

|                        |                       |                                                                     |
|------------------------|-----------------------|---------------------------------------------------------------------|
| constructieadvies      | <b>Project:</b>       | <b>VL02430</b><br>Uitbreiding woonhuis fam Hoogerheide te Drempt    |
| bouwkunde              | <b>Onderwerp:</b>     | Statische berekening                                                |
| bouwmanagement         | <b>Fase</b>           | Uitvoering                                                          |
| uitvoeringsengineering | <b>Status:</b>        | definitief                                                          |
| prefab                 | <b>Datum:</b>         | 13-11-2007                                                          |
| infra                  |                       |                                                                     |
| brandveiligheid        | <b>Opdrachtgever:</b> | Bouwkunsten<br>Dorpstraat 28<br>6923 AE GROESSEN<br>T 0316-84 48 44 |

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Ale werkzaamheden worden verricht onder de toepasselijkheid van de Rechtsverhouding opdrachtgever - architect, ingenieur en adviseur DNR2005, gedeponeerd op 5 oktober 2004 ter griffie van de Rechtbank te Amsterdam onder nummer 139/2004.

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BTWnr. NL00423275.802



Overige vestigingen in:

Amsterdam - Apeldoorn - Eist - Enschede - Leeuwarden - Lochem - Utrecht - Zwijndrecht - Duitsland - Bulgarije - Polen

Project: Uitbreiding woonhuis Fam. Hoogerheide te Drempt

Werknr. VL02430 Bladnr. 1

## Algemene gegevens

**Voorschriften:** - NEN 6702 Belastingen en Vervormingen - NEN 6760 Houtconstructies  
 - NEN 6720 Betonconstructies - NEN 6770 Staalconstructies  
 - NEN 6740 Geotechniek - NEN 6790 Steenconstructies

**NEN 6702:** Bouwwerkaanduiding: woonhuis belastingfactoren:  
**art. 5** Veiligheidsklasse 2  $\gamma_g = 1,2 ; 1,35$   
 Referentieperiode 50 jaar  $\gamma_q = 1,30$

**Windbelasting:** Gebied in Nederland = 3 stuwdrukwaarde  $P_w = 0,65 \text{ KN/m}^2$   
 Bebouwd/Onbebouwd Onbebouwd  
 Gebouwhoogte boven mv 7,50 m  
 Dakhelling 1  $\alpha = 51,00^\circ$

**Sneeuw:** 1=lessenaard;2=zadeld 2  
 Sneeuwvormfactor  $C_i = 0,36$

**Fundering:** Wapening fundering  
 Beton C20/25  
 Staal FeB500  $f_s = 435 \text{ N/mm}^2$   
 Minimum wapening:  $\omega_{0,min} = 0,15 \%$

Gegevens balken/stroken:  
 dekking 50 [mm]  
 Geschatte diameter 10 [mm]  
 $h-d = 50 + 0,5 \cdot 10 = 55 \text{ [mm]}$

**Staal:** Staalkwaliteit S 235  
 Boutkwaliteit 8.8  
 Ankerkwaliteit 4.6  
 Vierkante en ronde buisprofielen alleen in warmgevormde uitvoering toepassen

**Hout:** Kapconstructie C24 (K24) (constructiehout)  
 Platbalklagen C18 (K17) (standaardbouwhout)

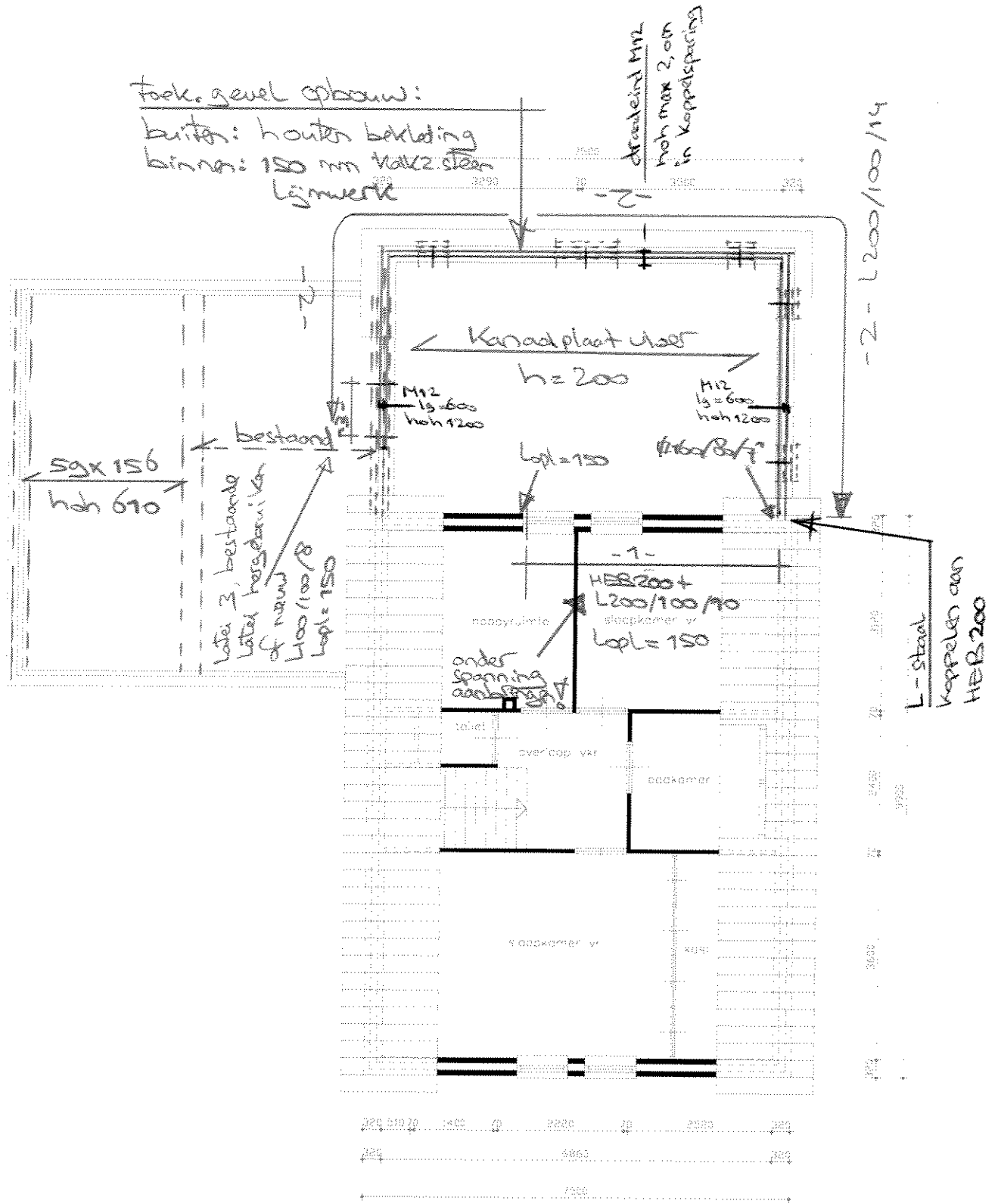
**Metselwerk:** Kalkzandsteen gemiddelde druksterkte van de stenen  $15,0 \text{ N/mm}^2$   
 (lijmwerk) representatieve druksterkte van de mortel  $12,5 \text{ N/mm}^2$   
 $f_{rep} = 6,0 \text{ N/mm}^2$  Hoogte < 11m  $\gamma_m = 1,3$   
 $f_d = 3,3 \text{ N/mm}^2$  (=  $f_{rep} / 1,8$ )  
 $f_d = 4,3 \text{ N/mm}^2$  (=  $f_{rep} / 1,8$ ) \* 1,3 (incl. modelfactor)

Metselwerk gemiddelde druksterkte van de stenen  $10,0 \text{ N/mm}^2$   
 representatieve druksterkte van de mortel  $7,5 \text{ N/mm}^2$   
 $f_{rep} = 3,0 \text{ N/mm}^2$   
 $f_d = 1,7 \text{ N/mm}^2$  (=  $f_{rep} / 1,8$ )  
 $f_d = 2,2 \text{ N/mm}^2$  (=  $f_{rep} / 1,8$ ) \* 1,3 (incl. modelfactor)

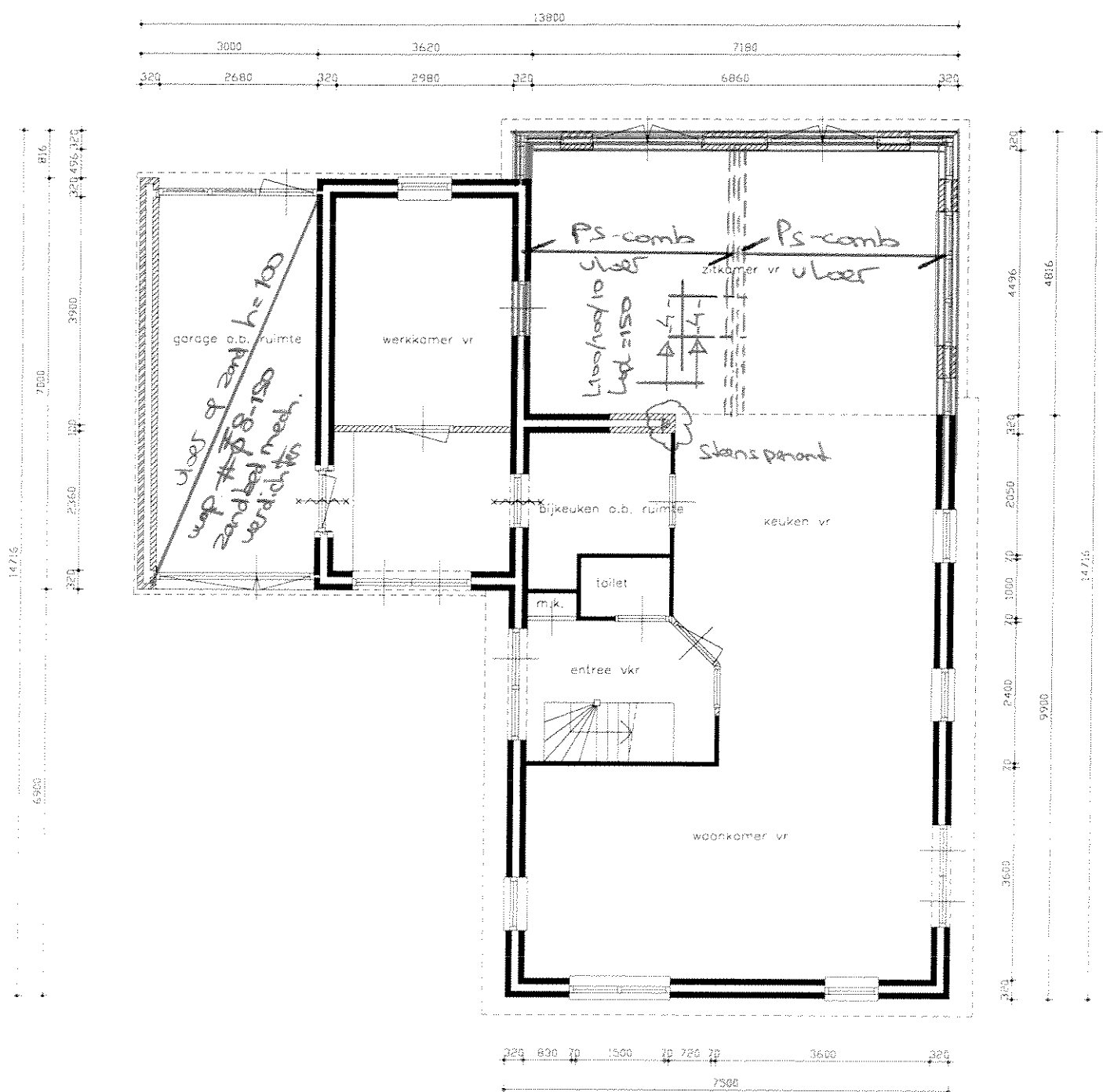
## Belastingen:

|                            |                                      |                          |                   |                        |                                  |
|----------------------------|--------------------------------------|--------------------------|-------------------|------------------------|----------------------------------|
| hellend dak 1              | dakhelling                           | 51 °                     |                   |                        |                                  |
|                            | belasting                            | $0,70 / \cos 51^\circ =$ |                   |                        | 1,11 kN/m <sup>2</sup> grondvlak |
| <hr/>                      |                                      |                          |                   |                        |                                  |
| plattendak                 | grind                                | 0 mm                     | kN/m <sup>3</sup> | 18,0                   | 0,00                             |
| zonder grind               | dakleer                              | 10 mm                    |                   | 14,0                   | 0,14                             |
|                            | isolatie                             | 80 mm                    |                   | 2,00                   | 0,16                             |
|                            | kanaalpl.vl.                         | 200 mm                   |                   |                        | 3,00                             |
|                            |                                      |                          |                   |                        | <hr/> 3,30 kN/m <sup>2</sup>     |
|                            | sneeuwbelasting plattendak           |                          |                   | 0,56 kN/m <sup>2</sup> | $\psi = 0$                       |
|                            | veranderlijke dakbelasting           |                          |                   | 1,00 kN/m <sup>2</sup> | $\psi = 0$                       |
| <hr/>                      |                                      |                          |                   |                        |                                  |
| ↑                          | NU                                   |                          |                   |                        |                                  |
| <hr/>                      |                                      |                          |                   |                        |                                  |
| TOEKOMSTIG                 |                                      |                          |                   |                        |                                  |
| ↓                          |                                      |                          |                   |                        |                                  |
| 1 <sup>e</sup> verd. vloer | kanaalpl.vl.                         | 200 mm                   | kN/m <sup>3</sup> | 3,00                   |                                  |
|                            | afwerking                            | 60 mm                    |                   | 20,0                   | 1,20                             |
|                            | wanden                               |                          |                   |                        | 0,80                             |
|                            |                                      |                          |                   |                        | <hr/> 5,00 kN/m <sup>2</sup>     |
|                            | veranderlijke vloerbelasting         |                          |                   | 1,75 kN/m <sup>2</sup> | $\psi = 0,4$                     |
| <hr/>                      |                                      |                          |                   |                        |                                  |
| beg.gr. vloer              | PS-isolatievloer incl. 40mm druklaag |                          | kN/m <sup>3</sup> | 2,00                   |                                  |
|                            | afwerking                            | 60 mm                    |                   | 20,0                   | 1,20                             |
|                            | wanden                               |                          |                   |                        | 0,80                             |
|                            |                                      |                          |                   |                        | <hr/> 4,00 kN/m <sup>2</sup>     |
|                            | veranderlijke vloerbelasting         |                          |                   | 1,75 kN/m <sup>2</sup> | $\psi = 0,4$                     |
| <hr/>                      |                                      |                          |                   |                        |                                  |
| beg.gr. vloer              | afwerklaag                           | 50 mm                    | kN/m <sup>3</sup> | 20,0                   | 1,00                             |
| garage                     | constr. vloer                        | 100 mm                   |                   | 25,0                   | 2,50                             |
|                            |                                      |                          |                   |                        | <hr/> 3,50 kN/m <sup>2</sup>     |
|                            | veranderlijke vloerbelasting         |                          |                   | 2,00 kN/m <sup>2</sup> | $\psi = 0,7$                     |

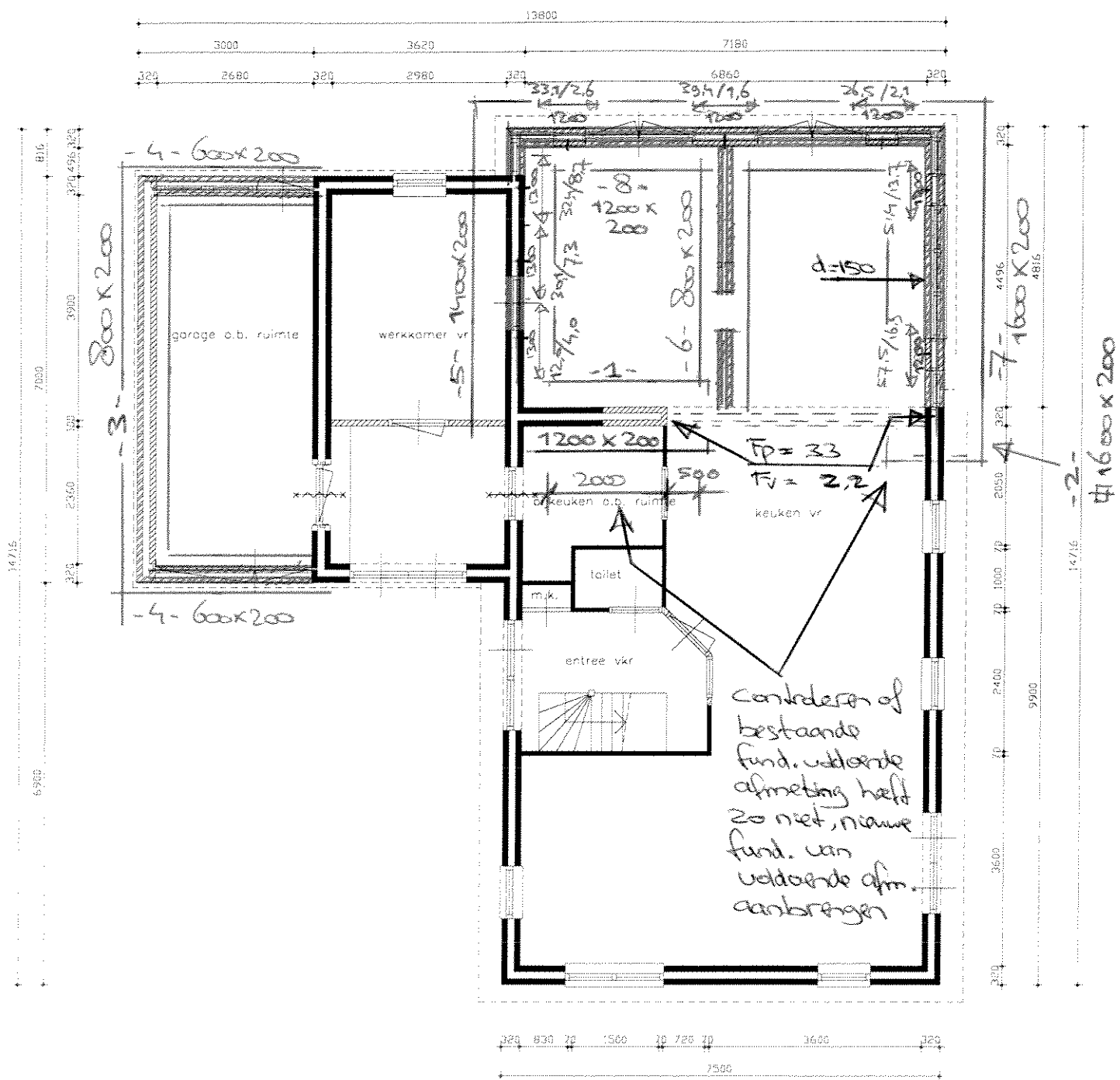
MAATGEVEND



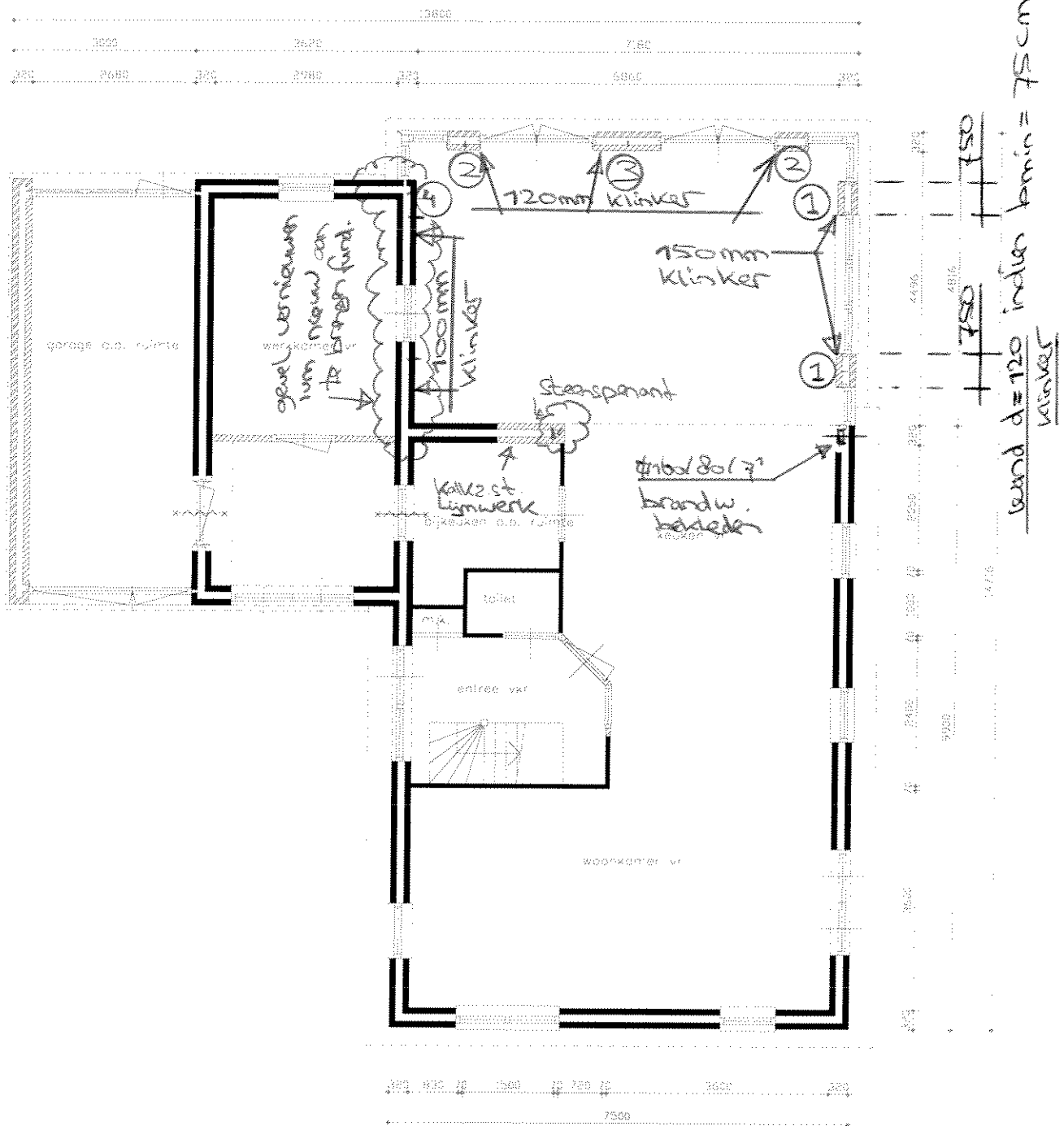
## DAKVLOER



**BEGANE GRONDVLOER**

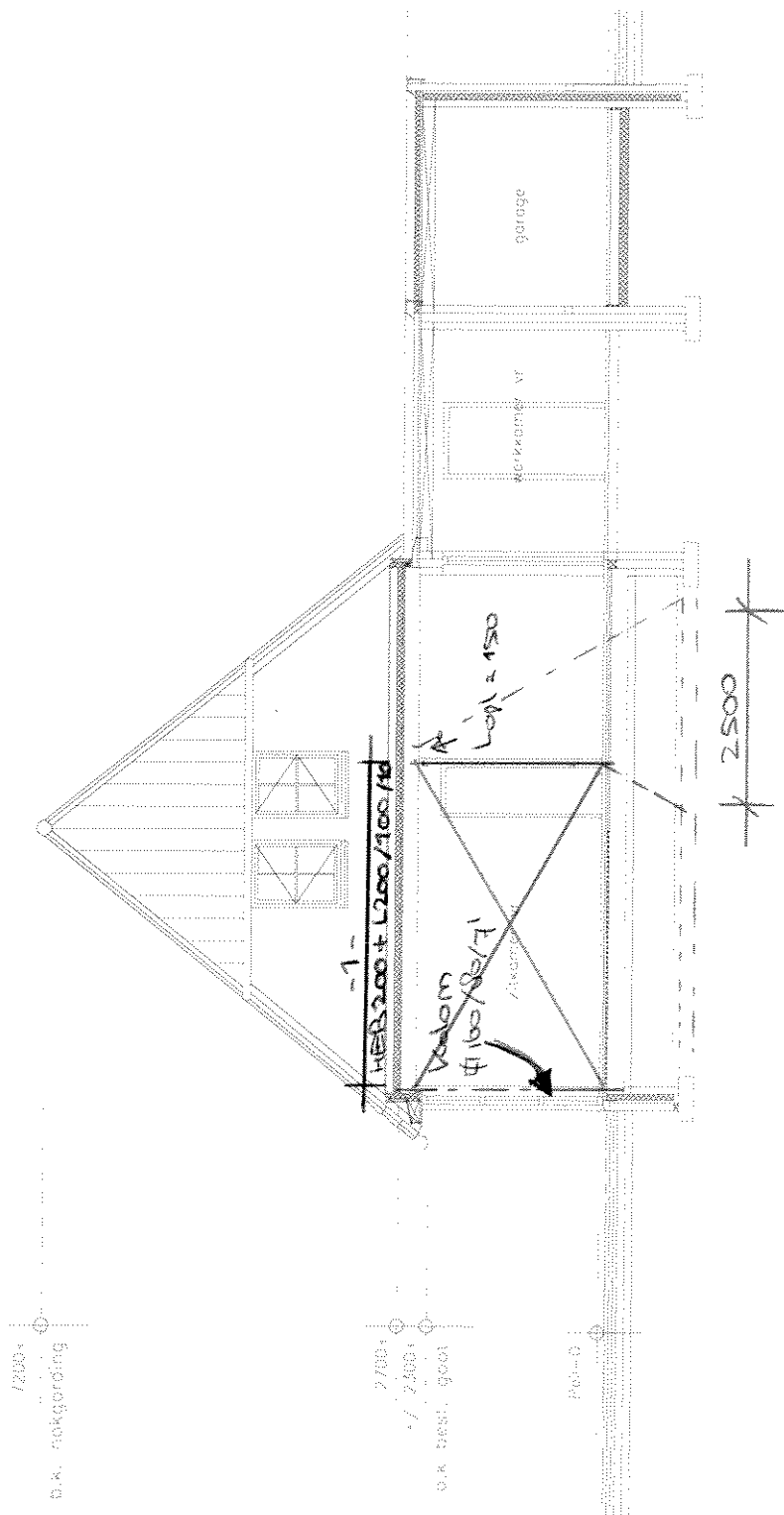


## FUNDERING



## (CONTROLE) DRAGENDE WANDEN

alle wanden uitvoeren in  
kalk zand steen lijmwerk



DOORSNEDE A-A

Project: Uitbreiding woonhuis Fam. Hoogerheide te Drempt

Werknr.: VL02430

Bladnr.: 8

**Balklaag plat dak** garage

Berekening gesteunde balklaag plat dak volgens NEN6760:2001

datum: 18 jan 2005

bestand: 0

versie: 2.04

**Ingevoerde gegevens**

|                        |                   |                     |            |                         |           |
|------------------------|-------------------|---------------------|------------|-------------------------|-----------|
| systeemplengte $l_t$   | 2,78 m            | veiligheidsklasse   | 2          | windgebied              | 3         |
| hart-op-hart           | 610 mm            | referentieperiode   | 50 jaar    | omgeving                | onbebouwd |
| dikte beplanking       | 19 mm             | klimaatklasse       | I          | hoogte t.o.v. m.v.      | 4,00 m    |
| max. bijk. doorbuiging | 0,004 $\cdot l_t$ | belastingduurklasse | III (kort) | ongehinderd aangeblazen | nee       |
| max. bijk. doorbuiging | 11 mm             |                     |            | gesloten bouwwerk       |           |
| max. eindoorbuiging    | 0,004 $\cdot l_t$ |                     |            |                         |           |
| max. eindoorbuiging    | 11 mm             |                     |            |                         |           |

**Balk- en materiaalgegevens**

|                  |                          |                         |        |                       |         |
|------------------|--------------------------|-------------------------|--------|-----------------------|---------|
|                  |                          | gezaagd hout            |        |                       |         |
| breedte x hoogte | 59 x 156 mm <sup>2</sup> | hoogte t.p.v. oplegging | 156 mm | duurzaamheidsklasse   | I t/m V |
| sterkteklasse    | C18                      | afschuining a           | 0 mm   | max. randvochtgehalte | 15 %    |

**Belastingen**

|              |                                         |                      |                         |            |
|--------------|-----------------------------------------|----------------------|-------------------------|------------|
| permanent    | totaal                                  | $p_g =$              | 0,60 kN/m <sup>2</sup>  |            |
| veranderlijk | gelijkmatig verdeeld                    | $p_{rep} =$          | 1,00 kN/m <sup>2</sup>  | $\psi = 0$ |
|              | geconcentreerd (0,1x0,1m <sup>2</sup> ) | $F_{rep} =$          | 1,5 kN                  |            |
|              | extra over geheel dakvlak               | $p_{rep,extra} =$    | 0,00 kN/m <sup>2</sup>  | $\psi = 0$ |
| wind         |                                         | $p_{wind,druk} =$    | 0,15 kN/m <sup>2</sup>  |            |
|              |                                         | $p_{wind,zuiging} =$ | -0,49 kN/m <sup>2</sup> |            |
| sneeuw       |                                         | $p_{sneeuw} =$       | 0,56 kN/m <sup>2</sup>  |            |
|              | extra sneeuwlast                        | $p_{sneeuw,extra} =$ | 0,00 kN/m <sup>2</sup>  |            |
| regenwater   |                                         | $d_{hw} =$           | 0,05 m                  |            |
| water        |                                         | $p_{water} =$        | 0,50 kN/m <sup>2</sup>  |            |

**Belastingcombinaties**

|                                      |                                                                                                                                 |               |
|--------------------------------------|---------------------------------------------------------------------------------------------------------------------------------|---------------|
| 1 permanent en veranderlijk          | $(\gamma_{f,g} \cdot p_g + \gamma_{f,q} \cdot \psi_{f,t} \cdot p_{rep})$                                                        | fund. comb. 1 |
| 2 permanent en puntlast              | $(\gamma_{f,g} \cdot p_g)$ en $(\gamma_{f,q} \cdot \psi_{f,t} \cdot F_{rep})$                                                   | fund. comb. 1 |
| 3 permanent en winddruk              | $(\gamma_{f,g} \cdot p_g + \gamma_{f,q} \cdot \psi_{f,t} \cdot p_{wind,druk} + \gamma_{f,q} \cdot \psi_{f,t} \cdot p_{rep})$    | fund. comb. 1 |
| 4 permanent (gunstig) en windzuiging | $(\gamma_{f,g} \cdot p_g + \gamma_{f,q} \cdot \psi_{f,t} \cdot p_{wind,zuiging} + \gamma_{f,q} \cdot \psi_{f,t} \cdot p_{rep})$ | fund. comb. 1 |
| 5 permanent en sneeuw                | $(\gamma_{f,g} \cdot p_g + \gamma_{f,q} \cdot \psi_{f,t} \cdot p_{sneeuw} + \gamma_{f,q} \cdot \psi_{f,t} \cdot p_{rep})$       | fund. comb. 1 |
| 6 permanent en regenwater            | $(\gamma_{f,g} \cdot p_g + \gamma_{f,q} \cdot \psi_{f,t} \cdot p_{water} + \gamma_{f,q} \cdot \psi_{f,t} \cdot p_{rep})$        | fund. comb. 1 |
| 7 permanent                          | $(\gamma_{f,g} \cdot p_g)$                                                                                                      | fund. comb. 2 |

**Combinaties uiterste grenstoestand**

|   | $p_d$             | $q_d$             | $F_d$ | $M_{y,d}$ | $V_{z,d}$ | $\sigma_{m,0;d}$  | $f_{m,0;u;d}$     | $\sigma_{v,d}$    | $f_{v,0;u;d}$     |
|---|-------------------|-------------------|-------|-----------|-----------|-------------------|-------------------|-------------------|-------------------|
| 1 | 2,02              | 1,23              | 0,00  | 1,19      | 1,71      | <b>4,97</b>       | 12,75             | <b>0,28</b>       | 1,42              |
| 2 | 0,72              | 0,44              | 1,47  | 1,45      | 2,08      | <b>6,05</b>       | 12,75             | <b>0,34</b>       | 1,42              |
| 3 | 0,91              | 0,56              | 0,00  | 0,54      | 0,77      | <b>2,24</b>       | 12,75             | <b>0,13</b>       | 1,42              |
| 4 | -0,10             | -0,06             | 0,00  | -0,06     | -0,08     | <b>0,24</b>       | 12,75             | <b>0,01</b>       | 1,42              |
| 5 | 1,45              | 0,88              | 0,00  | 0,85      | 1,23      | <b>3,57</b>       | 12,75             | <b>0,20</b>       | 1,42              |
| 6 | 1,37              | 0,84              | 0,00  | 0,81      | 1,16      | <b>3,37</b>       | 12,75             | <b>0,19</b>       | 1,42              |
| 7 | 0,81              | 0,49              | 0,00  | 0,48      | 0,69      | <b>1,99</b>       | 10,50             | <b>0,11</b>       | 1,42              |
|   | kN/m <sup>2</sup> | kN/m <sup>1</sup> | kN    | kNm       | kN        | N/mm <sup>2</sup> | N/mm <sup>2</sup> | N/mm <sup>2</sup> | N/mm <sup>2</sup> |

Combinatie 2 maatgevend m.b.t. buigsterkte (u.c. = 0,47)

Combinatie 2 maatgevend m.b.t. schuifsterkte (u.c. = 0,24)

**Combinaties bruikbaarheidsgrenstoestand**

|   | $p_{y,rep}$       | $q_{y,rep}$       | $u_{on}$ | $u_{krp}$ | $u_{bij}$  | $u_{bij,max}$ | $u_{eind}$ | $u_{eind,max}$                                                |
|---|-------------------|-------------------|----------|-----------|------------|---------------|------------|---------------------------------------------------------------|
| 1 | 1,60              | 0,98              | 1,7      | 1,7       | <b>4,5</b> | 11,1          | <b>6,2</b> | 11,1                                                          |
| 3 | 0,75              | 0,46              | 1,7      | 1,7       | <b>2,1</b> | 11,1          | <b>3,8</b> | 11,1                                                          |
| 4 | 0,11              | 0,07              | 1,7      | 1,7       | <b>0,3</b> | 11,1          | <b>2,0</b> | 11,1                                                          |
| 5 | 1,16              | 0,71              | 1,7      | 1,7       | <b>3,3</b> | 11,1          | <b>5,0</b> | 11,1                                                          |
| 6 | 1,10              | 0,67              | 1,7      | 1,7       | <b>3,1</b> | 11,1          | <b>4,8</b> | 11,1 (1 <sup>o</sup> orde, niet berekend op wateraccumulatie) |
|   | kN/m <sup>2</sup> | kN/m <sup>1</sup> | mm       | mm        | mm         | mm            | mm         | mm                                                            |

Combinatie 1 maatgevend m.b.t. de bijkomende doorbuiging (u.c. = 0,41)

Combinatie 1 maatgevend m.b.t. de eindoorbuiging (u.c. = 0,56)

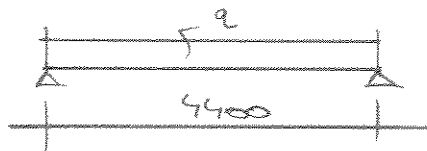
de balkafmeting

59 x 156 voldoet



opvang bestaande achtergevel

-1-

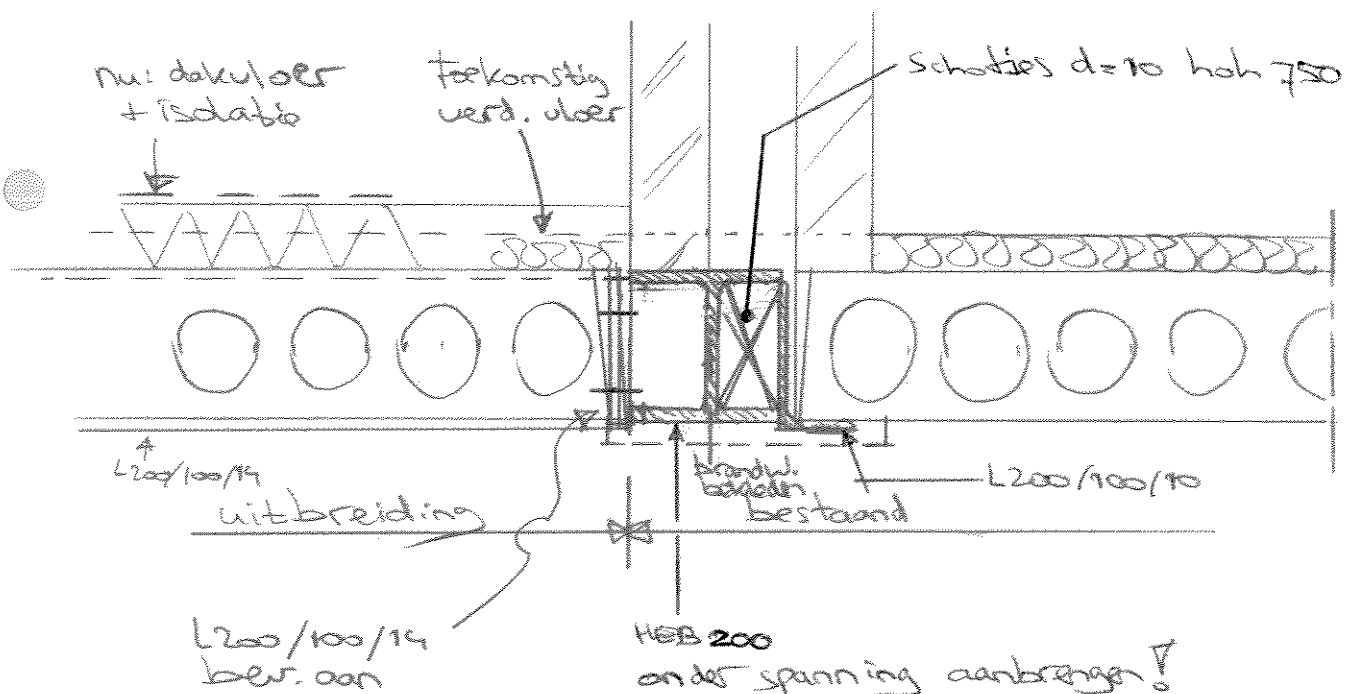


$$q \text{ gewel } 2,5 \times \left( \frac{4}{4 \text{ m} \times (1,1 \times 0,36 \times 0,7)} \right) = \frac{10,0}{4,4} = \frac{1,0}{1,0}$$

toepassen: HER 200 + L 200/100/10

$$L_{opL} = \frac{44,6 \times 10^3}{3,33 \times 150} = 150 \text{ mm}$$

[voor ber. zie bijlage A]

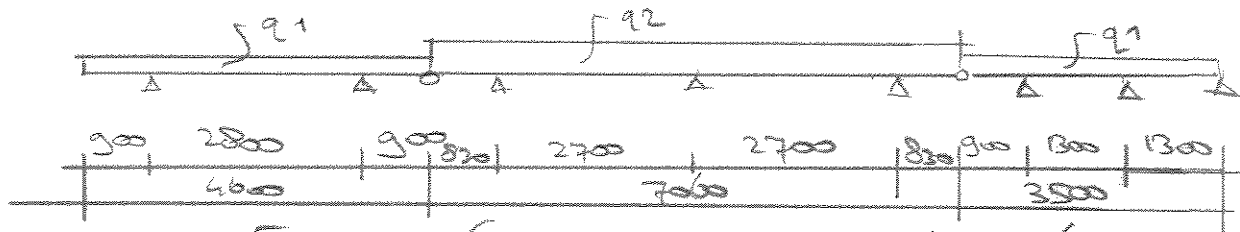


TPU rechter zijgevel kolom  $\varnothing 160/80/7$   $F'_{ud} = 523 \text{ kN}$   
 $L_k = 3,0 \text{ m}$



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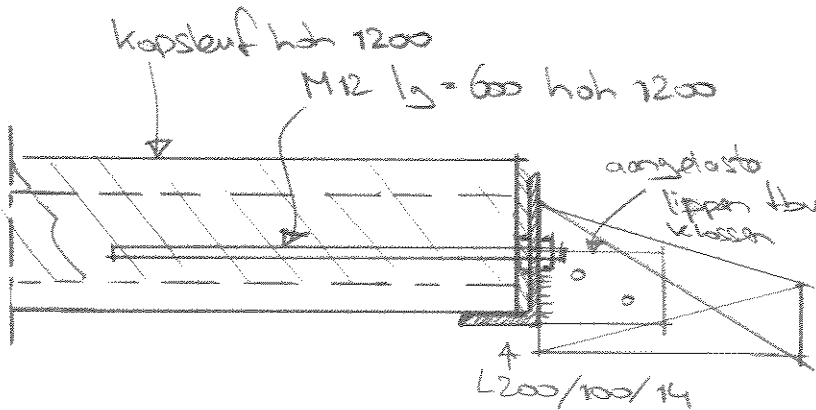
Latei 2



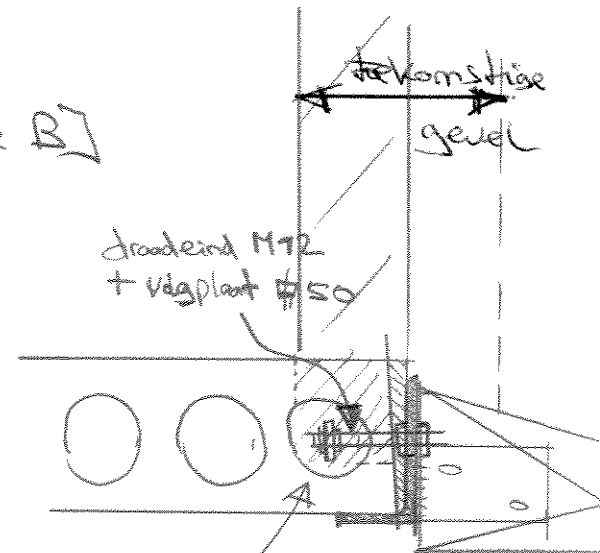
q1 dak-/vert. dak  $3,53 \times (5,0 \quad 1,75) = 17,65 \quad 6,2$   
 toek.dak  $4 \times (1,11 \quad 0,36 \times 0,7) = \frac{4,4}{22,1} \quad \frac{1,0}{7,2}$

q2 toek. achtergevel  $2,5 \times (4 \quad 0) = 10,0$   
 toek.dak  $3 \times (1,11 \quad 0,36 \times 0,7) = \frac{3,3}{13,3} \quad \frac{0,76}{0,8}$

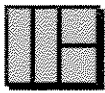
toepassen: L200 / 100 / 14 [bijlage B]



detail tpu zijgevels



detail tpu achtergevel



Controle mu Peranten  $L_k = 3,0m$

Perant 1  $b = 550 - 70 = 480 \text{ mm}$   
 $\uparrow$   
 evt. verzwakking ium elektra doos

belasting latei 2 st.p. 2 = 91 kN

toepassen: 150 mm klinker  $F'_{ud} = 0,48 \times 349,4 = 167,7$   
 alternatief: 120 mm klinker breedte Perant min 75 cm

Perant 2  $b = 480 \text{ mm}$  (als Perant 1)

belasting latei 2 st.p. 4 & 6 = 44,7 kN

toepassen: 120 mm klinker  $F'_{ud} = 0,48 \times 168,1 = 80,7 \text{ kN}$

Perant 3  $b = 1,0 \text{ m}$

belasting 53,2 kN (latei 2 st.p. 5)

wand d = 120 voldoet  $F'_{ud} = 168,1 > 53,2$

Perant/wand 4  $b = 0,6 \text{ m}$

belasting latei 2 st.p. 7,8,9  $F'_{ud} = 50,2 \text{ kN}$

toepassen: 100 mm klinker

$F'_{ud} = 0,6 \text{ m} \times 85 = 51 \text{ kN} > 50,2$

**latei 3**
**1-velds latei**

| belastingen | last.br. | * | permanent         |        | veranderlijk      |        |   | perm.            | ver.             |
|-------------|----------|---|-------------------|--------|-------------------|--------|---|------------------|------------------|
|             |          |   | kN/m <sup>2</sup> | red./ψ | kN/m <sup>2</sup> | red./ψ |   | q <sub>rep</sub> | q <sub>rep</sub> |
| gevel       | 0,00     | * | 2,00              | 1,00   |                   | 1,00   | = | 0,00             | 0,00             |
| dak         | 1,60     | * | 0,60              | 1,00   | 1,00              | 1,00   | = | 0,96             | 1,60             |
| profiel     | 1,00     | * | 0,12              | 1,00   |                   | 1,00   | = | 0,12             | 0,00             |
|             |          |   |                   |        |                   |        |   | <u>1,08</u>      | <u>1,60</u>      |

$$q_{rep} = 1,0 \quad * \quad 1,08 \quad + \quad 1,0 \quad * \quad 1,60 \quad = \quad 2,68 \text{ kN/m}^2$$

$$q_d = 1,2 \quad * \quad 1,08 \quad + \quad 1,3 \quad * \quad 1,60 \quad = \quad 3,38 \text{ kN/m}^2$$

$$\text{dagmaat} = 1,00 \text{ m} \quad U_{eind,max} = 0,002 \quad * \quad 1150 \quad = \quad 2,3 \text{ mm}$$

$$\text{max.doorb.} = 3,0 \text{ mm} \quad \text{maatgevende max. doorbuiging} = 2,3 \text{ mm}$$

**Sterkte:**

$$M_d = 1/8 \quad * \quad 3,38 \quad * \quad 1,15^2 \quad = \quad 0,56 \text{ kNm}$$

$$W_{ben} = 0,56 \quad / \quad ( \quad 235 \quad * \quad 0,75 \quad ) \quad = \quad 3,17 \cdot 10^3 \text{ mm}^3$$

**Doorbuiging:**

$$l_{ben} = 5 \cdot q \cdot L^4 / (384 \cdot E \cdot U) \quad = \quad 13 \cdot 10^4 \text{ mm}^4$$

**gekozen:**
**L100/100/8**

$$W_y = 19,9 \cdot 10^3 \text{ mm}^3 \quad \text{u.c.} = 0,120$$

$$I_y = 145 \cdot 10^4 \text{ m}$$

$$U = 5 \cdot q \cdot L^4 / (384 \cdot E \cdot I) \quad = \quad 0,2 \text{ mm}$$

**Oplegging: (op metselwerk= 0; kalkzandsteen= 1)**

1

$$R_d = 1/2 \quad * \quad 3,38 \quad * \quad 1,2 \quad = \quad 1,94 \text{ kN}$$

$$R_{perm} = 1/2 \quad * \quad 1,08 \quad * \quad 1,2 \quad = \quad 0,62 \text{ kN}$$

$$R_{ver} = 1/2 \quad * \quad 1,60 \quad * \quad 1,2 \quad = \quad 0,92 \text{ kN}$$

$$L_{opleg} = \frac{R_d}{1,94 \cdot 10^3} \quad / \quad ( \quad \frac{B_{opleg}}{70} \quad * \quad \frac{\sigma_{opleg,max}}{3,3} \quad ) \quad = \quad 8 \text{ mm}$$

 kies  $L_{opleg}$ : **150 mm**

woonhuis, Veiligheidsklasse 2

 $\gamma;g = 1,2; 1,35$ 
 $\gamma;q = 1,30$ 
**latei 4**
**1-velds latei**

| belastingen | last.br. | * | permanent         |        |  | veranderlijk      |        |  | perm.            | ver.             |
|-------------|----------|---|-------------------|--------|--|-------------------|--------|--|------------------|------------------|
|             |          |   | kN/m <sup>2</sup> | red./ψ |  | kN/m <sup>2</sup> | red./ψ |  | q <sub>rep</sub> | q <sub>rep</sub> |
| gevel       | 0,00     | * | 2,00              | 1,00   |  | 1,00              | =      |  | 0,00             | 0,00             |
| b.g. vloer  | 1,72     | * | 4,00              | 1,00   |  | 1,75              | =      |  | 6,88             | 3,01             |
| profiel     | 1,00     | * | 0,15              | 1,00   |  | 1,00              | =      |  | 0,15             | 0,00             |
|             |          |   |                   |        |  |                   |        |  | <u>7,03</u>      | <u>3,01</u>      |

$$q_{rep} = 1,0 \quad * \quad 7,03 \quad + \quad 1,0 \quad * \quad 3,01 \quad = \quad 10,04 \text{ kN/m}^1$$

$$q_d = 1,2 \quad * \quad 7,03 \quad + \quad 1,3 \quad * \quad 3,01 \quad = \quad 12,35 \text{ kN/m}^1$$

$$\text{dagmaat} = 0,80 \text{ m} \quad U_{eind,max} = 0,002 \quad * \quad 950 \quad = \quad 1,9 \text{ mm}$$

$$\text{max.doorb.} = 3,0 \text{ mm} \quad \text{maatgevende max. doorbuiging} = 1,9 \text{ mm}$$

Sterkte:

$$M_d = 1/8 \quad * \quad 12,35 \quad * \quad 0,95^2 \quad = \quad 1,39 \text{ kNm}$$

$$W_{ben} = 1,39 \quad / \quad ( \quad 235 \quad * \quad 0,75 \quad ) \quad = \quad 7,91 \cdot 10^3 \text{ mm}^3$$

Doorbuiging:

$$I_{ben} = 5 \cdot q \cdot L^4 / (384 \cdot E \cdot U) \quad = \quad 27 \cdot 10^4 \text{ mm}^4$$

gekozen:

**L100/100/10**

$$W_y = 24,7 \cdot 10^3 \text{ mm}^3 \quad \text{u.c.} = 0,240$$

$$I_y = 177 \cdot 10^4 \text{ mm}^4$$

$$U = 5 \cdot q \cdot L^4 / (384 \cdot E \cdot I) \quad = \quad 0,3 \text{ mm}$$

Oplegging: (op metselwerk= 0; kalkzandsteen= 1)

$$R_d = 1/2 \quad * \quad 12,35 \quad * \quad 1,0 \quad = \quad 5,87 \text{ kN}$$

$$R_{perm} = 1/2 \quad * \quad 7,03 \quad * \quad 1,0 \quad = \quad 3,34 \text{ kN}$$

$$R_{ver} = 1/2 \quad * \quad 3,01 \quad * \quad 1,0 \quad = \quad 1,43 \text{ kN}$$

$$L_{opleg} = \frac{R_d}{5,87 \cdot 10^3} \quad / \quad ( \quad \frac{B_{opleg}}{70} \quad * \quad \frac{\sigma_{opleg,max}}{3,3} \quad ) \quad = \quad 25 \text{ mm}$$

 kies L<sub>opleg</sub>: **150 mm**

Dit programma berekent de toelaatbare grondspanning van een strook volgens de NEN 6740- NEN 6744 GEOTECHNIEK. Bij de berekening wordt er vanuit gegaan dat de grond onder de fundatie zich gedraagt als een gedraineerde grond en dat alle onderliggende grondlagen identiek aan elkaar zijn.

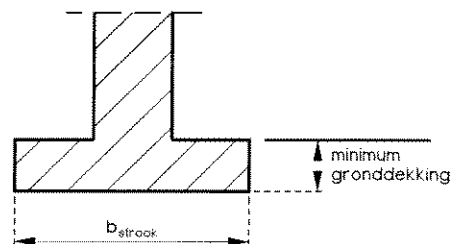
17082005

werk Uitbreiding woonhuis Fam. Hoogerheide te Drempt  
onderdeel draagkracht strookfundering

werknr. VL02430  
datum 13-11-2007

$$\sigma'_{\max,d} = (c'_{e,d} * N_c * s_c * i_c) + (\sigma'_{v,z,o;d} * N_q * s_q * i_q) + (0,5 * \gamma'_{e,d} * B_{ef} * N_\gamma * s_\gamma * i_\gamma)$$

|                             |   |                                    |                    |         |
|-----------------------------|---|------------------------------------|--------------------|---------|
| wrijvingshoek ( $\varphi$ ) | = | 27,5 °                             | $\varphi'_{e,d} =$ | 24,35 ° |
| $\gamma_m$                  | = | 1,15                               |                    |         |
| cohesie                     | = | 0,0 kPa                            |                    |         |
| $\gamma_{rep}$ (droog)      | = | 18,0 kN/m <sup>3</sup>             |                    |         |
| $\gamma_{sat,rep}$ (nat)    | = | 20,0 kN/m <sup>3</sup>             |                    |         |
| gronddekking                | = | 0,10 m <sup>1</sup>                |                    |         |
| grondwaterstand             | = | 0,00 m <sup>1</sup> - aanlegniveau |                    |         |
| $L_{ef}$                    | = | 10,0 m <sup>1</sup>                |                    |         |
| $B_{ef}$                    | = | 1,0 m <sup>1</sup>                 |                    |         |
| $F_{s,h;d}$                 | = | 0,0 kN                             |                    |         |
| $F_{s,v;d}$                 | = | 100,0 kN                           |                    |         |



|                     |   |      |           |              |                |
|---------------------|---|------|-----------|--------------|----------------|
| $N_q$               | = | 10,0 | (5.2.3.3) |              |                |
| $N_c$               | = | 19,8 | "         |              |                |
| $N_\gamma$          | = | 8,1  | "         |              |                |
| $s_q$               | = | 1,04 | "         | $i_q =$      | 1,00 (5.2.3.4) |
| $s_c$               | = | 1,05 | "         | $i_c =$      | 1,00 "         |
| $s_\gamma$          | = | 0,97 | "         | $i_\gamma =$ | 1,00 "         |
| $\sigma'_{v,z,o;d}$ | = | 1,62 | "         |              |                |

#### Overzicht toelaatbare strookbelasting

| $b_{strook}$ | $\gamma'_{e,d}$      | $\sigma; N_\gamma$   | $\sigma$             | $q_{max}$            |
|--------------|----------------------|----------------------|----------------------|----------------------|
| [m]          | [kN/m <sup>3</sup> ] | [kN/m <sup>2</sup> ] | [kN/m <sup>2</sup> ] | [kN/m <sup>1</sup> ] |
| 0,40         | 9,09                 | 35,78                | 31,1                 | 12,4                 |
| 0,50         | 9,09                 | 35,78                | 34,7                 | 17,4                 |
| 0,60         | 9,09                 | 35,78                | 38,3                 | 23,0                 |
| 0,70         | 9,09                 | 35,78                | 41,9                 | 29,3                 |
| 0,80         | 9,09                 | 35,78                | 45,4                 | 36,3                 |
| 0,90         | 9,09                 | 35,78                | 49,0                 | 44,1                 |
| 1,00         | 9,09                 | 35,78                | 52,6                 | 52,6                 |
| 1,10         | 9,09                 | 35,78                | 56,2                 | 61,8                 |
| 1,20         | 9,09                 | 35,78                | 59,8                 | 71,7                 |
| 1,30         | 9,09                 | 35,78                | 63,3                 | 82,3                 |
| 1,40         | 9,09                 | 35,78                | 66,9                 | 93,7                 |

| $b_{strook}$ | $\gamma'_{e,d}$      | $\sigma; N_\gamma$   | $\sigma$             | $q_{max}$            |
|--------------|----------------------|----------------------|----------------------|----------------------|
| [m]          | [kN/m <sup>3</sup> ] | [kN/m <sup>2</sup> ] | [kN/m <sup>2</sup> ] | [kN/m <sup>1</sup> ] |
| 1,50         | 9,09                 | 35,78                | 70,5                 | 105,7                |
| 1,60         | 9,09                 | 35,78                | 74,1                 | 118,5                |
| 1,70         | 9,09                 | 35,78                | 77,6                 | 132,0                |
| 1,80         | 9,09                 | 35,78                | 81,2                 | 146,2                |
| 1,90         | 9,09                 | 35,78                | 84,8                 | 161,1                |
| 2,00         | 9,09                 | 35,78                | 88,4                 | 176,8                |
| 2,10         | 9,09                 | 35,78                | 92,0                 | 193,1                |
| 2,20         | 9,09                 | 35,78                | 95,5                 | 210,2                |
| 2,30         | 9,09                 | 35,78                | 99,1                 | 228,0                |
| 2,40         | 9,09                 | 35,78                | 102,7                | 246,5                |
| 2,50         | 9,09                 | 35,78                | 106,3                | 265,7                |

$$\gamma'_{e,d} = \frac{(\text{opp. afschuifvlak droge grond} * \gamma_{rep}(\text{droog}) + \text{opp. afschuifvlak natte grond} * \gamma_{sat,rep}(\text{nat}))}{\text{opp. totale afschuifvlak}}$$

$$\text{totale hoogte afschuifpiramide} = 1,5 * \text{poerafm.}$$

Dit programma berekent de toelaatbare grondspanning van een strook volgens de NEN 6740- NEN 6744 GEOTECHNIEK. Bij de berekening wordt er vanuit gegaan dat de grond onder de fundatie zich gedraagt als een gedraineerde grond en dat alle onderliggende grondlagen identiek aan elkaar zijn.

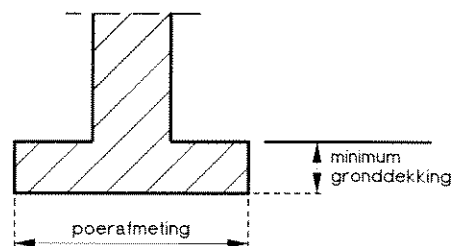
17082005

werk           Uitbreiding woonhuis Fam. Hoogerheide te Drempt  
onderdeel   draagkracht vierkante poeren

werknr. VL02430  
datum 13-11-2007

$$\sigma'_{\max;d} = (C'_{e,d} * N_c * s_c * i_c) + (\sigma'_{v,z;o;d} * N_q * s_q * i_q) + (0,5 * \gamma'_{e,d} * B_{ef} * N_\gamma * s_\gamma * i_\gamma)$$

|                             |   |                                    |                    |         |
|-----------------------------|---|------------------------------------|--------------------|---------|
| wrijvingshoek ( $\varphi$ ) | = | 27,5 °                             | $\varphi'_{e,d} =$ | 24,35 ° |
| $\gamma_m$                  | = | 1,15                               |                    |         |
| cohesie                     | = | 0,0 kPa                            |                    |         |
| $\gamma_{rep}$ (droog)      | = | 18,0 kN/m <sup>3</sup>             |                    |         |
| $\gamma_{sat,rep}$ (nat)    | = | 20,0 kN/m <sup>3</sup>             |                    |         |
| gronddekking                | = | 0,10 m <sup>1</sup>                |                    |         |
| grondwaterstand             | = | 0,00 m <sup>1</sup> - aanlegniveau |                    |         |
| $L_{ef}$                    | = | 1,0 m <sup>1</sup>                 |                    |         |
| $B_{ef}$                    | = | 1,0 m <sup>1</sup>                 |                    |         |
| $F_{s,h;d}$                 | = | 0,0 kN                             |                    |         |
| $F_{s,v;d}$                 | = | 100,0 kN                           |                    |         |



|                     |   |      |           |              |                |
|---------------------|---|------|-----------|--------------|----------------|
| $N_q$               | = | 10,0 | (5.2.3.3) |              |                |
| $N_c$               | = | 19,8 | "         |              |                |
| $N_\gamma$          | = | 8,1  | "         |              |                |
| $s_q$               | = | 1,41 | "         | $i_q =$      | 1,00 (5.2.3.4) |
| $s_c$               | = | 1,46 | "         | $i_c =$      | 1,00 "         |
| $s_\gamma$          | = | 0,70 | "         | $i_\gamma =$ | 1,00 "         |
| $\sigma'_{v,z;o;d}$ | = | 1,62 | "         |              |                |

Overzicht toelaatbare poerbelasting (vierkante poeren)

| poerafm. | $\gamma'_{e,d}$      | $\sigma; N_\gamma$   | $\sigma$             | $F_{\max}$ |
|----------|----------------------|----------------------|----------------------|------------|
| [m]      | [kN/m <sup>3</sup> ] | [kN/m <sup>2</sup> ] | [kN/m <sup>2</sup> ] | [kN]       |
| 0,40     | 9,09                 | 25,82                | 33,1                 | 5,3        |
| 0,50     | 9,09                 | 25,82                | 35,7                 | 8,9        |
| 0,60     | 9,09                 | 25,82                | 38,3                 | 13,8       |
| 0,70     | 9,09                 | 25,82                | 40,9                 | 20,0       |
| 0,80     | 9,09                 | 25,82                | 43,5                 | 27,8       |
| 0,90     | 9,09                 | 25,82                | 46,0                 | 37,3       |
| 1,00     | 9,09                 | 25,82                | 48,6                 | 48,6       |
| 1,10     | 9,09                 | 25,82                | 51,2                 | 62,0       |
| 1,20     | 9,09                 | 25,82                | 53,8                 | 77,5       |
| 1,30     | 9,09                 | 25,82                | 56,4                 | 95,3       |
| 1,40     | 9,09                 | 25,82                | 59,0                 | 115,5      |

| poerafm. | $\gamma'_{e,d}$      | $\sigma; N_\gamma$   | $\sigma$             | $F_{\max}$ |
|----------|----------------------|----------------------|----------------------|------------|
| [m]      | [kN/m <sup>3</sup> ] | [kN/m <sup>2</sup> ] | [kN/m <sup>2</sup> ] | [kN]       |
| 1,50     | 9,09                 | 25,82                | 61,5                 | 138,5      |
| 1,60     | 9,09                 | 25,82                | 64,1                 | 164,1      |
| 1,70     | 9,09                 | 25,82                | 66,7                 | 192,8      |
| 1,80     | 9,09                 | 25,82                | 69,3                 | 224,5      |
| 1,90     | 9,09                 | 25,82                | 71,9                 | 259,4      |
| 2,00     | 9,09                 | 25,82                | 74,4                 | 297,8      |
| 2,10     | 9,09                 | 25,82                | 77,0                 | 339,7      |
| 2,20     | 9,09                 | 25,82                | 79,6                 | 385,3      |
| 2,30     | 9,09                 | 25,82                | 82,2                 | 434,8      |
| 2,40     | 9,09                 | 25,82                | 84,8                 | 488,3      |
| 2,50     | 9,09                 | 25,82                | 87,4                 | 546,0      |

$$\gamma'_{e,d} = \frac{(\text{opp. afschuifvlak droge grond} * \gamma_{rep}(\text{droog}) + \text{opp. afschuifvlak natte grond} * \gamma_{sat,rep}(\text{nat}))}{\text{opp. totale afschuifvlak}}$$

$$\text{totale hoogte afschuifpiramide} = 1,5 * \text{poerafm.}$$

Project: Uitbreiding woonhuis Fam. Hoogerheide te Drempt

Werknr. VL02430 Bladnr. 16

woonhuis, Veiligheidsklasse 2

 $\gamma_g = 1,2 ; 1,35$ 
 $\gamma_q = 1,3$ 

Beton C20/25

 $f_b = 15 \text{ N/mm}^2$ 
 $f_b = 1,15 \text{ N/mm}^2$ 

Staalkwaliteit FeB500

 $f_s = 435 \text{ N/mm}^2$ 
**strook 1**

|                                                | last.br. |   | permanent       |              | veranderlijk    |              |   | perm.        | ver.        |
|------------------------------------------------|----------|---|-----------------|--------------|-----------------|--------------|---|--------------|-------------|
|                                                |          |   | $\text{kN/m}^2$ | red./ $\psi$ | $\text{kN/m}^2$ | red./ $\psi$ |   | $q_{rep}$    | $q_{rep}$   |
| dak                                            | 4,00     | * | 1,11            | 1,00         | 0,70            | 0,36         | = | 4,44         | 1,01        |
| gevel                                          | 6,00     | * | 4,00            | 1,00         |                 | 1,00         | = | 24,00        | 0,00        |
| 1e verd.vl.                                    | 0,00     | * | 5,00            | 1,00         | 1,75            | 1,00         | = | 0,00         | 0,00        |
| bg. vloer                                      | 0,60     | * | 4,00            | 1,00         | 1,75            | 1,00         | = | 2,40         | 1,05        |
| reactie latei 1, spreiden over $l=2,5\text{m}$ |          |   |                 |              |                 |              |   |              |             |
| latei 1                                        | 0,40     | * | 33,00           | 1,00         | 2,20            | 1,00         | = | 13,20        | 0,88        |
| strook                                         | 25,00    | * | 1,20            | 0,20         |                 |              | = | 6,00         |             |
|                                                |          |   |                 |              |                 |              |   | <u>50,04</u> | <u>2,94</u> |

$$q_d = 1,35 \cdot 50,04 = 67,55 \text{ kN/m}^1$$

|              | breedte | hoogte |                 |    |                 |
|--------------|---------|--------|-----------------|----|-----------------|
| afm. stroken | 1,20 m  | 0,20 m | $\sigma_{gr} =$ | 56 | $\text{kN/m}^2$ |

controle dwarskracht:

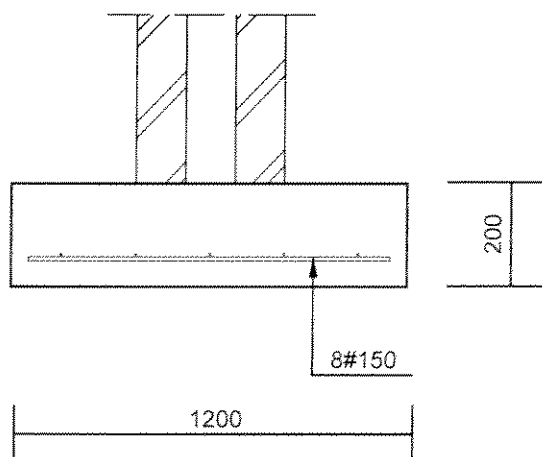
|            |       |                 |                |      |                 |
|------------|-------|-----------------|----------------|------|-----------------|
| $d =$      | 146   | mm              | breedte muur = | 320  | mm              |
| $V_d =$    | 24,77 | kN              |                |      |                 |
| $\tau_d =$ | 0,170 | $\text{N/mm}^2$ | $<$            | 0,46 | $\text{N/mm}^2$ |

berekening benodigde wapening

|         |      |                          |                      |     |                                     |
|---------|------|--------------------------|----------------------|-----|-------------------------------------|
| $M_d =$ | 7,43 | $\text{kNm/m}^1$         |                      |     |                                     |
| $A_s =$ | 118  | $\text{mm}^2/\text{m}^1$ | $A_{s;\min} =$       | 300 | $\text{mm}^2/\text{m}^1$            |
|         |      |                          | $A_{s;\text{ben}} =$ | 148 | $\text{mm}^2/\text{m}^1$            |
|         |      |                          |                      |     | $(\omega_{o,\min} \cdot b \cdot h)$ |

|              | diam. | h.o.h. afstand: |         |                   |
|--------------|-------|-----------------|---------|-------------------|
| basis wap. = | 8     | 150             | $A_s =$ | 335 $\text{mm}^2$ |

$$\underline{\underline{335}} > 148 \text{ mm}^2$$



Project: Uitbreiding woonhuis Fam. Hoogerheide te Drempt

Werknr. VL02430 Bladnr. 17

woonhuis, Veiligheidsklasse 2

$\gamma; g = 1,2 ; 1,35$

$\gamma; q = 1,3$

Beton C20/25

$f_b = 15 \text{ N/mm}^2$

$f_b = 1,15 \text{ N/mm}^2$

Staalkwaliteit FeB500

$f_s = 435 \text{ N/mm}^2$

## poer 2

### Lijnlasten in lengterichting van de poer

|             | last.br. |   | permanent<br>kN/m <sup>2</sup> | red./ $\psi$ | lengte<br>q-last | veranderlijk<br>kN/m <sup>2</sup> | red./ $\psi$ |   | perm.<br>q <sub>rep</sub> | ver.<br>q <sub>rep</sub> |
|-------------|----------|---|--------------------------------|--------------|------------------|-----------------------------------|--------------|---|---------------------------|--------------------------|
| dak         | 3,00     | * | 1,11                           | 1,00         | 1,60             | 0,70                              | 0,36         | = | 5,33                      | 1,21                     |
| gevel       | 4,00     | * | 4,00                           | 1,00         | 1,60             |                                   | 1,00         | = | 25,60                     | 0,00                     |
| 1e verd.vl. | 0,00     | * | 5,00                           | 1,00         | 1,60             | 1,75                              | 1,00         | = | 0,00                      | 0,00                     |
| bg. vloer   | 1,72     | * | 4,00                           | 1,00         | 1,60             | 1,75                              | 1,00         | = | 11,01                     | 4,82                     |
| poer        | 25,00    | * | 1,60                           | 0,20         | 1,60             |                                   | 1,00         | = | 12,80                     | 0,00                     |

### Puntlast(en)

|                 |      |   |       |      |  |      |      |   | F <sub>rep</sub> | F <sub>rep</sub> |
|-----------------|------|---|-------|------|--|------|------|---|------------------|------------------|
| reactie latei 1 | 1,00 | * | 33,00 | 1,00 |  | 2,20 | 1,00 | = | 33,00            | 2,20             |
|                 |      |   |       |      |  |      |      |   | <u>87,74</u>     | <u>8,23</u>      |

$$F_d = 1,35 \quad * \quad 87,74 \quad = \quad 118,44 \text{ kN}$$

|           | breedte | lengte | hoogte |                 |                      |
|-----------|---------|--------|--------|-----------------|----------------------|
| afm. poer | 1,60    | 1,60   | 0,20 m | $\sigma_{gr} =$ | 46 kN/m <sup>2</sup> |

### controle dwarskracht:

|            |                         |                |                        |
|------------|-------------------------|----------------|------------------------|
| d=         | 145 mm                  | breedte muur = | 320 mm                 |
| $\tau_d =$ | 0,181 N/mm <sup>2</sup> | <              | 0,46 N/mm <sup>2</sup> |

### berekening benodigde wapening

|     |                                     |         |                                                                  |
|-----|-------------------------------------|---------|------------------------------------------------------------------|
| Md= | 11,84 kNm/m <sup>1</sup>            |         |                                                                  |
| As= | 192 mm <sup>2</sup> /m <sup>1</sup> | As;min= | 300 mm <sup>2</sup> /m <sup>1</sup> ( $\omega_{o,min} * b * h$ ) |
|     |                                     | As;ben= | 239 mm <sup>2</sup> /m <sup>1</sup>                              |

|             | diam. | h.o.h. afstand: |                                      |
|-------------|-------|-----------------|--------------------------------------|
| basis wap.= | 8     | 150             | A <sub>s</sub> = 335 mm <sup>2</sup> |

$$\underline{\underline{335}} > 239 \text{ mm}^2$$

Project: Uitbreiding woonhuis Fam. Hoogerheide te Drempt

Werknr. VL02430 Bladnr. 18

woonhuis, Veiligheidsklasse 2

 $\gamma; g = 1,2 ; 1,35$ 
 $\gamma; q = 1,3$ 

Beton C20/25

 $f_b = 15 \text{ N/mm}^2$ 
 $f_b = 1,15 \text{ N/mm}^2$ 

Staalkwaliteit FeB500

 $f_s = 435 \text{ N/mm}^2$ 
**strook 3**

|             | last.br. |   | permanent       |              | veranderlijk    |              |   | perm.            | ver.             |
|-------------|----------|---|-----------------|--------------|-----------------|--------------|---|------------------|------------------|
|             |          |   | $\text{kN/m}^2$ | red./ $\psi$ | $\text{kN/m}^2$ | red./ $\psi$ |   | $q_{\text{rep}}$ | $q_{\text{rep}}$ |
| dak         | 1,50     | * | 0,60            | 1,00         | 1,00            | 1,00         | = | 0,90             | 1,50             |
| gevel       | 3,80     | * | 4,00            | 1,00         |                 | 1,00         | = | 15,20            | 0,00             |
| 1e verd.vl. | 0,00     | * | 5,00            | 1,00         | 1,75            | 1,00         | = | 0,00             | 0,00             |
| bg. vloer   | 1,00     | * | 3,50            | 1,00         | 2,00            | 1,00         | = | 3,50             | 2,00             |
| strook      | 25,00    | * | 0,80            | 0,20         |                 |              | = | 4,00             |                  |
|             |          |   |                 |              |                 |              |   | <u>23,60</u>     | <u>3,50</u>      |

$$q_d = 1,2 * 23,60 + 1,3 * 3,50 = 32,87 \text{ kN/m}^1$$

afm. stroken      breedte      hoogte       $\sigma_{gr} = 41 \text{ kN/m}^2$

0,80 m      0,20 m

controle dwarskracht:

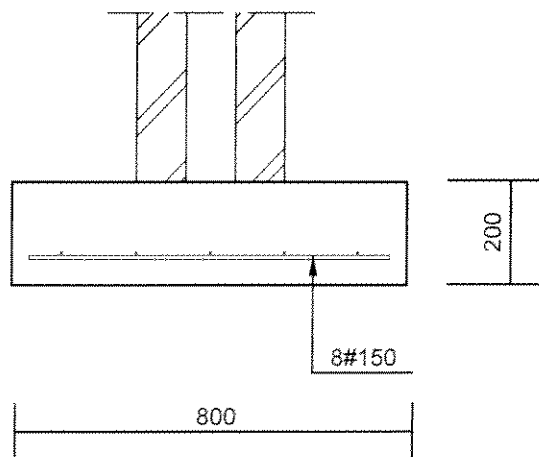
$d = 146 \text{ mm}$       breedte muur = 320 mm  
 $V_d = 9,86 \text{ kN}$   
 $\tau_d = 0,068 \text{ N/mm}^2 < 0,46 \text{ N/mm}^2$

berekening benodigde wapening

$M_d = 1,97 \text{ kNm/m}^1$   
 $A_s = 31 \text{ mm}^2/\text{m}^1$        $A_{s;\text{min}} = 300 \text{ mm}^2/\text{m}^1$        $(\omega_{0,\text{min}} * b * h)$   
 $A_{s;\text{ben}} = 39 \text{ mm}^2/\text{m}^1$

basis wap. =      diam.      h.o.h. afstand:       $A_s = 335 \text{ mm}^2$   
                          8      150

$$\underline{\underline{335}} > 39 \text{ mm}^2$$



Project: Uitbreiding woonhuis Fam. Hoogerheide te Drempt

Werknr. VL02430 Bladnr. 19

woonhuis, Veiligheidsklasse 2

 $\gamma; g = 1,2 ; 1,35$ 
 $\gamma; q = 1,3$ 

Beton C20/25

 $f_b = 15 \text{ N/mm}^2$ 
 $f_b = 1,15 \text{ N/mm}^2$ 

Staalkwaliteit FeB500

 $f_s = 435 \text{ N/mm}^2$ 
**strook 4**

|            | last.br. |   | permanent       |              | veranderlijk    |              |   | perm.        | ver.        |
|------------|----------|---|-----------------|--------------|-----------------|--------------|---|--------------|-------------|
|            |          |   | $\text{kN/m}^2$ | red./ $\psi$ | $\text{kN/m}^2$ | red./ $\psi$ |   | $q_{rep}$    | $q_{rep}$   |
| dak        | 0,60     | * | 0,60            | 1,00         | 1,00            | 1,00         | = | 0,36         | 0,60        |
| fund. m.w. | 1,00     | * | 4,00            | 1,00         |                 | 1,00         | = | 4,00         | 0,00        |
| pui        | 3,00     | * | 0,50            | 1,00         |                 | 1,00         | = | 1,50         | 0,00        |
| bg. vloer  | 1,00     | * | 3,50            | 1,00         | 2,00            | 1,00         | = | 3,50         | 2,00        |
| strook     | 25,00    | * | 0,60            | 0,20         |                 |              | = | 3,00         |             |
|            |          |   |                 |              |                 |              |   | <u>12,36</u> | <u>2,60</u> |

$$q_d = 1,2 * 12,36 + 1,3 * 2,60 = 18,21 \text{ kN/m}^1$$

afm. stroken      breedte      hoogte       $\sigma_{gr} = 30 \text{ kN/m}^2$

0,60 m      0,20 m

controle dwarskracht:

$d = 146 \text{ mm}$       breedte muur = 320 mm  
 $V_d = 4,25 \text{ kN}$   
 $\tau_d = 0,029 \text{ N/mm}^2 < 0,46 \text{ N/mm}^2$

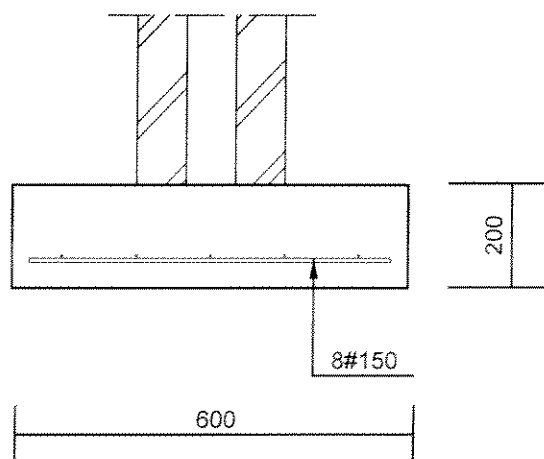
berekening benodigde wapening

$M_d = 0,64 \text{ kNm/m}^1$   
 $A_s = 10 \text{ mm}^2/\text{m}^1$        $A_{s;\min} = 300 \text{ mm}^2/\text{m}^1$        $(\omega_{o,\min} * b * h)$   
 $A_{s;\text{ben}} = 13 \text{ mm}^2/\text{m}^1$

basis wap.=      diam.      h.o.h. afstand:       $A_s = 335 \text{ mm}^2$

8      150

$$\underline{\underline{335}} > 13 \text{ mm}^2$$



Project: Uitbreiding woonhuis Fam. Hoogerheide te Drempt

Werknr. VL02430 Bladnr. 20

woonhuis, Veiligheidsklasse 2

 $\gamma_g = 1,2 ; 1,35$ 
 $\gamma_q = 1,3$ 

Beton C20/25

 $f_b = 15 \text{ N/mm}^2$ 
 $f_{ct} = 1,15 \text{ N/mm}^2$ 

Staalkwaliteit FeB500

 $f_s = 435 \text{ N/mm}^2$ 
**strook 5**

|                                                                                        | last.br. |   | permanent       |              | veranderlijk    |              |   | perm.        | ver.        |
|----------------------------------------------------------------------------------------|----------|---|-----------------|--------------|-----------------|--------------|---|--------------|-------------|
|                                                                                        |          |   | $\text{kN/m}^2$ | red./ $\psi$ | $\text{kN/m}^2$ | red./ $\psi$ |   | $q_{rep}$    | $q_{rep}$   |
| dak (toek.)                                                                            | 4,00     | * | 1,11            | 1,00         | 0,70            | 0,36         | = | 4,44         | 1,01        |
| gevel                                                                                  | 3,80     | * | 4,00            | 1,00         |                 | 1,00         | = | 15,20        | 0,00        |
| 1e verd.vl. -> reactie latei 2, spreiden over $l=1,3\text{m} \rightarrow 1/1,3=0,77^*$ |          |   |                 |              |                 |              |   |              |             |
| 1e verd.vl.                                                                            | 0,77     | * | 32,40           | 1,00         | 8,70            | 1,00         | = | 24,95        | 6,70        |
| bg. vl. (op zand)                                                                      | 1,00     | * | 3,50            | 1,00         | 1,75            | 0,40         | = | 3,50         | 0,70        |
| bg. vloer                                                                              | 1,75     | * | 4,00            | 1,00         | 1,75            | 0,40         | = | 7,00         | 1,23        |
| strook                                                                                 | 25,00    | * | 1,40            | 0,20         |                 |              | = | 7,00         |             |
|                                                                                        |          |   |                 |              |                 |              |   | <u>62,09</u> | <u>9,63</u> |

$$q_d = 1,2 * 62,09 + 1,3 * 9,63 = 87,03 \text{ kN/m}^1$$

afm. stroken      breedte      hoogte  
 1,40 m      0,20 m       $\sigma_{gr} = 62 \text{ kN/m}^2$

controle dwarskracht:

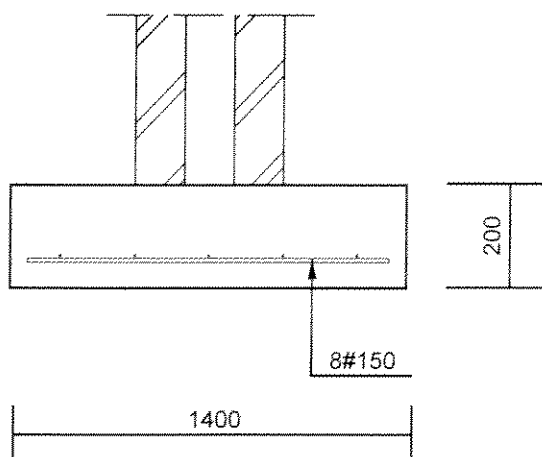
$d = 146 \text{ mm}$       breedte muur =  $320 \text{ mm}$   
 $V_d = 33,57 \text{ kN}$   
 $\tau_d = 0,230 \text{ N/mm}^2 < 0,46 \text{ N/mm}^2$

berekening benodigde wapening

$M_d = 11,75 \text{ kNm/m}^1$   
 $A_s = 189 \text{ mm}^2/\text{m}^1$        $A_{s;\min} = 300 \text{ mm}^2/\text{m}^1$        $(\omega_{o;\min} * b * h)$   
 $A_{s;\text{ben}} = 236 \text{ mm}^2/\text{m}^1$

basis wap. =      diam.      h.o.h. afstand:  
                  8      150       $A_s = 335 \text{ mm}^2$

$$\underline{\underline{335}} > 236 \text{ mm}^2$$



Project: Uitbreiding woonhuis Fam. Hoogerheide te Drempt

Werknr. VL02430 Bladnr. 21

woonhuis, Veiligheidsklasse 2

 $\gamma_g = 1,2 ; 1,35$ 
 $\gamma_q = 1,3$ 

Beton C20/25

 $f_b = 15 \text{ N/mm}^2$ 
 $f_b = 1,15 \text{ N/mm}^2$ 

Staalkwaliteit FeB500

 $f_s = 435 \text{ N/mm}^2$ 
**strook 6**

|            | last.br. |   | permanent       |              | veranderlijk    |              |   | perm.        | ver.        |
|------------|----------|---|-----------------|--------------|-----------------|--------------|---|--------------|-------------|
|            |          |   | $\text{kN/m}^2$ | red./ $\psi$ | $\text{kN/m}^2$ | red./ $\psi$ |   | $q_{rep}$    | $q_{rep}$   |
| dak        | 0,00     | * | 1,11            | 1,00         | 0,70            | 0,36         | = | 0,00         | 0,00        |
| fund. m.w. | 0,80     | * | 4,00            | 1,00         |                 | 1,00         | = | 3,20         | 0,00        |
| bg. vloer  | 3,43     | * | 4,00            | 1,00         | 1,75            | 1,00         | = | 13,72        | 6,00        |
| strook     | 25,00    | * | 0,80            | 0,20         |                 |              | = | 4,00         |             |
|            |          |   |                 |              |                 |              |   | <u>20,92</u> | <u>6,00</u> |

$$q_d = 1,2 * 20,92 + 1,3 * 6,00 = 32,91 \text{ kN/m}^1$$

afm. stroken      breedte      hoogte       $\sigma_{gr} = 41 \text{ kN/m}^2$

0,80 m      0,20 m

controle dwarskracht:

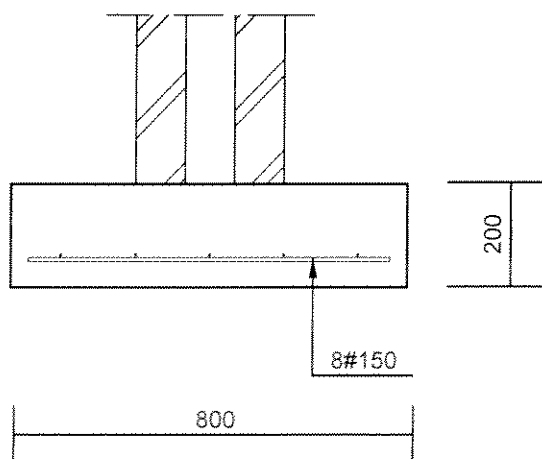
$d = 146 \text{ mm}$       breedte muur = 320 mm  
 $V_d = 9,87 \text{ kN}$   
 $\tau_d = 0,068 \text{ N/mm}^2 < 0,46 \text{ N/mm}^2$

berekening benodigde wapening

$M_d = 1,97 \text{ kNm/m}^1$   
 $A_s = 31 \text{ mm}^2/\text{m}^1$        $A_{s,min} = 300 \text{ mm}^2/\text{m}^1$        $(\omega_{0,min} * b * h)$   
 $A_{s,ben} = 39 \text{ mm}^2/\text{m}^1$

diam.      h.o.h. afstand:  
 basis wap.= 8      150       $A_s = 335 \text{ mm}^2$

$$\underline{\underline{335}} > 39 \text{ mm}^2$$



woonhuis, Veiligheidsklasse 2

 $\gamma; g = 1,2 ; 1,35$ 
 $\gamma; q = 1,3$ 

Beton C20/25

 $f_b = 15 \text{ N/mm}^2$ 
 $f_b = 1,15 \text{ N/mm}^2$ 

Staalkwaliteit FeB500

 $f_s = 435 \text{ N/mm}^2$ 
**strook 7**

|                                                                                                                       | last.br. |   | permanent         |              | veranderlijk      |              |   | perm.        | ver.         |
|-----------------------------------------------------------------------------------------------------------------------|----------|---|-------------------|--------------|-------------------|--------------|---|--------------|--------------|
|                                                                                                                       |          |   | kN/m <sup>2</sup> | red./ $\psi$ | kN/m <sup>2</sup> | red./ $\psi$ |   | $q_{rep}$    | $q_{rep}$    |
| dak (toek.)                                                                                                           | 4,00     | * | 1,11              | 1,00         | 0,70              | 0,36         | = | 4,44         | 1,01         |
| fund. m.w.                                                                                                            | 0,80     | * | 5,00              | 1,00         |                   | 1,00         | = | 4,00         | 0,00         |
| penant $b=0,5\text{m} \rightarrow F_p=3,8*5*0,5=9,5\text{kN}$ , spreiden over $l=1,2\text{m} \rightarrow 1/1,2=0,83*$ |          |   |                   |              |                   |              |   |              |              |
| gevel                                                                                                                 | 0,83     | * | 9,50              | 1,00         |                   | 1,00         | = | 7,92         | 0,00         |
| 1e verd.vl. $\rightarrow$ reactie latei 2, spreiden over $l=1,2\text{m} \rightarrow 1/1,2=0,83*$                      |          |   |                   |              |                   |              |   |              |              |
| 1e verd.vl.                                                                                                           | 0,83     | * | 57,50             | 1,00         | 16,90             | 1,00         | = | 47,73        | 14,03        |
| bg. vloer                                                                                                             | 1,75     | * | 4,00              | 1,00         | 1,75              | 0,40         | = | 7,00         | 1,23         |
| strook                                                                                                                | 25,00    | * | 1,60              | 0,20         |                   |              | = | 8,00         |              |
|                                                                                                                       |          |   |                   |              |                   |              |   | <u>79,08</u> | <u>16,26</u> |

$$q_d = 1,2 * 79,08 + 1,3 * 16,26 = 116,04 \text{ kN/m}^1$$

|              |         |        |                 |    |                   |
|--------------|---------|--------|-----------------|----|-------------------|
|              | breedte | hoogte |                 |    |                   |
| afm. stroken | 1,60 m  | 0,20 m | $\sigma_{gr} =$ | 73 | kN/m <sup>2</sup> |

**controle dwarskracht:**

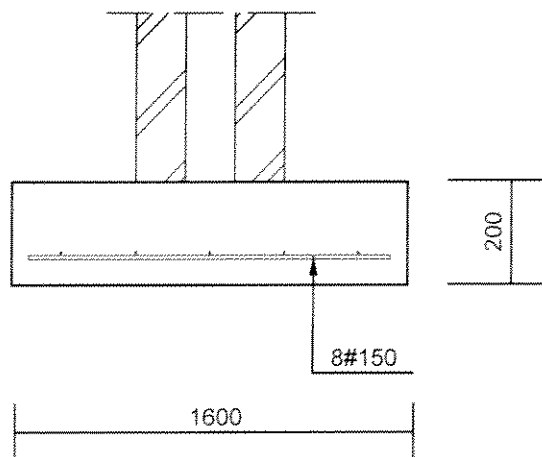
|            |       |                   |                |      |                   |
|------------|-------|-------------------|----------------|------|-------------------|
| $d =$      | 146   | mm                | breedte muur = | 320  | mm                |
| $V_d =$    | 46,41 | kN                |                |      |                   |
| $\tau_d =$ | 0,318 | N/mm <sup>2</sup> | <              | 0,46 | N/mm <sup>2</sup> |

**berekening benodigde wapening**

|         |       |                                 |                            |     |                                 |
|---------|-------|---------------------------------|----------------------------|-----|---------------------------------|
| $M_d =$ | 18,57 | kNm/m <sup>1</sup>              |                            |     |                                 |
| $A_s =$ | 302   | mm <sup>2</sup> /m <sup>1</sup> | $A_{s;min} =$              | 300 | mm <sup>2</sup> /m <sup>1</sup> |
|         |       |                                 | $A_{s;ben} =$              | 302 | mm <sup>2</sup> /m <sup>1</sup> |
|         |       |                                 | $(\omega_{o,min} * b * h)$ |     |                                 |

|             |       |                 |         |                     |
|-------------|-------|-----------------|---------|---------------------|
|             | diam. | h.o.h. afstand: |         |                     |
| basis wap.= | 8     | 150             | $A_s =$ | 335 mm <sup>2</sup> |

335

 > 302 mm<sup>2</sup>


woonhuis, Veiligheidsklasse 2

 $\gamma; g = 1,2 ; 1,35$ 
 $\gamma; q = 1,3$ 

Beton C20/25

 $f_b = 15 \text{ N/mm}^2$ 
 $f_b = 1,15 \text{ N/mm}^2$ 

Staalkwaliteit FeB500

 $f_s = 435 \text{ N/mm}^2$ 
**strook 8**

|                                                                                       | last.br. |   | permanent<br>kN/m <sup>2</sup> | red./ψ | veranderlijk<br>kN/m <sup>2</sup> | red./ψ |   | perm.<br>q <sub>rep</sub> | ver.<br>q <sub>rep</sub> |
|---------------------------------------------------------------------------------------|----------|---|--------------------------------|--------|-----------------------------------|--------|---|---------------------------|--------------------------|
| dak (toek.)                                                                           | 3,00     | * | 1,11                           | 1,00   | 0,70                              | 0,36   | = | 3,33                      | 0,76                     |
| fund. m.w.                                                                            | 0,80     | * | 4,00                           | 1,00   |                                   | 1,00   | = | 3,20                      | 0,00                     |
| penant b=0,5m -> F <sub>p</sub> =3,8*4*0,5=8,4kN, spreiden over l=1,2m -> 1/1,2=0,83* |          |   |                                |        |                                   |        |   |                           |                          |
| gevel                                                                                 | 0,83     | * | 8,40                           | 1,00   |                                   | 1,00   | = | 7,00                      | 0,00                     |
| 1e verd.vl. -> reactie latei 2, spreiden over l=1,2m -> 1/1,2=0,83*                   |          |   |                                |        |                                   |        |   |                           |                          |
| 1e verd.vl.                                                                           | 0,83     | * | 33,10                          | 1,00   | 2,60                              | 1,00   | = | 27,47                     | 2,16                     |
| bg. vloer                                                                             | 0,00     | * | 4,00                           | 1,00   | 1,75                              | 0,40   | = | 0,00                      | 0,00                     |
| strook                                                                                | 25,00    | * | 1,20                           | 0,20   |                                   |        | = | 6,00                      |                          |
|                                                                                       |          |   |                                |        |                                   |        |   | <u>47,00</u>              | <u>2,91</u>              |

$$q_d = 1,35 * 47,00 = 63,45 \text{ kN/m}^1$$

|                     |               |               |                 |           |                         |
|---------------------|---------------|---------------|-----------------|-----------|-------------------------|
|                     | breedte       | hoogte        |                 |           |                         |
| <b>afm. stroken</b> | <b>1,20 m</b> | <b>0,20 m</b> | $\sigma_{gr} =$ | <b>53</b> | <b>kN/m<sup>2</sup></b> |

**controle dwarskracht:**

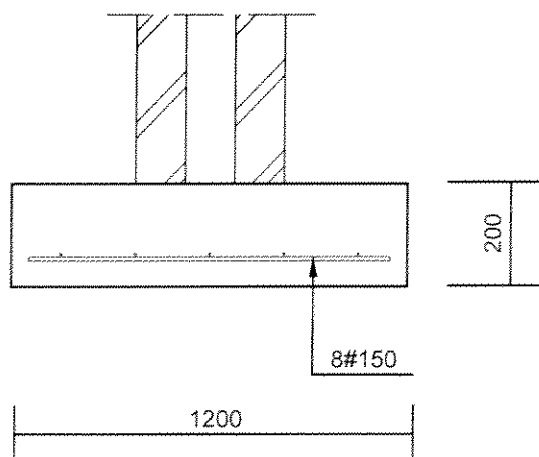
|                  |                         |                |                        |
|------------------|-------------------------|----------------|------------------------|
| d=               | 146 mm                  | breedte muur = | 320 mm                 |
| V <sub>d</sub> = | 23,27 kN                |                |                        |
| τ <sub>d</sub> = | 0,159 N/mm <sup>2</sup> | <              | 0,46 N/mm <sup>2</sup> |

**berekening benodigde wapening**

|     |                                     |         |                                                               |
|-----|-------------------------------------|---------|---------------------------------------------------------------|
| Md= | 6,98 kNm/m <sup>1</sup>             |         |                                                               |
| As= | 111 mm <sup>2</sup> /m <sup>1</sup> | As;min= | 300 mm <sup>2</sup> /m <sup>1</sup> (ω <sub>o,min</sub> *b*h) |
|     |                                     | As;ben= | 139 mm <sup>2</sup> /m <sup>1</sup>                           |

|                    |          |                 |                                          |
|--------------------|----------|-----------------|------------------------------------------|
|                    | diam.    | h.o.h. afstand: |                                          |
| <b>basis wap.=</b> | <b>8</b> | <b>150</b>      | <b>A<sub>s</sub>= 335 mm<sup>2</sup></b> |

$$\underline{\underline{335}} > 139 \text{ mm}^2$$



Project.....: Uitbreiding woonhuis Fam. Hoogerheide te Drempt

Onderdeel....: opvang bestaande achtergevel (ligger -1-)

Constructeur.: wvandenbrink1

Opdrachtgever:

Dimensies....: kN/m/rad

Datum.....: 13/11/2007

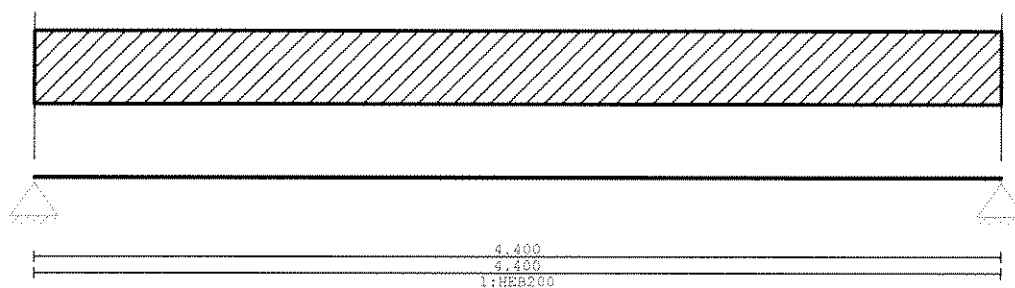
Bestand...: h:\v102430\reken\ligger 1.dlw

Toegepaste norm : TGB 1990

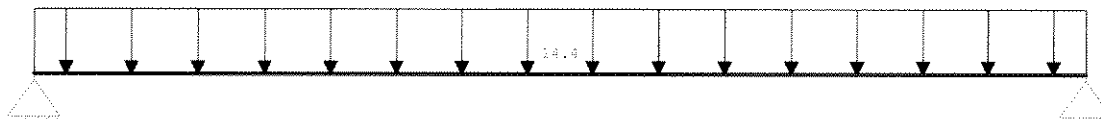
Veiligheidsklasse: 2

Referentieperiode

:50

**GEOMETRIE****VELDBELASTINGEN**

B.G:1 Permanent

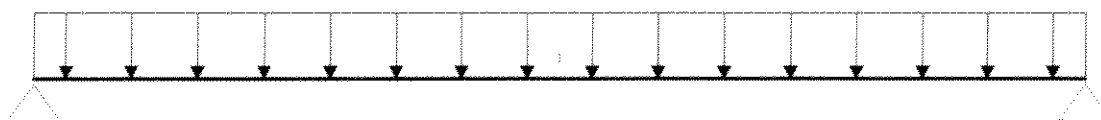
**REACTIES**

B.G:1 Permanent

| Stp                                          | F     | M     |
|----------------------------------------------|-------|-------|
| 1                                            | 33.03 | 0.00  |
| 2                                            | 33.03 | -0.00 |
| 66.06 : (absoluut) grootste som reacties     |       |       |
| -66.06 : (absoluut) grootste som belastingen |       |       |

**VELDBELASTINGEN**

B.G:2 Veranderlijk



Project.....: Uitbreiding woonhuis Fam. Hoogerheide te Drempt  
 Onderdeel....: opvang bestaande achtergevel (ligger -1-)

**REACTIES**

B.G:2 Veranderlijk

| Stp | Fmin | Fmax | Mmin | Mmax |
|-----|------|------|------|------|
| 1   | 0.00 | 2.20 | 0.00 | 0.00 |
| 2   | 0.00 | 2.20 | 0.00 | 0.00 |

**BELASTINGCOMBINATIES**

| BC Type | BG Factor | BG Factor | BG Factor | BG Factor | BG Factor |
|---------|-----------|-----------|-----------|-----------|-----------|
| 1 Fund. | 1         | 1.20      | 2         | 1.30      |           |
| 2 Fund. | 1         | 1.35      |           |           |           |
| 3 Inc.  | 1         | 1.00      | 2         | 1.00      |           |
| 4 Mom.  | 1         | 1.00      | 2         | 0.60      |           |
| 5 Perm. | 1         | 1.00      |           |           |           |

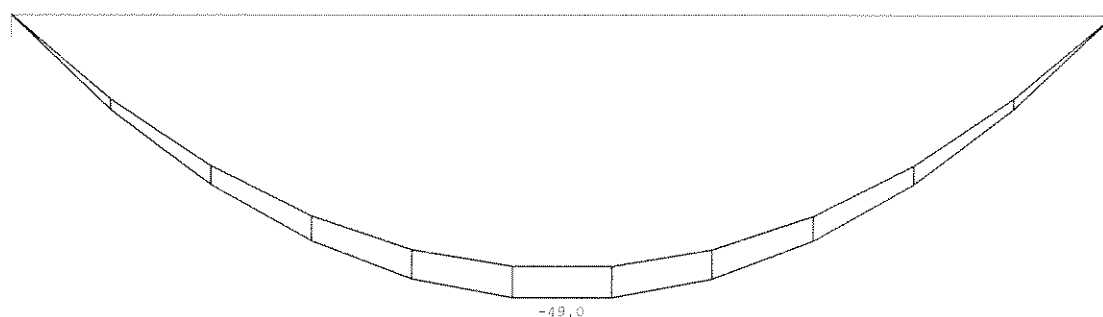
**GUNSTIGE WERKING PERMANENTE BELASTINGEN**

BC Velden met gunstige werking

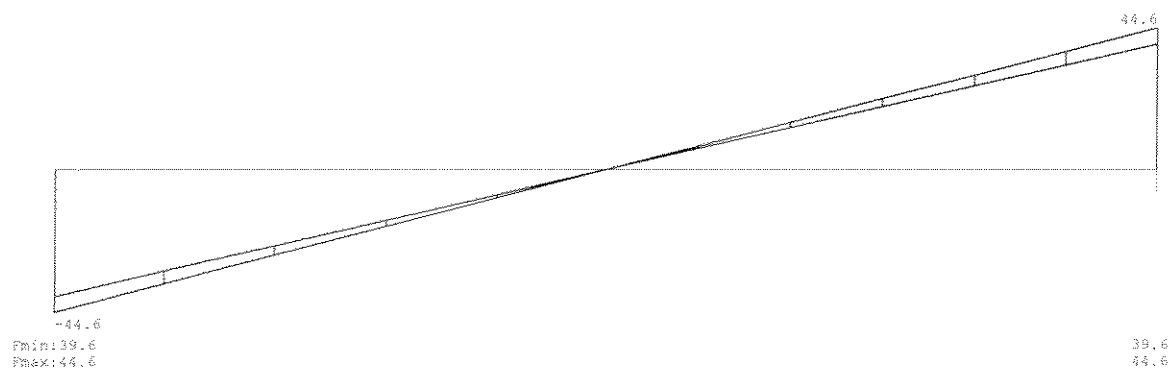
- 1 Geen
- 2 Geen

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

Fundamentele combinatie

**DWARSKRACHTEN**

Fundamentele combinatie



Project.....: Uitbreiding woonhuis Fam. Hoogerheide te Drempt  
 Onderdeel.....: opvang bestaande achtergevel (ligger -1-)

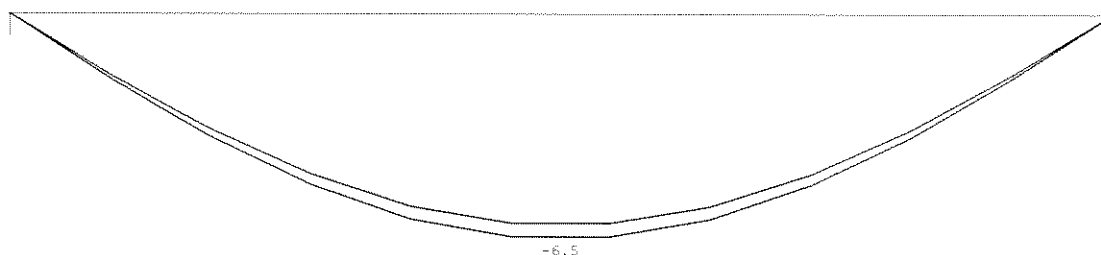
**REACTIES**

Fundamentele combinatie

| Stp | Fmin  | Fmax  | Mmin  | Mmax |
|-----|-------|-------|-------|------|
| 1   | 39.63 | 44.59 | 0.00  | 0.00 |
| 2   | 39.63 | 44.59 | -0.00 | 0.00 |

**OMHULLENDE VAN DE INCIDENTELE COMBINATIES****VERPLAATSINGEN** [mm]

Incidentele combinatie

**STAALPROFIELEN - ALGEMENE GEGEVENS**

Stabiliteit: Classificatie gehele constructie: Geschoord

**MATERIAAL**

| Mat nr. | Profielnaam | Vloeisp. [N/mm <sup>2</sup> ] | Productie methode | Min. drsn. klasse |
|---------|-------------|-------------------------------|-------------------|-------------------|
| 1       | HEB200      | 235                           | Gewalst           | 1                 |

**KIPSTABILITEIT**

| Staaf nr. | Plts. aangr. | l gaffel | Kipsteunafstanden [m] |       |
|-----------|--------------|----------|-----------------------|-------|
| 1         | 1.0*h        | boven:   | 4.40                  | 4.400 |
|           |              | onder:   | 4.40                  | 4.400 |

**TOETSING SPANNINGEN**

| Staaf nr. | Mat | BC | Sit | Kl | Plaats | Norm | Artikel | Formule  | Hoogste toetsing U.C. [N/mm <sup>2</sup> ] | Opm. |
|-----------|-----|----|-----|----|--------|------|---------|----------|--------------------------------------------|------|
| 1         | 1   | 2  | 1   | 1  | Staaf  | 6771 | 12.2    | (12.2-3) | 0.378                                      | 89   |

**TOETSING DOORBUIGING**

| Staaf | Soort | Mtg | Lengte<br>(m) | Overst<br>I | Zeeg<br>J | u tot<br>(mm) | BC   | Sit      | u<br>(mm) | Toelaatbaar<br>(mm) | *1    |
|-------|-------|-----|---------------|-------------|-----------|---------------|------|----------|-----------|---------------------|-------|
| 1     | Vloer | db  | 4.40          | N           | N         | 0.0           | -6.5 | 3 1 Eind | -6.5      | ±17.6               | 0.004 |
|       |       | db  |               |             |           |               |      | 3 1 Bijk | -0.4      | ±13.2               | 0.003 |

Project.....: Uitbreiding woonhuis Fam. Hoogerheide te Drempt

Onderdeel.....: ligger -2-

Constructeur.: wvandenbrink1

Opdrachtgever:

Dimensies.....: kN/m/rad

Datum.....: 13/11/2007

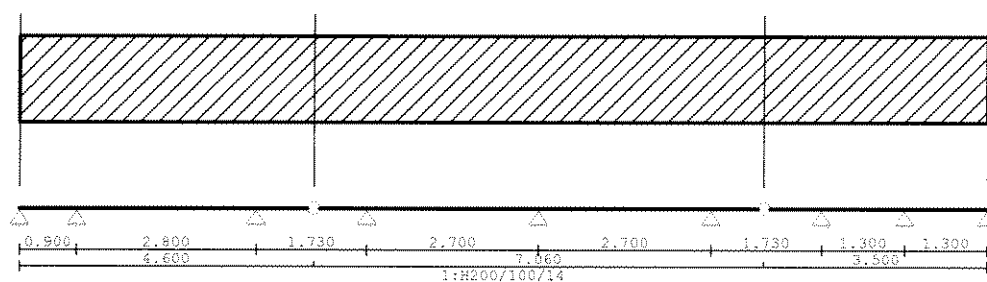
Bestand...: h:\vl02430\reken\ligger 2.dlw

Toegepaste norm : TGB 1990

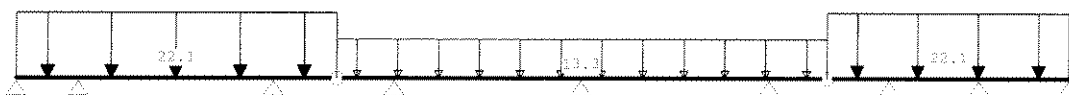
Veiligheidsklasse: 2

Referentieperiode

:50

**GEOMETRIE****VELDBELASTINGEN**

B.G:1 Permanent

**REACTIES**

B.G:1 Permanent

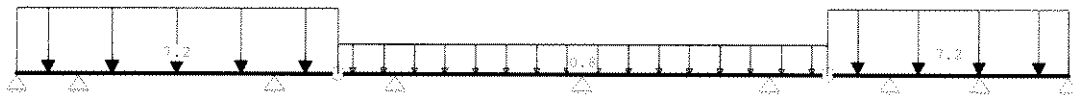
| Stp | F     | M     |
|-----|-------|-------|
| 1   | -4.77 | 0.00  |
| 2   | 57.52 | -0.00 |
| 3   | 51.44 | -0.00 |
| 4   | 26.51 | 0.00  |
| 5   | 39.40 | 0.00  |
| 6   | 33.14 | 0.00  |
| 7   | 32.38 | 0.00  |
| 8   | 30.10 | 0.00  |
| 9   | 11.98 | 0.00  |

277.70 : (absoluut) grootste som reacties  
 -277.70 : (absoluut) grootste som belastingen

Project.....: Uitbreiding woonhuis Fam. Hoogerheide te Drempt  
 Onderdeel.....: ligger -2-

**VELDBELASTINGEN**

B.G:2 Veranderlijk

**REACTIES**

B.G:2 Veranderlijk

| Stp | Fmin  | Fmax  | Mmin  | Mmax |
|-----|-------|-------|-------|------|
| 1   | -3.61 | 1.44  | -0.00 | 0.00 |
| 2   | 0.92  | 16.93 | -0.00 | 0.00 |
| 3   | 2.12  | 13.65 | -0.00 | 0.00 |
| 4   | -1.56 | 2.09  | -0.00 | 0.00 |
| 5   | 0.34  | 1.64  | -0.00 | 0.00 |
| 6   | 0.29  | 2.56  | -0.00 | 0.00 |
| 7   | 1.43  | 8.73  | -0.00 | 0.00 |
| 8   | 1.37  | 7.34  | -0.00 | 0.00 |
| 9   | -0.07 | 4.00  | -0.00 | 0.00 |

**BELASTINGCOMBINATIES**

| BC Type | BG Factor | BG Factor | BG Factor | BG Factor | BG Factor |
|---------|-----------|-----------|-----------|-----------|-----------|
| 1 Fund. | 1         | 1.20      | 2         | 1.30      |           |
| 2 Fund. | 1         | 1.35      |           |           |           |
| 3 Inc.  | 1         | 1.00      | 2         | 1.00      |           |
| 4 Mom.  | 1         | 1.00      | 2         | 0.60      |           |
| 5 Perm. | 1         | 1.00      |           |           |           |

**GUNSTIGE WERKING PERMANENTE BELASTINGEN**

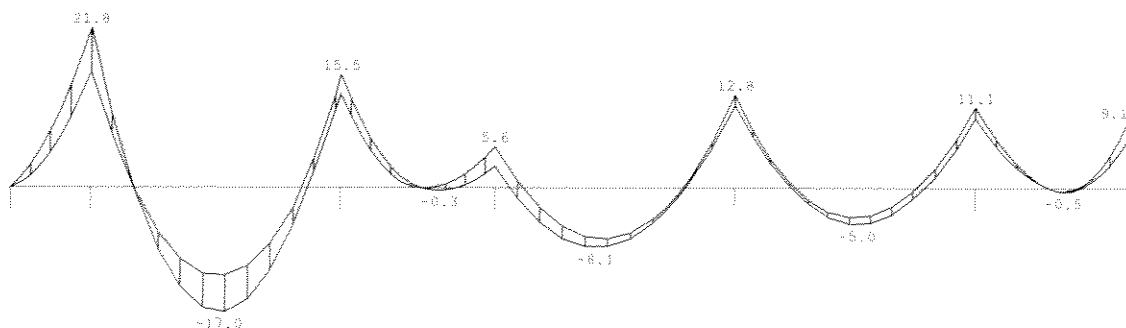
BC Velden met gunstige werking

- 1 Geen
- 2 Geen

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

Fundamentele combinatie

Velden: 1 t/m 6

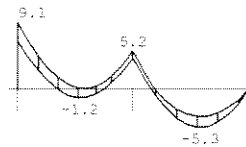


Project.....: Uitbreiding woonhuis Fam. Hoogerheide te Drempt  
 Onderdeel....: ligger -2-

**MOMENTEN**

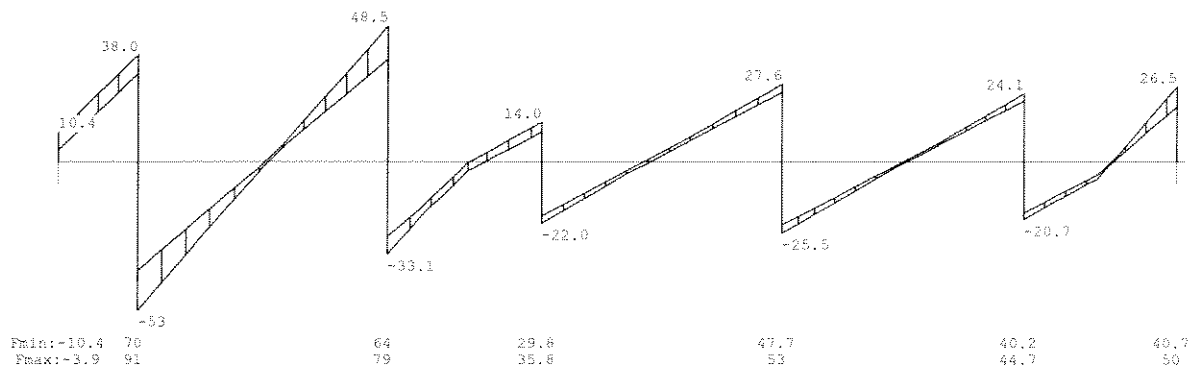
Fundamentele combinatie

Velden: 7 t/m 8

**DWARSKRACHTEN**

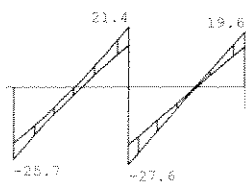
Fundamentele combinatie

Velden: 1 t/m 6

**DWARSKRACHTEN**

Fundamentele combinatie

Velden: 7 t/m 8



|           |      |      |
|-----------|------|------|
| Fmin:40.7 | 37.9 | 14.3 |
| Fmax:56   | 45.7 | 19.6 |

**REACTIES**

Fundamentele combinatie

| Stp | Fmin   | Fmax  | Mmin  | Mmax |
|-----|--------|-------|-------|------|
| 1   | -10.43 | -3.86 | -0.00 | 0.00 |
| 2   | 70.22  | 91.03 | -0.00 | 0.00 |
| 3   | 64.49  | 79.48 | -0.00 | 0.00 |
| 4   | 29.78  | 35.79 | -0.00 | 0.00 |
| 5   | 47.72  | 53.19 | 0.00  | 0.00 |
| 6   | 40.16  | 44.74 | -0.00 | 0.00 |
| 7   | 40.71  | 50.21 | -0.00 | 0.00 |
| 8   | 37.91  | 45.67 | -0.00 | 0.00 |
| 9   | 14.28  | 19.58 | 0.00  | 0.00 |

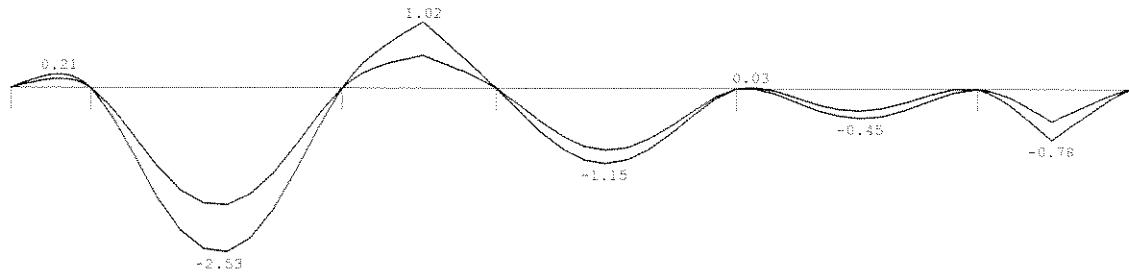
Project.....: Uitbreiding woonhuis Fam. Hoogerheide te Drempt  
 Onderdeel....: ligger -2-

## OMHULLENDE VAN DE INCIDENTELE COMBINATIES

### VERPLAATSINGEN [mm]

Incidentele combinatie

Velden: 1 t/m 6



### VERPLAATSINGEN [mm]

Incidentele combinatie

Velden: 7 t/m 8



## STAALPROFIELEN - ALGEMENE GEGEVENS

Stabiliteit: Classificatie gehele constructie: Geschoord

### MATERIAAL

| Mat nr. | Profielnaam | Vloeisp.<br>[N/mm <sup>2</sup> ] | Productie<br>methode | Min. drsn.<br>klasse |
|---------|-------------|----------------------------------|----------------------|----------------------|
| 1       | H200/100/14 | 235                              | Gewalst              | 1                    |

### KIPSTABILITEIT

| Staafl | Plts.<br>aanr. | 1 gaffel<br>[m] | Kipsteunafstanden<br>[m] |
|--------|----------------|-----------------|--------------------------|
| 1      | 1.0*h          | boven:          | 0.90 0.900               |
|        |                | onder:          | 0.90 0.900               |
| 2      | 1.0*h          | boven:          | 2.80 2.800               |
|        |                | onder:          | 2.80 2.800               |
| 3-4    | 1.0*h          | boven:          | 1.73 1.730               |
|        |                | onder:          | 1.73 1.730               |
| 5      | 1.0*h          | boven:          | 2.70 2.700               |
|        |                | onder:          | 2.70 2.700               |
| 6      | 1.0*h          | boven:          | 2.70 2.700               |
|        |                | onder:          | 2.70 2.700               |
| 7-8    | 1.0*h          | boven:          | 1.73 1.730               |
|        |                | onder:          | 1.73 1.730               |

Project.....: Uitbreiding woonhuis Fam. Hoogerheide te Drempt  
 Onderdeel.....: ligger -2-

**KIPSTABILITEIT**

| Staafl | Plts.<br>aangr. | 1 gaffel | Kipsteunafstanden |
|--------|-----------------|----------|-------------------|
|        |                 | [m]      | [m]               |
| 9      | 1.0*h           | boven:   | 1.30 1.300        |
|        |                 | onder:   | 1.30 1.300        |
| 10     | 1.0*h           | boven:   | 1.30 1.300        |
|        |                 | onder:   | 1.30 1.300        |

**TOETSING SPANNINGEN**

| Staafl | Mat | BC | Sit | Kl | Plaats | Norm | Artikel | Formule  | Hoogste toetsing          | Opm.  |
|--------|-----|----|-----|----|--------|------|---------|----------|---------------------------|-------|
| nr.    |     |    |     |    |        |      |         |          | U.C. [N/mm <sup>2</sup> ] |       |
| 1      | 1   | 1  | 2   | 3  | Einde  | 6770 | 11.4    | (11.4-3) | 0.738 173                 | 76    |
| 2      | 1   | 1  | 2   | 3  | Begin  | 6770 | 11.4    | (11.4-3) | 0.752 177                 | 76    |
| 3-4    | 1   | 1  | 2   | 3  | Begin  | 6770 | 11.4    | (11.4-3) | 0.527 124                 | 60,76 |
| 5      | 1   | 2  | 1   | 3  | Einde  | 6770 | 11.4    | (11.4-3) | 0.437 103                 | 76    |
| 6      | 1   | 2  | 1   | 3  | Begin  | 6770 | 11.4    | (11.4-3) | 0.435 102                 | 76    |
| 7-8    | 1   | 1  | 6   | 3  | Begin  | 6770 | 11.4    | (11.4-3) | 0.377 89                  | 60,76 |
| 9      | 1   | 1  | 6   | 3  | Begin  | 6770 | 11.4    | (11.4-3) | 0.317 75                  | 76    |
| 10     | 1   | 1  | 8   | 3  | Begin  | 6770 | 11.4    | (11.4-3) | 0.203 48                  | 76    |

Opmerkingen:

[ 60] Waarschuwing: Er is een intern staafscharnier aanwezig!

[ 76] Toetsing van kipstabiliteit voor dit profieltype is niet voorzien.

**TOETSING DOORBUIGING**

| Staafl | Soort | Mtg | Lengte | Overst | Zeeg | u <sub>tot</sub> | BC   | Sit      | u    | Toelaatbaar |
|--------|-------|-----|--------|--------|------|------------------|------|----------|------|-------------|
|        |       |     | [m]    | I      | J    | [mm]             |      |          | [mm] | [mm] *1     |
| 1      | Vloer | db  | 0.90   | N      | N    | 0.0              | 0.2  | 3 2 Eind | 0.2  | ±3.6 0.004  |
|        |       | db  |        |        |      |                  |      | 3 2 Bijk | 0.1  | ±2.7 0.003  |
| 2      | Vloer | db  | 2.80   | N      | N    | 0.0              | -2.5 | 3 2 Eind | -2.5 | ±11.2 0.004 |
|        |       | db  |        |        |      |                  |      | 3 2 Bijk | -0.7 | ±8.4 0.003  |
| 3-4    | Vloer | db  | 1.73   | N      | N    | 0.0              | 1.0  | 3 2 Eind | 1.0  | ±6.9 0.004  |
|        |       | db  |        |        |      |                  |      | 3 2 Bijk | 0.4  | ±5.2 0.003  |
| 5      | Vloer | db  | 2.70   | N      | N    | 0.0              | -1.1 | 3 2 Eind | -1.1 | ±10.8 0.004 |
|        |       | db  |        |        |      |                  |      | 3 2 Bijk | -0.2 | ±8.1 0.003  |
| 6      | Vloer | db  | 2.70   | N      | N    | 0.0              | -0.5 | 3 5 Eind | -0.5 | ±10.8 0.004 |
|        |       | db  |        |        |      |                  |      | 3 6 Bijk | 0.1  | ±8.1 0.003  |
| 7-8    | Vloer | db  | 1.73   | N      | N    | 0.0              | -0.8 | 3 6 Eind | -0.8 | ±6.9 0.004  |
|        |       | db  |        |        |      |                  |      | 3 6 Bijk | -0.3 | ±5.2 0.003  |
| 9      | Vloer | db  | 1.30   | N      | N    | 0.0              | 0.1  | 3 6 Eind | 0.1  | ±5.2 0.004  |
|        |       | db  |        |        |      |                  |      | 3 6 Bijk | 0.0  | ±3.9 0.003  |
| 10     | Vloer | db  | 1.30   | N      | N    | 0.0              | -0.2 | 3 8 Eind | -0.2 | ±5.2 0.004  |
|        |       | db  |        |        |      |                  |      | 3 8 Bijk | -0.1 | ±3.9 0.003  |