

## STATISCHE BEREKENING

**Project:** Potstal De Marsen Het Twiske Dikpotweg 1 te Landsmeer

**Onderdeel:** berekening fundering

**Architect:** Warmolt Lameris / Michiel Schim van der Loeff  
Scholekster 10  
Driebergen

**Opdrachtgever:** Recreatieschap Twiske-Waterland

**Aangehouden voorschriften:** NEN-EN 1991 (EC 1) Belastingen op constructies  
NEN-EN 1992 (EC 2) Ontwerp en berekening van betonconstructies  
NEN-EN 1993 (EC 3) Ontwerp en berekening van staalconstructies  
NEN-EN 1994 (EC 5) Ontwerp en berekening van houtconstructies  
NEN-EN 1996 (EC 6) Ontwerp en berekening van metselwerkconstructies  
NEN-EN 1997 (EC 7) Geotechnisch ontwerp

**Toegepaste Materialen:**

Beton C20/25  
Betonstaal B500B  
Constructiestaal S235  
Standaard bouwhout C18

**Windbelasting:**

gebied II, terreincategorie II (onbebouwd)

**Gevolgklasse:**

CC1

**Fundering:**

op prefab betonpalen 220x220 mm

## - Inhoudsopgave -

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## 1. Neerkomende belastingen

### verdiepingsvloer

|                                                     |   |                                    |       |   |                        |
|-----------------------------------------------------|---|------------------------------------|-------|---|------------------------|
| e.g. balklaag + beschot                             | : |                                    | $p_g$ | = | 0.25 kN/m <sup>2</sup> |
| v.b. ( $\psi_0=1.0$ , $\psi_1=0.9$ , $\psi_2=0.8$ ) | : | stobalen max 2.5m hoog; 1.50 x 2.5 | $p_q$ | = | 3.75 "                 |
| v.b. ( $\psi_0=1.0$ , $\psi_1=0.9$ , $\psi_2=0.8$ ) | : | veeschuur                          | $p_q$ | = | 2.50 "                 |

### begane grondvloer

|                      |   |                                                |       |   |                        |
|----------------------|---|------------------------------------------------|-------|---|------------------------|
| e.g. betonvloer      | : | 24.0 x 0.2                                     | $p_g$ | = | 4.80 kN/m <sup>2</sup> |
| v.b. vloer in stal   | : | ( $\psi_0=0.4$ , $\psi_1=0.5$ , $\psi_2=0.3$ ) | $p_q$ | = | 4.00 "                 |
| v.b. vloer mestplaat | : | ( $\psi_0=0.4$ , $\psi_1=0.5$ , $\psi_2=0.3$ ) | $p_q$ | = | 30.00 "                |

## 2. Fundering

### 2.1. stroken betonvloeren

Naam: betonvloeren

#### TS/Liggers

Rel: 5.29c 9 mei 2014

Project.....: - stal de Marsen te Twiske  
Onderdeel.....: begane grondvloer  
Constructeur.: marcell  
Opdrachtgever:  
Dimensies.....: kN/m/rad  
Datum.....: 09/05/2014  
Bestand.....: P:\2014\14119\BEREKE~1\betonvloeren.dlw

|                              |       |                           |         |
|------------------------------|-------|---------------------------|---------|
| Betrouwbaarheidsklasse       | : 1   | Referentieperiode         | : 50    |
| Toevalige inklemmingen begin | : 15% | Toevalige inklemming eind | : 15%   |
| Herverdelen van momenten     | : nee | Maximale deellengte       | : 0.000 |
| Ouderdom bij belasten        | : 28  | Relatieve vochtigheid     | : 50%   |

Doorbuigingen(beton) zijn dmv gecorrigeerde stijfheden berekend.

Fysisch lineair : Er is gerekend met de e-modulus uit de materiaaltabel.  
Fys.NLE.kort : Er is gerekend met een gecorrigeerde e-modulus (korte duur).  
Deze e-mod. is berekend mbv de krachten uit de fysisch lineair berekening.

#### Toegepaste normen volgens Eurocode met Nederlandse NB

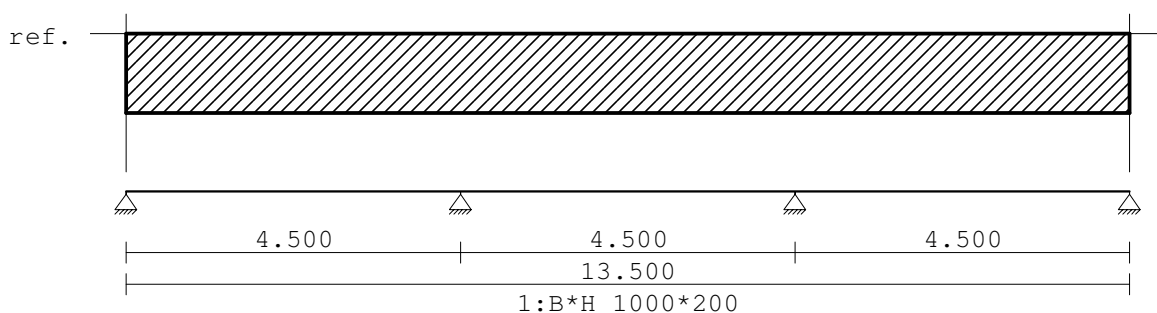
|             |                      |         |             |
|-------------|----------------------|---------|-------------|
| Belastingen | NEN-EN 1990:2002     | C2:2010 | NB:2011(nl) |
|             | NEN-EN 1991-1-1:2002 | C1:2009 | NB:2011(nl) |
| Beton       | NEN-EN 1992-1-1:2005 | C2:2010 | NB:2011(nl) |

#### LIGGER:veeschuur

Profiel : B\*H 1000\*200

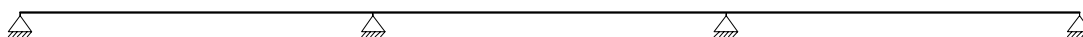
#### GEOMETRIE

Ligger:veeschuur



#### VELDBELASTINGEN

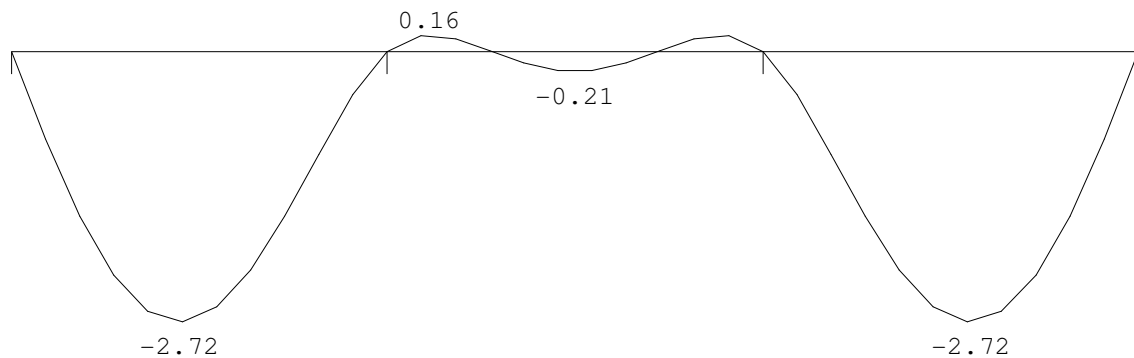
Ligger:veeschuur B.G:1 Permanent



Project.....: - stal de Marsen te Twiske  
Onderdeel.....: begane grondvloer

**VERPLAATSINGEN** [mm] Fysisch lineair

Ligger:veeschuur B.G:1 Permanent



**REACTIES** Fysisch lineair

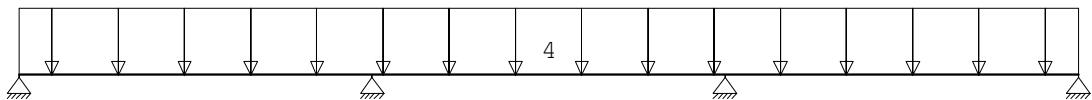
Ligger:veeschuur B.G:1 Permanent

| Stp | F     | M    |
|-----|-------|------|
| 1   | 8.64  | 0.00 |
| 2   | 23.76 | 0.00 |
| 3   | 23.76 | 0.00 |
| 4   | 8.64  | 0.00 |

64.80 : (absoluut) grootste som reacties  
-64.80 : (absoluut) grootste som belastingen

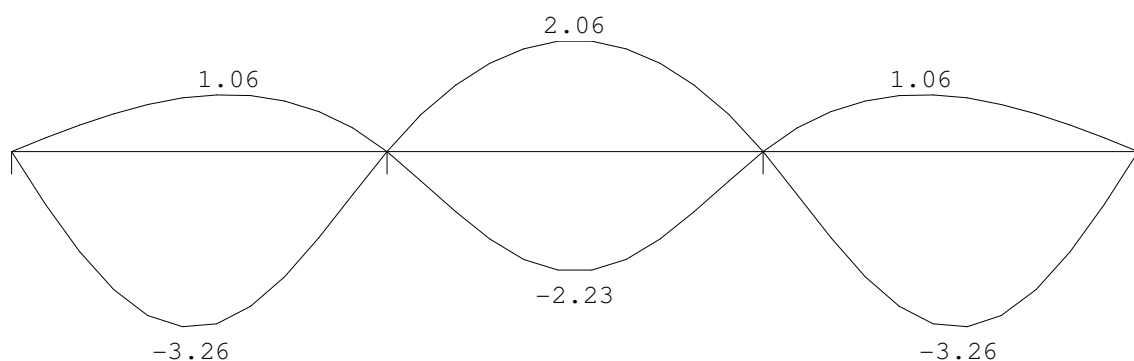
**VELDBELASTINGEN**

Ligger:veeschuur B.G:2 Veranderlijk



**VERPLAATSINGEN** [mm] Fysisch lineair

Ligger:veeschuur B.G:2 Veranderlijk



Project.....: - stal de Marsen te Twiske  
Onderdeel.....: begane grondvloer

**REACTIES** Fysisch lineair

Ligger:veeschuur B.G:2 Veranderlijk

| Stp | Fmin  | Fmax  | Mmin | Mmax |
|-----|-------|-------|------|------|
| 1   | -0.90 | 8.10  | 0.00 | 0.00 |
| 2   | 0.00  | 21.60 | 0.00 | 0.00 |
| 3   | 0.00  | 21.60 | 0.00 | 0.00 |
| 4   | -0.90 | 8.10  | 0.00 | 0.00 |

**BELASTINGCOMBINATIES**

| BC Type | BG Gen. Factor | BG Gen. Factor | BG Gen. Factor | BG Gen. Factor |
|---------|----------------|----------------|----------------|----------------|
| 1 Fund. | 1 Perm         | 1.22           | 2 psi0         | 1.35           |
| 2 Fund. | 1 Perm         | 1.08           | 2 Extr         | 1.35           |
| 3 Kar.  | 1 Perm         | 1.00           | 2 Extr         | 1.00           |
| 4 Freq. | 1 Perm         | 1.00           | 2 psi1         | 1.00           |
| 5 Quas. | 1 Perm         | 1.00           | 2 psi2         | 1.00           |
| 6 Blij. | 1 Perm         | 1.00           |                |                |

**GUNSTIGE WERKING PERMANENTE BELASTINGEN**

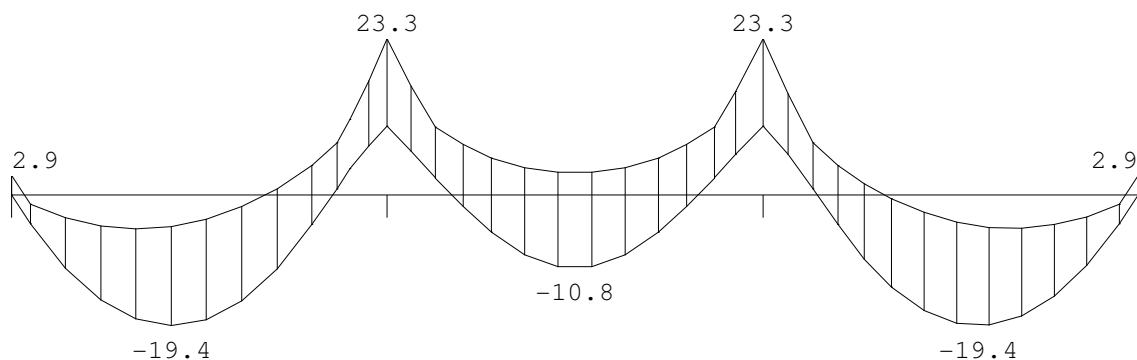
Ligger:veeschuur

| BC Velden met gunstige werking |
|--------------------------------|
| 1 1-3                          |
| 2 1-3                          |

**OMHULLENDE VAN DE FUNDAMENTELE COMBINATIES**

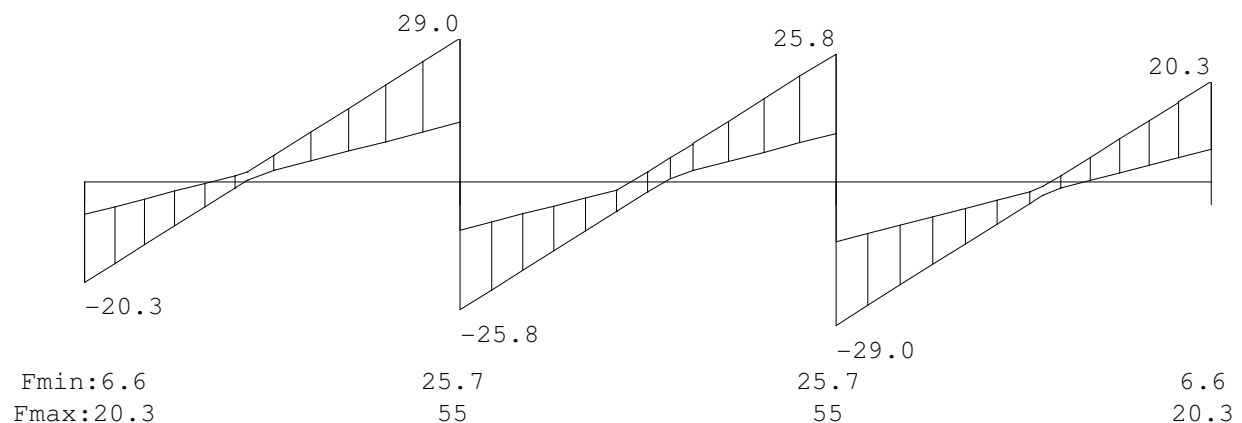
**MOMENTEN** Fysisch lineair

Ligger:veeschuur Fundamentele combinatie



**DWARSKRACHTEN** Fysisch lineair

Ligger:veeschuur Fundamentele combinatie



Project.....: - stal de Marsen te Twiske  
Onderdeel.....: begane grondvloer

**PROFIELGEGEVENS Vloer**
**[N] [mm]**

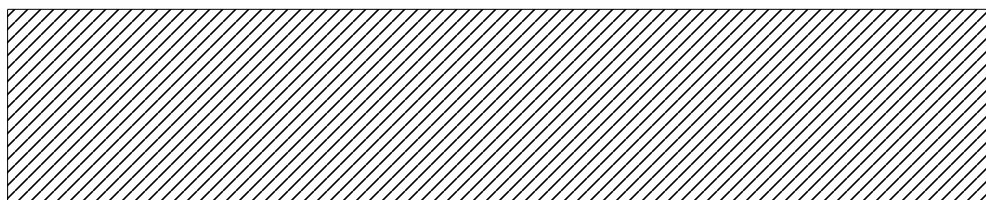
t.b.v. profiel:1 B\*H 1000\*200

**Algemeen**

Materiaal : C20/25  
Oppervlak : 2.000000e+005 Traagheid : 6.6667e+008  
Staaftype : 0: normaal Vormfactor : 0.00

**Doorsnede**

breedte : 1000 hoogte : 200 zwaartepunt tov onderkant : 100  
Referentie : Boven



Fictieve dikte : 166.7  
Betonkwaliteit element : C20/25 Kruipcoëf. : 3.010  
Soort spanningsrekdiagram : Parabolisch - rechthoekig diagram  
Staalkwaliteit hoofdwapening : 500  $\epsilon_{uk}$  : 5.00  
Soort spanningsrekdiagram : Bi-lineair diagram met klimmende tak  
Geprefabriceerd element : Nee

**Betondekking**

|                                   |               |               |
|-----------------------------------|---------------|---------------|
|                                   | Boven         | Onder         |
| Milieu :                          | XC3           | XC3           |
| Gestort tegen bestaand beton :    | Nee           | Nee           |
| Element met plaatgeometrie :      | Ja            | Ja            |
| Specifieke kwaliteitsbeheersing : | Nee           | Nee           |
| Oneffen beton oppervlak :         | Nee           | Nee           |
| Ondergrond :                      | Glad / N.v.t. | Glad / N.v.t. |
| Constructieklasse :               | S3            | S3            |
| Grootste korrel :                 | 31.5          |               |

|                                              |           |           |
|----------------------------------------------|-----------|-----------|
| Hoofdwapening :                              | 1ste laag | 1ste laag |
| Nominale dekking :                           | 25        | 25        |
| Toegepaste dekking :                         | 30        | 30        |
| Gelijkwaardige diameter :                    | 10        | 10        |
| $C_{min,b}$ $C_{min,dur}$ $\Delta C_{dur}$ : | 10 20 0   | 10 20 0   |
| $C_{min}$ $\Delta C_{dev}$ $C_{nom}$ :       | 20 5 25   | 20 5 25   |

|                                              |          |          |
|----------------------------------------------|----------|----------|
| Beugel / Verdeelwapening :                   | 2de laag | 2de laag |
| Nominale dekking :                           | 25       | 25       |
| Toegepaste dekking :                         | 40       | 40       |
| Gelijkwaardige diameter :                    | 6        | 6        |
| $C_{min,b}$ $C_{min,dur}$ $\Delta C_{dur}$ : | 6 20 0   | 6 20 0   |
| $C_{min}$ $\Delta C_{dev}$ $C_{nom}$ :       | 20 5 25  | 20 5 25  |

**Wapening**

|                               |       |       |
|-------------------------------|-------|-------|
|                               | Boven | Onder |
| Diameter nuttige hoogte :     | 10.0  | 10.0  |
| Art. 7.3.2 minimum wapening : | Ja    | Ja    |
| diameter verdeelwapening :    | 6.0   | 6.0   |

**Hoofdwapening**

Ligger:veeschuur

| Geb. | Vanaf<br>[mm] | Tot<br>[mm] | $M_{Ed}$<br>[kNm] | z<br>[mm] | B/O | $A_b$<br>[mm <sup>2</sup> ] | $A_a$<br>[mm <sup>2</sup> ] | Opm. |
|------|---------------|-------------|-------------------|-----------|-----|-----------------------------|-----------------------------|------|
| 1    | S1+0          | S1+149      | 2.91              | 0         | Bov | 177*                        | 177                         | 54   |
| 2    | S1+0          | S2-650      | -19.40            | 160       | Ond | 260                         | 260                         |      |
| 3    | S2-1463       | S2+2250     | 23.26             | 159       | Bov | 317                         | 317                         |      |
| 4    | S2+770        | S3-770      | -10.83            | 0         | Ond | 180*                        | 180                         | 1    |
| 5    | S2+2250       | S3+1462     | 23.26             | 159       | Bov | 317                         | 317                         |      |
| 6    | S3+650        | S4+0        | -19.40            | 160       | Ond | 260                         | 260                         |      |
| 7    | S4-149        | S4+0        | 2.91              | 0         | Bov | 177*                        | 177                         | 54   |

Project.....: - stal de Marsen te Twiske  
Onderdeel.....: begane grondvloer

**Hoofdwapening**

Ligger:veeschuur

Opmerkingen

[1] \* = Eisen met betrekking tot minimum wapening zijn toegepast, zie nationale bijlage art. 9.2.1.1(1).

Alle maten zijn zonder verschuiving van de m-lijn en verankering

[54] \* = Eisen met betrekking tot minimum wapening ten behoeve van gecontroleerde scheurvorming zijn toegepast volgens art. 7.3.2.

**Scheurvorming volgens artikel 7.3.4**

Ligger:veeschuur

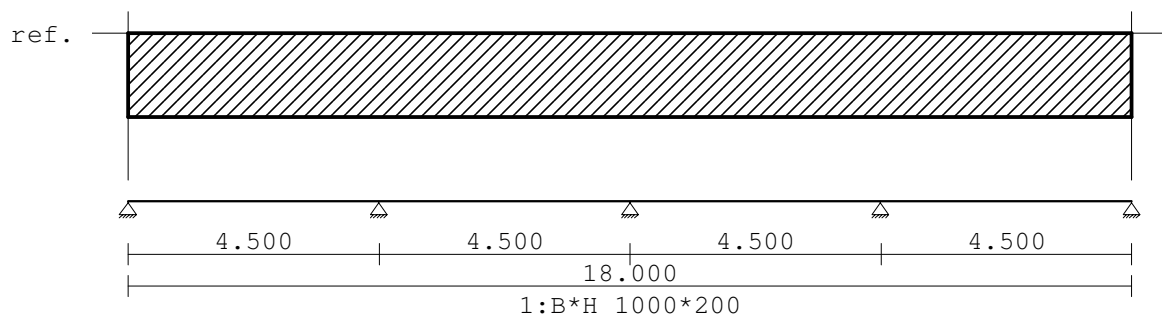
| Geb. | Pos.<br>[mm] | $M_{E, freq}$<br>[kNm] | B/O | $s_{r, max}$<br>[mm] | Frm. | $\epsilon_{sm} - \epsilon_{cm}$<br>[%] | $w_k$<br>[mm] | $k_x$ | $w_{max}$<br>[mm] | U.C. | Opm. |
|------|--------------|------------------------|-----|----------------------|------|----------------------------------------|---------------|-------|-------------------|------|------|
| 2    | S1+1915      | -11.83                 | Ond | 215                  | 7.14 | 0.890                                  | 0.192         | 1.20  | 0.360             | 0.53 |      |
| 3    | S2+0         | 14.44                  | Bov | 211                  | 7.14 | 0.899                                  | 0.190         | 1.20  | 0.360             | 0.53 |      |
| 4    | S2+2250      | -5.47                  | Ond | 222                  | 7.14 | 0.588                                  | 0.131         | 1.20  | 0.360             | 0.36 |      |
| 5    | S3+0         | 14.44                  | Bov | 211                  | 7.14 | 0.899                                  | 0.190         | 1.20  | 0.360             | 0.53 |      |
| 6    | S4-1915      | -11.83                 | Ond | 215                  | 7.14 | 0.890                                  | 0.192         | 1.20  | 0.360             | 0.53 |      |

**LIGGER:hellingstal**

Profiel : B\*H 1000\*200

**GEOMETRIE**

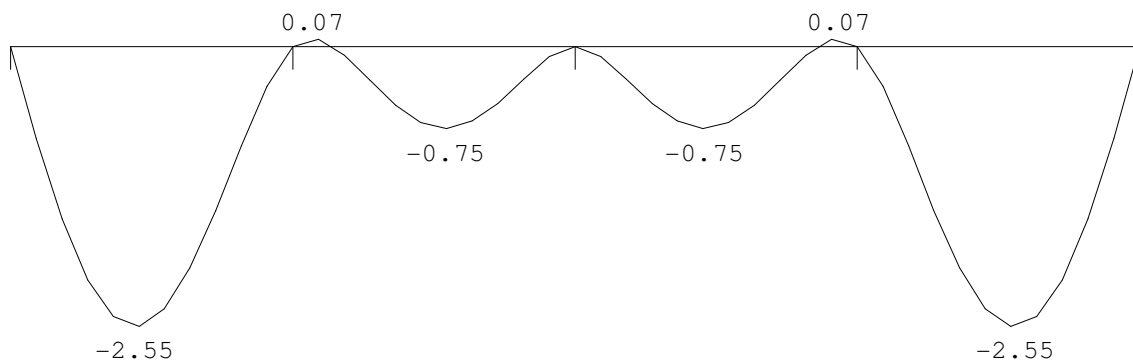
Ligger:hellingstal

**VELDBELASTINGEN**

Ligger:hellingstal B.G:1 Permanent

**VERPLAATSINGEN** [mm] Fysisch lineair

Ligger:hellingstal B.G:1 Permanent





Project.....: - stal de Marsen te Twiske  
Onderdeel.....: begane grondvloer

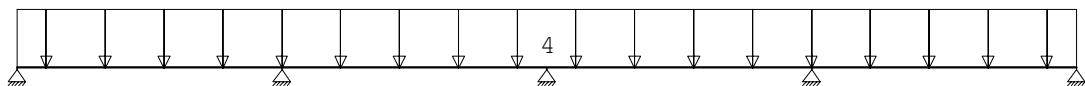
**REACTIES** Fysisch lineair

Ligger:hellingstal B.G:1 Permanent

| Stp      | F                                   | M    |
|----------|-------------------------------------|------|
| 1        | 8.49                                | 0.00 |
| 2        | 24.69                               | 0.00 |
| 3        | 20.06                               | 0.00 |
| 4        | 24.69                               | 0.00 |
| 5        | 8.49                                | 0.00 |
| <hr/>    |                                     |      |
| 86.40 :  | (absoluut) grootste som reacties    |      |
| -86.40 : | (absoluut) grootste som belastingen |      |

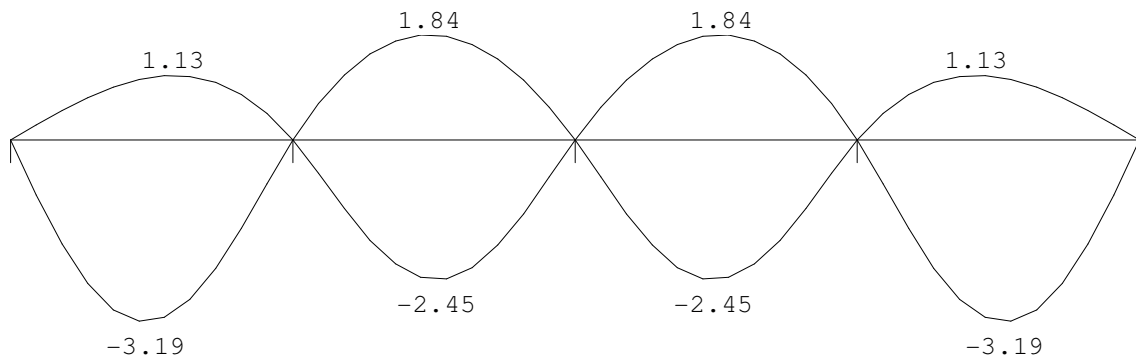
**VELDBELASTINGEN**

Ligger:hellingstal B.G:2 Veranderlijk



**VERPLAATSINGEN** [mm] Fysisch lineair

Ligger:hellingstal B.G:2 Veranderlijk



**REACTIES** Fysisch lineair

Ligger:hellingstal B.G:2 Veranderlijk

| Stp | Fmin  | Fmax  | Mmin | Mmax |
|-----|-------|-------|------|------|
| 1   | -0.96 | 8.04  | 0.00 | 0.00 |
| 2   | 0.00  | 22.02 | 0.00 | 0.00 |
| 3   | 0.00  | 20.57 | 0.00 | 0.00 |
| 4   | 0.00  | 22.02 | 0.00 | 0.00 |
| 5   | -0.96 | 8.04  | 0.00 | 0.00 |

**GUNSTIGE WERKING PERMANENTE BELASTINGEN**

Ligger:hellingstal

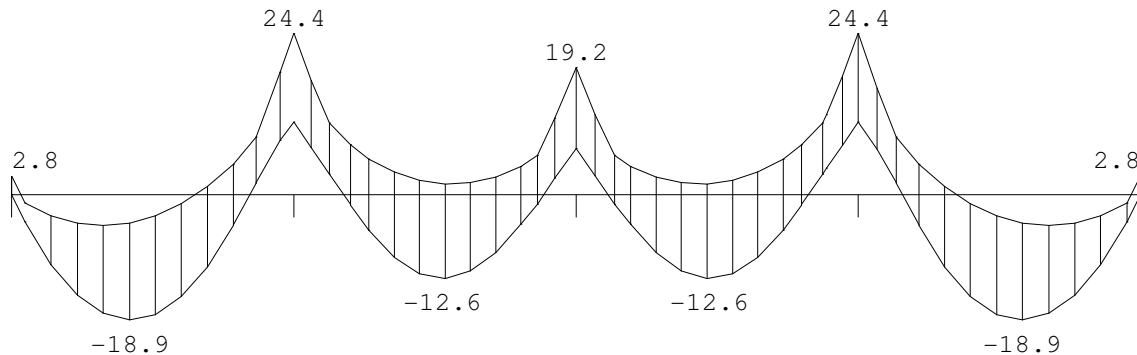
|                                |     |  |  |  |
|--------------------------------|-----|--|--|--|
| BC Velden met gunstige werking |     |  |  |  |
| 1                              | 1-4 |  |  |  |
| 2                              | 1-4 |  |  |  |

Project.....: - stal de Marsen te Twiske  
Onderdeel.....: begane grondvloer

## OMHULLENDE VAN DE FUNDAMENTELE COMBINATIES

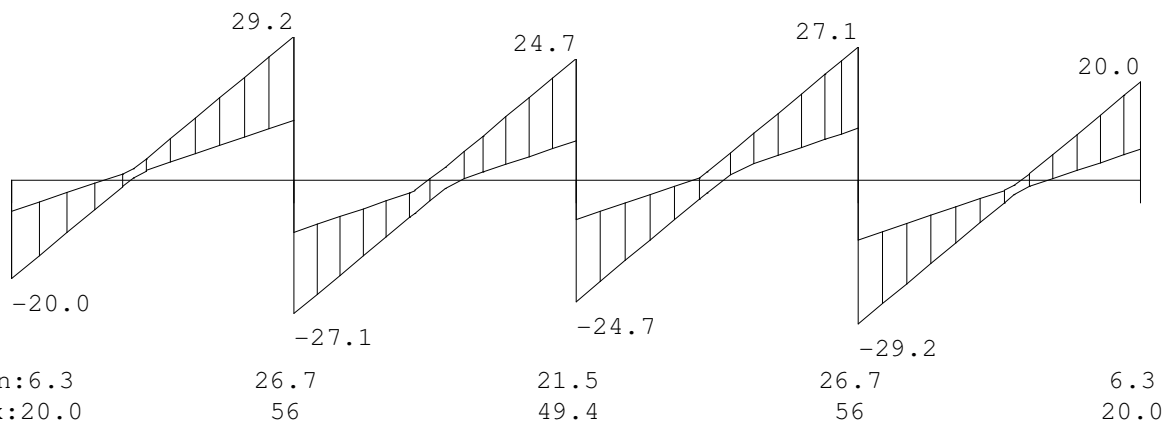
**MOMENTEN** Fysisch lineair

Ligger:hellingstal Fundamentele combinatie



**DWARSKRACHTEN** Fysisch lineair

Ligger:hellingstal Fundamentele combinatie



## Hoofdwapening

Ligger:hellingstal

| Geb. | Vanaf<br>[mm] | Tot<br>[mm] | $M_{Ed}$<br>[kNm] | $z$<br>[mm] | B/O | $A_b$<br>[mm <sup>2</sup> ] | $A_a$<br>[mm <sup>2</sup> ] | Opm. |
|------|---------------|-------------|-------------------|-------------|-----|-----------------------------|-----------------------------|------|
| 1    | S1+0          | S1+148      | 2.84              | 0           | Bov | 177*                        | 177                         | 54   |
| 2    | S1+0          | S2-696      | -18.92            | 160         | Ond | 254                         | 254                         |      |
| 3    | S2-1567       | S3-1989     | 24.43             | 159         | Bov | 334                         | 334                         |      |
| 4    | S2+779        | S3-506      | -12.61            | 161         | Ond | 197*                        | 197                         | 1    |
| 5    | S3-1989       | S3+1989     | 19.21             | 160         | Bov | 258                         | 258                         |      |
| 6    | S3+506        | S4-779      | -12.61            | 161         | Ond | 197*                        | 197                         | 1    |
| 7    | S3+1989       | S4+1567     | 24.43             | 159         | Bov | 334                         | 334                         |      |
| 8    | S4+696        | S5+0        | -18.92            | 160         | Ond | 254                         | 254                         |      |
| 9    | S5-148        | S5+0        | 2.84              | 0           | Bov | 177*                        | 177                         | 54   |

Opmerkingen

[1] \* = Eisen met betrekking tot minimum wapening zijn toegepast, zie nationale bijlage art. 9.2.1.1(1).

Alle maten zijn zonder verschuiving van de m-lijn en verankering

[54] \* = Eisen met betrekking tot minimum wapening ten behoeve van gecontroleerde scheurvorming zijn toegepast volgens art. 7.3.2.

Project.....: - stal de Marsen te Twiske  
Onderdeel.....: begane grondvloer

## Scheurvorming volgens artikel 7.3.4

Ligger:hellingstal

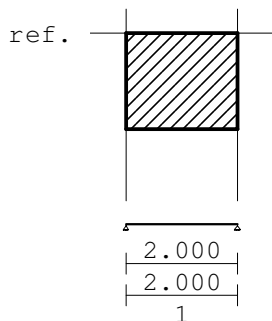
| Geb. | Pos.<br>[mm] | $M_{E;freq}$<br>[kNm] | B/O | $s_{r,max}$<br>[mm] | Frm. | $\epsilon_{sm}-\epsilon_{cm}$<br>[%] | $w_k$<br>[mm] | $k_x$ | $w_{max}$<br>[mm] | U.C. | Opm. |
|------|--------------|-----------------------|-----|---------------------|------|--------------------------------------|---------------|-------|-------------------|------|------|
| 2    | S1+1891      | -11.49                | Ond | 215                 | 7.14 | 0.886                                | 0.191         | 1.20  | 0.360             | 0.53 |      |
| 3    | S2+0         | 15.30                 | Bov | 210                 | 7.14 | 0.904                                | 0.190         | 1.20  | 0.360             | 0.53 |      |
| 4    | S3-2130      | -6.79                 | Ond | 220                 | 7.14 | 0.669                                | 0.148         | 1.20  | 0.360             | 0.41 |      |
| 5    | S3+0         | 11.28                 | Bov | 215                 | 7.14 | 0.857                                | 0.185         | 1.20  | 0.360             | 0.51 |      |
| 6    | S3+2130      | -6.79                 | Ond | 220                 | 7.14 | 0.669                                | 0.148         | 1.20  | 0.360             | 0.41 |      |
| 7    | S4+0         | 15.30                 | Bov | 210                 | 7.14 | 0.904                                | 0.190         | 1.20  | 0.360             | 0.53 |      |
| 8    | S5-1891      | -11.49                | Ond | 215                 | 7.14 | 0.886                                | 0.191         | 1.20  | 0.360             | 0.53 |      |

## LIGGER:voergang

Profiel : B\*H 1000\*200

## GEOMETRIE

Ligger:voergang



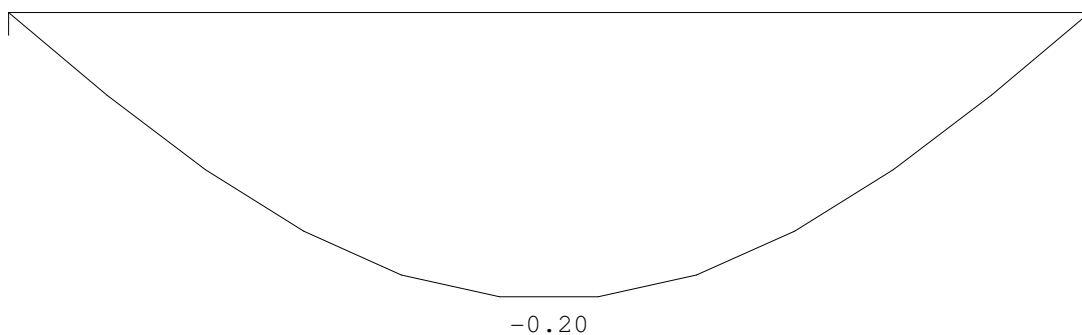
## VELDBELASTINGEN

Ligger:voergang B.G:1 Permanent



## VERPLAATSINGEN [mm] Fysisch lineair

Ligger:voergang B.G:1 Permanent



Project.....: - stal de Marsen te Twiske  
Onderdeel.....: begane grondvloer

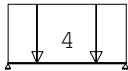
**REACTIES** Fysisch lineair

Ligger:voergang B.G:1 Permanent

| Stp                                         | F    | M    |
|---------------------------------------------|------|------|
| 1                                           | 4.80 | 0.00 |
| 2                                           | 4.80 | 0.00 |
| 9.60 : (absoluut) grootste som reacties     |      |      |
| -9.60 : (absoluut) grootste som belastingen |      |      |

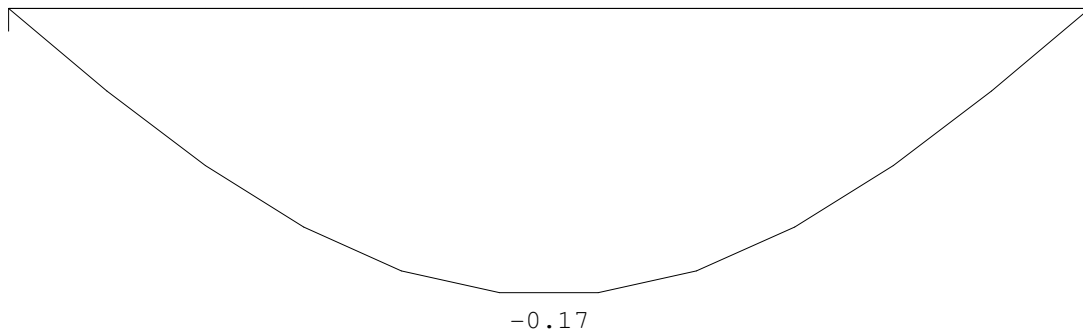
**VELDBELASTINGEN**

Ligger:voergang B.G:2 Veranderlijk



**VERPLAATSINGEN** [mm] Fysisch lineair

Ligger:voergang B.G:2 Veranderlijk



**REACTIES** Fysisch lineair

Ligger:voergang B.G:2 Veranderlijk

| Stp | Fmin | Fmax | Mmin | Mmax |
|-----|------|------|------|------|
| 1   | 0.00 | 4.00 | 0.00 | 0.00 |
| 2   | 0.00 | 4.00 | 0.00 | 0.00 |

**GUNSTIGE WERKING PERMANENTE BELASTINGEN**

Ligger:voergang

BC Velden met gunstige werking

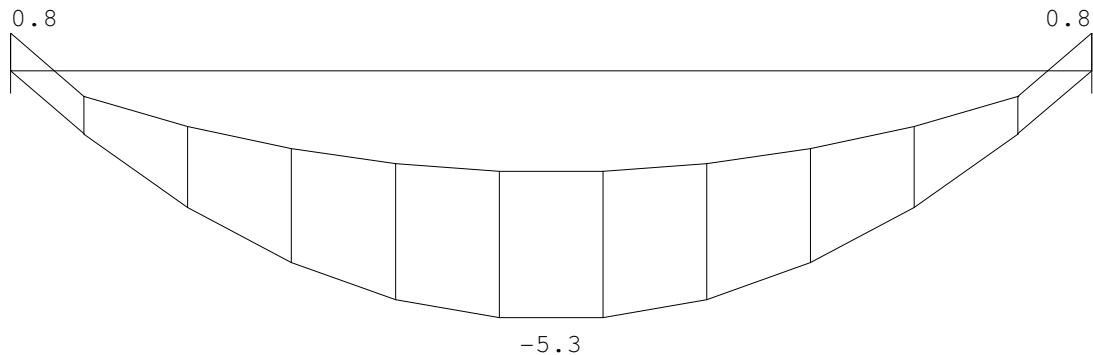
1 1  
2 1

Project.....: - stal de Marsen te Twiske  
Onderdeel.....: begane grondvloer

## OMHULLENDE VAN DE FUNDAMENTELE COMBINATIES

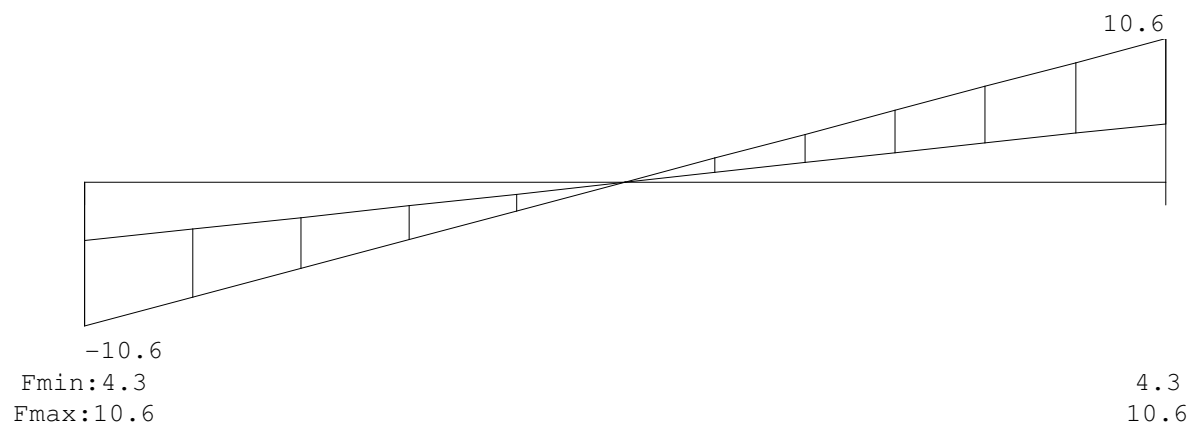
**MOMENTEN** Fysisch lineair

Ligger:voergang Fundamentele combinatie



**DWARSKRACHTEN** Fysisch lineair

Ligger:voergang Fundamentele combinatie



### Hoofdwapening

Ligger:voergang

| Geb. | Vanaf<br>[mm] | Tot<br>[mm] | $M_{Ed}$<br>[kNm] | $z$<br>[mm] | B/O | $A_b$<br>[mm <sup>2</sup> ] | $A_a$<br>[mm <sup>2</sup> ] | Opm. |
|------|---------------|-------------|-------------------|-------------|-----|-----------------------------|-----------------------------|------|
| 1    | S1+0          | S1+78       | 0.79              | 0           | Bov | 177*                        | 177                         | 54   |
| 2    | S1+0          | S2+0        | -5.29             | 0           | Ond | 177*                        | 177                         | 54   |
| 3    | S2-78         | S2+0        | 0.79              | 0           | Bov | 177*                        | 177                         | 54   |

Opmerkingen

Alle maten zijn zonder verschuiving van de m-lijn en verankering  
[54] \* = Eisen met betrekking tot minimum wapening ten behoeve van  
gecontroleerde scheurvorming zijn toegepast volgens art. 7.3.2.

### Scheurvorming volgens artikel 7.3.4

Ligger:voergang

| Geb. | Pos.<br>[mm] | $M_{E,freq}$<br>[kNm] | B/O | $s_{r,max}$<br>[mm] | Frm. | $\epsilon_{sm}-\epsilon_{cm}$<br>[%] | $w_k$<br>[mm] | $k_x$ | $w_{max}$<br>[mm] | U.C. | Opm. |
|------|--------------|-----------------------|-----|---------------------|------|--------------------------------------|---------------|-------|-------------------|------|------|
| 2    | S1+1000      | -3.40                 | Ond | 222                 | 7.14 | 0.371                                | 0.083         | 1.20  | 0.360             | 0.23 |      |

## 2.2. paal draagvermogen

Naam: paal draagvermogen

**TS/Palen Verticaal**

**Rel: 5.33a 28 mei 2014**

### ALGEMENE GEGEVENS

Project : Potstal De Marsen Het Twiske Dikpotweg 1 te Landsmeer  
 Onderdeel : berekening fundering - paal draagvermogen  
 Datum : 28-05-2014

Alle niveaus/hoogtes/peilmaten zijn t.o.v.: N.A.P.

### Toegepaste normen volgens Eurocode met Nederlandse NB

|             |                    |         |         |
|-------------|--------------------|---------|---------|
| Geotechniek | EN 1997-1:2004     | AC:2009 |         |
|             | NEN-EN 1997-1:2005 | C1:2009 | NB:2012 |
|             | NEN 9997-1:2011    | C1:2012 |         |

### PAALGEGEVENS Paal 220x220

Type : Geheide paal (beton)  
 Wijze van installeren : Heien  
 Afmeting a [m] : 0.220  
 Afmeting b [m] : 0.220  
 Elasticiteitsmodulus [N/mm<sup>2</sup>] : 20000  
 Factor  $\alpha_s$  (tabel 7.c EC 7.1) : 0.010 (zandlagen; voor kleilagen zie tabel 7.d)  
 Factor  $\alpha_t$  (tabel 7.c EC 7.1) : 0.0070 (zandlagen; voor kleilagen zie tabel 7.d)  
 Paalklassefactor  $\alpha_p$  : 1.00  
 Paalvoetvormfactor  $\beta$  : 1.00  
 Type lastzakingsdiagram : Grondverdringende paal  
 Verm.factor \*  $\phi'_{j,k}$  : 0.75

### RESULTATEN Geval 1

Alle niveaus/hoogtes/peilmaten zijn t.o.v.: N.A.P.

| Sondering | D1            | DSKM2         | D3            |
|-----------|---------------|---------------|---------------|
| Niveau    | $F_{netto;d}$ | $F_{netto;d}$ | $F_{netto;d}$ |
| [m]       | [kN]          | [kN]          | [kN]          |
| -16.00    | 272           | 134           | <b>274</b>    |
| -16.25    | <b>348</b>    | 130           | 305           |
| -16.50    | <b>446</b>    | 106           | 365           |
| -16.75    | <b>503</b>    | 260           | 474           |
| -17.00    | 524           | 323           | <b>550</b>    |
| -17.25    | 546           | 335           | <b>571</b>    |
| -17.50    | 567           | 358           | <b>592</b>    |

**SAMENVATTINGSTABEL Geval 1**
**Uitgangspunten**

|                                      |   |                                                 |
|--------------------------------------|---|-------------------------------------------------|
| - paal                               | : | Paal 220x220                                    |
| - paaltype                           | : | Geheide paal (beton)                            |
| - schachtafmeting                    | : | 220 x 220                                       |
| Paalklassefactor $\alpha_p$          | : | 1.00                                            |
| Factor $\alpha_s$ (tabel 7.c EC 7.1) | : | 0.010 (zandlagen; voor kleilagen zie tabel 7.d) |
| Factor $\xi_{gem}$                   | : | 1.30                                            |
| Factor $\xi_{min}$                   | : | 1.30                                            |

Alle niveaus/hoogtes/peilmaten zijn t.o.v.: N.A.P.

| sondering | maaiveld<br>niveau | paalpunt<br>niveau | Bezwijkdraagvermogen |               |                   | Rekenwaarden      |                    |                         |
|-----------|--------------------|--------------------|----------------------|---------------|-------------------|-------------------|--------------------|-------------------------|
|           |                    |                    | $R_b$<br>[kN]        | $R_s$<br>[kN] | $R_{ccg}$<br>[kN] | $R_{c;d}$<br>[kN] | $F_{nk;d}$<br>[kN] | $R_{c;netto;d}$<br>[kN] |
| D1        | -2.01              | -16.00             | 446.6                | 9.5           | 456.2             | 292.4             | -20.4              | 272.1                   |
|           |                    | -16.25             | 550.3                | 24.8          | 575.1             | 368.7             | -20.4              | 348.3                   |
|           |                    | -16.50             | 669.6                | 57.8          | 727.5             | 466.3             | -20.4              | 446.0                   |
|           |                    | -16.75             | 726.0                | 90.8          | 816.8             | 523.6             | -20.4              | 503.3                   |
|           |                    | -17.00             | 726.0                | 123.8         | 849.8             | 544.8             | -20.4              | 524.4                   |
|           |                    | -17.25             | 726.0                | 156.8         | 882.8             | 565.9             | -20.4              | 545.6                   |
|           |                    | -17.50             | 726.0                | 189.8         | 915.8             | 587.1             | -20.4              | 566.7                   |
| DSKM2     | -2.00              | -16.00             | 234.6                | 6.4           | 241.0             | 154.5             | -20.6              | 133.9                   |
|           |                    | -16.25             | 202.4                | 32.8          | 235.2             | 150.8             | -20.6              | 130.1                   |
|           |                    | -16.50             | 140.8                | 57.4          | 198.2             | 127.1             | -20.6              | 106.4                   |
|           |                    | -16.75             | 376.6                | 60.5          | 437.1             | 280.2             | -20.6              | 259.5                   |
|           |                    | -17.00             | 456.3                | 80.1          | 536.4             | 343.8             | -20.6              | 323.2                   |
|           |                    | -17.25             | 447.9                | 106.5         | 554.4             | 355.4             | -20.6              | 334.7                   |
|           |                    | -17.50             | 457.3                | 132.9         | 590.2             | 378.3             | -20.6              | 357.7                   |
| D3        | -2.25              | -16.00             | 398.8                | 55.6          | 454.4             | 291.3             | -17.2              | 274.1                   |
|           |                    | -16.25             | 420.5                | 82.0          | 502.5             | 322.1             | -17.2              | 304.9                   |
|           |                    | -16.50             | 500.6                | 95.5          | 596.2             | 382.2             | -17.2              | 365.0                   |
|           |                    | -16.75             | 641.4                | 125.4         | 766.8             | 491.5             | -17.2              | 474.3                   |
|           |                    | -17.00             | 726.0                | 158.4         | 884.4             | 566.9             | -17.2              | 549.7                   |
|           |                    | -17.25             | 726.0                | 191.4         | 917.4             | 588.1             | -17.2              | 570.9                   |
|           |                    | -17.50             | 726.0                | 224.4         | 950.4             | 609.2             | -17.2              | 592.1                   |

**OVERZICHT NETTO DRAAGVERMOGEN**

Alle niveaus/hoogtes/peilmaten zijn t.o.v.: N.A.P.

| sondering | maaiveld<br>niveau | paalpunt<br>niveau | $R_{c;netto;d}$ [kN] |
|-----------|--------------------|--------------------|----------------------|
|           |                    |                    | Geval 1              |
| D1        | -2.01              | -16.00             | 272                  |
|           |                    | -16.25             | 348                  |
|           |                    | -16.50             | 446                  |
|           |                    | -16.75             | 503                  |
|           |                    | -17.00             | 524                  |
|           |                    | -17.25             | 546                  |
|           |                    | -17.50             | 567                  |
| DSKM2     | -2.00              | -16.00             | 134                  |
|           |                    | -16.25             | 130                  |
|           |                    | -16.50             | 106                  |
|           |                    | -16.75             | 260                  |
|           |                    | -17.00             | 323                  |
|           |                    | -17.25             | 335                  |
|           |                    | -17.50             | 358                  |
| D3        | -2.25              | -16.00             | 274                  |
|           |                    | -16.25             | 305                  |
|           |                    | -16.50             | 365                  |
|           |                    | -16.75             | 474                  |
|           |                    | -17.00             | 550                  |
|           |                    | -17.25             | 571                  |
|           |                    | -17.50             | 592                  |

## **2.3. balkrooster**

Naam: balkrooster

### **TS/Balkroosters**

**Rel: 5.28a 30 mei 2014**

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Project...: pitpotstal de Marsen  
Onderdeel: het Twiske  
Dimensies: kN/m/rad  
Datum....: 09/05/2014  
Bestand...: P:\2014\14119\BEREKE~1\balkrooster.grw  
Torsiefac: 10 %

Betrouwbaarheidsklasse : 1 Referentieperiode : 50  
Doorbuigingen(beton) zijn dmv gecorrigeerde stijfheden berekend.

Fysisch lineair : Er is gerekend met de e-modulus uit de materiaaltabel.  
Fys.NLE.kort : Er is gerekend met een gecorrigeerde e-modulus (korte duur).  
Deze e-mod. is berekend mbv de krachten uit de fysisch lineair berekening.

### **Toegepaste normen volgens Eurocode met Nederlandse NB**

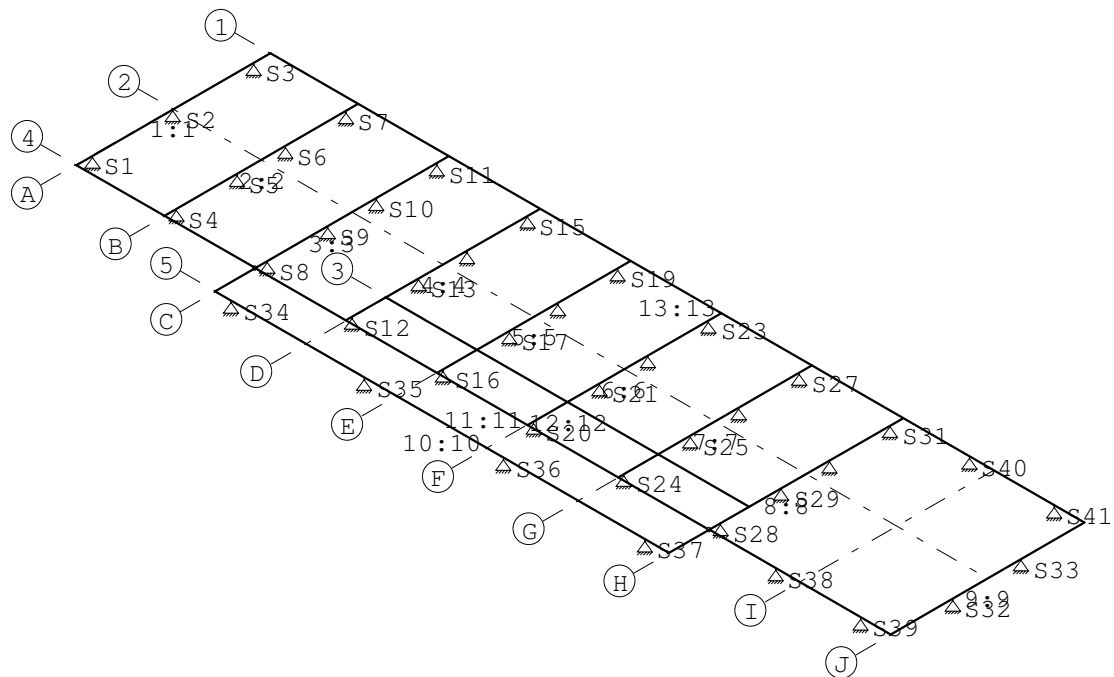
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|             |                      |         |             |
|-------------|----------------------|---------|-------------|
| Belastingen | NEN-EN 1990:2002     | C2:2010 | NB:2011(nl) |
|             | NEN-EN 1991-1-1:2002 | C1:2009 | NB:2011(nl) |
| Beton       | NEN-EN 1992-1-1:2005 | C2:2010 | NB:2011(nl) |



Project...: - pitpotstal de Marsen  
Onderdeel: het Twiske

## GEOMETRIE



## MATERIALEN

Mt Omschrijving E-mechanica[N/mm<sup>2</sup>] Kruipcoef. S.M. Pois.

|          |      |      |      |      |
|----------|------|------|------|------|
| 1 C20/25 | 7480 | 3.01 | 24.0 | 0.20 |
|----------|------|------|------|------|

## PROFIELEN [mm]

| Prof. Omschrijving | Materiaal | Oppervlak  | Torsietr.  | Traagheid  |
|--------------------|-----------|------------|------------|------------|
| 1 B*H 400*500      | 1:C20/25  | 2.000e+005 | 5.577e+009 | 4.167e+009 |
| 2 B*H 400*450      | 1:C20/25  | 1.800e+005 | 4.578e+009 | 3.037e+009 |

## PROFIELEN vervolg [mm]

| Nr. | Vormf. | Breedte | Hoogte | Zs  | Rek.As | Type | b1 | h1 | b2 | h2 |
|-----|--------|---------|--------|-----|--------|------|----|----|----|----|
| 1   | 0.00   | 400     | 500    | 250 | 0.00   | 0:RH |    |    |    |    |
| 2   | 0.00   | 400     | 450    | 225 | 0.00   | 0:RH |    |    |    |    |

## STRAMIENLIJNEN

| Nr. | Naam | X-begin | Y-begin | X-eind | Y-Eind |
|-----|------|---------|---------|--------|--------|
| 1   | A    | 0.000   | 0.000   | 0.000  | 9.600  |
| 2   | B    | 4.375   | 0.000   | 4.375  | 9.600  |
| 3   | C    | 8.875   | -2.000  | 8.875  | 9.600  |
| 4   | D    | 13.375  | -2.000  | 13.375 | 9.600  |
| 5   | E    | 17.875  | -2.000  | 17.875 | 9.600  |
| 6   | F    | 22.375  | -2.000  | 22.375 | 9.600  |
| 7   | G    | 26.875  | -2.000  | 26.875 | 9.600  |
| 8   | H    | 31.375  | -2.000  | 31.375 | 9.600  |
| 9   | I    | 35.875  | 0.000   | 35.875 | 9.600  |
| 10  | J    | 40.375  | 0.000   | 40.375 | 9.600  |
| 11  | 1    | 0.000   | 9.600   | 40.375 | 9.600  |
| 12  | 2    | 0.000   | 4.800   | 40.375 | 4.800  |
| 13  | 3    | 13.375  | 2.000   | 31.375 | 2.000  |
| 14  | 4    | 0.000   | 0.000   | 40.375 | 0.000  |
| 15  | 5    | 8.875   | -2.000  | 31.375 | -2.000 |

Project...: - pitpotstal de Marsen  
Onderdeel: het Twiske

**BALKEN**

| Nr. | Naam | Begin | Eind | Profiel               |
|-----|------|-------|------|-----------------------|
| 1   | 1    | A;4   | A;1  | 1:B*H 400*500         |
| 2   | 2    | B;4   | B;1  | 1:B*H 400*500         |
| 3   | 3    | C;5   | C;1  | 1:B*H 400*500         |
| 4   | 4    | D;4   | D;1  | 1:B*H 400*500         |
| 5   | 5    | E;4   | E;1  | 1:B*H 400*500         |
| 6   | 6    | F;4   | F;1  | 1:B*H 400*500         |
| 7   | 7    | G;4   | G;1  | 1:B*H 400*500         |
| 8   | 8    | H;5   | H;1  | 1:B*H 400*500         |
| 9   | 9    | J;4   | J;1  | 1:B*H 400*500         |
| 10  | 10   | C;5   | H;5  | 1:B*H 400*500         |
| 11  | 11   | A;4   | J;4  | Zie Doorsnedesectoren |
| 12  | 12   | D;3   | H;3  | 2:B*H 400*450         |
| 13  | 13   | A;1   | J;1  | 1:B*H 400*500         |

**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     |      |

Opmerkingen:

De torsie traagheid van alle balken is tot 10% gereduceerd

**DOORSNEDESECTOREN**

| Balk  | Vanaf  | Tot    | Lengte | Profiel       | Eindcode | Bedding   | Br. [mm] |
|-------|--------|--------|--------|---------------|----------|-----------|----------|
| 11:11 | 0.000  | 8.875  | 8.875  | 1:B*H 400*500 | 0:       | Scharnier |          |
| 11:11 | 8.875  | 31.375 | 22.500 | 2:B*H 400*450 | 0:       | Scharnier |          |
| 11:11 | 31.375 | 40.375 | 9.000  | 1:B*H 400*500 | 1:       | Vast      |          |

**STEUNPUNT TYPEN**

|           |              |              |                     |
|-----------|--------------|--------------|---------------------|
| Nr.       | : 1          | Rotatie      | X:Vrij              |
| Afmeting  | : 220X220    | Verplaatsing | Z:Veerwaarde: 30000 |
| Lengte    | : 15.000     | Rotatie      | Y:Vrij              |
| Fd        | : 300.000000 |              |                     |
| Min.afst. | : 0.800      |              |                     |

Project...: - pitpotstal de Marsen  
Onderdeel: het Twiske

### STEUNPUNTEN

| Nr. | Steunpunttype | Balk  | Positie | Excentr. | Opm: |
|-----|---------------|-------|---------|----------|------|
| 1   | 1:220X220     | 1:1   | 0.800   | 0.000    |      |
| 2   | 1:220X220     | 1:1   | 4.800   | 0.000    |      |
| 3   | 1:220X220     | 1:1   | 8.800   | 0.000    |      |
| 4   | 1:220X220     | 2:2   | 0.600   | 0.000    |      |
| 5   | 1:220X220     | 2:2   | 3.600   | 0.000    |      |
| 6   | 1:220X220     | 2:2   | 6.000   | 0.000    |      |
| 7   | 1:220X220     | 2:2   | 9.000   | 0.000    |      |
| 8   | 1:220X220     | 3:3   | 2.600   | 0.000    |      |
| 9   | 1:220X220     | 3:3   | 5.600   | 0.000    |      |
| 10  | 1:220X220     | 3:3   | 8.000   | 0.000    |      |
| 11  | 1:220X220     | 3:3   | 11.000  | 0.000    |      |
| 12  | 1:220X220     | 4:4   | 0.300   | 0.000    |      |
| 13  | 1:220X220     | 4:4   | 3.600   | 0.000    |      |
| 14  | 1:220X220     | 4:4   | 6.000   | 0.000    |      |
| 15  | 1:220X220     | 4:4   | 9.000   | 0.000    |      |
| 16  | 1:220X220     | 5:5   | 0.300   | 0.000    |      |
| 17  | 1:220X220     | 5:5   | 3.600   | 0.000    |      |
| 18  | 1:220X220     | 5:5   | 6.000   | 0.000    |      |
| 19  | 1:220X220     | 5:5   | 9.000   | 0.000    |      |
| 20  | 1:220X220     | 6:6   | 0.300   | 0.000    |      |
| 21  | 1:220X220     | 6:6   | 3.600   | 0.000    |      |
| 22  | 1:220X220     | 6:6   | 6.000   | 0.000    |      |
| 23  | 1:220X220     | 6:6   | 9.000   | 0.000    |      |
| 24  | 1:220X220     | 7:7   | 0.300   | 0.000    |      |
| 25  | 1:220X220     | 7:7   | 3.600   | 0.000    |      |
| 26  | 1:220X220     | 7:7   | 6.000   | 0.000    |      |
| 27  | 1:220X220     | 7:7   | 9.000   | 0.000    |      |
| 28  | 1:220X220     | 8:8   | 2.600   | 0.000    |      |
| 29  | 1:220X220     | 8:8   | 5.600   | 0.000    |      |
| 30  | 1:220X220     | 8:8   | 8.000   | 0.000    |      |
| 31  | 1:220X220     | 8:8   | 11.000  | 0.000    |      |
| 32  | 1:220X220     | 9:9   | 3.100   | 0.000    |      |
| 33  | 1:220X220     | 9:9   | 6.500   | 0.000    |      |
| 34  | 1:220X220     | 10:10 | 0.825   | 0.000    |      |
| 35  | 1:220X220     | 10:10 | 7.425   | 0.000    |      |
| 36  | 1:220X220     | 10:10 | 14.325  | 0.000    |      |
| 37  | 1:220X220     | 10:10 | 21.325  | 0.000    |      |
| 38  | 1:220X220     | 11:11 | 34.700  | 0.000    |      |
| 39  | 1:220X220     | 11:11 | 38.900  | 0.000    |      |
| 40  | 1:220X220     | 13:13 | 34.700  | 0.000    |      |
| 41  | 1:220X220     | 13:13 | 38.900  | 0.000    |      |

### BELASTINGGEVALLEN

| B.G. | Omschrijving | Belast/onbelast    | $\Psi_0$ | $\Psi_1$ | $\Psi_2$ | e.g.  |
|------|--------------|--------------------|----------|----------|----------|-------|
| 1    | Permanent    | 2:Permanent EN1991 |          |          |          | -1.00 |
| 2    | v.b. beggr   | 0:Alles tegelijk   | 0.40     | 0.50     | 0.30     | 0.00  |
| 3    | v.b. verd    | 0:Alles tegelijk   | 0.40     | 0.50     | 0.30     | 0.00  |
| 4    | v.b. verkeer | 0:Alles tegelijk   | 0.70     | 0.50     | 0.30     | 0.00  |

Project...: - pitpotstal de Marsen  
Onderdeel: het Twiske

## Gewichtsberekening

### Permanent

#### Balk 1

Type:-QZGlobaal

| Index   | Omschrijving         | Formule       | Waarde    |
|---------|----------------------|---------------|-----------|
| q1      | betonvloer veeschuur | 8.64          | 8.64 kN/m |
| q2      | verdiepingsvloer     | 0.25*2.2      | 0.55 kN/m |
| q6      | betonwand            | 24.0*0.15*1.2 | 4.32 kN/m |
|         | houten gevel         | 0.50*3.8      | 1.90 kN/m |
|         | dak                  | 0.21*2.3      | 0.48 kN/m |
| Totaal: |                      |               | 6.70 kN/m |

#### Balk 2

| Index          | Omschrijving         | Formule | Waarde     |
|----------------|----------------------|---------|------------|
| q3             | betonvloer veeschuur | 23.76   | 23.76 kN/m |
| Type:-PZLokaal |                      |         |            |
| F1             | spant                | 13.50   | 13.50 kN   |

#### Balk 3

Type:-QZGlobaal

| Index   | Omschrijving         | Formule       | Waarde     |
|---------|----------------------|---------------|------------|
| q4      | betonvloer veeschuur | 23.76         | 23.76 kN/m |
| q5      | betonwand            | 24.0*0.15*1.2 | 4.32 kN/m  |
|         | houten wand          | 0.50*3.8      | 1.90 kN/m  |
|         | dak                  | 0.21*4.5      | 0.94 kN/m  |
| Totaal: |                      |               | 7.16 kN/m  |

| Index | Omschrijving     | Formule  | Waarde    |
|-------|------------------|----------|-----------|
| q7    | verdiepingsvloer | 0.25*2.2 | 0.55 kN/m |

Type:-PZLokaal

|    |     |              |         |
|----|-----|--------------|---------|
| F2 | dak | 0.21*2.3*3.0 | 1.45 kN |
|----|-----|--------------|---------|

#### Balk 4

Type:-QZGlobaal

| Index   | Omschrijving           | Formule       | Waarde     |
|---------|------------------------|---------------|------------|
| q8      | betonvloer veeschuur   | 8.64          | 8.64 kN/m  |
| q9      | betonwand              | 24.0*0.15*2.1 | 7.56 kN/m  |
|         | betonvloer hellingstal | 8.49          | 8.49 kN/m  |
| Totaal: |                        |               | 16.05 kN/m |

Type:-PZLokaal

| Index | Omschrijving | Formule | Waarde   |
|-------|--------------|---------|----------|
| F3    | spant        | 17.60   | 17.60 kN |

#### Balk 5

Type:-QZGlobaal

| Index | Omschrijving           | Formule | Waarde     |
|-------|------------------------|---------|------------|
| q10   | betonvloer hellingstal | 24.69   | 24.69 kN/m |

Type:-PZLokaal

|    |       |       |          |
|----|-------|-------|----------|
| F4 | spant | 17.60 | 17.60 kN |
|----|-------|-------|----------|

Project...: - pitpotstal de Marsen  
Onderdeel: het Twiske

**Balk 6**

Type:-QZGlobaal

| Index | Omschrijving           | Formule | Waarde     |
|-------|------------------------|---------|------------|
| q11   | betonvloer hellingstal | 20.06   | 20.06 kN/m |

Type:-PZLokaal

|    |       |       |          |
|----|-------|-------|----------|
| F5 | spant | 17.60 | 17.60 kN |
|----|-------|-------|----------|

**Balk 7****Balk 8**

Type:-QZGlobaal

| Index   | Omschrijving           | Formule       | Waarde     |
|---------|------------------------|---------------|------------|
| q12     | betonvloer mestplaat   | 24.0*0.25*1.1 | 6.60 kN/m  |
| q13     | betonwand              | 24.0*0.15*2.1 | 7.56 kN/m  |
|         | houten gevel           | 0.50*3.8      | 1.90 kN/m  |
|         | dak                    | 0.21*2.3      | 0.48 kN/m  |
|         | betonvloer hellingstal | 8.49          | 8.49 kN/m  |
| Totaal: |                        |               | 18.43 kN/m |

| Index | Omschrijving     | Formule  | Waarde    |
|-------|------------------|----------|-----------|
| q14   | verdiepingsvloer | 0.25*2.2 | 0.55 kN/m |

Type:-PZLokaal

|    |       |           |         |
|----|-------|-----------|---------|
| F6 | spant | 0.5*16.50 | 8.25 kN |
|----|-------|-----------|---------|

**Balk 9**

Type:-QZGlobaal

| Index   | Omschrijving         | Formule       | Waarde     |
|---------|----------------------|---------------|------------|
| q15     | betonvloer mestplaat | 24.0*0.25*1.1 | 6.60 kN/m  |
|         | betonwand            | 24.0*0.15*1.2 | 4.32 kN/m  |
| Totaal: |                      |               | 10.92 kN/m |

**Balk 10**

| Index | Omschrijving        | Formule      | Waarde    |
|-------|---------------------|--------------|-----------|
| q16   | betonvloer voergang | 24.0*0.2*1.0 | 4.80 kN/m |

**Balk 11**

| Index   | Omschrijving | Formule       | Waarde    |
|---------|--------------|---------------|-----------|
| q17     | betonwand    | 24.0*0.15*1.2 | 4.32 kN/m |
|         | houten gevel | 0.50*2.8      | 1.40 kN/m |
| Totaal: |              |               | 5.72 kN/m |

| Index   | Omschrijving        | Formule      | Waarde    |
|---------|---------------------|--------------|-----------|
| q18     | betonvloer voergang | 24.0*0.2*1.0 | 4.80 kN/m |
| q19     | betonvloer mestgang | 24.0*0.2*1.0 | 4.80 kN/m |
|         | voerhek             | 0.70*1.2     | 0.84 kN/m |
| Totaal: |                     |              | 5.64 kN/m |

| Index | Omschrijving         | Formule       | Waarde    |
|-------|----------------------|---------------|-----------|
| q20   | betonvloer mestplaat | 24.0*0.25*1.2 | 7.20 kN/m |

Type:-PZLokaal

|    |        |                  |          |
|----|--------|------------------|----------|
| F7 | spant  | 7.20             | 7.20 kN  |
| F8 | spant  | 16.50            | 16.50 kN |
| F9 | penant | 24.0*0.3*0.3*1.2 | 2.59 kN  |

Project...: - pitpotstal de Marsen  
Onderdeel: het Twiske

**Balk 12**

Type:-QZGlobaal

| Index | Omschrijving        | Formule                      | Waarde    |
|-------|---------------------|------------------------------|-----------|
| q21   | betonvloer mestgang | $24.0 \times 0.2 \times 1.0$ | 4.80 kN/m |

**Balk 13**

| Index   | Omschrijving | Formule                       | Waarde    |
|---------|--------------|-------------------------------|-----------|
| q22     | betonwand    | $24.0 \times 0.15 \times 1.2$ | 4.32 kN/m |
|         | houten gevel | $0.50 \times 2.8$             | 1.40 kN/m |
| Totaal: |              |                               | 5.72 kN/m |

| Index | Omschrijving         | Formule                       | Waarde    |
|-------|----------------------|-------------------------------|-----------|
| q23   | betonwand            | $24.0 \times 0.15 \times 1.2$ | 4.32 kN/m |
| q24   | betonwand            | $24.0 \times 0.15 \times 2.6$ | 9.36 kN/m |
| q25   | betonvloer mestplaat | $24.0 \times 0.25 \times 1.2$ | 7.20 kN/m |

Type:-PZLokaal

|     |        |                                         |         |
|-----|--------|-----------------------------------------|---------|
| F10 | spant  | 9.50                                    | 9.50 kN |
| F11 | spant  | 7.30                                    | 7.30 kN |
| F12 | penant | $24.0 \times 0.3 \times 0.3 \times 2.6$ | 5.62 kN |
| F13 | penant | $24.0 \times 0.3 \times 0.3 \times 1.2$ | 2.59 kN |

**v.b. beggr****Balk 1**

Type:-QZGlobaal

| Index | Omschrijving      | Formule | Waarde    |
|-------|-------------------|---------|-----------|
| q26   | v.b. begane grond | 8.10    | 8.10 kN/m |

**Balk 2**

| Index | Omschrijving      | Formule | Waarde     |
|-------|-------------------|---------|------------|
| q27   | v.b. begane grond | 21.60   | 21.60 kN/m |

**Balk 3**

| Index | Omschrijving      | Formule | Waarde     |
|-------|-------------------|---------|------------|
| q28   | v.b. begane grond | 21.60   | 21.60 kN/m |

**Balk 4**

| Index | Omschrijving      | Formule | Waarde    |
|-------|-------------------|---------|-----------|
| q29   | v.b. begane grond | 8.10    | 8.10 kN/m |
| q30   | v.b. hellingstal  | 8.04    | 8.04 kN/m |

**Balk 5**

| Index | Omschrijving     | Formule | Waarde     |
|-------|------------------|---------|------------|
| q31   | v.b. hellingstal | 22.10   | 22.10 kN/m |

**Balk 6**

| Index | Omschrijving     | Formule | Waarde     |
|-------|------------------|---------|------------|
| q32   | v.b. hellingstal | 20.60   | 20.60 kN/m |

**Balk 7**

Project...: - pitpotstal de Marsen  
Onderdeel: het Twiske

**Balk 8**

| Index | Omschrijving     | Formule  | Waarde     |
|-------|------------------|----------|------------|
| q33   | v.b. hellingstal | 8.10     | 8.10 kN/m  |
| q34   | v.b. mestplaat   | 30.0*1.1 | 33.00 kN/m |

**Balk 9**

| Index | Omschrijving   | Formule  | Waarde     |
|-------|----------------|----------|------------|
| q35   | v.b. mestplaat | 30.0*1.1 | 33.00 kN/m |

**Balk 10**

| Index | Omschrijving  | Formule  | Waarde    |
|-------|---------------|----------|-----------|
| q36   | v.b. voergang | 4.00*1.0 | 4.00 kN/m |

**Balk 11**

| Index | Omschrijving   | Formule  | Waarde     |
|-------|----------------|----------|------------|
| q37   | v.b. voergang  | 4.00*1.0 | 4.00 kN/m  |
| q38   | v.b.mestgang   | 4.00*1.0 | 4.00 kN/m  |
| q39   | v.b. mestplaat | 30.0*1.2 | 36.00 kN/m |

**Balk 12**

| Index | Omschrijving | Formule  | Waarde    |
|-------|--------------|----------|-----------|
| q40   | v.b.mestgang | 4.00*1.0 | 4.00 kN/m |

**Balk 13**

| Index | Omschrijving   | Formule  | Waarde     |
|-------|----------------|----------|------------|
| q41   | v.b. mestplaat | 30.0*1.2 | 36.00 kN/m |

**v.b. verd****Balk 1**

| Index | Omschrijving    | Formule  | Waarde    |
|-------|-----------------|----------|-----------|
| q42   | v.b. verdieping | 2.50*2.2 | 5.50 kN/m |

**Balk 2**

| Type:-PZLokaal |                 |         |          |
|----------------|-----------------|---------|----------|
| Index          | Omschrijving    | Formule | Waarde   |
| F14            | v.b. verdieping | 49.10   | 49.10 kN |

**Balk 3**

| Type:-QZGlobaal |                 |                     |           |
|-----------------|-----------------|---------------------|-----------|
| Index           | Omschrijving    | Formule             | Waarde    |
| q43             | v.b. verdieping | 2.50*2.2            | 5.50 kN/m |
| q44             | v.b. verdieping | 3.75*2.2            | 8.25 kN/m |
| Type:-PZLokaal  |                 |                     |           |
| F15             | v.b. verdieping | 3.75*2.2*0.6        | 4.95 kN   |
| F16             | v.b. verdieping | (3.75+2.50)*2.2*0.6 | 8.25 kN   |

**Balk 4**

| Index | Omschrijving    | Formule | Waarde   |
|-------|-----------------|---------|----------|
| F17   | v.b. verdieping | 87.20   | 87.20 kN |

Project...: - pitpotstal de Marsen  
Onderdeel: het Twiske

**Balk 5**

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| Index | Omschrijving    | Formule | Waarde   |
|-------|-----------------|---------|----------|
| F18   | v.b. verdieping | 87.20   | 87.20 kN |

**Balk 6**

---

| Index | Omschrijving    | Formule | Waarde   |
|-------|-----------------|---------|----------|
| F19   | v.b. verdieping | 87.20   | 87.20 kN |

**Balk 7**

---

**Balk 8**

---

| Type:-QZGlobaal |                 |              |           |
|-----------------|-----------------|--------------|-----------|
| Index           | Omschrijving    | Formule      | Waarde    |
| q45             | v.b. verdieping | 3.75*2.2     | 8.25 kN/m |
| Type:-PZLokaal  |                 |              |           |
| F20             | v.b. verdieping | 3.75*2.2*1.0 | 8.25 kN   |

**Balk 9**

---

**Balk 10**

---

**Balk 11**

---

| Index | Omschrijving    | Formule | Waarde   |
|-------|-----------------|---------|----------|
| F22   | v.b. verdieping | 3.20    | 3.20 kN  |
| F21   | v.b. verdieping | 39.10   | 39.10 kN |

**Balk 12**

---

**Balk 13**

---

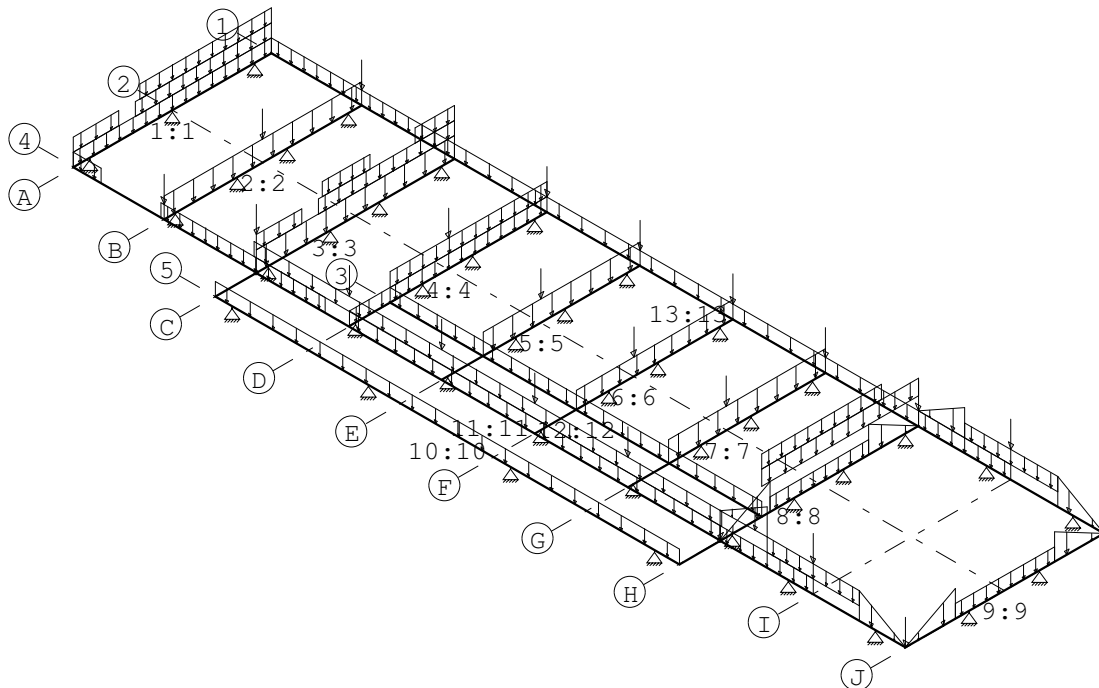
| Index | Omschrijving    | Formule | Waarde   |
|-------|-----------------|---------|----------|
| F23   | v.b. verdieping | 26.00   | 26.00 kN |
| F24   | v.b. verdieping | 10.80   | 10.80 kN |



Project...: - pitpotstal de Marsen  
Onderdeel: het Twiske

## VELDBELASTINGEN

B.G:1 Permanent



## VELDBELASTINGEN

Balk 1:1 B.G:1 Permanent

| Last | Index | Type     | q1/p/m | q2     | Afstand | Lengte | Exc.  |
|------|-------|----------|--------|--------|---------|--------|-------|
| 1    | q1    | 1:q-last | -8.640 | -8.640 | 0.000   | 9.600  | 0.000 |
| 2    | q2    | 1:q-last | -0.550 | -0.550 | 3.000   | 6.600  | 0.000 |
| 3    | q6    | 1:q-last | -6.703 | -6.703 | 0.000   | 2.200  | 0.000 |
| 4    | q6    | 1:q-last | -6.703 | -6.703 | 3.200   | 6.400  | 0.000 |

## VELDBELASTINGEN

Balk 2:2 B.G:1 Permanent

| Last | Index | Type       | q1/p/m  | q2      | Afstand | Lengte | Exc.  |
|------|-------|------------|---------|---------|---------|--------|-------|
| 1    | q3    | 1:q-last   | -23.760 | -23.760 | 0.000   | 9.600  | 0.000 |
| 2    | F1    | 8:Puntlast | -13.500 |         | 4.800   |        | 0.000 |

## VELDBELASTINGEN

Balk 3:3 B.G:1 Permanent

| Last | Index | Type       | q1/p/m  | q2      | Afstand | Lengte | Exc.  |
|------|-------|------------|---------|---------|---------|--------|-------|
| 1    | q4    | 1:q-last   | -23.760 | -23.760 | 2.000   | 9.600  | 0.000 |
| 2    | q5    | 1:q-last   | -7.165  | -7.165  | 2.000   | 2.200  | 0.000 |
| 3    | q5    | 1:q-last   | -7.165  | -7.165  | 5.200   | 2.300  | 0.000 |
| 4    | q5    | 1:q-last   | -7.165  | -7.165  | 9.700   | 1.900  | 0.000 |
| 5    | q7    | 1:q-last   | -0.550  | -0.550  | 5.000   | 6.600  | 0.000 |
| 6    | F2    | 8:Puntlast | -1.449  |         | 2.000   |        | 0.000 |

## VELDBELASTINGEN

Balk 4:4 B.G:1 Permanent

| Last | Index | Type       | q1/p/m  | q2      | Afstand | Lengte | Exc.  |
|------|-------|------------|---------|---------|---------|--------|-------|
| 1    | q8    | 1:q-last   | -8.640  | -8.640  | 0.000   | 9.600  | 0.000 |
| 2    | q9    | 1:q-last   | -16.050 | -16.050 | 2.000   | 7.600  | 0.000 |
| 3    | F3    | 8:Puntlast | -17.600 |         | 4.800   |        | 0.000 |

## VELDBELASTINGEN

Balk 5:5 B.G:1 Permanent

| Last | Index | Type       | q1/p/m  | q2      | Afstand | Lengte | Exc.  |
|------|-------|------------|---------|---------|---------|--------|-------|
| 1    | q10   | 1:q-last   | -24.690 | -24.690 | 2.000   | 7.600  | 0.000 |
| 2    | F4    | 8:Puntlast | -17.600 |         | 4.800   |        | 0.000 |

**VELDBELASTINGEN**

Balk 6:6 B.G:1 Permanent

| Last | Index | Type       | q1/p/m  | q2      | Afstand | Lengte | Exc.  |
|------|-------|------------|---------|---------|---------|--------|-------|
| 1    | q11   | 1:q-last   | -20.060 | -20.060 | 2.000   | 7.600  | 0.000 |
| 2    | F5    | 8:Puntlast | -17.600 |         | 4.800   |        | 0.000 |

**VELDBELASTINGEN**

Balk 7:7 B.G:1 Permanent

| Last | Index | Type       | q1/p/m  | q2      | Afstand | Lengte | Exc.  |
|------|-------|------------|---------|---------|---------|--------|-------|
| 1    | q10   | 1:q-last   | -24.690 | -24.690 | 2.000   | 7.600  | 0.000 |
| 2    | F4    | 8:Puntlast | -17.600 |         | 4.800   |        | 0.000 |

**VELDBELASTINGEN**

Balk 8:8 B.G:1 Permanent

| Last | Index | Type       | q1/p/m  | q2      | Afstand | Lengte | Exc.  |
|------|-------|------------|---------|---------|---------|--------|-------|
| 1    |       | 1:q-last   | 0.000   | -6.600  | 2.000   | 2.400  | 0.000 |
| 2    | q12   | 1:q-last   | -6.600  | -6.600  | 4.400   | 4.800  | 0.000 |
| 3    |       | 1:q-last   | -6.600  | 0.000   | 9.200   | 2.400  | 0.000 |
| 4    | q13   | 1:q-last   | -18.433 | -18.433 | 4.000   | 7.600  | 0.000 |
| 5    | q14   | 1:q-last   | -0.550  | -0.550  | 4.000   | 5.800  | 0.000 |
| 6    | F6    | 8:Puntlast | -8.250  |         | 2.000   |        | 0.000 |

**VELDBELASTINGEN**

Balk 9:9 B.G:1 Permanent

| Last | Index | Type     | q1/p/m  | q2      | Afstand | Lengte | Exc.  |
|------|-------|----------|---------|---------|---------|--------|-------|
| 1    | q15   | 1:q-last | -10.920 | -10.920 | 2.400   | 4.800  | 0.000 |
| 2    |       | 1:q-last | 0.000   | -10.920 | 0.000   | 2.400  | 0.000 |
| 3    |       | 1:q-last | -10.920 | 0.000   | 7.200   | 2.400  | 0.000 |

**VELDBELASTINGEN**

Balk 10:10 B.G:1 Permanent

| Last | Index | Type     | q1/p/m | q2     | Afstand | Lengte | Exc.  |
|------|-------|----------|--------|--------|---------|--------|-------|
| 1    | q16   | 1:q-last | -4.800 | -4.800 | 0.000   | 22.500 | 0.000 |

**VELDBELASTINGEN**

Balk 11:11 B.G:1 Permanent

| Last | Index | Type       | q1/p/m  | q2     | Afstand | Lengte | Exc.  |
|------|-------|------------|---------|--------|---------|--------|-------|
| 1    | q17   | 1:q-last   | -5.720  | -5.720 | 0.000   | 1.350  | 0.000 |
| 2    | q17   | 1:q-last   | -5.720  | -5.720 | 4.250   | 7.950  | 0.000 |
| 3    | q18   | 1:q-last   | -4.800  | -4.800 | 8.750   | 22.700 | 0.000 |
| 4    | q19   | 1:q-last   | -5.640  | -5.640 | 13.375  | 18.000 | 0.000 |
| 5    | q17   | 1:q-last   | -5.720  | -5.720 | 31.375  | 4.500  | 0.000 |
| 6    |       | 1:q-last   | 0.000   | -7.200 | 31.375  | 2.250  | 0.000 |
| 7    | q20   | 1:q-last   | -7.200  | -7.200 | 33.625  | 4.500  | 0.000 |
| 8    |       | 1:q-last   | -7.200  | 0.000  | 38.125  | 2.250  | 0.000 |
| 9    | F7    | 8:Puntlast | -7.200  |        | 4.375   |        | 0.000 |
| 10   | F8    | 8:Puntlast | -16.500 |        | 13.375  |        | 0.000 |
| 11   | F8    | 8:Puntlast | -16.500 |        | 17.875  |        | 0.000 |
| 12   | F8    | 8:Puntlast | -16.500 |        | 22.375  |        | 0.000 |
| 13   | F8    | 8:Puntlast | -16.500 |        | 26.875  |        | 0.000 |
| 14   | F9    | 8:Puntlast | -2.592  |        | 35.875  |        | 0.000 |
| 15   | F9    | 8:Puntlast | -2.592  |        | 40.375  |        | 0.000 |

**VELDBELASTINGEN**

Balk 12:12 B.G:1 Permanent

| Last | Index | Type     | q1/p/m | q2     | Afstand | Lengte | Exc.  |
|------|-------|----------|--------|--------|---------|--------|-------|
| 1    | q21   | 1:q-last | -4.800 | -4.800 | 0.000   | 18.000 | 0.000 |

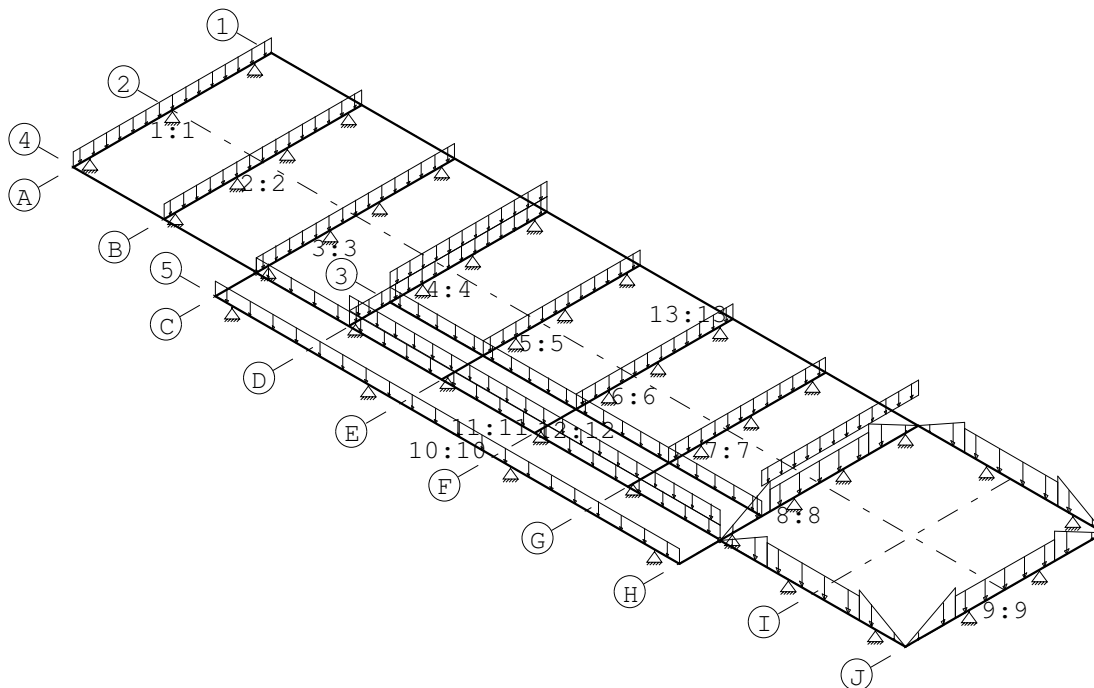
**VELDBELASTINGEN**

Balk 13:13 B.G:1 Permanent

| Last | Index | Type       | q1/p/m | q2     | Afstand | Lengte | Exc.  |
|------|-------|------------|--------|--------|---------|--------|-------|
| 1    | q22   | 1:q-last   | -5.720 | -5.720 | 0.000   | 8.875  | 0.000 |
| 2    | q23   | 1:q-last   | -4.320 | -4.320 | 31.375  | 4.500  | 0.000 |
| 3    | q24   | 1:q-last   | -9.360 | -9.360 | 8.875   | 22.500 | 0.000 |
| 4    |       | 1:q-last   | 0.000  | -7.200 | 31.375  | 2.250  | 0.000 |
| 5    | q25   | 1:q-last   | -7.200 | -7.200 | 33.625  | 4.500  | 0.000 |
| 6    |       | 1:q-last   | -7.200 | 0.000  | 38.125  | 2.250  | 0.000 |
| 7    | F10   | 8:Puntlast | -9.500 |        | 4.375   |        | 0.000 |
| 8    | F11   | 8:Puntlast | -7.300 |        | 13.375  |        | 0.000 |
| 9    | F11   | 8:Puntlast | -7.300 |        | 17.875  |        | 0.000 |
| 10   | F11   | 8:Puntlast | -7.300 |        | 22.375  |        | 0.000 |
| 11   | F11   | 8:Puntlast | -7.300 |        | 26.875  |        | 0.000 |
| 12   | F12   | 8:Puntlast | -5.616 |        | 31.375  |        | 0.000 |
| 13   | F13   | 8:Puntlast | -2.592 |        | 35.875  |        | 0.000 |
| 14   | F13   | 8:Puntlast | -2.592 |        | 40.375  |        | 0.000 |

## VELDBELASTINGEN

B.G:2 v.b. beggr



### VELDBELASTINGEN

Balk 1:1 B.G:2 v.b. beggr

| Last Index | Type     | q1/p/m | q2     | Afstand | Lengte | Exc.  |
|------------|----------|--------|--------|---------|--------|-------|
| 1 q26      | 1:q-last | -8.100 | -8.100 | 0.000   | 9.600  | 0.000 |

### VELDBELASTINGEN

Balk 2:2 B.G:2 v.b. beggr

| Last Index | Type     | q1/p/m  | q2      | Afstand | Lengte | Exc.  |
|------------|----------|---------|---------|---------|--------|-------|
| 1 q27      | 1:q-last | -21.600 | -21.600 | 0.000   | 9.600  | 0.000 |

### VELDBELASTINGEN

Balk 3:3 B.G:2 v.b. beggr

| Last Index | Type     | q1/p/m  | q2      | Afstand | Lengte | Exc.  |
|------------|----------|---------|---------|---------|--------|-------|
| 1 q28      | 1:q-last | -21.600 | -21.600 | 2.000   | 9.600  | 0.000 |

### VELDBELASTINGEN

Balk 4:4 B.G:2 v.b. beggr

| Last Index | Type     | q1/p/m | q2     | Afstand | Lengte | Exc.  |
|------------|----------|--------|--------|---------|--------|-------|
| 1 q29      | 1:q-last | -8.100 | -8.100 | 0.000   | 9.600  | 0.000 |
| 2 q30      | 1:q-last | -8.040 | -8.040 | 2.000   | 7.600  | 0.000 |

### VELDBELASTINGEN

Balk 5:5 B.G:2 v.b. beggr

| Last Index | Type     | q1/p/m  | q2      | Afstand | Lengte | Exc.  |
|------------|----------|---------|---------|---------|--------|-------|
| 1 q31      | 1:q-last | -22.100 | -22.100 | 2.000   | 7.600  | 0.000 |

Project...: - pitpotstal de Marsen  
Onderdeel: het Twiske

**VELDBELASTINGEN**

Balk 6:6 B.G:2 v.b. beggr

| Last Index | Type     | q1/p/m  | q2      | Afstand | Lengte | Exc.  |
|------------|----------|---------|---------|---------|--------|-------|
| 1 q32      | 1:q-last | -20.600 | -20.600 | 2.000   | 7.600  | 0.000 |

**VELDBELASTINGEN**

Balk 7:7 B.G:2 v.b. beggr

| Last Index | Type     | q1/p/m  | q2      | Afstand | Lengte | Exc.  |
|------------|----------|---------|---------|---------|--------|-------|
| 1 q31      | 1:q-last | -22.100 | -22.100 | 2.000   | 7.600  | 0.000 |

**VELDBELASTINGEN**

Balk 8:8 B.G:2 v.b. beggr

| Last Index | Type     | q1/p/m  | q2      | Afstand | Lengte | Exc.  |
|------------|----------|---------|---------|---------|--------|-------|
| 1 q33      | 1:q-last | -8.100  | -8.100  | 4.000   | 7.600  | 0.000 |
| 2          | 1:q-last | 0.000   | -33.000 | 2.000   | 2.400  | 0.000 |
| 3 q34      | 1:q-last | -33.000 | -33.000 | 4.400   | 4.800  | 0.000 |
| 4          | 1:q-last | -33.000 | 0.000   | 9.200   | 2.400  | 0.000 |

**VELDBELASTINGEN**

Balk 9:9 B.G:2 v.b. beggr

| Last Index | Type     | q1/p/m  | q2      | Afstand | Lengte | Exc.  |
|------------|----------|---------|---------|---------|--------|-------|
| 1          | 1:q-last | 0.000   | -33.000 | 0.000   | 2.400  | 0.000 |
| 2 q35      | 1:q-last | -33.000 | -33.000 | 2.400   | 4.800  | 0.000 |
| 3          | 1:q-last | -33.000 | 0.000   | 7.200   | 2.400  | 0.000 |

**VELDBELASTINGEN**

Balk 10:10 B.G:2 v.b. beggr

| Last Index | Type     | q1/p/m | q2     | Afstand | Lengte | Exc.  |
|------------|----------|--------|--------|---------|--------|-------|
| 1 q36      | 1:q-last | -4.000 | -4.000 | 0.000   | 22.500 | 0.000 |

**VELDBELASTINGEN**

Balk 11:11 B.G:2 v.b. beggr

| Last Index | Type     | q1/p/m  | q2      | Afstand | Lengte | Exc.  |
|------------|----------|---------|---------|---------|--------|-------|
| 1 q37      | 1:q-last | -4.000  | -4.000  | 8.875   | 22.500 | 0.000 |
| 2 q38      | 1:q-last | -4.000  | -4.000  | 13.375  | 18.000 | 0.000 |
| 3          | 1:q-last | 0.000   | -36.000 | 31.375  | 2.250  | 0.000 |
| 4 q39      | 1:q-last | -36.000 | -36.000 | 33.625  | 4.500  | 0.000 |
| 5          | 1:q-last | -36.000 | 0.000   | 38.125  | 2.250  | 0.000 |

**VELDBELASTINGEN**

Balk 12:12 B.G:2 v.b. beggr

| Last Index | Type     | q1/p/m | q2     | Afstand | Lengte | Exc.  |
|------------|----------|--------|--------|---------|--------|-------|
| 1 q40      | 1:q-last | -4.000 | -4.000 | 0.000   | 18.000 | 0.000 |

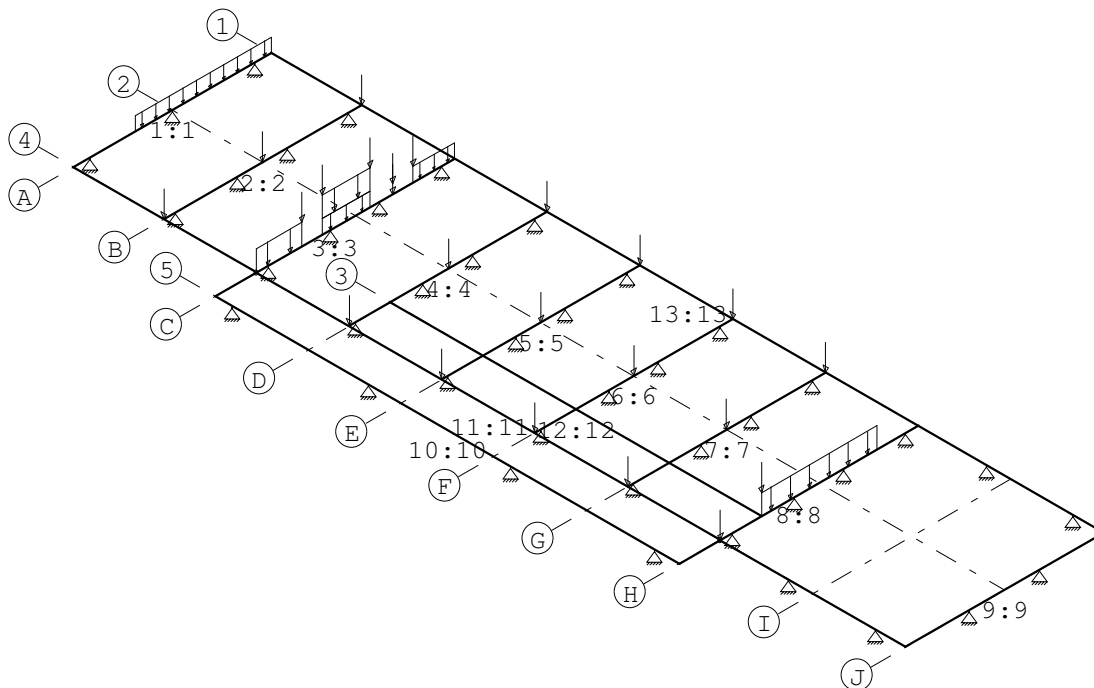
**VELDBELASTINGEN**

Balk 13:13 B.G:2 v.b. beggr

| Last Index | Type     | q1/p/m  | q2      | Afstand | Lengte | Exc.  |
|------------|----------|---------|---------|---------|--------|-------|
| 1          | 1:q-last | 0.000   | -36.000 | 31.375  | 2.250  | 0.000 |
| 2 q41      | 1:q-last | -36.000 | -36.000 | 33.625  | 4.500  | 0.000 |
| 3          | 1:q-last | -36.000 | 0.000   | 38.125  | 2.250  | 0.000 |

## VELDBELASTINGEN

B.G:3 v.b. verd



## VELDBELASTINGEN

Balk 1:1 B.G:3 v.b. verd

| Last Index | Type     | q1/p/m | q2     | Afstand | Lengte | Exc.  |
|------------|----------|--------|--------|---------|--------|-------|
| 1 q42      | 1:q-last | -5.500 | -5.500 | 3.000   | 6.600  | 0.000 |

## VELDBELASTINGEN

Balk 2:2 B.G:3 v.b. verd

| Last Index | Type       | q1/p/m  | q2 | Afstand | Lengte | Exc.  |
|------------|------------|---------|----|---------|--------|-------|
| 1 F14      | 8:Puntlast | -49.100 |    | 4.800   |        | 0.000 |

## VELDBELASTINGEN

Balk 3:3 B.G:3 v.b. verd

| Last Index | Type       | q1/p/m | q2     | Afstand | Lengte | Exc.  |
|------------|------------|--------|--------|---------|--------|-------|
| 1 q43      | 1:q-last   | -5.500 | -5.500 | 5.200   | 2.300  | 0.000 |
| 2 q44      | 1:q-last   | -8.250 | -8.250 | 2.000   | 2.200  | 0.000 |
| 3 F15      | 8:Puntlast | -4.950 |        | 4.200   |        | 0.000 |
| 4 F15      | 8:Puntlast | -4.950 |        | 5.200   |        | 0.000 |
| 5 F16      | 8:Puntlast | -8.250 |        | 7.500   |        | 0.000 |
| 6 F16      | 8:Puntlast | -8.250 |        | 8.600   |        | 0.000 |
| 7 F16      | 8:Puntlast | -8.250 |        | 8.600   |        | 0.000 |
| 8 F16      | 8:Puntlast | -8.250 |        | 9.600   |        | 0.000 |
| 9 q44      | 1:q-last   | -8.250 | -8.250 | 5.200   | 2.300  | 0.000 |
| 10 q43     | 1:q-last   | -5.500 | -5.500 | 9.600   | 2.000  | 0.000 |

## VELDBELASTINGEN

Balk 4:4 B.G:3 v.b. verd

| Last Index | Type       | q1/p/m  | q2 | Afstand | Lengte | Exc.  |
|------------|------------|---------|----|---------|--------|-------|
| 1 F17      | 8:Puntlast | -87.200 |    | 4.800   |        | 0.000 |

## VELDBELASTINGEN

Balk 5:5 B.G:3 v.b. verd

| Last Index | Type       | q1/p/m  | q2 | Afstand | Lengte | Exc.  |
|------------|------------|---------|----|---------|--------|-------|
| 1 F18      | 8:Puntlast | -87.200 |    | 4.800   |        | 0.000 |

## VELDBELASTINGEN

Balk 6:6 B.G:3 v.b. verd

| Last Index | Type       | q1/p/m  | q2 | Afstand | Lengte | Exc.  |
|------------|------------|---------|----|---------|--------|-------|
| 1 F19      | 8:Puntlast | -87.200 |    | 4.800   |        | 0.000 |

Project...: - pitpotstal de Marsen  
Onderdeel: het Twiske

**VELDBELASTINGEN**

Balk 7:7 B.G:3 v.b. verd

| Last Index | Type       | q1/p/m  | q2 | Afstand | Lengte | Exc.  |
|------------|------------|---------|----|---------|--------|-------|
| 1 F18      | 8:Puntlast | -87.200 |    | 4.800   |        | 0.000 |

**VELDBELASTINGEN**

Balk 8:8 B.G:3 v.b. verd

| Last Index | Type       | q1/p/m | q2     | Afstand | Lengte | Exc.  |
|------------|------------|--------|--------|---------|--------|-------|
| 1 q45      | 1:q-last   | -8.250 | -8.250 | 4.000   | 5.600  | 0.000 |
| 2 F20      | 8:Puntlast | -8.250 |        | 2.000   |        | 0.000 |
| 3 F20      | 8:Puntlast | -8.250 |        | 4.000   |        | 0.000 |

**VELDBELASTINGEN**

Balk 11:11 B.G:3 v.b. verd

| Last Index | Type       | q1/p/m  | q2 | Afstand | Lengte | Exc.  |
|------------|------------|---------|----|---------|--------|-------|
| 1 F22      | 8:Puntlast | -3.200  |    | 4.375   |        | 0.000 |
| 2 F21      | 8:Puntlast | -39.100 |    | 13.375  |        | 0.000 |
| 3 F21      | 8:Puntlast | -39.100 |    | 17.875  |        | 0.000 |
| 4 F21      | 8:Puntlast | -39.100 |    | 22.375  |        | 0.000 |
| 5 F21      | 8:Puntlast | -39.100 |    | 26.875  |        | 0.000 |

**VELDBELASTINGEN**

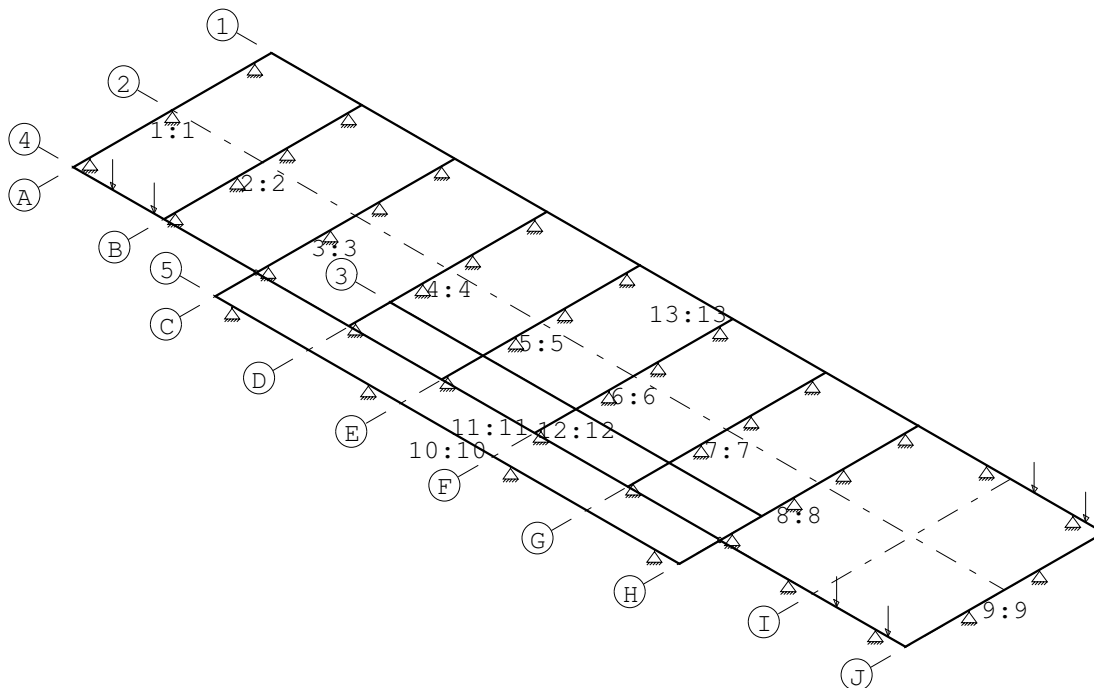
Balk 13:13 B.G:3 v.b. verd

| Last Index | Type       | q1/p/m  | q2 | Afstand | Lengte | Exc.  |
|------------|------------|---------|----|---------|--------|-------|
| 1 F23      | 8:Puntlast | -26.000 |    | 4.375   |        | 0.000 |
| 2 F24      | 8:Puntlast | -10.800 |    | 13.375  |        | 0.000 |
| 3 F24      | 8:Puntlast | -10.800 |    | 17.875  |        | 0.000 |
| 4 F24      | 8:Puntlast | -10.800 |    | 22.375  |        | 0.000 |
| 5 F24      | 8:Puntlast | -10.800 |    | 26.875  |        | 0.000 |

Project...: - pitpotstal de Marsen  
Onderdeel: het Twiske

## VELDBELASTINGEN

B.G:4 v.b. verkeer



## VELDBELASTINGEN

Balk 11:11 B.G:4 v.b. verkeer

| Last Index | Type       | q1/p/m  | q2 | Afstand | Lengte | Exc.  |
|------------|------------|---------|----|---------|--------|-------|
| 1          | 8:Puntlast | -30.000 |    | 1.900   |        | 0.000 |
| 2          | 8:Puntlast | -30.000 |    | 3.900   |        | 0.000 |
| 3          | 8:Puntlast | -50.000 |    | 39.500  |        | 0.000 |
| 4          | 8:Puntlast | -50.000 |    | 37.000  |        | 0.000 |

## VELDBELASTINGEN

Balk 13:13 B.G:4 v.b. verkeer

| Last Index | Type       | q1/p/m  | q2 | Afstand | Lengte | Exc.  |
|------------|------------|---------|----|---------|--------|-------|
| 1          | 8:Puntlast | -50.000 |    | 37.000  |        | 0.000 |
| 2          | 8:Puntlast | -50.000 |    | 39.500  |        | 0.000 |

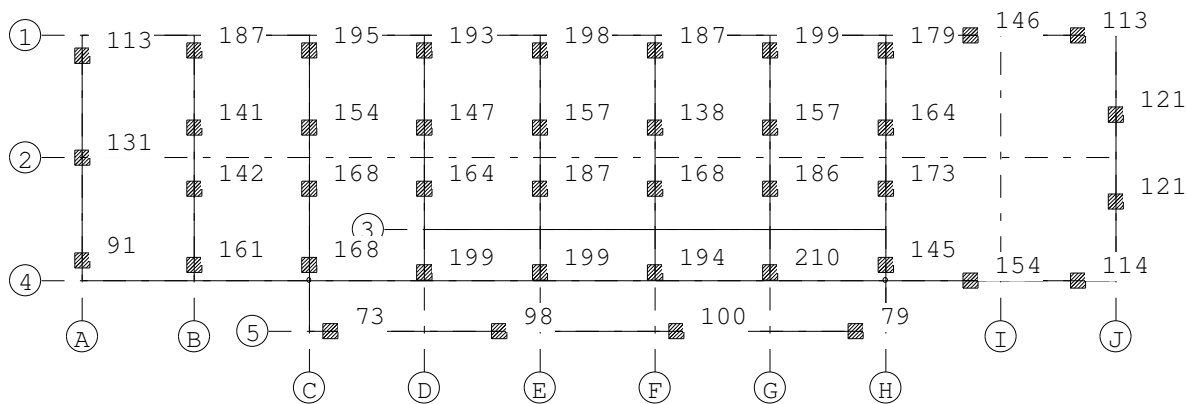
## BELASTINGCOMBINATIES

| BC | Type  | BG | Gen. | Factor | BG | Gen. | Factor | BG | Gen. | Factor | BG | Gen. | Factor |
|----|-------|----|------|--------|----|------|--------|----|------|--------|----|------|--------|
| 1  | Fund. | 1  | Perm | 1.22   | 2  | psi0 | 1.35   | 3  | psi0 | 1.35   |    |      |        |
| 2  | Fund. | 1  | Perm | 1.08   | 4  | Extr | 1.35   | 3  | Extr | 1.35   |    |      |        |
| 3  | Fund. | 1  | Extr | 1.08   | 4  | Extr | 1.35   | 3  | Extr | 1.35   |    |      |        |
| 4  | Kar.  | 1  | Perm | 1.00   | 2  | Extr | 1.00   | 3  | Extr | 1.00   |    |      |        |
| 5  | Freq. | 1  | Perm | 1.00   | 2  | psi1 | 1.00   | 3  | psi2 | 1.00   |    |      |        |
| 6  | Quas. | 1  | Perm | 1.00   | 2  | psi2 | 1.00   | 3  | psi2 | 1.00   |    |      |        |
| 7  | Quas. | 1  | Extr | 1.00   | 3  | psi2 | 1.00   | 2  | psi2 | 1.00   |    |      |        |
| 8  | Blij. | 1  | Perm | 1.00   |    |      |        |    |      |        |    |      |        |

Project...: - pitpotstal de Marsen  
Onderdeel: het Twiske

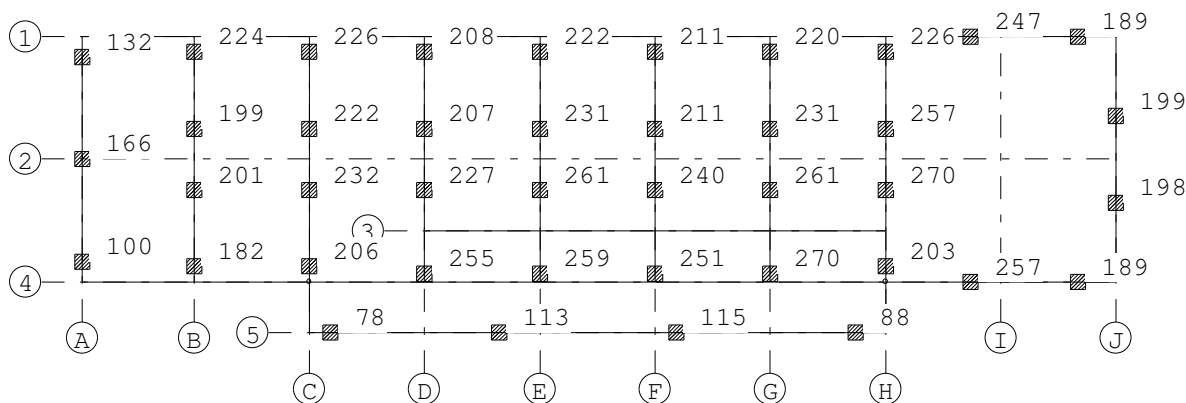
**REACTIES** Fysisch lineair

B.C:1 Fundamenteel (6.10a)



**REACTIES** Fysisch lineair

B.C:2 Fundamenteel (6.10b)



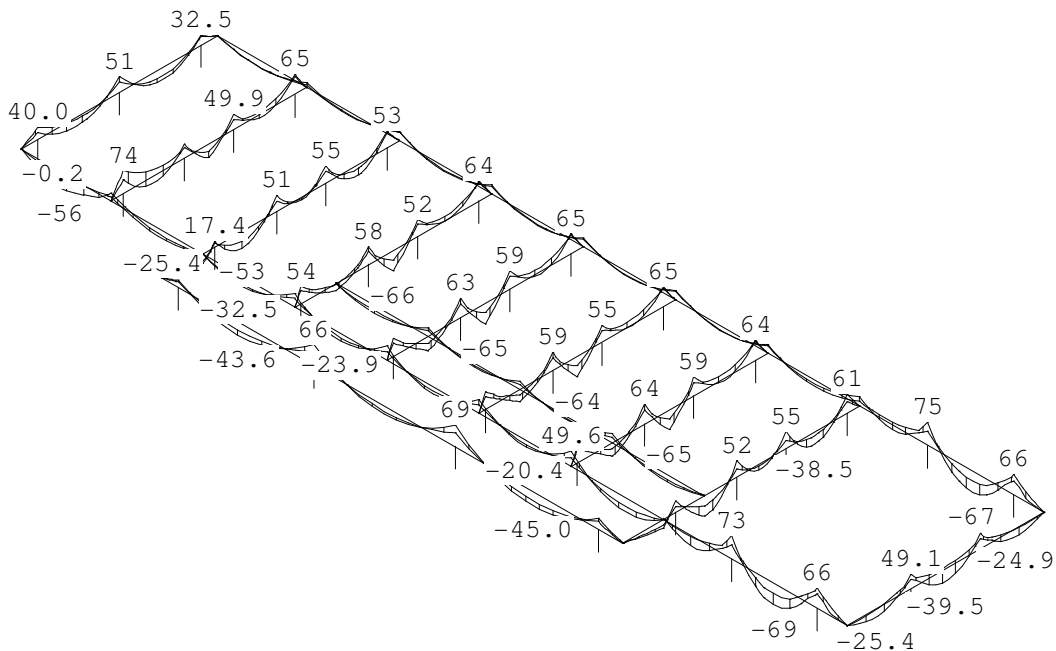


Project...: - pitpotstal de Marsen  
Onderdeel: het Twiske

**OMHULLENDE VAN DE FUNDAMENTELE COMBINATIES**

**MOMENTEN** Fysisch lineair

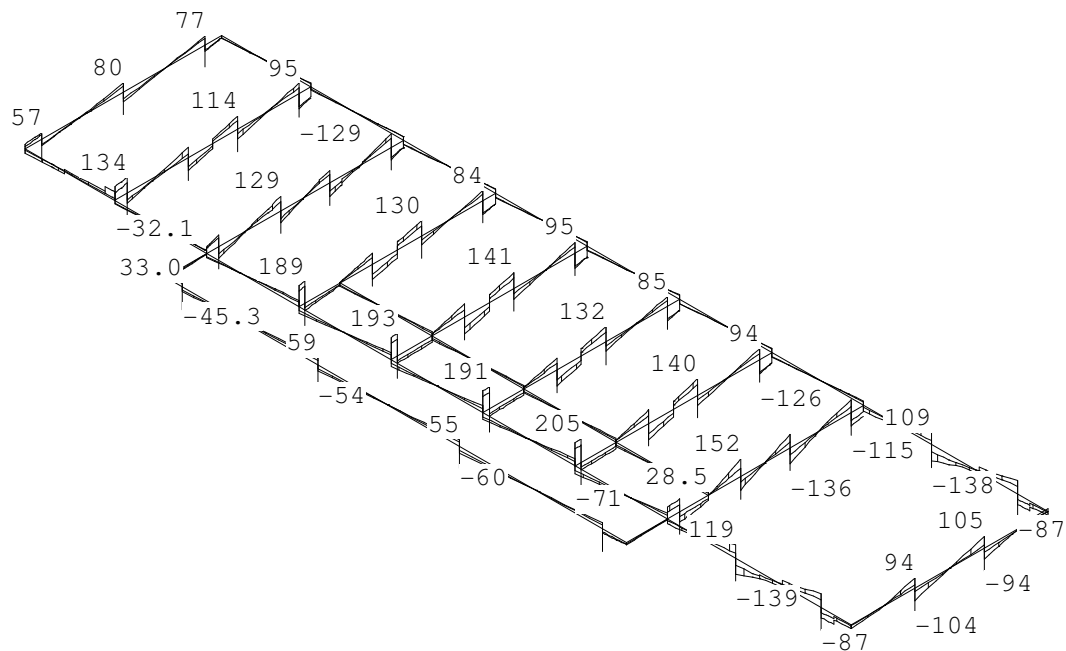
Fundamentele combinatie



Project...: - pitpotstal de Marsen  
Onderdeel: het Twiske

**DWARSKRACHTEN** Fysisch lineair

Fundamentele combinatie



**PROFIELGEGEVENS Balk**

[N] [mm]

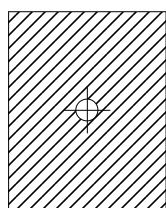
t.b.v. profiel:1 B\*H 400\*500

**Algemeen**

|           |                 |            |               |
|-----------|-----------------|------------|---------------|
| Materiaal | : C20/25        | Traagheid  | : 4.1667e+009 |
| Oppervlak | : 2.000000e+005 | Vormfactor | : 0.00        |
| Staaftype | : 0:normaal     |            |               |

**Doorsnede**

|            |         |        |       |                           |       |
|------------|---------|--------|-------|---------------------------|-------|
| breedte    | : 400   | hoogte | : 500 | zwaartepunt tov onderkant | : 250 |
| Referentie | : Boven |        |       |                           |       |



200 200

|                              |                                        |                     |         |
|------------------------------|----------------------------------------|---------------------|---------|
| Fictieve dikte               | : 222.2                                |                     |         |
| Betonkwaliteit element       | : C20/25                               | Kruipcoëf.          | : 3.010 |
| Soort spanningsrekdiagram    | : Parabolisch - rechthoekig diagram    |                     |         |
| Staalkwaliteit hoofdwapening | : 500                                  | $\epsilon_{uk}$     | : 5.00  |
| Soort spanningsrekdiagram    | : Bi-lineair diagram met klimmende tak |                     |         |
| Staalkwaliteit beugels       | : 500                                  |                     |         |
| Bundels toepassen            | : Nee                                  | Breedte stort sleuf | : 50    |
| Geprefabriceerd element      | : Nee                                  |                     |         |

Project...: - pitpotstal de Marsen  
Onderdeel: het Twiske

| Betondekking                               |   | Boven                        |                        |    | Onder         |     |    |
|--------------------------------------------|---|------------------------------|------------------------|----|---------------|-----|----|
| Milieu                                     | : | XC3                          |                        |    | XC3           |     |    |
| Gestort tegen bestaand beton               | : | Nee                          |                        |    | Nee           |     |    |
| Element met plaatgeometrie                 | : | Nee                          |                        |    | Nee           |     |    |
| Specifieke kwaliteitsbeheersing            | : | Nee                          |                        |    | Nee           |     |    |
| Oneffen beton oppervlak                    | : | Nee                          |                        |    | Nee           |     |    |
| Ondergrond                                 | : | Glad / N.v.t.                |                        |    | Glad / N.v.t. |     |    |
| Constructieklasse                          | : | S4                           |                        |    | S4            |     |    |
| Grootste korrel                            | : | 31.5                         |                        |    |               |     |    |
|                                            |   |                              |                        |    |               |     |    |
| Hoofdwapening                              | : | 2de laag                     |                        |    | 2de laag      |     |    |
| Nominale dekking                           | : | 30                           |                        |    | 30            |     |    |
| Toegepaste dekking                         | : | 43                           |                        |    | 43            |     |    |
| Gelijkwaardige diameter                    | : | 12                           |                        |    | 12            |     |    |
| $C_{min,b}$ $C_{min,dur}$ $\Delta C_{dur}$ | : | 12                           | 25                     | 0  | 12            | 25  | 0  |
| $C_{min}$ $\Delta C_{dev}$ $C_{nom}$       | : | 25                           | 5                      | 30 | 25            | 5   | 30 |
|                                            |   |                              |                        |    |               |     |    |
| Beugel / Verdeelwapening                   | : | 1ste laag                    |                        |    | 1ste laag     |     |    |
| Nominale dekking                           | : | 30                           |                        |    | 30            |     |    |
| Toegepaste dekking                         | : | 35                           |                        |    | 35            |     |    |
| Gelijkwaardige diameter                    | : | 8                            |                        |    | 8             |     |    |
| $C_{min,b}$ $C_{min,dur}$ $\Delta C_{dur}$ | : | 8                            | 25                     | 0  | 8             | 25  | 0  |
| $C_{min}$ $\Delta C_{dev}$ $C_{nom}$       | : | 25                           | 5                      | 30 | 25            | 5   | 30 |
|                                            |   |                              |                        |    |               |     |    |
| Wapening                                   |   | Boven                        |                        |    | Onder         |     |    |
| Diameter nuttige hoogte                    | : | 12.0                         |                        |    | 12.0          |     |    |
| Art. 7.3.2 minimum wapening                | : | Ja                           |                        |    | Ja            |     |    |
| Beugels                                    |   |                              |                        |    |               |     |    |
| Voorkeur h.o.h. afstand                    | : | 300;250;200;150;100;75;60;50 |                        |    |               |     |    |
| Beugeldiameter                             | : | 8                            |                        |    |               |     |    |
| Betonkwaliteit                             | : | C20/25                       |                        |    |               |     |    |
| Breedte t.b.v. dwarskracht                 | : | 400                          | Hoogte t.b.v. dwarskr: |    |               | 500 |    |
| Aantal beugelsneden per beugel             | : | 2                            |                        |    |               |     |    |
| Min. hoek betondrukdiagonaal $\theta$      | : | 21.8                         | z berekenen via:       |    |               | MRd |    |

**PROFIELGEGEVENS Balk**
**[N] [mm]**

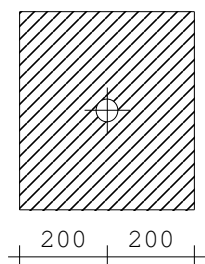
t.b.v. profiel:2 B\*H 400\*450

**Algemeen**

|           |   |               |                         |
|-----------|---|---------------|-------------------------|
| Materiaal | : | C20/25        |                         |
| Oppervlak | : | 1.800000e+005 | Traagheid : 3.0375e+009 |
| Staaftype | : | 0:normaal     | Vormfactor : 0.00       |

**Doorsnede**

|            |         |          |     |                             |     |
|------------|---------|----------|-----|-----------------------------|-----|
| breedte :  | 400     | hoogte : | 450 | zwaartepunt tov onderkant : | 225 |
| Referentie | : Boven |          |     |                             |     |



|                              |   |                                      |                      |         |
|------------------------------|---|--------------------------------------|----------------------|---------|
| Fictieve dikte               | : | 211.8                                |                      |         |
| Betonkwaliteit element       | : | C20/25                               | Kruipcoëf.           | : 3.010 |
| Soort spanningsrekdiagram    | : | Parabolisch - rechthoekig diagram    |                      |         |
| Staalkwaliteit hoofdwapening | : | 500                                  | $\epsilon_{u\ k}$    | : 5.00  |
| Soort spanningsrekdiagram    | : | Bi-lineair diagram met klimmende tak |                      |         |
| Staalkwaliteit beugels       | : | 500                                  |                      |         |
| Bundels toepassen            | : | Nee                                  | Breedte stort sleuf: | 50      |
| Geprefabriceerd element      | : | Nee                                  |                      |         |

Project...: - pitpotstal de Marsen  
Onderdeel: het Twiske

| Betondekking                               |   | Boven                        |                        |    | Onder         |    |    |
|--------------------------------------------|---|------------------------------|------------------------|----|---------------|----|----|
| Milieu                                     | : | XC3                          |                        |    | XC3           |    |    |
| Gestort tegen bestaand beton               | : | Nee                          |                        |    | Nee           |    |    |
| Element met plaatgeometrie                 | : | Nee                          |                        |    | Nee           |    |    |
| Specifieke kwaliteitsbeheersing            | : | Nee                          |                        |    | Nee           |    |    |
| Oneffen beton oppervlak                    | : | Nee                          |                        |    | Nee           |    |    |
| Ondergrond                                 | : | Glad / N.v.t.                |                        |    | Glad / N.v.t. |    |    |
| Constructieklasse                          | : | S4                           |                        |    | S4            |    |    |
| Grootste korrel                            | : | 31.5                         |                        |    |               |    |    |
|                                            |   |                              |                        |    |               |    |    |
| Hoofdwapening                              | : | 2de laag                     |                        |    | 2de laag      |    |    |
| Nominale dekking                           | : | 30                           |                        |    | 30            |    |    |
| Toegepaste dekking                         | : | 43                           |                        |    | 43            |    |    |
| Gelijkwaardige diameter                    | : | 12                           |                        |    | 12            |    |    |
| $C_{min,b}$ $C_{min,dur}$ $\Delta C_{dur}$ | : | 12                           | 25                     | 0  | 12            | 25 | 0  |
| $C_{min}$ $\Delta C_{dev}$ $C_{nom}$       | : | 25                           | 5                      | 30 | 25            | 5  | 30 |
|                                            |   |                              |                        |    |               |    |    |
| Beugel / Verdeelwapening                   | : | 1ste laag                    |                        |    | 1ste laag     |    |    |
| Nominale dekking                           | : | 30                           |                        |    | 30            |    |    |
| Toegepaste dekking                         | : | 35                           |                        |    | 35            |    |    |
| Gelijkwaardige diameter                    | : | 8                            |                        |    | 8             |    |    |
| $C_{min,b}$ $C_{min,dur}$ $\Delta C_{dur}$ | : | 8                            | 25                     | 0  | 8             | 25 | 0  |
| $C_{min}$ $\Delta C_{dev}$ $C_{nom}$       | : | 25                           | 5                      | 30 | 25            | 5  | 30 |
|                                            |   |                              |                        |    |               |    |    |
| Wapening                                   |   | Boven                        |                        |    | Onder         |    |    |
| Diameter nuttige hoogte                    | : | 12.0                         |                        |    | 12.0          |    |    |
| Art. 7.3.2 minimum wapening                | : | Ja                           |                        |    | Ja            |    |    |
| Beugels                                    |   |                              |                        |    |               |    |    |
| Voorkeur h.o.h. afstand                    | : | 300;250;200;150;100;75;60;50 |                        |    |               |    |    |
| Beugeldiameter                             | : | 8                            |                        |    |               |    |    |
| Betonkwaliteit                             | : | C20/25                       |                        |    |               |    |    |
| Breedte t.b.v. dwarskracht                 | : | 400                          | Hoogte t.b.v. dwarskr: |    | 450           |    |    |
| Aantal beugelsneden per beugel             | : | 2                            |                        |    |               |    |    |
| Min. hoek betondrukdiagonaal $\theta$      | : | 21.8                         | z berekenen via:       |    | MRd           |    |    |

## Hoofdwapening

Balk 1:1

| Geb. | Vanaf<br>[mm] | Tot<br>[mm] | $M_{Ed}$<br>[kNm] | z B/O<br>[mm] | Ab<br>[mm <sup>2</sup> ] | Aa<br>[mm <sup>2</sup> ] | Opm.    |
|------|---------------|-------------|-------------------|---------------|--------------------------|--------------------------|---------|
| 1    | S1-800        | S1+0        | 39.96             | 405           | Bov                      | 227                      | 227 2   |
| 2    | S1+0          | S1+1340     | 39.96             | 441           | Bov                      | 195                      | 195     |
| 3    | S1+463        | S2-800      | -28.61            | 0             | Ond                      | 175*                     | 175 1   |
| 4    | S2-964        | S2+738      | 50.98             | 439           | Bov                      | 249                      | 249     |
| 5    | S2+671        | S3-485      | -39.95            | 441           | Ond                      | 195                      | 195     |
| 6    | S3-582        | S3+0        | 32.47             | 442           | Bov                      | 180*                     | 180 1   |
| 7    | S3+0          | S3+800      | 32.47             | 405           | Bov                      | 210*                     | 210 1,2 |

Opmerkingen

- [1] \* = Eisen met betrekking tot minimum wapening zijn toegepast, zie nationale bijlage art. 9.2.1.1(1).  
[2] Benodigde wapening en inwendige hefboomsarm zijn bepaald volgens gedrongen ligger detaillering, zie nationale bijlage art. 6.1(10).  
Alle maten zijn zonder verschuiving van de m-lijn en verankering

## Scheurvorming

Balk 1:1

| Geb. | Pos.<br>[mm] | $M_{E,freq}$<br>[kNm] | B/O | $\sigma_s$<br>[N/mm <sup>2</sup> ] | art.  | s<br>opt.<br>[mm] | s<br>max.<br>[mm] | $\sigma_{km}$<br>opt.<br>[mm] | $\sigma_{km}$<br>max.<br>[mm] | $\sigma_b$<br>opt.<br>[N/mm <sup>2</sup> ] | $\sigma_b$<br>max.<br>[N/mm <sup>2</sup> ] | Opm. |
|------|--------------|-----------------------|-----|------------------------------------|-------|-------------------|-------------------|-------------------------------|-------------------------------|--------------------------------------------|--------------------------------------------|------|
| 1    | S1+0         | 19.61                 | Bov | 204.9                              | 7.3.3 |                   | 294               |                               | 23.7                          |                                            |                                            |      |
| 2    | S1+0         | 19.61                 | Bov | 238.0                              | 7.3.3 |                   | 252               |                               | 16.0                          |                                            |                                            |      |
| 3    | S1+1877      | -17.85                | Ond | 240.0                              | 7.3.3 |                   | 250               |                               | 15.6                          |                                            |                                            |      |
| 4    | S2+0         | 33.61                 | Bov | 320.5                              | 7.3.3 |                   | 149               |                               | 9.3                           |                                            |                                            |      |
| 5    | S3-1886      | -23.49                | Ond | 285.2                              | 7.3.3 |                   | 194               |                               | 12.0                          |                                            |                                            |      |
| 6    | S3+0         | 25.12                 | Bov | 329.5                              | 7.3.3 |                   | 138               |                               | 9.0                           |                                            |                                            |      |
| 7    | S3+0         | 25.12                 | Bov | 283.4                              | 7.3.3 |                   | 196               |                               | 12.2                          |                                            |                                            |      |

Project...: - pitpotstal de Marsen  
Onderdeel: het Twiske

**Wring- en dwarskrachtwapening**

Balk 1:1

| Geb. | Vanaf  | Tot    | n | Bgl  | Hoh  | Lengte | <Wringing>             |                      | <Dwarskr.>         |                    | V <sub>Ed</sub> | T <sub>Ed</sub> | Opm. |
|------|--------|--------|---|------|------|--------|------------------------|----------------------|--------------------|--------------------|-----------------|-----------------|------|
|      | [mm]   | [mm]   |   | [mm] | [mm] | [mm]   | A <sub>l a n g s</sub> | A <sub>b g l</sub>   | A <sub>b g l</sub> | A <sub>o p g</sub> | [kN]            | [kNm]           |      |
|      |        |        |   |      |      |        | [mm <sup>2</sup> ]     | [mm <sup>2</sup> /m] | [mm <sup>2</sup> ] | [mm <sup>2</sup> ] |                 |                 |      |
| 1    | S1-800 | S1+0   | 2 | 8.0  | 300  | 800    | 0                      | 0                    | 286                | 0                  | 57              | 0               | 59   |
| 2    | S1+0   | S2-500 | 2 | 8.0  | 300  | 3500   | 0                      | 0                    | 286                | 0                  | 60              | 0               |      |
| 3    | S2-500 | S2+0   | 2 | 8.0  | 300  | 500    | 8                      | 1                    | 286                | 0                  | 80              | 0               | 6    |
| 4    | S2+0   | S2+800 | 2 | 8.0  | 300  | 800    | 8                      | 1                    | 286                | 0                  | 86              | 0               | 6    |
| 5    | S2+800 | S3-500 | 2 | 8.0  | 300  | 2700   | 0                      | 0                    | 286                | 0                  | 56              | 0               |      |
| 6    | S3-500 | S3+0   | 2 | 8.0  | 300  | 500    | 8                      | 1                    | 286                | 0                  | 77              | 0               | 6    |
| 7    | S3+0   | S3+800 | 2 | 8.0  | 300  | 800    | 0                      | 0                    | 286                | 0                  | 56              | 0               | 59   |

Opmerkingen

[6] 9.2.2 (4) 50% van de dwarskrachtwapening moet uit beugels bestaan.

[59] 6.2.3: Z is berekend m.b.v. de gedrongen ligger berekening art 6.1 (10)

**Hoofdwapening**

Balk 2:2

| Geb. | Vanaf   | Tot     | M <sub>Ed</sub> | z    | B/O | Ab                 | Aa                 | Opm. |
|------|---------|---------|-----------------|------|-----|--------------------|--------------------|------|
|      | [mm]    | [mm]    | [kNm]           | [mm] |     | [mm <sup>2</sup> ] | [mm <sup>2</sup> ] |      |
| 1    | S4-600  | S4-591  | -0.97           | 0    | Ond | 153*               | 153                | 54,2 |
| 2    | S4-592  | S4+0    | 74.15           | 370  | Bov | 462                | 462                | 2    |
| 3    | S4+0    | S5-1066 | 74.15           | 434  | Bov | 372                | 377                |      |
| 4    | S4+627  | S5-639  | -22.57          | 0    | Ond | 153*               | 153                | 54   |
| 5    | S5-1066 | S5+556  | 45.47           | 440  | Bov | 222                | 222                |      |
| 6    | S5+471  | S6-452  | -44.03          | 441  | Ond | 215                | 215                |      |
| 7    | S6-584  | S6+1187 | 49.92           | 439  | Bov | 244                | 244                |      |
| 8    | S6+833  | S7-1004 | -10.15          | 0    | Ond | 153*               | 153                | 54   |
| 9    | S6+1187 | S7+0    | 65.24           | 436  | Bov | 323                | 323                |      |
| 10   | S7+0    | S7+587  | 65.24           | 370  | Bov | 406                | 406                | 2    |
| 11   | S7+583  | S7+600  | -1.64           | 0    | Ond | 153*               | 153                | 54,2 |

Opmerkingen

[2] Benodigde wapening en inwendige hefboomsarm zijn bepaald volgens gedrongen ligger detaillering, zie nationale bijlage art. 6.1(10).

Alle maten zijn zonder verschuiving van de m-lijn en verankering

[54] \* = Eisen met betrekking tot minimum wapening ten behoeve van gecontroleerde scheurvorming zijn toegepast volgens art. 7.3.2.

**Scheurvorming**

Balk 2:2

| Geb. | Pos.    | M <sub>E ; f r e q</sub> | B/O | σ <sub>s</sub>       | art.  | s    | s    | Ø <sub>k m</sub> | Ø <sub>k m</sub> | σ <sub>b</sub>       | σ <sub>b</sub>       | Opm. |
|------|---------|--------------------------|-----|----------------------|-------|------|------|------------------|------------------|----------------------|----------------------|------|
|      | [mm]    | [kNm]                    |     | [N/mm <sup>2</sup> ] |       | opt. | max. | opt.             | max.             | opt.                 | max.                 |      |
|      |         |                          |     |                      |       | [mm] | [mm] | [mm]             | [mm]             | [N/mm <sup>2</sup> ] | [N/mm <sup>2</sup> ] |      |
| 1    | S4-600  | -0.45                    | Ond | 7.0                  | 7.3.3 | 300  |      | 31.1             |                  |                      |                      |      |
| 2    | S4+0    | 36.45                    | Bov | 191.8                | 7.3.3 | 300  |      | 26.2             |                  |                      |                      |      |
| 3    | S4+0    | 36.45                    | Bov | 236.2                | 7.3.3 | 255  |      | 16.4             |                  |                      |                      |      |
| 4    | S4+1494 | -11.51                   | Ond | 177.1                | 7.3.3 | 300  |      | 28.4             |                  |                      |                      |      |
| 5    | S5+0    | 29.06                    | Bov | 310.4                | 7.3.3 | 162  |      | 10.1             |                  |                      |                      |      |
| 6    | S5+1200 | -15.29                   | Ond | 168.7                | 7.3.3 | 300  |      | 29.8             |                  |                      |                      |      |
| 7    | S6+0    | 30.91                    | Bov | 300.9                | 7.3.3 | 174  |      | 10.8             |                  |                      |                      |      |
| 8    | S6+1415 | -6.48                    | Ond | 99.7                 | 7.3.3 | 300  |      | 31.1             |                  |                      |                      |      |
| 9    | S7+0    | 45.23                    | Bov | 336.0                | 7.3.3 | 130  |      | 8.7              |                  |                      |                      |      |
| 10   | S7+0    | 45.23                    | Bov | 269.2                | 7.3.3 | 214  |      | 13.3             |                  |                      |                      |      |
| 11   | S7+600  | -0.74                    | Ond | 11.4                 | 7.3.3 | 300  |      | 31.1             |                  |                      |                      |      |

**Wring- en dwarskrachtwapening**

Balk 2:2

| Geb. | Vanaf  | Tot    | n | Bgl  | Hoh  | Lengte | <Wringing>             |                      | <Dwarskr.>         |                    | V <sub>Ed</sub> | T <sub>Ed</sub> | Opm. |
|------|--------|--------|---|------|------|--------|------------------------|----------------------|--------------------|--------------------|-----------------|-----------------|------|
|      | [mm]   | [mm]   |   | [mm] | [mm] | [mm]   | A <sub>l a n g s</sub> | A <sub>b g l</sub>   | A <sub>b g l</sub> | A <sub>o p g</sub> | [kN]            | [kNm]           |      |
|      |        |        |   |      |      |        | [mm <sup>2</sup> ]     | [mm <sup>2</sup> /m] | [mm <sup>2</sup> ] | [mm <sup>2</sup> ] |                 |                 |      |
| 1    | S4-600 | S4-300 | 2 | 8.0  | 300  | 300    | 5                      | 1                    | 311                | 0                  | 125             | 0               | 6,59 |
| 2    | S4-300 | S4+0   | 2 | 8.0  | 250  | 300    | 5                      | 1                    | 334                | 0                  | 134             | 0               | 6,59 |
| 3    | S4+0   | S4+600 | 2 | 8.0  | 300  | 600    | 5                      | 1                    | 286                | 0                  | 89              | 0               | 6    |
| 4    | S4+600 | S5-600 | 2 | 8.0  | 300  | 1800   | 0                      | 0                    | 286                | 0                  | 54              | 0               |      |
| 5    | S5-600 | S5+0   | 2 | 8.0  | 300  | 600    | 5                      | 1                    | 286                | 0                  | 90              | 0               | 6    |
| 6    | S5+0   | S5+900 | 2 | 8.0  | 300  | 900    | 5                      | 1                    | 324                | 0                  | 110             | 0               | 6    |
| 7    | S5+900 | S6-900 | 2 | 8.0  | 300  | 600    | 0                      | 0                    | 286                | 0                  | 60              | 0               |      |
| 8    | S6-900 | S6+0   | 2 | 8.0  | 300  | 900    | 5                      | 1                    | 318                | 0                  | 114             | 0               | 6    |

Project...: - pitpotstal de Marsen  
Onderdeel: het Twiske

**Wring- en dwarskrachtwapening**

Balk 2:2

| Geb. | Vanaf  | Tot    | n | Bgl  | Hoh  | Lengte | <Wringing>             |                      | <Dwarskr.>         |                    | V <sub>Ed</sub> | T <sub>Ed</sub> | Opm. |
|------|--------|--------|---|------|------|--------|------------------------|----------------------|--------------------|--------------------|-----------------|-----------------|------|
|      | [mm]   | [mm]   |   | [mm] | [mm] | [mm]   | A <sub>l a n g s</sub> | A <sub>b g l</sub>   | A <sub>b g l</sub> | A <sub>o p g</sub> | [kN]            | [kNm]           |      |
|      |        |        |   |      |      |        | [mm <sup>2</sup> ]     | [mm <sup>2</sup> /m] | [mm <sup>2</sup> ] |                    |                 |                 |      |
| 9    | S6+0   | S6+600 | 2 | 8.0  | 300  | 600    | 5                      | 1                    | 286                | 0                  | 85              | 0               | 6    |
| 10   | S6+600 | S7-600 | 2 | 8.0  | 300  | 1800   | 0                      | 0                    | 286                | 0                  | 59              | 0               |      |
| 11   | S7-600 | S7+0   | 2 | 8.0  | 300  | 600    | 5                      | 1                    | 286                | 0                  | 95              | 0               | 6    |
| 12   | S7+0   | S7+600 | 2 | 8.0  | 300  | 600    | 5                      | 1                    | 321                | 0                  | 129             | 0               | 6,59 |

Opmerkingen

[6] 9.2.2 (4) 50% van de dwarskrachtwapening moet uit beugels bestaan.

[59] 6.2.3: Z is berekend m.b.v. de gedrongen ligger berekening art 6.1 (10)

**Hoofdwapening**

Balk 3:3

| Geb. | Vanaf   | Tot     | M <sub>Ed</sub> | z    | B/O | Ab                 | Aa                 | Opm. |
|------|---------|---------|-----------------|------|-----|--------------------|--------------------|------|
|      | [mm]    | [mm]    | [kNm]           | [mm] |     | [mm <sup>2</sup> ] | [mm <sup>2</sup> ] |      |
| 1    | S8-2600 | S8-2598 | 0.04            | 0    | Bov | 153*               | 0                  | 54   |
| 2    | S8-2598 | S8-147  | -31.20          | 442  | Ond | 180*               | 180                | 1    |
| 3    | S8-187  | S8+194  | 17.36           | 0    | Bov | 153*               | 153                | 54   |
| 4    | S8+171  | S9-479  | -53.31          | 439  | Ond | 261                | 261                |      |
| 5    | S9-504  | S9+794  | 51.30           | 439  | Bov | 251                | 251                |      |
| 6    | S9+676  | S10-719 | -10.34          | 0    | Ond | 153*               | 153                | 54   |
| 7    | S10-855 | S10+699 | 55.44           | 438  | Bov | 272                | 272                |      |
| 8    | S10+539 | S11-560 | -35.50          | 442  | Ond | 180*               | 180                | 1    |
| 9    | S11-842 | S11-0   | 53.29           | 439  | Bov | 261                | 261                |      |
| 10   | S11-0   | S11+600 | 53.29           | 370  | Bov | 332                | 332                | 2    |

Opmerkingen

[1] \* = Eisen met betrekking tot minimum wapening zijn toegepast, zie nationale bijlage art. 9.2.1.1(1).

[2] Benodigde wapening en inwendige hefboomsarm zijn bepaald volgens gedrongen ligger detaillering, zie nationale bijlage art. 6.1(10).

Alle maten zijn zonder verschuiving van de m-lijn en verankering

[54] \* = Eisen met betrekking tot minimum wapening ten behoeve van gecontroleerde scheurvorming zijn toegepast volgens art. 7.3.2.

**Scheurvorming**

Balk 3:3

| Geb. | Pos.     | M <sub>Ed</sub> ; f <sub>req</sub> | B/O | σ <sub>s</sub>       | art.  | s    | s    | Ø <sub>km</sub> | Ø <sub>km</sub> | σ <sub>b</sub>       | σ <sub>b</sub>       | Opm. |
|------|----------|------------------------------------|-----|----------------------|-------|------|------|-----------------|-----------------|----------------------|----------------------|------|
|      | [mm]     | [kNm]                              |     | [N/mm <sup>2</sup> ] |       | opt. | max. | opt.            | max.            | opt.                 | max.                 |      |
|      |          |                                    |     |                      |       | [mm] | [mm] | [mm]            | [mm]            | [N/mm <sup>2</sup> ] | [N/mm <sup>2</sup> ] |      |
| 1    | S8-2600  | 0.02                               | Bov | 0.4                  | 7.3.3 |      | 300  |                 | 31.1            |                      |                      |      |
| 2    | S8-600   | -25.99                             | Ond | 340.9                | 7.3.3 |      | 124  |                 | 8.5             |                      |                      |      |
| 3    | S8-0     | 10.08                              | Bov | 155.0                | 7.3.3 |      | 300  |                 | 31.1            |                      |                      |      |
| 4    | S8+1338  | -32.14                             | Ond | 293.1                | 7.3.3 |      | 184  |                 | 11.4            |                      |                      |      |
| 5    | S9-0     | 31.81                              | Bov | 301.5                | 7.3.3 |      | 173  |                 | 10.8            |                      |                      |      |
| 6    | S9+1191  | -3.07                              | Ond | 47.2                 | 7.3.3 |      | 300  |                 | 31.1            |                      |                      |      |
| 7    | S10-0    | 35.63                              | Bov | 312.7                | 7.3.3 |      | 159  |                 | 9.9             |                      |                      |      |
| 8    | S11-1400 | -12.18                             | Ond | 159.7                | 7.3.3 |      | 300  |                 | 31.1            |                      |                      |      |
| 9    | S11-0    | 43.54                              | Bov | 397.3                | 7.3.3 |      | 100  |                 | 6.3             |                      |                      |      |
| 10   | S11-0    | 43.54                              | Bov | 314.9                | 7.3.3 |      | 156  |                 | 9.7             |                      |                      |      |

**Wring- en dwarskrachtwapening**

Balk 3:3

| Geb. | Vanaf   | Tot     | n | Bgl  | Hoh  | Lengte | <Wringing>             |                      | <Dwarskr.>         |                    | V <sub>Ed</sub> | T <sub>Ed</sub> | Opm. |
|------|---------|---------|---|------|------|--------|------------------------|----------------------|--------------------|--------------------|-----------------|-----------------|------|
|      | [mm]    | [mm]    |   | [mm] | [mm] | [mm]   | A <sub>l a n g s</sub> | A <sub>b g l</sub>   | A <sub>b g l</sub> | A <sub>o p g</sub> | [kN]            | [kNm]           |      |
|      |         |         |   |      |      |        | [mm <sup>2</sup> ]     | [mm <sup>2</sup> /m] | [mm <sup>2</sup> ] |                    |                 |                 |      |
| 1    | S8-2600 | S8-550  | 2 | 8.0  | 300  | 2050   | 0                      | 0                    | 286                | 0                  | 57              | 1               |      |
| 2    | S8-550  | S8-250  | 2 | 8.0  | 300  | 300    | 17                     | 2                    | 286                | 0                  | 81              | 0               | 6    |
| 3    | S8-250  | S8-0    | 2 | 8.0  | 250  | 250    | 17                     | 2                    | 377                | 0                  | 100             | 0               | 6    |
| 4    | S8-0    | S8+300  | 2 | 8.0  | 200  | 300    | 17                     | 2                    | 408                | 0                  | 105             | 0               | 6    |
| 5    | S8+300  | S8+600  | 2 | 8.0  | 300  | 300    | 17                     | 2                    | 286                | 0                  | 82              | 0               | 6    |
| 6    | S8+600  | S9-900  | 2 | 8.0  | 300  | 1500   | 0                      | 0                    | 286                | 0                  | 58              | 0               |      |
| 7    | S9-900  | S9-300  | 2 | 8.0  | 300  | 600    | 17                     | 2                    | 290                | 0                  | 103             | 0               | 6    |
| 8    | S9-300  | S9-0    | 2 | 8.0  | 250  | 300    | 17                     | 2                    | 353                | 0                  | 129             | 0               | 6    |
| 9    | S9-0    | S9+600  | 2 | 8.0  | 300  | 600    | 17                     | 2                    | 286                | 0                  | 103             | 0               | 6    |
| 10   | S9+600  | S10-600 | 2 | 8.0  | 300  | 1200   | 0                      | 0                    | 286                | 0                  | 53              | 0               |      |
| 11   | S10-600 | S10-0   | 2 | 8.0  | 300  | 600    | 17                     | 2                    | 286                | 0                  | 103             | 0               | 6    |

Project...: - pitpotstal de Marsen  
Onderdeel: het Twiske

**Wring- en dwarskrachtwapening**

Balk 3:3

| Geb. | Vanaf   | Tot     | n | Bgl  | Hoh  | Lengte | <Wringing>         |                      | <Dwarskr.>         |                  | V <sub>Ed</sub> | T <sub>Ed</sub> | Opm. |
|------|---------|---------|---|------|------|--------|--------------------|----------------------|--------------------|------------------|-----------------|-----------------|------|
|      | [mm]    | [mm]    |   | [mm] | [mm] | [mm]   | A <sub>langs</sub> | A <sub>bgl</sub>     | A <sub>bgl</sub>   | A <sub>opg</sub> | [kN]            | [kNm]           |      |
|      |         |         |   |      |      |        | [mm <sup>2</sup> ] | [mm <sup>2</sup> /m] | [mm <sup>2</sup> ] |                  |                 |                 |      |
| 12   | S10-0   | S10+900 | 2 | 8.0  | 300  | 900    | 17                 | 2                    | 314                | 0                | 119             | 0               | 6    |
| 13   | S10+900 | S11-900 | 2 | 8.0  | 300  | 1200   | 0                  | 0                    | 286                | 0                | 48              | 0               |      |
| 14   | S11-900 | S11-0   | 2 | 8.0  | 300  | 900    | 17                 | 2                    | 313                | 0                | 116             | 0               | 6    |
| 15   | S11-0   | S11+600 | 2 | 8.0  | 300  | 600    | 17                 | 2                    | 286                | 0                | 110             | 0               | 6,59 |

Opmerkingen

[6] 9.2.2 (4) 50% van de dwarskrachtwapening moet uit beugels bestaan.

[59] 6.2.3: Z is berekend m.b.v. de gedrongen ligger berekening art 6.1 (10)

**Hoofdwapening**

Balk 4:4

| Geb. | Vanaf    | Tot      | M <sub>Ed</sub> | z    | B/O | Ab                 | Aa                 | Opm. |
|------|----------|----------|-----------------|------|-----|--------------------|--------------------|------|
|      | [mm]     | [mm]     | [kNm]           | [mm] |     | [mm <sup>2</sup> ] | [mm <sup>2</sup> ] |      |
| 1    | S12-300  | S12+0    | 54.40           | 290  | Bov | 432                | 432                | 2    |
| 2    | S12-300  | S12+0    | -1.13           | 0    | Ond | 153*               | 153                | 54,2 |
| 3    | S12+0    | S12+1441 | 54.40           | 438  | Bov | 267                | 267                |      |
| 4    | S12+914  | S13-710  | -22.00          | 0    | Ond | 153*               | 153                | 54   |
| 5    | S13-1157 | S13+568  | 57.80           | 438  | Bov | 284                | 284                |      |
| 6    | S13+408  | S14-391  | -65.57          | 436  | Ond | 325                | 330                |      |
| 7    | S14-559  | S14+1282 | 52.38           | 439  | Bov | 256                | 256                |      |
| 8    | S14+1136 | S15-1281 | -2.28           | 0    | Ond | 153*               | 153                | 54   |
| 9    | S14+1282 | S15+0    | 64.04           | 436  | Bov | 316                | 316                |      |
| 10   | S15+0    | S15+596  | 64.04           | 370  | Bov | 399                | 399                | 2    |
| 11   | S15+594  | S15+600  | -0.59           | 0    | Ond | 153*               | 153                | 54,2 |

Opmerkingen

[2] Benodigde wapening en inwendige hefboomsarm zijn bepaald volgens gedrongen ligger detaillering, zie nationale bijlage art. 6.1(10).

Alle maten zijn zonder verschuiving van de m-lijn en verankering

[54] \* = Eisen met betrekking tot minimum wapening ten behoeve van gecontroleerde scheurvorming zijn toegepast volgens art. 7.3.2.

**Scheurvorming**

Balk 4:4

| Geb. | Pos.     | M <sub>Ed</sub> | B/O | σ <sub>s</sub>       | art.  | s    | s    | Ø <sub>km</sub> | Ø <sub>km</sub> | σ <sub>b</sub>       | σ <sub>b</sub>       | Opm. |
|------|----------|-----------------|-----|----------------------|-------|------|------|-----------------|-----------------|----------------------|----------------------|------|
|      | [mm]     | [kNm]           |     | [N/mm <sup>2</sup> ] |       | opt. | max. | opt.            | max.            | opt.                 | max.                 |      |
|      |          |                 |     |                      |       | [mm] | [mm] | [mm]            | [mm]            | [N/mm <sup>2</sup> ] | [N/mm <sup>2</sup> ] |      |
| 1    | S12+0    | 33.09           | Bov | 185.5                | 7.3.3 |      | 300  |                 | 27.1            |                      |                      |      |
| 2    | S12-300  | -0.66           | Ond | 10.2                 | 7.3.3 |      | 300  |                 | 31.1            |                      |                      |      |
| 3    | S12+0    | 33.09           | Bov | 295.8                | 7.3.3 |      | 180  |                 | 11.2            |                      |                      |      |
| 4    | S13-1600 | -20.33          | Ond | 312.8                | 7.3.3 |      | 159  |                 | 9.9             |                      |                      |      |
| 5    | S13+0    | 34.48           | Bov | 290.3                | 7.3.3 |      | 187  |                 | 11.6            |                      |                      |      |
| 6    | S13+1200 | -19.12          | Ond | 141.3                | 7.3.3 |      | 300  |                 | 31.1            |                      |                      |      |
| 7    | S14+0    | 33.88           | Bov | 314.5                | 7.3.3 |      | 157  |                 | 9.8             |                      |                      |      |
| 8    | S14+1428 | -1.90           | Ond | 29.2                 | 7.3.3 |      | 300  |                 | 31.1            |                      |                      |      |
| 9    | S15+0    | 51.30           | Bov | 388.8                | 7.3.3 |      | 100  |                 | 6.7             |                      |                      |      |
| 10   | S15+0    | 51.30           | Bov | 310.8                | 7.3.3 |      | 161  |                 | 10.0            |                      |                      |      |
| 11   | S15+600  | -0.30           | Ond | 4.7                  | 7.3.3 |      | 300  |                 | 31.1            |                      |                      |      |

**Wring- en dwarskrachtwapening**

Balk 4:4

| Geb. | Vanaf   | Tot     | n | Bgl  | Hoh  | Lengte | <Wringing>         |                      | <Dwarskr.>         |                  | V <sub>Ed</sub> | T <sub>Ed</sub> | Opm. |
|------|---------|---------|---|------|------|--------|--------------------|----------------------|--------------------|------------------|-----------------|-----------------|------|
|      | [mm]    | [mm]    |   | [mm] | [mm] | [mm]   | A <sub>langs</sub> | A <sub>bgl</sub>     | A <sub>bgl</sub>   | A <sub>opg</sub> | [kN]            | [kNm]           |      |
|      |         |         |   |      |      |        | [mm <sup>2</sup> ] | [mm <sup>2</sup> /m] | [mm <sup>2</sup> ] |                  |                 |                 |      |
| 1    | S12-300 | S12+0   | 2 | 8.0  | 150  | 300    | 48                 | 6                    | 599                | 0                | 189             | 1               | 6,59 |
| 2    | S12+0   | S12+600 | 2 | 8.0  | 300  | 600    | 48                 | 6                    | 286                | 0                | 66              | 1               | 6    |
| 3    | S12+600 | S13-600 | 2 | 8.0  | 300  | 2100   | 0                  | 0                    | 286                | 0                | 60              | 1               |      |
| 4    | S13-600 | S13+0   | 2 | 8.0  | 300  | 600    | 13                 | 2                    | 286                | 0                | 92              | 0               | 6    |
| 5    | S13+0   | S13+300 | 2 | 8.0  | 250  | 300    | 13                 | 2                    | 354                | 0                | 135             | 0               | 6    |
| 6    | S13+300 | S14-300 | 2 | 8.0  | 300  | 1800   | 13                 | 2                    | 322                | 0                | 119             | 0               | 6    |
| 7    | S14-300 | S14+0   | 2 | 8.0  | 250  | 300    | 13                 | 2                    | 361                | 0                | 130             | 0               | 6    |
| 8    | S14+0   | S14+600 | 2 | 8.0  | 300  | 600    | 13                 | 2                    | 286                | 0                | 76              | 0               | 6    |
| 9    | S14+600 | S15-600 | 2 | 8.0  | 300  | 1800   | 0                  | 0                    | 286                | 0                | 52              | 0               |      |
| 10   | S15-600 | S15+0   | 2 | 8.0  | 300  | 600    | 13                 | 2                    | 286                | 0                | 84              | 0               | 6    |
| 11   | S15+0   | S15+600 | 2 | 8.0  | 300  | 600    | 13                 | 2                    | 307                | 0                | 124             | 0               | 6,59 |

Opmerkingen

[6] 9.2.2 (4) 50% van de dwarskrachtwapening moet uit beugels bestaan.

[59] 6.2.3: Z is berekend m.b.v. de gedrongen ligger berekening art 6.1 (10)

Project...: - pitpotstal de Marsen  
Onderdeel: het Twiske

## Hoofdwapening

Balk 5:5

| Geb. | Vanaf<br>[mm] | Tot<br>[mm] | $M_{Ed}$<br>[kNm] | $z$<br>[mm] | B/O | $A_b$<br>[mm <sup>2</sup> ] | $A_a$<br>[mm <sup>2</sup> ] | Opm. |
|------|---------------|-------------|-------------------|-------------|-----|-----------------------------|-----------------------------|------|
| 1    | S16-300       | S16+0       | 58.11             | 290         | Bov | 462                         | 462                         | 2    |
| 2    | S16+0         | S16+1094    | 58.11             | 438         | Bov | 285                         | 285                         |      |
| 3    | S16+795       | S17-573     | -45.29            | 440         | Ond | 221                         | 221                         |      |
| 4    | S17-823       | S17+600     | 63.21             | 437         | Bov | 312                         | 317                         |      |
| 5    | S17+430       | S18-413     | -65.38            | 436         | Ond | 323                         | 328                         |      |
| 6    | S18-595       | S18+1295    | 58.94             | 438         | Bov | 289                         | 289                         |      |
| 7    | S18+980       | S19-1050    | -7.26             | 0           | Ond | 153*                        | 153                         | 54   |
| 8    | S18+1295      | S19+0       | 65.40             | 436         | Bov | 324                         | 352                         |      |
| 9    | S19+0         | S19+600     | 65.40             | 370         | Bov | 407                         | 407                         | 2    |

Opmerkingen

[2] Benodigde wapening en inwendige hefboomsarm zijn bepaald volgens gedrongen ligger detaillering, zie nationale bijlage art. 6.1(10).

Alle maten zijn zonder verschuiving van de m-lijn en verankering

[54] \* = Eisen met betrekking tot minimum wapening ten behoeve van gecontroleerde scheurvorming zijn toegepast volgens art. 7.3.2.

## Scheurvorming

Balk 5:5

| Geb. | Pos.<br>[mm] | $M_{E;freq}$<br>[kNm] | B/O | $\sigma_s$<br>[N/mm <sup>2</sup> ] | art.  | $s$<br>opt.<br>[mm] | $s$<br>max.<br>[mm] | $\sigma_{km}$<br>opt.<br>[mm] | $\sigma_{km}$<br>max.<br>[mm] | $\sigma_b$<br>opt.<br>[N/mm <sup>2</sup> ] | $\sigma_b$<br>max.<br>[N/mm <sup>2</sup> ] | Opm. |
|------|--------------|-----------------------|-----|------------------------------------|-------|---------------------|---------------------|-------------------------------|-------------------------------|--------------------------------------------|--------------------------------------------|------|
| 1    | S16+0        | 34.23                 | Bov | 180.1                              | 7.3.3 |                     | 300                 |                               | 28.0                          |                                            |                                            |      |
| 2    | S16+0        | 34.23                 | Bov | 286.6                              | 7.3.3 |                     | 192                 |                               | 11.9                          |                                            |                                            |      |
| 3    | S17-1600     | -39.10                | Ond | 419.3                              | 7.3.3 |                     | 100                 |                               | 5.6                           |                                            |                                            |      |
| 4    | S17+0        | 37.62                 | Bov | 289.1                              | 7.3.3 |                     | 189                 |                               | 11.7                          |                                            |                                            |      |
| 5    | S17+1200     | -17.95                | Ond | 133.1                              | 7.3.3 |                     | 300                 |                               | 31.1                          |                                            |                                            |      |
| 6    | S18+0        | 37.37                 | Bov | 308.5                              | 7.3.3 |                     | 164                 |                               | 10.2                          |                                            |                                            |      |
| 7    | S18+1465     | -1.26                 | Ond | 19.5                               | 7.3.3 |                     | 300                 |                               | 31.1                          |                                            |                                            |      |
| 8    | S19+0        | 51.60                 | Bov | 382.3                              | 7.3.3 |                     | 100                 |                               | 6.9                           |                                            |                                            |      |
| 9    | S19+0        | 51.60                 | Bov | 306.4                              | 7.3.3 |                     | 167                 |                               | 10.4                          |                                            |                                            |      |

## Wring- en dwarskrachtwapening

Balk 5:5

| Geb. | Vanaf<br>[mm] | Tot<br>[mm] | $n$ | Bgl<br>[mm] | Hoh<br>[mm] | Lengte<br>[mm] | <Wringing>                       |                                   | <Dwarskr.>                      |                                 | $V_{Ed}$<br>[kN] | $T_{Ed}$<br>[kNm] | Opm. |
|------|---------------|-------------|-----|-------------|-------------|----------------|----------------------------------|-----------------------------------|---------------------------------|---------------------------------|------------------|-------------------|------|
|      |               |             |     |             |             |                | $A_{lang}$<br>[mm <sup>2</sup> ] | $A_{bgl}$<br>[mm <sup>2</sup> /m] | $A_{bgl}$<br>[mm <sup>2</sup> ] | $A_{opg}$<br>[mm <sup>2</sup> ] |                  |                   |      |
| 1    | S16-300       | S16+0       | 2   | 8.0         | 150         | 300            | 9                                | 1                                 | 614                             | 0                               | 193              | 0                 | 6,59 |
| 2    | S16+0         | S16+1200    | 2   | 8.0         | 300         | 1200           | 9                                | 1                                 | 286                             | 0                               | 65               | 0                 | 6    |
| 3    | S16+1200      | S17-1200    | 2   | 8.0         | 300         | 900            | 0                                | 0                                 | 286                             | 0                               | 59               | 0                 |      |
| 4    | S17-1200      | S17+0       | 2   | 8.0         | 300         | 1200           | 3                                | 0                                 | 287                             | 0                               | 117              | 0                 | 6    |
| 5    | S17+0         | S17+300     | 2   | 8.0         | 250         | 300            | 3                                | 0                                 | 357                             | 0                               | 144              | 0                 | 6    |
| 6    | S17+300       | S18-300     | 2   | 8.0         | 300         | 1800           | 3                                | 0                                 | 324                             | 0                               | 125              | 0                 | 6    |
| 7    | S18-300       | S18+0       | 2   | 8.0         | 250         | 300            | 3                                | 0                                 | 365                             | 0                               | 140              | 0                 | 6    |
| 8    | S18+0         | S18+600     | 2   | 8.0         | 300         | 600            | 3                                | 0                                 | 286                             | 0                               | 90               | 0                 | 6    |
| 9    | S18+600       | S19-600     | 2   | 8.0         | 300         | 1800           | 0                                | 0                                 | 286                             | 0                               | 57               | 0                 |      |
| 10   | S19-600       | S19+0       | 2   | 8.0         | 300         | 600            | 3                                | 0                                 | 286                             | 0                               | 94               | 0                 | 6    |
| 11   | S19+0         | S19+600     | 2   | 8.0         | 300         | 600            | 3                                | 0                                 | 316                             | 0                               | 127              | 0                 | 6,59 |

Opmerkingen

[6] 9.2.2 (4) 50% van de dwarskrachtwapening moet uit beugels bestaan.

[59] 6.2.3: Z is berekend m.b.v. de gedrongen ligger berekening art 6.1 (10)



Project...: - pitpotstal de Marsen  
Onderdeel: het Twiske

## Hoofdwapening

Balk 6:6

| Geb. | Vanaf<br>[mm] | Tot<br>[mm] | $M_{Ed}$<br>[kNm] | z<br>[mm] | B/O | Ab<br>[mm <sup>2</sup> ] | Aa<br>[mm <sup>2</sup> ] | Opm. |
|------|---------------|-------------|-------------------|-----------|-----|--------------------------|--------------------------|------|
| 1    | S20-300       | S20-298     | -0.11             | 0         | Ond | 153*                     | 0                        | 54,2 |
| 2    | S20-298       | S20+0       | 57.04             | 290       | Bov | 453                      | 453                      | 2    |
| 3    | S20+0         | S20+1190    | 57.04             | 438       | Bov | 280                      | 280                      |      |
| 4    | S20+856       | S21-609     | -37.52            | 442       | Ond | 183                      | 183                      |      |
| 5    | S21-911       | S21+601     | 59.26             | 437       | Bov | 291                      | 296                      |      |
| 6    | S21+426       | S22-405     | -64.34            | 436       | Ond | 318                      | 323                      |      |
| 7    | S22-592       | S22+1222    | 54.85             | 438       | Bov | 269                      | 269                      |      |
| 8    | S22+1202      | S23-1330    | -1.50             | 0         | Ond | 153*                     | 153                      | 54   |
| 9    | S22+1222      | S23+0       | 65.36             | 436       | Bov | 323                      | 351                      |      |
| 10   | S23+0         | S23+600     | 65.36             | 370       | Bov | 407                      | 407                      | 2    |
| 11   | S23+597       | S23+600     | -0.26             | 0         | Ond | 153*                     | 153                      | 54,2 |

Opmerkingen

[2] Benodigde wapening en inwendige hefboomsarm zijn bepaald volgens gedrongen  
ligger detaillering, zie nationale bijlage art. 6.1(10).

Alle maten zijn zonder verschuiving van de m-lijn en verankering

[54] \* = Eisen met betrekking tot minimum wapening ten behoeve van  
gecontroleerde scheurvorming zijn toegepast volgens art. 7.3.2.

## Scheurvorming

Balk 6:6

| Geb. | Pos.     | $M_{Ed, req}$<br>[kNm] | B/O | $\sigma_s$<br>[N/mm <sup>2</sup> ] | art.  | s<br>opt.<br>[mm] | s<br>max.<br>[mm] | $\sigma_{km}$<br>opt.<br>[mm] | $\sigma_{km}$<br>max.<br>[mm] | $\sigma_b$<br>opt.<br>[N/mm <sup>2</sup> ] | $\sigma_b$<br>max.<br>[N/mm <sup>2</sup> ] | Opm. |
|------|----------|------------------------|-----|------------------------------------|-------|-------------------|-------------------|-------------------------------|-------------------------------|--------------------------------------------|--------------------------------------------|------|
| 1    | S20-300  | -0.09                  | Ond | 1.4                                | 7.3.3 |                   | 300               |                               | 31.1                          |                                            |                                            |      |
| 2    | S20+0    | 33.67                  | Bov | 180.4                              | 7.3.3 |                   | 300               |                               | 27.9                          |                                            |                                            |      |
| 3    | S20+0    | 33.67                  | Bov | 287.1                              | 7.3.3 |                   | 191               |                               | 11.9                          |                                            |                                            |      |
| 4    | S21-1600 | -33.36                 | Ond | 430.9                              | 7.3.3 |                   | 100               |                               | 5.3                           |                                            |                                            |      |
| 5    | S21+0    | 34.79                  | Bov | 285.7                              | 7.3.3 |                   | 193               |                               | 12.0                          |                                            |                                            |      |
| 6    | S21+1200 | -17.05                 | Ond | 128.6                              | 7.3.3 |                   | 300               |                               | 31.1                          |                                            |                                            |      |
| 7    | S22+0    | 34.26                  | Bov | 303.8                              | 7.3.3 |                   | 170               |                               | 10.6                          |                                            |                                            |      |
| 8    | S22+1436 | -1.25                  | Ond | 19.2                               | 7.3.3 |                   | 300               |                               | 31.1                          |                                            |                                            |      |
| 9    | S23+0    | 51.42                  | Bov | 381.3                              | 7.3.3 |                   | 100               |                               | 6.9                           |                                            |                                            |      |
| 10   | S23+0    | 51.42                  | Bov | 305.5                              | 7.3.3 |                   | 168               |                               | 10.5                          |                                            |                                            |      |
| 11   | S23+600  | -0.16                  | Ond | 2.5                                | 7.3.3 |                   | 300               |                               | 31.1                          |                                            |                                            |      |

## Wring- en dwarskrachtwapening

Balk 6:6

| Geb. | Vanaf<br>[mm] | Tot<br>[mm] | n | Bgl<br>[mm] | Hoh<br>[mm] | Lengte<br>[mm] | <Wringing><br>$A_{lang}$<br>[mm <sup>2</sup> ] | <Dwarskr.><br>$A_{bgl}$<br>[mm <sup>2</sup> /m] | $A_{opg}$<br>[mm <sup>2</sup> ] | $V_{Ed}$<br>[kN] | $T_{Ed}$<br>[kNm] | Opm.   |
|------|---------------|-------------|---|-------------|-------------|----------------|------------------------------------------------|-------------------------------------------------|---------------------------------|------------------|-------------------|--------|
| 1    | S20-300       | S20+0       | 2 | 8.0         | 150         | 300            | 1                                              | 0                                               | 607                             | 0                | 191               | 0 6,59 |
| 2    | S20+0         | S21+0       | 2 | 8.0         | 300         | 3300           | 0                                              | 0                                               | 286                             | 0                | 104               | 0 6    |
| 3    | S21+0         | S21+300     | 2 | 8.0         | 250         | 300            | 0                                              | 0                                               | 346                             | 0                | 136               | 0 6    |
| 4    | S21+300       | S22-300     | 2 | 8.0         | 300         | 1800           | 0                                              | 0                                               | 322                             | 0                | 119               | 0 6    |
| 5    | S22-300       | S22+0       | 2 | 8.0         | 250         | 300            | 0                                              | 0                                               | 355                             | 0                | 132               | 0 6    |
| 6    | S22+0         | S23+0       | 2 | 8.0         | 300         | 3000           | 0                                              | 0                                               | 286                             | 0                | 85                | 0 6    |
| 7    | S23+0         | S23+600     | 2 | 8.0         | 300         | 600            | 0                                              | 0                                               | 312                             | 0                | 126               | 0 6,59 |

Opmerkingen

[6] 9.2.2 (4) 50% van de dwarskrachtwapening moet uit beugels bestaan.

[59] 6.2.3: Z is berekend m.b.v. de gedrongen ligger berekening art 6.1 (10)

## Hoofdwapening

Balk 7:7

| Geb. | Vanaf<br>[mm] | Tot<br>[mm] | $M_{Ed}$<br>[kNm] | z<br>[mm] | B/O | Ab<br>[mm <sup>2</sup> ] | Aa<br>[mm <sup>2</sup> ] | Opm. |
|------|---------------|-------------|-------------------|-----------|-----|--------------------------|--------------------------|------|
| 1    | S24-300       | S24+0       | 61.14             | 290       | Bov | 485                      | 485                      | 2    |
| 2    | S24+0         | S24+1142    | 61.14             | 437       | Bov | 300                      | 300                      |      |
| 3    | S24+844       | S25-592     | -43.52            | 441       | Ond | 212                      | 212                      |      |
| 4    | S25-850       | S25+611     | 64.31             | 436       | Bov | 318                      | 323                      |      |
| 5    | S25+434       | S26-413     | -64.90            | 436       | Ond | 321                      | 326                      |      |
| 6    | S26-598       | S26+1298    | 58.79             | 438       | Bov | 289                      | 289                      |      |
| 7    | S26+961       | S27-1017    | -8.05             | 0         | Ond | 153*                     | 153                      | 54   |
| 8    | S26+1298      | S27+0       | 63.95             | 436       | Bov | 316                      | 316                      |      |
| 9    | S27+0         | S27+597     | 63.95             | 370       | Bov | 398                      | 398                      | 2    |

Project...: - pitpotstal de Marsen  
Onderdeel: het Twiske

## Hoofdwapening

Balk 7:7

| Geb. | Vanaf<br>[mm] | Tot<br>[mm] | $M_{Ed}$<br>[kNm] | $z$<br>[mm] | B/O | $A_b$<br>[mm <sup>2</sup> ] | $A_a$<br>[mm <sup>2</sup> ] | Opm. |
|------|---------------|-------------|-------------------|-------------|-----|-----------------------------|-----------------------------|------|
| 10   | S27+595       | S27+600     | -0.46             | 0           | Ond | 153*                        | 153                         | 54,2 |

Opmerkingen

[2] Benodigde wapening en inwendige hefboomsarm zijn bepaald volgens gedrongen ligger detaillering, zie nationale bijlage art. 6.1(10).

Alle maten zijn zonder verschuiving van de m-lijn en verankering

[54] \* = Eisen met betrekking tot minimum wapening ten behoeve van gecontroleerde scheurvorming zijn toegepast volgens art. 7.3.2.

## Scheurvorming

Balk 7:7

| Geb. | Pos.<br>[mm] | $M_{E, freq}$<br>[kNm] | B/O | $\sigma_s$<br>[N/mm <sup>2</sup> ] | art.  | $s$<br>opt.<br>[mm] | $s$<br>max.<br>[mm] | $\sigma_{km}$<br>opt.<br>[mm] | $\sigma_{km}$<br>max.<br>[mm] | $\sigma_b$<br>opt.<br>[N/mm <sup>2</sup> ] | $\sigma_b$<br>max.<br>[N/mm <sup>2</sup> ] | Opm. |
|------|--------------|------------------------|-----|------------------------------------|-------|---------------------|---------------------|-------------------------------|-------------------------------|--------------------------------------------|--------------------------------------------|------|
| 1    | S24+0        | 36.61                  | Bov | 183.5                              | 7.3.3 |                     | 300                 |                               | 27.5                          |                                            |                                            |      |
| 2    | S24+0        | 36.61                  | Bov | 291.5                              | 7.3.3 |                     | 186                 |                               | 11.6                          |                                            |                                            |      |
| 3    | S25-1600     | -37.33                 | Ond | 416.5                              | 7.3.3 |                     | 100                 |                               | 5.7                           |                                            |                                            |      |
| 4    | S25+0        | 38.36                  | Bov | 289.4                              | 7.3.3 |                     | 188                 |                               | 11.7                          |                                            |                                            |      |
| 5    | S25+1200     | -17.57                 | Ond | 131.2                              | 7.3.3 |                     | 300                 |                               | 31.1                          |                                            |                                            |      |
| 6    | S26+0        | 37.40                  | Bov | 309.6                              | 7.3.3 |                     | 163                 |                               | 10.1                          |                                            |                                            |      |
| 7    | S26+1472     | -1.19                  | Ond | 18.3                               | 7.3.3 |                     | 300                 |                               | 31.1                          |                                            |                                            |      |
| 8    | S27+0        | 51.67                  | Bov | 392.2                              | 7.3.3 |                     | 100                 |                               | 6.5                           |                                            |                                            |      |
| 9    | S27+0        | 51.67                  | Bov | 313.5                              | 7.3.3 |                     | 158                 |                               | 9.8                           |                                            |                                            |      |
| 10   | S27+600      | -0.26                  | Ond | 4.0                                | 7.3.3 |                     | 300                 |                               | 31.1                          |                                            |                                            |      |

## Wring- en dwarskrachtwapening

Balk 7:7

| Geb. | Vanaf<br>[mm] | Tot<br>[mm] | $n$ | Bgl<br>[mm] | Hoh<br>[mm] | Lengte<br>[mm] | <Wringing><br>$A_{lang}$<br>[mm <sup>2</sup> ] | <Dwarskr.><br>$A_{bgl}$<br>[mm <sup>2</sup> /m] | $A_{bgl}$<br>[mm <sup>2</sup> ] | $A_{opg}$<br>[mm <sup>2</sup> ] | $V_{Ed}$<br>[kN] | $T_{Ed}$<br>[kNm] | Opm. |
|------|---------------|-------------|-----|-------------|-------------|----------------|------------------------------------------------|-------------------------------------------------|---------------------------------|---------------------------------|------------------|-------------------|------|
| 1    | S24-300       | S24+0       | 2   | 8.0         | 150         | 300            | 2                                              | 0                                               | 649                             | 0                               | 204              | 0                 | 6,59 |
| 2    | S24+0         | S24+1200    | 2   | 8.0         | 300         | 1200           | 2                                              | 0                                               | 286                             | 0                               | 66               | 0                 | 6    |
| 3    | S24+1200      | S25-1200    | 2   | 8.0         | 300         | 900            | 0                                              | 0                                               | 286                             | 0                               | 60               | 0                 |      |
| 4    | S25-1200      | S25+0       | 2   | 8.0         | 300         | 1200           | 4                                              | 1                                               | 286                             | 0                               | 117              | 0                 | 6    |
| 5    | S25+0         | S25+300     | 2   | 8.0         | 250         | 300            | 4                                              | 1                                               | 355                             | 0                               | 144              | 0                 | 6    |
| 6    | S25+300       | S26-300     | 2   | 8.0         | 300         | 1800           | 4                                              | 1                                               | 325                             | 0                               | 126              | 0                 | 6    |
| 7    | S26-300       | S26+0       | 2   | 8.0         | 250         | 300            | 4                                              | 1                                               | 364                             | 0                               | 140              | 0                 | 6    |
| 8    | S26+0         | S26+600     | 2   | 8.0         | 300         | 600            | 4                                              | 1                                               | 286                             | 0                               | 91               | 0                 | 6    |
| 9    | S26+600       | S27-600     | 2   | 8.0         | 300         | 1800           | 0                                              | 0                                               | 286                             | 0                               | 57               | 0                 |      |
| 10   | S27-600       | S27+0       | 2   | 8.0         | 300         | 600            | 4                                              | 1                                               | 286                             | 0                               | 94               | 0                 | 6    |
| 11   | S27+0         | S27+600     | 2   | 8.0         | 300         | 600            | 4                                              | 1                                               | 312                             | 0                               | 125              | 0                 | 6,59 |

Opmerkingen

[6] 9.2.2 (4) 50% van de dwarskrachtwapening moet uit beugels bestaan.

[59] 6.2.3:  $z$  is berekend m.b.v. de gedrongen ligger berekening art 6.1 (10)

## Hoofdwapening

Balk 8:8

| Geb. | Vanaf<br>[mm] | Tot<br>[mm] | $M_{Ed}$<br>[kNm] | $z$<br>[mm] | B/O | $A_b$<br>[mm <sup>2</sup> ] | $A_a$<br>[mm <sup>2</sup> ] | Opm. |
|------|---------------|-------------|-------------------|-------------|-----|-----------------------------|-----------------------------|------|
| 1    | S28-2600      | S28-293     | -27.25            | 0           | Ond | 166*                        | 166                         | 1    |
| 2    | S28-342       | S28+462     | 37.07             | 442         | Bov | 180                         | 180                         |      |
| 3    | S28+425       | S29-394     | -63.85            | 436         | Ond | 315                         | 315                         |      |
| 4    | S29-413       | S29+669     | 51.99             | 439         | Bov | 254                         | 254                         |      |
| 5    | S29+583       | S30-606     | -18.25            | 0           | Ond | 153*                        | 153                         | 54   |
| 6    | S30-706       | S30+602     | 54.72             | 438         | Bov | 268                         | 268                         |      |
| 7    | S30+489       | S31-658     | -38.53            | 442         | Ond | 188                         | 188                         |      |
| 8    | S31-923       | S31-0       | 61.40             | 437         | Bov | 302                         | 307                         |      |
| 9    | S31-0         | S31+600     | 61.40             | 370         | Bov | 382                         | 382                         | 2    |

Opmerkingen

[1] \* = Eisen met betrekking tot minimum wapening zijn toegepast, zie nationale bijlage art. 9.2.1.1(1).

[2] Benodigde wapening en inwendige hefboomsarm zijn bepaald volgens gedrongen ligger detaillering, zie nationale bijlage art. 6.1(10).

Alle maten zijn zonder verschuiving van de m-lijn en verankering

Project...: - pitpotstal de Marsen

Onderdeel: het Twiske

[54] \* = Eisen met betrekking tot minimum wapening ten behoeve van gecontroleerde scheurvorming zijn toegepast volgens art. 7.3.2.

## Scheurvorming

Balk 8:8

| Geb. | Pos.     | $M_{E;freq}$ | B/O | $\sigma_s$           | art.  | s    | s    | $\emptyset_{km}$ | $\emptyset_{km}$ | $\sigma_b$           | $\sigma_b$           | Opm. |
|------|----------|--------------|-----|----------------------|-------|------|------|------------------|------------------|----------------------|----------------------|------|
|      | [mm]     | [kNm]        |     | [N/mm <sup>2</sup> ] |       | opt. | max. | opt.             | max.             | opt.                 | max.                 |      |
|      |          |              |     |                      |       | [mm] | [mm] | [mm]             | [mm]             | [N/mm <sup>2</sup> ] | [N/mm <sup>2</sup> ] |      |
| 1    | S28-600  | -20.80       | Ond | 294.2                | 7.3.3 |      | 182  |                  | 11.3             |                      |                      |      |
| 2    | S28-0    | 20.47        | Bov | 267.6                | 7.3.3 |      | 216  |                  | 13.4             |                      |                      |      |
| 3    | S28+1400 | -34.44       | Ond | 261.8                | 7.3.3 |      | 223  |                  | 13.9             |                      |                      |      |
| 4    | S29-0    | 29.60        | Bov | 276.9                | 7.3.3 |      | 204  |                  | 12.7             |                      |                      |      |
| 5    | S29+1188 | -7.19        | Ond | 110.7                | 7.3.3 |      | 300  |                  | 31.1             |                      |                      |      |
| 6    | S30-0    | 32.94        | Bov | 292.8                | 7.3.3 |      | 184  |                  | 11.4             |                      |                      |      |
| 7    | S30+1373 | -16.02       | Ond | 201.6                | 7.3.3 |      | 298  |                  | 24.5             |                      |                      |      |
| 8    | S31-0    | 44.14        | Bov | 349.9                | 7.3.3 |      | 113  |                  | 8.2              |                      |                      |      |
| 9    | S31-0    | 44.14        | Bov | 278.5                | 7.3.3 |      | 202  |                  | 12.6             |                      |                      |      |

## Wring- en dwarskrachtwapening

Balk 8:8

| Geb. | Vanaf    | Tot      | n | Bgl  | Hoh  | Lengte | <Wringing > <Dwarskr.> |                      |                    |                    | $V_{Ed}$ | $T_{Ed}$ | Opm. |
|------|----------|----------|---|------|------|--------|------------------------|----------------------|--------------------|--------------------|----------|----------|------|
|      | [mm]     | [mm]     |   | [mm] | [mm] | [mm]   | $A_{lang}$             | $A_{bgl}$            | $A_{bgl}$          | $A_{opg}$          | [kN]     | [kNm]    |      |
|      |          |          |   |      |      |        | [mm <sup>2</sup> ]     | [mm <sup>2</sup> /m] | [mm <sup>2</sup> ] | [mm <sup>2</sup> ] |          |          |      |
| 1    | S28-2600 | S28-850  | 2 | 8.0  | 300  | 1750   | 0                      | 0                    | 286                | 0                  | 19       | 3        |      |
| 2    | S28-850  | S28-550  | 2 | 8.0  | 250  | 300    | 96                     | 11                   | 375                | 0                  | 104      | 3        | 6    |
| 3    | S28-550  | S28-250  | 2 | 8.0  | 200  | 300    | 95                     | 11                   | 385                | 0                  | 107      | 3        | 6    |
| 4    | S28-250  | S28-0    | 2 | 8.0  | 250  | 250    | 95                     | 11                   | 374                | 0                  | 111      | 3        | 6    |
| 5    | S28-0    | S28+1500 | 2 | 8.0  | 300  | 1500   | 95                     | 11                   | 313                | 0                  | 92       | 3        | 6    |
| 6    | S28+1500 | S29-1200 | 2 | 8.0  | 300  | 300    | 0                      | 0                    | 286                | 0                  | 32       | 0        |      |
| 7    | S29-1200 | S29-300  | 2 | 8.0  | 300  | 900    | 12                     | 1                    | 312                | 0                  | 121      | 0        | 6    |
| 8    | S29-300  | S29-0    | 2 | 8.0  | 200  | 300    | 12                     | 1                    | 423                | 0                  | 151      | 0        | 6    |
| 9    | S29-0    | S29+600  | 2 | 8.0  | 300  | 600    | 12                     | 1                    | 322                | 0                  | 118      | 0        | 6    |
| 10   | S29+600  | S30-900  | 2 | 8.0  | 300  | 900    | 0                      | 0                    | 286                | 0                  | 58       | 0        |      |
| 11   | S30-900  | S30-0    | 2 | 8.0  | 300  | 900    | 12                     | 1                    | 319                | 0                  | 120      | 0        | 6    |
| 12   | S30-0    | S30+300  | 2 | 8.0  | 250  | 300    | 12                     | 1                    | 361                | 0                  | 136      | 0        | 6    |
| 13   | S30+300  | S30+900  | 2 | 8.0  | 300  | 600    | 12                     | 1                    | 287                | 0                  | 106      | 0        | 6    |
| 14   | S30+900  | S31-900  | 2 | 8.0  | 300  | 1200   | 0                      | 0                    | 286                | 0                  | 58       | 0        |      |
| 15   | S31-900  | S31-0    | 2 | 8.0  | 300  | 900    | 12                     | 1                    | 286                | 0                  | 111      | 0        | 6    |
| 16   | S31-0    | S31+600  | 2 | 8.0  | 300  | 600    | 12                     | 1                    | 287                | 0                  | 115      | 0        | 6,59 |

Opmerkingen

[6] 9.2.2 (4) 50% van de dwarskrachtwapening moet uit beugels bestaan.

[59] 6.2.3: Z is berekend m.b.v. de gedrongen ligger berekening art 6.1 (10)

## Hoofdwapening

Balk 9:9

| Geb. | Vanaf    | Tot      | $M_{Ed}$ | z    | B/O | Ab                 | Aa                 | Opm. |
|------|----------|----------|----------|------|-----|--------------------|--------------------|------|
|      | [mm]     | [mm]     | [kNm]    | [mm] |     | [mm <sup>2</sup> ] | [mm <sup>2</sup> ] |      |
| 1    | S32-3100 | S32-671  | -25.36   | 0    | Ond | 156*               | 156                | 1    |
| 2    | S32-1627 | S32+1691 | 49.07    | 440  | Bov | 240                | 240                |      |
| 3    | S32+564  | S33-570  | -39.52   | 442  | Ond | 192                | 192                |      |
| 4    | S32+1691 | S33+1680 | 49.71    | 439  | Bov | 243                | 243                |      |
| 5    | S33+682  | S33+3100 | -24.88   | 0    | Ond | 153*               | 153                | 1    |
| 6    | S33+3085 | S33+3100 | 0.28     | 0    | Bov | 153*               | 153                | 54   |

Opmerkingen

[1] \* = Eisen met betrekking tot minimum wapening zijn toegepast, zie nationale bijlage art. 9.2.1.1(1).

Alle maten zijn zonder verschuiving van de m-lijn en verankering

[54] \* = Eisen met betrekking tot minimum wapening ten behoeve van gecontroleerde scheurvorming zijn toegepast volgens art. 7.3.2.

## Scheurvorming

Balk 9:9

| Geb. | Pos.     | $M_{E;freq}$ | B/O | $\sigma_s$           | art.  | s    | s    | $\emptyset_{km}$ | $\emptyset_{km}$ | $\sigma_b$           | $\sigma_b$           | Opm. |
|------|----------|--------------|-----|----------------------|-------|------|------|------------------|------------------|----------------------|----------------------|------|
|      | [mm]     | [kNm]        |     | [N/mm <sup>2</sup> ] |       | opt. | max. | opt.             | max.             | opt.                 | max.                 |      |
|      |          |              |     |                      |       | [mm] | [mm] | [mm]             | [mm]             | [N/mm <sup>2</sup> ] | [N/mm <sup>2</sup> ] |      |
| 1    | S32-1724 | -13.12       | Ond | 197.3                | 7.3.3 |      | 300  |                  | 25.3             |                      |                      |      |
| 2    | S32+0    | 28.26        | Bov | 279.9                | 7.3.3 |      | 200  |                  | 12.5             |                      |                      |      |
| 3    | S32+1697 | -18.00       | Ond | 220.9                | 7.3.3 |      | 274  |                  | 20.0             |                      |                      |      |
| 4    | S33+0    | 28.86        | Bov | 282.1                | 7.3.3 |      | 197  |                  | 12.3             |                      |                      |      |
| 5    | S33+1727 | -12.68       | Ond | 194.3                | 7.3.3 |      | 300  |                  | 25.8             |                      |                      |      |
| 6    | S33+3100 | 0.24         | Bov | 3.7                  | 7.3.3 |      | 300  |                  | 31.1             |                      |                      |      |

Project...: - pitpotstal de Marsen  
Onderdeel: het Twiske

**Wring- en dwarskrachtwapening**

Balk 9:9

| Geb. | Vanaf    | Tot      | n | Bgl  | Hoh  | Lengte | <Wringing >            |                      | <Dwarskr.>         |                    | V <sub>Ed</sub> | T <sub>Ed</sub> | Opm. |
|------|----------|----------|---|------|------|--------|------------------------|----------------------|--------------------|--------------------|-----------------|-----------------|------|
|      | [mm]     | [mm]     |   | [mm] | [mm] | [mm]   | A <sub>l a n g s</sub> | A <sub>b g l</sub>   | A <sub>b g l</sub> | A <sub>o p g</sub> | [kN]            | [kNm]           |      |
|      |          |          |   |      |      |        | [mm <sup>2</sup> ]     | [mm <sup>2</sup> /m] | [mm <sup>2</sup> ] | [mm <sup>2</sup> ] |                 |                 |      |
| 1    | S32-3100 | S32+0    | 2 | 8.0  | 300  | 3100   | 1                      | 0                    | 286                | 0                  | 94              | 0               | 6    |
| 2    | S32+0    | S33+0    | 2 | 8.0  | 300  | 3400   | 1                      | 0                    | 293                | 0                  | 105             | 0               | 6    |
| 3    | S33+0    | S33+3100 | 2 | 8.0  | 300  | 3100   | 0                      | 0                    | 286                | 0                  | 94              | 0               | 6    |

Opmerkingen

[6] 9.2.2 (4) 50% van de dwarskrachtwapening moet uit beugels bestaan.

**Hoofdwapening**

Balk 10:10

| Geb. | Vanaf    | Tot      | M <sub>Ed</sub> | z    | B/O | Ab                 | Aa                 | Opm. |
|------|----------|----------|-----------------|------|-----|--------------------|--------------------|------|
|      | [mm]     | [mm]     | [kNm]           | [mm] |     | [mm <sup>2</sup> ] | [mm <sup>2</sup> ] |      |
| 1    | S34-825  | S34-779  | -0.81           | 0    | Ond | 153*               | 153                | 54,2 |
| 2    | S34-805  | S34+0    | 21.83           | 0    | Bov | 156*               | 156                | 1,2  |
| 3    | S34+0    | S34+631  | 21.83           | 0    | Bov | 153*               | 153                | 54   |
| 4    | S34+521  | S35-1376 | -43.59          | 441  | Ond | 213                | 213                |      |
| 5    | S35-1385 | S35+1592 | 65.94           | 436  | Bov | 327                | 327                |      |
| 6    | S35+1571 | S36-1636 | -26.41          | 0    | Ond | 161*               | 161                | 1    |
| 7    | S36-1647 | S36+1418 | 68.92           | 435  | Bov | 343                | 343                |      |
| 8    | S36+1413 | S37-811  | -44.96          | 440  | Ond | 219                | 219                |      |
| 9    | S37-853  | S37+0    | 35.74           | 442  | Bov | 180*               | 180                | 1    |
| 10   | S37+0    | S37+1175 | 35.74           | 405  | Bov | 210*               | 210                | 1,2  |

Opmerkingen

[1] \* = Eisen met betrekking tot minimum wapening zijn toegepast, zie nationale bijlage art. 9.2.1.1(1).

[2] Benodigde wapening en inwendige hefboomsarm zijn bepaald volgens gedrongen ligger detaillering, zie nationale bijlage art. 6.1(10).

Alle maten zijn zonder verschuiving van de m-lijn en verankering

[54] \* = Eisen met betrekking tot minimum wapening ten behoeve van gecontroleerde scheurvorming zijn toegepast volgens art. 7.3.2.

**Scheurvorming**

Balk 10:10

| Geb. | Pos.     | M <sub>E, f r e q</sub> | B/O | σ <sub>s</sub>       | art.  | s    | s    | Ø <sub>k m</sub> | Ø <sub>k m</sub> | σ <sub>b</sub>       | σ <sub>b</sub>       | Opm. |
|------|----------|-------------------------|-----|----------------------|-------|------|------|------------------|------------------|----------------------|----------------------|------|
|      | [mm]     | [kNm]                   |     | [N/mm <sup>2</sup> ] |       | opt. | max. | opt.             | max.             | opt.                 | max.                 |      |
|      |          |                         |     |                      |       | [mm] | [mm] | [mm]             | [mm]             | [N/mm <sup>2</sup> ] | [N/mm <sup>2</sup> ] |      |
| 1    | S34-825  | -0.43                   | Ond | 6.6                  | 7.3.3 |      | 300  |                  | 31.1             |                      |                      |      |
| 2    | S34+0    | 18.21                   | Bov | 274.9                | 7.3.3 |      | 206  |                  | 12.8             |                      |                      |      |
| 3    | S34+0    | 18.21                   | Bov | 280.2                | 7.3.3 |      | 200  |                  | 12.4             |                      |                      |      |
| 4    | S34+2873 | -30.88                  | Ond | 343.9                | 7.3.3 |      | 120  |                  | 8.4              |                      |                      |      |
| 5    | S35+0    | 48.10                   | Bov | 353.3                | 7.3.3 |      | 108  |                  | 8.0              |                      |                      |      |
| 6    | S35+3423 | -19.70                  | Ond | 288.0                | 7.3.3 |      | 190  |                  | 11.8             |                      |                      |      |
| 7    | S36+0    | 50.57                   | Bov | 354.3                | 7.3.3 |      | 107  |                  | 8.0              |                      |                      |      |
| 8    | S37-3199 | -32.54                  | Ond | 351.5                | 7.3.3 |      | 111  |                  | 8.1              |                      |                      |      |
| 9    | S37+0    | 27.39                   | Bov | 359.3                | 7.3.3 |      | 101  |                  | 7.8              |                      |                      |      |
| 10   | S37+0    | 27.39                   | Bov | 308.9                | 7.3.3 |      | 164  |                  | 10.2             |                      |                      |      |

**Wring- en dwarskrachtwapening**

Balk 10:10

| Geb. | Vanaf   | Tot      | n | Bgl  | Hoh  | Lengte | <Wringing >            |                      | <Dwarskr.>         |                    | V <sub>Ed</sub> | T <sub>Ed</sub> | Opm. |
|------|---------|----------|---|------|------|--------|------------------------|----------------------|--------------------|--------------------|-----------------|-----------------|------|
|      | [mm]    | [mm]     |   | [mm] | [mm] | [mm]   | A <sub>l a n g s</sub> | A <sub>b g l</sub>   | A <sub>b g l</sub> | A <sub>o p g</sub> | [kN]            | [kNm]           |      |
|      |         |          |   |      |      |        | [mm <sup>2</sup> ]     | [mm <sup>2</sup> /m] | [mm <sup>2</sup> ] | [mm <sup>2</sup> ] |                 |                 |      |
| 1    | S34-825 | S34+0    | 2 | 8.0  | 300  | 825    | 0                      | 0                    | 286                | 0                  | 33              | 0               | 59   |
| 2    | S34+0   | S35+0    | 2 | 8.0  | 300  | 6600   | 0                      | 0                    | 286                | 0                  | 59              | 0               |      |
| 3    | S35+0   | S36+0    | 2 | 8.0  | 300  | 6900   | 0                      | 0                    | 286                | 0                  | 55              | 0               |      |
| 4    | S36+0   | S37+0    | 2 | 8.0  | 300  | 7000   | 0                      | 0                    | 286                | 0                  | 60              | 0               |      |
| 5    | S37+0   | S37+1175 | 2 | 8.0  | 300  | 1175   | 0                      | 0                    | 286                | 0                  | 37              | 0               | 59   |

Opmerkingen

[59] 6.2.3: Z is berekend m.b.v. de gedrongen ligger berekening art 6.1 (10)

Project...: - pitpotstal de Marsen  
Onderdeel: het Twiske

## Hoofdwapening

Balk 11:11

| Geb. | Vanaf<br>[mm] | Tot<br>[mm] | $M_{Ed}$<br>[kNm] | z<br>[mm] | B/O | $A_b$<br>[mm <sup>2</sup> ] | $A_a$<br>[mm <sup>2</sup> ] | Opm. |
|------|---------------|-------------|-------------------|-----------|-----|-----------------------------|-----------------------------|------|
| 1    | S38-34700     | S38-34694   | 0.23              | 0         | Bov | 153*                        | 153                         | 54   |
| 2    | S38-34700     | S38-30677   | -56.28            | 438       | Ond | 276                         | 276                         |      |
| 3    | S38-31328     | S38-29352   | 25.04             | 0         | Bov | 154*                        | 154                         | 1    |
| 4    | S38-29829     | S38-25825   | -25.38            | 0         | Ond | 156*                        | 156                         | 1    |
| 5    | S38-27587     | S38-25825   | 1.18              | 0         | Bov | 153*                        | 153                         | 54   |
| 6    | S38-25825     | S38-25784   | 1.18              | 0         | Bov | 143*                        | 143                         | 54   |
| 7    | S38-25801     | S38-22218   | -32.49            | 392       | Ond | 178                         | 178                         |      |
| 8    | S38-22316     | S38-20360   | 43.38             | 390       | Bov | 239                         | 239                         |      |
| 9    | S38-20442     | S38-17769   | -23.88            | 393       | Ond | 164*                        | 164                         | 1    |
| 10   | S38-17778     | S38-15857   | 45.87             | 389       | Bov | 253                         | 253                         |      |
| 11   | S38-15869     | S38-13277   | -22.20            | 0         | Ond | 153*                        | 153                         | 1    |
| 12   | S38-13293     | S38-11346   | 45.11             | 389       | Bov | 249                         | 249                         |      |
| 13   | S38-11357     | S38-8787    | -20.35            | 0         | Ond | 143*                        | 143                         | 54   |
| 14   | S38-8881      | S38-6998    | 49.61             | 388       | Bov | 275                         | 275                         |      |
| 15   | S38-7071      | S38-3325    | -45.16            | 389       | Ond | 249                         | 249                         |      |
| 16   | S38-5198      | S38-3325    | 5.50              | 0         | Bov | 143*                        | 143                         | 54   |
| 17   | S38-3325      | S38-3144    | 5.50              | 0         | Bov | 153*                        | 153                         | 54   |
| 18   | S38-3200      | S38-782     | -32.31            | 442       | Ond | 180*                        | 180                         | 1    |
| 19   | S38-1643      | S38+810     | 73.37             | 434       | Bov | 367                         | 372                         |      |
| 20   | S38+624       | S39-617     | -68.62            | 435       | Ond | 341                         | 341                         |      |
| 21   | S39-946       | S39+0       | 66.49             | 436       | Bov | 330                         | 357                         |      |
| 22   | S39+0         | S39+1475    | 66.49             | 405       | Bov | 377                         | 377                         | 2    |

Opmerkingen

- [1] \* = Eisen met betrekking tot minimum wapening zijn toegepast, zie nationale bijlage art. 9.2.1.1(1).  
[2] Benodigde wapening en inwendige hefboomsarm zijn bepaald volgens gedrongen ligger detaillering, zie nationale bijlage art. 6.1(10).  
Alle maten zijn zonder verschuiving van de m-lijn en verankering  
[54] \* = Eisen met betrekking tot minimum wapening ten behoeve van gecontroleerde scheurvorming zijn toegepast volgens art. 7.3.2.

## Scheurvorming

Balk 11:11

| Geb. | Pos.<br>[mm] | $M_{Ed, req}$<br>[kNm] | B/O | $\sigma_s$<br>[N/mm <sup>2</sup> ] | art.  | s<br>opt.<br>[mm] | s<br>max.<br>[mm] | $\sigma_{km}$<br>opt.<br>[mm] | $\sigma_{km}$<br>max.<br>[mm] | $\sigma_b$<br>opt.<br>[N/mm <sup>2</sup> ] | $\sigma_b$<br>max.<br>[N/mm <sup>2</sup> ] | Opm. |
|------|--------------|------------------------|-----|------------------------------------|-------|-------------------|-------------------|-------------------------------|-------------------------------|--------------------------------------------|--------------------------------------------|------|
| 1    | S38-34700    | 0.19                   | Bov | 2.9                                | 7.3.3 |                   | 300               |                               | 31.1                          |                                            |                                            |      |
| 2    | S38-32800    | -9.08                  | Ond | 78.5                               | 7.3.3 |                   | 300               |                               | 31.1                          |                                            |                                            |      |
| 3    | S38-30325    | 12.09                  | Bov | 184.2                              | 7.3.3 |                   | 300               |                               | 27.3                          |                                            |                                            |      |
| 4    | S38-27816    | -20.95                 | Ond | 314.8                              | 7.3.3 |                   | 157               |                               | 9.7                           |                                            |                                            |      |
| 5    | S38-25825    | 0.74                   | Bov | 11.3                               | 7.3.3 |                   | 300               |                               | 31.1                          |                                            |                                            |      |
| 6    | S38-25825    | 0.74                   | Bov | 13.6                               | 7.3.3 |                   | 300               |                               | 28.0                          |                                            |                                            |      |
| 7    | S38-24060    | -25.56                 | Ond | 381.7                              | 7.3.3 |                   | 100               |                               | 6.2                           |                                            |                                            |      |
| 8    | S38-21325    | 33.37                  | Bov | 374.1                              | 7.3.3 |                   | 100               |                               | 6.5                           |                                            |                                            |      |
| 9    | S38-19105    | -15.58                 | Ond | 252.3                              | 7.3.3 |                   | 235               |                               | 13.1                          |                                            |                                            |      |
| 10   | S38-16825    | 31.79                  | Bov | 337.2                              | 7.3.3 |                   | 128               |                               | 7.8                           |                                            |                                            |      |
| 11   | S38-14569    | -15.79                 | Ond | 273.4                              | 7.3.3 |                   | 208               |                               | 11.7                          |                                            |                                            |      |
| 12   | S38-12325    | 31.61                  | Bov | 340.9                              | 7.3.3 |                   | 124               |                               | 7.7                           |                                            |                                            |      |
| 13   | S38-10112    | -14.11                 | Ond | 261.2                              | 7.3.3 |                   | 224               |                               | 12.5                          |                                            |                                            |      |
| 14   | S38-7825     | 35.25                  | Bov | 345.4                              | 7.3.3 |                   | 118               |                               | 7.5                           |                                            |                                            |      |
| 15   | S38-5163     | -31.50                 | Ond | 339.3                              | 7.3.3 |                   | 126               |                               | 7.7                           |                                            |                                            |      |
| 16   | S38-3325     | 3.32                   | Bov | 61.4                               | 7.3.3 |                   | 300               |                               | 28.0                          |                                            |                                            |      |
| 17   | S38-3325     | 3.32                   | Bov | 51.1                               | 7.3.3 |                   | 300               |                               | 31.1                          |                                            |                                            |      |
| 18   | S38-1869     | -18.77                 | Ond | 246.2                              | 7.3.3 |                   | 242               |                               | 15.1                          |                                            |                                            |      |
| 19   | S38+0        | 38.72                  | Bov | 253.8                              | 7.3.3 |                   | 233               |                               | 14.5                          |                                            |                                            |      |
| 20   | S38+2090     | -30.25                 | Ond | 212.9                              | 7.3.3 |                   | 284               |                               | 21.9                          |                                            |                                            |      |
| 21   | S39+0        | 39.24                  | Bov | 285.7                              | 7.3.3 |                   | 193               |                               | 12.0                          |                                            |                                            |      |
| 22   | S39+0        | 39.24                  | Bov | 250.7                              | 7.3.3 |                   | 237               |                               | 14.7                          |                                            |                                            |      |

Project...: - pitpotstal de Marsen  
Onderdeel: het Twiske

**Wring- en dwarskrachtwapening**

Balk 11:11

| Geb. | Vanaf     | Tot       | n | Bgl  | Hoh  | Lengte | <Wringing>             |                      | <Dwarskr.>         |                    | V <sub>Ed</sub> | T <sub>Ed</sub> | Opm. |
|------|-----------|-----------|---|------|------|--------|------------------------|----------------------|--------------------|--------------------|-----------------|-----------------|------|
|      | [mm]      | [mm]      |   | [mm] | [mm] | [mm]   | A <sub>l a n g s</sub> | A <sub>b g l</sub>   | A <sub>b g l</sub> | A <sub>o p g</sub> | [kN]            | [kNm]           |      |
|      |           |           |   |      |      |        | [mm <sup>2</sup> ]     | [mm <sup>2</sup> /m] | [mm <sup>2</sup> ] | [mm <sup>2</sup> ] |                 |                 |      |
| 1    | S38-34700 | S38-30863 | 2 | 8.0  | 300  | 3838   | 0                      | 0                    | 286                | 0                  | 40              | 1               |      |
| 2    | S38-30863 | S38-30325 | 2 | 8.0  | 300  | 538    | 34                     | 4                    | 286                | 0                  | 73              | 1               | 6    |
| 3    | S38-30325 | S38-25825 | 2 | 8.0  | 300  | 4500   | 0                      | 0                    | 286                | 0                  | 32              | 1               |      |
| 4    | S38-25825 | S38-21325 | 4 | 8.0  | 300  | 4500   | 0                      | 0                    | 286                | 0                  | 51              | 1               | 8    |
| 5    | S38-21325 | S38-21025 | 4 | 8.0  | 300  | 300    | 7                      | 1                    | 286                | 0                  | 59              | 1               | 6,8  |
| 6    | S38-21025 | S38-17125 | 4 | 8.0  | 300  | 3900   | 0                      | 0                    | 286                | 0                  | 53              | 0               | 8    |
| 7    | S38-17125 | S38-16825 | 4 | 8.0  | 300  | 300    | 7                      | 1                    | 286                | 0                  | 61              | 0               | 6,8  |
| 8    | S38-16825 | S38-16525 | 4 | 8.0  | 300  | 300    | 4                      | 0                    | 286                | 0                  | 60              | 0               | 6,8  |
| 9    | S38-16525 | S38-12625 | 4 | 8.0  | 300  | 3900   | 0                      | 0                    | 286                | 0                  | 52              | 0               | 8    |
| 10   | S38-12625 | S38-12325 | 4 | 8.0  | 300  | 300    | 4                      | 0                    | 286                | 0                  | 60              | 0               | 6,8  |
| 11   | S38-12325 | S38-7825  | 4 | 8.0  | 300  | 4500   | 1                      | 0                    | 286                | 0                  | 61              | 0               | 6,8  |
| 12   | S38-7825  | S38-3325  | 4 | 8.0  | 300  | 4500   | 0                      | 0                    | 286                | 0                  | 71              | 0               | 6,8  |
| 13   | S38-3325  | S38-1063  | 2 | 8.0  | 300  | 2263   | 0                      | 0                    | 286                | 0                  | 47              | 0               |      |
| 14   | S38-1063  | S38+0     | 2 | 8.0  | 300  | 1063   | 14                     | 2                    | 286                | 0                  | 119             | 0               | 6    |
| 15   | S38+0     | S38+1200  | 2 | 8.0  | 300  | 1200   | 14                     | 2                    | 319                | 0                  | 139             | 0               | 6    |
| 16   | S38+1200  | S39-1200  | 2 | 8.0  | 300  | 1800   | 0                      | 0                    | 286                | 0                  | 56              | 0               |      |
| 17   | S39-1200  | S39+0     | 2 | 8.0  | 300  | 1200   | 14                     | 2                    | 286                | 0                  | 122             | 0               | 6    |
| 18   | S39+0     | S39+887   | 2 | 8.0  | 300  | 888    | 14                     | 2                    | 286                | 0                  | 87              | 0               | 6,59 |
| 19   | S39+887   | S39+1475  | 2 | 8.0  | 300  | 588    | 0                      | 0                    | 286                | 0                  | 39              | 0               | 59   |

Opmerkingen

[6] 9.2.2 (4) 50% van de dwarskrachtwapening moet uit beugels bestaan.

[8] Er zijn meer dan 2 (n) beugelstaven per doorsnede toegepast.

[59] 6.2.3: Z is berekend m.b.v. de gedrongen ligger berekening art 6.1 (10)

**Hoofdwapening**

Balk 12:12

| Geb. | Vanaf | Tot   | M <sub>Ed</sub> | z    | B/O | Ab                 | Aa                 | Opm. |
|------|-------|-------|-----------------|------|-----|--------------------|--------------------|------|
|      | [mm]  | [mm]  | [kNm]           | [mm] |     | [mm <sup>2</sup> ] | [mm <sup>2</sup> ] |      |
| 1    | 0     | 70    | 1.77            | 0    | Bov | 143*               | 143                | 54   |
| 2    | 63    | 3663  | -24.70          | 393  | Ond | 164*               | 164                | 1    |
| 3    | 3652  | 5578  | 28.32           | 393  | Bov | 164*               | 164                | 1    |
| 4    | 5557  | 7978  | -11.17          | 0    | Ond | 143*               | 143                | 54   |
| 5    | 7945  | 10038 | 26.84           | 393  | Bov | 164*               | 164                | 1    |
| 6    | 10020 | 12539 | -10.54          | 0    | Ond | 143*               | 143                | 54   |
| 7    | 12390 | 14380 | 29.44           | 393  | Bov | 164*               | 164                | 1    |
| 8    | 14260 | 17927 | -23.46          | 0    | Ond | 162*               | 162                | 1    |
| 9    | 17888 | 18000 | 3.08            | 0    | Bov | 143*               | 143                | 54   |

Opmerkingen

[1] \* = Eisen met betrekking tot minimum wapening zijn toegepast, zie nationale bijlage art. 9.2.1.1(1).

Alle maten zijn zonder verschuiving van de m-lijn en verankering

[54] \* = Eisen met betrekking tot minimum wapening ten behoeve van gecontroleerde scheurvorming zijn toegepast volgens art. 7.3.2.

**Scheurvorming**

Balk 12:12

| Geb. | Pos.  | M <sub>Ed</sub> | B/O | σ <sub>s</sub>       | art.  | s    | s    | Ø <sub>km</sub> | Ø <sub>km</sub> | σ <sub>b</sub>       | σ <sub>b</sub>       | Opm. |
|------|-------|-----------------|-----|----------------------|-------|------|------|-----------------|-----------------|----------------------|----------------------|------|
|      | [mm]  | [kNm]           |     | [N/mm <sup>2</sup> ] |       | opt. | max. | opt.            | max.            | opt.                 | max.                 |      |
|      |       |                 |     |                      |       | [mm] | [mm] | [mm]            | [mm]            | [N/mm <sup>2</sup> ] | [N/mm <sup>2</sup> ] |      |
| 1    | 0     | 1.43            | Bov | 26.4                 | 7.3.3 |      | 300  |                 | 28.0            |                      |                      |      |
| 2    | 1863  | -17.87          | Ond | 289.5                | 7.3.3 |      | 188  |                 | 10.5            |                      |                      |      |
| 3    | 4500  | 20.78           | Bov | 336.6                | 7.3.3 |      | 129  |                 | 7.8             |                      |                      |      |
| 4    | 6767  | -8.00           | Ond | 148.0                | 7.3.3 |      | 300  |                 | 28.0            |                      |                      |      |
| 5    | 9000  | 19.80           | Bov | 320.7                | 7.3.3 |      | 149  |                 | 8.4             |                      |                      |      |
| 6    | 11214 | -8.12           | Ond | 150.3                | 7.3.3 |      | 300  |                 | 28.0            |                      |                      |      |
| 7    | 13500 | 20.24           | Bov | 327.8                | 7.3.3 |      | 140  |                 | 8.1             |                      |                      |      |
| 8    | 16134 | -17.79          | Ond | 290.8                | 7.3.3 |      | 187  |                 | 10.4            |                      |                      |      |
| 9    | 18000 | 1.96            | Bov | 36.2                 | 7.3.3 |      | 300  |                 | 28.0            |                      |                      |      |

**Wring- en dwarskrachtwapening**

Balk 12:12

| Geb. | Vanaf | Tot   | n | Bgl  | Hoh  | Lengte | <Wringing>             |                      | <Dwarskr.>         |                    | V <sub>Ed</sub> | T <sub>Ed</sub> | Opm. |
|------|-------|-------|---|------|------|--------|------------------------|----------------------|--------------------|--------------------|-----------------|-----------------|------|
|      | [mm]  | [mm]  |   | [mm] | [mm] | [mm]   | A <sub>l a n g s</sub> | A <sub>b g l</sub>   | A <sub>b g l</sub> | A <sub>o p g</sub> | [kN]            | [kNm]           |      |
|      |       |       |   |      |      |        | [mm <sup>2</sup> ]     | [mm <sup>2</sup> /m] | [mm <sup>2</sup> ] |                    |                 |                 |      |
| 1    | 0     | 4500  | 4 | 8.0  | 300  | 4500   | 0                      | 0                    | 286                | 0                  | 40              | 0               | 8    |
| 2    | 4500  | 9000  | 4 | 8.0  | 300  | 4500   | 0                      | 0                    | 286                | 0                  | 35              | 0               | 8    |
| 3    | 9000  | 13500 | 4 | 8.0  | 300  | 4500   | 0                      | 0                    | 286                | 0                  | 35              | 0               | 8    |
| 4    | 13500 | 18000 | 4 | 8.0  | 300  | 4500   | 0                      | 0                    | 286                | 0                  | 40              | 0               | 8    |

Opmerkingen

[8] Er zijn meer dan 2 (n) beugelstaven per doorsnede toegepast.

**Hoofdwapening**

Balk 13:13

| Geb. | Vanaf              | Tot  | M <sub>Ed</sub> | z    | B/O | Ab                 | Aa                 | Opm. |
|------|--------------------|------|-----------------|------|-----|--------------------|--------------------|------|
|      | [mm]               | [mm] | [kNm]           | [mm] |     | [mm <sup>2</sup> ] | [mm <sup>2</sup> ] |      |
| 1    | S40-34700S40-34693 |      | 0.15            | 0    | Bov | 153*               | 153                | 54   |
| 2    | S40-34700S40-30647 |      | -23.40          | 0    | Ond | 153*               | 153                | 54   |
| 3    | S40-30868S40-29618 |      | 15.17           | 0    | Bov | 153*               | 153                | 54   |
| 4    | S40-29907S40-26987 |      | -11.95          | 0    | Ond | 153*               | 153                | 54   |
| 5    | S40-27070S40-24813 |      | 28.17           | 0    | Bov | 172*               | 172                | 1    |
| 6    | S40-24919S40-22251 |      | -15.19          | 0    | Ond | 153*               | 153                | 54   |
| 7    | S40-22316S40-20379 |      | 28.93           | 0    | Bov | 177*               | 177                | 1    |
| 8    | S40-20431S40-17714 |      | -15.22          | 0    | Ond | 153*               | 153                | 54   |
| 9    | S40-17743S40-15874 |      | 28.11           | 0    | Bov | 172*               | 172                | 1    |
| 10   | S40-15919S40-13323 |      | -14.13          | 0    | Ond | 153*               | 153                | 54   |
| 11   | S40-13335S40-11335 |      | 30.74           | 442  | Bov | 180*               | 180                | 1    |
| 12   | S40-11349 S40-8650 |      | -14.76          | 0    | Ond | 153*               | 153                | 54   |
| 13   | S40-8715 S40-6939  |      | 26.87           | 0    | Bov | 164*               | 164                | 1    |
| 14   | S40-7086 S40-3901  |      | -19.40          | 0    | Ond | 153*               | 153                | 54   |
| 15   | S40-4442 S40-2171  |      | 31.20           | 442  | Bov | 180*               | 180                | 1    |
| 16   | S40-2577 S40-984   |      | -15.46          | 0    | Ond | 153*               | 153                | 54   |
| 17   | S40-2171 S40+860   |      | 75.24           | 434  | Bov | 378                | 383                |      |
| 18   | S40+647 S41-620    |      | -67.25          | 436  | Ond | 334                | 334                |      |
| 19   | S41-956 S41+0      |      | 66.30           | 436  | Bov | 329                | 334                |      |
| 20   | S41+0 S41+1475     |      | 66.30           | 405  | Bov | 376                | 376                | 2    |
| 21   | S41+1473 S41+1475  |      | -0.02           | 0    | Ond | 153*               | 153                | 54,2 |

Opmerkingen

[1] \* = Eisen met betrekking tot minimum wapening zijn toegepast, zie nationale bijlage art. 9.2.1.1(1).

[2] Benodigde wapening en inwendige hefboomsarm zijn bepaald volgens gedrongen ligger detaillering, zie nationale bijlage art. 6.1(10).

Alle maten zijn zonder verschuiving van de m-lijn en verankering

[54] \* = Eisen met betrekking tot minimum wapening ten behoeve van gecontroleerde scheurvorming zijn toegepast volgens art. 7.3.2.

**Scheurvorming**

Balk 13:13

| Geb. | Pos.      | M <sub>Ed</sub> ; f <sub>req</sub> | B/O | σ <sub>s</sub>       | art.  | s    | s    | Ø <sub>k m</sub> | Ø <sub>k m</sub> | σ <sub>b</sub>       | σ <sub>b</sub>       | Opm. |
|------|-----------|------------------------------------|-----|----------------------|-------|------|------|------------------|------------------|----------------------|----------------------|------|
|      | [mm]      | [kNm]                              |     | [N/mm <sup>2</sup> ] |       | opt. | max. | opt.             | max.             | opt.                 | max.                 |      |
|      |           |                                    |     |                      |       | [mm] | [mm] | [mm]             | [mm]             | [N/mm <sup>2</sup> ] | [N/mm <sup>2</sup> ] |      |
| 1    | S40-34700 | 0.09                               | Bov | 1.4                  | 7.3.3 |      | 300  |                  | 31.1             |                      |                      |      |
| 2    | S40-32782 | -18.99                             | Ond | 292.2                | 7.3.3 |      | 185  |                  | 11.5             |                      |                      |      |
| 3    | S40-30325 | 13.12                              | Bov | 201.8                | 7.3.3 |      | 298  |                  | 24.5             |                      |                      |      |
| 4    | S40-28456 | -8.81                              | Ond | 135.5                | 7.3.3 |      | 300  |                  | 31.1             |                      |                      |      |
| 5    | S40-25825 | 22.71                              | Bov | 310.2                | 7.3.3 |      | 162  |                  | 10.1             |                      |                      |      |
| 6    | S40-23590 | -12.67                             | Ond | 195.0                | 7.3.3 |      | 300  |                  | 25.7             |                      |                      |      |
| 7    | S40-21325 | 23.95                              | Bov | 318.2                | 7.3.3 |      | 152  |                  | 9.5              |                      |                      |      |
| 8    | S40-19068 | -12.49                             | Ond | 192.2                | 7.3.3 |      | 300  |                  | 26.1             |                      |                      |      |
| 9    | S40-16825 | 23.09                              | Bov | 316.2                | 7.3.3 |      | 155  |                  | 9.6              |                      |                      |      |
| 10   | S40-14609 | -11.66                             | Ond | 179.4                | 7.3.3 |      | 300  |                  | 28.1             |                      |                      |      |
| 11   | S40-12325 | 25.30                              | Bov | 331.8                | 7.3.3 |      | 135  |                  | 8.9              |                      |                      |      |
| 12   | S40-10025 | -12.08                             | Ond | 186.0                | 7.3.3 |      | 300  |                  | 27.1             |                      |                      |      |
| 13   | S40-7825  | 22.25                              | Bov | 319.4                | 7.3.3 |      | 151  |                  | 9.4              |                      |                      |      |
| 14   | S40-5493  | -15.49                             | Ond | 238.4                | 7.3.3 |      | 252  |                  | 15.9             |                      |                      |      |
| 15   | S40-3325  | 18.72                              | Bov | 245.5                | 7.3.3 |      | 243  |                  | 15.1             |                      |                      |      |
| 16   | S40-1727  | -6.73                              | Ond | 103.6                | 7.3.3 |      | 300  |                  | 31.1             |                      |                      |      |
| 17   | S40+0     | 42.40                              | Bov | 270.5                | 7.3.3 |      | 212  |                  | 13.2             |                      |                      |      |
| 18   | S40+2102  | -28.01                             | Ond | 201.4                | 7.3.3 |      | 298  |                  | 24.6             |                      |                      |      |
| 19   | S41+0     | 39.05                              | Bov | 285.2                | 7.3.3 |      | 194  |                  | 12.0             |                      |                      |      |
| 20   | S41+0     | 39.05                              | Bov | 250.2                | 7.3.3 |      | 237  |                  | 14.8             |                      |                      |      |
| 21   | S41+1475  | -0.02                              | Ond | 0.4                  | 7.3.3 |      | 300  |                  | 31.1             |                      |                      |      |

Project...: - pitpotstal de Marsen  
Onderdeel: het Twiske

**Wring- en dwarskrachtwapening**

Balk 13:13

| Geb. | Vanaf     | Tot       | n | Bgl  | Hoh  | Lengte | <Wringing>             |                      | <Dwarskr.>         |                    | V <sub>Ed</sub> | T <sub>Ed</sub> | Opm. |
|------|-----------|-----------|---|------|------|--------|------------------------|----------------------|--------------------|--------------------|-----------------|-----------------|------|
|      | [mm]      | [mm]      |   | [mm] | [mm] | [mm]   | A <sub>l a n g s</sub> | A <sub>b g l</sub>   | A <sub>b g l</sub> | A <sub>o p g</sub> | [kN]            | [kNm]           |      |
|      |           |           |   |      |      |        | [mm <sup>2</sup> ]     | [mm <sup>2</sup> /m] | [mm <sup>2</sup> ] |                    |                 |                 |      |
| 1    | S40-34700 | S40-30325 | 2 | 8.0  | 300  | 4375   | 0                      | 0                    | 286                | 0                  | 31              | 1               |      |
| 2    | S40-30325 | S40-25825 | 2 | 8.0  | 300  | 4500   | 0                      | 0                    | 286                | 0                  | 32              | 1               |      |
| 3    | S40-25825 | S40-21325 | 2 | 8.0  | 300  | 4500   | 0                      | 0                    | 286                | 0                  | 39              | 1               |      |
| 4    | S40-21325 | S40-16825 | 2 | 8.0  | 300  | 4500   | 0                      | 0                    | 286                | 0                  | 39              | 1               |      |
| 5    | S40-16825 | S40-12325 | 2 | 8.0  | 300  | 4500   | 0                      | 0                    | 286                | 0                  | 39              | 1               |      |
| 6    | S40-12325 | S40-7825  | 2 | 8.0  | 300  | 4500   | 0                      | 0                    | 286                | 0                  | 40              | 1               |      |
| 7    | S40-7825  | S40-3325  | 2 | 8.0  | 300  | 4500   | 0                      | 0                    | 286                | 0                  | 40              | 1               |      |
| 8    | S40-3325  | S40-763   | 2 | 8.0  | 300  | 2563   | 0                      | 0                    | 286                | 0                  | 58              | 1               |      |
| 9    | S40-763   | S40+0     | 2 | 8.0  | 300  | 763    | 10                     | 1                    | 286                | 0                  | 109             | 0 6             |      |
| 10   | S40+0     | S40+1200  | 2 | 8.0  | 300  | 1200   | 10                     | 1                    | 313                | 0                  | 137             | 0 6             |      |
| 11   | S40+1200  | S41-1200  | 2 | 8.0  | 300  | 1800   | 0                      | 0                    | 286                | 0                  | 55              | 0               |      |
| 12   | S41-1200  | S41+0     | 2 | 8.0  | 300  | 1200   | 10                     | 1                    | 292                | 0                  | 122             | 0 6             |      |
| 13   | S41+0     | S41+887   | 2 | 8.0  | 300  | 888    | 10                     | 1                    | 286                | 0                  | 87              | 0 6,59          |      |
| 14   | S41+887   | S41+1475  | 2 | 8.0  | 300  | 588    | 0                      | 0                    | 286                | 0                  | 39              | 0 59            |      |

Opmerkingen

[6] 9.2.2 (4) 50% van de dwarskrachtwapening moet uit beugels bestaan.

[59] 6.2.3: Z is berekend m.b.v. de gedrongen ligger berekening art 6.1 (10)

**2.4. palen onder de mestvloer**

De vloer uitvoeren als puntvormig ondersteunde vloer.

rekenwaarde : 1.2 x 4.80 + 30.00 x 1.35

p<sub>d</sub> = 46.26 kN/m<sup>2</sup>

Er wordt een paalstramien van 2.25 x 2.4 m toegepast.

Maximale paalbelasting : 46.26 x 2.25 x 2.4

F<sub>d</sub> = 249.80 kN

**2.4.1. pons**
**TS/Construct**
**Rel: 5.27 30 mei 2014**

Project : Pikpotstal  
Onderdeel : betonconstructie  
Datum : 24/03/2014  
Eenheden : kN/m/rad  
Bestand : P:\2014\14119\berekeningen\pons.cnw

**Toegepaste normen volgens Eurocode met Nederlandse NB**

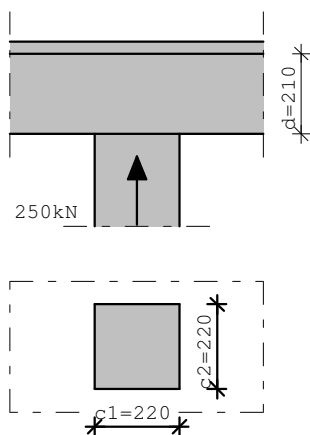
|             |                      |         |             |
|-------------|----------------------|---------|-------------|
| Belastingen | NEN-EN 1990:2002     | C2:2010 | NB:2011(nl) |
|             | NEN-EN 1991-1-1:2002 | C1:2009 | NB:2011(nl) |
| Beton       | NEN-EN 1992-1-1:2005 | C2:2010 | NB:2011(nl) |

**Pons 25-250**
**GEOMETRIE**

Kolomvorm : Rechthoekig  
Kolomsoort : Midden - onder de vloer  
Betonkwaliteit : C20/25  
Nuttige hoogte d [mm]: 210

Kolom  
Breedte lastvlak c<sub>1</sub> [mm]: 220      Lengte lastvlak c<sub>2</sub> [mm]: 220





### WAPENING

|                            |   |         |                                |           |
|----------------------------|---|---------|--------------------------------|-----------|
| Staalkwaliteit             | : | B500B   |                                |           |
| Wapeningsratio $\rho_{ly}$ | : | 0.00300 | Wapeningsratio $\rho_{lz}$     | : 0.00300 |
| Radiale afstand $s_r$ [mm] | : | 157     | Tangentiële afstand $s_t$ [mm] | : 315     |
| Beugel diameter [mm]       | : | 6       | Hoek $\alpha$                  | : 90      |

### BELASTING

|                 |       |       |
|-----------------|-------|-------|
| Kracht $V_{Ed}$ | [kN]: | 250.0 |
|-----------------|-------|-------|

### RESULTATEN

| Ponsomtrek [mm] | $v_{Rd,c}$ [N/mm <sup>2</sup> ] | $v_{Rd,max}$ [N/mm <sup>2</sup> ] | $v_{Ed}$ [N/mm <sup>2</sup> ] | $v_{Rd,s}$ [N/mm <sup>2</sup> ] | $A_{sw}/s_r$ [mm <sup>2</sup> /mm] | $A_{sw}$ [mm <sup>2</sup> ] | code |
|-----------------|---------------------------------|-----------------------------------|-------------------------------|---------------------------------|------------------------------------|-----------------------------|------|
| $u_0$ 880       | n.v.t.                          | 2.94                              | 1.56                          | n.v.t.                          | n.v.t.                             | n.v.t.                      |      |
| $u_1$ 3519      | 0.43                            | 2.94                              | 0.39                          | 0.00                            | 0.00                               | 0 [42]                      |      |

### Opmerkingen

[ 42] Er is geen ponswapening nodig ( $v_{Ed} < v_{Rd,c}$ ).

### Controle-omtrek $u_0$ ( 880 mm )

|                                                              |      |                                              |      |
|--------------------------------------------------------------|------|----------------------------------------------|------|
| Rekenwaarde schuifspanning volgens art. 6.4.5 (formule 6.53) |      |                                              |      |
| Nuttige plaatdikte $d$ [mm]:                                 | 210  | Omtrek $u_0$ [mm]:                           | 880  |
| Factor $\beta$ :                                             | 1.15 |                                              |      |
| Schuifsp. $v_{Ed}$ [N/mm <sup>2</sup> ]:                     | 1.56 | Schuifsp. $v_{Rd,max}$ [N/mm <sup>2</sup> ]: | 2.94 |

### Controle-omtrek $u_1$ ( 3519 mm )

|                                             |      |                    |      |
|---------------------------------------------|------|--------------------|------|
| Rekenwaarde schuifspanning volgens art. 6.4 |      |                    |      |
| Afstand tot aan kolom [mm]:                 | 420  |                    |      |
| Nuttige plaatdikte $d$ [mm]:                | 210  | Omtrek $u_1$ [mm]: | 3519 |
| Factor $\beta$ :                            | 1.15 |                    |      |
| Schuifsp. $v_{Ed}$ [N/mm <sup>2</sup> ]:    | 0.39 |                    |      |
| Schuifsp. $v_{Rd,c}$ [N/mm <sup>2</sup> ]:  | 0.43 |                    |      |