

STRACKEE BV BOUWADVIESBUREAU

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werk: Mainport Big Spotters Hill
plaats: Haarlemmermeer
werknummer: 910-199
Architect: Lehner Gunther Architectuur
Wagenaarstraat 383
1093 CN Amsterdam
berekeningnummer: 4
onderdeel: reactie 3 op opmerkingen BWT
bijbehorende tekening(en): B01A en B02A
losse bijlage(n):
constructeur: Ing. C.G. Hulan
gecontroleerd:



datum: 5 juli 2013

deze berekening bestaat uit 21 genummerde bladzijden

INHOUD

INLEIDING..... 2
OPMERKING 1..... 2
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INLEIDING

Deze berekening beantwoordt de opmerkingen van Bouwtoezicht op berekening 3

1. Op pag. 3 daar moet naar mijn het volgende uitkomen:
 $X=0$; $z/Le=0,22$; $S=0,67$; $C_0 = 1 + 2 \times 0,67 \times 0,22 = 1,29$;
2. Op pag. is de Q-last van wind (op een half gevelstramien + wrijving) nog niet ingevoerd;
3. Op pag. 19 is de combinatie 0,9 eg + 1,5 wind nog niet ingevoerd.

OPMERKING 1

Aangepast: belasting vergroot met factor $C_0 = 1.29$

TS/Raamwerken
 2013

Rel: 5.27a 5 jul

Project...: 908-118
 Onderdeel:
 Dimensies: kN;m;rad (tenzij anders aangegeven)
 Datum....: 18/09/2007
 Bestand...: H:\Berekeningen\2010\910-199\berekenen\nieuw\bwt\berekening 4\
 raamwerk as a dak dicht def alternatief.rww

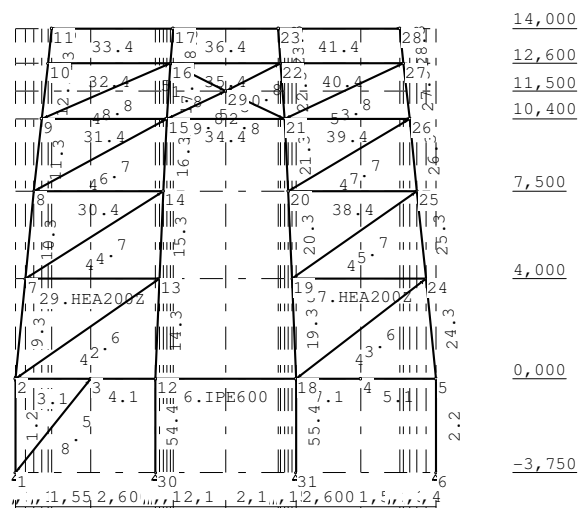
Rekenmodel.....: 2e-orde-elastisch.
 Theorieën voor de bepaling van de krachtsverdeling:
 1) Losse belastinggevallen:
 Lineaire-elasticiteitstheorie
 2) Uiterste grenstoestand:
 Geometrisch niet lineair alle staven.
 Fysisch lineair alle staven.
 3) Gebruiksgrenstoestand:
 Geometrisch niet lineair alle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

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



STRAMIENLIJNEN

| Nr. | X | Z-min | Z-max |
|-----|-------|--------|--------|
| 1 | 0.000 | -3.750 | 14.000 |
| 2 | 0.400 | -3.750 | 14.000 |
| 3 | 0.750 | -3.750 | 14.000 |
| 4 | 1.050 | -3.750 | 14.000 |
| 5 | 1.300 | -3.750 | 14.000 |
| 6 | 1.450 | -3.750 | 14.000 |
| 7 | 3.000 | -3.750 | 14.000 |
| 8 | 5.600 | -3.750 | 14.000 |
| 9 | 5.750 | -3.750 | 14.000 |

STRAMIENLIJNEN

| Nr. | X | Z-min | Z-max |
|-----|--------|--------|--------|
| 10 | 6.050 | -3.750 | 14.000 |
| 11 | 5.900 | -3.750 | 14.000 |
| 12 | 6.200 | -3.750 | 14.000 |
| 13 | 6.300 | -3.750 | 14.000 |
| 14 | 8.400 | -3.750 | 14.000 |
| 15 | 10.500 | -3.750 | 14.000 |
| 16 | 10.600 | -3.750 | 14.000 |
| 17 | 11.050 | -3.750 | 14.000 |
| 18 | 10.750 | -3.750 | 14.000 |
| 19 | 10.900 | -3.750 | 14.000 |
| 20 | 11.200 | -3.750 | 14.000 |
| 21 | 13.800 | -3.750 | 14.000 |
| 22 | 15.350 | -3.750 | 14.000 |
| 23 | 15.500 | -3.750 | 14.000 |
| 24 | 15.750 | -3.750 | 14.000 |
| 25 | 16.050 | -3.750 | 14.000 |
| 26 | 16.400 | -3.750 | 14.000 |
| 27 | 16.800 | -3.750 | 14.000 |

NIVEAUS

| Nr. | Z | X-min | X-max |
|-----|--------|-------|--------|
| 1 | -3.750 | 0.000 | 16.800 |
| 2 | 0.000 | 0.000 | 16.800 |
| 3 | 4.000 | 0.000 | 16.800 |
| 4 | 7.500 | 0.000 | 16.800 |
| 5 | 10.400 | 0.000 | 16.800 |
| 6 | 11.500 | 0.000 | 16.800 |
| 7 | 12.600 | 0.000 | 16.800 |
| 8 | 14.000 | 0.000 | 16.800 |

MATERIALEN

| Mt | Omschrijving | E-modulus[N/mm2] | S.M. | Pois. | Uitz. coëff |
|----|--------------|------------------|------|-------|-------------|
| 1 | S235 | 210000 | 78.5 | 0.30 | 1.2000e-005 |
| 2 | S275 | 210000 | 78.5 | 0.30 | 1.2000e-005 |
| 3 | S355 | 210000 | 78.5 | 0.30 | 1.2000e-005 |
| 4 | S460 | 210000 | 78.5 | 0.30 | 1.2000e-005 |

PROFIELEN [mm]

| Prof. | Omschrijving | Materiaal | Oppervlak | Traagheid | Vormf. |
|-------|--------------|-----------|-------------|-------------|--------|
| 1 | IPE600 | 1:S235 | 1.5600e+004 | 9.2080e+008 | 0.00 |
| 2 | B610/30 | 1:S235 | 5.4664e+004 | 2.3048e+009 | 0.00 |
| 3 | K200/200/10 | 3:S355 | 7.4927e+003 | 4.4709e+007 | 0.00 |
| 4 | HEA200Z | 1:S235 | 5.3800e+003 | 1.3360e+007 | 0.00 |
| 5 | ROND42 | 4:S460 | 1.3854e+003 | 1.5275e+005 | 0.00 |
| 6 | ROND 24 | 4:S460 | 4.5239e+002 | 1.6286e+004 | 0.00 |
| 7 | ROND 20 | 4:S460 | 3.1416e+002 | 7.8540e+003 | 0.00 |
| 8 | ROND 16 | 4:S460 | 2.0106e+002 | 3.2170e+003 | 0.00 |

PROFIELEN vervolg [mm]

| Prof. | Staaftype | Breedte | Hoogte | e | Type | b1 | h1 | b2 | h2 |
|-------|-----------|---------|--------|-------|------|----|----|----|----|
| 1 | 0:Normaal | 220 | 600 | 300.0 | | | | | |
| 2 | 0:Normaal | 610 | 610 | 305.0 | | | | | |
| 3 | 0:Normaal | 200 | 200 | 100.0 | | | | | |
| 4 | 0:Normaal | 200 | 190 | 100.0 | | | | | |
| 5 | 1:Trek | 42 | 42 | 21.0 | | | | | |
| 6 | 1:Trek | 24 | 24 | 12.0 | | | | | |
| 7 | 1:Trek | 20 | 20 | 10.0 | | | | | |
| 8 | 1:Trek | 16 | 16 | 8.0 | | | | | |

KNOPEN

| Knoop | X | Z | Knoop | X | Z |
|-------|--------|--------|-------|--------|--------|
| 1 | 0.000 | -3.750 | 6 | 16.800 | -3.750 |
| 2 | 0.000 | 0.000 | 7 | 0.400 | 4.000 |
| 3 | 3.000 | 0.000 | 8 | 0.750 | 7.500 |
| 4 | 13.800 | 0.000 | 9 | 1.050 | 10.400 |
| 5 | 16.800 | 0.000 | 10 | 1.300 | 12.600 |
| | | | | | |
| 11 | 1.450 | 14.000 | 16 | 6.200 | 12.600 |
| 12 | 5.600 | 0.000 | 17 | 6.300 | 14.000 |
| 13 | 5.750 | 4.000 | 18 | 11.200 | 0.000 |
| 14 | 5.900 | 7.500 | 19 | 11.050 | 4.000 |
| 15 | 6.050 | 10.400 | 20 | 10.900 | 7.500 |
| | | | | | |
| 21 | 10.750 | 10.400 | 26 | 15.750 | 10.400 |
| 22 | 10.600 | 12.600 | 27 | 15.500 | 12.600 |
| 23 | 10.500 | 14.000 | 28 | 15.350 | 14.000 |
| 24 | 16.400 | 4.000 | 29 | 8.400 | 11.500 |
| 25 | 16.050 | 7.500 | 30 | 5.600 | -3.750 |
| | | | | | |
| 31 | 11.200 | -3.750 | | | |

STAVEN

| St. | ki | kj | Profiel | Aansl.i | Aansl.j | Lengte | Opm. |
|-----|----|----|---------------|---------|---------|--------|------|
| 1 | 1 | 2 | 2:B610/30 | NDM | ND | 3.750 | |
| 2 | 6 | 5 | 2:B610/30 | NDM | ND | 3.750 | |
| 3 | 2 | 3 | 1:IPE600 | NDM | NDM | 3.000 | |
| 4 | 3 | 12 | 1:IPE600 | NDM | NDM | 2.600 | |
| 5 | 4 | 5 | 1:IPE600 | NDM | NDM | 3.000 | |
| | | | | | | | |
| 6 | 12 | 18 | 1:IPE600 | NDM | NDM | 5.600 | |
| 7 | 18 | 4 | 1:IPE600 | NDM | NDM | 2.600 | |
| 8 | 1 | 3 | 5:ROND42 | ND | ND | 4.802 | |
| 9 | 2 | 7 | 3:K200/200/10 | ND | NDM | 4.020 | |
| 10 | 7 | 8 | 3:K200/200/10 | NDM | NDM | 3.517 | |
| | | | | | | | |
| 11 | 8 | 9 | 3:K200/200/10 | NDM | NDM | 2.915 | |
| 12 | 9 | 10 | 3:K200/200/10 | NDM | NDM | 2.214 | |
| 13 | 10 | 11 | 3:K200/200/10 | NDM | NDM | 1.408 | |
| 14 | 12 | 13 | 3:K200/200/10 | ND | NDM | 4.003 | |
| 15 | 13 | 14 | 3:K200/200/10 | NDM | NDM | 3.503 | |
| | | | | | | | |
| 16 | 14 | 15 | 3:K200/200/10 | NDM | NDM | 2.904 | |
| 17 | 15 | 16 | 3:K200/200/10 | NDM | ND | 2.205 | |
| 18 | 16 | 17 | 3:K200/200/10 | NDM | ND | 1.404 | |
| 19 | 18 | 19 | 3:K200/200/10 | ND | NDM | 4.003 | |
| 20 | 19 | 20 | 3:K200/200/10 | NDM | NDM | 3.503 | |
| | | | | | | | |
| 21 | 20 | 21 | 3:K200/200/10 | NDM | NDM | 2.904 | |
| 22 | 21 | 22 | 3:K200/200/10 | NDM | ND | 2.205 | |
| 23 | 22 | 23 | 3:K200/200/10 | NDM | ND | 1.404 | |
| 24 | 5 | 24 | 3:K200/200/10 | ND | NDM | 4.020 | |
| 25 | 24 | 25 | 3:K200/200/10 | NDM | NDM | 3.517 | |
| | | | | | | | |
| 26 | 25 | 26 | 3:K200/200/10 | NDM | NDM | 2.915 | |
| 27 | 26 | 27 | 3:K200/200/10 | NDM | NDM | 2.214 | |
| 28 | 27 | 28 | 3:K200/200/10 | NDM | NDM | 1.408 | |
| 29 | 7 | 13 | 4:HEA200Z | ND | ND | 5.350 | |
| 30 | 8 | 14 | 4:HEA200Z | ND | ND | 5.150 | |
| | | | | | | | |
| 31 | 9 | 15 | 4:HEA200Z | ND | ND | 5.000 | |
| 32 | 10 | 16 | 4:HEA200Z | ND | NDM | 4.900 | |
| 33 | 11 | 17 | 4:HEA200Z | ND | NDM | 4.850 | |
| 34 | 15 | 21 | 4:HEA200Z | ND | ND | 4.700 | |
| 35 | 16 | 22 | 4:HEA200Z | NDM | NDM | 4.400 | |
| | | | | | | | |
| 36 | 17 | 23 | 4:HEA200Z | NDM | NDM | 4.200 | |
| 37 | 19 | 24 | 4:HEA200Z | ND | NDM | 5.350 | |
| 38 | 20 | 25 | 4:HEA200Z | ND | ND | 5.150 | |
| 39 | 21 | 26 | 4:HEA200Z | ND | ND | 5.000 | |
| 40 | 22 | 27 | 4:HEA200Z | NDM | ND | 4.900 | |
| | | | | | | | |
| 41 | 23 | 28 | 4:HEA200Z | NDM | ND | 4.850 | |
| 42 | 2 | 13 | 6:ROND 24 | NDM | NDM | 7.004 | |

STAVEN

| St. | ki | kj | Profiel | Aansl.i | Aansl.j | Lengte | Opm. |
|-----|----|----|-----------|---------|---------|--------|------|
| 43 | 18 | 24 | 6:ROND 24 | NDM | NDM | 6.560 | |
| 44 | 7 | 14 | 7:ROND 20 | NDM | NDM | 6.519 | |
| 45 | 19 | 25 | 7:ROND 20 | NDM | NDM | 6.103 | |
| 46 | 8 | 15 | 7:ROND 20 | NDM | NDM | 6.042 | |
| 47 | 20 | 26 | 7:ROND 20 | NDM | NDM | 5.651 | |
| 48 | 9 | 16 | 8:ROND 16 | NDM | NDM | 5.600 | |
| 49 | 15 | 29 | 8:ROND 16 | NDM | NDM | 2.595 | |
| 50 | 29 | 22 | 8:ROND 16 | NDM | NDM | 2.460 | |
| 51 | 16 | 29 | 8:ROND 16 | NDM | NDM | 2.460 | |
| 52 | 29 | 21 | 8:ROND 16 | NDM | NDM | 2.595 | |
| 53 | 21 | 27 | 8:ROND 16 | NDM | NDM | 5.235 | |
| 54 | 30 | 12 | 4:HEA200Z | NDM | ND | 3.750 | |
| 55 | 31 | 18 | 4:HEA200Z | NDM | ND | 3.750 | |

VASTE STEUNPUNTEN

| Nr. | knoop | Kode | XZR | l=vast | 0=vrij | Hoek |
|-----|-------|------|-----|--------|--------|------|
| 1 | 1 | 110 | | | | 0.00 |
| 2 | 6 | 110 | | | | 0.00 |
| 3 | 30 | 110 | | | | 0.00 |
| 4 | 31 | 110 | | | | 0.00 |

BELASTINGGEVALLEN

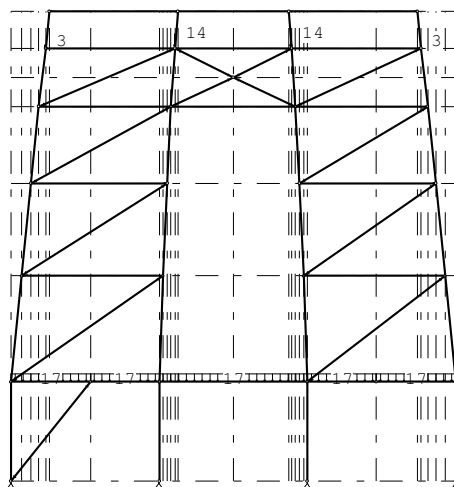
| B.G. | Omschrijving | Type | e.g.X | e.g.Z |
|------|-----------------------|------|-------|-------|
| 1 | Permanente belasting | 1 | 0.00 | -1.00 |
| 2 | Veranderlijk personen | 2 | 0.00 | 0.00 |
| 3 | Veranderlijk wind | 2 | 0.00 | 0.00 |

BELASTINGEN

B.G:1 Permanente

belasting

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

**KNOOPBELASTINGEN**

B.G:1 Permanente

belasting

| Last | Knoop | Richting | waarde |
|------|-------|----------|---------|
| 1 | 16 | Z | -14.000 |
| 2 | 22 | Z | -14.000 |
| 3 | 10 | Z | -3.000 |
| 4 | 27 | Z | -3.000 |

STAAFBELASTINGEN

B.G:1 Permanente

belasting

| Staat | Type | q1/p/m | q2 | A | B | psi0 | psi1 | psi2 |
|-------|------------|--------|--------|-------|-------|------|------|------|
| 3 | 1:QZLokaal | -17.00 | -17.00 | 0.000 | 0.000 | | | |
| 4 | 1:QZLokaal | -17.00 | -17.00 | 0.000 | 0.000 | | | |
| 6 | 1:QZLokaal | -17.00 | -17.00 | 0.000 | 0.000 | | | |
| 7 | 1:QZLokaal | -17.00 | -17.00 | 0.000 | 0.000 | | | |
| 5 | 1:QZLokaal | -17.00 | -17.00 | 0.000 | 0.000 | | | |

REACTIES

1e orde

B.G:1 Permanente

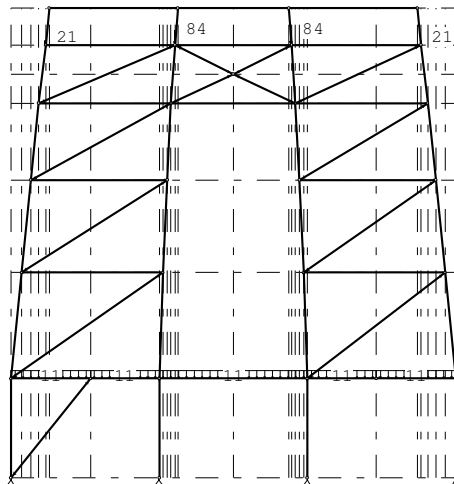
belasting

| Kn. | X | Z | M |
|-----|-------|---------|--------------------------|
| 1 | -0.00 | 74.45 | |
| 6 | 0.00 | 74.62 | |
| 30 | 0.00 | 145.13 | |
| 31 | 0.00 | 143.26 | |
| | -0.00 | 437.45 | : Som van de reacties |
| | 0.00 | -437.45 | : Som van de belastingen |

BELASTINGEN

B.G:2 Veranderlijk

personen

**KNOOPBELASTINGEN**

B.G:2 Veranderlijk

personen

| Last | Knoop | Richting | waarde |
|------|-------|----------|---------|
| 1 | 16 | Z | -84.000 |
| 2 | 22 | Z | -84.000 |
| 3 | 10 | Z | -21.000 |
| 4 | 27 | Z | -21.000 |

STAAFBELASTINGEN

B.G:2 Veranderlijk

personen

| Staat | Type | q1/p/m | q2 | A | B | psi0 | psi1 | psi2 |
|-------|------------|--------|--------|-------|-------|------|------|------|
| 3 | 1:QZLokaal | -11.00 | -11.00 | 0.000 | 0.000 | 0.4 | 0.5 | 0.3 |
| 4 | 1:QZLokaal | -11.00 | -11.00 | 0.000 | 0.000 | 0.4 | 0.5 | 0.3 |
| 6 | 1:QZLokaal | -11.00 | -11.00 | 0.000 | 0.000 | 0.4 | 0.5 | 0.3 |
| 7 | 1:QZLokaal | -11.00 | -11.00 | 0.000 | 0.000 | 0.4 | 0.5 | 0.3 |
| 5 | 1:QZLokaal | -11.00 | -11.00 | 0.000 | 0.000 | 0.4 | 0.5 | 0.3 |

REACTIES

1e orde

B.G:2 Veranderlijk

personen

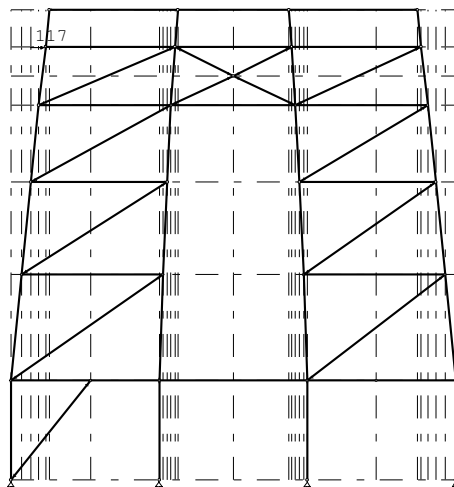
| Kn. | X | Z | M |
|-----|------|---------|--------------------------|
| 1 | 0.00 | 46.41 | |
| 6 | 0.00 | 46.94 | |
| 30 | 0.00 | 151.52 | |
| 31 | 0.00 | 149.93 | |
| | 0.00 | 394.80 | : Som van de reacties |
| | 0.00 | -394.80 | : Som van de belastingen |

:

BELASTINGEN

B.G:3

Veranderlijk wind

**KNOOPBELASTINGEN**

B.G:3

Veranderlijk wind

| Last | Knoop | Richting | waarde |
|------|-------|----------|---------|
| 1 | 10 | X | 117.000 |

REACTIES

1e orde

B.G:3

Veranderlijk wind

| Kn. | X | Z | M |
|-----|---------|---------|--------------------------|
| 1 | -117.00 | -198.68 | |
| 6 | 0.00 | 130.22 | |
| 30 | 0.00 | 185.99 | |
| 31 | 0.00 | -117.52 | |
| | -117.00 | 0.00 | : Som van de reacties |
| | 117.00 | 0.00 | : Som van de belastingen |

BEREKENINGSTATUS

Controlerende

berekening

| 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 | 3 | Nauwkeurigheid bereikt |

BELASTINGCOMBINATIES

| BC Type | BG Gen. | Factor | BG Gen. | Factor | BG Gen. | Factor | BG Gen. | Factor |
|---------|---------|--------|---------|--------|---------|--------|---------|--------|
| 1 Fund. | 1 Perm | 1.20 | 2 Extr | 1.50 | | | | |
| 2 Fund. | 1 Perm | 1.20 | 2 psi0 | 1.50 | 3 Extr | 1.50 | | |
| 3 Fund. | 1 Perm | 0.90 | 3 Extr | 1.50 | | | | |
| 4 Fund. | 1 Perm | 1.35 | 2 psi0 | 1.50 | | | | |
| 5 Kar. | 1 Perm | 1.00 | 2 psi0 | 1.00 | 3 Extr | 1.00 | | |
| 6 Quas. | 1 Perm | 1.00 | 2 Extr | 0.75 | | | | |
| 7 Blij. | 1 Perm | 1.00 | | | | | | |

GUNSTIGE WERKING PERMANENTE BELASTINGEN

BC Staven met gunstige werking

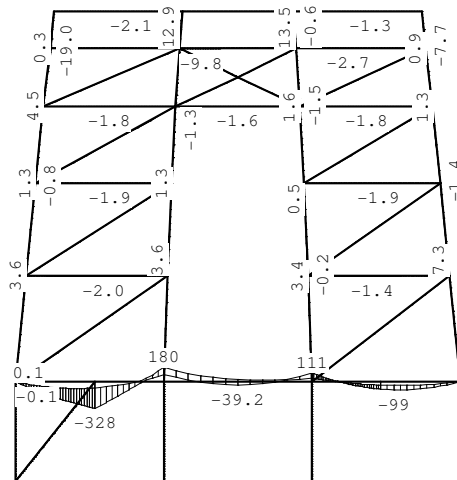
- 1 Geen
- 2 Geen
- 3 Alle staven de factor:0.90
- 4 Geen

OMHULLENDE VAN DE FUNDAMENTELE COMBINATIES

MOMENTEN
combinatie

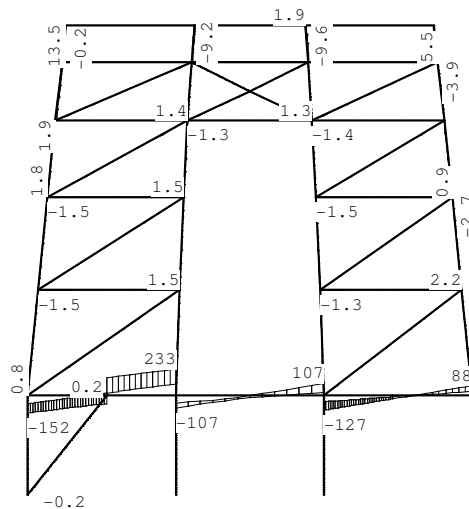
2e orde

Fundamentele

DWARSKRACHTEN
combinatie

2e orde

Fundamentele

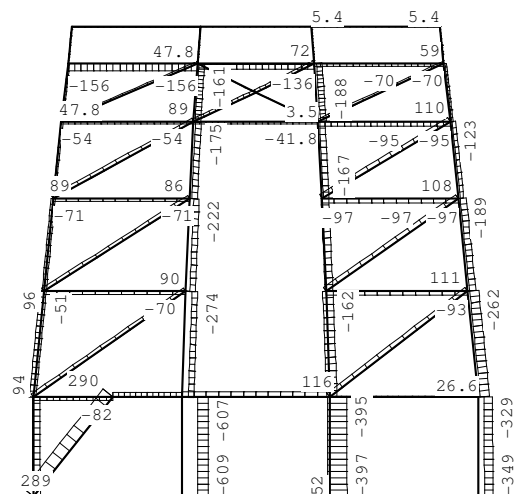


NORMAALKRACHTEN

2e orde

Fundamentele

combinatie



REACTIONS

2e orde

Fundamentele

combinatie

| Kn. | X-min | X-max | Z-min | Z-max | M-min | M-max |
|-----|---------|-------|---------|--------|-------|-------|
| 1 | -179.72 | -0.53 | -228.66 | 158.33 | | |
| 6 | 0.09 | 1.32 | 148.17 | 348.75 | | |
| 30 | 0.22 | 2.33 | 363.01 | 608.77 | | |
| 31 | -0.19 | 0.56 | -52.10 | 396.96 | | |

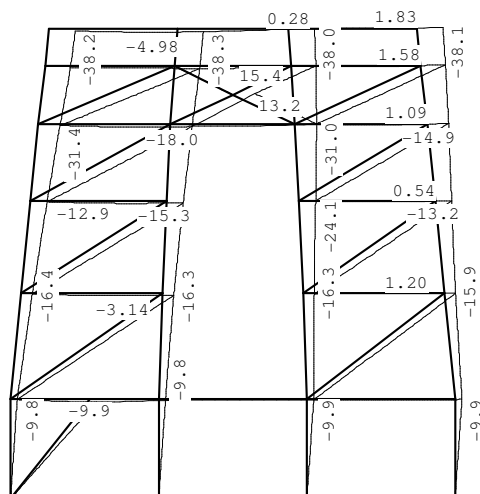
OMHULLENDE VAN DE KARAKTERISTIEKE COMBINATIES

VERPLAATSINGEN

2e orde [mm]

Karakteristieke

combinatie



STAALPROFIELEN – ALGEMENE GEGEVENS

Stabiliteit: Classificatie gehele constructie: Ongeschoord

Doorbuiging en verplaatsing:

Aantal bouwlagen:

4

Gebouwtype:

Overig

Toel. horiz. verplaatsing gehele gebouw:

h/500

Kleinste gevelhoogte [m]:

0.0

MATERIAAL

| Mat nr. | Profielnaam | Vloeisp. [N/mm ²] | Productie methode | Min. drsn. klasse |
|---------|-------------|-------------------------------|-------------------|-------------------|
| 1 | IPE600 | 235 | Gewalst | 1 |
| 2 | B610/30 | 235 | Warmgewalst | 1 |
| 3 | K200/200/10 | 355 | Warmgewalst | 1 |
| 4 | HEA200Z | 235 | Gewalst | 1 |
| 5 | ROND42 | 460 | Gewalst | 1 |
| 6 | ROND 24 | 460 | Gewalst | 1 |
| 7 | ROND 20 | 460 | Gewalst | 1 |
| 8 | ROND 16 | 460 | Gewalst | 1 |

Partiële veiligheidsfactoren:

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

KNIKSTABILITEIT

| Staafl | l _{sys} [m] | Classif. y sterke as | l _{knik,y} [m] | Extra | | l _{knik,z} [m] | Extra | |
|--------|----------------------|-------------------------|-------------------------|--------------|-------------------------|-------------------------|--------------|--|
| | | | | aanp. y [kN] | Classif. z zwakke as | | aanp. z [kN] | |
| 1 | 3.750 | Ongeschoord | 2e orde | | Geschoord | 3.750 | 0.0 | |
| 2 | 3.750 | Ongeschoord | 2e orde | | Geschoord | 3.750 | 0.0 | |
| 3 | 3.000 | Ongeschoord | 2e orde | | Geschoord | 3.000 | 0.0 | |
| 4 | 2.600 | Ongeschoord | 2e orde | | Geschoord | 2.600 | 0.0 | |
| 5 | 3.000 | Ongeschoord | 2e orde | | Geschoord | 3.000 | 0.0 | |
| 6 | 5.600 | Ongeschoord | 2e orde | | Geschoord | 5.600 | 0.0 | |
| 7 | 2.600 | Ongeschoord | 2e orde | | Geschoord | 2.600 | 0.0 | |
| 8 | 4.802 | Ongeschoord | 2e orde | | Geschoord | 4.802 | 0.0 | |
| 9 | 4.020 | Ongeschoord | 2e orde | | Geschoord | 4.020 | 0.0 | |
| 10 | 3.517 | Ongeschoord | 2e orde | | Geschoord | 3.517 | 0.0 | |

KNIKSTABILITEIT

| Staafl | l _{sys} [m] | Classif. y sterke as | l _{knik,y} [m] | Extra | | l _{knik,z} [m] | Extra | |
|--------|----------------------|-------------------------|-------------------------|--------------|-------------------------|-------------------------|--------------|--|
| | | | | aanp. y [kN] | Classif. z zwakke as | | aanp. z [kN] | |
| 11 | 2.915 | Ongeschoord | 2e orde | | Geschoord | 2.915 | 0.0 | |
| 12 | 2.214 | Ongeschoord | 2e orde | | Geschoord | 2.214 | 0.0 | |
| 13 | 1.408 | Ongeschoord | 2e orde | | Geschoord | 1.408 | 0.0 | |
| 14 | 4.003 | Ongeschoord | 2e orde | | Geschoord | 4.003 | 0.0 | |
| 15 | 3.503 | Ongeschoord | 2e orde | | Geschoord | 3.503 | 0.0 | |
| 16 | 2.904 | Ongeschoord | 2e orde | | Geschoord | 2.904 | 0.0 | |
| 17 | 2.205 | Ongeschoord | 2e orde | | Geschoord | 2.205 | 0.0 | |
| 18 | 1.404 | Ongeschoord | 2e orde | | Geschoord | 1.404 | 0.0 | |
| 19 | 4.003 | Ongeschoord | 2e orde | | Geschoord | 4.003 | 0.0 | |
| 20 | 3.503 | Ongeschoord | 2e orde | | Geschoord | 3.503 | 0.0 | |
| 21 | 2.904 | Ongeschoord | 2e orde | | Geschoord | 2.904 | 0.0 | |
| 22 | 2.205 | Ongeschoord | 2e orde | | Geschoord | 2.205 | 0.0 | |
| 23 | 1.404 | Ongeschoord | 2e orde | | Geschoord | 1.404 | 0.0 | |
| 24 | 4.020 | Ongeschoord | 2e orde | | Geschoord | 4.020 | 0.0 | |
| 25 | 3.517 | Ongeschoord | 2e orde | | Geschoord | 3.517 | 0.0 | |
| 26 | 2.915 | Ongeschoord | 2e orde | | Geschoord | 2.915 | 0.0 | |
| 27 | 2.214 | Ongeschoord | 2e orde | | Geschoord | 2.214 | 0.0 | |
| 28 | 1.408 | Ongeschoord | 2e orde | | Geschoord | 1.408 | 0.0 | |
| 29 | 5.350 | Geschoord | 5.350 | 0.0 | Ongeschoord 2e orde | | | |
| 30 | 5.150 | Geschoord | 5.150 | 0.0 | Ongeschoord 2e orde | | | |
| 31 | 5.000 | Geschoord | 5.000 | 0.0 | Ongeschoord 2e orde | | | |
| 32 | 4.900 | Geschoord | 4.900 | 0.0 | Ongeschoord 2e orde | | | |
| 33 | 4.850 | Geschoord | 4.850 | 0.0 | Ongeschoord 2e orde | | | |
| 34 | 4.700 | Geschoord | 4.700 | 0.0 | Ongeschoord 2e orde | | | |
| 35 | 4.400 | Geschoord | 4.400 | 0.0 | Ongeschoord 2e orde | | | |
| 36 | 4.200 | Geschoord | 4.200 | 0.0 | Ongeschoord 2e orde | | | |
| 37 | 5.350 | Geschoord | 5.350 | 0.0 | Ongeschoord 2e orde | | | |
| 38 | 5.150 | Geschoord | 5.150 | 0.0 | Ongeschoord 2e orde | | | |
| 39 | 5.000 | Geschoord | 5.000 | 0.0 | Ongeschoord 2e orde | | | |
| 40 | 4.900 | Geschoord | 4.900 | 0.0 | Ongeschoord 2e orde | | | |
| 41 | 4.850 | Geschoord | 4.850 | 0.0 | Ongeschoord 2e orde | | | |
| 42 | 7.004 | Ongeschoord | 2e orde | | Geschoord | 7.004 | 0.0 | |
| 43 | 6.560 | Ongeschoord | 2e orde | | Geschoord | 6.560 | 0.0 | |
| 44 | 6.519 | Ongeschoord | 2e orde | | Geschoord | 6.519 | 0.0 | |
| 45 | 6.103 | Ongeschoord | 2e orde | | Geschoord | 6.103 | 0.0 | |
| 46 | 6.042 | Ongeschoord | 2e orde | | Geschoord | 6.042 | 0.0 | |
| 47 | 5.651 | Ongeschoord | 2e orde | | Geschoord | 5.651 | 0.0 | |
| 48 | 5.600 | Ongeschoord | 2e orde | | Geschoord | 5.600 | 0.0 | |
| 49 | 2.595 | Ongeschoord | 2e orde | | Geschoord | 2.595 | 0.0 | |
| 50 | 2.460 | Ongeschoord | 2e orde | | Geschoord | 2.460 | 0.0 | |
| 51 | 2.460 | Ongeschoord | 2e orde | | Geschoord | 2.460 | 0.0 | |
| 52 | 2.595 | Ongeschoord | 2e orde | | Geschoord | 2.595 | 0.0 | |

| | | | | | | |
|----|-------|-------------|---------|-----------|-------------|---------|
| 53 | 5.235 | Ongeschoord | 2e orde | Geschoord | 5.235 | 0.0 |
| 54 | 3.750 | Geschoord | 3.750 | 0.0 | Ongeschoord | 2e orde |
| 55 | 3.750 | Geschoord | 3.750 | 0.0 | Ongeschoord | 2e orde |

KIPSTABILITEIT

| Staaft | Plts. aangr. | | l gaffel [m] | Kipsteunafstanden [m] |
|--------|-----------------|--------|-----------------|--------------------------|
| 1 | 1.0*h | boven: | 3.75 | 3.750 |
| | | onder: | 3.75 | 3.750 |
| 2 | 0.0*h | boven: | 3.75 | 3.750 |
| | | onder: | 3.75 | 3.750 |
| 3 | 1.0*h | boven: | 3.00 | 3 |
| | | onder: | 3.00 | 3 |
| 4 | 1.0*h | boven: | 2.60 | 2,6 |
| | | onder: | 2.60 | 2,6 |
| 5 | 1.0*h | boven: | 3.00 | 3*1 |
| | | onder: | 3.00 | 3*1 |
| 6 | 1.0*h | boven: | 5.60 | 5*1;,6 |
| | | onder: | 5.60 | 5*1;,6 |

KIPSTABILITEIT

| Staaft | Plts. aangr. | | l gaffel [m] | Kipsteunafstanden [m] |
|--------|-----------------|--------|-----------------|--------------------------|
| 7 | 1.0*h | boven: | 2.60 | 1;1,1;0,5 |
| | | onder: | 2.60 | 1;1,1;0,5 |
| 8 | 1.0*h | boven: | 4.80 | 4,802 |
| | | onder: | 4.80 | 4,802 |
| 9 | 1.0*h | boven: | 4.02 | 4.020 |
| | | onder: | 4.02 | 4.020 |
| 10 | 1.0*h | boven: | 3.52 | 3.517 |
| | | onder: | 3.52 | 3.517 |
| 11 | 1.0*h | boven: | 2.92 | 2.915 |
| | | onder: | 2.92 | 2.915 |
| 12 | 1.0*h | boven: | 2.21 | 2.214 |
| | | onder: | 2.21 | 2.214 |
| 13 | 1.0*h | boven: | 1.41 | 1.408 |
| | | onder: | 1.41 | 1.408 |
| 14 | 1.0*h | boven: | 4.00 | 4.000 |
| | | onder: | 4.00 | 4.000 |
| 15 | 1.0*h | boven: | 3.50 | 3.500 |
| | | onder: | 3.50 | 3.500 |
| 16 | 1.0*h | boven: | 2.90 | 2.900 |
| | | onder: | 2.90 | 2.900 |
| 17 | 1.0*h | boven: | 2.21 | 2.200 |
| | | onder: | 2.21 | 2.200 |
| 18 | 1.0*h | boven: | 1.40 | 1.400 |
| | | onder: | 1.40 | 1.400 |
| 19 | 1.0*h | boven: | 4.00 | 4.000 |
| | | onder: | 4.00 | 4.000 |
| 20 | 1.0*h | boven: | 3.50 | 3.500 |
| | | onder: | 3.50 | 3.500 |
| 21 | 1.0*h | boven: | 2.90 | 2.900 |
| | | onder: | 2.90 | 2.900 |
| 22 | 1.0*h | boven: | 2.21 | 2.200 |
| | | onder: | 2.21 | 2.200 |
| 23 | 1.0*h | boven: | 1.40 | 1.400 |
| | | onder: | 1.40 | 1.400 |
| 24 | 0.0*h | boven: | 4.02 | 4.020 |
| | | onder: | 4.02 | 4.020 |
| 25 | 0.0*h | boven: | 3.52 | 3.517 |
| | | onder: | 3.52 | 3.517 |
| 26 | 0.0*h | boven: | 2.92 | 2.915 |
| | | onder: | 2.92 | 2.915 |
| 27 | 0.0*h | boven: | 2.21 | 2.214 |
| | | onder: | 2.21 | 2.214 |
| 28 | 0.0*h | boven: | 1.41 | 1.408 |
| | | onder: | 1.41 | 1.408 |
| 29 | 1.0*h | boven: | 5.35 | 5,35 |
| | | onder: | 5.35 | 5,35 |
| 30 | 1.0*h | boven: | 5.15 | 5,15 |
| | | onder: | 5.15 | 5,15 |
| 31 | 1.0*h | boven: | 5.00 | 5 |
| | | onder: | 5.00 | 5 |
| 32 | 1.0*h | boven: | 4.90 | 4,9 |
| | | onder: | 4.90 | 4,9 |
| 33 | 1.0*h | boven: | 4.85 | 4,85 |
| | | onder: | 4.85 | 4,85 |
| 34 | 1.0*h | boven: | 4.70 | 4,7 |

| | | | |
|----|-------|--------|-----------|
| 35 | 1.0*h | onder: | 4.70 4,7 |
| | | boven: | 4.40 4,4 |
| | | onder: | 4.40 4,4 |
| 36 | 1.0*h | boven: | 4.20 4,2 |
| | | onder: | 4.20 4,2 |
| 37 | 1.0*h | boven: | 5.35 5,35 |
| | | onder: | 5.35 5,35 |
| 38 | 1.0*h | boven: | 5.15 5,15 |
| | | onder: | 5.15 5,15 |
| 39 | 1.0*h | boven: | 5.00 5 |
| | | onder: | 5.00 5 |

KIPSTABILITEIT

| Staafl | Plts. | | l gaffel | Kipsteunafstanden |
|--------|-------|--------|------------|-------------------|
| aangr. | | | [m] | [m] |
| 40 | 1.0*h | boven: | 4.90 4,9 | |
| | | onder: | 4.90 4,9 | |
| 41 | 1.0*h | boven: | 4.85 4,85 | |
| | | onder: | 4.85 4,85 | |
| 42 | 1.0*h | boven: | 7.00 7,004 | |
| | | onder: | 7.00 7,004 | |
| 43 | 1.0*h | boven: | 6.56 6,560 | |
| | | onder: | 6.56 6,560 | |
| 44 | 1.0*h | boven: | 6.52 6,519 | |
| | | onder: | 6.52 6,519 | |
| 45 | 1.0*h | boven: | 6.10 6,103 | |
| | | onder: | 6.10 6,103 | |
| 46 | 1.0*h | boven: | 6.04 6,042 | |
| | | onder: | 6.04 6,042 | |
| 47 | 1.0*h | boven: | 5.65 5,651 | |
| | | onder: | 5.65 5,651 | |
| 48 | 1.0*h | boven: | 5.60 5,6 | |
| | | onder: | 5.60 5,6 | |
| 49 | 1.0*h | boven: | 2.59 2,595 | |
| | | onder: | 2.59 2,595 | |
| 50 | 1.0*h | boven: | 2.46 2,46 | |
| | | onder: | 2.46 2,46 | |
| 51 | 1.0*h | boven: | 2.46 2,46 | |
| | | onder: | 2.46 2,46 | |
| 52 | 1.0*h | boven: | 2.59 2,595 | |
| | | onder: | 2.59 2,595 | |
| 53 | 1.0*h | boven: | 5.23 5,235 | |
| | | onder: | 5.23 5,235 | |
| 54 | 1.0*h | boven: | 3.75 3,750 | |
| | | onder: | 3.75 3,750 | |
| 55 | 1.0*h | boven: | 3.75 3,750 | |
| | | onder: | 3.75 3,750 | |

TOETSING SPANNINGEN

| Staafl | Mat | BC | Sit | Kl | Plaats | Norm | Artikel | Formule | Hoogste toetsing | Opm. |
|--------|-----|----|-----|----|--------|---------|---------|---------|---------------------------|------|
| nr. | | | | | | | | | U.C. [N/mm ²] | |
| 1 | 2 | 1 | 1 | 1 | Begin | EN3-1-1 | 6.2.4 | (6.9) | 0.012 | 3 |
| 2 | 2 | 2 | 1 | 1 | Begin | EN3-1-1 | 6.2.4 | (6.9) | 0.027 | 6 |
| 3 | 1 | 2 | 1 | 1 | Staafl | EN3-1-1 | 6.3.2 | (6.54) | 0.413 | 97 |
| 4 | 1 | 2 | 1 | 1 | Staafl | EN3-1-1 | 6.3.1.1 | T(6.46) | 0.536 | 126 |
| 5 | 1 | 1 | 1 | 1 | Staafl | EN3-1-1 | 6.3.1.1 | T(6.46) | 0.136 | 32 |
| 6 | 1 | 2 | 1 | 1 | Begin | EN3-1-1 | 6.2.10 | (6.31) | 0.218 | 51 |
| 7 | 1 | 1 | 1 | 1 | Staafl | EN3-1-1 | 6.3.1.1 | T(6.46) | 0.153 | 36 |
| 8 | 5 | 2 | 1 | 1 | Einde | EN3-1-1 | 6.2.1 | N+D | 0.455 | 209 |
| 9 | 3 | 3 | 1 | 1 | Einde | EN3-1-1 | 6.2.1 | N+D | 0.037 | 13 |
| 10 | 3 | 4 | 1 | 1 | Staafl | EN3-1-1 | 6.3.3 | (6.61) | 0.027 | 10 |
| 11 | 3 | 2 | 1 | 1 | Staafl | EN3-1-1 | 6.3.3 | (6.61) | 0.032 | 11 |
| 12 | 3 | 2 | 1 | 1 | Staafl | EN3-1-1 | 6.3.3 | (6.61) | 0.106 | 38 |
| 13 | 3 | 2 | 1 | 1 | Begin | EN3-1-1 | 6.2.10 | (6.31) | 0.101 | 36 |
| 14 | 3 | 2 | 1 | 1 | Staafl | EN3-1-1 | 6.3.3 | (6.61) | 0.138 | 49 |
| 15 | 3 | 2 | 1 | 1 | Staafl | EN3-1-1 | 6.3.3 | (6.61) | 0.112 | 40 |
| 16 | 3 | 2 | 1 | 1 | Staafl | EN3-1-1 | 6.3.3 | (6.61) | 0.078 | 28 |
| 17 | 3 | 2 | 1 | 1 | Staafl | EN3-1-1 | 6.3.3 | (6.61) | 0.070 | 25 |
| 18 | 3 | 3 | 1 | 1 | Begin | EN3-1-1 | 6.2.10 | (6.31) | 0.068 | 24 |
| 19 | 3 | 4 | 1 | 1 | Staafl | EN3-1-1 | 6.3.3 | (6.61) | 0.073 | 26 |
| 20 | 3 | 4 | 1 | 1 | Staafl | EN3-1-1 | 6.3.3 | (6.61) | 0.069 | 24 |
| 21 | 3 | 2 | 1 | 1 | Staafl | EN3-1-1 | 6.3.3 | (6.61) | 0.074 | 26 |
| 22 | 3 | 2 | 1 | 1 | Staafl | EN3-1-1 | 6.3.3 | (6.61) | 0.080 | 28 |
| 23 | 3 | 2 | 1 | 1 | Begin | EN3-1-1 | 6.2.10 | (6.31) | 0.071 | 25 |
| 24 | 3 | 2 | 1 | 1 | Staafl | EN3-1-1 | 6.3.3 | (6.61) | 0.124 | 44 |
| 25 | 3 | 2 | 1 | 1 | Staafl | EN3-1-1 | 6.3.3 | (6.61) | 0.117 | 41 |

| | | | | | | | | | | |
|----|---|---|---|---|------|---------|-------|--------|-------|----|
| 26 | 3 | 2 | 1 | 1 | Staa | EN3-1-1 | 6.3.3 | (6.61) | 0.058 | 20 |
| 27 | 3 | 2 | 1 | 1 | Staa | EN3-1-1 | 6.3.3 | (6.61) | 0.061 | 22 |

TOETSING SPANNINGEN

| Staa | Mat | BC | Sit | Kl | Plaats | Norm | Artikel | Formule | Hoogste toetsing | Opm. |
|------|-----|----|-----|----|--------|---------|---------|---------|---------------------------|------|
| nr. | | | | | | | | | U.C. [N/mm ²] | |
| 28 | 3 | 3 | 1 | 1 | Begin | EN3-1-1 | 6.2.10 | (6.31) | 0.041 | 14 |
| 29 | 4 | 2 | 1 | 1 | Staa | EN3-1-1 | 6.3.3 | (6.62) | 0.156 | 37 |
| 30 | 4 | 2 | 1 | 1 | Staa | EN3-1-1 | 6.3.3 | (6.62) | 0.149 | 35 |
| 31 | 4 | 2 | 1 | 1 | Staa | EN3-1-1 | 6.3.3 | (6.62) | 0.116 | 27 |
| 32 | 4 | 2 | 1 | 1 | Staa | EN3-1-1 | 6.3.3 | (6.62) | 0.317 | 74 |
| 33 | 4 | 2 | 1 | 1 | Staa | EN3-1-1 | 6.3.3 | (6.62) | 0.061 | 14 |
| 34 | 4 | 2 | 1 | 1 | Staa | EN3-1-1 | 6.3.3 | (6.62) | 0.089 | 21 |
| 35 | 4 | 2 | 1 | 1 | Staa | EN3-1-1 | 6.3.3 | (6.62) | 0.459 | 108 |
| 36 | 4 | 2 | 1 | 1 | Staa | EN3-1-1 | 6.3.3 | (6.62) | 0.056 | 13 |
| 37 | 4 | 2 | 1 | 1 | Staa | EN3-1-1 | 6.3.3 | (6.62) | 0.289 | 68 |
| 38 | 4 | 2 | 1 | 1 | Staa | EN3-1-1 | 6.3.3 | (6.62) | 0.202 | 47 |
| 39 | 4 | 2 | 1 | 1 | Staa | EN3-1-1 | 6.3.3 | (6.62) | 0.189 | 45 |
| 40 | 4 | 2 | 1 | 1 | Staa | EN3-1-1 | 6.3.3 | (6.62) | 0.166 | 39 |
| 41 | 4 | 2 | 1 | 1 | Begin | EN3-1-1 | 6.2.10 | (6.31) | 0.054 | 13 |
| 42 | 6 | 2 | 1 | 1 | Einde | EN3-1-1 | 6.2.1 | (6.2) | 0.639 | 294 |
| 43 | 6 | 2 | 1 | 1 | Einde | EN3-1-1 | 6.2.1 | (6.2) | 0.734 | 338 |
| 44 | 7 | 2 | 1 | 1 | Einde | EN3-1-1 | 6.2.1 | (6.2) | 0.814 | 374 |
| 45 | 7 | 2 | 1 | 1 | Einde | EN3-1-1 | 6.2.1 | (6.2) | 0.966 | 444 |
| 46 | 7 | 2 | 1 | 1 | Einde | EN3-1-1 | 6.2.1 | (6.2) | 0.818 | 376 |
| 47 | 7 | 2 | 1 | 1 | Einde | EN3-1-1 | 6.2.1 | (6.2) | 0.963 | 443 |
| 48 | 8 | 2 | 1 | 1 | Einde | EN3-1-1 | 6.2.1 | (6.2) | 0.734 | 337 |
| 49 | 8 | 2 | 1 | 1 | Einde | EN3-1-1 | 6.2.1 | (6.2) | 0.888 | 409 |
| 50 | 8 | 2 | 1 | 1 | Begin | EN3-1-1 | 6.2.1 | (6.2) | 0.829 | 381 |
| 51 | 8 | 4 | 1 | 1 | Einde | EN3-1-1 | 6.2.1 | (6.2) | 0.104 | 48 |
| 52 | 8 | 4 | 1 | 1 | Einde | EN3-1-1 | 6.2.1 | (6.2) | 0.101 | 46 |
| 53 | 8 | 2 | 1 | 1 | Einde | EN3-1-1 | 6.2.1 | (6.2) | 0.866 | 399 |
| 54 | 4 | 2 | 1 | 1 | Staa | EN3-1-1 | 6.3.1.1 | (6.47z) | 0.728 | 171 |
| 55 | 4 | 1 | 1 | 1 | Staa | EN3-1-1 | 6.3.1.1 | (6.47z) | 0.475 | 112 |

TOETSING DOORBUIGING

| Staa | Soort | Mtg | Lengte | Overst | Zeeg | u _{tot} | BC | Sit | u | Toelaatbaar |
|------|-------|-----|--------|--------|------|------------------|------|----------|------|---------------|
| | | | [m] | I | J | [mm] | | | [mm] | [mm] *1 |
| 3 | Vloer | ss | 3.00 | N | N | 0.0 | -3.7 | 5 1 Eind | -3.7 | ±24.0 2*0.004 |
| | | ss | | | | | | 5 1 Bijk | -2.8 | ±18.0 2*0.003 |
| 4 | Vloer | ss | 2.60 | N | N | 0.0 | -2.3 | 5 1 Eind | -2.3 | ±20.8 2*0.004 |
| | | ss | | | | | | 5 1 Bijk | -1.8 | ±15.6 2*0.003 |
| 5 | Vloer | ss | 3.00 | N | N | 0.0 | -1.0 | 5 1 Eind | -1.0 | ±24.0 2*0.004 |
| | | ss | | | | | | 5 1 Bijk | -0.2 | ±18.0 2*0.003 |
| 6 | Vloer | ss | 5.60 | N | N | 0.0 | -1.0 | 5 1 Eind | -1.0 | ±44.8 2*0.004 |
| | | ss | | | | | | 5 1 Bijk | -1.0 | ±33.6 2*0.003 |
| 7 | Vloer | ss | 2.60 | N | N | 0.0 | -0.7 | 5 1 Eind | -0.7 | ±20.8 2*0.004 |
| | | ss | | | | | | 5 1 Bijk | -0.3 | ±15.6 2*0.003 |
| 9 | Dak | ss | 4.02 | N | N | 0.0 | -6.7 | 5 1 Eind | -6.7 | -32.2 2*0.004 |
| | | ss | | | | | | 5 1 Bijk | -7.5 | -32.2 2*0.004 |
| 10 | Dak | ss | 3.52 | N | N | 0.0 | -7.9 | 5 1 Eind | -7.9 | -28.1 2*0.004 |
| | | ss | | | | | | 5 1 Bijk | -8.8 | -28.1 2*0.004 |
| 11 | Dak | ss | 2.92 | N | N | 0.0 | -7.1 | 5 1 Eind | -7.1 | -23.3 2*0.004 |
| | | ss | | | | | | 5 1 Bijk | -7.7 | -23.3 2*0.004 |
| 12 | Dak | ss | 2.21 | N | N | 0.0 | -5.5 | 5 1 Eind | -5.5 | -17.7 2*0.004 |
| | | ss | | | | | | 5 1 Bijk | -5.6 | -17.7 2*0.004 |
| 13 | Dak | ss | 1.41 | N | N | 0.0 | -1.4 | 5 1 Eind | -1.4 | -11.3 2*0.004 |
| | | ss | | | | | | 5 1 Bijk | -1.4 | -11.3 2*0.004 |
| 24 | Dak | ss | 4.02 | N | N | 0.0 | 6.1 | 5 1 Eind | 6.1 | -32.2 2*0.004 |
| | | ss | | | | | | 5 1 Bijk | 7.5 | -32.2 2*0.004 |
| 25 | Dak | ss | 3.52 | N | N | 0.0 | 7.9 | 5 1 Eind | 7.9 | -28.1 2*0.004 |
| | | ss | | | | | | 5 1 Bijk | 8.6 | -28.1 2*0.004 |
| 26 | Dak | ss | 2.92 | N | N | 0.0 | 6.9 | 5 1 Eind | 6.9 | -23.3 2*0.004 |
| | | ss | | | | | | 5 1 Bijk | 7.1 | -23.3 2*0.004 |
| 27 | Dak | ss | 2.21 | N | N | 0.0 | 5.0 | 5 1 Eind | 5.0 | -17.7 2*0.004 |
| | | ss | | | | | | 5 1 Bijk | 5.1 | -17.7 2*0.004 |
| 28 | Dak | ss | 1.41 | N | N | 0.0 | 2.3 | 5 1 Eind | 2.3 | -11.3 2*0.004 |
| | | ss | | | | | | 5 1 Bijk | 2.3 | -11.3 2*0.004 |
| 29 | Vloer | db | 5.35 | N | N | 0.0 | -1.7 | 5 1 Eind | -1.7 | ±21.4 0.004 |
| | | db | | | | | | 5 1 Bijk | -1.0 | ±16.1 0.003 |

TOETSING DOORBUIGING

| Staaft | Soort | Mtg | Lengte | Overst | Zeeg | u _{tot} | BC | Sit | u | Toelaatbaar | |
|--------|-------|-----|--------|--------|------|------------------|------|----------|------|-------------|---------|
| | | | [m] | I | J | [mm] | | | [mm] | [mm] | *1 |
| 30 | Vloer | db | 5.15 | N | N | 0.0 | -1.5 | 5 1 Eind | -1.5 | ±20.6 | 0.004 |
| | | db | | | | | | 5 1 Bijk | -0.8 | ±15.5 | 0.003 |
| 31 | Vloer | db | 5.00 | N | N | 0.0 | -1.3 | 5 1 Eind | -1.3 | ±20.0 | 0.004 |
| | | db | | | | | | 5 1 Bijk | -0.6 | ±15.0 | 0.003 |
| 32 | Vloer | ss | 4.90 | N | N | 0.0 | -1.1 | 5 1 Eind | -1.1 | ±39.2 | 2*0.004 |
| | | ss | | | | | | 5 1 Bijk | 0.7 | ±29.4 | 2*0.003 |
| 33 | Dak | db | 4.85 | N | N | 0.0 | -1.4 | 5 1 Eind | -1.4 | -19.4 | 0.004 |
| | | db | | | | | | 5 1 Bijk | -0.7 | -19.4 | 0.004 |
| 34 | Vloer | ss | 4.70 | N | N | 0.0 | -3.5 | 5 1 Eind | -3.5 | ±37.6 | 2*0.004 |
| | | ss | | | | | | 5 1 Bijk | -3.6 | ±28.2 | 2*0.003 |
| 35 | Vloer | ss | 4.40 | N | N | 0.0 | -4.1 | 5 1 Eind | -4.1 | ±35.2 | 2*0.004 |
| | | ss | | | | | | 5 1 Bijk | -4.3 | ±26.4 | 2*0.003 |
| 36 | Dak | ss | 4.20 | N | N | 0.0 | -4.4 | 5 1 Eind | -4.4 | -33.6 | 2*0.004 |
| | | ss | | | | | | 5 1 Bijk | -4.6 | -33.6 | 2*0.004 |
| 37 | Vloer | db | 5.35 | N | N | 0.0 | 1.2 | 5 1 Eind | 1.2 | ±21.4 | 0.004 |
| | | db | | | | | | 5 1 Bijk | 2.3 | ±16.0 | 0.003 |
| 38 | Vloer | db | 5.15 | N | N | 0.0 | -1.5 | 5 1 Eind | -1.5 | ±20.6 | 0.004 |
| | | db | | | | | | 5 1 Bijk | 0.3 | ±15.5 | 0.003 |
| 39 | Vloer | db | 5.00 | N | N | 0.0 | -1.3 | 5 1 Eind | -1.3 | ±20.0 | 0.004 |
| | | db | | | | | | 5 1 Bijk | 0.7 | ±15.0 | 0.003 |
| 40 | Vloer | db | 4.90 | N | N | 0.0 | -1.7 | 5 1 Eind | -1.7 | ±19.6 | 0.004 |
| | | db | | | | | | 5 1 Bijk | -1.2 | ±14.7 | 0.003 |
| 41 | Dak | ss | 4.85 | N | N | 0.0 | 1.5 | 5 1 Eind | 1.5 | -38.8 | 2*0.004 |
| | | ss | | | | | | 5 1 Bijk | 1.1 | -38.8 | 2*0.004 |

OPMERKING 2

De in rekening gebrachte belasting is de helft van de totale belasting op nivo 5 inclusief een half stramien, aangrijpend op nivo 5 (dakschijf). De gerekende belasting is ongunstiger.
 De belastingen zijn inclusief wrijving dak/gevel, druk en zuiging, zie ook berekening 1B blz 5.

OPMERKING 3

Aangepast

TS/Raamwerken
2013

Rel: 5.27a 5 jul

Project...: 908-118
 Onderdeel:
 Dimensies: kN;m;rad (tenzij anders aangegeven)
 Datum....: 18/09/2007
 Bestand...: H:\Berekeningen\2010\910-199\berekenen\nieuw\bwt\berekening 4\
 vakwerk as B dak dicht 2 def.rww

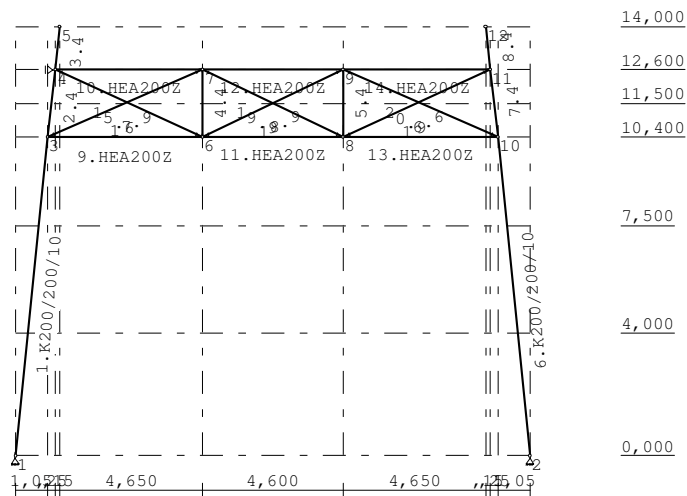
Rekenmodel.....: 2e-orde-elastisch.
 Theorieën voor de bepaling van de krachtsverdeling:
 1) Uiterste grenstoestand:
 Geometrisch niet lineair alle staven.
 Fysisch lineair alle staven.
 2) Gebruiksgrenstoestand:
 Geometrisch niet lineair alle staven.
 Fysisch lineair alle staven.

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

Toegepaste normen volgens Eurocode met Nederlandse NB

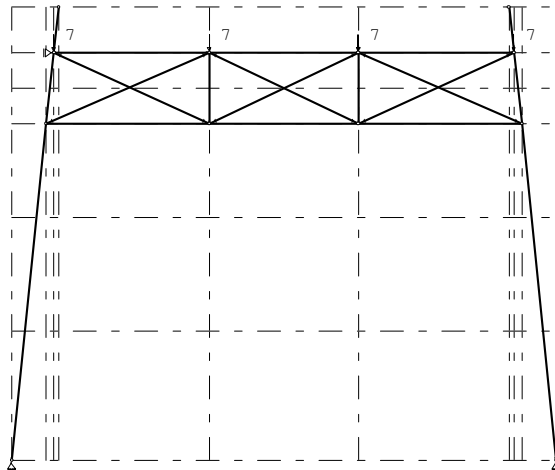
| | | | |
|-------------|----------------------|---------|-------------|
| Belastingen | NEN-EN 1990:2002 | C2:2010 | NB:2011(nl) |
| | NEN-EN 1991-1-1:2002 | C1:2009 | NB:2011(nl) |
| Staal | NEN-EN 1993-1-1:2006 | C2:2009 | NB:2011(nl) |

GEOMETRIE**BELASTINGEN**

B.G:1 Permanente

belasting

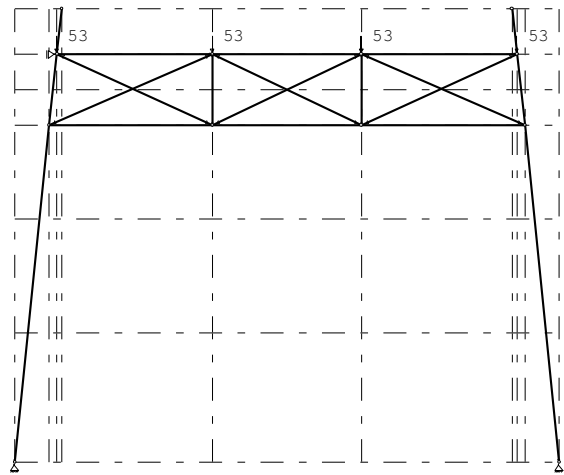
Eigen gewicht van alle staven is meegenomen in berekening. Richting:↓



BELASTINGEN

B.G:2 Veranderlijk

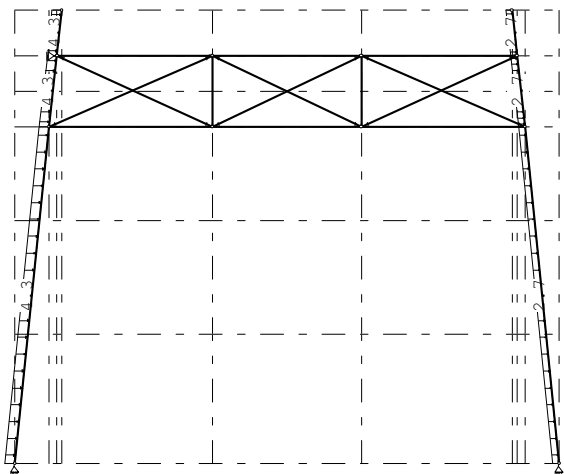
personen



BELASTINGEN

B.G:3

Veranderlijk wind



BEREKENINGSTATUS

Controlerende

berekening

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 | 3 | Nauwkeurigheid bereikt |

BELASTINGCOMBINATIES

| BC Type | BG | Gen. | Factor | BG | Gen. | Factor | BG | Gen. | Factor | BG | Gen. | Factor |
|---------|----|------|--------|--------|------|--------|------|------|--------|----|------|--------|
| 1 Fund. | 1 | Perm | 1.20 | 2 Extr | 1.50 | | | | | | | |
| 2 Fund. | 1 | Perm | 1.20 | 2 psi0 | 1.50 | 3 Extr | 1.50 | | | | | |
| 3 Fund. | 1 | Perm | 0.90 | 3 Extr | 1.50 | | | | | | | |
| 4 Fund. | 1 | Perm | 1.35 | 2 psi0 | 1.50 | | | | | | | |
| 5 Kar. | 1 | Perm | 1.00 | 2 Extr | 1.00 | | | | | | | |
| 6 Quas. | 1 | Perm | 1.00 | 2 Extr | 0.75 | | | | | | | |
| 7 Blij. | 1 | Perm | 1.00 | | | | | | | | | |

GUNSTIGE WERKING PERMANENTE BELASTINGEN

BC Staven met gunstige werking

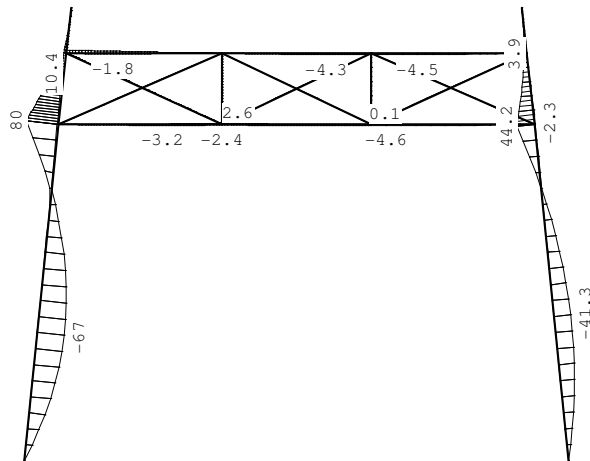
- 1 Geen
- 2 Geen
- 3 Alle staven de factor:0.90
- 4 Geen

OMHULLENDE VAN DE FUNDAMENTELE COMBINATIES**MOMENTEN**

2e orde

Fundamentele

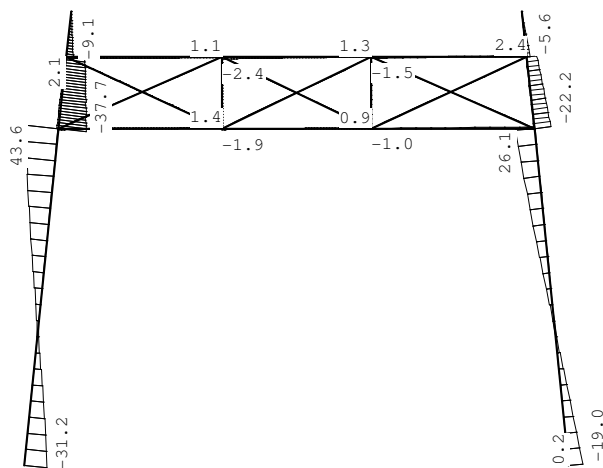
combinatie

**DWARSKRACHTEN**

2e orde

Fundamentele

combinatie

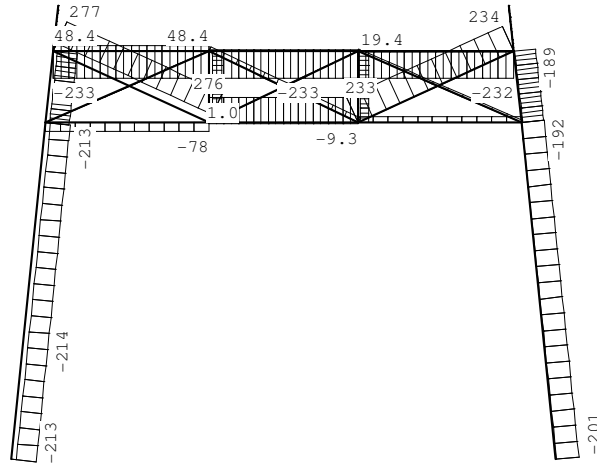


NORMAALKRACHTEN

2e orde

Fundamentele

combinatie

**REACTIES**

2e orde

Fundamentele

combinatie

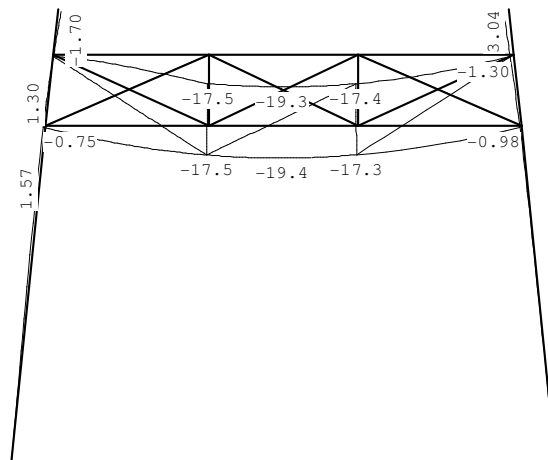
| Kn. | X-min | X-max | Z-min | Z-max | M-min | M-max |
|-----|---------|--------|-------|--------|-------|-------|
| 1 | -22.63 | 19.96 | 46.03 | 215.33 | | |
| 2 | -34.14 | -17.83 | 8.22 | 199.67 | | |
| 4 | -109.05 | 0.03 | | | | |

OMHULLENDE VAN DE KARAKTERISTIEKE COMBINATIES**VERPLAATSINGEN**

2e orde [mm]

Karakteristieke

combinatie

**STAALPROFIELEN - ALGEMENE GEGEVENS**

| | | |
|------------------------------|--|-------------|
| Stabiliteit: | Classificatie gehele constructie: | Ongeschoord |
| Doorbuiging en verplaatsing: | Aantal bouwlagen: | 4 |
| | Gebouwtype: | Overig |
| | Toel. horiz. verplaatsing gehele gebouw: | h/500 |
| | Kleinste gevelhoogte [m]: | 0.0 |

MATERIAAL

| Mat nr. | Profielnaam | Vloeisp. [N/mm ²] | Productie methode | Min. drsn. klasse |
|---------|-------------|----------------------------------|----------------------|----------------------|
| 1 | IPE600 | 235 | Gewalst | 1 |
| 2 | B610/30 | 235 | Warmgewalst | 1 |
| 3 | K150/150/10 | 355 | Warmgewalst | 1 |
| 4 | K200/200/10 | 355 | Warmgewalst | 1 |
| 5 | HEA200Z | 235 | Gewalst | 1 |
| 6 | ROND 30 | 460 | Gewalst | 1 |
| 7 | ROND 24 | 460 | Gewalst | 1 |
| 8 | ROND 20 | 460 | Gewalst | 1 |
| 9 | ROND 16 | 460 | Gewalst | 1 |

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

KNIKSTABILITEIT

| Staafl | l _{sys} [m] | Classif. y sterke as | l _{knik,y} [m] | Extra | | l _{knik,z} [m] | Extra | |
|--------|-------------------------|-------------------------|----------------------------|-----------------|-------------------------|----------------------------|-----------------|--|
| | | | | aanp. y [kN] | Classif. z zwakke as | | aanp. z [kN] | |
| 1 | 10.453 | Ongeschoord | 2e orde | | Geschoord | 10.453 | 0.0 | |
| 2 | 2.214 | Ongeschoord | 2e orde | | Geschoord | 2.214 | 0.0 | |
| 3 | 1.408 | Ongeschoord | 2e orde | | Geschoord | 1.408 | 0.0 | |
| 4 | 2.200 | Ongeschoord | 2e orde | | Geschoord | 2.200 | 0.0 | |
| 5 | 2.200 | Ongeschoord | 2e orde | | Geschoord | 2.200 | 0.0 | |
| 6 | 10.453 | Ongeschoord | 2e orde | | Geschoord | 10.453 | 0.0 | |
| 7 | 2.214 | Ongeschoord | 2e orde | | Geschoord | 2.214 | 0.0 | |
| 8 | 1.408 | Ongeschoord | 2e orde | | Geschoord | 1.408 | 0.0 | |
| 9 | 5.050 | Geschoord | 5.050 | 0.0 | Ongeschoord | 2e orde | | |
| 10 | 4.800 | Geschoord | 4.800 | 0.0 | Ongeschoord | 2e orde | | |
| 11 | 4.600 | Geschoord | 4.600 | 0.0 | Ongeschoord | 2e orde | | |
| 12 | 4.600 | Geschoord | 4.600 | 0.0 | Ongeschoord | 2e orde | | |
| 13 | 5.050 | Geschoord | 5.050 | 0.0 | Ongeschoord | 2e orde | | |
| 14 | 4.800 | Geschoord | 4.800 | 0.0 | Ongeschoord | 2e orde | | |
| 15 | 5.280 | Ongeschoord | 2e orde | | Geschoord | 5.280 | 0.0 | |
| 16 | 5.280 | Ongeschoord | 2e orde | | Geschoord | 5.280 | 0.0 | |
| 17 | 5.508 | Ongeschoord | 2e orde | | Geschoord | 5.508 | 0.0 | |
| 18 | 5.099 | Ongeschoord | 2e orde | | Geschoord | 5.099 | 0.0 | |
| 19 | 5.099 | Ongeschoord | 2e orde | | Geschoord | 5.099 | 0.0 | |
| 20 | 5.508 | Ongeschoord | 2e orde | | Geschoord | 5.508 | 0.0 | |

KIPSTABILITEIT

| Staafl | Plts. aangr. | l gaffel | | Kipsteunafstanden | |
|--------|-----------------|----------|-------|-------------------|--|
| | | | [m] | [m] | |
| 1 | 1.0*h | boven: | 10.45 | 10,453 | |
| | | onder: | 10.45 | 10,453 | |
| 2 | 1.0*h | boven: | 2.21 | 2.214 | |
| | | onder: | 2.21 | 2.214 | |
| 3 | 1.0*h | boven: | 1.41 | 1.408 | |
| | | onder: | 1.41 | 1.408 | |
| 4 | 1.0*h | boven: | 2.20 | 2.200 | |
| | | onder: | 2.20 | 2.200 | |
| 5 | 1.0*h | boven: | 2.20 | 2.200 | |
| | | onder: | 2.20 | 2.200 | |
| 6 | 0.0*h | boven: | 10.45 | 10,453 | |
| | | onder: | 10.45 | 10,453 | |
| 7 | 0.0*h | boven: | 2.21 | 2.214 | |
| | | onder: | 2.21 | 2.214 | |
| 8 | 0.0*h | boven: | 1.41 | 1.408 | |
| | | onder: | 1.41 | 1.408 | |
| 9 | 1.0*h | boven: | 5.05 | 5,05 | |
| | | onder: | 5.05 | 5,05 | |
| : | | | | | |

KIPSTABILITEIT

| Staafl | Plts. aangr. | l gaffel [m] | Kipsteunafstanden [m] |
|--------|-----------------|------------------|--------------------------|
| 10 | 1.0*h | boven: onder: | 4.80 4,8 4.80 4,8 |
| 11 | 1.0*h | boven: onder: | 4.60 4,6 4.60 4,6 |
| 12 | 1.0*h | boven: onder: | 4.60 4,6 4.60 4,6 |
| 13 | 1.0*h | boven: onder: | 5.05 5,05 5.05 5,05 |
| 14 | 1.0*h | boven: onder: | 4.80 4,8 4.80 4,8 |
| 15 | 1.0*h | boven: onder: | 5.28 5,28 5.28 5,28 |
| 16 | 1.0*h | boven: onder: | 5.28 5,28 5.28 5,28 |
| 17 | 1.0*h | boven: onder: | 5.51 5.508 5.51 5.508 |
| 18 | 1.0*h | boven: onder: | 5.10 5.099 5.10 5.099 |
| 19 | 1.0*h | boven: onder: | 5.10 5.099 5.10 5.099 |
| 20 | 1.0*h | boven: onder: | 5.51 5.508 5.51 5.508 |

KRACHTEN UIT HET VLAK

| Staafl | M _{begin} [kNm] | M _{max} [kNm] | M _{midden} [kNm] | M _{einde} [kNm] | V _{begin} [kN] | V _{tpv} [kN] | M _{max} [kN] | V _{einde} [kN] | M _x [kNm] |
|--------|-----------------------------|---------------------------|------------------------------|-----------------------------|----------------------------|--------------------------|--------------------------|----------------------------|-------------------------|
| 10 | 0.0 | 0.0 | 4.4 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 12 | 0.0 | 0.0 | 4.4 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 14 | 0.0 | 0.0 | 4.4 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |

TOETSING SPANNINGEN

| Staafl | Mat | BC | Sit | KL | Plaats | Norm | Artikel | Formule | Hoogste toetsing U.C. [N/mm ²] | Opm. |
|--------|-----|----|-----|----|--------------------|---------|---------|---------|---|------|
| 1 | 4 | 2 | 1 | 1 | Staafl | EN3-1-1 | 6.3.3 | (6.61) | 0.759 | 269 |
| 2 | 4 | 2 | 1 | 1 | Staafl | EN3-1-1 | 6.3.3 | (6.61) | 0.467 | 166 |
| 3 | 4 | 2 | 1 | 1 | Begin | EN3-1-1 | 6.2.8 | (6.29) | 0.034 | 12 |
| 4 | 4 | 2 | 1 | 1 | Staafl | EN3-1-1 | 6.3.1.1 | (6.47y) | 0.043 | 15 |
| 5 | 4 | 4 | 1 | 1 | Staafl | EN3-1-1 | 6.3.1.1 | (6.47y) | 0.037 | 13 |
| 6 | 4 | 2 | 1 | 1 | Staafl | EN3-1-1 | 6.3.3 | (6.61) | 0.491 | 174 |
| 7 | 4 | 2 | 1 | 1 | Staafl | EN3-1-1 | 6.3.3 | (6.61) | 0.280 | 99 |
| 8 | 4 | 3 | 1 | 1 | Begin | EN3-1-1 | 6.2.10 | (6.31) | 0.021 | 7 |
| 9 | 5 | 3 | 1 | 1 | Staafl | EN3-1-1 | 6.3.3 | (6.62) | 0.177 | 42 |
| 10 | 5 | 4 | 1 | 1 | Staafl | EN3-1-1 | 6.3.3 | (6.62) | 0.589 | 138 |
| 11 | 5 | 4 | 1 | 1 | Einde | EN3-1-1 | 6.2.1 | N+D | 0.169 | 40 |
| 12 | 5 | 4 | 1 | 1 | Staafl | EN3-1-1 | 6.3.3 | (6.62) | 0.474 | 111 |
| 13 | 5 | 2 | 1 | 1 | Mz-max | EN3-1-1 | 6.2.9.1 | (6.31) | 0.095 | 22 |
| 14 | 5 | 4 | 1 | 1 | Staafl | EN3-1-1 | 6.3.3 | (6.62) | 0.492 | 116 |
| 15 | 6 | 2 | 1 | 1 | Begin | EN3-1-1 | 6.2.1 | (6.2) | 0.969 | 446 |
| 16 | 6 | 4 | 1 | 1 | Einde | EN3-1-1 | 6.2.1 | (6.2) | 0.869 | 400 |
| 17 | 9 | | | | Staafl is onbelast | | | | | |
| 18 | 9 | 4 | 1 | 1 | Einde | EN3-1-1 | 6.2.1 | (6.2) | 0.232 | 107 |
| 19 | 9 | 2 | 1 | 1 | Einde | EN3-1-1 | 6.2.1 | (6.2) | 0.658 | 303 |
| 20 | 9 | 3 | 1 | 1 | Begin | EN3-1-1 | 6.2.1 | (6.2) | 0.391 | 180 |

TOETSING DOORBUIGING

| Staafl | Soort | Mtg | Lengte [m] | Overst I J | Zeeg [mm] | u _{tot} [mm] | BC | Sit | u [mm] | Toelaatbaar [mm] | *1 |
|--------|-------|-----|---------------|---------------|--------------|--------------------------|----|--------|-----------|---------------------|---------|
| 9 | Vloer | ss | 5.05 | N N | 0.0 | -16.7 | 5 | 1 Eind | -16.7 | ±40.4 | 2*0.004 |
| | | ss | | | | | 5 | 1 Bijk | -13.6 | ±30.3 | 2*0.003 |
| 10 | Vloer | ss | 4.80 | N N | 0.0 | -16.5 | 5 | 1 Eind | -16.5 | ±38.4 | 2*0.004 |
| | | ss | | | | | 5 | 1 Bijk | -13.4 | ±28.8 | 2*0.003 |
| 11 | Vloer | db | 4.60 | N N | 0.0 | -2.0 | 5 | 1 Eind | -2.0 | ±18.4 | 0.004 |
| | | db | | | | | 5 | 1 Bijk | -1.6 | ±13.8 | 0.003 |
| 12 | Vloer | db | 4.60 | N N | 0.0 | -1.8 | 5 | 1 Eind | -1.8 | ±18.4 | 0.004 |
| | | db | | | | | 5 | 1 Bijk | -1.2 | ±13.8 | 0.003 |

TOETSING DOORBUIGING

| Staaf | Soort | Mtg | Lengte | Overst | | Zeeg | u_{tot} | BC Sit | | u | Toelaatbaar | | |
|-------|-------|-----|--------|--------|---|------|-----------|--------|--------|-------|-------------|---------|--|
| | | | [m] | I | J | [mm] | [mm] | | | [mm] | [mm] | *1 | |
| 13 | Vloer | ss | 5.05 | N | N | 0.0 | -16.4 | 5 | 1 Eind | -16.4 | ±40.4 | 2*0.004 | |
| | | ss | | | | | | 5 | 1 Bijk | -13.2 | ±30.3 | 2*0.003 | |
| 14 | Vloer | ss | 4.80 | N | N | 0.0 | -16.1 | 5 | 1 Eind | -16.1 | ±38.4 | 2*0.004 | |
| | | ss | | | | | | 5 | 1 Bijk | -13.0 | ±28.8 | 2*0.003 | |