# Staalconstructie theater Spui

# Den Haag

## Constructieve berekening

| | |
|---|---|
| Opdrachtnummer | : **14132-01** |
| Document | : Ber-01 |
| Status | : Concept |
| Datum | : 06-04-2016 |





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Ingenieursburo **Ulehake**

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**Ontwerp:**

nvt

**Adviseur Bouwconstructies:**

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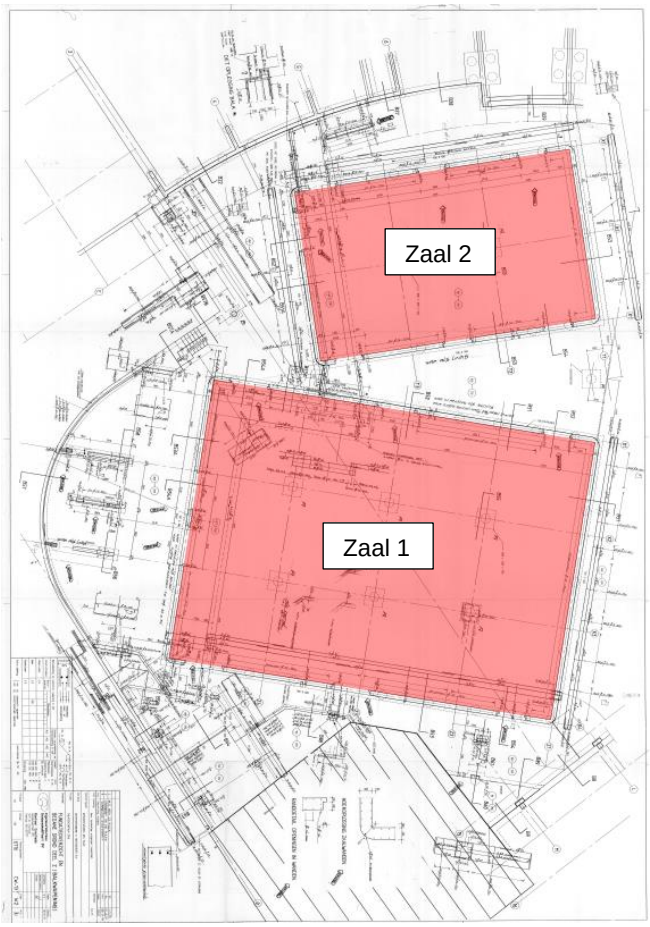
(*markvansommeren@ulehake.nl*)

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# 1. INLEIDING

In opdracht van Samenwerkende Theaterspecialisten wordt er voor het project Staalconstructie theater Spui deze rapportage opgesteld. Ten behoeve de nieuw aan te brengen theaterinstallatie in het theater Spui te Den Haag dient de bestaande constructie gecontroleerd te worden en aanvullende constructie ontworpen te worden. Voor deze aanpassingen wordt uitsluitend gekeken naar zaal 1 en zaal 2. In zaal 1 is de vraag of er zoveel mogelijk van de bestaande constructie gehandhaafd kan worden zowel op het dak als strak on der plafond. In beide zalen is het verzoek om de constructiehoogte onder het plafond zo minimaal mogelijk te maken.



# 2. UITGANGSPUNTEN

De uitgangspunten kunnen terug worden gevonden in het rapport “14132-01-Rap-01-B-dd 06-04-2016” dd. 06-04-2016.

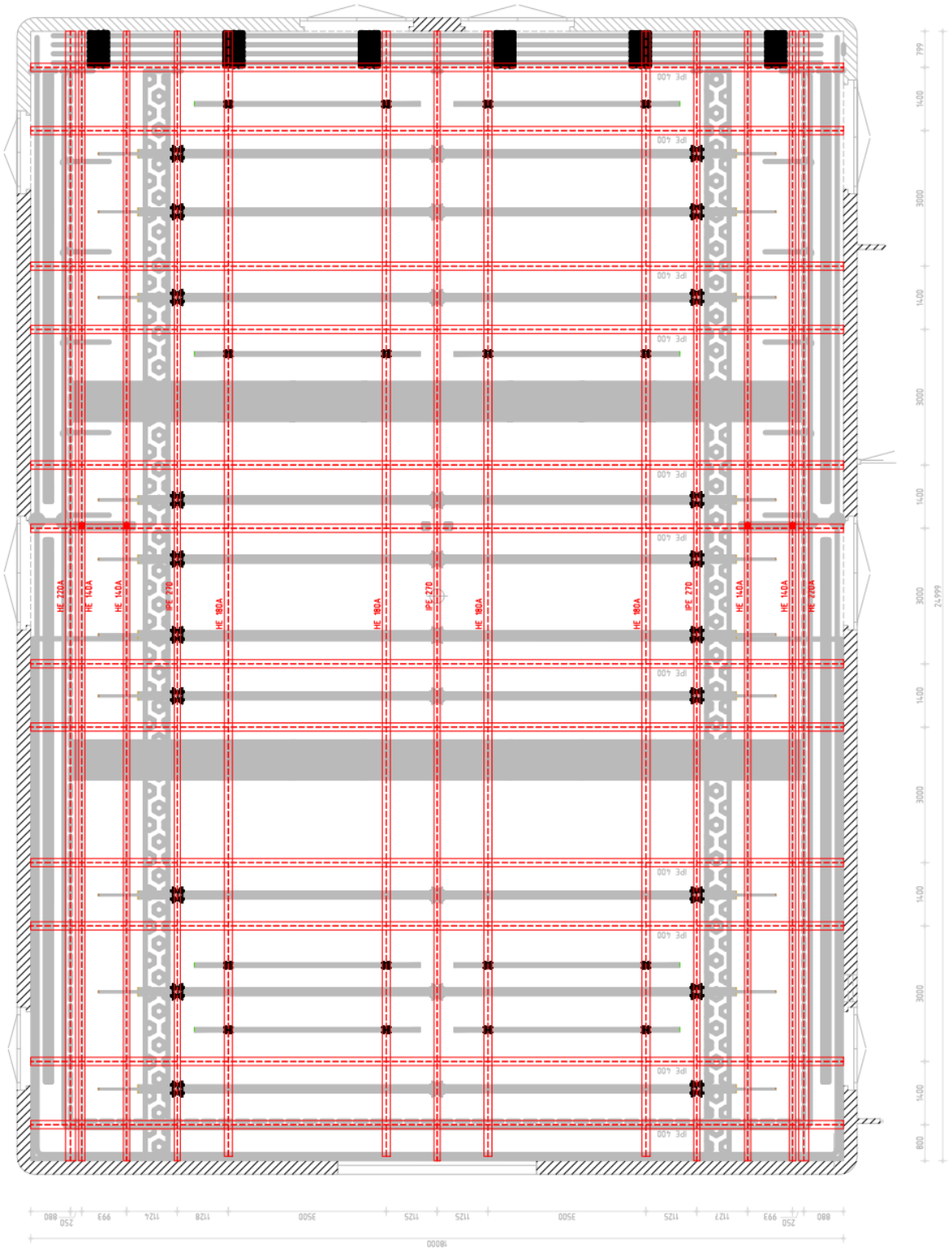
# 3. CONCLUSIE

Bij zaal 1 is het met de aangenomen belastingen niet mogelijk om de gehele bestaande constructie te handhaven. De hoofdliggers en dwarsligger op het dak zullen moeten worden vervangen. De IPE 400 liggers die tegen het plafond gemonteerd zijn in zaal 1 kunnen gehandhaafd worden.

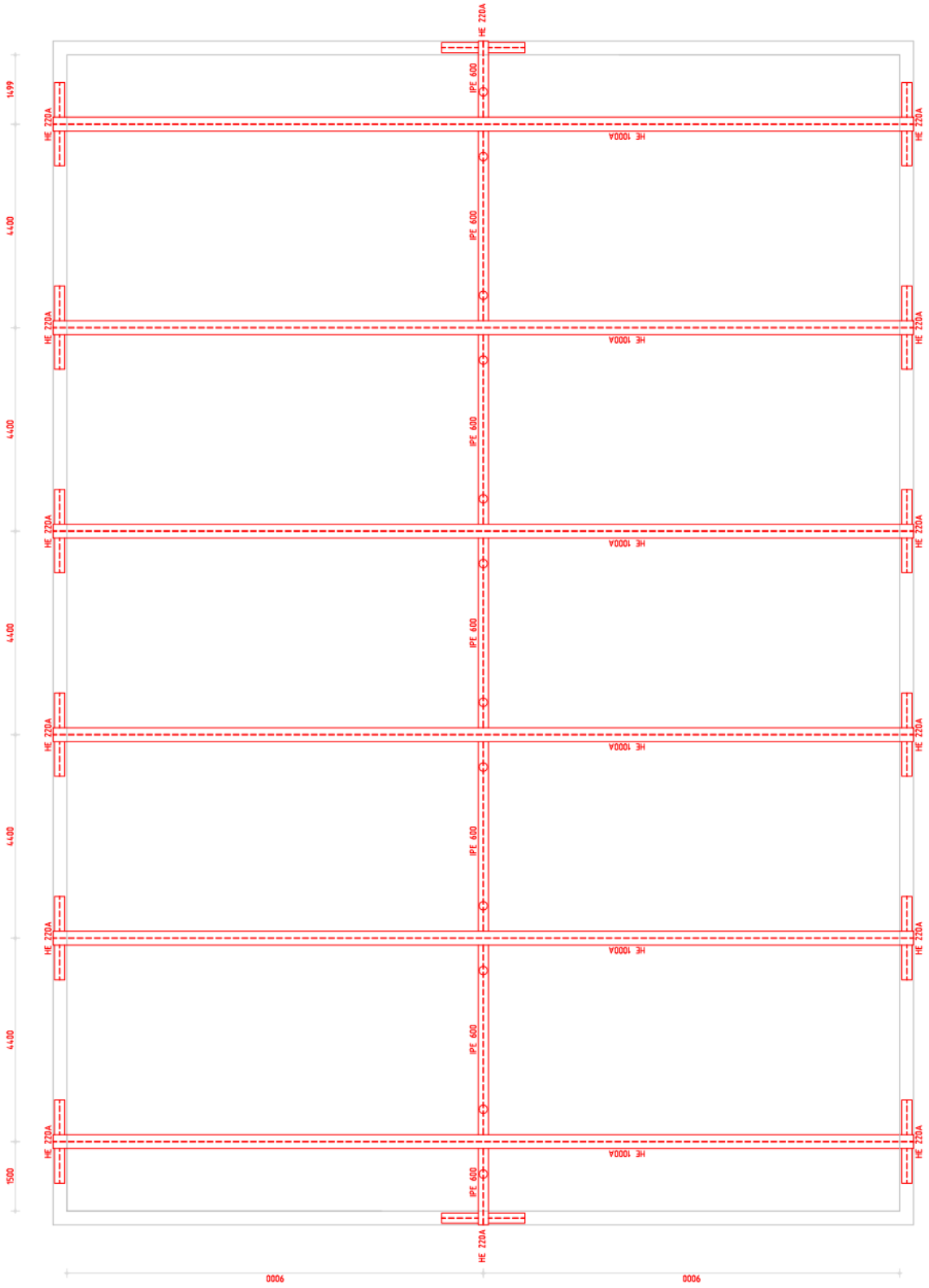
In zaal 2 komt een geheel nieuwe constructie op de bovenzijde van het dak. Deze bestaat uit een dubbele ligger over de gehele lengte van de zaal met ondertussen twee dwarsbalken die er op aansluiten. Aan de onderzijde van het dak wordt de bestaande constructie in zijn geheel gehandhaafd. Op de locatie van de bestaande ankers in het midden van zaal wordt een aanpassing gemaakt om deze te verbinden met de nieuwe constructie bovenop en bij de zijwanden dient er een verbinding te worden gemaakt om de IPE 180 te laten afdragen naar de wand in plaats van het plafond.

# 4. CONSTRUCTIE SCHETSEN

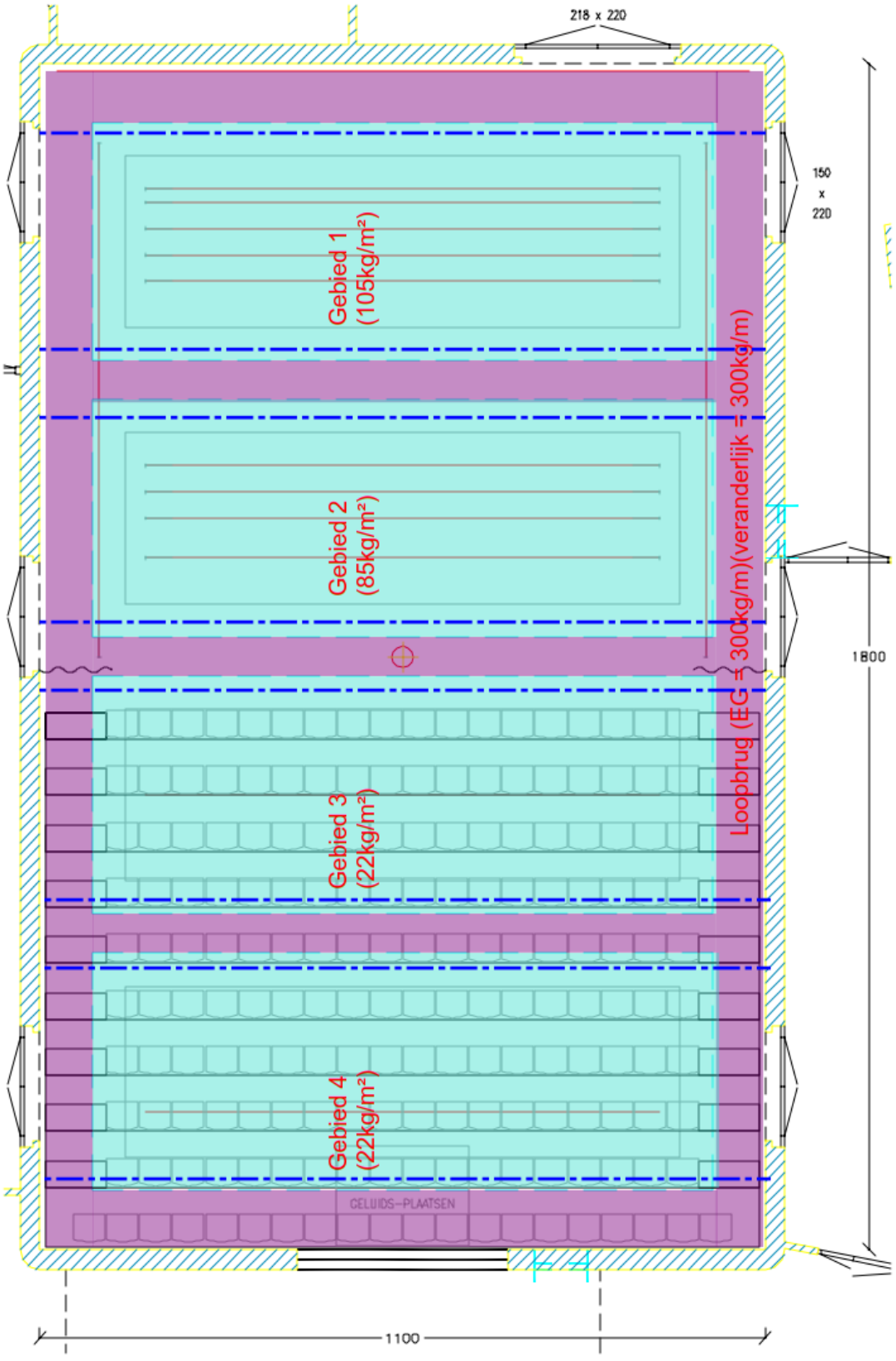
## 4.1. Zaal 1 onder plafond



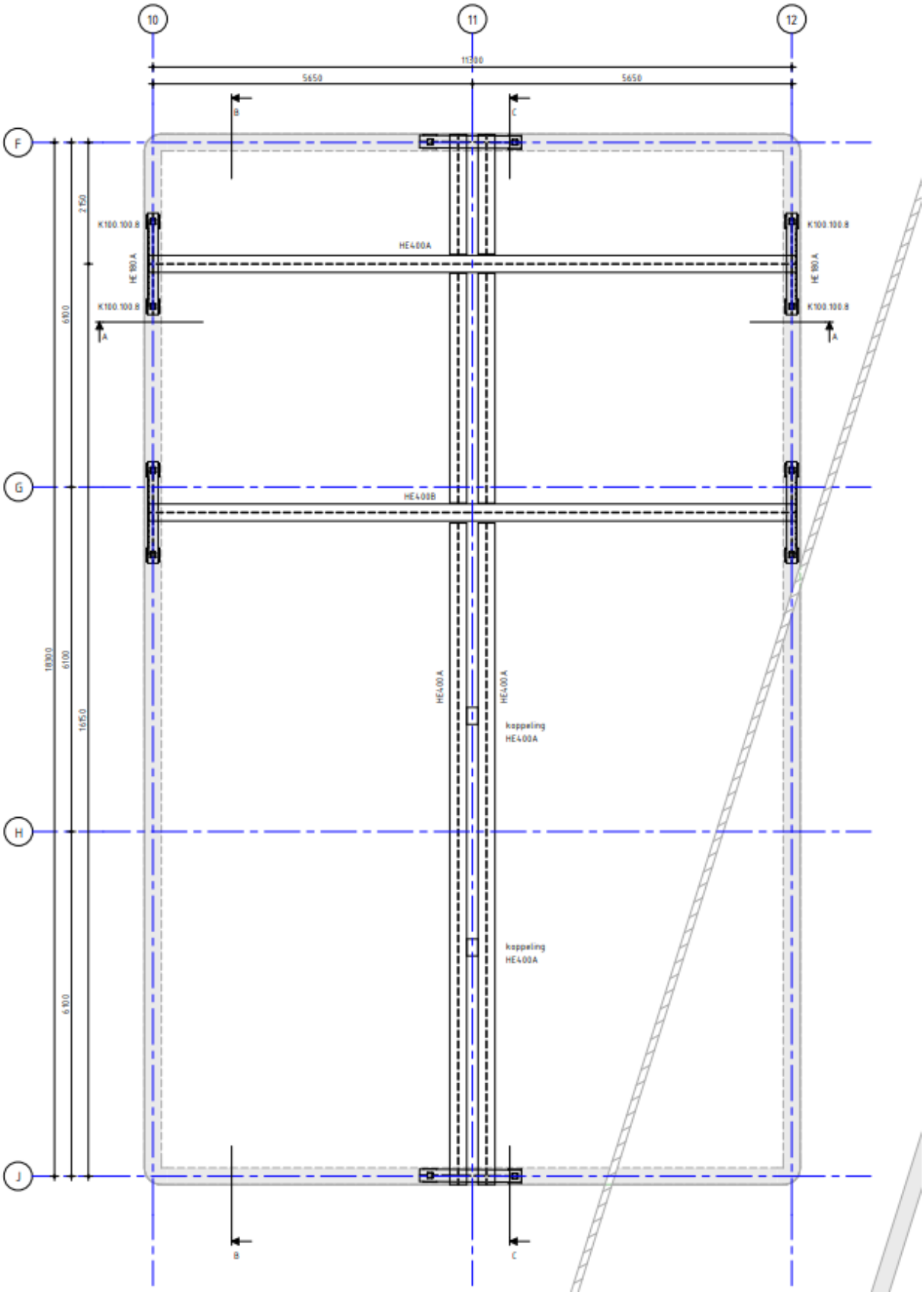
## 4.2. Zaal 1 op dak



## 4.3. Zaal 2 onder plafond



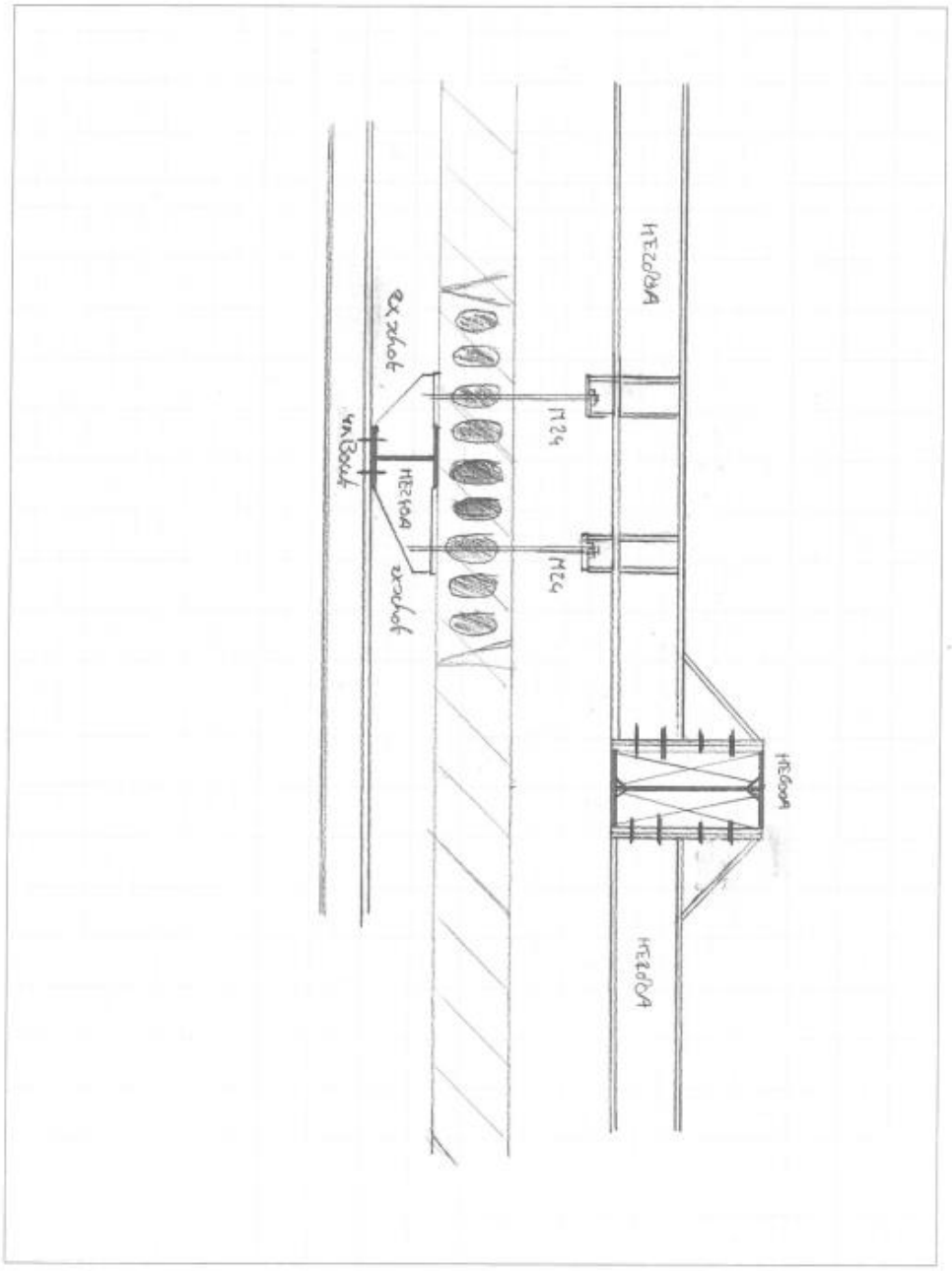
## 4.4. Zaal 2 op dak



## 4.5. Schetsdetails verbindingen

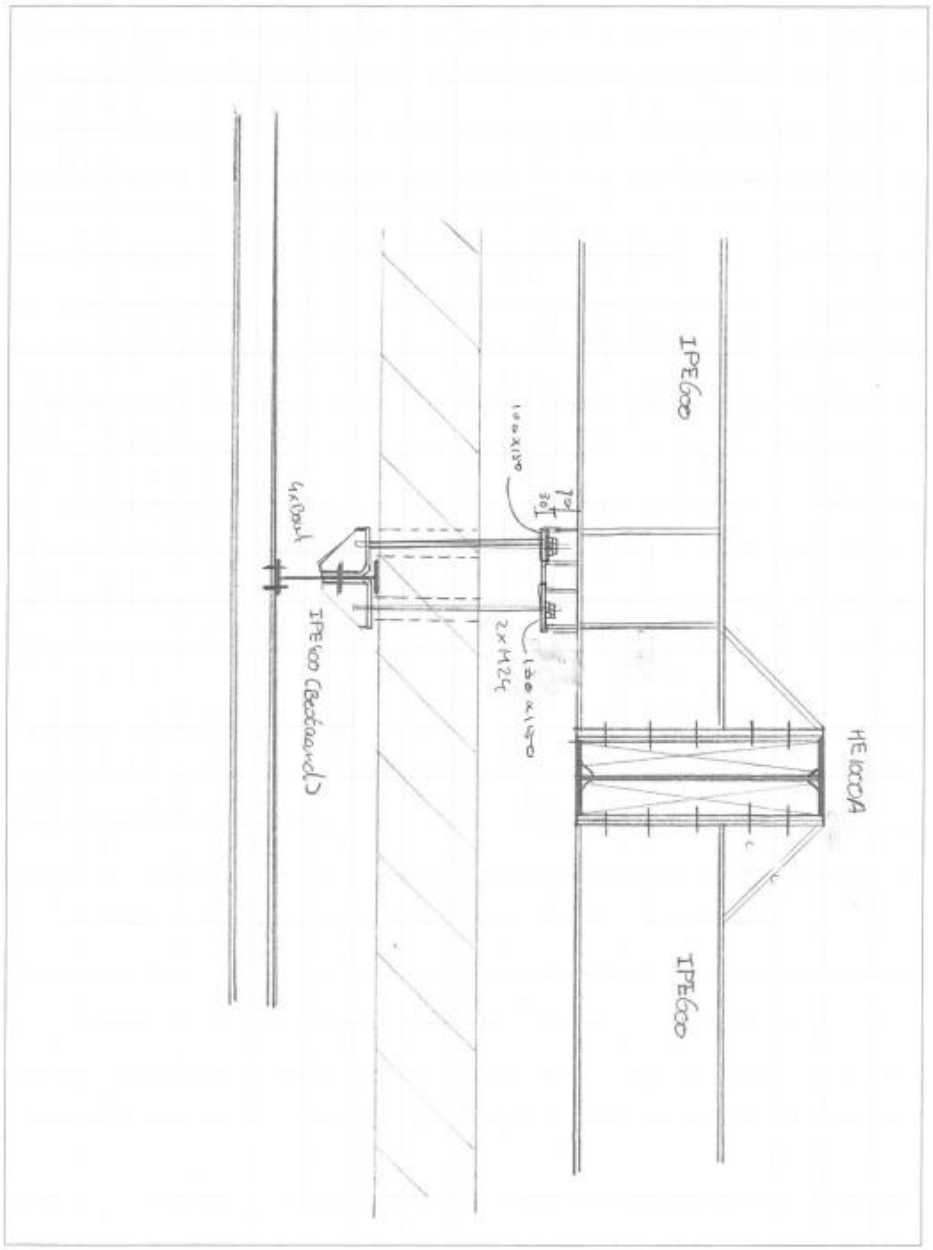
Omschrijving:
Werknummer:
Datum: Blad:

Ingenieursburo Ulehake



Omschrijving:
Werknummer:
Datum: Blad:

Ingenieursburo Ulehake

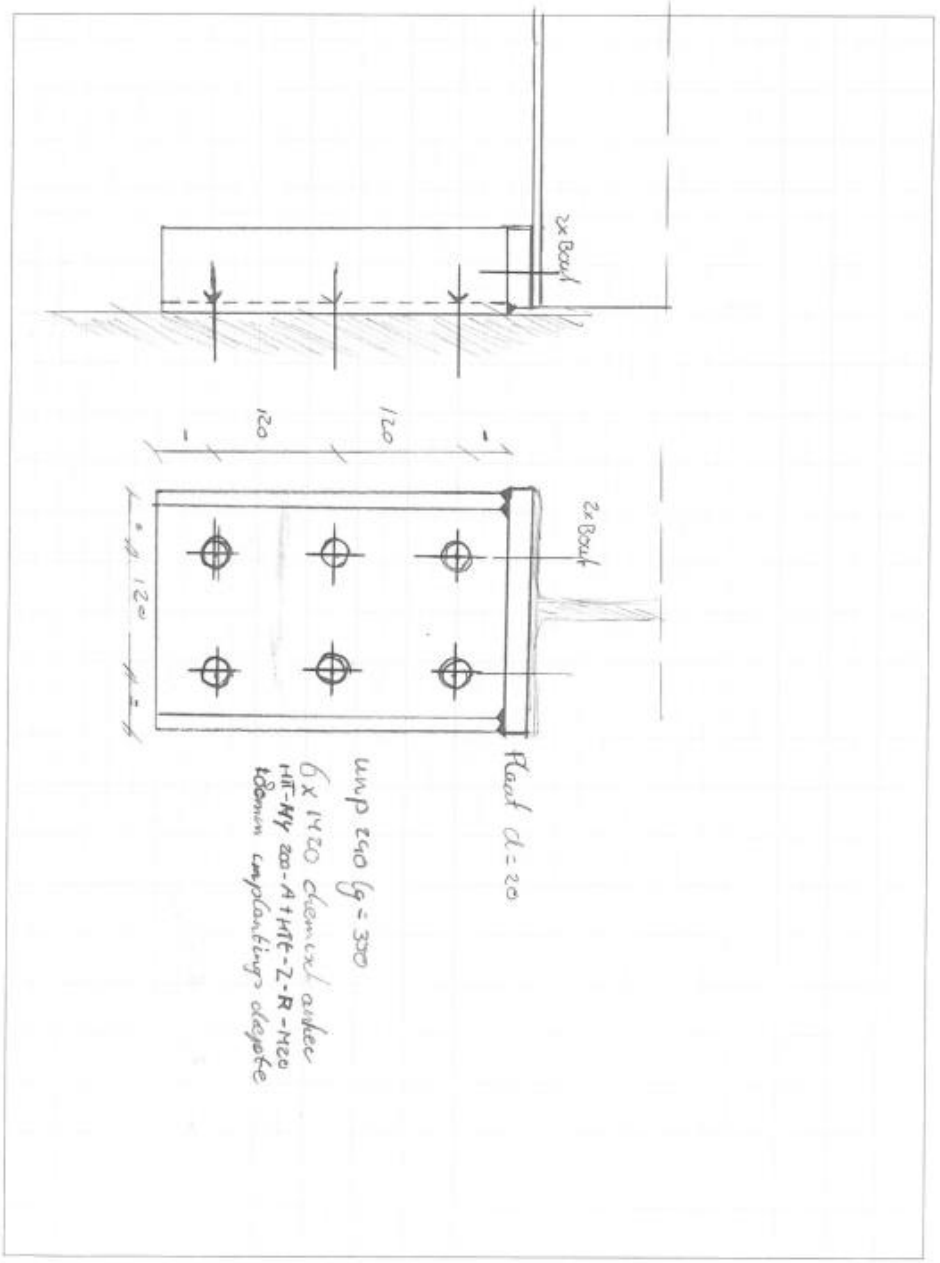


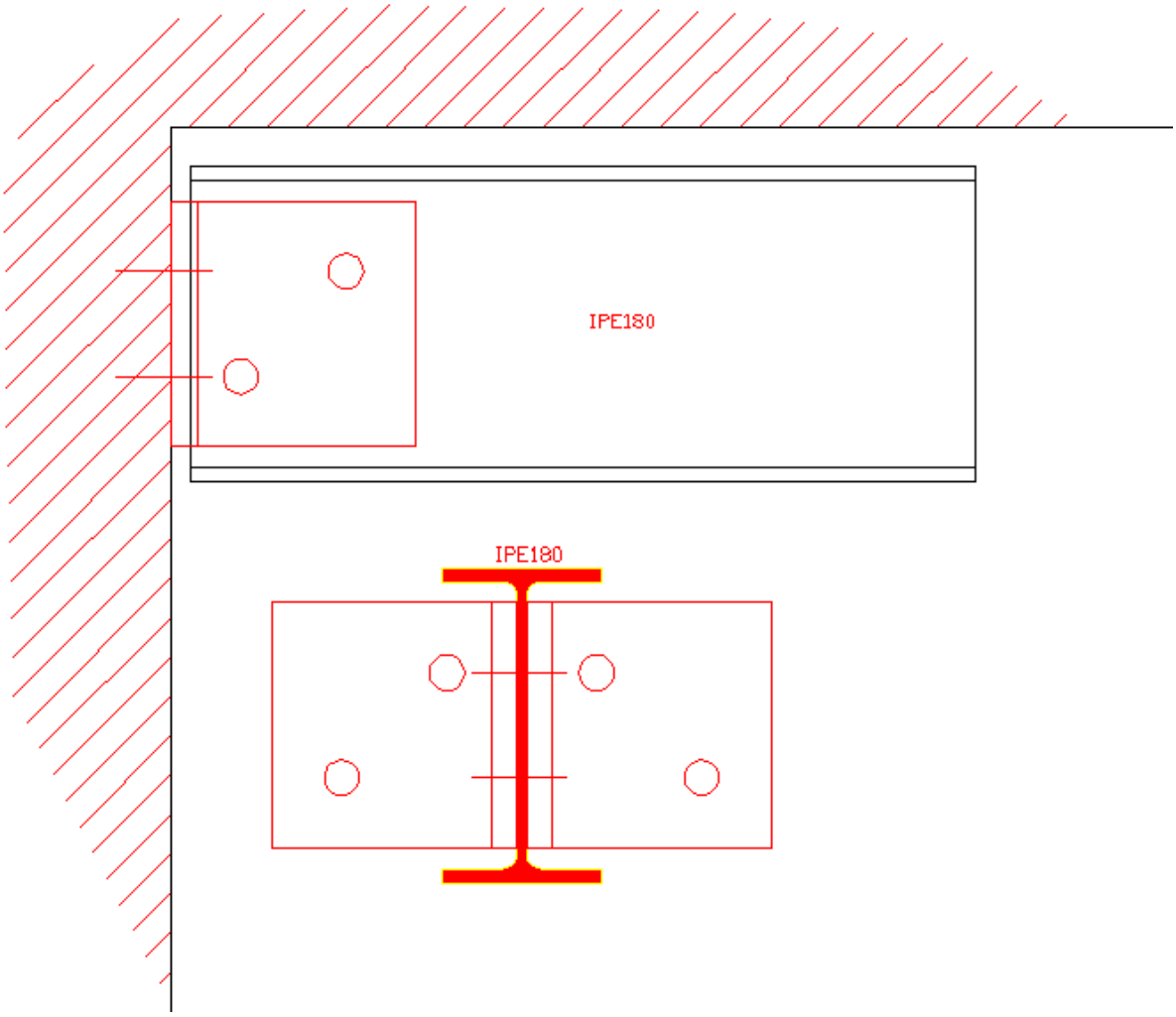
Omschrijving:

Werknummer:

Datum: Blad:

Ingenieursburo Ulehake




IPE180
IPE180

# 5. GEWICHTSBEREKENING

**TS/Construct** **Rel: 6.00 6 apr 2016**

```
Project          : 14132
Onderdeel        : Gewichtsberekening
Datum            : 03/03/2016
Eenheden         : kN/m/rad
Bestand          : X:\Ing.Buro\14100 tm 14199\14132\BouwConstructie\
                   Besteksfase\Berekeningen\
                   14132-01-Gewichtsberekening.cnw
```

**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) |

**Gewichtsberekening.**

**Belastingaannamen**

| Index | Omschrijving | Belasting [kN/m2] |
|---|---|---|
| lbz1 | Loopbrug | 2.60 |
| | - Staalwerk loopbrug | 2.50 |
| | - Houten vloerdelen | 0.10 |
| bbz1 | Beweegbare brug | 3.60 |
| | - Staalwerk beweegbare brug | 3.50 |
| | - houten vloerdelen | 0.10 |
| rz1 | Rails | 1.00 |
| | - Eigen gewicht rail type 2 | 1.00 |
| sbz1 | Slingerbalk | 1.00 |
| | - Eigen gewicht slingerbalk | 1.00 |
| rgz1 | Rails voor gordijn | 0.10 |
| | - Rails voor gordijn | 0.10 |
| lbz2 | Loopbrug | 2.60 |
| | - Staalwerk loopbrug | 2.50 |
| | - Houten vloerdeel | 0.10 |
| bbz2 | Beweegbare brug | 3.10 |
| | - Staalwerk beweegbare brug | 3.00 |
| | - houten vloerdelen | 0.10 |
| r1z2 | Rails | 0.60 |
| | - Eigen gewicht rail | 0.60 |
| rgz2 | Rails voor gordijn | 0.10 |
| | - Rails voor gordijn | 0.10 |

Variabelen

| Index | Omschrijving | Formule | Waarde |
|---|---|---|---|
| vb150 | Verand. bel. rail 1 | 1.5 | 1.50 kN/m |
| vb250 | Verand. bel. rail 2 | 2.5 | 2.50 kN/m |
| vb300 | Verand. bel. lb incl app | 3.0 | 3.00 kN/m |
| vb020 | Verand. bel. gordijn | 0.2 | 0.20 kN/m |
| vb1000 | Verand. bel. slingerbalk | 10 | 10.00 kN |

## Permanent

### 101

### 102

### 106

### 107

### 108

### 109

### 110

### 111

## Veranderlijk

### 101

Type:-PZGeproj

| Index | Omschrijving | Formule | Waarde |
|---|---|---|---|
| q1 | Beweegbarebrug *4.5 | bbz2*4.5 = 3.1*4.5 | 13.95 kN |
| | Ver. bel. loopbrug * 4.5 | vb300*4.5 = 3*4.5 | 13.50 kN |
| | | Totaal: | 27.45 kN |

Type:-QZGlobaal

| Index | Omschrijving | Formule | Waarde |
|---|---|---|---|
| q3 | Loopbrug | lbz2 = 2.6 | 2.60 kN/m |
| | Ver. bel. loopbrug | vb300 = 3 | 3.00 kN/m |
| | Rails | r1z2 = 0.6 | 0.60 kN/m |
| | Gordijnrails *2 | rgz2*2 = 0.1*2 | 0.20 kN/m |
| | Ver. bel.gordijn*5*2 | vb020*5*2 = 0.2*5*2 | 2.00 kN/m |
| | | Totaal: | 8.40 kN/m |

Type:-PZGeproj

| Index | Omschrijving | Formule | Waarde |
|---|---|---|---|
| q4 | Ver. bel. zijtrek | vb150*2 = 1.5*2 | 3.00 kN |

### 102

| Index | Omschrijving | Formule | Waarde |
|---|---|---|---|
| q2 | Trek * 4.5 | r1z2*4.5 = 0.6*4.5 | 2.70 kN |
| | Ver. bel. trek * 4.5 | vb150*2 = 1.5*2 | 3.00 kN |
| | | Totaal: | 5.70 kN |

Type:-QZGlobaal

| Index | Omschrijving | Formule | Waarde |
|---|---|---|---|
| q5 | Loopburg * 2.6 | lbz2*2.6 = 2.6*2.6 | 6.76 kN/m |
| | Ver. bel. loopbrug * 2.6 | vb300*2.6 = 3*2.6 | 7.80 kN/m |
| | Gordijnrails *2*2.6 | rgz2*2*2.6 = 0.1*2*2.6 | 0.52 kN/m |
| | Gording *2*2.6 | vb020*2*2.6 = 0.2*2*2.6 | 1.04 kN/m |
| | | Totaal: | 16.12 kN/m |

| Index | Omschrijving | Formule | Waarde |
|---|---|---|---|
| q6 | Rails * 4 * 2.6 | r1z2*4*2.6 = 0.6*4*2.6 | 6.24 kN/m |

| Index | Omschrijving | Formule | Waarde |
|---|---|---|---|
| | | Transport: | 6.24 kN/m |
| | Ver. bel. trek *4*0.3 | vb150*4*0.3 = 1.5*4*0.3 | 1.80 kN/m |
| | | Totaal: | 8.04 kN/m |

## 106

Type:-PZGeproj

| Index | Omschrijving | Formule | Waarde |
|---|---|---|---|
| q13 | Beweegbarebrug*16.2*0.5 | bbz1*16.2*0.5 = 3.6*16.2*0.5 | 29.16 kN |
| | Ver. bel. loopbrug*8.1 | vb300*8.1 = 3*8.1 | 24.30 kN |
| | | Totaal: | 53.46 kN |

Type:-QZGlobaal

| Index | Omschrijving | Formule | Waarde |
|---|---|---|---|
| q16 | Loopbrug | lbz1 = 2.6 | 2.60 kN/m |
| | Ver. bel. loopbrug | vb300 = 3 | 3.00 kN/m |
| | Rails | rz1 = 1 | 1.00 kN/m |
| | Gordijn rails*2 | rgz1*2 = 0.1*2 | 0.20 kN/m |
| | Gordijn *5*2 | vb020*5*2 = 0.2*5*2 | 2.00 kN/m |
| | | Totaal: | 8.80 kN/m |

Type:-PZGeproj

| Index | Omschrijving | Formule | Waarde |
|---|---|---|---|
| q17 | Ver. bel. zijtrek | vb150*2 = 1.5*2 | 3.00 kN |

## 107

| Index | Omschrijving | Formule | Waarde |
|---|---|---|---|
| q14 | Trek * 16.1*0.5 | rz1*8.1 = 1*8.1 | 8.10 kN |
| | Ver. bel. trek * 2 | vb250*2 = 2.5*2 | 5.00 kN |
| | | Totaal: | 13.10 kN |

## 108

| Index | Omschrijving | Formule | Waarde |
|---|---|---|---|
| q15 | Slingerbalk * 6*0.5 | sbz1*3 = 1*3 | 3.00 kN |
| | Ver. bel. slingerbalk*1 | vb1000*1 = 10*1 | 10.00 kN |
| | | Totaal: | 13.00 kN |

Type:-QZGlobaal

| Index | Omschrijving | Formule | Waarde |
|---|---|---|---|
| q18 | Loopbrug * 3 | lbz1*3 = 2.6*3 | 7.80 kN/m |
| | Ver. bel. loopbrug * 3 | vb300*3 = 3*3 | 9.00 kN/m |
| | Gordijn rails *2*3 | rgz1*2*3 = 0.1*2*3 | 0.60 kN/m |
| | Gordijn *5*3*2 | vb020*5*3*2 = 0.2*5*3*2 | 6.00 kN/m |
| | | Totaal: | 23.40 kN/m |

| Index | Omschrijving | Formule | Waarde |
|---|---|---|---|
| q19 | Rails * 4* 3 | rz1*4*3 = 1*4*3 | 12.00 kN/m |
| | Ver. bel. trek * 2*4*0.3 | vb150*2*4*0.3 = 1.5*2*4*0.3 | 3.60 kN/m |
| | | Totaal: | 15.60 kN/m |

## 109

Type:-PZGeproj

| Index | Omschrijving | Formule | Waarde |
|---|---|---|---|
| q20 | Slingerbalk * 3*0.5 | sbz1*3 = 1*3 | 3.00 kN |
| | Ver. bel. rail2 | vb250*2 = 2.5*2 | 5.00 kN |
| | | Totaal: | 8.00 kN |

Type:-QZGlobaal

| Index | Omschrijving | Formule | Waarde |
|---|---|---|---|
| q21 | Loopbrug * 2 | lbz1*2 = 2.6*2 | 5.20 kN/m |
| | Ver. bel. loopbrug * 2 | vb300*2 = 3*2 | 6.00 kN/m |
| | Gordijn rails *2*2 | rgz1*2*2 = 0.1*2*2 | 0.40 kN/m |
| | Gordijn *5*2*2 | vb020*5*2*2 = 0.2*5*2*2 | 4.00 kN/m |
| | | Totaal: | 15.60 kN/m |

| Index | Omschrijving | Formule | Waarde |
|---|---|---|---|
| q22 | Rails * 4* 2 | rz1*4*2 = 1*4*2 | 8.00 kN/m |
| | Ver. bel. trek * 2*4*0.2 | vb150*2*4*0.2 = 1.5*2*4*0.2 | 2.40 kN/m |
| | | Totaal: | 10.40 kN/m |

**110**

**111**

# 6. BEREKENING

## 6.1. 101 & 102

**TS/Balkroosters** **Rel: 6.03 23 jun 2016**

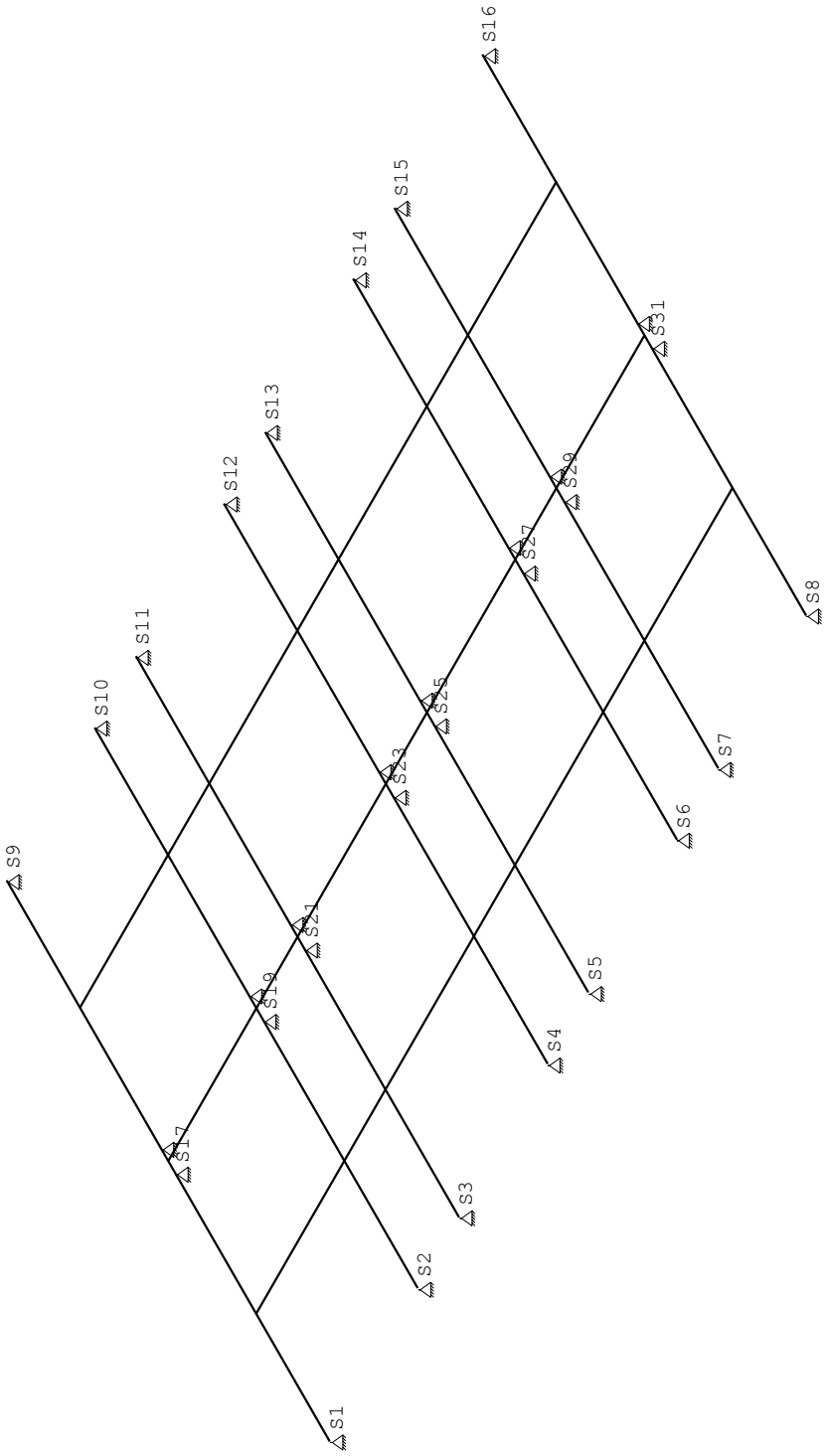
```
Project..: 14132
Onderdeel:
Dimensies: kN/m/rad
Datum....: 07/03/2016
Bestand..: x:\ing.buro\14100 tm 14199\14132\bouwconstructie\besteksfase\
           berekeningen\zaal 2 onder plafond.grw
Torsiefac: 10 %

Betrouwbaarheidsklasse       : 2       Referentieperiode          : 50
```

**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) |
| Staal | NEN-EN 1993-1-1:2006 | C2:2009 | NB:2011(nl) |

**GEOMETRIE**


S16
S15
S14
S31
S13
S12
S29
S27
S8
S11
S10
S25
S23
S7
S6
S9
S21
S19
S5
S4
S17
S3
S2
S1

## MATERIALEN

| Mt | Omschrijving | E-modulus[N/mm2] | S.M. | Pois. | Uitz. coëff |
|---|---|---|---|---|---|
| 1 | S235 | 210000 | 78.5 | 0.30 | 1.2000e-005 |

## PROFIELEN [mm]

| Prof. | Omschrijving | Materiaal | Oppervlak | Torsietr. | Traagheid | Vormf. |
|---|---|---|---|---|---|---|
| 1 | IPE180 | 1:S235 | 2.395e+003 | 4.730e+004 | 1.317e+007 | 0.00 |
| 2 | K80/80/5CF | 1:S235 | 1.436e+003 | 2.178e+006 | 1.314e+006 | 0.00 |

## PROFIELEN vervolg [mm]

| Prof. | Staaftype | Breedte | Hoogte | Zs | Rek.As | Type | b1 | h1 | b2 | h2 |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0:Normaal | 91 | 180 | 90 | 0.00 | | | | | |
| 2 | 0:Normaal | 80 | 80 | 40 | 0.00 | | | | | |

## PROFIELVORMEN [mm]

1 IPE180



2 K80/80/5CF



## KNOPEN

| Knoop | X | Z | Knoop | X | Z |
|---|---|---|---|---|---|
| 1 | 0.300 | 0.000 | 6 | 12.100 | 0.000 |
| 2 | 3.300 | 0.000 | 7 | 13.500 | 0.000 |
| 3 | 4.700 | 0.000 | 8 | 16.500 | 0.000 |
| 4 | 7.700 | 0.000 | 9 | 0.300 | 11.000 |
| 5 | 9.100 | 0.000 | 10 | 3.300 | 11.000 |
| 11 | 4.700 | 11.000 | 16 | 16.500 | 11.000 |
| 12 | 7.700 | 11.000 | 17 | 0.300 | 5.500 |
| 13 | 9.100 | 11.000 | 18 | 16.500 | 5.500 |
| 14 | 12.100 | 11.000 | 19 | 0.300 | 2.500 |
| 15 | 13.500 | 11.000 | 20 | 0.300 | 8.500 |
| 21 | 16.500 | 2.500 | | | |
| 22 | 16.500 | 8.500 | | | |

## BALKEN

| Nr. | Naam | Begin | Eind | Profiel |
|---|---|---|---|---|
| 1 | 1 | 1 | 9 | 1:IPE180 |
| 2 | 2 | 2 | 10 | 1:IPE180 |
| 3 | 3 | 3 | 11 | 1:IPE180 |
| 4 | 4 | 4 | 12 | 1:IPE180 |
| 5 | 5 | 5 | 13 | 1:IPE180 |
| 6 | 6 | 6 | 14 | 1:IPE180 |
| 7 | 7 | 7 | 15 | 1:IPE180 |
| 8 | 8 | 8 | 16 | 1:IPE180 |
| 9 | 9 | 19 | 21 | 2:K80/80/5CF |
| 10 | 10 | 17 | 18 | 2:K80/80/5CF |
| 11 | 11 | 20 | 22 | 2:K80/80/5CF |

## BALKEN vervolg

| Nr. | Naam | Aansl.begin | Aansl.eind | Excentr. | Pasm.begin | Pasm.eind | Opm. |
|---|---|---|---|---|---|---|---|
| 1 | 1 | WDM | WDM | 0.000 | 0.000 | 0.000 | |
| 2 | 2 | WDM | WDM | 0.000 | 0.000 | 0.000 | |
| 3 | 3 | WDM | WDM | 0.000 | 0.000 | 0.000 | |
| 4 | 4 | WDM | WDM | 0.000 | 0.000 | 0.000 | |
| 5 | 5 | WDM | WDM | 0.000 | 0.000 | 0.000 | |
| 6 | 6 | WDM | WDM | 0.000 | 0.000 | 0.000 | |
| 7 | 7 | WDM | WDM | 0.000 | 0.000 | 0.000 | |
| 8 | 8 | WDM | WDM | 0.000 | 0.000 | 0.000 | |
| 9 | 9 | WDM | WDM | 0.000 | 0.000 | 0.000 | |
| 10 | 10 | WDM | WDM | 0.000 | 0.000 | 0.000 | |
| 11 | 11 | WDM | WDM | 0.000 | 0.000 | 0.000 | |

Opmerkingen:
De torsie traagheid van alle balken is tot 10% gereduceerd

## STEUNPUNTTYPEN

Nr. : 1 Rx:Vrij Z:Vast Ry:Vrij
Afmeting : 0*0
Inheiniv.: 0
Afhakniv.: 0
Min.afst.: 0.150

Nr. : 2 Rotatie X:Vrij
Afmeting : 0*0 Verplaatsing Z:Veerwaarde: 10000
Inheiniv.: 0 Rotatie Y:Vrij
Afhakniv.: 0
Min.afst.: 0.150

Nr. : 3 Rotatie X:Vrij
Afmeting : 0*0 Verplaatsing Z:Veerwaarde: 6000
Inheiniv.: 0 Rotatie Y:Vrij
Afhakniv.: 0
Min.afst.: 0.150

Nr. : 4 Rotatie X:Vrij
Afmeting : 0*0 Verplaatsing Z:Veerwaarde: 30000
Inheiniv.: 0 Rotatie Y:Vrij
Afhakniv.: 0
Min.afst.: 0.150

## STEUNPUNTEN

| Nr. | Steunpunttype | Balk | Positie | Excentr. | Opm: |
|---|---|---|---|---|---|
| 1 | 1:0*0 | 1 | 0.000 | 0.000 | |
| 2 | 1:0*0 | 2 | 0.000 | 0.000 | |
| 3 | 1:0*0 | 3 | 0.000 | 0.000 | |
| 4 | 1:0*0 | 4 | 0.000 | 0.000 | |
| 5 | 1:0*0 | 5 | 0.000 | 0.000 | |
| 6 | 1:0*0 | 6 | 0.000 | 0.000 | |
| 7 | 1:0*0 | 7 | 0.000 | 0.000 | |
| 8 | 1:0*0 | 8 | 0.000 | 0.000 | |
| 9 | 1:0*0 | 1 | 11.000 | 0.000 | |
| 10 | 1:0*0 | 2 | 11.000 | 0.000 | |
| 11 | 1:0*0 | 3 | 11.000 | 0.000 | |
| 12 | 1:0*0 | 4 | 11.000 | 0.000 | |
| 13 | 1:0*0 | 5 | 11.000 | 0.000 | |
| 14 | 1:0*0 | 6 | 11.000 | 0.000 | |
| 15 | 1:0*0 | 7 | 11.000 | 0.000 | |
| 16 | 1:0*0 | 8 | 11.000 | 0.000 | |
| 17 | 4:0*0 | 1 | 5.25 | 0.000 | |
| 18 | 4:0*0 | 1 | 5.75 | 0.000 | |

**STEUNPUNTEN**

| Nr. | Steunpunttype | Balk | Positie | Excentr. | Opm: |
|---|---|---|---|---|---|
| 19 | 3:0*0 | 2 | 5.25 | 0.000 | |
| 20 | 3:0*0 | 2 | 5.75 | 0.000 | |
| 21 | 3:0*0 | 3 | 5.25 | 0.000 | |
| 22 | 3:0*0 | 3 | 5.75 | 0.000 | |
| 23 | 2:0*0 | 4 | 5.25 | 0.000 | |
| 24 | 2:0*0 | 4 | 5.75 | 0.000 | |
| 25 | 2:0*0 | 5 | 5.25 | 0.000 | |
| 26 | 2:0*0 | 5 | 5.75 | 0.000 | |
| 27 | 2:0*0 | 6 | 5.25 | 0.000 | |
| 28 | 2:0*0 | 6 | 5.75 | 0.000 | |
| 29 | 2:0*0 | 7 | 5.25 | 0.000 | |
| 30 | 2:0*0 | 7 | 5.75 | 0.000 | |
| 31 | 4:0*0 | 8 | 5.25 | 0.000 | |
| 32 | 4:0*0 | 8 | 5.75 | 0.000 | |

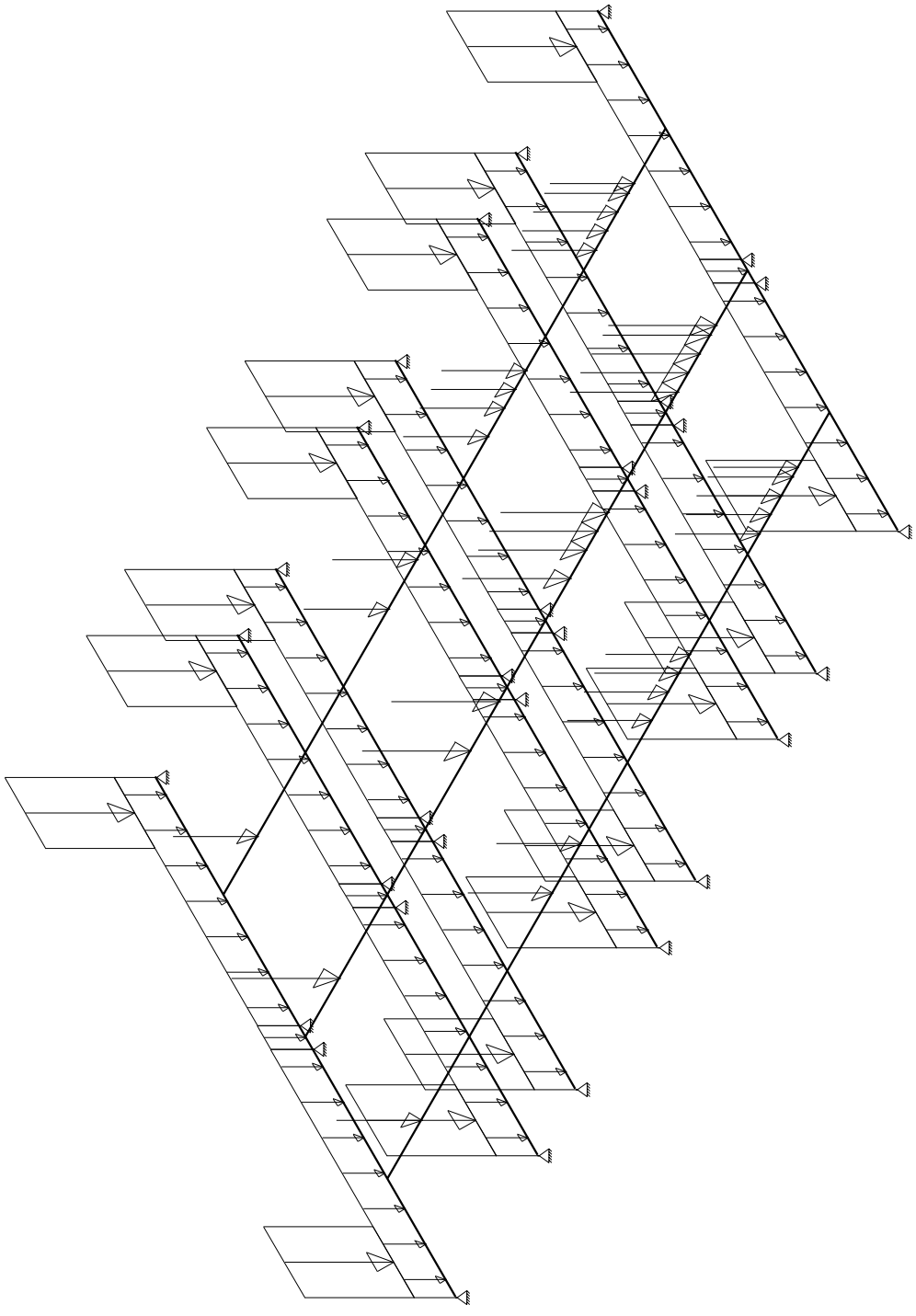
**BELASTINGGEVALLEN**

| B.G. | Omschrijving | Belast/onbelast | $\psi_0$ | $\psi_1$ | $\psi_2$ | e.g. |
|---|---|---|---|---|---|---|
| 1 | Permanent | 2:Permanent EN1991 | | | | -1.00 |
| 2 | Veranderlijk | 0:Alles tegelijk | 0.50 | 0.50 | 0.30 | 0.00 |

**BELASTINGGEVALLEN**

| B.G. | Omschrijving | Type |
|---|---|---|
| 1 | Permanent | 1 Permanente belasting |
| 2 | Veranderlijk | 2 Ver. bel. pers. ed. (p_rep) |

**VELDBELASTINGEN** B.G:1 Permanent



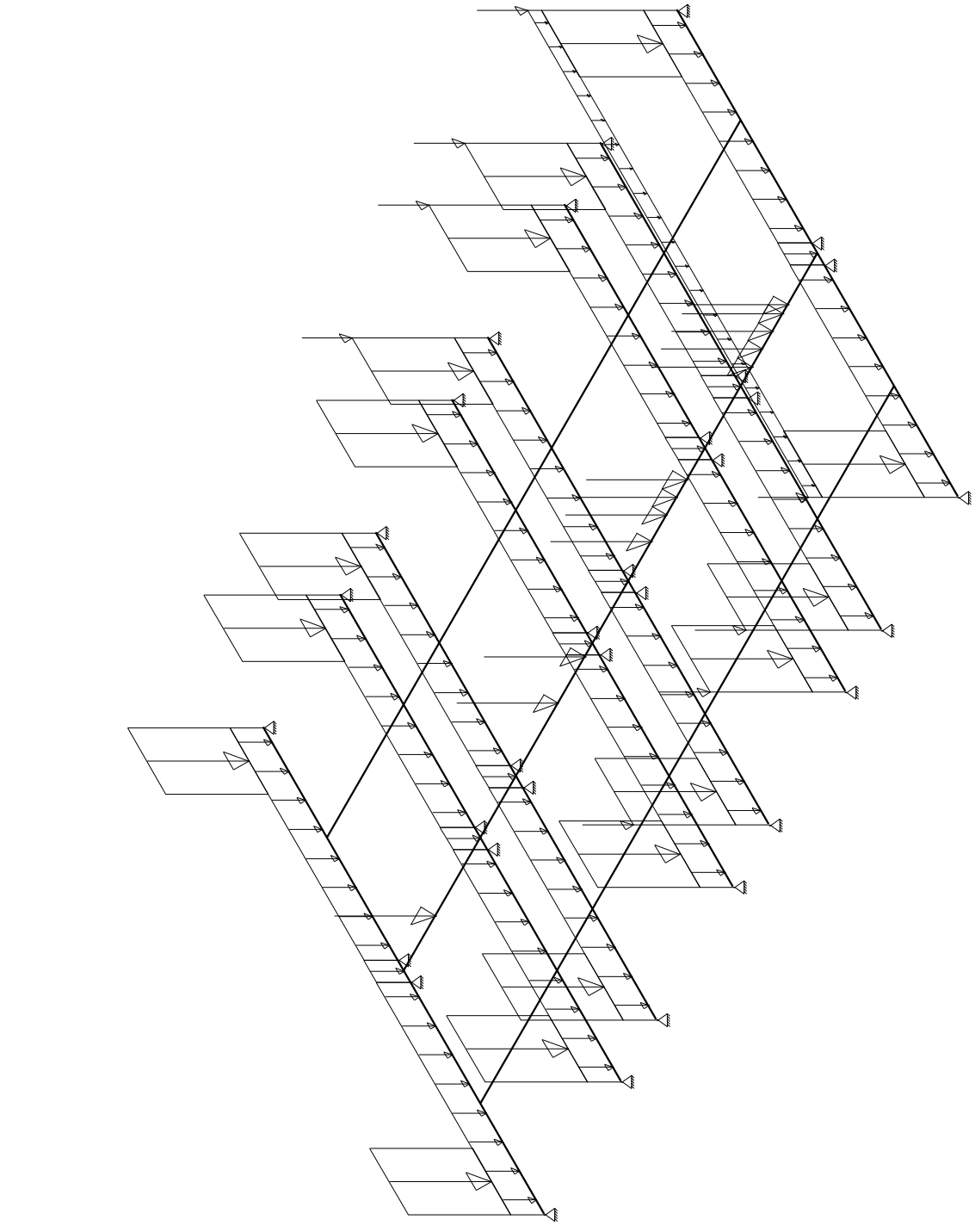
**VELDBELASTINGEN** B.G:1 Permanent

| Balk | Last | Type | q1/p/m | q2 | Afstand | Lengte | Exc. |
|---|---|---|---|---|---|---|---|
| 1 | 1 | 1:q-last | -1.500 | -1.500 | 0.000 | 5.250 | 0.000 |
| 1 | 2 | 1:q-last | -1.500 | -1.500 | 5.750 | 5.250 | 0.000 |
| 1 | 3 | 1:q-last | -1.500 | -1.500 | 5.250 | 0.500 | 0.000 |
| 1 | 4 | 1:q-last | -3.900 | -3.900 | 0.000 | 1.500 | 0.000 |
| 1 | 5 | 1:q-last | -3.900 | -3.900 | 9.500 | 1.500 | 0.000 |
| 2 | 1 | 1:q-last | -1.500 | -1.500 | 0.000 | 5.250 | 0.000 |
| 2 | 2 | 1:q-last | -1.500 | -1.500 | 5.750 | 5.250 | 0.000 |
| 2 | 3 | 1:q-last | -1.500 | -1.500 | 5.250 | 0.500 | 0.000 |
| 2 | 4 | 1:q-last | -3.900 | -3.900 | 0.000 | 1.500 | 0.000 |
| 2 | 5 | 1:q-last | -3.900 | -3.900 | 9.500 | 1.500 | 0.000 |
| 3 | 1 | 1:q-last | -1.500 | -1.500 | 0.000 | 5.250 | 0.000 |
| 3 | 2 | 1:q-last | -1.500 | -1.500 | 5.750 | 5.250 | 0.000 |
| 3 | 3 | 1:q-last | -1.500 | -1.500 | 5.250 | 0.500 | 0.000 |
| 3 | 4 | 1:q-last | -3.900 | -3.900 | 0.000 | 1.500 | 0.000 |
| 3 | 5 | 1:q-last | -3.900 | -3.900 | 9.500 | 1.500 | 0.000 |
| 4 | 1 | 1:q-last | -1.500 | -1.500 | 0.000 | 5.250 | 0.000 |
| 4 | 2 | 1:q-last | -1.500 | -1.500 | 5.750 | 5.250 | 0.000 |
| 4 | 3 | 1:q-last | -1.500 | -1.500 | 5.250 | 0.500 | 0.000 |
| 4 | 4 | 1:q-last | -3.900 | -3.900 | 0.000 | 1.500 | 0.000 |
| 4 | 5 | 1:q-last | -3.900 | -3.900 | 9.500 | 1.500 | 0.000 |
| 5 | 1 | 1:q-last | -1.500 | -1.500 | 0.000 | 5.250 | 0.000 |
| 5 | 2 | 1:q-last | -1.500 | -1.500 | 5.750 | 5.250 | 0.000 |
| 5 | 3 | 1:q-last | -1.500 | -1.500 | 5.250 | 0.500 | 0.000 |
| 5 | 4 | 1:q-last | -3.900 | -3.900 | 0.000 | 1.500 | 0.000 |
| 5 | 5 | 1:q-last | -3.900 | -3.900 | 9.500 | 1.500 | 0.000 |
| 6 | 1 | 1:q-last | -1.500 | -1.500 | 0.000 | 5.250 | 0.000 |
| 6 | 2 | 1:q-last | -1.500 | -1.500 | 5.750 | 5.250 | 0.000 |
| 6 | 3 | 1:q-last | -1.500 | -1.500 | 5.250 | 0.500 | 0.000 |
| 6 | 4 | 1:q-last | -3.900 | -3.900 | 0.000 | 1.500 | 0.000 |
| 6 | 5 | 1:q-last | -3.900 | -3.900 | 9.500 | 1.500 | 0.000 |
| 7 | 1 | 1:q-last | -1.500 | -1.500 | 0.000 | 5.250 | 0.000 |
| 7 | 2 | 1:q-last | -1.500 | -1.500 | 5.750 | 5.250 | 0.000 |
| 7 | 3 | 1:q-last | -1.500 | -1.500 | 5.250 | 0.500 | 0.000 |
| 7 | 4 | 1:q-last | -3.900 | -3.900 | 0.000 | 1.500 | 0.000 |
| 7 | 5 | 1:q-last | -3.900 | -3.900 | 9.500 | 1.500 | 0.000 |
| 8 | 1 | 1:q-last | -1.500 | -1.500 | 0.000 | 5.250 | 0.000 |
| 8 | 2 | 1:q-last | -1.500 | -1.500 | 5.750 | 5.250 | 0.000 |
| 8 | 3 | 1:q-last | -1.500 | -1.500 | 5.250 | 0.500 | 0.000 |
| 8 | 4 | 1:q-last | -3.900 | -3.900 | 0.000 | 1.500 | 0.000 |
| 8 | 5 | 1:q-last | -3.900 | -3.900 | 9.500 | 1.500 | 0.000 |
| 9 | 1 | 8:Puntlast | -1.650 | | 15.050 | | 0.000 |
| 9 | 2 | 8:Puntlast | -1.650 | | 14.850 | | 0.000 |
| 9 | 3 | 8:Puntlast | -1.650 | | 14.450 | | 0.000 |
| 9 | 4 | 8:Puntlast | -1.650 | | 14.050 | | 0.000 |
| 9 | 5 | 8:Puntlast | -1.650 | | 13.650 | | 0.000 |
| 9 | 6 | 8:Puntlast | -1.650 | | 11.100 | | 0.000 |
| 9 | 7 | 8:Puntlast | -1.650 | | 10.700 | | 0.000 |
| 9 | 8 | 8:Puntlast | -1.650 | | 10.300 | | 0.000 |
| 9 | 9 | 8:Puntlast | -1.650 | | 9.700 | | 0.000 |
| 9 | 10 | 8:Puntlast | -1.650 | | 7.100 | | 0.000 |
| 9 | 11 | 8:Puntlast | -1.650 | | 6.050 | | 0.000 |
| 9 | 12 | 8:Puntlast | -1.650 | | 1.250 | | 0.000 |
| 10 | 1 | 8:Puntlast | -2.100 | | 15.050 | | 0.000 |
| 10 | 2 | 8:Puntlast | -2.100 | | 14.850 | | 0.000 |
| 10 | 3 | 8:Puntlast | -2.100 | | 14.450 | | 0.000 |
| 10 | 4 | 8:Puntlast | -2.100 | | 14.050 | | 0.000 |
| 10 | 5 | 8:Puntlast | -2.100 | | 13.650 | | 0.000 |
| 10 | 6 | 8:Puntlast | -2.100 | | 11.100 | | 0.000 |
| 10 | 7 | 8:Puntlast | -2.100 | | 10.700 | | 0.000 |
| 10 | 8 | 8:Puntlast | -2.100 | | 10.300 | | 0.000 |
| 10 | 9 | 8:Puntlast | -2.100 | | 9.700 | | 0.000 |

**VELDBELASTINGEN** B.G:1 Permanent

| Balk | Last | Type | q1/p/m | q2 | Afstand | Lengte | Exc. |
|---|---|---|---|---|---|---|---|
| 10 | 10 | 8:Puntlast | -2.100 | | 7.100 | | 0.000 |
| 10 | 11 | 8:Puntlast | -2.100 | | 6.050 | | 0.000 |
| 10 | 12 | 8:Puntlast | -2.100 | | 1.250 | | 0.000 |
| 11 | 1 | 8:Puntlast | -1.650 | | 15.050 | | 0.000 |
| 11 | 2 | 8:Puntlast | -1.650 | | 14.850 | | 0.000 |
| 11 | 3 | 8:Puntlast | -1.650 | | 14.450 | | 0.000 |
| 11 | 4 | 8:Puntlast | -1.650 | | 14.050 | | 0.000 |
| 11 | 5 | 8:Puntlast | -1.650 | | 13.650 | | 0.000 |
| 11 | 6 | 8:Puntlast | -1.650 | | 11.100 | | 0.000 |
| 11 | 7 | 8:Puntlast | -1.650 | | 10.700 | | 0.000 |
| 11 | 8 | 8:Puntlast | -1.650 | | 10.300 | | 0.000 |
| 11 | 9 | 8:Puntlast | -1.650 | | 9.700 | | 0.000 |
| 11 | 10 | 8:Puntlast | -1.650 | | 7.100 | | 0.000 |
| 11 | 11 | 8:Puntlast | -1.650 | | 6.050 | | 0.000 |
| 11 | 12 | 8:Puntlast | -1.650 | | 1.250 | | 0.000 |

**VELDBELASTINGEN** B.G:2 Veranderlijk



**VELDBELASTINGEN** B.G:2 Veranderlijk

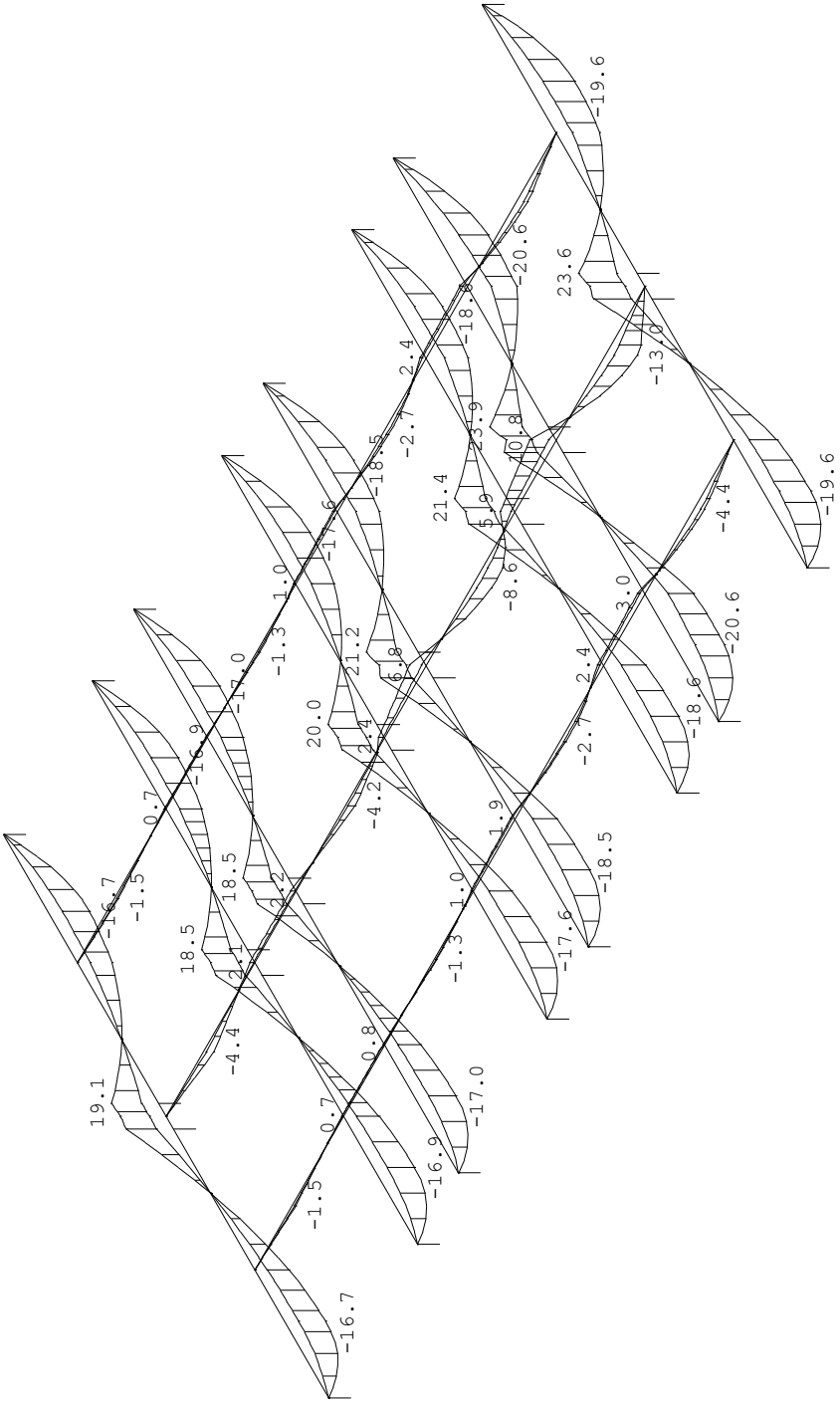
| Balk | Last | Type | q1/p/m | q2 | Afstand | Lengte | Exc. |
|---|---|---|---|---|---|---|---|
| 1 | 1 | 1:q-last | -1.500 | -1.500 | 0.000 | 5.250 | 0.000 |
| 1 | 2 | 1:q-last | -1.500 | -1.500 | 5.750 | 5.250 | 0.000 |
| 1 | 3 | 1:q-last | -1.500 | -1.500 | 5.250 | 0.500 | 0.000 |
| 1 | 4 | 1:q-last | -4.500 | -4.500 | 0.000 | 1.500 | 0.000 |
| 1 | 5 | 1:q-last | -4.500 | -4.500 | 9.500 | 1.500 | 0.000 |
| 2 | 1 | 1:q-last | -1.500 | -1.500 | 0.000 | 5.250 | 0.000 |
| 2 | 2 | 1:q-last | -1.500 | -1.500 | 5.750 | 5.250 | 0.000 |
| 2 | 3 | 1:q-last | -1.500 | -1.500 | 5.250 | 0.500 | 0.000 |
| 2 | 4 | 1:q-last | -4.500 | -4.500 | 0.000 | 1.500 | 0.000 |
| 2 | 5 | 1:q-last | -4.500 | -4.500 | 9.500 | 1.500 | 0.000 |
| 3 | 1 | 1:q-last | -1.500 | -1.500 | 0.000 | 5.250 | 0.000 |
| 3 | 2 | 1:q-last | -1.500 | -1.500 | 5.750 | 5.250 | 0.000 |
| 3 | 3 | 1:q-last | -1.500 | -1.500 | 5.250 | 0.500 | 0.000 |
| 3 | 4 | 1:q-last | -4.500 | -4.500 | 0.000 | 1.500 | 0.000 |
| 3 | 5 | 1:q-last | -4.500 | -4.500 | 9.500 | 1.500 | 0.000 |
| 4 | 1 | 1:q-last | -1.500 | -1.500 | 0.000 | 5.250 | 0.000 |
| 4 | 2 | 1:q-last | -1.500 | -1.500 | 5.750 | 5.250 | 0.000 |
| 4 | 3 | 1:q-last | -1.500 | -1.500 | 5.250 | 0.500 | 0.000 |
| 4 | 4 | 1:q-last | -4.500 | -4.500 | 0.000 | 1.500 | 0.000 |
| 4 | 5 | 1:q-last | -4.500 | -4.500 | 9.500 | 1.500 | 0.000 |
| 5 | 1 | 1:q-last | -1.500 | -1.500 | 0.000 | 5.250 | 0.000 |
| 5 | 2 | 1:q-last | -1.500 | -1.500 | 5.750 | 5.250 | 0.000 |
| 5 | 3 | 1:q-last | -1.500 | -1.500 | 5.250 | 0.500 | 0.000 |
| 5 | 4 | 1:q-last | -4.500 | -4.500 | 0.000 | 1.500 | 0.000 |
| 5 | 5 | 1:q-last | -4.500 | -4.500 | 9.500 | 1.500 | 0.000 |
| 5 | 6 | 8:Puntlast | -1.500 | | 0.000 | | 0.000 |
| 5 | 7 | 8:Puntlast | -1.500 | | 11.000 | | 0.000 |
| 6 | 1 | 1:q-last | -1.500 | -1.500 | 0.000 | 5.250 | 0.000 |
| 6 | 2 | 1:q-last | -1.500 | -1.500 | 5.750 | 5.250 | 0.000 |
| 6 | 3 | 1:q-last | -1.500 | -1.500 | 5.250 | 0.500 | 0.000 |
| 6 | 4 | 1:q-last | -4.500 | -4.500 | 0.000 | 1.500 | 0.000 |
| 6 | 5 | 1:q-last | -4.500 | -4.500 | 9.500 | 1.500 | 0.000 |
| 6 | 6 | 8:Puntlast | -1.500 | | -0.000 | | 0.000 |
| 6 | 7 | 8:Puntlast | -1.500 | | 11.000 | | 0.000 |
| 7 | 1 | 1:q-last | -1.500 | -1.500 | 0.000 | 5.250 | 0.000 |
| 7 | 2 | 1:q-last | -1.500 | -1.500 | 5.750 | 5.250 | 0.000 |
| 7 | 3 | 1:q-last | -1.500 | -1.500 | 5.250 | 0.500 | 0.000 |
| 7 | 4 | 1:q-last | -4.500 | -4.500 | 0.000 | 1.500 | 0.000 |
| 7 | 5 | 1:q-last | -4.500 | -4.500 | 9.500 | 1.500 | 0.000 |
| 7 | 6 | 8:Puntlast | -1.500 | | -0.000 | | 0.000 |
| 7 | 7 | 8:Puntlast | -1.500 | | 11.000 | | 0.000 |
| 8 | 1 | 1:q-last | -1.500 | -1.500 | 0.000 | 5.250 | 0.000 |
| 8 | 2 | 1:q-last | -1.500 | -1.500 | 5.750 | 5.250 | 0.000 |
| 8 | 3 | 1:q-last | -1.500 | -1.500 | 5.250 | 0.500 | 0.000 |
| 8 | 4 | 1:q-last | -4.500 | -4.500 | 0.000 | 1.500 | 0.000 |
| 8 | 5 | 1:q-last | -4.500 | -4.500 | 9.500 | 1.500 | 0.000 |
| 8 | 6 | 8:Puntlast | -1.500 | | -0.000 | | 0.000 |
| 8 | 7 | 8:Puntlast | -1.500 | | 11.000 | | 0.000 |
| 8 | 8 | 1:q-last | -0.600 | -0.600 | 0.000 | 11.000 | 0.000 |
| 10 | 1 | 8:Puntlast | -3.000 | | 15.050 | | 0.000 |
| 10 | 2 | 8:Puntlast | -3.000 | | 14.850 | | 0.000 |
| 10 | 3 | 8:Puntlast | -3.000 | | 14.450 | | 0.000 |
| 10 | 4 | 8:Puntlast | -3.000 | | 14.050 | | 0.000 |
| 10 | 5 | 8:Puntlast | -3.000 | | 13.650 | | 0.000 |
| 10 | 6 | 8:Puntlast | -3.000 | | 11.100 | | 0.000 |
| 10 | 7 | 8:Puntlast | -3.000 | | 10.700 | | 0.000 |
| 10 | 8 | 8:Puntlast | -3.000 | | 10.300 | | 0.000 |
| 10 | 9 | 8:Puntlast | -3.000 | | 9.700 | | 0.000 |
| 10 | 10 | 8:Puntlast | -3.000 | | 7.100 | | 0.000 |
| 10 | 11 | 8:Puntlast | -3.000 | | 6.050 | | 0.000 |
| 10 | 12 | 8:Puntlast | -3.000 | | 1.250 | | 0.000 |

**BELASTINGCOMBINATIES**

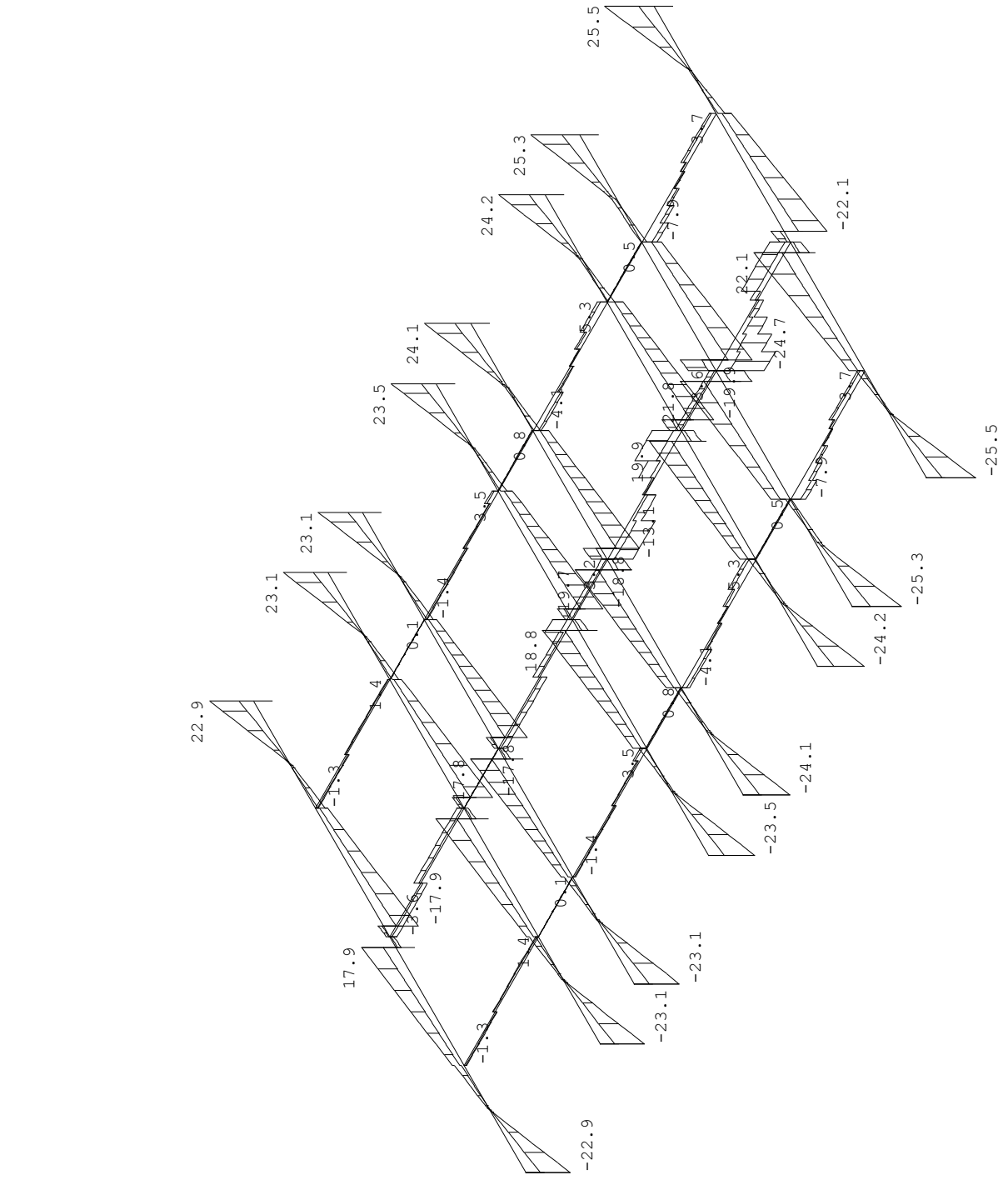
| BC | Type | BG | Gen. | Factor | BG | Gen. | Factor | BG | Gen. | Factor | BG | Gen. | Factor |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Fund. | 1 | Perm | 1.35 | | | | | | | | | |
| 2 | Fund. | 1 | Perm | 0.90 | | | | | | | | | |
| 3 | Fund. | 1 | Perm | 1.35 | 2 | psi0 | 1.50 | | | | | | |
| 4 | Fund. | 1 | Perm | 1.20 | 2 | Extr | 1.50 | | | | | | |
| 5 | Fund. | 1 | Perm | 0.90 | 2 | Extr | 1.50 | | | | | | |
| 6 | Fund. | 1 | Perm | 0.90 | 2 | psi0 | 1.50 | | | | | | |
| 7 | Kar. | 1 | Perm | 1.00 | 2 | Extr | 1.00 | | | | | | |
| 8 | Quas. | 1 | Perm | 1.00 | | | | | | | | | |
| 9 | Quas. | 1 | Perm | 1.00 | 2 | psi2 | 1.00 | | | | | | |
| 10 | Freq. | 1 | Perm | 1.00 | | | | | | | | | |
| 11 | Freq. | 1 | Perm | 1.00 | 2 | psi1 | 1.00 | | | | | | |
| 12 | Blij. | 1 | Perm | 1.00 | | | | | | | | | |

**OMHULLENDE VAN DE FUNDAMENTELE COMBINATIES**

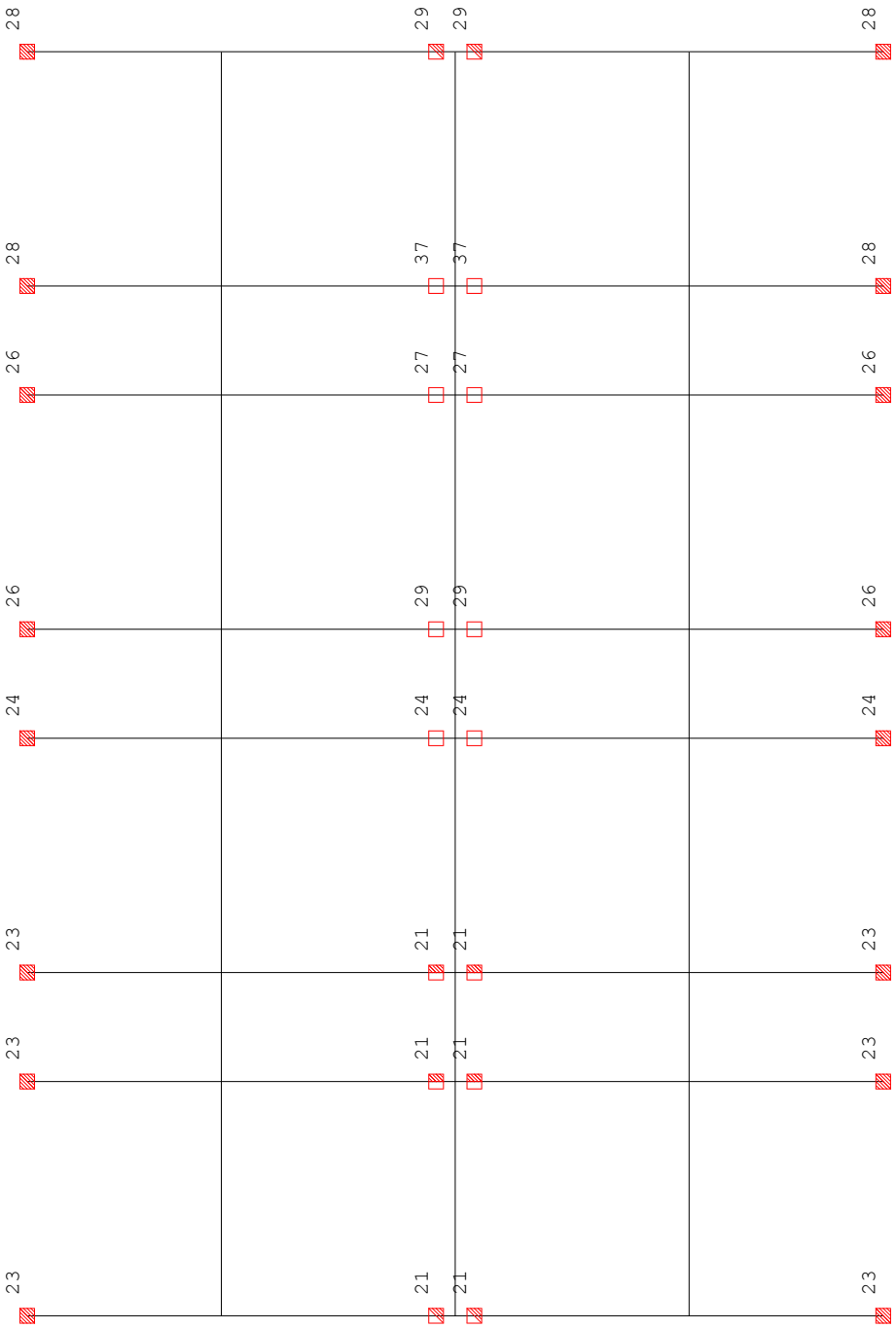
**MOMENTEN** Fundamentele combinatie



**DWARSKRACHTEN** Fundamentele combinatie

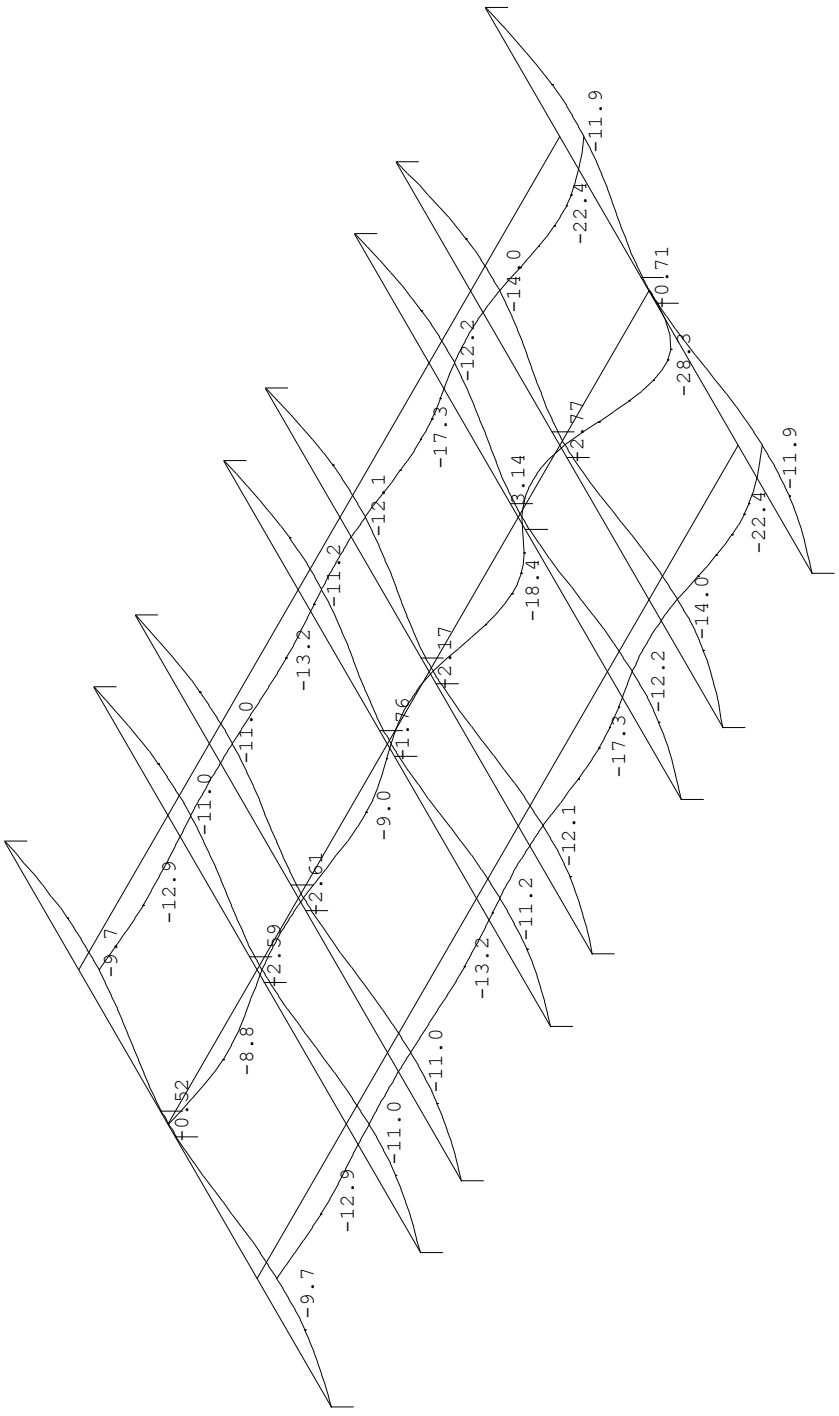


**REACTIES** Fundamentele combinatie



## OMHULLENDE VAN DE KARAKTERISTIEKE COMBINATIES

**VERPLAATSINGEN** [mm] Karakteristieke combinatie



## STAALPROFIELEN - ALGEMENE GEGEVENS

Stabiliteit: Classificatie gehele constructie: Geschoord

### MATERIAAL

| Mat nr. | Profielnaam | Vloeisp. [N/mm$^2$] | Productie methode | Min. drsn. klasse |
|---|---|---|---|---|
| 1 | IPE180 | 235 | Gewalst | 1 |
| 2 | K80/80/5CF | 235 | Koudgewalst | 1 |

Partiële veiligheidsfactoren:
Gamma M;0 : 1.00 Gamma M;1 : 1.00

### KIPSTABILITEIT

| Staaf | Plts. aangr. | | l gaffel [m] | Kipsteunafstanden [m] |
|---|---|---|---|---|
| **1** | | | | |
| V1 | 1.0*h | boven: | 5.25 | 0.000 |
| | | onder: | 5.25 | 0.000 |
| V2 | 1.0*h | boven: | 0.50 | 0.000 |
| | | onder: | 0.50 | 0.000 |
| V3 | 1.0*h | boven: | 5.25 | 0.000 |
| | | onder: | 5.25 | 0.000 |
| **2** | | | | |
| V4 | 1.0*h | boven: | 5.25 | 0.000 |
| | | onder: | 5.25 | 0.000 |
| V5 | 1.0*h | boven: | 0.50 | 0.000 |
| | | onder: | 0.50 | 0.000 |
| V6 | 1.0*h | boven: | 5.25 | 0.000 |
| | | onder: | 5.25 | 0.000 |
| **3** | | | | |
| V7 | 1.0*h | boven: | 5.25 | 0.000 |
| | | onder: | 5.25 | 0.000 |
| V8 | 1.0*h | boven: | 0.50 | 0.000 |
| | | onder: | 0.50 | 0.000 |
| V9 | 1.0*h | boven: | 5.25 | 0.000 |
| | | onder: | 5.25 | 0.000 |
| **4** | | | | |
| V10 | 1.0*h | boven: | 5.25 | 0.000 |
| | | onder: | 5.25 | 0.000 |
| V11 | 1.0*h | boven: | 0.50 | 0.000 |
| | | onder: | 0.50 | 0.000 |
| V12 | 1.0*h | boven: | 5.25 | 0.000 |
| | | onder: | 5.25 | 0.000 |
| **5** | | | | |
| V13 | 1.0*h | boven: | 5.25 | 0.000 |
| | | onder: | 5.25 | 0.000 |
| V14 | 1.0*h | boven: | 0.50 | 0.000 |
| | | onder: | 0.50 | 0.000 |
| V15 | 1.0*h | boven: | 5.25 | 0.000 |
| | | onder: | 5.25 | 0.000 |
| **6** | | | | |
| V16 | 1.0*h | boven: | 5.25 | 0.000 |
| | | onder: | 5.25 | 0.000 |
| V17 | 1.0*h | boven: | 0.50 | 0.000 |
| | | onder: | 0.50 | 0.000 |
| V18 | 1.0*h | boven: | 5.25 | 0.000 |
| | | onder: | 5.25 | 0.000 |
| **7** | | | | |
| V19 | 1.0*h | boven: | 5.25 | 0.000 |
| | | onder: | 5.25 | 0.000 |
| V20 | 1.0*h | boven: | 0.50 | 0.000 |
| | | onder: | 0.50 | 0.000 |

**KIPSTABILITEIT**

| Staaf | Plts. aangr. | | l gaffel [m] | Kipsteunafstanden [m] |
|---|---|---|---|---|
| V21 | 1.0*h | boven: | 5.25 | 0.000 |
| | | onder: | 5.25 | 0.000 |
| **8** | | | | |
| V22 | 1.0*h | boven: | 5.25 | 0.000 |
| | | onder: | 5.25 | 0.000 |
| V23 | 1.0*h | boven: | 0.50 | 0.000 |
| | | onder: | 0.50 | 0.000 |
| V24 | 1.0*h | boven: | 5.25 | 0.000 |
| | | onder: | 5.25 | 0.000 |
| **9** | | | | |
| V25 | 1.0*h | boven: | 3.00 | 0.000 |
| | | onder: | 3.00 | 0.000 |
| V26 | 1.0*h | boven: | 1.40 | 0.000 |
| | | onder: | 1.40 | 0.000 |
| V27 | 1.0*h | boven: | 3.00 | 0.000 |
| | | onder: | 3.00 | 0.000 |
| V28 | 1.0*h | boven: | 1.40 | 0.000 |
| | | onder: | 1.40 | 0.000 |
| V29 | 1.0*h | boven: | 3.00 | 0.000 |
| | | onder: | 3.00 | 0.000 |
| V30 | 1.0*h | boven: | 1.40 | 0.000 |
| | | onder: | 1.40 | 0.000 |
| V31 | 1.0*h | boven: | 3.00 | 0.000 |
| | | onder: | 3.00 | 0.000 |
| **10** | | | | |
| V32 | 1.0*h | boven: | 3.00 | 0.000 |
| | | onder: | 3.00 | 0.000 |
| V33 | 1.0*h | boven: | 1.40 | 0.000 |
| | | onder: | 1.40 | 0.000 |
| V34 | 1.0*h | boven: | 3.00 | 0.000 |
| | | onder: | 3.00 | 0.000 |
| V35 | 1.0*h | boven: | 1.40 | 0.000 |
| | | onder: | 1.40 | 0.000 |
| V36 | 1.0*h | boven: | 3.00 | 0.000 |
| | | onder: | 3.00 | 0.000 |
| V37 | 1.0*h | boven: | 1.40 | 0.000 |
| | | onder: | 1.40 | 0.000 |
| V38 | 1.0*h | boven: | 3.00 | 0.000 |
| | | onder: | 3.00 | 0.000 |
| **11** | | | | |
| V39 | 1.0*h | boven: | 3.00 | 0.000 |
| | | onder: | 3.00 | 0.000 |
| V40 | 1.0*h | boven: | 1.40 | 0.000 |
| | | onder: | 1.40 | 0.000 |
| V41 | 1.0*h | boven: | 3.00 | 0.000 |
| | | onder: | 3.00 | 0.000 |
| V42 | 1.0*h | boven: | 1.40 | 0.000 |
| | | onder: | 1.40 | 0.000 |
| V43 | 1.0*h | boven: | 3.00 | 0.000 |
| | | onder: | 3.00 | 0.000 |
| V44 | 1.0*h | boven: | 1.40 | 0.000 |
| | | onder: | 1.40 | 0.000 |
| V45 | 1.0*h | boven: | 3.00 | 0.000 |
| | | onder: | 3.00 | 0.000 |

## TOETSING SPANNINGEN

| Staaf nr. | Mat | BC | Sit | Kl | Plaats | Norm Artikel | Formule | Hoogste toetsing U.C. | [N/mm$^2$] | Opm. |
|---|---|---|---|---|---|---|---|---|---|---|
| **1** | | | | | | | | | | |
| V1 | 1 | 4 | 1 | 1 | Einde | EN3-1-1 6.2.8 | (6.30) | 0.489 | 115 | |
| V2 | 1 | 4 | 1 | 1 | Begin | EN3-1-1 6.2.8 | (6.30) | 0.489 | 115 | |
| V3 | 1 | 4 | 1 | 1 | Begin | EN3-1-1 6.2.8 | (6.30) | 0.489 | 115 | |
| **2** | | | | | | | | | | |
| V4 | 1 | 4 | 1 | 1 | Einde | EN3-1-1 6.2.8 | (6.30) | 0.473 | 111 | |
| V5 | 1 | 4 | 1 | 1 | Begin | EN3-1-1 6.2.8 | (6.30) | 0.473 | 111 | |
| V6 | 1 | 4 | 1 | 1 | Begin | EN3-1-1 6.2.8 | (6.30) | 0.473 | 111 | |
| **3** | | | | | | | | | | |
| V7 | 1 | 4 | 1 | 1 | Einde | EN3-1-1 6.2.8 | (6.30) | 0.474 | 111 | |
| V8 | 1 | 4 | 1 | 1 | Begin | EN3-1-1 6.2.8 | (6.30) | 0.474 | 111 | |
| V9 | 1 | 4 | 1 | 1 | Begin | EN3-1-1 6.2.8 | (6.30) | 0.474 | 111 | |
| **4** | | | | | | | | | | |
| V10 | 1 | 4 | 1 | 1 | Einde | EN3-1-1 6.2.8 | (6.30) | 0.512 | 120 | |
| V11 | 1 | 4 | 1 | 1 | Begin | EN3-1-1 6.2.8 | (6.30) | 0.512 | 120 | |
| V12 | 1 | 4 | 1 | 1 | Begin | EN3-1-1 6.2.8 | (6.30) | 0.512 | 120 | |
| **5** | | | | | | | | | | |
| V13 | 1 | 4 | 1 | 1 | Einde | EN3-1-1 6.2.8 | (6.30) | 0.543 | 128 | |
| V14 | 1 | 4 | 1 | 1 | Begin | EN3-1-1 6.2.8 | (6.30) | 0.543 | 128 | |
| V15 | 1 | 4 | 1 | 1 | Begin | EN3-1-1 6.2.8 | (6.30) | 0.543 | 128 | |
| **6** | | | | | | | | | | |
| V16 | 1 | 4 | 1 | 1 | Einde | EN3-1-1 6.2.8 | (6.30) | 0.548 | 129 | |
| V17 | 1 | 4 | 1 | 1 | Begin | EN3-1-1 6.2.8 | (6.30) | 0.548 | 129 | |
| V18 | 1 | 4 | 1 | 1 | Begin | EN3-1-1 6.2.8 | (6.30) | 0.548 | 129 | |
| **7** | | | | | | | | | | |
| V19 | 1 | 4 | 1 | 1 | Einde | EN3-1-1 6.2.8 | (6.30) | 0.610 | 143 | |
| V20 | 1 | 4 | 1 | 1 | Begin | EN3-1-1 6.2.8 | (6.30) | 0.610 | 143 | |
| V21 | 1 | 4 | 1 | 1 | Begin | EN3-1-1 6.2.8 | (6.30) | 0.610 | 143 | |
| **8** | | | | | | | | | | |
| V22 | 1 | 4 | 1 | 1 | Einde | EN3-1-1 6.2.8 | (6.30) | 0.605 | 142 | 3,19 |
| V23 | 1 | 4 | 1 | 1 | Begin | EN3-1-1 6.2.8 | (6.30) | 0.605 | 142 | 3,19 |
| V24 | 1 | 4 | 1 | 1 | Begin | EN3-1-1 6.2.8 | (6.30) | 0.605 | 142 | 3,19 |
| **9** | | | | | | | | | | |
| V25 | 2 | 3 | 1 | 1 | My-max | EN3-1-1 6.2.8 | (6.29) | 0.160 | 38 | |
| V26 | 2 | 1 | 1 | 1 | Einde | EN3-1-1 6.2.8 | (6.29) | 0.081 | 19 | |
| V27 | 2 | 1 | 1 | 1 | My-max | EN3-1-1 6.2.8 | (6.29) | 0.141 | 33 | |
| V28 | 2 | 1 | 1 | 1 | Einde | EN3-1-1 6.2.8 | (6.29) | 0.203 | 48 | |
| V29 | 2 | 1 | 1 | 1 | My-max | EN3-1-1 6.2.8 | (6.29) | 0.291 | 68 | |
| V30 | 2 | 3 | 1 | 1 | Einde | EN3-1-1 6.2.8 | (6.29) | 0.320 | 75 | |
| V31 | 2 | 1 | 1 | 1 | My-max | EN3-1-1 6.2.8 | (6.29) | 0.476 | 112 | |
| **10** | | | | | | | | | | |
| V32 | 2 | 4 | 1 | 1 | My-max | EN3-1-1 6.2.8 | (6.29) | 0.472 | 111 | |
| V33 | 2 | 4 | 1 | 1 | Einde | EN3-1-1 6.2.8 | (6.29) | 0.232 | 55 | |
| V34 | 2 | 4 | 1 | 1 | My-max | EN3-1-1 6.2.8 | (6.29) | 0.451 | 106 | |
| V35 | 2 | 4 | 1 | 1 | Einde | EN3-1-1 6.2.8 | (6.29) | 0.723 | 170 | |
| V36 | 2 | 4 | 1 | 1 | My-max | EN3-1-1 6.2.8 | (6.29) | 0.918 | 216 | |
| V37 | 2 | 4 | 1 | 1 | Einde | EN3-1-1 6.2.8 | (6.29) | *1.151* | *271* | |
| V38 | 2 | 4 | 1 | 1 | My-max | EN3-1-1 6.2.8 | (6.29) | *1.394* | *328* | |
| **11** | | | | | | | | | | |
| V39 | 2 | 3 | 1 | 1 | My-max | EN3-1-1 6.2.8 | (6.29) | 0.160 | 38 | |
| V40 | 2 | 1 | 1 | 1 | Einde | EN3-1-1 6.2.8 | (6.29) | 0.081 | 19 | |
| V41 | 2 | 1 | 1 | 1 | My-max | EN3-1-1 6.2.8 | (6.29) | 0.141 | 33 | |
| V42 | 2 | 1 | 1 | 1 | Einde | EN3-1-1 6.2.8 | (6.29) | 0.203 | 48 | |
| V43 | 2 | 1 | 1 | 1 | My-max | EN3-1-1 6.2.8 | (6.29) | 0.291 | 68 | |
| V44 | 2 | 3 | 1 | 1 | Einde | EN3-1-1 6.2.8 | (6.29) | 0.320 | 75 | |

## TOETSING SPANNINGEN

| Staaf nr. | Mat | BC | Sit | Kl | Plaats | Norm | Artikel | Formule | Hoogste toetsing U.C. | [N/mm$^2$] | Opm. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| V45 | 2 | 1 | 1 | 1 | My-max | EN3-1-1 | 6.2.8 | (6.29) | 0.476 | 112 | |

Opmerkingen:
**[ 3] Als ongest. lengte voor wringing is de syst.lengte-Y aangehouden.**
[ 19] Toetsing volgens vloeikriterium geschiedt als ware het een klasse 3 profiel.

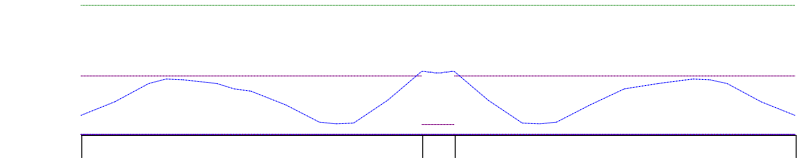
## TOETSING DOORBUIGING

| Staaf | Soort | Mtg | Lengte [m] | Overst I | Overst J | Zeeg [mm] | $u_{tot}$ [mm] | BC | Sit | u [mm] | Toelaatbaar [mm] | *l |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **1** | | | | | | | | | | | | |
| V1 | Vloer | db | 5.25 | N | N | 0.0 | -9.5 | 7 | 1 Eind | -9.5 | ±21.0 | 0.004 |
| | | db | | | | | | 7 | 1 Bijk | -4.5 | ±15.8 | 0.003 |
| V2 | Vloer | db | 0.50 | N | N | 0.0 | 0.2 | 7 | 1 Eind | 0.2 | ±2.0 | 0.004 |
| | | db | | | | | | 7 | 1 Bijk | 0.1 | ±1.5 | 0.003 |
| V3 | Vloer | db | 5.25 | N | N | 0.0 | -9.5 | 7 | 1 Eind | -9.5 | ±21.0 | 0.004 |
| | | db | | | | | | 7 | 1 Bijk | -4.5 | ±15.8 | 0.003 |
| **2** | | | | | | | | | | | | |
| V4 | Vloer | db | 5.25 | N | N | 0.0 | -9.9 | 7 | 1 Eind | -9.9 | ±21.0 | 0.004 |
| | | db | | | | | | 7 | 1 Bijk | -4.6 | ±15.8 | 0.003 |
| V5 | Vloer | db | 0.50 | N | N | 0.0 | 0.2 | 7 | 1 Eind | 0.2 | ±2.0 | 0.004 |
| | | db | | | | | | 7 | 1 Bijk | 0.1 | ±1.5 | 0.003 |
| V6 | Vloer | db | 5.25 | N | N | 0.0 | -9.9 | 7 | 1 Eind | -9.9 | ±21.0 | 0.004 |
| | | db | | | | | | 7 | 1 Bijk | -4.6 | ±15.8 | 0.003 |
| **3** | | | | | | | | | | | | |
| V7 | Vloer | db | 5.25 | N | N | 0.0 | -9.9 | 7 | 1 Eind | -9.9 | ±21.0 | 0.004 |
| | | db | | | | | | 7 | 1 Bijk | -4.6 | ±15.8 | 0.003 |
| V8 | Vloer | db | 0.50 | N | N | 0.0 | 0.2 | 7 | 1 Eind | 0.2 | ±2.0 | 0.004 |
| | | db | | | | | | 7 | 1 Bijk | 0.1 | ±1.5 | 0.003 |
| V9 | Vloer | db | 5.25 | N | N | 0.0 | -9.9 | 7 | 1 Eind | -9.9 | ±21.0 | 0.004 |
| | | db | | | | | | 7 | 1 Bijk | -4.6 | ±15.8 | 0.003 |
| **4** | | | | | | | | | | | | |
| V10 | Vloer | db | 5.25 | N | N | 0.0 | -10.4 | 7 | 1 Eind | -10.4 | ±21.0 | 0.004 |
| | | db | | | | | | 7 | 1 Bijk | -4.5 | ±15.8 | 0.003 |
| V11 | Vloer | db | 0.50 | N | N | 0.0 | 0.2 | 7 | 1 Eind | 0.2 | ±2.0 | 0.004 |
| | | db | | | | | | 7 | 1 Bijk | 0.1 | ±1.5 | 0.003 |
| V12 | Vloer | db | 5.25 | N | N | 0.0 | -10.4 | 7 | 1 Eind | -10.4 | ±21.0 | 0.004 |
| | | db | | | | | | 7 | 1 Bijk | -4.5 | ±15.8 | 0.003 |
| **5** | | | | | | | | | | | | |
| V13 | Vloer | db | 5.25 | N | N | 0.0 | -11.2 | 7 | 1 Eind | -11.2 | ±21.0 | 0.004 |
| | | db | | | | | | 7 | 1 Bijk | -4.5 | ±15.8 | 0.003 |
| V14 | Vloer | db | 0.50 | N | N | 0.0 | 0.2 | 7 | 1 Eind | 0.2 | ±2.0 | 0.004 |
| | | db | | | | | | 7 | 1 Bijk | 0.1 | ±1.5 | 0.003 |
| V15 | Vloer | db | 5.25 | N | N | 0.0 | -11.2 | 7 | 1 Eind | -11.2 | ±21.0 | 0.004 |
| | | db | | | | | | 7 | 1 Bijk | -4.5 | ±15.8 | 0.003 |
| **6** | | | | | | | | | | | | |
| V16 | Vloer | db | 5.25 | N | N | 0.0 | -11.3 | 7 | 1 Eind | -11.3 | ±21.0 | 0.004 |
| | | db | | | | | | 7 | 1 Bijk | -4.5 | ±15.8 | 0.003 |
| V17 | Vloer | db | 0.50 | N | N | 0.0 | 0.2 | 7 | 1 Eind | 0.2 | ±2.0 | 0.004 |
| | | db | | | | | | 7 | 1 Bijk | 0.1 | ±1.5 | 0.003 |
| V18 | Vloer | db | 5.25 | N | N | 0.0 | -11.3 | 7 | 1 Eind | -11.3 | ±21.0 | 0.004 |
| | | db | | | | | | 7 | 1 Bijk | -4.5 | ±15.8 | 0.003 |
| **7** | | | | | | | | | | | | |
| V19 | Vloer | db | 5.25 | N | N | 0.0 | -12.8 | 7 | 1 Eind | -12.8 | ±21.0 | 0.004 |
| | | db | | | | | | 7 | 1 Bijk | -4.5 | ±15.8 | 0.003 |
| V20 | Vloer | db | 0.50 | N | N | 0.0 | 0.2 | 7 | 1 Eind | 0.2 | ±2.0 | 0.004 |
| | | db | | | | | | 7 | 1 Bijk | 0.1 | ±1.5 | 0.003 |
| V21 | Vloer | db | 5.25 | N | N | 0.0 | -12.8 | 7 | 1 Eind | -12.8 | ±21.0 | 0.004 |
| | | db | | | | | | 7 | 1 Bijk | -4.5 | ±15.8 | 0.003 |

## TOETSING DOORBUIGING

| Staaf | Soort | Mtg | Lengte [m] | Overst I | Overst J | Zeeg [mm] | $u_{tot}$ [mm] | BC | Sit | | u [mm] | Toelaatbaar [mm] | Toelaatbaar *l |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **8** | | | | | | | | | | | | | |
| V22 | Vloer | db | 5.25 | N | N | 0.0 | -11.6 | 7 | 1 | Eind | -11.6 | ±21.0 | 0.004 |
| | | db | | | | | | 7 | 1 | Bijk | -5.5 | ±15.8 | 0.003 |
| V23 | Vloer | db | 0.50 | N | N | 0.0 | 0.2 | 7 | 1 | Eind | 0.2 | ±2.0 | 0.004 |
| | | db | | | | | | 7 | 1 | Bijk | 0.1 | ±1.5 | 0.003 |
| V24 | Vloer | db | 5.25 | N | N | 0.0 | -11.6 | 7 | 1 | Eind | -11.6 | ±21.0 | 0.004 |
| | | db | | | | | | 7 | 1 | Bijk | -5.5 | ±15.8 | 0.003 |
| **9** | | | | | | | | | | | | | |
| V25 | Vloer | db | 3.00 | N | N | 0.0 | -2.6 | 7 | 1 | Eind | -2.6 | ±12.0 | 0.004 |
| | | db | | | | | | 7 | 1 | Bijk | -0.6 | ±9.0 | 0.003 |
| V26 | Vloer | db | 1.40 | N | N | 0.0 | 0.4 | 7 | 1 | Eind | 0.4 | ±5.6 | 0.004 |
| | | db | | | | | | 7 | 1 | Bijk | -0.0 | ±4.2 | 0.003 |
| V27 | Vloer | db | 3.00 | N | N | 0.0 | -2.1 | 7 | 1 | Eind | -2.1 | ±12.0 | 0.004 |
| | | db | | | | | | 7 | 1 | Bijk | 0.2 | ±9.0 | 0.003 |
| V28 | Vloer | db | 1.40 | N | N | 0.0 | -1.0 | 7 | 1 | Eind | -1.0 | ±5.6 | 0.004 |
| | | db | | | | | | 7 | 1 | Bijk | -0.0 | ±4.2 | 0.003 |
| V29 | Vloer | db | 3.00 | N | N | 0.0 | -5.2 | 7 | 1 | Eind | -5.2 | ±12.0 | 0.004 |
| | | db | | | | | | 7 | 1 | Bijk | 0.0 | ±9.0 | 0.003 |
| V30 | Vloer | db | 1.40 | N | N | 0.0 | -1.9 | 7 | 1 | Eind | -1.9 | ±5.6 | 0.004 |
| | | db | | | | | | 7 | 1 | Bijk | -0.2 | ±4.2 | 0.003 |
| V31 | Vloer | db | 3.00 | N | N | 0.0 | -9.6 | 7 | 1 | Eind | -9.6 | ±12.0 | 0.004 |
| | | db | | | | | | 7 | 1 | Bijk | 0.5 | ±9.0 | 0.003 |
| **10** | | | | | | | | | | | | | |
| V32 | Vloer | db | 3.00 | N | N | 0.0 | -7.4 | 7 | 1 | Eind | -7.4 | ±12.0 | 0.004 |
| | | db | | | | | | 7 | 1 | Bijk | -4.2 | ±9.0 | 0.003 |
| V33 | Vloer | db | 1.40 | N | N | 0.0 | 1.4 | 7 | 1 | Eind | 1.4 | ±5.6 | 0.004 |
| | | db | | | | | | 7 | 1 | Bijk | 0.8 | ±4.2 | 0.003 |
| V34 | Vloer | db | 3.00 | N | N | 0.0 | -7.0 | 7 | 1 | Eind | -7.0 | ±12.0 | 0.004 |
| | | db | | | | | | 7 | 1 | Bijk | -4.0 | ±9.0 | 0.003 |
| V35 | Vloer | db | 1.40 | N | N | 0.0 | 3.0 | 7 | 1 | Eind | 3.0 | ±5.6 | 0.004 |
| | | db | | | | | | 7 | 1 | Bijk | 1.7 | ±4.2 | 0.003 |
| V36 | Vloer | db | 3.00 | N | N | 0.0 | -16.5 | 7 | *1* | *Eind* | *-16.5* | *±12.0* | *0.004* |
| | | db | | | | | | 7 | *1* | *Bijk* | *-9.6* | *±9.0* | *0.003* |
| V37 | Vloer | db | 1.40 | N | N | 0.0 | 5.4 | 7 | 1 | Eind | 5.4 | ±5.6 | 0.004 |
| | | db | | | | | | 7 | 1 | Bijk | 3.1 | ±4.2 | 0.003 |
| V38 | Vloer | db | 3.00 | N | N | 0.0 | -26.8 | 7 | *1* | *Eind* | *-26.8* | *±12.0* | *0.004* |
| | | db | | | | | | 7 | *1* | *Bijk* | *-15.6* | *±9.0* | *0.003* |
| **11** | | | | | | | | | | | | | |
| V39 | Vloer | db | 3.00 | N | N | 0.0 | -2.6 | 7 | 1 | Eind | -2.6 | ±12.0 | 0.004 |
| | | db | | | | | | 7 | 1 | Bijk | -0.6 | ±9.0 | 0.003 |
| V40 | Vloer | db | 1.40 | N | N | 0.0 | 0.4 | 7 | 1 | Eind | 0.4 | ±5.6 | 0.004 |
| | | db | | | | | | 7 | 1 | Bijk | -0.0 | ±4.2 | 0.003 |
| V41 | Vloer | db | 3.00 | N | N | 0.0 | -2.1 | 7 | 1 | Eind | -2.1 | ±12.0 | 0.004 |
| | | db | | | | | | 7 | 1 | Bijk | 0.2 | ±9.0 | 0.003 |
| V42 | Vloer | db | 1.40 | N | N | 0.0 | -1.0 | 7 | 1 | Eind | -1.0 | ±5.6 | 0.004 |
| | | db | | | | | | 7 | 1 | Bijk | -0.0 | ±4.2 | 0.003 |
| V43 | Vloer | db | 3.00 | N | N | 0.0 | -5.2 | 7 | 1 | Eind | -5.2 | ±12.0 | 0.004 |
| | | db | | | | | | 7 | 1 | Bijk | 0.0 | ±9.0 | 0.003 |
| V44 | Vloer | db | 1.40 | N | N | 0.0 | -1.9 | 7 | 1 | Eind | -1.9 | ±5.6 | 0.004 |
| | | db | | | | | | 7 | 1 | Bijk | -0.2 | ±4.2 | 0.003 |
| V45 | Vloer | db | 3.00 | N | N | 0.0 | -9.6 | 7 | 1 | Eind | -9.6 | ±12.0 | 0.004 |
| | | db | | | | | | 7 | 1 | Bijk | 0.5 | ±9.0 | 0.003 |

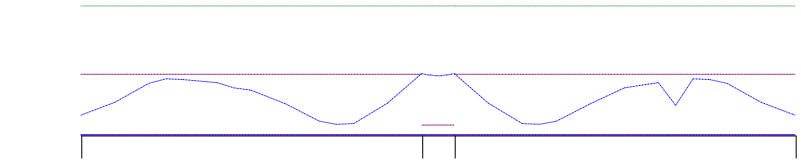
## UNITY-CHECK'S 1 OMHULLENDE VAN ALLES



Toelaatbare unity-check (1.0)
Hoogste unity-check i.v.m. doorsnedecontrole
Hoogste unity-check i.v.m. doorbuiging

## UNITY-CHECK'S 2 OMHULLENDE VAN ALLES

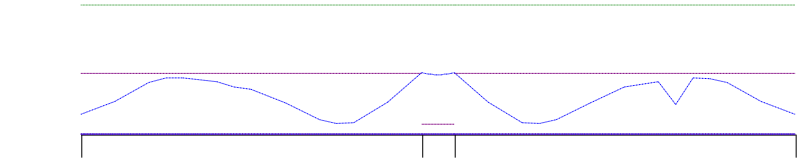
Velden: 4 t/m 6



Toelaatbare unity-check (1.0)
Hoogste unity-check i.v.m. doorsnedecontrole
Hoogste unity-check i.v.m. doorbuiging

## UNITY-CHECK'S 3 OMHULLENDE VAN ALLES

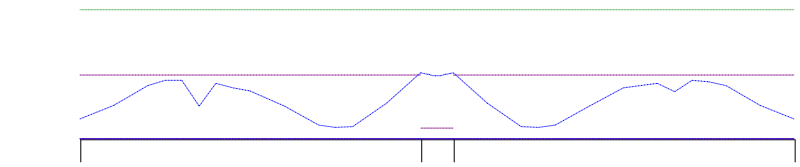
Velden: 7 t/m 9



Toelaatbare unity-check (1.0)
Hoogste unity-check i.v.m. doorsnedecontrole
Hoogste unity-check i.v.m. doorbuiging

**UNITY-CHECK'S** 4 OMHULLENDE VAN ALLES

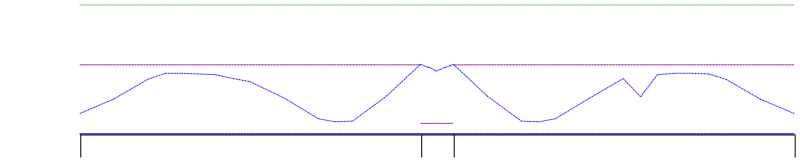
Velden: 10 t/m 12



Toelaatbare unity-check (1.0)
Hoogste unity-check i.v.m. doorsnedecontrole
Hoogste unity-check i.v.m. doorbuiging

**UNITY-CHECK'S** 5 OMHULLENDE VAN ALLES

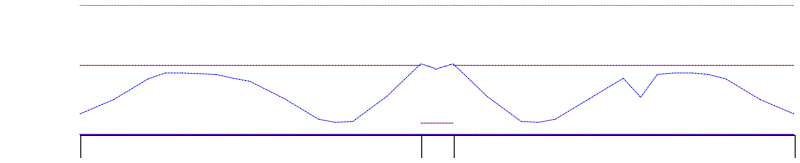
Velden: 13 t/m 15



Toelaatbare unity-check (1.0)
Hoogste unity-check i.v.m. doorsnedecontrole
Hoogste unity-check i.v.m. doorbuiging

**UNITY-CHECK'S** 6 OMHULLENDE VAN ALLES

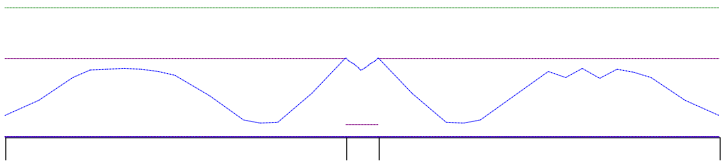
Velden: 16 t/m 18



Toelaatbare unity-check (1.0)
Hoogste unity-check i.v.m. doorsnedecontrole
Hoogste unity-check i.v.m. doorbuiging

**UNITY-CHECK'S** 7 OMHULLENDE VAN ALLES

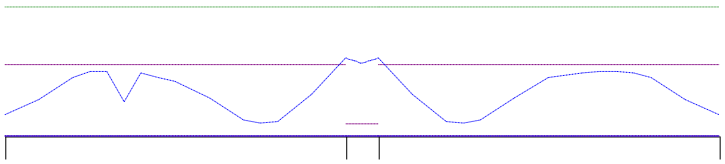
Velden: 19 t/m 21



Toelaatbare unity-check (1.0)
Hoogste unity-check i.v.m. doorsnedecontrole
Hoogste unity-check i.v.m. doorbuiging

**UNITY-CHECK'S** 8 OMHULLENDE VAN ALLES

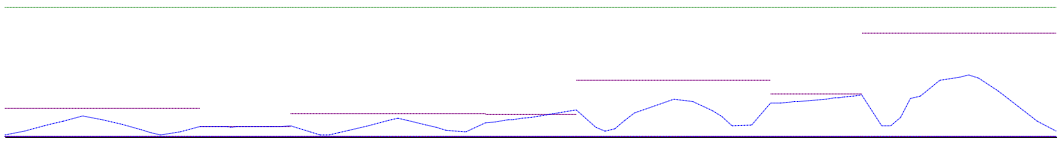
Velden: 22 t/m 24



Toelaatbare unity-check (1.0)
Hoogste unity-check i.v.m. doorsnedecontrole
Hoogste unity-check i.v.m. doorbuiging

**UNITY-CHECK'S** 9 OMHULLENDE VAN ALLES

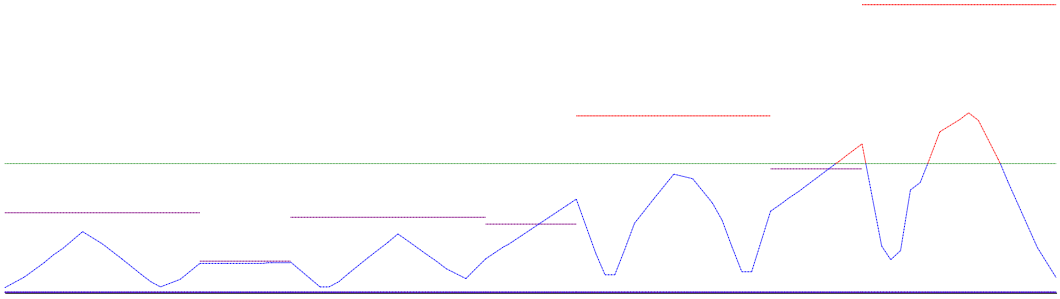
Velden: 25 t/m 31



Toelaatbare unity-check (1.0)
Hoogste unity-check i.v.m. doorsnedecontrole
Hoogste unity-check i.v.m. doorbuiging

**UNITY-CHECK'S** 10 OMHULLENDE VAN ALLES

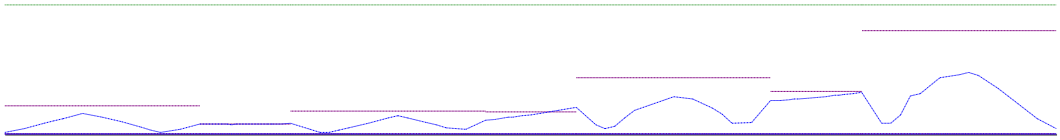
Velden: 32 t/m 38



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

**UNITY-CHECK'S** 11 OMHULLENDE VAN ALLES

Velden: 39 t/m 45



Toelaatbare unity-check (1.0)
Hoogste unity-check i.v.m. doorsnedecontrole
Hoogste unity-check i.v.m. doorbuiging

## 6.2. 103-104-105

**TS/Balkroosters** **Rel: 6.03 23 jun 2016**

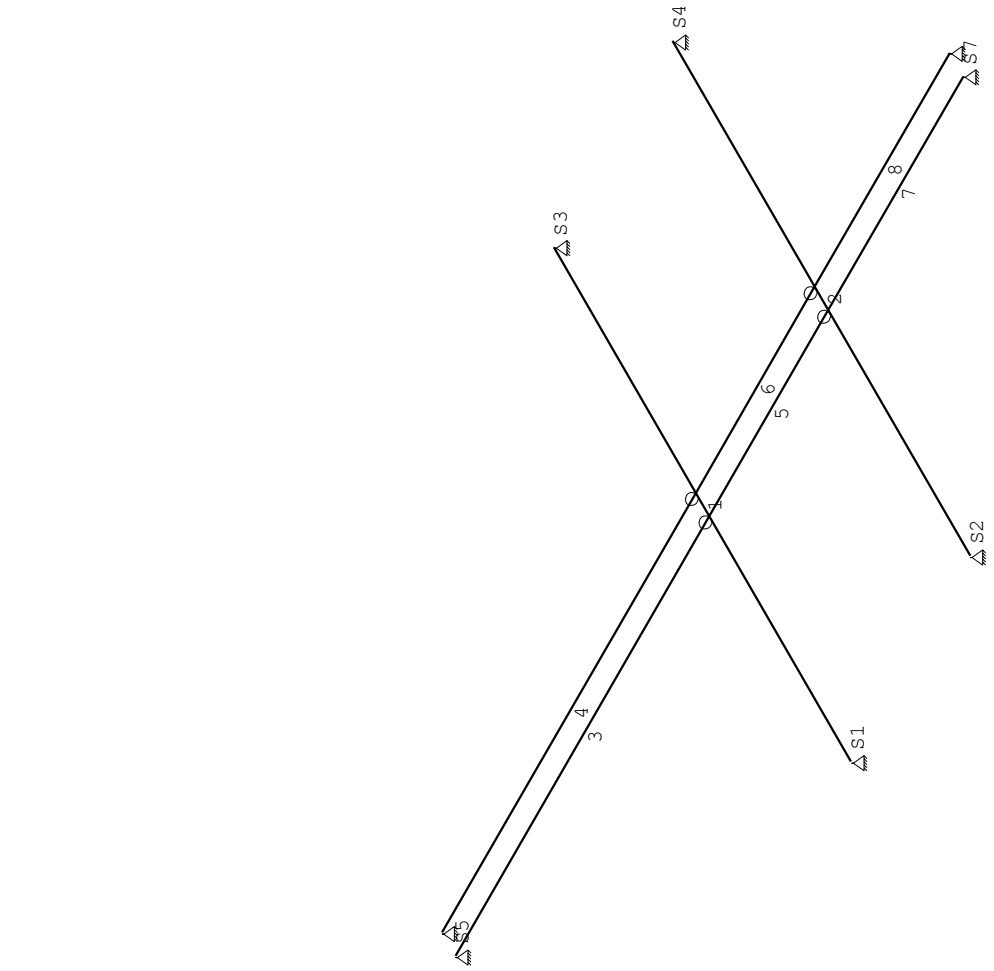
```
Project..: 14132
Onderdeel:
Dimensies: kN/m/rad
Datum....: 07/03/2016
Bestand..: x:\ing.buro\14100 tm 14199\14132\bouwconstructie\besteksfase\
           berekeningen\zaal 2 103-104-105.grw
Torsiefac: 10 %

Betrouwbaarheidsklasse       : 2       Referentieperiode          : 50
```

**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) |
| Staal | NEN-EN 1993-1-1:2006 | C2:2009 | NB:2011(nl) |

## GEOMETRIE




## MATERIALEN

| Mt | Omschrijving | E-modulus[N/mm2] | S.M. | Pois. | Uitz. coëff |
|---|---|---|---|---|---|
| 1 | S235 | 210000 | 78.5 | 0.30 | 1.2000e-005 |

## PROFIELEN [mm]

| Prof. | Omschrijving | Materiaal | Oppervlak | Torsietr. | Traagheid | Vormf. |
|---|---|---|---|---|---|---|
| 1 | HEA400 | 1:S235 | 1.590e+004 | 1.932e+006 | 4.507e+008 | 0.00 |
| 2 | HEA400 | 1:S235 | 1.590e+004 | 1.932e+006 | 4.507e+008 | 0.00 |
| 3 | HEB400 | 1:S235 | 1.978e+004 | 3.610e+006 | 5.768e+008 | 0.00 |
| 4 | HEA200 | 1:S235 | 5.380e+003 | 2.105e+005 | 3.692e+007 | 0.00 |
| 5 | HEA260 | 1:S235 | 8.680e+003 | 5.420e+005 | 1.046e+008 | 0.00 |

## PROFIELEN vervolg [mm]

| Prof. | Staaftype | Breedte | Hoogte | Zs | Rek.As | Type | b1 | h1 | b2 | h2 |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0:Normaal | 300 | 390 | 195 | 0.00 | | | | | |
| 2 | 0:Normaal | 300 | 390 | 195 | 0.00 | | | | | |
| 3 | 0:Normaal | 300 | 400 | 200 | 0.00 | | | | | |
| 4 | 0:Normaal | 200 | 190 | 95 | 0.00 | | | | | |
| 5 | 0:Normaal | 260 | 250 | 125 | 0.00 | | | | | |

## PROFIELVORMEN [mm]

1 HEA400



2 HEA400



3 HEB400



4 HEA200



5 HEA260



## KNOPEN

| Knoop | X | Z | Knoop | X | Z |
|---|---|---|---|---|---|
| 1 | 8.400 | 0.000 | 6 | 17.800 | 5.250 |
| 2 | 12.800 | 0.000 | 7 | 8.400 | 11.000 |
| 3 | -1.000 | 5.250 | 8 | 12.800 | 11.000 |
| 4 | 8.400 | 5.250 | 9 | -1.000 | 5.750 |
| 5 | 12.800 | 5.250 | 10 | 8.400 | 5.750 |
| 11 | 12.800 | 5.750 | | | |
| 12 | 17.800 | 5.750 | | | |

## BALKEN

| Nr. | Naam | Begin | Eind | Profiel |
|---|---|---|---|---|
| 1 | 1 | 1 | 7 | 3:HEB400 |
| 2 | 2 | 2 | 8 | 1:HEA400 |
| 3 | 3 | 3 | 4 | 2:HEA400 |
| 4 | 4 | 9 | 10 | 2:HEA400 |
| 5 | 5 | 4 | 5 | 4:HEA200 |
| 6 | 6 | 10 | 11 | 4:HEA200 |
| 7 | 7 | 5 | 6 | 5:HEA260 |
| 8 | 8 | 11 | 12 | 5:HEA260 |

## BALKEN vervolg

| Nr. | Naam | Aansl.begin | Aansl.eind | Excentr. | Pasm.begin | Pasm.eind | Opm. |
|---|---|---|---|---|---|---|---|
| 1 | 1 | WDM | WDM | 0.000 | 0.000 | 0.000 | |
| 2 | 2 | WDM | WDM | 0.000 | 0.000 | 0.000 | |
| 3 | 3 | WDM | WD | 0.000 | 0.000 | 0.000 | |
| 4 | 4 | WDM | WD | 0.000 | 0.000 | 0.000 | |
| 5 | 5 | WDM | WD | 0.000 | 0.000 | 0.000 | |
| 6 | 6 | WDM | WD | 0.000 | 0.000 | 0.000 | |
| 7 | 7 | WDM | WDM | 0.000 | 0.000 | 0.000 | |
| 8 | 8 | WDM | WDM | 0.000 | 0.000 | 0.000 | |

Opmerkingen:
De torsie traagheid van alle balken is tot 10% gereduceerd

## STEUNPUNTTYPEN

Nr. : 1 Rx:Vrij Z:Vast Ry:Vrij
Afmeting : 0*0
Inheiniv.: 0
Afhakniv.: 0
Min.afst.: 0.150

## STEUNPUNTEN

| Nr. | Steunpunttype | Balk | Positie | Excentr. | Opm: |
|---|---|---|---|---|---|
| 1 | 1:0*0 | 1 | 0.000 | 0.000 | |
| 2 | 1:0*0 | 2 | 0.000 | 0.000 | |
| 3 | 1:0*0 | 1 | 11.000 | 0.000 | |
| 4 | 1:0*0 | 2 | 11.000 | 0.000 | |
| 5 | 1:0*0 | 3 | 0.000 | 0.000 | |
| 6 | 1:0*0 | 4 | 0.000 | 0.000 | |
| 7 | 1:0*0 | 7 | 5.000 | 0.000 | |
| 8 | 1:0*0 | 8 | 5.000 | 0.000 | |

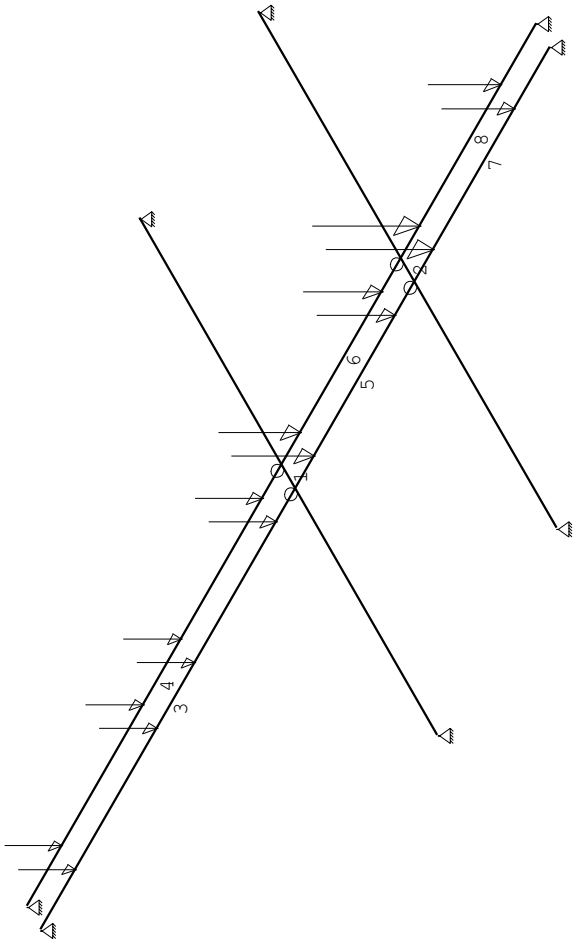
## BELASTINGGEVALLEN

| B.G. | Omschrijving | Belast/onbelast | $\psi_0$ | $\psi_1$ | $\psi_2$ | e.g. |
|---|---|---|---|---|---|---|
| 1 | Permanent | 2:Permanent EN1991 | | | | -1.00 |
| 2 | Veranderlijk | 0:Alles tegelijk | 0.50 | 0.50 | 0.30 | 0.00 |

## BELASTINGGEVALLEN

| B.G. | Omschrijving | Type |
|---|---|---|
| 1 | Permanent | 1 Permanente belasting |
| 2 | Veranderlijk | 2 Ver. bel. pers. ed. (p_rep) |

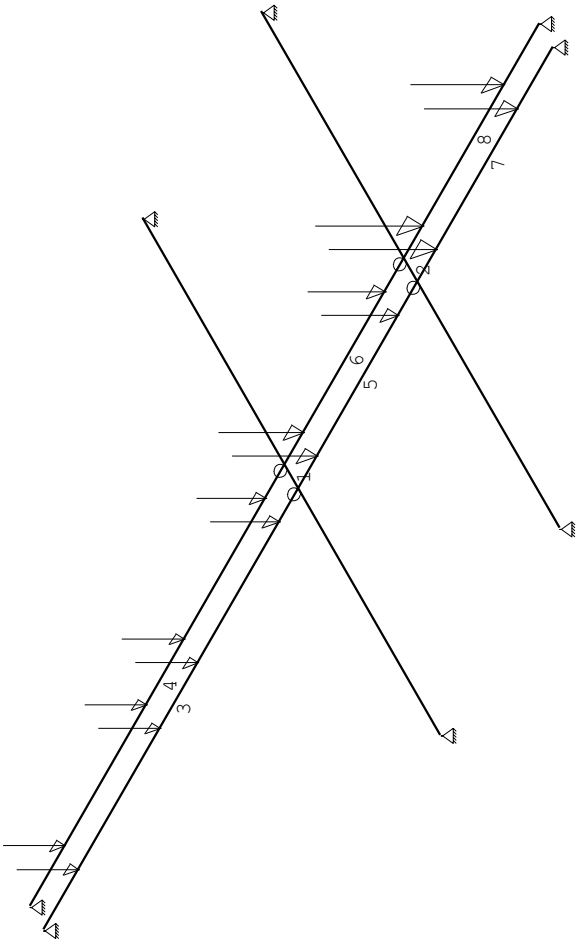
**VELDBELASTINGEN** B.G:1 Permanent




**VELDBELASTINGEN** B.G:1 Permanent

| Balk | Last | Type | q1/p/m | q2 | Afstand | Lengte | Exc. |
|---|---|---|---|---|---|---|---|
| 3 | 1 | 8:Puntlast | -8.200 | | 1.300 | | 0.000 |
| 3 | 2 | 8:Puntlast | -8.300 | | 4.300 | | 0.000 |
| 3 | 3 | 8:Puntlast | -8.300 | | 5.700 | | 0.000 |
| 3 | 4 | 8:Puntlast | -9.600 | | 8.700 | | 0.000 |
| 4 | 1 | 8:Puntlast | -8.200 | | 1.300 | | 0.000 |
| 4 | 2 | 8:Puntlast | -8.300 | | 4.300 | | 0.000 |
| 4 | 3 | 8:Puntlast | -8.300 | | 5.700 | | 0.000 |
| 4 | 4 | 8:Puntlast | -9.600 | | 8.700 | | 0.000 |
| 5 | 1 | 8:Puntlast | -11.700 | | 0.700 | | 0.000 |
| 5 | 2 | 8:Puntlast | -11.200 | | 3.700 | | 0.000 |
| 6 | 1 | 8:Puntlast | -11.700 | | 0.700 | | 0.000 |
| 6 | 2 | 8:Puntlast | -11.200 | | 3.700 | | 0.000 |
| 7 | 1 | 8:Puntlast | -15.200 | | 0.700 | | 0.000 |
| 7 | 2 | 8:Puntlast | -10.400 | | 3.700 | | 0.000 |
| 8 | 1 | 8:Puntlast | -15.200 | | 0.700 | | 0.000 |
| 8 | 2 | 8:Puntlast | -10.400 | | 3.700 | | 0.000 |

**VELDBELASTINGEN** B.G:2 Veranderlijk




**VELDBELASTINGEN** B.G:2 Veranderlijk

| Balk | Last | Type | q1/p/m | q2 | Afstand | Lengte | Exc. |
|---|---|---|---|---|---|---|---|
| 3 | 1 | 8:Puntlast | -7.300 | | 1.300 | | 0.000 |
| 3 | 2 | 8:Puntlast | -7.200 | | 4.300 | | 0.000 |
| 3 | 3 | 8:Puntlast | -7.300 | | 5.700 | | 0.000 |
| 3 | 4 | 8:Puntlast | -8.100 | | 8.700 | | 0.000 |
| 4 | 1 | 8:Puntlast | -7.300 | | 1.300 | | 0.000 |
| 4 | 2 | 8:Puntlast | -7.200 | | 4.300 | | 0.000 |
| 4 | 3 | 8:Puntlast | -7.300 | | 5.700 | | 0.000 |
| 4 | 4 | 8:Puntlast | -8.100 | | 8.700 | | 0.000 |
| 5 | 1 | 8:Puntlast | -9.900 | | 0.700 | | 0.000 |
| 5 | 2 | 8:Puntlast | -9.000 | | 3.700 | | 0.000 |
| 6 | 1 | 8:Puntlast | -9.900 | | 0.700 | | 0.000 |
| 6 | 2 | 8:Puntlast | -9.000 | | 3.700 | | 0.000 |
| 7 | 1 | 8:Puntlast | -12.500 | | 0.700 | | 0.000 |
| 7 | 2 | 8:Puntlast | -10.900 | | 3.700 | | 0.000 |
| 8 | 1 | 8:Puntlast | -12.500 | | 0.700 | | 0.000 |
| 8 | 2 | 8:Puntlast | -10.900 | | 3.700 | | 0.000 |

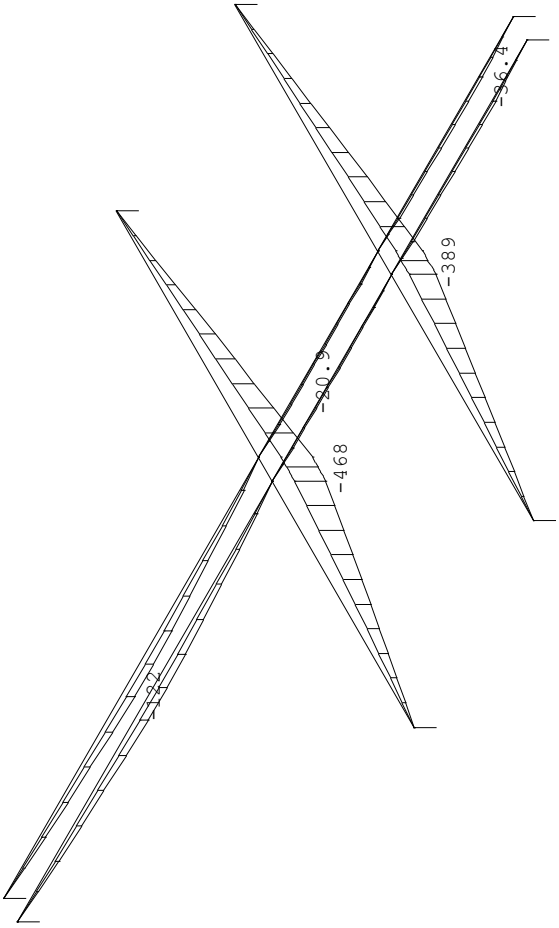


**BELASTINGCOMBINATIES**

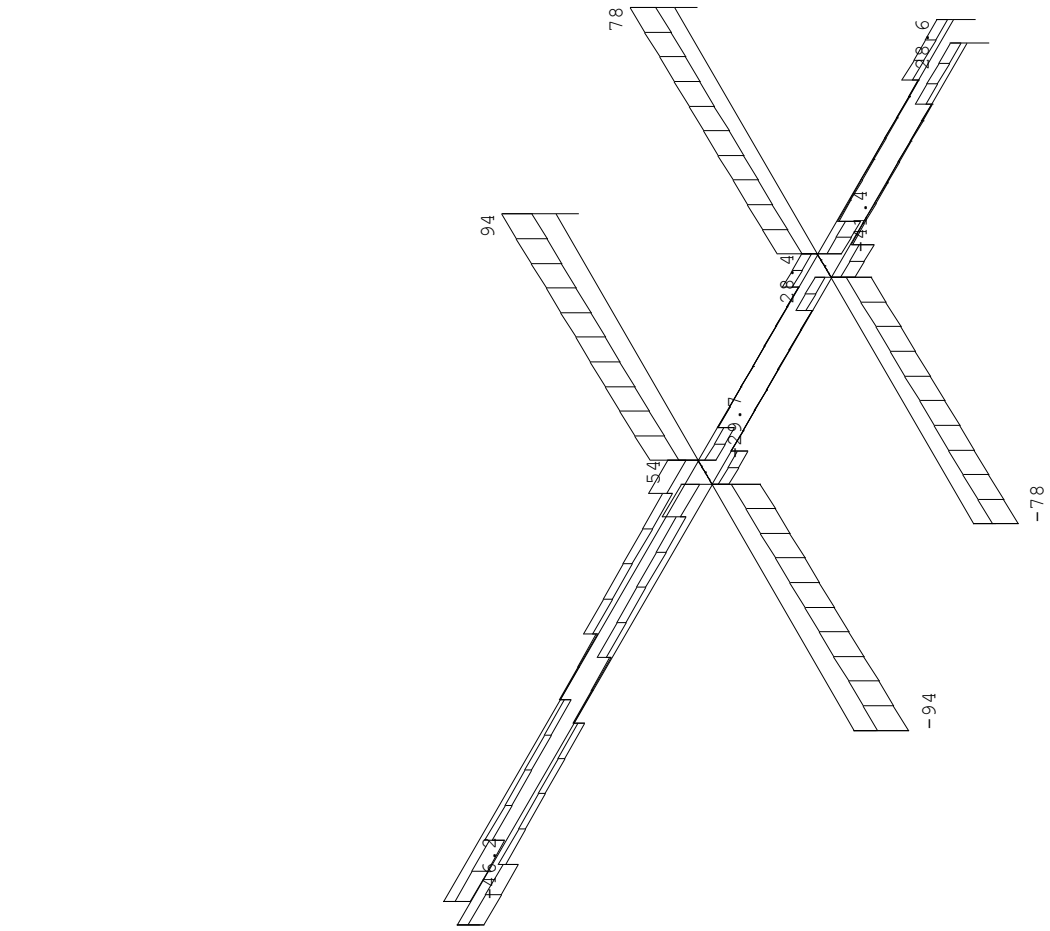
| BC | Type | BG | Gen. | Factor | BG | Gen. | Factor | BG | Gen. | Factor | BG | Gen. | Factor |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Fund. | 1 | Perm | 1.35 | | | | | | | | | |
| 2 | Fund. | 1 | Perm | 0.90 | | | | | | | | | |
| 3 | Fund. | 1 | Perm | 1.35 | 2 | psi0 | 1.50 | | | | | | |
| 4 | Fund. | 1 | Perm | 1.20 | 2 | Extr | 1.50 | | | | | | |
| 5 | Fund. | 1 | Perm | 0.90 | 2 | Extr | 1.50 | | | | | | |
| 6 | Fund. | 1 | Perm | 0.90 | 2 | psi0 | 1.50 | | | | | | |
| 7 | Kar. | 1 | Perm | 1.00 | 2 | Extr | 1.00 | | | | | | |
| 8 | Quas. | 1 | Perm | 1.00 | | | | | | | | | |
| 9 | Quas. | 1 | Perm | 1.00 | 2 | psi2 | 1.00 | | | | | | |
| 10 | Freq. | 1 | Perm | 1.00 | | | | | | | | | |
| 11 | Freq. | 1 | Perm | 1.00 | 2 | psi1 | 1.00 | | | | | | |
| 12 | Blij. | 1 | Perm | 1.00 | | | | | | | | | |

**OMHULLENDE VAN DE FUNDAMENTELE COMBINATIES**

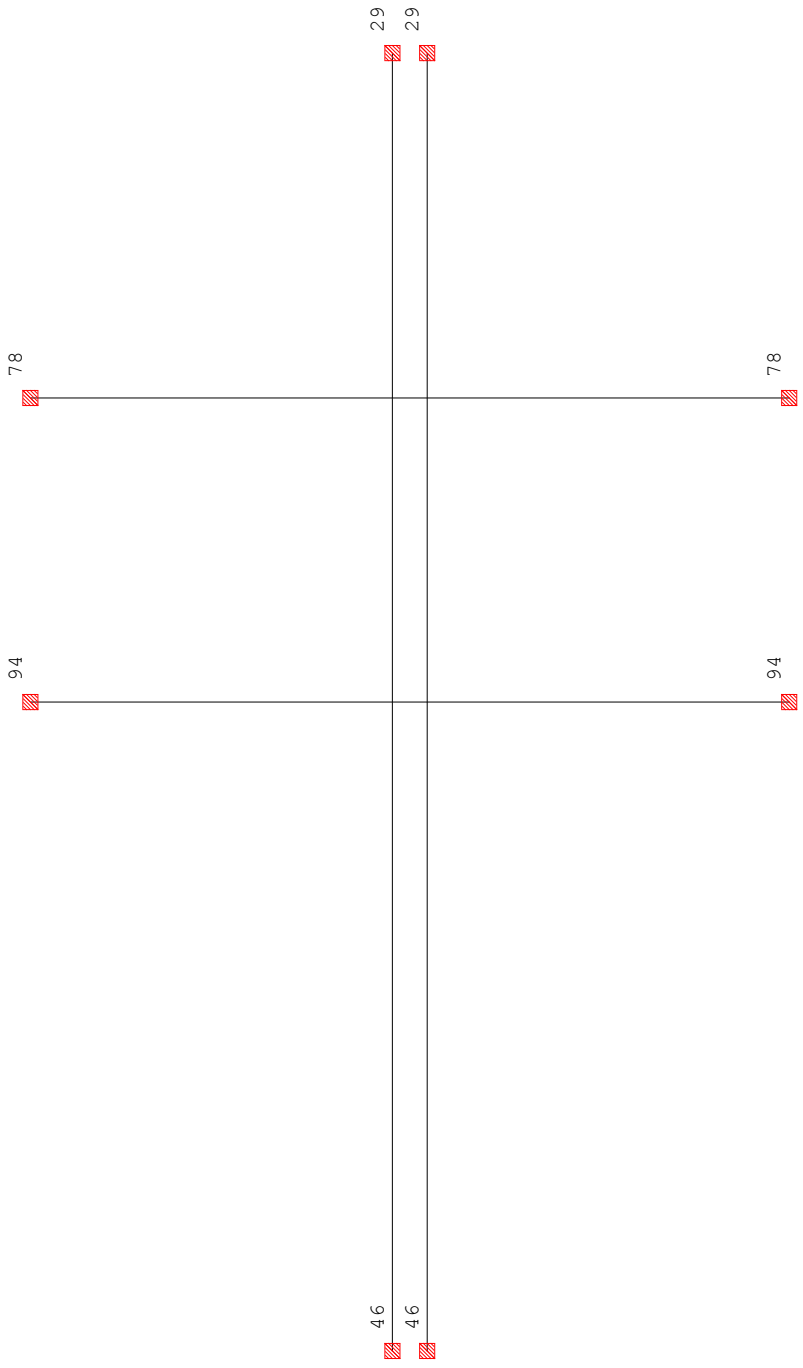
**MOMENTEN** Fundamentele combinatie



**DWARSKRACHTEN** Fundamentele combinatie

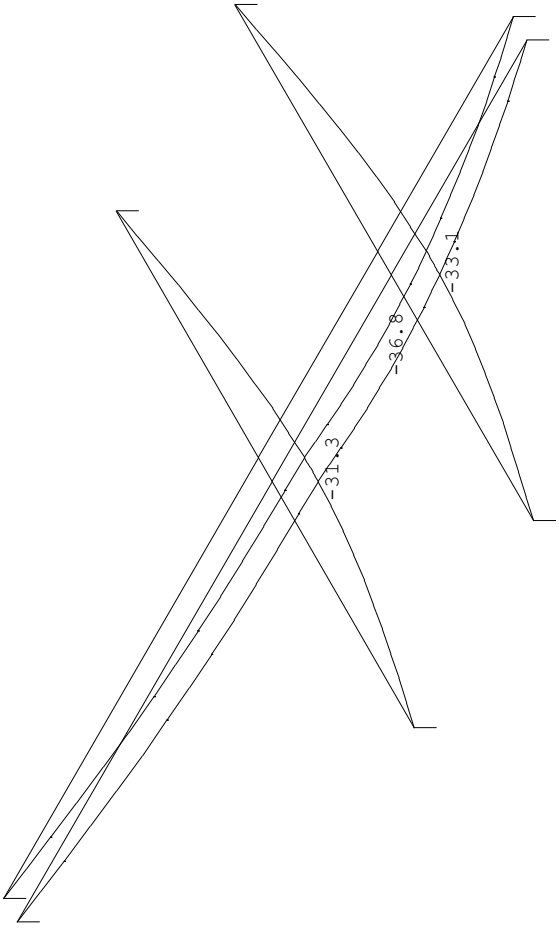


**REACTIES** Fundamentele combinatie



## OMHULLENDE VAN DE KARAKTERISTIEKE COMBINATIES

**VERPLAATSINGEN** [mm] Karakteristieke combinatie



## STAALPROFIELEN - ALGEMENE GEGEVENS

Stabiliteit: Classificatie gehele constructie: Geschoord

### MATERIAAL

| Mat nr. | Profielnaam | Vloeisp. [N/mm$^2$] | Productie methode | Min. drsn. klasse |
|---|---|---|---|---|
| 1 | HEA400 | 235 | Gewalst | 1 |
| 2 | HEA400 | 235 | Gewalst | 1 |
| 3 | HEB400 | 235 | Gewalst | 1 |
| 4 | HEA200 | 235 | Gewalst | 1 |
| 5 | HEA260 | 235 | Gewalst | 1 |

Partiële veiligheidsfactoren:
Gamma M;0 : 1.00 Gamma M;1 : 1.00

### KIPSTABILITEIT

| Staaf | Plts. aangr. | | l gaffel [m] | Kipsteunafstanden [m] |
|---|---|---|---|---|
| **1** | | | | |
| V1 | 1.0*h | boven: | 11.00 | LST=2.750 |
| | | onder: | 11.00 | 11.000 |
| **2** | | | | |
| V2 | 1.0*h | boven: | 11.00 | LST=2.750 |
| | | onder: | 11.00 | 11.000 |
| **3** | | | | |
| V3 | 1.0*h | boven: | 9.40 | LST=2.750 |
| | | onder: | 9.40 | 9.400 |
| **4** | | | | |
| V4 | 1.0*h | boven: | 9.40 | LST=2.750 |
| | | onder: | 9.40 | 9.400 |
| **5** | | | | |
| V5 | 1.0*h | boven: | 4.40 | 4.400 |
| | | onder: | 4.40 | 4.400 |
| **6** | | | | |
| V6 | 1.0*h | boven: | 4.40 | 4.400 |
| | | onder: | 4.40 | 4.400 |
| **7** | | | | |
| V7 | 1.0*h | boven: | 5.00 | LST=2.750 |
| | | onder: | 5.00 | 5 |
| **8** | | | | |
| V8 | 1.0*h | boven: | 5.00 | LST=2.750 |
| | | onder: | 5.00 | 5 |

### TOETSING SPANNINGEN

| Staaf | Mat nr. | BC | Sit | Kl | Plaats | Norm Artikel | Formule | Hoogste toetsing U.C. [N/mm$^2$] | | Opm. |
|---|---|---|---|---|---|---|---|---|---|---|
| **1** | | | | | | | | | | |
| V1 | 3 | 4 | 1 | 1 | My-max | EN3-1-1 6.2.5 | (6.12y) | 0.616 | 145 | |
| **2** | | | | | | | | | | |
| V2 | 1 | 4 | 1 | 1 | My-max | EN3-1-1 6.2.5 | (6.12y) | 0.646 | 152 | |
| **3** | | | | | | | | | | |
| V3 | 2 | 4 | 1 | 1 | My-max | EN3-1-1 6.2.8 | (6.30) | 0.203 | 48 | 46 |
| **4** | | | | | | | | | | |
| V4 | 2 | 4 | 1 | 1 | My-max | EN3-1-1 6.2.8 | (6.30) | 0.203 | 48 | 46 |
| **5** | | | | | | | | | | |
| V5 | 4 | 4 | 1 | 1 | My-max | EN3-1-1 6.2.5 | (6.12y) | 0.207 | 49 | 46 |

## TOETSING SPANNINGEN

| Staaf | Mat nr. | BC | Sit | Kl | Plaats | Norm | Artikel | Formule | Hoogste toetsing U.C. [N/mm$^2$] | | Opm. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **6** | | | | | | | | | | | |
| V6 | 4 | 4 | 1 | 1 | My-max | EN3-1-1 | 6.2.5 | (6.12y) | 0.207 | 49 | 46 |
| **7** | | | | | | | | | | | |
| V7 | 5 | 4 | 1 | 1 | My-max | EN3-1-1 | 6.2.8 | (6.30) | 0.169 | 40 | 46 |
| **8** | | | | | | | | | | | |
| V8 | 5 | 4 | 1 | 1 | My-max | EN3-1-1 | 6.2.8 | (6.30) | 0.169 | 40 | 46 |

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

## TOETSING DOORBUIGING

| Staaf | Soort | Mtg | Lengte [m] | Overst I | Overst J | Zeeg [mm] | $u_{tot}$ [mm] | BC | Sit | u [mm] | Toelaatbaar [mm] | *l |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **1** | | | | | | | | | | | | |
| V1 | Vloer | db | 11.00 | N | N | 0.0 | -31.3 | 7 | 1 Eind | -31.3 | ±44.0 | 0.004 |
| | | db | | | | | | 7 | 1 Bijk | -11.9 | ±33.0 | 0.003 |
| **2** | | | | | | | | | | | | |
| V2 | Vloer | db | 11.00 | N | N | 0.0 | -33.1 | 7 | 1 Eind | -33.1 | ±44.0 | 0.004 |
| | | db | | | | | | 7 | 1 Bijk | -13.3 | ±33.0 | 0.003 |
| **3** | | | | | | | | | | | | |
| V3 | Vloer | ss | 9.40 | N | N | 0.0 | -31.2 | 7 | 1 Eind | -31.2 | ±75.2 | 2*0.004 |
| | | ss | | | | | | 7 | 1 Bijk | -11.8 | ±56.4 | 2*0.003 |
| **4** | | | | | | | | | | | | |
| V4 | Vloer | ss | 9.40 | N | N | 0.0 | -31.2 | 7 | 1 Eind | -31.2 | ±75.2 | 2*0.004 |
| | | ss | | | | | | 7 | 1 Bijk | -11.8 | ±56.4 | 2*0.003 |
| **5** | | | | | | | | | | | | |
| V5 | Vloer | db | 4.40 | N | N | 0.0 | -4.7 | 7 | 1 Eind | -4.7 | ±17.6 | 0.004 |
| | | db | | | | | | 7 | 1 Bijk | -2.0 | ±13.2 | 0.003 |
| **6** | | | | | | | | | | | | |
| V6 | Vloer | db | 4.40 | N | N | 0.0 | -4.7 | 7 | 1 Eind | -4.7 | ±17.6 | 0.004 |
| | | db | | | | | | 7 | 1 Bijk | -2.0 | ±13.2 | 0.003 |
| **7** | | | | | | | | | | | | |
| V7 | Vloer | ss | 5.00 | N | N | 0.0 | -33.0 | 7 | 1 Eind | -33.0 | ±40.0 | 2*0.004 |
| | | ss | | | | | | 7 | 1 Bijk | -13.2 | ±30.0 | 2*0.003 |
| **8** | | | | | | | | | | | | |
| V8 | Vloer | ss | 5.00 | N | N | 0.0 | -33.0 | 7 | 1 Eind | -33.0 | ±40.0 | 2*0.004 |
| | | ss | | | | | | 7 | 1 Bijk | -13.2 | ±30.0 | 2*0.003 |

## 6.3. Oplegbalk zaal 2

**TS/Liggers** **Rel: 6.20 6 apr 2016**

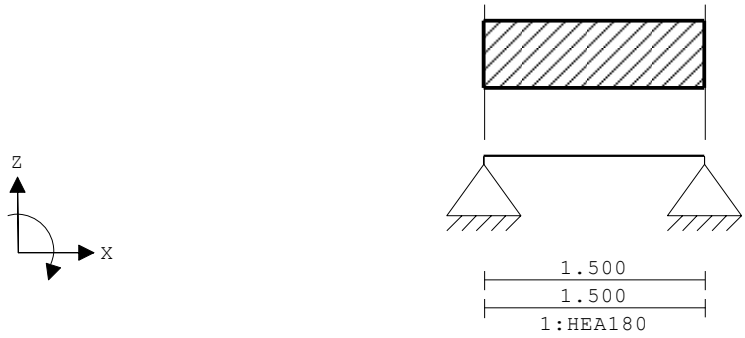
```
Project......:  -
Onderdeel....:
Constructeur.: MvSommeren
Opdrachtgever:
Dimensies....: kN/m/rad
Datum........: 05/04/2016
Bestand......: x:\ing.buro\14100 tm 14199\14132\bouwconstructie\besteksfase\
               berekeningen\14132-01-opleg balk zaal 2.dlw

Betrouwbaarheidsklasse        : 2        Referentieperiode           : 50
```

**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) |
| Staal | NEN-EN 1993-1-1:2006 | C2:2009 | NB:2011(nl) |

**GEOMETRIE** Ligger:1




**VELDLENGTEN** Ligger:1

| Veld | Vanaf | Tot | Lengte |
|---|---|---|---|
| 1 | 0.000 | 1.500 | 1.500 |

**MATERIALEN**

| Mt | Omschrijving | E-modulus[N/mm2] | S.M. | Pois. | Uitz. coëff |
|---|---|---|---|---|---|
| 1 | S235 | 210000 | 78.5 | 0.30 | 1.2000e-005 |

**PROFIELEN [mm]**

| Prof. | Omschrijving | Materiaal | Oppervlak | Traagheid | Vormf. |
|---|---|---|---|---|---|
| 1 | HEA180 | 1:S235 | 4.5300e+003 | 2.5100e+007 | 0.00 |

**PROFIELEN vervolg [mm]**

| Prof. | Staaftype | Breedte | Hoogte | e | Type | b1 | h1 | b2 | h2 |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 0:Normaal | 180 | 171 | 85.5 | | | | | |

**PROFIELVORMEN [mm]**

1 HEA180



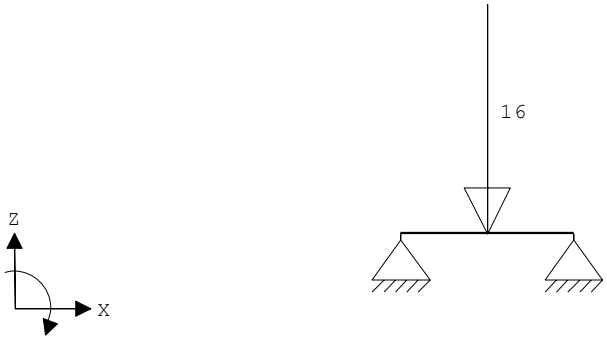
**BELASTINGGEVALLEN**

| B.G. | Omschrijving | Belast/onbelast | $\psi_0$ | $\psi_1$ | $\psi_2$ | e.g. |
|---|---|---|---|---|---|---|
| 1 | Permanent | 2:Permanent EN1991 | | | | -1.00 |
| 2 | Veranderlijk | 1:Schaakbord EN1991 | 0.40 | 0.50 | 0.30 | 0.00 |

**BELASTINGGEVALLEN**

| B.G. | Omschrijving | Type |
|---|---|---|
| 1 | Permanent | 1 Permanente belasting |
| 2 | Veranderlijk | 2 Ver. bel. pers. ed. (p_rep) |

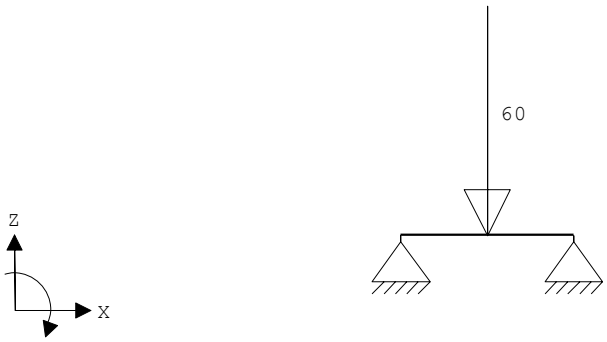
**VELDBELASTINGEN** Ligger:1 B.G:1 Permanent




**VELDBELASTINGEN** Ligger:1 B.G:1 Permanent

| Last | Ref. | Type | Omschrijving | q1/p/m | q2 | psi | Afstand | Lengte |
|---|---|---|---|---|---|---|---|---|
| 1 | | 8:Puntlast | | -16.000 | | | 0.750 | |

**VELDBELASTINGEN** Ligger:1 B.G:2 Veranderlijk



**VELDBELASTINGEN** Ligger:1 B.G:2 Veranderlijk

| Last Ref. | Type | Omschrijving | q1/p/m | q2 | psi | Afstand | Lengte |
|---|---|---|---|---|---|---|---|
| 1 | 8:Puntlast | | -60.000 | | | 0.750 | |

**BELASTINGCOMBINATIES**

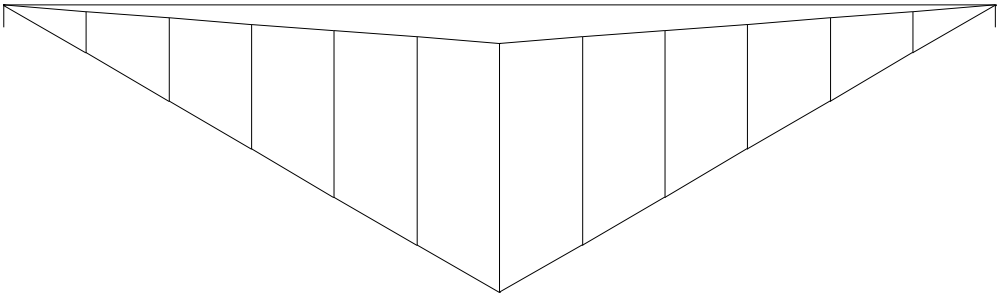
| BC | Type | BG | Gen. | Factor | BG | Gen. | Factor | BG | Gen. | Factor | BG | Gen. | Factor |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Fund. | 1 | Perm | 1.35 | | | | | | | | | |
| 2 | Fund. | 1 | Perm | 0.90 | | | | | | | | | |
| 3 | Fund. | 1 | Perm | 1.35 | 2 | psi0 | 1.50 | | | | | | |
| 4 | Fund. | 1 | Perm | 1.20 | 2 | Extr | 1.50 | | | | | | |
| 5 | Fund. | 1 | Perm | 0.90 | 2 | Extr | 1.50 | | | | | | |
| 6 | Fund. | 1 | Perm | 0.90 | 2 | psi0 | 1.50 | | | | | | |
| 7 | Kar. | 1 | Perm | 1.00 | 2 | Extr | 1.00 | | | | | | |
| 8 | Quas. | 1 | Perm | 1.00 | | | | | | | | | |
| 9 | Quas. | 1 | Perm | 1.00 | 2 | psi2 | 1.00 | | | | | | |
| 10 | Freq. | 1 | Perm | 1.00 | | | | | | | | | |
| 11 | Freq. | 1 | Perm | 1.00 | 2 | psi1 | 1.00 | | | | | | |
| 12 | Blij. | 1 | Perm | 1.00 | | | | | | | | | |

**GUNSTIGE WERKING PERMANENTE BELASTINGEN**

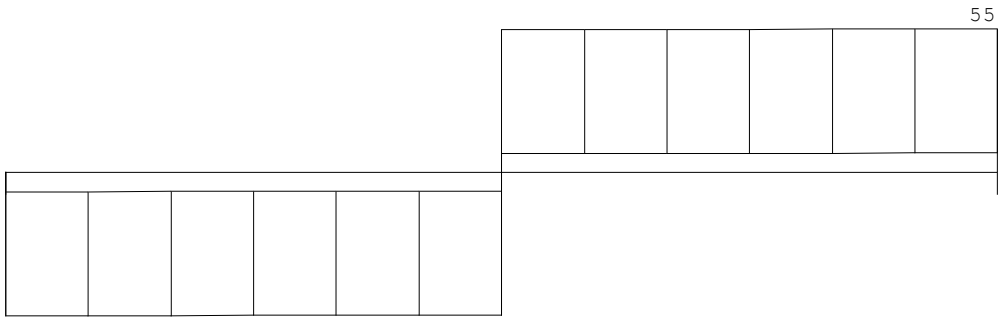
| BC | Velden met gunstige werking |
|---|---|
| 1 | Geen |
| 2 | Alle velden de factor:0.90 |
| 3 | Geen |
| 4 | Geen |
| 5 | Alle velden de factor:0.90 |
| 6 | Alle velden de factor:0.90 |

**OMHULLENDE VAN DE FUNDAMENTELE COMBINATIES**

**MOMENTEN** Ligger:1 Fundamentele combinatie

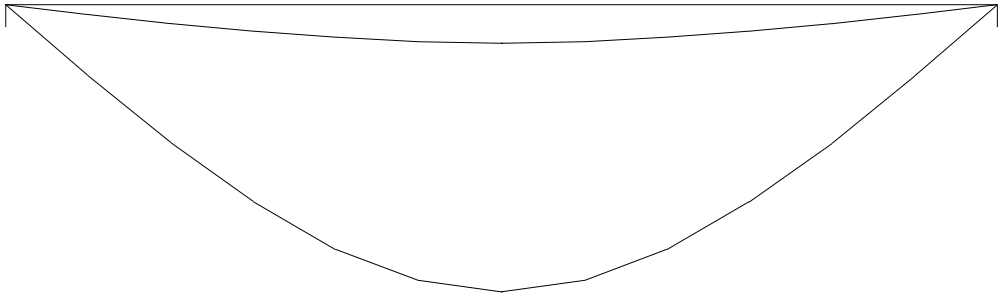


**DWARSKRACHTEN** Ligger:1 Fundamentele combinatie




Fmin:7.4 7.4
Fmax:55 55

**VERPLAATSINGEN** [mm] Ligger:1 Fundamentele combinatie




**REACTIES** Ligger:1 Fundamentele combinatie

| Stp | Fmin | Fmax | Mmin | Mmax |
|---|---|---|---|---|
| 1 | 7.44 | 54.92 | 0.00 | 0.00 |
| 2 | 7.44 | 54.92 | 0.00 | 0.00 |

## STAALPROFIELEN - ALGEMENE GEGEVENS

Ligger:1

Stabiliteit: Classificatie gehele constructie: Geschoord

### MATERIAAL

| Mat nr. | Profielnaam | Vloeisp. [N/mm$^2$] | Productie methode | Min. drsn. klasse |
|---|---|---|---|---|
| 1 | HEA180 | 235 | Gewalst | 1 |

Partiële veiligheidsfactoren:
Gamma M;0 : 1.00 Gamma M;1 : 1.00

## KIPSTABILITEIT

Ligger:1

| Staaf | Plts. aangr. | | l gaffel [m] | Kipsteunafstanden [m] |
|---|---|---|---|---|
| 1 | 1.0*h | boven: | 1.50 | 1.500 |
| | | onder: | 1.50 | 1.500 |

## TOETSING SPANNINGEN

Ligger:1

| Staaf | Mat nr. | BC | Sit | Kl | Plaats | Norm | Artikel | Formule | Hoogste toetsing U.C. | [N/mm$^2$] | Opm. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1 | 4 | 1 | 1 | My-max | EN3-1-1 | 6.2.8 | (6.30) | 0.538 | 126 | |

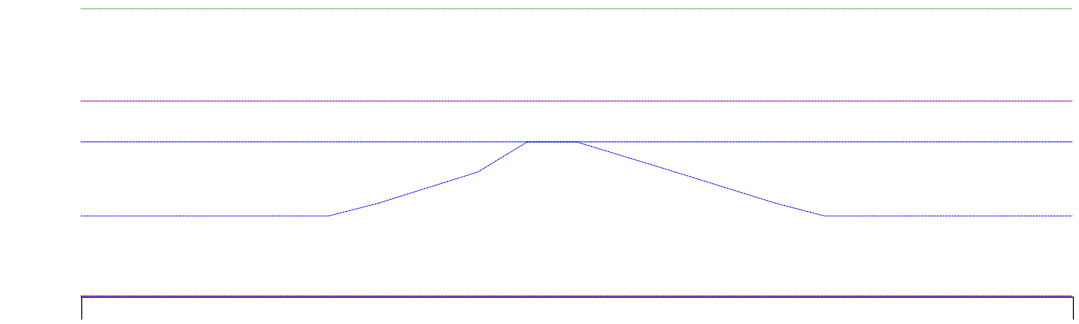
## TOETSING DOORBUIGING

Ligger:1

| Staaf | Soort | Mtg | Lengte [m] | Overst I | Overst J | Zeeg [mm] | $u_{tot}$ [mm] | BC | Sit | | u [mm] | Toelaatbaar [mm] | *l |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Vloer | db | 1.50 | N | N | 0.0 | -1.0 | 7 | 1 | Eind | -1.0 | ±1.5 | 0.001 |
| | | db | | | | | | 7 | 1 | Bijk | -0.8 | ±1.5 | 0.001 |

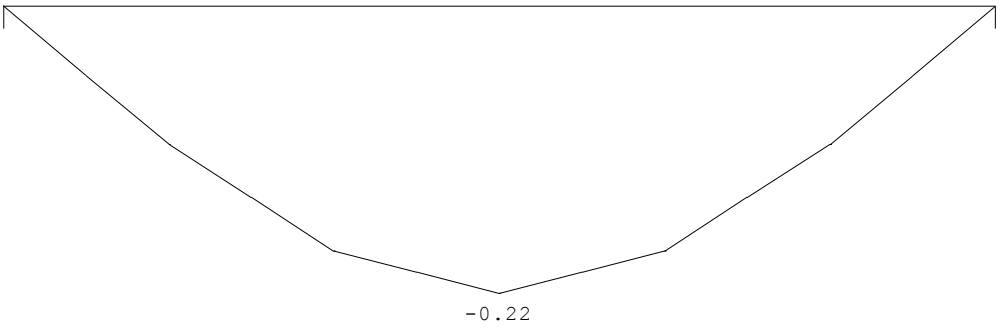
## UNITY-CHECK'S

Ligger:1 OMHULLENDE VAN ALLES

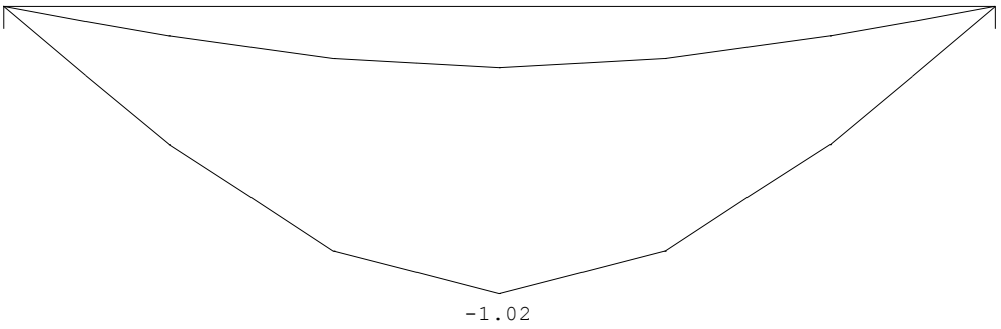


Toelaatbare unity-check (1.0)
Unity-check i.v.m. kipstabiliteit
Hoogste unity-check i.v.m. doorsnedecontrole
Hoogste unity-check i.v.m. doorbuiging

**DOORBUIGINGEN w1** [mm] Ligger:1 Blijvende combinatie




**DOORBUIGINGEN Wmax** [mm] Ligger:1 Karakteristieke combinatie



**DOORBUIGINGEN** Karakteristieke combinatie

| Veld | Zijde | positie [m] | $l_{rep}$ [mm] | $w_1$ [mm] | $w_2$ [mm] | $w_{bij}$ [mm] | $w_{bij}$ [lrep/] | $w_{tot}$ [mm] | $w_c$ [mm] | $w_{max}$ [mm] | $w_{max}$ [lrep/] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Neg. | 0.750 | 1500 | -0.2 | | -0.8 | 1874 | -1.0 | | -1.0 | 1473 |

## 6.4. 106

**TS/Liggers** **Rel: 6.20 5 apr 2016**

```
Project......: 14132 -
Onderdeel....: 106
Constructeur.: MvSommeren
Opdrachtgever:
Dimensies....: kN/m/rad
Datum........: 04/03/2016
Bestand......: x:\ing.buro\14100 tm 14199\14132\bouwconstructie\besteksfase\
               berekeningen\14132-01-106.dlw

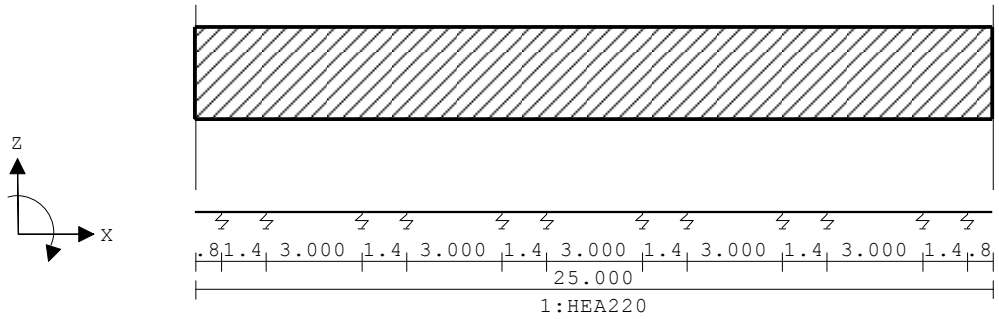
Betrouwbaarheidsklasse        : 2        Referentieperiode           : 50
```

### 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) |
| Staal | NEN-EN 1993-1-1:2006 | C2:2009 | NB:2011(nl) |

### GEOMETRIE

Ligger:1




### VELDLENGTEN

Ligger:1

| Veld | Vanaf | Tot | Lengte | Veld | Vanaf | Tot | Lengte |
|---|---|---|---|---|---|---|---|
| 1 | 0.000 | 0.800 | 0.800 | 6 | 9.600 | 11.000 | 1.400 |
| 2 | 0.800 | 2.200 | 1.400 | 7 | 11.000 | 14.000 | 3.000 |
| 3 | 2.200 | 5.200 | 3.000 | 8 | 14.000 | 15.400 | 1.400 |
| 4 | 5.200 | 6.600 | 1.400 | 9 | 15.400 | 18.400 | 3.000 |
| 5 | 6.600 | 9.600 | 3.000 | 10 | 18.400 | 19.800 | 1.400 |
| 11 | 19.800 | 22.800 | 3.000 | | | | |
| 12 | 22.800 | 24.200 | 1.400 | | | | |
| 13 | 24.200 | 25.000 | 0.800 | | | | |

### MATERIALEN

| Mt | Omschrijving | E-modulus[N/mm2] | S.M. | Pois. | Uitz. coëff |
|---|---|---|---|---|---|
| 1 | S235 | 210000 | 78.5 | 0.30 | 1.2000e-005 |

### PROFIELEN [mm]

| Prof. | Omschrijving | Materiaal | Oppervlak | Traagheid | Vormf. |
|---|---|---|---|---|---|
| 1 | HEA220 | 1:S235 | 6.4300e+003 | 5.4100e+007 | 0.00 |

## PROFIELEN vervolg [mm]

| Prof. | Staaftype | Breedte | Hoogte | e | Type | b1 | h1 | b2 | h2 |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 0:Normaal | 220 | 210 | 105.0 | | | | | |

## PROFIELVORMEN [mm]

1 HEA220



## VEREN

Ligger:1

| Veer | Steunpunt | Richting | Veerwaarde | Type | Ondergrens | Bovengrens |
|---|---|---|---|---|---|---|
| 1 | 1 | 2:Z-transl. | 1.000e+004 | Normaal | 0.000 | 0.000 |
| 2 | 2 | 2:Z-transl. | 1.000e+004 | Normaal | 0.000 | 0.000 |
| 3 | 3 | 2:Z-transl. | 1.111e+004 | Normaal | 0.000 | 0.000 |
| 4 | 4 | 2:Z-transl. | 1.111e+004 | Normaal | 0.000 | 0.000 |
| 5 | 5 | 2:Z-transl. | 1.111e+004 | Normaal | 0.000 | 0.000 |
| 6 | 6 | 2:Z-transl. | 1.111e+004 | Normaal | 0.000 | 0.000 |
| 7 | 7 | 2:Z-transl. | 1.111e+004 | Normaal | 0.000 | 0.000 |
| 8 | 8 | 2:Z-transl. | 1.111e+004 | Normaal | 0.000 | 0.000 |
| 9 | 9 | 2:Z-transl. | 1.111e+004 | Normaal | 0.000 | 0.000 |
| 10 | 10 | 2:Z-transl. | 1.111e+004 | Normaal | 0.000 | 0.000 |
| 11 | 11 | 2:Z-transl. | 1.000e+004 | Normaal | 0.000 | 0.000 |
| 12 | 12 | 2:Z-transl. | 1.000e+004 | Normaal | 0.000 | 0.000 |

## BELASTINGGEVALLEN

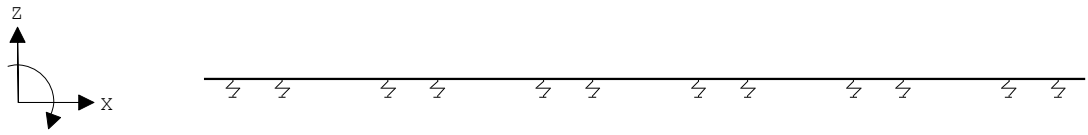
| B.G. | Omschrijving | Belast/onbelast | $\psi_0$ | $\psi_1$ | $\psi_2$ | e.g. |
|---|---|---|---|---|---|---|
| 1 | Permanent | 2:Permanent EN1991 | | | | -1.00 |
| 2 | Veranderlijk | 3:Kraanbaan | 0.40 | 0.50 | 0.30 | 0.00 |

## BELASTINGGEVALLEN

| B.G. | Omschrijving | Type |
|---|---|---|
| 1 | Permanent | 1 Permanente belasting |
| 2 | Veranderlijk | 2 Ver. bel. pers. ed. (p_rep) |

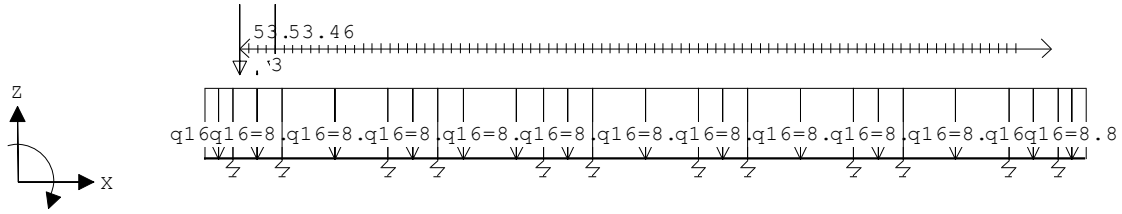
## VELDBELASTINGEN

Ligger:1 B.G:1 Permanent



## VELDBELASTINGEN

Ligger:1 B.G:2 Veranderlijk




## VELDBELASTINGEN

Ligger:1 B.G:2 Veranderlijk

| Last | Omschr/Ref/Index | Type | q1/p/m | q2 | psi | Afstand | Lengte |
|---|---|---|---|---|---|---|---|
| 1 | | 15:Pass.stelsel | -53.460 | 0.250 | | 1.000 | 23.000 |
| 2 | | 17:Meelopend | -53.460 | | | 1.000 | |
| 3 | q16 | 1:q-last | -8.800 | -8.800 | | 0.000 | 0.800 |
| 4 | q16 | 1:q-last | -8.800 | -8.800 | | 0.800 | 1.400 |
| 5 | q16 | 1:q-last | -8.800 | -8.800 | | 2.200 | 3.000 |
| 6 | q16 | 1:q-last | -8.800 | -8.800 | | 5.200 | 1.400 |
| 7 | q16 | 1:q-last | -8.800 | -8.800 | | 6.600 | 3.000 |
| 8 | q16 | 1:q-last | -8.800 | -8.800 | | 9.600 | 1.400 |
| 9 | q16 | 1:q-last | -8.800 | -8.800 | | 11.000 | 3.000 |
| 10 | q16 | 1:q-last | -8.800 | -8.800 | | 14.000 | 1.400 |
| 11 | q16 | 1:q-last | -8.800 | -8.800 | | 15.400 | 3.000 |
| 12 | q16 | 1:q-last | -8.800 | -8.800 | | 18.400 | 1.400 |
| 13 | q16 | 1:q-last | -8.800 | -8.800 | | 19.800 | 3.000 |
| 14 | q16 | 1:q-last | -8.800 | -8.800 | | 22.800 | 1.400 |
| 15 | q16 | 1:q-last | -8.800 | -8.800 | | 24.200 | 0.800 |
| 16 | | 17:Meelopend | -3.000 | | | 0.500 | |

## BELASTINGCOMBINATIES

| BC | Type | BG | Gen. | Factor | BG | Gen. | Factor | BG | Gen. | Factor | BG | Gen. | Factor |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Fund. | 1 | Perm | 1.35 | | | | | | | | | |
| 2 | Fund. | 1 | Perm | 0.90 | | | | | | | | | |
| 3 | Fund. | 1 | Perm | 1.35 | 2 | psi0 | 1.50 | | | | | | |
| 4 | Fund. | 1 | Perm | 1.20 | 2 | Extr | 1.50 | | | | | | |
| 5 | Fund. | 1 | Perm | 0.90 | 2 | Extr | 1.50 | | | | | | |
| 6 | Fund. | 1 | Perm | 0.90 | 2 | psi0 | 1.50 | | | | | | |
| 7 | Kar. | 1 | Perm | 1.00 | 2 | Extr | 1.00 | | | | | | |
| 8 | Quas. | 1 | Perm | 1.00 | | | | | | | | | |
| 9 | Quas. | 1 | Perm | 1.00 | 2 | psi2 | 1.00 | | | | | | |
| 10 | Freq. | 1 | Perm | 1.00 | | | | | | | | | |
| 11 | Freq. | 1 | Perm | 1.00 | 2 | psi1 | 1.00 | | | | | | |
| 12 | Blij. | 1 | Perm | 1.00 | | | | | | | | | |

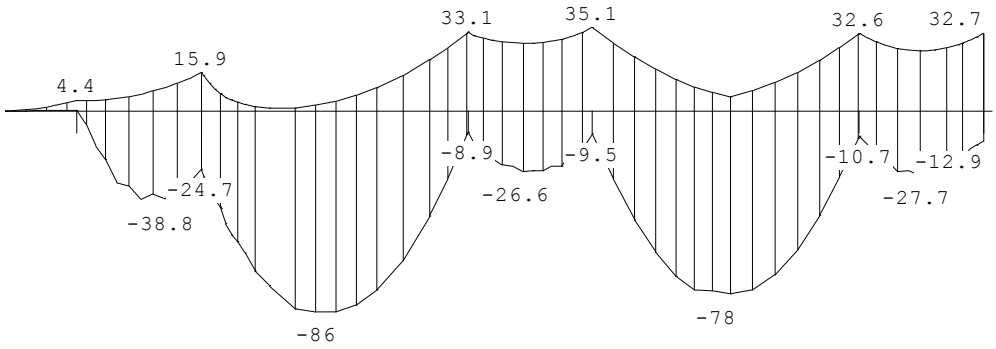
## GUNSTIGE WERKING PERMANENTE BELASTINGEN

| BC | Velden met gunstige werking |
|---|---|
| 1 | Geen |
| 2 | Alle velden de factor:0.90 |
| 3 | Geen |
| 4 | Geen |
| 5 | Alle velden de factor:0.90 |
| 6 | Alle velden de factor:0.90 |

## OMHULLENDE VAN DE FUNDAMENTELE COMBINATIES

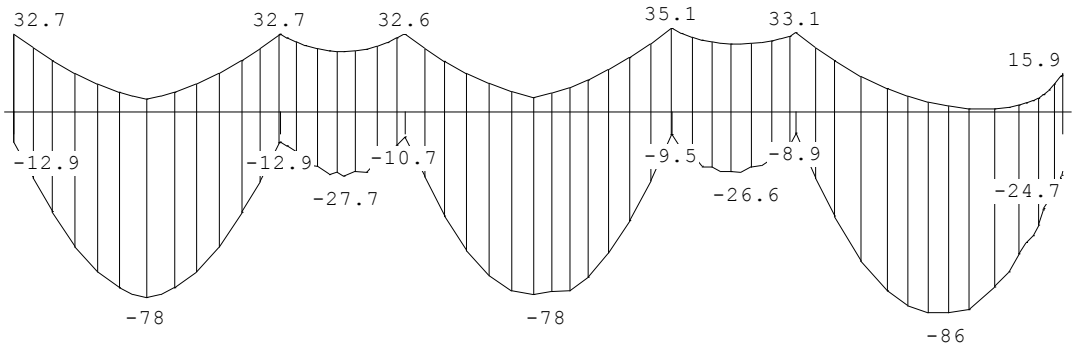
**MOMENTEN** Ligger:1 Fundamentele combinatie

Velden: 1 t/m 6



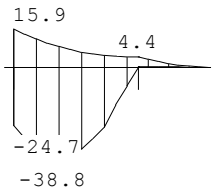

**MOMENTEN** Ligger:1 Fundamentele combinatie

Velden: 7 t/m 11



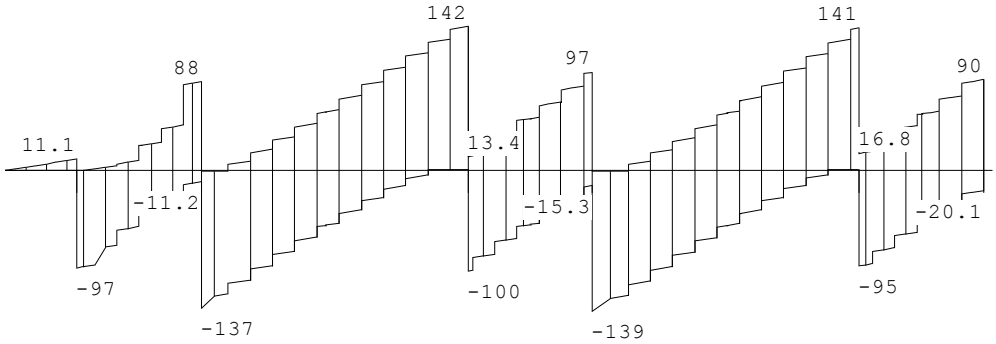

**MOMENTEN** Ligger:1 Fundamentele combinatie

Velden: 12 t/m 13



**DWARSKRACHTEN** Ligger:1 Fundamentele combinatie

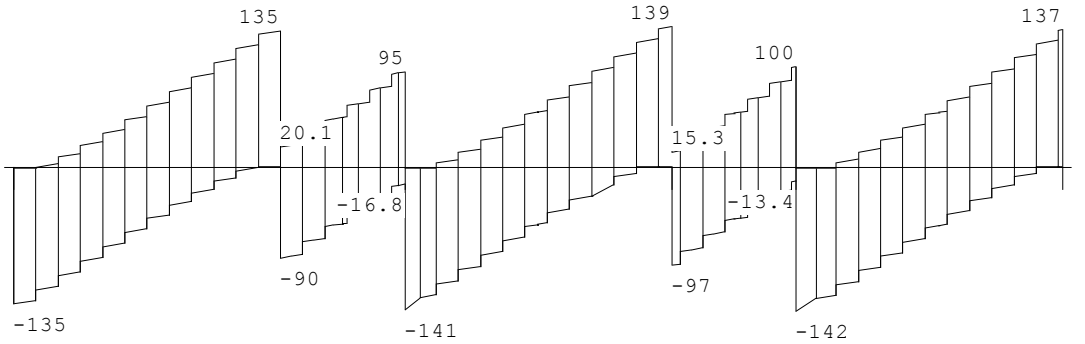
Velden: 1 t/m 6




| | | | | | | |
|---|---|---|---|---|---|---|
| Fmin: | 0.69 | 0.94 | 1.05 | 1.00 | 0.99 | 1.00 |
| Fmax: | 108 | 126 | 130 | 125 | 125 | 125 |

**DWARSKRACHTEN** Ligger:1 Fundamentele combinatie

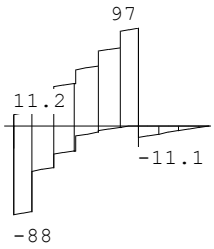
Velden: 7 t/m 11




| | | | | | | |
|---|---|---|---|---|---|---|
| Fmin: | 1.00 | 1.00 | 0.99 | 1.00 | 1.05 | 0.94 |
| Fmax: | 125 | 125 | 125 | 125 | 130 | 126 |

**DWARSKRACHTEN** Ligger:1 Fundamentele combinatie

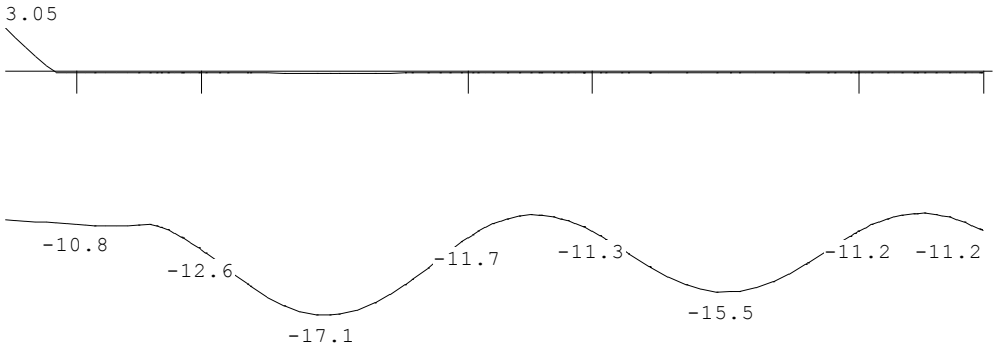
Velden: 12 t/m 13




| | | |
|---|---|---|
| Fmin: | 0.94 | 0.69 |
| Fmax: | 126 | 108 |

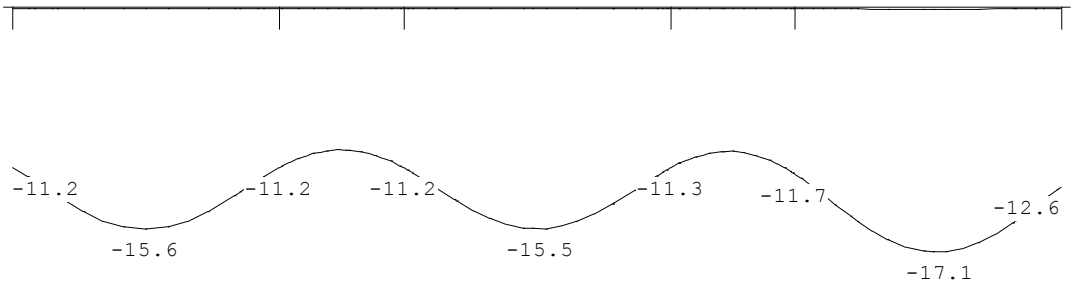
**VERPLAATSINGEN** [mm] Ligger:1 Fundamentele combinatie

Velden: 1 t/m 6



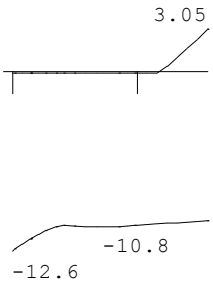

**VERPLAATSINGEN** [mm] Ligger:1 Fundamentele combinatie

Velden: 7 t/m 11




**VERPLAATSINGEN** [mm] Ligger:1 Fundamentele combinatie

Velden: 12 t/m 13



## REACTIES

Ligger:1 Fundamentele combinatie

| Stp | Fmin | Fmax | Mmin | Mmax |
|---|---|---|---|---|
| 1 | 0.69 | 107.66 | 0.00 | 0.00 |
| 2 | 0.94 | 125.58 | 0.00 | 0.00 |
| 3 | 1.05 | 130.08 | 0.00 | 0.00 |
| 4 | 1.00 | 125.23 | 0.00 | 0.00 |
| 5 | 0.99 | 124.89 | 0.00 | 0.00 |
| 6 | 1.00 | 124.92 | 0.00 | 0.00 |
| 7 | 1.00 | 124.92 | 0.00 | 0.00 |
| 8 | 0.99 | 124.89 | 0.00 | 0.00 |
| 9 | 1.00 | 125.23 | 0.00 | 0.00 |
| 10 | 1.05 | 130.07 | 0.00 | 0.00 |
| 11 | 0.94 | 125.58 | 0.00 | 0.00 |
| 12 | 0.69 | 107.66 | 0.00 | 0.00 |

## STAALPROFIELEN - ALGEMENE GEGEVENS

Ligger:1

Stabiliteit: Classificatie gehele constructie: Geschoord

## MATERIAAL

| Mat nr. | Profielnaam | Vloeisp. [N/mm$^2$] | Productie methode | Min. drsn. klasse |
|---|---|---|---|---|
| 1 | HEA220 | 235 | Gewalst | 1 |

Partiële veiligheidsfactoren:
Gamma M;0 : 1.00 Gamma M;1 : 1.00

## KIPSTABILITEIT

Ligger:1

| Staaf | Plts. aangr. | | l gaffel [m] | Kipsteunafstanden [m] |
|---|---|---|---|---|
| 1 | 1.0*h | boven: | 1.60 | 0.800 |
| | | onder: | 1.60 | 0.800 |
| 2 | 1.0*h | boven: | 1.40 | 1.400 |
| | | onder: | 1.40 | 1.400 |
| 3 | 1.0*h | boven: | 3.00 | 3.000 |
| | | onder: | 3.00 | 3.000 |
| 4 | 1.0*h | boven: | 1.40 | 1.400 |
| | | onder: | 1.40 | 1.400 |
| 5 | 1.0*h | boven: | 3.00 | 3.000 |
| | | onder: | 3.00 | 3.000 |
| 6 | 1.0*h | boven: | 1.40 | 1.400 |
| | | onder: | 1.40 | 1.400 |
| 7 | 1.0*h | boven: | 3.00 | 3.000 |
| | | onder: | 3.00 | 3.000 |
| 8 | 1.0*h | boven: | 1.40 | 1.400 |
| | | onder: | 1.40 | 1.400 |
| 9 | 1.0*h | boven: | 3.00 | 3.000 |
| | | onder: | 3.00 | 3.000 |
| 10 | 1.0*h | boven: | 1.40 | 1.400 |
| | | onder: | 1.40 | 1.400 |
| 11 | 1.0*h | boven: | 3.00 | 3.000 |
| | | onder: | 3.00 | 3.000 |
| 12 | 1.0*h | boven: | 1.40 | 1.400 |
| | | onder: | 1.40 | 1.400 |
| 13 | 1.0*h | boven: | 1.50 | 0.750 |
| | | onder: | 1.50 | 0.750 |

## TOETSING SPANNINGEN

Ligger:1

| Staaf nr. | Mat | BC | Sit | Kl | Plaats | Norm | Artikel | Formule | Hoogste toetsing U.C. | [N/mm$^2$] | Opm. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1 | 3 | 1 | 1 | Einde | EN3-1-1 | 6.2.6 | (6.17) | 0.040 | 5 | |
| 2 | 1 | 3 | 1 | 1 | Begin | EN3-1-1 | 6.2.6 | (6.17) | 0.345 | 47 | 46 |
| 3 | 1 | 3 | 8 | 1 | Staaf | EN3-1-1 | 6.3.2 | (6.54) | 0.681 | 160 | 46 |
| 4 | 1 | 3 | 18 | 1 | Begin | EN3-1-1 | 6.2.6 | (6.17) | 0.356 | 48 | 46 |
| 5 | 1 | 3 | 29 | 1 | Staaf | EN3-1-1 | 6.3.2 | (6.54) | 0.604 | 142 | 46 |
| 6 | 1 | 3 | 36 | 1 | Begin | EN3-1-1 | 6.2.6 | (6.17) | 0.338 | 46 | 46 |
| 7 | 1 | 3 | 43 | 1 | Staaf | EN3-1-1 | 6.3.2 | (6.54) | 0.603 | 142 | 46 |
| 8 | 1 | 3 | 54 | 1 | Einde | EN3-1-1 | 6.2.6 | (6.17) | 0.338 | 46 | 46 |
| 9 | 1 | 3 | 61 | 1 | Staaf | EN3-1-1 | 6.3.2 | (6.54) | 0.604 | 142 | 46 |
| 10 | 1 | 3 | 72 | 1 | Einde | EN3-1-1 | 6.2.6 | (6.17) | 0.356 | 48 | 46 |
| 11 | 1 | 3 | 82 | 1 | Staaf | EN3-1-1 | 6.3.2 | (6.54) | 0.681 | 160 | 46 |
| 12 | 1 | 3 | 89 | 1 | Einde | EN3-1-1 | 6.2.6 | (6.17) | 0.345 | 47 | 46 |
| 13 | 1 | 3 | 1 | 1 | Begin | EN3-1-1 | 6.2.6 | (6.17) | 0.040 | 5 | |

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

## TOETSING DOORBUIGING

Ligger:1

| Staaf | Soort | Mtg | Lengte [m] | Overst I | Overst J | Zeeg [mm] | $u_{tot}$ [mm] | BC | Sit | u [mm] | Toelaatbaar [mm] | *l |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Vloer | ss | 0.80 | J | N | 0.0 | -3.5 | 7 | 7 Eind | -3.5 | ±6.4 | 2*0.004 |
| | | ss | | | | | | 7 | 7 Bijk | -3.5 | ±4.8 | 2*0.003 |
| 2 | Vloer | ss | 1.40 | N | N | 0.0 | -6.2 | 7 | 8 Eind | -6.2 | ±11.2 | 2*0.004 |
| | | ss | | | | | | 7 | 8 Bijk | -6.1 | ±8.4 | 2*0.003 |
| 3 | Vloer | db | 3.00 | N | N | 0.0 | -4.4 | 7 | 10 Eind | -4.4 | ±12.0 | 0.004 |
| | | | | | | | -4.4 | 7 | 2 Eind | -4.4 | | |
| | | db | | | | | | 7 | 10 Bijk | -4.4 | ±9.0 | 0.003 |
| 4 | Vloer | ss | 1.40 | N | N | 0.0 | -4.3 | 7 | 11 Eind | -4.3 | ±11.2 | 2*0.004 |
| | | ss | | | | | | 7 | 11 Bijk | -4.3 | ±8.4 | 2*0.003 |
| 5 | Vloer | db | 3.00 | N | N | 0.0 | -3.9 | 7 | 27 Eind | -3.9 | ±12.0 | 0.004 |
| | | | | | | | -4.0 | 7 | 20 Eind | -4.0 | | |
| | | db | | | | | | 7 | 27 Bijk | -3.9 | ±9.0 | 0.003 |
| 6 | Vloer | ss | 1.40 | N | N | 0.0 | -3.9 | 7 | 43 Eind | -3.9 | ±11.2 | 2*0.004 |
| | | ss | | | | | | 7 | 43 Bijk | -3.9 | ±8.4 | 2*0.003 |
| 7 | Vloer | db | 3.00 | N | N | 0.0 | -4.0 | 7 | 45 Eind | -4.0 | ±12.0 | 0.004 |
| | | | | | | | -4.0 | 7 | 37 Eind | -4.0 | | |
| | | db | | | | | | 7 | 45 Bijk | -3.9 | ±9.0 | 0.003 |
| 8 | Vloer | ss | 1.40 | N | N | 0.0 | -3.9 | 7 | 47 Eind | -3.9 | ±11.2 | 2*0.004 |
| | | ss | | | | | | 7 | 47 Bijk | -3.9 | ±8.4 | 2*0.003 |
| 9 | Vloer | db | 3.00 | N | N | 0.0 | -3.9 | 7 | 63 Eind | -3.9 | ±12.0 | 0.004 |
| | | | | | | | -4.0 | 7 | 70 Eind | -4.0 | | |
| | | db | | | | | | 7 | 63 Bijk | -3.9 | ±9.0 | 0.003 |
| 10 | Vloer | ss | 1.40 | N | N | 0.0 | -4.3 | 7 | 79 Eind | -4.3 | ±11.2 | 2*0.004 |
| | | ss | | | | | | 7 | 79 Bijk | -4.3 | ±8.4 | 2*0.003 |
| 11 | Vloer | db | 3.00 | N | N | 0.0 | -4.4 | 7 | 80 Eind | -4.4 | ±12.0 | 0.004 |
| | | | | | | | -4.4 | 7 | 88 Eind | -4.4 | | |
| | | db | | | | | | 7 | 80 Bijk | -4.4 | ±9.0 | 0.003 |
| 12 | Vloer | ss | 1.40 | N | N | 0.0 | -6.2 | 7 | 82 Eind | -6.2 | ±11.2 | 2*0.004 |
| | | ss | | | | | | 7 | 82 Bijk | -6.1 | ±8.4 | 2*0.003 |
| 13 | Vloer | ss | 0.80 | N | J | 0.0 | -3.5 | 7 | 83 Eind | -3.5 | ±6.4 | 2*0.004 |
| | | ss | | | | | | 7 | 83 Bijk | -3.5 | ±4.8 | 2*0.003 |

**UNITY-CHECK'S** Ligger:1 OMHULLENDE VAN ALLES

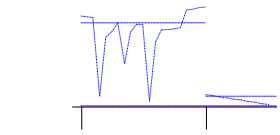
Velden: 1 t/m 6

**UNITY-CHECK'S** Ligger:1 OMHULLENDE VAN ALLES

Velden: 7 t/m 11

**UNITY-CHECK'S** Ligger:1 OMHULLENDE VAN ALLES

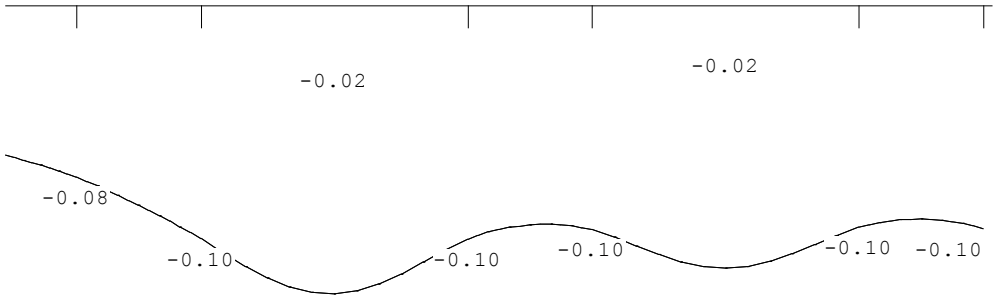
Velden: 12 t/m 13



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

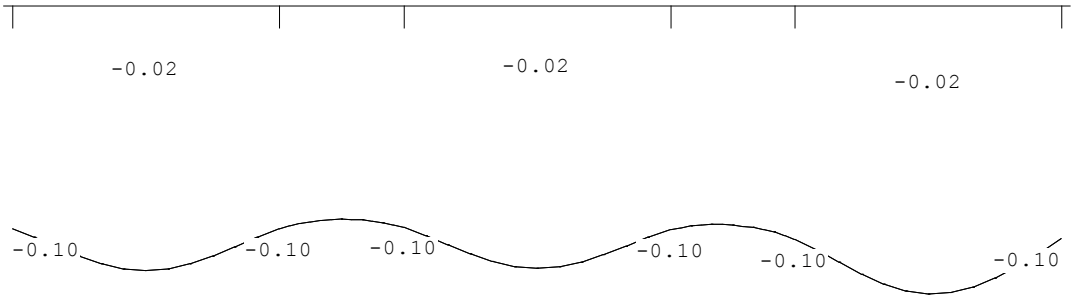
**DOORBUIGINGEN w1** [mm] Ligger:1 Blijvende combinatie

Velden: 1 t/m 6



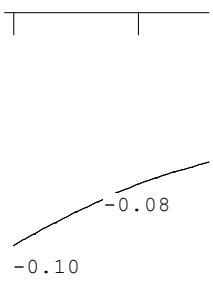

**DOORBUIGINGEN w1** [mm] Ligger:1 Blijvende combinatie

Velden: 7 t/m 11



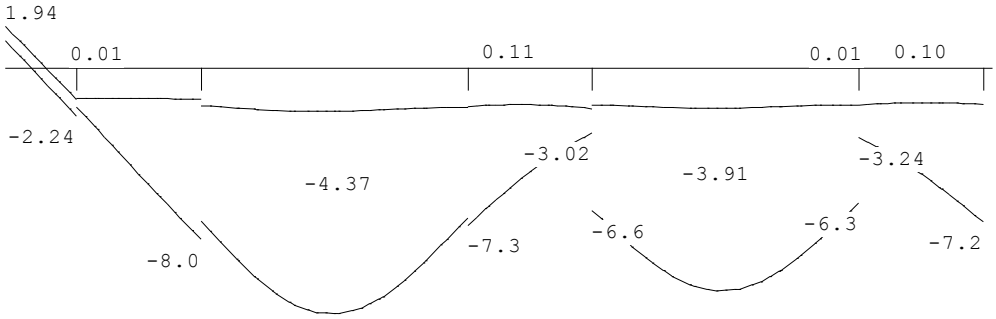
**DOORBUIGINGEN w1** [mm] Ligger:1 Blijvende combinatie

Velden: 12 t/m 13



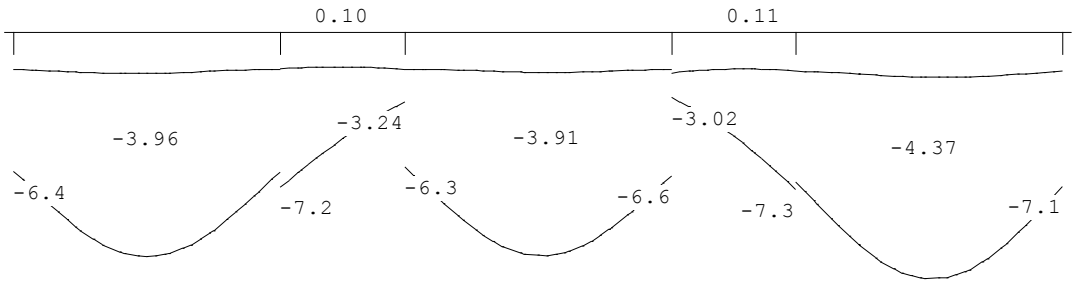

**DOORBUIGINGEN Wmax** [mm] Ligger:1 Karakteristieke combinatie

Velden: 1 t/m 6



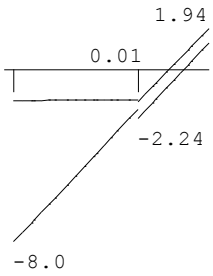

**DOORBUIGINGEN Wmax** [mm] Ligger:1 Karakteristieke combinatie

Velden: 7 t/m 11



**DOORBUIGINGEN Wmax** [mm] Ligger:1 Karakteristieke combinatie

Velden: 12 t/m 13



**DOORBUIGINGEN** Karakteristieke combinatie

| Veld | Zijde | positie [m] | $l_{rep}$ [mm] | $w_1$ [mm] | $w_2$ [mm] | \|-- $w_{bij}$ --\| [mm] | [lrep/] | $w_{tot}$ [mm] | $w_c$ [mm] | \|-- $w_{max}$ --\| [mm] | [lrep/] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Neg. | / | 1600 | -0.0 | | -3.5 | 457 | -3.5 | | -3.5 | 455 |
| 2 | Neg. | / | 2800 | -0.0 | | -6.1 | 456 | -6.2 | | -6.2 | 453 |
| 3 | Neg. | 1.550 | 3000 | -0.0 | | -4.3 | 690 | -4.4 | | -4.4 | 686 |
| 4 | Pos. | / | 2800 | | | 4.3 | 653 | 4.3 | | 4.3 | 652 |
| 5 | Neg. | 1.400 | 3000 | -0.0 | | -3.9 | 770 | -3.9 | | -3.9 | 767 |
| 6 | Neg. | / | 2800 | | | -3.9 | 713 | -3.9 | | -3.9 | 713 |
| 7 | Neg. | 1.500 | 3000 | -0.0 | | -3.9 | 762 | -4.0 | | -4.0 | 758 |
| 8 | Pos. | / | 2800 | | | 3.9 | 713 | 3.9 | | 3.9 | 713 |
| 9 | Neg. | 1.600 | 3000 | -0.0 | | -3.9 | 770 | -3.9 | | -3.9 | 767 |
| 10 | Neg. | / | 2800 | | | -4.3 | 653 | -4.3 | | -4.3 | 652 |
| 11 | Neg. | 1.450 | 3000 | -0.0 | | -4.3 | 690 | -4.4 | | -4.4 | 686 |
| 12 | Pos. | / | 2800 | 0.0 | | 6.1 | 455 | 6.2 | | 6.2 | 453 |
| 13 | Pos. | / | 1600 | 0.0 | | 3.5 | 457 | 3.5 | | 3.5 | 455 |

## 6.5. 107

**TS/Liggers** **Rel: 6.20 5 apr 2016**

```
Project......: 14132 -
Onderdeel....: 106
Constructeur.: MvSommeren
Opdrachtgever:
Dimensies....: kN/m/rad
Datum........: 04/03/2016
Bestand......: x:\ing.buro\14100 tm 14199\14132\bouwconstructie\besteksfase\
               berekeningen\14132-01-107.dlw

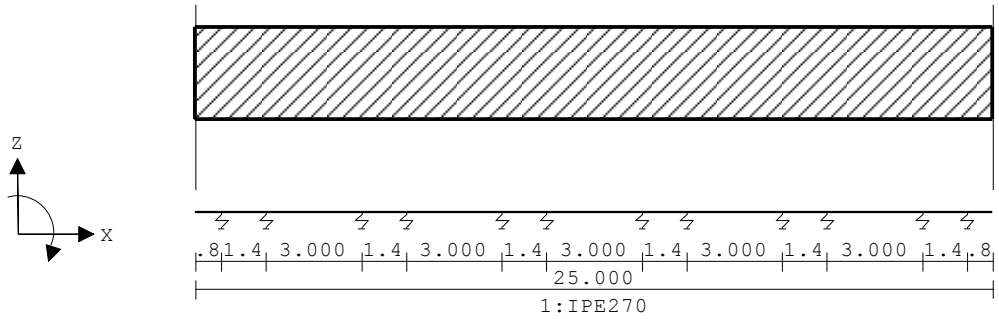
Betrouwbaarheidsklasse        : 2        Referentieperiode           : 50
```

### 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) |
| Staal | NEN-EN 1993-1-1:2006 | C2:2009 | NB:2011(nl) |

### GEOMETRIE

Ligger:1




### VELDLENGTEN

Ligger:1

| Veld | Vanaf | Tot | Lengte | Veld | Vanaf | Tot | Lengte |
|---|---|---|---|---|---|---|---|
| 1 | 0.000 | 0.800 | 0.800 | 6 | 9.600 | 11.000 | 1.400 |
| 2 | 0.800 | 2.200 | 1.400 | 7 | 11.000 | 14.000 | 3.000 |
| 3 | 2.200 | 5.200 | 3.000 | 8 | 14.000 | 15.400 | 1.400 |
| 4 | 5.200 | 6.600 | 1.400 | 9 | 15.400 | 18.400 | 3.000 |
| 5 | 6.600 | 9.600 | 3.000 | 10 | 18.400 | 19.800 | 1.400 |
| 11 | 19.800 | 22.800 | 3.000 | | | | |
| 12 | 22.800 | 24.200 | 1.400 | | | | |
| 13 | 24.200 | 25.000 | 0.800 | | | | |

### MATERIALEN

| Mt | Omschrijving | E-modulus[N/mm2] | S.M. | Pois. | Uitz. coëff |
|---|---|---|---|---|---|
| 1 | S235 | 210000 | 78.5 | 0.30 | 1.2000e-005 |

### PROFIELEN [mm]

| Prof. | Omschrijving | Materiaal | Oppervlak | Traagheid | Vormf. |
|---|---|---|---|---|---|
| 1 | IPE270 | 1:S235 | 4.5900e+003 | 5.7900e+007 | 0.00 |

## PROFIELEN vervolg [mm]

| Prof. | Staaftype | Breedte | Hoogte | e | Type | b1 | h1 | b2 | h2 |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 0:Normaal | 135 | 270 | 135.0 | | | | | |

## PROFIELVORMEN [mm]

1 IPE270



## VEREN

Ligger:1

| Veer | Steunpunt | Richting | Veerwaarde | Type | Ondergrens | Bovengrens |
|---|---|---|---|---|---|---|
| 1 | 1 | 2:Z-transl. | 1.000e+004 | Normaal | 0.000 | 0.000 |
| 2 | 2 | 2:Z-transl. | 1.000e+004 | Normaal | 0.000 | 0.000 |
| 3 | 3 | 2:Z-transl. | 1.111e+004 | Normaal | 0.000 | 0.000 |
| 4 | 4 | 2:Z-transl. | 1.111e+004 | Normaal | 0.000 | 0.000 |
| 5 | 5 | 2:Z-transl. | 1.111e+004 | Normaal | 0.000 | 0.000 |
| 6 | 6 | 2:Z-transl. | 1.111e+004 | Normaal | 0.000 | 0.000 |
| 7 | 7 | 2:Z-transl. | 1.111e+004 | Normaal | 0.000 | 0.000 |
| 8 | 8 | 2:Z-transl. | 1.111e+004 | Normaal | 0.000 | 0.000 |
| 9 | 9 | 2:Z-transl. | 1.111e+004 | Normaal | 0.000 | 0.000 |
| 10 | 10 | 2:Z-transl. | 1.111e+004 | Normaal | 0.000 | 0.000 |
| 11 | 11 | 2:Z-transl. | 1.000e+004 | Normaal | 0.000 | 0.000 |
| 12 | 12 | 2:Z-transl. | 1.000e+004 | Normaal | 0.000 | 0.000 |

## BELASTINGGEVALLEN

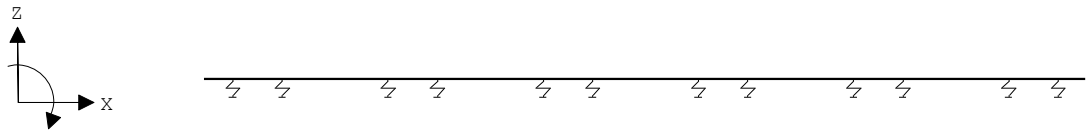
| B.G. | Omschrijving | Belast/onbelast | $\psi_0$ | $\psi_1$ | $\psi_2$ | e.g. |
|---|---|---|---|---|---|---|
| 1 | Permanent | 2:Permanent EN1991 | | | | -1.00 |
| 2 | Veranderlijk | 3:Kraanbaan | 0.40 | 0.50 | 0.30 | 0.00 |

## BELASTINGGEVALLEN

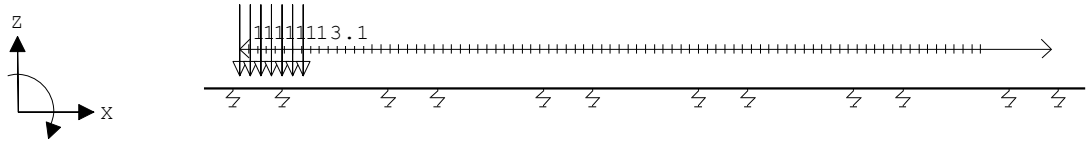
| B.G. | Omschrijving | Type |
|---|---|---|
| 1 | Permanent | 1 Permanente belasting |
| 2 | Veranderlijk | 2 Ver. bel. pers. ed. (p_rep) |

## VELDBELASTINGEN

Ligger:1 B.G:1 Permanent



**VELDBELASTINGEN** Ligger:1 B.G:2 Veranderlijk




**VELDBELASTINGEN** Ligger:1 B.G:2 Veranderlijk

| Last | Omschr/Ref/Index | Type | q1/p/m | q2 | psi | Afstand | Lengte |
|---|---|---|---|---|---|---|---|
| 1 | | 15:Pass.stelsel | -13.100 | 0.250 | | 1.000 | 23.000 |
| 2 | | 17:Meelopend | -13.100 | | | 0.300 | |
| 3 | | 17:Meelopend | -13.100 | | | 0.600 | |
| 4 | | 17:Meelopend | -13.100 | | | 0.900 | |
| 5 | | 17:Meelopend | -13.100 | | | 1.200 | |
| 6 | | 17:Meelopend | -13.100 | | | 1.500 | |
| 7 | | 17:Meelopend | -13.100 | | | 1.800 | |

**BELASTINGCOMBINATIES**

| BC | Type | BG | Gen. | Factor | BG | Gen. | Factor | BG | Gen. | Factor | BG | Gen. | Factor |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Fund. | 1 | Perm | 1.35 | | | | | | | | | |
| 2 | Fund. | 1 | Perm | 0.90 | | | | | | | | | |
| 3 | Fund. | 1 | Perm | 1.35 | 2 | psi0 | 1.50 | | | | | | |
| 4 | Fund. | 1 | Perm | 1.20 | 2 | Extr | 1.50 | | | | | | |
| 5 | Fund. | 1 | Perm | 0.90 | 2 | Extr | 1.50 | | | | | | |
| 6 | Fund. | 1 | Perm | 0.90 | 2 | psi0 | 1.50 | | | | | | |
| 7 | Kar. | 1 | Perm | 1.00 | 2 | Extr | 1.00 | | | | | | |
| 8 | Quas. | 1 | Perm | 1.00 | | | | | | | | | |
| 9 | Quas. | 1 | Perm | 1.00 | 2 | psi2 | 1.00 | | | | | | |
| 10 | Freq. | 1 | Perm | 1.00 | | | | | | | | | |
| 11 | Freq. | 1 | Perm | 1.00 | 2 | psi1 | 1.00 | | | | | | |
| 12 | Blij. | 1 | Perm | 1.00 | | | | | | | | | |

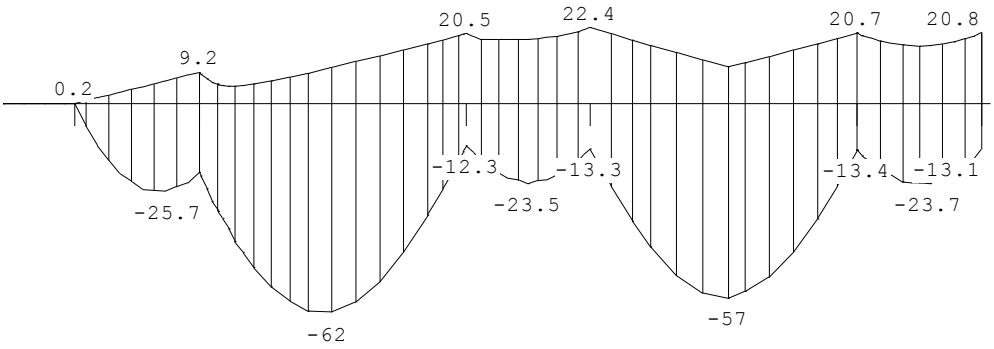
**GUNSTIGE WERKING PERMANENTE BELASTINGEN**

| BC | Velden met gunstige werking |
|---|---|
| 1 | Geen |
| 2 | Alle velden de factor:0.90 |
| 3 | Geen |
| 4 | Geen |
| 5 | Alle velden de factor:0.90 |
| 6 | Alle velden de factor:0.90 |

## OMHULLENDE VAN DE FUNDAMENTELE COMBINATIES

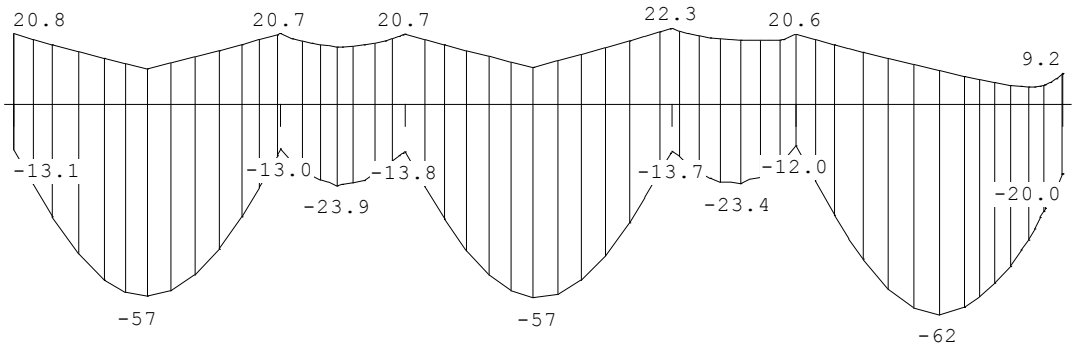
**MOMENTEN** Ligger:1 Fundamentele combinatie

Velden: 1 t/m 6



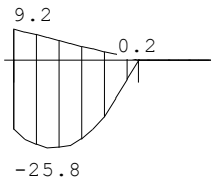

**MOMENTEN** Ligger:1 Fundamentele combinatie

Velden: 7 t/m 11



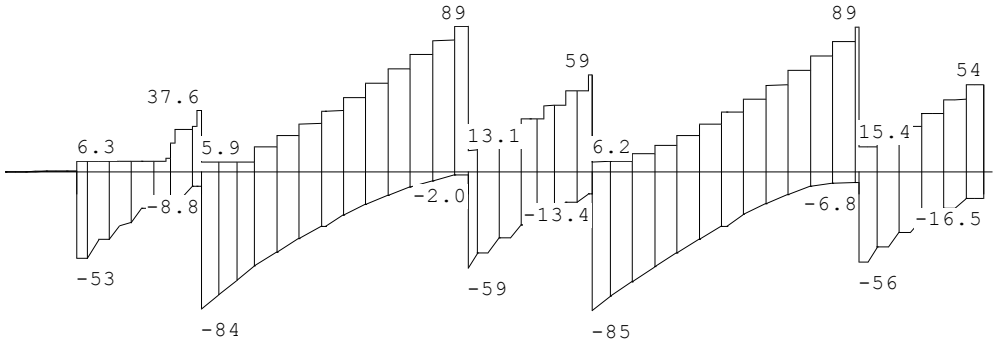

**MOMENTEN** Ligger:1 Fundamentele combinatie

Velden: 12 t/m 13



**DWARSKRACHTEN** Ligger:1 Fundamentele combinatie

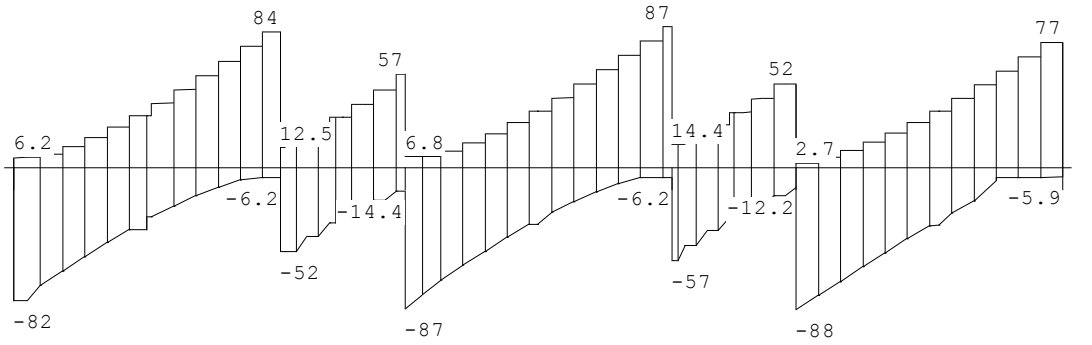
Velden: 1 t/m 6




| | | | | | | |
|---|---|---|---|---|---|---|
| Fmin:-6.0 | -4.98 | -1.46 | -4.76 | -5.4 | -4.76 | |
| Fmax:53 | 79 | 80 | 77 | 77 | 77 | |

**DWARSKRACHTEN** Ligger:1 Fundamentele combinatie

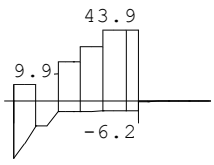
Velden: 7 t/m 11




| | | | | | | |
|---|---|---|---|---|---|---|
| Fmin:-4.76 | -4.76 | -5.4 | -4.77 | -1.45 | -4.97 | |
| Fmax:77 | 77 | 77 | 77 | 80 | 79 | |

**DWARSKRACHTEN** Ligger:1 Fundamentele combinatie

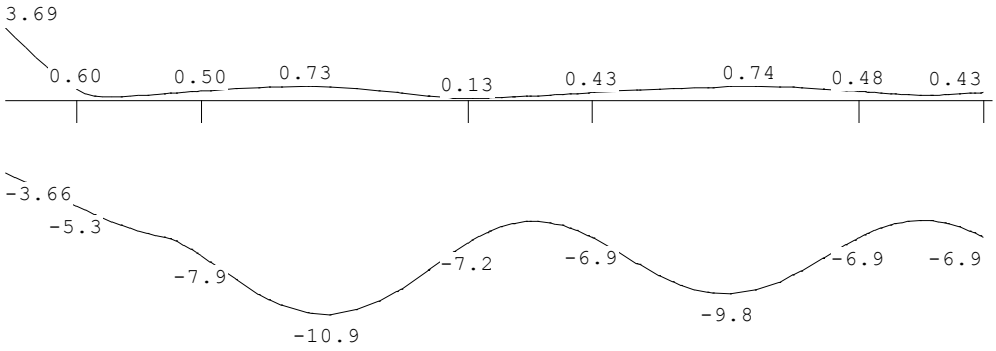
Velden: 12 t/m 13




| | | |
|---|---|---|
| Fmin:-4.97 | -6.0 | |
| Fmax:79 | 44.3 | |

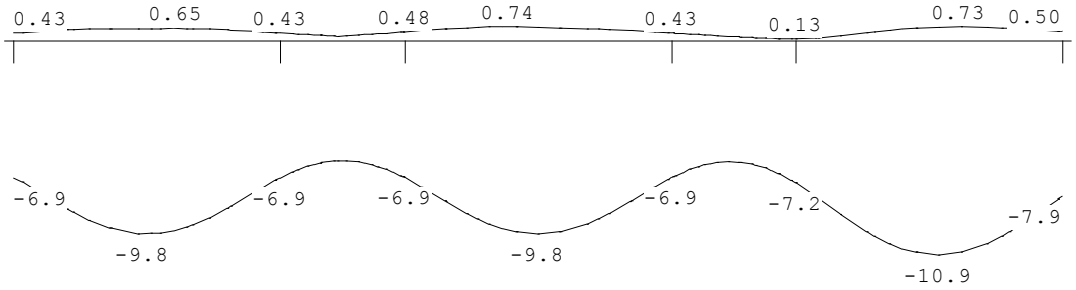
**VERPLAATSINGEN** [mm] Ligger:1 Fundamentele combinatie

Velden: 1 t/m 6



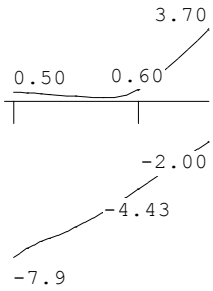

**VERPLAATSINGEN** [mm] Ligger:1 Fundamentele combinatie

Velden: 7 t/m 11




**VERPLAATSINGEN** [mm] Ligger:1 Fundamentele combinatie

Velden: 12 t/m 13



## REACTIES

Ligger:1 Fundamentele combinatie

| Stp | Fmin | Fmax | Mmin | Mmax |
|---|---|---|---|---|
| 1 | -5.99 | 53.44 | 0.00 | 0.00 |
| 2 | -4.98 | 78.75 | 0.00 | 0.00 |
| 3 | -1.46 | 80.18 | 0.00 | 0.00 |
| 4 | -4.76 | 77.02 | 0.00 | 0.00 |
| 5 | -5.36 | 77.15 | 0.00 | 0.00 |
| 6 | -4.76 | 77.14 | 0.00 | 0.00 |
| 7 | -4.76 | 77.11 | 0.00 | 0.00 |
| 8 | -5.37 | 77.07 | 0.00 | 0.00 |
| 9 | -4.77 | 77.04 | 0.00 | 0.00 |
| 10 | -1.45 | 80.06 | 0.00 | 0.00 |
| 11 | -4.97 | 78.70 | 0.00 | 0.00 |
| 12 | -5.97 | 44.27 | 0.00 | 0.00 |

## STAALPROFIELEN - ALGEMENE GEGEVENS

Ligger:1

Stabiliteit: Classificatie gehele constructie: Geschoord

## MATERIAAL

| Mat nr. | Profielnaam | Vloeisp. [N/mm$^2$] | Productie methode | Min. drsn. klasse |
|---|---|---|---|---|
| 1 | IPE270 | 235 | Gewalst | 1 |

Partiële veiligheidsfactoren:
Gamma M;0 : 1.00 Gamma M;1 : 1.00

## KIPSTABILITEIT

Ligger:1

| Staaf | Plts. aangr. | | l gaffel [m] | Kipsteunafstanden [m] |
|---|---|---|---|---|
| 1 | 1.0*h | boven: | 1.60 | 0.800 |
| | | onder: | 1.60 | 0.800 |
| 2 | 1.0*h | boven: | 1.40 | 1.400 |
| | | onder: | 1.40 | 1.400 |
| 3 | 1.0*h | boven: | 3.00 | 3.000 |
| | | onder: | 3.00 | 3.000 |
| 4 | 1.0*h | boven: | 1.40 | 1.400 |
| | | onder: | 1.40 | 1.400 |
| 5 | 1.0*h | boven: | 3.00 | 3.000 |
| | | onder: | 3.00 | 3.000 |
| 6 | 1.0*h | boven: | 1.40 | 1.400 |
| | | onder: | 1.40 | 1.400 |
| 7 | 1.0*h | boven: | 3.00 | 3.000 |
| | | onder: | 3.00 | 3.000 |
| 8 | 1.0*h | boven: | 1.40 | 1.400 |
| | | onder: | 1.40 | 1.400 |
| 9 | 1.0*h | boven: | 3.00 | 3.000 |
| | | onder: | 3.00 | 3.000 |
| 10 | 1.0*h | boven: | 1.40 | 1.400 |
| | | onder: | 1.40 | 1.400 |
| 11 | 1.0*h | boven: | 3.00 | 3.000 |
| | | onder: | 3.00 | 3.000 |
| 12 | 1.0*h | boven: | 1.40 | 1.400 |
| | | onder: | 1.40 | 1.400 |
| 13 | 1.0*h | boven: | 1.50 | 0.750 |
| | | onder: | 1.50 | 0.750 |

## TOETSING SPANNINGEN

Ligger:1

| Staaf | Mat nr. | BC | Sit | Kl | Plaats | Norm | Artikel | Formule | Hoogste toetsing U.C. | [N/mm$^2$] | Opm. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1 | | | | Staaf is onbelast | | | | | | 57 |
| 2 | 1 | 5 | 2 | 1 | My-max | EN3-1-1 | 6.2.8 | (6.30) | 0.226 | 53 | 46 |
| 3 | 1 | 3 | 8 | 1 | Staaf | EN3-1-1 | 6.3.2 | (6.54) | 0.728 | 171 | 46 |
| 4 | 1 | 5 | 17 | 1 | Staaf | EN3-1-1 | 6.3.2 | (6.54) | 0.206 | 48 | |
| 5 | 1 | 3 | 26 | 1 | Staaf | EN3-1-1 | 6.3.2 | (6.54) | 0.649 | 152 | 46 |
| 6 | 1 | 5 | 35 | 1 | My-max | EN3-1-1 | 6.2.8 | (6.30) | 0.208 | 49 | 46 |
| 7 | 1 | 3 | 43 | 1 | Staaf | EN3-1-1 | 6.3.2 | (6.54) | 0.646 | 152 | 46 |
| 8 | 1 | 5 | 52 | 1 | My-max | EN3-1-1 | 6.2.8 | (6.30) | 0.210 | 49 | 46 |
| 9 | 1 | 3 | 61 | 1 | Staaf | EN3-1-1 | 6.3.2 | (6.54) | 0.649 | 153 | 46 |
| 10 | 1 | 5 | 70 | 1 | My-max | EN3-1-1 | 6.2.8 | (6.30) | 0.205 | 48 | 46 |
| 11 | 1 | 3 | 79 | 1 | Staaf | EN3-1-1 | 6.3.2 | (6.54) | 0.729 | 171 | 46 |
| 12 | 1 | 5 | 85 | 1 | My-max | EN3-1-1 | 6.2.8 | (6.30) | 0.227 | 53 | 46 |
| 13 | 1 | | | | Staaf is onbelast | | | | | | 57 |

Opmerkingen:
[ 46] T.b.v. kip is een equivalente Q-last berekend.
[ 57] Staaf is (nagenoeg) onbelast.

## TOETSING DOORBUIGING

Ligger:1

| Staaf | Soort | Mtg | Lengte [m] | Overst I | Overst J | Zeeg [mm] | $u_{tot}$ [mm] | BC | Sit | u [mm] | Toelaatbaar [mm] | *l |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Vloer | ss | 0.80 | J | N | 0.0 | 2.6 | 7 | 6 Eind | 2.6 | ±6.4 | 2*0.004 |
| | | | | | | | -2.4 | 7 | 4 Eind | -2.4 | | |
| | | ss | | | | | | 7 | 6 Bijk | 2.6 | ±4.8 | 2*0.003 |
| 2 | Vloer | ss | 1.40 | N | N | 0.0 | -4.5 | 7 | 7 Eind | -4.5 | ±11.2 | 2*0.004 |
| | | ss | | | | | | 7 | 7 Bijk | -4.4 | ±8.4 | 2*0.003 |
| 3 | Vloer | db | 3.00 | N | N | 0.0 | -3.0 | 7 | 8 Eind | -3.0 | ±12.0 | 0.004 |
| | | | | | | | -3.5 | 7 | 1 Eind | -3.5 | | |
| | | db | | | | | | 7 | 8 Bijk | -3.0 | ±9.0 | 0.003 |
| 4 | Vloer | ss | 1.40 | N | N | 0.0 | -3.3 | 7 | 9 Eind | -3.3 | ±11.2 | 2*0.004 |
| | | ss | | | | | | 7 | 9 Bijk | -3.3 | ±8.4 | 2*0.003 |
| 5 | Vloer | db | 3.00 | N | N | 0.0 | -2.7 | 7 | 26 Eind | -2.7 | ±12.0 | 0.004 |
| | | | | | | | -3.2 | 7 | 18 Eind | -3.2 | | |
| | | db | | | | | | 7 | 26 Bijk | -2.7 | ±9.0 | 0.003 |
| 6 | Vloer | ss | 1.40 | N | N | 0.0 | -3.1 | 7 | 42 Eind | -3.1 | ±11.2 | 2*0.004 |
| | | ss | | | | | | 7 | 42 Bijk | -3.1 | ±8.4 | 2*0.003 |
| 7 | Vloer | db | 3.00 | N | N | 0.0 | -2.7 | 7 | 43 Eind | -2.7 | ±12.0 | 0.004 |
| | | | | | | | -3.1 | 7 | 51 Eind | -3.1 | | |
| | | db | | | | | | 7 | 43 Bijk | -2.7 | ±9.0 | 0.003 |
| 8 | Vloer | ss | 1.40 | N | N | 0.0 | -3.1 | 7 | 45 Eind | -3.1 | ±11.2 | 2*0.004 |
| | | ss | | | | | | 7 | 45 Bijk | -3.1 | ±8.4 | 2*0.003 |
| 9 | Vloer | db | 3.00 | N | N | 0.0 | -2.7 | 7 | 61 Eind | -2.7 | ±12.0 | 0.004 |
| | | | | | | | -3.2 | 7 | 69 Eind | -3.2 | | |
| | | db | | | | | | 7 | 56 Bijk | -2.7 | ±9.0 | 0.003 |
| 10 | Vloer | ss | 1.40 | N | N | 0.0 | -3.3 | 7 | 77 Eind | -3.3 | ±11.2 | 2*0.004 |
| | | ss | | | | | | 7 | 77 Bijk | -3.3 | ±8.4 | 2*0.003 |
| 11 | Vloer | db | 3.00 | N | N | 0.0 | -3.0 | 7 | 79 Eind | -3.0 | ±12.0 | 0.004 |
| | | | | | | | -3.4 | 7 | 85 Eind | -3.4 | | |
| | | db | | | | | | 7 | 79 Bijk | -3.0 | ±9.0 | 0.003 |
| 12 | Vloer | ss | 1.40 | N | N | 0.0 | -4.5 | 7 | 80 Eind | -4.5 | ±11.2 | 2*0.004 |
| | | ss | | | | | | 7 | 80 Bijk | -4.4 | ±8.4 | 2*0.003 |
| 13 | Vloer | ss | 0.80 | N | J | 0.0 | 2.6 | 7 | 81 Eind | 2.6 | ±6.4 | 2*0.004 |
| | | | | | | | -2.4 | 7 | 83 Eind | -2.4 | | |
| | | ss | | | | | | 7 | 81 Bijk | 2.6 | ±4.8 | 2*0.003 |

**UNITY-CHECK'S** Ligger:1 OMHULLENDE VAN ALLES

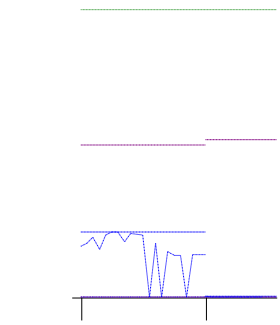
Velden: 1 t/m 6

**UNITY-CHECK'S** Ligger:1 OMHULLENDE VAN ALLES

Velden: 7 t/m 11

**UNITY-CHECK'S** Ligger:1 OMHULLENDE VAN ALLES

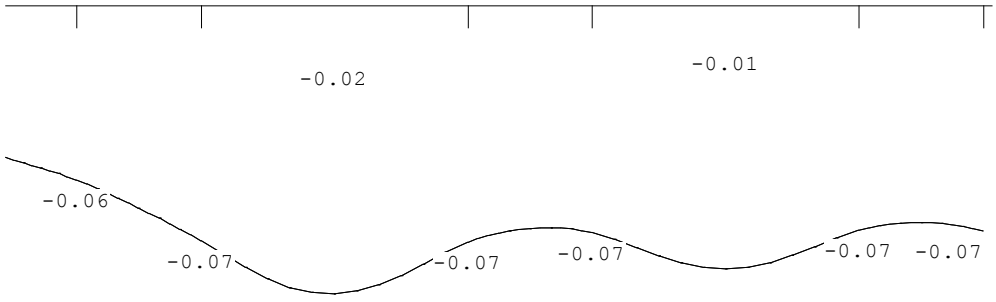
Velden: 12 t/m 13



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

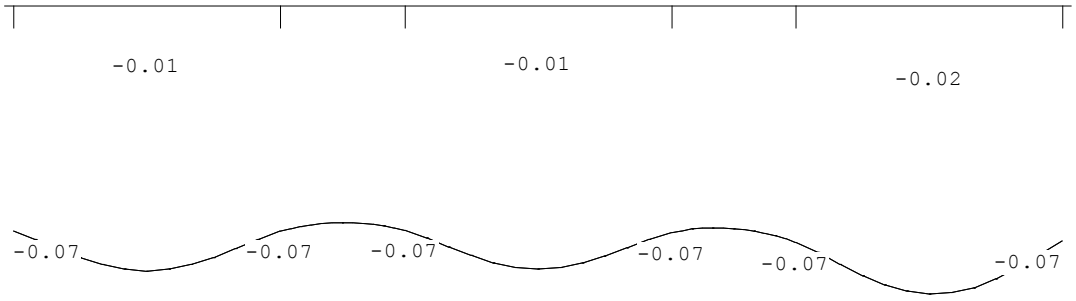
**DOORBUIGINGEN w1** [mm] Ligger:1 Blijvende combinatie

Velden: 1 t/m 6



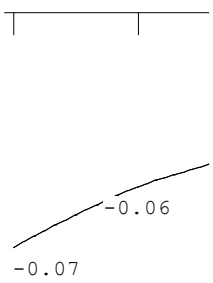

**DOORBUIGINGEN w1** [mm] Ligger:1 Blijvende combinatie

Velden: 7 t/m 11



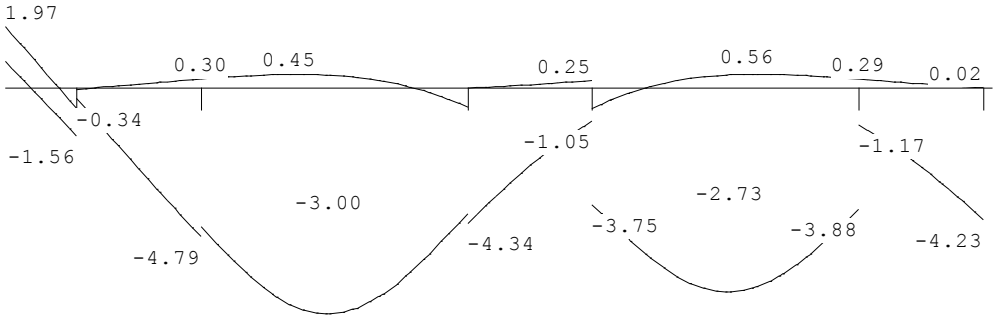
**DOORBUIGINGEN w1** [mm] Ligger:1 Blijvende combinatie

Velden: 12 t/m 13



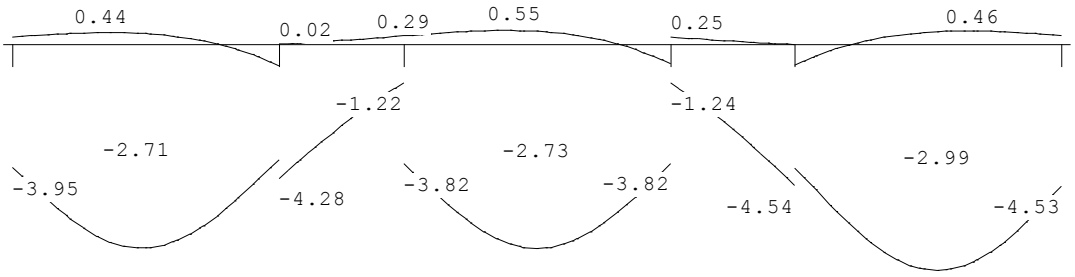

**DOORBUIGINGEN Wmax** [mm] Ligger:1 Karakteristieke combinatie

Velden: 1 t/m 6



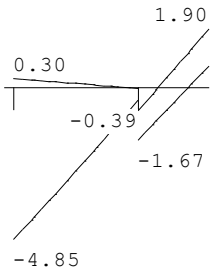

**DOORBUIGINGEN Wmax** [mm] Ligger:1 Karakteristieke combinatie

Velden: 7 t/m 11



**DOORBUIGINGEN Wmax** [mm] Ligger:1 Karakteristieke combinatie

Velden: 12 t/m 13



**DOORBUIGINGEN** Karakteristieke combinatie

| Veld | Zijde | positie [m] | $l_{rep}$ [mm] | $w_1$ [mm] | $w_2$ [mm] | \|-- $w_{bij}$ --\| [mm] | [lrep/] | $w_{tot}$ [mm] | $w_c$ [mm] | \|-- $w_{max}$ --\| [mm] | [lrep/] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Neg. | / | 1600 | -0.0 | | -2.6 | 609 | -2.6 | | -2.6 | 608 |
| 2 | Neg. | / | 2800 | -0.0 | | -4.4 | 631 | -4.5 | | -4.5 | 629 |
| 2 | Pos. | / | 2800 | -0.0 | | 0.3 | 8065 | 0.3 | | 0.3 | 8537 |
| 3 | Neg. | 1.450 | 3000 | -0.0 | | -3.0 | 1006 | -3.0 | | -3.0 | 1000 |
| 3 | Pos. | 1.500 | 3000 | -0.0 | | 0.6 | 5118 | 0.6 | | 0.6 | 5267 |
| 4 | Pos. | / | 2800 | | | 3.3 | 851 | 3.3 | | 3.3 | 850 |
| 5 | Neg. | 1.550 | 3000 | -0.0 | | -2.7 | 1104 | -2.7 | | -2.7 | 1099 |
| 5 | Pos. | 1.500 | 3000 | -0.0 | | 0.6 | 4848 | 0.6 | | 0.6 | 4943 |
| 6 | Neg. | / | 2800 | | | -3.1 | 915 | -3.1 | | -3.1 | 914 |
| 7 | Neg. | 1.400 | 3000 | -0.0 | | -2.7 | 1112 | -2.7 | | -2.7 | 1107 |
| 7 | Pos. | 1.500 | 3000 | -0.0 | | 0.6 | 5213 | 0.6 | | 0.6 | 5330 |
| 8 | Pos. | / | 2800 | | | 3.1 | 915 | 3.1 | | 3.1 | 915 |
| 9 | Neg. | 1.500 | 3000 | -0.0 | | -2.7 | 1102 | -2.7 | | -2.7 | 1097 |
| 9 | Pos. | 1.500 | 3000 | -0.0 | | 0.6 | 4928 | 0.6 | | 0.6 | 5026 |
| 10 | Neg. | / | 2800 | | | -3.3 | 850 | -3.3 | | -3.3 | 849 |
| 11 | Neg. | 1.600 | 3000 | -0.0 | | -3.0 | 1009 | -3.0 | | -3.0 | 1004 |
| 11 | Pos. | 1.500 | 3000 | -0.0 | | 0.6 | 5034 | 0.6 | | 0.6 | 5178 |
| 12 | Neg. | / | 2800 | 0.0 | | -0.3 | 8081 | -0.3 | | -0.3 | 8555 |
| 12 | Pos. | / | 2800 | 0.0 | | 4.4 | 631 | 4.5 | | 4.5 | 629 |
| 13 | Pos. | / | 1600 | 0.0 | | 2.6 | 610 | 2.6 | | 2.6 | 609 |

## 6.6. 108

**TS/Liggers** **Rel: 6.20 5 apr 2016**

```
Project......: 14132 -
Onderdeel....: 106
Constructeur.: MvSommeren
Opdrachtgever:
Dimensies....: kN/m/rad
Datum........: 04/03/2016
Bestand......: x:\ing.buro\14100 tm 14199\14132\bouwconstructie\besteksfase\
               berekeningen\14132-01-108.dlw

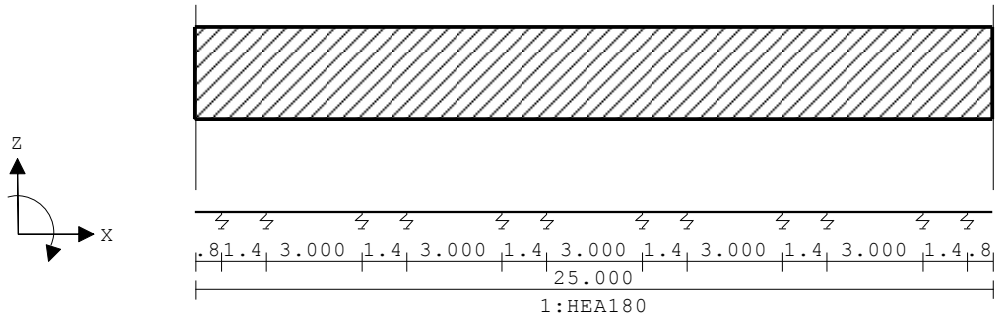
Betrouwbaarheidsklasse        : 2        Referentieperiode           : 50
```

### 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) |
| Staal | NEN-EN 1993-1-1:2006 | C2:2009 | NB:2011(nl) |

### GEOMETRIE

Ligger:1




### VELDLENGTEN

Ligger:1

| Veld | Vanaf | Tot | Lengte | Veld | Vanaf | Tot | Lengte |
|---|---|---|---|---|---|---|---|
| 1 | 0.000 | 0.800 | 0.800 | 6 | 9.600 | 11.000 | 1.400 |
| 2 | 0.800 | 2.200 | 1.400 | 7 | 11.000 | 14.000 | 3.000 |
| 3 | 2.200 | 5.200 | 3.000 | 8 | 14.000 | 15.400 | 1.400 |
| 4 | 5.200 | 6.600 | 1.400 | 9 | 15.400 | 18.400 | 3.000 |
| 5 | 6.600 | 9.600 | 3.000 | 10 | 18.400 | 19.800 | 1.400 |
| 11 | 19.800 | 22.800 | 3.000 | | | | |
| 12 | 22.800 | 24.200 | 1.400 | | | | |
| 13 | 24.200 | 25.000 | 0.800 | | | | |

### MATERIALEN

| Mt | Omschrijving | E-modulus[N/mm2] | S.M. | Pois. | Uitz. coëff |
|---|---|---|---|---|---|
| 1 | S235 | 210000 | 78.5 | 0.30 | 1.2000e-005 |

### PROFIELEN [mm]

| Prof. | Omschrijving | Materiaal | Oppervlak | Traagheid | Vormf. |
|---|---|---|---|---|---|
| 1 | HEA180 | 1:S235 | 4.5300e+003 | 2.5100e+007 | 0.00 |

## PROFIELEN vervolg [mm]

| Prof. | Staaftype | Breedte | Hoogte | e | Type | b1 | h1 | b2 | h2 |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 0:Normaal | 180 | 171 | 85.5 | | | | | |

## PROFIELVORMEN [mm]

1 HEA180



## VEREN

Ligger:1

| Veer | Steunpunt | Richting | Veerwaarde | Type | Ondergrens | Bovengrens |
|---|---|---|---|---|---|---|
| 1 | 1 | 2:Z-transl. | 1.000e+004 | Normaal | 0.000 | 0.000 |
| 2 | 2 | 2:Z-transl. | 1.000e+004 | Normaal | 0.000 | 0.000 |
| 3 | 3 | 2:Z-transl. | 1.111e+004 | Normaal | 0.000 | 0.000 |
| 4 | 4 | 2:Z-transl. | 1.111e+004 | Normaal | 0.000 | 0.000 |
| 5 | 5 | 2:Z-transl. | 1.111e+004 | Normaal | 0.000 | 0.000 |
| 6 | 6 | 2:Z-transl. | 1.111e+004 | Normaal | 0.000 | 0.000 |
| 7 | 7 | 2:Z-transl. | 1.111e+004 | Normaal | 0.000 | 0.000 |
| 8 | 8 | 2:Z-transl. | 1.111e+004 | Normaal | 0.000 | 0.000 |
| 9 | 9 | 2:Z-transl. | 1.111e+004 | Normaal | 0.000 | 0.000 |
| 10 | 10 | 2:Z-transl. | 1.111e+004 | Normaal | 0.000 | 0.000 |
| 11 | 11 | 2:Z-transl. | 1.000e+004 | Normaal | 0.000 | 0.000 |
| 12 | 12 | 2:Z-transl. | 1.000e+004 | Normaal | 0.000 | 0.000 |

## BELASTINGGEVALLEN

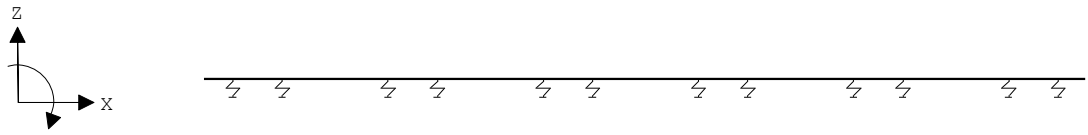
| B.G. | Omschrijving | Belast/onbelast | $\psi_0$ | $\psi_1$ | $\psi_2$ | e.g. |
|---|---|---|---|---|---|---|
| 1 | Permanent | 2:Permanent EN1991 | | | | -1.00 |
| 2 | Veranderlijk | 3:Kraanbaan | 0.40 | 0.50 | 0.30 | 0.00 |

## BELASTINGGEVALLEN

| B.G. | Omschrijving | Type |
|---|---|---|
| 1 | Permanent | 1 Permanente belasting |
| 2 | Veranderlijk | 2 Ver. bel. pers. ed. (p_rep) |

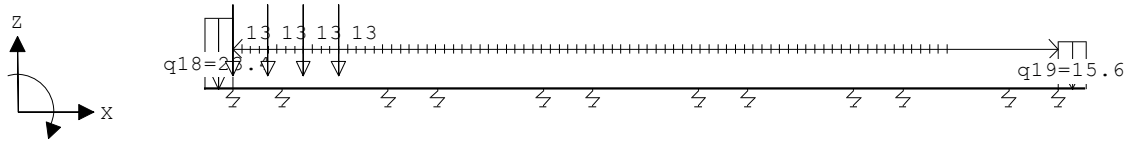
## VELDBELASTINGEN

Ligger:1 B.G:1 Permanent



## VELDBELASTINGEN

Ligger:1 B.G:2 Veranderlijk




## VELDBELASTINGEN

Ligger:1 B.G:2 Veranderlijk

| Last | Omschr/Ref/Index | Type | q1/p/m | q2 | psi | Afstand | Lengte |
|---|---|---|---|---|---|---|---|
| 1 | q18 | 1:q-last | -23.400 | -23.400 | | 0.000 | 0.800 |
| 2 | q19 | 1:q-last | -15.600 | -15.600 | | 24.200 | 0.800 |
| 3 | | 15:Pass.stelsel | -13.000 | 0.250 | | 0.800 | 23.400 |
| 4 | | 17:Meelopend | -13.000 | | | 1.000 | |
| 5 | | 17:Meelopend | -13.000 | | | 2.000 | |
| 6 | | 17:Meelopend | -13.000 | | | 3.000 | |

## BELASTINGCOMBINATIES

| BC | Type | BG | Gen. | Factor | BG | Gen. | Factor | BG | Gen. | Factor | BG | Gen. | Factor |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Fund. | 1 | Perm | 1.35 | | | | | | | | | |
| 2 | Fund. | 1 | Perm | 0.90 | | | | | | | | | |
| 3 | Fund. | 1 | Perm | 1.35 | 2 | psi0 | 1.50 | | | | | | |
| 4 | Fund. | 1 | Perm | 1.20 | 2 | Extr | 1.50 | | | | | | |
| 5 | Fund. | 1 | Perm | 0.90 | 2 | Extr | 1.50 | | | | | | |
| 6 | Fund. | 1 | Perm | 0.90 | 2 | psi0 | 1.50 | | | | | | |
| 7 | Kar. | 1 | Perm | 1.00 | 2 | Extr | 1.00 | | | | | | |
| 8 | Quas. | 1 | Perm | 1.00 | | | | | | | | | |
| 9 | Quas. | 1 | Perm | 1.00 | 2 | psi2 | 1.00 | | | | | | |
| 10 | Freq. | 1 | Perm | 1.00 | | | | | | | | | |
| 11 | Freq. | 1 | Perm | 1.00 | 2 | psi1 | 1.00 | | | | | | |
| 12 | Blij. | 1 | Perm | 1.00 | | | | | | | | | |

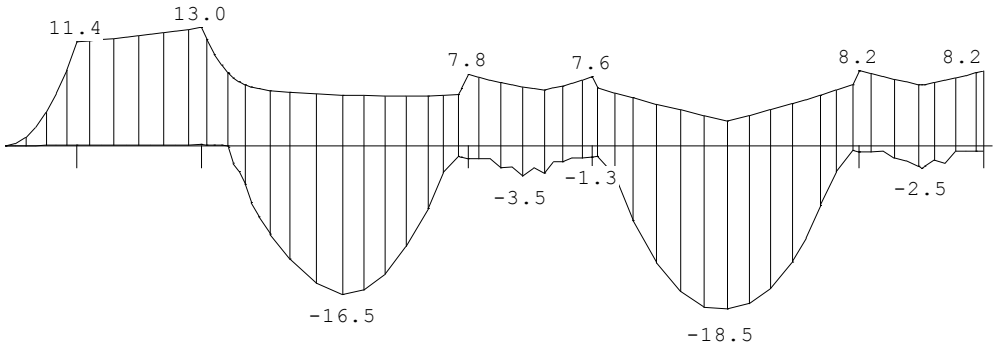
## GUNSTIGE WERKING PERMANENTE BELASTINGEN

| BC | Velden met gunstige werking |
|---|---|
| 1 | Geen |
| 2 | Alle velden de factor:0.90 |
| 3 | Geen |
| 4 | Geen |
| 5 | Alle velden de factor:0.90 |
| 6 | Alle velden de factor:0.90 |

## OMHULLENDE VAN DE FUNDAMENTELE COMBINATIES

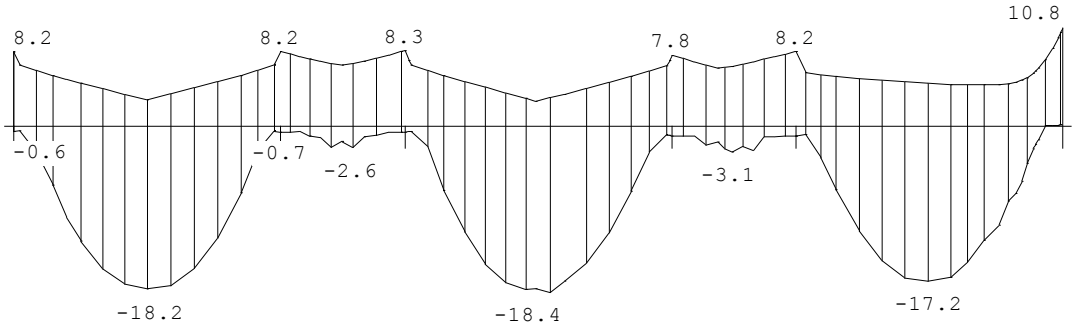
**MOMENTEN** Ligger:1 Fundamentele combinatie

Velden: 1 t/m 6



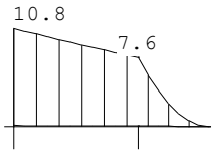

**MOMENTEN** Ligger:1 Fundamentele combinatie

Velden: 7 t/m 11



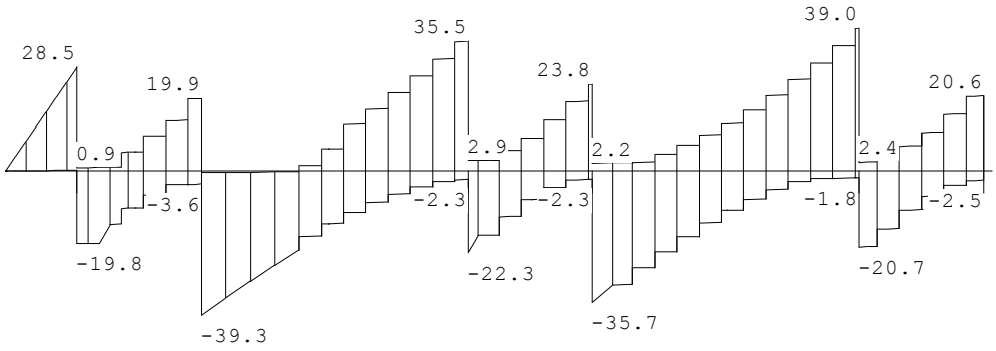

**MOMENTEN** Ligger:1 Fundamentele combinatie

Velden: 12 t/m 13



**DWARSKRACHTEN** Ligger:1 Fundamentele combinatie

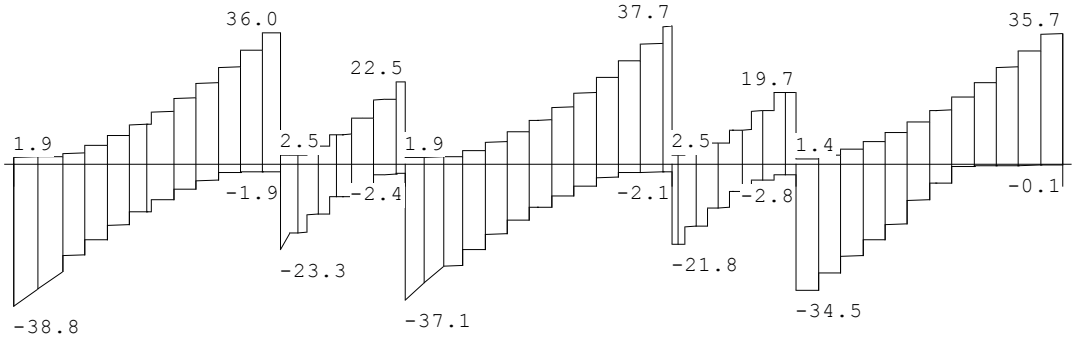
Velden: 1 t/m 6




| | | | | | | |
|---|---|---|---|---|---|---|
| Fmin: | 0.46 | -2.73 | -3.81 | -1.71 | -1.77 | -1.93 |
| Fmax: | 54 | 43.6 | 41.0 | 43.0 | 43.2 | 42.9 |

**DWARSKRACHTEN** Ligger:1 Fundamentele combinatie

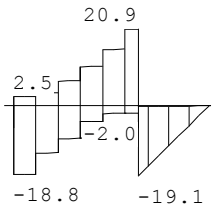
Velden: 7 t/m 11




| | | | | | | |
|---|---|---|---|---|---|---|
| Fmin: | -1.93 | -1.93 | -1.86 | -1.76 | -2.80 | -2.50 |
| Fmax: | 42.9 | 42.8 | 43.1 | 43.1 | 41.9 | 43.9 |

**DWARSKRACHTEN** Ligger:1 Fundamentele combinatie

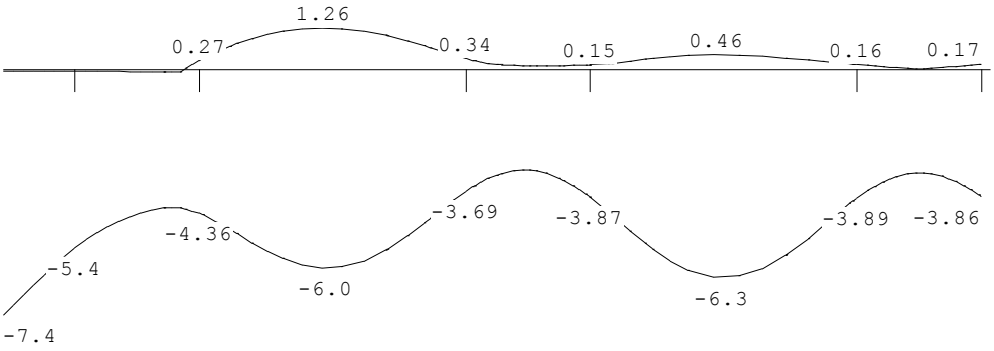
Velden: 12 t/m 13




| | | |
|---|---|---|
| Fmin: | -2.50 | 0.46 |
| Fmax: | 43.9 | 40.0 |

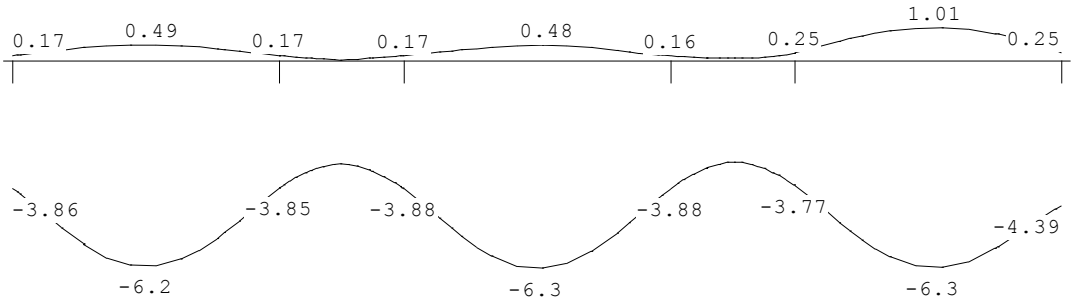
**VERPLAATSINGEN** [mm] Ligger:1 Fundamentele combinatie

Velden: 1 t/m 6



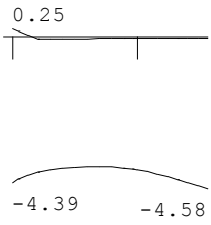

**VERPLAATSINGEN** [mm] Ligger:1 Fundamentele combinatie

Velden: 7 t/m 11




**VERPLAATSINGEN** [mm] Ligger:1 Fundamentele combinatie

Velden: 12 t/m 13




**REACTIES** Ligger:1 Fundamentele combinatie

| Stp | Fmin | Fmax | Mmin | Mmax |
|---|---|---|---|---|
| 1 | 0.46 | 54.09 | 0.00 | 0.00 |
| 2 | -2.73 | 43.59 | 0.00 | 0.00 |
| 3 | -3.81 | 41.03 | 0.00 | 0.00 |
| 4 | -1.71 | 43.03 | 0.00 | 0.00 |
| 5 | -1.77 | 43.20 | 0.00 | 0.00 |
| 6 | -1.93 | 42.88 | 0.00 | 0.00 |
| 7 | -1.93 | 42.79 | 0.00 | 0.00 |
| 8 | -1.86 | 43.08 | 0.00 | 0.00 |

## REACTIES

Ligger:1 Fundamentele combinatie

| Stp | Fmin | Fmax | Mmin | Mmax |
|---|---|---|---|---|
| 9 | -1.76 | 43.05 | 0.00 | 0.00 |
| 10 | -2.80 | 41.94 | 0.00 | 0.00 |
| 11 | -2.50 | 43.86 | 0.00 | 0.00 |
| 12 | 0.46 | 40.02 | 0.00 | 0.00 |

## STAALPROFIELEN - ALGEMENE GEGEVENS

Ligger:1

Stabiliteit: Classificatie gehele constructie: Geschoord

## MATERIAAL

| Mat nr. | Profielnaam | Vloeisp. [N/mm$^2$] | Productie methode | Min. drsn. klasse |
|---|---|---|---|---|
| 1 | HEA180 | 235 | Gewalst | 1 |

Partiële veiligheidsfactoren:
Gamma M;0 : 1.00 Gamma M;1 : 1.00

## KIPSTABILITEIT

Ligger:1

| Staaf | Plts. aangr. | | l gaffel [m] | Kipsteunafstanden [m] |
|---|---|---|---|---|
| 1 | 1.0*h | boven: | 1.60 | 0.800 |
| | | onder: | 1.60 | 0.800 |
| 2 | 1.0*h | boven: | 1.40 | 1.400 |
| | | onder: | 1.40 | 1.400 |
| 3 | 1.0*h | boven: | 3.00 | 3.000 |
| | | onder: | 3.00 | 3.000 |
| 4 | 1.0*h | boven: | 1.40 | 1.400 |
| | | onder: | 1.40 | 1.400 |
| 5 | 1.0*h | boven: | 3.00 | 3.000 |
| | | onder: | 3.00 | 3.000 |
| 6 | 1.0*h | boven: | 1.40 | 1.400 |
| | | onder: | 1.40 | 1.400 |
| 7 | 1.0*h | boven: | 3.00 | 3.000 |
| | | onder: | 3.00 | 3.000 |
| 8 | 1.0*h | boven: | 1.40 | 1.400 |
| | | onder: | 1.40 | 1.400 |
| 9 | 1.0*h | boven: | 3.00 | 3.000 |
| | | onder: | 3.00 | 3.000 |
| 10 | 1.0*h | boven: | 1.40 | 1.400 |
| | | onder: | 1.40 | 1.400 |
| 11 | 1.0*h | boven: | 3.00 | 3.000 |
| | | onder: | 3.00 | 3.000 |
| 12 | 1.0*h | boven: | 1.40 | 1.400 |
| | | onder: | 1.40 | 1.400 |
| 13 | 1.0*h | boven: | 1.50 | 0.750 |
| | | onder: | 1.50 | 0.750 |

## TOETSING SPANNINGEN

Ligger:1

| Staaf | Mat nr. | BC | Sit | Kl | Plaats | Norm | Artikel | Formule | Hoogste toetsing U.C. [N/mm$^2$] | | Opm. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1 | 3 | 1 | 1 | Einde | EN3-1-1 | 6.2.8 | (6.30) | 0.149 | 35 | |
| 2 | 1 | 3 | 11 | 1 | Einde | EN3-1-1 | 6.2.8 | (6.30) | 0.170 | 40 | |
| 3 | 1 | 3 | 5 | 1 | My-max | EN3-1-1 | 6.2.8 | (6.30) | 0.216 | 51 | 46 |
| 4 | 1 | 3 | 20 | 1 | Einde | EN3-1-1 | 6.2.6 | (6.17) | 0.121 | 16 | 46 |
| 5 | 1 | 3 | 26 | 1 | My-max | EN3-1-1 | 6.2.8 | (6.30) | 0.242 | 57 | 46 |
| 6 | 1 | 3 | 21 | 1 | Begin | EN3-1-1 | 6.2.8 | (6.30) | 0.108 | 25 | |

## TOETSING SPANNINGEN

Ligger:1

| Staaf | Mat nr. | BC | Sit | Kl | Plaats | Norm | Artikel | Formule | Hoogste toetsing U.C. | [N/mm$^2$] | Opm. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 7 | 1 | 3 | 40 | 1 | My-max | EN3-1-1 | 6.2.8 | (6.30) | 0.239 | 56 | 46 |
| 8 | 1 | 3 | 46 | 1 | Begin | EN3-1-1 | 6.2.6 | (6.17) | 0.118 | 16 | 46 |
| 9 | 1 | 3 | 61 | 1 | My-max | EN3-1-1 | 6.2.8 | (6.30) | 0.241 | 57 | 46 |
| 10 | 1 | 3 | 64 | 1 | Begin | EN3-1-1 | 6.2.6 | (6.17) | 0.111 | 15 | 46 |
| 11 | 1 | 3 | 79 | 1 | My-max | EN3-1-1 | 6.2.8 | (6.30) | 0.225 | 53 | 46 |
| 12 | 1 | 3 | 73 | 1 | Begin | EN3-1-1 | 6.2.8 | (6.30) | 0.141 | 33 | |
| 13 | 1 | 3 | 1 | 1 | Begin | EN3-1-1 | 6.2.8 | (6.30) | 0.100 | 24 | |

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

## TOETSING DOORBUIGING

Ligger:1

| Staaf | Soort | Mtg | Lengte [m] | Overst I | Overst J | Zeeg [mm] | $u_{tot}$ [mm] | BC | Sit | u [mm] | Toelaatbaar [mm] | *1 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Vloer | ss | 0.80 | J | N | 0.0 | -2.2 | 7 | 25 Eind | -2.2 | ±6.4 | 2*0.004 |
| | | ss | | | | | | 7 | 25 Bijk | -2.2 | ±4.8 | 2*0.003 |
| 2 | Vloer | ss | 1.40 | N | N | 0.0 | -2.3 | 7 | 25 Eind | -2.3 | ±11.2 | 2*0.004 |
| | | ss | | | | | | 7 | 25 Bijk | -2.4 | ±8.4 | 2*0.003 |
| 3 | Vloer | db | 3.00 | N | N | 0.0 | -1.7 | 7 | 1 Eind | -1.7 | ±12.0 | 0.004 |
| | | db | | | | | | 7 | 1 Bijk | -1.7 | ±9.0 | 0.003 |
| 4 | Vloer | ss | 1.40 | N | N | 0.0 | -2.1 | 7 | 24 Eind | -2.1 | ±11.2 | 2*0.004 |
| | | ss | | | | | | 7 | 24 Bijk | -2.2 | ±8.4 | 2*0.003 |
| 5 | Vloer | db | 3.00 | N | N | 0.0 | -1.9 | 7 | 24 Eind | -1.9 | ±12.0 | 0.004 |
| | | db | | | | | | 7 | 24 Bijk | -1.9 | ±9.0 | 0.003 |
| 6 | Vloer | ss | 1.40 | N | N | 0.0 | -2.0 | 7 | 25 Eind | -2.0 | ±11.2 | 2*0.004 |
| | | ss | | | | | | 7 | 25 Bijk | -2.0 | ±8.4 | 2*0.003 |
| 7 | Vloer | db | 3.00 | N | N | 0.0 | -1.9 | 7 | 42 Eind | -1.9 | ±12.0 | 0.004 |
| | | db | | | | | | 7 | 42 Bijk | -1.9 | ±9.0 | 0.003 |
| 8 | Vloer | ss | 1.40 | N | N | 0.0 | -2.0 | 7 | 59 Eind | -2.0 | ±11.2 | 2*0.004 |
| | | ss | | | | | | 7 | 59 Bijk | -2.0 | ±8.4 | 2*0.003 |
| 9 | Vloer | db | 3.00 | N | N | 0.0 | -1.9 | 7 | 59 Eind | -1.9 | ±12.0 | 0.004 |
| | | db | | | | | | 7 | 59 Bijk | -1.9 | ±9.0 | 0.003 |
| 10 | Vloer | ss | 1.40 | N | N | 0.0 | -2.1 | 7 | 60 Eind | -2.1 | ±11.2 | 2*0.004 |
| | | ss | | | | | | 7 | 60 Bijk | -2.1 | ±8.4 | 2*0.003 |
| 11 | Vloer | db | 3.00 | N | N | 0.0 | -1.7 | 7 | 77 Eind | -1.7 | ±12.0 | 0.004 |
| | | db | | | | | | 7 | 77 Bijk | -1.7 | ±9.0 | 0.003 |
| 12 | Vloer | ss | 1.40 | N | N | 0.0 | -1.6 | 7 | 59 Eind | -1.6 | ±11.2 | 2*0.004 |
| | | ss | | | | | | 7 | 59 Bijk | -1.6 | ±8.4 | 2*0.003 |
| 13 | Vloer | ss | 0.80 | N | J | 0.0 | -1.5 | 7 | 59 Eind | -1.5 | ±6.4 | 2*0.004 |
| | | ss | | | | | | 7 | 59 Bijk | -1.5 | ±4.8 | 2*0.003 |

**UNITY-CHECK'S** Ligger:1 OMHULLENDE VAN ALLES

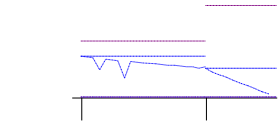
Velden: 1 t/m 6

**UNITY-CHECK'S** Ligger:1 OMHULLENDE VAN ALLES

Velden: 7 t/m 11

**UNITY-CHECK'S** Ligger:1 OMHULLENDE VAN ALLES

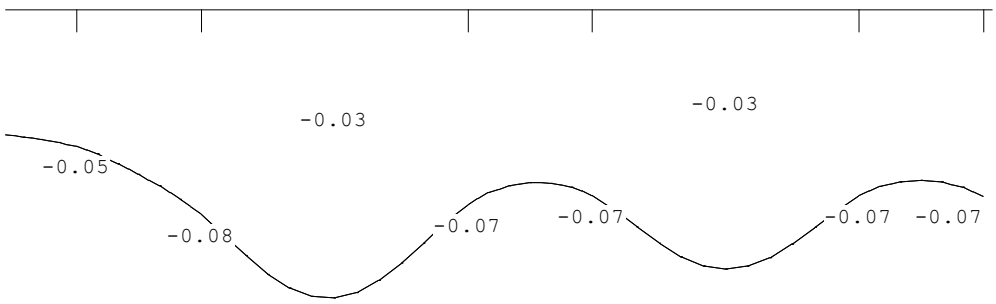
Velden: 12 t/m 13



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

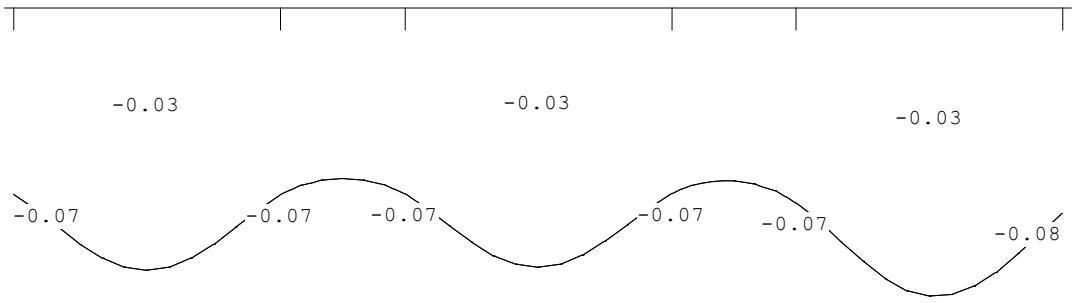
**DOORBUIGINGEN w1** [mm] Ligger:1 Blijvende combinatie

Velden: 1 t/m 6



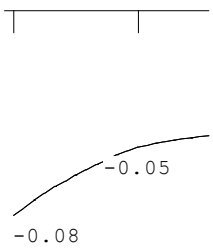

**DOORBUIGINGEN w1** [mm] Ligger:1 Blijvende combinatie

Velden: 7 t/m 11



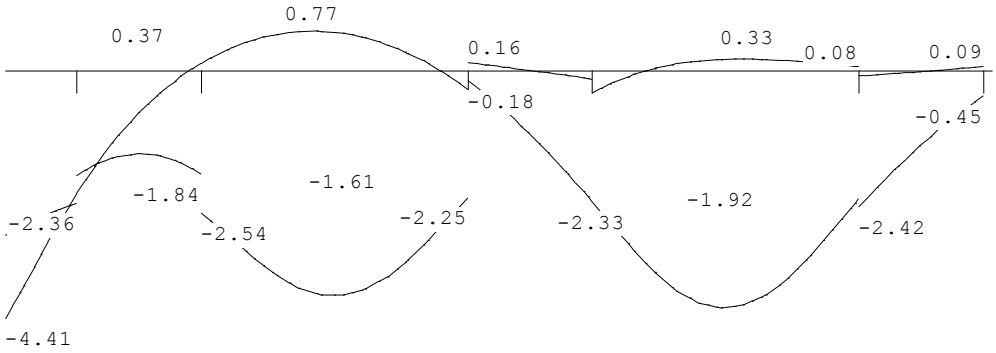
**DOORBUIGINGEN w1** [mm] Ligger:1 Blijvende combinatie

Velden: 12 t/m 13



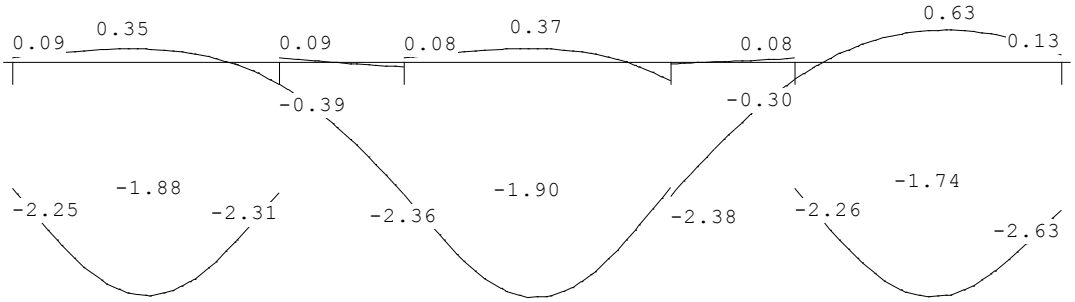

**DOORBUIGINGEN Wmax** [mm] Ligger:1 Karakteristieke combinatie

Velden: 1 t/m 6



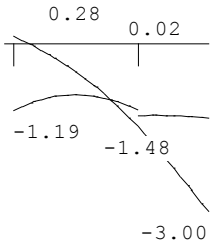

**DOORBUIGINGEN Wmax** [mm] Ligger:1 Karakteristieke combinatie

Velden: 7 t/m 11



**DOORBUIGINGEN Wmax** [mm] Ligger:1 Karakteristieke combinatie

Velden: 12 t/m 13




**DOORBUIGINGEN** Karakteristieke combinatie

| Veld | Zijde | positie [m] | $l_{rep}$ [mm] | $w_1$ [mm] | $w_2$ [mm] | \|-- $w_{bij}$ --\| [mm] | [lrep/] | $w_{tot}$ [mm] | $w_c$ [mm] | \|-- $w_{max}$ --\| [mm] | [lrep/] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Pos. | / | 1600 | | | 2.2 | 714 | 2.2 | | 2.2 | 715 |
| 2 | Pos. | / | 2800 | -0.0 | | 2.4 | 1191 | 2.3 | | 2.3 | 1204 |
| 3 | Neg. | 1.600 | 3000 | -0.0 | | -1.6 | 1902 | -1.6 | | -1.6 | 1864 |
| 3 | Pos. | 1.500 | 3000 | -0.0 | | 0.8 | 3645 | 0.8 | | 0.8 | 3799 |
| 4 | Neg. | / | 2800 | | | -2.2 | 1300 | -2.1 | | -2.1 | 1302 |
| 5 | Neg. | 1.450 | 3000 | -0.0 | | -1.9 | 1588 | -1.9 | | -1.9 | 1564 |
| 5 | Pos. | 1.500 | 3000 | -0.0 | | 0.4 | 7562 | 0.4 | | 0.4 | 8133 |
| 6 | Pos. | / | 2800 | | | 2.0 | 1425 | 2.0 | | 2.0 | 1426 |
| 7 | Neg. | 1.550 | 3000 | -0.0 | | -1.9 | 1622 | -1.9 | | -1.9 | 1597 |
| 7 | Pos. | 1.500 | 3000 | -0.0 | | 0.4 | 7155 | 0.4 | | 0.4 | 7677 |
| 8 | Neg. | / | 2800 | | | -2.0 | 1423 | -2.0 | | -2.0 | 1423 |
| 9 | Neg. | 1.400 | 3000 | -0.0 | | -1.9 | 1605 | -1.9 | | -1.9 | 1582 |
| 9 | Pos. | 1.500 | 3000 | -0.0 | | 0.4 | 7534 | 0.4 | | 0.4 | 8100 |
| 10 | Pos. | / | 2800 | | | 2.1 | 1342 | 2.1 | | 2.1 | 1345 |
| 11 | Neg. | 1.500 | 3000 | -0.0 | | -1.7 | 1754 | -1.7 | | -1.7 | 1721 |
| 11 | Pos. | 1.500 | 3000 | -0.0 | | 0.7 | 4383 | 0.7 | | 0.7 | 4607 |
| 12 | Neg. | / | 2800 | 0.0 | | -1.6 | 1710 | -1.6 | | -1.6 | 1737 |
| 12 | Pos. | 0.700 | 1400 | | | 0.3 | 5136 | 0.3 | | 0.3 | 5090 |
| 13 | Neg. | / | 1600 | | | -1.5 | 1046 | -1.5 | | -1.5 | 1049 |

## 6.7. 109

**TS/Liggers** **Rel: 6.20 5 apr 2016**

```
Project......: 14132 -
Onderdeel....: 106
Constructeur.: MvSommeren
Opdrachtgever:
Dimensies....: kN/m/rad
Datum........: 04/03/2016
Bestand......: x:\ing.buro\14100 tm 14199\14132\bouwconstructie\besteksfase\
               berekeningen\14132-01-109 - kopie.dlw

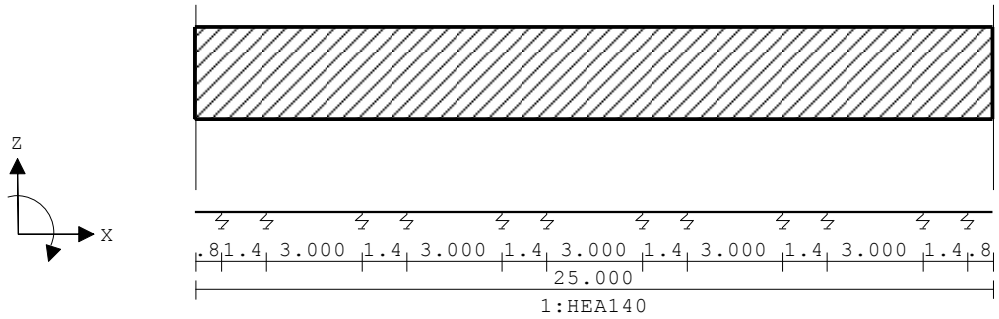
Betrouwbaarheidsklasse        : 2        Referentieperiode           : 50
```

### 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) |
| Staal | NEN-EN 1993-1-1:2006 | C2:2009 | NB:2011(nl) |

### GEOMETRIE

Ligger:1




### VELDLENGTEN

Ligger:1

| Veld | Vanaf | Tot | Lengte | Veld | Vanaf | Tot | Lengte |
|---|---|---|---|---|---|---|---|
| 1 | 0.000 | 0.800 | 0.800 | 6 | 9.600 | 11.000 | 1.400 |
| 2 | 0.800 | 2.200 | 1.400 | 7 | 11.000 | 14.000 | 3.000 |
| 3 | 2.200 | 5.200 | 3.000 | 8 | 14.000 | 15.400 | 1.400 |
| 4 | 5.200 | 6.600 | 1.400 | 9 | 15.400 | 18.400 | 3.000 |
| 5 | 6.600 | 9.600 | 3.000 | 10 | 18.400 | 19.800 | 1.400 |
| 11 | 19.800 | 22.800 | 3.000 | | | | |
| 12 | 22.800 | 24.200 | 1.400 | | | | |
| 13 | 24.200 | 25.000 | 0.800 | | | | |

### MATERIALEN

| Mt | Omschrijving | E-modulus[N/mm2] | S.M. | Pois. | Uitz. coëff |
|---|---|---|---|---|---|
| 1 | S235 | 210000 | 78.5 | 0.30 | 1.2000e-005 |

### PROFIELEN [mm]

| Prof. | Omschrijving | Materiaal | Oppervlak | Traagheid | Vormf. |
|---|---|---|---|---|---|
| 1 | HEA140 | 1:S235 | 3.1420e+003 | 1.0330e+007 | 0.00 |

## PROFIELEN vervolg [mm]

| Prof. | Staaftype | Breedte | Hoogte | e | Type | b1 | h1 | b2 | h2 |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 0:Normaal | 140 | 133 | 66.5 | | | | | |

## PROFIELVORMEN [mm]

1 HEA140



## VEREN

Ligger:1

| Veer | Steunpunt | Richting | Veerwaarde | Type | Ondergrens | Bovengrens |
|---|---|---|---|---|---|---|
| 1 | 1 | 2:Z-transl. | 1.000e+004 | Normaal | 0.000 | 0.000 |
| 2 | 2 | 2:Z-transl. | 1.000e+004 | Normaal | 0.000 | 0.000 |
| 3 | 3 | 2:Z-transl. | 1.111e+004 | Normaal | 0.000 | 0.000 |
| 4 | 4 | 2:Z-transl. | 1.111e+004 | Normaal | 0.000 | 0.000 |
| 5 | 5 | 2:Z-transl. | 1.111e+004 | Normaal | 0.000 | 0.000 |
| 6 | 6 | 2:Z-transl. | 1.111e+004 | Normaal | 0.000 | 0.000 |
| 7 | 7 | 2:Z-transl. | 1.111e+004 | Normaal | 0.000 | 0.000 |
| 8 | 8 | 2:Z-transl. | 1.111e+004 | Normaal | 0.000 | 0.000 |
| 9 | 9 | 2:Z-transl. | 1.111e+004 | Normaal | 0.000 | 0.000 |
| 10 | 10 | 2:Z-transl. | 1.111e+004 | Normaal | 0.000 | 0.000 |
| 11 | 11 | 2:Z-transl. | 1.000e+004 | Normaal | 0.000 | 0.000 |
| 12 | 12 | 2:Z-transl. | 1.000e+004 | Normaal | 0.000 | 0.000 |

## BELASTINGGEVALLEN

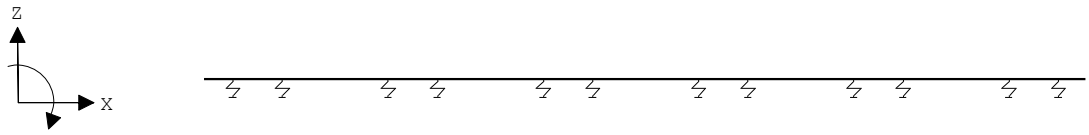
| B.G. | Omschrijving | Belast/onbelast | $\psi_0$ | $\psi_1$ | $\psi_2$ | e.g. |
|---|---|---|---|---|---|---|
| 1 | Permanent | 2:Permanent EN1991 | | | | -1.00 |
| 2 | Veranderlijk | 3:Kraanbaan | 0.40 | 0.50 | 0.30 | 0.00 |

## BELASTINGGEVALLEN

| B.G. | Omschrijving | Type |
|---|---|---|
| 1 | Permanent | 1 Permanente belasting |
| 2 | Veranderlijk | 2 Ver. bel. pers. ed. (p_rep) |

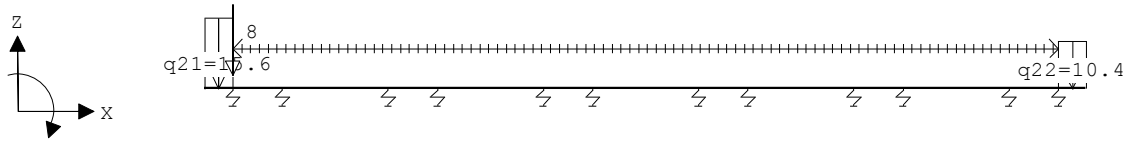
## VELDBELASTINGEN

Ligger:1 B.G:1 Permanent



## VELDBELASTINGEN

Ligger:1 B.G:2 Veranderlijk




## VELDBELASTINGEN

Ligger:1 B.G:2 Veranderlijk

| Last | Omschr/Ref/Index | Type | q1/p/m | q2 | psi | Afstand | Lengte |
|---|---|---|---|---|---|---|---|
| 1 | q21 | 1:q-last | -15.600 | -15.600 | | 0.000 | 0.800 |
| 2 | q22 | 1:q-last | -10.400 | -10.400 | | 24.200 | 0.800 |
| 3 | | 15:Pass.stelsel | -8.000 | 0.250 | | 0.800 | 23.400 |

## BELASTINGCOMBINATIES

| BC | Type | BG | Gen. | Factor | BG | Gen. | Factor | BG | Gen. | Factor | BG | Gen. | Factor |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Fund. | 1 | Perm | 1.35 | | | | | | | | | |
| 2 | Fund. | 1 | Perm | 0.90 | | | | | | | | | |
| 3 | Fund. | 1 | Perm | 1.35 | 2 | psi0 | 1.50 | | | | | | |
| 4 | Fund. | 1 | Perm | 1.20 | 2 | Extr | 1.50 | | | | | | |
| 5 | Fund. | 1 | Perm | 0.90 | 2 | Extr | 1.50 | | | | | | |
| 6 | Fund. | 1 | Perm | 0.90 | 2 | psi0 | 1.50 | | | | | | |
| 7 | Kar. | 1 | Perm | 1.00 | 2 | Extr | 1.00 | | | | | | |
| 8 | Quas. | 1 | Perm | 1.00 | | | | | | | | | |
| 9 | Quas. | 1 | Perm | 1.00 | 2 | psi2 | 1.00 | | | | | | |
| 10 | Freq. | 1 | Perm | 1.00 | | | | | | | | | |
| 11 | Freq. | 1 | Perm | 1.00 | 2 | psi1 | 1.00 | | | | | | |
| 12 | Blij. | 1 | Perm | 1.00 | | | | | | | | | |

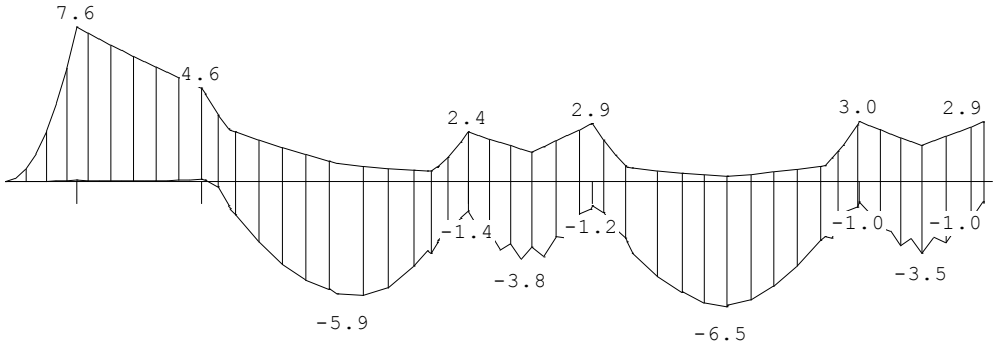
## GUNSTIGE WERKING PERMANENTE BELASTINGEN

| BC | Velden met gunstige werking |
|---|---|
| 1 | Geen |
| 2 | Alle velden de factor:0.90 |
| 3 | Geen |
| 4 | Geen |
| 5 | Alle velden de factor:0.90 |
| 6 | Alle velden de factor:0.90 |

## OMHULLENDE VAN DE FUNDAMENTELE COMBINATIES

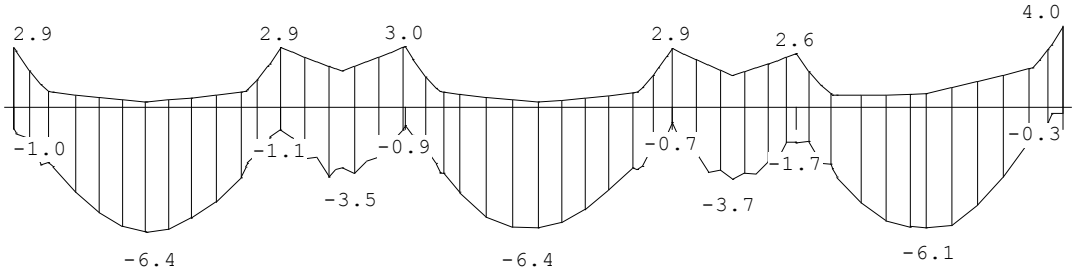
**MOMENTEN** Ligger:1 Fundamentele combinatie

Velden: 1 t/m 6



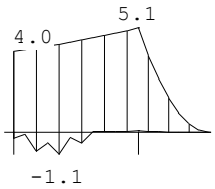

**MOMENTEN** Ligger:1 Fundamentele combinatie

Velden: 7 t/m 11



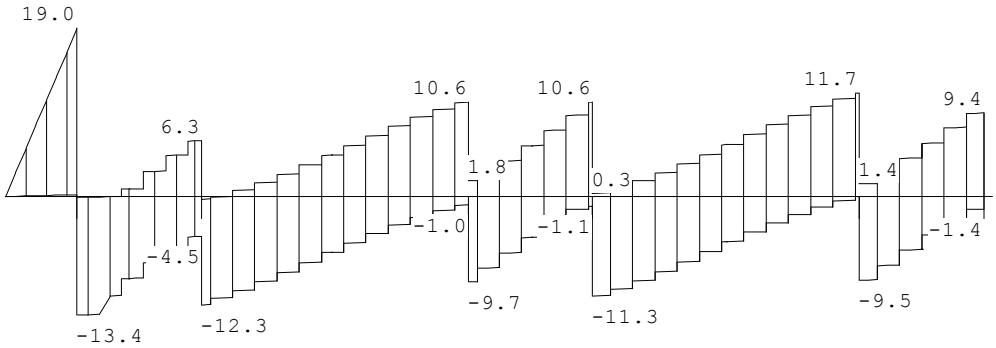

**MOMENTEN** Ligger:1 Fundamentele combinatie

Velden: 12 t/m 13



**DWARSKRACHTEN** Ligger:1 Fundamentele combinatie

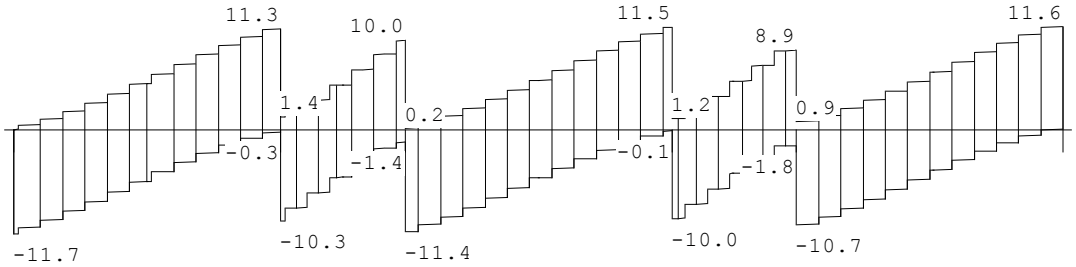
Velden: 1 t/m 6




| | | | | | | |
|---|---|---|---|---|---|---|
| Fmin: | 0.31 | -3.17 | -2.03 | -0.59 | -0.82 | -0.89 |
| Fmax: | 34.5 | 8.1 | 9.8 | 11.3 | 10.9 | 10.9 |

**DWARSKRACHTEN** Ligger:1 Fundamentele combinatie

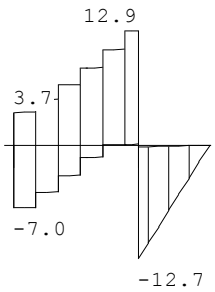
Velden: 7 t/m 11




| | | | | | | |
|---|---|---|---|---|---|---|
| Fmin: | -0.89 | -0.88 | -0.82 | -0.69 | -1.65 | -2.10 |
| Fmax: | 10.9 | 10.9 | 11.0 | 11.1 | 10.2 | 9.1 |

**DWARSKRACHTEN** Ligger:1 Fundamentele combinatie

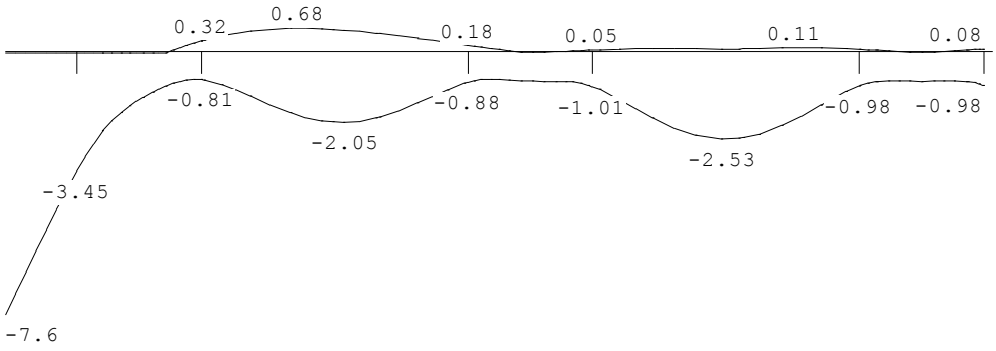
Velden: 12 t/m 13




| | | |
|---|---|---|
| Fmin: | -2.10 | 0.31 |
| Fmax: | 9.1 | 25.6 |

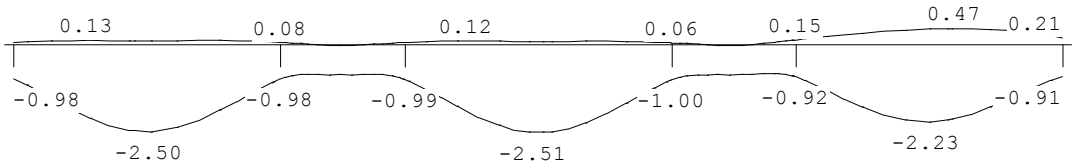
**VERPLAATSINGEN** [mm] Ligger:1 Fundamentele combinatie

Velden: 1 t/m 6



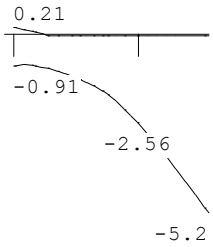

**VERPLAATSINGEN** [mm] Ligger:1 Fundamentele combinatie

Velden: 7 t/m 11




**VERPLAATSINGEN** [mm] Ligger:1 Fundamentele combinatie

Velden: 12 t/m 13




**REACTIES** Ligger:1 Fundamentele combinatie

| Stp | Fmin | Fmax | Mmin | Mmax |
|---|---|---|---|---|
| 1 | 0.31 | 34.45 | 0.00 | 0.00 |
| 2 | -3.17 | 8.09 | 0.00 | 0.00 |
| 3 | -2.03 | 9.81 | 0.00 | 0.00 |
| 4 | -0.59 | 11.25 | 0.00 | 0.00 |
| 5 | -0.82 | 10.94 | 0.00 | 0.00 |
| 6 | -0.89 | 10.87 | 0.00 | 0.00 |
| 7 | -0.88 | 10.91 | 0.00 | 0.00 |
| 8 | -0.82 | 10.96 | 0.00 | 0.00 |
| 9 | -0.69 | 11.12 | 0.00 | 0.00 |
| 10 | -1.65 | 10.20 | 0.00 | 0.00 |
| 11 | -2.10 | 9.15 | 0.00 | 0.00 |
| 12 | 0.31 | 25.62 | 0.00 | 0.00 |

## STAALPROFIELEN - ALGEMENE GEGEVENS

Ligger:1

Stabiliteit: Classificatie gehele constructie: Geschoord

### MATERIAAL

| Mat nr. | Profielnaam | Vloeisp. [N/mm$^2$] | Productie methode | Min. drsn. klasse |
|---|---|---|---|---|
| 1 | HEA140 | 235 | Gewalst | 1 |

Partiële veiligheidsfactoren:
Gamma M;0 : 1.00 Gamma M;1 : 1.00

## KIPSTABILITEIT

Ligger:1

| Staaf | Plts. aangr. | | l gaffel [m] | Kipsteunafstanden [m] |
|---|---|---|---|---|
| 1 | 1.0*h | boven: | 1.60 | 0.800 |
| | | onder: | 1.60 | 0.800 |
| 2 | 1.0*h | boven: | 1.40 | 1.400 |
| | | onder: | 1.40 | 1.400 |
| 3 | 1.0*h | boven: | 3.00 | 3.000 |
| | | onder: | 3.00 | 3.000 |
| 4 | 1.0*h | boven: | 1.40 | 1.400 |
| | | onder: | 1.40 | 1.400 |
| 5 | 1.0*h | boven: | 3.00 | 3.000 |
| | | onder: | 3.00 | 3.000 |
| 6 | 1.0*h | boven: | 1.40 | 1.400 |
| | | onder: | 1.40 | 1.400 |
| 7 | 1.0*h | boven: | 3.00 | 3.000 |
| | | onder: | 3.00 | 3.000 |
| 8 | 1.0*h | boven: | 1.40 | 1.400 |
| | | onder: | 1.40 | 1.400 |
| 9 | 1.0*h | boven: | 3.00 | 3.000 |
| | | onder: | 3.00 | 3.000 |
| 10 | 1.0*h | boven: | 1.40 | 1.400 |
| | | onder: | 1.40 | 1.400 |
| 11 | 1.0*h | boven: | 3.00 | 3.000 |
| | | onder: | 3.00 | 3.000 |
| 12 | 1.0*h | boven: | 1.40 | 1.400 |
| | | onder: | 1.40 | 1.400 |
| 13 | 1.0*h | boven: | 1.50 | 0.750 |
| | | onder: | 1.50 | 0.750 |

## TOETSING SPANNINGEN

Ligger:1

| Staaf | Mat nr. | BC | Sit | Kl | Plaats | Norm | Artikel | Formule | Hoogste toetsing U.C. | [N/mm$^2$] | Opm. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1 | 3 | 1 | 1 | Einde | EN3-1-1 | 6.2.8 | (6.30) | 0.186 | 44 | |
| 2 | 1 | 3 | 1 | 1 | Begin | EN3-1-1 | 6.2.8 | (6.30) | 0.186 | 44 | |
| 3 | 1 | 3 | 13 | 1 | My-max | EN3-1-1 | 6.2.8 | (6.30) | 0.145 | 34 | 46 |
| 4 | 1 | 5 | 21 | 1 | My-max | EN3-1-1 | 6.2.8 | (6.30) | 0.094 | 22 | 46 |
| 5 | 1 | 3 | 30 | 1 | My-max | EN3-1-1 | 6.2.8 | (6.30) | 0.159 | 37 | 46 |
| 6 | 1 | 5 | 39 | 1 | My-max | EN3-1-1 | 6.2.8 | (6.30) | 0.086 | 20 | 46 |
| 7 | 1 | 3 | 48 | 1 | My-max | EN3-1-1 | 6.2.8 | (6.30) | 0.158 | 37 | 46 |
| 8 | 1 | 5 | 57 | 1 | My-max | EN3-1-1 | 6.2.8 | (6.30) | 0.085 | 20 | 46 |
| 9 | 1 | 3 | 65 | 1 | My-max | EN3-1-1 | 6.2.8 | (6.30) | 0.158 | 37 | 46 |
| 10 | 1 | 5 | 74 | 1 | My-max | EN3-1-1 | 6.2.8 | (6.30) | 0.091 | 21 | 46 |
| 11 | 1 | 3 | 83 | 1 | My-max | EN3-1-1 | 6.2.8 | (6.30) | 0.149 | 35 | 46 |
| 12 | 1 | 3 | 1 | 1 | Einde | EN3-1-1 | 6.2.8 | (6.30) | 0.125 | 29 | |
| 13 | 1 | 3 | 1 | 1 | Begin | EN3-1-1 | 6.2.8 | (6.30) | 0.125 | 29 | |

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

**TOETSING DOORBUIGING** Ligger:1

| Staaf | Soort | Mtg | Lengte [m] | Overst I | Overst J | Zeeg [mm] | $u_{tot}$ [mm] | BC | Sit | u [mm] | Toelaatbaar [mm] | Toelaatbaar *l |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Vloer | ss | 0.80 | J | N | 0.0 | -2.8 | 7 1 | Eind | -2.8 | ±6.4 | 2*0.004 |
| | | ss | | | | | | 7 1 | Bijk | -2.8 | ±4.8 | 2*0.003 |
| 2 | Vloer | ss | 1.40 | N | N | 0.0 | -2.4 | 7 1 | Eind | -2.4 | ±11.2 | 2*0.004 |
| | | ss | | | | | | 7 1 | Bijk | -2.4 | ±8.4 | 2*0.003 |
| 3 | Vloer | db | 3.00 | N | N | 0.0 | -1.0 | 7 13 | Eind | -1.0 | ±12.0 | 0.004 |
| | | db | | | | | | 7 13 | Bijk | -0.9 | ±9.0 | 0.003 |
| 4 | Vloer | ss | 1.40 | N | N | 0.0 | -0.7 | 7 27 | Eind | -0.7 | ±11.2 | 2*0.004 |
| | | ss | | | | | | 7 27 | Bijk | -0.7 | ±8.4 | 2*0.003 |
| 5 | Vloer | db | 3.00 | N | N | 0.0 | -1.2 | 7 30 | Eind | -1.2 | ±12.0 | 0.004 |
| | | db | | | | | | 7 30 | Bijk | -1.1 | ±9.0 | 0.003 |
| 6 | Vloer | ss | 1.40 | N | N | 0.0 | -0.6 | 7 33 | Eind | -0.6 | ±11.2 | 2*0.004 |
| | | ss | | | | | | 7 33 | Bijk | -0.6 | ±8.4 | 2*0.003 |
| 7 | Vloer | db | 3.00 | N | N | 0.0 | -1.2 | 7 48 | Eind | -1.2 | ±12.0 | 0.004 |
| | | db | | | | | | 7 48 | Bijk | -1.1 | ±9.0 | 0.003 |
| 8 | Vloer | ss | 1.40 | N | N | 0.0 | -0.6 | 7 63 | Eind | -0.6 | ±11.2 | 2*0.004 |
| | | ss | | | | | | 7 63 | Bijk | -0.6 | ±8.4 | 2*0.003 |
| 9 | Vloer | db | 3.00 | N | N | 0.0 | -1.2 | 7 65 | Eind | -1.2 | ±12.0 | 0.004 |
| | | db | | | | | | 7 65 | Bijk | -1.1 | ±9.0 | 0.003 |
| 10 | Vloer | ss | 1.40 | N | N | 0.0 | -0.7 | 7 68 | Eind | -0.7 | ±11.2 | 2*0.004 |
| | | ss | | | | | | 7 68 | Bijk | -0.7 | ±8.4 | 2*0.003 |
| 11 | Vloer | db | 3.00 | N | N | 0.0 | -1.0 | 7 83 | Eind | -1.0 | ±12.0 | 0.004 |
| | | db | | | | | | 7 83 | Bijk | -1.0 | ±9.0 | 0.003 |
| 12 | Vloer | ss | 1.40 | N | N | 0.0 | -1.6 | 7 94 | Eind | -1.6 | ±11.2 | 2*0.004 |
| | | ss | | | | | | 7 94 | Bijk | -1.7 | ±8.4 | 2*0.003 |
| 13 | Vloer | ss | 0.80 | N | J | 0.0 | -1.7 | 7 94 | Eind | -1.7 | ±6.4 | 2*0.004 |
| | | ss | | | | | | 7 94 | Bijk | -1.7 | ±4.8 | 2*0.003 |

**UNITY-CHECK'S** Ligger:1 OMHULLENDE VAN ALLES

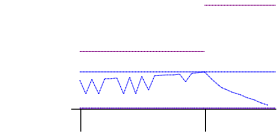
Velden: 1 t/m 6

**UNITY-CHECK'S** Ligger:1 OMHULLENDE VAN ALLES

Velden: 7 t/m 11

**UNITY-CHECK'S** Ligger:1 OMHULLENDE VAN ALLES

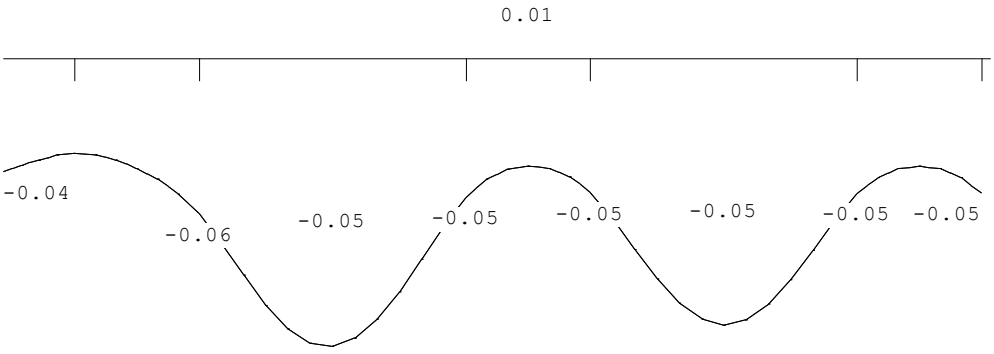
Velden: 12 t/m 13



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

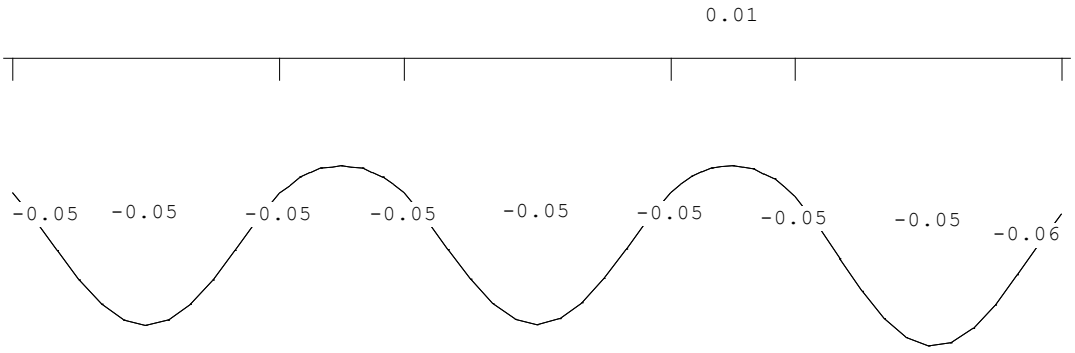
**DOORBUIGINGEN w1** [mm] Ligger:1 Blijvende combinatie

Velden: 1 t/m 6



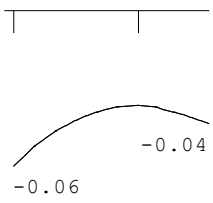

**DOORBUIGINGEN w1** [mm] Ligger:1 Blijvende combinatie

Velden: 7 t/m 11



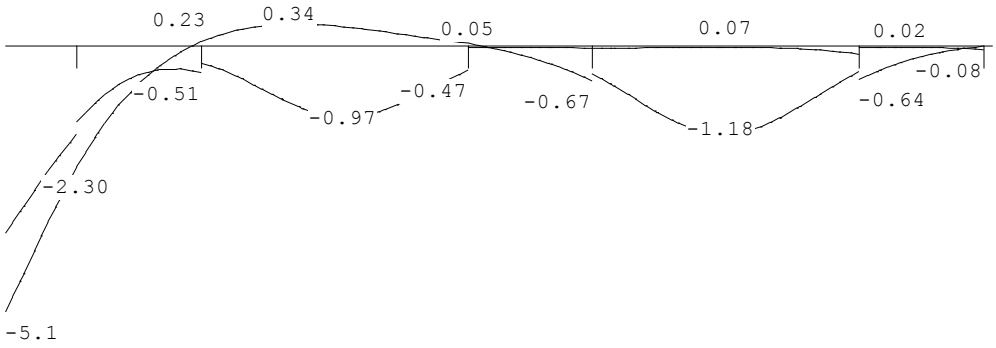
**DOORBUIGINGEN w1** [mm] Ligger:1 Blijvende combinatie

Velden: 12 t/m 13



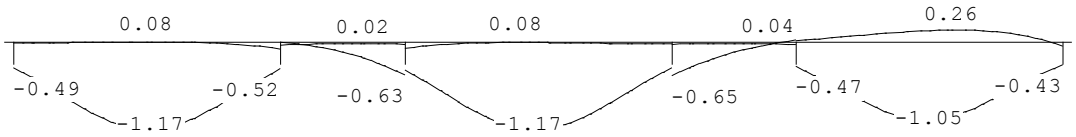

**DOORBUIGINGEN Wmax** [mm] Ligger:1 Karakteristieke combinatie

Velden: 1 t/m 6



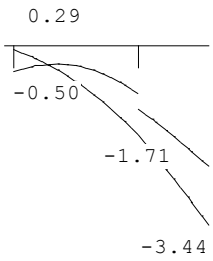

**DOORBUIGINGEN Wmax** [mm] Ligger:1 Karakteristieke combinatie

Velden: 7 t/m 11




**DOORBUIGINGEN Wmax** [mm] Ligger:1 Karakteristieke combinatie

Velden: 12 t/m 13



**DOORBUIGINGEN** Karakteristieke combinatie

| Veld | Zijde | positie [m] | $l_{rep}$ [mm] | $w_1$ [mm] | $w_2$ [mm] | $w_{bij}$ [mm] | $w_{bij}$ [lrep/] | $w_{tot}$ [mm] | $w_c$ [mm] | $w_{max}$ [mm] | $w_{max}$ [lrep/] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Pos. | / | 1600 | 0.0 | | 2.8 | 578 | 2.8 | | 2.8 | 577 |
| 2 | Pos. | / | 2800 | -0.0 | | 2.4 | 1166 | 2.4 | | 2.4 | 1177 |
| 3 | Neg. | 1.600 | 3000 | -0.0 | | -0.9 | 3258 | -1.0 | | -1.0 | 3090 |
| 3 | Pos. | 1.000 | 3000 | -0.0 | | 0.4 | 7724 | 0.3 | | 0.3 | 8700 |
| 4 | Neg. | / | 2800 | | | -0.7 | 3896 | -0.7 | | -0.7 | 3905 |
| 5 | Neg. | 1.450 | 3000 | -0.0 | | -1.1 | 2653 | -1.2 | | -1.2 | 2540 |
| 6 | Pos. | / | 2800 | | | 0.6 | 4413 | 0.6 | | 0.6 | 4413 |
| 7 | Neg. | 1.550 | 3000 | -0.0 | | -1.1 | 2665 | -1.2 | | -1.2 | 2557 |
| 8 | Neg. | / | 2800 | | | -0.6 | 4437 | -0.6 | | -0.6 | 4438 |
| 9 | Neg. | 1.400 | 3000 | -0.0 | | -1.1 | 2675 | -1.2 | | -1.2 | 2563 |
| 10 | Pos. | / | 2800 | | | 0.7 | 4055 | 0.7 | | 0.7 | 4065 |
| 11 | Neg. | 1.500 | 3000 | -0.1 | | -1.0 | 3016 | -1.0 | | -1.0 | 2869 |
| 11 | Pos. | 1.750 | 3000 | -0.0 | | 0.3 | 9623 | 0.3 | | 0.3 | 11428 |
| 12 | Neg. | / | 2800 | 0.0 | | -1.7 | 1685 | -1.6 | | -1.6 | 1708 |
| 12 | Pos. | 0.700 | 1400 | 0.0 | | 0.3 | 4234 | 0.3 | | 0.3 | 4164 |
| 13 | Neg. | / | 1600 | -0.0 | | -1.7 | 930 | -1.7 | | -1.7 | 926 |

## 6.8. 110-111-112

**TS/Balkroosters** **Rel: 6.03 6 apr 2016**

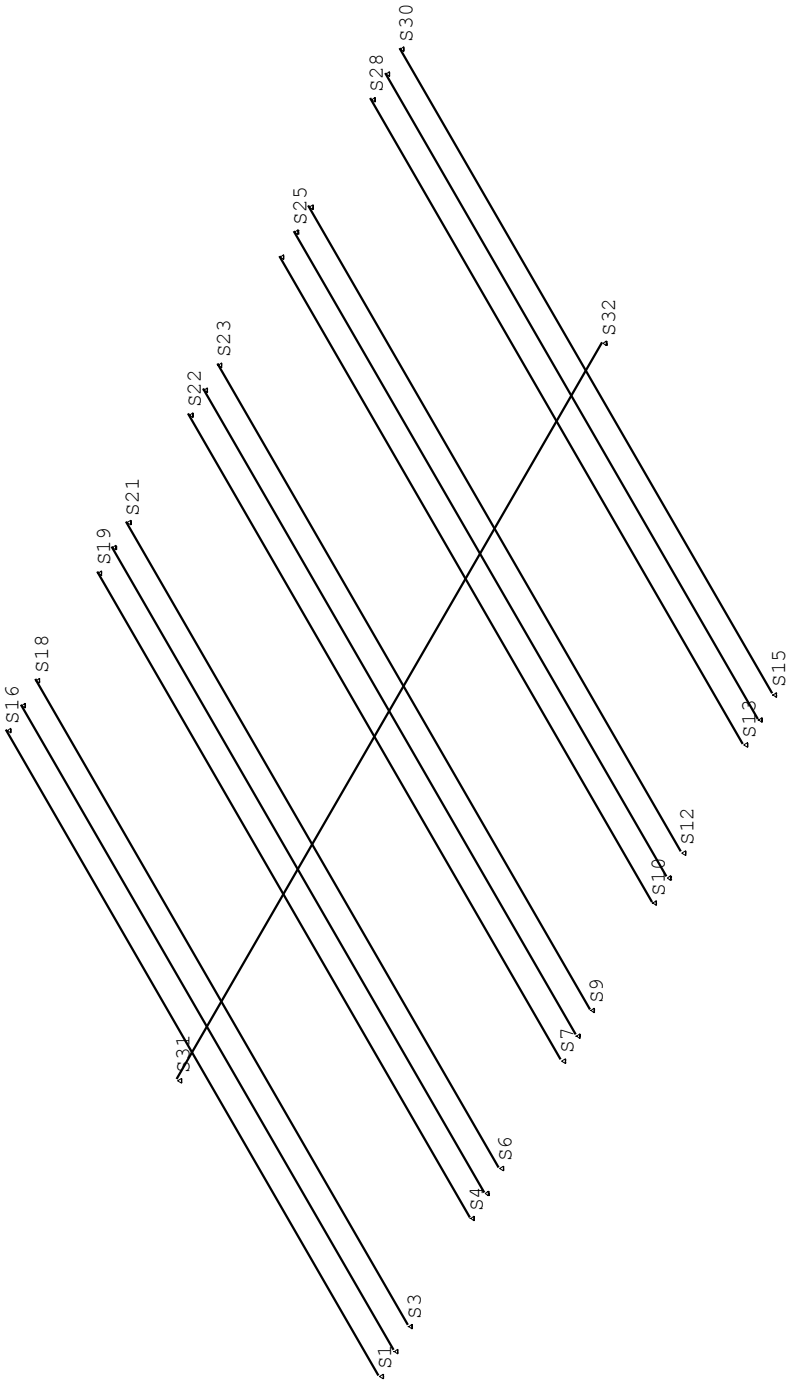
```
Project..: 14132
Onderdeel: 110-111
Dimensies: kN/m/rad
Datum....: 04/03/2016
Bestand..: x:\ing.buro\14100 tm 14199\14132\bouwconstructie\besteksfase\
               berekeningen\14132-01-110-111-112.grw
Torsiefac: 10 %

Betrouwbaarheidsklasse        : 2        Referentieperiode           : 50
```

**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) |
| Staal | NEN-EN 1993-1-1:2006 | C2:2009 | NB:2011(nl) |

**GEOMETRIE**


S30
S28
S25
S32
S23
S22
S21
S19
S18
S16
S15
S13
S12
S10
S9
S7
S31
S6
S4
S3
S1

## MATERIALEN

| Mt | Omschrijving | E-modulus[N/mm2] | S.M. | Pois. | Uitz. coëff |
|---|---|---|---|---|---|
| 1 | S235 | 210000 | 78.5 | 0.30 | 1.2000e-005 |
| 2 | S235 | 210000 | 78.5 | 0.30 | 1.2000e-005 |

## PROFIELEN [mm]

| Prof. | Omschrijving | Materiaal | Oppervlak | Torsietr. | Traagheid | Vormf. |
|---|---|---|---|---|---|---|
| 1 | HEA1000 | 2:S235 | 3.470e+004 | 8.350e+006 | 5.538e+009 | 0.00 |
| 2 | IPE600 | 1:S235 | 1.560e+004 | 1.652e+006 | 9.208e+008 | 0.00 |
| 3 | IPE400 | 1:S235 | 8.450e+003 | 5.130e+005 | 2.313e+008 | 0.00 |

## PROFIELEN vervolg [mm]

| Prof. | Staaftype | Breedte | Hoogte | Zs | Rek.As | Type | b1 | h1 | b2 | h2 |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0:Normaal | 300 | 990 | 495 | 0.00 | | | | | |
| 2 | 0:Normaal | 220 | 600 | 300 | 0.00 | | | | | |
| 3 | 0:Normaal | 180 | 400 | 200 | 0.00 | | | | | |

## PROFIELVORMEN [mm]

1 HEA1000



2 IPE600



3 IPE400



## KNOPEN

| Knoop | X | Z | Knoop | X | Z |
|---|---|---|---|---|---|
| 1 | 1.450 | 0.000 | 6 | 0.000 | 9.000 |
| 2 | 5.850 | 0.000 | 7 | 1.450 | 9.000 |
| 3 | 10.250 | 0.000 | 8 | 5.850 | 9.000 |
| 4 | 14.650 | 0.000 | 9 | 10.250 | 9.000 |
| 5 | 19.050 | 0.000 | 10 | 14.650 | 9.000 |
| 11 | 19.050 | 9.000 | 16 | 14.650 | 18.000 |
| 12 | 20.550 | 9.000 | 17 | 19.050 | 18.000 |
| 13 | 1.450 | 18.000 | 18 | 0.750 | 0.000 |
| 14 | 5.850 | 18.000 | 19 | 5.150 | 0.000 |
| 15 | 10.250 | 18.000 | 20 | 9.550 | 0.000 |
| 21 | 13.950 | 0.000 | 26 | 13.950 | 9.000 |
| 22 | 18.350 | 0.000 | 27 | 18.350 | 9.000 |
| 23 | 0.750 | 9.000 | 28 | 0.750 | 18.000 |
| 24 | 5.150 | 9.000 | 29 | 5.150 | 18.000 |
| 25 | 9.550 | 9.000 | 30 | 9.550 | 18.000 |
| 31 | 13.950 | 18.000 | 36 | 15.350 | 0.000 |
| 32 | 18.350 | 18.000 | 37 | 19.750 | 0.000 |
| 33 | 2.150 | 0.000 | 38 | 2.150 | 9.000 |
| 34 | 6.550 | 0.000 | 39 | 6.550 | 9.000 |
| 35 | 10.950 | 0.000 | 40 | 10.950 | 9.000 |
| 41 | 15.350 | 9.000 | 46 | 15.350 | 18.000 |
| 42 | 19.750 | 9.000 | 47 | 19.750 | 18.000 |
| 43 | 2.150 | 18.000 | | | |
| 44 | 6.550 | 18.000 | | | |

**KNOPEN**

| Knoop | X | Z | Knoop | X | Z |
|---|---|---|---|---|---|
| 45 | 10.950 | 18.000 | | | |

**BALKEN**

| Nr. | Naam | Begin | Eind | Profiel |
|---|---|---|---|---|
| 1 | 1 | 1 | 13 | 1:HEA1000 |
| 2 | 2 | 2 | 14 | 1:HEA1000 |
| 3 | 3 | 3 | 15 | 1:HEA1000 |
| 4 | 4 | 4 | 16 | 1:HEA1000 |
| 5 | 5 | 5 | 17 | 1:HEA1000 |
| 6 | 6 | 6 | 12 | 2:IPE600 |
| 7 | 7 | 18 | 28 | 3:IPE400 |
| 8 | 8 | 19 | 29 | 3:IPE400 |
| 9 | 9 | 20 | 30 | 3:IPE400 |
| 10 | 10 | 21 | 31 | 3:IPE400 |
| 11 | 11 | 22 | 32 | 3:IPE400 |
| 12 | 12 | 33 | 43 | 3:IPE400 |
| 13 | 13 | 34 | 44 | 3:IPE400 |
| 14 | 14 | 35 | 45 | 3:IPE400 |
| 15 | 15 | 36 | 46 | 3:IPE400 |
| 16 | 16 | 37 | 47 | 3:IPE400 |

**BALKEN vervolg**

| Nr. | Naam | Aansl.begin | Aansl.eind | Excentr. | Pasm.begin | Pasm.eind | Opm. |
|---|---|---|---|---|---|---|---|
| 1 | 1 | WDM | WDM | 0.000 | 0.000 | 0.000 | |
| 2 | 2 | WDM | WDM | 0.000 | 0.000 | 0.000 | |
| 3 | 3 | WDM | WDM | 0.000 | 0.000 | 0.000 | |
| 4 | 4 | WDM | WDM | 0.000 | 0.000 | 0.000 | |
| 5 | 5 | WDM | WDM | 0.000 | 0.000 | 0.000 | |
| 6 | 6 | WDM | WDM | 0.000 | 0.000 | 0.000 | |
| 7 | 7 | WDM | WDM | 0.000 | 0.000 | 0.000 | |
| 8 | 8 | WDM | WDM | 0.000 | 0.000 | 0.000 | |
| 9 | 9 | WDM | WDM | 0.000 | 0.000 | 0.000 | |
| 10 | 10 | WDM | WDM | 0.000 | 0.000 | 0.000 | |
| 11 | 11 | WDM | WDM | 0.000 | 0.000 | 0.000 | |
| 12 | 12 | WDM | WDM | 0.000 | 0.000 | 0.000 | |
| 13 | 13 | WDM | WDM | 0.000 | 0.000 | 0.000 | |
| 14 | 14 | WDM | WDM | 0.000 | 0.000 | 0.000 | |
| 15 | 15 | WDM | WDM | 0.000 | 0.000 | 0.000 | |
| 16 | 16 | WDM | WDM | 0.000 | 0.000 | 0.000 | |

Opmerkingen:
De torsie traagheid van alle balken is tot 10% gereduceerd

**STEUNPUNTTYPEN**

Nr. : 1 Rx:Vrij Z:Vast Ry:Vrij
Afmeting : 0*0
Inheiniv.: 0
Afhakniv.: 0
Min.afst.: 0.500



**STEUNPUNTEN**

| Nr. | Steunpunttype | Balk | Positie | Excentr. | Opm: |
|---|---|---|---|---|---|
| 1 | 1:0*0 | 7 | 0.000 | 0.000 | |
| 2 | 1:0*0 | 1 | 0.000 | 0.000 | |
| 3 | 1:0*0 | 12 | 0.000 | 0.000 | |
| 4 | 1:0*0 | 8 | 0.000 | 0.000 | |
| 5 | 1:0*0 | 2 | 0.000 | 0.000 | |
| 6 | 1:0*0 | 13 | 0.000 | 0.000 | |
| 7 | 1:0*0 | 9 | 0.000 | 0.000 | |
| 8 | 1:0*0 | 3 | 0.000 | 0.000 | |
| 9 | 1:0*0 | 14 | 0.000 | 0.000 | |
| 10 | 1:0*0 | 10 | 0.000 | 0.000 | |
| 11 | 1:0*0 | 4 | 0.000 | 0.000 | |
| 12 | 1:0*0 | 15 | 0.000 | 0.000 | |
| 13 | 1:0*0 | 11 | 0.000 | 0.000 | |
| 14 | 1:0*0 | 5 | 0.000 | 0.000 | |
| 15 | 1:0*0 | 16 | 0.000 | 0.000 | |
| 16 | 1:0*0 | 7 | 18.000 | 0.000 | |
| 17 | 1:0*0 | 1 | 18.000 | 0.000 | |
| 18 | 1:0*0 | 12 | 18.000 | 0.000 | |
| 19 | 1:0*0 | 8 | 18.000 | 0.000 | |
| 20 | 1:0*0 | 2 | 18.000 | 0.000 | |
| 21 | 1:0*0 | 13 | 18.000 | 0.000 | |
| 22 | 1:0*0 | 9 | 18.000 | 0.000 | |
| 23 | 1:0*0 | 14 | 18.000 | 0.000 | |
| 24 | 1:0*0 | 3 | 18.000 | 0.000 | |
| 25 | 1:0*0 | 4 | 18.000 | 0.000 | |
| 26 | 1:0*0 | 10 | 18.000 | 0.000 | |
| 27 | 1:0*0 | 15 | 18.000 | 0.000 | |
| 28 | 1:0*0 | 11 | 18.000 | 0.000 | |
| 29 | 1:0*0 | 5 | 18.000 | 0.000 | |
| 30 | 1:0*0 | 16 | 18.000 | 0.000 | |
| 31 | 1:0*0 | 6 | 0.000 | 0.000 | |
| 32 | 1:0*0 | 6 | 20.550 | 0.000 | |

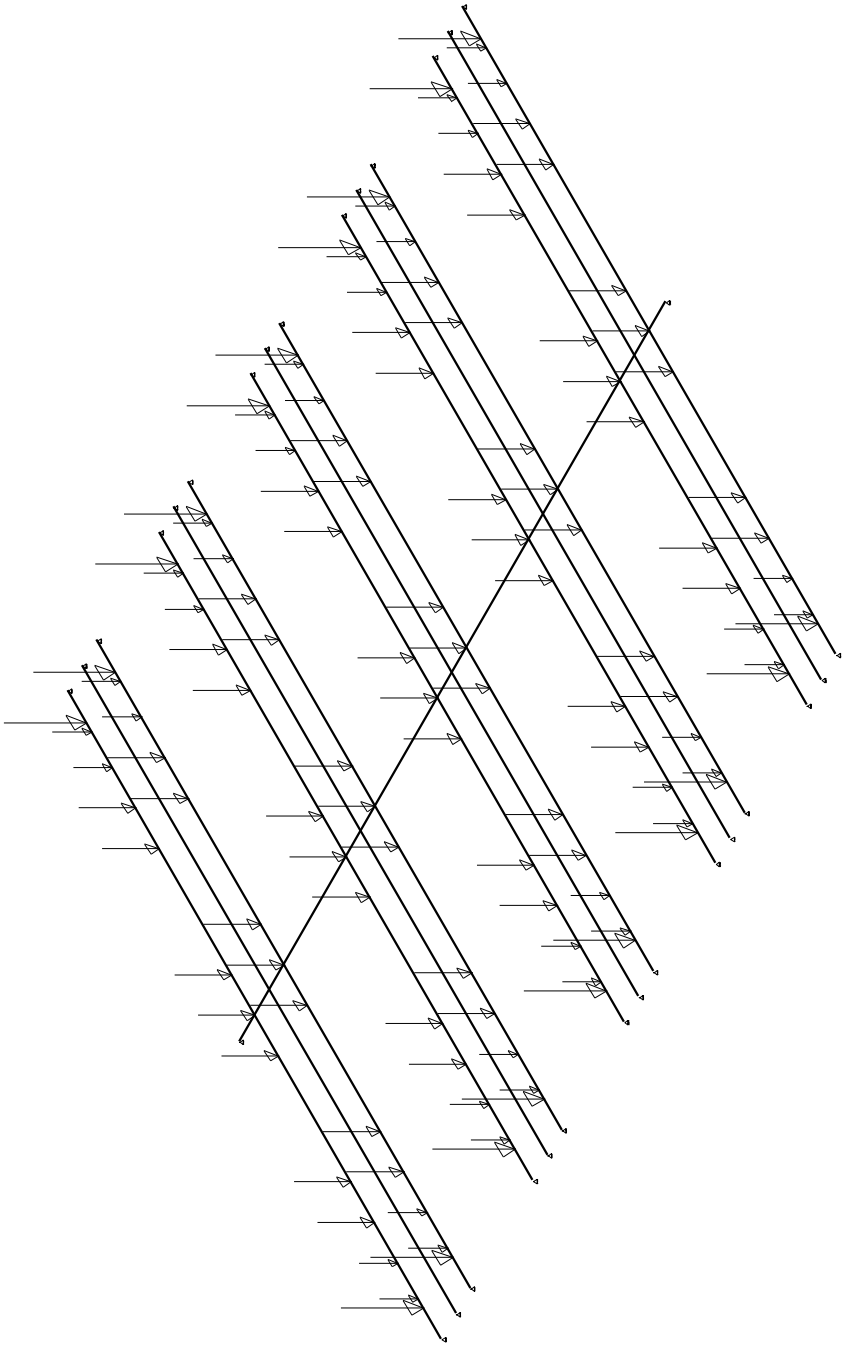
**BELASTINGGEVALLEN**

| B.G. | Omschrijving | Belast/onbelast | $\psi_0$ | $\psi_1$ | $\psi_2$ | e.g. |
|---|---|---|---|---|---|---|
| 1 | Permanent | 2:Permanent EN1991 | | | | -1.00 |
| 2 | Veranderlijk | 0:Alles tegelijk | 0.50 | 0.50 | 0.30 | 0.00 |

**BELASTINGGEVALLEN**

| B.G. | Omschrijving | Type |
|---|---|---|
| 1 | Permanent | 1 Permanente belasting |
| 2 | Veranderlijk | 2 Ver. bel. pers. ed. (p_rep) |

**VELDBELASTINGEN** B.G:1 Permanent



**VELDBELASTINGEN** B.G:1 Permanent

| Balk | Last | Type | q1/p/m | q2 | Afstand | Lengte | Exc. |
|---|---|---|---|---|---|---|---|
| 7 | 1 | 8:Puntlast | -1.150 | | 0.880 | | 0.000 |
| 7 | 2 | 8:Puntlast | -0.550 | | 1.130 | | 0.000 |
| 7 | 3 | 8:Puntlast | -0.550 | | 2.123 | | 0.000 |
| 7 | 4 | 8:Puntlast | -0.800 | | 3.250 | | 0.000 |
| 7 | 5 | 8:Puntlast | -0.800 | | 4.375 | | 0.000 |
| 7 | 6 | 8:Puntlast | -0.800 | | 7.875 | | 0.000 |
| 7 | 7 | 8:Puntlast | -0.800 | | 9.000 | | 0.000 |
| 7 | 8 | 8:Puntlast | -0.800 | | 10.125 | | 0.000 |
| 7 | 9 | 8:Puntlast | -0.800 | | 13.625 | | 0.000 |
| 7 | 10 | 8:Puntlast | -0.800 | | 14.753 | | 0.000 |
| 7 | 11 | 8:Puntlast | -0.550 | | 15.877 | | 0.000 |
| 7 | 12 | 8:Puntlast | -0.550 | | 16.870 | | 0.000 |
| 7 | 13 | 8:Puntlast | -1.150 | | 17.120 | | 0.000 |
| 8 | 1 | 8:Puntlast | -1.150 | | 0.880 | | 0.000 |
| 8 | 2 | 8:Puntlast | -0.550 | | 1.130 | | 0.000 |
| 8 | 3 | 8:Puntlast | -0.550 | | 2.123 | | 0.000 |
| 8 | 4 | 8:Puntlast | -0.800 | | 3.250 | | 0.000 |
| 8 | 5 | 8:Puntlast | -0.800 | | 4.375 | | 0.000 |
| 8 | 6 | 8:Puntlast | -0.800 | | 7.875 | | 0.000 |
| 8 | 7 | 8:Puntlast | -0.800 | | 9.000 | | 0.000 |
| 8 | 8 | 8:Puntlast | -0.800 | | 10.125 | | 0.000 |
| 8 | 9 | 8:Puntlast | -0.800 | | 13.625 | | 0.000 |
| 8 | 10 | 8:Puntlast | -0.800 | | 14.753 | | 0.000 |
| 8 | 11 | 8:Puntlast | -0.550 | | 15.877 | | 0.000 |
| 8 | 12 | 8:Puntlast | -0.550 | | 16.870 | | 0.000 |
| 8 | 13 | 8:Puntlast | -1.150 | | 17.120 | | 0.000 |
| 9 | 1 | 8:Puntlast | -1.150 | | 0.880 | | 0.000 |
| 9 | 2 | 8:Puntlast | -0.550 | | 1.130 | | 0.000 |
| 9 | 3 | 8:Puntlast | -0.550 | | 2.123 | | 0.000 |
| 9 | 4 | 8:Puntlast | -0.800 | | 3.250 | | 0.000 |
| 9 | 5 | 8:Puntlast | -0.800 | | 4.375 | | 0.000 |
| 9 | 6 | 8:Puntlast | -0.800 | | 7.875 | | 0.000 |
| 9 | 7 | 8:Puntlast | -0.800 | | 9.000 | | 0.000 |
| 9 | 8 | 8:Puntlast | -0.800 | | 10.125 | | 0.000 |
| 9 | 9 | 8:Puntlast | -0.800 | | 13.625 | | 0.000 |
| 9 | 10 | 8:Puntlast | -0.800 | | 14.753 | | 0.000 |
| 9 | 11 | 8:Puntlast | -0.550 | | 15.877 | | 0.000 |
| 9 | 12 | 8:Puntlast | -0.550 | | 16.870 | | 0.000 |
| 9 | 13 | 8:Puntlast | -1.150 | | 17.120 | | 0.000 |
| 10 | 1 | 8:Puntlast | -1.150 | | 0.880 | | 0.000 |
| 10 | 2 | 8:Puntlast | -0.550 | | 1.130 | | 0.000 |
| 10 | 3 | 8:Puntlast | -0.550 | | 2.123 | | 0.000 |
| 10 | 4 | 8:Puntlast | -0.800 | | 3.250 | | 0.000 |
| 10 | 5 | 8:Puntlast | -0.800 | | 4.375 | | 0.000 |
| 10 | 6 | 8:Puntlast | -0.800 | | 7.875 | | 0.000 |
| 10 | 7 | 8:Puntlast | -0.800 | | 9.000 | | 0.000 |
| 10 | 8 | 8:Puntlast | -0.800 | | 10.125 | | 0.000 |
| 10 | 9 | 8:Puntlast | -0.800 | | 13.625 | | 0.000 |
| 10 | 10 | 8:Puntlast | -0.800 | | 14.753 | | 0.000 |
| 10 | 11 | 8:Puntlast | -0.550 | | 15.877 | | 0.000 |
| 10 | 12 | 8:Puntlast | -0.550 | | 16.870 | | 0.000 |
| 10 | 13 | 8:Puntlast | -1.150 | | 17.120 | | 0.000 |
| 11 | 1 | 8:Puntlast | -1.150 | | 0.880 | | 0.000 |
| 11 | 2 | 8:Puntlast | -0.550 | | 1.130 | | 0.000 |
| 11 | 3 | 8:Puntlast | -0.550 | | 2.123 | | 0.000 |
| 11 | 4 | 8:Puntlast | -0.800 | | 3.250 | | 0.000 |
| 11 | 5 | 8:Puntlast | -0.800 | | 4.375 | | 0.000 |
| 11 | 6 | 8:Puntlast | -0.800 | | 7.875 | | 0.000 |
| 11 | 7 | 8:Puntlast | -0.800 | | 9.000 | | 0.000 |
| 11 | 8 | 8:Puntlast | -0.800 | | 10.125 | | 0.000 |
| 11 | 9 | 8:Puntlast | -0.800 | | 13.625 | | 0.000 |

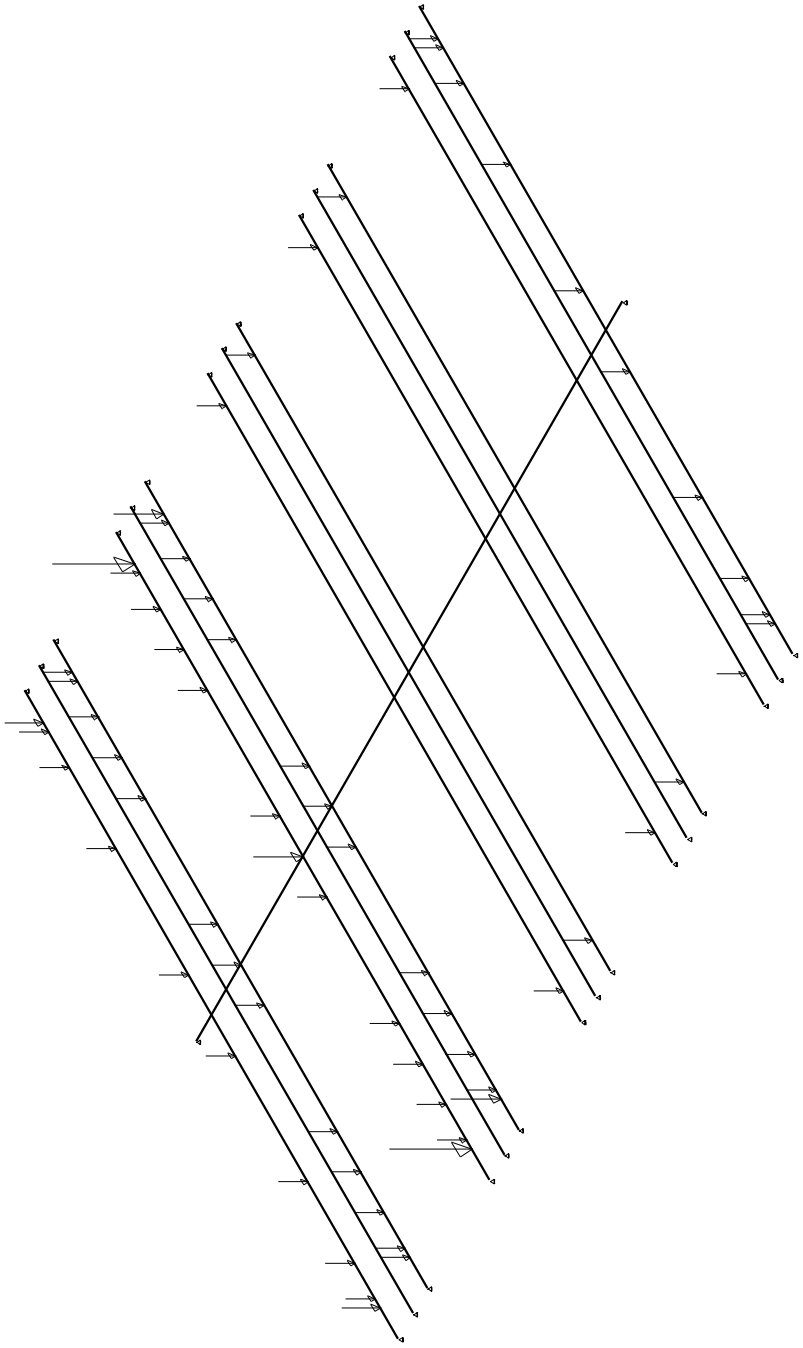
**VELDBELASTINGEN** B.G:1 Permanent

| Balk | Last | Type | q1/p/m | q2 | Afstand | Lengte | Exc. |
|---|---|---|---|---|---|---|---|
| 11 | 10 | 8:Puntlast | -0.800 | | 14.753 | | 0.000 |
| 11 | 11 | 8:Puntlast | -0.550 | | 15.877 | | 0.000 |
| 11 | 12 | 8:Puntlast | -0.550 | | 16.870 | | 0.000 |
| 11 | 13 | 8:Puntlast | -1.150 | | 17.120 | | 0.000 |
| 12 | 1 | 8:Puntlast | -1.150 | | 0.880 | | 0.000 |
| 12 | 2 | 8:Puntlast | -0.550 | | 1.130 | | 0.000 |
| 12 | 3 | 8:Puntlast | -0.550 | | 2.123 | | 0.000 |
| 12 | 4 | 8:Puntlast | -0.800 | | 3.250 | | 0.000 |
| 12 | 5 | 8:Puntlast | -0.800 | | 4.375 | | 0.000 |
| 12 | 6 | 8:Puntlast | -0.800 | | 7.875 | | 0.000 |
| 12 | 7 | 8:Puntlast | -0.800 | | 9.000 | | 0.000 |
| 12 | 8 | 8:Puntlast | -0.800 | | 10.125 | | 0.000 |
| 12 | 9 | 8:Puntlast | -0.800 | | 13.625 | | 0.000 |
| 12 | 10 | 8:Puntlast | -0.800 | | 14.753 | | 0.000 |
| 12 | 11 | 8:Puntlast | -0.550 | | 15.877 | | 0.000 |
| 12 | 12 | 8:Puntlast | -0.550 | | 16.870 | | 0.000 |
| 12 | 13 | 8:Puntlast | -1.150 | | 17.120 | | 0.000 |
| 13 | 1 | 8:Puntlast | -1.150 | | 0.880 | | 0.000 |
| 13 | 2 | 8:Puntlast | -0.550 | | 1.130 | | 0.000 |
| 13 | 3 | 8:Puntlast | -0.550 | | 2.123 | | 0.000 |
| 13 | 4 | 8:Puntlast | -0.800 | | 3.250 | | 0.000 |
| 13 | 5 | 8:Puntlast | -0.800 | | 4.375 | | 0.000 |
| 13 | 6 | 8:Puntlast | -0.800 | | 7.875 | | 0.000 |
| 13 | 7 | 8:Puntlast | -0.800 | | 9.000 | | 0.000 |
| 13 | 8 | 8:Puntlast | -0.800 | | 10.125 | | 0.000 |
| 13 | 9 | 8:Puntlast | -0.800 | | 13.625 | | 0.000 |
| 13 | 10 | 8:Puntlast | -0.800 | | 14.753 | | 0.000 |
| 13 | 11 | 8:Puntlast | -0.550 | | 15.877 | | 0.000 |
| 13 | 12 | 8:Puntlast | -0.550 | | 16.870 | | 0.000 |
| 13 | 13 | 8:Puntlast | -1.150 | | 17.120 | | 0.000 |
| 14 | 1 | 8:Puntlast | -1.150 | | 0.880 | | 0.000 |
| 14 | 2 | 8:Puntlast | -0.550 | | 1.130 | | 0.000 |
| 14 | 3 | 8:Puntlast | -0.550 | | 2.123 | | 0.000 |
| 14 | 4 | 8:Puntlast | -0.800 | | 3.250 | | 0.000 |
| 14 | 5 | 8:Puntlast | -0.800 | | 4.375 | | 0.000 |
| 14 | 6 | 8:Puntlast | -0.800 | | 7.875 | | 0.000 |
| 14 | 7 | 8:Puntlast | -0.800 | | 9.000 | | 0.000 |
| 14 | 8 | 8:Puntlast | -0.800 | | 10.125 | | 0.000 |
| 14 | 9 | 8:Puntlast | -0.800 | | 13.625 | | 0.000 |
| 14 | 10 | 8:Puntlast | -0.800 | | 14.753 | | 0.000 |
| 14 | 11 | 8:Puntlast | -0.550 | | 15.877 | | 0.000 |
| 14 | 12 | 8:Puntlast | -0.550 | | 16.870 | | 0.000 |
| 14 | 13 | 8:Puntlast | -1.150 | | 17.120 | | 0.000 |
| 15 | 1 | 8:Puntlast | -1.150 | | 0.880 | | 0.000 |
| 15 | 2 | 8:Puntlast | -0.550 | | 1.130 | | 0.000 |
| 15 | 3 | 8:Puntlast | -0.550 | | 2.123 | | 0.000 |
| 15 | 4 | 8:Puntlast | -0.800 | | 3.250 | | 0.000 |
| 15 | 5 | 8:Puntlast | -0.800 | | 4.375 | | 0.000 |
| 15 | 6 | 8:Puntlast | -0.800 | | 7.875 | | 0.000 |
| 15 | 7 | 8:Puntlast | -0.800 | | 9.000 | | 0.000 |
| 15 | 8 | 8:Puntlast | -0.800 | | 10.125 | | 0.000 |
| 15 | 9 | 8:Puntlast | -0.800 | | 13.625 | | 0.000 |
| 15 | 10 | 8:Puntlast | -0.800 | | 14.753 | | 0.000 |
| 15 | 11 | 8:Puntlast | -0.550 | | 15.877 | | 0.000 |
| 15 | 12 | 8:Puntlast | -0.550 | | 16.870 | | 0.000 |
| 15 | 13 | 8:Puntlast | -1.150 | | 17.120 | | 0.000 |
| 16 | 1 | 8:Puntlast | -1.150 | | 0.880 | | 0.000 |
| 16 | 2 | 8:Puntlast | -0.550 | | 1.130 | | 0.000 |
| 16 | 3 | 8:Puntlast | -0.550 | | 2.123 | | 0.000 |
| 16 | 4 | 8:Puntlast | -0.800 | | 3.250 | | 0.000 |
| 16 | 5 | 8:Puntlast | -0.800 | | 4.375 | | 0.000 |

**VELDBELASTINGEN** B.G:1 Permanent

| Balk | Last | Type | q1/p/m | q2 | Afstand | Lengte | Exc. |
|---|---|---|---|---|---|---|---|
| 16 | 6 | 8:Puntlast | -0.800 | | 7.875 | | 0.000 |
| 16 | 7 | 8:Puntlast | -0.800 | | 9.000 | | 0.000 |
| 16 | 8 | 8:Puntlast | -0.800 | | 10.125 | | 0.000 |
| 16 | 9 | 8:Puntlast | -0.800 | | 13.625 | | 0.000 |
| 16 | 10 | 8:Puntlast | -0.800 | | 14.753 | | 0.000 |
| 16 | 11 | 8:Puntlast | -0.550 | | 15.877 | | 0.000 |
| 16 | 12 | 8:Puntlast | -0.550 | | 16.870 | | 0.000 |
| 16 | 13 | 8:Puntlast | -1.150 | | 17.120 | | 0.000 |

**VELDBELASTINGEN** B.G:2 Veranderlijk



**VELDBELASTINGEN** B.G:2 Veranderlijk

| Balk | Last | Type | q1/p/m | q2 | Afstand | Lengte | Exc. |
|---|---|---|---|---|---|---|---|
| 7 | 1 | 8:Puntlast | -40.000 | | 0.880 | | 0.000 |
| 7 | 2 | 8:Puntlast | -18.000 | | 1.130 | | 0.000 |
| 7 | 3 | 8:Puntlast | -18.000 | | 2.123 | | 0.000 |
| 7 | 4 | 8:Puntlast | -19.000 | | 4.375 | | 0.000 |
| 7 | 5 | 8:Puntlast | -19.000 | | 7.875 | | 0.000 |
| 7 | 6 | 8:Puntlast | -19.000 | | 10.125 | | 0.000 |
| 7 | 7 | 8:Puntlast | -19.000 | | 13.625 | | 0.000 |
| 7 | 8 | 8:Puntlast | -18.000 | | 15.877 | | 0.000 |
| 7 | 9 | 8:Puntlast | -18.000 | | 16.870 | | 0.000 |
| 7 | 10 | 8:Puntlast | -40.000 | | 17.120 | | 0.000 |
| 8 | 1 | 8:Puntlast | -85.000 | | 0.880 | | 0.000 |
| 8 | 2 | 8:Puntlast | -5.600 | | 1.130 | | 0.000 |
| 8 | 3 | 8:Puntlast | -5.600 | | 2.123 | | 0.000 |
| 8 | 4 | 8:Puntlast | -25.000 | | 3.250 | | 0.000 |
| 8 | 5 | 8:Puntlast | -17.000 | | 4.375 | | 0.000 |
| 8 | 6 | 8:Puntlast | -27.000 | | 7.875 | | 0.000 |
| 8 | 7 | 8:Puntlast | -52.000 | | 9.000 | | 0.000 |
| 8 | 8 | 8:Puntlast | -27.000 | | 10.125 | | 0.000 |
| 8 | 9 | 8:Puntlast | -17.000 | | 13.625 | | 0.000 |
| 8 | 10 | 8:Puntlast | -25.000 | | 14.753 | | 0.000 |
| 8 | 11 | 8:Puntlast | -5.600 | | 15.877 | | 0.000 |
| 8 | 12 | 8:Puntlast | -5.600 | | 16.870 | | 0.000 |
| 8 | 13 | 8:Puntlast | -85.000 | | 17.120 | | 0.000 |
| 9 | 1 | 8:Puntlast | -20.000 | | 0.880 | | 0.000 |
| 9 | 2 | 8:Puntlast | -20.000 | | 17.120 | | 0.000 |
| 10 | 1 | 8:Puntlast | -20.000 | | 0.880 | | 0.000 |
| 10 | 2 | 8:Puntlast | -20.000 | | 17.120 | | 0.000 |
| 11 | 1 | 8:Puntlast | -20.000 | | 0.880 | | 0.000 |
| 11 | 2 | 8:Puntlast | -20.000 | | 17.120 | | 0.000 |
| 12 | 1 | 8:Puntlast | -20.000 | | 0.880 | | 0.000 |
| 12 | 2 | 8:Puntlast | -1.500 | | 1.130 | | 0.000 |
| 12 | 3 | 8:Puntlast | -1.500 | | 2.123 | | 0.000 |
| 12 | 4 | 8:Puntlast | -15.000 | | 3.250 | | 0.000 |
| 12 | 5 | 8:Puntlast | -10.000 | | 4.375 | | 0.000 |
| 12 | 6 | 8:Puntlast | -18.000 | | 7.875 | | 0.000 |
| 12 | 7 | 8:Puntlast | -22.000 | | 9.000 | | 0.000 |
| 12 | 8 | 8:Puntlast | -18.000 | | 10.125 | | 0.000 |
| 12 | 9 | 8:Puntlast | -10.000 | | 13.625 | | 0.000 |
| 12 | 10 | 8:Puntlast | -15.000 | | 14.753 | | 0.000 |
| 12 | 11 | 8:Puntlast | -1.500 | | 15.877 | | 0.000 |
| 12 | 12 | 8:Puntlast | -1.500 | | 16.870 | | 0.000 |
| 12 | 13 | 8:Puntlast | -20.000 | | 17.120 | | 0.000 |
| 13 | 1 | 8:Puntlast | -52.000 | | 0.880 | | 0.000 |
| 13 | 2 | 8:Puntlast | -1.600 | | 1.130 | | 0.000 |
| 13 | 3 | 8:Puntlast | -1.600 | | 2.123 | | 0.000 |
| 13 | 4 | 8:Puntlast | -15.000 | | 3.250 | | 0.000 |
| 13 | 5 | 8:Puntlast | -6.000 | | 4.375 | | 0.000 |
| 13 | 6 | 8:Puntlast | -10.000 | | 7.875 | | 0.000 |
| 13 | 7 | 8:Puntlast | -24.300 | | 9.000 | | 0.000 |
| 13 | 8 | 8:Puntlast | -10.000 | | 10.125 | | 0.000 |
| 13 | 9 | 8:Puntlast | -6.000 | | 13.625 | | 0.000 |
| 13 | 10 | 8:Puntlast | -15.000 | | 14.753 | | 0.000 |
| 13 | 11 | 8:Puntlast | -1.600 | | 15.877 | | 0.000 |
| 13 | 12 | 8:Puntlast | -1.600 | | 16.870 | | 0.000 |
| 13 | 13 | 8:Puntlast | -52.000 | | 17.120 | | 0.000 |
| 14 | 1 | 8:Puntlast | -20.000 | | 0.880 | | 0.000 |
| 14 | 2 | 8:Puntlast | -20.000 | | 17.120 | | 0.000 |
| 15 | 1 | 8:Puntlast | -20.000 | | 0.880 | | 0.000 |
| 15 | 2 | 8:Puntlast | -20.000 | | 17.120 | | 0.000 |
| 16 | 1 | 8:Puntlast | -20.000 | | 0.880 | | 0.000 |
| 16 | 2 | 8:Puntlast | -18.000 | | 1.130 | | 0.000 |



**VELDBELASTINGEN** B.G:2 Veranderlijk

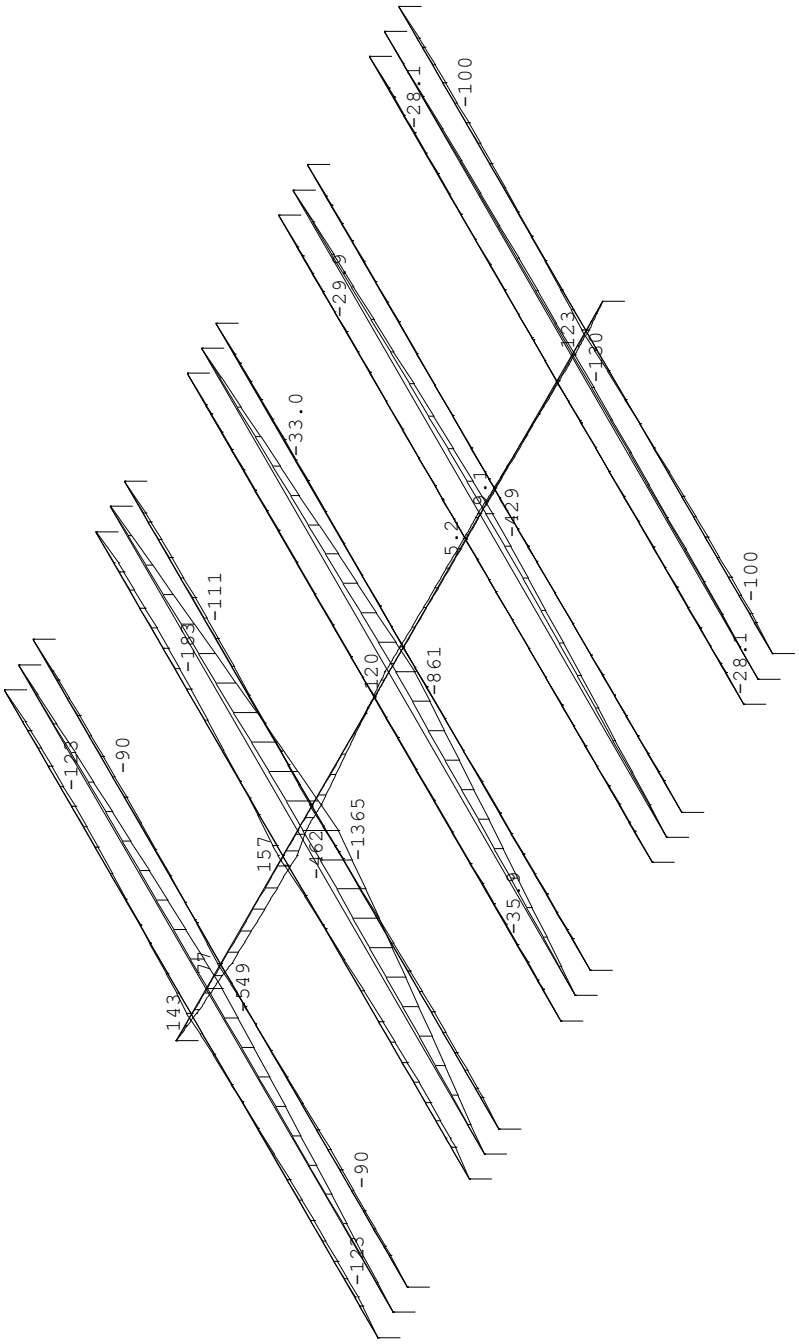
| Balk | Last | Type | q1/p/m | q2 | Afstand | Lengte | Exc. |
|---|---|---|---|---|---|---|---|
| 16 | 3 | 8:Puntlast | -18.000 | | 2.123 | | 0.000 |
| 16 | 4 | 8:Puntlast | -15.000 | | 4.375 | | 0.000 |
| 16 | 5 | 8:Puntlast | -15.000 | | 7.875 | | 0.000 |
| 16 | 6 | 8:Puntlast | -15.000 | | 10.125 | | 0.000 |
| 16 | 7 | 8:Puntlast | -15.000 | | 13.625 | | 0.000 |
| 16 | 8 | 8:Puntlast | -18.000 | | 15.877 | | 0.000 |
| 16 | 9 | 8:Puntlast | -18.000 | | 16.870 | | 0.000 |
| 16 | 10 | 8:Puntlast | -20.000 | | 17.120 | | 0.000 |

**BELASTINGCOMBINATIES**

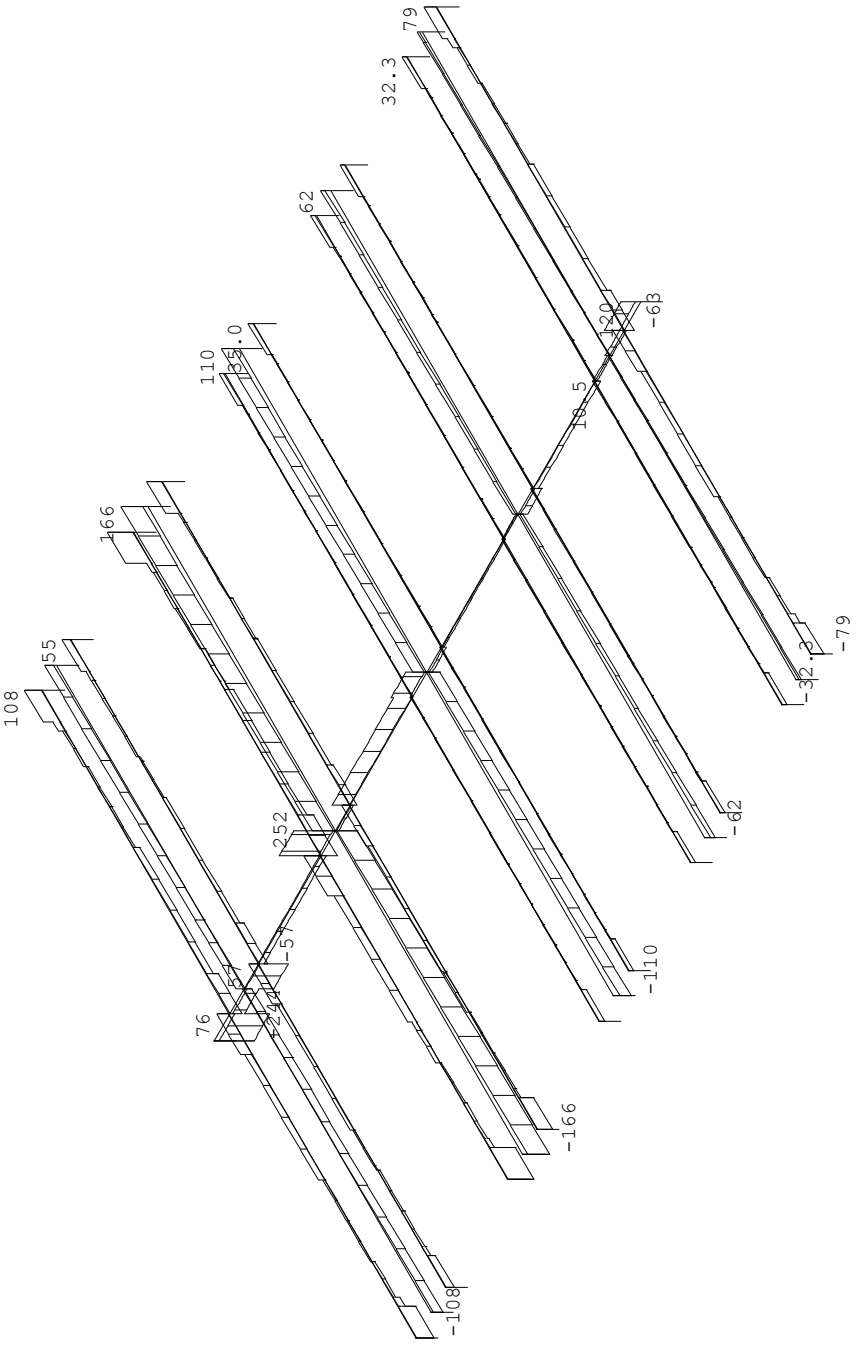
| BC | Type | BG | Gen. | Factor | BG | Gen. | Factor | BG | Gen. | Factor | BG | Gen. | Factor |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Fund. | 1 | Perm | 1.35 | | | | | | | | | |
| 2 | Fund. | 1 | Perm | 0.90 | | | | | | | | | |
| 3 | Fund. | 1 | Perm | 1.35 | 2 | psi0 | 1.50 | | | | | | |
| 4 | Fund. | 1 | Perm | 1.20 | 2 | Extr | 1.50 | | | | | | |
| 5 | Fund. | 1 | Perm | 0.90 | 2 | Extr | 1.50 | | | | | | |
| 6 | Fund. | 1 | Perm | 0.90 | 2 | psi0 | 1.50 | | | | | | |
| 7 | Kar. | 1 | Perm | 1.00 | 2 | Extr | 1.00 | | | | | | |
| 8 | Quas. | 1 | Perm | 1.00 | | | | | | | | | |
| 9 | Quas. | 1 | Perm | 1.00 | 2 | psi2 | 1.00 | | | | | | |
| 10 | Freq. | 1 | Perm | 1.00 | | | | | | | | | |
| 11 | Freq. | 1 | Perm | 1.00 | 2 | psi1 | 1.00 | | | | | | |
| 12 | Blij. | 1 | Perm | 1.00 | | | | | | | | | |

**OMHULLENDE VAN DE FUNDAMENTELE COMBINATIES**

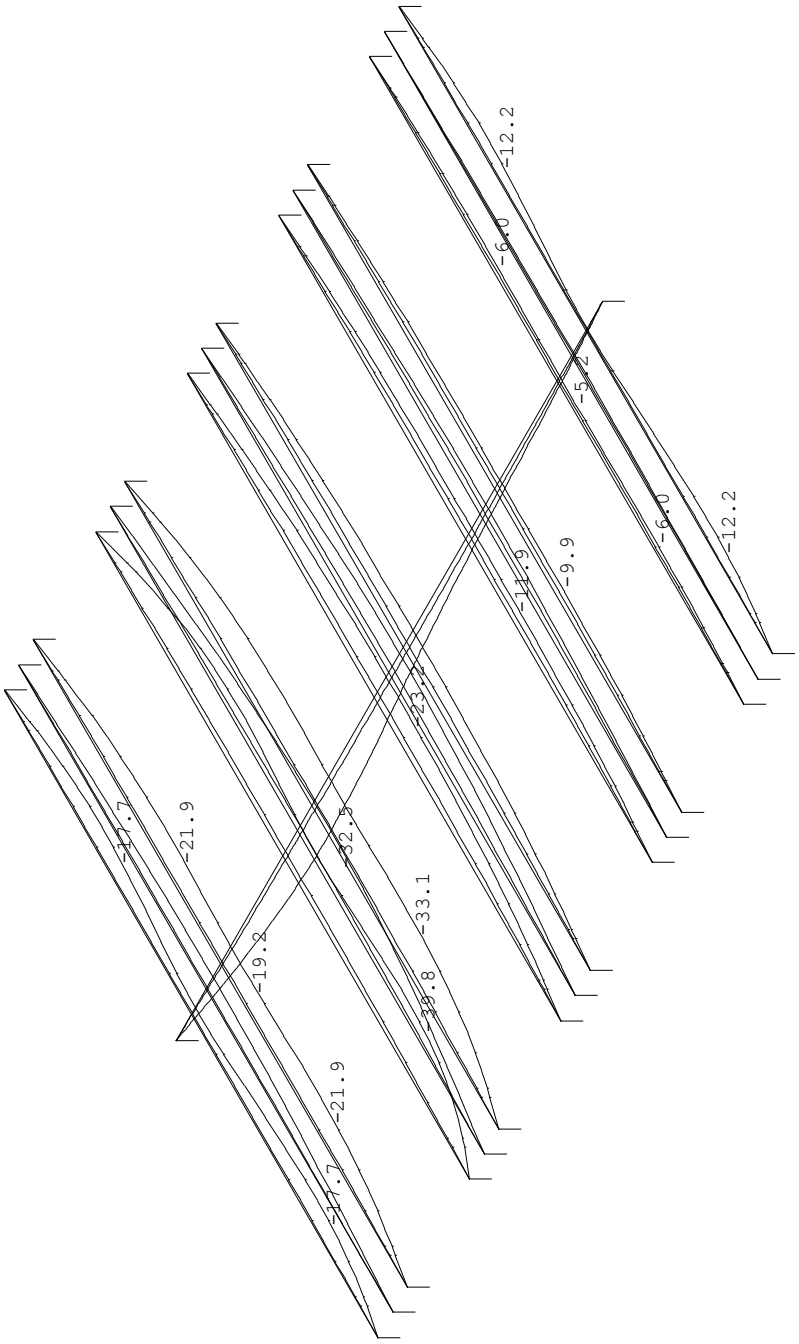
**MOMENTEN** Fundamentele combinatie



**DWARSKRACHTEN** Fundamentele combinatie

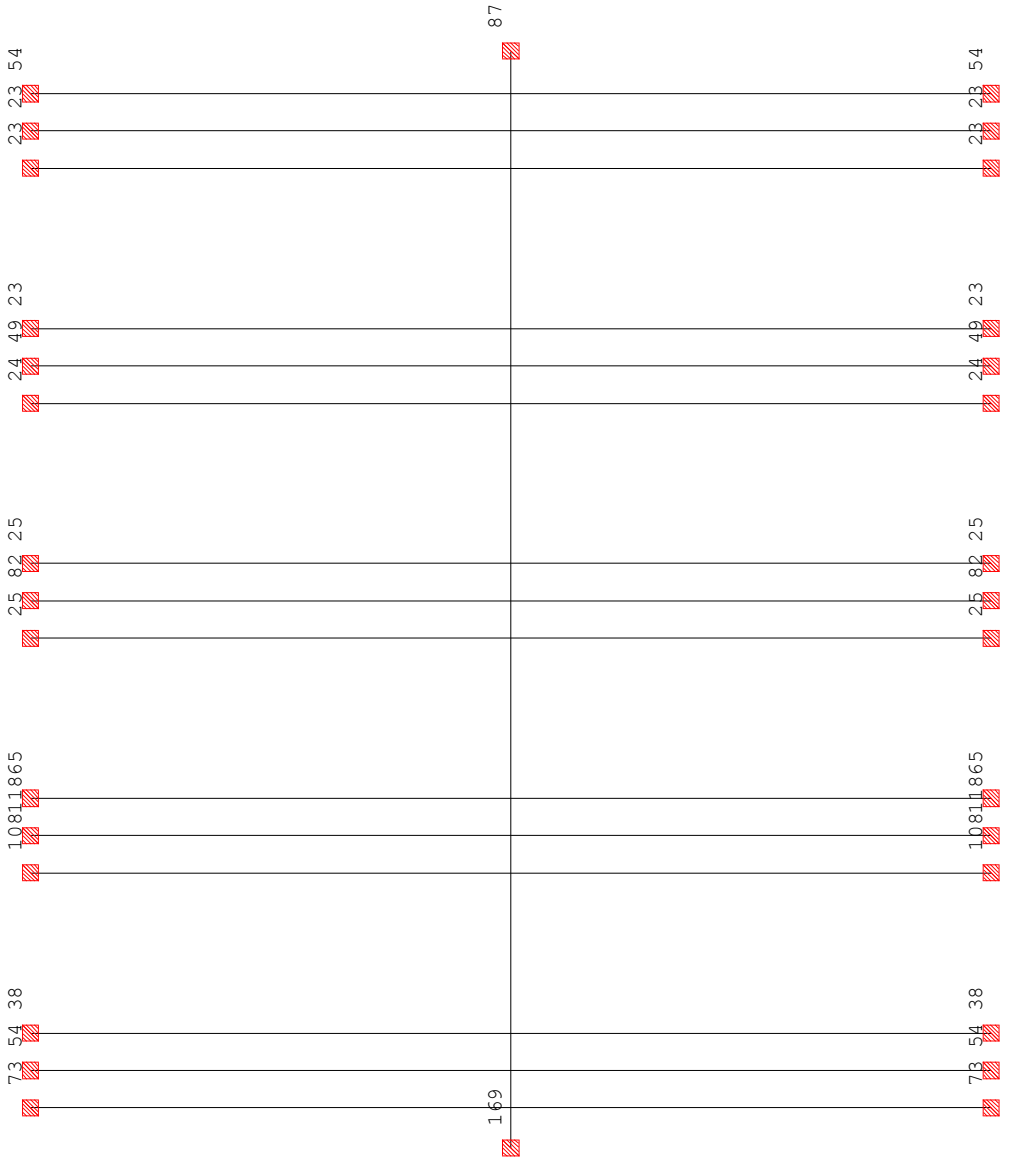


**VERPLAATSINGEN** [mm] Fundamentele combinatie



## OMHULLENDE VAN DE KARAKTERISTIEKE COMBINATIES

**REACTIES** Karakteristieke combinatie



## STAALPROFIELEN - ALGEMENE GEGEVENS

Stabiliteit: Classificatie gehele constructie: Geschoord

### MATERIAAL

| Mat nr. | Profielnaam | Vloeisp. [N/mm$^2$] | Productie methode | Min. drsn. klasse |
|---|---|---|---|---|
| 1 | HEA1000 | 235 | Gewalst | 1 |
| 2 | IPE600 | 235 | Gewalst | 1 |
| 3 | IPE400 | 235 | Gewalst | 1 |

Partiële veiligheidsfactoren:
Gamma M;0 : 1.00 Gamma M;1 : 1.00

### KIPSTABILITEIT

| Staaf | Plts. aangr. | | l gaffel [m] | Kipsteunafstanden [m] |
|---|---|---|---|---|
| **1** | | | | |
| V1 | 0.0*h | boven: | 18.00 | 4*4.5 |
| | | onder: | 18.00 | 4*4.5 |
| **2** | | | | |
| V2 | 0.0*h | boven: | 18.00 | 4*4.5 |
| | | onder: | 18.00 | 4*4.5 |
| **3** | | | | |
| V3 | 0.0*h | boven: | 18.00 | 4*4.5 |
| | | onder: | 18.00 | 4*4.5 |
| **4** | | | | |
| V4 | 0.0*h | boven: | 18.00 | 4*4.5 |
| | | onder: | 18.00 | 4*4.5 |
| **5** | | | | |
| V5 | 0.0*h | boven: | 18.00 | 4*4.5 |
| | | onder: | 18.00 | 4*4.5 |
| **6** | | | | |
| V6 | 0.0*h | boven: | 2.90 | 1.450 |
| | | onder: | 2.90 | 1.450 |
| V7 | 0.0*h | boven: | 4.40 | 4.400 |
| | | onder: | 4.40 | 4.400 |
| V8 | 0.0*h | boven: | 4.40 | 4.400 |
| | | onder: | 4.40 | 4.400 |
| V9 | 0.0*h | boven: | 4.40 | 4.400 |
| | | onder: | 4.40 | 4.400 |
| V10 | 0.0*h | boven: | 4.40 | 4.400 |
| | | onder: | 4.40 | 4.400 |
| V11 | 0.0*h | boven: | 3.00 | 1.500 |
| | | onder: | 3.00 | 1.500 |
| **7** | | | | |
| V12 | 0.0*h | boven: | 18.00 | 4*4.5 |
| | | onder: | 18.00 | 4*4.5 |
| **8** | | | | |
| V13 | 0.0*h | boven: | 18.00 | 4*4.5 |
| | | onder: | 18.00 | 4*4.5 |
| **9** | | | | |
| V14 | 0.0*h | boven: | 18.00 | 4*4.5 |
| | | onder: | 18.00 | 4*4.5 |
| **10** | | | | |
| V15 | 0.0*h | boven: | 18.00 | 4*4.5 |
| | | onder: | 18.00 | 4*4.5 |

## KIPSTABILITEIT

| Staaf | Plts. aangr. | | l gaffel [m] | Kipsteunafstanden [m] |
|---|---|---|---|---|
| **11** | | | | |
| V16 | 0.0*h | boven: | 18.00 | 4*4.5 |
| | | onder: | 18.00 | 4*4.5 |
| **12** | | | | |
| V17 | 0.0*h | boven: | 18.00 | 4*4.5 |
| | | onder: | 18.00 | 4*4.5 |
| **13** | | | | |
| V18 | 0.0*h | boven: | 18.00 | 4*4.5 |
| | | onder: | 18.00 | 4*4.5 |
| **14** | | | | |
| V19 | 0.0*h | boven: | 18.00 | 4*4.5 |
| | | onder: | 18.00 | 4*4.5 |
| **15** | | | | |
| V20 | 0.0*h | boven: | 18.00 | 4*4.5 |
| | | onder: | 18.00 | 4*4.5 |
| **16** | | | | |
| V21 | 0.0*h | boven: | 18.00 | 4*4.5 |
| | | onder: | 18.00 | 4*4.5 |

## KIP - ONDERFLENSINKLEMMINGEN

| Staaf | Begin Type opl. | Breedte oplegging | Eind-maat | Einde Type opl. | Breedte oplegging | Eind-maat |
|---|---|---|---|---|---|---|
| **6** | | | | | | |
| V6 | Ondfl.inkl | 300 | 100 | Ondfl.inkl | 300 | 100 |
| V7 | Ondfl.inkl | 300 | 100 | Ondfl.inkl | 300 | 100 |
| V8 | Ondfl.inkl | 300 | 100 | Ondfl.inkl | 300 | 100 |
| V9 | Ondfl.inkl | 300 | 100 | Ondfl.inkl | 300 | 100 |
| V10 | Ondfl.inkl | 300 | 100 | Ondfl.inkl | 300 | 100 |
| V11 | Ondfl.inkl | 300 | 100 | Ondfl.inkl | 300 | 100 |

## TOETSING SPANNINGEN

| Staaf | Mat nr. | BC | Sit | Kl | Plaats | Norm | Artikel | Formule | Hoogste toetsing U.C. | [N/mm$^2$] | Opm. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **1** | | | | | | | | | | | |
| V1 | 1 | 4 | 1 | 1 | My-max | EN3-1-1 | 6.2.8 | (6.30) | 0.182 | 43 | |
| **2** | | | | | | | | | | | |
| V2 | 1 | 4 | 1 | 1 | My-max | EN3-1-1 | 6.2.8 | (6.30) | 0.453 | 106 | |
| **3** | | | | | | | | | | | |
| V3 | 1 | 4 | 1 | 1 | My-max | EN3-1-1 | 6.2.8 | (6.30) | 0.286 | 67 | |
| **4** | | | | | | | | | | | |
| V4 | 1 | 4 | 1 | 1 | My-max | EN3-1-1 | 6.2.8 | (6.30) | 0.142 | 33 | |
| **5** | | | | | | | | | | | |
| V5 | 1 | 4 | 1 | 1 | My-max | EN3-1-1 | 6.2.5 | (6.12y) | 0.043 | 10 | |
| **6** | | | | | | | | | | | |
| V6 | 2 | 4 | 1 | 1 | Begin | EN3-1-1 | 6.3.2.5 1 | (NB.71) | *2.278* | *535* | 46,8,4 |
| V7 | 2 | 4 | 1 | 1 | Einde | EN3-1-1 | 6.3.2.5 1 | (NB.71) | *2.355* | *553* | 46 |
| V8 | 2 | 4 | 1 | 1 | Einde | EN3-1-1 | 6.3.2.5 1 | (NB.71) | *1.198* | *282* | 46 |
| V9 | 2 | 4 | 1 | 1 | Begin | EN3-1-1 | 6.3.2.5 1 | (NB.71) | 0.315 | 74 | 46 |
| V10 | 2 | 4 | 1 | 1 | Begin | EN3-1-1 | 6.3.2.5 1 | (NB.71) | 0.538 | 126 | 46 |
| V11 | 2 | 4 | 1 | 1 | Einde | EN3-1-1 | 6.3.2.5 1 | (NB.71) | *1.120* | *263* | 46 |

## TOETSING SPANNINGEN

| Staaf nr. | Mat | BC | Sit | Kl | Plaats | Norm | Artikel | Formule | Hoogste toetsing U.C. | [N/mm$^2$] | Opm. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **7** | | | | | | | | | | | |
| V12 | 3 | 4 | 1 | 1 | Staaf | EN3-1-1 | 6.3.2 | (6.54) | 0.633 | 149 | 42 |
| **8** | | | | | | | | | | | |
| V13 | 3 | 4 | 1 | 1 | Staaf | EN3-1-1 | 6.3.2 | (6.54) | 0.951 | 223 | 46 |
| **9** | | | | | | | | | | | |
| V14 | 3 | 4 | 1 | 1 | My-max | EN3-1-1 | 6.2.8 | (6.30) | 0.117 | 27 | 46 |
| **10** | | | | | | | | | | | |
| V15 | 3 | 4 | 1 | 1 | My-max | EN3-1-1 | 6.2.5 | (6.12y) | 0.097 | 23 | 46 |
| **11** | | | | | | | | | | | |
| V16 | 3 | 4 | 1 | 1 | My-max | EN3-1-1 | 6.2.8 | (6.30) | 0.092 | 22 | 42,46 |
| **12** | | | | | | | | | | | |
| V17 | 3 | 4 | 1 | 1 | Staaf | EN3-1-1 | 6.3.2 | (6.54) | 0.471 | 111 | 42,46 |
| **13** | | | | | | | | | | | |
| V18 | 3 | 4 | 1 | 1 | Staaf | EN3-1-1 | 6.3.2 | (6.54) | 0.575 | 135 | 46 |
| **14** | | | | | | | | | | | |
| V19 | 3 | 4 | 1 | 1 | My-max | EN3-1-1 | 6.2.5 | (6.12y) | 0.107 | 25 | 46 |
| **15** | | | | | | | | | | | |
| V20 | 3 | 4 | 1 | 1 | My-max | EN3-1-1 | 6.2.5 | (6.12y) | 0.095 | 22 | 46 |
| **16** | | | | | | | | | | | |
| V21 | 3 | 4 | 1 | 1 | Staaf | EN3-1-1 | 6.3.2 | (6.54) | 0.511 | 120 | 42 |

Opmerkingen:
[ 4] Controle gedrukte T-rand houdt geen rekening met 2e-orde-wringing.
[ 8] Controle van de gedrukte rand is toegepast (zonder buiging!).
**[ 42] Waarschuwing: Er sluiten tussentijds staven en/of opleggingen aan.**
[ 46] T.b.v. kip is een equivalente Q-last berekend.

## TOETSING DOORBUIGING

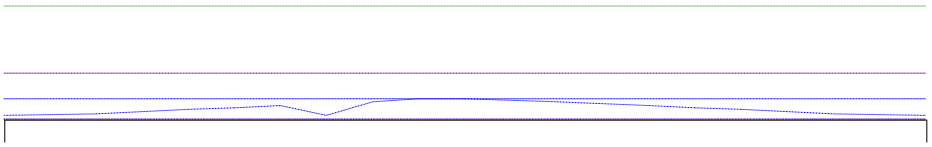
| Staaf | Soort | Mtg | Lengte [m] | Overst I | Overst J | Zeeg [mm] | $u_{tot}$ [mm] | BC | Sit | u [mm] | Toelaatbaar [mm] | *l |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **1** | | | | | | | | | | | | |
| V1 | Vlr+w | db | 18.00 | N | N | 0.0 | -9.4 | 7 | 1 Eind | -9.4 | ±72.0 | 0.004 |
| | | db | | | | | | 7 | 1 Bijk | -7.3 | ±18.0 | 0.001 |
| **2** | | | | | | | | | | | | |
| V2 | Vlr+w | db | 18.00 | N | N | 0.0 | -22.8 | 7 | 1 Eind | -22.8 | ±72.0 | 0.004 |
| | | db | | | | | | 7 | 1 Bijk | -16.9 | ±18.0 | 0.001 |
| **3** | | | | | | | | | | | | |
| V3 | Vlr+w | db | 18.00 | N | N | 0.0 | -15.2 | 7 | 1 Eind | -15.2 | ±72.0 | 0.004 |
| | | db | | | | | | 7 | 1 Bijk | -8.4 | ±18.0 | 0.001 |
| **4** | | | | | | | | | | | | |
| V4 | Vlr+w | db | 18.00 | N | N | 0.0 | -8.3 | 7 | 1 Eind | -8.3 | ±72.0 | 0.004 |
| | | db | | | | | | 7 | 1 Bijk | -2.4 | ±18.0 | 0.001 |
| **5** | | | | | | | | | | | | |
| V5 | Vlr+w | db | 18.00 | N | N | 0.0 | -3.0 | 7 | 1 Eind | -3.0 | ±72.0 | 0.004 |
| | | db | | | | | | 7 | 1 Bijk | -0.8 | ±18.0 | 0.001 |
| **6** | | | | | | | | | | | | |
| V6 | Vlr+w | ss | 1.45 | J | N | 0.0 | -9.4 | 7 | 1 Eind | -9.4 | ±11.6 | 2*0.004 |
| | | ss | | | | | | 7 | *1 Bijk* | *-7.3* | *±2.9* | *2*0.001* |
| V7 | Vlr+w | ss | 4.40 | N | N | 0.0 | -13.4 | 7 | 1 Eind | -13.4 | ±35.2 | 2*0.004 |
| | | ss | | | | | | 7 | *1 Bijk* | *-9.6* | *±8.8* | *2*0.001* |
| V8 | Vlr+w | ss | 4.40 | N | N | 0.0 | -7.6 | 7 | 1 Eind | -7.6 | ±35.2 | 2*0.004 |
| | | ss | | | | | | 7 | 1 Bijk | -8.5 | ±8.8 | 2*0.001 |
| V9 | Vlr+w | ss | 4.40 | N | N | 0.0 | -6.8 | 7 | 1 Eind | -6.8 | ±35.2 | 2*0.004 |
| | | ss | | | | | | 7 | 1 Bijk | -6.0 | ±8.8 | 2*0.001 |
| V10 | Vlr+w | ss | 4.40 | N | N | 0.0 | -5.4 | 7 | 1 Eind | -5.4 | ±35.2 | 2*0.004 |
| | | ss | | | | | | 7 | 1 Bijk | -1.6 | ±8.8 | 2*0.001 |

## TOETSING DOORBUIGING

| Staaf | Soort | Mtg | Lengte [m] | Overst I | Overst J | Zeeg [mm] | $u_{tot}$ [mm] | BC | Sit | | u [mm] | Toelaatbaar [mm] | Toelaatbaar *l |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| V11 | Vlr+w | ss | 1.50 | N | N | 0.0 | -3.0 | 7 | 1 | Eind | -3.0 | ±12.0 | 2*0.004 |
| | | ss | | | | | | 7 | 1 | Bijk | -0.8 | ±3.0 | 2*0.001 |
| **7** | | | | | | | | | | | | | |
| V12 | Vlr+w | db | 18.00 | N | N | 0.0 | -12.1 | 7 | 1 | Eind | -12.1 | ±72.0 | 0.004 |
| | | db | | | | | | 7 | 1 | Bijk | -10.5 | ±18.0 | 0.001 |
| **8** | | | | | | | | | | | | | |
| V13 | Vlr+w | db | 18.00 | N | N | 0.0 | -27.5 | 7 | 1 | Eind | -27.5 | ±72.0 | 0.004 |
| | | db | | | | | | 7 | *1* | *Bijk* | *-21.9* | *±18.0* | *0.001* |
| **9** | | | | | | | | | | | | | |
| V14 | Vlr+w | db | 18.00 | N | N | 0.0 | -16.8 | 7 | 1 | Eind | -16.8 | ±72.0 | 0.004 |
| | | db | | | | | | 7 | 1 | Bijk | -10.0 | ±18.0 | 0.001 |
| **10** | | | | | | | | | | | | | |
| V15 | Vlr+w | db | 18.00 | N | N | 0.0 | -9.2 | 7 | 1 | Eind | -9.2 | ±72.0 | 0.004 |
| | | db | | | | | | 7 | 1 | Bijk | -3.0 | ±18.0 | 0.001 |
| **11** | | | | | | | | | | | | | |
| V16 | Vlr+w | db | 18.00 | N | N | 0.0 | -4.6 | 7 | 1 | Eind | -4.6 | ±72.0 | 0.004 |
| | | db | | | | | | 7 | 1 | Bijk | -1.5 | ±18.0 | 0.001 |
| **12** | | | | | | | | | | | | | |
| V17 | Vlr+w | db | 18.00 | N | N | 0.0 | -15.2 | 7 | 1 | Eind | -15.2 | ±72.0 | 0.004 |
| | | db | | | | | | 7 | 1 | Bijk | -12.1 | ±18.0 | 0.001 |
| **13** | | | | | | | | | | | | | |
| V18 | Vlr+w | db | 18.00 | N | N | 0.0 | -23.3 | 7 | 1 | Eind | -23.3 | ±72.0 | 0.004 |
| | | db | | | | | | 7 | 1 | Bijk | -17.1 | ±18.0 | 0.001 |
| **14** | | | | | | | | | | | | | |
| V19 | Vlr+w | db | 18.00 | N | N | 0.0 | -13.8 | 7 | 1 | Eind | -13.8 | ±72.0 | 0.004 |
| | | db | | | | | | 7 | 1 | Bijk | -7.0 | ±18.0 | 0.001 |
| **15** | | | | | | | | | | | | | |
| V20 | Vlr+w | db | 18.00 | N | N | 0.0 | -7.7 | 7 | 1 | Eind | -7.7 | ±72.0 | 0.004 |
| | | db | | | | | | 7 | 1 | Bijk | -2.1 | ±18.0 | 0.001 |
| **16** | | | | | | | | | | | | | |
| V21 | Vlr+w | db | 18.00 | N | N | 0.0 | -8.4 | 7 | 1 | Eind | -8.4 | ±72.0 | 0.004 |
| | | db | | | | | | 7 | 1 | Bijk | -6.8 | ±18.0 | 0.001 |

## UNITY-CHECK'S

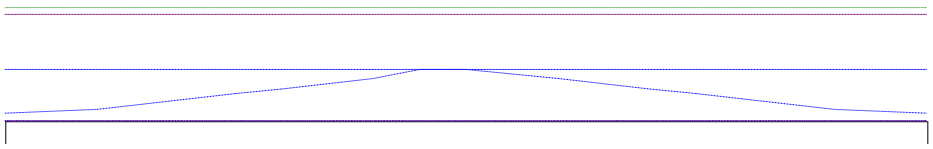
1 OMHULLENDE VAN ALLES



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

**UNITY-CHECK'S** 2 OMHULLENDE VAN ALLES

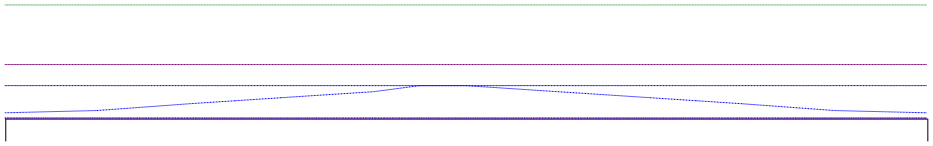
Velden: 2 t/m 2



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

**UNITY-CHECK'S** 3 OMHULLENDE VAN ALLES

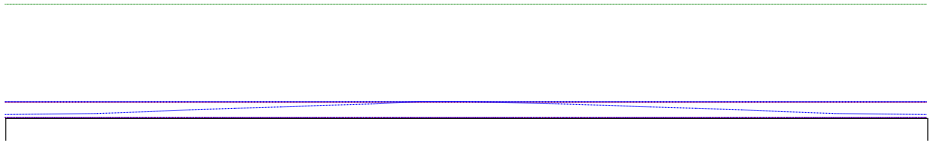
Velden: 3 t/m 3



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

**UNITY-CHECK'S** 4 OMHULLENDE VAN ALLES

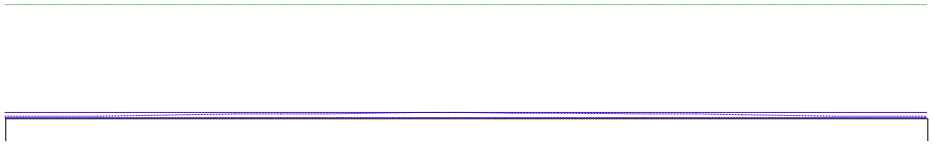
Velden: 4 t/m 4



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

**UNITY-CHECK'S** 5 OMHULLENDE VAN ALLES

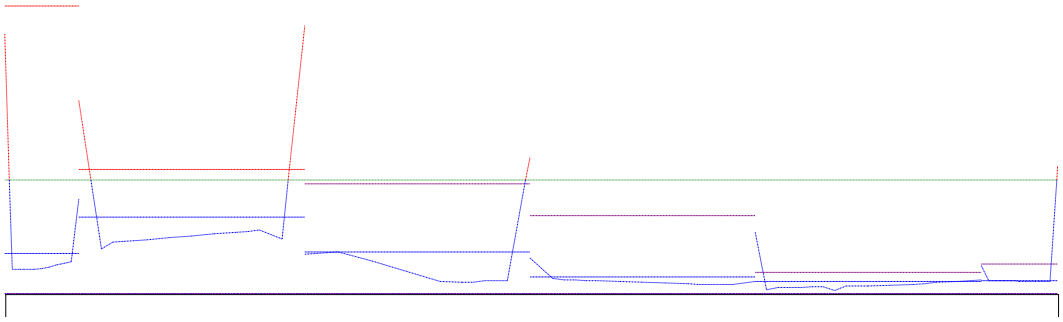
Velden: 5 t/m 5



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

**UNITY-CHECK'S** 6 OMHULLENDE VAN ALLES

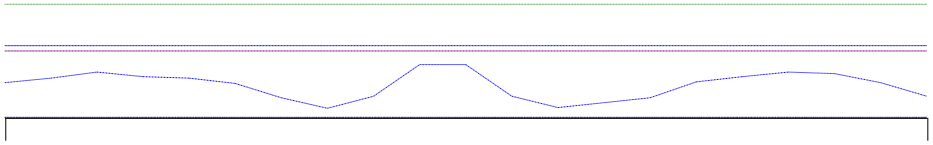
Velden: 6 t/m 11



Toelaatbare unity-check (1.0)
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)

**UNITY-CHECK'S** 7 OMHULLENDE VAN ALLES

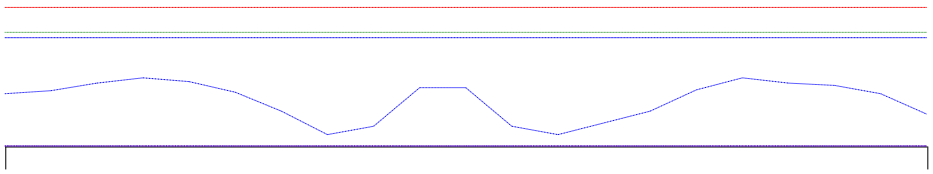
Velden: 12 t/m 12



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

**UNITY-CHECK'S** 8 OMHULLENDE VAN ALLES

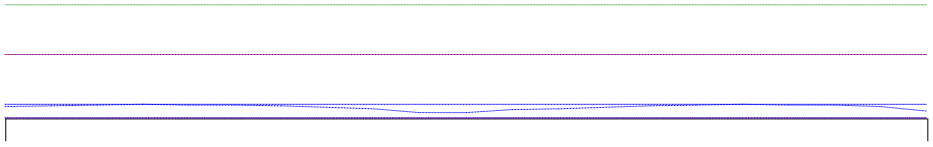
Velden: 13 t/m 13



Toelaatbare unity-check (1.0)
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)

**UNITY-CHECK'S** 9 OMHULLENDE VAN ALLES

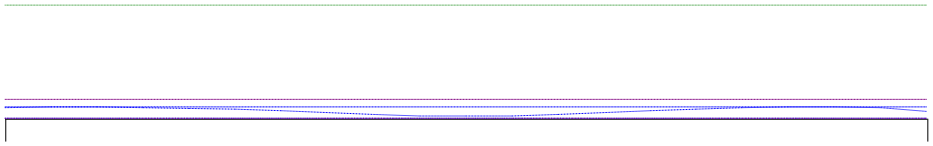
Velden: 14 t/m 14



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

**UNITY-CHECK'S** 10 OMHULLENDE VAN ALLES

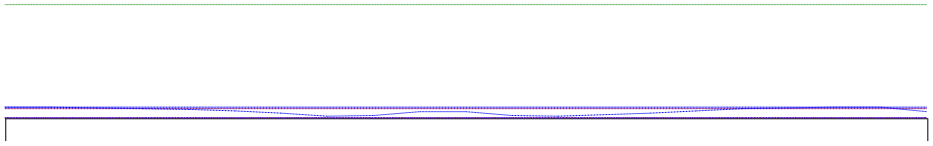
Velden: 15 t/m 15



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

**UNITY-CHECK'S** 11 OMHULLENDE VAN ALLES

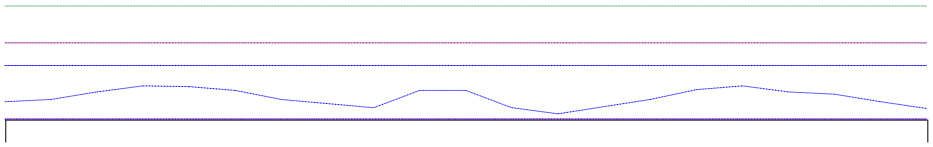
Velden: 16 t/m 16



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

**UNITY-CHECK'S** 12 OMHULLENDE VAN ALLES

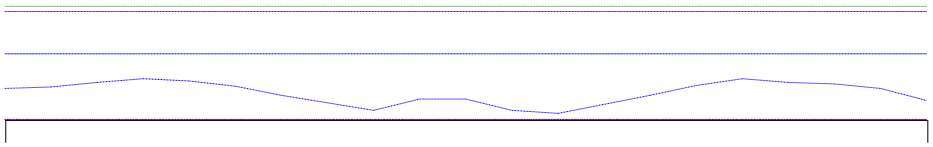
Velden: 17 t/m 17



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

**UNITY-CHECK'S** 13 OMHULLENDE VAN ALLES

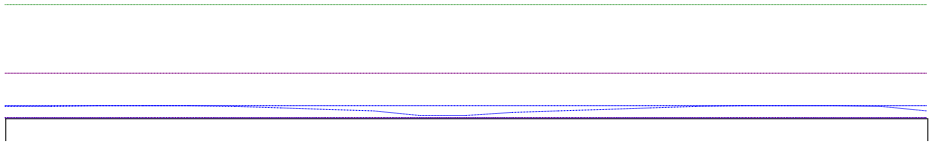
Velden: 18 t/m 18



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

**UNITY-CHECK'S** 14 OMHULLENDE VAN ALLES

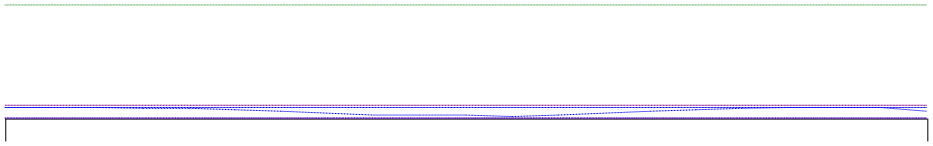
Velden: 19 t/m 19



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

**UNITY-CHECK'S** 15 OMHULLENDE VAN ALLES

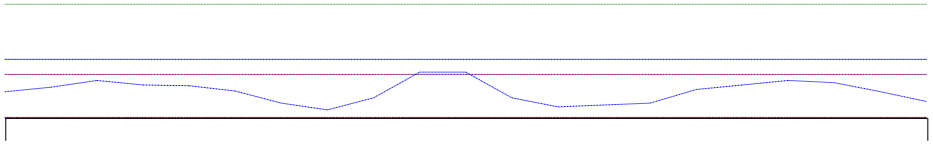
Velden: 20 t/m 20



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

**UNITY-CHECK'S** 16 OMHULLENDE VAN ALLES

Velden: 21 t/m 21



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

## 6.9. Oplegbalk zaal 1

**TS/Liggers** **Rel: 6.20 6 apr 2016**

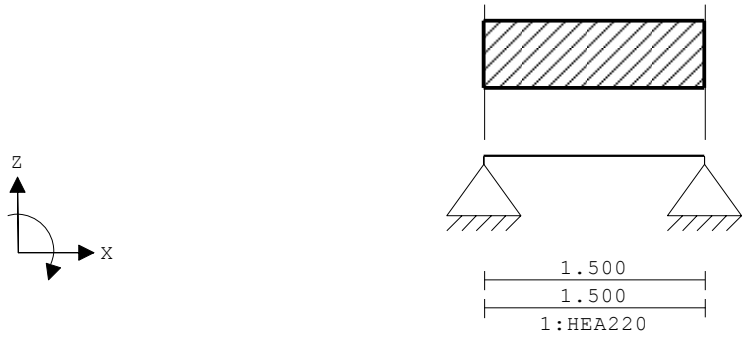
```
Project......:  -
Onderdeel....:
Constructeur.: MvSommeren
Opdrachtgever:
Dimensies....: kN/m/rad
Datum........: 05/04/2016
Bestand......: x:\ing.buro\14100 tm 14199\14132\bouwconstructie\besteksfase\
               berekeningen\14132-01-opleg balk zaal 1.dlw

Betrouwbaarheidsklasse        : 2        Referentieperiode           : 50
```

**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) |
| Staal | NEN-EN 1993-1-1:2006 | C2:2009 | NB:2011(nl) |

**GEOMETRIE** Ligger:1




**VELDLENGTEN** Ligger:1

| Veld | Vanaf | Tot | Lengte |
|---|---|---|---|
| 1 | 0.000 | 1.500 | 1.500 |

**MATERIALEN**

| Mt | Omschrijving | E-modulus[N/mm2] | S.M. | Pois. | Uitz. coëff |
|---|---|---|---|---|---|
| 1 | S235 | 210000 | 78.5 | 0.30 | 1.2000e-005 |

**PROFIELEN [mm]**

| Prof. | Omschrijving | Materiaal | Oppervlak | Traagheid | Vormf. |
|---|---|---|---|---|---|
| 1 | HEA220 | 1:S235 | 6.4300e+003 | 5.4100e+007 | 0.00 |

**PROFIELEN vervolg [mm]**

| Prof. | Staaftype | Breedte | Hoogte | e | Type | b1 | h1 | b2 | h2 |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 0:Normaal | 220 | 210 | 105.0 | | | | | |

**PROFIELVORMEN [mm]**

1 HEA220



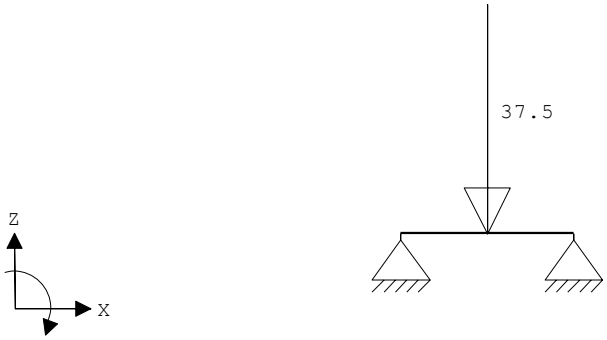
**BELASTINGGEVALLEN**

| B.G. | Omschrijving | Belast/onbelast | $\psi_0$ | $\psi_1$ | $\psi_2$ | e.g. |
|---|---|---|---|---|---|---|
| 1 | Permanent | 2:Permanent EN1991 | | | | -1.00 |
| 2 | Veranderlijk | 1:Schaakbord EN1991 | 0.40 | 0.50 | 0.30 | 0.00 |

**BELASTINGGEVALLEN**

| B.G. | Omschrijving | Type |
|---|---|---|
| 1 | Permanent | 1 Permanente belasting |
| 2 | Veranderlijk | 2 Ver. bel. pers. ed. (p_rep) |

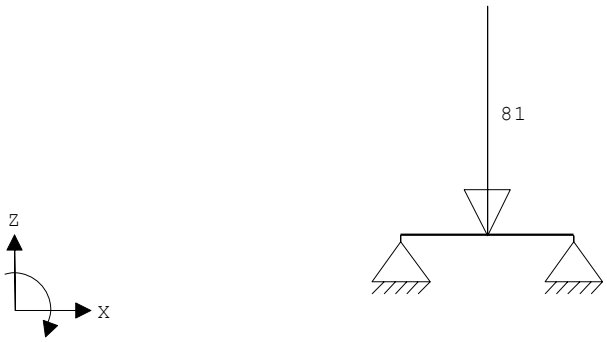
**VELDBELASTINGEN** Ligger:1 B.G:1 Permanent




**VELDBELASTINGEN** Ligger:1 B.G:1 Permanent

| Last | Ref. | Type | Omschrijving | q1/p/m | q2 | psi | Afstand | Lengte |
|---|---|---|---|---|---|---|---|---|
| 1 | | 8:Puntlast | | -37.500 | | | 0.750 | |

**VELDBELASTINGEN** Ligger:1 B.G:2 Veranderlijk



**VELDBELASTINGEN** Ligger:1 B.G:2 Veranderlijk

| Last Ref. | Type | Omschrijving | q1/p/m | q2 | psi | Afstand | Lengte |
|---|---|---|---|---|---|---|---|
| 1 | 8:Puntlast | | -81.000 | | | 0.750 | |

**BELASTINGCOMBINATIES**

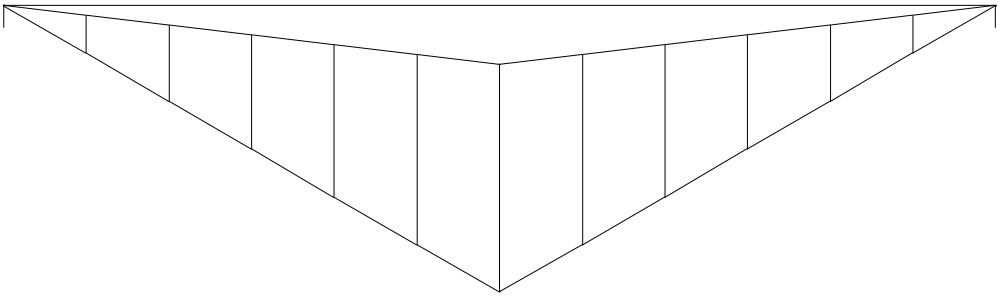
| BC | Type | BG | Gen. | Factor | BG | Gen. | Factor | BG | Gen. | Factor | BG | Gen. | Factor |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Fund. | 1 | Perm | 1.35 | | | | | | | | | |
| 2 | Fund. | 1 | Perm | 0.90 | | | | | | | | | |
| 3 | Fund. | 1 | Perm | 1.35 | 2 | psi0 | 1.50 | | | | | | |
| 4 | Fund. | 1 | Perm | 1.20 | 2 | Extr | 1.50 | | | | | | |
| 5 | Fund. | 1 | Perm | 0.90 | 2 | Extr | 1.50 | | | | | | |
| 6 | Fund. | 1 | Perm | 0.90 | 2 | psi0 | 1.50 | | | | | | |
| 7 | Kar. | 1 | Perm | 1.00 | 2 | Extr | 1.00 | | | | | | |
| 8 | Quas. | 1 | Perm | 1.00 | | | | | | | | | |
| 9 | Quas. | 1 | Perm | 1.00 | 2 | psi2 | 1.00 | | | | | | |
| 10 | Freq. | 1 | Perm | 1.00 | | | | | | | | | |
| 11 | Freq. | 1 | Perm | 1.00 | 2 | psi1 | 1.00 | | | | | | |
| 12 | Blij. | 1 | Perm | 1.00 | | | | | | | | | |

**GUNSTIGE WERKING PERMANENTE BELASTINGEN**

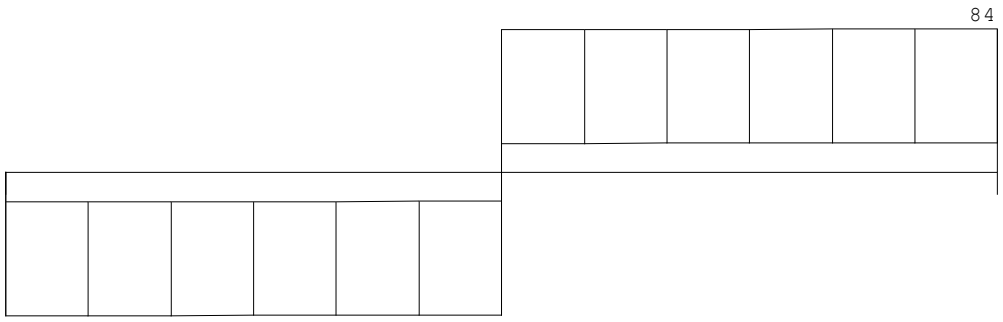
| BC | Velden met gunstige werking |
|---|---|
| 1 | Geen |
| 2 | Alle velden de factor:0.90 |
| 3 | Geen |
| 4 | Geen |
| 5 | Alle velden de factor:0.90 |
| 6 | Alle velden de factor:0.90 |

**OMHULLENDE VAN DE FUNDAMENTELE COMBINATIES**

**MOMENTEN** Ligger:1 Fundamentele combinatie

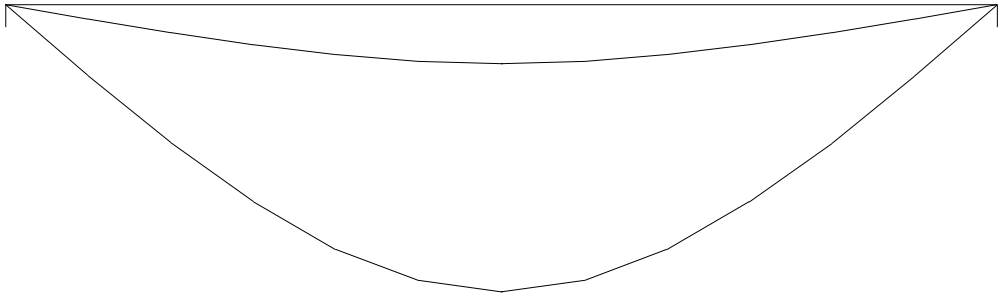


**DWARSKRACHTEN** Ligger:1 Fundamentele combinatie




Fmin:17.2 17.2
Fmax:84 84

**VERPLAATSINGEN** [mm] Ligger:1 Fundamentele combinatie




**REACTIES** Ligger:1 Fundamentele combinatie

| Stp | Fmin | Fmax | Mmin | Mmax |
|---|---|---|---|---|
| 1 | 17.22 | 83.70 | 0.00 | 0.00 |
| 2 | 17.22 | 83.70 | 0.00 | 0.00 |

## STAALPROFIELEN - ALGEMENE GEGEVENS

Ligger:1

Stabiliteit: Classificatie gehele constructie: Geschoord

### MATERIAAL

| Mat nr. | Profielnaam | Vloeisp. [N/mm$^2$] | Productie methode | Min. drsn. klasse |
|---|---|---|---|---|
| 1 | HEA220 | 235 | Gewalst | 1 |

Partiële veiligheidsfactoren:
Gamma M;0 : 1.00 Gamma M;1 : 1.00

## KIPSTABILITEIT

Ligger:1

| Staaf | Plts. aangr. | | l gaffel [m] | Kipsteunafstanden [m] |
|---|---|---|---|---|
| 1 | 1.0*h | boven: | 1.50 | 1.500 |
| | | onder: | 1.50 | 1.500 |

## TOETSING SPANNINGEN

Ligger:1

| Staaf | Mat nr. | BC | Sit | Kl | Plaats | Norm | Artikel | Formule | Hoogste toetsing U.C. [N/mm$^2$] | Opm. |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1 | 4 | 1 | 1 | My-max | EN3-1-1 | 6.2.8 | (6.30) | 0.469 | 110 |

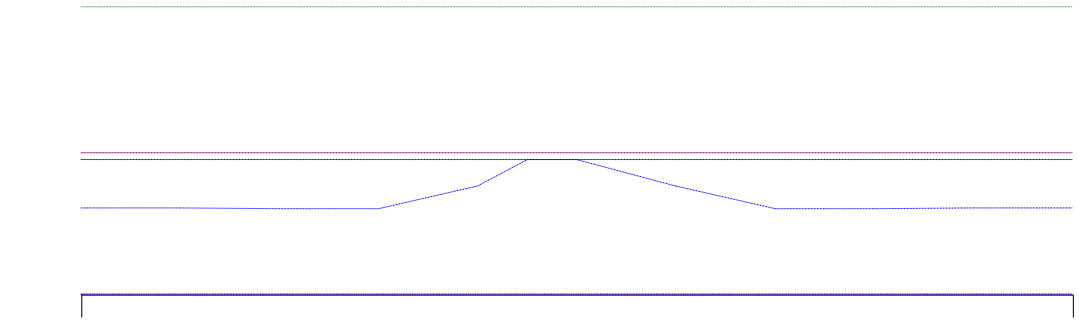
## TOETSING DOORBUIGING

Ligger:1

| Staaf | Soort | Mtg | Lengte [m] | Overst I | Overst J | Zeeg [mm] | $u_{tot}$ [mm] | BC | Sit | | u [mm] | Toelaatbaar [mm] | *l |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Vloer | db | 1.50 | N | N | 0.0 | -0.7 | 7 | 1 | Eind | -0.7 | ±1.5 | 0.001 |
| | | db | | | | | | 7 | 1 | Bijk | -0.5 | ±1.5 | 0.001 |

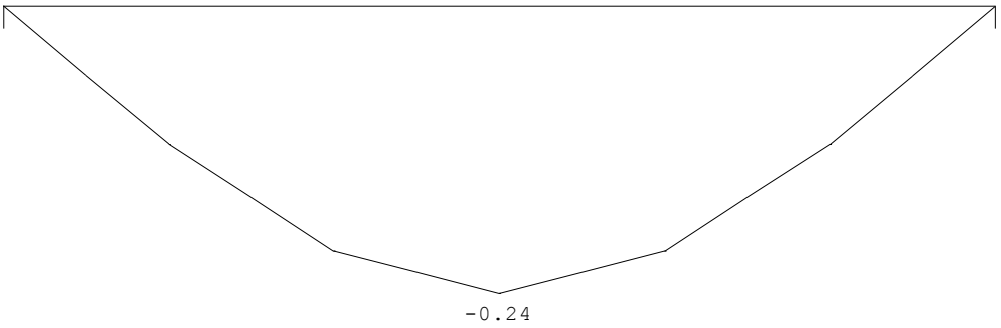
## UNITY-CHECK'S

Ligger:1 OMHULLENDE VAN ALLES

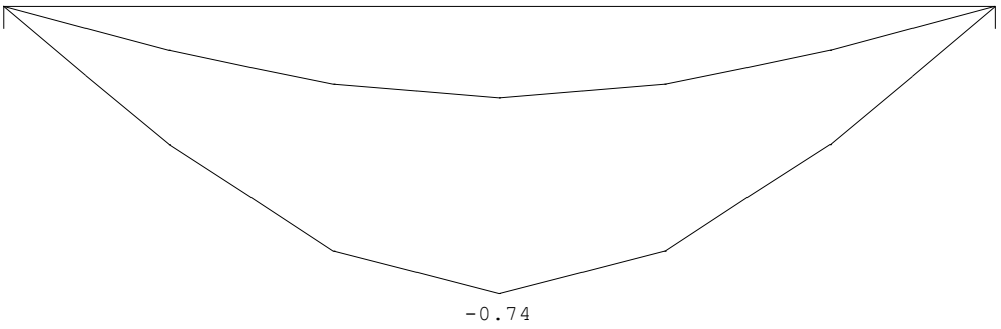


Toelaatbare unity-check (1.0)
Unity-check i.v.m. kipstabiliteit
Hoogste unity-check i.v.m. doorsnedecontrole
Hoogste unity-check i.v.m. doorbuiging

**DOORBUIGINGEN w1** [mm] Ligger:1 Blijvende combinatie




**DOORBUIGINGEN Wmax** [mm] Ligger:1 Karakteristieke combinatie



**DOORBUIGINGEN** Karakteristieke combinatie

| Veld | Zijde | positie [m] | $l_{rep}$ [mm] | $w_1$ [mm] | $w_2$ [mm] | $w_{bij}$ [mm] | $w_{bij}$ [lrep/] | $w_{tot}$ [mm] | $w_c$ [mm] | $w_{max}$ [mm] | $w_{max}$ [lrep/] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Neg. | 0.750 | 1500 | -0.2 | | -0.5 | 2992 | -0.7 | | -0.7 | 2037 |

## 6.10. Oplegpunt aan zaalwand

www.hilti.nl — Profis Anchor 2.4.7

| | | | |
|---|---|---|---|
| Firma: | | Bladzijde: | 1 |
| Constructeur: | | Project: | |
| Adres: | | Sub-Project I Pos. Nr.: | |
| Tel. I Fax: | \| | Datum: | 6-4-2016 |
| E-mail: | | | |

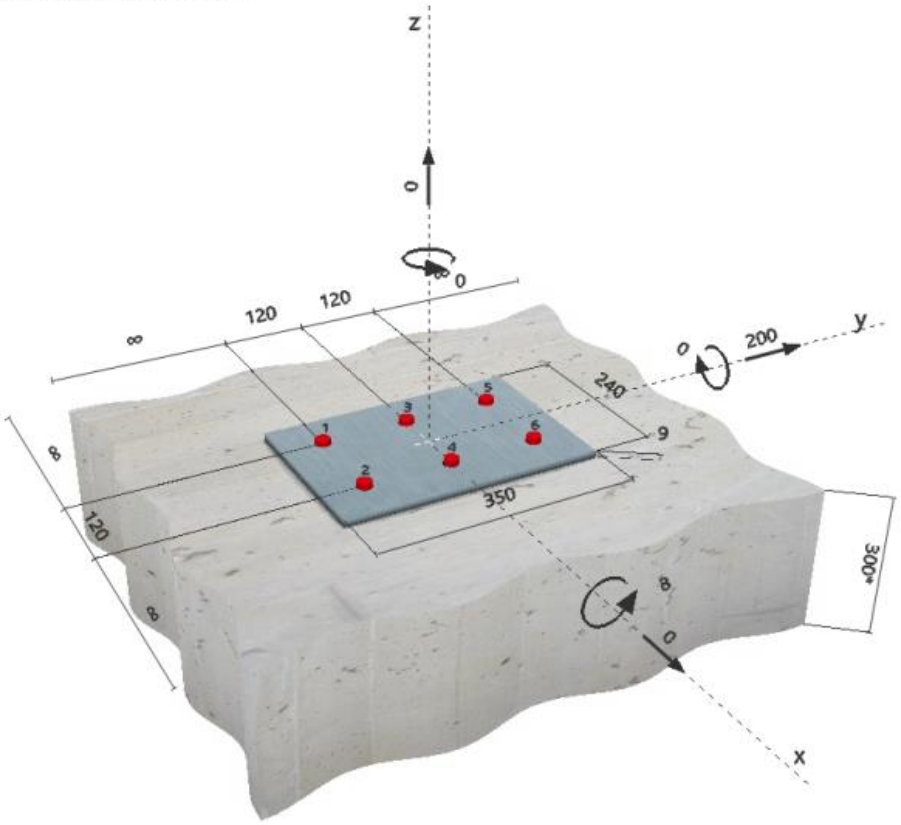
**Opmerkingen van de constructeur:**

### 1 Invoergegevens



| | |
|---|---|
| **Ankertype en -afmeting:** | **HIT-HY 200-A + HIT-Z-R M20** |
| Effectieve verankeringsdiepte: | $h_{ef,act}$ = 180 mm ($h_{ef,limit}$ = - mm) |
| Materiaal: | A4 |
| Goedkeuring nr.: | ETA 12/0006 |
| Uitgegeven I Geldig: | 15-3-2013 \| 10-2-2017 |
| Aantoning: | rekenmethode ETAG methode voor lijmankers; EOTA TR 029 |
| Afstandsmontage: | $e_b$ = 0 mm (geen afstandsmontage); t = 9 mm |
| Ankerplaat: | $l_x$ x $l_y$ x t = 240 mm x 350 mm x 9 mm; (Aanbevolen ankerplaatdikte: niet berekend) |
| Staalprofiel: | geen profiel |
| Ondergrond: | ongescheurd beton, C20/25, $f_{cc}$ = 25,00 N/mm²; h = 300 mm, Temp. kort/lang: 40/24 °C |
| Plaatsing: | hamergeboord gat, plaatsingsconditie: droog |
| Wapening: | Geen wapening of wapening met staafafstand >= 150 mm (elke Ø) of >= 100 (Ø <= 10mm)<br>geen rechte randwapening<br>Wapening tegen splijten volgens EOTA, TR 029, 5.2.2.6 is aanwezig. |

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



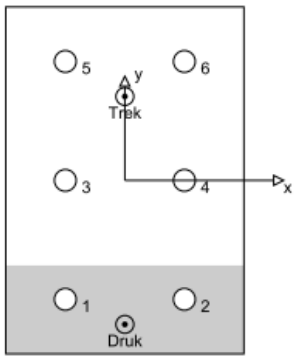

Invoergegevens en resultaten moeten worden gecontroleerd op overeenstemming met de realiteit en op waarschijnlijkheid!
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Firma:
Constructeur:
Adres:
Tel. I Fax: |
E-mail:

Bladzijde: 2
Project:
Sub-Project I Pos. Nr.:
Datum: 6-4-2016

## 2 Belastingsituatie/Resulterende ankerlasten

Belastingsituatie: Rekenwaarden belasting




**Ankerreacties [kN]**
Trekkracht: (+ Trek, - Druk)

| Anker | Trekkracht | Afschuifkracht | Afschuifkracht x | Afschuifkracht y |
|---|---|---|---|---|
| 1 | 0,000 | 33,333 | 0,000 | 33,333 |
| 2 | 0,000 | 33,333 | 0,000 | 33,333 |
| 3 | 5,120 | 33,333 | 0,000 | 33,333 |
| 4 | 5,120 | 33,333 | 0,000 | 33,333 |
| 5 | 12,274 | 33,333 | 0,000 | 33,333 |
| 6 | 12,274 | 33,333 | 0,000 | 33,333 |

max. stuik van het beton: 0,11 [‰]
max. betondrukspanning: 3,25 [N/mm²]
resulterende trekkracht in (x/y)=(0/85): 34,787 [kN]
resulterende drukkracht in (x/y)=(0/-145): 34,787 [kN]

## 3 Treklast (EOTA TR 029, paragraaf 5.2.2)

| | Belasting [kN] | Capaciteit [kN] | Benutting $\beta_N$ [%] | Status |
|---|---|---|---|---|
| Staalbreuk* | 12,274 | 97,333 | 13 | OK |
| Gecombineerd bezwijken door uittrekken en betonkegelbreuk** | 34,787 | 169,204 | 21 | OK |
| Betonkegelbreuk** | 34,787 | 111,282 | 32 | OK |
| Splijten** | 34,787 | 101,238 | 35 | OK |

* ongunstigste anker **ankergroep (ankers onder trekbelasting)

### 3.1 Staalbreuk

| $N_{Rk,s}$ [kN] | $\gamma_{M,s}$ | $N_{Rd,s}$ [kN] | $N_{Sd}$ [kN] |
|---|---|---|---|
| 146,000 | 1,500 | 97,333 | 12,274 |

### 3.2 Gecombineerd bezwijken door uittrekken en betonkegelbreuk

| $A_{p,N}$ [mm²] | $A^0_{p,N}$ [mm²] | $\tau_{Rk,ucr,25}$ [N/mm²] | $s_{cr,Np}$ [mm] | $c_{cr,Np}$ [mm] | $c_{min}$ [mm] | $h_{ef,Helix}$ [mm] |
|---|---|---|---|---|---|---|
| 176400 | 90000 | 24,00 | 300 | 150 | ∞ | 100 |

| $\psi_c$ | $\tau_{Rk,ucr}$ [N/mm²] | k | $\psi^0_{g,Np}$ | $\psi_{g,Np}$ |
|---|---|---|---|---|
| 1,000 | 24,00 | 3,200 | 1,000 | 1,000 |

| $e_{c1,N}$ [mm] | $\psi_{ec1,Np}$ | $e_{c2,N}$ [mm] | $\psi_{ec2,Np}$ | $\psi_{s,Np}$ | $\psi_{re,Np}$ |
|---|---|---|---|---|---|
| 0 | 1,000 | 25 | 0,859 | 1,000 | 1,000 |

| $N^0_{Rk,p}$ [kN] | $N_{Rk,p}$ [kN] | $\gamma_{M,p}$ | $N_{Rd,p}$ [kN] | $N_{Sd}$ [kN] |
|---|---|---|---|---|
| 150,796 | 253,806 | 1,500 | 169,204 | 34,787 |

### 3.3 Betonkegelbreuk

| $A_{c,N}$ [mm²] | $A^0_{c,N}$ [mm²] | $c_{cr,N}$ [mm] | $s_{cr,N}$ [mm] |
|---|---|---|---|
| 435600 | 291600 | 270 | 540 |

| $e_{c1,N}$ [mm] | $\psi_{ec1,N}$ | $e_{c2,N}$ [mm] | $\psi_{ec2,N}$ | $\psi_{s,N}$ | $\psi_{re,N}$ | $k_1$ |
|---|---|---|---|---|---|---|
| 0 | 1,000 | 25 | 0,916 | 1,000 | 1,000 | 10,100 |

| $N^0_{Rk,c}$ [kN] | $\gamma_{M,c}$ | $N_{Rd,c}$ [kN] | $N_{Sd}$ [kN] |
|---|---|---|---|
| 121,955 | 1,500 | 111,282 | 34,787 |

### 3.4 Splijten

| $A_{c,N}$ [mm²] | $A^0_{c,N}$ [mm²] | $c_{cr,sp}$ [mm] | $s_{cr,sp}$ [mm] | $\psi_{h,sp}$ |
|---|---|---|---|---|
| 1327104 | 1065024 | 516 | 1032 | 1,047 |

| $e_{c1,N}$ [mm] | $\psi_{ec1,N}$ | $e_{c2,N}$ [mm] | $\psi_{ec2,N}$ | $\psi_{s,N}$ | $\psi_{re,N}$ | $k_1$ |
|---|---|---|---|---|---|---|
| 0 | 1,000 | 25 | 0,954 | 1,000 | 1,000 | 10,100 |

| $N^0_{Rk,c}$ [kN] | $\gamma_{M,sp}$ | $N_{Rd,sp}$ [kN] | $N_{Sd}$ [kN] |
|---|---|---|---|
| 121,955 | 1,500 | 101,238 | 34,787 |

Invoergegevens en resultaten moeten worden gecontroleerd op overeenstemming met de realiteit en op waarschijnlijkheid!
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Firma:
Constructeur:
Adres:
Tel. I Fax: |
E-mail:



## 4 Afschuifbelasting (EOTA TR 029, paragraaf 5.2.3)

| | Belasting [kN] | Capaciteit [kN] | Benutting $\beta_V$ [%] | Status |
|---|---|---|---|---|
| Staalbreuk (zonder hefboomsarm)* | 33,333 | 70,400 | 48 | OK |
| Staalbreuk (met hefboomsarm)* | N.V.T. | N.V.T. | N.V.T. | N.V.T. |
| Betonachteruitbreken** | 200,000 | 287,071 | 70 | OK |
| Betonrandbreuk in richting ** | N.V.T. | N.V.T. | N.V.T. | N.V.T. |

* ongunstigste anker **ankergroep (geactiveerde ankers)

### 4.1 Staalbreuk (zonder hefboomsarm)

| $V_{Rk,s}$ [kN] | $\gamma_{M,s}$ | $V_{Rd,s}$ [kN] | $V_{Sd}$ [kN] |
|---|---|---|---|
| 88,000 | 1,250 | 70,400 | 33,333 |

### 4.2 Betonachteruitbreken (door betonkegelbreuk)

| $A_{c,N}$ [mm²] | $A^0_{c,N}$ [mm²] | $c_{cr,N}$ [mm] | $s_{cr,N}$ [mm] | k-factor | $k_1$ |
|---|---|---|---|---|---|
| 514800 | 291600 | 270 | 540 | 2,000 | 10,100 |

| $e_{c1,V}$ [mm] | $\psi_{ec1,N}$ | $e_{c2,V}$ [mm] | $\psi_{ec2,N}$ | $\psi_{s,N}$ | $\psi_{re,N}$ |
|---|---|---|---|---|---|
| 0 | 1,000 | 0 | 1,000 | 1,000 | 1,000 |

| $N^0_{Rk,c}$ [kN] | $\gamma_{M,c,p}$ | $V_{Rd,c1}$ [kN] | $V_{Sd}$ [kN] |
|---|---|---|---|
| 121,955 | 1,500 | 287,071 | 200,000 |

## 5 Combinatie van trek en afschuiving (EOTA TR 029, paragraaf 5.2.4)

| $\beta_N$ | $\beta_V$ | $\alpha$ | Benutting $\beta_{N,V}$ [%] | Status |
|---|---|---|---|---|
| 0,344 | 0,697 | 1,500 | 79 | OK |

$\beta_N^\alpha + \beta_V^\alpha <= 1$

## 6 Verplaatsingen (hoogst belaste anker)

Kortdurende belastingen

$N_{Sk}$ = 9,092 [kN] $\delta_N$ = 0,056 [mm]
$V_{Sk}$ = 24,691 [kN] $\delta_V$ = 0,988 [mm]
$\delta_{NV}$ = 0,989 [mm]

Langeduur-belastingen

$N_{Sk}$ = 9,092 [kN] $\delta_N$ = 0,137 [mm]
$V_{Sk}$ = 24,691 [kN] $\delta_V$ = 1,481 [mm]
$\delta_{NV}$ = 1,488 [mm]

NB: Verplaatsingen t.g.v. trekbelasting zijn gebaseerd op de helft van het vereiste aandraaimoment voor ongescheurd beton! Verplaatsingen t.g.v. afschuiving zijn bepaald zonder inachtneming van wrijving tussen beton en ankerplaat! De speling als gevolg van toleranties in boorgatdiameter en gatdiameter in ankerplaat wordt niet beschouwd in deze berekening!

Hoeveel verplaatsing toelaatbaar is, hangt af van de verbinding en dient door de constructeur te worden bepaald!

## 7 Waarschuwingen

- De ankerplaat wordt verondersteld voldoende stijf te zijn zodat geen vervorming optreedt onder invloed van de optredende belastingen!
- Deze bevestigingsdikte valt buiten het bereik dat met standaard ankers kan worden gemonteerd. Neem contact op met Hilti voor beschikbaarheid!
- De overdracht van de belastingen in de ondergrond moet worden gecontroleerd volgens EOTA TR 029 paragraaf 7!
- De berekening is enkel geldig indien het boutgat in de ankerplaat niet groter is dan de waarde die is opgegeven in Tabel 4.1 van EOTA TR 029! Voor grotere boutgatdiameters zie Hoofdstuk 1.1 van EOTA TR029!
- De lijst van benodigdheden is slechts ter informatie voor de gebruiker. In elk geval, dienen de gebruiksinstructies behorende bij het produkt opgevolgd te worden om een juiste installatie te bewerkstelligen.
- Karakteristieke hechtspanningen zijn afhankelijk van korte en lange termijn temperaturen.
- Er is geen randwapening vereist om splijten te voorkomen

Invoergegevens en resultaten moeten worden gecontroleerd op overeenstemming met de realiteit en op waarschijnlijkheid!
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| | | | |
|---|---|---|---|
| Firma: | | Bladzijde: | 4 |
| Constructeur: | | Project: | |
| Adres: | | Sub-Project I Pos. Nr.: | |
| Tel. I Fax: | \| | Datum: | 6-4-2016 |
| E-mail: | | | |

## Verbinding is VEILIG!

Invoergegevens en resultaten moeten worden gecontroleerd op overeenstemming met de realiteit en op waarschijnlijkheid!
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Firma:
Constructeur:
Adres:
Tel. I Fax: |
E-mail:

Bladzijde: 5
Project:
Sub-Project I Pos. Nr.:
Datum: 6-4-2016

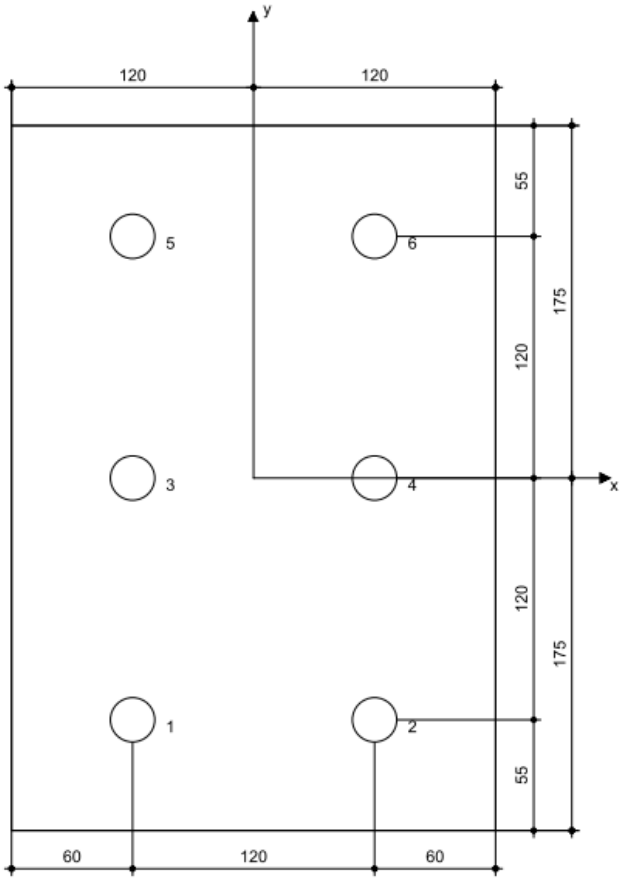
## 8 Plaatsingsgegevens

Ankerplaat, staal: -
Staalprofiel: geen profiel; 0 x 0 x 0 mm
Gatdiameter in ankerplaat: $d_f$ = 22 mm
Ankerplaatdikte (invoer): 9 mm
Aanbevolen ankerplaatdikte: niet berekend
Boorgatreiniging: Boorgatreiniging is niet noodzakelijk

Ankertype en -afmeting: HIT-HY 200-A + HIT-Z-R M20
Aandraaimoment: 0,150 kNm
Boorgatdiameter: 22 mm
Boorgatdiepte in ondergrond: 235 mm
Minimale dikte van de ondergrond: 280 mm

### 8.1 Vereiste toebehoren

| Boren | Boorgatreiniging | Plaatsing |
|---|---|---|
| • Hamerboormachine | • Geen toebehoren benodigd | • Dispenser inclusief cassette en mixtuit |
| • Juiste boordiameter | | • Momentsleutel |




**Ankercoördinaten [mm]**

| Anker | x | y | $c_{-x}$ | $c_{+x}$ | $c_{-y}$ | $c_{+y}$ |
|---|---|---|---|---|---|---|
| 1 | -60 | -120 | - | - | - | - |
| 2 | 60 | -120 | - | - | - | - |
| 3 | -60 | 0 | - | - | - | - |
| 4 | 60 | 0 | - | - | - | - |
| 5 | -60 | 120 | - | - | - | - |
| 6 | 60 | 120 | - | - | - | - |

Invoergegevens en resultaten moeten worden gecontroleerd op overeenstemming met de realiteit en op waarschijnlijkheid!
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## 9 Opmerkingen

- Alle informatie en data die deel uitmaken van de Software hebben uitsluitend betrekking op het gebruik van Hilti producten en zijn gebaseerd op de principes, formules en beveiligingsregels zoals die van kracht zijn op technische richtlijnen die Hilti hanteert en de instructies voor gebruik, montage, assemblage enz. die strikt dienen te worden nageleefd door de gebruiker. Alle in die informatie genoemde cijfers zijn gemiddelden, wat wil zeggen dat op de specifieke toepassing toegesneden tests nodig kunnen zijn voordat een product van Hilti daadwerkelijk in gebruik wordt genomen. De uitkomsten van met behulp van de Software uitgevoerde berekeningen zijn in essentie niet los te zien van de door u als gebruiker ingevoerde gegevens. Eventuele fouten in die berekeningen zijn dan ook niet aan de Software toe te schrijven, maar, waar van toepassing, het gevolg van mogelijke onvolledigheid of irrelevantie van de door u ingevoerde gegevens. Daarnaast bent u ook als enige verantwoordelijk voor het laten controleren en bevestigen van zulke berekeningen en de uitkomsten daarvan door een terzake deskundige, met name waar het gaat om conformering aan geldende normen en voorschriften, voordat u deze toepast binnen uw organisatie. De Software is uitsluitend bedoeld als hulpmiddel bij de interpretatie van zulke normen en voorschriften, zonder dat garanties worden verleend ten aanzien van volledige correctheid en relevantie van de resultaten, noch ten aanzien van geschiktheid voor een specifieke toepassing.
- U bent persoonlijk verantwoordelijk voor binnen de grenzen van het redelijke te nemen stappen en maatregelen ter voorkoming van schade die het gevolg kan zijn van gebruik van de Software. Dat wil onder meer zeggen dat u zorg dient te dragen voor regelmatige backups van programmatuur en gegevens, en implementatie van updates op de Software die door Hilti ter beschikking worden gesteld. Als u ervoor kiest geen gebruik te maken van de AutoUpdate functie die in de Software beschikbaar is, dient u zeker te stellen dat u in alle gevallen met de actuele, op dat moment nieuwste versie van de Software werkt door middel van handmatige updates via de Hilti Website. Hilti is niet aansprakelijk voor schadelijke gevolgen, bijvoorbeeld in de vorm van gegevensverlies, gegevenscorruptie of schade aan programmatuur, van het op de genoemde punten in gebreke blijven door de gebruiker.


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## 6.11. Begane grond vloer

**TS/Raamwerken** **Rel: 6.05 6 apr 2016**

```
Project..:
Onderdeel:
Dimensies: kN;m;rad  (tenzij anders aangegeven)
Datum....: 06/04/2016
Bestand..: x:\ing.buro\9700 tm 9799\9732\bouwconstructie\besteksfase\
           berekeningen\-02\vloer begane grond.rww

Belastingbreedte.:   0.600
Rekenmodel.......: 2e-orde-elastisch.
Theorieën voor de bepaling van de krachtsverdeling:
1) Uiterste grenstoestand:
   Geometrisch niet lineair alle staven.
   Fysisch lineair alle staven.
2) Gebruiksgrenstoestand:
   Lineaire-elasticiteitstheorie

Maximum aantal iteraties......: 50
Max.deellengte kolommen/wanden:  0.500 Max.deellengte balken/vloeren:  0.500
Max. X-verplaatsing in UGT....:  0.500 Max. Z-verplaatsing in UGT...:  0.250

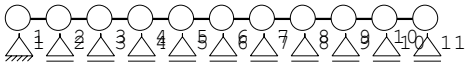
Gunstige werking van de permanente belasting wordt automatisch verwerkt

Belastingfactoren zijn bepaald conform NEN8700:2011
Tabel A1.2(B) en (C): Factoren bij verbouw.
```

### 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 8700:2011 | | |
| Hout | NEN-EN 1995-1-1:2005 | A1:2011,C1:2006 | NB:2011(nl) |

### GEOMETRIE




### MATERIALEN

| Mt | Omschrijving | E-modulus[N/mm2] | S.M. | S.M.verhoogd | Pois. | Uitz. coëff |
|---|---|---|---|---|---|---|
| 1 | C18 | 9000 | 3.2 | 3.8 | 0.00 | 5.0000e-006 |

Bij de bepaling v.h. e.g. van houten staven is de S.M.verhoogd toegepast.

### PROFIELEN [mm]

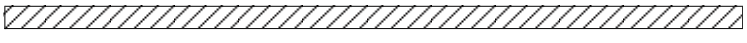
| Prof. | Omschrijving | Materiaal | Oppervlak | Traagheid | Vormf. |
|---|---|---|---|---|---|
| 1 | B*H 600*18 | 1:C18 | 1.0800e+004 | 2.9160e+005 | 0.00 |

### PROFIELEN vervolg [mm]

| Prof. | Staaftype | Breedte | Hoogte | e | Type | b1 | h1 | b2 | h2 |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 0:Normaal | 600 | 18 | 9.0 | 0:RH | | | | |

### PROFIELVORMEN [mm]

1 B*H 600*18



### KNOPEN

| Knoop | X | Z | Knoop | X | Z |
|---|---|---|---|---|---|
| 1 | 0.000 | 0.000 | 6 | 1.500 | 0.000 |
| 2 | 0.300 | 0.000 | 7 | 1.800 | 0.000 |
| 3 | 0.600 | 0.000 | 8 | 2.100 | 0.000 |
| 4 | 0.900 | 0.000 | 9 | 2.400 | 0.000 |
| 5 | 1.200 | 0.000 | 10 | 2.700 | 0.000 |
| 11 | 3.000 | 0.000 | | | |

## STAVEN

| St. | ki | kj | Profiel | Aansl.i | Aansl.j | Lengte | Opm. |
|---|---|---|---|---|---|---|---|
| 1 | 1 | 2 | 1:B*H 600*18 | NDM | NDM | 0.300 | |
| 2 | 2 | 3 | 1:B*H 600*18 | NDM | NDM | 0.300 | |
| 3 | 3 | 4 | 1:B*H 600*18 | NDM | NDM | 0.300 | |
| 4 | 4 | 5 | 1:B*H 600*18 | NDM | NDM | 0.300 | |
| 5 | 5 | 6 | 1:B*H 600*18 | NDM | NDM | 0.300 | |
| 6 | 6 | 7 | 1:B*H 600*18 | NDM | NDM | 0.300 | |
| 7 | 7 | 8 | 1:B*H 600*18 | NDM | NDM | 0.300 | |
| 8 | 8 | 9 | 1:B*H 600*18 | NDM | NDM | 0.300 | |
| 9 | 9 | 10 | 1:B*H 600*18 | NDM | NDM | 0.300 | |
| 10 | 10 | 11 | 1:B*H 600*18 | NDM | NDM | 0.300 | |

## VASTE STEUNPUNTEN

| Nr. | knoop | Kode XZR 1=vast 0=vrij | Hoek |
|---|---|---|---|
| 1 | 1 | 110 | 0.00 |
| 2 | 2 | 010 | 0.00 |
| 3 | 3 | 010 | 0.00 |
| 4 | 4 | 010 | 0.00 |
| 5 | 5 | 010 | 0.00 |
| 6 | 6 | 010 | 0.00 |
| 7 | 7 | 010 | 0.00 |
| 8 | 8 | 010 | 0.00 |
| 9 | 9 | 010 | 0.00 |
| 10 | 10 | 010 | 0.00 |
| 11 | 11 | 010 | 0.00 |

## BELASTINGGENERATIE ALGEMEEN.

| | | | |
|---|---|---|---|
| Betrouwbaarheidsklasse.....: | 1 | Referentieperiode.....: | 50 |
| Gebouwdiepte.....: | 0.00 | Gebouwhoogte.....: | 0.00 |
| Niveau aansl.terrein.....: | 0.00 | E.g. scheid.w. [kN/m2]: | 1.20 |

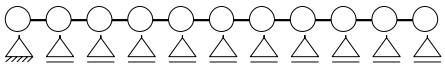
## BELASTINGGEVALLEN

| B.G. | Omschrijving | | Type |
|---|---|---|---|
| 1 | Permanent | EGZ=-1.00 | 1 Permanente belasting |
| 2 | Werklast | | 2 Ver. bel. pers. ed. (p_rep) |

## BELASTINGEN

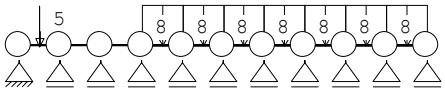
B.G:1 Permanent

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



## BELASTINGEN

B.G:2 Werklast




## STAAFBELASTINGEN

B.G:2 Werklast

| Staaf | Type | q1/p/m | q2 | A | B | $\psi_0$ | $\psi_1$ | $\psi_2$ |
|---|---|---|---|---|---|---|---|---|
| 1 | 10:PZGeproj. | -5.00 | | 0.150 | | 0.4 | 0.7 | 0.6 |
| 10 | 1:QZLokaal | -8.00 | -8.00 | 0.000 | 0.000 | 0.4 | 0.7 | 0.6 |
| 8 | 1:QZLokaal | -8.00 | -8.00 | 0.000 | 0.000 | 0.4 | 0.7 | 0.6 |
| 7 | 1:QZLokaal | -8.00 | -8.00 | 0.000 | 0.000 | 0.4 | 0.7 | 0.6 |
| 9 | 1:QZLokaal | -8.00 | -8.00 | 0.000 | 0.000 | 0.4 | 0.7 | 0.6 |
| 6 | 1:QZLokaal | -8.00 | -8.00 | 0.000 | 0.000 | 0.4 | 0.7 | 0.6 |
| 5 | 1:QZLokaal | -8.00 | -8.00 | 0.000 | 0.000 | 0.4 | 0.7 | 0.6 |
| 4 | 1:QZLokaal | -8.00 | -8.00 | 0.000 | 0.000 | 0.4 | 0.7 | 0.6 |

## BEREKENINGSTATUS

| B.C. | Iteratie | Status |
|---|---|---|
| 1 | 3 | Nauwkeurigheid bereikt |
| 2 | 3 | Nauwkeurigheid bereikt |
| 3 | 3 | Nauwkeurigheid bereikt |
| 4 | 3 | Nauwkeurigheid bereikt |
| 5 | 3 | Nauwkeurigheid bereikt |
| 6 | 3 | Nauwkeurigheid bereikt |
| 7 | 1 | Lineaire berekening |
| 8 | 1 | Lineaire berekening |
| 9 | 1 | Lineaire berekening |
| 10 | 1 | Lineaire berekening |
| 11 | 1 | Lineaire berekening |
| 12 | 1 | Lineaire berekening |

## BELASTINGCOMBINATIES

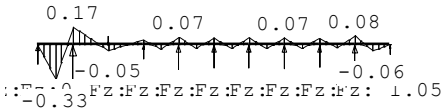
| BC | Type | |
|---|---|---|
| 1 | Fund. | $1.15\ G_{k,1}$ |
| 2 | Fund. | $0.90\ G_{k,1}$ |
| 3 | Fund. | $1.15\ G_{k,1} + 1.10\ \psi_0\ Q_{k,2}$ |
| 4 | Fund. | $1.05\ G_{k,1} + 1.10\ Q_{k,2}$ |
| 5 | Fund. | $0.90\ G_{k,1} + 1.10\ Q_{k,2}$ |
| 6 | Fund. | $0.90\ G_{k,1} + 1.10\ \psi_0\ Q_{k,2}$ |
| 7 | Kar. | $1.00\ G_{k,1} + 1.00\ Q_{k,2}$ |
| 8 | Quas. | $1.00\ G_{k,1}$ |
| 9 | Quas. | $1.00\ G_{k,1} + 1.00\ \psi_2\ Q_{k,2}$ |
| 10 | Freq. | $1.00\ G_{k,1}$ |
| 11 | Freq. | $1.00\ G_{k,1} + 1.00\ \psi_1\ Q_{k,2}$ |
| 12 | Blij. | $1.00\ G_{k,1}$ |

## GUNSTIGE WERKING PERMANENTE BELASTINGEN

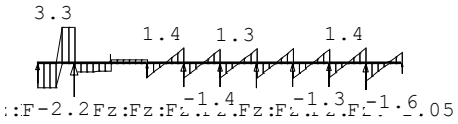
| BC | Staven met gunstige werking |
|---|---|
| 1 | Geen |
| 2 | Alle staven de factor:0.90 |
| 3 | Geen |
| 4 | Geen |
| 5 | Alle staven de factor:0.90 |
| 6 | Alle staven de factor:0.90 |

## OMHULLENDE VAN DE FUNDAMENTELE COMBINATIES

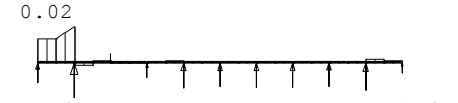
**MOMENTEN** 2e orde Fundamentele combinatie




**DWARSKRACHTEN** 2e orde Fundamentele combinatie




**NORMAALKRACHTEN** 2e orde Fundamentele combinatie




**REACTIES** 2e orde Fundamentele combinatie

| Kn. | X-min | X-max | Z-min | Z-max | M-min | M-max |
|---|---|---|---|---|---|---|
| 1 | 0.00 | 0.00 | 0.00 | 2.20 | | |
| 2 | | | 0.01 | 4.06 | | |
| 3 | | | -1.05 | 0.01 | | |
| 4 | | | 0.01 | 1.57 | | |
| 5 | | | 0.01 | 2.77 | | |
| 6 | | | 0.01 | 2.62 | | |
| 7 | | | 0.01 | 2.65 | | |
| 8 | | | 0.01 | 2.68 | | |
| 9 | | | 0.01 | 2.56 | | |
| 10 | | | 0.01 | 3.01 | | |
| 11 | | | 0.00 | 1.05 | | |

**MATERIAALGEGEVENS**

| Materiaal | $f_{m,y,k}$ [N/mm$^2$] | $\rho_k$ [kg/m$^3$] | $\rho_{mean}$ [kg/m$^3$] | $f_{t,0,k}$ [N/mm$^2$] | $f_{t,90,k}$ [N/mm$^2$] | $f_{c,0,k}$ [N/mm$^2$] | $f_{c,90,k}$ [N/mm$^2$] | $f_{v,k}$ [N/mm$^2$] |
|---|---|---|---|---|---|---|---|---|
| C18 | 18 | 320 | 380 | 11 | 0.4 | 18 | 2.2 | 3.4 |

**MATERIAALGEGEVENS (vervolg)**

| Materiaal | $G_{mean}$ [N/mm$^2$] | $E_{0,05}$ [N/mm$^2$] | $E_{90mean}$ [N/mm$^2$] | $E_{0,mean}$ [N/mm$^2$] | Klimaatklasse | $k_{def}$ | $E_{0mean,fin}$ [N/mm$^2$] |
|---|---|---|---|---|---|---|---|
| C18 | 560 | 6000 | 300 | 9000 | I | 0.60 | 5625 |

**KIPSTABILITEIT**

| Staaf | Plts. aangr. | | l sys. [m] | Kipsteunafstanden [m] |
|---|---|---|---|---|
| 1 | 1.0*h | boven: | 0.30 | 0;0.300 |
| | | onder: | 0.30 | 0;0.300 |
| 2 | 1.0*h | boven: | 0.30 | 0.300 |
| | | onder: | 0.30 | 0.300 |
| 3 | 1.0*h | boven: | 0.30 | 0.300 |
| | | onder: | 0.30 | 0.300 |

## KIPSTABILITEIT

| Staaf | Plts. aangr. | | l sys. [m] | Kipsteunafstanden [m] |
|---|---|---|---|---|
| 4 | 1.0*h | boven: | 0.30 | 0.300 |
| | | onder: | 0.30 | 0.300 |
| 5 | 1.0*h | boven: | 0.30 | 0.300 |
| | | onder: | 0.30 | 0.300 |
| 6 | 1.0*h | boven: | 0.30 | 0.300 |
| | | onder: | 0.30 | 0.300 |
| 7 | 1.0*h | boven: | 0.30 | 0.300 |
| | | onder: | 0.30 | 0.300 |
| 8 | 1.0*h | boven: | 0.30 | 0.300 |
| | | onder: | 0.30 | 0.300 |
| 9 | 1.0*h | boven: | 0.30 | 0.300 |
| | | onder: | 0.30 | 0.300 |
| 10 | 1.0*h | boven: | 0.30 | 0.300 |
| | | onder: | 0.30 | 0.300 |

## STABILITEIT

| Stf | $b_{gem}$ [mm] | $h_{gem}$ [mm] | $l_{sys}$ [mm] | $l_{buc,y/z}$ [mm] | [mm] | $\lambda_y$ | $\lambda_z$ | $\lambda_{rel,y/z}$ | $\beta_c$ | $k_y$ | $k_z$ | $k_{c,y}$ | $k_{c,z}$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 600 | 18 | 300 | 300 | 300 | 57.7 | 1.7 | 1.007 | 0.030 | 0.2 | 1.077 | 0.473 | 0.684 | 1.057 |
| 2 | 600 | 18 | 300 | 300 | 300 | 57.7 | 1.7 | 1.007 | 0.030 | 0.2 | 1.077 | 0.473 | 0.684 | 1.057 |
| 3 | 600 | 18 | 300 | 299 | 299 | 57.7 | 1.7 | 1.007 | 0.030 | 0.2 | 1.077 | 0.473 | 0.684 | 1.057 |
| 4 | 600 | 18 | 300 | 300 | 300 | 57.7 | 1.7 | 1.007 | 0.030 | 0.2 | 1.077 | 0.473 | 0.684 | 1.057 |
| 5 | 600 | 18 | 300 | 299 | 299 | 57.7 | 1.7 | 1.007 | 0.030 | 0.2 | 1.077 | 0.473 | 0.684 | 1.057 |
| 6 | 600 | 18 | 300 | 299 | 299 | 57.7 | 1.7 | 1.007 | 0.030 | 0.2 | 1.077 | 0.473 | 0.684 | 1.057 |
| 7 | 600 | 18 | 300 | 299 | 299 | 57.7 | 1.7 | 1.007 | 0.030 | 0.2 | 1.077 | 0.473 | 0.684 | 1.057 |
| 8 | 600 | 18 | 300 | 300 | 300 | 57.7 | 1.7 | 1.007 | 0.030 | 0.2 | 1.077 | 0.473 | 0.684 | 1.057 |
| 9 | 600 | 18 | 300 | 299 | 299 | 57.7 | 1.7 | 1.007 | 0.030 | 0.2 | 1.077 | 0.473 | 0.684 | 1.057 |
| 10 | 600 | 18 | 300 | 299 | 299 | 57.7 | 1.7 | 1.007 | 0.030 | 0.2 | 1.077 | 0.473 | 0.684 | 1.057 |

## TOETSING SPANNINGEN

**Staaf 1 BC / Sit. 4 / 1 UC frm(6.17) 0.94**

Maatg. is norm.trekkr. + buiging (EN 1995-1-1 art. 6.2.3(1)) aan bovenzijde staaf

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Positie | 150 | [mm] | Breedte | 600.00 | [mm] | Hoogte | 18.00 | [mm] |
| $k_{mod}$ | 0.60 | [-] | $k_h$ | 1.00 | [-] | $k_{h(fmk,\ ftok)}$ | 1.00 | [-] |
| $f_{m,y,d}$ | 10.80 | [N/mm$^2$] | $f_{c,0,d}$ | 8.31 | [N/mm$^2$] | $f_{t,0,d}$ | 5.08 | [N/mm$^2$] |
| $f_{v,d}$ | 1.57 | [N/mm$^2$] | $f_{c,90,d}$ | 1.02 | [N/mm$^2$] | $f_{t,90,d}$ | 0.18 | [N/mm$^2$] |
| N | 0.02 | [kN] | D | 3.31 | [kN] | M | -0.33 | [kNm] |
| $\sigma_{t,0,d}$ | 0.00 | [N/mm$^2$] | $\sigma_{v,d}$ | 0.46 | [N/mm$^2$] | $\sigma_{m,y,d}$ | 10.15 | [N/mm$^2$] |
| $k_{c,z}$ | 1.06 | [-] | $k_m$ | 0.70 | [-] | $l_{ef,y}$ | 276.00 | [mm] |
| $\sigma_{my,crit}$ | 339130.44 | [N/$^m$m2] | $_{lrel,m}$y | 0.01 | [-] | $_{kcrit,}$y | 1.00 | [-] |

**Staaf 2 BC / Sit. 4 / 1 UC frm(6.23) 0.48**

Maatg. is norm.drukkr. + buiging (EN 1995-1-1 art. 6.3.2(3)) aan onderzijde staaf

| | | | | | |
|---|---|---|---|---|---|
| Positie | 0 [mm] | Breedte | 600.00 [mm] | Hoogte | 18.00 [mm] |
| $k_{mod}$ | 0.60 [-] | $k_h$ | 1.00 [-] | $k_{h(fmk, ftok)}$ | 1.00 [-] |
| $f_{m,y,d}$ | 10.80 [N/mm$^2$] | $f_{c,0,d}$ | 8.31 [N/mm$^2$] | $f_{t,0,d}$ | 5.08 [N/mm$^2$] |
| $f_{v,d}$ | 1.57 [N/mm$^2$] | $f_{c,90,d}$ | 1.02 [N/mm$^2$] | $f_{t,90,d}$ | 0.18 [N/mm$^2$] |
| N | -0.00 [kN] | D | -0.74 [kN] | M | 0.17 [kNm] |
| $\sigma_{c,0,d}$ | 0.00 [N/mm$^2$] | $\sigma_{v,d}$ | 0.10 [N/mm$^2$] | $\sigma_{m,y,d}$ | -5.20 [N/mm$^2$] |
| $k_{c,z}$ | 1.00 [-] | $k_m$ | 0.70 [-] | $l_{ef,y}$ | 291.00 [mm] |
| $\sigma_{my,crit}$ | 321649.47 [N/$^m$m2] | $_{lrel,m}$y | 0.01 [-] | $_{kcrit,}$y | 1.00 [-] |

**Staaf 3 BC / Sit. 5 / 1 UC frm(6.23) 0.15**

Maatg. is norm.drukkr. + buiging (EN 1995-1-1 art. 6.3.2(3)) aan bovenzijde staaf

| | | | | | |
|---|---|---|---|---|---|
| Positie | 0 [mm] | Breedte | 600.00 [mm] | Hoogte | 18.00 [mm] |
| $k_{mod}$ | 0.60 [-] | $k_h$ | 1.00 [-] | $k_{h(fmk, ftok)}$ | 1.00 [-] |
| $f_{m,y,d}$ | 10.80 [N/mm$^2$] | $f_{c,0,d}$ | 8.31 [N/mm$^2$] | $f_{t,0,d}$ | 5.08 [N/mm$^2$] |
| $f_{v,d}$ | 1.57 [N/mm$^2$] | $f_{c,90,d}$ | 1.02 [N/mm$^2$] | $f_{t,90,d}$ | 0.18 [N/mm$^2$] |
| N | -0.00 [kN] | D | 0.32 [kN] | M | -0.05 [kNm] |
| $\sigma_{c,0,d}$ | 0.00 [N/mm$^2$] | $\sigma_{v,d}$ | 0.04 [N/mm$^2$] | $\sigma_{m,y,d}$ | -1.63 [N/mm$^2$] |
| $k_{c,z}$ | 1.00 [-] | $k_m$ | 0.70 [-] | $l_{ef,y}$ | 336.00 [mm] |
| $\sigma_{my,crit}$ | 278571.41 [N/$^m$m2] | $_{lrel,m}$y | 0.01 [-] | $_{kcrit,}$y | 1.00 [-] |

**Staaf 4 BC / Sit. 4 / 1 UC frm(6.17) 0.21**

Maatg. is norm.trekkr. + buiging (EN 1995-1-1 art. 6.2.3(1)) aan onderzijde staaf

| | | | | | |
|---|---|---|---|---|---|
| Positie | 299 [mm] | Breedte | 600.00 [mm] | Hoogte | 18.00 [mm] |
| $k_{mod}$ | 0.60 [-] | $k_h$ | 1.00 [-] | $k_{h(fmk, ftok)}$ | 1.00 [-] |
| $f_{m,y,d}$ | 10.80 [N/mm$^2$] | $f_{c,0,d}$ | 8.31 [N/mm$^2$] | $f_{t,0,d}$ | 5.08 [N/mm$^2$] |
| $f_{v,d}$ | 1.57 [N/mm$^2$] | $f_{c,90,d}$ | 1.02 [N/mm$^2$] | $f_{t,90,d}$ | 0.18 [N/mm$^2$] |
| N | 0.00 [kN] | D | 1.42 [kN] | M | 0.07 [kNm] |
| $\sigma_{t,0,d}$ | 0.00 [N/mm$^2$] | $\sigma_{v,d}$ | 0.20 [N/mm$^2$] | $\sigma_{m,y,d}$ | 2.22 [N/mm$^2$] |
| $k_{c,z}$ | 1.00 [-] | $k_m$ | 0.70 [-] | $l_{ef,y}$ | 291.00 [mm] |
| $\sigma_{my,crit}$ | 321649.47 [N/$^m$m2] | $_{lrel,m}$y | 0.01 [-] | $_{kcrit,}$y | 1.00 [-] |

**Staaf 5 BC / Sit. 4 / 1 UC frm(6.17) 0.21**

Maatg. is norm.trekkr. + buiging (EN 1995-1-1 art. 6.2.3(1)) aan onderzijde staaf

| | | | | | |
|---|---|---|---|---|---|
| Positie | 0 [mm] | Breedte | 600.00 [mm] | Hoogte | 18.00 [mm] |
| $k_{mod}$ | 0.60 [-] | $k_h$ | 1.00 [-] | $k_{h(fmk, ftok)}$ | 1.00 [-] |
| $f_{m,y,d}$ | 10.80 [N/mm$^2$] | $f_{c,0,d}$ | 8.31 [N/mm$^2$] | $f_{t,0,d}$ | 5.08 [N/mm$^2$] |
| $f_{v,d}$ | 1.57 [N/mm$^2$] | $f_{c,90,d}$ | 1.02 [N/mm$^2$] | $f_{t,90,d}$ | 0.18 [N/mm$^2$] |
| N | 0.00 [kN] | D | -1.35 [kN] | M | 0.07 [kNm] |
| $\sigma_{t,0,d}$ | 0.00 [N/mm$^2$] | $\sigma_{v,d}$ | 0.19 [N/mm$^2$] | $\sigma_{m,y,d}$ | 2.22 [N/mm$^2$] |
| $k_{c,z}$ | 1.00 [-] | $k_m$ | 0.70 [-] | $l_{ef,y}$ | 291.00 [mm] |
| $\sigma_{my,crit}$ | 321649.47 [N/$^m$m2] | $_{lrel,m}$y | 0.01 [-] | $_{kcrit,}$y | 1.00 [-] |

**TOETSING SPANNINGEN**

**Staaf 6 BC / Sit. 4 / 1 UC frm(6.17) 0.19**

Maatg. is norm.trekkr. + buiging (EN 1995-1-1 art. 6.2.3(1)) aan onderzijde staaf

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Positie | 300 | [mm] | Breedte | 600.00 | [mm] | Hoogte | 18.00 | [mm] |
| $k_{mod}$ | 0.60 | [-] | $k_h$ | 1.00 | [-] | $k_{h(fmk, ftok)}$ | 1.00 | [-] |
| $f_{m,y,d}$ | 10.80 | [N/mm$^2$] | $f_{c,0,d}$ | 8.31 | [N/mm$^2$] | $f_{t,0,d}$ | 5.08 | [N/mm$^2$] |
| $f_{v,d}$ | 1.57 | [N/mm$^2$] | $f_{c,90,d}$ | 1.02 | [N/mm$^2$] | $f_{t,90,d}$ | 0.18 | [N/mm$^2$] |
| N | 0.00 | [kN] | D | 1.33 | [kN] | M | 0.07 | [kNm] |
| $\sigma_{t,0,d}$ | 0.00 | [N/mm$^2$] | $\sigma_{v,d}$ | 0.18 | [N/mm$^2$] | $\sigma_{m,y,d}$ | 2.05 | [N/mm$^2$] |
| $k_{c,z}$ | 1.00 | [-] | $k_m$ | 0.70 | [-] | $l_{ef,y}$ | 291.00 | [mm] |
| $\sigma_{my,crit}$ | 321649.47 | [N/$^m$m2] | $_{lrel,m}$y | 0.01 | [-] | $_{kcrit,}$y | 1.00 | [-] |

**Staaf 7 BC / Sit. 4 / 1 UC frm(6.17) 0.19**

Maatg. is norm.trekkr. + buiging (EN 1995-1-1 art. 6.2.3(1)) aan onderzijde staaf

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Positie | 300 | [mm] | Breedte | 600.00 | [mm] | Hoogte | 18.00 | [mm] |
| $k_{mod}$ | 0.60 | [-] | $k_h$ | 1.00 | [-] | $k_{h(fmk, ftok)}$ | 1.00 | [-] |
| $f_{m,y,d}$ | 10.80 | [N/mm$^2$] | $f_{c,0,d}$ | 8.31 | [N/mm$^2$] | $f_{t,0,d}$ | 5.08 | [N/mm$^2$] |
| $f_{v,d}$ | 1.57 | [N/mm$^2$] | $f_{c,90,d}$ | 1.02 | [N/mm$^2$] | $f_{t,90,d}$ | 0.18 | [N/mm$^2$] |
| N | 0.00 | [kN] | D | 1.33 | [kN] | M | 0.07 | [kNm] |
| $\sigma_{t,0,d}$ | 0.00 | [N/mm$^2$] | $\sigma_{v,d}$ | 0.18 | [N/mm$^2$] | $\sigma_{m,y,d}$ | 2.08 | [N/mm$^2$] |
| $k_{c,z}$ | 1.00 | [-] | $k_m$ | 0.70 | [-] | $l_{ef,y}$ | 291.00 | [mm] |
| $\sigma_{my,crit}$ | 321649.47 | [N/$^m$m2] | $_{lrel,m}$y | 0.01 | [-] | $_{kcrit,}$y | 1.00 | [-] |

**Staaf 8 BC / Sit. 4 / 1 UC frm(6.17) 0.19**

Maatg. is norm.trekkr. + buiging (EN 1995-1-1 art. 6.2.3(1)) aan onderzijde staaf

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Positie | 0 | [mm] | Breedte | 600.00 | [mm] | Hoogte | 18.00 | [mm] |
| $k_{mod}$ | 0.60 | [-] | $k_h$ | 1.00 | [-] | $k_{h(fmk, ftok)}$ | 1.00 | [-] |
| $f_{m,y,d}$ | 10.80 | [N/mm$^2$] | $f_{c,0,d}$ | 8.31 | [N/mm$^2$] | $f_{t,0,d}$ | 5.08 | [N/mm$^2$] |
| $f_{v,d}$ | 1.57 | [N/mm$^2$] | $f_{c,90,d}$ | 1.02 | [N/mm$^2$] | $f_{t,90,d}$ | 0.18 | [N/mm$^2$] |
| N | 0.00 | [kN] | D | -1.35 | [kN] | M | 0.07 | [kNm] |
| $\sigma_{t,0,d}$ | 0.00 | [N/mm$^2$] | $\sigma_{v,d}$ | 0.19 | [N/mm$^2$] | $\sigma_{m,y,d}$ | 2.08 | [N/mm$^2$] |
| $k_{c,z}$ | 1.00 | [-] | $k_m$ | 0.70 | [-] | $l_{ef,y}$ | 291.00 | [mm] |
| $\sigma_{my,crit}$ | 321649.47 | [N/$^m$m2] | $_{lrel,m}$y | 0.01 | [-] | $_{kcrit,}$y | 1.00 | [-] |

**Staaf 9 BC / Sit. 4 / 1 UC frm(6.17) 0.24**

Maatg. is norm.trekkr. + buiging (EN 1995-1-1 art. 6.2.3(1)) aan onderzijde staaf

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Positie | 300 | [mm] | Breedte | 600.00 | [mm] | Hoogte | 18.00 | [mm] |
| $k_{mod}$ | 0.60 | [-] | $k_h$ | 1.00 | [-] | $k_{h(fmk, ftok)}$ | 1.00 | [-] |
| $f_{m,y,d}$ | 10.80 | [N/mm$^2$] | $f_{c,0,d}$ | 8.31 | [N/mm$^2$] | $f_{t,0,d}$ | 5.08 | [N/mm$^2$] |
| $f_{v,d}$ | 1.57 | [N/mm$^2$] | $f_{c,90,d}$ | 1.02 | [N/mm$^2$] | $f_{t,90,d}$ | 0.18 | [N/mm$^2$] |
| N | 0.00 | [kN] | D | 1.40 | [kN] | M | 0.08 | [kNm] |
| $\sigma_{t,0,d}$ | 0.00 | [N/mm$^2$] | $\sigma_{v,d}$ | 0.19 | [N/mm$^2$] | $\sigma_{m,y,d}$ | 2.60 | [N/mm$^2$] |
| $k_{c,z}$ | 1.00 | [-] | $k_m$ | 0.70 | [-] | $l_{ef,y}$ | 291.00 | [mm] |
| $\sigma_{my,crit}$ | 321649.47 | [N/$^m$m2] | $_{lrel,m}$y | 0.01 | [-] | $_{kcrit,}$y | 1.00 | [-] |

**TOETSING SPANNINGEN**

**Staaf 10 BC / Sit. 4 / 1 UC frm(6.17) 0.24**

Maatg. is norm.trekkr. + buiging (EN 1995-1-1 art. 6.2.3(1)) aan onderzijde staaf

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Positie | 0 | [mm] | Breedte | 600.00 | [mm] | Hoogte | 18.00 | [mm] |
| $k_{mod}$ | 0.60 | [-] | $k_h$ | 1.00 | [-] | $k_{h(fmk,\ ftok)}$ | 1.00 | [-] |
| $f_{m,y,d}$ | 10.80 | [N/mm$^2$] | $f_{c,0,d}$ | 8.31 | [N/mm$^2$] | $f_{t,0,d}$ | 5.08 | [N/mm$^2$] |
| $f_{v,d}$ | 1.57 | [N/mm$^2$] | $f_{c,90,d}$ | 1.02 | [N/mm$^2$] | $f_{t,90,d}$ | 0.18 | [N/mm$^2$] |
| N | 0.00 | [kN] | D | -1.61 | [kN] | M | 0.08 | [kNm] |
| $\sigma_{t,0,d}$ | 0.00 | [N/mm$^2$] | $\sigma_{v,d}$ | 0.22 | [N/mm$^2$] | $\sigma_{m,y,d}$ | 2.60 | [N/mm$^2$] |
| $k_{c,z}$ | 1.00 | [-] | $k_m$ | 0.70 | [-] | $l_{ef,y}$ | 231.00 | [mm] |
| $\sigma_{my,crit}$ | 405194.78 | [N/$^m$m2] | $_{lrel,m}$y | 0.01 | [-] | $_{kcrit}$,y | 1.00 | [-] |

## TOETSING DOORBUIGING

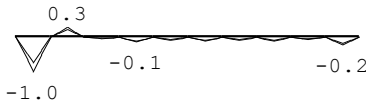
| Stf | Soort | $l_{sys}$ [mm] | Overstek i | Overstek j | BC | Sit | $u_{bij}$ [mm] | Toelaatbaar [mm] | Toelaatbaar *l | $u_{fin,net}$ [mm] | Toelaatbaar [mm] | Toelaatbaar *l |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Vloer | 300 | Nee | Nee | 9 | 1 | *-1.0* | -0.9 | 0.003 | -1.0 | -1.2 | 0.004 |
| 3 | Vloer | 300 | Nee | Nee | 9 | 1 | -0.0 | -0.9 | 0.003 | -0.0 | -1.2 | 0.004 |
| 4 | Vloer | 300 | Nee | Nee | 9 | 1 | -0.1 | -0.9 | 0.003 | -0.1 | -1.2 | 0.004 |
| 5 | Vloer | 300 | Nee | Nee | 9 | 1 | -0.1 | -0.9 | 0.003 | -0.1 | -1.2 | 0.004 |
| 6 | Vloer | 300 | Nee | Nee | 9 | 1 | -0.1 | -0.9 | 0.003 | -0.1 | -1.2 | 0.004 |
| 7 | Vloer | 300 | Nee | Nee | 9 | 1 | -0.1 | -0.9 | 0.003 | -0.1 | -1.2 | 0.004 |
| 8 | Vloer | 300 | Nee | Nee | 9 | 1 | -0.1 | -0.9 | 0.003 | -0.1 | -1.2 | 0.004 |
| 9 | Vloer | 300 | Nee | Nee | 9 | 1 | -0.1 | -0.9 | 0.003 | -0.1 | -1.2 | 0.004 |
| 10 | Vloer | 300 | Nee | Nee | 9 | 1 | -0.2 | -0.9 | 0.003 | -0.2 | -1.2 | 0.004 |

## TOETSING DOORBUIGING (vervolg)

| Stf | Soort | $l_{sys}$ [mm] | Overstek i | Overstek j | BC | Sit | $u_{inst}$ [mm] | Toelaatbaar [mm] | Toelaatbaar *l |
|---|---|---|---|---|---|---|---|---|---|
| 1 | Vloer | 300 | Nee | Nee | 7 | 1 | -0.7 | -1.2 | 0.004 |
| 2 | Vloer | 300 | Nee | Nee | 7 | 1 | 0.2 | 1.2 | 0.004 |
| 3 | Vloer | 300 | Nee | Nee | 7 | 1 | -0.0 | -1.2 | 0.004 |
| 4 | Vloer | 300 | Nee | Nee | 7 | 1 | -0.1 | -1.2 | 0.004 |
| 5 | Vloer | 300 | Nee | Nee | 7 | 1 | -0.1 | -1.2 | 0.004 |
| 6 | Vloer | 300 | Nee | Nee | 7 | 1 | -0.1 | -1.2 | 0.004 |
| 7 | Vloer | 300 | Nee | Nee | 7 | 1 | -0.1 | -1.2 | 0.004 |
| 8 | Vloer | 300 | Nee | Nee | 7 | 1 | -0.1 | -1.2 | 0.004 |
| 9 | Vloer | 300 | Nee | Nee | 7 | 1 | -0.0 | -1.2 | 0.004 |
| 10 | Vloer | 300 | Nee | Nee | 7 | 1 | -0.2 | -1.2 | 0.004 |

**VERVORMINGEN w1** Blijvende combinatie

**VERVORMINGEN Wmax** Karakteristieke combinatie

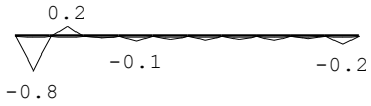



**DOORBUIGINGEN** Karakteristieke combinatie

| Nr. | staven | Zijde | positie [m] | $l_{rep}$ [mm] | $w_1$ [mm] | $w_2$ [mm] | $w_{bij}$ [mm] | $w_{bij}$ [lrep/] | $w_{tot}$ [mm] | $w_c$ [mm] | $w_{max}$ [mm] | $w_{max}$ [lrep/] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1 | Neg. | 0.150 | 300 | | -0.3 | -1.0 | 296 | -1.0 | | -1.0 | 296 |
| 2 | 2 | Pos. | 0.150 | 300 | | 0.1 | 0.3 | 987 | 0.3 | | 0.3 | 987 |
| 4 | 4 | Neg. | 0.150 | 300 | | -0.0 | -0.1 | 2332 | -0.1 | | -0.1 | 2326 |
| 5 | 5 | Neg. | 0.150 | 300 | | -0.0 | -0.1 | 3922 | -0.1 | | -0.1 | 3904 |
| 6 | 6 | Neg. | 0.150 | 300 | | -0.0 | -0.1 | 3288 | -0.1 | | -0.1 | 3276 |
| 7 | 7 | Neg. | 0.150 | 300 | | -0.0 | -0.1 | 3555 | -0.1 | | -0.1 | 3541 |
| 8 | 8 | Neg. | 0.150 | 300 | | -0.0 | -0.1 | 3090 | -0.1 | | -0.1 | 3079 |
| 9 | 9 | Neg. | 0.150 | 300 | | -0.0 | -0.1 | 5638 | -0.1 | | -0.1 | 5617 |
| 10 | 10 | Neg. | 0.150 | 300 | | -0.1 | -0.2 | 1389 | -0.2 | | -0.2 | 1384 |

Velden met een wbij en Wmax < lrep/9999 zijn niet afgedrukt

**VERVORMINGEN Wmax** Frequente combinatie



**DOORBUIGINGEN** Frequente combinatie

| Nr. | staven | Zijde | positie [m] | $l_{rep}$ [mm] | $w_1$ [mm] | $w_2$ [mm] | $w_{bij}$ [mm] | $w_{bij}$ [lrep/] | $w_{tot}$ [mm] | $w_c$ [mm] | $w_{max}$ [mm] | $w_{max}$ [lrep/] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1 | Neg. | 0.150 | 300 | | -0.3 | -0.8 | 380 | -0.8 | | -0.8 | 380 |
| 2 | 2 | Pos. | 0.150 | 300 | | 0.1 | 0.2 | 1266 | 0.2 | | 0.2 | 1267 |
| 4 | 4 | Neg. | 0.150 | 300 | | -0.0 | -0.1 | 2991 | -0.1 | | -0.1 | 2981 |
| 5 | 5 | Neg. | 0.150 | 300 | | -0.0 | -0.1 | 5028 | -0.1 | | -0.1 | 5000 |
| 6 | 6 | Neg. | 0.150 | 300 | | -0.0 | -0.1 | 4216 | -0.1 | | -0.1 | 4196 |
| 7 | 7 | Neg. | 0.150 | 300 | | -0.0 | -0.1 | 4558 | -0.1 | | -0.1 | 4536 |
| 8 | 8 | Neg. | 0.150 | 300 | | -0.0 | -0.1 | 3963 | -0.1 | | -0.1 | 3943 |
| 9 | 9 | Neg. | 0.150 | 300 | | -0.0 | -0.0 | 7230 | -0.0 | | -0.0 | 7194 |
| 10 | 10 | Neg. | 0.150 | 300 | | -0.1 | -0.2 | 1781 | -0.2 | | -0.2 | 1772 |

Velden met een wbij en Wmax < lrep/9999 zijn niet afgedrukt