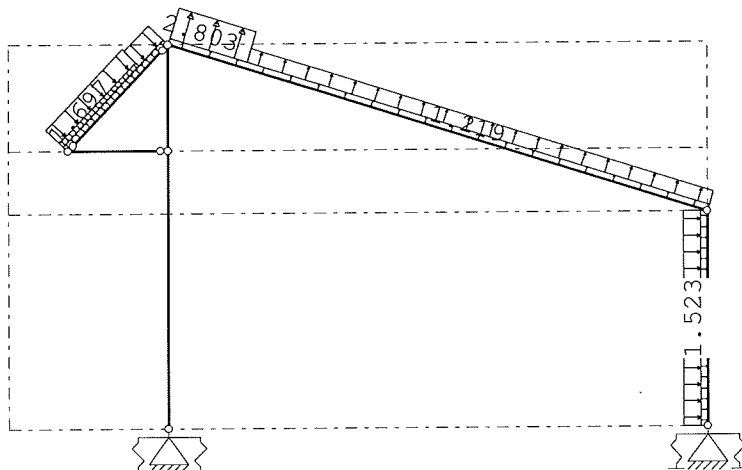
| Staaftype    | Index | q1/p/m | q2    | A     | B     | $\psi_0$ | $\psi_1$ | $\psi_2$ |
|--------------|-------|--------|-------|-------|-------|----------|----------|----------|
| 5 1:QZLokaal | Qw1   | -0.91  | -0.91 | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |
| 4 1:QZLokaal | Qw1   | -0.91  | -0.91 | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |
| 3 1:QZLokaal | Qw2   | 0.91   | 0.91  | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |
| 5 1:QZLokaal | Qw3   | -0.44  | -0.44 | 0.000 | 0.704 | 0.0      | 0.2      | 0.0      |
| 5 1:QZLokaal | Qw4   | -1.70  | -1.70 | 0.000 | 0.704 | 0.0      | 0.2      | 0.0      |
| 5 1:QZLokaal | Qw5   | -1.85  | -1.85 | 2.201 | 0.000 | 0.0      | 0.2      | 0.0      |
| 4 1:QZLokaal | Qw6   | 2.80   | 2.80  | 0.000 | 9.619 | 0.0      | 0.2      | 0.0      |
| 4 1:QZLokaal | Qw7   | 1.22   | 1.22  | 1.593 | 0.000 | 0.0      | 0.2      | 0.0      |
| 3 1:QZLokaal | Qw8   | -1.52  | -1.52 | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |

Project..:

Onderdeel:

**BELASTINGEN**

B.G:5 Wind van links overdruk A

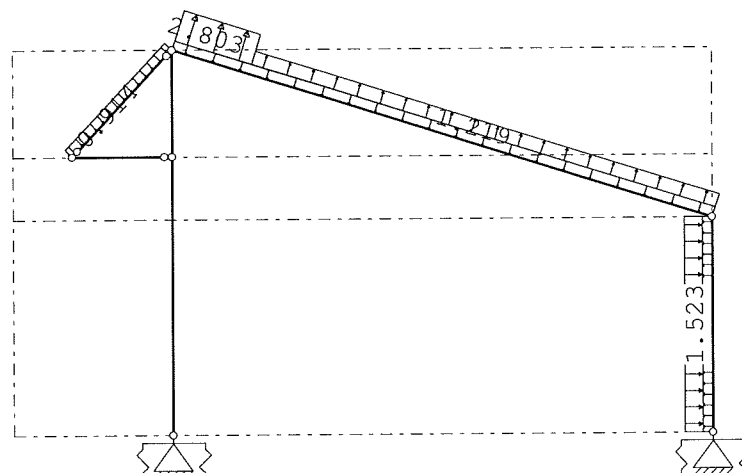
**STAAFBELASTINGEN**

B.G:5 Wind van links overdruk A

| Staaf Type   | Index | q1/p/m | q2    | A     | B     | $\psi_0$ | $\psi_1$ | $\psi_2$ |
|--------------|-------|--------|-------|-------|-------|----------|----------|----------|
| 5 1:QZLokaal | Qw9   | 0.61   | 0.61  | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |
| 4 1:QZLokaal | Qw9   | 0.61   | 0.61  | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |
| 3 1:QZLokaal | Qw10  | -0.61  | -0.61 | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |
| 5 1:QZLokaal | Qw3   | -0.44  | -0.44 | 0.000 | 0.704 | 0.0      | 0.2      | 0.0      |
| 5 1:QZLokaal | Qw4   | -1.70  | -1.70 | 0.000 | 0.704 | 0.0      | 0.2      | 0.0      |
| 5 1:QZLokaal | Qw5   | -1.85  | -1.85 | 2.201 | 0.000 | 0.0      | 0.2      | 0.0      |
| 4 1:QZLokaal | Qw6   | 2.80   | 2.80  | 0.000 | 9.619 | 0.0      | 0.2      | 0.0      |
| 4 1:QZLokaal | Qw7   | 1.22   | 1.22  | 1.593 | 0.000 | 0.0      | 0.2      | 0.0      |
| 3 1:QZLokaal | Qw8   | -1.52  | -1.52 | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |

**BELASTINGEN**

B.G:6 Wind van links onderdruk B



Project...:

Onderdeel:

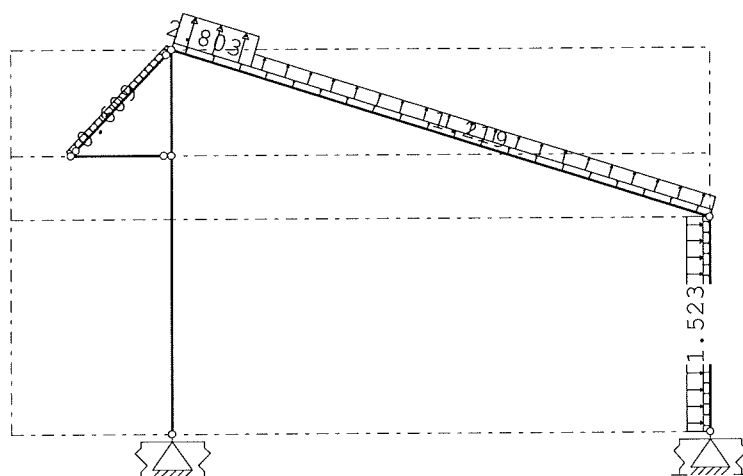
**STAAFBELASTINGEN**

B.G:6 Wind van links onderdruk B

| Staaft Type  | Index | q1/p/m | q2    | A     | B     | $\psi_0$ | $\psi_1$ | $\psi_2$ |
|--------------|-------|--------|-------|-------|-------|----------|----------|----------|
| 5 1:QZLokaal | Qw1   | -0.91  | -0.91 | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |
| 4 1:QZLokaal | Qw1   | -0.91  | -0.91 | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |
| 3 1:QZLokaal | Qw2   | 0.91   | 0.91  | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |
| 4 1:QZLokaal | Qw6   | 2.80   | 2.80  | 0.000 | 9.619 | 0.0      | 0.2      | 0.0      |
| 4 1:QZLokaal | Qw7   | 1.22   | 1.22  | 1.593 | 0.000 | 0.0      | 0.2      | 0.0      |
| 3 1:QZLokaal | Qw8   | -1.52  | -1.52 | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |

**BELASTINGEN**

B.G:7 Wind van links overdruk B

**STAAFBELASTINGEN**

B.G:7 Wind van links overdruk B

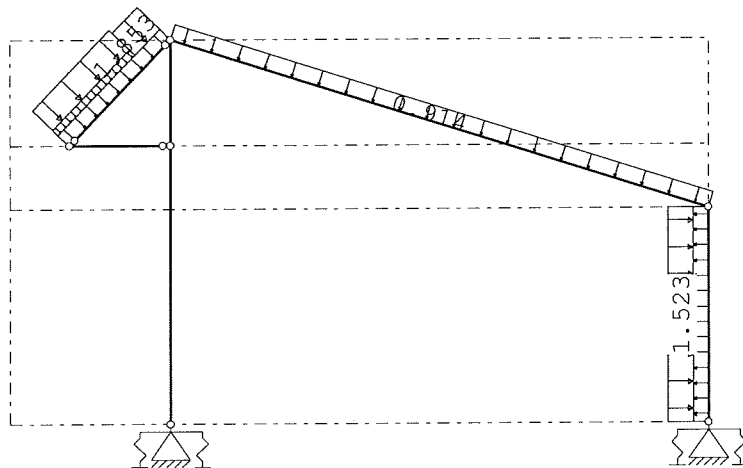
| Staaft Type  | Index | q1/p/m | q2    | A     | B     | $\psi_0$ | $\psi_1$ | $\psi_2$ |
|--------------|-------|--------|-------|-------|-------|----------|----------|----------|
| 5 1:QZLokaal | Qw9   | 0.61   | 0.61  | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |
| 4 1:QZLokaal | Qw9   | 0.61   | 0.61  | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |
| 3 1:QZLokaal | Qw10  | -0.61  | -0.61 | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |
| 4 1:QZLokaal | Qw6   | 2.80   | 2.80  | 0.000 | 9.619 | 0.0      | 0.2      | 0.0      |
| 4 1:QZLokaal | Qw7   | 1.22   | 1.22  | 1.593 | 0.000 | 0.0      | 0.2      | 0.0      |
| 3 1:QZLokaal | Qw8   | -1.52  | -1.52 | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |

Project...:

Onderdeel:

**BELASTINGEN**

B.G:8 Wind van links onderdruk C

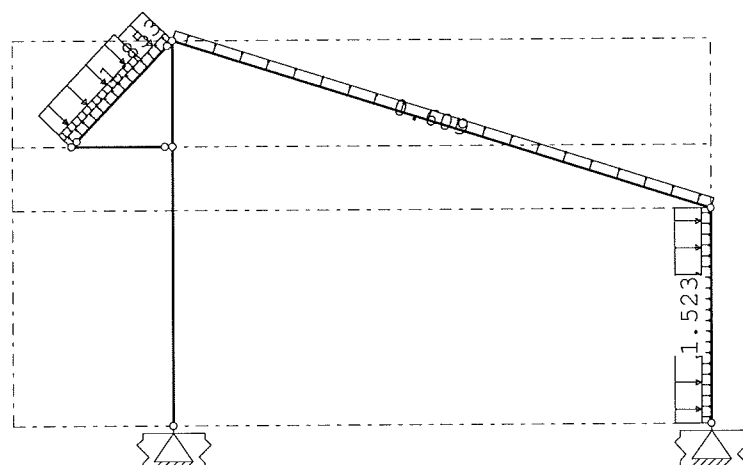
**STAAFBELASTINGEN**

B.G:8 Wind van links onderdruk C

| Staaftype | Type       | Index | q1/p/m | q2    | A     | B     | $\psi_0$ | $\psi_1$ | $\psi_2$ |
|-----------|------------|-------|--------|-------|-------|-------|----------|----------|----------|
| 5         | 1:QZLokaal | Qw1   | -0.91  | -0.91 | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |
| 4         | 1:QZLokaal | Qw1   | -0.91  | -0.91 | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |
| 3         | 1:QZLokaal | Qw2   | 0.91   | 0.91  | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |
| 5         | 1:QZLokaal | Qw3   | -0.44  | -0.44 | 0.000 | 0.704 | 0.0      | 0.2      | 0.0      |
| 5         | 1:QZLokaal | Qw4   | -1.70  | -1.70 | 0.000 | 0.704 | 0.0      | 0.2      | 0.0      |
| 5         | 1:QZLokaal | Qw5   | -1.85  | -1.85 | 2.201 | 0.000 | 0.0      | 0.2      | 0.0      |
| 3         | 1:QZLokaal | Qw8   | -1.52  | -1.52 | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |

**BELASTINGEN**

B.G:9 Wind van links overdruk C

**STAAFBELASTINGEN**

B.G:9 Wind van links overdruk C

| Staaftype | Type       | Index | q1/p/m | q2    | A     | B     | $\psi_0$ | $\psi_1$ | $\psi_2$ |
|-----------|------------|-------|--------|-------|-------|-------|----------|----------|----------|
| 5         | 1:QZLokaal | Qw9   | 0.61   | 0.61  | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |
| 4         | 1:QZLokaal | Qw9   | 0.61   | 0.61  | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |
| 3         | 1:QZLokaal | Qw10  | -0.61  | -0.61 | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |
| 5         | 1:QZLokaal | Qw3   | -0.44  | -0.44 | 0.000 | 0.704 | 0.0      | 0.2      | 0.0      |
| 5         | 1:QZLokaal | Qw4   | -1.70  | -1.70 | 0.000 | 0.704 | 0.0      | 0.2      | 0.0      |

Project...:

Onderdeel:

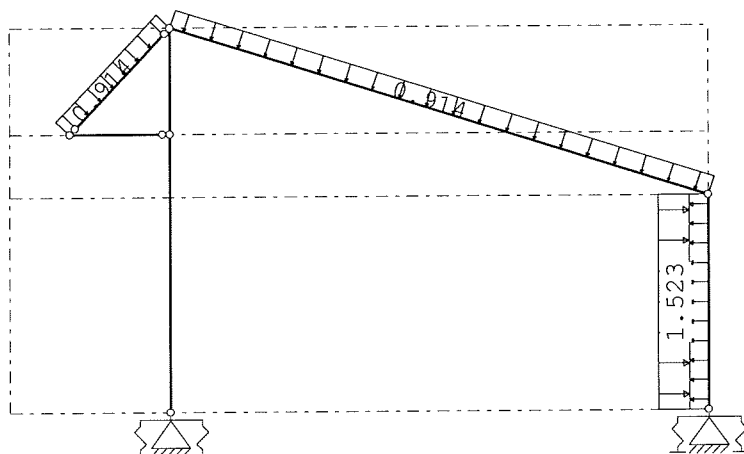
**STAAFBELASTINGEN**

B.G:9 Wind van links overdruk C

| Staaft Type  | Index | q1/p/m | q2    | A     | B     | $\Psi_0$ | $\Psi_1$ | $\Psi_2$ |
|--------------|-------|--------|-------|-------|-------|----------|----------|----------|
| 5 1:QZLokaal | Qw5   | -1.85  | -1.85 | 2.201 | 0.000 | 0.0      | 0.2      | 0.0      |
| 3 1:QZLokaal | Qw8   | -1.52  | -1.52 | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |

**BELASTINGEN**

B.G:10 Wind van links onderdruk D

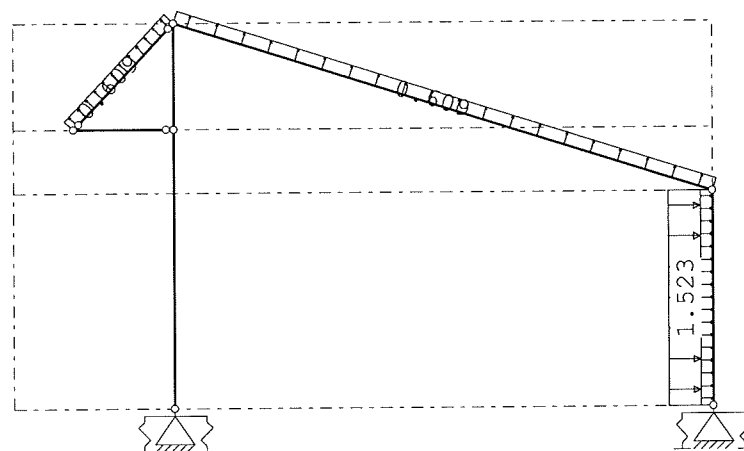
**STAAFBELASTINGEN**

B.G:10 Wind van links onderdruk D

| Staaft Type  | Index | q1/p/m | q2    | A     | B     | $\Psi_0$ | $\Psi_1$ | $\Psi_2$ |
|--------------|-------|--------|-------|-------|-------|----------|----------|----------|
| 5 1:QZLokaal | Qw1   | -0.91  | -0.91 | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |
| 4 1:QZLokaal | Qw1   | -0.91  | -0.91 | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |
| 3 1:QZLokaal | Qw2   | 0.91   | 0.91  | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |
| 3 1:QZLokaal | Qw8   | -1.52  | -1.52 | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |

**BELASTINGEN**

B.G:11 Wind van links overdruk D



Project...:

Onderdeel:

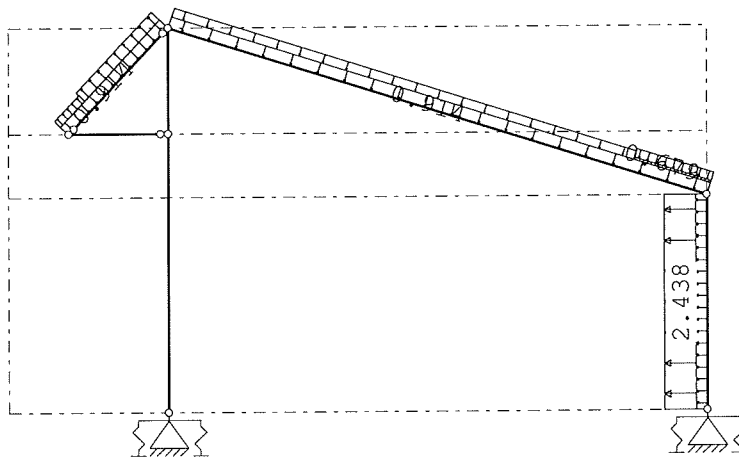
**STAAFBELASTINGEN**

B.G:11 Wind van links overdruk D

| Staaf Type   | Index | q1/p/m | q2    | A     | B     | $\Psi_0$ | $\Psi_1$ | $\Psi_2$ |
|--------------|-------|--------|-------|-------|-------|----------|----------|----------|
| 5 1:QZLokaal | Qw9   | 0.61   | 0.61  | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |
| 4 1:QZLokaal | Qw9   | 0.61   | 0.61  | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |
| 3 1:QZLokaal | Qw10  | -0.61  | -0.61 | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |
| 3 1:QZLokaal | Qw8   | -1.52  | -1.52 | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |

**BELASTINGEN**

B.G:12 Wind van rechts onderdruk A

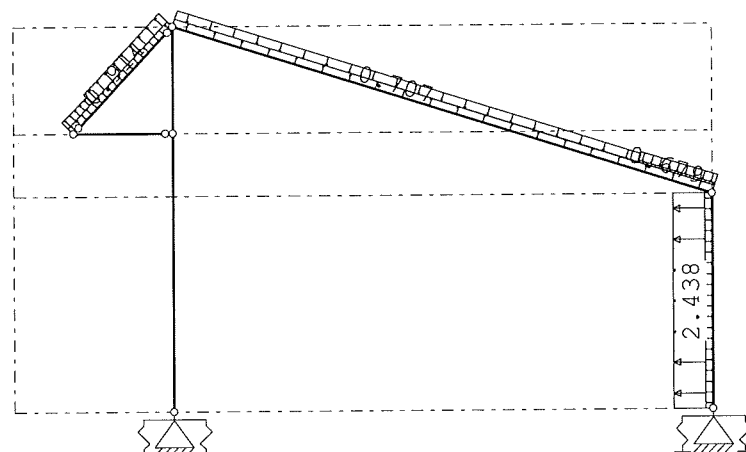
**STAAFBELASTINGEN**

B.G:12 Wind van rechts onderdruk A

| Staaf Type   | Index | q1/p/m | q2    | A     | B     | $\Psi_0$ | $\Psi_1$ | $\Psi_2$ |
|--------------|-------|--------|-------|-------|-------|----------|----------|----------|
| 5 1:QZLokaal | Qw1   | -0.91  | -0.91 | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |
| 4 1:QZLokaal | Qw1   | -0.91  | -0.91 | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |
| 3 1:QZLokaal | Qw2   | 0.91   | 0.91  | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |
| 3 1:QZLokaal | Qw11  | 2.44   | 2.44  | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |
| 4 1:QZLokaal | Qw12  | -0.17  | -0.17 | 9.619 | 0.000 | 0.0      | 0.2      | 0.0      |
| 4 1:QZLokaal | Qw13  | -0.68  | -0.68 | 9.619 | 0.000 | 0.0      | 0.2      | 0.0      |
| 4 1:QZLokaal | Qw14  | -0.71  | -0.71 | 0.000 | 1.593 | 0.0      | 0.2      | 0.0      |
| 5 1:QZLokaal | Qw15  | 0.91   | 0.91  | 0.704 | 0.000 | 0.0      | 0.2      | 0.0      |
| 5 1:QZLokaal | Qw16  | 0.61   | 0.61  | 0.000 | 2.201 | 0.0      | 0.2      | 0.0      |

**BELASTINGEN**

B.G:13 Wind van rechts overdruk A





Project...:

Onderdeel:

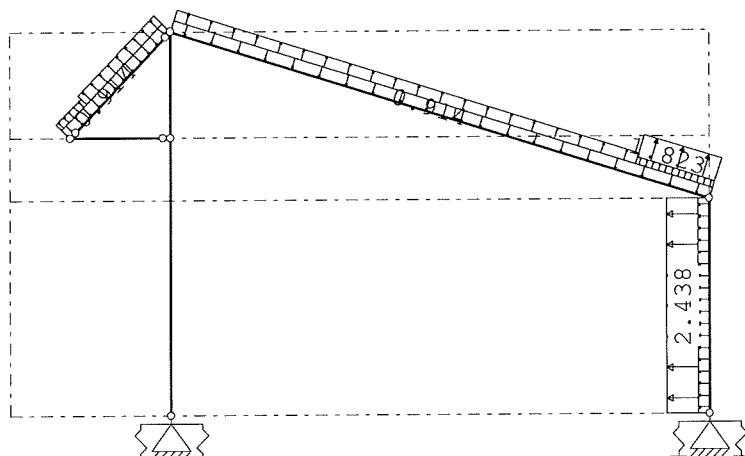
**STAAFBELASTINGEN**

B.G:13 Wind van rechts overdruk A

| Staaftype | Type       | Index | q1/p/m | q2    | A     | B     | $\Psi_0$ | $\Psi_1$ | $\Psi_2$ |
|-----------|------------|-------|--------|-------|-------|-------|----------|----------|----------|
| 5         | 1:QZLokaal | Qw9   | 0.61   | 0.61  | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |
| 4         | 1:QZLokaal | Qw9   | 0.61   | 0.61  | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |
| 3         | 1:QZLokaal | Qw10  | -0.61  | -0.61 | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |
| 3         | 1:QZLokaal | Qw11  | 2.44   | 2.44  | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |
| 4         | 1:QZLokaal | Qw12  | -0.17  | -0.17 | 9.619 | 0.000 | 0.0      | 0.2      | 0.0      |
| 4         | 1:QZLokaal | Qw13  | -0.68  | -0.68 | 9.619 | 0.000 | 0.0      | 0.2      | 0.0      |
| 4         | 1:QZLokaal | Qw14  | -0.71  | -0.71 | 0.000 | 1.593 | 0.0      | 0.2      | 0.0      |
| 5         | 1:QZLokaal | Qw15  | 0.91   | 0.91  | 0.704 | 0.000 | 0.0      | 0.2      | 0.0      |
| 5         | 1:QZLokaal | Qw16  | 0.61   | 0.61  | 0.000 | 2.201 | 0.0      | 0.2      | 0.0      |

**BELASTINGEN**

B.G:14 Wind van rechts onderdruk B

**STAAFBELASTINGEN**

B.G:14 Wind van rechts onderdruk B

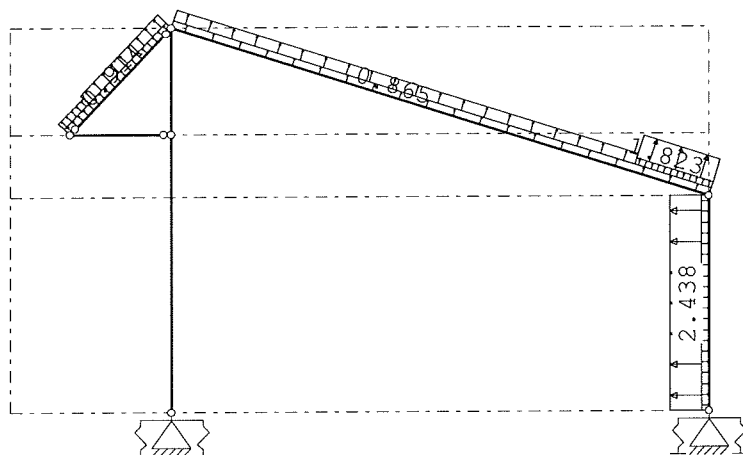
| Staaftype | Type       | Index | q1/p/m | q2    | A     | B     | $\Psi_0$ | $\Psi_1$ | $\Psi_2$ |
|-----------|------------|-------|--------|-------|-------|-------|----------|----------|----------|
| 5         | 1:QZLokaal | Qw1   | -0.91  | -0.91 | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |
| 4         | 1:QZLokaal | Qw1   | -0.91  | -0.91 | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |
| 3         | 1:QZLokaal | Qw2   | 0.91   | 0.91  | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |
| 3         | 1:QZLokaal | Qw11  | 2.44   | 2.44  | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |
| 4         | 1:QZLokaal | Qw17  | 0.52   | 0.52  | 9.619 | 0.000 | 0.0      | 0.2      | 0.0      |
| 4         | 1:QZLokaal | Qw18  | 1.82   | 1.82  | 9.619 | 0.000 | 0.0      | 0.2      | 0.0      |
| 4         | 1:QZLokaal | Qw19  | 0.87   | 0.87  | 0.000 | 1.593 | 0.0      | 0.2      | 0.0      |
| 5         | 1:QZLokaal | Qw15  | 0.91   | 0.91  | 0.704 | 0.000 | 0.0      | 0.2      | 0.0      |
| 5         | 1:QZLokaal | Qw16  | 0.61   | 0.61  | 0.000 | 2.201 | 0.0      | 0.2      | 0.0      |

Project...:

Onderdeel:

**BELASTINGEN**

B.G:15 Wind van rechts overdruk B

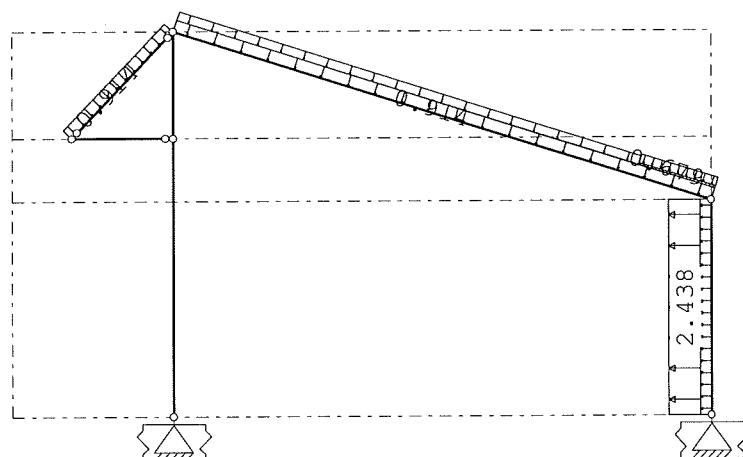
**STAAFBELASTINGEN**

B.G:15 Wind van rechts overdruk B

| Staaftype | Type       | Index | q1/p/m | q2    | A     | B     | $\psi_0$ | $\psi_1$ | $\psi_2$ |
|-----------|------------|-------|--------|-------|-------|-------|----------|----------|----------|
| 5         | 1:QZLokaal | Qw9   | 0.61   | 0.61  | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |
| 4         | 1:QZLokaal | Qw9   | 0.61   | 0.61  | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |
| 3         | 1:QZLokaal | Qw10  | -0.61  | -0.61 | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |
| 3         | 1:QZLokaal | Qw11  | 2.44   | 2.44  | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |
| 4         | 1:QZLokaal | Qw17  | 0.52   | 0.52  | 9.619 | 0.000 | 0.0      | 0.2      | 0.0      |
| 4         | 1:QZLokaal | Qw18  | 1.82   | 1.82  | 9.619 | 0.000 | 0.0      | 0.2      | 0.0      |
| 4         | 1:QZLokaal | Qw19  | 0.87   | 0.87  | 0.000 | 1.593 | 0.0      | 0.2      | 0.0      |
| 5         | 1:QZLokaal | Qw15  | 0.91   | 0.91  | 0.704 | 0.000 | 0.0      | 0.2      | 0.0      |
| 5         | 1:QZLokaal | Qw16  | 0.61   | 0.61  | 0.000 | 2.201 | 0.0      | 0.2      | 0.0      |

**BELASTINGEN**

B.G:16 Wind van rechts onderdruk C



Project..:

Onderdeel:

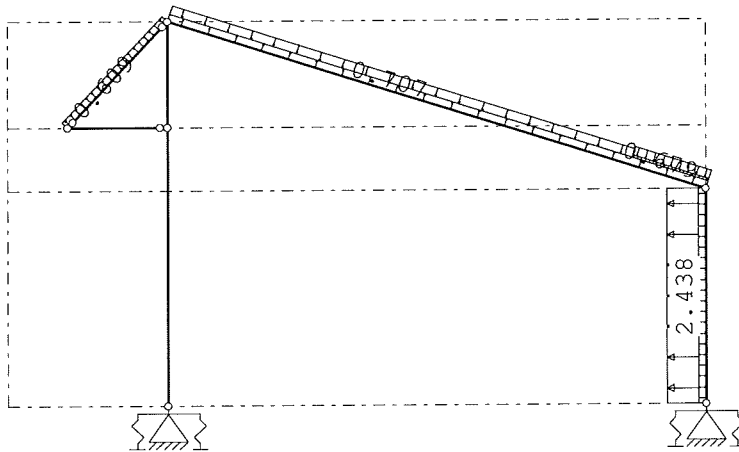
**STAAFBELASTINGEN**

B.G:16 Wind van rechts onderdruk C

| Staaftype    | Index | q1/p/m | q2    | A     | B     | $\Psi_0$ | $\Psi_1$ | $\Psi_2$ |
|--------------|-------|--------|-------|-------|-------|----------|----------|----------|
| 5 1:QZLokaal | Qw1   | -0.91  | -0.91 | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |
| 4 1:QZLokaal | Qw1   | -0.91  | -0.91 | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |
| 3 1:QZLokaal | Qw2   | 0.91   | 0.91  | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |
| 3 1:QZLokaal | Qw11  | 2.44   | 2.44  | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |
| 4 1:QZLokaal | Qw12  | -0.17  | -0.17 | 9.619 | 0.000 | 0.0      | 0.2      | 0.0      |
| 4 1:QZLokaal | Qw13  | -0.68  | -0.68 | 9.619 | 0.000 | 0.0      | 0.2      | 0.0      |
| 4 1:QZLokaal | Qw14  | -0.71  | -0.71 | 0.000 | 1.593 | 0.0      | 0.2      | 0.0      |

**BELASTINGEN**

B.G:17 Wind van rechts overdruk C

**STAAFBELASTINGEN**

B.G:17 Wind van rechts overdruk C

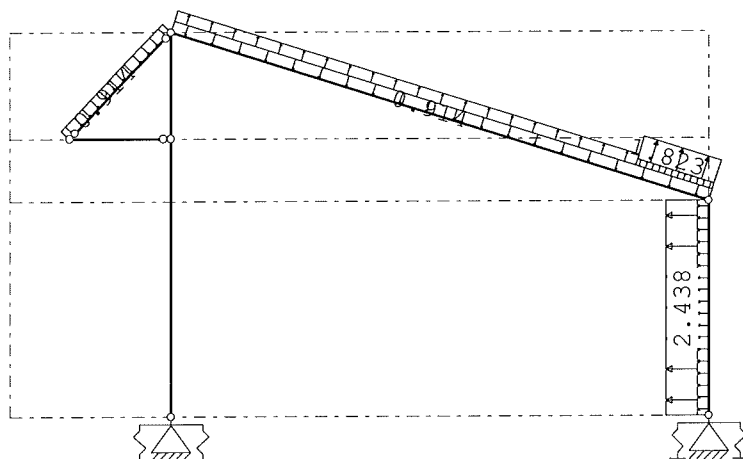
| Staaftype    | Index | q1/p/m | q2    | A     | B     | $\Psi_0$ | $\Psi_1$ | $\Psi_2$ |
|--------------|-------|--------|-------|-------|-------|----------|----------|----------|
| 5 1:QZLokaal | Qw9   | 0.61   | 0.61  | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |
| 4 1:QZLokaal | Qw9   | 0.61   | 0.61  | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |
| 3 1:QZLokaal | Qw10  | -0.61  | -0.61 | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |
| 3 1:QZLokaal | Qw11  | 2.44   | 2.44  | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |
| 4 1:QZLokaal | Qw12  | -0.17  | -0.17 | 9.619 | 0.000 | 0.0      | 0.2      | 0.0      |
| 4 1:QZLokaal | Qw13  | -0.68  | -0.68 | 9.619 | 0.000 | 0.0      | 0.2      | 0.0      |
| 4 1:QZLokaal | Qw14  | -0.71  | -0.71 | 0.000 | 1.593 | 0.0      | 0.2      | 0.0      |

Project...:

Onderdeel:

**BELASTINGEN**

B.G:18 Wind van rechts onderdruk D

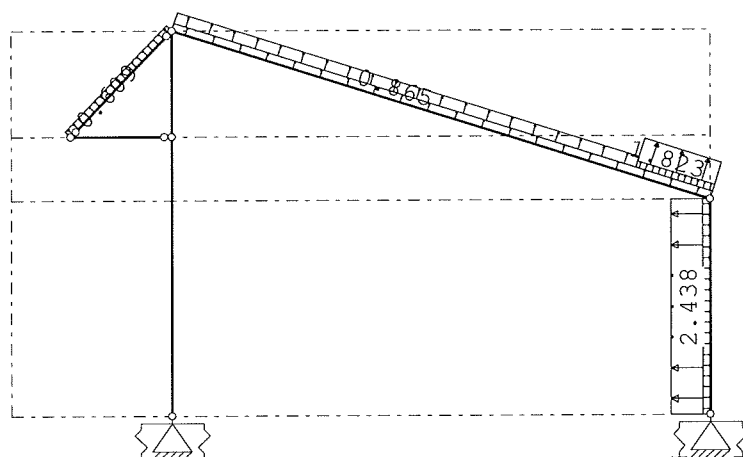
**STAAFBELASTINGEN**

B.G:18 Wind van rechts onderdruk D

| Staaftype    | Index | q1/p/m | q2    | A     | B     | $\Psi_0$ | $\Psi_1$ | $\Psi_2$ |
|--------------|-------|--------|-------|-------|-------|----------|----------|----------|
| 5 1:QZLokaal | Qw1   | -0.91  | -0.91 | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |
| 4 1:QZLokaal | Qw1   | -0.91  | -0.91 | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |
| 3 1:QZLokaal | Qw2   | 0.91   | 0.91  | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |
| 3 1:QZLokaal | Qw11  | 2.44   | 2.44  | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |
| 4 1:QZLokaal | Qw17  | 0.52   | 0.52  | 9.619 | 0.000 | 0.0      | 0.2      | 0.0      |
| 4 1:QZLokaal | Qw18  | 1.82   | 1.82  | 9.619 | 0.000 | 0.0      | 0.2      | 0.0      |
| 4 1:QZLokaal | Qw19  | 0.87   | 0.87  | 0.000 | 1.593 | 0.0      | 0.2      | 0.0      |

**BELASTINGEN**

B.G:19 Wind van rechts overdruk D

**STAAFBELASTINGEN**

B.G:19 Wind van rechts overdruk D

| Staaftype    | Index | q1/p/m | q2    | A     | B     | $\Psi_0$ | $\Psi_1$ | $\Psi_2$ |
|--------------|-------|--------|-------|-------|-------|----------|----------|----------|
| 5 1:QZLokaal | Qw9   | 0.61   | 0.61  | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |
| 4 1:QZLokaal | Qw9   | 0.61   | 0.61  | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |
| 3 1:QZLokaal | Qw10  | -0.61  | -0.61 | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |
| 3 1:QZLokaal | Qw11  | 2.44   | 2.44  | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |
| 4 1:QZLokaal | Qw17  | 0.52   | 0.52  | 9.619 | 0.000 | 0.0      | 0.2      | 0.0      |
| 4 1:QZLokaal | Qw18  | 1.82   | 1.82  | 9.619 | 0.000 | 0.0      | 0.2      | 0.0      |

Project...:

Onderdeel:

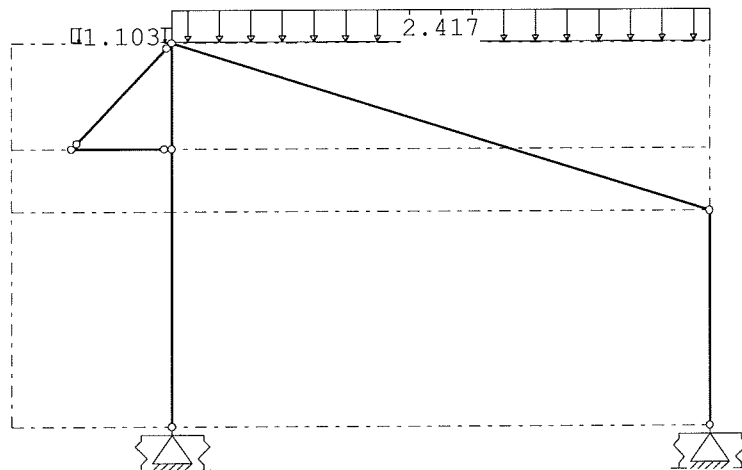
**STAAFBELASTINGEN**

B.G:19 Wind van rechts overdruk D

| Staaft Type  | Index | q1/p/m | q2   | A     | B     | $\psi_0$ | $\psi_1$ | $\psi_2$ |
|--------------|-------|--------|------|-------|-------|----------|----------|----------|
| 4 1:QZLokaal | Qw19  | 0.87   | 0.87 | 0.000 | 1.593 | 0.0      | 0.2      | 0.0      |

**BELASTINGEN**

B.G:20 Sneeuw A

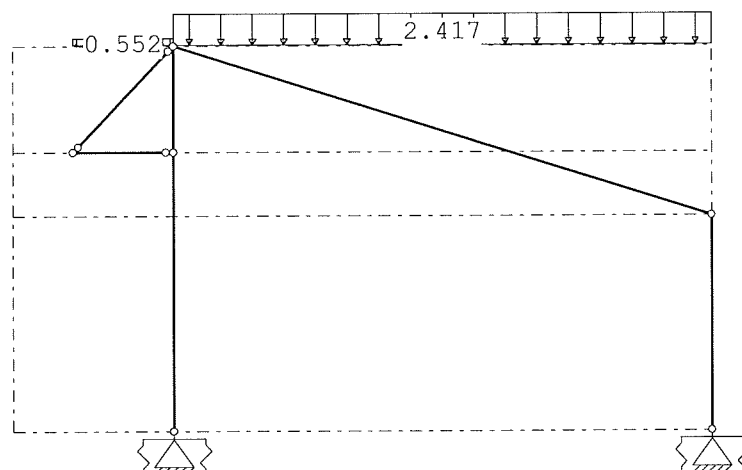
**STAAFBELASTINGEN**

B.G:20 Sneeuw A

| Staaft Type   | Index | q1/p/m | q2    | A     | B     | $\psi_0$ | $\psi_1$ | $\psi_2$ |
|---------------|-------|--------|-------|-------|-------|----------|----------|----------|
| 4 3:QZgeProj. | Qs1   | -2.42  | -2.42 | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |
| 5 3:QZgeProj. | Qs2   | -1.10  | -1.10 | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |

**BELASTINGEN**

B.G:21 Sneeuw B

**STAAFBELASTINGEN**

B.G:21 Sneeuw B

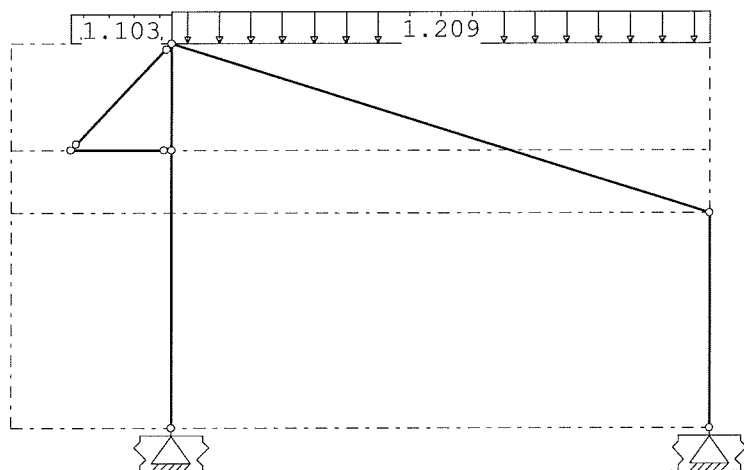
| Staaft Type   | Index | q1/p/m | q2    | A     | B     | $\psi_0$ | $\psi_1$ | $\psi_2$ |
|---------------|-------|--------|-------|-------|-------|----------|----------|----------|
| 4 3:QZgeProj. | Qs1   | -2.42  | -2.42 | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |
| 5 3:QZgeProj. | Qs3   | -0.55  | -0.55 | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |

Project...:

Onderdeel:

**BELASTINGEN**

B.G:22 Sneeuw C

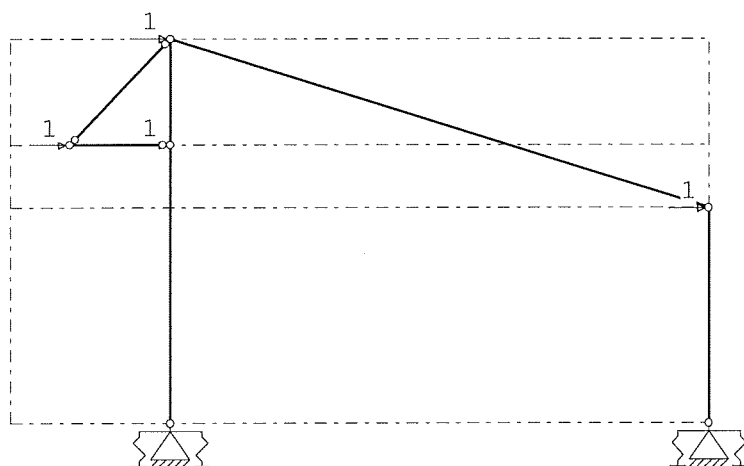
**STAAFBELASTINGEN**

B.G:22 Sneeuw C

| Staaf | Type        | Index | q1/p/m | q2    | A     | B     | $\Psi_0$ | $\Psi_1$ | $\Psi_2$ |
|-------|-------------|-------|--------|-------|-------|-------|----------|----------|----------|
| 4     | 3:QZgeProj. | Qs4   | -1.21  | -1.21 | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |
| 5     | 3:QZgeProj. | Qs2   | -1.10  | -1.10 | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |

**BELASTINGEN**

B.G:23 Knik

**KNOOPBELASTINGEN**

B.G:23 Knik

| Last | Knoop | Richting | waarde | $\Psi_0$ | $\Psi_1$ | $\Psi_2$ |
|------|-------|----------|--------|----------|----------|----------|
| 1    | 2     | X        | 1.000  |          |          |          |
| 2    | 3     | X        | 1.000  |          |          |          |
| 3    | 4     | X        | 1.000  |          |          |          |
| 4    | 6     | X        | 1.000  |          |          |          |



Project...:

Onderdeel:

**BELASTINGCOMBINATIES**

| BC Type  |      |           |   |                 |
|----------|------|-----------|---|-----------------|
| 1 Fund.  | 1.22 | $G_{k,1}$ |   |                 |
| 2 Fund.  | 0.90 | $G_{k,1}$ |   |                 |
| 3 Fund.  | 1.08 | $G_{k,1}$ | + | 1.35 $Q_{k,2}$  |
| 4 Fund.  | 1.08 | $G_{k,1}$ | + | 1.35 $Q_{k,3}$  |
| 5 Fund.  | 1.08 | $G_{k,1}$ | + | 1.35 $Q_{k,4}$  |
| 6 Fund.  | 1.08 | $G_{k,1}$ | + | 1.35 $Q_{k,5}$  |
| 7 Fund.  | 1.08 | $G_{k,1}$ | + | 1.35 $Q_{k,6}$  |
| 8 Fund.  | 1.08 | $G_{k,1}$ | + | 1.35 $Q_{k,7}$  |
| 9 Fund.  | 1.08 | $G_{k,1}$ | + | 1.35 $Q_{k,8}$  |
| 10 Fund. | 1.08 | $G_{k,1}$ | + | 1.35 $Q_{k,9}$  |
| 11 Fund. | 1.08 | $G_{k,1}$ | + | 1.35 $Q_{k,10}$ |
| 12 Fund. | 1.08 | $G_{k,1}$ | + | 1.35 $Q_{k,11}$ |
| 13 Fund. | 1.08 | $G_{k,1}$ | + | 1.35 $Q_{k,12}$ |
| 14 Fund. | 1.08 | $G_{k,1}$ | + | 1.35 $Q_{k,13}$ |
| 15 Fund. | 1.08 | $G_{k,1}$ | + | 1.35 $Q_{k,14}$ |
| 16 Fund. | 1.08 | $G_{k,1}$ | + | 1.35 $Q_{k,15}$ |
| 17 Fund. | 1.08 | $G_{k,1}$ | + | 1.35 $Q_{k,16}$ |
| 18 Fund. | 1.08 | $G_{k,1}$ | + | 1.35 $Q_{k,17}$ |
| 19 Fund. | 1.08 | $G_{k,1}$ | + | 1.35 $Q_{k,18}$ |
| 20 Fund. | 1.08 | $G_{k,1}$ | + | 1.35 $Q_{k,19}$ |
| 21 Fund. | 1.08 | $G_{k,1}$ | + | 1.35 $Q_{k,20}$ |
| 22 Fund. | 1.08 | $G_{k,1}$ | + | 1.35 $Q_{k,21}$ |
| 23 Fund. | 1.08 | $G_{k,1}$ | + | 1.35 $Q_{k,22}$ |
| 24 Fund. | 0.90 | $G_{k,1}$ | + | 1.35 $Q_{k,2}$  |
| 25 Fund. | 0.90 | $G_{k,1}$ | + | 1.35 $Q_{k,3}$  |
| 26 Fund. | 0.90 | $G_{k,1}$ | + | 1.35 $Q_{k,4}$  |
| 27 Fund. | 0.90 | $G_{k,1}$ | + | 1.35 $Q_{k,5}$  |
| 28 Fund. | 0.90 | $G_{k,1}$ | + | 1.35 $Q_{k,6}$  |
| 29 Fund. | 0.90 | $G_{k,1}$ | + | 1.35 $Q_{k,7}$  |
| 30 Fund. | 0.90 | $G_{k,1}$ | + | 1.35 $Q_{k,8}$  |
| 31 Fund. | 0.90 | $G_{k,1}$ | + | 1.35 $Q_{k,9}$  |
| 32 Fund. | 0.90 | $G_{k,1}$ | + | 1.35 $Q_{k,10}$ |
| 33 Fund. | 0.90 | $G_{k,1}$ | + | 1.35 $Q_{k,11}$ |
| 34 Fund. | 0.90 | $G_{k,1}$ | + | 1.35 $Q_{k,12}$ |
| 35 Fund. | 0.90 | $G_{k,1}$ | + | 1.35 $Q_{k,13}$ |
| 36 Fund. | 0.90 | $G_{k,1}$ | + | 1.35 $Q_{k,14}$ |
| 37 Fund. | 0.90 | $G_{k,1}$ | + | 1.35 $Q_{k,15}$ |
| 38 Fund. | 0.90 | $G_{k,1}$ | + | 1.35 $Q_{k,16}$ |
| 39 Fund. | 0.90 | $G_{k,1}$ | + | 1.35 $Q_{k,17}$ |
| 40 Fund. | 0.90 | $G_{k,1}$ | + | 1.35 $Q_{k,18}$ |
| 41 Fund. | 0.90 | $G_{k,1}$ | + | 1.35 $Q_{k,19}$ |
| 42 Fund. | 0.90 | $G_{k,1}$ | + | 1.35 $Q_{k,20}$ |
| 43 Fund. | 0.90 | $G_{k,1}$ | + | 1.35 $Q_{k,21}$ |
| 44 Fund. | 0.90 | $G_{k,1}$ | + | 1.35 $Q_{k,22}$ |
| 45 Kar.  | 1.00 | $G_{k,1}$ |   |                 |

Project...:

Onderdeel:

**BELASTINGCOMBINATIES**

| BC Type |      |           |   |                 |
|---------|------|-----------|---|-----------------|
| <hr/>   |      |           |   |                 |
| 46 Kar. | 1.00 | $G_{k,1}$ |   |                 |
| 47 Kar. | 1.00 | $G_{k,1}$ |   |                 |
| 48 Kar. | 1.00 | $G_{k,1}$ |   |                 |
| 49 Kar. | 1.00 | $G_{k,1}$ |   |                 |
| 50 Kar. | 1.00 | $G_{k,1}$ |   |                 |
|         |      |           |   |                 |
| 51 Kar. | 1.00 | $G_{k,1}$ |   |                 |
| 52 Kar. | 1.00 | $G_{k,1}$ |   |                 |
| 53 Kar. | 1.00 | $G_{k,1}$ |   |                 |
| 54 Kar. | 1.00 | $G_{k,1}$ |   |                 |
| 55 Kar. | 1.00 | $G_{k,1}$ |   |                 |
|         |      |           |   |                 |
| 56 Kar. | 1.00 | $G_{k,1}$ |   |                 |
| 57 Kar. | 1.00 | $G_{k,1}$ |   |                 |
| 58 Kar. | 1.00 | $G_{k,1}$ |   |                 |
| 59 Kar. | 1.00 | $G_{k,1}$ |   |                 |
| 60 Kar. | 1.00 | $G_{k,1}$ |   |                 |
|         |      |           |   |                 |
| 61 Kar. | 1.00 | $G_{k,1}$ | + | 1.00 $Q_{k,2}$  |
| 62 Kar. | 1.00 | $G_{k,1}$ | + | 1.00 $Q_{k,3}$  |
| 63 Kar. | 1.00 | $G_{k,1}$ | + | 1.00 $Q_{k,4}$  |
| 64 Kar. | 1.00 | $G_{k,1}$ | + | 0.95 $Q_{k,4}$  |
| 65 Kar. | 1.00 | $G_{k,1}$ | + | 1.00 $Q_{k,5}$  |
|         |      |           |   |                 |
| 66 Kar. | 1.00 | $G_{k,1}$ | + | 0.95 $Q_{k,5}$  |
| 67 Kar. | 1.00 | $G_{k,1}$ | + | 1.00 $Q_{k,6}$  |
| 68 Kar. | 1.00 | $G_{k,1}$ | + | 0.95 $Q_{k,6}$  |
| 69 Kar. | 1.00 | $G_{k,1}$ | + | 1.00 $Q_{k,7}$  |
| 70 Kar. | 1.00 | $G_{k,1}$ | + | 0.95 $Q_{k,7}$  |
|         |      |           |   |                 |
| 71 Kar. | 1.00 | $G_{k,1}$ | + | 1.00 $Q_{k,8}$  |
| 72 Kar. | 1.00 | $G_{k,1}$ | + | 0.95 $Q_{k,8}$  |
| 73 Kar. | 1.00 | $G_{k,1}$ | + | 1.00 $Q_{k,9}$  |
| 74 Kar. | 1.00 | $G_{k,1}$ | + | 0.95 $Q_{k,9}$  |
| 75 Kar. | 1.00 | $G_{k,1}$ | + | 1.00 $Q_{k,10}$ |
|         |      |           |   |                 |
| 76 Kar. | 1.00 | $G_{k,1}$ | + | 0.95 $Q_{k,10}$ |
| 77 Kar. | 1.00 | $G_{k,1}$ | + | 1.00 $Q_{k,11}$ |
| 78 Kar. | 1.00 | $G_{k,1}$ | + | 0.95 $Q_{k,11}$ |
| 79 Kar. | 1.00 | $G_{k,1}$ | + | 1.00 $Q_{k,12}$ |
| 80 Kar. | 1.00 | $G_{k,1}$ | + | 0.95 $Q_{k,12}$ |
|         |      |           |   |                 |
| 81 Kar. | 1.00 | $G_{k,1}$ | + | 1.00 $Q_{k,13}$ |
| 82 Kar. | 1.00 | $G_{k,1}$ | + | 0.95 $Q_{k,13}$ |
| 83 Kar. | 1.00 | $G_{k,1}$ | + | 1.00 $Q_{k,14}$ |
| 84 Kar. | 1.00 | $G_{k,1}$ | + | 0.95 $Q_{k,14}$ |
| 85 Kar. | 1.00 | $G_{k,1}$ | + | 1.00 $Q_{k,15}$ |
|         |      |           |   |                 |
| 86 Kar. | 1.00 | $G_{k,1}$ | + | 0.95 $Q_{k,15}$ |
| 87 Kar. | 1.00 | $G_{k,1}$ | + | 1.00 $Q_{k,16}$ |
| 88 Kar. | 1.00 | $G_{k,1}$ | + | 0.95 $Q_{k,16}$ |
| 89 Kar. | 1.00 | $G_{k,1}$ | + | 1.00 $Q_{k,17}$ |

Project...:

Onderdeel:

**BELASTINGCOMBINATIES**

| BC Type   |                |   |               |            |
|-----------|----------------|---|---------------|------------|
| 90 Kar.   | 1.00 $G_{k,1}$ | + | 0.95          | $Q_{k,17}$ |
| 91 Kar.   | 1.00 $G_{k,1}$ | + | 1.00          | $Q_{k,18}$ |
| 92 Kar.   | 1.00 $G_{k,1}$ | + | 0.95          | $Q_{k,18}$ |
| 93 Kar.   | 1.00 $G_{k,1}$ | + | 1.00          | $Q_{k,19}$ |
| 94 Kar.   | 1.00 $G_{k,1}$ | + | 0.95          | $Q_{k,19}$ |
| 95 Kar.   | 1.00 $G_{k,1}$ | + | 1.00          | $Q_{k,20}$ |
| 96 Kar.   | 1.00 $G_{k,1}$ | + | 1.00          | $Q_{k,21}$ |
| 97 Kar.   | 1.00 $G_{k,1}$ | + | 1.00          | $Q_{k,22}$ |
| 98 Quas.  | 1.00 $G_{k,1}$ |   |               |            |
| 99 Freq.  | 1.00 $G_{k,1}$ |   |               |            |
| 100 Freq. | 1.00 $G_{k,1}$ | + | 1.00 $\psi_1$ | $Q_{k,4}$  |
| 101 Freq. | 1.00 $G_{k,1}$ | + | 1.00 $\psi_1$ | $Q_{k,5}$  |
| 102 Freq. | 1.00 $G_{k,1}$ | + | 1.00 $\psi_1$ | $Q_{k,6}$  |
| 103 Freq. | 1.00 $G_{k,1}$ | + | 1.00 $\psi_1$ | $Q_{k,7}$  |
| 104 Freq. | 1.00 $G_{k,1}$ | + | 1.00 $\psi_1$ | $Q_{k,8}$  |
| 105 Freq. | 1.00 $G_{k,1}$ | + | 1.00 $\psi_1$ | $Q_{k,9}$  |
| 106 Freq. | 1.00 $G_{k,1}$ | + | 1.00 $\psi_1$ | $Q_{k,10}$ |
| 107 Freq. | 1.00 $G_{k,1}$ | + | 1.00 $\psi_1$ | $Q_{k,11}$ |
| 108 Freq. | 1.00 $G_{k,1}$ | + | 1.00 $\psi_1$ | $Q_{k,12}$ |
| 109 Freq. | 1.00 $G_{k,1}$ | + | 1.00 $\psi_1$ | $Q_{k,13}$ |
| 110 Freq. | 1.00 $G_{k,1}$ | + | 1.00 $\psi_1$ | $Q_{k,14}$ |
| 111 Freq. | 1.00 $G_{k,1}$ | + | 1.00 $\psi_1$ | $Q_{k,15}$ |
| 112 Freq. | 1.00 $G_{k,1}$ | + | 1.00 $\psi_1$ | $Q_{k,16}$ |
| 113 Freq. | 1.00 $G_{k,1}$ | + | 1.00 $\psi_1$ | $Q_{k,17}$ |
| 114 Freq. | 1.00 $G_{k,1}$ | + | 1.00 $\psi_1$ | $Q_{k,18}$ |
| 115 Freq. | 1.00 $G_{k,1}$ | + | 1.00 $\psi_1$ | $Q_{k,19}$ |
| 116 Freq. | 1.00 $G_{k,1}$ | + | 1.00 $\psi_1$ | $Q_{k,20}$ |
| 117 Freq. | 1.00 $G_{k,1}$ | + | 1.00 $\psi_1$ | $Q_{k,21}$ |
| 118 Freq. | 1.00 $G_{k,1}$ | + | 1.00 $\psi_1$ | $Q_{k,22}$ |
| 119 Blij. | 1.00 $G_{k,1}$ |   |               |            |

**GUNSTIGE WERKING PERMANENTE BELASTINGEN**

BC Staven met gunstige werking

- 1 Geen
- 2 Alle staven de factor:0.90
- 3 Geen
- 4 Geen
- 5 Geen
- 6 Geen
- 7 Geen
- 8 Geen
- 9 Geen
- 10 Geen
- 11 Geen

Project...:

Onderdeel:

**GUNSTIGE WERKING PERMANENTE BELASTINGEN**

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BC Staven met gunstige werking

---

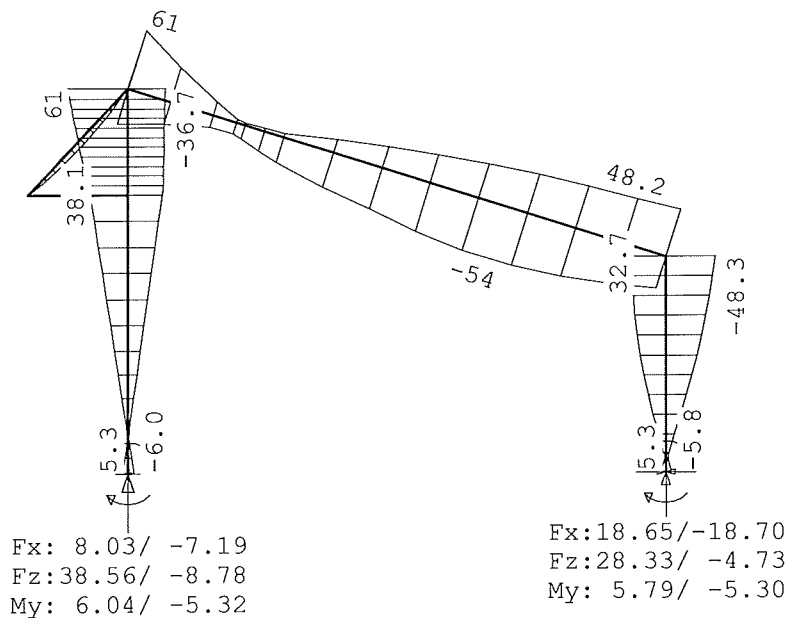
12 Geen  
13 Geen  
14 Geen  
15 Geen  
16 Geen  
17 Geen  
18 Geen  
19 Geen  
20 Geen  
21 Geen  
22 Geen  
23 Geen  
24 Alle staven de factor:0.90  
25 Alle staven de factor:0.90  
26 Alle staven de factor:0.90  
27 Alle staven de factor:0.90  
28 Alle staven de factor:0.90  
29 Alle staven de factor:0.90  
30 Alle staven de factor:0.90  
31 Alle staven de factor:0.90  
32 Alle staven de factor:0.90  
33 Alle staven de factor:0.90  
34 Alle staven de factor:0.90  
35 Alle staven de factor:0.90  
36 Alle staven de factor:0.90  
37 Alle staven de factor:0.90  
38 Alle staven de factor:0.90  
39 Alle staven de factor:0.90  
40 Alle staven de factor:0.90  
41 Alle staven de factor:0.90  
42 Alle staven de factor:0.90  
43 Alle staven de factor:0.90  
44 Alle staven de factor:0.90

Project...:

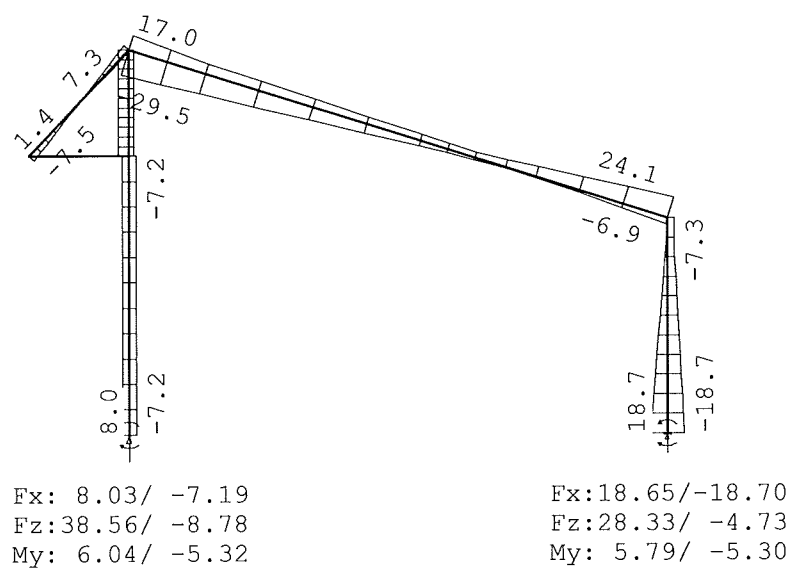
Onderdeel:

**OMHULLENDE VAN DE FUNDAMENTELE COMBINATIES****MOMENTEN**

Fundamentele combinatie

**DWARSKRACHTEN**

Fundamentele combinatie

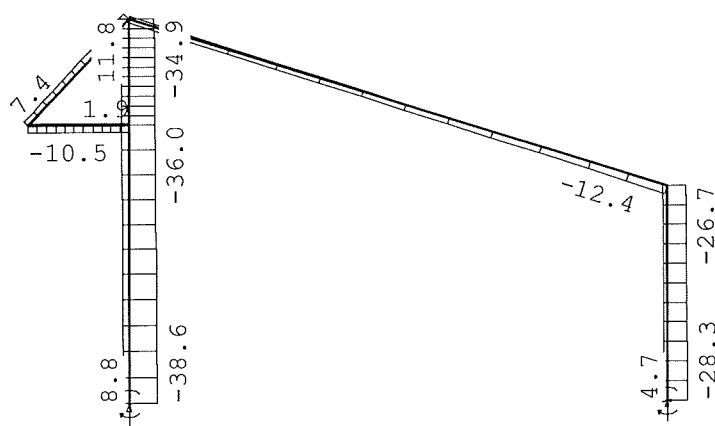


Project...:

Onderdeel:

**NORMAALKRACHTEN**

Fundamentele combinatie



Fx: 8.03/ -7.19  
 Fz: 38.56/ -8.78  
 My: 6.04/ -5.32

Fx: 18.65/ -18.70  
 Fz: 28.33/ -4.73  
 My: 5.79/ -5.30

**REACTIES**

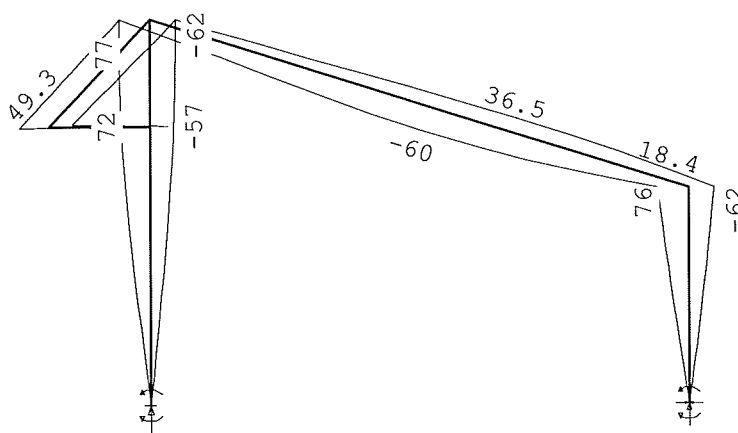
Fundamentele combinatie

| Kn. | X-min  | X-max | Z-min | Z-max | M-min | M-max |
|-----|--------|-------|-------|-------|-------|-------|
| 1   | -7.19  | 8.03  | -8.78 | 38.56 | -5.32 | 6.04  |
| 5   | -18.70 | 18.65 | -4.73 | 28.33 | -5.30 | 5.79  |

**OMHULLENDE VAN DE KARAKTERISTIEKE COMBINATIES****VERPLAATSINGEN**

[mm]

Karakteristieke combinatie



Fx: 6.21/ -4.88  
 Fz: 31.90/ -0.93  
 My: 4.64/ -3.67

Fx: 13.38/ -14.11  
 Fz: 22.98/ -0.17  
 My: 4.38/ -3.77

**REACTIES**

Karakteristieke combinatie

| Kn. | X-min | X-max | Z-min | Z-max | M-min | M-max |
|-----|-------|-------|-------|-------|-------|-------|
|-----|-------|-------|-------|-------|-------|-------|



Project...:

Onderdeel:

**REACTIES**

Karakteristieke combinatie

| Kn. | X-min  | X-max | Z-min | Z-max | M-min | M-max |
|-----|--------|-------|-------|-------|-------|-------|
| 1   | -4.88  | 6.21  | -0.93 | 31.90 | -3.67 | 4.64  |
| 5   | -14.11 | 13.38 | -0.17 | 22.98 | -3.77 | 4.38  |

**STAALPROFIELEN - ALGEMENE GEGEVENS**

|                              |                                            |             |
|------------------------------|--------------------------------------------|-------------|
| Stabiliteit:                 | Classificatie gehele constructie:          | Ongeschoord |
|                              | Belastinggeval m.b.t. bepaling kniklengte: | 23=Knik     |
|                              | Aanpassing inkl. parameter C :             | Steunpunten |
| Tweede-orde-effect:          |                                            |             |
|                              | Aan te houden verhouding $n/(n-1)$         |             |
|                              | voor steunmomenten en verplaatsingen:      | 1.10        |
| Doorbuiging en verplaatsing: |                                            |             |
|                              | Aantal bouwlagen:                          | 1           |
|                              | Gebouwtype:                                | Overig      |
|                              | Toel. horiz. verplaatsing gehele gebouw:   | $h/300$     |
|                              | Kleinste gevelhoogte [m]:                  | 0.0         |

**MATERIAAL**

| Mat nr. | Profielnaam | Vloeisp. [N/mm <sup>2</sup> ] | Productie methode | Min. drsn. klasse |
|---------|-------------|-------------------------------|-------------------|-------------------|
| 1       | IPE270      | 235                           | Gewalst           | 1                 |
| 2       | HEA200      | 235                           | Gewalst           | 1                 |
| 3       | HEA100      | 235                           | Gewalst           | 1                 |
| 4       | IPE200      | 235                           | Gewalst           | 1                 |

Partiële veiligheidsfactoren:

Gamma M;0 : 1.00 Gamma M;1 : 1.00

**KNIKSTABILITEIT**

| Staafl | $l_{sys}$ [m] | Classif. y  | $l_{knik;y}$ [m] | Extra aanp. y [kN] | Classif. z | $l_{knik;z}$ [m] | Extra aanp. z [kN] |
|--------|---------------|-------------|------------------|--------------------|------------|------------------|--------------------|
|        |               | sterke as   |                  |                    | zwakke as  |                  |                    |
| 1      | 5.500         | Ongeschoord | 12.832           | 0.0                | Geschoord  | 5.500            | 0.0                |
| 2      | 2.100         | Ongeschoord | 3.450            | 0.0                | Geschoord  | 2.100            | 0.0                |
| 3      | 4.250         | Ongeschoord | 12.098           | 0.0                | Geschoord  | 4.250            | 0.0                |
| 4      | 11.212        | Ongeschoord | 14.234           | 0.0                | Geschoord  | 11.212           | 0.0                |
| 5      | 2.904         | Geschoord   | 2.904            | 0.0                | Geschoord  | 2.904            | 0.0                |
| 6      | 2.006         | Geschoord   | 2.006            | 0.0                | Geschoord  | 2.006            | 0.0                |

**KIPSTABILITEIT**

| Staafl | Plts. aangr. | l gaffel [m] | Kipsteunafstanden [m] |
|--------|--------------|--------------|-----------------------|
| 1      | 1.0*h        | boven:       | 5.50 5,5              |
|        |              | onder:       | 5.50 5,5              |
| 2      | 1.0*h        | boven:       | 2.10 2,1              |
|        |              | onder:       | 2.10 2,1              |
| 3      | 0.0*h        | boven:       | 4.25 4.250            |
|        |              | onder:       | 4.25 4.250            |
| 4      | 1.0*h        | boven:       | 11.21 4*2,242;2,244   |
|        |              | onder:       | 11.21 1*11,212        |
| 5      | 1.0*h        | boven:       | 2.90 2*1,452          |
|        |              | onder:       | 2.90 2,904            |

Project...:

Onderdeel:

**KIPSTABILITEIT**

| Staafl | Plts.  | l gaffel | Kipsteunafstanden |
|--------|--------|----------|-------------------|
|        | aangr. | [m]      | [m]               |
| 6      | 1.0*h  | boven:   | 2.01 2,006        |
|        |        | onder:   | 2.01 2,006        |

**TOETSING SPANNINGEN**

| Staafl | Mat | BC | Sit | Kl | Plaats | Norm    | Artikel | Formule | Hoogste toetsing          | Opm.  |
|--------|-----|----|-----|----|--------|---------|---------|---------|---------------------------|-------|
| nr.    |     |    |     |    |        |         |         |         | U.C. [N/mm <sup>2</sup> ] |       |
| 1      | 2   | 13 | 1   | 1  | Staafl | EN3-1-1 | 6.3.3   | (6.61)  | 0.467 110                 | 47    |
| 2      | 2   | 13 | 1   | 1  | Einde  | EN3-1-1 | 6.2.10  | (6.31)  | 0.660 155                 | 47    |
| 3      | 1   | 6  | 1   | 1  | Staafl | EN3-1-1 | 6.3.3   | (6.62)  | 0.536 126                 | 47    |
| 4      | 1   | 27 | 1   | 1  | Staafl | EN3-1-1 | 6.3.3   | (6.62)  | 0.977 230                 | 46,47 |
| 5      | 4   | 5  | 1   | 1  | My-max | EN3-1-1 | 6.2.9.1 | (6.31)  | 0.115 27                  |       |
| 6      | 3   | 5  | 1   | 1  | Staafl | EN3-1-1 | 6.3.3   | (6.62)  | 0.038 9                   |       |

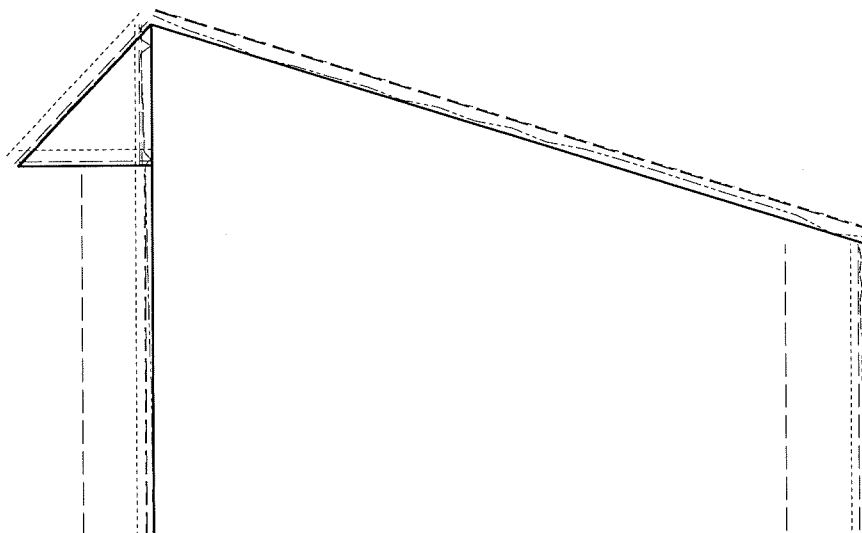
Opmerkingen:

[ 46] T.b.v. kip is een equivalente Q-last berekend.

[ 47] Bij verlopende normaalkracht wordt de grootste drukkracht genomen.

**UNITY-CHECK 'S**

OMHULLENDE VAN ALLES



----- Toelaatbare unity-check (1.0)

----- Hoogste unity-check i.v.m. knikstabiliteit

----- Unity-check i.v.m. kipstabiliteit

----- Hoogste unity-check i.v.m. doorsnedecontrole

----- Hoogste unity-check i.v.m. doorbuiging

----- Unity-check te hoog (> 1.0)

Project...:

Onderdeel:

Dimensies: kN;m;rad (tenzij anders aangegeven)

Datum....: 10/07/2019

Bestand...: z:\werk\2019\19-071-frenken-reuver-aelmans\werktuigb-1.rww

Belastingbreedte.: 5.750

Rekenmodel.....: 1e-orde-elastisch.

Theorie voor de bepaling van de krachtsverdeling:

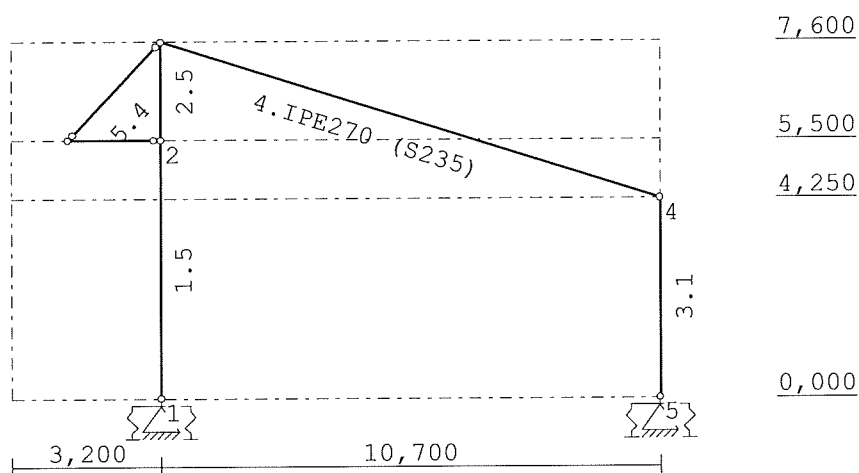
Geometrisch lineair.

Fysisch lineair.

Gunstige werking van de permanente belasting wordt automatisch verwerkt.

**Toegepaste normen volgens Eurocode met Nederlandse NB**

|             |                      |                 |             |
|-------------|----------------------|-----------------|-------------|
| Belastingen | NEN-EN 1990:2002     | C2:2010         | NB:2011(nl) |
|             | NEN-EN 1991-1-1:2002 | C1:2009         | NB:2011(nl) |
|             | NEN-EN 1991-1-3:2003 | C1:2009         | NB:2011(nl) |
|             | NEN-EN 1991-1-4:2005 | C2:2011         | NB:2011(nl) |
| Staal       | NEN-EN 1993-1-1:2006 | C2:2011,A1:2016 | NB:2016(nl) |

**GEOMETRIE****STRAMIENLIJNEN**

| Nr. | X      | Z-min | Z-max |
|-----|--------|-------|-------|
| 1   | 0.000  | 0.000 | 7.600 |
| 2   | 10.700 | 0.000 | 7.600 |
| 3   | -3.200 | 0.000 | 7.600 |

**NIVEAUS**

| Nr. | Z     | X-min  | X-max  |
|-----|-------|--------|--------|
| 1   | 0.000 | -3.200 | 10.700 |
| 2   | 7.600 | -3.200 | 10.700 |
| 3   | 4.250 | -3.200 | 10.700 |
| 4   | 5.500 | -3.200 | 10.700 |

Project...:

Onderdeel:

**MATERIALEN**Mt Omschrijving E-modulus [N/mm<sup>2</sup>] S.G. Pois. Uitz. coëff

1 S235 210000 78.5 0.30 1.2000e-05

**PROFIELEN [mm]**

| Prof. Omschrijving | Materiaal | Oppervlak  | Traagheid  | Vormf. |
|--------------------|-----------|------------|------------|--------|
| 1 IPE270           | 1:S235    | 4.5900e+03 | 5.7900e+07 | 0.00   |
| 2 HEA200           | 1:S235    | 5.3800e+03 | 3.6920e+07 | 0.00   |
| 3 HEA100           | 1:S235    | 2.1240e+03 | 3.4900e+06 | 0.00   |
| 4 IPE200           | 1:S235    | 2.8480e+03 | 1.9430e+07 | 0.00   |
| 5 IPE240           | 1:S235    | 3.9100e+03 | 3.8920e+07 | 0.00   |

**PROFIELEN vervolg [mm]**

| Prof. | Staaftype | Breedte | Hoogte | e     | Type | b1 | h1 | b2 | h2 |
|-------|-----------|---------|--------|-------|------|----|----|----|----|
| 1     | 0:Normaal | 135     | 270    | 135.0 |      |    |    |    |    |
| 2     | 0:Normaal | 200     | 190    | 95.0  |      |    |    |    |    |
| 3     | 0:Normaal | 100     | 96     | 48.0  |      |    |    |    |    |
| 4     | 0:Normaal | 100     | 200    | 100.0 |      |    |    |    |    |
| 5     | 0:Normaal | 120     | 240    | 120.0 |      |    |    |    |    |

**PROFIELVORMEN [mm]**

1 IPE270



2 HEA200



3 HEA100



4 IPE200



5 IPE240

**KNOPEN**

| Knoop | X      | Z     | Knoop | X      | Z     |
|-------|--------|-------|-------|--------|-------|
| 1     | 0.000  | 0.000 | 6     | -2.006 | 5.500 |
| 2     | 0.000  | 5.500 |       |        |       |
| 3     | 0.000  | 7.600 |       |        |       |
| 4     | 10.700 | 4.250 |       |        |       |
| 5     | 10.700 | 0.000 |       |        |       |

Project...:

Onderdeel:

**STAVEN**

| St. | ki | kj | Profiel  | Aansl.i | Aansl.j | Lengte Opm. |
|-----|----|----|----------|---------|---------|-------------|
| 1   | 1  | 2  | 5:IPE240 | NDM     | NDM     | 5.500       |
| 2   | 2  | 3  | 5:IPE240 | NDM     | NDM     | 2.100       |
| 3   | 5  | 4  | 1:IPE270 | NDM     | NDM     | 4.250       |
| 4   | 3  | 4  | 1:IPE270 | NDM     | NDM     | 11.212      |
| 5   | 6  | 3  | 4:IPE200 | ND      | ND      | 2.904       |
| 6   | 6  | 2  | 3:HEA100 | NDM     | ND      | 2.006       |

**VASTE STEUNPUNTEN**

| Nr. | knoop | Kode | XZR 1=vast 0=vrij | Hoek |
|-----|-------|------|-------------------|------|
| 1   | 1     | 110  |                   | 0.00 |
| 2   | 5     | 110  |                   | 0.00 |

**VEREN**

| Veer | Knoop | Richting  | Hoek | Veerwaarde | Type    | Ondergrens | Bovengrens |
|------|-------|-----------|------|------------|---------|------------|------------|
| 1    | 1     | 3:Rotatie | 0.00 | 3.000e+02  | Normaal | -1.000e+10 | 1.000e+10  |
| 2    | 5     | 3:Rotatie | 0.00 | 2.250e+02  | Normaal | -1.000e+10 | 1.000e+10  |

**BELASTINGGEVALLEN**

| B.G. | Omschrijving                     | Type       |
|------|----------------------------------|------------|
|      | 1 Permanente belasting EGZ=-1.00 | 1          |
| g    | 2 Ver. bel. pers. ed. (p_rep)    | 2          |
| g    | 3 Ver. bel. pers. ed. (F_rep)    | 3          |
| g    | 4 Wind van links onderdruk A     | 7          |
| g    | 5 Wind van links overdruk A      | 8          |
| g    | 6 Wind van links onderdruk B     | 9          |
| g    | 7 Wind van links overdruk B      | 10         |
| g    | 8 Wind van links onderdruk C     | 37         |
| g    | 9 Wind van links overdruk C      | 38         |
| g    | 10 Wind van links onderdruk D    | 39         |
| g    | 11 Wind van links overdruk D     | 40         |
| g    | 12 Wind van rechts onderdruk A   | 11         |
| g    | 13 Wind van rechts overdruk A    | 12         |
| g    | 14 Wind van rechts onderdruk B   | 13         |
| g    | 15 Wind van rechts overdruk B    | 14         |
| g    | 16 Wind van rechts onderdruk C   | 41         |
| g    | 17 Wind van rechts overdruk C    | 42         |
| g    | 18 Wind van rechts onderdruk D   | 43         |
| g    | 19 Wind van rechts overdruk D    | 44         |
| g    | 20 Sneeuw A                      | 22         |
| g    | 21 Sneeuw B                      | 23         |
| g    | 22 Sneeuw C                      | 33         |
|      | 23 Knik                          | 0 Onbekend |

g = gegenereerd belastinggeval

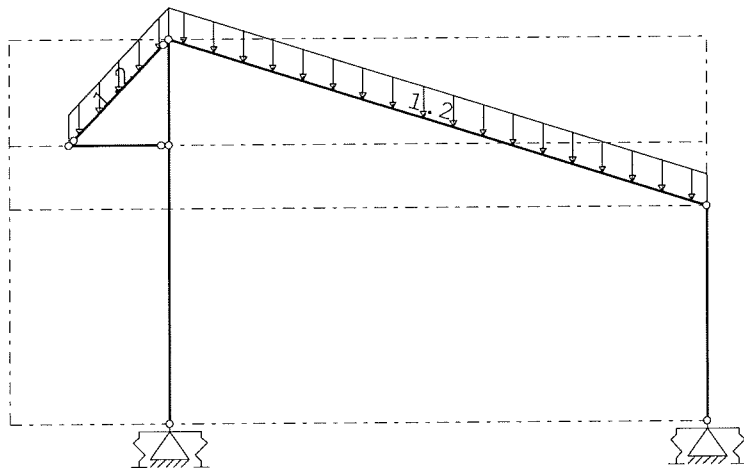
Project...:

Onderdeel:

**BELASTINGEN**

B.G:1 Permanente belasting

Eigen gewicht van alle staven is meegenomen in berekening. Richting:↓

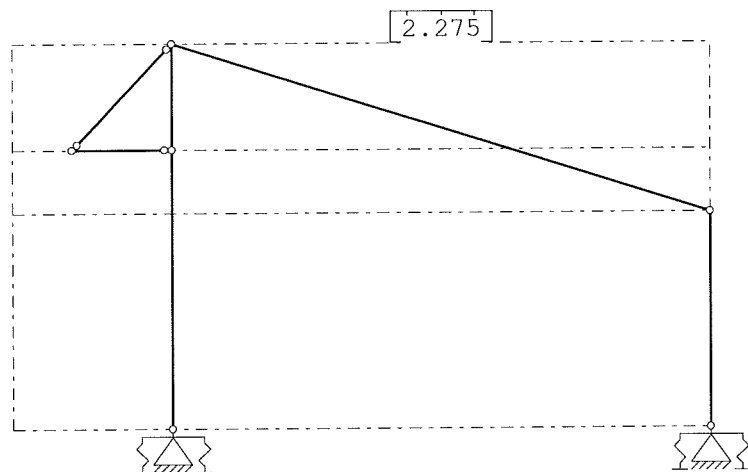
**STAAFBELASTINGEN**

B.G:1 Permanente belasting

| Staaft | Type       | q1/p/m | q2    | A     | B     | $\psi_0$ | $\psi_1$ | $\psi_2$ |
|--------|------------|--------|-------|-------|-------|----------|----------|----------|
| 5      | 5:QZGloaal | -1.20  | -1.20 | 0.000 | 0.000 |          |          |          |
| 4      | 5:QZGloaal | -1.20  | -1.20 | 0.000 | 0.000 |          |          |          |

**BELASTINGEN**

B.G:2 Ver. bel. pers. ed. (p\_rep)

**STAAFBELASTINGEN**

B.G:2 Ver. bel. pers. ed. (p\_rep)

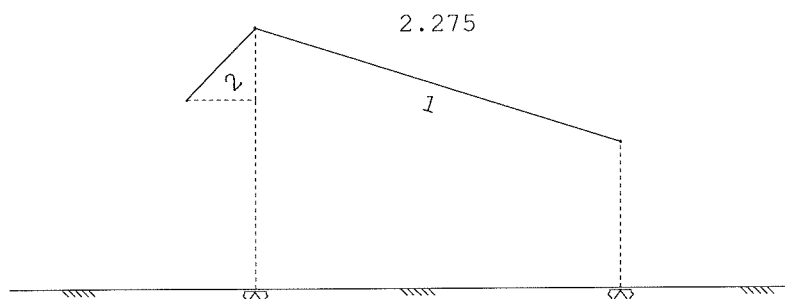
| Staaft | Type        | q1/p/m | q2    | A     | B     | $\psi_0$ | $\psi_1$ | $\psi_2$ |
|--------|-------------|--------|-------|-------|-------|----------|----------|----------|
| 4      | 3:QZgeProj. | -2.28  | -2.28 | 4.350 | 4.350 | 0.0      | 0.0      | 0.0      |

Project...:

Onderdeel:

**SITUATIES BELAST/ONBELAST**

B.G:2 Ver. bel. pers. ed. (p\_rep)

**SITUATIES BELAST/ONBELAST**

Belastingtype: P-rep

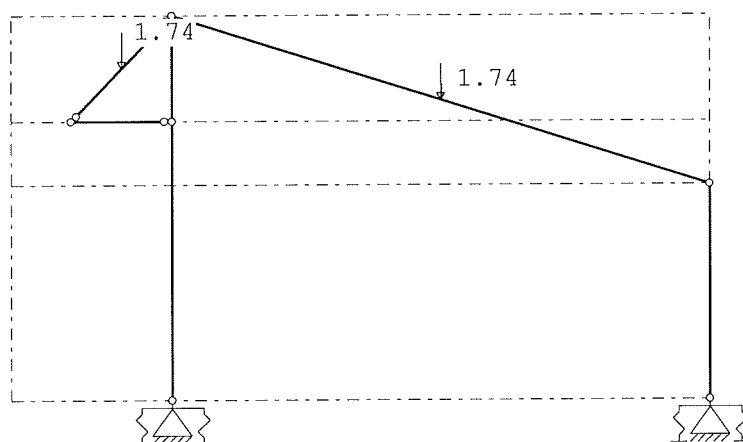
Nr Lastvelden belast

Lastvelden onbelast

1 1,2

**BELASTINGEN**

B.G:3 Ver. bel. pers. ed. (F-rep)

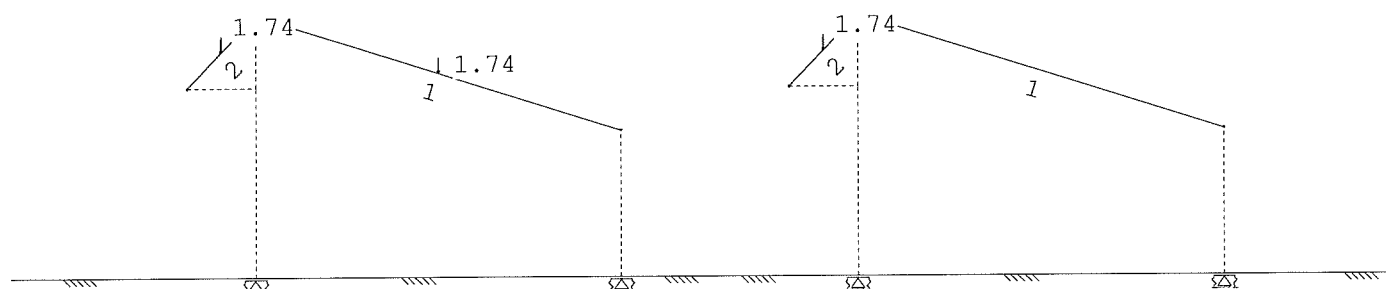
**STAAFBELASTINGEN**

B.G:3 Ver. bel. pers. ed. (F-rep)

| Staaft Type     | q1/p/m | q2 | A     | B | $\psi_0$ | $\psi_1$ | $\psi_2$ |
|-----------------|--------|----|-------|---|----------|----------|----------|
| 4 10:PZGepro.j. | -1.74  |    | 5.606 |   | 0.0      | 0.0      | 0.0      |
| 5 10:PZGepro.j. | -1.74  |    | 1.452 |   | 0.0      | 0.0      | 0.0      |

**SITUATIES BELAST/ONBELAST**

B.G:3 Ver. bel. pers. ed. (F-rep)



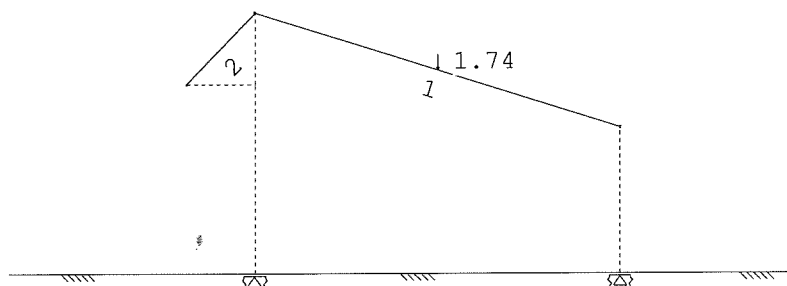


Project...:

Onderdeel:

**SITUATIES BELAST/ONBELAST**

B.G:3 Ver. bel. pers. ed. (F-rep)

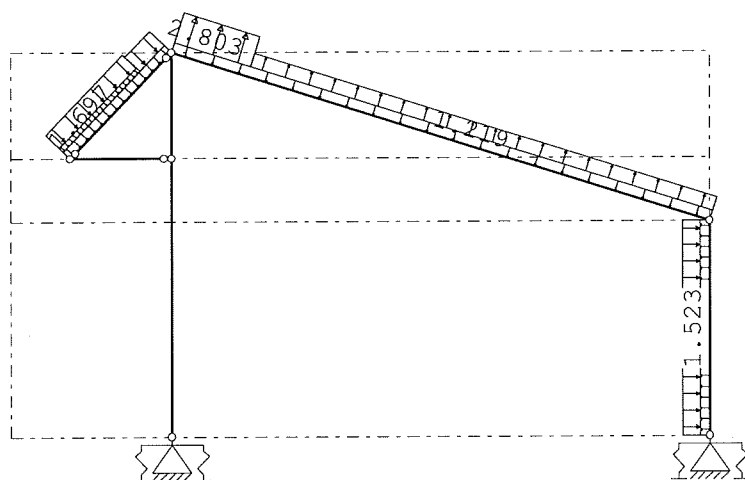
**SITUATIES BELAST/ONBELAST**

Belastingtype: F-rep

| Nr | Lastvelden belast | Lastvelden onbelast |
|----|-------------------|---------------------|
| 1  | 1, 2              |                     |
| 2  | 2                 | 1                   |
| 3  | 1                 | 2                   |

**BELASTINGEN**

B.G:4 Wind van links onderdruk A

**STAAFBELASTINGEN**

B.G:4 Wind van links onderdruk A

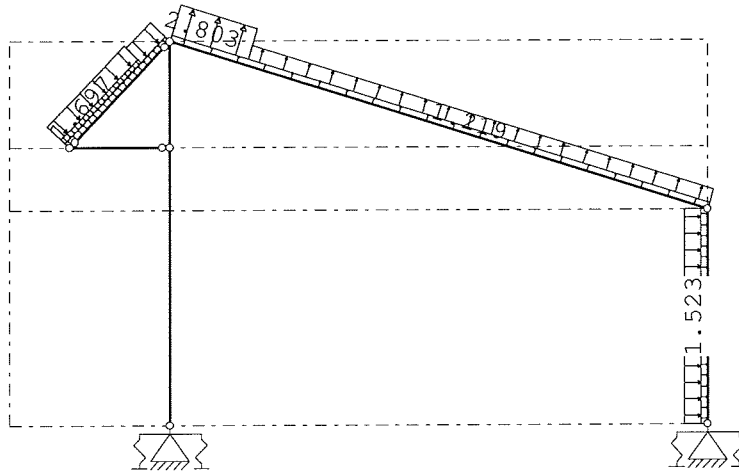
| Staaftype | Type       | Index | q1/p/m | q2    | A     | B     | $\psi_0$ | $\psi_1$ | $\psi_2$ |
|-----------|------------|-------|--------|-------|-------|-------|----------|----------|----------|
| 5         | 1:QZLokaal | Qw1   | -0.91  | -0.91 | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |
| 4         | 1:QZLokaal | Qw1   | -0.91  | -0.91 | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |
| 3         | 1:QZLokaal | Qw2   | 0.91   | 0.91  | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |
| 5         | 1:QZLokaal | Qw3   | -0.44  | -0.44 | 0.000 | 0.704 | 0.0      | 0.2      | 0.0      |
| 5         | 1:QZLokaal | Qw4   | -1.70  | -1.70 | 0.000 | 0.704 | 0.0      | 0.2      | 0.0      |
| 5         | 1:QZLokaal | Qw5   | -1.85  | -1.85 | 2.201 | 0.000 | 0.0      | 0.2      | 0.0      |
| 4         | 1:QZLokaal | Qw6   | 2.80   | 2.80  | 0.000 | 9.619 | 0.0      | 0.2      | 0.0      |
| 4         | 1:QZLokaal | Qw7   | 1.22   | 1.22  | 1.593 | 0.000 | 0.0      | 0.2      | 0.0      |
| 3         | 1:QZLokaal | Qw8   | -1.52  | -1.52 | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |

Project...:

Onderdeel:

**BELASTINGEN**

B.G:5 Wind van links overdruk A

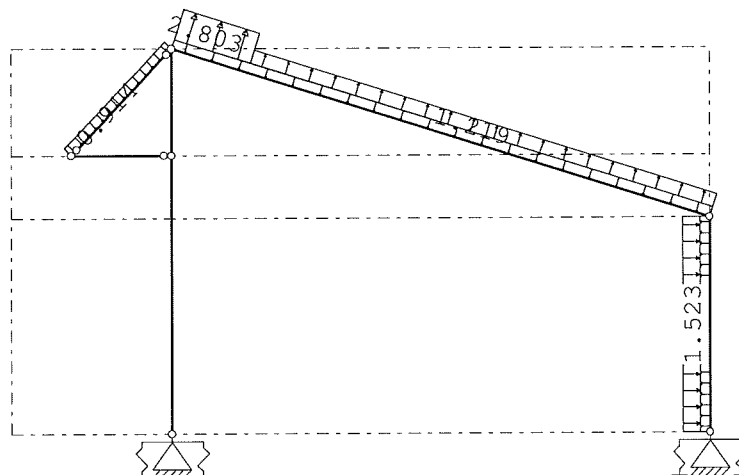
**STAAFBELASTINGEN**

B.G:5 Wind van links overdruk A

| Staaftype | Type       | Index | q1/p/m | q2    | A     | B     | $\psi_0$ | $\psi_1$ | $\psi_2$ |
|-----------|------------|-------|--------|-------|-------|-------|----------|----------|----------|
| 5         | 1:QZLokaal | Qw9   | 0.61   | 0.61  | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |
| 4         | 1:QZLokaal | Qw9   | 0.61   | 0.61  | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |
| 3         | 1:QZLokaal | Qw10  | -0.61  | -0.61 | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |
| 5         | 1:QZLokaal | Qw3   | -0.44  | -0.44 | 0.000 | 0.704 | 0.0      | 0.2      | 0.0      |
| 5         | 1:QZLokaal | Qw4   | -1.70  | -1.70 | 0.000 | 0.704 | 0.0      | 0.2      | 0.0      |
| 5         | 1:QZLokaal | Qw5   | -1.85  | -1.85 | 2.201 | 0.000 | 0.0      | 0.2      | 0.0      |
| 4         | 1:QZLokaal | Qw6   | 2.80   | 2.80  | 0.000 | 9.619 | 0.0      | 0.2      | 0.0      |
| 4         | 1:QZLokaal | Qw7   | 1.22   | 1.22  | 1.593 | 0.000 | 0.0      | 0.2      | 0.0      |
| 3         | 1:QZLokaal | Qw8   | -1.52  | -1.52 | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |

**BELASTINGEN**

B.G:6 Wind van links onderdruk B



Project...:

Onderdeel:

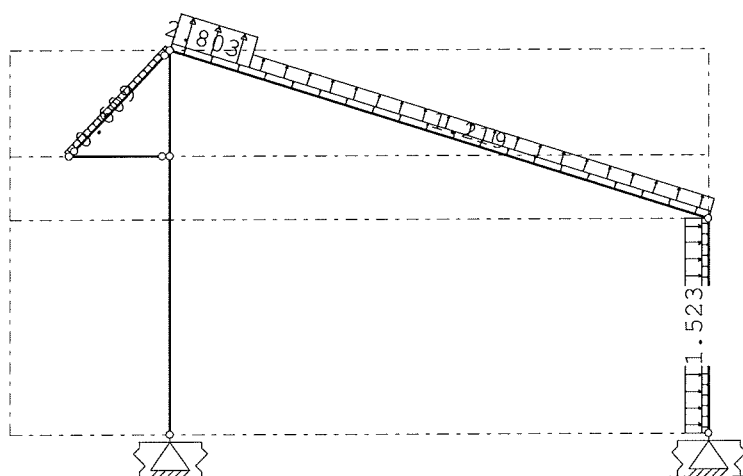
**STAAFBELASTINGEN**

B.G:6 Wind van links onderdruk B

| Staaf Type   | Index | q1/p/m | q2    | A     | B     | $\psi_0$ | $\psi_1$ | $\psi_2$ |
|--------------|-------|--------|-------|-------|-------|----------|----------|----------|
| 5 1:QZLokaal | Qw1   | -0.91  | -0.91 | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |
| 4 1:QZLokaal | Qw1   | -0.91  | -0.91 | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |
| 3 1:QZLokaal | Qw2   | 0.91   | 0.91  | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |
| 4 1:QZLokaal | Qw6   | 2.80   | 2.80  | 0.000 | 9.619 | 0.0      | 0.2      | 0.0      |
| 4 1:QZLokaal | Qw7   | 1.22   | 1.22  | 1.593 | 0.000 | 0.0      | 0.2      | 0.0      |
| 3 1:QZLokaal | Qw8   | -1.52  | -1.52 | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |

**BELASTINGEN**

B.G:7 Wind van links overdruk B

**STAAFBELASTINGEN**

B.G:7 Wind van links overdruk B

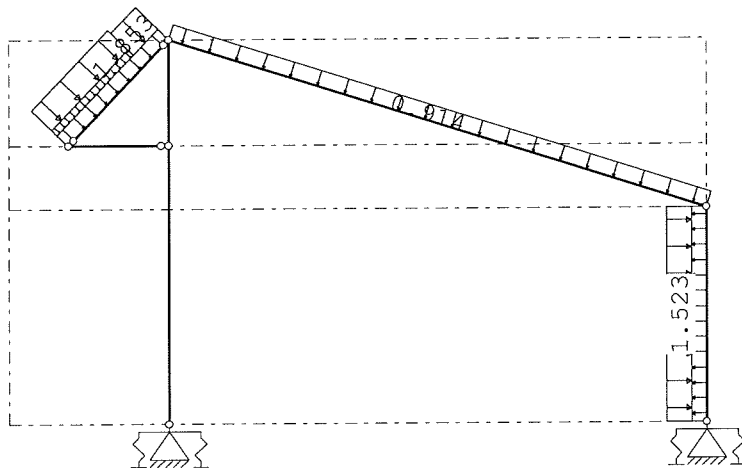
| Staaf Type   | Index | q1/p/m | q2    | A     | B     | $\psi_0$ | $\psi_1$ | $\psi_2$ |
|--------------|-------|--------|-------|-------|-------|----------|----------|----------|
| 5 1:QZLokaal | Qw9   | 0.61   | 0.61  | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |
| 4 1:QZLokaal | Qw9   | 0.61   | 0.61  | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |
| 3 1:QZLokaal | Qw10  | -0.61  | -0.61 | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |
| 4 1:QZLokaal | Qw6   | 2.80   | 2.80  | 0.000 | 9.619 | 0.0      | 0.2      | 0.0      |
| 4 1:QZLokaal | Qw7   | 1.22   | 1.22  | 1.593 | 0.000 | 0.0      | 0.2      | 0.0      |
| 3 1:QZLokaal | Qw8   | -1.52  | -1.52 | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |

Project...:

Onderdeel:

**BELASTINGEN**

B.G:8 Wind van links onderdruk C

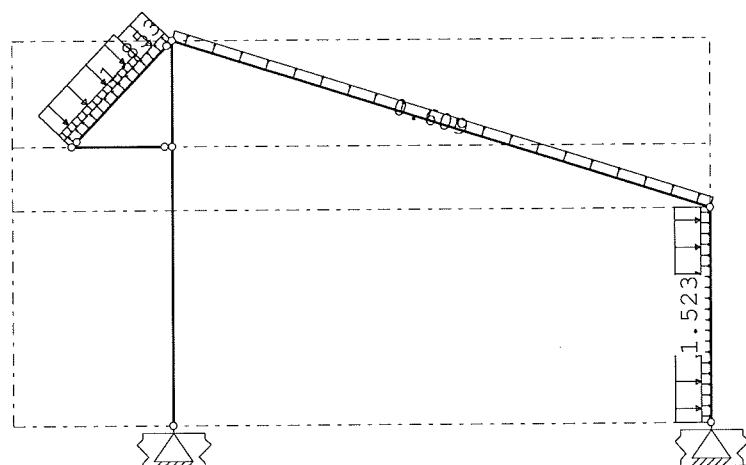
**STAAFBELASTINGEN**

B.G:8 Wind van links onderdruk C

| Staaftype | Type       | Index | q1/p/m | q2    | A     | B     | $\psi_0$ | $\psi_1$ | $\psi_2$ |
|-----------|------------|-------|--------|-------|-------|-------|----------|----------|----------|
| 5         | 1:QZLokaal | Qw1   | -0.91  | -0.91 | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |
| 4         | 1:QZLokaal | Qw1   | -0.91  | -0.91 | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |
| 3         | 1:QZLokaal | Qw2   | 0.91   | 0.91  | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |
| 5         | 1:QZLokaal | Qw3   | -0.44  | -0.44 | 0.000 | 0.704 | 0.0      | 0.2      | 0.0      |
| 5         | 1:QZLokaal | Qw4   | -1.70  | -1.70 | 0.000 | 0.704 | 0.0      | 0.2      | 0.0      |
| 5         | 1:QZLokaal | Qw5   | -1.85  | -1.85 | 2.201 | 0.000 | 0.0      | 0.2      | 0.0      |
| 3         | 1:QZLokaal | Qw8   | -1.52  | -1.52 | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |

**BELASTINGEN**

B.G:9 Wind van links overdruk C

**STAAFBELASTINGEN**

B.G:9 Wind van links overdruk C

| Staaftype | Type       | Index | q1/p/m | q2    | A     | B     | $\psi_0$ | $\psi_1$ | $\psi_2$ |
|-----------|------------|-------|--------|-------|-------|-------|----------|----------|----------|
| 5         | 1:QZLokaal | Qw9   | 0.61   | 0.61  | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |
| 4         | 1:QZLokaal | Qw9   | 0.61   | 0.61  | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |
| 3         | 1:QZLokaal | Qw10  | -0.61  | -0.61 | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |
| 5         | 1:QZLokaal | Qw3   | -0.44  | -0.44 | 0.000 | 0.704 | 0.0      | 0.2      | 0.0      |
| 5         | 1:QZLokaal | Qw4   | -1.70  | -1.70 | 0.000 | 0.704 | 0.0      | 0.2      | 0.0      |

Project...:

Onderdeel:

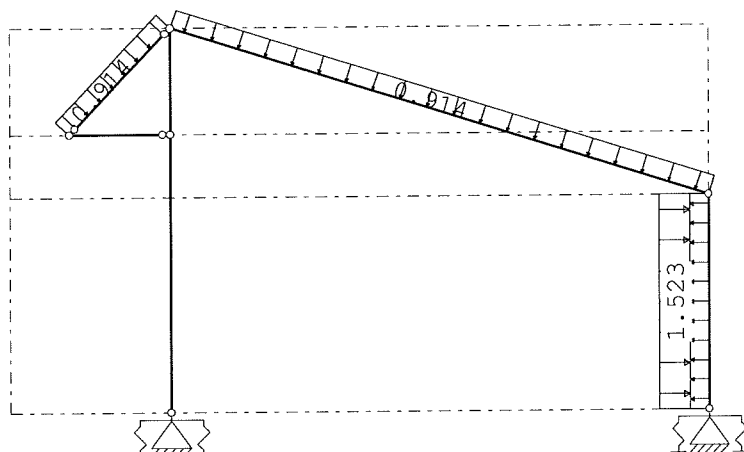
**STAAFBELASTINGEN**

B.G:9 Wind van links overdruk C

| Staaft Type  | Index | q1/p/m | q2    | A     | B     | $\Psi_0$ | $\Psi_1$ | $\Psi_2$ |
|--------------|-------|--------|-------|-------|-------|----------|----------|----------|
| 5 1:QZLokaal | Qw5   | -1.85  | -1.85 | 2.201 | 0.000 | 0.0      | 0.2      | 0.0      |
| 3 1:QZLokaal | Qw8   | -1.52  | -1.52 | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |

**BELASTINGEN**

B.G:10 Wind van links onderdruk D

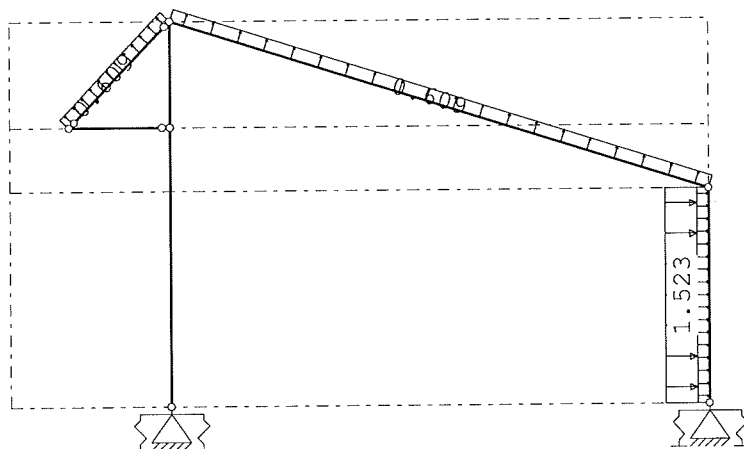
**STAAFBELASTINGEN**

B.G:10 Wind van links onderdruk D

| Staaft Type  | Index | q1/p/m | q2    | A     | B     | $\Psi_0$ | $\Psi_1$ | $\Psi_2$ |
|--------------|-------|--------|-------|-------|-------|----------|----------|----------|
| 5 1:QZLokaal | Qw1   | -0.91  | -0.91 | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |
| 4 1:QZLokaal | Qw1   | -0.91  | -0.91 | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |
| 3 1:QZLokaal | Qw2   | 0.91   | 0.91  | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |
| 3 1:QZLokaal | Qw8   | -1.52  | -1.52 | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |

**BELASTINGEN**

B.G:11 Wind van links overdruk D



Project...:

Onderdeel:

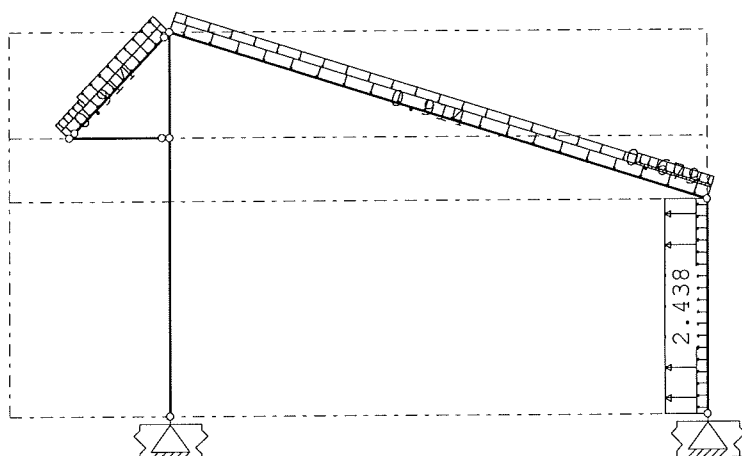
**STAAFBELASTINGEN**

B.G:11 Wind van links overdruk D

| Staaf Type   | Index | q1/p/m | q2    | A     | B     | $\Psi_0$ | $\Psi_1$ | $\Psi_2$ |
|--------------|-------|--------|-------|-------|-------|----------|----------|----------|
| 5 1:QZLokaal | Qw9   | 0.61   | 0.61  | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |
| 4 1:QZLokaal | Qw9   | 0.61   | 0.61  | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |
| 3 1:QZLokaal | Qw10  | -0.61  | -0.61 | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |
| 3 1:QZLokaal | Qw8   | -1.52  | -1.52 | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |

**BELASTINGEN**

B.G:12 Wind van rechts onderdruk A

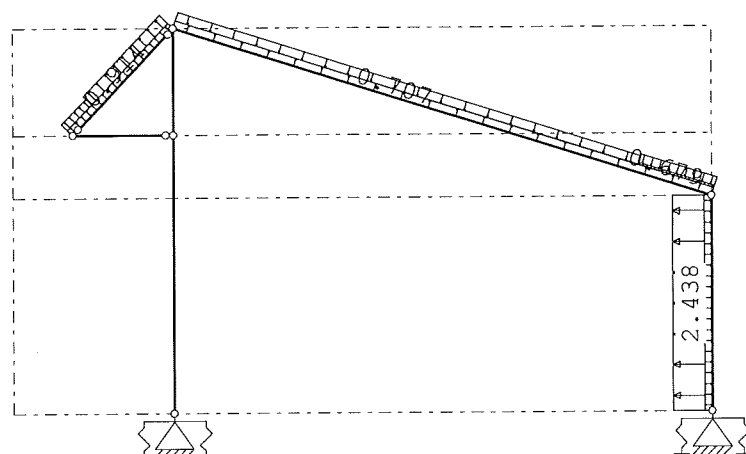
**STAAFBELASTINGEN**

B.G:12 Wind van rechts onderdruk A

| Staaf Type   | Index | q1/p/m | q2    | A     | B     | $\Psi_0$ | $\Psi_1$ | $\Psi_2$ |
|--------------|-------|--------|-------|-------|-------|----------|----------|----------|
| 5 1:QZLokaal | Qw1   | -0.91  | -0.91 | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |
| 4 1:QZLokaal | Qw1   | -0.91  | -0.91 | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |
| 3 1:QZLokaal | Qw2   | 0.91   | 0.91  | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |
| 3 1:QZLokaal | Qw11  | 2.44   | 2.44  | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |
| 4 1:QZLokaal | Qw12  | -0.17  | -0.17 | 9.619 | 0.000 | 0.0      | 0.2      | 0.0      |
| 4 1:QZLokaal | Qw13  | -0.68  | -0.68 | 9.619 | 0.000 | 0.0      | 0.2      | 0.0      |
| 4 1:QZLokaal | Qw14  | -0.71  | -0.71 | 0.000 | 1.593 | 0.0      | 0.2      | 0.0      |
| 5 1:QZLokaal | Qw15  | 0.91   | 0.91  | 0.704 | 0.000 | 0.0      | 0.2      | 0.0      |
| 5 1:QZLokaal | Qw16  | 0.61   | 0.61  | 0.000 | 2.201 | 0.0      | 0.2      | 0.0      |

**BELASTINGEN**

B.G:13 Wind van rechts overdruk A



Project...:

Onderdeel:

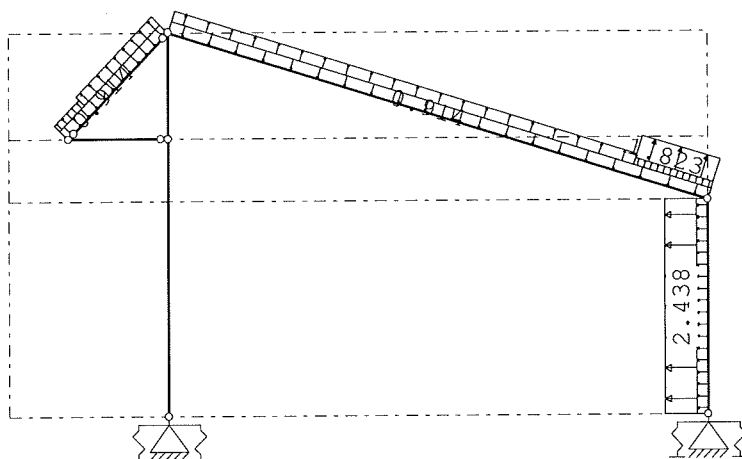
**STAAFBELASTINGEN**

B.G:13 Wind van rechts overdruk A

| Staaftype    | Index | q1/p/m | q2    | A     | B     | $\Psi_0$ | $\Psi_1$ | $\Psi_2$ |
|--------------|-------|--------|-------|-------|-------|----------|----------|----------|
| 5 1:QZLokaal | Qw9   | 0.61   | 0.61  | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |
| 4 1:QZLokaal | Qw9   | 0.61   | 0.61  | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |
| 3 1:QZLokaal | Qw10  | -0.61  | -0.61 | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |
| 3 1:QZLokaal | Qw11  | 2.44   | 2.44  | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |
| 4 1:QZLokaal | Qw12  | -0.17  | -0.17 | 9.619 | 0.000 | 0.0      | 0.2      | 0.0      |
| 4 1:QZLokaal | Qw13  | -0.68  | -0.68 | 9.619 | 0.000 | 0.0      | 0.2      | 0.0      |
| 4 1:QZLokaal | Qw14  | -0.71  | -0.71 | 0.000 | 1.593 | 0.0      | 0.2      | 0.0      |
| 5 1:QZLokaal | Qw15  | 0.91   | 0.91  | 0.704 | 0.000 | 0.0      | 0.2      | 0.0      |
| 5 1:QZLokaal | Qw16  | 0.61   | 0.61  | 0.000 | 2.201 | 0.0      | 0.2      | 0.0      |

**BELASTINGEN**

B.G:14 Wind van rechts onderdruk B

**STAAFBELASTINGEN**

B.G:14 Wind van rechts onderdruk B

| Staaftype    | Index | q1/p/m | q2    | A     | B     | $\Psi_0$ | $\Psi_1$ | $\Psi_2$ |
|--------------|-------|--------|-------|-------|-------|----------|----------|----------|
| 5 1:QZLokaal | Qw1   | -0.91  | -0.91 | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |
| 4 1:QZLokaal | Qw1   | -0.91  | -0.91 | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |
| 3 1:QZLokaal | Qw2   | 0.91   | 0.91  | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |
| 3 1:QZLokaal | Qw11  | 2.44   | 2.44  | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |
| 4 1:QZLokaal | Qw17  | 0.52   | 0.52  | 9.619 | 0.000 | 0.0      | 0.2      | 0.0      |
| 4 1:QZLokaal | Qw18  | 1.82   | 1.82  | 9.619 | 0.000 | 0.0      | 0.2      | 0.0      |
| 4 1:QZLokaal | Qw19  | 0.87   | 0.87  | 0.000 | 1.593 | 0.0      | 0.2      | 0.0      |
| 5 1:QZLokaal | Qw15  | 0.91   | 0.91  | 0.704 | 0.000 | 0.0      | 0.2      | 0.0      |
| 5 1:QZLokaal | Qw16  | 0.61   | 0.61  | 0.000 | 2.201 | 0.0      | 0.2      | 0.0      |

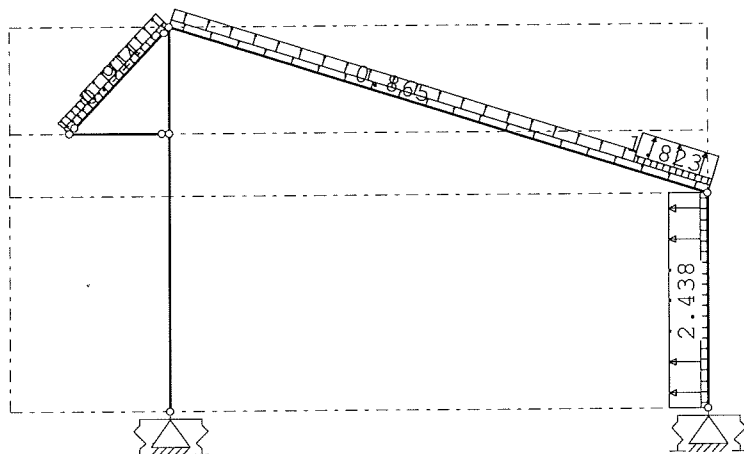


Project...:

Onderdeel:

**BELASTINGEN**

B.G:15 Wind van rechts overdruk B

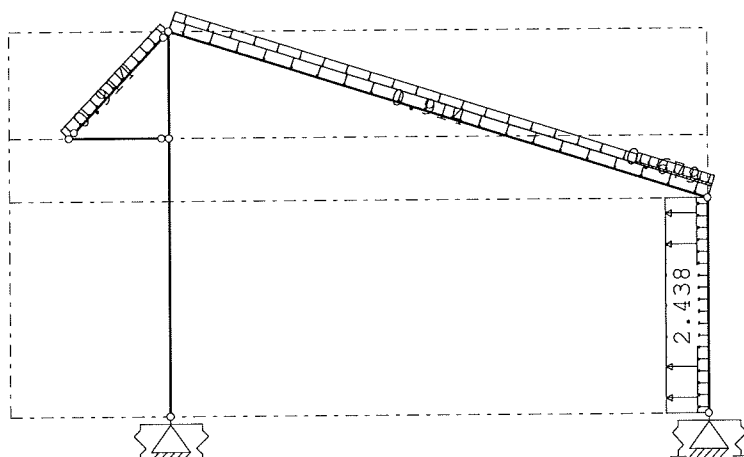
**STAAFBELASTINGEN**

B.G:15 Wind van rechts overdruk B

| Staaft Type  | Index | q1/p/m | q2    | A     | B     | $\psi_0$ | $\psi_1$ | $\psi_2$ |
|--------------|-------|--------|-------|-------|-------|----------|----------|----------|
| 5 1:QZLokaal | Qw9   | 0.61   | 0.61  | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |
| 4 1:QZLokaal | Qw9   | 0.61   | 0.61  | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |
| 3 1:QZLokaal | Qw10  | -0.61  | -0.61 | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |
| 3 1:QZLokaal | Qw11  | 2.44   | 2.44  | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |
| 4 1:QZLokaal | Qw17  | 0.52   | 0.52  | 9.619 | 0.000 | 0.0      | 0.2      | 0.0      |
| 4 1:QZLokaal | Qw18  | 1.82   | 1.82  | 9.619 | 0.000 | 0.0      | 0.2      | 0.0      |
| 4 1:QZLokaal | Qw19  | 0.87   | 0.87  | 0.000 | 1.593 | 0.0      | 0.2      | 0.0      |
| 5 1:QZLokaal | Qw15  | 0.91   | 0.91  | 0.704 | 0.000 | 0.0      | 0.2      | 0.0      |
| 5 1:QZLokaal | Qw16  | 0.61   | 0.61  | 0.000 | 2.201 | 0.0      | 0.2      | 0.0      |

**BELASTINGEN**

B.G:16 Wind van rechts onderdruk C



Project...:

Onderdeel:

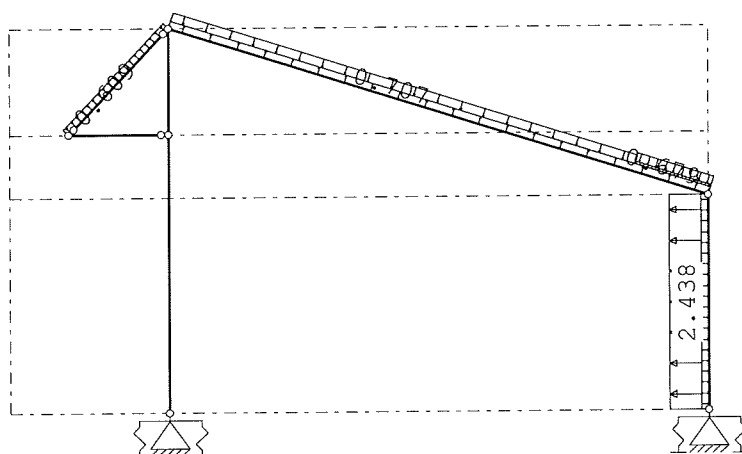
**STAAFBELASTINGEN**

B.G:16 Wind van rechts onderdruk C

| Staaft Type  | Index | q1/p/m | q2    | A     | B     | $\Psi_0$ | $\Psi_1$ | $\Psi_2$ |
|--------------|-------|--------|-------|-------|-------|----------|----------|----------|
| 5 1:QZLokaal | Qw1   | -0.91  | -0.91 | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |
| 4 1:QZLokaal | Qw1   | -0.91  | -0.91 | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |
| 3 1:QZLokaal | Qw2   | 0.91   | 0.91  | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |
| 3 1:QZLokaal | Qw11  | 2.44   | 2.44  | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |
| 4 1:QZLokaal | Qw12  | -0.17  | -0.17 | 9.619 | 0.000 | 0.0      | 0.2      | 0.0      |
| 4 1:QZLokaal | Qw13  | -0.68  | -0.68 | 9.619 | 0.000 | 0.0      | 0.2      | 0.0      |
| 4 1:QZLokaal | Qw14  | -0.71  | -0.71 | 0.000 | 1.593 | 0.0      | 0.2      | 0.0      |

**BELASTINGEN**

B.G:17 Wind van rechts overdruk C

**STAAFBELASTINGEN**

B.G:17 Wind van rechts overdruk C

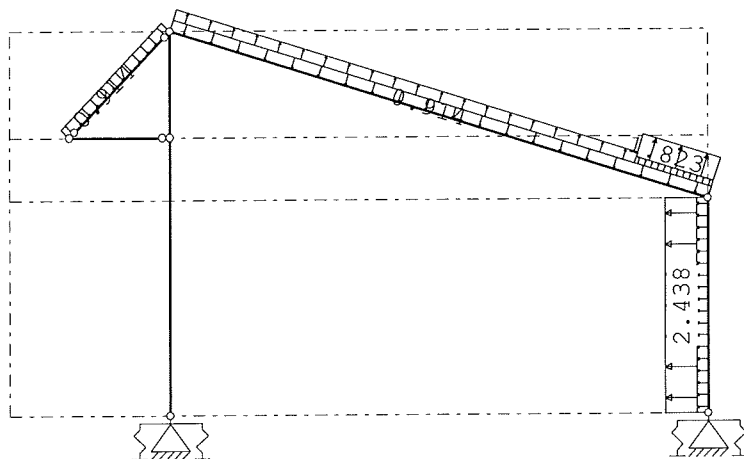
| Staaft Type  | Index | q1/p/m | q2    | A     | B     | $\Psi_0$ | $\Psi_1$ | $\Psi_2$ |
|--------------|-------|--------|-------|-------|-------|----------|----------|----------|
| 5 1:QZLokaal | Qw9   | 0.61   | 0.61  | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |
| 4 1:QZLokaal | Qw9   | 0.61   | 0.61  | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |
| 3 1:QZLokaal | Qw10  | -0.61  | -0.61 | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |
| 3 1:QZLokaal | Qw11  | 2.44   | 2.44  | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |
| 4 1:QZLokaal | Qw12  | -0.17  | -0.17 | 9.619 | 0.000 | 0.0      | 0.2      | 0.0      |
| 4 1:QZLokaal | Qw13  | -0.68  | -0.68 | 9.619 | 0.000 | 0.0      | 0.2      | 0.0      |
| 4 1:QZLokaal | Qw14  | -0.71  | -0.71 | 0.000 | 1.593 | 0.0      | 0.2      | 0.0      |

Project...:

Onderdeel:

**BELASTINGEN**

B.G:18 Wind van rechts onderdruk D

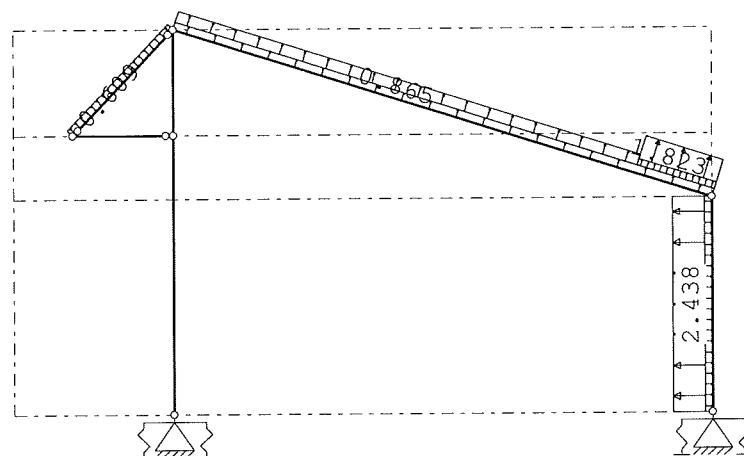
**STAAFBELASTINGEN**

B.G:18 Wind van rechts onderdruk D

| Staaftype | Type       | Index | q1/p/m | q2    | A     | B     | $\psi_0$ | $\psi_1$ | $\psi_2$ |
|-----------|------------|-------|--------|-------|-------|-------|----------|----------|----------|
| 5         | 1:QZLokaal | Qw1   | -0.91  | -0.91 | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |
| 4         | 1:QZLokaal | Qw1   | -0.91  | -0.91 | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |
| 3         | 1:QZLokaal | Qw2   | 0.91   | 0.91  | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |
| 3         | 1:QZLokaal | Qw11  | 2.44   | 2.44  | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |
| 4         | 1:QZLokaal | Qw17  | 0.52   | 0.52  | 9.619 | 0.000 | 0.0      | 0.2      | 0.0      |
| 4         | 1:QZLokaal | Qw18  | 1.82   | 1.82  | 9.619 | 0.000 | 0.0      | 0.2      | 0.0      |
| 4         | 1:QZLokaal | Qw19  | 0.87   | 0.87  | 0.000 | 1.593 | 0.0      | 0.2      | 0.0      |

**BELASTINGEN**

B.G:19 Wind van rechts overdruk D

**STAAFBELASTINGEN**

B.G:19 Wind van rechts overdruk D

| Staaftype | Type       | Index | q1/p/m | q2    | A     | B     | $\psi_0$ | $\psi_1$ | $\psi_2$ |
|-----------|------------|-------|--------|-------|-------|-------|----------|----------|----------|
| 5         | 1:QZLokaal | Qw9   | 0.61   | 0.61  | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |
| 4         | 1:QZLokaal | Qw9   | 0.61   | 0.61  | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |
| 3         | 1:QZLokaal | Qw10  | -0.61  | -0.61 | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |
| 3         | 1:QZLokaal | Qw11  | 2.44   | 2.44  | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |
| 4         | 1:QZLokaal | Qw17  | 0.52   | 0.52  | 9.619 | 0.000 | 0.0      | 0.2      | 0.0      |
| 4         | 1:QZLokaal | Qw18  | 1.82   | 1.82  | 9.619 | 0.000 | 0.0      | 0.2      | 0.0      |

Project...:

Onderdeel:

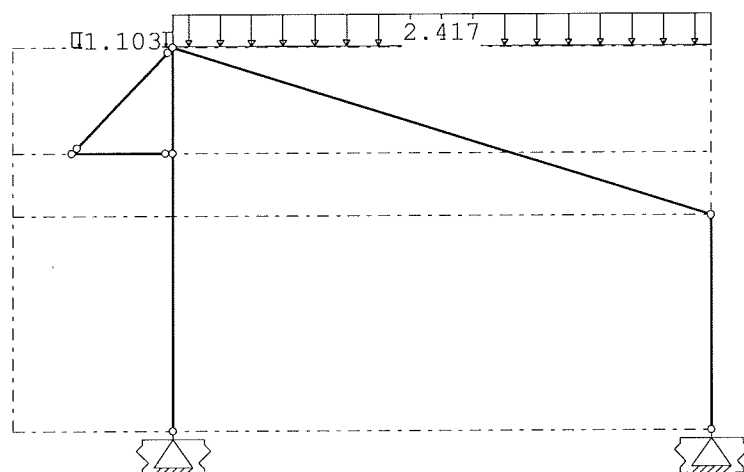
**STAAFBELASTINGEN**

B.G:19 Wind van rechts overdruk D

| Staaft Type  | Index | q1/p/m | q2   | A     | B     | $\psi_0$ | $\psi_1$ | $\psi_2$ |
|--------------|-------|--------|------|-------|-------|----------|----------|----------|
| 4 1:QZLokaal | Qw19  | 0.87   | 0.87 | 0.000 | 1.593 | 0.0      | 0.2      | 0.0      |

**BELASTINGEN**

B.G:20 Sneeuw A

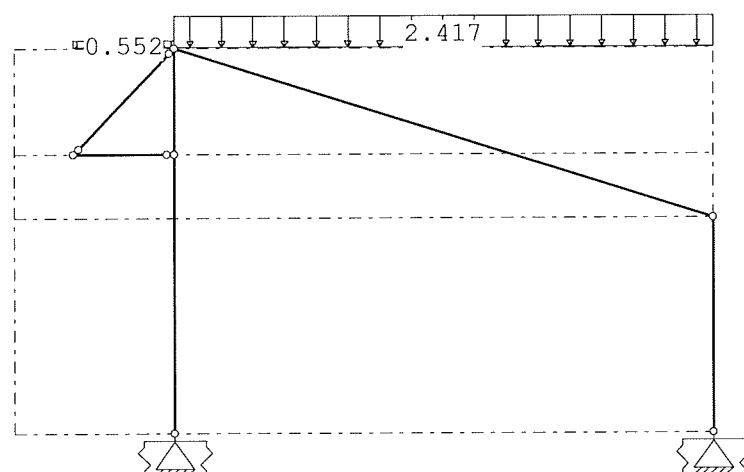
**STAAFBELASTINGEN**

B.G:20 Sneeuw A

| Staaft Type   | Index | q1/p/m | q2    | A     | B     | $\psi_0$ | $\psi_1$ | $\psi_2$ |
|---------------|-------|--------|-------|-------|-------|----------|----------|----------|
| 4 3:QZgeProj. | Qs1   | -2.42  | -2.42 | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |
| 5 3:QZgeProj. | Qs2   | -1.10  | -1.10 | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |

**BELASTINGEN**

B.G:21 Sneeuw B

**STAAFBELASTINGEN**

B.G:21 Sneeuw B

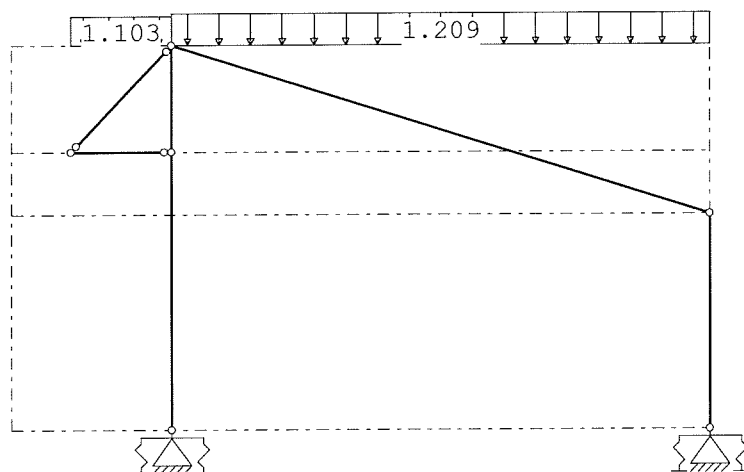
| Staaft Type   | Index | q1/p/m | q2    | A     | B     | $\psi_0$ | $\psi_1$ | $\psi_2$ |
|---------------|-------|--------|-------|-------|-------|----------|----------|----------|
| 4 3:QZgeProj. | Qs1   | -2.42  | -2.42 | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |
| 5 3:QZgeProj. | Qs3   | -0.55  | -0.55 | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |

Project...:

Onderdeel:

**BELASTINGEN**

B.G:22 Sneeuw C

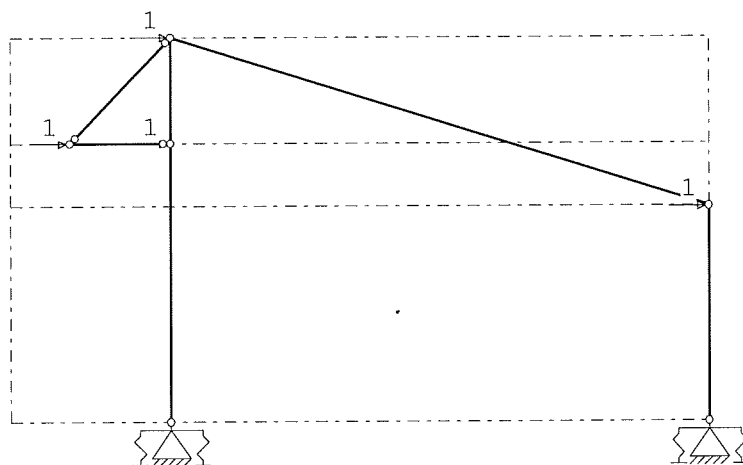
**STAAFBELASTINGEN**

B.G:22 Sneeuw C

| Staaf | Type        | Index | q1/p/m | q2    | A     | B     | $\Psi_0$ | $\Psi_1$ | $\Psi_2$ |
|-------|-------------|-------|--------|-------|-------|-------|----------|----------|----------|
| 4     | 3:QZgeProj. | Qs4   | -1.21  | -1.21 | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |
| 5     | 3:QZgeProj. | Qs2   | -1.10  | -1.10 | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |

**BELASTINGEN**

B.G:23 Knik

**KNOOPBELASTINGEN**

B.G:23 Knik

| Last | Knoop | Richting | waarde | $\Psi_0$ | $\Psi_1$ | $\Psi_2$ |
|------|-------|----------|--------|----------|----------|----------|
| 1    | 2     | X        | 1.000  |          |          |          |
| 2    | 3     | X        | 1.000  |          |          |          |
| 3    | 4     | X        | 1.000  |          |          |          |
| 4    | 6     | X        | 1.000  |          |          |          |

Project...:

Onderdeel:

**BELASTINGCOMBINATIES**

| BC Type  |      |           |   |                 |
|----------|------|-----------|---|-----------------|
| 1 Fund.  | 1.22 | $G_{k,1}$ |   |                 |
| 2 Fund.  | 0.90 | $G_{k,1}$ |   |                 |
| 3 Fund.  | 1.08 | $G_{k,1}$ | + | 1.35 $Q_{k,2}$  |
| 4 Fund.  | 1.08 | $G_{k,1}$ | + | 1.35 $Q_{k,3}$  |
| 5 Fund.  | 1.08 | $G_{k,1}$ | + | 1.35 $Q_{k,4}$  |
| 6 Fund.  | 1.08 | $G_{k,1}$ | + | 1.35 $Q_{k,5}$  |
| 7 Fund.  | 1.08 | $G_{k,1}$ | + | 1.35 $Q_{k,6}$  |
| 8 Fund.  | 1.08 | $G_{k,1}$ | + | 1.35 $Q_{k,7}$  |
| 9 Fund.  | 1.08 | $G_{k,1}$ | + | 1.35 $Q_{k,8}$  |
| 10 Fund. | 1.08 | $G_{k,1}$ | + | 1.35 $Q_{k,9}$  |
| 11 Fund. | 1.08 | $G_{k,1}$ | + | 1.35 $Q_{k,10}$ |
| 12 Fund. | 1.08 | $G_{k,1}$ | + | 1.35 $Q_{k,11}$ |
| 13 Fund. | 1.08 | $G_{k,1}$ | + | 1.35 $Q_{k,12}$ |
| 14 Fund. | 1.08 | $G_{k,1}$ | + | 1.35 $Q_{k,13}$ |
| 15 Fund. | 1.08 | $G_{k,1}$ | + | 1.35 $Q_{k,14}$ |
| 16 Fund. | 1.08 | $G_{k,1}$ | + | 1.35 $Q_{k,15}$ |
| 17 Fund. | 1.08 | $G_{k,1}$ | + | 1.35 $Q_{k,16}$ |
| 18 Fund. | 1.08 | $G_{k,1}$ | + | 1.35 $Q_{k,17}$ |
| 19 Fund. | 1.08 | $G_{k,1}$ | + | 1.35 $Q_{k,18}$ |
| 20 Fund. | 1.08 | $G_{k,1}$ | + | 1.35 $Q_{k,19}$ |
| 21 Fund. | 1.08 | $G_{k,1}$ | + | 1.35 $Q_{k,20}$ |
| 22 Fund. | 1.08 | $G_{k,1}$ | + | 1.35 $Q_{k,21}$ |
| 23 Fund. | 1.08 | $G_{k,1}$ | + | 1.35 $Q_{k,22}$ |
| 24 Fund. | 0.90 | $G_{k,1}$ | + | 1.35 $Q_{k,2}$  |
| 25 Fund. | 0.90 | $G_{k,1}$ | + | 1.35 $Q_{k,3}$  |
| 26 Fund. | 0.90 | $G_{k,1}$ | + | 1.35 $Q_{k,4}$  |
| 27 Fund. | 0.90 | $G_{k,1}$ | + | 1.35 $Q_{k,5}$  |
| 28 Fund. | 0.90 | $G_{k,1}$ | + | 1.35 $Q_{k,6}$  |
| 29 Fund. | 0.90 | $G_{k,1}$ | + | 1.35 $Q_{k,7}$  |
| 30 Fund. | 0.90 | $G_{k,1}$ | + | 1.35 $Q_{k,8}$  |
| 31 Fund. | 0.90 | $G_{k,1}$ | + | 1.35 $Q_{k,9}$  |
| 32 Fund. | 0.90 | $G_{k,1}$ | + | 1.35 $Q_{k,10}$ |
| 33 Fund. | 0.90 | $G_{k,1}$ | + | 1.35 $Q_{k,11}$ |
| 34 Fund. | 0.90 | $G_{k,1}$ | + | 1.35 $Q_{k,12}$ |
| 35 Fund. | 0.90 | $G_{k,1}$ | + | 1.35 $Q_{k,13}$ |
| 36 Fund. | 0.90 | $G_{k,1}$ | + | 1.35 $Q_{k,14}$ |
| 37 Fund. | 0.90 | $G_{k,1}$ | + | 1.35 $Q_{k,15}$ |
| 38 Fund. | 0.90 | $G_{k,1}$ | + | 1.35 $Q_{k,16}$ |
| 39 Fund. | 0.90 | $G_{k,1}$ | + | 1.35 $Q_{k,17}$ |
| 40 Fund. | 0.90 | $G_{k,1}$ | + | 1.35 $Q_{k,18}$ |
| 41 Fund. | 0.90 | $G_{k,1}$ | + | 1.35 $Q_{k,19}$ |
| 42 Fund. | 0.90 | $G_{k,1}$ | + | 1.35 $Q_{k,20}$ |
| 43 Fund. | 0.90 | $G_{k,1}$ | + | 1.35 $Q_{k,21}$ |
| 44 Fund. | 0.90 | $G_{k,1}$ | + | 1.35 $Q_{k,22}$ |
| 45 Kar.  | 1.00 | $G_{k,1}$ |   |                 |

Project..:

Onderdeel:

**BELASTINGCOMBINATIES**

BC Type

|         |      |           |   |                 |
|---------|------|-----------|---|-----------------|
| 46 Kar. | 1.00 | $G_{k,1}$ |   |                 |
| 47 Kar. | 1.00 | $G_{k,1}$ |   |                 |
| 48 Kar. | 1.00 | $G_{k,1}$ |   |                 |
| 49 Kar. | 1.00 | $G_{k,1}$ |   |                 |
| 50 Kar. | 1.00 | $G_{k,1}$ |   |                 |
| 51 Kar. | 1.00 | $G_{k,1}$ |   |                 |
| 52 Kar. | 1.00 | $G_{k,1}$ |   |                 |
| 53 Kar. | 1.00 | $G_{k,1}$ |   |                 |
| 54 Kar. | 1.00 | $G_{k,1}$ |   |                 |
| 55 Kar. | 1.00 | $G_{k,1}$ |   |                 |
| 56 Kar. | 1.00 | $G_{k,1}$ |   |                 |
| 57 Kar. | 1.00 | $G_{k,1}$ |   |                 |
| 58 Kar. | 1.00 | $G_{k,1}$ |   |                 |
| 59 Kar. | 1.00 | $G_{k,1}$ |   |                 |
| 60 Kar. | 1.00 | $G_{k,1}$ |   |                 |
| 61 Kar. | 1.00 | $G_{k,1}$ | + | 1.00 $Q_{k,2}$  |
| 62 Kar. | 1.00 | $G_{k,1}$ | + | 1.00 $Q_{k,3}$  |
| 63 Kar. | 1.00 | $G_{k,1}$ | + | 1.00 $Q_{k,4}$  |
| 64 Kar. | 1.00 | $G_{k,1}$ | + | 0.95 $Q_{k,4}$  |
| 65 Kar. | 1.00 | $G_{k,1}$ | + | 1.00 $Q_{k,5}$  |
| 66 Kar. | 1.00 | $G_{k,1}$ | + | 0.95 $Q_{k,5}$  |
| 67 Kar. | 1.00 | $G_{k,1}$ | + | 1.00 $Q_{k,6}$  |
| 68 Kar. | 1.00 | $G_{k,1}$ | + | 0.95 $Q_{k,6}$  |
| 69 Kar. | 1.00 | $G_{k,1}$ | + | 1.00 $Q_{k,7}$  |
| 70 Kar. | 1.00 | $G_{k,1}$ | + | 0.95 $Q_{k,7}$  |
| 71 Kar. | 1.00 | $G_{k,1}$ | + | 1.00 $Q_{k,8}$  |
| 72 Kar. | 1.00 | $G_{k,1}$ | + | 0.95 $Q_{k,8}$  |
| 73 Kar. | 1.00 | $G_{k,1}$ | + | 1.00 $Q_{k,9}$  |
| 74 Kar. | 1.00 | $G_{k,1}$ | + | 0.95 $Q_{k,9}$  |
| 75 Kar. | 1.00 | $G_{k,1}$ | + | 1.00 $Q_{k,10}$ |
| 76 Kar. | 1.00 | $G_{k,1}$ | + | 0.95 $Q_{k,10}$ |
| 77 Kar. | 1.00 | $G_{k,1}$ | + | 1.00 $Q_{k,11}$ |
| 78 Kar. | 1.00 | $G_{k,1}$ | + | 0.95 $Q_{k,11}$ |
| 79 Kar. | 1.00 | $G_{k,1}$ | + | 1.00 $Q_{k,12}$ |
| 80 Kar. | 1.00 | $G_{k,1}$ | + | 0.95 $Q_{k,12}$ |
| 81 Kar. | 1.00 | $G_{k,1}$ | + | 1.00 $Q_{k,13}$ |
| 82 Kar. | 1.00 | $G_{k,1}$ | + | 0.95 $Q_{k,13}$ |
| 83 Kar. | 1.00 | $G_{k,1}$ | + | 1.00 $Q_{k,14}$ |
| 84 Kar. | 1.00 | $G_{k,1}$ | + | 0.95 $Q_{k,14}$ |
| 85 Kar. | 1.00 | $G_{k,1}$ | + | 1.00 $Q_{k,15}$ |
| 86 Kar. | 1.00 | $G_{k,1}$ | + | 0.95 $Q_{k,15}$ |
| 87 Kar. | 1.00 | $G_{k,1}$ | + | 1.00 $Q_{k,16}$ |
| 88 Kar. | 1.00 | $G_{k,1}$ | + | 0.95 $Q_{k,16}$ |
| 89 Kar. | 1.00 | $G_{k,1}$ | + | 1.00 $Q_{k,17}$ |



Project..:

Onderdeel:

**BELASTINGCOMBINATIES**

| BC Type   |                |   |               |            |
|-----------|----------------|---|---------------|------------|
| 90 Kar.   | 1.00 $G_{k,1}$ | + | 0.95          | $Q_{k,17}$ |
| 91 Kar.   | 1.00 $G_{k,1}$ | + | 1.00          | $Q_{k,18}$ |
| 92 Kar.   | 1.00 $G_{k,1}$ | + | 0.95          | $Q_{k,18}$ |
| 93 Kar.   | 1.00 $G_{k,1}$ | + | 1.00          | $Q_{k,19}$ |
| 94 Kar.   | 1.00 $G_{k,1}$ | + | 0.95          | $Q_{k,19}$ |
| 95 Kar.   | 1.00 $G_{k,1}$ | + | 1.00          | $Q_{k,20}$ |
| 96 Kar.   | 1.00 $G_{k,1}$ | + | 1.00          | $Q_{k,21}$ |
| 97 Kar.   | 1.00 $G_{k,1}$ | + | 1.00          | $Q_{k,22}$ |
| 98 Quas.  | 1.00 $G_{k,1}$ |   |               |            |
| 99 Freq.  | 1.00 $G_{k,1}$ |   |               |            |
| 100 Freq. | 1.00 $G_{k,1}$ | + | 1.00 $\psi_1$ | $Q_{k,4}$  |
| 101 Freq. | 1.00 $G_{k,1}$ | + | 1.00 $\psi_1$ | $Q_{k,5}$  |
| 102 Freq. | 1.00 $G_{k,1}$ | + | 1.00 $\psi_1$ | $Q_{k,6}$  |
| 103 Freq. | 1.00 $G_{k,1}$ | + | 1.00 $\psi_1$ | $Q_{k,7}$  |
| 104 Freq. | 1.00 $G_{k,1}$ | + | 1.00 $\psi_1$ | $Q_{k,8}$  |
| 105 Freq. | 1.00 $G_{k,1}$ | + | 1.00 $\psi_1$ | $Q_{k,9}$  |
| 106 Freq. | 1.00 $G_{k,1}$ | + | 1.00 $\psi_1$ | $Q_{k,10}$ |
| 107 Freq. | 1.00 $G_{k,1}$ | + | 1.00 $\psi_1$ | $Q_{k,11}$ |
| 108 Freq. | 1.00 $G_{k,1}$ | + | 1.00 $\psi_1$ | $Q_{k,12}$ |
| 109 Freq. | 1.00 $G_{k,1}$ | + | 1.00 $\psi_1$ | $Q_{k,13}$ |
| 110 Freq. | 1.00 $G_{k,1}$ | + | 1.00 $\psi_1$ | $Q_{k,14}$ |
| 111 Freq. | 1.00 $G_{k,1}$ | + | 1.00 $\psi_1$ | $Q_{k,15}$ |
| 112 Freq. | 1.00 $G_{k,1}$ | + | 1.00 $\psi_1$ | $Q_{k,16}$ |
| 113 Freq. | 1.00 $G_{k,1}$ | + | 1.00 $\psi_1$ | $Q_{k,17}$ |
| 114 Freq. | 1.00 $G_{k,1}$ | + | 1.00 $\psi_1$ | $Q_{k,18}$ |
| 115 Freq. | 1.00 $G_{k,1}$ | + | 1.00 $\psi_1$ | $Q_{k,19}$ |
| 116 Freq. | 1.00 $G_{k,1}$ | + | 1.00 $\psi_1$ | $Q_{k,20}$ |
| 117 Freq. | 1.00 $G_{k,1}$ | + | 1.00 $\psi_1$ | $Q_{k,21}$ |
| 118 Freq. | 1.00 $G_{k,1}$ | + | 1.00 $\psi_1$ | $Q_{k,22}$ |
| 119 Blij. | 1.00 $G_{k,1}$ |   |               |            |

**GUNSTIGE WERKING PERMANENTE BELASTINGEN**

BC Staven met gunstige werking

- 1 Geen
- 2 Alle staven de factor:0.90
- 3 Geen
- 4 Geen
- 5 Geen
- 6 Geen
- 7 Geen
- 8 Geen
- 9 Geen
- 10 Geen
- 11 Geen

Project...:

Onderdeel:

**GUNSTIGE WERKING PERMANENTE BELASTINGEN**

---

BC Staven met gunstige werking

---

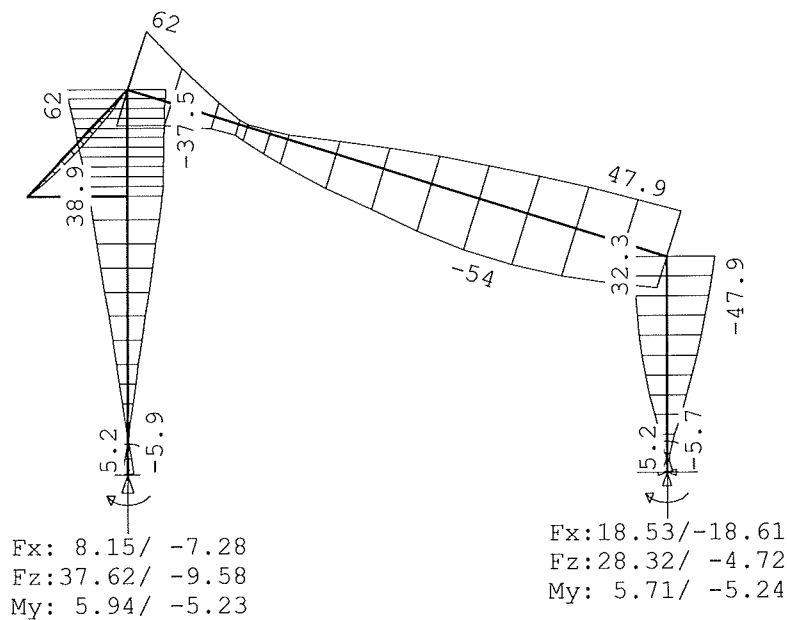
12 Geen  
13 Geen  
14 Geen  
15 Geen  
16 Geen  
17 Geen  
18 Geen  
19 Geen  
20 Geen  
21 Geen  
22 Geen  
23 Geen  
24 Alle staven de factor:0.90  
25 Alle staven de factor:0.90  
26 Alle staven de factor:0.90  
27 Alle staven de factor:0.90  
28 Alle staven de factor:0.90  
29 Alle staven de factor:0.90  
30 Alle staven de factor:0.90  
31 Alle staven de factor:0.90  
32 Alle staven de factor:0.90  
33 Alle staven de factor:0.90  
34 Alle staven de factor:0.90  
35 Alle staven de factor:0.90  
36 Alle staven de factor:0.90  
37 Alle staven de factor:0.90  
38 Alle staven de factor:0.90  
39 Alle staven de factor:0.90  
40 Alle staven de factor:0.90  
41 Alle staven de factor:0.90  
42 Alle staven de factor:0.90  
43 Alle staven de factor:0.90  
44 Alle staven de factor:0.90

Project...:

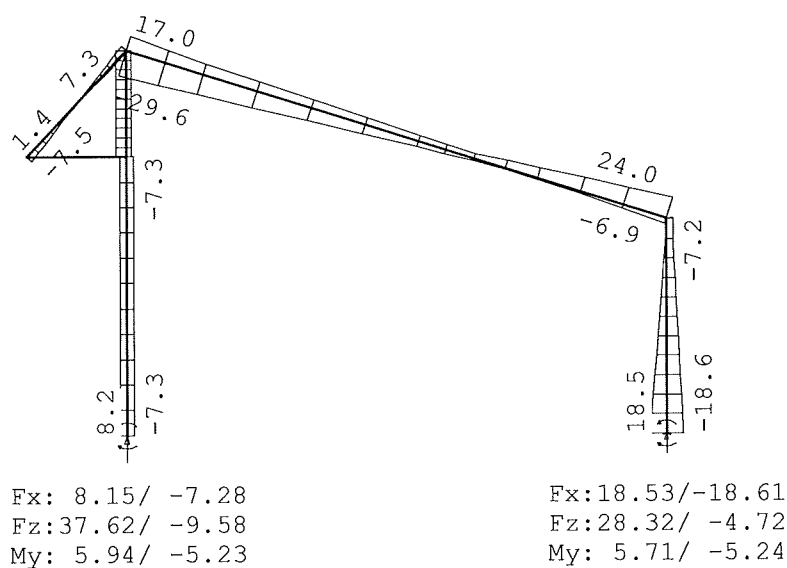
Onderdeel:

**OMHULLENDE VAN DE FUNDAMENTELE COMBINATIES****MOMENTEN**

Fundamentele combinatie

**DWARSKRACHTEN**

Fundamentele combinatie

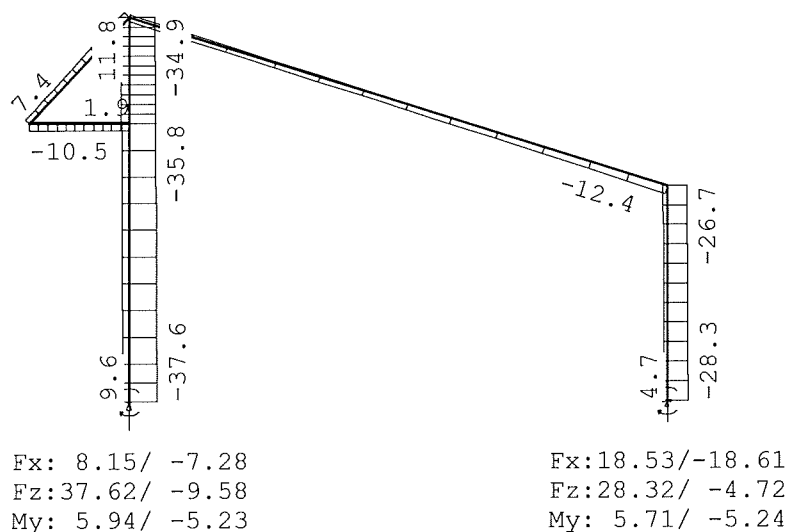


Project...:

Onderdeel:

**NORMAALKRACHTEN**

Fundamentele combinatie

**REACTIES**

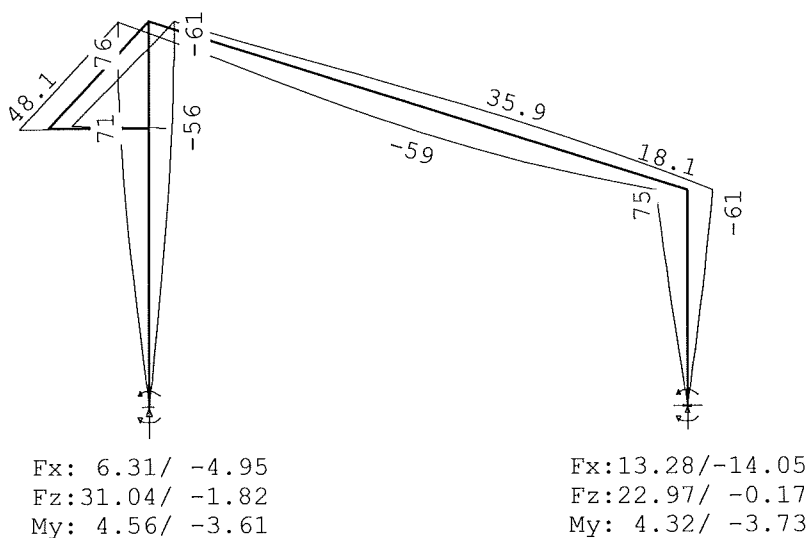
Fundamentele combinatie

| Kn. | X-min  | X-max | Z-min | Z-max | M-min | M-max |
|-----|--------|-------|-------|-------|-------|-------|
| 1   | -7.28  | 8.15  | -9.58 | 37.62 | -5.23 | 5.94  |
| 5   | -18.61 | 18.53 | -4.72 | 28.32 | -5.24 | 5.71  |

**OMHULLENDE VAN DE KARAKTERISTIEKE COMBINATIES****VERPLAATSINGEN**

[mm]

Karakteristieke combinatie

**REACTIES**

Karakteristieke combinatie

| Kn. | X-min | X-max | Z-min | Z-max | M-min | M-max |
|-----|-------|-------|-------|-------|-------|-------|
|-----|-------|-------|-------|-------|-------|-------|

Project...:

Onderdeel:

**REACTIES**

Karakteristieke combinatie

| Kn. | X-min  | X-max | Z-min | Z-max | M-min | M-max |
|-----|--------|-------|-------|-------|-------|-------|
| 1   | -4.95  | 6.31  | -1.82 | 31.04 | -3.61 | 4.56  |
| 5   | -14.05 | 13.28 | -0.17 | 22.97 | -3.73 | 4.32  |

**STAALPROFIELEN - ALGEMENE GEGEVENS**

|                              |                                            |             |
|------------------------------|--------------------------------------------|-------------|
| Stabiliteit:                 | Classificatie gehele constructie:          | Ongeschoord |
|                              | Belastinggeval m.b.t. bepaling kniklengte: | 23=Knik     |
|                              | Aanpassing inkl. parameter C :             | Steunpunten |
| Tweede-orde-effect:          |                                            |             |
|                              | Aan te houden verhouding $n/(n-1)$         |             |
|                              | voor steunmomenten en verplaatsingen:      | 1.10        |
| Doorbuiging en verplaatsing: |                                            |             |
|                              | Aantal bouwlagen:                          | 1           |
|                              | Gebouwtype:                                | Overig      |
|                              | Toel. horiz. verplaatsing gehele gebouw:   | $h/300$     |
|                              | Kleinste gevelhoogte [m]:                  | 0.0         |

**MATERIAAL**

| Mat nr. | Profielnaam | Vloeisp. [N/mm <sup>2</sup> ] | Productie methode | Min. drsn. klasse |
|---------|-------------|-------------------------------|-------------------|-------------------|
| 1       | IPE270      | 235                           | Gewalst           | 1                 |
| 2       | HEA200      | 235                           | Gewalst           | 1                 |
| 3       | HEA100      | 235                           | Gewalst           | 1                 |
| 4       | IPE200      | 235                           | Gewalst           | 1                 |
| 5       | IPE240      | 235                           | Gewalst           | 1                 |

Partiële veiligheidsfactoren:

Gamma M;0 : 1.00 Gamma M;1 : 1.00

**KNIKSTABILITEIT**

| Staafl | $l_{sys}$ [m] | Classif. y sterke as | $l_{knik;y}$ [m] | Extra aanp. y [kN] | Classif. z zwakke as | $l_{knik;z}$ [m] | Extra aanp. z [kN] |
|--------|---------------|----------------------|------------------|--------------------|----------------------|------------------|--------------------|
| 1      | 5.500         | Ongeschoord          | 12.983           | 0.0                | Geschoord            | 5.500            | 0.0                |
| 2      | 2.100         | Ongeschoord          | 3.387            | 0.0                | Geschoord            | 2.100            | 0.0                |
| 3      | 4.250         | Ongeschoord          | 12.067           | 0.0                | Geschoord            | 4.250            | 0.0                |
| 4      | 11.212        | Ongeschoord          | 14.075           | 0.0                | Geschoord            | 11.212           | 0.0                |
| 5      | 2.904         | Geschoord            | 2.904            | 0.0                | Geschoord            | 2.904            | 0.0                |
| 6      | 2.006         | Geschoord            | 2.006            | 0.0                | Geschoord            | 2.006            | 0.0                |

**KIPSTABILITEIT**

| Staafl | Plts. aangr. | l gaffel [m] | Kipsteunafstanden [m] |
|--------|--------------|--------------|-----------------------|
| 1      | 1.0*h        | boven:       | 5.50 5,5              |
|        |              | onder:       | 5.50 5,5              |
| 2      | 1.0*h        | boven:       | 2.10 2,1              |
|        |              | onder:       | 2.10 2,1              |
| 3      | 0.0*h        | boven:       | 4.25 4.250            |
|        |              | onder:       | 4.25 4.250            |
| 4      | 1.0*h        | boven:       | 11.21 4*2,242;2,244   |
|        |              | onder:       | 11.21 1*11,212        |

Project...:

Onderdeel:

**KIPSTABILITEIT**

| Staafl | Plts.  | l gaffel | Kipsteunafstanden |
|--------|--------|----------|-------------------|
|        | aangr. |          | [m] [m]           |
| 5      | 1.0*h  | boven:   | 2.90 2*1,452      |
|        |        | onder:   | 2.90 2,904        |
| 6      | 1.0*h  | boven:   | 2.01 2,006        |
|        |        | onder:   | 2.01 2,006        |

**TOETSING SPANNINGEN**

| Staafl | Mat | BC | Sit | Kl | Plaats | Norm    | Artikel | Formule | Hoogste toetsing          | Opm.  |
|--------|-----|----|-----|----|--------|---------|---------|---------|---------------------------|-------|
| nr.    |     |    |     |    |        |         |         |         | U.C. [N/mm <sup>2</sup> ] |       |
| 1      | 5   | 13 | 1   | 1  | Staafl | EN3-1-1 | 6.3.3   | (6.62)  | 0.710 167                 | 47    |
| 2      | 5   | 13 | 1   | 1  | Staafl | EN3-1-1 | 6.3.3   | (6.62)  | 0.788 185                 | 47    |
| 3      | 1   | 6  | 1   | 1  | Staafl | EN3-1-1 | 6.3.3   | (6.62)  | 0.532 125                 | 47    |
| 4      | 1   | 27 | 1   | 1  | Staafl | EN3-1-1 | 6.3.3   | (6.62)  | 0.964 227                 | 46,47 |
| 5      | 4   | 5  | 1   | 1  | My-max | EN3-1-1 | 6.2.9.1 | (6.31)  | 0.115 27                  |       |
| 6      | 3   | 5  | 1   | 1  | Staafl | EN3-1-1 | 6.3.3   | (6.62)  | 0.038 9                   |       |

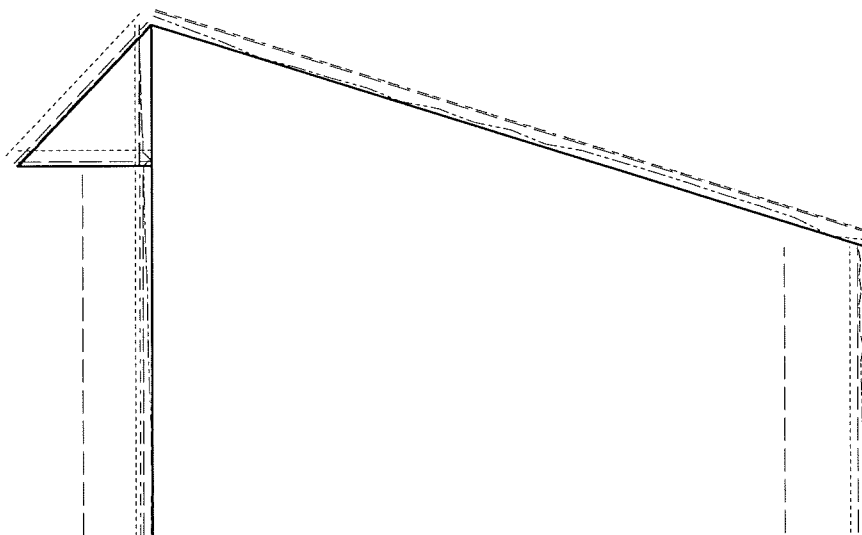
Opmerkingen:

[ 46] T.b.v. kip is een equivalente Q-last berekend.

[ 47] Bij verlopende normaalkracht wordt de grootste drukkracht genomen.

**UNITY-CHECK 'S**

OMHULLENDE VAN ALLES



----- Toelaatbare unity-check (1.0)

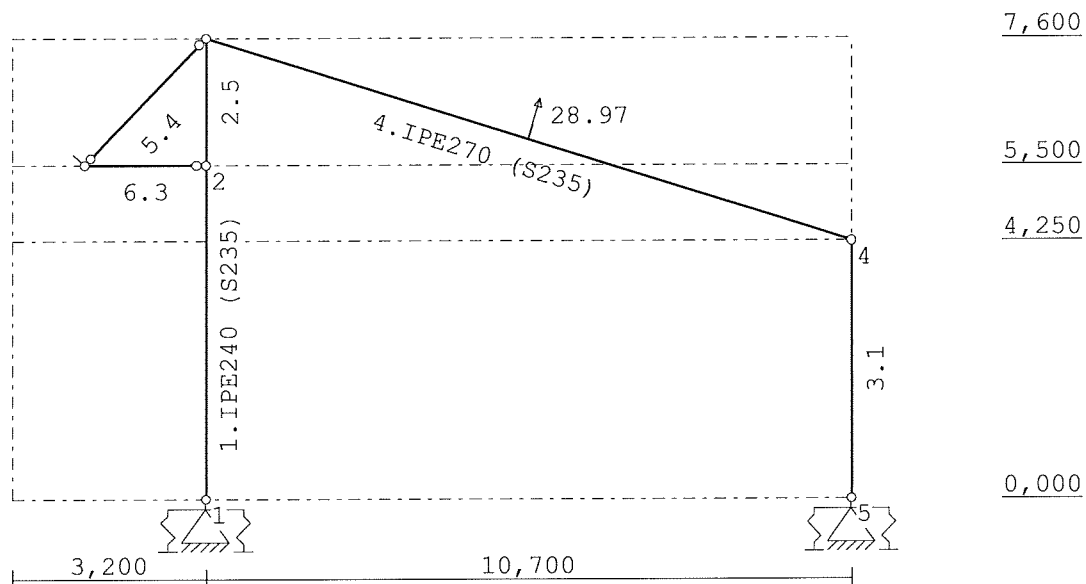
----- Hoogste unity-check i.v.m. knikstabiliteit

----- Unity-check i.v.m. kipstabiliteit

----- Hoogste unity-check i.v.m. doorsnedecontrole

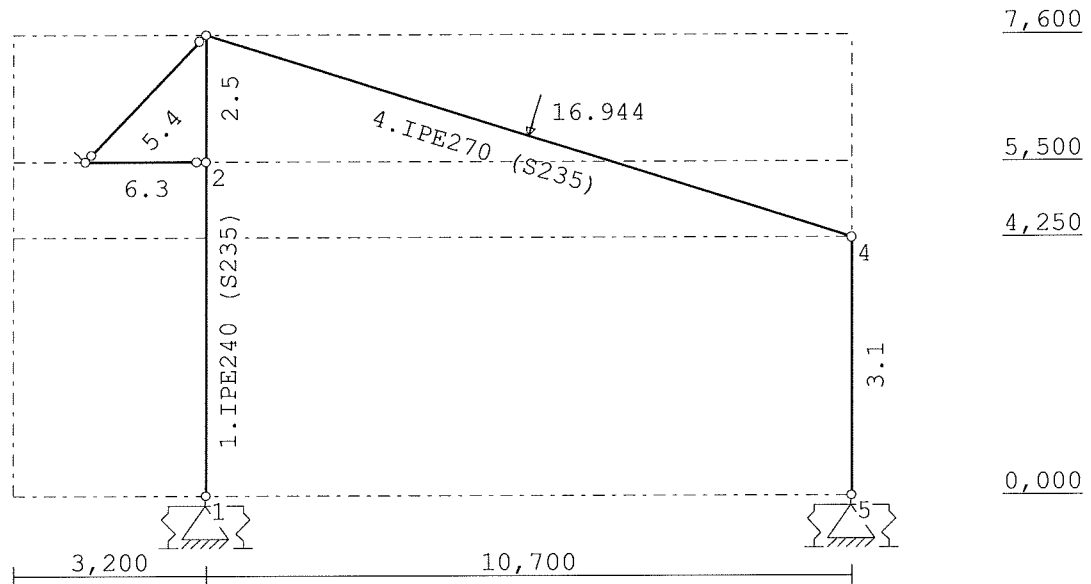
----- Hoogste unity-check i.v.m. doorbuiging

----- Unity-check te hoog (> 1.0)



# GEOMETRIE

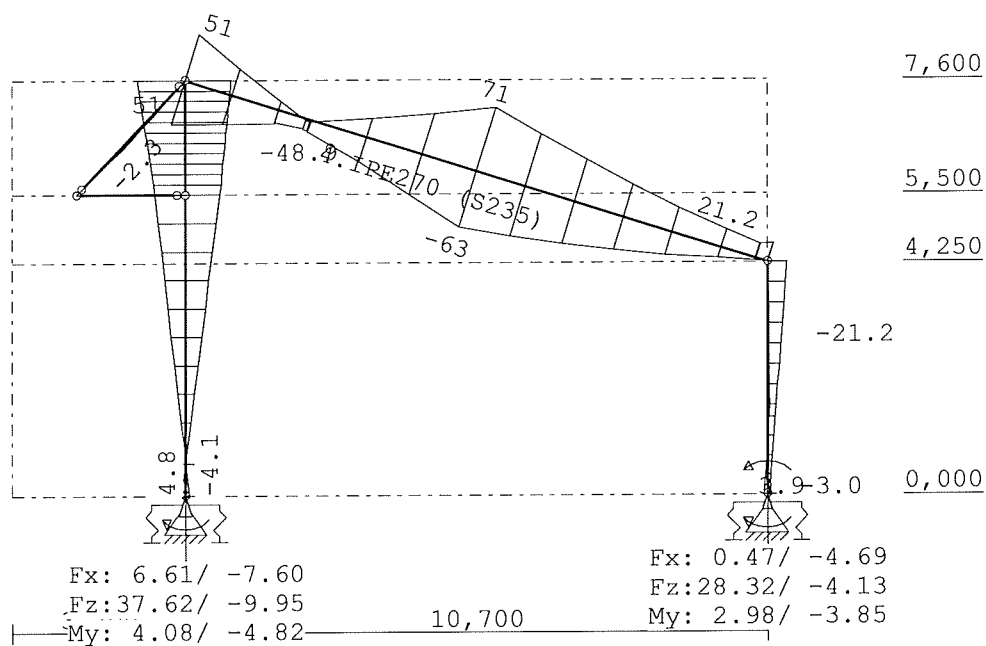
B.G:5 Wind op overkapping neerwaarts





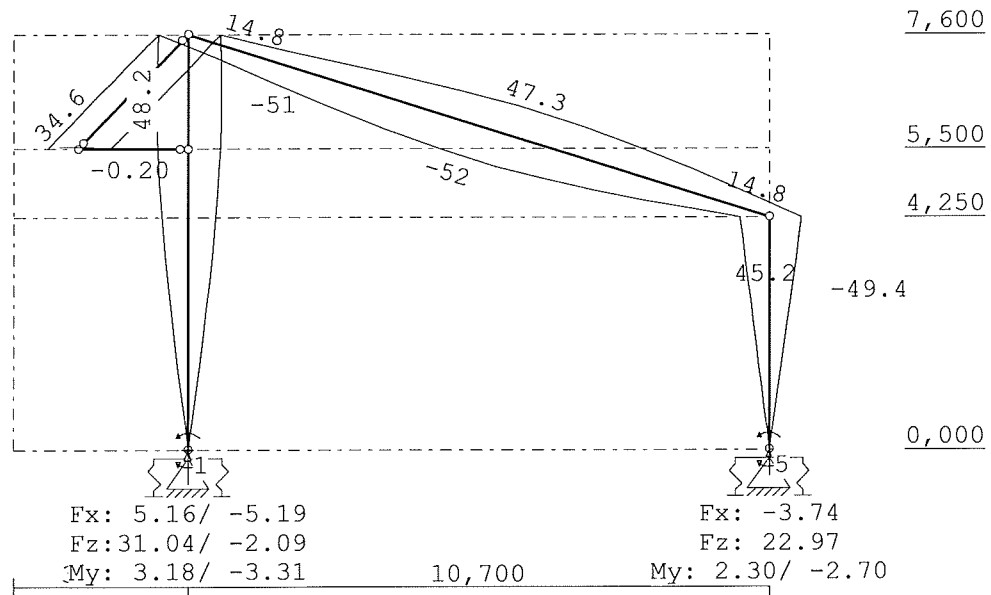
## MOMENTEN

Fundamentele combinatie



**VERPLAATSINGEN** [mm]

Karakteristieke combinatie



Project...:

Onderdeel:

Dimensies: kN;m;rad (tenzij anders aangegeven)

Datum....: 10/07/2019

Bestand...: z:\werk\2019\19-071-frenken-reuver-aelmans\werktuigb-1.rww

Belastingbreedte.: 5.750

Rekenmodel.....: 1e-orde-elastisch.

Theorie voor de bepaling van de krachtsverdeling:

Geometrisch lineair.

Fysisch lineair.

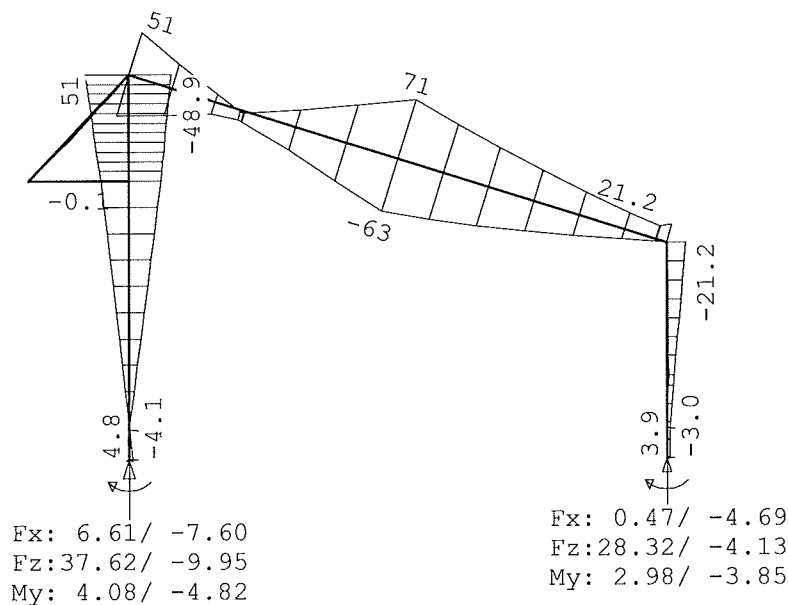
Gunstige werking van de permanente belasting wordt automatisch verwerkt.

**Toegepaste normen volgens Eurocode met Nederlandse NB**

|             |                      |                 |             |
|-------------|----------------------|-----------------|-------------|
| Belastingen | NEN-EN 1990:2002     | C2:2010         | NB:2011(nl) |
|             | NEN-EN 1991-1-1:2002 | C1:2009         | NB:2011(nl) |
|             | NEN-EN 1991-1-3:2003 | C1:2009         | NB:2011(nl) |
|             | NEN-EN 1991-1-4:2005 | C2:2011         | NB:2011(nl) |
| Staal       | NEN-EN 1993-1-1:2006 | C2:2011,A1:2016 | NB:2016(nl) |
|             |                      |                 |             |

**OMHULLENDE VAN DE FUNDAMENTELE COMBINATIES****MOMENTEN**

Fundamentele combinatie

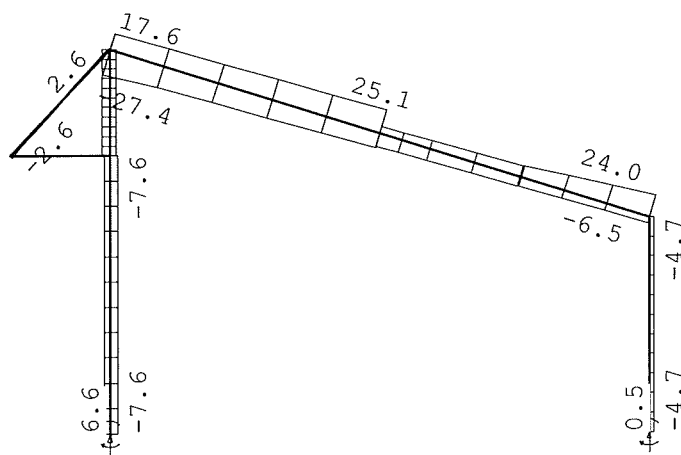


Project...:

Onderdeel:

**DWARSKRACHTEN**

Fundamentele combinatie

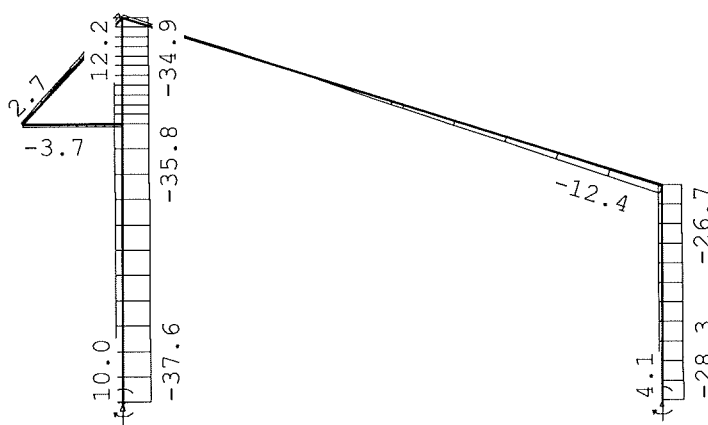


Fx: 6.61/ -7.60  
 Fz: 37.62/ -9.95  
 My: 4.08/ -4.82

Fx: 0.47/ -4.69  
 Fz: 28.32/ -4.13  
 My: 2.98/ -3.85

**NORMAALKRACHTEN**

Fundamentele combinatie



Fx: 6.61/ -7.60  
 Fz: 37.62/ -9.95  
 My: 4.08/ -4.82

Fx: 0.47/ -4.69  
 Fz: 28.32/ -4.13  
 My: 2.98/ -3.85

**REACTIES**

Fundamentele combinatie

| Kn. | X-min | X-max | Z-min | Z-max | M-min | M-max |
|-----|-------|-------|-------|-------|-------|-------|
| 1   | -7.60 | 6.61  | -9.95 | 37.62 | -4.82 | 4.08  |
| 5   | -4.69 | 0.47  | -4.13 | 28.32 | -3.85 | 2.98  |

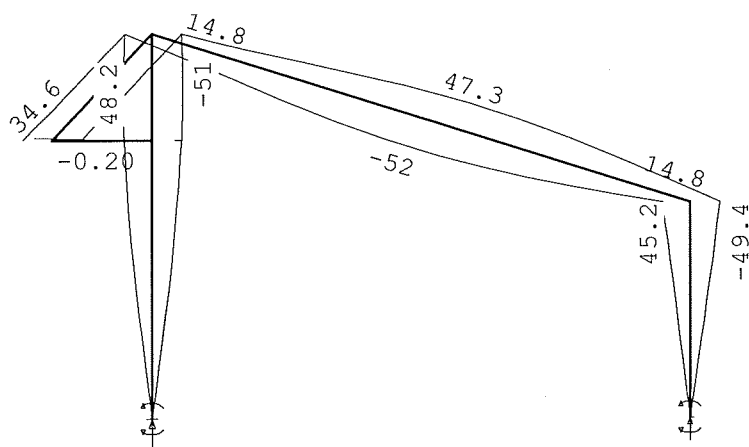
Project...:

Onderdeel:

**OMHULLENDE VAN DE KARAKTERISTIEKE COMBINATIES****VERPLAATSINGEN**

[mm]

Karakteristieke combinatie



Fx: 5.16/ -5.19  
 Fz: 31.04/ -2.09  
 My: 3.18/ -3.31

Fx: -3.74  
 Fz: 22.97  
 My: 2.30/ -2.70

**REACTIES**

Karakteristieke combinatie

| Kn. | X-min | X-max | Z-min | Z-max | M-min | M-max |
|-----|-------|-------|-------|-------|-------|-------|
| 1   | -5.19 | 5.16  | -2.09 | 31.04 | -3.31 | 3.18  |
| 5   | -3.74 | -0.10 | 0.27  | 22.97 | -2.70 | 2.30  |

**STAALPROFIELEN - ALGEMENE GEGEVENS**

Stabiliteit: Classificatie gehele constructie: Ongeschoord  
 Belastinggeval m.b.t. bepaling kniklengte: 12=Knik  
 Aanpassing inkl. parameter C : Steunpunten  
 Tweede-orde-effect:  
 Aan te houden verhouding  $n/(n-1)$   
 voor steunmomenten en verplaatsingen: 1.10  
 Doorbuiging en verplaatsing:  
 Aantal bouwlagen: 1  
 Gebouwtype: Overig  
 Toel. horiz. verplaatsing gehele gebouw:  $h/300$   
 Kleinste gevelhoogte [m]: 0.0

**MATERIAAL**

| Mat nr. | Profielnaam | Vloeisp. [N/mm <sup>2</sup> ] | Productie methode | Min. drsn. klasse |
|---------|-------------|-------------------------------|-------------------|-------------------|
| 1       | IPE270      | 235                           | Gewalst           | 1                 |
| 2       | HEA200      | 235                           | Gewalst           | 1                 |
| 3       | HEA100      | 235                           | Gewalst           | 1                 |
| 4       | IPE200      | 235                           | Gewalst           | 1                 |
| 5       | IPE240      | 235                           | Gewalst           | 1                 |

Partiële veiligheidsfactoren:

Gamma M;0 : 1.00 Gamma M;1 : 1.00

Project...:

Onderdeel:

**KNIKSTABILITEIT**

| Staafl | l <sub>sys</sub><br>[m] | Classif. y<br>sterke as | l <sub>knik;y</sub><br>[m] | Extra           |                         | l <sub>knik;z</sub><br>[m] | Extra           |  |
|--------|-------------------------|-------------------------|----------------------------|-----------------|-------------------------|----------------------------|-----------------|--|
|        |                         |                         |                            | aanp. y<br>[kN] | Classif. z<br>zwakke as |                            | aanp. z<br>[kN] |  |
| 1      | 5.500                   | Ongeschoord             | 12.983                     | 0.0             | Geschoord               | 5.500                      | 0.0             |  |
| 2      | 2.100                   | Ongeschoord             | 3.387                      | 0.0             | Geschoord               | 2.100                      | 0.0             |  |
| 3      | 4.250                   | Ongeschoord             | 12.067                     | 0.0             | Geschoord               | 4.250                      | 0.0             |  |
| 4      | 11.212                  | Ongeschoord             | 14.075                     | 0.0             | Geschoord               | 11.212                     | 0.0             |  |
| 5      | 2.904                   | Geschoord               | 2.904                      | 0.0             | Geschoord               | 2.904                      | 0.0             |  |
| 6      | 2.006                   | Geschoord               | 2.006                      | 0.0             | Geschoord               | 2.006                      | 0.0             |  |

**KIPSTABILITEIT**

| Staafl | Plts.<br>aangr. |        | l gaffel<br>[m] | Kipsteunafstanden<br>[m] |
|--------|-----------------|--------|-----------------|--------------------------|
| 1      | 1.0*h           | boven: | 5.50            | 5,5                      |
|        |                 | onder: | 5.50            | 5,5                      |
| 2      | 1.0*h           | boven: | 2.10            | 2,1                      |
|        |                 | onder: | 2.10            | 2,1                      |
| 3      | 0.0*h           | boven: | 4.25            | 4.250                    |
|        |                 | onder: | 4.25            | 4.250                    |
| 4      | 1.0*h           | boven: | 11.21           | 6*1,602;1,6              |
|        |                 | onder: | 11.21           | 2*5,606                  |
| 5      | 1.0*h           | boven: | 2.90            | 2*1,452                  |
|        |                 | onder: | 2.90            | 2,904                    |
| 6      | 1.0*h           | boven: | 2.01            | 2,006                    |
|        |                 | onder: | 2.01            | 2,006                    |

**TOETSING SPANNINGEN**

| Staafl | Mat | BC | Sit | Kl | Plaats | Norm    | Artikel | Formule | Hoogste toetsing          |     | Opm.  |
|--------|-----|----|-----|----|--------|---------|---------|---------|---------------------------|-----|-------|
| nr.    |     |    |     |    |        |         |         |         | U.C. [N/mm <sup>2</sup> ] |     |       |
| 1      | 5   | 6  | 1   | 1  | Staafl | EN3-1-1 | 6.3.3   | (6.62)  | 0.606                     | 143 | 47    |
| 2      | 5   | 14 | 1   | 1  | Staafl | EN3-1-1 | 6.3.2   | (6.54)  | 0.688                     | 162 |       |
| 3      | 1   | 10 | 1   | 1  | Staafl | EN3-1-1 | 6.3.3   | (6.62)  | 0.259                     | 61  | 47    |
| 4      | 1   | 14 | 1   | 1  | Staafl | EN3-1-1 | 6.3.3   | (6.62)  | 1.004                     | 236 | 46,47 |
| 5      | 4   | 4  | 1   | 1  | My-max | EN3-1-1 | 6.2.10  | (6.31)  | 0.049                     | 11  |       |
| 6      | 3   | 9  | 1   | 1  | Staafl | EN3-1-1 | 6.3.3   | (6.62)  | 0.017                     | 4   |       |

Opmerkingen:

[ 46] T.b.v. kip is een equivalente Q-last berekend.

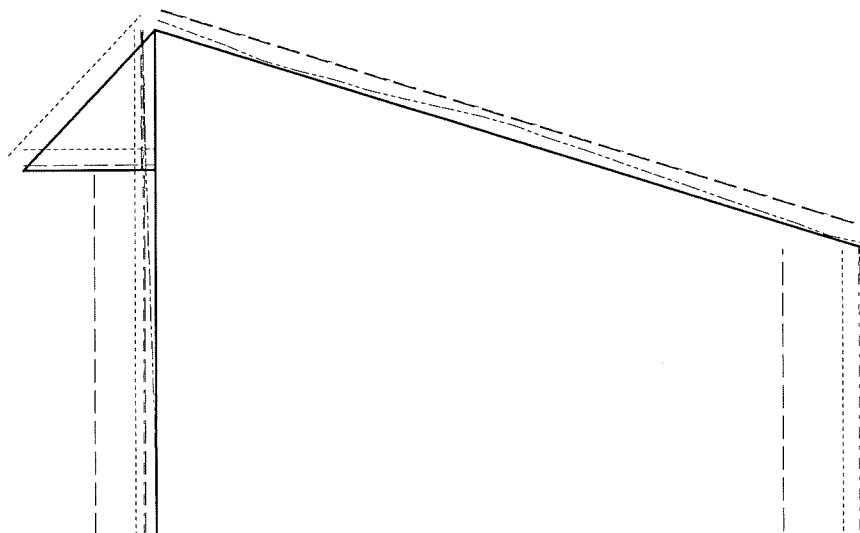
[ 47] Bij verlopende normaalkracht wordt de grootste drukkracht genomen.

Project...:

Onderdeel:

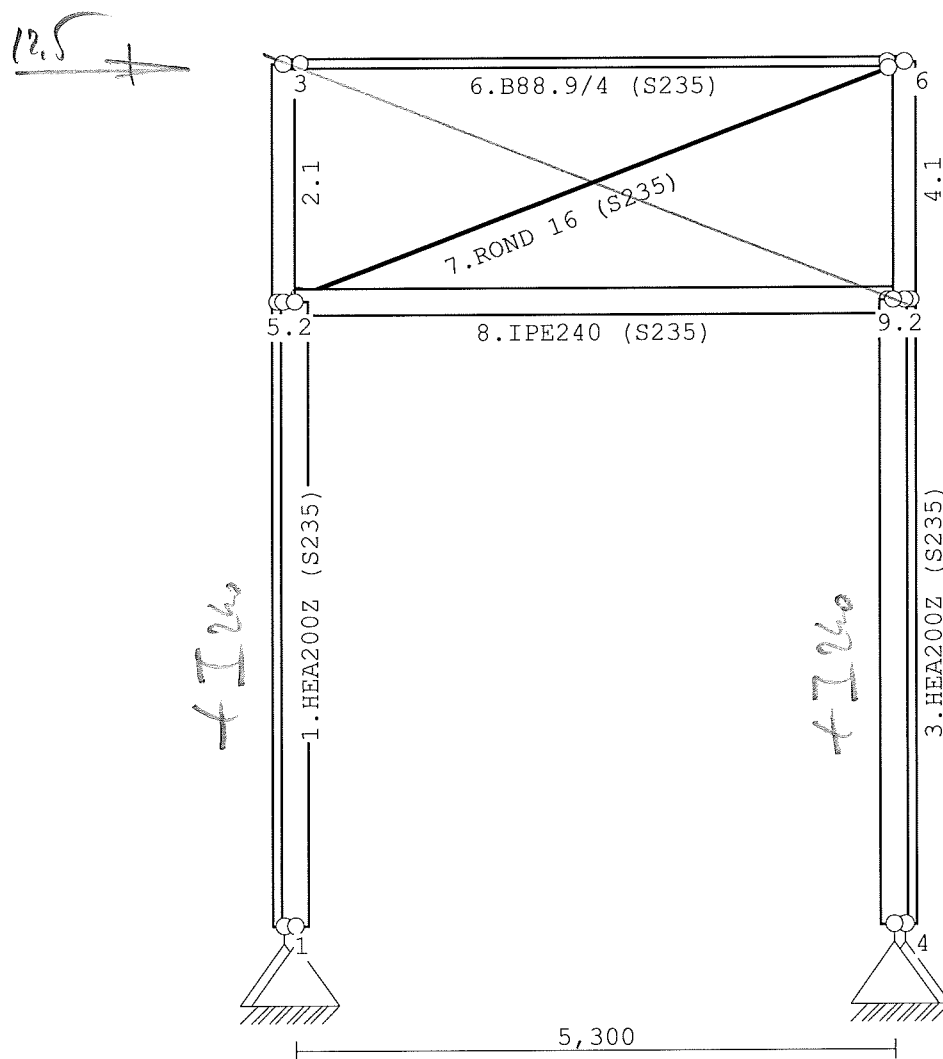
**UNITY-CHECK'S**

OMHULLENDE VAN ALLES



----- Toelaatbare unity-check (1.0)  
----- Hoogste unity-check i.v.m. knikstabiliteit  
----- Unity-check i.v.m. kipstabiliteit  
----- Hoogste unity-check i.v.m. doorsnedecontrole  
----- Hoogste unity-check i.v.m. doorbuiging  
----- Unity-check te hoog (> 1.0)

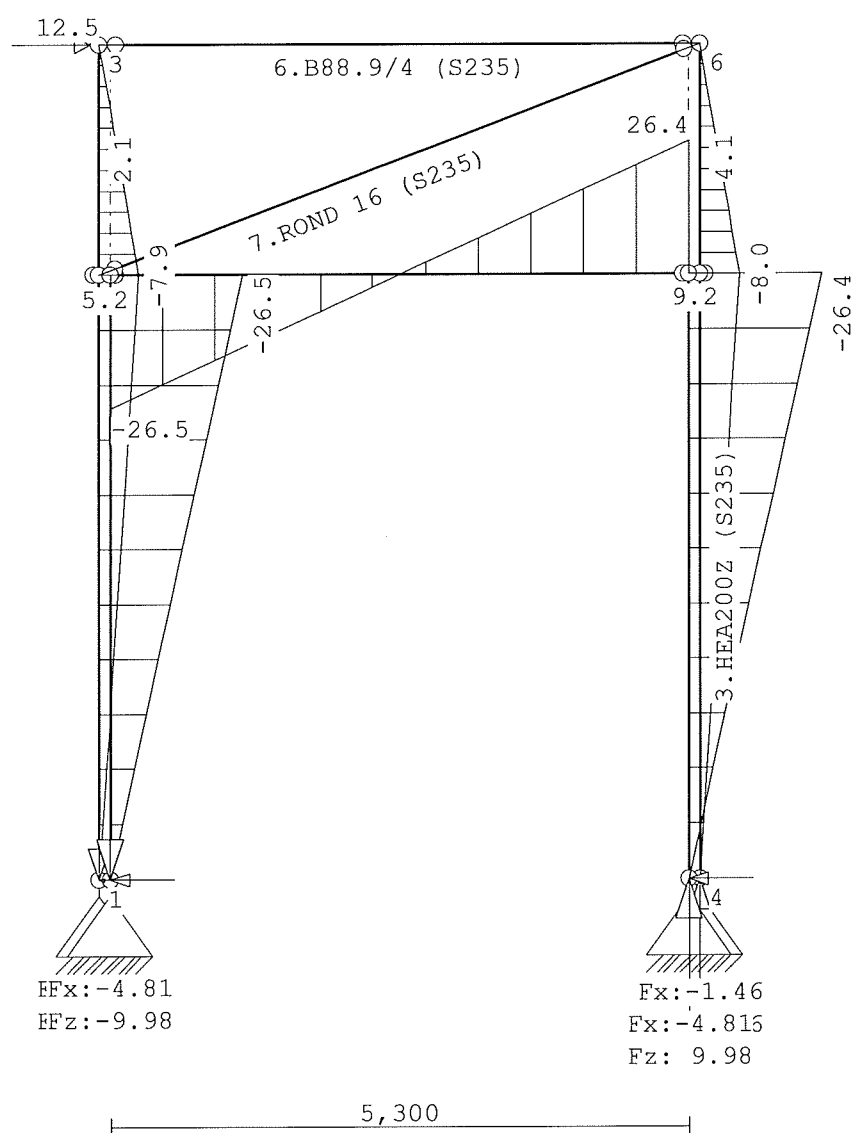
## GEOMETRIE





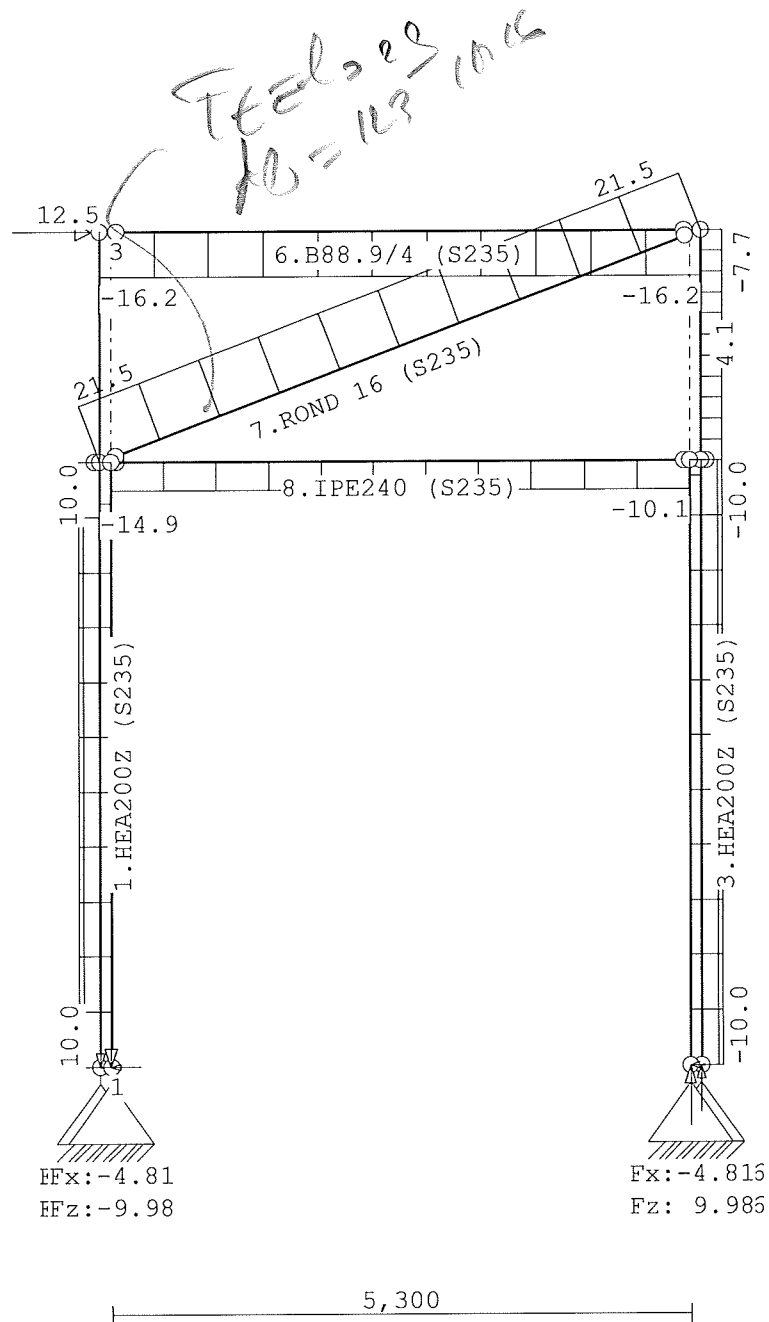
**MOMENTEN**

B.G:1 Permanente belasting



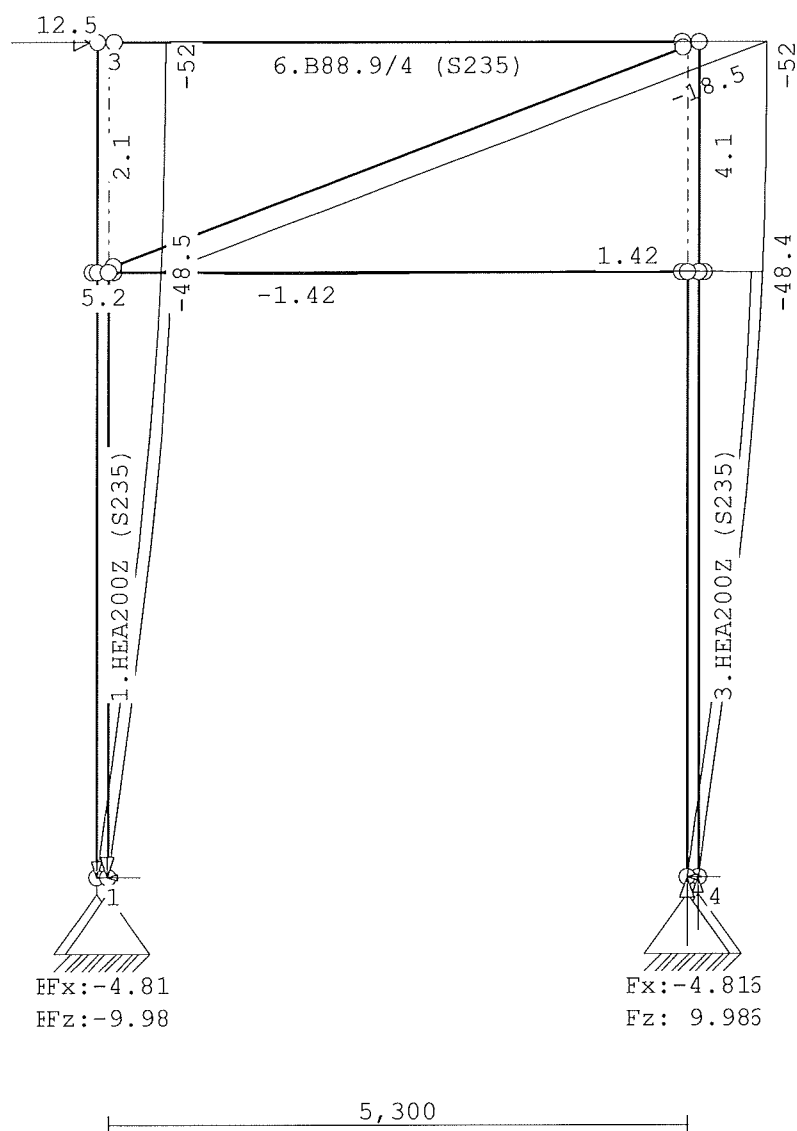
## NORMAALKRACHTEN

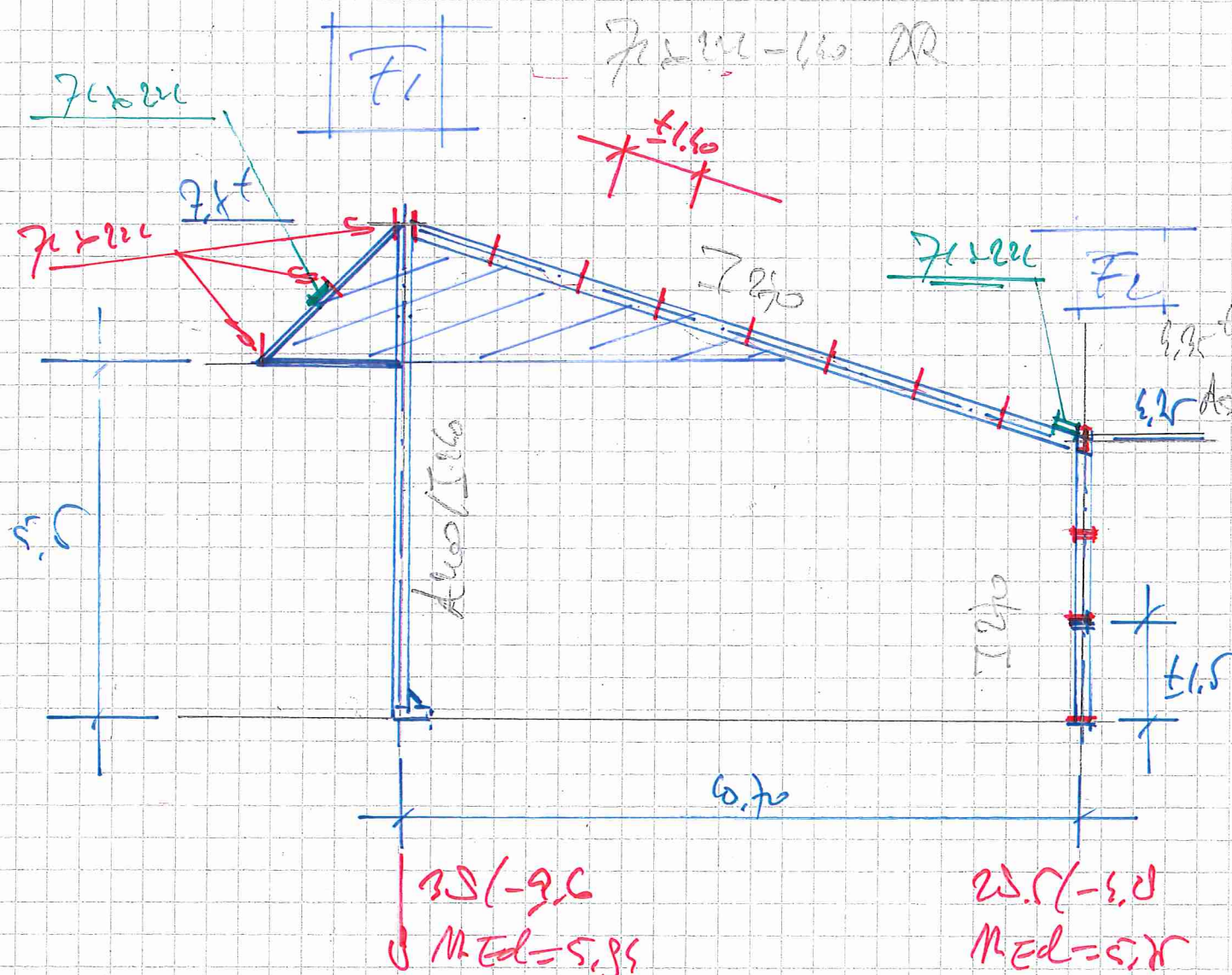
B.G:1 Permanente belasting



**VERPLAATSINGEN** [mm]

B.G:1 Permanente belasting





$$\begin{aligned} \text{DR} &= 7 \times 220 - 140 \quad \zeta = 0.5 \\ &= 68 \times 110 - 140 \quad \chi = 0.5 \end{aligned}$$

$$h = 38.5$$

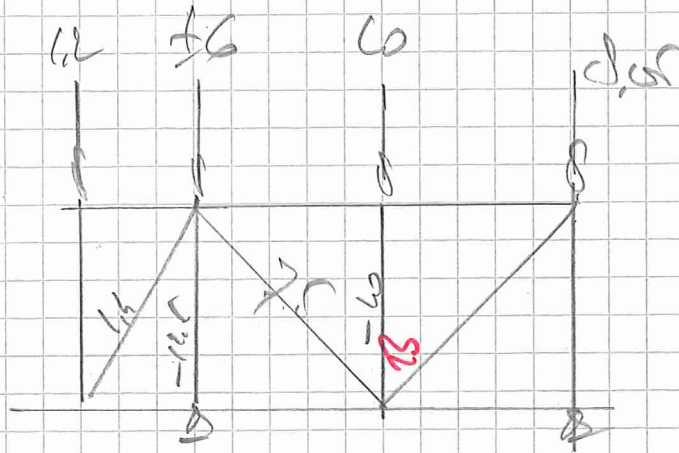
$$\underline{\text{4.111}} \quad 0.6.5 = 0.6 > 0.61(7)$$

$$\begin{aligned} F_2 &= 38.5 \cdot 7.70 \cdot 0.05 \cdot 0.62 \cdot 0.85 \cdot \eta_2 \\ &= 12.35 \end{aligned}$$

$$\begin{aligned} F_1 &= 7.70 \cdot 1.1 \cdot 0.85 \cdot 0.62 \cdot 38.5 \cdot 0.05 \cdot 0.52 \\ &= 11.61 \end{aligned}$$

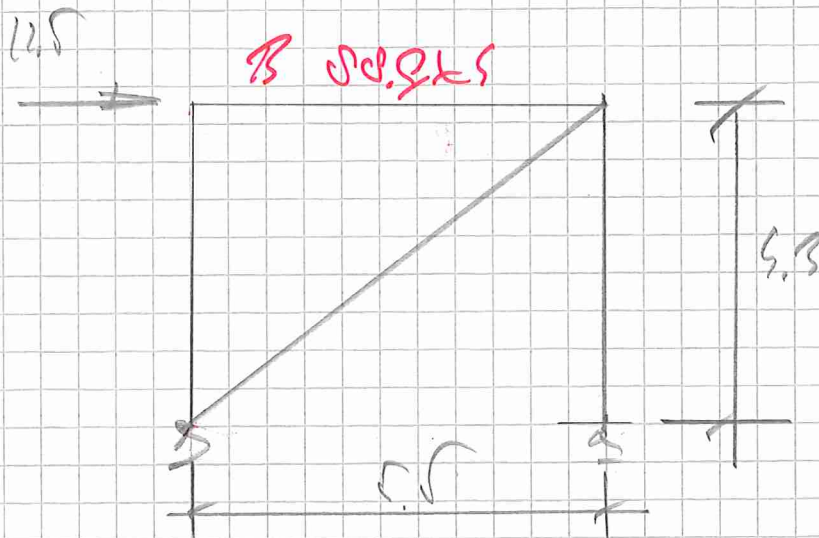
$$F_1 = F_2 = \pm 12.5$$

$$\underline{D_{Ed} + W = 1700}$$



$$F_{tEd} = 7.5 \cdot 1.35 = 10.15 \text{ (kN)}$$

$$N'_{Ed} = 1.35 \cdot 12.5 = -16.875$$



$$N_{Ed} = \pm 13.2$$

$$F_{tEd} = 21.52 \text{ (kN)}$$

Onderdeel : Gording 71x221 kan druk opnemen  
 Datum : 16/07/2019  
 Eenheden : kN/m/rad

### Toegepaste normen volgens Eurocode met Nederlandse NB

|             |                      |                 |             |
|-------------|----------------------|-----------------|-------------|
| Belastingen | NEN-EN 1990:2002     | C2:2010         | NB:2011(nl) |
|             | NEN-EN 1991-1-1:2002 | C1:2009         | NB:2011(nl) |
| Hout        | NEN-EN 1995-1-1:2005 | A1:2011,C1:2006 | NB:2013(nl) |
|             | NEN-EN 14080:2013    |                 |             |

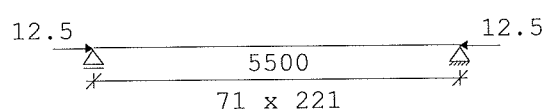
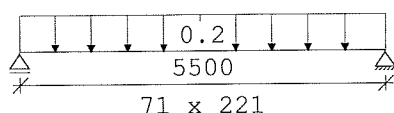
### Berekening willekeurige staaf. (H)

#### Algemene gegevens

|                  |        |           |                         |       |
|------------------|--------|-----------|-------------------------|-------|
| B x H            | [mm] : | 71 x 221  | Referentie periode [j]: | 50    |
| $l_{sys}$        | [mm] : | 5500      |                         |       |
| $l_{buc;y}$      | [mm] : | 5500      | Toelaatbare doorbuiging |       |
| $l_{buc;z}$      | [mm] : | 1200      | Bijkomend [* l] :       | 0.003 |
| Plaats kipsteun  | :      | Bovenkant |                         |       |
| Steunpunt links  | :      | Rol       | Eind [* l] :            | 0.004 |
| Steunpunt rechts | :      | Scharnier |                         |       |
| Sterkteklasse    | :      | C18       | Klimaatklasse :         | I     |

#### Belastingen

|                |          | Permanent | Veranderlijk |
|----------------|----------|-----------|--------------|
| $q_z$          | [kN/m] : | -0.15     | 0.00         |
| $\Psi_0$       | [ - ] :  |           | 0.00         |
| $\Psi_2$       | [ - ] :  |           | 0.20         |
| $F_z$          | [kN] :   | 0.00      | 0.00         |
| Vanaf links    | [mm] :   | 1100      |              |
| $N_x$          | [kN] :   | 0.00      | 12.50        |
| $M_{y;links}$  | [kNm] :  | 0.00      | 0.00         |
| $M_{y;rechts}$ | [kNm] :  | 0.00      | 0.00         |



#### Belastingfactoren (NEN-EN 1990)

|                |                  |      |              |      |
|----------------|------------------|------|--------------|------|
| Formule 6.10a: | $\gamma_G$ :     | 1.22 | $\gamma_Q$ : | 1.35 |
| Formule 6.10b: | $\xi \gamma_G$ : | 1.08 | $\gamma_Q$ : | 1.35 |

Partiële factor (Tabel 2.3 NEN-EN 1995-1-1)

$\gamma_M[-]$ : 1.30

#### Stabiliteit

1. Factoren t.b.v. toetsing knikstabiliteit volgens par. 6.3.2.:

|       |       |                |           |       |                |
|-------|-------|----------------|-----------|-------|----------------|
| $k_y$ | [-] : | 1.75 frm(6.27) | $k_{c,y}$ | [-] : | 0.38 frm(6.25) |
| $k_z$ | [-] : | 1.09 frm(6.28) | $k_{c,z}$ | [-] : | 0.67 frm(6.26) |

2. Factoren t.b.v. toetsing kipstabiliteit volgens par. 6.3.3.:

Fundamentele combinatie (6.10a):

$\kappa_{crit,y}$  [-] : 1.00 frm(6.34)

Fundamentele combinatie (6.10b):

$\kappa_{crit,y}$  [-] : 1.00 frm(6.34)

Onderdeel : Gording 71x221 kan druk opnemen

Datum : 16/07/2019

Eenheden : kN/m/rad

**Fundamentele combinatie (6.10a)** **frm(6.11)** **u.c.** **0.14**Normaalkracht [kN] 0.0  $\sigma_{c,0,d}$  [N/mm<sup>2</sup>] 0.00Dwarskracht [kN] -0.5  $\tau_{v,d}$  [N/mm<sup>2</sup>] 0.05Moment [kNm] -0.7  $\sigma_{m,y,d}$  [N/mm<sup>2</sup>] 1.20 $f_{m,y,d}$  [N/mm<sup>2</sup>] 8.3  $f_{c,0,d}$  [N/mm<sup>2</sup>] 8.31  $b_{ef}$  71 [mm] frm(6.13a) $f_{t,0,d}$  [N/mm<sup>2</sup>] 5.1  $f_{v,d}$  [N/mm<sup>2</sup>] 1.57  $k_{mod}$  0.60 [-] tab(3.1 )**Fundamentele combinatie (6.10b)** **frm(6.23)** **u.c.** **0.35**Normaalkracht [kN] 16.9  $\sigma_{c,0,d}$  [N/mm<sup>2</sup>] 1.08Dwarskracht [kN] -0.4  $\tau_{v,d}$  [N/mm<sup>2</sup>] 0.04Moment [kNm] -0.6  $\sigma_{m,y,d}$  [N/mm<sup>2</sup>] 1.06 $f_{m,y,d}$  [N/mm<sup>2</sup>] 11.1  $f_{c,0,d}$  [N/mm<sup>2</sup>] 11.08  $b_{ef}$  71 [mm] frm(6.13a) $f_{t,0,d}$  [N/mm<sup>2</sup>] 6.8  $f_{v,d}$  [N/mm<sup>2</sup>] 2.09  $k_{mod}$  0.80 [-] tab(3.1 )**Doorbuiging** **u.c.** $u_{bij}$  = 1.87 < 16.50 [mm] 0.11 $u_{net,fin}$  = 4.98 < 22.00 [mm] 0.23



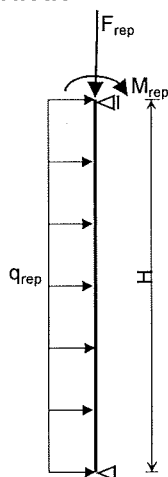
## Drukkoker

### Basisgegevens

|            |             |   |                                            |                           |  |
|------------|-------------|---|--------------------------------------------|---------------------------|--|
| Profiel:   | Buis 88,9x4 | ⇒ | G = 8,4 kg/m                               |                           |  |
|            |             |   | A = 1067 mm <sup>2</sup>                   | d = 88,9 mm.              |  |
|            |             |   | I <sub>y</sub> = 9,634E+05 mm <sup>4</sup> | t = 4,0 mm.               |  |
|            |             |   | Wy;pl = 2,885E+04 mm <sup>3</sup>          | i <sub>y</sub> = 30,0 mm. |  |
|            |             |   |                                            | i <sub>z</sub> = 30,0 mm. |  |
| Staalsoort | S 235       | ⇒ | E <sub>d</sub> = 210000 N/mm <sup>2</sup>  |                           |  |
|            |             |   | f <sub>y;d</sub> = 235 N/mm <sup>2</sup>   |                           |  |
|            |             |   | f <sub>t;d</sub> = 360 N/mm <sup>2</sup>   |                           |  |
|            |             |   | G <sub>d</sub> = 81000 N/mm <sup>2</sup>   |                           |  |

Veiligheidsklasse: 2

### Constructie



|                      |          |         |                    |
|----------------------|----------|---------|--------------------|
| H =                  | 5500 mm. |         |                    |
| I <sub>y;buc</sub> = | 5500 mm. |         |                    |
| I <sub>z;buc</sub> = | 5500 mm. |         |                    |
| I <sub>kip</sub> =   | 5500 mm. |         |                    |
| F <sub>G;rep</sub> = | 0,0 kN   |         | (Excl. E.G. kolom) |
| F <sub>Q;rep</sub> = | 13,0 kN  | Ψ = 0,0 |                    |
| M <sub>G;rep</sub> = | 0,0 kNm  |         |                    |
| M <sub>Q;rep</sub> = | 0,0 kNm  | Ψ = 0,0 |                    |
| q <sub>rep</sub> =   | 0,5 kN/m | Ψ = 0,0 | (Wind)             |

### Toetsing

#### Doorbuiging

|                    |           |   |        |                    |              |
|--------------------|-----------|---|--------|--------------------|--------------|
| u <sub>max</sub> = | 26,50 mm. | > | 0,004L | Kolom voldoet niet | x = 2772 mm. |
|--------------------|-----------|---|--------|--------------------|--------------|

#### Toetsing stabiliteit volgens NEN 6770, artikel 12.3

|                      |                           |   |                            |            |
|----------------------|---------------------------|---|----------------------------|------------|
| ω <sub>kip</sub> :   | λ <sub>rel</sub> = 0,00   | ⇒ | ω <sub>kip</sub> = 1,000   | (kromme a) |
| ω <sub>y;buc</sub> : | λ <sub>y,rel</sub> = 1,95 | ⇒ | ω <sub>y;buc</sub> = 0,233 | (kromme a) |
| ω <sub>z;buc</sub> : | λ <sub>z,rel</sub> = 1,95 | ⇒ | ω <sub>z;buc</sub> = 0,233 | (kromme a) |
| N <sub>pl;d</sub> =  | 250,7 kN                  |   |                            |            |
| M <sub>y,u;d</sub> = | 6,8 kNm                   |   |                            |            |

#### Dakbelasting extreem

|                       |             |   |     |                    |
|-----------------------|-------------|---|-----|--------------------|
| M <sub>y,eq;d</sub> = | 0,00 kNm    |   |     |                    |
| N <sub>c;s;d</sub> =  | 17,45 kN    |   |     | (Incl. E.G. kolom) |
| ⇒                     | U.C. = 0,33 | ≤ | 1,0 | Kolom voldoet      |

#### Windbelasting extreem

|                       |             |   |     |                    |
|-----------------------|-------------|---|-----|--------------------|
| M <sub>y,eq;d</sub> = | 2,21 kNm    |   |     |                    |
| N <sub>c;s;d</sub> =  | 0,62 kN     |   |     | (Incl. E.G. kolom) |
| ⇒                     | U.C. = 0,37 | ≤ | 1,0 | Kolom voldoet      |

#### Oplegreacties

|              |                              |                                |                                |  |
|--------------|------------------------------|--------------------------------|--------------------------------|--|
| Verticaal:   | F <sub>G;rep</sub> = 0,5 kN  |                                |                                |  |
|              | F <sub>Q;rep</sub> = 13,0 kN |                                |                                |  |
| Horizontaal: | Top kolom:                   | F <sub>G;rep;M</sub> = 0,00 kN |                                |  |
|              |                              | F <sub>Q;rep;M</sub> = 0,00 kN | F <sub>Q;rep;q</sub> = 1,24 kN |  |
|              | Voet kolom:                  | F <sub>G;rep;M</sub> = 0,00 kN |                                |  |
|              |                              | F <sub>Q;rep;M</sub> = 0,00 kN | F <sub>Q;rep;q</sub> = 1,24 kN |  |

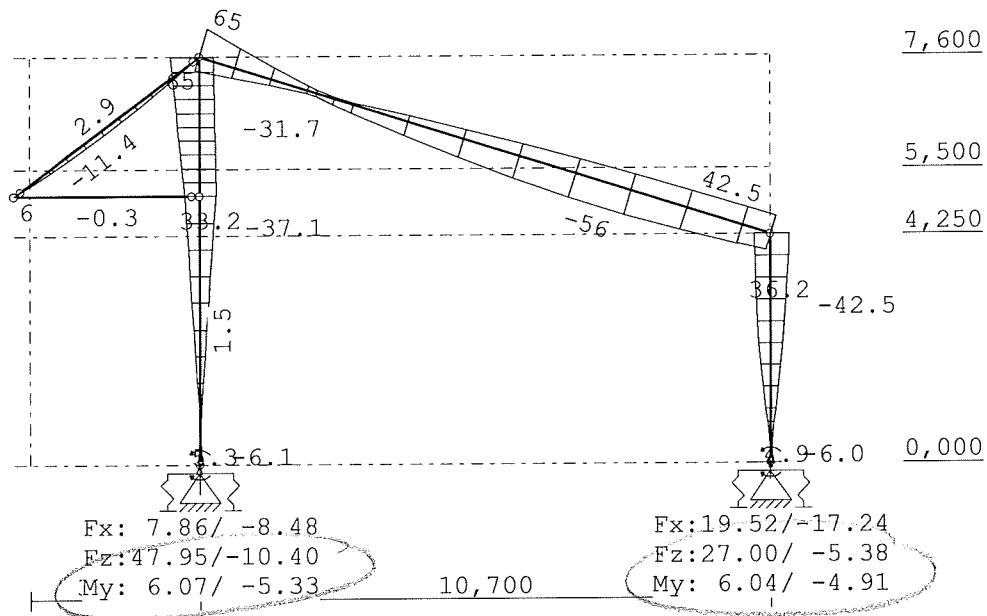


$$\underline{0,160,160,1}$$

$$F_{ed} = 38,5 + 1.19,8 = 158,3$$

$$F_c = \frac{44.0,35 + 6}{33} = 0,98$$

$$\sigma_f = 2.54 / (2. (0,16 - 0,98)) = 140$$



$$38.6/-11.4-2.6$$

$$M_{Ed} = 6.04$$

$$25.33/-5.74$$

$$M_{Ed} = 5.74$$

$$M_{Ed} = 6.7/45 \text{ kN}$$

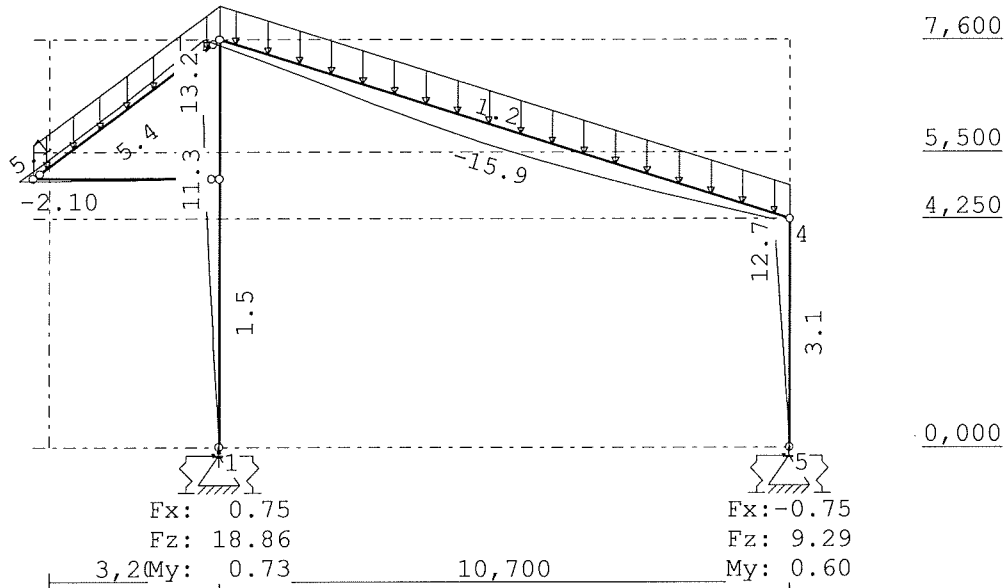
$$M_{Ed} \text{ uitk} = 66 \text{ LGS k}$$

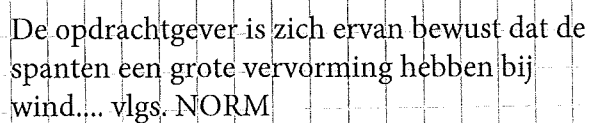
VERPLAATSINGEN

[mm]

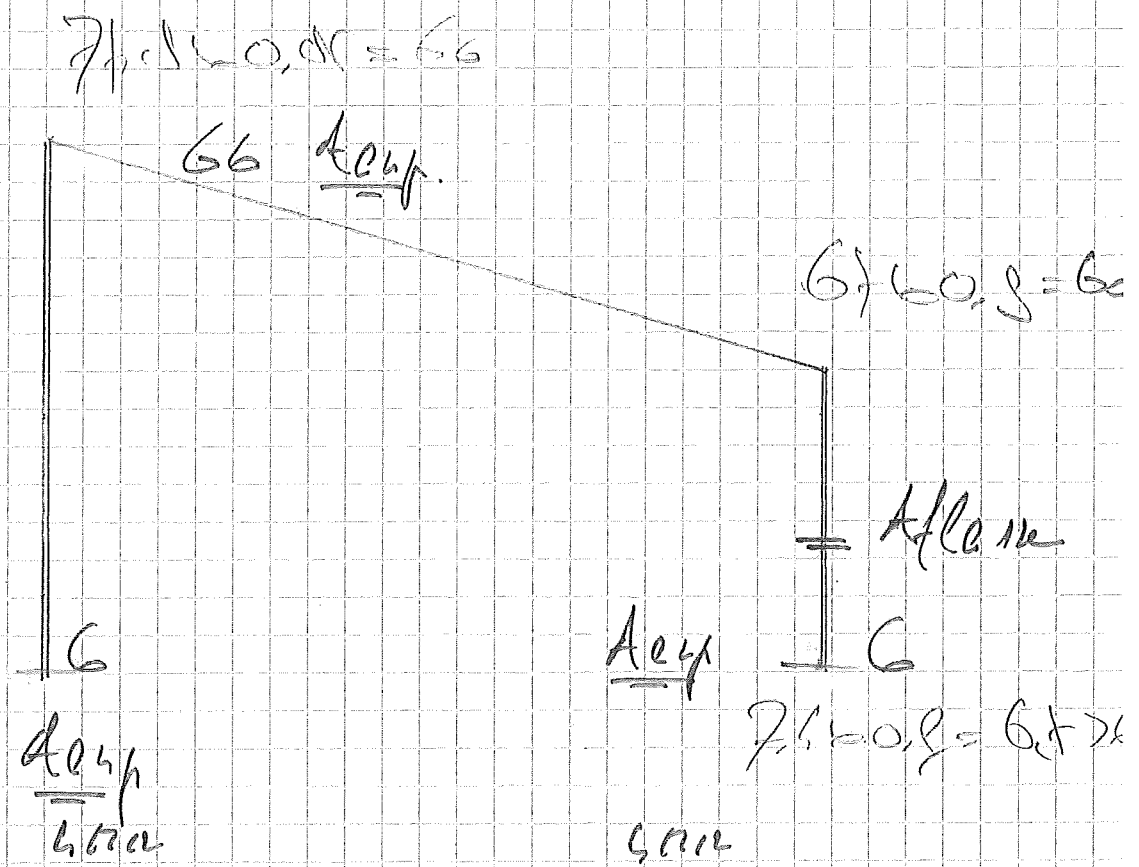
*hinf*

B.G:1 Permanente belasting



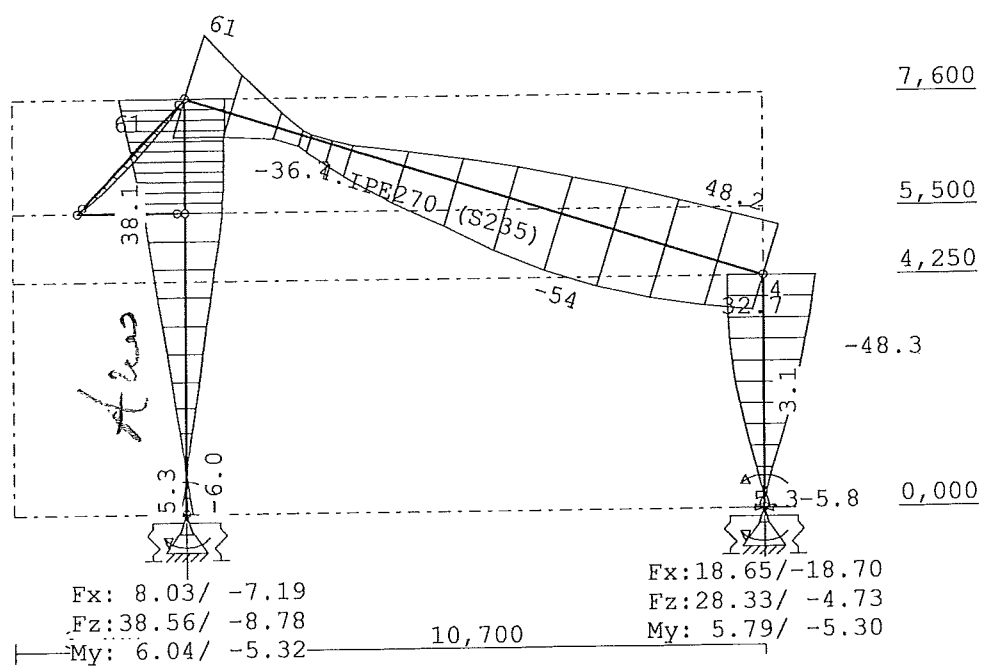


# Phasenmodul der Vekt.



## MOMENTEN

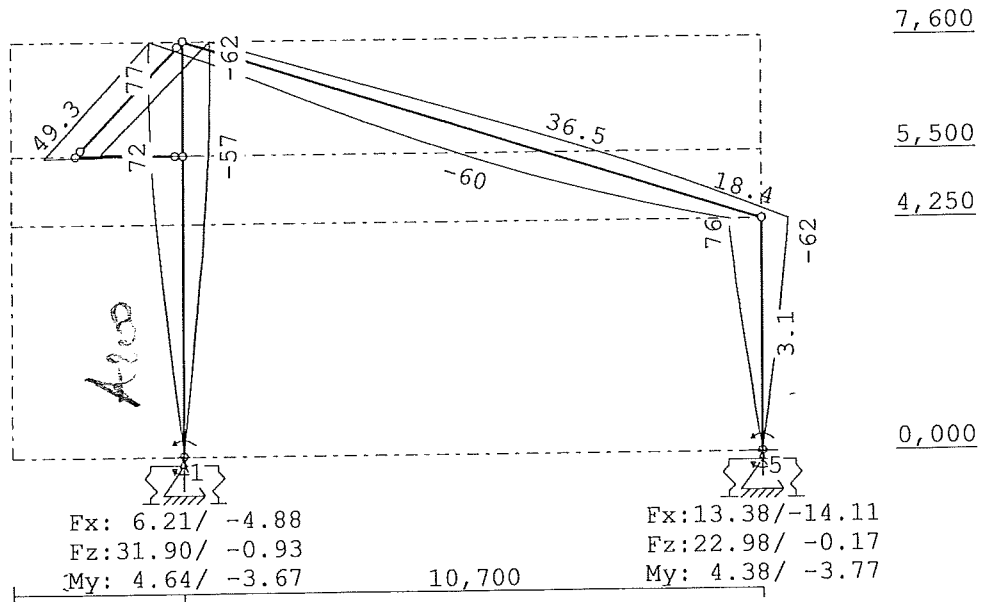
## Fundamentele combinatie



VERPLAATSINGEN

[mm]

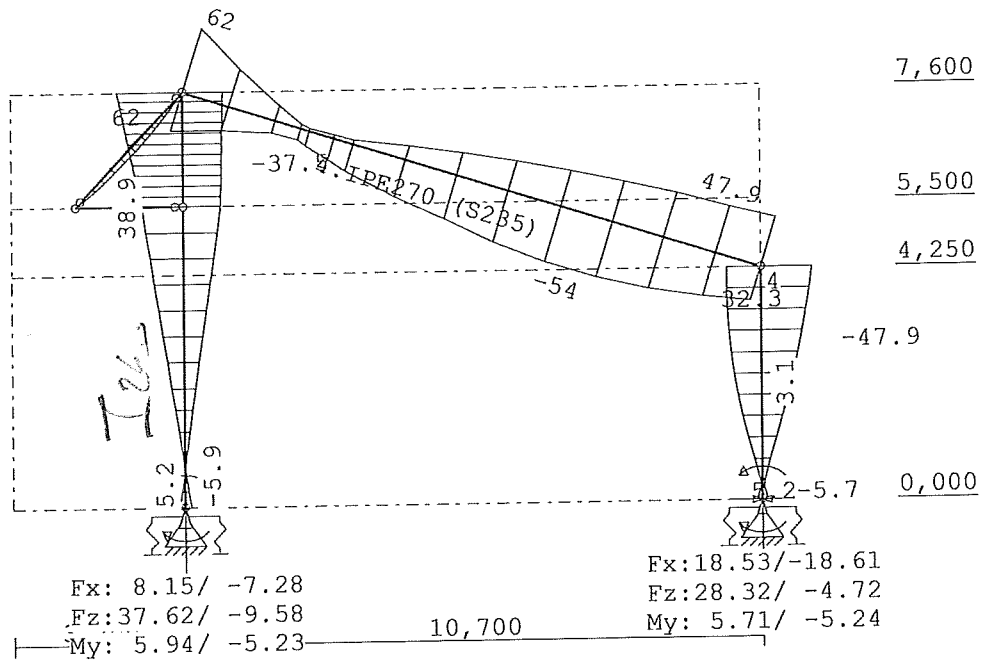
Karakteristieke combinatie



## MOMENTEN

Moogelijk die ke

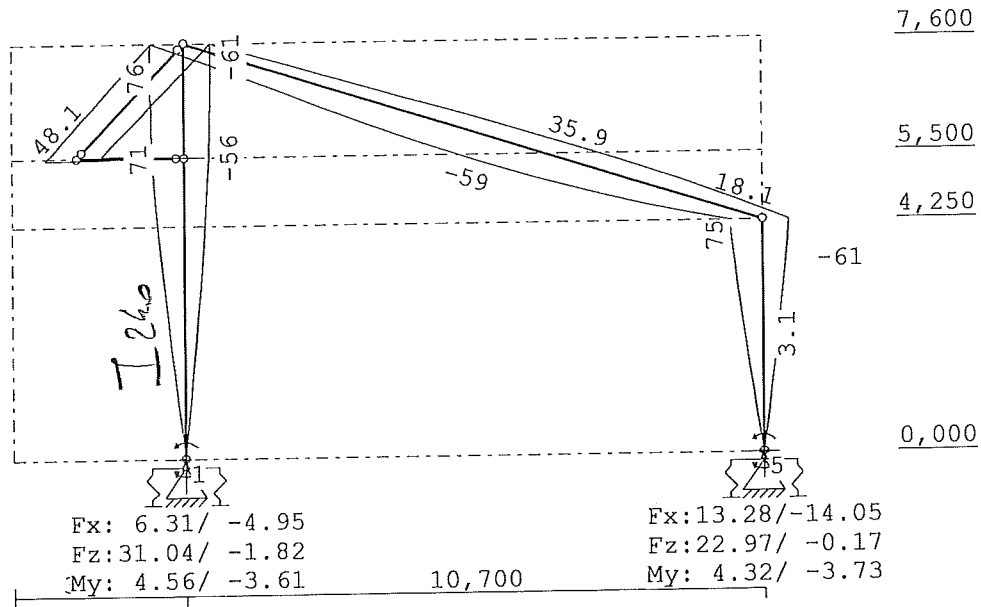
Fundamentele combinatie





**VERPLAATSINGEN** [mm]

Karakteristieke combinatie



Project...:

Onderdeel:

**KIPSTABILITEIT**

| Staaf | Plts.<br>aangr. | 1 gaffel | Kipsteunafstanden |       |
|-------|-----------------|----------|-------------------|-------|
|       |                 |          | [m]               | [m]   |
| 6     | 1.0*h           | boven:   | 2.01              | 2,006 |
|       |                 | onder:   | 2.01              | 2,006 |

**TOETSING SPANNINGEN**

| Staaf | Mat | BC | Sit | Kl | Plaats | Norm    | Artikel | Formule | Hoogste toetsing          |     | Opm.  |
|-------|-----|----|-----|----|--------|---------|---------|---------|---------------------------|-----|-------|
| nr.   |     |    |     |    |        |         |         |         | U.C. [N/mm <sup>2</sup> ] |     |       |
| 1     | 2   | 13 | 1   | 1  | Staaf  | EN3-1-1 | 6.3.3   | (6.61)  | 0.467                     | 110 | 47    |
| 2     | 2   | 13 | 1   | 1  | Einde  | EN3-1-1 | 6.2.10  | (6.31)  | 0.660                     | 155 | 47    |
| 3     | 1   | 6  | 1   | 1  | Staaf  | EN3-1-1 | 6.3.3   | (6.62)  | 0.536                     | 126 | 47    |
| 4     | 1   | 27 | 1   | 1  | Staaf  | EN3-1-1 | 6.3.3   | (6.62)  | 0.977                     | 230 | 46,47 |
| 5     | 4   | 5  | 1   | 1  | My-max | EN3-1-1 | 6.2.9.1 | (6.31)  | 0.115                     | 27  |       |
| 6     | 3   | 5  | 1   | 1  | Staaf  | EN3-1-1 | 6.3.3   | (6.62)  | 0.038                     | 9   |       |

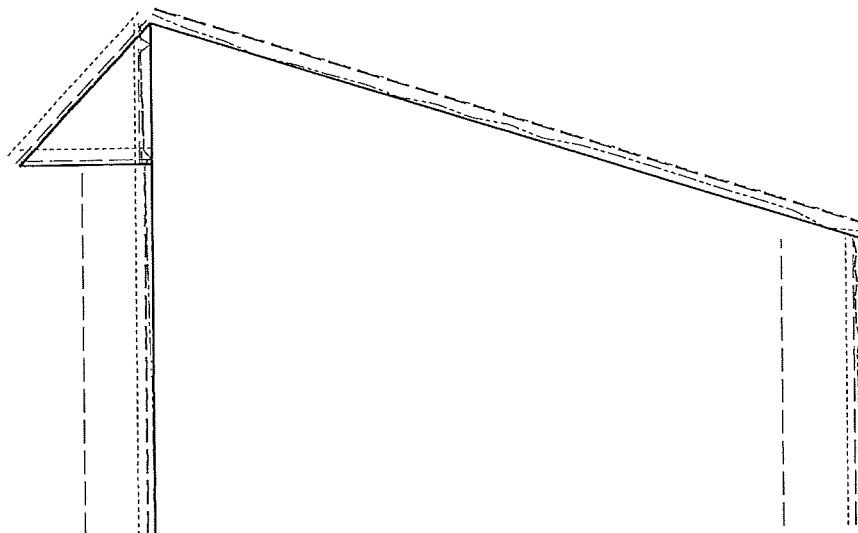
Opmerkingen:

[ 46] T.b.v. kip is een equivalente Q-last berekend.

[ 47] Bij verlopende normaalkracht wordt de grootste drukkracht genomen.

**UNITY-CHECK 'S**

OMHULLENDE VAN ALLES



----- Toelaatbare unity-check (1.0)  
 ----- Hoogste unity-check i.v.m. knikstabiliteit  
 ----- Unity-check i.v.m. kipstabiliteit  
 ----- Hoogste unity-check i.v.m. doorsnedecontrole  
 ----- Hoogste unity-check i.v.m. doorbuiging  
 ----- Unity-check te hoog (> 1.0)

Project..:

Onderdeel:

**KIPSTABILITEIT**

| Staaf | Plts.<br>aangr. | l gaffel | Kipsteunafstanden |         |
|-------|-----------------|----------|-------------------|---------|
|       |                 |          | [m]               | [m]     |
| 5     | 1.0*h           | boven:   | 2.90              | 2*1,452 |
|       |                 | onder:   | 2.90              | 2,904   |
| 6     | 1.0*h           | boven:   | 2.01              | 2,006   |
|       |                 | onder:   | 2.01              | 2,006   |

**TOETSING SPANNINGEN**

| Staaf | Mat | BC | Sit | KL | Plaats | Norm    | Artikel | Formule | Hoogste toetsing          |     | Opm.  |
|-------|-----|----|-----|----|--------|---------|---------|---------|---------------------------|-----|-------|
| nr.   |     |    |     |    |        |         |         |         | U.C. [N/mm <sup>2</sup> ] |     |       |
| 1     | 5   | 13 | 1   | 1  | Staaf  | EN3-1-1 | 6.3.3   | (6.62)  | 0.710                     | 167 | 47    |
| 2     | 5   | 13 | 1   | 1  | Staaf  | EN3-1-1 | 6.3.3   | (6.62)  | 0.788                     | 185 | 47    |
| 3     | 1   | 6  | 1   | 1  | Staaf  | EN3-1-1 | 6.3.3   | (6.62)  | 0.532                     | 125 | 47    |
| 4     | 1   | 27 | 1   | 1  | Staaf  | EN3-1-1 | 6.3.3   | (6.62)  | 0.964                     | 227 | 46,47 |
| 5     | 4   | 5  | 1   | 1  | My-max | EN3-1-1 | 6.2.9.1 | (6.31)  | 0.115                     | 27  |       |
| 6     | 3   | 5  | 1   | 1  | Staaf  | EN3-1-1 | 6.3.3   | (6.62)  | 0.038                     | 9   |       |

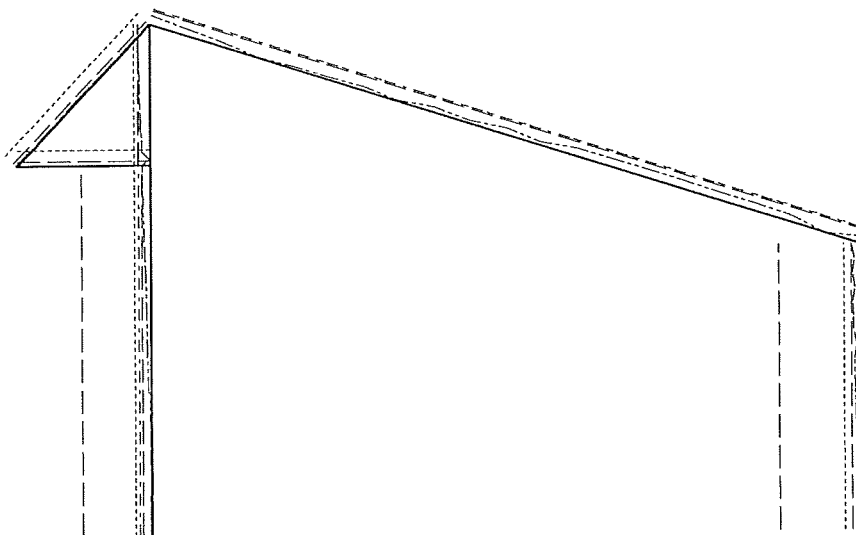
Opmerkingen:

[ 46] T.b.v. kip is een equivalente Q-last berekend.

[ 47] Bij verlopende normaalkracht wordt de grootste drukkracht genomen.

**UNITY-CHECK'S**

OMHULLENDE VAN ALLES



----- Toelaatbare unity-check (1.0)  
 ----- Hoogste unity-check i.v.m. knikstabiliteit  
 ----- Unity-check i.v.m. kipstabiliteit  
 ----- Hoogste unity-check i.v.m. doorsnedecontrole  
 ----- Hoogste unity-check i.v.m. doorbuiging  
 ----- Unity-check te hoog (> 1.0)

Project...:

Onderdeel:

Dimensies: kN;m;rad (tenzij anders aangegeven)

Datum....: 10/07/2019

Bestand...: z:\werk\2019\19-071-frenken-reuver-aelmans\werktuigb-1.rww

Belastingbreedte.: 5.750

Rekenmodel.....: 1e-orde-elastisch.

Theorie voor de bepaling van de krachtsverdeling:

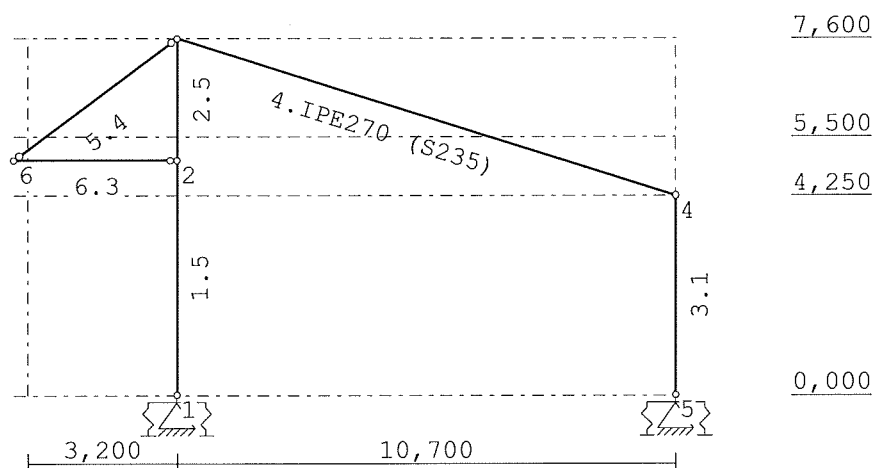
Geometrisch lineair.

Fysisch lineair.

Gunstige werking van de permanente belasting wordt automatisch verwerkt.

**Toegepaste normen volgens Eurocode met Nederlandse NB**

|             |                      |                 |             |
|-------------|----------------------|-----------------|-------------|
| Belastingen | NEN-EN 1990:2002     | C2:2010         | NB:2011(nl) |
|             | NEN-EN 1991-1-1:2002 | C1:2009         | NB:2011(nl) |
|             | NEN-EN 1991-1-3:2003 | C1:2009         | NB:2011(nl) |
|             | NEN-EN 1991-1-4:2005 | C2:2011         | NB:2011(nl) |
| Staal       | NEN-EN 1993-1-1:2006 | C2:2011,A1:2016 | NB:2016(nl) |

**GEOMETRIE****STRAMIENLIJNEN**

| Nr. | X      | Z-min | Z-max |
|-----|--------|-------|-------|
| 1   | 0.000  | 0.000 | 7.600 |
| 2   | 10.700 | 0.000 | 7.600 |
| 3   | -3.200 | 0.000 | 7.600 |

**NIVEAUS**

| Nr. | Z     | X-min  | X-max  |
|-----|-------|--------|--------|
| 1   | 0.000 | -3.500 | 10.700 |
| 2   | 7.600 | -3.500 | 10.700 |
| 3   | 4.250 | -3.500 | 10.700 |
| 4   | 5.500 | -3.500 | 10.700 |

Project...:

Onderdeel:

**MATERIALEN**

| Mt | Omschrijving | E-modulus[N/mm2] | S.G. | Pois. | Uitz. coëff |
|----|--------------|------------------|------|-------|-------------|
| 1  | S235         | 210000           | 78.5 | 0.30  | 1.2000e-05  |

**PROFIELEN [mm]**

| Prof. | Omschrijving | Materiaal | Oppervlak  | Traagheid  | Vormf. |
|-------|--------------|-----------|------------|------------|--------|
| 1     | IPE270       | 1:S235    | 4.5900e+03 | 5.7900e+07 | 0.00   |
| 2     | HEA200       | 1:S235    | 5.3800e+03 | 3.6920e+07 | 0.00   |
| 3     | HEA100       | 1:S235    | 2.1240e+03 | 3.4900e+06 | 0.00   |
| 4     | IPE200       | 1:S235    | 2.8480e+03 | 1.9430e+07 | 0.00   |
| 5     | IPE240       | 1:S235    | 3.9100e+03 | 3.8920e+07 | 0.00   |

**PROFIELEN vervolg [mm]**

| Prof. | Staaftype | Breedte | Hoogte | e     | Type | b1 | h1 | b2 | h2 |
|-------|-----------|---------|--------|-------|------|----|----|----|----|
| 1     | 0:Normaal | 135     | 270    | 135.0 |      |    |    |    |    |
| 2     | 0:Normaal | 200     | 190    | 95.0  |      |    |    |    |    |
| 3     | 0:Normaal | 100     | 96     | 48.0  |      |    |    |    |    |
| 4     | 0:Normaal | 100     | 200    | 100.0 |      |    |    |    |    |
| 5     | 0:Normaal | 120     | 240    | 120.0 |      |    |    |    |    |

**PROFIELVORMEN [mm]**

|   |        |                                                                                     |
|---|--------|-------------------------------------------------------------------------------------|
| 1 | IPE270 |  |
| 2 | HEA200 |  |
| 3 | HEA100 |  |
| 4 | IPE200 |  |
| 5 | IPE240 |  |

**KNOPEN**

| Knoop | X      | Z     | Knoop | X      | Z     |
|-------|--------|-------|-------|--------|-------|
| 1     | 0.000  | 0.000 | 6     | -3.500 | 5.000 |
| 2     | 0.000  | 5.000 |       |        |       |
| 3     | 0.000  | 7.600 |       |        |       |
| 4     | 10.700 | 4.250 |       |        |       |
| 5     | 10.700 | 0.000 |       |        |       |

Project...:

Onderdeel:

**STAVEN**

| St. | ki | kj | Profiel  | Aansl.i | Aansl.j | Lengte Opm. |
|-----|----|----|----------|---------|---------|-------------|
| 1   | 1  | 2  | 5:IPE240 | NDM     | NDM     | 5.000       |
| 2   | 2  | 3  | 5:IPE240 | NDM     | NDM     | 2.600       |
| 3   | 5  | 4  | 1:IPE270 | NDM     | NDM     | 4.250       |
| 4   | 3  | 4  | 1:IPE270 | NDM     | NDM     | 11.212      |
| 5   | 6  | 3  | 4:IPE200 | ND      | ND      | 4.360       |
| 6   | 6  | 2  | 3:HEA100 | NDM     | ND      | 3.500       |

**VASTE STEUNPUNTEN**

| Nr. | knoop | Kode | XZR 1=vast 0=vrij | Hoek |
|-----|-------|------|-------------------|------|
| 1   | 1     | 110  |                   | 0.00 |
| 2   | 5     | 110  |                   | 0.00 |

**VEREN**

| Veer | Knoop | Richting  | Hoek | Veerwaarde | Type    | Ondergrens | Bovengrens |
|------|-------|-----------|------|------------|---------|------------|------------|
| 1    | 1     | 3:Rotatie | 0.00 | 3.000e+02  | Normaal | -1.000e+10 | 1.000e+10  |
| 2    | 5     | 3:Rotatie | 0.00 | 2.250e+02  | Normaal | -1.000e+10 | 1.000e+10  |

**BELASTINGGENERATIE ALGEMEEN.**

Betrouwbaarheidsklasse.....: 1 Referentieperiode.....: 15  
 Gebouwdiepte.....: 33.00 Gebouwhoogte.....: 7.60  
 Niveau aansl.terrein.....: 0.00 E.g. scheid.w. [kN/m2]: 1.20

**WIND**

Terrein categorie ...[4.3.2]....: Onbebouwd  
 Windgebied .....: 3 Vb,0 ..[4.2].....: 24.500  
 Referentie periode wind.....: 15.00 Vb(p) ..[4.2].....: 22.397  
 K .....[4.2].....: 0.280 n ....[4.2].....: 0.500  
 Positie spant in het gebouw....: 5.500 Kr ....[4.3.2].....: 0.209  
 z0 .....[4.3.2]....: 0.200 Zmin ..[4.3.2].....: 4.000  
 Co wind van links ..[4.3.3]....: 1.000 Co wind van rechts....: 1.000  
 Co wind loodrecht ..[4.3.3]....: 1.000  
 Cpi wind van links ..[7.2.9]....: 0.200 -0.300  
 Cpi windloodrecht ...[7.2.9]....: 0.200 -0.300  
 Cpi wind van rechts ..[7.2.9]....: 0.200 -0.300  
 Cfr windwrijving ....[7.5].....: 0.040

**SNEEUW**

Sneeuwbelasting (sk) 50 jaar : 0.70  
 Sneeuwbelasting (sn) n jaar : 0.53

Project...:

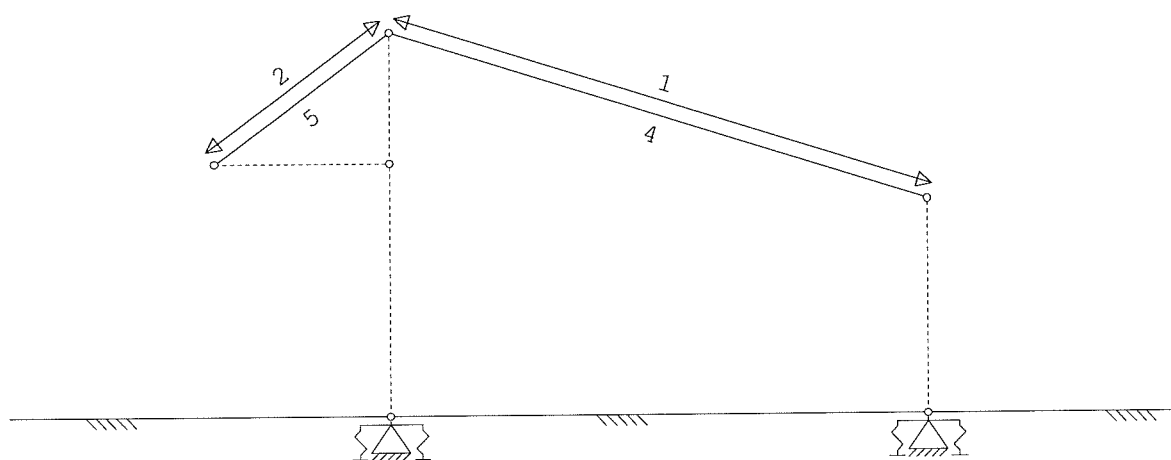
Onderdeel:

**STAFTYPEN**

| Type             | staven  |
|------------------|---------|
| 6:Rechter gevel. | : 3     |
| 7:Dak.           | : 4,5   |
| 9:Open.          | : 1,2,6 |

**LASTVELDEN**

Veranderlijke belastingen door personen

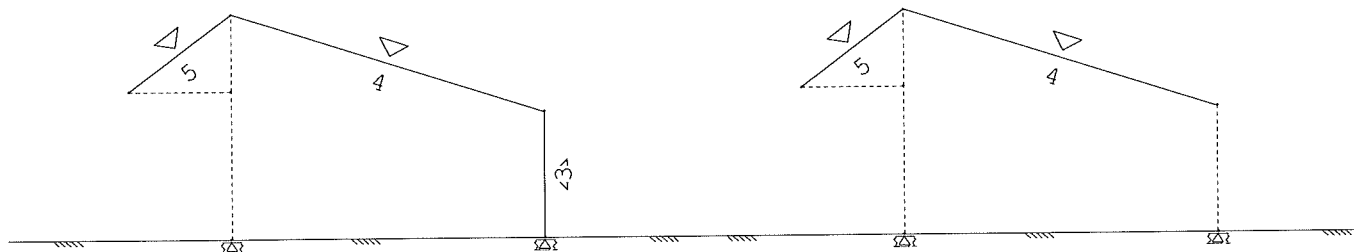
**LASTVELDEN**

| Nr | Staat | Tabel | Klasse-Gebruiksfunctie   | Verd. | $q_k$ | $Q_k$ | $F_t/F_{t0}$ |
|----|-------|-------|--------------------------|-------|-------|-------|--------------|
| 1  | 4-4   | 6.10  | H-Dak (onder dakbeschot) | 2     | -0.52 | -2.00 | 0.87         |
| 2  | 5-5   | 6.10  | H-Dak (onder dakbeschot) | 1     | 0.00  | -2.00 | 0.87         |

**LASTVELDEN**

Wind staven

Sneeuw staven

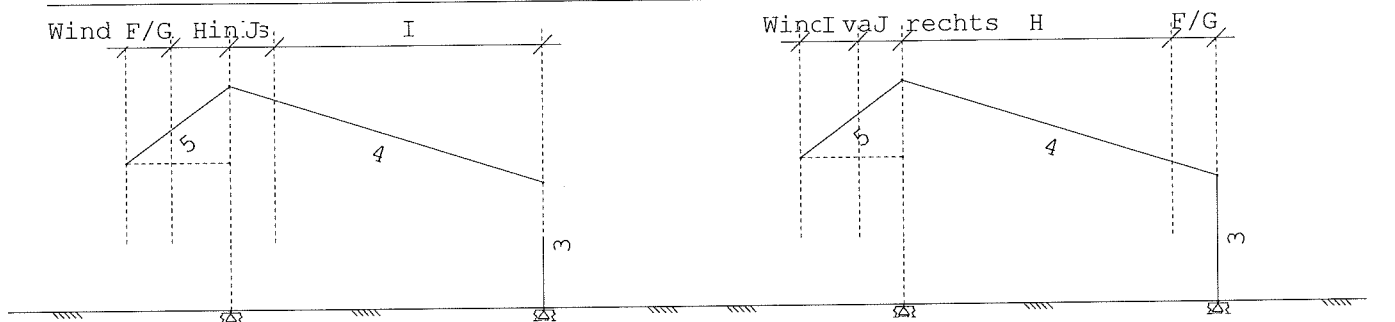


Project...:

Onderdeel:

**WIND DAKTYPES**

| Nr. | Staaft Type | reductie bij<br>wind van links | reductie bij<br>wind van Rechts | Cpe volgens art: |
|-----|-------------|--------------------------------|---------------------------------|------------------|
| 1   | 5 Zadeldak  | 1.000                          | 1.000                           | 7.2.5            |
| 2   | 4 Zadeldak  | 1.000                          | 1.000                           | 7.2.5            |
| 3   | 3 Gevel     | 1.000                          | 1.000                           | 7.2.2            |

**WIND ZONES****WIND VAN LINKS ZONES**

| Nr. | Staaft | Positie | Lengte | Zone |
|-----|--------|---------|--------|------|
| 1   | 5      | 0.000   | 1.520  | F/G  |
| 2   | 5      | 1.520   | 1.980  | H    |
| 3   | 4      | 0.000   | 1.520  | J    |
| 4   | 4      | 1.520   | 9.180  | I    |
| 5   | 3      | 0.000   | 4.250  | E    |

**WIND VAN RECHTS ZONES**

| Nr. | Staaft | Positie | Lengte | Zone |
|-----|--------|---------|--------|------|
| 1   | 3      | 0.000   | 4.250  | D    |
| 2   | 4      | 0.000   | 1.520  | F/G  |
| 3   | 4      | 1.520   | 9.180  | H    |
| 4   | 5      | 0.000   | 1.520  | J    |
| 5   | 5      | 1.520   | 1.980  | I    |

**Wind indexen**

| Index | CsCd | Cpe/Cpi | qp    | breedte | reductie | Qw     | Zone | Hoek(en) |
|-------|------|---------|-------|---------|----------|--------|------|----------|
| Qw1   |      | 0.300   | 0.530 | 5.750   |          | -0.914 | -i   |          |
| Qw2   |      | -0.300  | 0.530 | 5.750   |          | 0.914  | -i   |          |
| Qw3   | 1.00 | 0.700   | 0.530 | 1.175   |          | -0.436 | F    | 36.6     |
| Qw4   | 1.00 | 0.700   | 0.530 | 4.575   |          | -1.697 | G    | 36.6     |
| Qw5   | 1.00 | 0.488   | 0.530 | 5.750   |          | -1.487 | H    | 36.6     |
| Qw6   | 1.00 | -0.920  | 0.530 | 5.750   |          | 2.803  | J    | 17.4     |
| Qw7   | 1.00 | -0.400  | 0.530 | 5.750   |          | 1.219  | I    | 17.4     |
| Qw8   | 1.00 | 0.500   | 0.530 | 5.750   |          | -1.523 | E    |          |
| Qw9   |      | -0.200  | 0.530 | 5.750   |          | 0.609  | +i   |          |
| Qw10  |      | 0.200   | 0.530 | 5.750   |          | -0.609 | +i   |          |
| Qw11  | 1.00 | -0.280  | 0.530 | 1.175   |          | 0.174  | F    | 36.6     |
| Qw12  | 1.00 | -0.280  | 0.530 | 4.575   |          | 0.679  | G    | 36.6     |
| Qw13  | 1.00 | -0.112  | 0.530 | 5.750   |          | 0.341  | H    | 36.6     |
| Qw14  | 1.00 | -0.800  | 0.530 | 5.750   |          | 2.438  | D    |          |
| Qw15  | 1.00 | 0.280   | 0.530 | 1.175   |          | -0.174 | F    | 17.4     |
| Qw16  | 1.00 | 0.280   | 0.530 | 4.575   |          | -0.679 | G    | 17.4     |
| Qw17  | 1.00 | 0.232   | 0.530 | 5.750   |          | -0.707 | H    | 17.4     |
| Qw18  | 1.00 | -0.412  | 0.530 | 5.750   |          | 1.255  | J    | 36.6     |
| Qw19  | 1.00 | -0.312  | 0.530 | 5.750   |          | 0.951  | I    | 36.6     |
| Qw20  | 1.00 | -0.836  | 0.530 | 1.175   |          | 0.521  | F    | 17.4     |



Project...:

Onderdeel:

**Wind indexen**

| Index | CsCd | Cpe/Cpi | qp    | breedte reductie | Qw Zone | Hoek(en) |
|-------|------|---------|-------|------------------|---------|----------|
| Qw21  | 1.00 | -0.752  | 0.530 | 4.575            | 1.823 G | 17.4     |
| Qw22  | 1.00 | -0.284  | 0.530 | 5.750            | 0.865 H | 17.4     |

**SNEEUW DAKTYPEN**

| Staafl | artikel         |
|--------|-----------------|
| 5-5    | 5.3.3 Zadel dak |
| 4-4    | 5.3.3 Zadel dak |

**Sneeuw indexen**

| Index | art   | $\mu$ | $s_k$ | red. posfac | breedte | $Q_s$ | hoek |
|-------|-------|-------|-------|-------------|---------|-------|------|
| Qs1   | 5.3.3 | 0.800 | 0.53  | 1.00        | 5.750   | 2.417 | 17.4 |
| Qs2   | 5.3.3 | 0.624 | 0.53  | 1.00        | 5.750   | 1.885 | 36.6 |
| Qs3   | 5.3.3 | 0.312 | 0.53  | 1.00        | 5.750   | 0.943 | 36.6 |
| Qs4   | 5.3.3 | 0.400 | 0.53  | 1.00        | 5.750   | 1.209 | 17.4 |

**BELASTINGGEVALLEN**

| B.G. | Omschrijving                     | Type       |
|------|----------------------------------|------------|
|      | 1 Permanente belasting EGZ=-1.00 | 1          |
| g    | 2 Ver. bel. pers. ed. (p_rep)    | 2          |
| g    | 3 Ver. bel. pers. ed. (F-rep)    | 3          |
| g    | 4 Wind van links onderdruk A     | 7          |
| g    | 5 Wind van links overdruk A      | 8          |
| g    | 6 Wind van links onderdruk B     | 9          |
| g    | 7 Wind van links overdruk B      | 10         |
| g    | 8 Wind van links onderdruk C     | 37         |
| g    | 9 Wind van links overdruk C      | 38         |
| g    | 10 Wind van links onderdruk D    | 39         |
| g    | 11 Wind van links overdruk D     | 40         |
| g    | 12 Wind van rechts onderdruk A   | 11         |
| g    | 13 Wind van rechts overdruk A    | 12         |
| g    | 14 Wind van rechts onderdruk B   | 13         |
| g    | 15 Wind van rechts overdruk B    | 14         |
| g    | 16 Wind van rechts onderdruk C   | 41         |
| g    | 17 Wind van rechts overdruk C    | 42         |
| g    | 18 Wind van rechts onderdruk D   | 43         |
| g    | 19 Wind van rechts overdruk D    | 44         |
| g    | 20 Sneeuw A                      | 22         |
| g    | 21 Sneeuw B                      | 23         |
| g    | 22 Sneeuw C                      | 33         |
|      | 23 Knik                          | 0 Onbekend |

g = gegenereerd belastinggeval

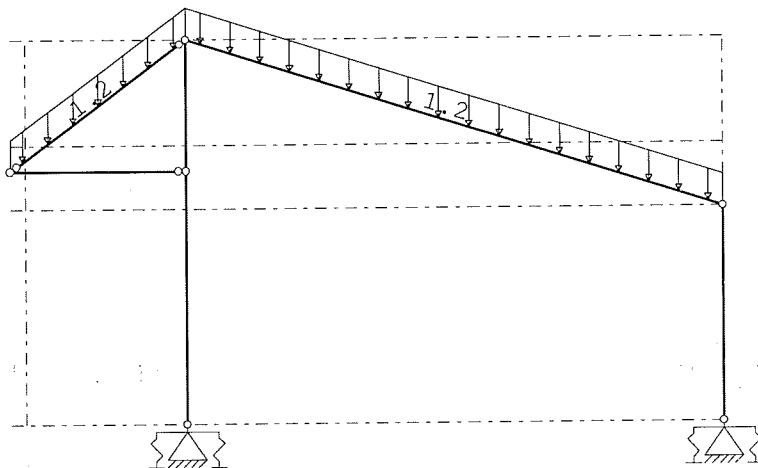
Project...:

Onderdeel:

**BELASTINGEN**

B.G:1 Permanente belasting

Eigen gewicht van alle staven is meegenomen in berekening. Richting:↓

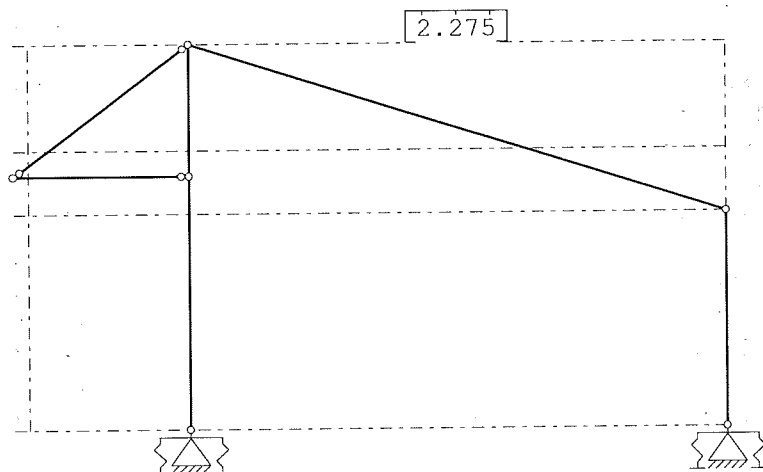
**STAAFBELASTINGEN**

B.G:1 Permanente belasting

| Staaft Type  | q1/p/m | q2    | A     | B     | $\psi_0$ | $\psi_1$ | $\psi_2$ |
|--------------|--------|-------|-------|-------|----------|----------|----------|
| 5 5:QZGloaal | -1.20  | -1.20 | 0.000 | 0.000 |          |          |          |
| 4 5:QZGloaal | -1.20  | -1.20 | 0.000 | 0.000 |          |          |          |

**BELASTINGEN**

B.G:2 Ver. bel. pers. ed. (p\_rep)

**STAAFBELASTINGEN**

B.G:2 Ver. bel. pers. ed. (p\_rep)

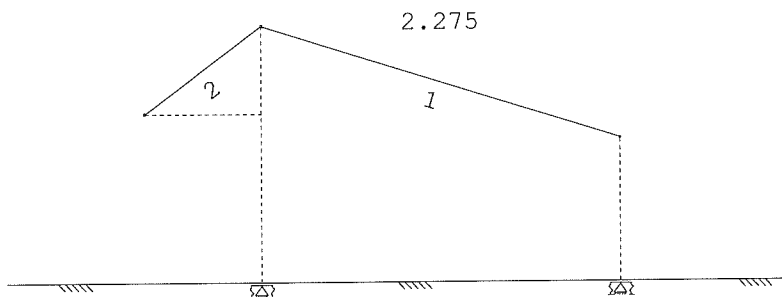
| Staaft Type   | q1/p/m | q2    | A     | B     | $\psi_0$ | $\psi_1$ | $\psi_2$ |
|---------------|--------|-------|-------|-------|----------|----------|----------|
| 4 3:QZgeProj. | -2.28  | -2.28 | 4.350 | 4.350 | 0.0      | 0.0      | 0.0      |

Project...:

Onderdeel:

**SITUATIES BELAST/ONBELAST**

B.G:2 Ver. bel. pers. ed. (p\_rep)

**SITUATIES BELAST/ONBELAST**

Belastingtype: P-rep

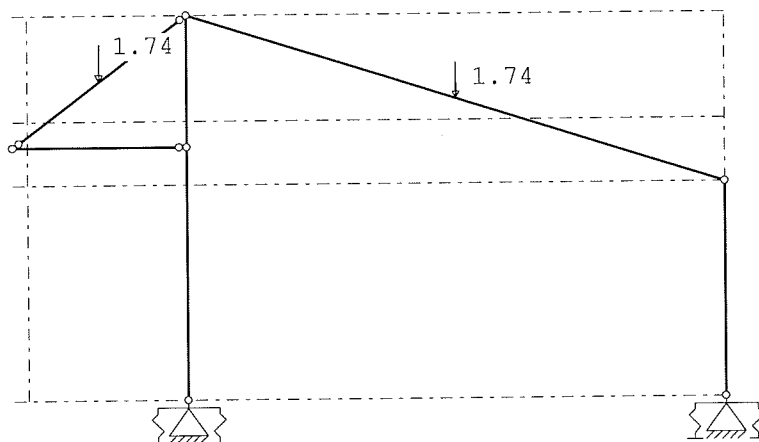
Nr Lastvelden belast

Lastvelden onbelast

1 1,2

**BELASTINGEN**

B.G:3 Ver. bel. pers. ed. (F-rep)

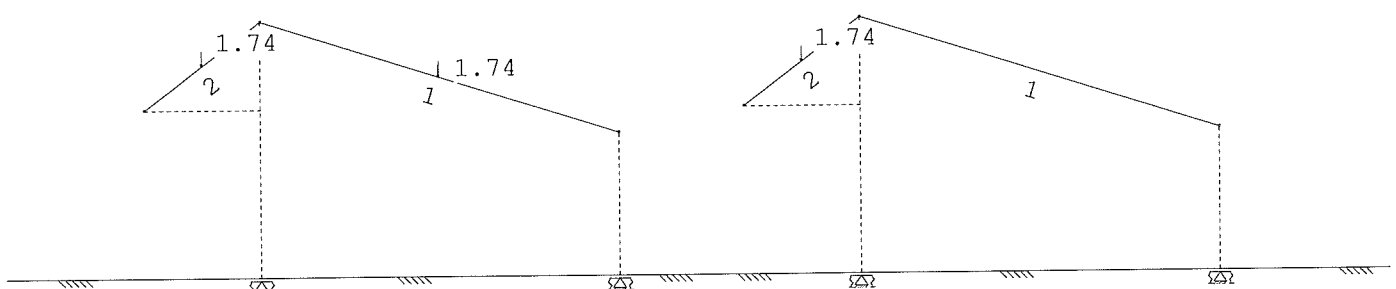
**STAAFBELASTINGEN**

B.G:3 Ver. bel. pers. ed. (F-rep)

| Staat | Type          | q1/p/m | q2 | A     | B | $\psi_0$ | $\psi_1$ | $\psi_2$ |
|-------|---------------|--------|----|-------|---|----------|----------|----------|
| 4     | 10:PZGepro.j. | -1.74  |    | 5.606 |   | 0.0      | 0.0      | 0.0      |
| 5     | 10:PZGepro.j. | -1.74  |    | 2.180 |   | 0.0      | 0.0      | 0.0      |

**SITUATIES BELAST/ONBELAST**

B.G:3 Ver. bel. pers. ed. (F-rep)

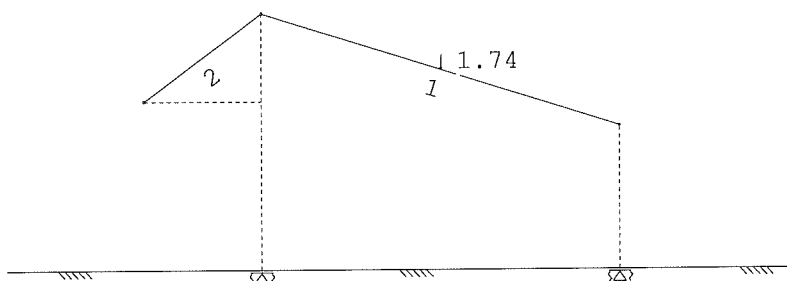


Project...:

Onderdeel:

**SITUATIES BELAST/ONBELAST**

B.G:3 Ver. bel. pers. ed. (F-rep)

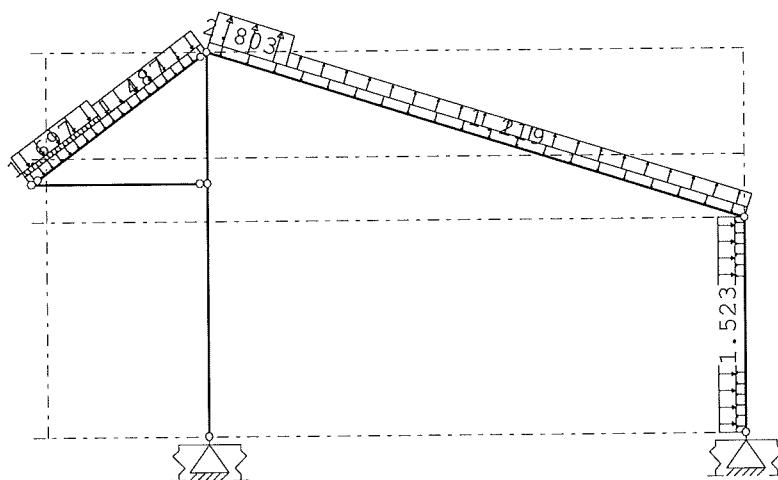
**SITUATIES BELAST/ONBELAST**

Belastingtype: F-rep

| Nr Lastvelden belast | Lastvelden onbelast |
|----------------------|---------------------|
| 1 1,2                |                     |
| 2 2                  | 1                   |
| 3 1                  | 2                   |

**BELASTINGEN**

B.G:4 Wind van links onderdruk A

**STAAFBELASTINGEN**

B.G:4 Wind van links onderdruk A

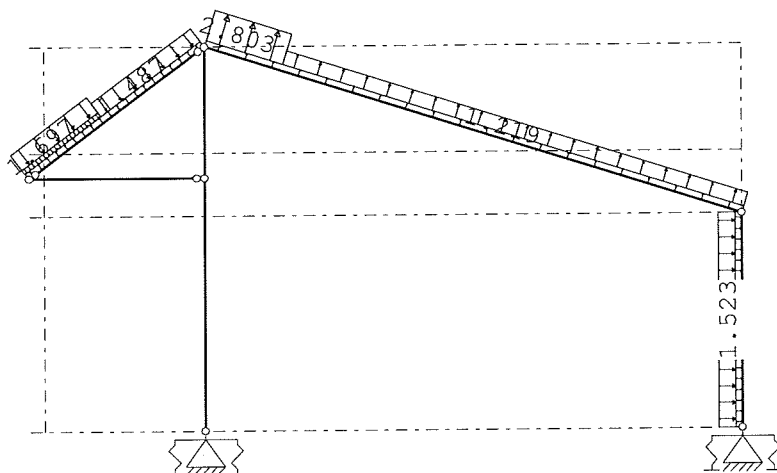
| Staaft Type  | Index | q1/p/m | q2    | A     | B     | $\psi_0$ | $\psi_1$ | $\psi_2$ |
|--------------|-------|--------|-------|-------|-------|----------|----------|----------|
| 5 1:QZLokaal | Qw1   | -0.91  | -0.91 | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |
| 4 1:QZLokaal | Qw1   | -0.91  | -0.91 | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |
| 3 1:QZLokaal | Qw2   | 0.91   | 0.91  | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |
| 5 1:QZLokaal | Qw3   | -0.44  | -0.44 | 0.000 | 2.467 | 0.0      | 0.2      | 0.0      |
| 5 1:QZLokaal | Qw4   | -1.70  | -1.70 | 0.000 | 2.467 | 0.0      | 0.2      | 0.0      |
| 5 1:QZLokaal | Qw5   | -1.49  | -1.49 | 1.894 | 0.000 | 0.0      | 0.2      | 0.0      |
| 4 1:QZLokaal | Qw6   | 2.80   | 2.80  | 0.000 | 9.619 | 0.0      | 0.2      | 0.0      |
| 4 1:QZLokaal | Qw7   | 1.22   | 1.22  | 1.593 | 0.000 | 0.0      | 0.2      | 0.0      |
| 3 1:QZLokaal | Qw8   | -1.52  | -1.52 | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |

Project...:

Onderdeel:

**BELASTINGEN**

B.G:5 Wind van links overdruk A

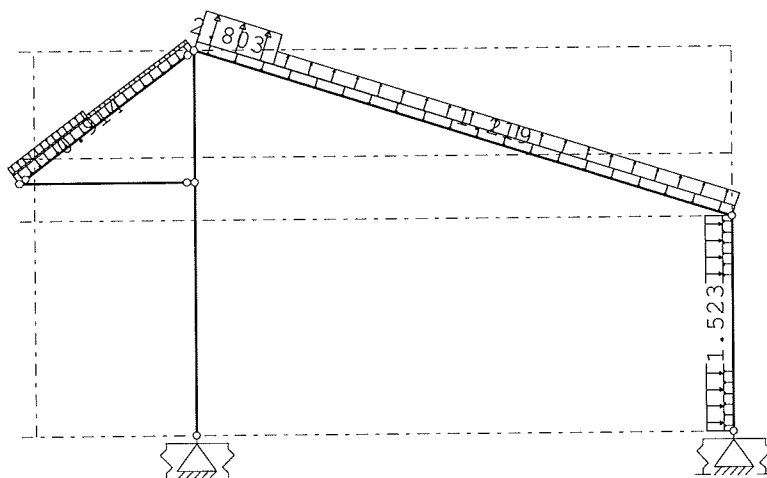
**STAAFBELASTINGEN**

B.G:5 Wind van links overdruk A

| Staaft Type  | Index | q1/p/m | q2    | A     | B     | $\psi_0$ | $\psi_1$ | $\psi_2$ |
|--------------|-------|--------|-------|-------|-------|----------|----------|----------|
| 5 1:QZLokaal | Qw9   | 0.61   | 0.61  | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |
| 4 1:QZLokaal | Qw9   | 0.61   | 0.61  | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |
| 3 1:QZLokaal | Qw10  | -0.61  | -0.61 | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |
| 5 1:QZLokaal | Qw3   | -0.44  | -0.44 | 0.000 | 2.467 | 0.0      | 0.2      | 0.0      |
| 5 1:QZLokaal | Qw4   | -1.70  | -1.70 | 0.000 | 2.467 | 0.0      | 0.2      | 0.0      |
| 5 1:QZLokaal | Qw5   | -1.49  | -1.49 | 1.894 | 0.000 | 0.0      | 0.2      | 0.0      |
| 4 1:QZLokaal | Qw6   | 2.80   | 2.80  | 0.000 | 9.619 | 0.0      | 0.2      | 0.0      |
| 4 1:QZLokaal | Qw7   | 1.22   | 1.22  | 1.593 | 0.000 | 0.0      | 0.2      | 0.0      |
| 3 1:QZLokaal | Qw8   | -1.52  | -1.52 | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |

**BELASTINGEN**

B.G:6 Wind van links onderdruk B



Project...:

Onderdeel:

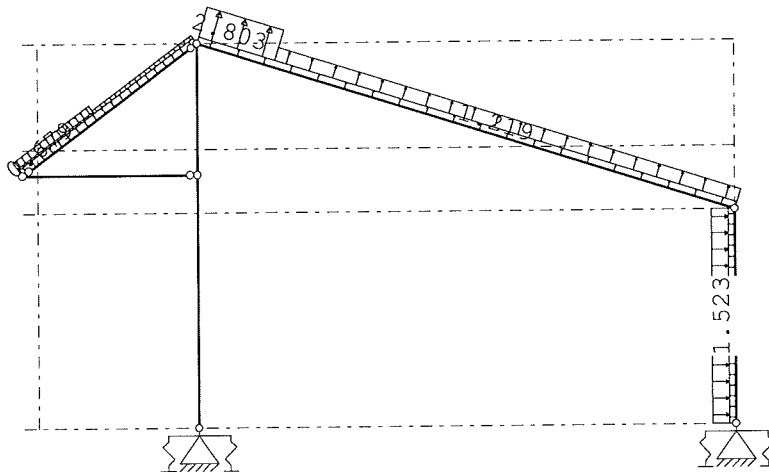
**STAAFBELASTINGEN**

B.G:6 Wind van links onderdruk B

| Staaf | Type       | Index | q1/p/m | q2    | A     | B     | $\psi_0$ | $\psi_1$ | $\psi_2$ |
|-------|------------|-------|--------|-------|-------|-------|----------|----------|----------|
| 5     | 1:QZLokaal | Qw1   | -0.91  | -0.91 | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |
| 4     | 1:QZLokaal | Qw1   | -0.91  | -0.91 | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |
| 3     | 1:QZLokaal | Qw2   | 0.91   | 0.91  | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |
| 5     | 1:QZLokaal | Qw11  | 0.17   | 0.17  | 0.000 | 2.467 | 0.0      | 0.2      | 0.0      |
| 5     | 1:QZLokaal | Qw12  | 0.68   | 0.68  | 0.000 | 2.467 | 0.0      | 0.2      | 0.0      |
| 5     | 1:QZLokaal | Qw13  | 0.34   | 0.34  | 1.894 | 0.000 | 0.0      | 0.2      | 0.0      |
| 4     | 1:QZLokaal | Qw6   | 2.80   | 2.80  | 0.000 | 9.619 | 0.0      | 0.2      | 0.0      |
| 4     | 1:QZLokaal | Qw7   | 1.22   | 1.22  | 1.593 | 0.000 | 0.0      | 0.2      | 0.0      |
| 3     | 1:QZLokaal | Qw8   | -1.52  | -1.52 | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |

**BELASTINGEN**

B.G:7 Wind van links overdruk B

**STAAFBELASTINGEN**

B.G:7 Wind van links overdruk B

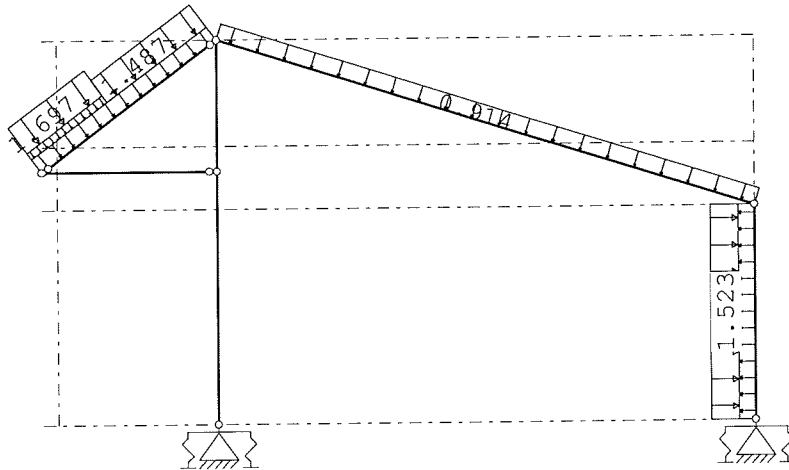
| Staaf | Type       | Index | q1/p/m | q2    | A     | B     | $\psi_0$ | $\psi_1$ | $\psi_2$ |
|-------|------------|-------|--------|-------|-------|-------|----------|----------|----------|
| 5     | 1:QZLokaal | Qw9   | 0.61   | 0.61  | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |
| 4     | 1:QZLokaal | Qw9   | 0.61   | 0.61  | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |
| 3     | 1:QZLokaal | Qw10  | -0.61  | -0.61 | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |
| 5     | 1:QZLokaal | Qw11  | 0.17   | 0.17  | 0.000 | 2.467 | 0.0      | 0.2      | 0.0      |
| 5     | 1:QZLokaal | Qw12  | 0.68   | 0.68  | 0.000 | 2.467 | 0.0      | 0.2      | 0.0      |
| 5     | 1:QZLokaal | Qw13  | 0.34   | 0.34  | 1.894 | 0.000 | 0.0      | 0.2      | 0.0      |
| 4     | 1:QZLokaal | Qw6   | 2.80   | 2.80  | 0.000 | 9.619 | 0.0      | 0.2      | 0.0      |
| 4     | 1:QZLokaal | Qw7   | 1.22   | 1.22  | 1.593 | 0.000 | 0.0      | 0.2      | 0.0      |
| 3     | 1:QZLokaal | Qw8   | -1.52  | -1.52 | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |

Project...:

Onderdeel:

**BELASTINGEN**

B.G:8 Wind van links onderdruk C

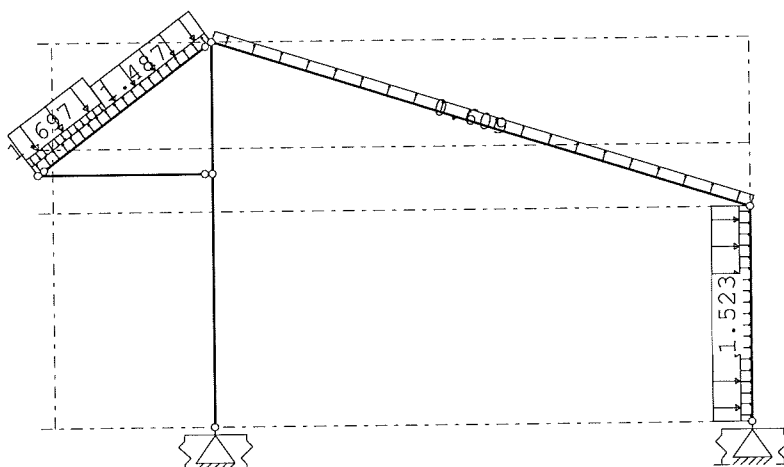
**STAAFBELASTINGEN**

B.G:8 Wind van links onderdruk C

| Staaftype    | Index | q1/p/m | q2    | A     | B     | $\psi_0$ | $\psi_1$ | $\psi_2$ |
|--------------|-------|--------|-------|-------|-------|----------|----------|----------|
| 5 1:QZLokaal | Qw1   | -0.91  | -0.91 | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |
| 4 1:QZLokaal | Qw1   | -0.91  | -0.91 | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |
| 3 1:QZLokaal | Qw2   | 0.91   | 0.91  | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |
| 5 1:QZLokaal | Qw3   | -0.44  | -0.44 | 0.000 | 2.467 | 0.0      | 0.2      | 0.0      |
| 5 1:QZLokaal | Qw4   | -1.70  | -1.70 | 0.000 | 2.467 | 0.0      | 0.2      | 0.0      |
| 5 1:QZLokaal | Qw5   | -1.49  | -1.49 | 1.894 | 0.000 | 0.0      | 0.2      | 0.0      |
| 3 1:QZLokaal | Qw8   | -1.52  | -1.52 | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |

**BELASTINGEN**

B.G:9 Wind van links overdruk C

**STAAFBELASTINGEN**

B.G:9 Wind van links overdruk C

| Staaftype    | Index | q1/p/m | q2    | A     | B     | $\psi_0$ | $\psi_1$ | $\psi_2$ |
|--------------|-------|--------|-------|-------|-------|----------|----------|----------|
| 5 1:QZLokaal | Qw9   | 0.61   | 0.61  | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |
| 4 1:QZLokaal | Qw9   | 0.61   | 0.61  | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |
| 3 1:QZLokaal | Qw10  | -0.61  | -0.61 | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |
| 5 1:QZLokaal | Qw3   | -0.44  | -0.44 | 0.000 | 2.467 | 0.0      | 0.2      | 0.0      |
| 5 1:QZLokaal | Qw4   | -1.70  | -1.70 | 0.000 | 2.467 | 0.0      | 0.2      | 0.0      |
| 5 1:QZLokaal | Qw5   | -1.49  | -1.49 | 1.894 | 0.000 | 0.0      | 0.2      | 0.0      |

Project...:

Onderdeel:

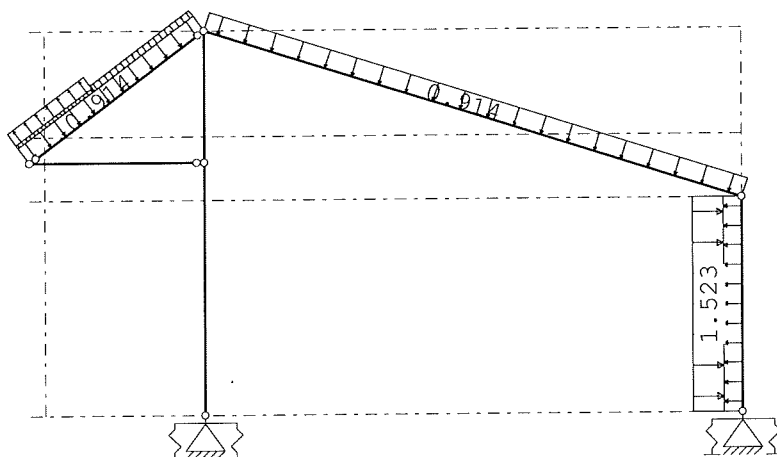
**STAAFBELASTINGEN**

B.G:9 Wind van links overdruk C

| Staaft Type  | Index | q1/p/m | q2    | A     | B     | $\psi_0$ | $\psi_1$ | $\psi_2$ |
|--------------|-------|--------|-------|-------|-------|----------|----------|----------|
| 3 1:QZLokaal | Qw8   | -1.52  | -1.52 | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |

**BELASTINGEN**

B.G:10 Wind van links onderdruk D

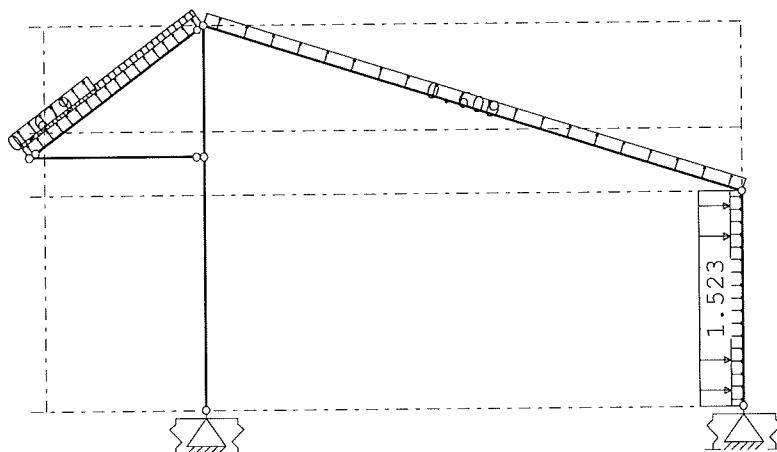
**STAAFBELASTINGEN**

B.G:10 Wind van links onderdruk D

| Staaft Type  | Index | q1/p/m | q2    | A     | B     | $\psi_0$ | $\psi_1$ | $\psi_2$ |
|--------------|-------|--------|-------|-------|-------|----------|----------|----------|
| 5 1:QZLokaal | Qw1   | -0.91  | -0.91 | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |
| 4 1:QZLokaal | Qw1   | -0.91  | -0.91 | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |
| 3 1:QZLokaal | Qw2   | 0.91   | 0.91  | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |
| 5 1:QZLokaal | Qw11  | 0.17   | 0.17  | 0.000 | 2.467 | 0.0      | 0.2      | 0.0      |
| 5 1:QZLokaal | Qw12  | 0.68   | 0.68  | 0.000 | 2.467 | 0.0      | 0.2      | 0.0      |
| 5 1:QZLokaal | Qw13  | 0.34   | 0.34  | 1.894 | 0.000 | 0.0      | 0.2      | 0.0      |
| 3 1:QZLokaal | Qw8   | -1.52  | -1.52 | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |

**BELASTINGEN**

B.G:11 Wind van links overdruk D





Project...:

Onderdeel:

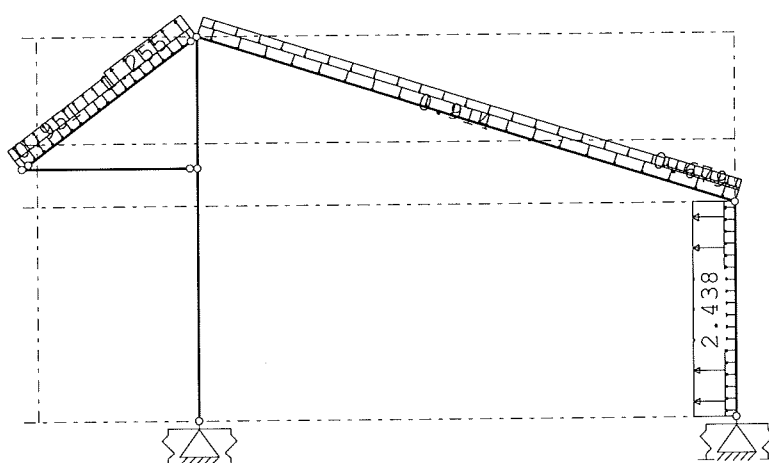
**STAAFBELASTINGEN**

B.G:11 Wind van links overdruk D

| Staaft Type  | Index | q1/p/m | q2    | A     | B     | $\psi_0$ | $\psi_1$ | $\psi_2$ |
|--------------|-------|--------|-------|-------|-------|----------|----------|----------|
| 5 1:QZLokaal | Qw9   | 0.61   | 0.61  | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |
| 4 1:QZLokaal | Qw9   | 0.61   | 0.61  | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |
| 3 1:QZLokaal | Qw10  | -0.61  | -0.61 | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |
| 5 1:QZLokaal | Qw11  | 0.17   | 0.17  | 0.000 | 2.467 | 0.0      | 0.2      | 0.0      |
| 5 1:QZLokaal | Qw12  | 0.68   | 0.68  | 0.000 | 2.467 | 0.0      | 0.2      | 0.0      |
| 5 1:QZLokaal | Qw13  | 0.34   | 0.34  | 1.894 | 0.000 | 0.0      | 0.2      | 0.0      |
| 3 1:QZLokaal | Qw8   | -1.52  | -1.52 | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |

**BELASTINGEN**

B.G:12 Wind van rechts onderdruk A

**STAAFBELASTINGEN**

B.G:12 Wind van rechts onderdruk A

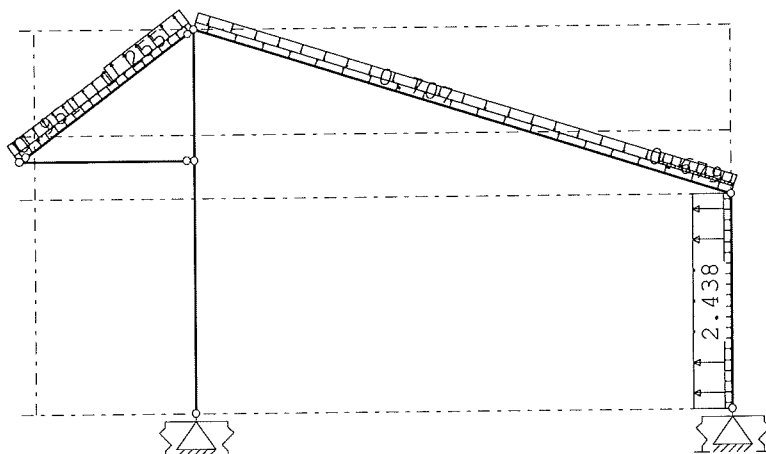
| Staaft Type  | Index | q1/p/m | q2    | A     | B     | $\psi_0$ | $\psi_1$ | $\psi_2$ |
|--------------|-------|--------|-------|-------|-------|----------|----------|----------|
| 5 1:QZLokaal | Qw1   | -0.91  | -0.91 | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |
| 4 1:QZLokaal | Qw1   | -0.91  | -0.91 | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |
| 3 1:QZLokaal | Qw2   | 0.91   | 0.91  | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |
| 3 1:QZLokaal | Qw14  | 2.44   | 2.44  | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |
| 4 1:QZLokaal | Qw15  | -0.17  | -0.17 | 9.619 | 0.000 | 0.0      | 0.2      | 0.0      |
| 4 1:QZLokaal | Qw16  | -0.68  | -0.68 | 9.619 | 0.000 | 0.0      | 0.2      | 0.0      |
| 4 1:QZLokaal | Qw17  | -0.71  | -0.71 | 0.000 | 1.593 | 0.0      | 0.2      | 0.0      |
| 5 1:QZLokaal | Qw18  | 1.26   | 1.26  | 2.467 | 0.000 | 0.0      | 0.2      | 0.0      |
| 5 1:QZLokaal | Qw19  | 0.95   | 0.95  | 0.000 | 1.894 | 0.0      | 0.2      | 0.0      |

Project...:

Onderdeel:

## BELASTINGEN

B.G:13 Wind van rechts overdruk A



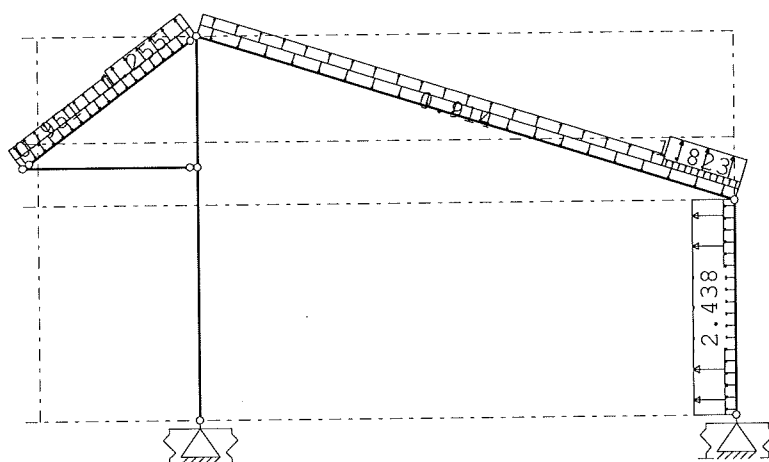
## STAAFBELASTINGEN

B.G:13 Wind van rechts overdruk A

| Staaft Type  | Index | q1/p/m | q2    | A     | B     | $\Psi_0$ | $\Psi_1$ | $\Psi_2$ |
|--------------|-------|--------|-------|-------|-------|----------|----------|----------|
| 5 1:QZLokaal | Qw9   | 0.61   | 0.61  | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |
| 4 1:QZLokaal | Qw9   | 0.61   | 0.61  | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |
| 3 1:QZLokaal | Qw10  | -0.61  | -0.61 | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |
| 3 1:QZLokaal | Qw14  | 2.44   | 2.44  | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |
| 4 1:QZLokaal | Qw15  | -0.17  | -0.17 | 9.619 | 0.000 | 0.0      | 0.2      | 0.0      |
| 4 1:QZLokaal | Qw16  | -0.68  | -0.68 | 9.619 | 0.000 | 0.0      | 0.2      | 0.0      |
| 4 1:QZLokaal | Qw17  | -0.71  | -0.71 | 0.000 | 1.593 | 0.0      | 0.2      | 0.0      |
| 5 1:QZLokaal | Qw18  | 1.26   | 1.26  | 2.467 | 0.000 | 0.0      | 0.2      | 0.0      |
| 5 1:QZLokaal | Qw19  | 0.95   | 0.95  | 0.000 | 1.894 | 0.0      | 0.2      | 0.0      |

## BELASTINGEN

B.G:14 Wind van rechts onderdruk B



Project...:

Onderdeel:

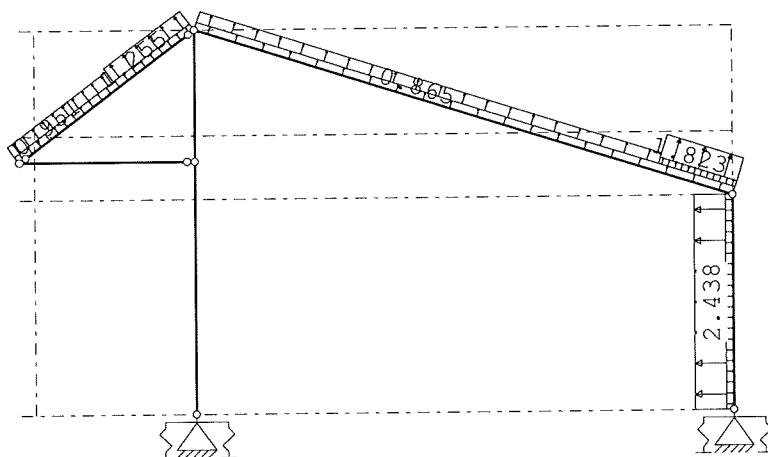
**STAAFBELASTINGEN**

B.G:14 Wind van rechts onderdruk B

| Staaf Type   | Index | q1/p/m | q2    | A     | B     | $\psi_0$ | $\psi_1$ | $\psi_2$ |
|--------------|-------|--------|-------|-------|-------|----------|----------|----------|
| 5 1:QZLokaal | Qw1   | -0.91  | -0.91 | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |
| 4 1:QZLokaal | Qw1   | -0.91  | -0.91 | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |
| 3 1:QZLokaal | Qw2   | 0.91   | 0.91  | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |
| 3 1:QZLokaal | Qw14  | 2.44   | 2.44  | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |
| 4 1:QZLokaal | Qw20  | 0.52   | 0.52  | 9.619 | 0.000 | 0.0      | 0.2      | 0.0      |
| 4 1:QZLokaal | Qw21  | 1.82   | 1.82  | 9.619 | 0.000 | 0.0      | 0.2      | 0.0      |
| 4 1:QZLokaal | Qw22  | 0.87   | 0.87  | 0.000 | 1.593 | 0.0      | 0.2      | 0.0      |
| 5 1:QZLokaal | Qw18  | 1.26   | 1.26  | 2.467 | 0.000 | 0.0      | 0.2      | 0.0      |
| 5 1:QZLokaal | Qw19  | 0.95   | 0.95  | 0.000 | 1.894 | 0.0      | 0.2      | 0.0      |

**BELASTINGEN**

B.G:15 Wind van rechts overdruk B

**STAAFBELASTINGEN**

B.G:15 Wind van rechts overdruk B

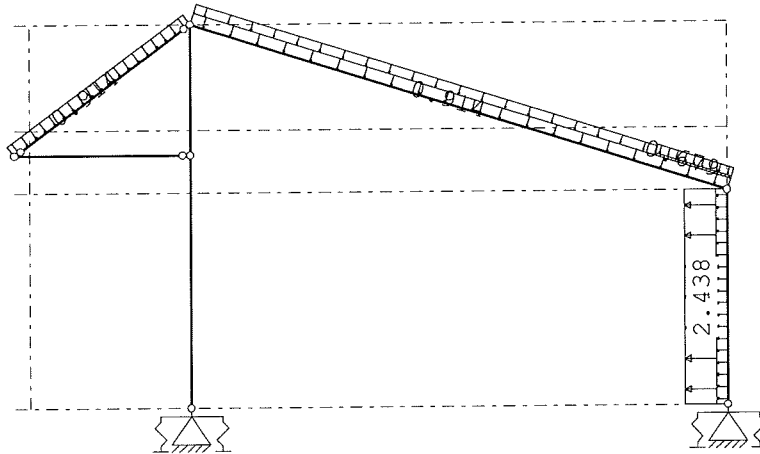
| Staaf Type   | Index | q1/p/m | q2    | A     | B     | $\psi_0$ | $\psi_1$ | $\psi_2$ |
|--------------|-------|--------|-------|-------|-------|----------|----------|----------|
| 5 1:QZLokaal | Qw9   | 0.61   | 0.61  | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |
| 4 1:QZLokaal | Qw9   | 0.61   | 0.61  | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |
| 3 1:QZLokaal | Qw10  | -0.61  | -0.61 | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |
| 3 1:QZLokaal | Qw14  | 2.44   | 2.44  | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |
| 4 1:QZLokaal | Qw20  | 0.52   | 0.52  | 9.619 | 0.000 | 0.0      | 0.2      | 0.0      |
| 4 1:QZLokaal | Qw21  | 1.82   | 1.82  | 9.619 | 0.000 | 0.0      | 0.2      | 0.0      |
| 4 1:QZLokaal | Qw22  | 0.87   | 0.87  | 0.000 | 1.593 | 0.0      | 0.2      | 0.0      |
| 5 1:QZLokaal | Qw18  | 1.26   | 1.26  | 2.467 | 0.000 | 0.0      | 0.2      | 0.0      |
| 5 1:QZLokaal | Qw19  | 0.95   | 0.95  | 0.000 | 1.894 | 0.0      | 0.2      | 0.0      |

Project...:

Onderdeel:

**BELASTINGEN**

B.G:16 Wind van rechts onderdruk C

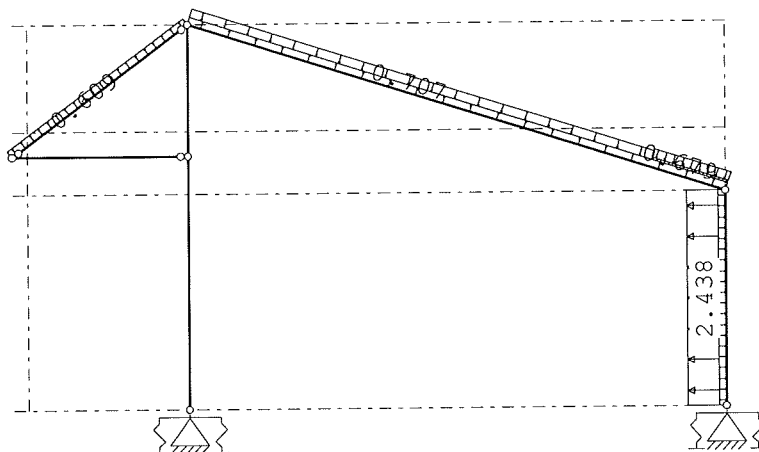
**STAAFBELASTINGEN**

B.G:16 Wind van rechts onderdruk C

| Staaftype | Type       | Index | q1/p/m | q2    | A     | B     | $\psi_0$ | $\psi_1$ | $\psi_2$ |
|-----------|------------|-------|--------|-------|-------|-------|----------|----------|----------|
| 5         | 1:QZLokaal | Qw1   | -0.91  | -0.91 | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |
| 4         | 1:QZLokaal | Qw1   | -0.91  | -0.91 | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |
| 3         | 1:QZLokaal | Qw2   | 0.91   | 0.91  | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |
| 3         | 1:QZLokaal | Qw14  | 2.44   | 2.44  | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |
| 4         | 1:QZLokaal | Qw15  | -0.17  | -0.17 | 9.619 | 0.000 | 0.0      | 0.2      | 0.0      |
| 4         | 1:QZLokaal | Qw16  | -0.68  | -0.68 | 9.619 | 0.000 | 0.0      | 0.2      | 0.0      |
| 4         | 1:QZLokaal | Qw17  | -0.71  | -0.71 | 0.000 | 1.593 | 0.0      | 0.2      | 0.0      |

**BELASTINGEN**

B.G:17 Wind van rechts overdruk C

**STAAFBELASTINGEN**

B.G:17 Wind van rechts overdruk C

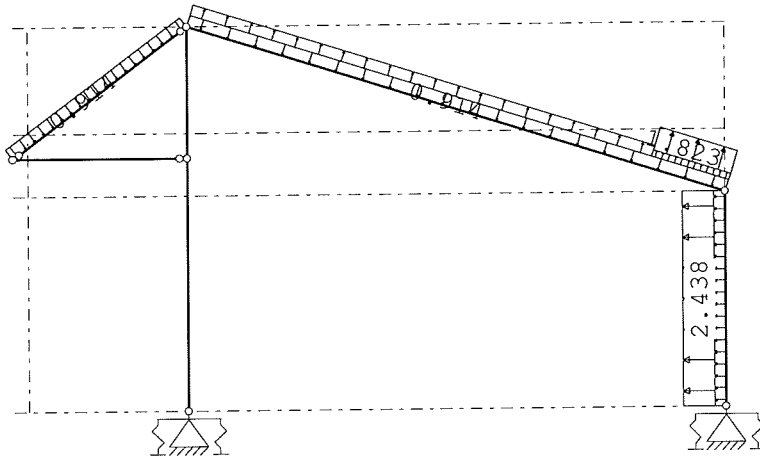
| Staaftype | Type       | Index | q1/p/m | q2    | A     | B     | $\psi_0$ | $\psi_1$ | $\psi_2$ |
|-----------|------------|-------|--------|-------|-------|-------|----------|----------|----------|
| 5         | 1:QZLokaal | Qw9   | 0.61   | 0.61  | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |
| 4         | 1:QZLokaal | Qw9   | 0.61   | 0.61  | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |
| 3         | 1:QZLokaal | Qw10  | -0.61  | -0.61 | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |
| 3         | 1:QZLokaal | Qw14  | 2.44   | 2.44  | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |
| 4         | 1:QZLokaal | Qw15  | -0.17  | -0.17 | 9.619 | 0.000 | 0.0      | 0.2      | 0.0      |
| 4         | 1:QZLokaal | Qw16  | -0.68  | -0.68 | 9.619 | 0.000 | 0.0      | 0.2      | 0.0      |
| 4         | 1:QZLokaal | Qw17  | -0.71  | -0.71 | 0.000 | 1.593 | 0.0      | 0.2      | 0.0      |

Project...:

Onderdeel:

**BELASTINGEN**

B.G:18 Wind van rechts onderdruk D

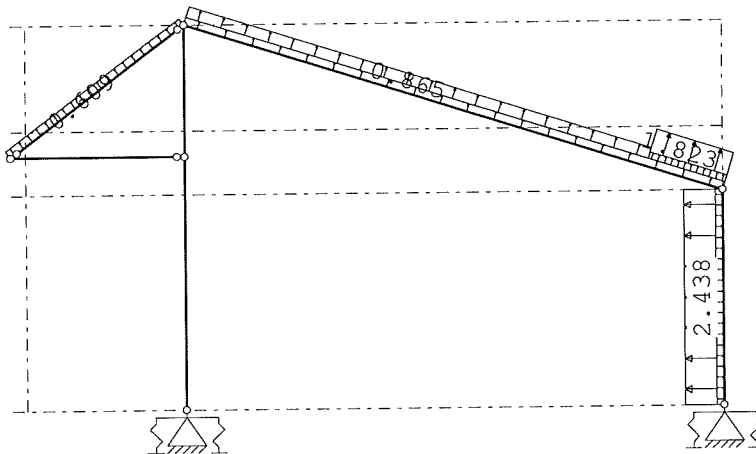
**STAAFBELASTINGEN**

B.G:18 Wind van rechts onderdruk D

| Staaft Type  | Index | q1/p/m | q2    | A     | B     | $\psi_0$ | $\psi_1$ | $\psi_2$ |
|--------------|-------|--------|-------|-------|-------|----------|----------|----------|
| 5 1:QZLokaal | Qw1   | -0.91  | -0.91 | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |
| 4 1:QZLokaal | Qw1   | -0.91  | -0.91 | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |
| 3 1:QZLokaal | Qw2   | 0.91   | 0.91  | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |
| 3 1:QZLokaal | Qw14  | 2.44   | 2.44  | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |
| 4 1:QZLokaal | Qw20  | 0.52   | 0.52  | 9.619 | 0.000 | 0.0      | 0.2      | 0.0      |
| 4 1:QZLokaal | Qw21  | 1.82   | 1.82  | 9.619 | 0.000 | 0.0      | 0.2      | 0.0      |
| 4 1:QZLokaal | Qw22  | 0.87   | 0.87  | 0.000 | 1.593 | 0.0      | 0.2      | 0.0      |

**BELASTINGEN**

B.G:19 Wind van rechts overdruk D

**STAAFBELASTINGEN**

B.G:19 Wind van rechts overdruk D

| Staaft Type  | Index | q1/p/m | q2    | A     | B     | $\psi_0$ | $\psi_1$ | $\psi_2$ |
|--------------|-------|--------|-------|-------|-------|----------|----------|----------|
| 5 1:QZLokaal | Qw9   | 0.61   | 0.61  | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |
| 4 1:QZLokaal | Qw9   | 0.61   | 0.61  | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |
| 3 1:QZLokaal | Qw10  | -0.61  | -0.61 | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |
| 3 1:QZLokaal | Qw14  | 2.44   | 2.44  | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |
| 4 1:QZLokaal | Qw20  | 0.52   | 0.52  | 9.619 | 0.000 | 0.0      | 0.2      | 0.0      |
| 4 1:QZLokaal | Qw21  | 1.82   | 1.82  | 9.619 | 0.000 | 0.0      | 0.2      | 0.0      |

Project...:

Onderdeel:

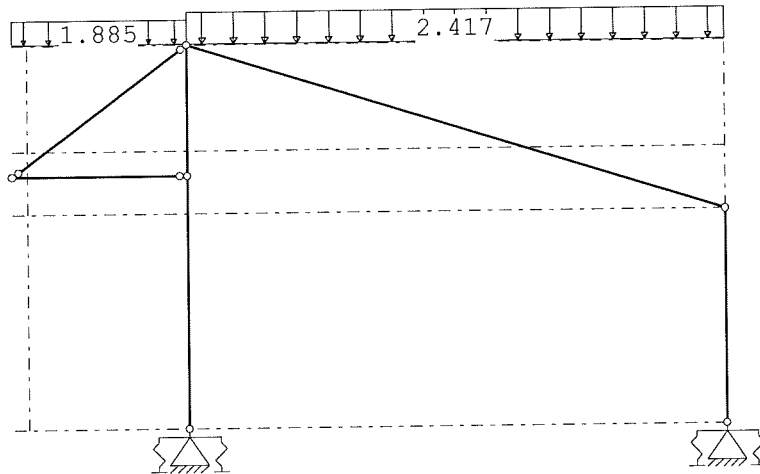
**STAAFBELASTINGEN**

B.G:19 Wind van rechts overdruk D

| Staaft Type  | Index | q1/p/m | q2   | A     | B     | $\psi_0$ | $\psi_1$ | $\psi_2$ |
|--------------|-------|--------|------|-------|-------|----------|----------|----------|
| 4 1:QZLokaal | Qw22  | 0.87   | 0.87 | 0.000 | 1.593 | 0.0      | 0.2      | 0.0      |

**BELASTINGEN**

B.G:20 Sneeuw A

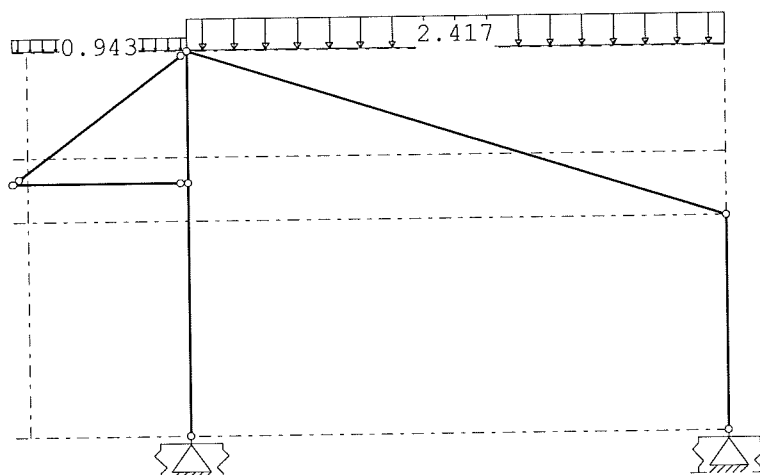
**STAAFBELASTINGEN**

B.G:20 Sneeuw A

| Staaft Type   | Index | q1/p/m | q2    | A     | B     | $\psi_0$ | $\psi_1$ | $\psi_2$ |
|---------------|-------|--------|-------|-------|-------|----------|----------|----------|
| 4 3:QZgeProj. | Qs1   | -2.42  | -2.42 | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |
| 5 3:QZgeProj. | Qs2   | -1.89  | -1.89 | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |

**BELASTINGEN**

B.G:21 Sneeuw B

**STAAFBELASTINGEN**

B.G:21 Sneeuw B

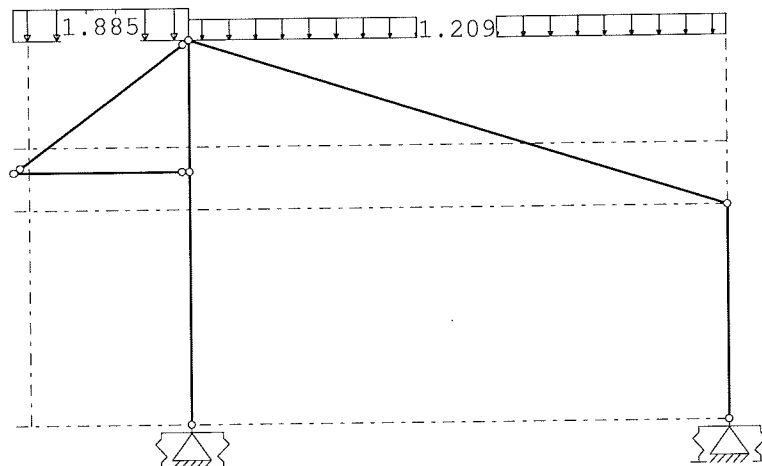
| Staaft Type   | Index | q1/p/m | q2    | A     | B     | $\psi_0$ | $\psi_1$ | $\psi_2$ |
|---------------|-------|--------|-------|-------|-------|----------|----------|----------|
| 4 3:QZgeProj. | Qs1   | -2.42  | -2.42 | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |
| 5 3:QZgeProj. | Qs3   | -0.94  | -0.94 | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |

Project...:

Onderdeel:

**BELASTINGEN**

B.G:22 Sneeuw C

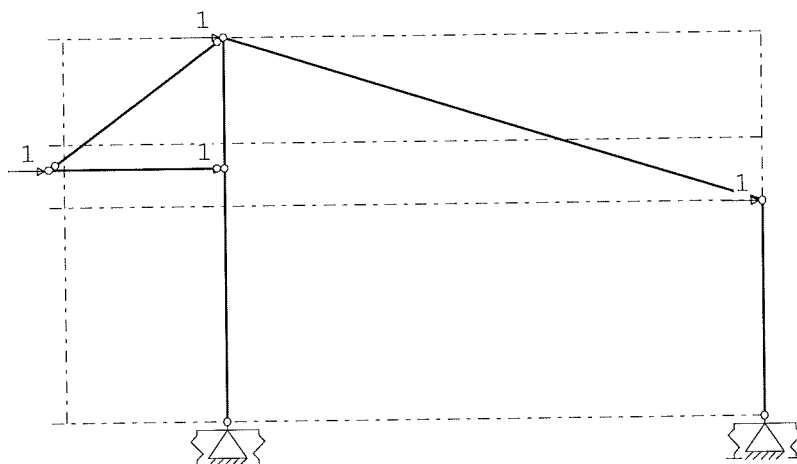
**STAAFBELASTINGEN**

B.G:22 Sneeuw C

| Staaftype     | Index | q1/p/m | q2    | A     | B     | $\psi_0$ | $\psi_1$ | $\psi_2$ |
|---------------|-------|--------|-------|-------|-------|----------|----------|----------|
| 4 3:QZgeProj. | Qs4   | -1.21  | -1.21 | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |
| 5 3:QZgeProj. | Qs2   | -1.89  | -1.89 | 0.000 | 0.000 | 0.0      | 0.2      | 0.0      |

**BELASTINGEN**

B.G:23 Knik

**KNOOPBELASTINGEN**

B.G:23 Knik

| Last | Knoop | Richting | waarde | $\psi_0$ | $\psi_1$ | $\psi_2$ |
|------|-------|----------|--------|----------|----------|----------|
| 1    | 2     | X        | 1.000  |          |          |          |
| 2    | 3     | X        | 1.000  |          |          |          |
| 3    | 4     | X        | 1.000  |          |          |          |
| 4    | 6     | X        | 1.000  |          |          |          |

Project...:

Onderdeel:

**BELASTINGCOMBINATIES**

| BC Type  |                |   |      |            |
|----------|----------------|---|------|------------|
| 1 Fund.  | 1.22 $G_{k,1}$ |   |      |            |
| 2 Fund.  | 0.90 $G_{k,1}$ |   |      |            |
| 3 Fund.  | 1.08 $G_{k,1}$ | + | 1.35 | $Q_{k,2}$  |
| 4 Fund.  | 1.08 $G_{k,1}$ | + | 1.35 | $Q_{k,3}$  |
| 5 Fund.  | 1.08 $G_{k,1}$ | + | 1.35 | $Q_{k,4}$  |
| 6 Fund.  | 1.08 $G_{k,1}$ | + | 1.35 | $Q_{k,5}$  |
| 7 Fund.  | 1.08 $G_{k,1}$ | + | 1.35 | $Q_{k,6}$  |
| 8 Fund.  | 1.08 $G_{k,1}$ | + | 1.35 | $Q_{k,7}$  |
| 9 Fund.  | 1.08 $G_{k,1}$ | + | 1.35 | $Q_{k,8}$  |
| 10 Fund. | 1.08 $G_{k,1}$ | + | 1.35 | $Q_{k,9}$  |
| 11 Fund. | 1.08 $G_{k,1}$ | + | 1.35 | $Q_{k,10}$ |
| 12 Fund. | 1.08 $G_{k,1}$ | + | 1.35 | $Q_{k,11}$ |
| 13 Fund. | 1.08 $G_{k,1}$ | + | 1.35 | $Q_{k,12}$ |
| 14 Fund. | 1.08 $G_{k,1}$ | + | 1.35 | $Q_{k,13}$ |
| 15 Fund. | 1.08 $G_{k,1}$ | + | 1.35 | $Q_{k,14}$ |
| 16 Fund. | 1.08 $G_{k,1}$ | + | 1.35 | $Q_{k,15}$ |
| 17 Fund. | 1.08 $G_{k,1}$ | + | 1.35 | $Q_{k,16}$ |
| 18 Fund. | 1.08 $G_{k,1}$ | + | 1.35 | $Q_{k,17}$ |
| 19 Fund. | 1.08 $G_{k,1}$ | + | 1.35 | $Q_{k,18}$ |
| 20 Fund. | 1.08 $G_{k,1}$ | + | 1.35 | $Q_{k,19}$ |
| 21 Fund. | 1.08 $G_{k,1}$ | + | 1.35 | $Q_{k,20}$ |
| 22 Fund. | 1.08 $G_{k,1}$ | + | 1.35 | $Q_{k,21}$ |
| 23 Fund. | 1.08 $G_{k,1}$ | + | 1.35 | $Q_{k,22}$ |
| 24 Fund. | 0.90 $G_{k,1}$ | + | 1.35 | $Q_{k,2}$  |
| 25 Fund. | 0.90 $G_{k,1}$ | + | 1.35 | $Q_{k,3}$  |
| 26 Fund. | 0.90 $G_{k,1}$ | + | 1.35 | $Q_{k,4}$  |
| 27 Fund. | 0.90 $G_{k,1}$ | + | 1.35 | $Q_{k,5}$  |
| 28 Fund. | 0.90 $G_{k,1}$ | + | 1.35 | $Q_{k,6}$  |
| 29 Fund. | 0.90 $G_{k,1}$ | + | 1.35 | $Q_{k,7}$  |
| 30 Fund. | 0.90 $G_{k,1}$ | + | 1.35 | $Q_{k,8}$  |
| 31 Fund. | 0.90 $G_{k,1}$ | + | 1.35 | $Q_{k,9}$  |
| 32 Fund. | 0.90 $G_{k,1}$ | + | 1.35 | $Q_{k,10}$ |
| 33 Fund. | 0.90 $G_{k,1}$ | + | 1.35 | $Q_{k,11}$ |
| 34 Fund. | 0.90 $G_{k,1}$ | + | 1.35 | $Q_{k,12}$ |
| 35 Fund. | 0.90 $G_{k,1}$ | + | 1.35 | $Q_{k,13}$ |
| 36 Fund. | 0.90 $G_{k,1}$ | + | 1.35 | $Q_{k,14}$ |
| 37 Fund. | 0.90 $G_{k,1}$ | + | 1.35 | $Q_{k,15}$ |
| 38 Fund. | 0.90 $G_{k,1}$ | + | 1.35 | $Q_{k,16}$ |
| 39 Fund. | 0.90 $G_{k,1}$ | + | 1.35 | $Q_{k,17}$ |
| 40 Fund. | 0.90 $G_{k,1}$ | + | 1.35 | $Q_{k,18}$ |
| 41 Fund. | 0.90 $G_{k,1}$ | + | 1.35 | $Q_{k,19}$ |
| 42 Fund. | 0.90 $G_{k,1}$ | + | 1.35 | $Q_{k,20}$ |
| 43 Fund. | 0.90 $G_{k,1}$ | + | 1.35 | $Q_{k,21}$ |
| 44 Fund. | 0.90 $G_{k,1}$ | + | 1.35 | $Q_{k,22}$ |
| 45 Kar.  | 1.00 $G_{k,1}$ |   |      |            |



Project...:

Onderdeel:

**BELASTINGCOMBINATIES**

| BC Type |                |   |      |            |
|---------|----------------|---|------|------------|
| <hr/>   |                |   |      |            |
| 46 Kar. | 1.00 $G_{k,1}$ |   |      |            |
| 47 Kar. | 1.00 $G_{k,1}$ |   |      |            |
| 48 Kar. | 1.00 $G_{k,1}$ |   |      |            |
| 49 Kar. | 1.00 $G_{k,1}$ |   |      |            |
| 50 Kar. | 1.00 $G_{k,1}$ |   |      |            |
|         |                |   |      |            |
| 51 Kar. | 1.00 $G_{k,1}$ |   |      |            |
| 52 Kar. | 1.00 $G_{k,1}$ |   |      |            |
| 53 Kar. | 1.00 $G_{k,1}$ |   |      |            |
| 54 Kar. | 1.00 $G_{k,1}$ |   |      |            |
| 55 Kar. | 1.00 $G_{k,1}$ |   |      |            |
|         |                |   |      |            |
| 56 Kar. | 1.00 $G_{k,1}$ |   |      |            |
| 57 Kar. | 1.00 $G_{k,1}$ |   |      |            |
| 58 Kar. | 1.00 $G_{k,1}$ |   |      |            |
| 59 Kar. | 1.00 $G_{k,1}$ |   |      |            |
| 60 Kar. | 1.00 $G_{k,1}$ |   |      |            |
|         |                |   |      |            |
| 61 Kar. | 1.00 $G_{k,1}$ | + | 1.00 | $Q_{k,2}$  |
| 62 Kar. | 1.00 $G_{k,1}$ | + | 1.00 | $Q_{k,3}$  |
| 63 Kar. | 1.00 $G_{k,1}$ | + | 1.00 | $Q_{k,4}$  |
| 64 Kar. | 1.00 $G_{k,1}$ | + | 0.95 | $Q_{k,4}$  |
| 65 Kar. | 1.00 $G_{k,1}$ | + | 1.00 | $Q_{k,5}$  |
|         |                |   |      |            |
| 66 Kar. | 1.00 $G_{k,1}$ | + | 0.95 | $Q_{k,5}$  |
| 67 Kar. | 1.00 $G_{k,1}$ | + | 1.00 | $Q_{k,6}$  |
| 68 Kar. | 1.00 $G_{k,1}$ | + | 0.95 | $Q_{k,6}$  |
| 69 Kar. | 1.00 $G_{k,1}$ | + | 1.00 | $Q_{k,7}$  |
| 70 Kar. | 1.00 $G_{k,1}$ | + | 0.95 | $Q_{k,7}$  |
|         |                |   |      |            |
| 71 Kar. | 1.00 $G_{k,1}$ | + | 1.00 | $Q_{k,8}$  |
| 72 Kar. | 1.00 $G_{k,1}$ | + | 0.95 | $Q_{k,8}$  |
| 73 Kar. | 1.00 $G_{k,1}$ | + | 1.00 | $Q_{k,9}$  |
| 74 Kar. | 1.00 $G_{k,1}$ | + | 0.95 | $Q_{k,9}$  |
| 75 Kar. | 1.00 $G_{k,1}$ | + | 1.00 | $Q_{k,10}$ |
|         |                |   |      |            |
| 76 Kar. | 1.00 $G_{k,1}$ | + | 0.95 | $Q_{k,10}$ |
| 77 Kar. | 1.00 $G_{k,1}$ | + | 1.00 | $Q_{k,11}$ |
| 78 Kar. | 1.00 $G_{k,1}$ | + | 0.95 | $Q_{k,11}$ |
| 79 Kar. | 1.00 $G_{k,1}$ | + | 1.00 | $Q_{k,12}$ |
| 80 Kar. | 1.00 $G_{k,1}$ | + | 0.95 | $Q_{k,12}$ |
|         |                |   |      |            |
| 81 Kar. | 1.00 $G_{k,1}$ | + | 1.00 | $Q_{k,13}$ |
| 82 Kar. | 1.00 $G_{k,1}$ | + | 0.95 | $Q_{k,13}$ |
| 83 Kar. | 1.00 $G_{k,1}$ | + | 1.00 | $Q_{k,14}$ |
| 84 Kar. | 1.00 $G_{k,1}$ | + | 0.95 | $Q_{k,14}$ |
| 85 Kar. | 1.00 $G_{k,1}$ | + | 1.00 | $Q_{k,15}$ |
|         |                |   |      |            |
| 86 Kar. | 1.00 $G_{k,1}$ | + | 0.95 | $Q_{k,15}$ |
| 87 Kar. | 1.00 $G_{k,1}$ | + | 1.00 | $Q_{k,16}$ |
| 88 Kar. | 1.00 $G_{k,1}$ | + | 0.95 | $Q_{k,16}$ |
| 89 Kar. | 1.00 $G_{k,1}$ | + | 1.00 | $Q_{k,17}$ |

Project..:

Onderdeel:

**BELASTINGCOMBINATIES**

| BC Type   |                |   |               |            |
|-----------|----------------|---|---------------|------------|
| 90 Kar.   | 1.00 $G_{k,1}$ | + | 0.95          | $Q_{k,17}$ |
| 91 Kar.   | 1.00 $G_{k,1}$ | + | 1.00          | $Q_{k,18}$ |
| 92 Kar.   | 1.00 $G_{k,1}$ | + | 0.95          | $Q_{k,18}$ |
| 93 Kar.   | 1.00 $G_{k,1}$ | + | 1.00          | $Q_{k,19}$ |
| 94 Kar.   | 1.00 $G_{k,1}$ | + | 0.95          | $Q_{k,19}$ |
| 95 Kar.   | 1.00 $G_{k,1}$ | + | 1.00          | $Q_{k,20}$ |
| 96 Kar.   | 1.00 $G_{k,1}$ | + | 1.00          | $Q_{k,21}$ |
| 97 Kar.   | 1.00 $G_{k,1}$ | + | 1.00          | $Q_{k,22}$ |
| 98 Quas.  | 1.00 $G_{k,1}$ |   |               |            |
| 99 Freq.  | 1.00 $G_{k,1}$ |   |               |            |
| 100 Freq. | 1.00 $G_{k,1}$ | + | 1.00 $\psi_1$ | $Q_{k,4}$  |
| 101 Freq. | 1.00 $G_{k,1}$ | + | 1.00 $\psi_1$ | $Q_{k,5}$  |
| 102 Freq. | 1.00 $G_{k,1}$ | + | 1.00 $\psi_1$ | $Q_{k,6}$  |
| 103 Freq. | 1.00 $G_{k,1}$ | + | 1.00 $\psi_1$ | $Q_{k,7}$  |
| 104 Freq. | 1.00 $G_{k,1}$ | + | 1.00 $\psi_1$ | $Q_{k,8}$  |
| 105 Freq. | 1.00 $G_{k,1}$ | + | 1.00 $\psi_1$ | $Q_{k,9}$  |
| 106 Freq. | 1.00 $G_{k,1}$ | + | 1.00 $\psi_1$ | $Q_{k,10}$ |
| 107 Freq. | 1.00 $G_{k,1}$ | + | 1.00 $\psi_1$ | $Q_{k,11}$ |
| 108 Freq. | 1.00 $G_{k,1}$ | + | 1.00 $\psi_1$ | $Q_{k,12}$ |
| 109 Freq. | 1.00 $G_{k,1}$ | + | 1.00 $\psi_1$ | $Q_{k,13}$ |
| 110 Freq. | 1.00 $G_{k,1}$ | + | 1.00 $\psi_1$ | $Q_{k,14}$ |
| 111 Freq. | 1.00 $G_{k,1}$ | + | 1.00 $\psi_1$ | $Q_{k,15}$ |
| 112 Freq. | 1.00 $G_{k,1}$ | + | 1.00 $\psi_1$ | $Q_{k,16}$ |
| 113 Freq. | 1.00 $G_{k,1}$ | + | 1.00 $\psi_1$ | $Q_{k,17}$ |
| 114 Freq. | 1.00 $G_{k,1}$ | + | 1.00 $\psi_1$ | $Q_{k,18}$ |
| 115 Freq. | 1.00 $G_{k,1}$ | + | 1.00 $\psi_1$ | $Q_{k,19}$ |
| 116 Freq. | 1.00 $G_{k,1}$ | + | 1.00 $\psi_1$ | $Q_{k,20}$ |
| 117 Freq. | 1.00 $G_{k,1}$ | + | 1.00 $\psi_1$ | $Q_{k,21}$ |
| 118 Freq. | 1.00 $G_{k,1}$ | + | 1.00 $\psi_1$ | $Q_{k,22}$ |
| 119 Blij. | 1.00 $G_{k,1}$ |   |               |            |

**GUNSTIGE WERKING PERMANENTE BELASTINGEN**

BC Staven met gunstige werking

- 1 Geen
- 2 Alle staven de factor:0.90
- 3 Geen
- 4 Geen
- 5 Geen
- 6 Geen
- 7 Geen
- 8 Geen
- 9 Geen
- 10 Geen
- 11 Geen

Project...:

Onderdeel:

**GUNSTIGE WERKING PERMANENTE BELASTINGEN**

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BC Staven met gunstige werking

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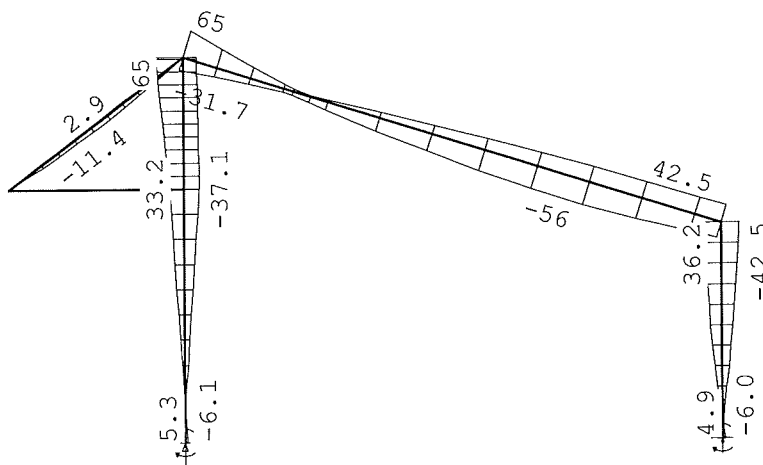
12 Geen  
13 Geen  
14 Geen  
15 Geen  
16 Geen  
17 Geen  
18 Geen  
19 Geen  
20 Geen  
21 Geen  
22 Geen  
23 Geen  
24 Alle staven de factor:0.90  
25 Alle staven de factor:0.90  
26 Alle staven de factor:0.90  
27 Alle staven de factor:0.90  
28 Alle staven de factor:0.90  
29 Alle staven de factor:0.90  
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43 Alle staven de factor:0.90  
44 Alle staven de factor:0.90

Project...:

Onderdeel:

**OMHULLENDE VAN DE FUNDAMENTELE COMBINATIES****MOMENTEN**

Fundamentele combinatie

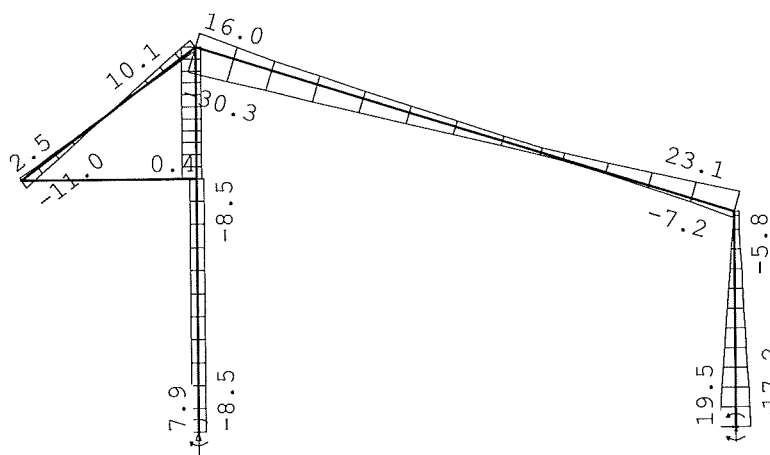


Fx: 7.86/ -8.48  
Fz: 47.95/ -10.40  
My: 6.07/ -5.33

Fx: 19.52/ -17.24  
Fz: 27.00/ -5.38  
My: 6.04/ -4.91

**DWARSKRACHTEN**

Fundamentele combinatie



Fx: 7.86/ -8.48  
Fz: 47.95/ -10.40  
My: 6.07/ -5.33

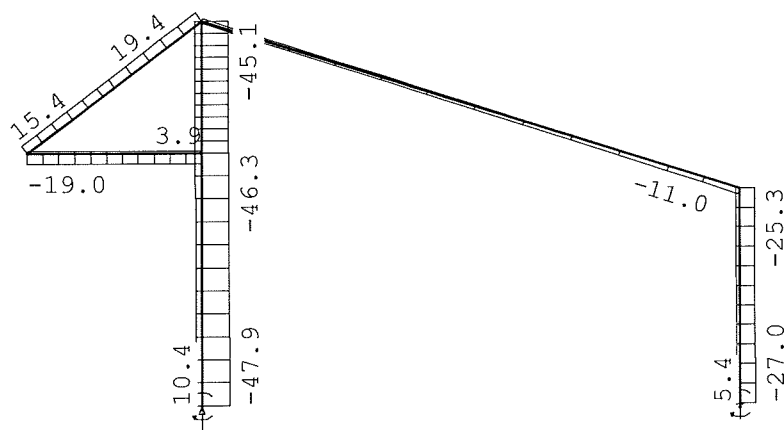
Fx: 19.52/ -17.24  
Fz: 27.00/ -5.38  
My: 6.04/ -4.91

Project...:

Onderdeel:

**NORMAALKRACHTEN**

Fundamentele combinatie



Fx: 7.86/ -8.48  
 Fz: 47.95/ -10.40  
 My: 6.07/ -5.33

Fx: 19.52/ -17.24  
 Fz: 27.00/ -5.38  
 My: 6.04/ -4.91

**REACTIES**

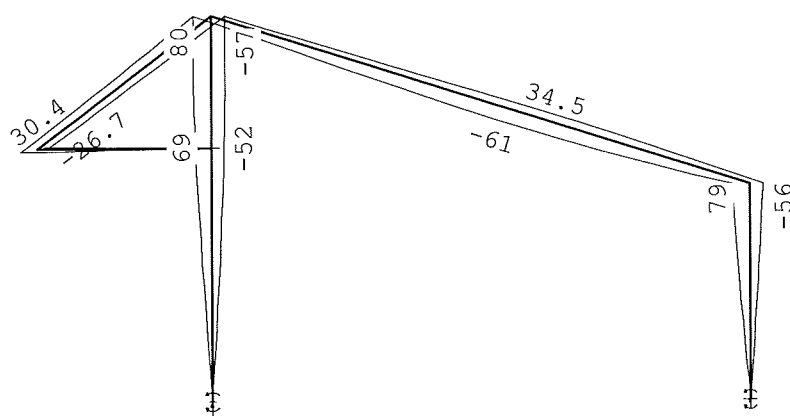
Fundamentele combinatie

| Kn. | X-min  | X-max | Z-min  | Z-max | M-min | M-max |
|-----|--------|-------|--------|-------|-------|-------|
| 1   | -8.48  | 7.86  | -10.40 | 47.95 | -5.33 | 6.07  |
| 5   | -17.24 | 19.52 | -5.38  | 27.00 | -4.91 | 6.04  |

**OMHULLENDE VAN DE KARAKTERISTIEKE COMBINATIES****VERPLAATSINGEN**

[mm]

Karakteristieke combinatie



Fx: 5.97/ -6.04  
 Fz: 39.29/ -1.42  
 My: 4.64/ -3.70

Fx: 14.21/ -12.92  
 Fz: 21.86/ -0.88  
 My: 4.59/ -3.43

**REACTIES**

Karakteristieke combinatie

| Kn. | X-min | X-max | Z-min | Z-max | M-min | M-max |
|-----|-------|-------|-------|-------|-------|-------|
|-----|-------|-------|-------|-------|-------|-------|

Project...:

Onderdeel:

**REACTIES**

Karakteristieke combinatie

| Kn. | X-min  | X-max | Z-min | Z-max | M-min | M-max |
|-----|--------|-------|-------|-------|-------|-------|
| 1   | -6.04  | 5.97  | -1.42 | 39.29 | -3.70 | 4.64  |
| 5   | -12.92 | 14.21 | -0.88 | 21.86 | -3.43 | 4.59  |

**STAALPROFIELEN - ALGEMENE GEGEVENS**

Stabiliteit: Classificatie gehele constructie: Ongeschoord  
 Belastinggeval m.b.t. bepaling kniklengte: 23=Knik  
 Aanpassing inkl. parameter C : Steunpunten

Tweede-orde-effect:  
 Aan te houden verhouding  $n/(n-1)$   
 voor steunmomenten en verplaatsingen: 1.10

Doorbuiging en verplaatsing:  
 Aantal bouwlagen: 1  
 Gebouwtype: Overig  
 Toel. horiz. verplaatsing gehele gebouw: h/300  
 Kleinste gevelhoogte [m]: 0.0

**MATERIAAL**

| Mat nr. | Profielnaam | Vloeisp. [N/mm <sup>2</sup> ] | Productie methode | Min. drsn. klasse |
|---------|-------------|-------------------------------|-------------------|-------------------|
| 1       | IPE270      | 235                           | Gewalst           | 1                 |
| 2       | HEA200      | 235                           | Gewalst           | 1                 |
| 3       | HEA100      | 235                           | Gewalst           | 1                 |
| 4       | IPE200      | 235                           | Gewalst           | 1                 |
| 5       | IPE240      | 235                           | Gewalst           | 1                 |

Partiële veiligheidsfactoren:

Gamma M;0 : 1.00 Gamma M;1 : 1.00

**KNIKSTABILITEIT**

| Staafl | $l_{sys}$ [m] | Classif. y sterke as | $l_{knik;y}$ [m] | Extra        |                      | $l_{knik;z}$ [m] | Extra        |  |
|--------|---------------|----------------------|------------------|--------------|----------------------|------------------|--------------|--|
|        |               |                      |                  | aanp. y [kN] | Classif. z zwakke as |                  | aanp. z [kN] |  |
| 1      | 5.000         | Ongeschoord          | 12.539           | 0.0          | Geschoord            | 5.000            | 0.0          |  |
| 2      | 2.600         | Ongeschoord          | 4.209            | 0.0          | Geschoord            | 2.600            | 0.0          |  |
| 3      | 4.250         | Ongeschoord          | 12.094           | 0.0          | Geschoord            | 4.250            | 0.0          |  |
| 4      | 11.212        | Ongeschoord          | 14.210           | 0.0          | Geschoord            | 11.212           | 0.0          |  |
| 5      | 4.360         | Geschoord            | 4.360            | 0.0          | Geschoord            | 4.360            | 0.0          |  |
| 6      | 3.500         | Geschoord            | 3.500            | 0.0          | Geschoord            | 3.500            | 0.0          |  |

**KIPSTABILITEIT**

| Staafl | Plts. aangr. | l gaffel [m]                 | Kipsteunafstanden [m]  |
|--------|--------------|------------------------------|------------------------|
| 1      | 1.0*h        | boven: 5.00<br>onder: 5.00   | 5 5                    |
| 2      | 1.0*h        | boven: 2.60<br>onder: 2.60   | 2,6 2,6                |
| 3      | 0.0*h        | boven: 4.25<br>onder: 4.25   | 4.250 4.250            |
| 4      | 1.0*h        | boven: 11.21<br>onder: 11.21 | 4*2,242;2,244 1*11,212 |

Project...:

Onderdeel:

**KIPSTABILITEIT**

| Staafl | Plts.  | 1 gaffel | Kipsteunafstanden |
|--------|--------|----------|-------------------|
|        | aangr. | [m]      | [m]               |
| 5      | 1.0*h  | boven:   | 4.36 3*1,452      |
|        |        | onder:   | 4.36 4,36         |
| 6      | 1.0*h  | boven:   | 3.50 3,5          |
|        |        | onder:   | 3.50 3,5          |

**TOETSING SPANNINGEN**

| Staafl | Mat | BC | Sit | Kl | Plaats | Norm    | Artikel | Formule | Hoogste toetsing          | Opm.  |
|--------|-----|----|-----|----|--------|---------|---------|---------|---------------------------|-------|
| nr.    |     |    |     |    |        |         |         |         | U.C. [N/mm <sup>2</sup> ] |       |
| 1      | 5   | 13 | 1   | 1  | Staafl | EN3-1-1 | 6.3.3   | (6.62)  | 0.596 140                 | 47    |
| 2      | 5   | 13 | 1   | 1  | Staafl | EN3-1-1 | 6.3.3   | (6.62)  | 0.865 203                 | 47    |
| 3      | 1   | 6  | 1   | 1  | Staafl | EN3-1-1 | 6.3.3   | (6.62)  | 0.471 111                 | 47    |
| 4      | 1   | 27 | 1   | 1  | Staafl | EN3-1-1 | 6.3.3   | (6.62)  | 0.885 208                 | 46,47 |
| 5      | 4   | 5  | 1   | 1  | My-max | EN3-1-1 | 6.2.9.1 | (6.31)  | 0.243 57                  | 46    |
| 6      | 3   | 5  | 1   | 1  | Staafl | EN3-1-1 | 6.3.3   | (6.62)  | 0.133 31                  |       |

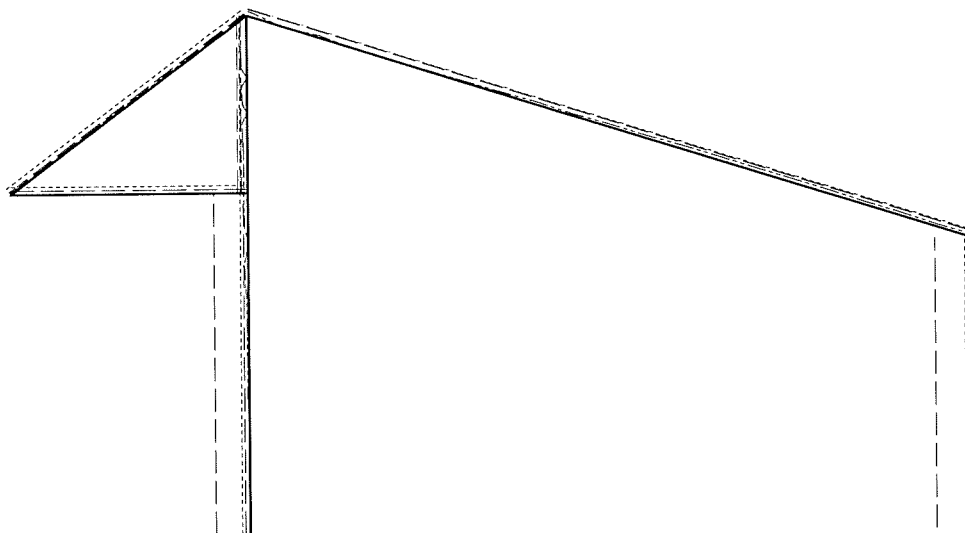
Opmerkingen:

[ 46] T.b.v. kip is een equivalente Q-last berekend.

[ 47] Bij verlopende normaalkracht wordt de grootste drukkracht genomen.

**UNITY-CHECK 'S**

OMHULLENDE VAN ALLES



----- Toelaatbare unity-check (1.0)

----- Hoogste unity-check i.v.m. knikstabiliteit

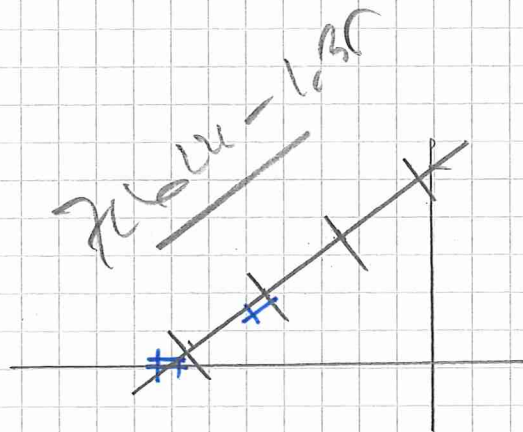
----- Unity-check i.v.m. kipstabiliteit

----- Hoogste unity-check i.v.m. doorsnedecontrole

----- Hoogste unity-check i.v.m. doorbuiging

----- Unity-check te hoog (> 1.0)

# workings - 1



$\alpha = 36.6^\circ$   $\gamma = 45^\circ$   $\omega = 11.0^\circ$   $\text{meat} = 0.014$

meat

meat - 1.25  $\omega = 11.0^\circ$

$\gamma = 0.10, 4.95, \alpha = 36.6^\circ$   $\omega = 11.0^\circ$   
 $\gamma = 0.615, 0.1, 4.95, \alpha = 36.6^\circ, \omega = 11.0^\circ$

plot  $\gamma = 1.25$  plot  $\gamma = 1.25$   
 $0.1 = 0.014$

$\frac{0.1}{0.014}$   
 $\frac{0.1}{0.014}$

$\gamma = 0.1 \neq 1.35, 0.06$   $\omega = 11.0^\circ$   
 $\omega = 11.0^\circ$   
 $\text{reserve} = 1.25$



$$q_1 + q_2 = 0.6$$

$$K_{WDI} = 16.1 \text{ €}$$

$$q_1 = 14.75 \cdot 347 \cdot 0.05 = 0.6$$

$$T_{10} = 16.6 + 11.0 \cdot 0.6 \cdot 16.1 = 24.5$$

$$K_{Verkauf} = 17.5$$

$$p_{115}$$

$$M = 12.5$$

$$T_{115} = 15.1 \cdot 35 = 52.5 \quad \text{117.5 €}$$

$$K_B = 17.5 \text{ €}$$

Verbot der ab ungerichtete Werts

toleranz bei Werten

$$P_{115} = \pm 11.5$$

$$T_{115} = 23.6 \quad K_B = 101 \quad 2113 \quad 11912$$