

Project : 2023237
Verbouwing woning
5.1, 2, e
te Amsterdam
Onderwerp : Hoofdberekening





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Opdrachtgever : Serge Schoemaker Architects
Architect : Serge Schoemaker Architects
Constructeur : 5.1, 2, e

Kenmerk : 2023237h68999__Rapport 01
Status : Definitief
Datum : 11 juli 2024
Versie : 2

Versies

| Versie | Datum | Constructeur | Omschrijving |
|--------|------------|---|-------------------------|
| 1 | 11-03-2024 |  | Eerste uitgave. |
| 2 | 11-07-2024 |  | Gewijzigde trap en kap. |

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1 Inleiding

Voorliggend rapport is de rekenkundige onderbouwing van de verbouwing van de woning aan de Bloemgracht te Amsterdam.

Van dit pand zijn bouwtekeningen en constructiegegevens uit de bouwdoSSIers beschikbaar.

In deze tweede versie van het rapport zijn wijzigingen aan de trap en de nieuwe kap verwerkt.

2 Berekeningen

2.1 Algemeen

Van toepassing zijnde normen:

- NEN-EN 1990 Grondslagen van het constructief ontwerp
 - NEN-EN 1991 Belastingen op constructies
 - NEN-EN 1992 Ontwerp en berekening van betonconstructies
 - NEN-EN 1993 Ontwerp en berekening van staalconstructies
 - NEN-EN 1994 Ontwerp en berekening van staal-betonconstructies
 - NEN-EN 1995 Ontwerp en berekening van houtconstructies
 - NEN-EN 1996 Ontwerp en berekening van constructies in metselwerk
 - NEN-EN 1997 Geotechnisch ontwerp en berekening
 - NEN-EN 1998 Ontwerp en berekening van aardbevingsbestendige constructies
 - NEN-EN 1999 Ontwerp en berekening van aluminiumconstructies
-
- NEN 8700:2011 Beoordeling van de constructieve veiligheid van een bestaand bouwwerk bij verbouw en afkeuren - Grondslagen
 - NEN 8701:2011 Beoordeling van de constructieve veiligheid van een bestaand bouwwerk bij verbouwen en afkeuren - Belastingen

Toegepaste Software

Technosoft V6

2.2 Uitgangspunten

Gebouwfunctie : Woonfunctie
Gevolgklasse : CC2 verbouwniveau voor 2003
Referentieperiode : 50 jaar

Staalconstructie

Staalkwaliteit : S235
Boutkwaliteit : 8.8
Ankerkwaliteit : 4.6

Houtconstructie

Houtkwaliteit : C18 (bestaand)
Houtkwaliteit : C24 (nieuw)
Klimaatklasse : I

Steenconstructies

Baksteen : steendruksterkte 10 N/mm² mortelkwaliteit: M2,5

Windbelastingen

Windgebied : II
Omgeving : Bebouwd

2.3 Belastingen

In onderstaand overzicht zijn de van toepassing zijnde belastingen weergegeven.

2.3.1 Daken

| | | |
|-------------------------------------|---|-------------------------------|
| Plat dak dakterras (nieuw) | Categorie A: Woon- of verblijfsfunctie | |
| Afwerking (composiet vlonder) | | 0,30 = 0,30 |
| Isolatie en dakbedekking | | 0,12 + 0,03 = 0,15 |
| Balklaag | | 0,25 = 0,25 |
| Plafond, leidingen etc | | 0,25 = 0,25 |
| | | + ----- |
| Totaal blijvende belasting | | 0,95 kN/m ² |
| Opgelegde belasting | | 2,50 = 2,50 kN/m ² |
| Geconcentreerde opgelegde belasting | | 3,00 kN |
| Momentaanfactor | $\psi_0 = 0,40$ $\psi_1 = 0,50$ $\psi_2 = 0,30$ | |
| Reductiefactor | | 1,00 |

| | | |
|-------------------------------------|---|-------------------------------|
| Plat dak dakkapel | Categorie H: Daken | |
| Daklicht / plat dak | | 0,80 = 0,80 |
| | | + ----- |
| Totaal blijvende belasting | | 0,80 kN/m ² |
| Opgelegde belasting | | 1,00 = 1,00 kN/m ² |
| Geconcentreerde opgelegde belasting | | 2,00 kN |
| Momentaanfactor | $\psi_0 = 0,00$ $\psi_1 = 0,00$ $\psi_2 = 0,00$ | |
| Reductiefactor | | 1,00 |

| | | |
|-------------------------------------|---|-------------------------------|
| Kap 52° (voorzijde) grondvlak | Sneeuwbelasting | |
| Dakpannen | | 0,45 / cos52 = 0,73 |
| Houten kap met dakbeschot | | 0,20 / cos52 = 0,32 |
| Isolatie | | 0,07 / cos52 = 0,11 |
| Plafond, leidingen etc | | 0,10 / cos52 = 0,16 |
| | | + ----- |
| Totaal blijvende belasting | | 1,33 kN/m ² |
| Sneeuwbelasting | | 0,15 = 0,15 kN/m ² |
| Geconcentreerde opgelegde belasting | | 2,00 kN |
| Momentaanfactor | $\psi_0 = 0,00$ $\psi_1 = 0,20$ $\psi_2 = 0,00$ | |
| Reductiefactor | | 1,00 |

| Kap 54° (nieuw) grondvlak | | Sneeuwbelasting | |
|-------------------------------------|-----------------|--------------------|------------------------|
| Zinken dakbedekking | | $0,20 / \cos 54 =$ | 0,34 |
| Houten kap met dakbeschot | | $0,25 / \cos 54 =$ | 0,43 |
| Isolatie | | $0,03 / \cos 54 =$ | 0,05 |
| Plafond, leidingen etc | | $0,20 / \cos 54 =$ | 0,34 |
| | | + ----- | |
| Totaal blijvende belasting | | | 1,16 kN/m ² |
| Sneeuwbelasting | | $0,11 =$ | 0,11 kN/m ² |
| Geconcentreerde opgelegde belasting | | | 2,00 kN |
| Momentaanfactor | $\psi_0 = 0,00$ | $\psi_1 = 0,20$ | $\psi_2 = 0,00$ |
| Reductiefactor | | | 1,00 |

| Kap 60° (nieuw) grondvlak | | Sneeuwbelasting | |
|-------------------------------------|-----------------|--------------------|------------------------|
| Zinken dakbedekking | | $0,20 / \cos 60 =$ | 0,40 |
| Houten kap met dakbeschot | | $0,25 / \cos 60 =$ | 0,50 |
| Isolatie | | $0,03 / \cos 60 =$ | 0,06 |
| Plafond, leidingen etc | | $0,20 / \cos 60 =$ | 0,40 |
| | | + ----- | |
| Totaal blijvende belasting | | | 1,36 kN/m ² |
| Opgelegde belasting | | $0,00 =$ | 0,00 kN/m ² |
| Geconcentreerde opgelegde belasting | | | 2,00 kN |
| Momentaanfactor | $\psi_0 = 0,00$ | $\psi_1 = 0,20$ | $\psi_2 = 0,00$ |
| Reductiefactor | | | 1,00 |

| PV-panelen 54° (grondvlak) | | Permanent | |
|----------------------------|--|--------------------|------------------------|
| PV-panelen incl. frame | | $0,15 / \cos 54 =$ | 0,26 |
| | | + ----- | |
| Totaal blijvende belasting | | | 0,26 kN/m ² |

| Plat dak (bestaand) | | Sneeuwbelasting | |
|-------------------------------------|-----------------|-----------------|------------------------|
| Isolatie en dakbedekking | | $0,12 + 0,03 =$ | 0,15 |
| Balklaag | | $0,25 =$ | 0,25 |
| Plafond, leidingen etc | | $0,25 =$ | 0,25 |
| | | + ----- | |
| Totaal blijvende belasting | | | 0,65 kN/m ² |
| Sneeuwbelasting (gemiddeld) | | $0,56 =$ | 0,56 kN/m ² |
| Geconcentreerde opgelegde belasting | | | 0,00 kN |
| Momentaanfactor | $\psi_0 = 0,00$ | $\psi_1 = 0,20$ | $\psi_2 = 0,00$ |
| Reductiefactor | | | 1,00 |

| Stuwdruk, h= 12,10 m ¹ | | Windbelasting | |
|--|-----------------|-----------------|------------------------|
| Windgebied II; Bebouwd; hoogte 12,100 boven maaiveld, stuwdruk = | | | 0,74 kN/m ² |
| Momentaanfactor | $\psi_0 = 0,00$ | $\psi_1 = 0,20$ | $\psi_2 = 0,00$ |
| Reductiefactor C _{prob} ² | | | 1,00 |

2.3.2 Vloeren

| | | | | |
|--|--|-----------------|-----------------|------------------------|
| Verdiepingsvloer | Categorie A: Woon- of verblijfsfunctie | | | |
| Plaatmateriaal | | | | 0,25 = 0,25 |
| Houten balklaag | | | | 0,25 = 0,25 |
| Plafond | | | | 0,15 = 0,15 |
| Extra | | | | = 0,00 |
| | | | | + ----- |
| Totaal blijvende belasting | | | | 0,65 kN/m ² |
| Opgelegde belasting inclusief scheidingswanden | 0,80 | + 1,75 | = | 2,55 kN/m ² |
| Geconcentreerde opgelegde belasting | | | | 3,00 kN |
| Momentaanfactor | $\psi_0 = 0,40$ | $\psi_1 = 0,50$ | $\psi_2 = 0,30$ | |
| Reductiefactor | | | | 1,00 |

| | | | | |
|--|--|-----------------|-----------------|------------------------|
| Begane grondvloer (nieuw) | Categorie A: Woon- of verblijfsfunctie | | | |
| Zwaluwstaartvloer | 0,06 | x 20,00 | = | 1,20 |
| Balklaag | | | | 0,25 = 0,25 |
| Extra | | | | = 0,00 |
| | | | | + ----- |
| Totaal blijvende belasting | | | | 1,45 kN/m ² |
| Opgelegde belasting inclusief scheidingswanden | 0,80 | + 1,75 | = | 2,55 kN/m ² |
| Geconcentreerde opgelegde belasting | | | | 3,00 kN |
| Momentaanfactor | $\psi_0 = 0,40$ | $\psi_1 = 0,50$ | $\psi_2 = 0,30$ | |
| Reductiefactor | | | | 1,00 |

| | | | | |
|-------------------------------------|--|-----------------|-----------------|------------------------|
| Souterrainvloer | Categorie A: Woon- of verblijfsfunctie | | | |
| Straatwerk (aanname) | 0,20 | x 19,00 | = | 3,80 |
| Extra | | | | = 0,00 |
| | | | | + ----- |
| Totaal blijvende belasting | | | | 3,80 kN/m ² |
| Opgelegde belasting | 1,75 | = | 1,75 | kN/m ² |
| Geconcentreerde opgelegde belasting | | | | 3,00 kN |
| Momentaanfactor | $\psi_0 = 0,40$ | $\psi_1 = 0,50$ | $\psi_2 = 0,30$ | |
| Reductiefactor | | | | 1,00 |

| | | | | |
|-------------------------------------|--|-----------------|-----------------|------------------------|
| Lichtstraat beloopbaar | Categorie A: Woon- of verblijfsfunctie | | | |
| Eigengewicht | 1,25 | = | 1,25 | |
| Extra | | | | = 0,00 |
| | | | | + ----- |
| Totaal blijvende belasting | | | | 1,25 kN/m ² |
| Opgelegde belasting | 2,50 | = | 2,50 | kN/m ² |
| Geconcentreerde opgelegde belasting | | | | 3,00 kN |
| Momentaanfactor | $\psi_0 = 0,40$ | $\psi_1 = 0,50$ | $\psi_2 = 0,30$ | |
| Reductiefactor | | | | 1,00 |

2.3.3 Wanden en overig

| | | |
|----------------------------|-----------|--|
| Steens metselwerk | Permanent | |
| Eigengewicht | | $0,22 \times 19,00 = 4,18$ |
| Stuc | | $2,00 \times 0,01 \times 13,00 = 0,26$ |
| Extra | | $= 0,00$ |
| | | + ----- |
| Totaal blijvende belasting | | 4,44 kN/m ² |

| | | |
|----------------------------|-----------|------------------------|
| Puier | Permanent | |
| Eigengewicht | | $0,60 = 0,60$ |
| Extra | | $= 0,00$ |
| | | + ----- |
| Totaal blijvende belasting | | 0,60 kN/m ² |

| | | |
|----------------------------|-----------|------------------------|
| Zijwang dakkapel (nieuw) | Permanent | |
| Zinken afwerking | | $0,20 = 0,20$ |
| HSB | | $0,30 = 0,30$ |
| Afwerking binnenzijde | | $0,15 = 0,15$ |
| | | + ----- |
| Totaal blijvende belasting | | 0,65 kN/m ² |

| | | |
|----------------------------|-----------|------------------------|
| HSB wand | Permanent | |
| HSB wand | | $0,35 = 0,35$ |
| Gipsplaten en afwerking | | $0,25 = 0,25$ |
| Extra | | $= 0,00$ |
| | | + ----- |
| Totaal blijvende belasting | | 0,60 kN/m ² |

2.4 Gewichtsberekening

De belasting op de houten paalfundering mag niet toenemen in de nieuwe situatie.

Onderstaand overzicht is een vergelijking van de lijnlast op de fundering van de bouwmuren. In 1922 is een betonplaat als beganegrondvloer toegevoegd. Deze betonvloer wordt in het nieuwe ontwerp gesloopt. Met het slopen van de betonvloer en het uitbreiden van de kap wordt de belastingcapaciteit van de fundering in de nieuwe situatie niet overschreden.

Belasting op paalfundering: vergelijking bestaande en nieuwe situatie
(*puinvulling is niet beschouwd in bestaande situatie; conservatieve benadering*)

q1: Lijnlast bouwmuur (bestaand)

| | | $G_{rep} + \psi_0 \times \psi_t \cdot Q_{rep}$ | pb | vb |
|--|---|--|---------|--------------|
| Plat dak (bestaand) | (| $0,50 \times 3,80) \times (0,65 + 0,00 \times 0,56)$ | = 1,24 | + 0,00 |
| verd. 2: Verdiepingsvloer (bestaand) | (| $0,50 \times 3,80) \times (0,55 + 0,40 \times 2,55)$ | = 1,05 | + 1,94 |
| verd. 1: Verdiepingsvloer (bestaand) | (| $0,50 \times 3,80) \times (0,55 + 1,00 \times 2,55)$ | = 1,05 | + 4,85 extr |
| bel-etage: Verdiepingsvloer (bestaand) | (| $0,50 \times 3,80) \times (0,55 + 1,00 \times 2,55)$ | = 1,05 | + 4,85 extr |
| BG: Betonvloer bestaand | (| $0,50 \times 3,80) \times (4,35 + 0,40 \times 1,75)$ | = 8,27 | + 1,33 |
| sou: Souterrainvloer // | (| $0,50) \times (3,80 + 0,40 \times 1,75)$ | = 1,90 | + 0,35 |
| Steens metselwerk | (| $11,00) \times (4,44 + 0,00 \times 0,00)$ | = 48,84 | + 0,00 |
| | | | + ----- | + ----- |
| | | Totaal | 63,38 | + 13,31 kN/m |

Veranderlijke belastingen: Frequent = 8,53 kN/m Quasi blijvend = 5,62 kN/m Karakteristiek = 7,49 kN/m

Belasting uiterste grenstoestand

$$q_{Ed} = 1,20 \times 63,38 + 1,30 \times 7,49 = 85,79 \text{ kN/m (NEN-EN 1990: vergelijking 6.10a)}$$

$$= 1,15 \times 63,38 + 1,30 \times 13,31 = 90,18 \text{ kN/m (NEN-EN 1990: vergelijking 6.10b)}$$

$$q_{Ed} = 1,00 \times 63,38 + 1,00 \times 8,53 = 71,90 \text{ kN/m (NEN-EN 1990: vergelijking 6.11b - frequent)}$$

$$q_{Ed} = 1,00 \times 63,38 + 1,00 \times 5,62 = 69,00 \text{ kN/m (NEN-EN 1990: vergelijking 6.11b - quasi blijvend)}$$

$$q_{Ed} = 1,00 \times 63,38 + 1,00 \times 13,31 = 76,68 \text{ kN/m (NEN-EN 1990: vergelijking 6.14b - karakteristiek)}$$

q1: Lijnlast bouwmuur (nieuw)

| | | $G_{rep} + \psi_0 \times \psi_t \cdot Q_{rep}$ | pb | vb |
|--------------------------------------|---|--|---------|--------------|
| Kap 54° (nieuw) grondvlak | (| $0,50 \times 3,80) \times (1,16 + 0,00 \times 0,11)$ | = 2,20 | + 0,00 |
| verd. 3: Verdiepingsvloer | (| $0,50 \times 3,80) \times (0,65 + 0,40 \times 2,55)$ | = 1,24 | + 1,94 |
| verd. 2: Verdiepingsvloer | (| $0,50 \times 3,80) \times (0,65 + 0,40 \times 2,55)$ | = 1,24 | + 1,94 |
| verd. 1: Verdiepingsvloer | (| $0,50 \times 3,80) \times (0,65 + 1,00 \times 2,55)$ | = 1,24 | + 4,85 extr |
| bel-etage: Begane grondvloer (nieuw) | (| $0,50 \times 3,80) \times (1,45 + 1,00 \times 2,55)$ | = 2,76 | + 4,85 extr |
| sou: Souterrainvloer // | (| $0,50) \times (3,80 + 0,40 \times 2,55)$ | = 1,90 | + 0,51 |
| Steens metselwerk | (| $11,00) \times (4,44 + 0,00 \times 0,00)$ | = 48,84 | + 0,00 |
| | | | + ----- | + ----- |
| | | Totaal | 59,40 | + 14,08 kN/m |

Veranderlijke belastingen: Frequent = 10,07 kN/m Quasi blijvend = 6,20 kN/m Karakteristiek = 8,26 kN/m

Belasting uiterste grenstoestand

$$q_{Ed} = 1,20 \times 59,40 + 1,30 \times 8,26 = 82,02 \text{ kN/m (NEN-EN 1990: vergelijking 6.10a)}$$

$$= 1,15 \times 59,40 + 1,30 \times 14,08 = 86,61 \text{ kN/m (NEN-EN 1990: vergelijking 6.10b)}$$

$$q_{Ed} = 1,00 \times 59,40 + 1,00 \times 10,07 = 69,47 \text{ kN/m (NEN-EN 1990: vergelijking 6.11b - frequent)}$$

$$q_{Ed} = 1,00 \times 59,40 + 1,00 \times 6,20 = 65,59 \text{ kN/m (NEN-EN 1990: vergelijking 6.11b - quasi blijvend)}$$

$$q_{Ed} = 1,00 \times 59,40 + 1,00 \times 14,08 = 73,47 \text{ kN/m (NEN-EN 1990: vergelijking 6.14b - karakteristiek)}$$

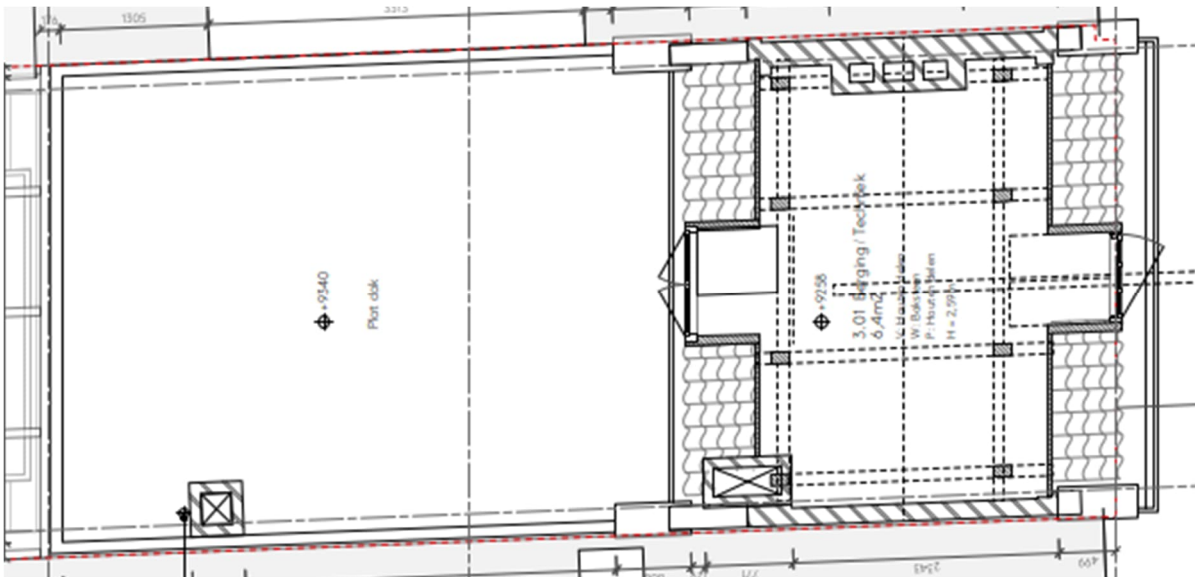
Benuttingsgraad fundering in nieuwe situatie: $90 / 87 = 96,0\%$ (uiterste grenstoestand)

Benuttingsgraad fundering in nieuwe situatie: $72 / 69 = 96,6\%$ (frequent)

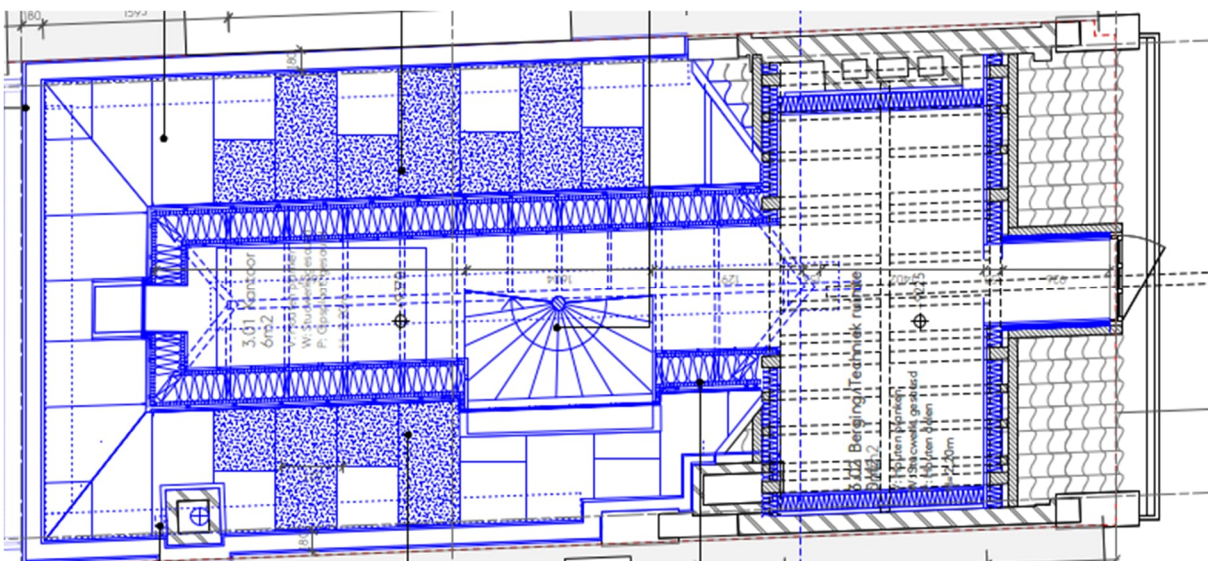
Benuttingsgraad fundering in nieuwe situatie: $69 / 66 = 95,1\%$ (quasi-blijvend)

3 Dakconstructie

In de huidige situatie bestaat het dak deels uit een sporenkap met spanten, de nokrichting loopt evenwijdig aan de voorgevel. Het overige dakvlak is een plat dak. In de nieuwe plannen wordt het deel met het plat dak voorzien van een nieuwe kap. De nokrichting van de nieuwe kap staat loodrecht op de voorgevel. Vanwege de beperkte vrije hoogte wordt het dak uitgevoerd als een sporenkap. Plaatmateriaal als dakbeschot verzorgt schijfwerking van het dakvlak. Het gewicht van het nieuwe dak is lager dan het bestaande dak, er wordt een zinken dakbedekking toegepast in plaats van dakpannen. Het nieuwe dak wordt niet door de bestaande kap ondersteund.



Figuur 1 – Plattegrond verdieping 3 met bestaande kap.



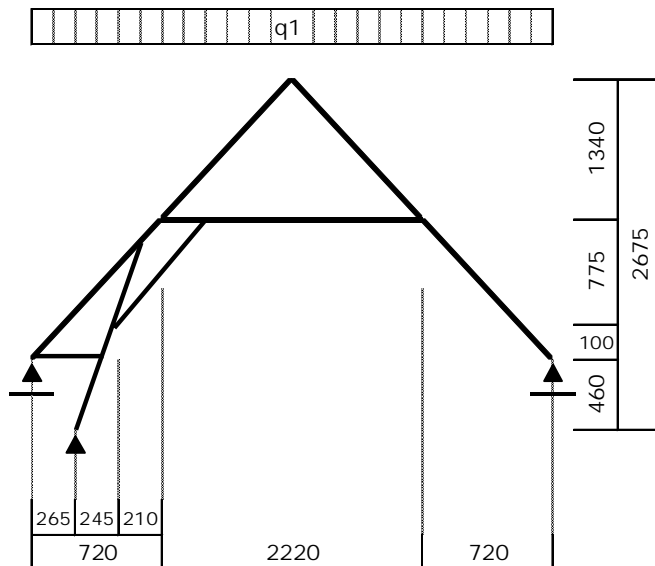
Figuur 2 – Plattegrond verdieping 3 met uitbreiding van de kap.

3.1 Spant bestaande kap

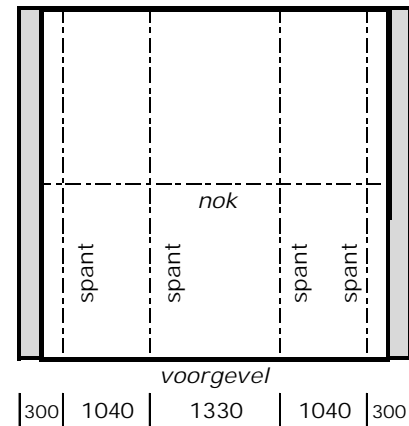
De controle van het dakspant is uitgevoerd in de nieuwe situatie. Het dak wordt geïsoleerd en voorzien van een plafond.

Dakspant voorzijde

Aanzicht spant schematisch



plattegrond zolder schematisch



Wind- en sneeuwbelasting wordt in Technosoft gegenereerd.

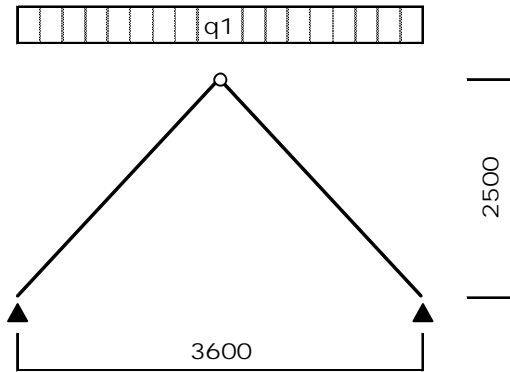
q1

| | | $G_{rep} + \psi_0 \times \psi_t \cdot Q_{rep}$ | pb | vb |
|-------------------------------|--------|--|----------|-----------|
| Kap 52° (voorzijde) grondvlak | (| $0,50 \times 1,04) \times (1,33 + 1,00 \times 0,15)$ | = 0,69 + | 0,08 extr |
| Kap 52° (voorzijde) grondvlak | (| $0,50 \times 1,33) \times (1,33 + 1,00 \times 0,15)$ | = 0,89 + | 0,10 extr |
| | | | + ----- | + ----- |
| | Totaal | | 1,58 + | 0,18 kN/m |

Voor de berekeningsresultaten wordt verwezen naar Bijlage A, blad 1 e.v.

3.2 Nieuwe kap: sporen

Nieuwe kap achterzijde: sporen



*muurplaten verankerd aan balklaag
spatkrachten opgenomen via ankers in balklaag*

h.o.h. sporen: 500 mm

q1 (incl. PV-panelen)

| | | $G_{rep} + \psi_0 \times \psi_t \cdot Q_{rep}$ | pb | vb |
|----------------------------|---|--|----------------|-----------|
| Kap 54° (nieuw) grondvlak | (| $0,50) \times (1,16 + 1,00 \times 0,11) =$ | 0,58 + | 0,06 extr |
| PV-panelen 54° (grondvlak) | (| $0,50) \times (0,26 + 0,00 \times 0,00) =$ | 0,13 + | 0,00 |
| | | | + ----- +----- | |
| | | Totaal | 0,71 + | 0,06 kN/m |

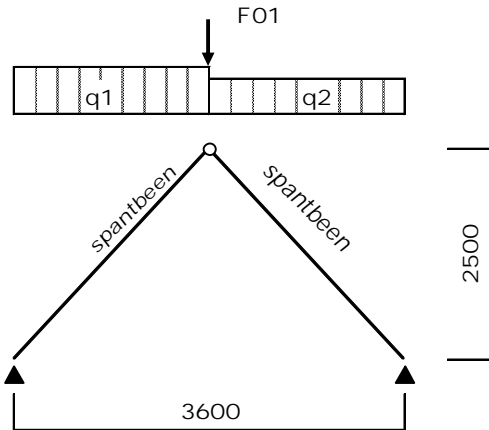
Pas toe: SLS 38 x 170 mm² (C24), h.o.h.: 500 mm

Voor de berekeningsresultaten wordt verwezen naar Bijlage A, blad 22 e.v.

3.3 Nieuwe kap: spant dakraam

Het spant draagt de uitkraging van de nokgording ten behoeve van de dakvlakken tot aan de kilkepers.

Nieuwe kap achterzijde: slaper



*muurplaten verankerd aan balklaag
spatkrachten opgenomen via ankers in balklaag*

q1 (spantbeen dakraam)

| | $G_{rep} + \psi_0 \times \psi_t \cdot Q_{rep}$ | pb | vb |
|---------------------------|--|---------|------------------|
| Kap 54° (nieuw) grondvlak | (0,93 + 0,25) x (1,16 + 1,00 x 0,11) = | 1,36 + | 0,13 extr |
| | | + ----- | + ----- |
| | | Totaal | 1,36 + 0,13 kN/m |

q2

| | $G_{rep} + \psi_0 \times \psi_t \cdot Q_{rep}$ | pb | vb |
|---------------------------|--|---------|------------------|
| Dakschild | | | |
| Kap 54° (nieuw) grondvlak | (0,50) x (1,16 + 1,00 x 0,11) = | 0,58 + | 0,06 extr |
| PV-panels 54° (grondvlak) | (0,50) x (0,26 + 0,00 x 0,00) = | 0,13 + | 0,00 |
| | | + ----- | + ----- |
| | | Totaal | 0,71 + 0,06 kN/m |

F01 (uit nokgording)

| | $G_{rep} + \psi_0 \times \psi_t \cdot Q_{rep}$ | pb | vb |
|---------------------------|---|---------|----------------|
| Kap 54° (nieuw) grondvlak | (2,00 x 1,50 x 1,80) x (1,16 + 1,00 x 0,11) = | 6,25 + | 0,61 extr |
| PV-panels 54° (grondvlak) | (2,00 x 1,50 x 1,80) x (0,26 + 0,00 x 0,00) = | 1,38 + | 0,00 |
| | | + ----- | + ----- |
| | | Totaal | 7,63 + 0,61 kN |

Pas toe voor de slaper: 58 x 170 mm² (C24).

Voor de berekeningsresultaten wordt verwezen naar Bijlage A, blad 37 e.v.

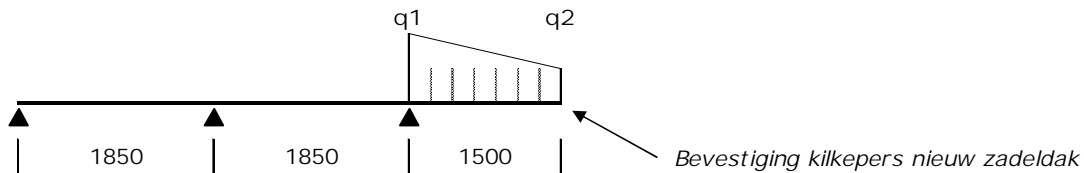
3.4 Nieuwe kap: nokgording

De nokgording is met name praktisch van aard en verzorgt samenhang tijdens de montage van het dak en de dakbedekking.

Nieuwe kap achterzijde: nokgording

uitgangspunt: sporen ondersteunen de nokgording

Toetsing nok: aansluiting op kilkepers nieuw zadeldak



q1

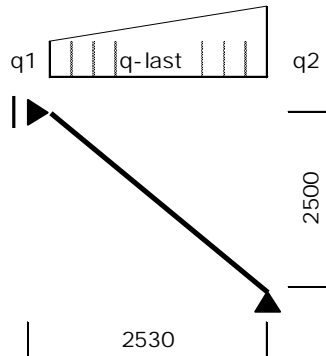
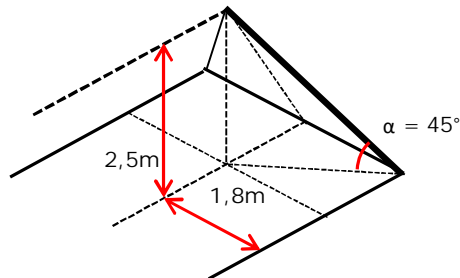
| | | | |
|---------------------------|---|---------------------------------|----------------------------|
| | $G_{rep} + \psi_0 \times \psi_t \cdot Q_{rep}$ | p_b | v_b |
| Kap 54° (nieuw) grondvlak | $(2,00 \times 0,50 \times 3,60) \times (1,16 + 1,00 \times 0,11) =$ | $4,16 +$ | $0,40 \text{ extr}$ |
| | | $+ \text{-----} + \text{-----}$ | |
| | | Totaal | $4,16 + 0,40 \text{ kN/m}$ |

Pas toe voor de nokgording minimaal: 70 x 245 mm² (C24).

Voor de berekeningsresultaten wordt verwezen naar Bijlage A, blad 54 e.v.

3.5 Nieuwe kap: hoekkeper

Nieuwe kap achterzijde: hoekkeper



q1

| | $G_{rep} + \psi_0 \times \psi_t \cdot Q_{rep}$ | pb | vb |
|-------------------------------------|---|---------|------------|
| Dakschild langsgevel incl. PV | | | |
| Kap 54° (nieuw) grondvlak // (| $0,50) \times (1,16 + 1,00 \times 0,11) =$ | 0,58 + | 0,06 extr |
| PV-panelen 54° (grondvlak) // (| $0,50) \times (0,26 + 0,00 \times 0,00) =$ | 0,13 + | 0,00 |
| Stuwdruk, h= 12,10 m ¹ (| $0,50 \times -1,20) \times (0,00 + 1,00 \times 0,74) =$ | 0,00 - | -0,44 extr |
| | | + ----- | + ----- |
| | Totaal | 0,71 - | -0,39 kN/m |

q2

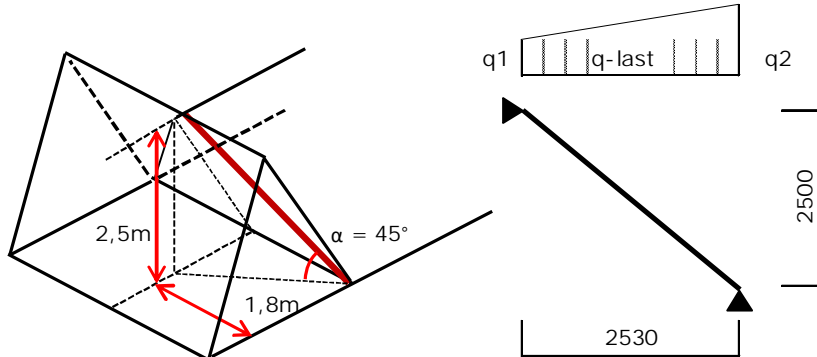
| | $G_{rep} + \psi_0 \times \psi_t \cdot Q_{rep}$ | pb | vb |
|-------------------------------------|---|---------|------------|
| Dakschild langsgevel incl. PV | | | |
| Kap 54° (nieuw) grondvlak (| $2,00) \times (1,16 + 1,00 \times 0,11) =$ | 2,31 + | 0,22 extr |
| PV-panelen 54° (grondvlak) (| $2,00) \times (0,26 + 0,00 \times 0,00) =$ | 0,51 + | 0,00 |
| Stuwdruk, h= 12,10 m ¹ (| $2,00 \times -1,20) \times (0,00 + 1,00 \times 0,74) =$ | 0,00 - | -1,77 extr |
| Dakschild kopgevel | | | |
| Kap 60° (nieuw) grondvlak (| $2,00) \times (1,36 + 0,00 \times 0,00) =$ | 2,72 + | 0,00 |
| Stuwdruk, h= 12,10 m ¹ (| $2,00 \times -1,20) \times (0,00 + 1,00 \times 0,74) =$ | 0,00 - | -1,77 extr |
| | | + ----- | + ----- |
| | Totaal | 5,54 - | -3,31 kN/m |

Pas toe voor de hoekkeper: 70 x 195 mm² (C24).

Voor de berekeningsresultaten wordt verwezen naar Bijlage A, blad 62 e.v.

3.6 Nieuwe kap: kilkeper

Nieuwe kap achterzijde: kilkeper



q1

| | | $G_{rep} + \psi_0 \times \psi_t \cdot Q_{rep}$ | pb | vb |
|-----------------------------------|---|---|---------|------------|
| Kap 54° (nieuw) grondvlak | (| $0,30) \times (1,16 + 1,00 \times 0,11) =$ | 0,35 + | 0,03 extr |
| PV-panelen 54° (grondvlak) | (| $0,30) \times (0,26 + 0,00 \times 0,00) =$ | 0,08 + | 0,00 |
| Stuwdruk, h= 12,10 m ¹ | (| $0,30 \times -1,20) \times (0,00 + 1,00 \times 0,74) =$ | 0,00 - | -0,27 extr |
| | | | + ----- | + ----- |
| | | Totaal | 0,42 - | -0,23 kN/m |

q2

| | | $G_{rep} + \psi_0 \times \psi_t \cdot Q_{rep}$ | pb | vb |
|-----------------------------------|---|---|---------|------------|
| Dakschild langsgevel incl. PV | | | | |
| Kap 54° (nieuw) grondvlak // | (| $1,00 \times 2,53) \times (1,16 + 1,00 \times 0,11) =$ | 2,93 + | 0,28 extr |
| PV-panelen 54° (grondvlak) // | (| $1,00 \times 2,53) \times (0,26 + 0,00 \times 0,00) =$ | 0,65 + | 0,00 |
| Stuwdruk, h= 12,10 m ¹ | (| $0,50 \times 3,10 \times -1,20) \times (0,00 + 1,00 \times 0,74) =$ | 0,00 - | -1,37 extr |
| | | | + ----- | + ----- |
| | | Totaal | 3,57 - | -1,09 kN/m |

Pas toe voor de kilkeper: 70 x 195 mm² (C24).

Voor de berekeningsresultaten wordt verwezen naar Bijlage A, blad 68 e.v.

4 Verdiepingsvloeren

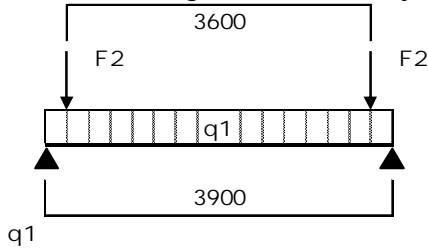
De verdiepingsvloeren in de bestaande situatie bestaan uit balklagen. De balklaag van de derde verdieping wordt aangepast ten behoeve van een trapsparing. De balklagen van de eerste en de tweede verdieping blijven gehandhaafd.

De betonvloer die in 1922 is aangebracht als beganegrondvloer wordt deels gesloopt, de betonplaat van de aanbouw blijft behouden. Boven deze betonvloer is een balklaag aangebracht. Deze wordt vervangen door een nieuwe balklaag vanwege het aanpassen van het vloerpeil.

4.1 B3-01: Balklaag 3^e verdieping achterzijde

In de nieuwe situatie gaat deze balklaag dienen als verdiepingvloer. De muurplaten van de nieuwe sporenkap worden verankerd aan de balklaag, waardoor de spatkrachten worden opgenomen in de balklaag.

B3-01: Balklaag 3e verd achterzijde



Houtmaat: 75 x 225 (C18)
h.o.h.: 650 mm

| | | $G_{rep} + \psi_0 \times \psi_t \cdot Q_{rep}$ | pb | vb |
|-----------------|---|--|---------|------------------|
| Verdiepingvloer | (| 0,65) x (0,65 + 1,00 x 2,55) = | 0,42 + | 1,66 extr |
| | | | + ----- | +----- |
| | | | Totaal | 0,42 + 1,66 kN/m |

F2: reactie muurplaat

| | | $G_{rep} + \psi_0 \times \psi_t \cdot Q_{rep}$ | pb | vb |
|----------------------------|---|--|---------|----------------|
| Kap 60° (nieuw) grondvlak | (| 0,50 x 3,60 x 0,65) x (1,36 + 0,00 x 0,00) = | 1,59 + | 0,00 |
| PV-panelen 54° (grondvlak) | (| 0,50 x 3,60 x 0,65) x (0,26 + 0,00 x 0,00) = | 0,30 + | 0,00 |
| Veranderlijk Qk | (| 0,75 x 3,60 / 3,60) x (0,00 + 1,00 x 2,00) = | 0,00 + | 1,50 |
| | | | + ----- | +----- |
| | | | Totaal | 1,89 + 1,50 kN |

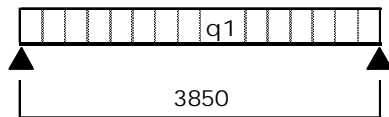
Bestaande balklaag van verdieping 3 voldoet.

Voor de berekeningsresultaten wordt verwezen naar Bijlage A, blad 76 e.v.

4.1.1 L3-01: Strijkbalk achtergevel

De strijkbalk wordt in de nieuwe situatie meer belast door het nieuwe dakschild.

L3-01: strijkbalk achtergevel



q1

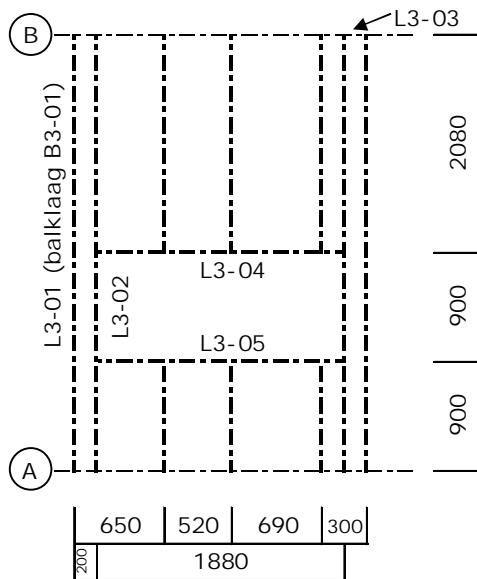
| | | $G_{rep} + \psi_0 \times \psi_t \cdot Q_{rep}$ | pb | vb |
|---------------------------|---|--|---------|-------------|
| Verdiepingsvloer | (| $0,50 \times 0,65) \times (0,65 + 1,00 \times 2,55)$ | = 0,21 | + 0,83 extr |
| Kap 54° (nieuw) grondvlak | (| $2,00) \times (1,16 + 1,00 \times 0,11)$ | = 2,31 | + 0,22 extr |
| | | | + ----- | + ----- |
| | | Totaal | 2,53 | + 1,05 kN/m |

De strijkbalk ter plekke van de achtergevel versterken met nieuwe balk 70 x 200 mm² (C24); bevestiging met houtdraadbouten M12 h.o.h. 500 mm.

Voor de berekeningsresultaten wordt verwezen naar Bijlage A, blad 86 e.v.

4.2 Balklaag 3^e verdieping: raveling trapsparing

Raveling trapgat (verdieping 3)



L3-01: *bestaand*

L3-02: *nieuw*

L3-03: *nieuw*

L3-04 en 05: *nieuw raveelbalk*

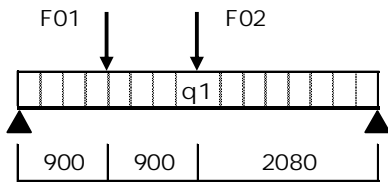
rest vloerbalken: *bestaand ingekort t.p.v. trapsparing*

Plattegrond schematisch

Ten behoeve van de trapsparing in de vloer van verdieping 3 worden twee nieuwe balken bijgelegd L3-02 en L3-03. Ter plekke van de trapsparing worden bestaande balken ingekorte, twee nieuwe raveelbalken L3-04 en L3-05 worden toegevoegd.

4.2.1 L3-02 en L3-03: trapsparing

L3-02 en L3-03: balk trapsparing nieuw



Balk nieuw: 90 x 245 mm² (C18)

Balkafmetingen in het werk te controleren

q1

| | | | | |
|------------------|---|--|---------|-----------|
| | | $G_{rep} + \psi_0 \times \psi_t \cdot Q_{rep}$ | pb | vb |
| Verdiepingsvloer | (| 0,65) x (0,65 + 1,00 x 1,75) = | 0,42 + | 1,14 extr |
| | | | + ----- | + ----- |
| | | Totaal | 0,42 + | 1,14 kN/m |

F01 (reactie raveling)

| | | | | |
|-------------------------|---|--|---------|-----------|
| | | $G_{rep} + \psi_0 \times \psi_t \cdot Q_{rep}$ | pb | vb |
| Verdiepingsvloer (trap) | (| 0,25 x 1,88 x 0,90) x (0,65 + 1,00 x 2,00) = | 0,27 + | 0,85 extr |
| Verdiepingsvloer | (| 0,25 x 1,88 x 0,90) x (0,65 + 1,00 x 1,75) = | 0,27 + | 0,74 extr |
| | | | + ----- | + ----- |
| | | Totaal | 0,55 + | 1,59 kN |

F02 (reactie raveling)

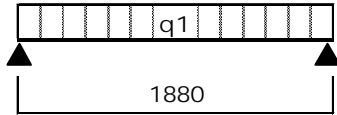
| | | | | |
|-------------------------|---|--|---------|-----------|
| | | $G_{rep} + \psi_0 \times \psi_t \cdot Q_{rep}$ | pb | vb |
| Verdiepingsvloer (trap) | (| 0,25 x 1,88 x 0,90) x (0,65 + 1,00 x 2,00) = | 0,27 + | 0,85 extr |
| Verdiepingsvloer | (| 0,25 x 1,88 x 2,08) x (0,65 + 1,00 x 1,75) = | 0,64 + | 1,71 extr |
| | | | + ----- | + ----- |
| | | Totaal | 0,91 + | 2,56 kN |

Pas toe: balk 95 x 220 mm² (C24).

Voor de berekeningsresultaten wordt verwezen naar Bijlage A, blad 95 e.v.

4.2.2 L3-04 en L3-05: raveelbalk trapsparring

L3-04 en L3-05: raveelbalk



q1

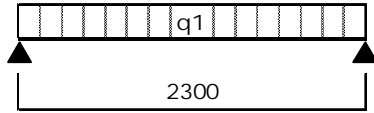
| | | $G_{rep} + \psi_0 \times \psi_t \times Q_{rep}$ | pb | vb |
|-------------------------|---|--|---------|-------------|
| Verdiepingsvloer (trap) | (| $0,50 \times 0,90) \times (0,65 + 1,00 \times 2,00)$ | = 0,29 | + 0,90 extr |
| Verdiepingsvloer | (| $0,50 \times 2,08) \times (0,65 + 1,00 \times 1,75)$ | = 0,68 | + 1,82 extr |
| | | | + ----- | + ----- |
| | | Totaal | 0,97 | + 2,72 kN/m |

Pas toe balk 70 x 220 mm² (C24).

Voor de berekeningsresultaten wordt verwezen naar Bijlage A, blad 103 e.v.

4.3 B1-01: Balklaag dakterras

B1-01: Balklaag dakterras



q1

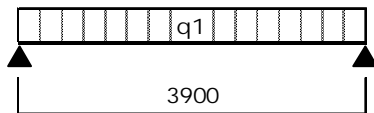
| | | | | |
|----------------------------|---|--|----------|-----------|
| | | $G_{rep} + \psi_0 \times \psi_t \cdot Q_{rep}$ | pb | vb |
| Plat dak dakterras (nieuw) | (| $0,61) \times (0,95 + 1,00 \times 2,50)$ | = 0,58 + | 1,53 extr |
| | | | + ----- | + ----- |
| | | Totaal | 0,58 + | 1,53 kN/m |

Pas toe: balk 58 x 155 mm² (C24), h.o.h. 610 mm.

Voor de berekeningsresultaten wordt verwezen naar Bijlage A, blad 111 e.v.

4.4 L1-01: Ligger dakterras (daklicht)

L1-01: ligger daklicht dakterras



q1

| | | | | |
|-------------------------------|---|--|----------|-----------|
| | | $G_{rep} + \psi_0 \times \psi_t \cdot Q_{rep}$ | pb | vb |
| Plat dak dakterras (bestaand) | (| $0,50 \times 2,30) \times (0,90 + 1,00 \times 2,50)$ | = 1,04 + | 2,88 extr |
| Lichtstraat beloopbaar | (| $1,00) \times (1,25 + 1,00 \times 2,50)$ | = 1,25 + | 2,50 extr |
| | | | + ----- | + ----- |
| | | Totaal | 2,29 + | 5,38 kN/m |

Controle oplegging metselwerk

$$F_{Ed} = 21,8 \text{ kN}$$

$$\sigma_d = \frac{F_{Ed}}{b \cdot h} = \frac{21800}{16000} = 1,36 \text{ N/mm}^2 < f_d = \frac{K \cdot f_b^\alpha \cdot f_m^\beta}{\gamma_m} = 1,53 \text{ N/mm}^2 \quad \text{U.C.} = 0,89$$

$$h = 100 \text{ mm (opleglengte)}$$

$$b = 160 \text{ mm (meewerkende breedte)}$$

$$K = 0,6$$

$$\alpha = 0,65$$

$$f_b = 10 \text{ N/mm}^2$$

$$\beta = 0,25$$

$$f_m = 2,5 \text{ N/mm}^2$$

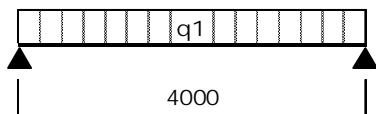
$$\gamma_m = 2,2$$

Pas toe: HEA160 (opleglengte 100 mm)

Voor de berekeningsresultaten wordt verwezen naar Bijlage A, blad 113 e.v.

4.5 B0-01: Balklaag begane grond

B0-01: Balklaag begane grond nieuw



q1

| | | | | |
|---------------------------|---|--|----------|------------------|
| | | $G_{rep} + \psi_0 \times \psi_t \cdot Q_{rep}$ | pb | vb |
| Begane grondvloer (nieuw) | (| $0,41) \times (1,45 + 1,00 \times 2,55)$ | = 0,59 + | 1,04 extr |
| | | | + ----- | +----- |
| | | | Totaal | 0,59 + 1,04 kN/m |

Pas toe: balk 95 x 195 mm² (C24), h.o.h.: 408 mm

Voor de berekeningsresultaten wordt verwezen naar Bijlage A, blad 119 e.v.

4.5.1 Dimensionering oplegging

Belasting op doorgaande hoeklijn

| | | | | |
|---------------------------|---|--|----------|------------------|
| | | $G_{rep} + \psi_0 \times \psi_t \cdot Q_{rep}$ | pb | vb |
| Begane grondvloer (nieuw) | (| $0,50 \times 4,00) \times (1,45 + 1,00 \times 2,55)$ | = 2,90 + | 5,10 extr |
| Eigen gewicht hoeklijn | (| $1,00) \times (0,19 + 0,00 \times 0,00)$ | = 0,19 + | 0,00 |
| | | | + ----- | +----- |
| | | | Totaal | 3,09 + 5,10 kN/m |

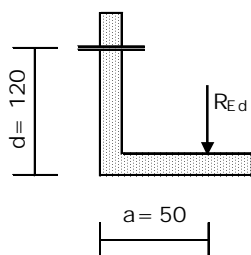
Veranderlijke belastingen: Frequent = 2,55 kN/m Quasi blijvend = 1,53 kN/m Karakteristiek = 2,04 kN/m

Belasting uiterste grenstoestand

$$q_{Ed} = 1,35 \times 3,09 + 1,50 \times 0,00 = 7,23 \text{ kN/m (NEN-EN 1990: vergelijking 6.10a)}$$

$$= 1,20 \times 3,09 + 1,50 \times 5,10 = 11,36 \text{ kN/m (NEN-EN 1990: vergelijking 6.10b)}$$

Bepaling ankerkrachten hoh 813 mm



Gegevens: a = 50 mm H150/100/10
d = 120 mm
 $q_{Ed} = 11,36 \text{ kN/m}$ dikte hoeklijn S 235
 $M_{Ed} = 11,36 \times 50 \cdot 10^{-3} = 0,57 \text{ kNm/m}$ $t \geq 3,81 \text{ mm}$ elastisch

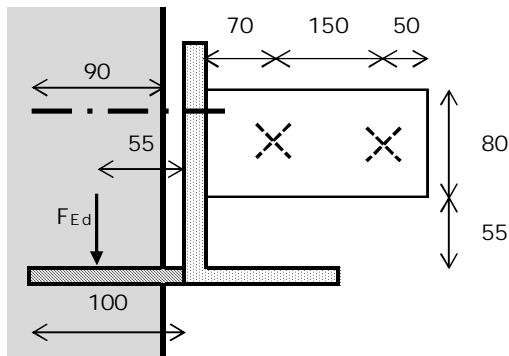
Berekening ankerkrachten

$$V_{Ed} = 11,36 \times 0,813 = 9,24 \text{ kN handjes toepassen}$$

$$H_{Ed} = 9,24 \times 50 / (0,9 \times 120) = 4,28 \text{ kN strips toepassen}$$

$$R_{Edi} = \sqrt{9,24^2 + 4,28^2} = 10,18 \text{ kN}$$

Dimensionering handje



plaat: 100 x 250 mm²
dikte: 10 mm
h.o.h.: 1000 mm
meewerkende breedte: 250 mm

stalen strips: t = 10 mm (hoh: 813 mm)
2 bouten M10 (4.8)

$$F_{Ed} = 11,36 \times 0,81 = 11,36 \text{ kN}$$

$$M_{Ed} = 11,36 \times 55 \times 10^{-3} = 0,62 \text{ kNm}$$

b = meewerkende breedte handje = 250 mm

t = dikte handje S235 $\geq 7,99$ mm elastisch

→ kies plaat: 100 x 250 mm²; t = 10 mm

Controle oplegging metselwerk

$$F_{Ed} = 11,36 \text{ kN}$$

$$\sigma_d = \frac{F_{Ed}}{b \cdot h} = \frac{11358}{22500} = 0,50 \text{ N/mm}^2 <$$

$$h = 90 \text{ mm}$$

$$b = 250 \text{ mm (meewerkende breedte)}$$

$$f_d = \frac{K \cdot f_b^\alpha \cdot f_m^\beta}{\gamma_m} = 1,53 \text{ N/mm}^2 \quad \text{U.C.} = 0,33$$

$$K = 0,6 \quad \alpha = 0,65$$

$$f_b = 10 \text{ N/mm}^2 \quad \beta = 0,25$$

$$f_m = 2,5 \text{ N/mm}^2 \quad \gamma_m = 2,2$$

Controle boutverbinding strip

$$M_{Ed} = 11,36 \times 50 \cdot 10^{-3} \times 0,81 = 0,46 \text{ kNm}$$

$$F_{v,Ed} = 0,46 / 150 \cdot 10^{-3} = 3,08 \text{ kN}$$

$$F_{v,Rd} = 4,1 \text{ kN (afschuifsterkte verbinding)}$$

$$F_{v,Rd} > F_{v,Ed} \rightarrow \text{voldoet}$$

4.6 B0-02: Balklaag begane grond aanbouw

De betonplaat ter plekke van de aanbouw blijft behouden. De nieuwe begane grondvloer wordt zwevend aangebracht boven de betonplaat. Als nieuwe balklaag worden balken van 70 x 170 mm² (C24) voorgesteld met daarop een zwaluwstaartvloer. De ruimte tussen betonplaat en balken wordt opgevuld met vulblokjes om optrekkend vocht te vermijden. Deze nieuwe balklaag is praktisch van aard.

4.7 Souterrainvloer

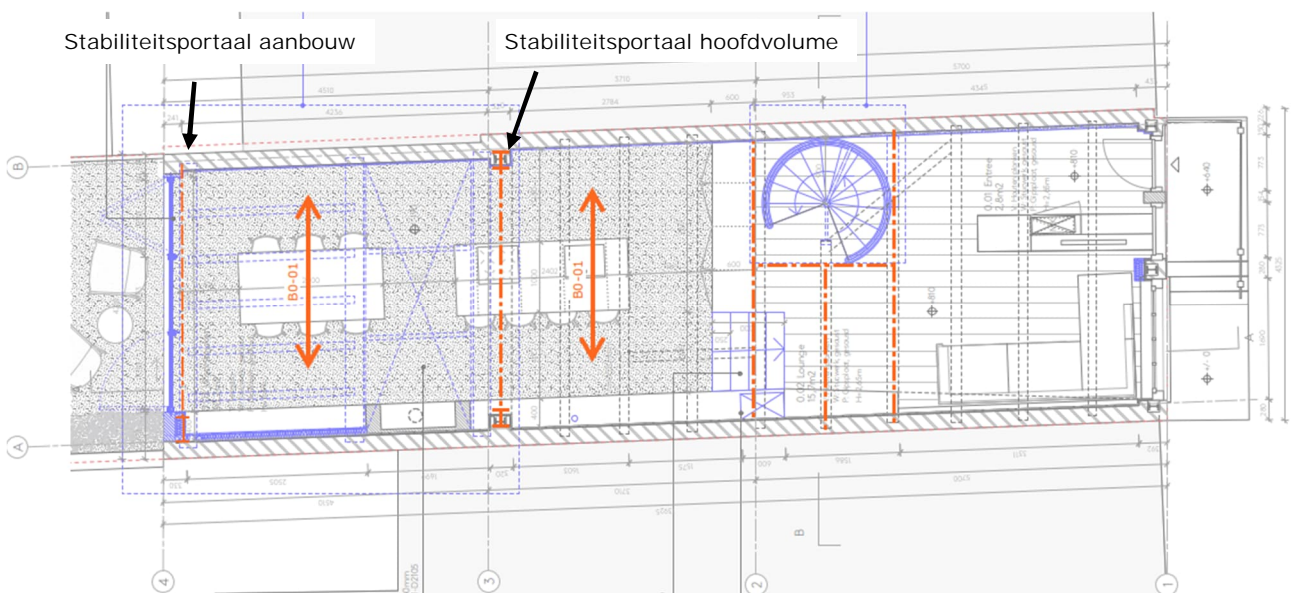
De huidige souterrainvloer kan op dit moment niet worden geïnspecteerd vanwege puinvulling van het souterrain. Na het afvoeren van het puin wordt de staat van de souterrainvloer bepaald. Eventuele aanpassingen aan de souterrainvloer die van invloed zijn op de constructie worden te zijner tijd ter beoordeling voorgelegd.

5 Stabiliteit

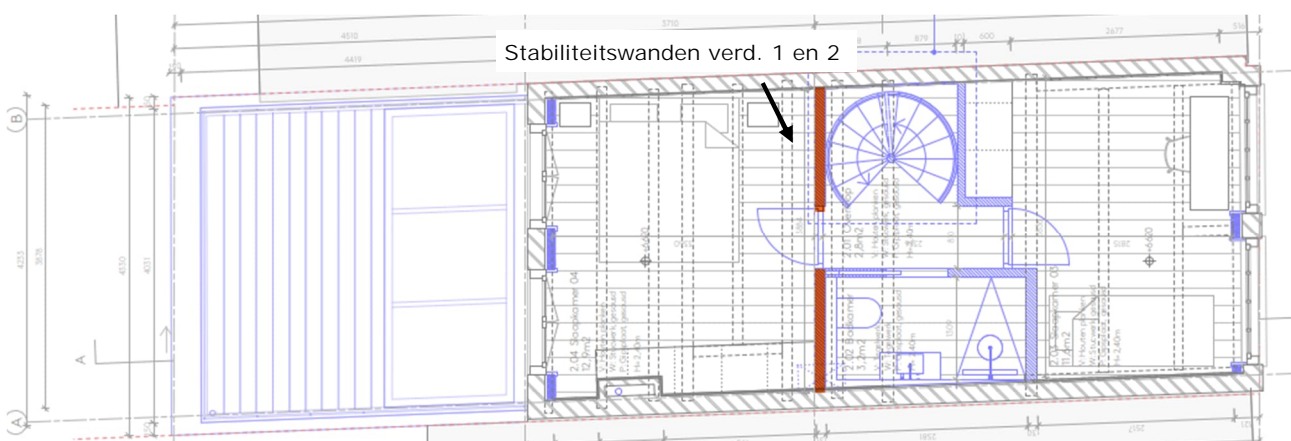
5.1 Algemeen

De stabiliteit in de langsrichting van het pand wordt verzorgd door de bouwmuren. Dwaars stabiliteit op de begane grond van het hoofdvolume wordt verzorgd door een nieuw portaal ter plekke van de achtergevel. De dwarsstabiliteit op de bovenliggende verdiepingen wordt verzorgd door nieuwe wanden ter plekke van het trappenhuis. Tevens is voor de dwarsstabiliteit van de aanbouw aan de achterzijde een nieuw portaal toegevoegd.

Schijfwerking van de verdiepingvloeren wordt verzorgd door de combinatie van vloerdelen met daarop plaatmateriaal. In het werk dient gecontroleerd te worden of de bestaande platen zijn geschroefd of genageld aan de balklaag.



Figuur 3 – Plattegrond begane grond.



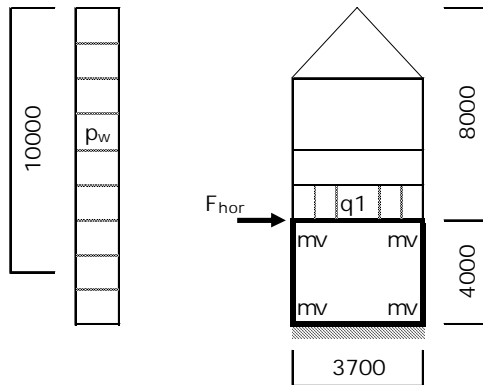
Figuur 4 – Plattegrond 2^e verdieping.

5.2 Stabiliteitsportaal achtergevel hoofdvolume

Voor de kolommen en de onder- en bovenregel worden HEB260 profielen toegepast. Hoeken momentvast uitvoeren middels stijve lasverbindingen met verlengde kopplaat, uitwerking door staalleverancier.

Stabiliteitsportaal begane grond
Aanzicht portaal schematisch

mv = momentvaste verbinding



$$F_w = C_s C_d \times C_f \times Q_{p(ze)}$$

$$C_s C_d = 0,86 \times 1,05 = 0,93 \quad (\text{tabel NB.21 - C.1})$$

$$C_{pe; \text{druk}} = 0,80$$

$$C_{pe; \text{zuiging}} = 0,5$$

$$Q_{p(ze)} = 0,74 \text{ kN/m}^2$$

$$P_{w; \text{druk}} = 0,93 \times 0,80 \times 0,74 = 0,55 \text{ kN/m}^2$$

$$P_{w; \text{zuiging}} = 0,93 \times 0,50 \times 0,74 = 0,34 \text{ kN/m}^2$$

$$P_{w; \text{combinatie}} = 0,85 \times (0,55 + 0,34) = 0,76 \text{ kN/m}^2$$

algemene initiële scheefstand: $\phi = \phi_0 \cdot \alpha_h \cdot \alpha_m = 1 / 400 = 0,0025$ (NEN-EN 1993-1-1, art. 5.3.2(3))

$$m = 2 \quad \phi_0 = 0,005$$

$$h = 12,0 \text{ m} \quad \alpha_h = \frac{2}{\sqrt{h}} = 0,58$$

$$\alpha_m = \sqrt{0,5 \times (1 + 1/m)} = 0,87$$

$F_{hor; \text{totaal}}$

| | $G_{rep} + \psi_0 \times \psi_t \cdot Q_{rep}$ | pb | vb |
|---------------------------|---|---------|-----------------|
| pw; combinatie (stuwdruk) | $(10,00 \times 9,00) \times (0,00 + 1,00 \times 0,76) =$ | 0,00 | 68,49 |
| Kap 54° (nieuw) grondvlak | $(0,0025 \times 8,70 \times 4,00) \times (1,16 + 0,00 \times 0,11) =$ | 0,10 | 0,00 |
| Verdiepingsvloer | $(0,0025 \times 8,40 \times 3,80) \times (0,65 + 0,40 \times 2,55) =$ | 0,05 | 0,08 |
| Verdiepingsvloer | $(0,0025 \times 8,40 \times 3,80) \times (0,65 + 0,40 \times 2,55) =$ | 0,05 | 0,08 |
| Verdiepingsvloer | $(0,0025 \times 8,40 \times 3,80) \times (0,65 + 0,40 \times 2,55) =$ | 0,05 | 0,08 |
| Steens metselwerk | $(135,00 + 60,00 \times 0,0025) \times (4,44 + 0,00 \times 0,00) =$ | 2,16 | 0,00 |
| | | + ----- | + ----- |
| | | Totaal | 2,42 + 68,73 kN |

q1: belasting achtergevel

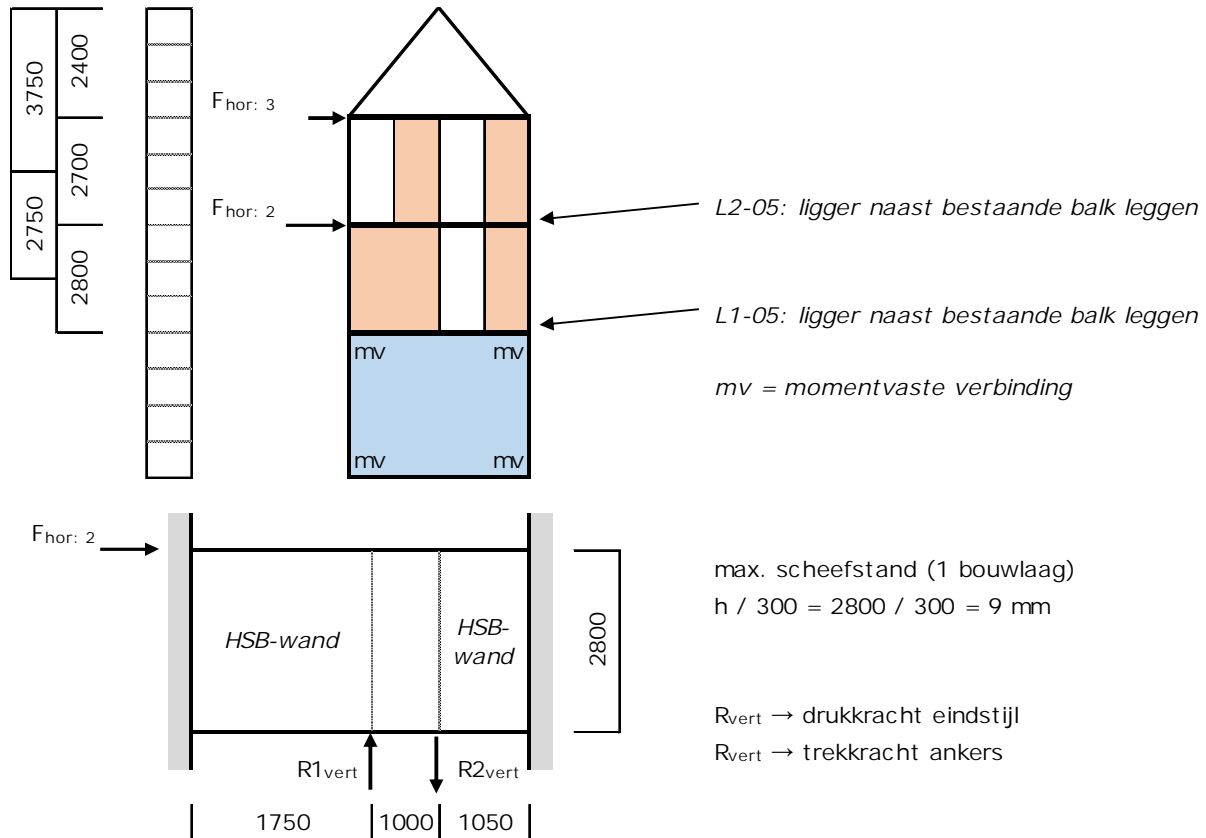
| | $G_{rep} + \psi_0 \times \psi_t \cdot Q_{rep}$ | pb | vb |
|---------------------------------|---|---------|-------------------|
| Kap 60° (nieuw) grondvlak | $(1,00) \times (1,36 + 0,00 \times 0,00) =$ | 1,36 | 0,00 |
| verd. 3: Verdiepingsvloer // | $(0,50) \times (0,65 + 0,40 \times 2,55) =$ | 0,33 | 0,51 |
| verd. 2: Verdiepingsvloer // | $(0,50) \times (0,65 + 0,40 \times 2,55) =$ | 0,33 | 0,51 |
| verd. 1: Verdiepingsvloer // | $(0,50) \times (0,65 + 1,00 \times 2,55) =$ | 0,33 | 1,28 extr |
| verd. 1: Lichtstraat beloopbaar | $(0,50 \times 1,75) \times (1,25 + 1,00 \times 2,50) =$ | 1,09 | 2,19 extr |
| Steens metselwerk | $(70\% \times 7,50) \times (4,44 + 0,00 \times 0,00) =$ | 23,31 | 0,00 |
| | | + ----- | + ----- |
| | | Totaal | 26,74 + 4,48 kN/m |

Voor de berekeningsresultaten wordt verwezen naar Bijlage A, blad 121 e.v.

5.3 Stabiliteitswanden verdieping 1 en 2

De dwarsstabiliteit op de eerste en tweede verdieping wordt verzorgd door de HSB-wanden. De eindstijlen aan weerszijde van de deuropening geven de verticale trek- en drukkrachten door aan ligger L2-05. De stijlen van de HSB-wand worden met stalen trekankers aan de ligger verbonden.

Dwarsstabiliteit verdieping 1 en 2 stramen 2 (HSB-wanden)

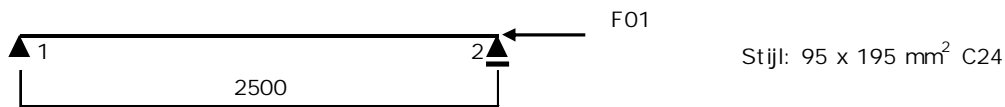


$F_{\text{hor: 2}}$ (incl. bovenliggende verdieping)

| | $G_{\text{rep}} + \psi_0 \times \psi_t \cdot Q_{\text{rep}}$ | pb | vb |
|---------------------------|--|-----------|----------|
| pw; combinatie (stuwdruk) | $(3,75 + 2,75 \times 9,00) \times (0,00 + 1,00 \times 0,76) =$ | 0,00 + | 44,52 |
| Kap 54° (nieuw) grondvlak | $(0,009 \times 8,70 \times 4,00) \times (1,16 + 0,00 \times 0,11) =$ | 0,38 + | 0,00 |
| verd. 3: Verdiepingsvloer | $(0,009 \times 8,40 \times 3,80) \times (0,65 + 0,40 \times 2,55) =$ | 0,19 + | 0,30 |
| verd. 2: Verdiepingsvloer | $(0,009 \times 8,40 \times 3,80) \times (0,65 + 0,40 \times 2,55) =$ | 0,19 + | 0,30 |
| Steens metselwerk | $(73,80 + 32,80 \times 0,009) \times (4,44 + 0,00 \times 0,00) =$ | 4,42 + | 0,00 |
| | | + ----- + | |
| | Totaal | 5,18 + | 45,12 kN |

5.3.2 Eindstijl stabiliteitswanden

W1-1: Eindstijl stabiliteitswand dwarsrichting verd. 1



F01

| | | | | |
|---------|--|----------------|--------|----------|
| | $G_{rep} + \psi_0 \times \psi_t \cdot Q_{rep}$ | p_b | v_b | |
| R1 vert | (1,00) x (5,04 + 1,00 x 43,87) = | 5,04 + | 43,87 | |
| | | + ----- +----- | | |
| | | Totaal | 5,04 + | 43,87 kN |

Pas toe: 95 x 195 mm² (C24), verbinding met Rothoblaas brackets voor eindstijlen aan liggers L1-05, L2-05 en L3-02.

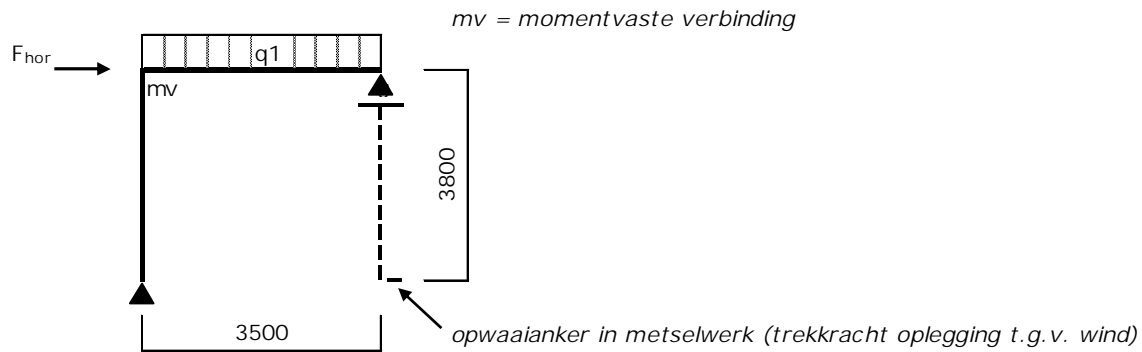
HSB wand met schijfwerking door toepassen van constructieplaat op beide zijden.

Voor de berekeningsresultaten wordt verwezen naar Bijlage A, blad 134 e.v.

5.4 Stabiliteitsportaal aanbouw achterzijde

De kolom van het portaal is een IPE360, de ligger is HEB220. De hoek wordt momentvast uitgevoerd middels stijve lasverbindingen met verlengde kopplaat, uitwerking door staalleverancier. Afhankelijk van de windrichting is er een opwaartse reactiekracht, voor de verankering wordt een opwaaianker toegepast. Het opwaaianker moet een lengte van minstens 2,1 m hebben.

Stabiliteit achtergevel aanbouw



F_{hor} (puntlast stabiliteit)

| | | | | |
|---------------------------|---|---|------------------------------------|--------------------------|
| | | $G_{rep} + \psi_0 \times \psi_t \times Q_{rep}$ | pb | vb |
| pw; combinatie (stuwdruk) | (| $0,50 \times 4,00 \times 4,50$ | $\times (0,00 + 1,00 \times 0,76)$ | $= 0,00 + 6,85$ |
| | | | + ----- | + ----- |
| | | | Totaal | $0,00 + 6,85 \text{ kN}$ |

q1

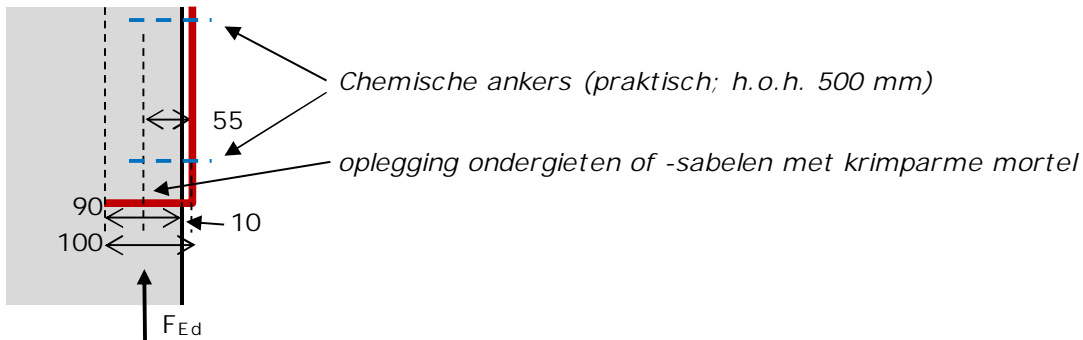
| | | | | |
|----------------------------|---|---|------------------------------------|------------------------------|
| | | $G_{rep} + \psi_0 \times \psi_t \times Q_{rep}$ | pb | vb |
| Plat dak dakterras (nieuw) | (| $0,50 \times 2,30$ | $\times (0,95 + 1,00 \times 2,50)$ | $= 1,09 + 2,88 \text{ extr}$ |
| Gevel (HSB) | (| $0,70$ | $\times (0,80 + 0,00 \times 0,00)$ | $= 0,56 + 0,00$ |
| Puien | (| $2,80$ | $\times (0,60 + 0,00 \times 0,00)$ | $= 1,68 + 0,00$ |
| | | | + ----- | + ----- |
| | | | Totaal | $3,33 + 2,88 \text{ kN/m}$ |

Voor de berekeningsresultaten wordt verwezen naar Bijlage A, blad 136 e.v.

5.4.1 Opwaaianker

Het opwaaianker bestaat uit een stripstraal (80 x 12 mm²) met aan het uiteinde een haak van 100 mm lang.

Opwaaianker



Dimensionering haak:

$$F_{Ed} = 7,4 \text{ kN}$$

$$M_{Ed} = 7,4 \times 55 \times 10^{-3} = 0,41 \text{ kNm}$$

b = meewerkende breedte strip = 80 mm

t = dikte strip S235 $\geq 11,42$ mm (elastisch)

→ kies strip: 80 x 12 (S235); lengte haak: 100 mm

De oplegging op de metselwerkwand voldoet in het geval van een drukkracht als reactie.

Voor de berekeningsresultaten wordt verwezen naar Bijlage A, blad 144 e.v.

Bijlage A

Technosoft uitvoer

A.1 Controle spant sporenkap (bestaand)

Technosoft Raamwerken release 6.80

8 mrt 2024

Project.....: 2023237 - 5.1, 2, e te Amsterdam
Onderdeel....: Spant bestaand
Constructeur.: ME
Dimensies....: kN/m/rad (tenzij anders aangegeven)
Datum.....: 23/02/2024
Bestand.....: K:\Werk\2023237\Berekeningen\Technosoft\Spant
 hulpconstructie V2.rww

Belastingbreedte.: 1.185
Rekenmodel.....: 2e-orde-elastisch.
Theorieën voor de bepaling van de krachtsverdeling:
1) Uiterste grenstoestand:
 Geometrisch niet lineair alle staven.
 Fysisch lineair alle staven.
2) Gebruiksgrenstoestand:
 Lineaire-elasticiteitstheorie

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

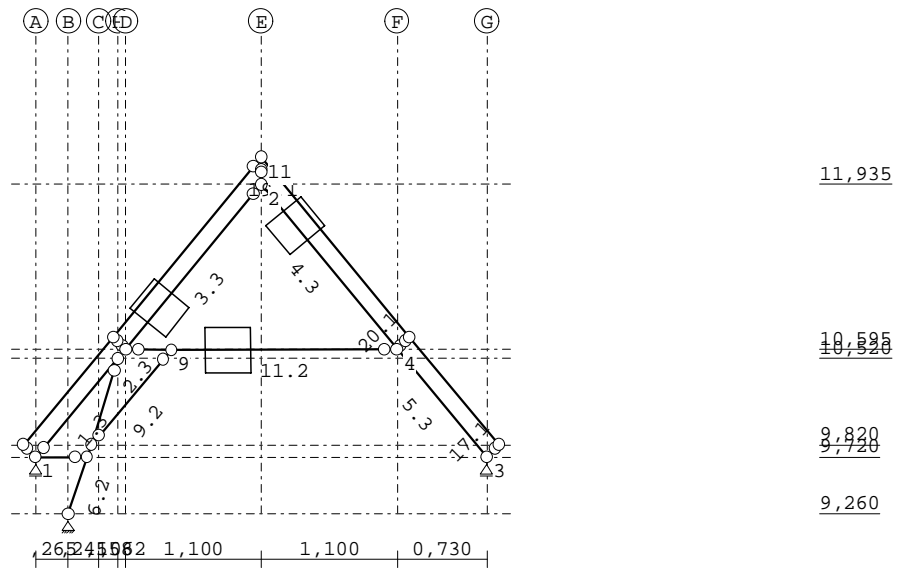
Gunstige werking van de permanente belasting wordt automatisch verwerkt.

Belastingfactoren zijn bepaald conform NEN 8700:2011+A1:2020
Tabel A1.2(B) en (C): Factoren bij verbouw.
Factoren ten behoeve van Bouwbesluit 2003 of daarvoor.

Toegepaste normen volgens Eurocode met Nederlandse NB

| | | | |
|-------------|----------------------|-----------------|-------------|
| Belastingen | NEN-EN 1990:2002 | C2:2010,A1:2019 | NB:2019(nl) |
| | NEN-EN 1991-1-1:2002 | C1/C11:2019 | NB:2019(nl) |
| | NEN 8700:2011 | A1:2020 | |
| | NEN-EN 1991-1-3:2003 | C1:2009 | NB:2011(nl) |
| | NEN-EN 1991-1-4:2005 | C2:2011 | NB:2011(nl) |
| Hout | NEN-EN 1995-1-1:2005 | A1:2011,C1:2006 | NB:2013(nl) |

GEOMETRIE



STRAMIENLIJNEN

| Nr. | Naam | X | Z-min | Z-max |
|-----|------|-------|-------|--------|
| 1 | A | 0.000 | 9.260 | 12.155 |
| 2 | B | 0.265 | 9.260 | 12.155 |
| 3 | C | 0.510 | 9.260 | 12.155 |
| 4 | H | 0.668 | 9.260 | 12.155 |
| 5 | D | 0.730 | 9.260 | 12.155 |
| 6 | E | 1.830 | 9.260 | 12.155 |
| 7 | F | 2.930 | 9.260 | 12.155 |
| 8 | G | 3.660 | 9.260 | 12.155 |

NIVEAUS

| Nr. | Z | X-min | X-max |
|-----|--------|--------|-------|
| 1 | 9.260 | -0.200 | 3.860 |
| 2 | 9.720 | -0.200 | 3.860 |
| 3 | 9.820 | -0.200 | 3.860 |
| 4 | 10.520 | -0.200 | 3.860 |
| 5 | 10.595 | -0.200 | 3.860 |
| 6 | 11.935 | -0.200 | 3.860 |

MATERIALEN

| Mt | Kwaliteit | E-modulus[N/mm ²] | S.G. | S.G.verhoogd | Pois. | Uitz. coëff |
|----|-----------|-------------------------------|------|--------------|-------|-------------|
| 1 | C18 | 9000 | 3.2 | 3.8 | 1.00 | 5.0000e-06 |

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

PROFIELEN [mm]

| Prof. | Omschrijving | Materiaal | Oppervlak | Traagheid | Vormf. |
|-------|--------------|-----------|------------|------------|--------|
| 1 | HULP | 1:C18 | 1.6900e+04 | 5.9502e+06 | 0.00 |
| 2 | B*H 100*100 | 1:C18 | 1.0000e+04 | 8.3333e+06 | 0.00 |
| 3 | B*H 100*120 | 1:C18 | 1.2000e+04 | 1.4400e+07 | 0.00 |

PROFIELEN vervolg [mm]

| Prof. | Staaftype | Breedte | Hoogte | e | Type | b1 | h1 | b2 | h2 |
|-------|-----------|---------|--------|------|------|----|----|----|----|
| 1 | 0:Normaal | 260 | 65 | 32.5 | | | | | |
| 2 | 0:Normaal | 100 | 100 | 50.0 | 0:RH | | | | |
| 3 | 0:Normaal | 100 | 120 | 60.0 | 0:RH | | | | |

PROFIELVORMEN [mm]

- 1 HULP
- 2 B*H 100*100



- 3 B*H 100*120



KNOPEN

| Knoop | X | Z | Knoop | X | Z |
|-------|-------|--------|-------|--------|--------|
| 1 | 0.000 | 9.720 | 6 | 0.668 | 10.520 |
| 2 | 1.830 | 11.935 | 7 | 0.450 | 9.820 |
| 3 | 3.660 | 9.720 | 8 | 0.265 | 9.260 |
| 4 | 2.930 | 10.595 | 9 | 1.100 | 10.590 |
| 5 | 0.730 | 10.595 | 10 | -0.100 | 9.820 |
| 11 | 1.830 | 12.155 | | | |
| 12 | 0.630 | 10.695 | | | |
| 13 | 3.760 | 9.820 | | | |
| 14 | 3.030 | 10.695 | | | |
| 15 | 0.416 | 9.720 | | | |

STAVEN

| St. | ki | kj | Profiel | Aansl.i | Aansl.j | Lengte | Opm. |
|-----|----|----|---------------|---------|---------|--------|------|
| 1 | 1 | 6 | 3:B*H 100*120 | ND- | NDM | 1.042 | |
| 2 | 6 | 5 | 3:B*H 100*120 | NDM | NDM | 0.097 | |
| 3 | 5 | 2 | 3:B*H 100*120 | NDM | ND- | 1.734 | |
| 4 | 2 | 4 | 3:B*H 100*120 | NDM | NDM | 1.734 | |
| 5 | 4 | 3 | 3:B*H 100*120 | NDM | NDM | 1.140 | |
| 6 | 8 | 15 | 2:B*H 100*100 | NDM | NDM | 0.484 | |
| 7 | 15 | 7 | 2:B*H 100*100 | NDM | NDM | 0.106 | |
| 8 | 7 | 6 | 2:B*H 100*100 | NDM | ND- | 0.733 | |
| 9 | 7 | 9 | 2:B*H 100*100 | ND- | ND- | 1.008 | |
| 10 | 5 | 9 | 2:B*H 100*100 | ND- | NDM | 0.370 | |
| 11 | 9 | 4 | 2:B*H 100*100 | NDM | ND- | 1.830 | |
| 12 | 1 | 10 | 1:HULP | ND- | NDM | 0.141 | |
| 13 | 10 | 12 | 1:HULP | NDM | NDM | 1.140 | |
| 14 | 12 | 11 | 1:HULP | NDM | ND- | 1.890 | |
| 15 | 11 | 14 | 1:HULP | NDM | NDM | 1.890 | |
| 16 | 14 | 13 | 1:HULP | NDM | NDM | 1.140 | |
| 17 | 13 | 3 | 1:HULP | NDM | ND- | 0.141 | |
| 18 | 12 | 5 | 1:HULP | ND- | ND- | 0.141 | |
| 19 | 11 | 2 | 1:HULP | ND- | ND- | 0.220 | |
| 20 | 14 | 4 | 1:HULP | ND- | ND- | 0.141 | |
| 21 | 1 | 15 | 2:B*H 100*100 | NDM | ND- | 0.416 | |

VASTE STEUNPUNTEN

| Nr. | knoop | Kode | XZR | 1=vast | 0=vrij | Hoek |
|-----|-------|-------|-----|--------|--------|------|
| 1 | | 1 010 | | | | 0.00 |
| 2 | | 3 010 | | | | 0.00 |
| 3 | | 8 110 | | | | 0.00 |

BELASTINGGEVALLEN

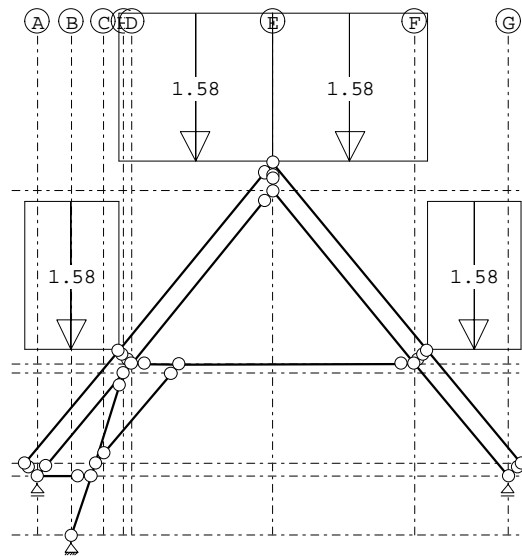
| B.G. | Omschrijving | EGZ | Type |
|------|-----------------------------|----------|------|
| 1 | Permanente belasting | EGZ=0.00 | 1 |
| 3 | Ver. bel. pers. ed. (Q_k) | | 3 |
| 4 | Wind van links onderdruk A | | 7 |
| 5 | Wind van links overdruk A | | 8 |
| 6 | Wind van rechts onderdruk A | | 11 |
| 7 | Wind van rechts overdruk A | | 12 |
| 8 | Sneeuw A | | 22 |
| 9 | Sneeuw B | | 23 |
| 10 | Sneeuw C | | 33 |

BELASTINGGEVALLEN vervolg

| B.G. | Omschrijving | Belastingduurklasse |
|------|-----------------------------|---------------------|
| 1 | Permanente belasting | Blijvend |
| 3 | Ver. bel. pers. ed. (Q_k) | Middellang |
| 4 | Wind van links onderdruk A | Kort |
| 5 | Wind van links overdruk A | Kort |
| 6 | Wind van rechts onderdruk A | Kort |
| 7 | Wind van rechts overdruk A | Kort |
| 8 | Sneeuw A | Kort |
| 9 | Sneeuw B | Kort |
| 10 | Sneeuw C | Kort |

BELASTINGEN

B.G:1 Permanente belasting



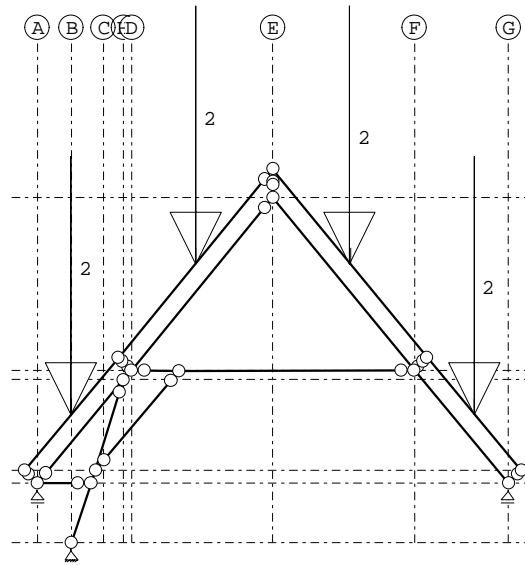
STAAFBELASTINGEN

B.G:1 Permanente belasting

| Staat | Type | q1/p/m | q2 | A | B | Ψ_0 | Ψ_1 | Ψ_2 |
|-------|-------------|--------|-------|-------|-------|----------|----------|----------|
| 13 | 3:QZgeProj. | -1.58 | -1.58 | 0.000 | 0.000 | | | |
| 14 | 3:QZgeProj. | -1.58 | -1.58 | 0.000 | 0.000 | | | |
| 15 | 3:QZgeProj. | -1.58 | -1.58 | 0.000 | 0.000 | | | |
| 16 | 3:QZgeProj. | -1.58 | -1.58 | 0.000 | 0.000 | | | |

BELASTINGEN

B.G:3 Ver. bel. pers. ed. (Q_k)



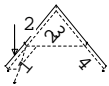
STAAFBELASTINGEN

B.G:3 Ver. bel. pers. ed. (Q_k)

| StAAF | Type | q1/p/m | q2 | A | B | Ψ_0 | Ψ_1 | Ψ_2 |
|-------|---------------|--------|----|-------|---|----------|----------|----------|
| 13 | 10:PZGepro.j. | -2.00 | | 0.570 | | 0.00 | 0.00 | 0.00 |
| 14 | 10:PZGepro.j. | -2.00 | | 0.945 | | 0.00 | 0.00 | 0.00 |
| 15 | 10:PZGepro.j. | -2.00 | | 0.945 | | 0.00 | 0.00 | 0.00 |
| 16 | 10:PZGepro.j. | -2.00 | | 0.570 | | 0.00 | 0.00 | 0.00 |

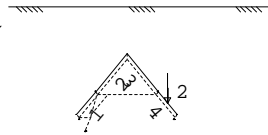
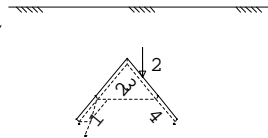
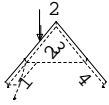
SITUATIES BELAST/ONBELAST

B.G:3 Ver. bel. pers. ed. (Q_k)



SITUATIES BELAST/ONBELAST

B.G:3 Ver. bel. pers. ed. (Q_k)



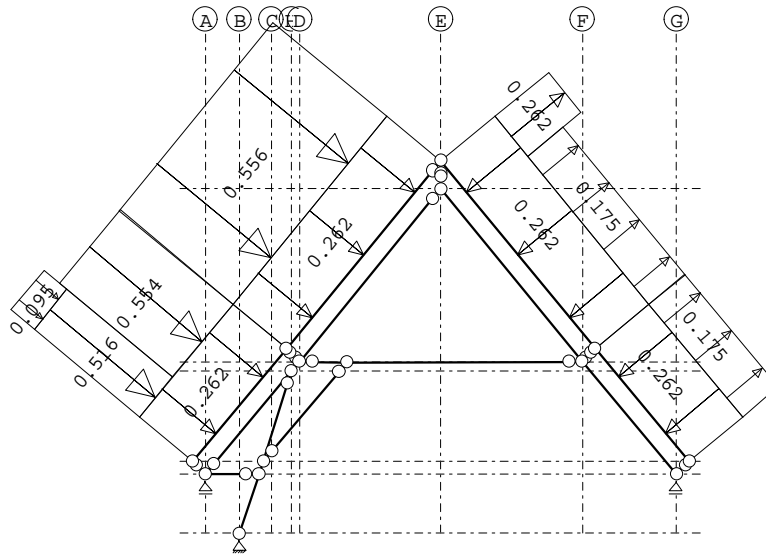
SITUATIES BELAST/ONBELAST

Belastingtype: Q_k

| Nr Lastvelden belast | Lastvelden onbelast |
|----------------------|---------------------|
| 1 1 | 2-4 |
| 2 2 | 1, 3, 4 |
| 3 3 | 1, 2, 4 |
| 4 4 | 1-3 |

BELASTINGEN

B.G:4 Wind van links onderdruk A



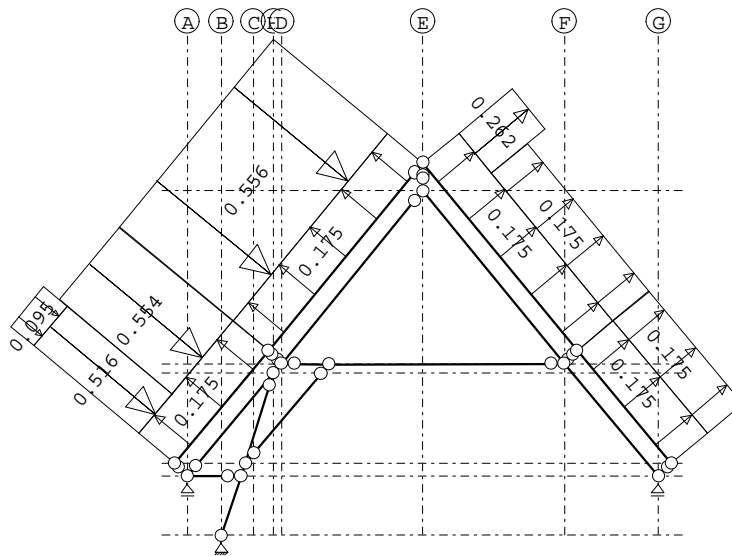
STAAFBELASTINGEN

B.G:4 Wind van links onderdruk A

| Staaftype | Type | q1/p/m | q2 | A | B | Ψ_0 | Ψ_1 | Ψ_2 |
|-----------|------------|--------|-------|-------|-------|----------|----------|----------|
| 13 | 1:QZLokaal | -0.26 | -0.26 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 14 | 1:QZLokaal | -0.26 | -0.26 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 15 | 1:QZLokaal | -0.26 | -0.26 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 16 | 1:QZLokaal | -0.26 | -0.26 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 13 | 1:QZLokaal | -0.52 | -0.52 | 0.000 | 0.740 | 0.00 | 0.20 | 0.00 |
| 13 | 1:QZLokaal | -0.10 | -0.10 | 0.000 | 0.740 | 0.00 | 0.20 | 0.00 |
| 13 | 1:QZLokaal | -0.55 | -0.55 | 0.400 | 0.000 | 0.00 | 0.20 | 0.00 |
| 14 | 1:QZLokaal | -0.56 | -0.56 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 15 | 1:QZLokaal | 0.26 | 0.26 | 0.000 | 1.490 | 0.00 | 0.20 | 0.00 |
| 15 | 1:QZLokaal | 0.17 | 0.17 | 0.400 | 0.000 | 0.00 | 0.20 | 0.00 |
| 16 | 1:QZLokaal | 0.17 | 0.17 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |

BELASTINGEN

B.G:5 Wind van links overdruk A



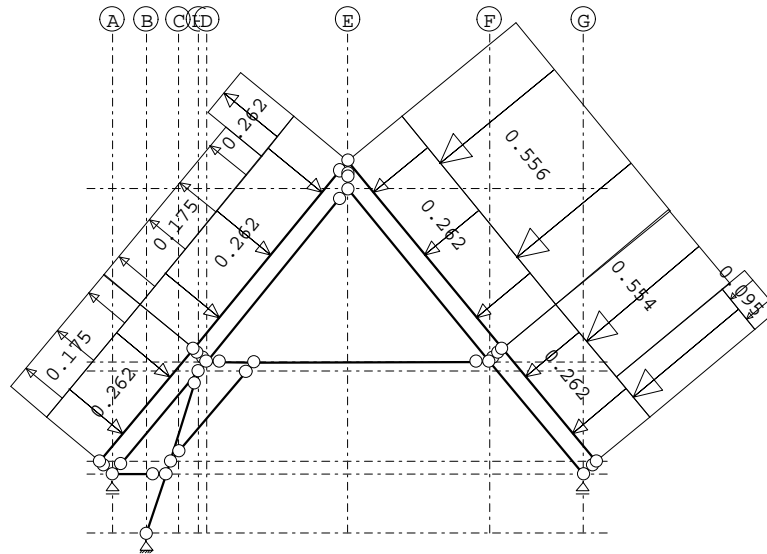
STAAFBELASTINGEN

B.G:5 Wind van links overdruk A

| Staaftype | Type | q1/p/m | q2 | A | B | Ψ_0 | Ψ_1 | Ψ_2 |
|-----------|------------|--------|-------|-------|-------|----------|----------|----------|
| 13 | 1:QZLokaal | 0.17 | 0.17 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 14 | 1:QZLokaal | 0.17 | 0.17 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 15 | 1:QZLokaal | 0.17 | 0.17 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 16 | 1:QZLokaal | 0.17 | 0.17 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 13 | 1:QZLokaal | -0.52 | -0.52 | 0.000 | 0.740 | 0.00 | 0.20 | 0.00 |
| 13 | 1:QZLokaal | -0.10 | -0.10 | 0.000 | 0.740 | 0.00 | 0.20 | 0.00 |
| 13 | 1:QZLokaal | -0.55 | -0.55 | 0.400 | 0.000 | 0.00 | 0.20 | 0.00 |
| 14 | 1:QZLokaal | -0.56 | -0.56 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 15 | 1:QZLokaal | 0.26 | 0.26 | 0.000 | 1.490 | 0.00 | 0.20 | 0.00 |
| 15 | 1:QZLokaal | 0.17 | 0.17 | 0.400 | 0.000 | 0.00 | 0.20 | 0.00 |
| 16 | 1:QZLokaal | 0.17 | 0.17 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |

BELASTINGEN

B.G:6 Wind van rechts onderdruk A



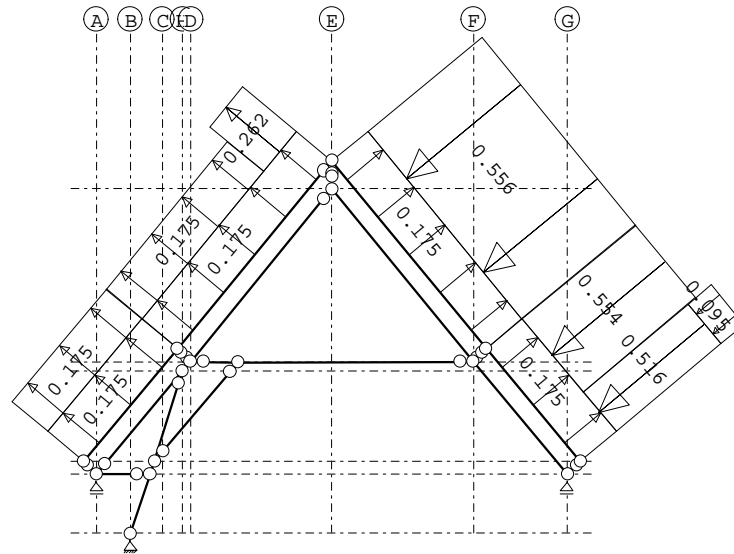
STAAFBELASTINGEN

B.G:6 Wind van rechts onderdruk A

| Staaftype | Type | q1/p/m | q2 | A | B | Ψ_0 | Ψ_1 | Ψ_2 |
|-----------|------------|--------|-------|-------|-------|----------|----------|----------|
| 13 | 1:QZLokaal | -0.26 | -0.26 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 14 | 1:QZLokaal | -0.26 | -0.26 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 15 | 1:QZLokaal | -0.26 | -0.26 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 16 | 1:QZLokaal | -0.26 | -0.26 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 16 | 1:QZLokaal | -0.52 | -0.52 | 0.740 | 0.000 | 0.00 | 0.20 | 0.00 |
| 16 | 1:QZLokaal | -0.10 | -0.10 | 0.740 | 0.000 | 0.00 | 0.20 | 0.00 |
| 16 | 1:QZLokaal | -0.55 | -0.55 | 0.000 | 0.400 | 0.00 | 0.20 | 0.00 |
| 15 | 1:QZLokaal | -0.56 | -0.56 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 14 | 1:QZLokaal | 0.26 | 0.26 | 1.490 | 0.000 | 0.00 | 0.20 | 0.00 |
| 14 | 1:QZLokaal | 0.17 | 0.17 | 0.000 | 0.400 | 0.00 | 0.20 | 0.00 |
| 13 | 1:QZLokaal | 0.17 | 0.17 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |

BELASTINGEN

B.G:7 Wind van rechts overdruk A



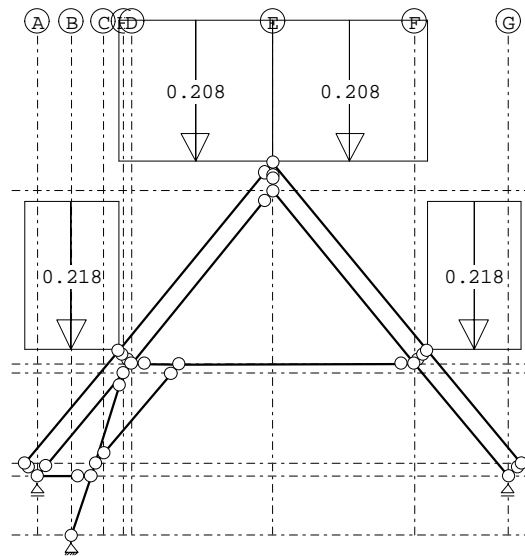
STAAFBELASTINGEN

B.G:7 Wind van rechts overdruk A

| StAAF | Type | q1/p/m | q2 | A | B | Ψ_0 | Ψ_1 | Ψ_2 |
|-------|------------|--------|-------|-------|-------|----------|----------|----------|
| 13 | 1:QZLokaal | 0.17 | 0.17 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 14 | 1:QZLokaal | 0.17 | 0.17 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 15 | 1:QZLokaal | 0.17 | 0.17 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 16 | 1:QZLokaal | 0.17 | 0.17 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 16 | 1:QZLokaal | -0.52 | -0.52 | 0.740 | 0.000 | 0.00 | 0.20 | 0.00 |
| 16 | 1:QZLokaal | -0.10 | -0.10 | 0.740 | 0.000 | 0.00 | 0.20 | 0.00 |
| 16 | 1:QZLokaal | -0.55 | -0.55 | 0.000 | 0.400 | 0.00 | 0.20 | 0.00 |
| 15 | 1:QZLokaal | -0.56 | -0.56 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 14 | 1:QZLokaal | 0.26 | 0.26 | 1.490 | 0.000 | 0.00 | 0.20 | 0.00 |
| 14 | 1:QZLokaal | 0.17 | 0.17 | 0.000 | 0.400 | 0.00 | 0.20 | 0.00 |
| 13 | 1:QZLokaal | 0.17 | 0.17 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |

BELASTINGEN

B.G:8 Sneeuw A



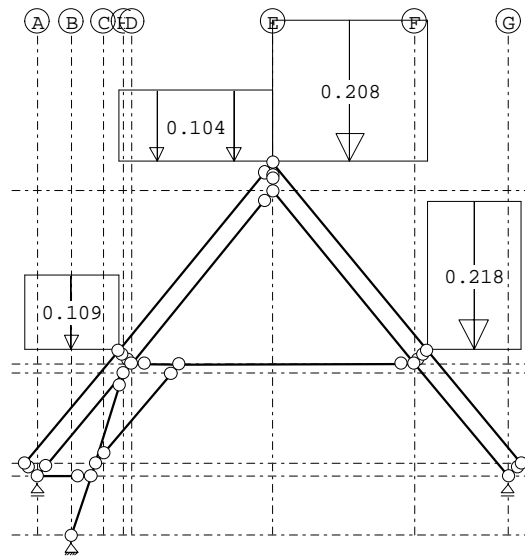
STAAFBELASTINGEN

B.G:8 Sneeuw A

| Staat | Type | q1/p/m | q2 | A | B | Ψ_0 | Ψ_1 | Ψ_2 |
|-------|-------------|--------|-------|-------|-------|----------|----------|----------|
| 13 | 3:QZgeProj. | -0.22 | -0.22 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 14 | 3:QZgeProj. | -0.21 | -0.21 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 15 | 3:QZgeProj. | -0.21 | -0.21 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 16 | 3:QZgeProj. | -0.22 | -0.22 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |

BELASTINGEN

B.G:9 Sneeuw B



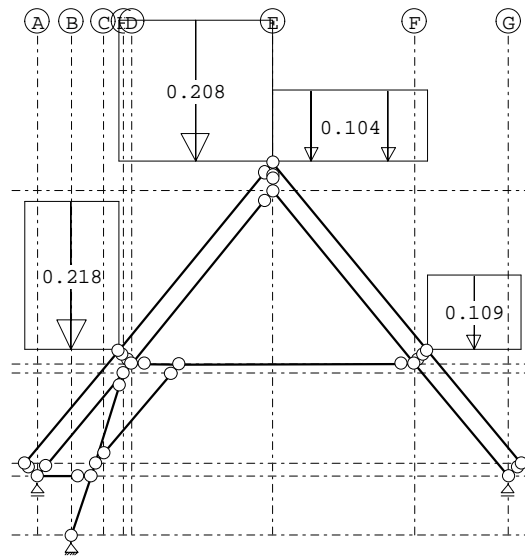
STAAFBELASTINGEN

B.G:9 Sneeuw B

| Staat | Type | q1/p/m | q2 | A | B | Ψ_0 | Ψ_1 | Ψ_2 |
|-------|-------------|--------|-------|-------|-------|----------|----------|----------|
| 13 | 3:QZgeProj. | -0.11 | -0.11 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 14 | 3:QZgeProj. | -0.10 | -0.10 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 15 | 3:QZgeProj. | -0.21 | -0.21 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 16 | 3:QZgeProj. | -0.22 | -0.22 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |

BELASTINGEN

B.G:10 Sneeuw C



STAAFBELASTINGEN

B.G:10 Sneeuw C

| Staal | Type | q1/p/m | q2 | A | B | Ψ_0 | Ψ_1 | Ψ_2 |
|-------|-------------|--------|-------|-------|-------|----------|----------|----------|
| 13 | 3:QZgeProj. | -0.22 | -0.22 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 14 | 3:QZgeProj. | -0.21 | -0.21 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 15 | 3:QZgeProj. | -0.10 | -0.10 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 16 | 3:QZgeProj. | -0.11 | -0.11 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |

BEREKENINGSTATUS

| B.C. | Iteratie | Status |
|------|----------|------------------------|
| 1 | 3 | Nauwkeurigheid bereikt |
| 2 | 3 | Nauwkeurigheid bereikt |
| 3 | 3 | Nauwkeurigheid bereikt |
| 4 | 3 | Nauwkeurigheid bereikt |
| 5 | 3 | Nauwkeurigheid bereikt |
| 6 | 3 | Nauwkeurigheid bereikt |
| 7 | 3 | Nauwkeurigheid bereikt |
| 8 | 3 | Nauwkeurigheid bereikt |
| 9 | 3 | Nauwkeurigheid bereikt |
| 10 | 3 | Nauwkeurigheid bereikt |
| 11 | 3 | Nauwkeurigheid bereikt |
| 12 | 3 | Nauwkeurigheid bereikt |
| 13 | 3 | Nauwkeurigheid bereikt |
| 14 | 3 | Nauwkeurigheid bereikt |
| 15 | 3 | Nauwkeurigheid bereikt |
| 16 | 3 | Nauwkeurigheid bereikt |
| 17 | 3 | Nauwkeurigheid bereikt |
| 18 | 3 | Nauwkeurigheid bereikt |
| 19 | 3 | Nauwkeurigheid bereikt |
| 20 | 1 | Lineaire berekening |
| 21 | 1 | Lineaire berekening |
| 22 | 1 | Lineaire berekening |
| 23 | 1 | Lineaire berekening |
| 24 | 1 | Lineaire berekening |
| 25 | 1 | Lineaire berekening |
| 26 | 1 | Lineaire berekening |

BEREKENINGSTATUS

| B.C. | Iteratie | Status |
|------|----------|---------------------|
| 27 | 1 | Lineaire berekening |
| 28 | 1 | Lineaire berekening |
| 29 | 1 | Lineaire berekening |
| 30 | 1 | Lineaire berekening |
| 31 | 1 | Lineaire berekening |
| 32 | 1 | Lineaire berekening |
| 33 | 1 | Lineaire berekening |
| 34 | 1 | Lineaire berekening |
| 35 | 1 | Lineaire berekening |
| 36 | 1 | Lineaire berekening |
| 37 | 1 | Lineaire berekening |

BELASTINGCOMBINATIES

| BC | Type | | | | |
|----|-------|------|-----------|-----------------|------------|
| 1 | Fund. | 1.20 | $G_{k,1}$ | | |
| 2 | Fund. | 1.15 | $G_{k,1}$ | | |
| 3 | Fund. | 0.90 | $G_{k,1}$ | | |
| 4 | Fund. | 1.15 | $G_{k,1}$ | + 1.30 | $Q_{k,3}$ |
| 5 | Fund. | 1.15 | $G_{k,1}$ | + 1.40 | $Q_{k,4}$ |
| 6 | Fund. | 1.15 | $G_{k,1}$ | + 1.40 | $Q_{k,5}$ |
| 7 | Fund. | 1.15 | $G_{k,1}$ | + 1.40 | $Q_{k,6}$ |
| 8 | Fund. | 1.15 | $G_{k,1}$ | + 1.40 | $Q_{k,7}$ |
| 9 | Fund. | 1.15 | $G_{k,1}$ | + 1.30 | $Q_{k,8}$ |
| 10 | Fund. | 1.15 | $G_{k,1}$ | + 1.30 | $Q_{k,9}$ |
| 11 | Fund. | 1.15 | $G_{k,1}$ | + 1.30 | $Q_{k,10}$ |
| 12 | Fund. | 0.90 | $G_{k,1}$ | + 1.30 | $Q_{k,3}$ |
| 13 | Fund. | 0.90 | $G_{k,1}$ | + 1.40 | $Q_{k,4}$ |
| 14 | Fund. | 0.90 | $G_{k,1}$ | + 1.40 | $Q_{k,5}$ |
| 15 | Fund. | 0.90 | $G_{k,1}$ | + 1.40 | $Q_{k,6}$ |
| 16 | Fund. | 0.90 | $G_{k,1}$ | + 1.40 | $Q_{k,7}$ |
| 17 | Fund. | 0.90 | $G_{k,1}$ | + 1.30 | $Q_{k,8}$ |
| 18 | Fund. | 0.90 | $G_{k,1}$ | + 1.30 | $Q_{k,9}$ |
| 19 | Fund. | 0.90 | $G_{k,1}$ | + 1.30 | $Q_{k,10}$ |
| 20 | Kar. | 1.00 | $G_{k,1}$ | + 1.00 | $Q_{k,3}$ |
| 21 | Kar. | 1.00 | $G_{k,1}$ | + 1.00 | $Q_{k,4}$ |
| 22 | Kar. | 1.00 | $G_{k,1}$ | + 1.00 | $Q_{k,5}$ |
| 23 | Kar. | 1.00 | $G_{k,1}$ | + 1.00 | $Q_{k,6}$ |
| 24 | Kar. | 1.00 | $G_{k,1}$ | + 1.00 | $Q_{k,7}$ |
| 25 | Kar. | 1.00 | $G_{k,1}$ | + 1.00 | $Q_{k,8}$ |
| 26 | Kar. | 1.00 | $G_{k,1}$ | + 1.00 | $Q_{k,9}$ |
| 27 | Kar. | 1.00 | $G_{k,1}$ | + 1.00 | $Q_{k,10}$ |
| 28 | Quas. | 1.00 | $G_{k,1}$ | | |
| 29 | Freq. | 1.00 | $G_{k,1}$ | | |
| 30 | Freq. | 1.00 | $G_{k,1}$ | + 1.00 ψ_1 | $Q_{k,4}$ |
| 31 | Freq. | 1.00 | $G_{k,1}$ | + 1.00 ψ_1 | $Q_{k,5}$ |
| 32 | Freq. | 1.00 | $G_{k,1}$ | + 1.00 ψ_1 | $Q_{k,6}$ |
| 33 | Freq. | 1.00 | $G_{k,1}$ | + 1.00 ψ_1 | $Q_{k,7}$ |
| 34 | Freq. | 1.00 | $G_{k,1}$ | + 1.00 ψ_1 | $Q_{k,8}$ |
| 35 | Freq. | 1.00 | $G_{k,1}$ | + 1.00 ψ_1 | $Q_{k,9}$ |
| 36 | Freq. | 1.00 | $G_{k,1}$ | + 1.00 ψ_1 | $Q_{k,10}$ |
| 37 | Blij. | 1.00 | $G_{k,1}$ | | |

GUNSTIGE WERKING PERMANENTE BELASTINGEN

BC Staven met gunstige werking

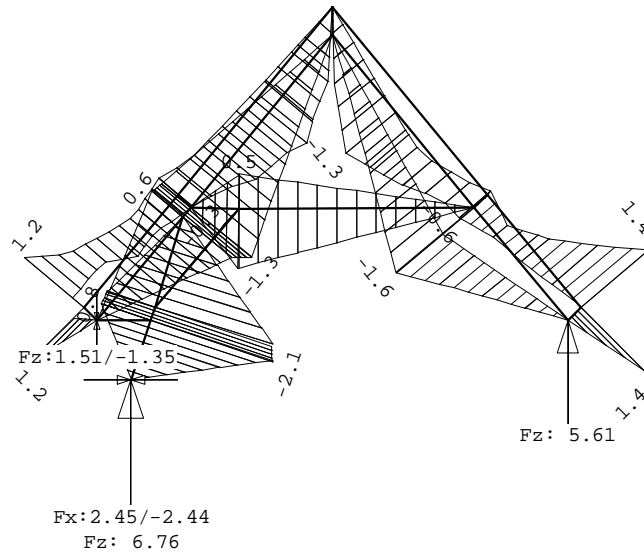
- 1 Geen
- 2 Geen
- 3 Alle staven de factor:0.90
- 4 Geen
- 5 Geen
- 6 Geen
- 7 Geen
- 8 Geen
- 9 Geen
- 10 Geen
- 11 Geen
- 12 Alle staven de factor:0.90
- 13 Alle staven de factor:0.90
- 14 Alle staven de factor:0.90
- 15 Alle staven de factor:0.90
- 16 Alle staven de factor:0.90
- 17 Alle staven de factor:0.90
- 18 Alle staven de factor:0.90
- 19 Alle staven de factor:0.90

OMHULLENDE VAN DE FUNDAMENTELE COMBINATIES

MOMENTEN

2e orde

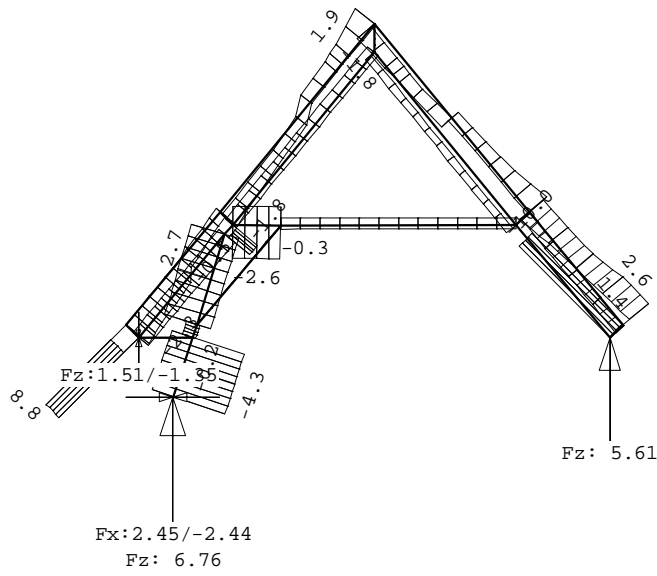
Fundamentele combinatie



DWARSKRACHTEN

2e orde

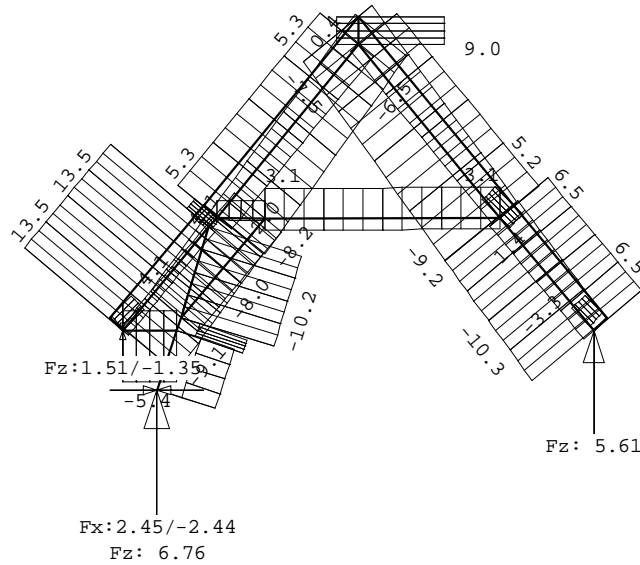
Fundamentele combinatie



NORMAALKRACHTEN

2e orde

Fundamentele combinatie



MATERIAALGEGEVENS

| Mt | Kwaliteit | $f_{m,y,k}$ [N/mm ²] | ρ_k [kg/m ³] | ρ_{mean} [kg/m ³] | $f_{t,0,k}$ [N/mm ²] | $f_{t,90,k}$ [N/mm ²] | $f_{c,0,k}$ [N/mm ²] | $f_{c,90,k}$ [N/mm ²] | $f_{v,k}$ [N/mm ²] |
|----|-----------|-------------------------------------|----------------------------------|---------------------------------------|-------------------------------------|--------------------------------------|-------------------------------------|--------------------------------------|-----------------------------------|
| 1 | C18 | 18 | 320 | 380 | 10.0 | 0.4 | 18.0 | 2.2 | 3.4 |

MATERIAALGEGEVENS (vervolg)

| Mt | Kwaliteit | G_{mean} [N/mm ²] | $E_{0,05}$ [N/mm ²] | $E_{90,mean}$ [N/mm ²] | $E_{0,mean}$ [N/mm ²] | Klimaatklasse | k_{def} | $E_{0,mean,fin}$ [N/mm ²] |
|----|-----------|------------------------------------|------------------------------------|---------------------------------------|--------------------------------------|---------------|-----------|--|
| 1 | C18 | 560 | 6000 | 300 | 9000 | I | 0.60 | 5625 |

KIPSTABILITEIT

| StAAF | Plts. aangr. | 1 sys. | Kipsteunafstanden [m] |
|-------|--------------|--------|-----------------------|
| 1 | 1.0*h | boven: | 1.04 0;1.042 |
| | | onder: | 1.04 0;1.042 |
| 2 | 1.0*h | boven: | 0.10 |
| | | onder: | 0.10 |
| 3 | 1.0*h | boven: | 1.73 1.734 |
| | | onder: | 1.73 1.734 |
| 4 | 1.0*h | boven: | 1.73 0;1.734 |
| | | onder: | 1.73 0;1.734 |
| 5 | 1.0*h | boven: | 1.14 1.140 |
| | | onder: | 1.14 1.140 |
| 6 | 1.0*h | boven: | 0.48 0;0.484 |
| | | onder: | 0.48 0;0.484 |
| 7 | 1.0*h | boven: | 0.11 0.106 |
| | | onder: | 0.11 0.106 |
| 8 | 1.0*h | boven: | 0.73 0.733 |
| | | onder: | 0.73 0.733 |
| 9 | 1.0*h | boven: | 1.01 0;1.008 |
| | | onder: | 1.01 0;1.008 |
| 10 | 1.0*h | boven: | 0.37 0;0.370 |
| | | onder: | 0.37 0;0.370 |

KIPSTABILITEIT

| Staal | Plts. aangr. | l sys. [m] | Kipsteunafstanden [m] |
|-------|--------------|----------------------------|-----------------------|
| 11 | 1.0*h | boven: 1.83 onder: 1.83 | 1.830 1.830 |
| 12 | 1.0*h | boven: 0.14 onder: 0.14 | 0;0,1414 0;0,1414 |
| 13 | 1.0*h | boven: 1.14 onder: 1.14 | 0;1.140 0;1.140 |
| 14 | 1.0*h | boven: 1.89 onder: 1.89 | 1,8899 1,8899 |
| 15 | 1.0*h | boven: 1.89 onder: 1.89 | 0;1,8899 0;1,8899 |
| 16 | 1.0*h | boven: 1.14 onder: 1.14 | 1.140 1.140 |
| 17 | 1.0*h | boven: 0.14 onder: 0.14 | 0;0,1414 0;0,1414 |
| 18 | 1.0*h | boven: 0.14 onder: 0.14 | 0;0,1414 0;0,1414 |
| 19 | 1.0*h | boven: 0.22 onder: 0.22 | 0;0,22 0;0,22 |
| 20 | 1.0*h | boven: 0.14 onder: 0.14 | 0;0,1414 0;0,1414 |
| 21 | 1.0*h | boven: 0.42 onder: 0.42 | 0;0.416 0;0.416 |

STABILITEIT

| Stf | D _{gem} [mm] | H _{gem} [mm] | l _{sys} [mm] | l _{buc,y/z} [mm] | λ _y | λ _z | λ _{rel,y/z} | β _c | K _y | K _z | K _{c,y} | K _{c,z} | |
|-----|-----------------------|-----------------------|-----------------------|---------------------------|----------------|----------------|----------------------|----------------|----------------|----------------|------------------|------------------|-------|
| 1 | 100 | 120 | 1042 | nvt 1042 | 30.1 | 36.1 | 0.525 | 0.629 | 0.2 | 0.660 | 0.731 | 0.943 | 0.907 |
| 2 | 100 | 120 | 97 | nvt 97 | 2.8 | 3.4 | 0.049 | 0.059 | 0.2 | 0.476 | 0.478 | 1.053 | 1.051 |
| 3 | 100 | 120 | 1734 | nvt 1734 | 50.0 | 60.1 | 0.873 | 1.047 | 0.2 | 0.938 | 1.123 | 0.780 | 0.654 |
| 4 | 100 | 120 | 1734 | nvt 1734 | 50.0 | 60.1 | 0.873 | 1.047 | 0.2 | 0.938 | 1.123 | 0.780 | 0.654 |
| 5 | 100 | 120 | 1140 | nvt 1140 | 32.9 | 39.5 | 0.574 | 0.688 | 0.2 | 0.692 | 0.776 | 0.927 | 0.882 |
| 6 | 100 | 100 | 484 | nvt 484 | 16.8 | 16.8 | 0.292 | 0.292 | 0.2 | 0.542 | 0.542 | 1.002 | 1.002 |
| 7 | 100 | 100 | 106 | nvt 106 | 3.7 | 3.7 | 0.064 | 0.064 | 0.2 | 0.478 | 0.478 | 1.050 | 1.050 |
| 8 | 100 | 100 | 733 | nvt 733 | 25.4 | 25.4 | 0.443 | 0.443 | 0.2 | 0.612 | 0.612 | 0.966 | 0.966 |
| 9 | 100 | 100 | 1008 | nvt 1008 | 34.9 | 34.9 | 0.609 | 0.609 | 0.2 | 0.716 | 0.716 | 0.915 | 0.915 |
| 10 | 100 | 100 | 370 | nvt 370 | 12.8 | 12.8 | 0.223 | 0.223 | 0.2 | 0.517 | 0.517 | 1.016 | 1.016 |
| 11 | 100 | 100 | 1830 | nvt 1830 | 63.4 | 63.4 | 1.105 | 1.105 | 0.2 | 1.191 | 1.191 | 0.611 | 0.611 |
| 21 | 100 | 100 | 416 | nvt 416 | 14.4 | 14.4 | 0.251 | 0.251 | 0.2 | 0.527 | 0.527 | 1.011 | 1.011 |

STABILITEIT (vervolg)

| Staal | positie [mm] | l _{ef,y} [mm] | σ _{m,crit} [N/mm ²] | λ _{rel,my} | k _{crit,y} |
|-------|--------------|------------------------|--|---------------------|---------------------|
| 1 | 1042 | 1178 | 331.13 | 0.23 | 1.00 |
| 2 | 97 | 2071 | 188.31 | 0.31 | 1.00 |
| 3 | 0 | 2071 | 188.31 | 0.31 | 1.00 |
| 4 | 1733 | 1801 | 216.59 | 0.29 | 1.00 |
| 5 | 0 | 1266 | 308.06 | 0.24 | 1.00 |
| 6 | 484 | 636 | 736.31 | 0.16 | 1.00 |
| 7 | 0 | 306 | 1529.41 | 0.11 | 1.00 |
| 8 | 0 | 860 | 544.38 | 0.18 | 1.00 |
| 9 | 0 | 1208 | 387.42 | 0.22 | 1.00 |
| 10 | 370 | 570 | 821.05 | 0.15 | 1.00 |
| 11 | 0 | 1847 | 253.38 | 0.27 | 1.00 |

STABILITEIT (vervolg)

| Staal | positie [mm] | $l_{ef,y}$ [mm] | $\sigma_{my,crit}$ [N/mm ²] | $\lambda_{rel,my}$ | $k_{crit,y}$ |
|-------|-----------------|--------------------|--|--------------------|--------------|
| 21 | 0 | 366 | 1278.69 | 0.12 | 1.00 |

TOETSING SPANNINGEN

| Staal | | | | | | |
|-------|----|-----------|-------|--------------|------|--|
| Staal | 1 | BC / Sit. | 5 / 1 | UC frm(6.17) | 0.48 | |
| Staal | 2 | BC / Sit. | 5 / 1 | UC frm(6.17) | 0.44 | |
| Staal | 3 | BC / Sit. | 5 / 1 | UC frm(6.17) | 0.46 | |
| Staal | 4 | BC / Sit. | 4 / 3 | UC frm(6.17) | 0.62 | |
| Staal | 5 | BC / Sit. | 4 / 3 | UC frm(6.17) | 0.64 | |
| Staal | 6 | BC / Sit. | 5 / 1 | UC frm(6.2) | 0.91 | |
| Staal | 7 | BC / Sit. | 5 / 1 | UC frm(6.2) | 0.92 | |
| Staal | 8 | BC / Sit. | 5 / 1 | UC frm(6.23) | 0.96 | |
| Staal | 9 | BC / Sit. | 5 / 1 | UC frm(6.17) | 0.06 | |
| Staal | 10 | BC / Sit. | 5 / 1 | UC frm(6.2) | 0.43 | |
| Staal | 11 | BC / Sit. | 5 / 1 | UC frm(6.17) | 0.46 | |
| Staal | 21 | BC / Sit. | 5 / 1 | UC frm(6.2) | 0.04 | |

TOETSING DOORBUIGING

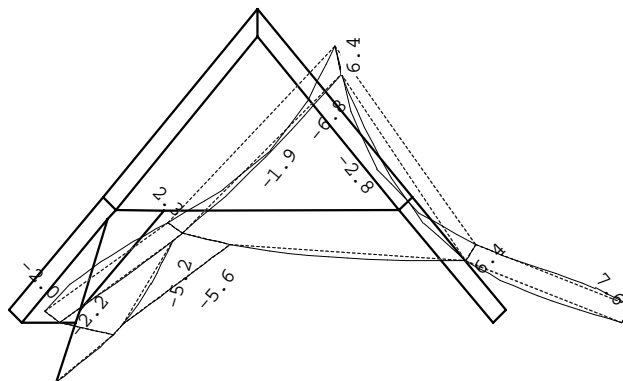
| Stf | Soort | Mtg | l_{sys} [mm] | Overstek i j | BC | Sit | u_{bij} [mm] | Toelaatbaar [mm] | $u_{fin,net}$ [mm] | Toelaatbaar [mm] |
|-----|-------|-----|-------------------|-----------------|----|-----|-------------------|---------------------|-----------------------|---------------------|
| 1 | Dak | ss | 1042 | Nee Nee | 28 | 1 | -5.5 | -8.3 2*0.004 | -8.2 | -8.3 2*0.004 |
| 2 | Dak | ss | 97 | Nee Nee | 28 | 1 | -0.3 | -0.8 2*0.004 | -0.5 | -0.8 2*0.004 |
| 3 | Dak | ss | 1734 | Nee Nee | 28 | 1 | -2.3 | -13.9 2*0.004 | -4.0 | -13.9 2*0.004 |
| 4 | Dak | db | 1734 | Nee Nee | 28 | 1 | -1.2 | -6.9 0.004 | -2.5 | -6.9 0.004 |
| 5 | Dak | ss | 1140 | Nee Nee | 28 | 1 | -5.7 | -9.1 2*0.004 | -11.9 | -9.1 2*0.004 |

TOETSING DOORBUIGING (vervolg)

| Stf | Soort | Mtg | l_{sys} [mm] | Overstek i j | Zeeg [mm] | BC | Sit | u_{inst} [mm] | Toelaatbaar [mm] |
|-----|-------|-----|-------------------|-----------------|--------------|----|-----|--------------------|---------------------|
| 1 | Dak | ss | 1042 | Nee Nee | 0.0 | 21 | 1 | -7.2 | -8.3 2*0.004 |
| 2 | Dak | ss | 97 | Nee Nee | 0.0 | 21 | 1 | -0.5 | -0.8 2*0.004 |
| 3 | Dak | ss | 1734 | Nee Nee | 0.0 | 23 | 1 | -3.6 | -13.9 2*0.004 |
| 4 | Dak | db | 1734 | Nee Nee | 0.0 | 20 | 3 | -2.1 | -6.9 0.004 |
| 5 | Dak | ss | 1140 | Nee Nee | 0.0 | 20 | 3 | -10.2 | -9.1 2*0.004 |

VERVORMINGEN w1

Blijvende combinatie



A.2 Nieuwe kap: sporen

Technosoft Raamwerken release 6.81a

11 jul 2024

Project.....: 2023237 - 5.1, 2, e te Amsterdam
 Onderdeel....: Kap nieuw: sporen
 Constructeur.: ME
 Dimensies....: kN/m/rad (tenzij anders aangegeven)
 Datum.....: 21/02/2024
 Bestand.....: K:\Werk\2023237\Berekeningen\Technosoft\Sporenkap -
 standaard.rww

Belastingbreedte.: 0.500
 Rekenmodel.....: 2e-orde-elastisch.
 Theorieën voor de bepaling van de krachtsverdeling:
 1) Uiterste grenstoestand:
 Geometrisch niet lineair alle staven.
 Fysisch lineair alle staven.
 2) Gebruiksgrenstoestand:
 Lineaire-elasticiteitstheorie

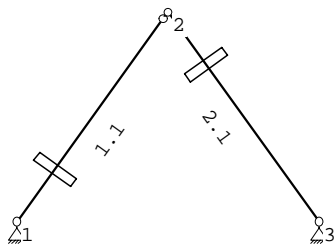
Maximum aantal iteraties.....: 50
 Max.deellengte kolommen/wanden: 0.500 Max.deellengte balken/vloeren: 0.500
 Max. X-verplaatsing in UGT....: 0.500 Max. Z-verplaatsing in UGT...: 0.250

Gunstige werking van de permanente belasting wordt automatisch verwerkt.

Toegepaste normen volgens Eurocode met Nederlandse NB

| Belastingen | NEN-EN 1990:2002 | C2:2010,A1:2019 | NB:2019(nl) |
|-------------|----------------------|-----------------|-------------|
| | NEN-EN 1991-1-1:2002 | C1/C11:2019 | NB:2019(nl) |
| | NEN-EN 1991-1-3:2003 | C1:2009 | NB:2011(nl) |
| | NEN-EN 1991-1-4:2005 | C2:2011 | NB:2011(nl) |
| Hout | NEN-EN 1995-1-1:2005 | A1:2011,C1:2006 | NB:2013(nl) |

GEOMETRIE



MATERIALEN

| Mt | Kwaliteit | E-modulus[N/mm ²] | S.G. | S.G.verhoogd | Pois. | Uitz. coëff |
|----|-----------|-------------------------------|------|--------------|-------|-------------|
| 1 | C24 | 11000 | 3.5 | 4.2 | 1.00 | 5.0000e-06 |

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

PROFIELEN [mm]

| Prof. | Omschrijving | Materiaal | Oppervlak | Traagheid | Vormf. |
|-------|--------------|-----------|------------|------------|--------|
| 1 | B*H 38*170 | 1:C24 | 6.4600e+03 | 1.5558e+07 | 0.00 |

PROFIELEN vervolg [mm]

| Prof. | Staaftype | Breedte | Hoogte | e | Type | b1 | h1 | b2 | h2 |
|-------|-----------|---------|--------|------|------|----|----|----|----|
| 1 | 0:Normaal | 38 | 170 | 85.0 | 0:RH | | | | |

PROFIELVORMEN [mm]

1 B*H 38*170



KNOPEN

| Knoop | X | Z |
|-------|-------|--------|
| 1 | 0.000 | 9.300 |
| 2 | 1.800 | 11.800 |
| 3 | 3.600 | 9.300 |

STAVEN

| St. | ki | kj | Profiel | Aansl.i | Aansl.j | Lengte | Opm. |
|-----|----|----|--------------|---------|---------|--------|------|
| 1 | 1 | 2 | 1:B*H 38*170 | NDM | ND- | 3.081 | |
| 2 | 2 | 3 | 1:B*H 38*170 | NDM | NDM | 3.081 | |

VASTE STEUNPUNTEN

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

BELASTINGGENERATIE ALGEMEEN.

| | | | |
|------------------------------|------|-------------------------|-------|
| Betrouwbaarheidsklasse.....: | 2 | Referentieperiode.....: | 50 |
| Gebouwdiepte.....: | 8.00 | Gebouwhoogte.....: | 11.80 |
| Niveau aansl.terrein.....: | 0.00 | E.g. scheid.w. [kN/m2]: | 0.00 |

WIND

| | |
|----------------------------------|-------------------------------------|
| Terrein categorie ...[4.3.2]...: | Onbebouwd |
| Windgebied | 2 Vb,0 ..[4.2].....: 27.000 |
| Positie spant in het gebouw....: | 4.000 Kr ...[4.3.2].....: 0.209 |
| z0 | 0.200 Zmin ..[4.3.2].....: 4.000 |
| Co wind van links ..[4.3.3]...: | 1.000 Co wind van rechts....: 1.000 |
| Co wind loodrecht ..[4.3.3]...: | 1.000 |
| Cpi wind van links ..[7.2.9]...: | 0.200 -0.300 |
| Cpi windloodrecht ...[7.2.9]...: | 0.200 -0.300 |
| Cpi wind van rechts .[7.2.9]...: | 0.200 -0.300 |
| Cfr windwrijving[7.5].....: | 0.040 |

SNEEUW

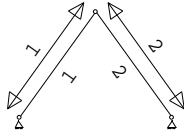
| | |
|--------------------------------|------|
| Sneeuwbelasting (sk) 50 jaar : | 0.70 |
| Sneeuwbelasting (sn) n jaar : | 0.70 |

STAAFTYPEN

| Type | staven |
|--------|--------|
| 7:Dak. | : 1,2 |

LASTVELDEN

Veranderlijke belastingen door personen



LASTVELDEN

| Nr | StAAF | Tabel | Klasse-Gebruiksfunctie | Verd. | q_k | Q_k | F_t / F_{t0} |
|----|-------|-------|--------------------------|-------|-------|-------|----------------|
| 1 | 1-1 | 6.10 | H-Dak (onder dakbeschot) | 0 | 0.00 | -2.00 | 1.00 |
| 2 | 2-2 | 6.10 | H-Dak (onder dakbeschot) | 1 | 0.00 | -2.00 | 1.00 |

LASTVELDEN

Wind staven



Sneeuw staven

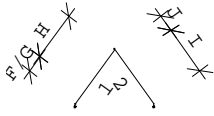


WIND DAKTYPES

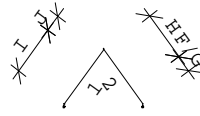
| Nr. | StAAF | Type | reductie bij wind van links | reductie bij wind van rechts | C _{pe} volgens art: |
|-----|-------|----------|--------------------------------|---------------------------------|------------------------------|
| 1 | 1 | Zadeldak | 1.000 | 1.000 | 7.2.5 |
| 2 | 2 | Zadeldak | 1.000 | 1.000 | 7.2.5 |

WIND ZONES

Wind van links



Wind van rechts



WIND VAN LINKS ZONES

| Nr. | StAAF | Positie | Lengte | Zone |
|-----|-------|---------|--------|------|
| 1 | 1 | 0.000 | 0.800 | F/G |
| 2 | 1 | 0.800 | 2.281 | H |
| 3 | 2 | 0.000 | 0.800 | J |
| 4 | 2 | 0.800 | 2.281 | I |

WIND VAN RECHTS ZONES

| Nr. | StAAF | Positie | Lengte | Zone |
|-----|-------|---------|--------|------|
| 1 | 2 | 0.000 | 0.800 | F/G |
| 2 | 2 | 0.800 | 2.281 | H |
| 3 | 1 | 0.000 | 0.800 | J |
| 4 | 1 | 0.800 | 2.281 | I |

Wind indexen

| Index | CsCd | Cpe/Cpi | qp | breedte | reductie | Qw | Zone | Hoek(en) |
|-------|------|---------|-------|---------|----------|--------|------|----------|
| Qw1 | | 0.300 | 0.899 | 0.500 | | -0.135 | -i | |
| Qw2 | 1.00 | 0.700 | 0.899 | 0.500 | | -0.315 | G | 54.2 |
| Qw3 | 1.00 | 0.661 | 0.899 | 0.500 | | -0.297 | H | 54.2 |
| Qw4 | 1.00 | -0.300 | 0.899 | 0.500 | | 0.135 | J | 54.2 |
| Qw5 | 1.00 | -0.200 | 0.899 | 0.500 | | 0.090 | I | 54.2 |
| Qw6 | | -0.200 | 0.899 | 0.500 | | 0.090 | +i | |

SNEEUW DAKTYPEN

| StAAF | artikel |
|-------|----------------|
| 1-1 | 5.3.3 Zadeldak |
| 2-2 | 5.3.3 Zadeldak |

Sneeuw indexen

| Index | art | μ | s_k | red. | posfac | breedte | Q_s | hoek |
|-------|-------|-------|-------|------|--------|---------|-------|------|
| Qs1 | 5.3.3 | 0.153 | 0.70 | 1.00 | | 0.500 | 0.054 | 54.2 |
| Qs2 | 5.3.3 | 0.077 | 0.70 | 1.00 | | 0.500 | 0.027 | 54.2 |

BELASTINGGEVALLEN

| B.G. | Omschrijving | Type |
|------|---------------------------------|------|
| | 1 Permanente belasting EGZ=0.00 | 1 |
| g | 2 Ver. bel. pers. ed. (q_k) | 2 |
| g | 3 Ver. bel. pers. ed. (Q_k) | 3 |
| g | 4 Wind van links onderdruk A | 7 |
| g | 5 Wind van links overdruk A | 8 |
| g | 6 Wind van rechts onderdruk A | 11 |
| g | 7 Wind van rechts overdruk A | 12 |
| g | 8 Sneeuw A | 22 |
| g | 9 Sneeuw B | 23 |
| g | 10 Sneeuw C | 33 |

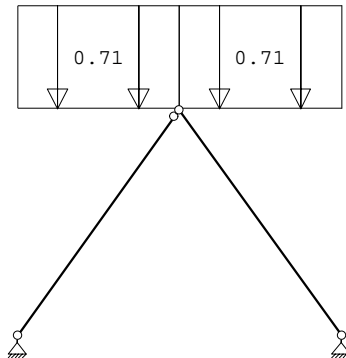
g = gegeneerd belastinggeval

BELASTINGGEVALLEN vervolg

| B.G. | Omschrijving | Belastingduurklasse |
|------|-------------------------------|---------------------|
| 1 | Permanente belasting | Blijvend |
| 2 | Ver. bel. pers. ed. (q_k) | Middellang |
| 3 | Ver. bel. pers. ed. (Q_k) | Kort |
| 4 | Wind van links onderdruk A | Kort |
| 5 | Wind van links overdruk A | Kort |
| 6 | Wind van rechts onderdruk A | Kort |
| 7 | Wind van rechts overdruk A | Kort |
| 8 | Sneeuw A | Kort |
| 9 | Sneeuw B | Kort |
| 10 | Sneeuw C | Kort |

BELASTINGEN

B.G:1 Permanente belasting



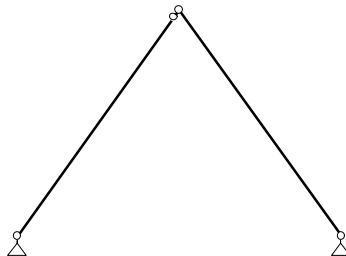
STAAFBELASTINGEN

B.G:1 Permanente belasting

| Staad | Type | $q_1/p/m$ | q_2 | A | B | Ψ_0 | Ψ_1 | Ψ_2 |
|-------|-------------|-----------|-------|-------|-------|----------|----------|----------|
| 1 | 3:QZgeProj. | -0.71 | -0.71 | 0.000 | 0.000 | | | |
| 2 | 3:QZgeProj. | -0.71 | -0.71 | 0.000 | 0.000 | | | |

BELASTINGEN

B.G:2 Ver. bel. pers. ed. (q_k)



SITUATIES BELAST/ONBELAST

B.G:2 Ver. bel. pers. ed. (q_k)



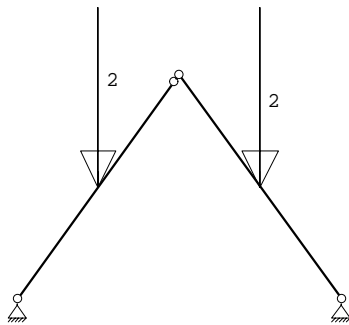
SITUATIES BELAST/ONBELAST

Belastingtype: q_k

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

BELASTINGEN

B.G:3 Ver. bel. pers. ed. (Q_k)



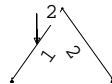
STAAFBELASTINGEN

B.G:3 Ver. bel. pers. ed. (Q_k)

| StAAF | Type | q1/p/m | q2 | A | B | Ψ_0 | Ψ_1 | Ψ_2 |
|-------|---------------|--------|----|-------|---|----------|----------|----------|
| 1 | 10:PZGepro.j. | -2.00 | | 1.540 | | 0.00 | 0.00 | 0.00 |
| 2 | 10:PZGepro.j. | -2.00 | | 1.540 | | 0.00 | 0.00 | 0.00 |

SITUATIES BELAST/ONBELAST

B.G:3 Ver. bel. pers. ed. (Q_k)



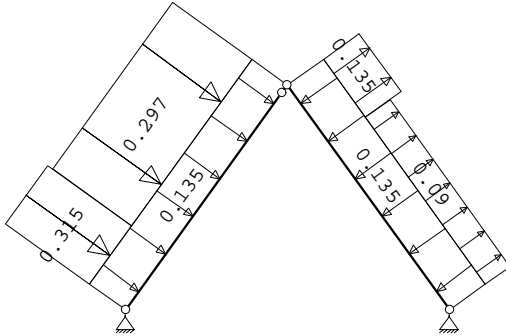
SITUATIES BELAST/ONBELAST

Belastingtype: Q_k

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

BELASTINGEN

B.G:4 Wind van links onderdruk A



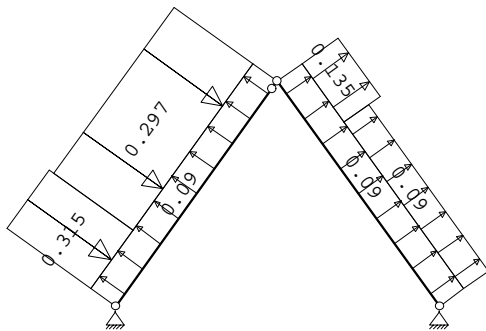
STAAFBELASTINGEN

B.G:4 Wind van links onderdruk A

| Staaftype | Type | Index | q1/p/m | q2 | A | B | ψ_0 | ψ_1 | ψ_2 |
|-----------|------------|-------|--------|-------|-------|-------|----------|----------|----------|
| 1 | 1:QZLokaal | Qw1 | -0.13 | -0.13 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 2 | 1:QZLokaal | Qw1 | -0.13 | -0.13 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 1 | 1:QZLokaal | Qw2 | -0.31 | -0.31 | 0.000 | 2.281 | 0.00 | 0.20 | 0.00 |
| 1 | 1:QZLokaal | Qw3 | -0.30 | -0.30 | 0.800 | 0.000 | 0.00 | 0.20 | 0.00 |
| 2 | 1:QZLokaal | Qw4 | 0.13 | 0.13 | 0.000 | 2.281 | 0.00 | 0.20 | 0.00 |
| 2 | 1:QZLokaal | Qw5 | 0.09 | 0.09 | 0.800 | 0.000 | 0.00 | 0.20 | 0.00 |

BELASTINGEN

B.G:5 Wind van links overdruk A



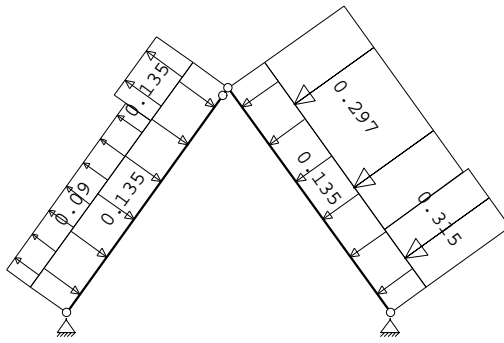
STAAFBELASTINGEN

B.G:5 Wind van links overdruk A

| Staaftype | Type | Index | q1/p/m | q2 | A | B | ψ_0 | ψ_1 | ψ_2 |
|-----------|------------|-------|--------|-------|-------|-------|----------|----------|----------|
| 1 | 1:QZLokaal | Qw6 | 0.09 | 0.09 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 2 | 1:QZLokaal | Qw6 | 0.09 | 0.09 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 1 | 1:QZLokaal | Qw2 | -0.31 | -0.31 | 0.000 | 2.281 | 0.00 | 0.20 | 0.00 |
| 1 | 1:QZLokaal | Qw3 | -0.30 | -0.30 | 0.800 | 0.000 | 0.00 | 0.20 | 0.00 |
| 2 | 1:QZLokaal | Qw4 | 0.13 | 0.13 | 0.000 | 2.281 | 0.00 | 0.20 | 0.00 |
| 2 | 1:QZLokaal | Qw5 | 0.09 | 0.09 | 0.800 | 0.000 | 0.00 | 0.20 | 0.00 |

BELASTINGEN

B.G:6 Wind van rechts onderdruk A



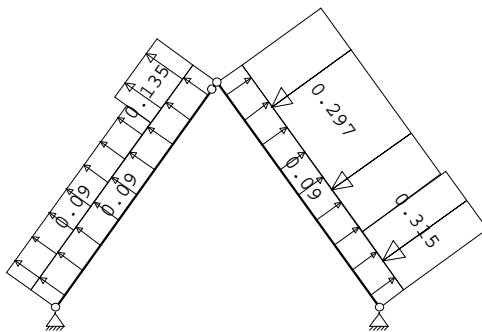
STAAFBELASTINGEN

B.G:6 Wind van rechts onderdruk A

| Staaftype | Type | Index | q1/p/m | q2 | A | B | ψ_0 | ψ_1 | ψ_2 |
|-----------|------------|-------|--------|-------|-------|-------|----------|----------|----------|
| 1 | 1:QZLokaal | Qw1 | -0.13 | -0.13 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 2 | 1:QZLokaal | Qw1 | -0.13 | -0.13 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 2 | 1:QZLokaal | Qw2 | -0.31 | -0.31 | 2.281 | 0.000 | 0.00 | 0.20 | 0.00 |
| 2 | 1:QZLokaal | Qw3 | -0.30 | -0.30 | 0.000 | 0.800 | 0.00 | 0.20 | 0.00 |
| 1 | 1:QZLokaal | Qw4 | 0.13 | 0.13 | 2.281 | 0.000 | 0.00 | 0.20 | 0.00 |
| 1 | 1:QZLokaal | Qw5 | 0.09 | 0.09 | 0.000 | 0.800 | 0.00 | 0.20 | 0.00 |

BELASTINGEN

B.G:7 Wind van rechts overdruk A



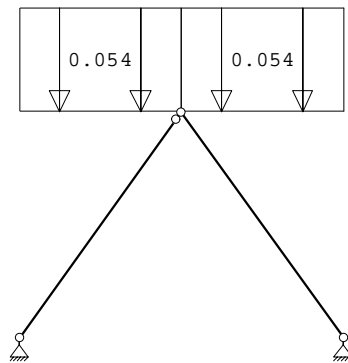
STAAFBELASTINGEN

B.G:7 Wind van rechts overdruk A

| Staaftype | Type | Index | q1/p/m | q2 | A | B | ψ_0 | ψ_1 | ψ_2 |
|-----------|------------|-------|--------|-------|-------|-------|----------|----------|----------|
| 1 | 1:QZLokaal | Qw6 | 0.09 | 0.09 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 2 | 1:QZLokaal | Qw6 | 0.09 | 0.09 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 2 | 1:QZLokaal | Qw2 | -0.31 | -0.31 | 2.281 | 0.000 | 0.00 | 0.20 | 0.00 |
| 2 | 1:QZLokaal | Qw3 | -0.30 | -0.30 | 0.000 | 0.800 | 0.00 | 0.20 | 0.00 |
| 1 | 1:QZLokaal | Qw4 | 0.13 | 0.13 | 2.281 | 0.000 | 0.00 | 0.20 | 0.00 |
| 1 | 1:QZLokaal | Qw5 | 0.09 | 0.09 | 0.000 | 0.800 | 0.00 | 0.20 | 0.00 |

BELASTINGEN

B.G:8 Sneeuw A



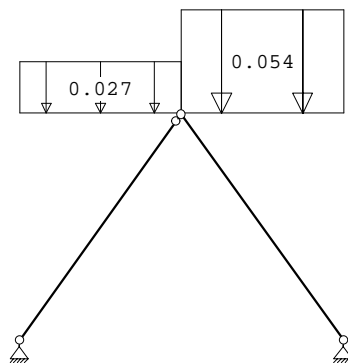
STAAFBELASTINGEN

B.G:8 Sneeuw A

| StAAF | Type | Index | q1/p/m | q2 | A | B | Ψ_0 | Ψ_1 | Ψ_2 |
|-------|-------------|-------|--------|-------|-------|-------|----------|----------|----------|
| 1 | 3:QZgeProj. | Qs1 | -0.05 | -0.05 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 2 | 3:QZgeProj. | Qs1 | -0.05 | -0.05 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |

BELASTINGEN

B.G:9 Sneeuw B



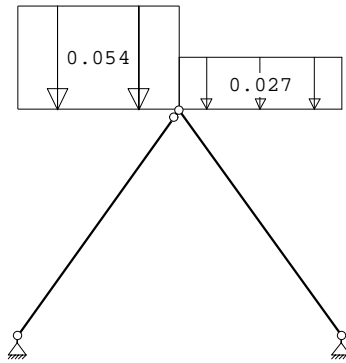
STAAFBELASTINGEN

B.G:9 Sneeuw B

| StAAF | Type | Index | q1/p/m | q2 | A | B | Ψ_0 | Ψ_1 | Ψ_2 |
|-------|-------------|-------|--------|-------|-------|-------|----------|----------|----------|
| 1 | 3:QZgeProj. | Qs2 | -0.03 | -0.03 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 2 | 3:QZgeProj. | Qs1 | -0.05 | -0.05 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |

BELASTINGEN

B.G:10 Sneeuw C



STAAFBELASTINGEN

B.G:10 Sneeuw C

| Staat | Type | Index | q1/p/m | q2 | A | B | Ψ_0 | Ψ_1 | Ψ_2 |
|-------|-------------|-------|--------|-------|-------|-------|----------|----------|----------|
| 1 | 3:QZgeProj. | Qs1 | -0.05 | -0.05 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 2 | 3:QZgeProj. | Qs2 | -0.03 | -0.03 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |

BEREKENINGSTATUS

| B.C. | Iteratie | Status |
|------|----------|------------------------|
| 1 | 3 | Nauwkeurigheid bereikt |
| 2 | 3 | Nauwkeurigheid bereikt |
| 3 | 3 | Nauwkeurigheid bereikt |
| 4 | 3 | Nauwkeurigheid bereikt |
| 5 | 3 | Nauwkeurigheid bereikt |
| 6 | 3 | Nauwkeurigheid bereikt |
| 7 | 3 | Nauwkeurigheid bereikt |
| 8 | 3 | Nauwkeurigheid bereikt |
| 9 | 3 | Nauwkeurigheid bereikt |
| 10 | 3 | Nauwkeurigheid bereikt |
| 11 | 3 | Nauwkeurigheid bereikt |
| 12 | 3 | Nauwkeurigheid bereikt |
| 13 | 3 | Nauwkeurigheid bereikt |
| 14 | 3 | Nauwkeurigheid bereikt |
| 15 | 3 | Nauwkeurigheid bereikt |
| 16 | 3 | Nauwkeurigheid bereikt |
| 17 | 3 | Nauwkeurigheid bereikt |
| 18 | 3 | Nauwkeurigheid bereikt |
| 19 | 1 | Lineaire berekening |
| 20 | 1 | Lineaire berekening |
| 21 | 1 | Lineaire berekening |
| 22 | 1 | Lineaire berekening |
| 23 | 1 | Lineaire berekening |
| 24 | 1 | Lineaire berekening |
| 25 | 1 | Lineaire berekening |
| 26 | 1 | Lineaire berekening |
| 27 | 1 | Lineaire berekening |
| 28 | 1 | Lineaire berekening |
| 29 | 1 | Lineaire berekening |
| 30 | 1 | Lineaire berekening |
| 31 | 1 | Lineaire berekening |
| 32 | 1 | Lineaire berekening |
| 33 | 1 | Lineaire berekening |
| 34 | 1 | Lineaire berekening |
| 35 | 1 | Lineaire berekening |
| 36 | 1 | Lineaire berekening |

BELASTINGCOMBINATIES

| BC | Type | | | | |
|----|-------|------|-----------|--------|-------------------|
| 1 | Fund. | 1.35 | $G_{k,1}$ | | |
| 2 | Fund. | 0.90 | $G_{k,1}$ | | |
| 3 | Fund. | 1.20 | $G_{k,1}$ | + 1.50 | $Q_{k,3}$ |
| 4 | Fund. | 1.20 | $G_{k,1}$ | + 1.50 | $Q_{k,4}$ |
| 5 | Fund. | 1.20 | $G_{k,1}$ | + 1.50 | $Q_{k,5}$ |
| 6 | Fund. | 1.20 | $G_{k,1}$ | + 1.50 | $Q_{k,6}$ |
| 7 | Fund. | 1.20 | $G_{k,1}$ | + 1.50 | $Q_{k,7}$ |
| 8 | Fund. | 1.20 | $G_{k,1}$ | + 1.50 | $Q_{k,8}$ |
| 9 | Fund. | 1.20 | $G_{k,1}$ | + 1.50 | $Q_{k,9}$ |
| 10 | Fund. | 1.20 | $G_{k,1}$ | + 1.50 | $Q_{k,10}$ |
| 11 | Fund. | 0.90 | $G_{k,1}$ | + 1.50 | $Q_{k,3}$ |
| 12 | Fund. | 0.90 | $G_{k,1}$ | + 1.50 | $Q_{k,4}$ |
| 13 | Fund. | 0.90 | $G_{k,1}$ | + 1.50 | $Q_{k,5}$ |
| 14 | Fund. | 0.90 | $G_{k,1}$ | + 1.50 | $Q_{k,6}$ |
| 15 | Fund. | 0.90 | $G_{k,1}$ | + 1.50 | $Q_{k,7}$ |
| 16 | Fund. | 0.90 | $G_{k,1}$ | + 1.50 | $Q_{k,8}$ |
| 17 | Fund. | 0.90 | $G_{k,1}$ | + 1.50 | $Q_{k,9}$ |
| 18 | Fund. | 0.90 | $G_{k,1}$ | + 1.50 | $Q_{k,10}$ |
| 19 | Kar. | 1.00 | $G_{k,1}$ | + 1.00 | $Q_{k,3}$ |
| 20 | Kar. | 1.00 | $G_{k,1}$ | + 1.00 | $Q_{k,4}$ |
| 21 | Kar. | 1.00 | $G_{k,1}$ | + 1.00 | $Q_{k,5}$ |
| 22 | Kar. | 1.00 | $G_{k,1}$ | + 1.00 | $Q_{k,6}$ |
| 23 | Kar. | 1.00 | $G_{k,1}$ | + 1.00 | $Q_{k,7}$ |
| 24 | Kar. | 1.00 | $G_{k,1}$ | + 1.00 | $Q_{k,8}$ |
| 25 | Kar. | 1.00 | $G_{k,1}$ | + 1.00 | $Q_{k,9}$ |
| 26 | Kar. | 1.00 | $G_{k,1}$ | + 1.00 | $Q_{k,10}$ |
| 27 | Quas. | 1.00 | $G_{k,1}$ | | |
| 28 | Freq. | 1.00 | $G_{k,1}$ | | |
| 29 | Freq. | 1.00 | $G_{k,1}$ | + 1.00 | $\psi_1 Q_{k,4}$ |
| 30 | Freq. | 1.00 | $G_{k,1}$ | + 1.00 | $\psi_1 Q_{k,5}$ |
| 31 | Freq. | 1.00 | $G_{k,1}$ | + 1.00 | $\psi_1 Q_{k,6}$ |
| 32 | Freq. | 1.00 | $G_{k,1}$ | + 1.00 | $\psi_1 Q_{k,7}$ |
| 33 | Freq. | 1.00 | $G_{k,1}$ | + 1.00 | $\psi_1 Q_{k,8}$ |
| 34 | Freq. | 1.00 | $G_{k,1}$ | + 1.00 | $\psi_1 Q_{k,9}$ |
| 35 | Freq. | 1.00 | $G_{k,1}$ | + 1.00 | $\psi_1 Q_{k,10}$ |
| 36 | Blij. | 1.00 | $G_{k,1}$ | | |

GUNSTIGE WERKING PERMANENTE BELASTINGEN

| BC | Staven met gunstige werking |
|----|-----------------------------|
| 1 | Geen |
| 2 | Alle staven de factor:0.90 |
| 3 | Geen |
| 4 | Geen |
| 5 | Geen |
| 6 | Geen |
| 7 | Geen |
| 8 | Geen |
| 9 | Geen |
| 10 | Geen |
| 11 | Alle staven de factor:0.90 |
| 12 | Alle staven de factor:0.90 |
| 13 | Alle staven de factor:0.90 |
| 14 | Alle staven de factor:0.90 |
| 15 | Alle staven de factor:0.90 |
| 16 | Alle staven de factor:0.90 |
| 17 | Alle staven de factor:0.90 |

GUNSTIGE WERKING PERMANENTE BELASTINGEN

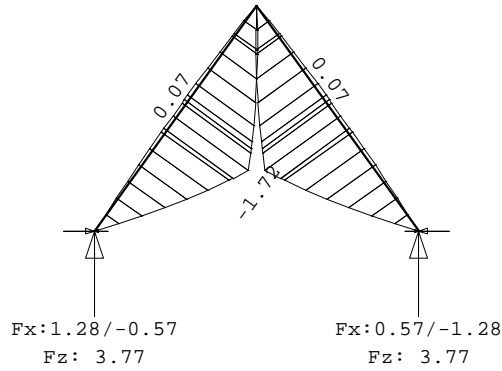
BC Staven met gunstige werking
18 Alle staven de factor:0.90

OMHULLENDE VAN DE FUNDAMENTELE COMBINATIES

MOMENTEN

2e orde

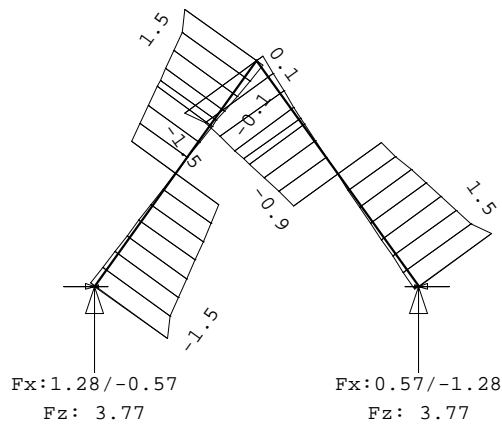
Fundamentele combinatie



DWARSKRACHTEN

2e orde

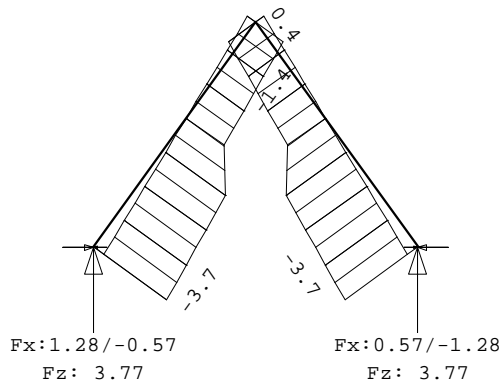
Fundamentele combinatie



NORMAALKRACHTEN

2e orde

Fundamentele combinatie



MATERIAALGEGEVENS

| Mt | Kwaliteit | $f_{m,y,k}$ [N/mm ²] | ρ_k [kg/m ³] | ρ_{mean} [kg/m ³] | $f_{t,0,k}$ [N/mm ²] | $f_{t,90,k}$ [N/mm ²] | $f_{c,0,k}$ [N/mm ²] | $f_{c,90,k}$ [N/mm ²] | $f_{v,k}$ [N/mm ²] |
|----|-----------|-------------------------------------|----------------------------------|---------------------------------------|-------------------------------------|--------------------------------------|-------------------------------------|--------------------------------------|-----------------------------------|
| 1 | C24 | 24 | 350 | 420 | 14.5 | 0.4 | 21.0 | 2.5 | 4.0 |

MATERIAALGEGEVENS (vervolg)

| Mt | Kwaliteit | G_{mean} [N/mm ²] | $E_{0,05}$ [N/mm ²] | $E_{90,mean}$ [N/mm ²] | $E_{0,mean}$ [N/mm ²] | Klimaatklasse | k_{def} | $E_{0,mean,fin}$ [N/mm ²] |
|----|-----------|------------------------------------|------------------------------------|---------------------------------------|--------------------------------------|---------------|-----------|--|
| 1 | C24 | 690 | 7400 | 370 | 11000 | I | 0.60 | 6875 |

KIPSTABILITEIT

| Staal | Plts. aangr. | l sys. [m] | Kipsteunafstanden [m] |
|-------|-----------------|------------------|------------------------------|
| 1 | 1.0*h | boven: onder: | 3.08 3*1,027 3.08 0;3.081 |
| 2 | 1.0*h | boven: onder: | 3.08 3*1,027 3.08 0;3.081 |

STABILITEIT

| Stf | b_{gem} [mm] | h_{gem} [mm] | l_{sys} [mm] | $l_{buc,y/z}$ [mm] | λ_y | λ_z | $\lambda_{rel,y/z}$ | β_c | k_y | k_z | $k_{c,y}$ | $k_{c,z}$ |
|-----|-------------------|-------------------|-------------------|-----------------------|-------------|-------------|---------------------|-----------|-------|-------|-----------|-----------|
| 1 | 38 | 170 | 3081 | nvt 1560 | 62.8 | 142.2 | 1.064 2.411 | 0.2 | 1.143 | 3.619 | 0.641 | 0.158 |
| 2 | 38 | 170 | 3081 | nvt 1560 | 62.8 | 142.2 | 1.064 2.411 | 0.2 | 1.143 | 3.619 | 0.641 | 0.158 |

STABILITEIT (vervolg)

| Staal | positie [mm] | $l_{ef,y}$ [mm] | $\sigma_{my,crit}$ [N/mm ²] | $\lambda_{rel,my}$ | $k_{crit,y}$ |
|-------|-----------------|--------------------|--|--------------------|--------------|
| 1 | 1540 | 1367 | 35.87 | 0.82 | 0.95 |
| 2 | 1540 | 1367 | 35.87 | 0.82 | 0.95 |

TOETSING SPANNINGEN

TOETSING SPANNINGEN

| Staal | 1 | BC / Sit. | 3 / 2 | UC frm(6.23) | 0.62 |
|-------|---|-----------|-------|--------------|------|
| Staal | 2 | BC / Sit. | 3 / 1 | UC frm(6.23) | 0.62 |

TOETSING DOORBUIGING

| Stf | Soort | Mtg | l_{sys} [mm] | Overstek i j | BC | Sit | u_{bij} [mm] | Toelaatbaar [mm] | $u_{fin,net}$ [mm] | Toelaatbaar [mm] | | |
|-----|-------|-----|-------------------|-----------------|----|-----|-------------------|---------------------|-----------------------|---------------------|-------|-------|
| 1 | Dak | db | 3081 | Nee Nee | 27 | 1 | -5.2 | -12.3 | 0.004 | -6.8 | -12.3 | 0.004 |
| 2 | Dak | db | 3081 | Nee Nee | 27 | 1 | -5.2 | -12.3 | 0.004 | -6.8 | -12.3 | 0.004 |

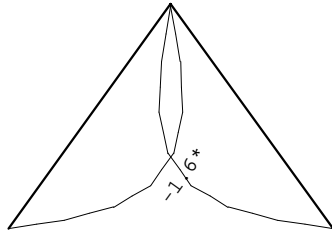
TOETSING DOORBUIGING (vervolg)

| Stf | Soort | Mtg | l_{sys} [mm] | Overstek i j | Zeeg [mm] | BC | Sit | u_{inst} [mm] | Toelaatbaar [mm] | *1 |
|-----|-------|-----|-------------------|-----------------|--------------|----|-----|--------------------|---------------------|-------|
| 1 | Dak | db | 3081 | Nee Nee | 0.0 | 19 | 2 | -5.8 | -12.3 | 0.004 |
| 2 | Dak | db | 3081 | Nee Nee | 0.0 | 19 | 1 | -5.8 | -12.3 | 0.004 |

VERVORMINGEN w_1

Blijvende combinatie

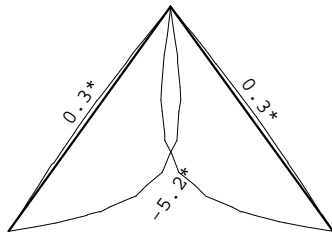
* - relatief aan de rechte lijn die de uiteinden verbindt



VERVORMINGEN w_{bij}

Karakteristieke combinatie

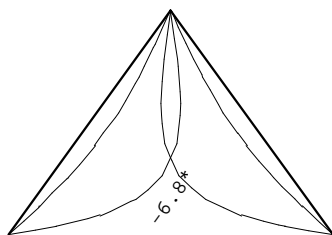
* - relatief aan de rechte lijn die de uiteinden verbindt



VERVORMINGEN w_{max}

Karakteristieke combinatie

* - relatief aan de rechte lijn die de uiteinden verbindt



DOORBUIGINGEN

Karakteristieke combinatie

| Nr. | staven | Zijde | positie [m] | l_{rep} [mm] | w_1 [mm] | w_2 [mm] | w_{bij} [mm] | l_{rep} | w_{tot} [mm] | w_c [mm] | w_{max} [mm] | l_{rep} |
|-----|--------|-------|----------------|-------------------|---------------|---------------|-------------------|-----------|-------------------|---------------|-------------------|-----------|
| 1 | 1 | Neg. | 1.540 | 3081 | -1.6 | -1.0 | -5.2 | 596 | -6.8 | | -6.8 | 454 |
| 2 | 2 | Neg. | 1.540 | 3081 | -1.6 | -1.0 | -5.2 | 596 | -6.8 | | -6.8 | 454 |

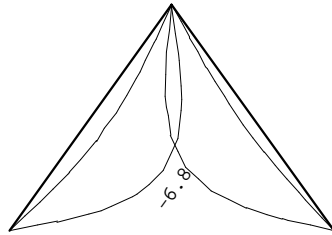
TOTALE HORIZONTALE VERPLAATSING

Karakteristieke combinatie

| knoop | Zijde | h [mm] | u_1 [mm] | u_2 [mm] | u_3 [mm] | u_{tot} [mm] | [h/] |
|-------|-------|-----------|---------------|---------------|---------------|-------------------|------|
|-------|-------|-----------|---------------|---------------|---------------|-------------------|------|

VERVORMINGEN W_{max}

Karakteristieke combinatie



DOORBUIGINGEN

Karakteristieke combinatie

| Nr. | staven | Zijde | positie | l_{rep} | W_1 | W_2 | W_{bij} | W_{tot} | W_c | W_{max} |
|-----|--------|-------|---------|-----------|-------|-------|--------------------|-----------|-------|--------------------|
| | | | [m] | [mm] | [mm] | [mm] | [mm][$l_{rep}/$] | [mm] | [mm] | [mm][$l_{rep}/$] |
| 1 | 1 | Neg. | 1.540 | 3081 | -1.6 | -1.0 | -5.2 | 596 | -6.8 | 454 |
| 2 | 2 | Neg. | 1.540 | 3081 | -1.3 | -0.8 | -5.0 | 618 | -6.3 | 488 |
| 2 | 2 | Pos. | 1.540 | 3081 | -1.3 | -0.8 | 0.5 | 6658 | -0.9 | 3543 |

TOTALE HORIZONTALE VERPLAATSING

Karakteristieke combinatie

| knoop | Zijde | h | u_1 | u_2 | u_3 | u_{tot} |
|-------|-------|------|-------|-------|-------|-----------|
| | | [mm] | [mm] | [mm] | [mm] | [mm] |
| | | | | | | [h/] |

A.3 Nieuwe kap: spant dakraam

Technosoft Raamwerken release 6.81a

11 jul 2024

Project.....: 2023237 - 5.1, 2, e te Amsterdam
Onderdeel....: Kap nieuw: sporen
Constructeur.: ME
Dimensies....: kN;m;rad (tenzij anders aangegeven)
Datum.....: 21/02/2024
Bestand.....: K:\Werk\2023237\Berekeningen\Technosoft\Sporenkap -
slaper V2.rww

Belastingbreedte.: 0.500
Rekenmodel.....: 2e-orde-elastisch.
Theorieën voor de bepaling van de krachtsverdeling:
1) Uiterste grenstoestand:
Geometrisch niet lineair alle staven.
Fysisch lineair alle staven.
2) Gebruiksgrenstoestand:
Lineaire-elasticiteitstheorie

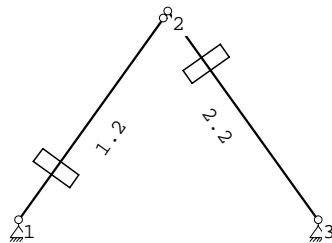
Maximum aantal iteraties.....: 50
Max.deellengte kolommen/wanden: 0.500 Max.deellengte balken/vloeren: 0.500
Max. X-verplaatsing in UGT....: 0.500 Max. Z-verplaatsing in UGT...: 0.250

Gunstige werking van de permanente belasting wordt automatisch verwerkt.

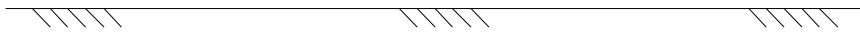
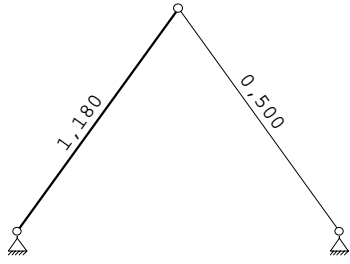
Toegepaste normen volgens Eurocode met Nederlandse NB

| | | | |
|-------------|----------------------|-----------------|-------------|
| Belastingen | NEN-EN 1990:2002 | C2:2010,A1:2019 | NB:2019(nl) |
| | NEN-EN 1991-1-1:2002 | C1/C11:2019 | NB:2019(nl) |
| | NEN-EN 1991-1-3:2003 | C1:2009 | NB:2011(nl) |
| | NEN-EN 1991-1-4:2005 | C2:2011 | NB:2011(nl) |
| Hout | NEN-EN 1995-1-1:2005 | A1:2011,C1:2006 | NB:2013(nl) |

GEOMETRIE



BELASTINGBREEDTEN



MATERIALEN

| Mt | Kwaliteit | E-modulus[N/mm ²] | S.G. | S.G.verhoogd | Pois. | Uitz. coëff |
|----|-----------|-------------------------------|------|--------------|-------|-------------|
| 1 | C24 | 11000 | 3.5 | 4.2 | 1.00 | 5.0000e-06 |

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

PROFIELEN [mm]

| Prof. | Omschrijving | Materiaal | Oppervlak | Traagheid | Vormf. |
|-------|--------------|-----------|------------|------------|--------|
| 1 | B*H 38*170 | 1:C24 | 6.4600e+03 | 1.5558e+07 | 0.00 |
| 2 | B*H 58*170 | 1:C24 | 9.8600e+03 | 2.3746e+07 | 0.00 |

PROFIELEN vervolg [mm]

| Prof. | Staaftype | Breedte | Hoogte | e | Type | b1 | h1 | b2 | h2 |
|-------|-----------|---------|--------|------|------|----|----|----|----|
| 1 | 0:Normaal | 38 | 170 | 85.0 | 0:RH | | | | |
| 2 | 0:Normaal | 58 | 170 | 85.0 | 0:RH | | | | |

PROFIELVORMEN [mm]

1 B*H 38*170



2 B*H 58*170



KNOPEN

| Knoop | X | Z |
|-------|-------|--------|
| 1 | 0.000 | 9.300 |
| 2 | 1.800 | 11.800 |
| 3 | 3.600 | 9.300 |

STAVEN

| St. | ki | kj | Profiel | Aansl.i | Aansl.j | Lengte | Opm. |
|-----|----|----|--------------|---------|---------|--------|------|
| 1 | 1 | 2 | 2:B*H 58*170 | NDM | ND- | 3.081 | |
| 2 | 2 | 3 | 2:B*H 58*170 | NDM | NDM | 3.081 | |

VASTE STEUNPUNTEN

| Nr. | knoop | Kode | XZR | 1=vast | 0=vrij | Hoek |
|-----|-------|------|-----|--------|--------|------|
| 1 | 1 | 110 | | | | 0.00 |
| 2 | 3 | 110 | | | | 0.00 |

BELASTINGBREEDTEN

| StAAF | Breedte-i | Breedte-j |
|-------|-----------|-----------|
| 1 | 1.180 | 1.180 |
| 2 | 0.500 | 0.500 |

BELASTINGGENERATIE ALGEMEEN.

| | | | |
|------------------------------|------|--------------------------------------|-------|
| Betrouwbaarheidsklasse.....: | 2 | Referentieperiode.....: | 50 |
| Gebouwdiepte.....: | 8.00 | Gebouwhoogte.....: | 11.80 |
| Niveau aansl.terrein.....: | 0.00 | E.g. scheid.w. [kN/m ²]: | 0.00 |

WIND

Terrein categorie ...[4.3.2]...: Bebouwd
 Windgebied: 2 Vb,0 ..[4.2].....: 27.000
 Positie spant in het gebouw...: 4.000 Kr[4.3.2].....: 0.223
 z0[4.3.2]...: 0.500 Zmin ..[4.3.2].....: 7.000
 Co wind van links ..[4.3.3]...: 1.000 Co wind van rechts....: 1.000
 Co wind loodrecht ..[4.3.3]...: 1.000
 Cpi wind van links ..[7.2.9]...: 0.200 -0.300
 Cpi windloodrecht ...[7.2.9]...: 0.200 -0.300
 Cpi wind van rechts ..[7.2.9]...: 0.200 -0.300
 Cfr windwrijving[7.5].....: 0.040

SNEEUW

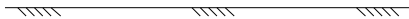
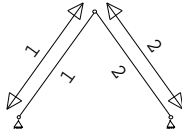
Sneeuwbelasting (sk) 50 jaar : 0.70
 Sneeuwbelasting (sn) n jaar : 0.70

STAAFTYPEN

Type staven
 7:Dak. : 1,2

LASTVELDEN

Veranderlijke belastingen door personen



LASTVELDEN

| Nr | Staaftabel | Tabel | Klasse-Gebruiksfunctie | Verd. | q _k | Q _k | F _t / F _{t,0} |
|----|------------|-------|--------------------------|-------|----------------|----------------|-----------------------------------|
| 1 | 1-1 | 6.10 | H-Dak (onder dakbeschot) | 0 | 0.00 | -2.00 | 1.00 |
| 2 | 2-2 | 6.10 | H-Dak (onder dakbeschot) | 1 | 0.00 | -2.00 | 1.00 |

LASTVELDEN

Wind staven



Sneeuw staven

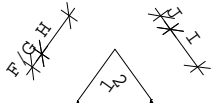


WIND DAKTYPES

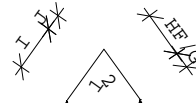
| Nr. | Staaftype | reductie bij wind van links | reductie bij wind van rechts | Cpe volgens art: |
|-----|------------|-----------------------------|------------------------------|------------------|
| 1 | 1 Zadeldak | 1.000 | 1.000 | 7.2.5 |
| 2 | 2 Zadeldak | 1.000 | 1.000 | 7.2.5 |

WIND ZONES

Wind van links



Wind van rechts



WIND VAN LINKS ZONES

| Nr. | Staaftype | Positie | Lengte | Zone |
|-----|-----------|---------|--------|------|
| 1 | 1 | 0.000 | 0.800 | F/G |
| 2 | 1 | 0.800 | 2.281 | H |
| 3 | 2 | 0.000 | 0.800 | J |
| 4 | 2 | 0.800 | 2.281 | I |

WIND VAN RECHTS ZONES

| Nr. | Staaftype | Positie | Lengte | Zone |
|-----|-----------|---------|--------|------|
| 1 | 2 | 0.000 | 0.800 | F/G |
| 2 | 2 | 0.800 | 2.281 | H |
| 3 | 1 | 0.000 | 0.800 | J |
| 4 | 1 | 0.800 | 2.281 | I |

Wind indexen

| Index | CsCd | Cpe/Cpi | qp | breedte | reductie | Qw | Zone | Hoek(en) |
|-------|------|---------|-------|---------|----------|--------|------|----------|
| Qw1 | | 0.300 | 0.728 | 1.180 | | -0.258 | -i | |
| Qw2 | | 0.300 | 0.728 | 0.500 | | -0.109 | -i | |
| Qw3 | 1.00 | 0.700 | 0.728 | 1.180 | | -0.601 | G | 54.2 |
| Qw4 | 1.00 | 0.661 | 0.728 | 1.180 | | -0.568 | H | 54.2 |
| Qw5 | 1.00 | -0.300 | 0.728 | 0.500 | | 0.109 | J | 54.2 |
| Qw6 | 1.00 | -0.200 | 0.728 | 0.500 | | 0.073 | I | 54.2 |
| Qw7 | | -0.200 | 0.728 | 1.180 | | 0.172 | +i | |
| Qw8 | | -0.200 | 0.728 | 0.500 | | 0.073 | +i | |
| Qw9 | 1.00 | 0.700 | 0.728 | 0.500 | | -0.255 | G | 54.2 |
| Qw10 | 1.00 | 0.661 | 0.728 | 0.500 | | -0.241 | H | 54.2 |
| Qw11 | 1.00 | -0.300 | 0.728 | 1.180 | | 0.258 | J | 54.2 |
| Qw12 | 1.00 | -0.200 | 0.728 | 1.180 | | 0.172 | I | 54.2 |

SNEEUW DAKTYPEN

| Staaft | artikel |
|--------|----------------|
| 1-1 | 5.3.3 Zadeldak |
| 2-2 | 5.3.3 Zadeldak |

Sneeuw indexen

| Index | art | μ | s_k | red. posfac | breedte | Q_s | hoek |
|-------|-------|-------|-------|-------------|---------|-------|------|
| Qs1 | 5.3.3 | 0.153 | 0.70 | 1.00 | 1.180 | 0.127 | 54.2 |
| Qs2 | 5.3.3 | 0.153 | 0.70 | 1.00 | 0.500 | 0.054 | 54.2 |
| Qs3 | 5.3.3 | 0.077 | 0.70 | 1.00 | 1.180 | 0.063 | 54.2 |
| Qs4 | 5.3.3 | 0.077 | 0.70 | 1.00 | 0.500 | 0.027 | 54.2 |

BELASTINGGEVALLEN

| B.G. | Omschrijving | Type |
|------|---------------------------------|------|
| | 1 Permanente belasting EGZ=0.00 | 1 |
| g | 3 Ver. bel. pers. ed. (Q_k) | 3 |
| g | 4 Wind van links onderdruk A | 7 |
| g | 5 Wind van links overdruk A | 8 |
| g | 6 Wind van rechts onderdruk A | 11 |
| g | 7 Wind van rechts overdruk A | 12 |
| g* | 8 Sneeuw A | 22 |
| g* | 9 Sneeuw B | 23 |
| g* | 10 Sneeuw C | 33 |

g = gegeneerd belastinggeval

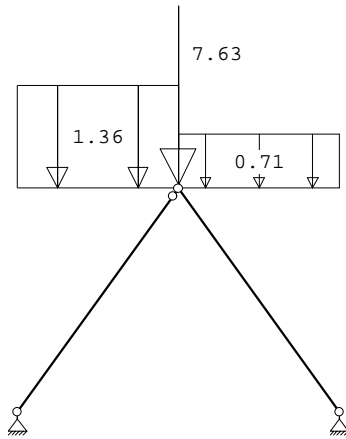
* = belastinggeval bevat 1 of meer handmatig toegevoegde en/of gewijzigde lasten

BELASTINGGEVALLEN vervolg

| B.G. | Omschrijving | Belastingduurklasse |
|------|---------------------------------|---------------------|
| | 1 Permanente belasting | Blijvend |
| | 3 Ver. bel. pers. ed. (Q_k) | Kort |
| | 4 Wind van links onderdruk A | Kort |
| | 5 Wind van links overdruk A | Kort |
| | 6 Wind van rechts onderdruk A | Kort |
| | 7 Wind van rechts overdruk A | Kort |
| | 8 Sneeuw A | Kort |
| | 9 Sneeuw B | Kort |
| | 10 Sneeuw C | Kort |

BELASTINGEN

B.G:1 Permanente belasting



KNOOPBELASTINGEN

B.G:1 Permanente belasting

| Last | Knoop | Richting | waarde | Ψ_0 | Ψ_1 | Ψ_2 |
|------|-------|----------|--------|----------|----------|----------|
| 1 | 2 | Z | -7.630 | | | |

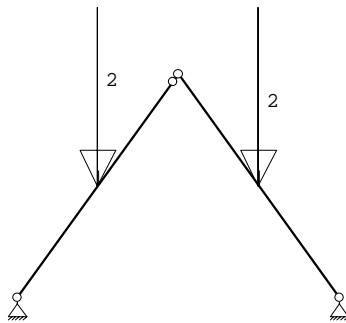
STAAFBELASTINGEN

B.G:1 Permanente belasting

| StAAF | Type | q1/p/m | q2 | A | B | Ψ_0 | Ψ_1 | Ψ_2 |
|-------|-------------|--------|-------|-------|-------|----------|----------|----------|
| 1 | 3:QZgeProj. | -1.36 | -1.36 | 0.000 | 0.000 | | | |
| 2 | 3:QZgeProj. | -0.71 | -0.71 | 0.000 | 0.000 | | | |

BELASTINGEN

B.G:3 Ver. bel. pers. ed. (Q_k)



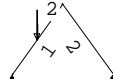
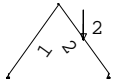
STAAFBELASTINGEN

B.G:3 Ver. bel. pers. ed. (Q_k)

| StAAF | Type | q1/p/m | q2 | A | B | Ψ_0 | Ψ_1 | Ψ_2 |
|-------|---------------|--------|----|-------|---|----------|----------|----------|
| 1 | 10:PZGepro.j. | -2.00 | | 1.540 | | 0.00 | 0.00 | 0.00 |
| 2 | 10:PZGepro.j. | -2.00 | | 1.540 | | 0.00 | 0.00 | 0.00 |

SITUATIES BELAST/ONBELAST

B.G:3 Ver. bel. pers. ed. (Q_k)



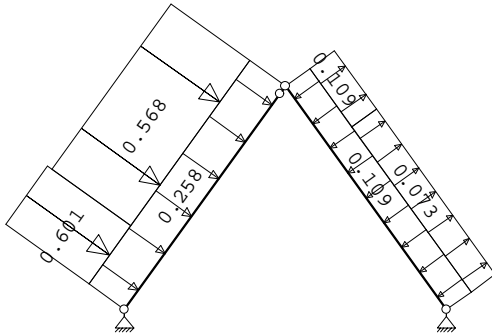
SITUATIES BELAST/ONBELAST

Belastingtype: Q_k

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

BELASTINGEN

B.G:4 Wind van links onderdruk A



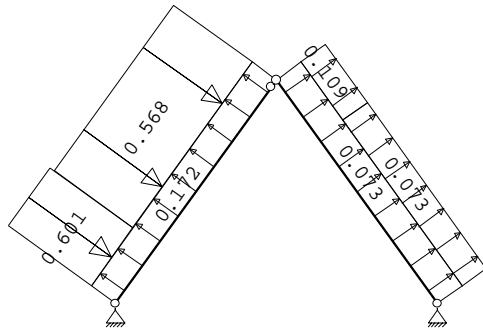
STAAFBELASTINGEN

B.G:4 Wind van links onderdruk A

| Staaftype | Type | Index | q1/p/m | q2 | A | B | ψ ₀ | ψ ₁ | ψ ₂ |
|-----------|------------|-------|--------|-------|-------|-------|----------------|----------------|----------------|
| 1 | 1:QZLokaal | Qw1 | -0.26 | -0.26 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 2 | 1:QZLokaal | Qw2 | -0.11 | -0.11 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 1 | 1:QZLokaal | Qw3 | -0.60 | -0.60 | 0.000 | 2.281 | 0.00 | 0.20 | 0.00 |
| 1 | 1:QZLokaal | Qw4 | -0.57 | -0.57 | 0.800 | 0.000 | 0.00 | 0.20 | 0.00 |
| 2 | 1:QZLokaal | Qw5 | 0.11 | 0.11 | 0.000 | 2.281 | 0.00 | 0.20 | 0.00 |
| 2 | 1:QZLokaal | Qw6 | 0.07 | 0.07 | 0.800 | 0.000 | 0.00 | 0.20 | 0.00 |

BELASTINGEN

B.G:5 Wind van links overdruk A



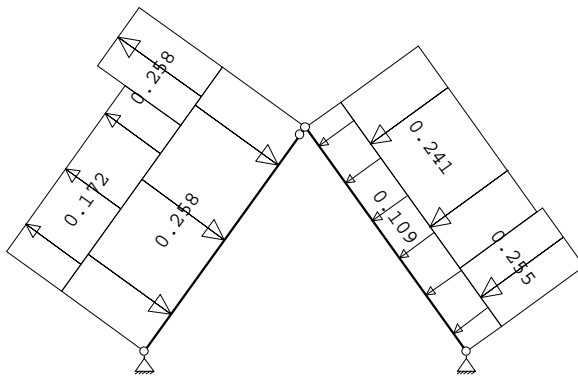
STAAFBELASTINGEN

B.G:5 Wind van links overdruk A

| Staaftype | Type | Index | q1/p/m | q2 | A | B | Ψ_0 | Ψ_1 | Ψ_2 |
|-----------|------------|-------|--------|-------|-------|-------|----------|----------|----------|
| 1 | 1:QZLokaal | Qw7 | 0.17 | 0.17 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 2 | 1:QZLokaal | Qw8 | 0.07 | 0.07 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 1 | 1:QZLokaal | Qw3 | -0.60 | -0.60 | 0.000 | 2.281 | 0.00 | 0.20 | 0.00 |
| 1 | 1:QZLokaal | Qw4 | -0.57 | -0.57 | 0.800 | 0.000 | 0.00 | 0.20 | 0.00 |
| 2 | 1:QZLokaal | Qw5 | 0.11 | 0.11 | 0.000 | 2.281 | 0.00 | 0.20 | 0.00 |
| 2 | 1:QZLokaal | Qw6 | 0.07 | 0.07 | 0.800 | 0.000 | 0.00 | 0.20 | 0.00 |

BELASTINGEN

B.G:6 Wind van rechts onderdruk A



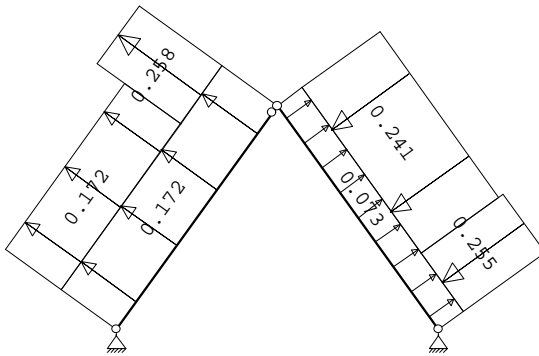
STAAFBELASTINGEN

B.G:6 Wind van rechts onderdruk A

| Staaftype | Type | Index | q1/p/m | q2 | A | B | Ψ_0 | Ψ_1 | Ψ_2 |
|-----------|------------|-------|--------|-------|-------|-------|----------|----------|----------|
| 1 | 1:QZLokaal | Qw1 | -0.26 | -0.26 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 2 | 1:QZLokaal | Qw2 | -0.11 | -0.11 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 2 | 1:QZLokaal | Qw9 | -0.25 | -0.25 | 2.281 | 0.000 | 0.00 | 0.20 | 0.00 |
| 2 | 1:QZLokaal | Qw10 | -0.24 | -0.24 | 0.000 | 0.800 | 0.00 | 0.20 | 0.00 |
| 1 | 1:QZLokaal | Qw11 | 0.26 | 0.26 | 2.281 | 0.000 | 0.00 | 0.20 | 0.00 |
| 1 | 1:QZLokaal | Qw12 | 0.17 | 0.17 | 0.000 | 0.800 | 0.00 | 0.20 | 0.00 |

BELASTINGEN

B.G:7 Wind van rechts overdruk A



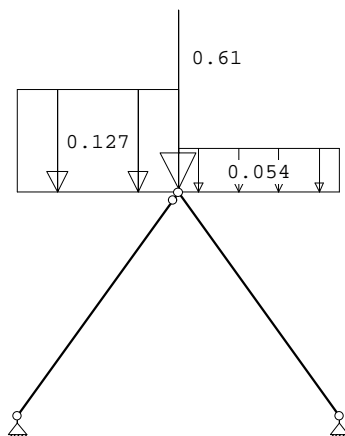
STAAFBELASTINGEN

B.G:7 Wind van rechts overdruk A

| Staaftype | Type | Index | q1/p/m | q2 | A | B | ψ_0 | ψ_1 | ψ_2 |
|-----------|------------|-------|--------|-------|-------|-------|----------|----------|----------|
| 1 | 1:QZLokaal | Qw7 | 0.17 | 0.17 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 2 | 1:QZLokaal | Qw8 | 0.07 | 0.07 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 2 | 1:QZLokaal | Qw9 | -0.25 | -0.25 | 2.281 | 0.000 | 0.00 | 0.20 | 0.00 |
| 2 | 1:QZLokaal | Qw10 | -0.24 | -0.24 | 0.000 | 0.800 | 0.00 | 0.20 | 0.00 |
| 1 | 1:QZLokaal | Qw11 | 0.26 | 0.26 | 2.281 | 0.000 | 0.00 | 0.20 | 0.00 |
| 1 | 1:QZLokaal | Qw12 | 0.17 | 0.17 | 0.000 | 0.800 | 0.00 | 0.20 | 0.00 |

BELASTINGEN

B.G:8 Sneeuw A



KNOOPBELASTINGEN

B.G:8 Sneeuw A

| Last | Knoop | Richting | waarde | ψ_0 | ψ_1 | ψ_2 | Opm. |
|------|-------|----------|--------|----------|----------|----------|------|
| 1 | 2 | Z | -0.610 | 0.00 | 0.20 | 0.00 | * |

Opmerkingen

[*] Deze belasting is handmatig toegevoegd of gewijzigd.

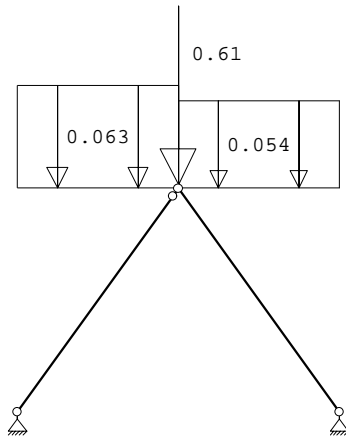
STAAFBELASTINGEN

B.G:8 Sneeuw A

| Staaftype | Type | Index | q1/p/m | q2 | A | B | ψ_0 | ψ_1 | ψ_2 |
|-----------|-------------|-------|--------|-------|-------|-------|----------|----------|----------|
| 1 | 3:QZgeProj. | Qs1 | -0.13 | -0.13 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 2 | 3:QZgeProj. | Qs2 | -0.05 | -0.05 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |

BELASTINGEN

B.G:9 Sneeuw B



KNOOPBELASTINGEN

B.G:9 Sneeuw B

| Last | Knoop | Richting | waarde | ψ_0 | ψ_1 | ψ_2 | Opm. |
|------|-------|----------|--------|----------|----------|----------|------|
| 1 | 2 | Z | -0.610 | 0.00 | 0.20 | 0.00 | * |

Opmerkingen

[*] Deze belasting is handmatig toegevoegd of gewijzigd.

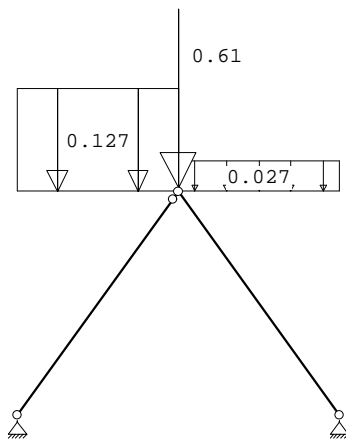
STAAFBELASTINGEN

B.G:9 Sneeuw B

| Staat | Type | Index | q1/p/m | q2 | A | B | ψ_0 | ψ_1 | ψ_2 |
|-------|-------------|-------|--------|-------|-------|-------|----------|----------|----------|
| 1 | 3:QZgeProj. | Qs3 | -0.06 | -0.06 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 2 | 3:QZgeProj. | Qs2 | -0.05 | -0.05 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |

BELASTINGEN

B.G:10 Sneeuw C



KNOOPBELASTINGEN

B.G:10 Sneeuw C

| Last | Knoop | Richting | waarde | ψ_0 | ψ_1 | ψ_2 | Opm. |
|------|-------|----------|--------|----------|----------|----------|------|
| 1 | 2 | Z | -0.610 | 0.00 | 0.20 | 0.00 | * |

Opmerkingen

[*] Deze belasting is handmatig toegevoegd of gewijzigd.

STAAFBELASTINGEN

B.G:10 Sneeuw C

| StAAF | Type | Index | q1/p/m | q2 | A | B | Ψ_0 | Ψ_1 | Ψ_2 |
|-------|-------------|-------|--------|-------|-------|-------|----------|----------|----------|
| 1 | 3:QZgeProj. | Qs1 | -0.13 | -0.13 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 2 | 3:QZgeProj. | Qs4 | -0.03 | -0.03 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |

BEREKENINGSTATUS

| B.C. | Iteratie | Status |
|------|----------|------------------------|
| 1 | 3 | Nauwkeurigheid bereikt |
| 2 | 3 | Nauwkeurigheid bereikt |
| 3 | 3 | Nauwkeurigheid bereikt |
| 4 | 4 | Nauwkeurigheid bereikt |
| 5 | 3 | Nauwkeurigheid bereikt |
| 6 | 3 | Nauwkeurigheid bereikt |
| 7 | 3 | Nauwkeurigheid bereikt |
| 8 | 3 | Nauwkeurigheid bereikt |
| 9 | 3 | Nauwkeurigheid bereikt |
| 10 | 3 | Nauwkeurigheid bereikt |
| 11 | 3 | Nauwkeurigheid bereikt |
| 12 | 3 | Nauwkeurigheid bereikt |
| 13 | 3 | Nauwkeurigheid bereikt |
| 14 | 3 | Nauwkeurigheid bereikt |
| 15 | 3 | Nauwkeurigheid bereikt |
| 16 | 3 | Nauwkeurigheid bereikt |
| 17 | 3 | Nauwkeurigheid bereikt |
| 18 | 3 | Nauwkeurigheid bereikt |
| 19 | 1 | Lineaire berekening |
| 20 | 1 | Lineaire berekening |
| 21 | 1 | Lineaire berekening |
| 22 | 1 | Lineaire berekening |
| 23 | 1 | Lineaire berekening |
| 24 | 1 | Lineaire berekening |
| 25 | 1 | Lineaire berekening |
| 26 | 1 | Lineaire berekening |
| 27 | 1 | Lineaire berekening |
| 28 | 1 | Lineaire berekening |
| 29 | 1 | Lineaire berekening |
| 30 | 1 | Lineaire berekening |
| 31 | 1 | Lineaire berekening |
| 32 | 1 | Lineaire berekening |
| 33 | 1 | Lineaire berekening |
| 34 | 1 | Lineaire berekening |
| 35 | 1 | Lineaire berekening |
| 36 | 1 | Lineaire berekening |

BELASTINGCOMBINATIES

| BC | Type | | | |
|----|-------|------|-----------|-------------------|
| 1 | Fund. | 1.35 | $G_{k,1}$ | |
| 2 | Fund. | 0.90 | $G_{k,1}$ | |
| 3 | Fund. | 1.20 | $G_{k,1}$ | + 1.50 $Q_{k,3}$ |
| 4 | Fund. | 1.20 | $G_{k,1}$ | + 1.50 $Q_{k,4}$ |
| 5 | Fund. | 1.20 | $G_{k,1}$ | + 1.50 $Q_{k,5}$ |
| 6 | Fund. | 1.20 | $G_{k,1}$ | + 1.50 $Q_{k,6}$ |
| 7 | Fund. | 1.20 | $G_{k,1}$ | + 1.50 $Q_{k,7}$ |
| 8 | Fund. | 1.20 | $G_{k,1}$ | + 1.50 $Q_{k,8}$ |
| 9 | Fund. | 1.20 | $G_{k,1}$ | + 1.50 $Q_{k,9}$ |
| 10 | Fund. | 1.20 | $G_{k,1}$ | + 1.50 $Q_{k,10}$ |
| 11 | Fund. | 0.90 | $G_{k,1}$ | + 1.50 $Q_{k,3}$ |
| 12 | Fund. | 0.90 | $G_{k,1}$ | + 1.50 $Q_{k,4}$ |
| 13 | Fund. | 0.90 | $G_{k,1}$ | + 1.50 $Q_{k,5}$ |
| 14 | Fund. | 0.90 | $G_{k,1}$ | + 1.50 $Q_{k,6}$ |
| 15 | Fund. | 0.90 | $G_{k,1}$ | + 1.50 $Q_{k,7}$ |
| 16 | Fund. | 0.90 | $G_{k,1}$ | + 1.50 $Q_{k,8}$ |

BELASTINGCOMBINATIES

| BC | Type | | | | |
|----|-------|------|-----------|---|------------------------|
| 17 | Fund. | 0.90 | $G_{k,1}$ | + | 1.50 $Q_{k,9}$ |
| 18 | Fund. | 0.90 | $G_{k,1}$ | + | 1.50 $Q_{k,10}$ |
| 19 | Kar. | 1.00 | $G_{k,1}$ | + | 1.00 $Q_{k,3}$ |
| 20 | Kar. | 1.00 | $G_{k,1}$ | + | 1.00 $Q_{k,4}$ |
| 21 | Kar. | 1.00 | $G_{k,1}$ | + | 1.00 $Q_{k,5}$ |
| 22 | Kar. | 1.00 | $G_{k,1}$ | + | 1.00 $Q_{k,6}$ |
| 23 | Kar. | 1.00 | $G_{k,1}$ | + | 1.00 $Q_{k,7}$ |
| 24 | Kar. | 1.00 | $G_{k,1}$ | + | 1.00 $Q_{k,8}$ |
| 25 | Kar. | 1.00 | $G_{k,1}$ | + | 1.00 $Q_{k,9}$ |
| 26 | Kar. | 1.00 | $G_{k,1}$ | + | 1.00 $Q_{k,10}$ |
| 27 | Quas. | 1.00 | $G_{k,1}$ | | |
| 28 | Freq. | 1.00 | $G_{k,1}$ | | |
| 29 | Freq. | 1.00 | $G_{k,1}$ | + | 1.00 $\psi_1 Q_{k,4}$ |
| 30 | Freq. | 1.00 | $G_{k,1}$ | + | 1.00 $\psi_1 Q_{k,5}$ |
| 31 | Freq. | 1.00 | $G_{k,1}$ | + | 1.00 $\psi_1 Q_{k,6}$ |
| 32 | Freq. | 1.00 | $G_{k,1}$ | + | 1.00 $\psi_1 Q_{k,7}$ |
| 33 | Freq. | 1.00 | $G_{k,1}$ | + | 1.00 $\psi_1 Q_{k,8}$ |
| 34 | Freq. | 1.00 | $G_{k,1}$ | + | 1.00 $\psi_1 Q_{k,9}$ |
| 35 | Freq. | 1.00 | $G_{k,1}$ | + | 1.00 $\psi_1 Q_{k,10}$ |
| 36 | Blij. | 1.00 | $G_{k,1}$ | | |

GUNSTIGE WERKING PERMANENTE BELASTINGEN

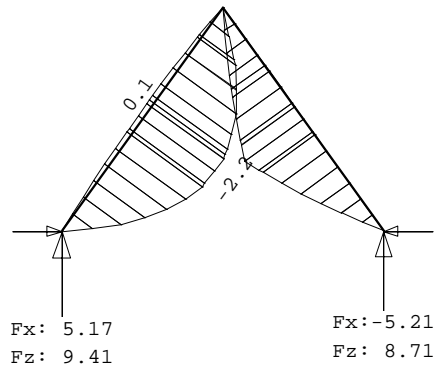
| BC | Staven met gunstige werking |
|----|-----------------------------|
| 1 | Geen |
| 2 | Alle staven de factor:0.90 |
| 3 | Geen |
| 4 | Geen |
| 5 | Geen |
| 6 | Geen |
| 7 | Geen |
| 8 | Geen |
| 9 | Geen |
| 10 | Geen |
| 11 | Alle staven de factor:0.90 |
| 12 | Alle staven de factor:0.90 |
| 13 | Alle staven de factor:0.90 |
| 14 | Alle staven de factor:0.90 |
| 15 | Alle staven de factor:0.90 |
| 16 | Alle staven de factor:0.90 |
| 17 | Alle staven de factor:0.90 |
| 18 | Alle staven de factor:0.90 |

OMHULLENDE VAN DE FUNDAMENTELE COMBINATIES

MOMENTEN

2e orde

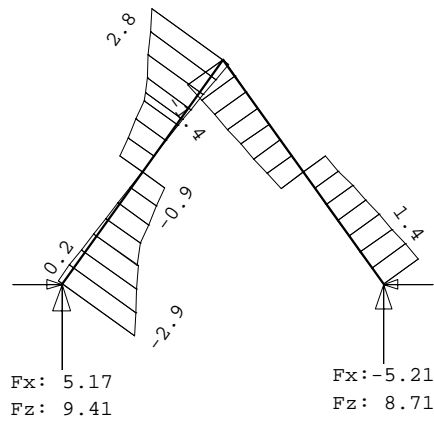
Fundamentele combinatie



DWARSKRACHTEN

2e orde

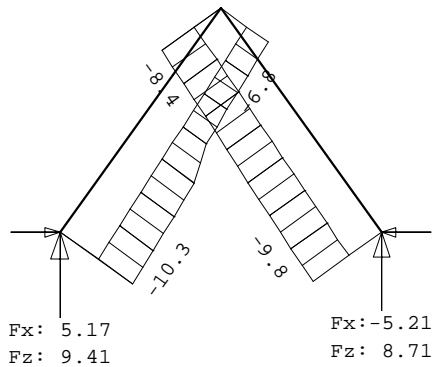
Fundamentele combinatie



NORMAALKRACHTEN

2e orde

Fundamentele combinatie



MATERIAALGEGEVENS

| Mt | Kwaliteit | $f_{m,y,k}$ [N/mm ²] | ρ_k [kg/m ³] | ρ_{mean} [kg/m ³] | $f_{t,0,k}$ [N/mm ²] | $f_{t,90,k}$ [N/mm ²] | $f_{c,0,k}$ [N/mm ²] | $f_{c,90,k}$ [N/mm ²] | $f_{v,k}$ [N/mm ²] |
|----|-----------|-------------------------------------|----------------------------------|---------------------------------------|-------------------------------------|--------------------------------------|-------------------------------------|--------------------------------------|-----------------------------------|
| 1 | C24 | 24 | 350 | 420 | 14.5 | 0.4 | 21.0 | 2.5 | 4.0 |

MATERIAALGEGEVENS (vervolg)

| Mt | Kwaliteit | G_{mean} [N/mm ²] | $E_{0,05}$ [N/mm ²] | $E_{90,mean}$ [N/mm ²] | $E_{0,mean}$ [N/mm ²] | Klimaatklasse | k_{def} | $E_{0,mean,fin}$ [N/mm ²] |
|----|-----------|------------------------------------|------------------------------------|---------------------------------------|--------------------------------------|---------------|-----------|--|
| 1 | C24 | 690 | 7400 | 370 | 11000 | I | 0.60 | 6875 |

KIPSTABILITEIT

| Staat | Plts. aangr. | l sys. [m] | Kipsteunafstanden [m] |
|-------|--------------|----------------------------|-----------------------|
| 1 | 1.0*h | boven: 3.08 onder: 3.08 | 3*1,027 0;3.081 |
| 2 | 1.0*h | boven: 3.08 onder: 3.08 | 3*1,027 0;3.081 |

STABILITEIT

| Stf | b_{gem} [mm] | h_{gem} [mm] | l_{sys} [mm] | $l_{buc,y/z}$ [mm] | λ_y | λ_z | $\lambda_{rel,y/z}$ | β_c | k_y | k_z | $k_{c,y}$ | $k_{c,z}$ |
|-----|-------------------|-------------------|-------------------|-----------------------|-------------|-------------|---------------------|-----------|-------|-------|-----------|-----------|
| 1 | 58 | 170 | 3081 | nvt 1560 | 62.8 | 93.2 | 1.064 1.580 | 0.2 | 1.143 | 1.876 | 0.641 | 0.346 |
| 2 | 58 | 170 | 3081 | nvt 1560 | 62.8 | 93.2 | 1.064 1.580 | 0.2 | 1.143 | 1.876 | 0.641 | 0.346 |

STABILITEIT (vervolg)

| Staat | positie [mm] | $l_{ef,y}$ [mm] | $\sigma_{m,crit}$ [N/mm ²] | $\lambda_{rel,my}$ | $k_{crit,y}$ |
|-------|--------------|--------------------|---|--------------------|--------------|
| 1 | 1540 | 1367 | 83.55 | 0.54 | 1.00 |
| 2 | 1540 | 1367 | 83.55 | 0.54 | 1.00 |

TOETSING SPANNINGEN

TOETSING SPANNINGEN

| | | | | | |
|-------|---|-----------|-------|--------------|------|
| StAAF | 1 | BC / Sit. | 3 / 2 | UC frm(6.23) | 0.55 |
| StAAF | 2 | BC / Sit. | 3 / 1 | UC frm(6.23) | 0.48 |

TOETSING DOORBUIGING

| Stf | Soort | Mtg | l_{sys} [mm] | Overstek i j | BC Sit | u_{bij} [mm] | Toelaatbaar [mm] | $u_{fin,net}$ [mm] | Toelaatbaar *1 | | |
|-----|-------|-----|-------------------|-----------------|--------|-------------------|---------------------|-----------------------|-------------------|-------|-------|
| 1 | Dak | db | 3081 | Nee Nee | 27 1 | -4.9 | -12.3 | 0.004 | -6.9 | -12.3 | 0.004 |
| 2 | Dak | db | 3081 | Nee Nee | 27 1 | -3.4 | -12.3 | 0.004 | -4.4 | -12.3 | 0.004 |

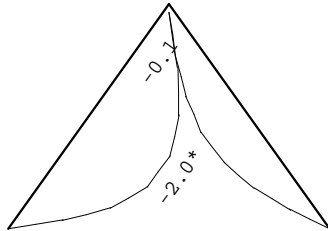
TOETSING DOORBUIGING (vervolg)

| Stf | Soort | Mtg | l_{sys} [mm] | Overstek i j | Zeeg [mm] | BC Sit | u_{inst} [mm] | Toelaatbaar [mm] | *1 |
|-----|-------|-----|-------------------|-----------------|--------------|--------|--------------------|---------------------|-------|
| 1 | Dak | db | 3081 | Nee Nee | 0.0 | 20 1 | -5.7 | -12.3 | 0.004 |
| 2 | Dak | db | 3081 | Nee Nee | 0.0 | 19 1 | -3.8 | -12.3 | 0.004 |

VERVORMINGEN w_1

Blijvende combinatie

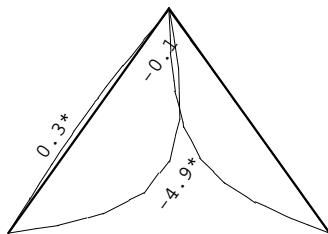
* - relatief aan de rechte lijn die de uiteinden verbindt



VERVORMINGEN w_{bij}

Karakteristieke combinatie

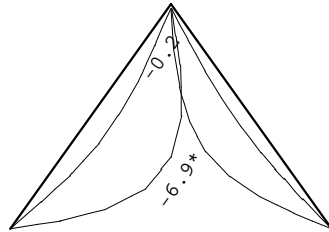
* - relatief aan de rechte lijn die de uiteinden verbindt



VERVORMINGEN W_{max}

Karakteristieke combinatie

* - relatief aan de rechte lijn die de uiteinden verbindt



DOORBUIGINGEN

Karakteristieke combinatie

| Nr. | staven | Zijde | positie | l_{rep} | w_1 | w_2 | W_{bij} | W_{tot} | w_c | W_{max} |
|-----|--------|-------|---------|-----------|-------|-------|-------------|-----------|-------|-------------|
| | | | [m] | [mm] | [mm] | [mm] | [mm][lrep/] | [mm] | [mm] | [mm][lrep/] |
| 1 | 1 | Neg. | 1.712 | 3081 | -2.0 | -1.2 | -4.9 | 627 | -6.9 | 444 |
| 1 | 1 | Pos. | 1.320 | 3081 | -2.0 | -1.2 | 0.3 | 8931 | -1.7 | 1824 |
| 2 | 2 | Neg. | 1.540 | 3081 | -1.1 | -0.6 | -3.4 | 909 | -4.5 | 692 |

TOTALE HORIZONTALE VERPLAATSING

Karakteristieke combinatie

| knoop | Zijde | h | u_1 | u_2 | u_3 | u_{tot} |
|-------|-------|------|-------|-------|-------|-----------|
| | | [mm] | [mm] | [mm] | [mm] | [mm] |
| | | | | | | [h/] |

A.4 Nieuwe kap: nokgording

Technosoft Liggers release 6.80b

11 jul 2024

Project.....: 2023237 - 5.1, 2, e te Amsterdam
Onderdeel....: Nokgording V2
Constructeur.: ME
Dimensies....: kN/m/rad
Datum.....: 02/07/2024
Bestand.....: K:\Werk\2023237\Berekeningen\Technosoft\Kap nieuw -
nokgording V2.dlw

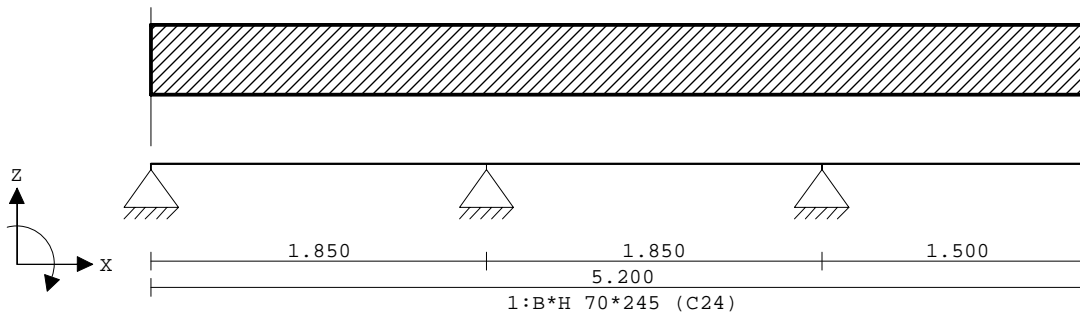
Betrouwbaarheidsklasse : 2 Referentieperiode : 50

Toegepaste normen volgens Eurocode met Nederlandse NB

| | | | |
|-------------|----------------------|-----------------|-------------|
| Belastingen | NEN-EN 1990:2002 | C2:2010,A1:2019 | NB:2019(nl) |
| | NEN-EN 1991-1-1:2002 | C1/C11:2019 | NB:2019(nl) |
| Hout | NEN-EN 1995-1-1:2005 | A1:2011,C1:2006 | NB:2013(nl) |

GEOMETRIE

Ligger:1



VELDLENGTEN

Ligger:1

| Veld | Vanaf | Tot | Lengte |
|------|-------|-------|--------|
| 1 | 0.000 | 1.850 | 1.850 |
| 2 | 1.850 | 3.700 | 1.850 |
| 3 | 3.700 | 5.200 | 1.500 |

MATERIALEN

| Mt | Kwaliteit | E-modulus[N/mm ²] | S.G. | S.G.verhoogd | Pois. | Uitz. coëff |
|----|-----------|-------------------------------|------|--------------|-------|-------------|
| 1 | C24 | 11000 | 3.5 | 4.2 | 1.00 | 5.0000e-06 |

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

PROFIELEN [mm]

| Prof. | Omschrijving | Materiaal | Oppervlak | Traagheid | Vormf. |
|-------|--------------|-----------|------------|------------|--------|
| 1 | B*H 70*245 | 1:C24 | 1.7150e+04 | 8.5786e+07 | 0.00 |

PROFIELEN vervolg [mm]

| Prof. | Staaftype | Breedte | Hoogte | e | Type | b1 | h1 | b2 | h2 |
|-------|-----------|---------|--------|-------|------|----|----|----|----|
| 1 | 0:Normaal | 70 | 245 | 122.5 | 0:RH | | | | |

PROFIELVORMEN [mm]

1 B*H 70*245



BELASTINGGEVALLEN

| B.G. | Omschrijving | Belast/onbelast | ψ_0 | ψ_1 | ψ_2 | e.g. |
|------|-----------------------------|---------------------|----------|----------|----------|------|
| 1 | Permanent | 2:Permanent EN1991 | | | | 0.00 |
| 2 | Sneeuw | 1:Schaakbord EN1991 | 0.00 | 0.20 | 0.00 | 0.00 |
| 3 | Veranderlijk Q _k | 1:Schaakbord EN1991 | 0.00 | 0.00 | 0.00 | 0.00 |

BELASTINGGEVALLEN

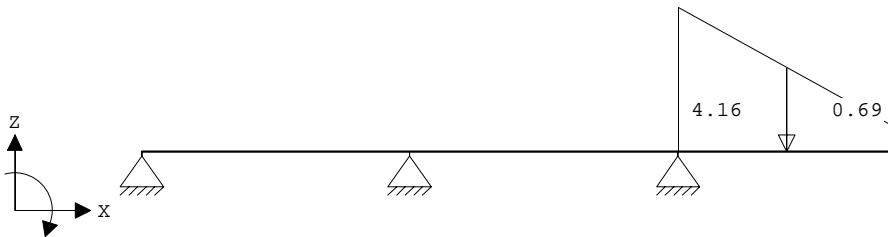
| B.G. | Omschrijving | Type |
|------|-----------------------------|---|
| 1 | Permanent | 1 Permanente belasting |
| 2 | Sneeuw | 22 Sneeuw A |
| 3 | Veranderlijk Q _k | 3 Ver. bel. pers. ed. (Q _k) |

BELASTINGGEVALLEN vervolg

| B.G. | Omschrijving | Belastingduurklasse |
|------|-----------------------------|---------------------|
| 1 | Permanent | Blijvend |
| 2 | Sneeuw | Kort |
| 3 | Veranderlijk Q _k | Kort |

VELDBELASTINGEN

Ligger:1 B.G:1 Permanent



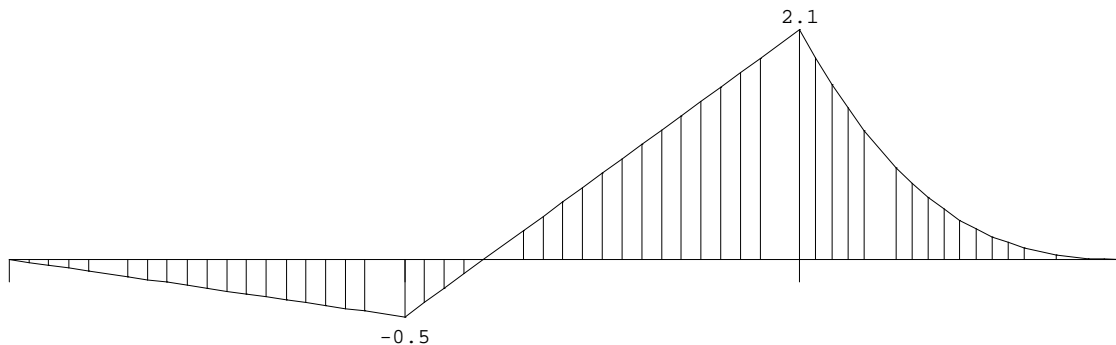
VELDBELASTINGEN

Ligger:1 B.G:1 Permanent

| Last Ref. | Type | Omschrijving | q1/p/m | q2 | psi | Afstand | Lengte |
|-----------|----------|--------------|--------|--------|-----|---------|--------|
| 1 | 1:g-last | | -4.160 | -0.690 | | 3.700 | 1.500 |

MOMENTEN

Ligger:1 B.G:1 Permanent



KIPSTABILITEIT

Ligger:1

| Staal | Plts. aangr. | l sys. [m] | Kipsteunafstanden [m] |
|-------|--------------|------------|-----------------------|
| 1 | 1.0*h | boven: | 1.85 0,000;3*,617 |
| | | onder: | 1.85 0,000;3*,617 |
| 2 | 1.0*h | boven: | 1.85 3*,617 |
| | | onder: | 1.85 0;3*,617 |
| 3 | 1.0*h | boven: | 1.50 0;3*,5 |
| | | onder: | 1.50 0;3*,5 |

STABILITEIT

| Staal | positie [mm] | $l_{ef,y}$ [mm] | $\sigma_{my,crit}$ [N/mm ²] | $\lambda_{rel,my}$ | $k_{crit,y}$ |
|-------|--------------|-----------------|---|--------------------|--------------|
| 1 | 1850 | 1106 | 104.38 | 0.48 | 1.00 |
| 2 | 1850 | 494 | 233.92 | 0.32 | 1.00 |
| 3 | 0 | 378 | 305.80 | 0.28 | 1.00 |

TOETSING SPANNINGEN

| Staal | 1 | BC / Sit. | 3 / 1 | UC frm(6.11) | 0.15 |
|-------|---|-----------|-------|--------------|------|
| Staal | 2 | BC / Sit. | 3 / 1 | UC frm(6.11) | 0.60 |
| Staal | 3 | BC / Sit. | 3 / 1 | UC frm(6.11) | 0.60 |

TOETSING DOORBUIGING

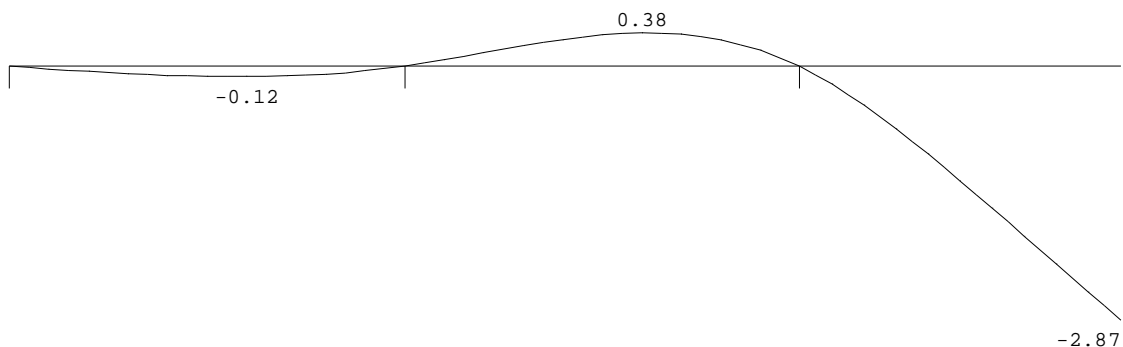
| Stf | Soort | Mtg | l_{sys} [mm] | Overstek i j | BC | Sit | u_{bij} [mm] | Toelaatbaar [mm] | $u_{fin,net}$ [mm] | Toelaatbaar [mm] |
|-----|-------|-----|----------------|--------------|----|-----|----------------|------------------|--------------------|------------------|
| 1 | Dak | db | 1850 | Nee Nee | 11 | 1 | -0.2 | -7.4 0.004 | -0.4 | -7.4 0.004 |
| 2 | Dak | db | 1850 | Nee Nee | 11 | 1 | 0.8 | 7.4 0.004 | 1.1 | 7.4 0.004 |
| 3 | Dak | ss | 1500 | Nee Ja | 11 | 1 | -6.7 | -12.0 2*0.004 | -9.5 | -12.0 2*0.004 |

TOETSING DOORBUIGING (vervolg)

| Stf | Soort | Mtg | l_{sys} [mm] | Overstek i j | Zeeg [mm] | BC | Sit | u_{inst} [mm] | Toelaatbaar [mm] |
|-----|-------|-----|----------------|--------------|-----------|----|-----|-----------------|------------------|
| 1 | Dak | db | 1850 | Nee Nee | 0.0 | 8 | 1 | -0.3 | -7.4 0.004 |
| 2 | Dak | db | 1850 | Nee Nee | 0.0 | 8 | 1 | 0.9 | 7.4 0.004 |
| 3 | Dak | ss | 1500 | Nee Ja | 0.0 | 8 | 1 | -7.8 | -12.0 2*0.004 |

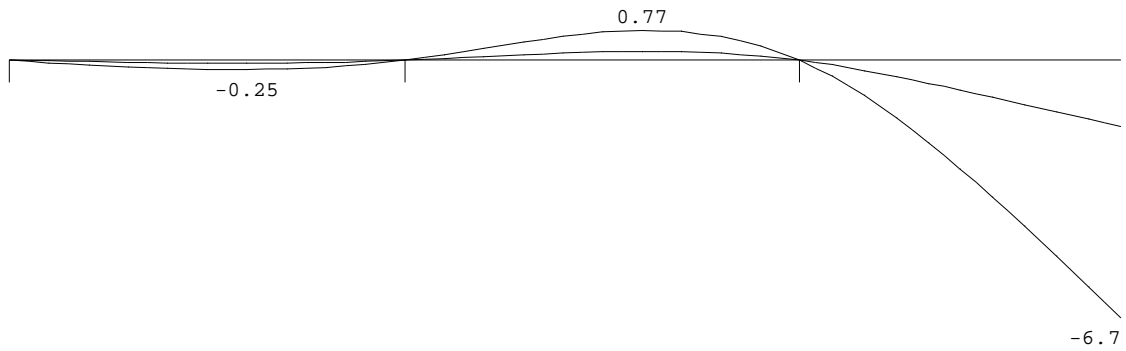
DOORBUIGINGEN w1 [mm]

Ligger:1 Blijvende combinatie



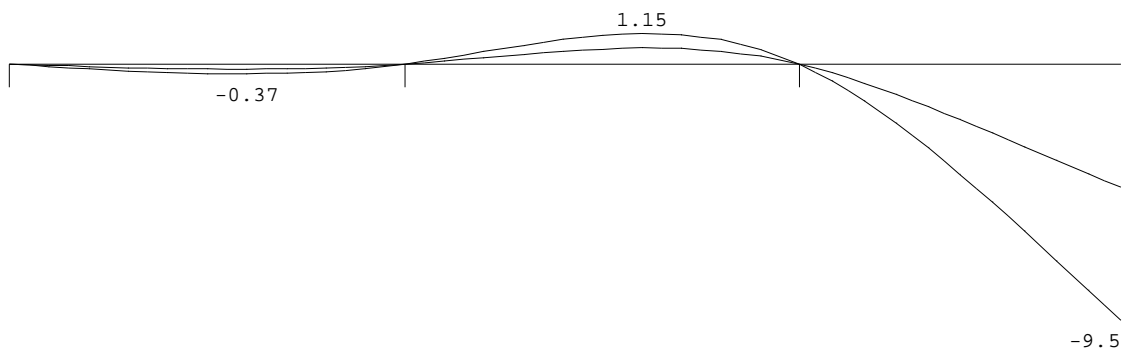
DOORBUIGINGEN W_{bij} [mm]

Ligger:1 Karakteristieke combinatie



DOORBUIGINGEN W_{max} [mm]

Ligger:1 Karakteristieke combinatie



DOORBUIGINGEN

Karakteristieke combinatie

| Veld | Zijde | positie | l_{rep} | W_1 | W_2 | W_{bij} | W_{tot} | W_c | W_{max} |
|------|-------|---------|-----------|-------|-------|-------------|-----------|-------|-------------|
| | | [m] | [mm] | [mm] | [mm] | [mm][lrep/] | [mm] | [mm] | [mm][lrep/] |
| 1 | Neg. | 1.110 | 1850 | -0.1 | -0.1 | -0.2 | 7507 | -0.4 | -0.4 |
| 2 | Pos. | 1.110 | 1850 | 0.4 | 0.2 | 0.8 | 2402 | 1.1 | 1.1 |
| 3 | Neg. | / | 3000 | -2.9 | -1.7 | -6.7 | 449 | -9.5 | -9.5 |
| 3 | Pos. | 0.750 | 1500 | 0.1 | 0.1 | 0.5 | 2824 | 0.7 | 0.7 |

A.5 Nieuwe kap: hoekkeper

Technosoft Raamwerken release 6.80

8 mrt 2024

Project.....: 2023237 - 5.1, 2, e te Amsterdam
 Onderdeel....: Kap nieuw - hoekkeper
 Constructeur.: ME
 Dimensies....: kN/m/rad (tenzij anders aangegeven)
 Datum.....: 22/02/2024
 Bestand.....: K:\Werk\2023237\Berekeningen\Technosoft\Sporenkap -
 hoekkeper.rww

Belastingbreedte.: 1.800
 Rekenmodel.....: 2e-orde-elastisch.
 Theorieën voor de bepaling van de krachtsverdeling:
 1) Uiterste grenstoestand:
 Geometrisch niet lineair alle staven.
 Fysisch lineair alle staven.
 2) Gebruiksgrenstoestand:
 Lineaire-elasticiteitstheorie

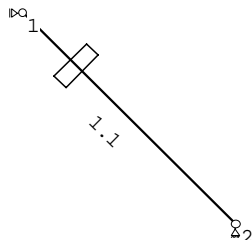
Maximum aantal iteraties.....: 50
 Max.deellengte kolommen/wanden: 0.500 Max.deellengte balken/vloeren: 0.500
 Max. X-verplaatsing in UGT....: 0.500 Max. Z-verplaatsing in UGT...: 0.250

Gunstige werking van de permanente belasting wordt automatisch verwerkt.

Toegepaste normen volgens Eurocode met Nederlandse NB

| Belastingen | NEN-EN 1990:2002 | C2:2010,A1:2019 | NB:2019(nl) |
|-------------|----------------------|-----------------|-------------|
| | NEN-EN 1991-1-1:2002 | C1/C11:2019 | NB:2019(nl) |
| Hout | NEN-EN 1995-1-1:2005 | A1:2011,C1:2006 | NB:2013(nl) |

GEOMETRIE



MATERIALEN

| Mt | Kwaliteit | E-modulus[N/mm ²] | S.G. | S.G.verhoogd | Pois. | Uitz. coëff |
|----|-----------|-------------------------------|------|--------------|-------|-------------|
| 1 | C24 | 11000 | 3.5 | 4.2 | 1.00 | 5.0000e-06 |

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

PROFIELEN [mm]

| Prof. | Omschrijving | Materiaal | Oppervlak | Traagheid | Vormf. |
|-------|--------------|-----------|------------|------------|--------|
| 1 | B*H 70*195 | 1:C24 | 1.3650e+04 | 4.3253e+07 | 0.00 |

PROFIELEN vervolg [mm]

| Prof. | Staaftype | Breedte | Hoogte | e | Type | b1 | h1 | b2 | h2 |
|-------|-----------|---------|--------|------|------|----|----|----|----|
| 1 | 0:Normaal | 70 | 195 | 97.5 | 0:RH | | | | |

PROFIELVORMEN [mm]

1 B*H 70*195



KNOPEN

| Knoop | X | Z |
|-------|-------|-------|
| 1 | 0.000 | 2.500 |
| 2 | 2.530 | 0.000 |

STAVEN

| St. | ki | kj | Profiel | Aansl.i | Aansl.j | Lengte | Opm. |
|-----|----|----|--------------|---------|---------|--------|------|
| 1 | 1 | 2 | 1:B*H 70*195 | NDM | NDM | 3.557 | |

VASTE STEUNPUNTEN

| Nr. knoop | Kode | XZR | l=vast | 0=vrij | Hoek |
|-----------|------|-----|--------|--------|------|
| 1 | 1 | 100 | | | 0.00 |
| 2 | 2 | 110 | | | 0.00 |

BELASTINGGENERATIE ALGEMEEN.

| | | | |
|------------------------------|------|-------------------------|------|
| Betrouwbaarheidsklasse.....: | 2 | Referentieperiode.....: | 50 |
| Gebouwdiepte.....: | 0.00 | Gebouwhoogte.....: | 2.50 |
| Niveau aansl.terrein.....: | 0.00 | E.g. scheid.w. [kN/m2]: | 0.00 |

BELASTINGGEVALLEN

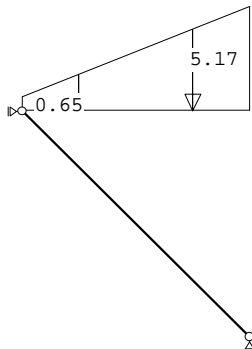
| B.G. | Omschrijving | EGZ=0.00 | Type |
|------|----------------------|----------|------------------------------|
| 1 | Permanente belasting | | 1 |
| 2 | Veranderlijk wind | | 7 Wind van links onderdruk A |
| 3 | Veranderlijk sneeuw | | 22 Sneeuw A |

BELASTINGGEVALLEN vervolg

| B.G. | Omschrijving | Belastingduurklasse |
|------|----------------------|---------------------|
| 1 | Permanente belasting | Blijvend |
| 2 | Veranderlijk wind | Kort |
| 3 | Veranderlijk sneeuw | Kort |

BELASTINGEN

B.G:1 Permanente belasting



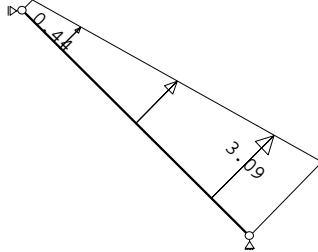
STAAFBELASTINGEN

B.G:1 Permanente belasting

| StAAF | Type | q1/p/m | q2 | A | B | Ψ_0 | Ψ_1 | Ψ_2 |
|-------|-------------|--------|-------|-------|-------|----------|----------|----------|
| 1 | 3:QZgeProj. | -0.65 | -5.17 | 0.000 | 0.000 | | | |

BELASTINGEN

B.G:2 Veranderlijk wind



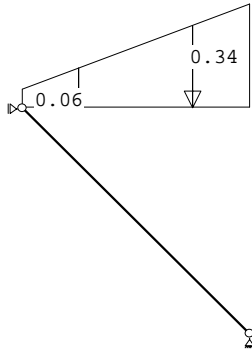
STAAFBELASTINGEN

B.G:2 Veranderlijk wind

| StAAF | Type | q1/p/m | q2 | A | B | Ψ_0 | Ψ_1 | Ψ_2 |
|-------|------------|--------|------|-------|-------|----------|----------|----------|
| 1 | 1:QZLokaal | 0.44 | 3.09 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |

BELASTINGEN

B.G:3 Veranderlijk sneeuw



STAAFBELASTINGEN

B.G:3 Veranderlijk sneeuw

| StAAF | Type | q1/p/m | q2 | A | B | Ψ_0 | Ψ_1 | Ψ_2 |
|-------|-------------|--------|-------|-------|-------|----------|----------|----------|
| 1 | 3:QZgeProj. | -0.06 | -0.34 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |

BEREKENINGSTATUS

| B.C. | Iteratie | Status |
|------|----------|------------------------|
| 1 | 3 | Nauwkeurigheid bereikt |
| 2 | 3 | Nauwkeurigheid bereikt |
| 3 | 3 | Nauwkeurigheid bereikt |
| 4 | 3 | Nauwkeurigheid bereikt |
| 5 | 3 | Nauwkeurigheid bereikt |
| 6 | 3 | Nauwkeurigheid bereikt |
| 7 | 1 | Lineaire berekening |
| 8 | 1 | Lineaire berekening |
| 9 | 1 | Lineaire berekening |
| 10 | 1 | Lineaire berekening |
| 11 | 1 | Lineaire berekening |
| 12 | 1 | Lineaire berekening |
| 13 | 1 | Lineaire berekening |

BELASTINGCOMBINATIES

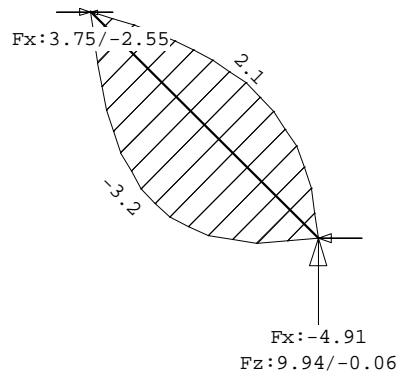
| BC | Type | | | | |
|----|-------|------|-----------|---|-----------------------|
| 1 | Fund. | 1.35 | $G_{k,1}$ | | |
| 2 | Fund. | 0.90 | $G_{k,1}$ | | |
| 3 | Fund. | 1.20 | $G_{k,1}$ | + | 1.50 $Q_{k,2}$ |
| 4 | Fund. | 1.20 | $G_{k,1}$ | + | 1.50 $Q_{k,3}$ |
| 5 | Fund. | 0.90 | $G_{k,1}$ | + | 1.50 $Q_{k,2}$ |
| 6 | Fund. | 0.90 | $G_{k,1}$ | + | 1.50 $Q_{k,3}$ |
| 7 | Kar. | 1.00 | $G_{k,1}$ | + | 1.00 $Q_{k,2}$ |
| 8 | Kar. | 1.00 | $G_{k,1}$ | + | 1.00 $Q_{k,3}$ |
| 9 | Quas. | 1.00 | $G_{k,1}$ | | |
| 10 | Freq. | 1.00 | $G_{k,1}$ | | |
| 11 | Freq. | 1.00 | $G_{k,1}$ | + | 1.00 $\psi_1 Q_{k,2}$ |
| 12 | Freq. | 1.00 | $G_{k,1}$ | + | 1.00 $\psi_1 Q_{k,3}$ |
| 13 | Blij. | 1.00 | $G_{k,1}$ | | |

GUNSTIGE WERKING PERMANENTE BELASTINGEN

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

OMHULLENDE VAN DE FUNDAMENTELE COMBINATIES

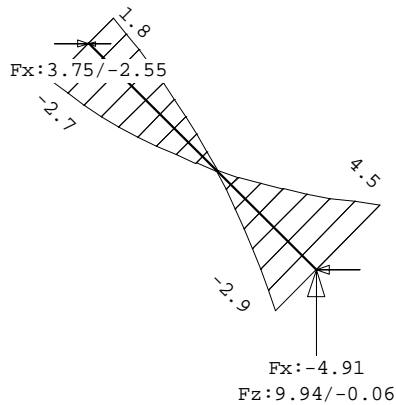
| MOMENTEN | 2e orde | Fundamentele combinatie |
|----------|---------|-------------------------|
|----------|---------|-------------------------|



DWARSKRACHTEN

2e orde

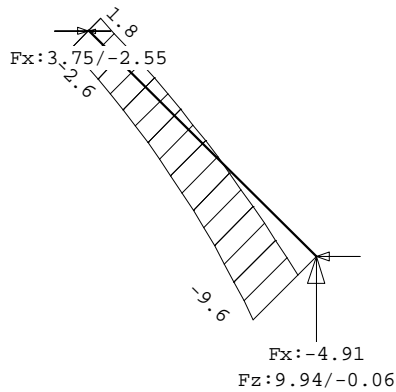
Fundamentele combinatie



NORMAALKRACHTEN

2e orde

Fundamentele combinatie



MATERIAALGEGEVENS

| Mt | Kwaliteit | $f_{m,y,k}$ [N/mm ²] | ρ_k [kg/m ³] | ρ_{mean} [kg/m ³] | $f_{t,0,k}$ [N/mm ²] | $f_{t,90,k}$ [N/mm ²] | $f_{c,0,k}$ [N/mm ²] | $f_{c,90,k}$ [N/mm ²] | $f_{v,k}$ [N/mm ²] |
|----|-----------|-------------------------------------|----------------------------------|---------------------------------------|-------------------------------------|--------------------------------------|-------------------------------------|--------------------------------------|-----------------------------------|
| 1 | C24 | 24 | 350 | 420 | 14.5 | 0.4 | 21.0 | 2.5 | 4.0 |

MATERIAALGEGEVENS (vervolg)

| Mt | Kwaliteit | G_{mean} [N/mm ²] | $E_{0,05}$ [N/mm ²] | $E_{90,mean}$ [N/mm ²] | $E_{0,mean}$ [N/mm ²] | Klimaatklasse | k_{def} | $E_{0,mean,fin}$ [N/mm ²] |
|----|-----------|------------------------------------|------------------------------------|---------------------------------------|--------------------------------------|---------------|-----------|--|
| 1 | C24 | 690 | 7400 | 370 | 11000 | I | 0.60 | 6875 |

KIPSTABILITEIT

| Staaft | Plts. aangr. | l | sys. | Kipsteunafstanden |
|--------|--------------|--------|------|-------------------|
| | | [m] | [m] | [m] |
| 1 | 1.0*h | boven: | 3.56 | 4*,889 |
| | | onder: | 3.56 | 4*,889 |

STABILITEIT

| Stf | D _{gem} [mm] | H _{gem} [mm] | l _{sys} [mm] | l _{buc,y/z} [mm] | λ _y | λ _z | λ _{rel,y/z} | β _c | K _y | K _z | K _{c,y} | K _{c,z} | | |
|-----|--------------------------|--------------------------|--------------------------|------------------------------|----------------|----------------|----------------------|----------------|----------------|----------------|------------------|------------------|-------|-------|
| 1 | 70 | 195 | 3557 | nvt | 1780 | 63.2 | 88.1 | 1.071 | 1.494 | 0.2 | 1.151 | 1.735 | 0.636 | 0.382 |

STABILITEIT (vervolg)

| Staf | positie [mm] | l _{eff,y} [mm] | σ _{m,y,crit} [N/mm ²] | λ _{rel,m,y} | k _{crit,y} |
|------|-----------------|----------------------------|---|----------------------|---------------------|
| 1 | 2223 | 1279 | 113.40 | 0.46 | 1.00 |

TOETSING SPANNINGEN

| | | | | | |
|------|---|-----------|-------|--------------|------|
| Staf | 1 | BC / Sit. | 1 / 1 | UC frm(6.23) | 0.72 |
|------|---|-----------|-------|--------------|------|

TOETSING DOORBUIGING

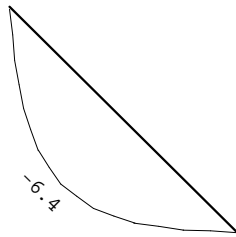
| Stf | Soort | Mtg | l _{sys} [mm] | Overstek i j | BC | Sit | u _{bij} [mm] | Toelaatbaar [mm] | *1 | u _{fin,net} [mm] | Toelaatbaar [mm] | *1 |
|-----|-------|-----|--------------------------|-----------------|----|-----|--------------------------|---------------------|-------|------------------------------|---------------------|-------|
| 1 | Dak | db | 3557 | Nee Nee | 9 | 1 | -4.3 | -14.2 | 0.004 | -10.8 | -14.2 | 0.004 |

TOETSING DOORBUIGING (vervolg)

| Stf | Soort | Mtg | l _{sys} [mm] | Overstek i j | Zeeg [mm] | BC | Sit | u _{inst} [mm] | Toelaatbaar [mm] | *1 |
|-----|-------|-----|--------------------------|-----------------|--------------|----|-----|---------------------------|---------------------|-------|
| 1 | Dak | db | 3557 | Nee Nee | 0.0 | 8 | 1 | -6.9 | -14.2 | 0.004 |

VERVORMINGEN w1

Blijvende combinatie



A.6 Nieuwe kap: kilkeper

Technosoft Raamwerken release 6.81a

11 jul 2024

Project.....: 2023237 - 5.1, 2, e te Amsterdam
Onderdeel....: Kap nieuw - hoekkeper
Constructeur.: ME
Dimensies....: kN;m;rad (tenzij anders aangegeven)
Datum.....: 22/02/2024
Bestand.....: K:\Werk\2023237\Berekeningen\Technosoft\Sporenkap -
kilkeper V2.rww

Belastingbreedte.: 1.800
Rekenmodel.....: 2e-orde-elastisch.
Theorieën voor de bepaling van de krachtsverdeling:
1) Uiterste grenstoestand:
Geometrisch niet lineair alle staven.
Fysisch lineair alle staven.
2) Gebruiksgrenstoestand:
Lineaire-elasticiteitstheorie

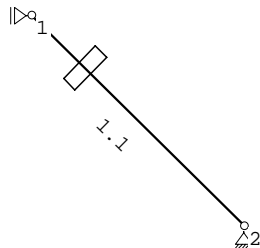
Maximum aantal iteraties.....: 50
Max.deellengte kolommen/wanden: 0.500 Max.deellengte balken/vloeren: 0.500
Max. X-verplaatsing in UGT....: 0.500 Max. Z-verplaatsing in UGT...: 0.250

Gunstige werking van de permanente belasting wordt automatisch verwerkt.

Toegepaste normen volgens Eurocode met Nederlandse NB

| Belastingen | NEN-EN 1990:2002 | C2:2010,A1:2019 | NB:2019(nl) |
|-------------|----------------------|-----------------|-------------|
| | NEN-EN 1991-1-1:2002 | C1/C11:2019 | NB:2019(nl) |
| Hout | NEN-EN 1995-1-1:2005 | A1:2011,C1:2006 | NB:2013(nl) |

GEOMETRIE



MATERIALEN

| Mt | Kwaliteit | E-modulus[N/mm2] | S.G. | S.G.verhoogd | Pois. | Uitz. coëff |
|----|-----------|------------------|------|--------------|-------|-------------|
| 1 | C24 | 11000 | 3.5 | 4.2 | 1.00 | 5.0000e-06 |

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

PROFIELEN [mm]

| Prof. | Omschrijving | Materiaal | Oppervlak | Traagheid | Vormf. |
|-------|--------------|-----------|------------|------------|--------|
| 1 | B*H 70*195 | 1:C24 | 1.3650e+04 | 4.3253e+07 | 0.00 |

PROFIELEN vervolg [mm]

| Prof. | Staaftype | Breedte | Hoogte | e | Type | b1 | h1 | b2 | h2 |
|-------|-----------|---------|--------|------|------|----|----|----|----|
| 1 | 0:Normaal | 70 | 195 | 97.5 | 0:RH | | | | |

PROFIELVORMEN [mm]

1 B*H 70*195



KNOPEN

| Knoop | X | Z |
|-------|-------|-------|
| 1 | 0.000 | 2.500 |
| 2 | 2.530 | 0.000 |

STAVEN

| St. | ki | kj | Profiel | Aansl.i | Aansl.j | Lengte | Opm. |
|-----|----|----|--------------|---------|---------|--------|------|
| 1 | 1 | 2 | 1:B*H 70*195 | NDM | NDM | 3.557 | |

VASTE STEUNPUNTEN

| Nr. knoop | Kode | XZR | l=vast | 0=vrij | Hoek |
|-----------|------|-----|--------|--------|------|
| 1 | 1 | 100 | | | 0.00 |
| 2 | 2 | 110 | | | 0.00 |

BELASTINGGENERATIE ALGEMEEN.

| | | | |
|------------------------------|------|-------------------------|------|
| Betrouwbaarheidsklasse.....: | 2 | Referentieperiode.....: | 50 |
| Gebouwdiepte.....: | 0.00 | Gebouwhoogte.....: | 2.50 |
| Niveau aansl.terrein.....: | 0.00 | E.g. scheid.w. [kN/m2]: | 0.00 |

BELASTINGGEVALLEN

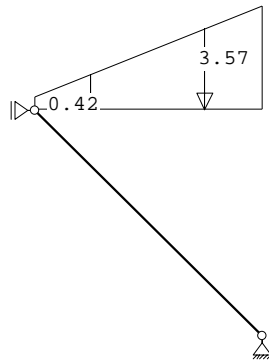
| B.G. | Omschrijving | EGZ=0.00 | Type |
|------|-----------------------------|----------|---|
| 1 | Permanente belasting | | 1 |
| 2 | Veranderlijk Q _k | | 3 Ver. bel. pers. ed. (Q _k) |
| 3 | Veranderlijk wind | | 7 Wind van links onderdruk A |
| 4 | Veranderlijk sneeuw | | 22 Sneeuw A |

BELASTINGGEVALLEN vervolg

| B.G. | Omschrijving | Belastingduurklasse |
|------|-----------------------------|---------------------|
| 1 | Permanente belasting | Blijvend |
| 2 | Veranderlijk Q _k | Kort |
| 3 | Veranderlijk wind | Kort |
| 4 | Veranderlijk sneeuw | Kort |

BELASTINGEN

B.G:1 Permanente belasting



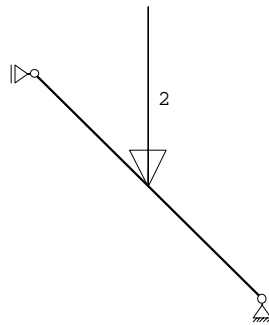
STAAFBELASTINGEN

B.G:1 Permanente belasting

| StAAF | Type | q1/p/m | q2 | A | B | Ψ_0 | Ψ_1 | Ψ_2 |
|-------|-------------|--------|-------|-------|-------|----------|----------|----------|
| 1 | 3:QZgeProj. | -0.42 | -3.57 | 0.000 | 0.000 | | | |

BELASTINGEN

B.G:2 Veranderlijk Q_k



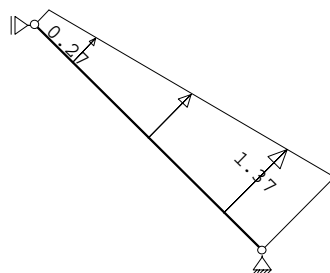
STAAFBELASTINGEN

B.G:2 Veranderlijk Q_k

| StAAF | Type | q1/p/m | q2 | A | B | Ψ_0 | Ψ_1 | Ψ_2 |
|-------|---------------|--------|----|-------|---|----------|----------|----------|
| 1 | 10:PZGeproij. | -2.00 | | 1.779 | | 0.00 | 0.00 | 0.00 |

BELASTINGEN

B.G:3 Veranderlijk wind



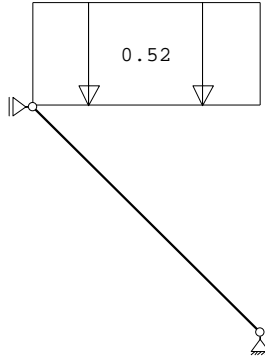
STAAFBELASTINGEN

B.G:3 Veranderlijk wind

| StAAF | Type | q1/p/m | q2 | A | B | Ψ_0 | Ψ_1 | Ψ_2 |
|-------|------------|--------|------|-------|-------|----------|----------|----------|
| 1 | 1:QZLokaal | 0.27 | 1.37 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |

BELASTINGEN

B.G:4 Veranderlijk sneeuw



STAAFBELASTINGEN

B.G:4 Veranderlijk sneeuw

| StAAF | Type | q1/p/m | q2 | A | B | Ψ_0 | Ψ_1 | Ψ_2 |
|-------|-------------|--------|-------|-------|-------|----------|----------|----------|
| 1 | 3:QZgeProj. | -0.52 | -0.52 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |

BEREKENINGSTATUS

| B.C. | Iteratie | Status |
|------|----------|------------------------|
| 1 | 3 | Nauwkeurigheid bereikt |
| 2 | 3 | Nauwkeurigheid bereikt |
| 3 | 3 | Nauwkeurigheid bereikt |
| 4 | 3 | Nauwkeurigheid bereikt |
| 5 | 3 | Nauwkeurigheid bereikt |
| 6 | 3 | Nauwkeurigheid bereikt |
| 7 | 3 | Nauwkeurigheid bereikt |
| 8 | 3 | Nauwkeurigheid bereikt |
| 9 | 1 | Lineaire berekening |
| 10 | 1 | Lineaire berekening |
| 11 | 1 | Lineaire berekening |
| 12 | 1 | Lineaire berekening |
| 13 | 1 | Lineaire berekening |
| 14 | 1 | Lineaire berekening |
| 15 | 1 | Lineaire berekening |
| 16 | 1 | Lineaire berekening |

BELASTINGCOMBINATIES

| BC | Type | | | | |
|----|-------|------|-----------|---|-----------------------|
| 1 | Fund. | 1.35 | $G_{k,1}$ | | |
| 2 | Fund. | 0.90 | $G_{k,1}$ | | |
| 3 | Fund. | 1.20 | $G_{k,1}$ | + | 1.50 $Q_{k,2}$ |
| 4 | Fund. | 1.20 | $G_{k,1}$ | + | 1.50 $Q_{k,3}$ |
| 5 | Fund. | 1.20 | $G_{k,1}$ | + | 1.50 $Q_{k,4}$ |
| 6 | Fund. | 0.90 | $G_{k,1}$ | + | 1.50 $Q_{k,2}$ |
| 7 | Fund. | 0.90 | $G_{k,1}$ | + | 1.50 $Q_{k,3}$ |
| 8 | Fund. | 0.90 | $G_{k,1}$ | + | 1.50 $Q_{k,4}$ |
| 9 | Kar. | 1.00 | $G_{k,1}$ | + | 1.00 $Q_{k,2}$ |
| 10 | Kar. | 1.00 | $G_{k,1}$ | + | 1.00 $Q_{k,3}$ |
| 11 | Kar. | 1.00 | $G_{k,1}$ | + | 1.00 $Q_{k,4}$ |
| 12 | Quas. | 1.00 | $G_{k,1}$ | | |
| 13 | Freq. | 1.00 | $G_{k,1}$ | | |
| 14 | Freq. | 1.00 | $G_{k,1}$ | + | 1.00 $\Psi_1 Q_{k,3}$ |

BELASTINGCOMBINATIES

BC Type

15 Freq. 1.00 $G_{k,1}$ + 1.00 $\psi_1 Q_{k,4}$

16 Blij. 1.00 $G_{k,1}$

GUNSTIGE WERKING PERMANENTE BELASTINGEN

BC Staven met gunstige werking

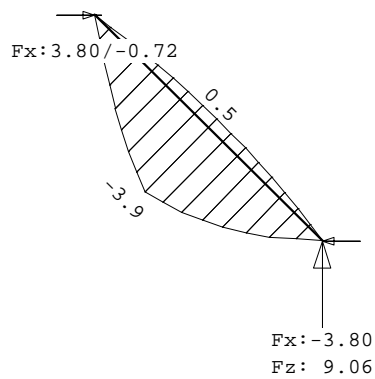
- 1 Geen
- 2 Alle staven de factor:0.90
- 3 Geen
- 4 Geen
- 5 Geen
- 6 Alle staven de factor:0.90
- 7 Alle staven de factor:0.90
- 8 Alle staven de factor:0.90

OMHULLENDE VAN DE FUNDAMENTELE COMBINATIES

MOMENTEN

2e orde

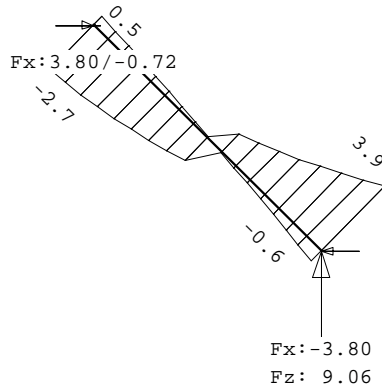
Fundamentele combinatie



DWARSKRACHTEN

2e orde

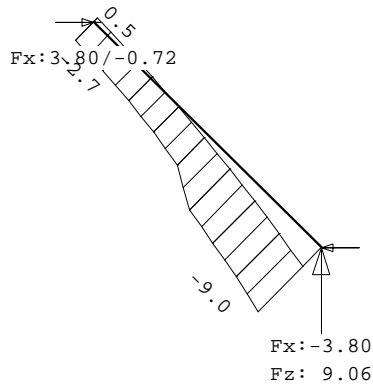
Fundamentele combinatie



NORMAALKRACHTEN

2e orde

Fundamentele combinatie



MATERIAALGEGEVENS

| Mt | Kwaliteit | $f_{m,y,k}$ [N/mm ²] | ρ_k [kg/m ³] | ρ_{mean} [kg/m ³] | $f_{t,0,k}$ [N/mm ²] | $f_{t,90,k}$ [N/mm ²] | $f_{c,0,k}$ [N/mm ²] | $f_{c,90,k}$ [N/mm ²] | $f_{v,k}$ [N/mm ²] |
|----|-----------|-------------------------------------|----------------------------------|---------------------------------------|-------------------------------------|--------------------------------------|-------------------------------------|--------------------------------------|-----------------------------------|
| 1 | C24 | 24 | 350 | 420 | 14.5 | 0.4 | 21.0 | 2.5 | 4.0 |

MATERIAALGEGEVENS (vervolg)

| Mt | Kwaliteit | G_{mean} [N/mm ²] | $E_{0,05}$ [N/mm ²] | $E_{90,mean}$ [N/mm ²] | $E_{0,mean}$ [N/mm ²] | Klimaatklasse | k_{def} | $E_{0,mean,fin}$ [N/mm ²] |
|----|-----------|------------------------------------|------------------------------------|---------------------------------------|--------------------------------------|---------------|-----------|--|
| 1 | C24 | 690 | 7400 | 370 | 11000 | I | 0.60 | 6875 |

KIPSTABILITEIT

| StAAF | Plts. aangr. | 1 sys. | Kipsteunafstanden [m] [m] |
|-------|-----------------|------------------|------------------------------|
| 1 | 1.0*h | boven: onder: | 3.56 0;3.557 3.56 0;3.557 |

STABILITEIT

| Stf | D _{gem} [mm] | H _{gem} [mm] | l _{sys} [mm] | l _{buc,y/z} [mm] | λ _y | λ _z | λ _{rel,y/z} | β _c | K _y | K _z | K _{c,y} | K _{c,z} | | |
|-----|--------------------------|--------------------------|--------------------------|------------------------------|----------------|----------------|----------------------|----------------|----------------|----------------|------------------|------------------|-------|-------|
| 1 | 70 | 195 | 3557 | nvt | 3557 | 63.2 | 176.0 | 1.071 | 2.985 | 0.2 | 1.151 | 5.223 | 0.636 | 0.105 |

STABILITEIT (vervolg)

| Staf | positie [mm] | l _{eff,y} [mm] | σ _{m,y,crit} [N/mm ²] | λ _{rel,m,y} | k _{crit,y} |
|------|-----------------|----------------------------|---|----------------------|---------------------|
| 1 | 1779 | 3947 | 36.75 | 0.81 | 0.95 |

TOETSING SPANNINGEN

| | | | | | |
|------|---|-----------|-------|--------------|------|
| Staf | 1 | BC / Sit. | 3 / 1 | UC frm(6.24) | 0.66 |
|------|---|-----------|-------|--------------|------|

TOETSING DOORBUIGING

| Stf | Soort | Mtg | l _{sys} [mm] | Overstek i j | BC | Sit | u _{bij} [mm] | Toelaatbaar [mm] | *1 | u _{fin,net} [mm] | Toelaatbaar [mm] | *1 |
|-----|-------|-----|--------------------------|-----------------|----|-----|--------------------------|---------------------|-------|------------------------------|---------------------|-------|
| 1 | Dak | db | 3557 | Nee Nee | 12 | 1 | -5.5 | -14.2 | 0.004 | -9.9 | -14.2 | 0.004 |

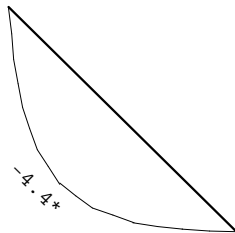
TOETSING DOORBUIGING (vervolg)

| Stf | Soort | Mtg | l _{sys} [mm] | Overstek i j | Zeeg [mm] | BC | Sit | u _{inst} [mm] | Toelaatbaar [mm] | *1 |
|-----|-------|-----|--------------------------|-----------------|--------------|----|-----|---------------------------|---------------------|-------|
| 1 | Dak | db | 3557 | Nee Nee | 0.0 | 9 | 1 | -7.2 | -14.2 | 0.004 |

VERVORMINGEN w1

Blijvende combinatie

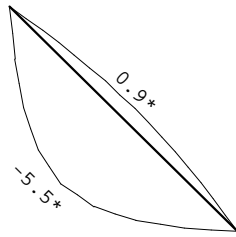
* - relatief aan de rechte lijn die de uiteinden verbindt



VERVORMINGEN w_{bij}

Karakteristieke combinatie

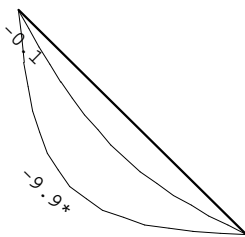
* - relatief aan de rechte lijn die de uiteinden verbindt



VERVORMINGEN w_{max}

Karakteristieke combinatie

* - relatief aan de rechte lijn die de uiteinden verbindt



DOORBUIGINGEN

Karakteristieke combinatie

| Nr. | staven | Zijde | positie | l_{rep} | w_1 | w_2 | w_{bij} | w_{tot} | w_c | w_{max} |
|-----|--------|-------|---------|-----------|-------|-------|-------------|-----------|-------|-------------|
| | | | [m] | [mm] | [mm] | [mm] | [mm][lrep/] | [mm] | [mm] | [mm][lrep/] |
| 1 | 1 | Neg. | 1.779 | 3557 | -4.4 | -2.7 | -5.5 | 652 | -9.9 | -9.9 360 |
| 1 | 1 | Pos. | 1.778 | 3557 | -4.4 | -2.7 | 0.9 | 3788 | -3.5 | -3.5 1021 |

A.7 B3-01: balklaag 3e verdieping achterzijde

Technosoft Liggers release 6.80b

11 jul 2024

Project.....: 2023237 - 5.1, 2, e te Amsterdam
Onderdeel....: Balklaag verd. 3
Constructeur.: ME
Dimensies....: kN/m/rad
Datum.....: 01/03/2024
Bestand.....: K:\Werk\2023237\Berekeningen\Technosoft\B3-1 - balklaag
verd 3.dlw

Betrouwbaarheidsklasse : 2 Referentieperiode : 50

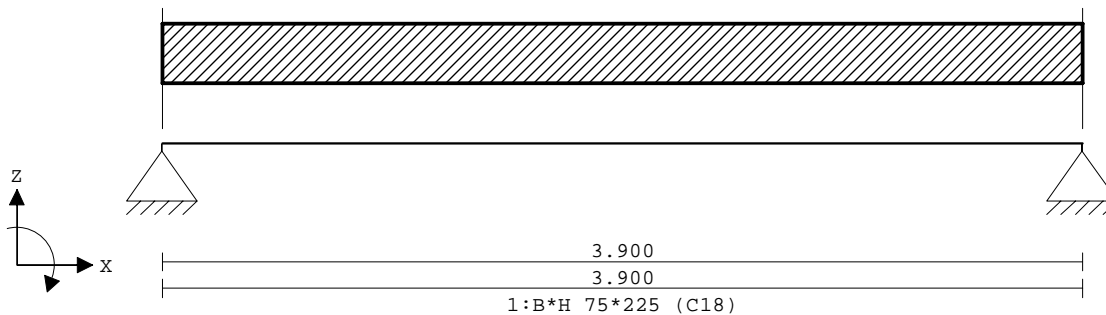
Belastingfactoren zijn bepaald conform NEN 8700:2011+A1:2020
Tabel A1.2(B) en (C): Factoren bij verbouw.
Factoren ten behoeve van Bouwbesluit 2003 of daarvoor.

Toegepaste normen volgens Eurocode met Nederlandse NB

| Belastingen | NEN-EN 1990:2002 | C2:2010,A1:2019 | NB:2019(nl) |
|-------------|----------------------|-----------------|-------------|
| | NEN-EN 1991-1-1:2002 | C1/C11:2019 | NB:2019(nl) |
| | NEN 8700:2011 | A1:2020 | |
| Hout | NEN-EN 1995-1-1:2005 | A1:2011,C1:2006 | NB:2013(nl) |

GEOMETRIE

Ligger:1



VELDLENGTEN

Ligger:1

| Veld | Vanaf | Tot | Lengte |
|------|-------|-------|--------|
| 1 | 0.000 | 3.900 | 3.900 |

MATERIALEN

| Mt | Kwaliteit | E-modulus[N/mm ²] | S.G. | S.G.verhoogd | Pois. | Uitz. coëff |
|----|-----------|-------------------------------|------|--------------|-------|-------------|
| 1 | C18 | 9000 | 3.2 | 3.8 | 1.00 | 5.0000e-06 |

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

PROFIELEN [mm]

| Prof. | Omschrijving | Materiaal | Oppervlak | Traagheid | Vormf. |
|-------|--------------|-----------|------------|------------|--------|
| 1 | B*H 75*225 | 1:C18 | 1.6875e+04 | 7.1191e+07 | 0.00 |

PROFIELEN vervolg [mm]

| Prof. | Staaftype | Breedte | Hoogte | e | Type | b1 | h1 | b2 | h2 |
|-------|-----------|---------|--------|-------|------|----|----|----|----|
| 1 | 0:Normaal | 75 | 225 | 112.5 | 0:RH | | | | |

PROFIELVORMEN [mm]

1 B*H 75*225



BELASTINGGEVALLEN

| B.G. | Omschrijving | Belast/onbelast | ψ_0 | ψ_1 | ψ_2 | e.g. |
|------|----------------------|---------------------|----------|----------|----------|------|
| 1 | Permanent | 2:Permanent EN1991 | | | | 0.00 |
| 2 | Veranderlijk | 1:Schaakbord EN1991 | 0.40 | 0.50 | 0.30 | 0.00 |
| 3 | Veranderlijk (dak pu | 1:Schaakbord EN1991 | 0.00 | 0.00 | 0.00 | 0.00 |
| 4 | Veranderlijk (puntla | 1:Schaakbord EN1991 | 0.40 | 0.50 | 0.30 | 0.00 |

BELASTINGGEVALLEN

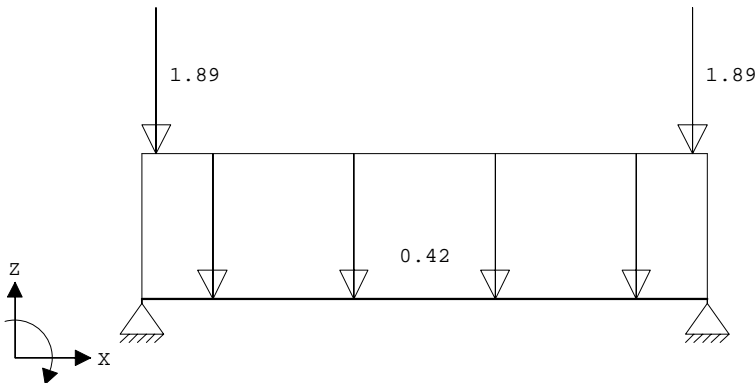
| B.G. | Omschrijving | Type |
|------|-----------------------------|---------------------------------|
| 1 | Permanent | 1 Permanente belasting |
| 2 | Veranderlijk | 2 Ver. bel. pers. ed. (q_k) |
| 3 | Veranderlijk (dak puntlast) | 2 Ver. bel. pers. ed. (q_k) |
| 4 | Veranderlijk (puntlast) | 3 Ver. bel. pers. ed. (Q_k) |

BELASTINGGEVALLEN vervolg

| B.G. | Omschrijving | Belastingduurklasse |
|------|-----------------------------|---------------------|
| 1 | Permanent | Blijvend |
| 2 | Veranderlijk | Middellang |
| 3 | Veranderlijk (dak puntlast) | Kort |
| 4 | Veranderlijk (puntlast) | Middellang |

VELDBELASTINGEN

Ligger:1 B.G:1 Permanent



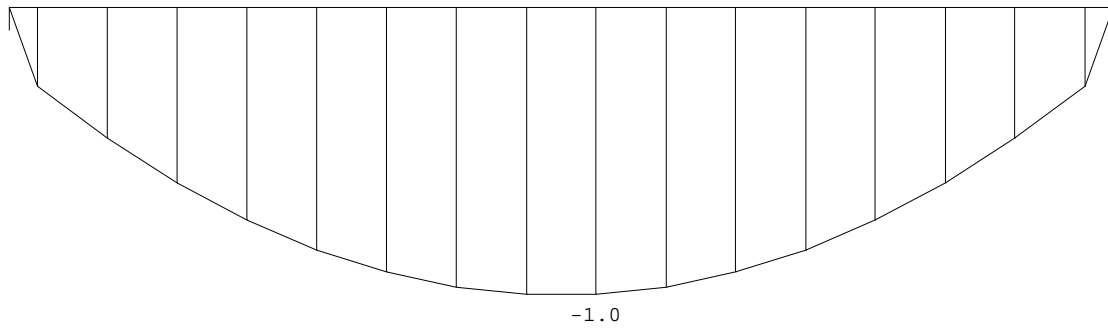
VELDBELASTINGEN

Ligger:1 B.G:1 Permanent

| Last Ref. | Type | Omschrijving | q_1 /p/m | q_2 psi | Afstand | Lengte |
|-----------|------------|--------------|------------|-----------|---------|--------|
| 1 | 1:q-last | | -0.420 | -0.420 | 0.000 | 0.000 |
| 2 | 8:Puntlast | | -1.890 | | 0.100 | |
| 3 | 8:Puntlast | | -1.890 | | 3.800 | |

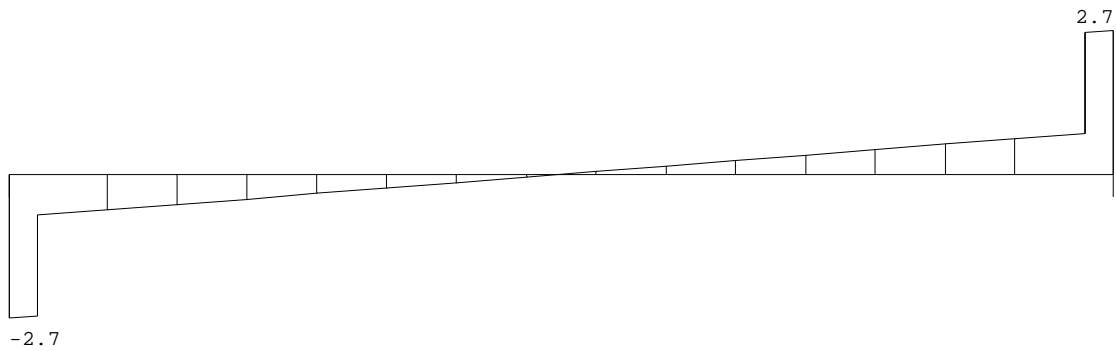
MOMENTEN

Ligger:1 B.G:1 Permanent



DWARSKRACHTEN

Ligger:1 B.G:1 Permanent



F: 2.71

2.71

REACTIES

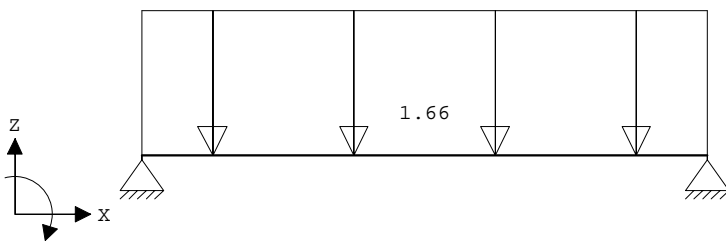
Ligger:1 B.G:1 Permanent

| Stp | F | M |
|-----|------|------|
| 1 | 2.71 | 0.00 |
| 2 | 2.71 | 0.00 |

5.42 : Som reacties
-5.42 : Som belastingen

VELDBELASTINGEN

Ligger:1 B.G:2 Veranderlijk



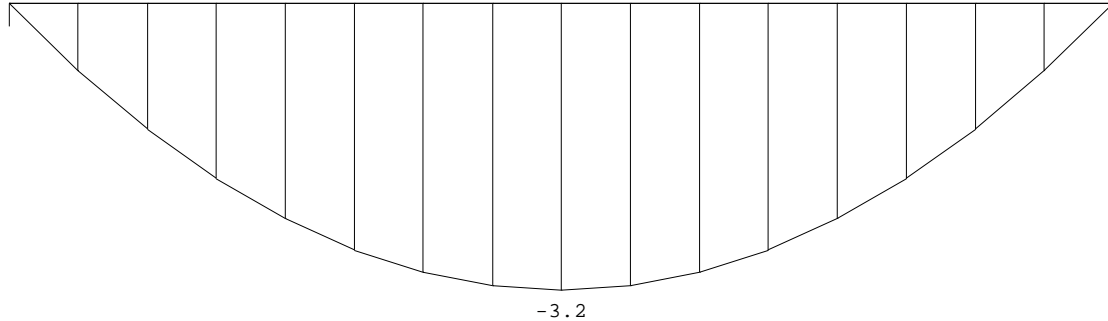
VELDBELASTINGEN

Ligger:1 B.G:2 Veranderlijk

| Last Ref. | Type | Omschrijving | q1/p/m | q2 | psi | Afstand | Lengte |
|-----------|----------|--------------|--------|--------|-----|---------|--------|
| 1 | 1:q-last | | -1.660 | -1.660 | | 0.000 | 0.000 |

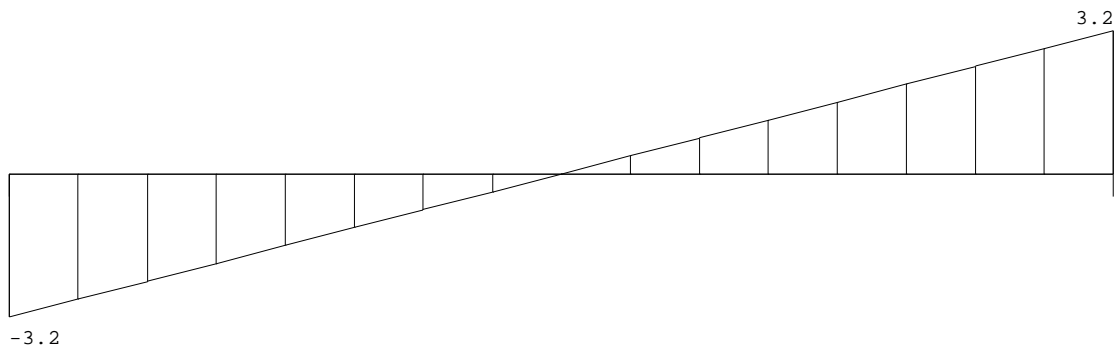
MOMENTEN

Ligger:1 B.G:2 Veranderlijk



DWARSKRACHTEN

Ligger:1 B.G:2 Veranderlijk



Fmin:0.00
Fmax:3.24

0.00
3.24

REACTIES

Ligger:1 B.G:2 Veranderlijk

| Stp | Fmin | Fmax | Mmin | Mmax |
|-----|------|------|------|------|
| 1 | 0.00 | 3.24 | 0.00 | 0.00 |
| 2 | 0.00 | 3.24 | 0.00 | 0.00 |

VELDBELASTINGEN

Ligger:1 B.G:3 Veranderlijk (dak puntlast)



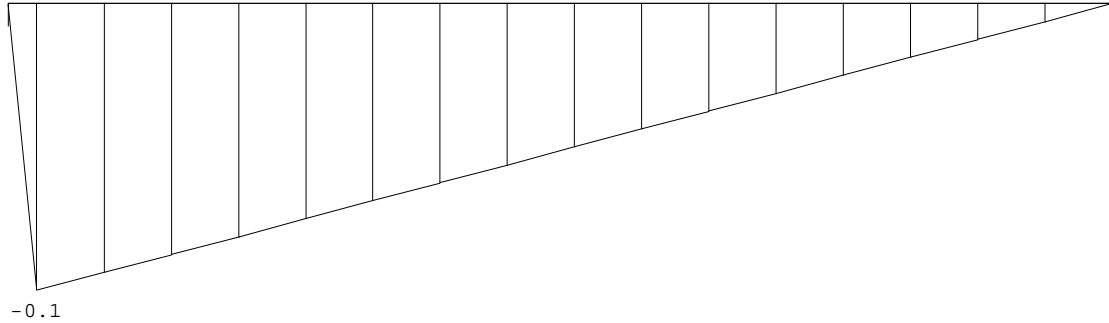
VELDBELASTINGEN

Ligger:1 B.G:3 Veranderlijk (dak puntlast)

| Last Ref. | Type | Omschrijving | q1/p/m | q2 psi | Afstand | Lengte |
|-----------|------------|--------------|--------|--------|---------|--------|
| 1 | 8:Puntlast | | -1.500 | | 0.100 | |

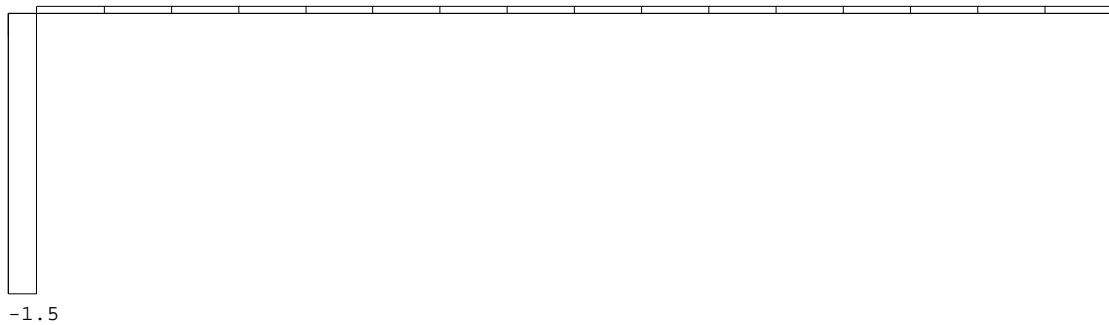
MOMENTEN

Ligger:1 B.G:3 Veranderlijk (dak puntlast)



DWARSKRACHTEN

Ligger:1 B.G:3 Veranderlijk (dak puntlast)



Fmin:0.00
Fmax:1.46

0.00
0.04

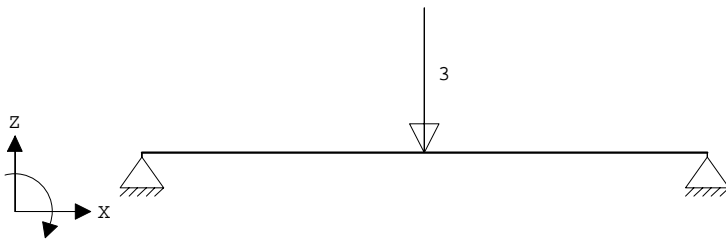
REACTIES

Ligger:1 B.G:3 Veranderlijk (dak puntlast)

| Stp | Fmin | Fmax | Mmin | Mmax |
|-----|------|------|------|------|
| 1 | 0.00 | 1.46 | 0.00 | 0.00 |
| 2 | 0.00 | 0.04 | 0.00 | 0.00 |

VELDBELASTINGEN

Ligger:1 B.G:4 Veranderlijk (puntlast)



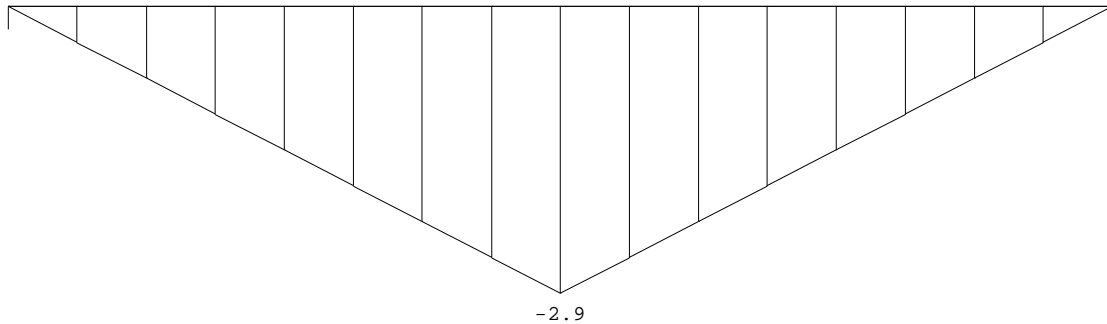
VELDBELASTINGEN

Ligger:1 B.G:4 Veranderlijk (puntlast)

| Last Ref. | Type | Omschrijving | q1/p/m | q2 | psi | Afstand | Lengte |
|-----------|------------|--------------|--------|----|-----|---------|--------|
| 1 | 8:Puntlast | | -3.000 | | | 1.950 | |

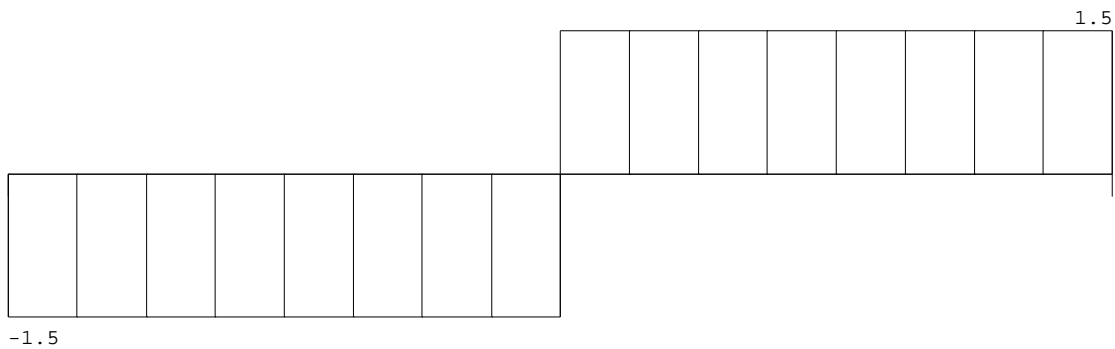
MOMENTEN

Ligger:1 B.G:4 Veranderlijk (puntlast)



DWARSKRACHTEN

Ligger:1 B.G:4 Veranderlijk (puntlast)



Fmin:0.00

0.00

Fmax:1.50

1.50

REACTIES

Ligger:1 B.G:4 Veranderlijk (puntlast)

| Stp | Fmin | Fmax | Mmin | Mmax |
|-----|------|------|------|------|
| 1 | 0.00 | 1.50 | 0.00 | 0.00 |
| 2 | 0.00 | 1.50 | 0.00 | 0.00 |

BELASTINGCOMBINATIES

| BC | Type | BG | Gen. | Factor | BG | Gen. | Factor | BG | Gen. | Factor | BG | Gen. | Factor |
|----|-------|----|------|--------|----|------|--------|----|------|--------|----|------|--------|
| 1 | Fund. | 1 | Perm | 1.20 | | | | | | | | | |
| 2 | Fund. | 1 | Perm | 1.20 | 2 | psi0 | 1.30 | 3 | psi0 | 1.30 | | | |
| 3 | Fund. | 1 | Perm | 1.20 | 4 | psi0 | 1.30 | | | | | | |
| 4 | Fund. | 1 | Perm | 1.15 | 2 | Extr | 1.30 | 3 | Extr | 1.30 | | | |
| 5 | Fund. | 1 | Perm | 1.15 | 4 | Extr | 1.30 | | | | | | |
| 6 | Fund. | 1 | Perm | 0.90 | | | | | | | | | |
| 7 | Fund. | 1 | Perm | 0.90 | 2 | psi0 | 1.30 | 3 | psi0 | 1.30 | | | |
| 8 | Fund. | 1 | Perm | 0.90 | 4 | psi0 | 1.30 | | | | | | |
| 9 | Fund. | 1 | Perm | 0.90 | 2 | Extr | 1.30 | 3 | Extr | 1.30 | | | |
| 10 | Fund. | 1 | Perm | 0.90 | 4 | Extr | 1.30 | | | | | | |
| 11 | Kar. | 1 | Perm | 1.00 | 2 | Extr | 1.00 | 3 | Extr | 1.00 | | | |
| 12 | Kar. | 1 | Perm | 1.00 | 4 | Extr | 1.00 | | | | | | |
| 13 | Freq. | 1 | Perm | 1.00 | | | | | | | | | |
| 14 | Freq. | 1 | Perm | 1.00 | 2 | psi1 | 1.00 | 3 | psi1 | 1.00 | | | |
| 15 | Freq. | 1 | Perm | 1.00 | 4 | psi1 | 1.00 | | | | | | |
| 16 | Quas. | 1 | Perm | 1.00 | | | | | | | | | |

BELASTINGCOMBINATIES

| BC Type | BG | Gen. | Factor | BG | Gen. | Factor | BG | Gen. | Factor | BG | Gen. | Factor |
|----------|----|------|--------|--------|------|--------|------|------|--------|----|------|--------|
| 17 Quas. | 1 | Perm | 1.00 | 2 psi2 | 1.00 | 3 psi2 | 1.00 | | | | | |
| 18 Quas. | 1 | Perm | 1.00 | 4 psi2 | 1.00 | | | | | | | |
| 19 Blij. | 1 | Perm | 1.00 | | | | | | | | | |

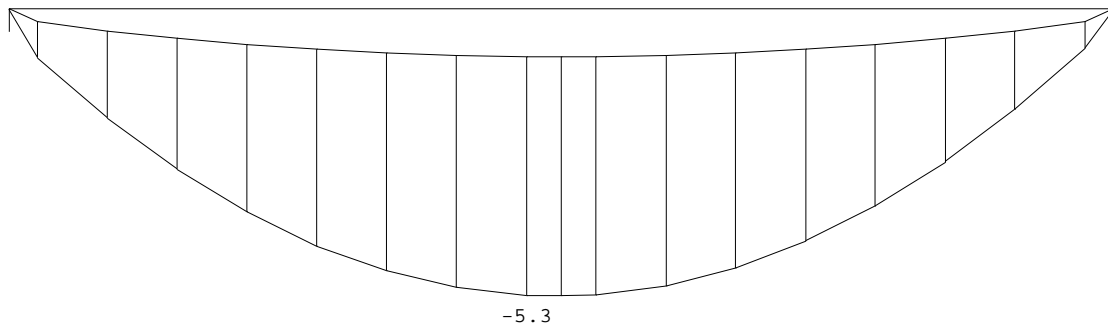
GUNSTIGE WERKING PERMANENTE BELASTINGEN

| BC | Velden met gunstige werking |
|----|-----------------------------|
| 1 | Geen |
| 2 | Geen |
| 3 | Geen |
| 4 | Geen |
| 5 | Geen |
| 6 | Alle velden de factor:0.90 |
| 7 | Alle velden de factor:0.90 |
| 8 | Alle velden de factor:0.90 |
| 9 | Alle velden de factor:0.90 |
| 10 | Alle velden de factor:0.90 |

OMHULLENDE VAN DE FUNDAMENTELE COMBINATIES

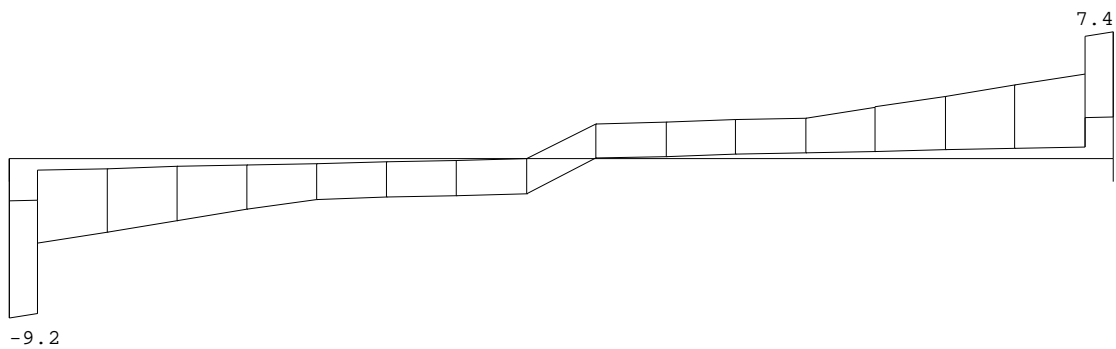
MOMENTEN

Ligger:1 Fundamentele combinatie



DWARSKRACHTEN

Ligger:1 Fundamentele combinatie

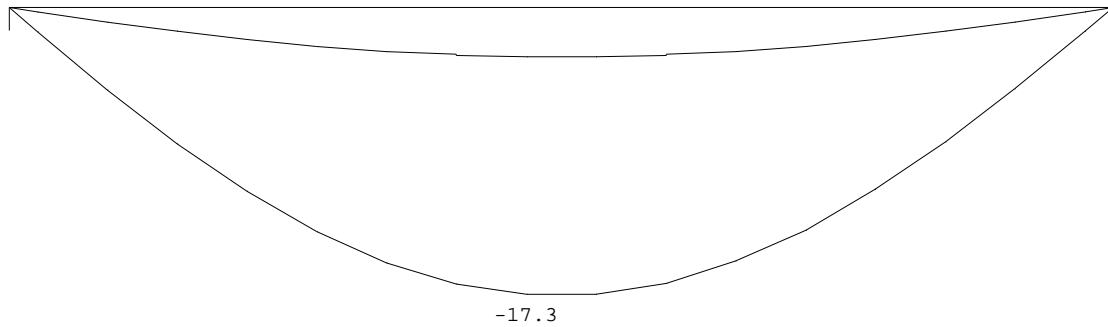


Fmin:2.44
Fmax:9.2

2.44
7.4

VERPLAATSINGEN [mm]

Ligger:1 Fundamentele combinatie



REACTIES

Ligger:1 Fundamentele combinatie

| Stp | Fmin | Fmax | Mmin | Mmax |
|-----|------|------|------|------|
| 1 | 2.44 | 9.22 | 0.00 | 0.00 |
| 2 | 2.44 | 7.37 | 0.00 | 0.00 |

MATERIAALGEGEVENS

| Mt | Kwaliteit | $f_{m,y,k}$ [N/mm ²] | ρ_k [kg/m ³] | ρ_{mean} [kg/m ³] | $f_{t,0,k}$ [N/mm ²] | $f_{t,90,k}$ [N/mm ²] | $f_{c,0,k}$ [N/mm ²] | $f_{c,90,k}$ [N/mm ²] | $f_{v,k}$ [N/mm ²] |
|----|-----------|-------------------------------------|----------------------------------|---------------------------------------|-------------------------------------|--------------------------------------|-------------------------------------|--------------------------------------|-----------------------------------|
| 1 | C18 | 18 | 320 | 380 | 10.0 | 0.4 | 18.0 | 2.2 | 3.4 |

MATERIAALGEGEVENS (vervolg)

| Mt | Kwaliteit | G_{mean} [N/mm ²] | $E_{0,05}$ [N/mm ²] | $E_{90,mean}$ [N/mm ²] | $E_{0,mean}$ [N/mm ²] | Klimaatklasse | k_{def} | $E_{0,mean,fin}$ [N/mm ²] |
|----|-----------|------------------------------------|------------------------------------|---------------------------------------|--------------------------------------|---------------|-----------|--|
| 1 | C18 | 560 | 6000 | 300 | 9000 | I | 0.60 | 5625 |

KIPSTABILITEIT

Ligger:1

| Staafl | Plts. aangr. | 1 sys. | Kipsteunafstanden [m] |
|--------|---------------------------|--------------|------------------------------|
| 1 | 1.0*h boven: onder: | 3.90 3.90 | 0.000;4*0.975 0.000;3.900 |

STABILITEIT

| Staafl | positie [mm] | $l_{ef,y}$ [mm] | $\sigma_{my,crit}$ [N/mm ²] | $\lambda_{rel,my}$ | $k_{crit,y}$ |
|--------|-----------------|--------------------|--|--------------------|--------------|
| 1 | 1950 | 1425 | 82.11 | 0.47 | 1.00 |

TOETSING SPANNINGEN

| | | | | | |
|--------|---|-----------|-------|--------------|------|
| Staafl | 1 | BC / Sit. | 5 / 1 | UC frm(6.11) | 0.70 |
|--------|---|-----------|-------|--------------|------|

TOETSING DOORBUIGING

| Stf | Soort | Mtg | l_{sys} [mm] | Overstek i j | BC | Sit | u_{bij} [mm] | Toelaatbaar [mm] | $u_{fin,net}$ [mm] | Toelaatbaar [mm] | | |
|-----|-------|-----|-------------------|-----------------|----|-----|-------------------|---------------------|-----------------------|---------------------|-------|-------|
| 1 | Vloer | db | 3900 | Nee Nee | 17 | 1 | -10.9 | -11.7 | 0.003 | -13.4 | -15.6 | 0.004 |

TOETSING DOORBUIGING (vervolg)

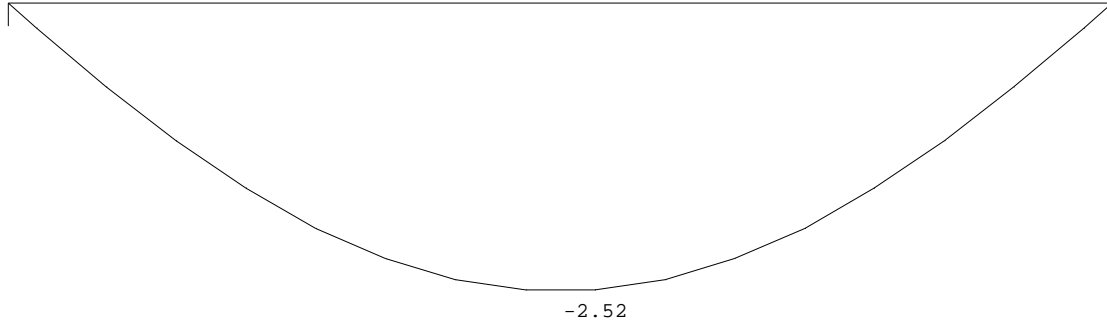
| Stf | Soort | Mtg | l_{sys} [mm] | Overstek i j | Zeeg [mm] | BC | Sit | u_{inst} [mm] | Toelaatbaar [mm] |
|-----|-------|-----|-------------------|-----------------|--------------|----|-----|--------------------|---------------------|
| | | | | | | | | | *1 |

TOETSING DOORBUIGING (vervolg)

| Stf | Soort | Mtg | l_{sys} [mm] | Overstek i j | Zeeg [mm] | BC | Sit | u_{inst} [mm] | Toelaatbaar [mm] | *1 |
|-----|-------|-----|-------------------|-----------------|--------------|----|-----|--------------------|---------------------|-------|
| 1 | Vloer | db | 3900 | Nee Nee | 0.0 | 11 | 1 | -10.5 | -15.6 | 0.004 |

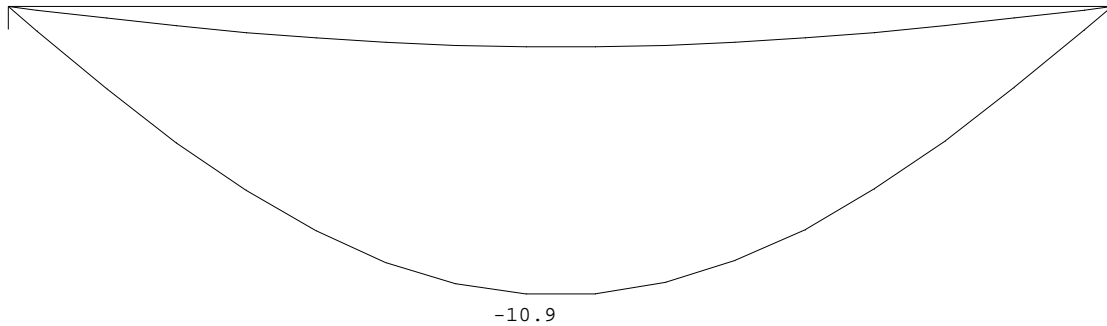
DOORBUIGINGEN w_1 [mm]

Ligger:1 Blijvende combinatie



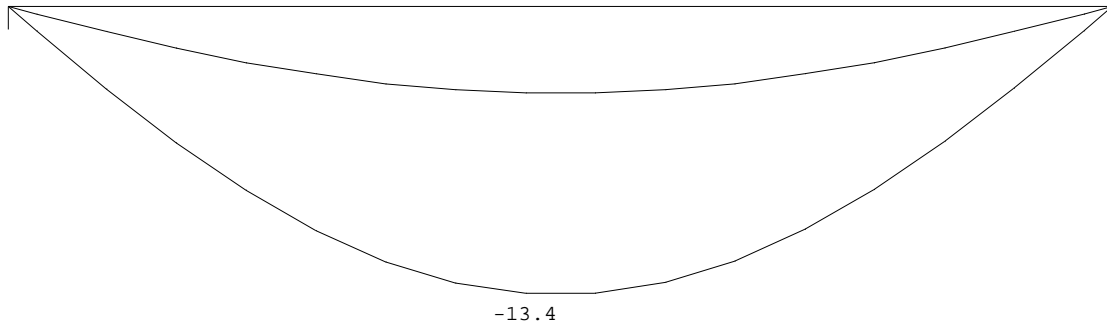
DOORBUIGINGEN w_{bij} [mm]

Ligger:1 Karakteristieke combinatie



DOORBUIGINGEN w_{max} [mm]

Ligger:1 Karakteristieke combinatie



DOORBUIGINGEN

Karakteristieke combinatie

| Veld | Zijde | positie | l_{rep} [m] | w_1 [mm] | w_2 [mm] | -- w_{bij} -- [mm][lrep/] | w_{tot} [mm] | w_c [mm] | -- w_{max} -- [mm][lrep/] |
|------|-------|---------|------------------|---------------|---------------|--------------------------------|-------------------|---------------|--------------------------------|
| | | | | | | | | | |

DOORBUIGINGEN

Karakteristieke combinatie

| Veld | Zijde | positie | l_{rep} | w_1 | w_2 | w_{bij} | w_{tot} | w_c | w_{max} |
|------|-------|---------|-----------|-------|-------|-----------|-----------|-------|-----------|
| | | [m] | [mm] | [mm] | [mm] | [mm] | [mm] | [mm] | [mm] |
| 1 | Neg. | 1.827 | 3900 | -2.5 | -2.9 | -10.9 | 358 | -13.4 | 290 |

A.8 L3-01: Strijkbalk achtergevel

Technosoft Liggers release 6.80b

11 jul 2024

Project.....: 2023237 - 5.1, 2, e te Amsterdam
Onderdeel....: Balklaag zolder - ondersteuning slof
Constructeur.: ME
Dimensies....: kN/m/rad
Datum.....: 26/02/2024
Bestand.....: K:\Werk\2023237\Berekeningen\Technosoft\
L3-01-strijkbalk.dlw

Betrouwbaarheidsklasse : 2 Referentieperiode : 50

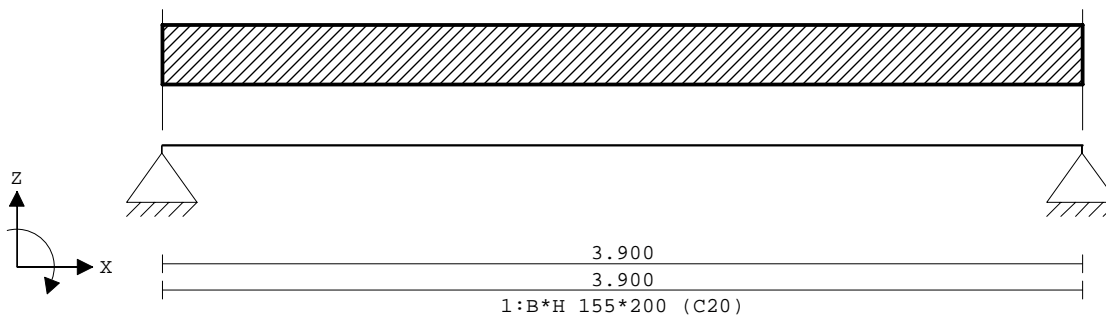
Belastingfactoren zijn bepaald conform NEN 8700:2011+A1:2020
Tabel A1.2(B) en (C): Factoren bij verbouw.
Factoren ten behoeve van Bouwbesluit 2003 of daarvoor.

Toegepaste normen volgens Eurocode met Nederlandse NB

| | | | |
|-------------|----------------------|-----------------|-------------|
| Belastingen | NEN-EN 1990:2002 | C2:2010,A1:2019 | NB:2019(nl) |
| | NEN-EN 1991-1-1:2002 | C1/C11:2019 | NB:2019(nl) |
| | NEN 8700:2011 | A1:2020 | |
| Hout | NEN-EN 1995-1-1:2005 | A1:2011,C1:2006 | NB:2013(nl) |

GEOMETRIE

Ligger:1



VELDLONGTEN

Ligger:1

| Veld | Vanaf | Tot | Lengte |
|------|-------|-------|--------|
| 1 | 0.000 | 3.900 | 3.900 |

MATERIALEN

| Mt | Kwaliteit | E-modulus[N/mm ²] | S.G. | S.G.verhoogd | Pois. | Uitz. coëff |
|----|-----------|-------------------------------|------|--------------|-------|-------------|
| 1 | C20 | 9500 | 3.3 | 4.0 | 1.00 | 5.0000e-06 |

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

PROFIELEN [mm]

| Prof. | Omschrijving | Materiaal | Oppervlak | Traagheid | Vormf. |
|-------|--------------|-----------|------------|------------|--------|
| 1 | B*H 155*200 | 1:C20 | 3.1000e+04 | 1.0333e+08 | 0.00 |

PROFIELEN vervolg [mm]

| Prof. | Staaftype | Breedte | Hoogte | e | Type | b1 | h1 | b2 | h2 |
|-------|-----------|---------|--------|-------|------|----|----|----|----|
| 1 | 0:Normaal | 155 | 200 | 100.0 | 0:RH | | | | |

PROFIELVORMEN [mm]

1 B*H 155*200



BELASTINGGEVALLEN

| B.G. Omschrijving | Belast/onbelast | Ψ_0 | Ψ_1 | Ψ_2 | e.g. |
|--------------------|----------------------|----------|----------|----------|------|
| 1 Permanent | 2: Permanent EN1991 | | | | 0.00 |
| 2 Veranderlijk | 1: Schaakbord EN1991 | 0.40 | 0.50 | 0.30 | 0.00 |
| 3 Veranderlijk dak | 1: Schaakbord EN1991 | 0.00 | 0.20 | 0.00 | 0.00 |

BELASTINGGEVALLEN

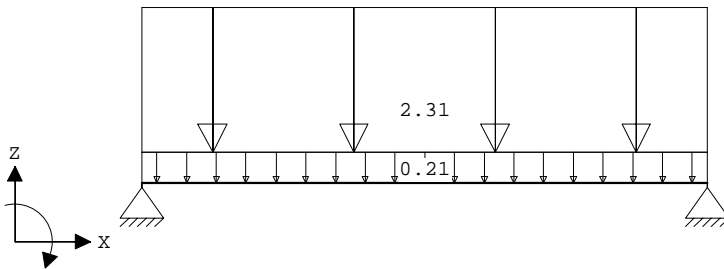
| B.G. Omschrijving | Type |
|--------------------|---------------------------------|
| 1 Permanent | 1 Permanente belasting |
| 2 Veranderlijk | 2 Ver. bel. pers. ed. (q_k) |
| 3 Veranderlijk dak | 22 Sneeuw A |

BELASTINGGEVALLEN vervolg

| B.G. Omschrijving | Belastingduurklasse |
|--------------------|---------------------|
| 1 Permanent | Blijvend |
| 2 Veranderlijk | Middellang |
| 3 Veranderlijk dak | Kort |

VELDBELASTINGEN

Ligger: 1 B.G: 1 Permanent



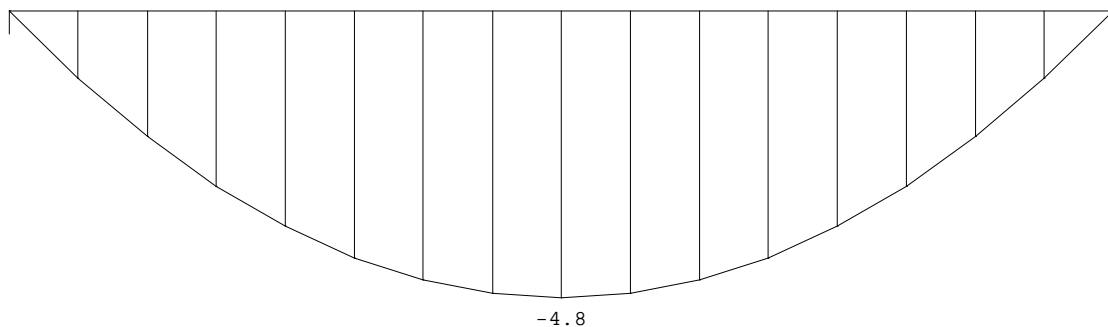
VELDBELASTINGEN

Ligger: 1 B.G: 1 Permanent

| Last Ref. | Type | Omschrijving | $q_1/p/m$ | q_2 | psi | Afstand | Lengte |
|-----------|-----------|--------------|-----------|--------|-----|---------|--------|
| 1 | 1: q-last | | -0.210 | -0.210 | | 0.000 | 0.000 |
| 2 | 1: q-last | | -2.310 | -2.310 | | 0.000 | 0.000 |

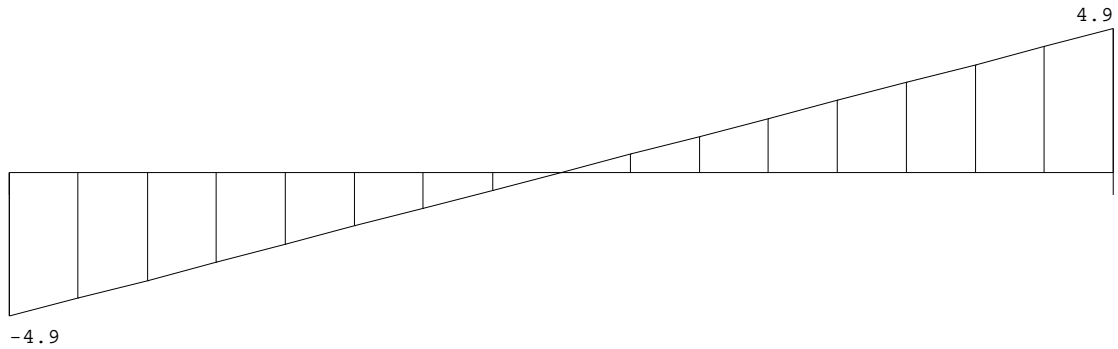
MOMENTEN

Ligger: 1 B.G: 1 Permanent



DWARSKRACHTEN

Ligger:1 B.G:1 Permanent



F:4.91

4.91

REACTIES

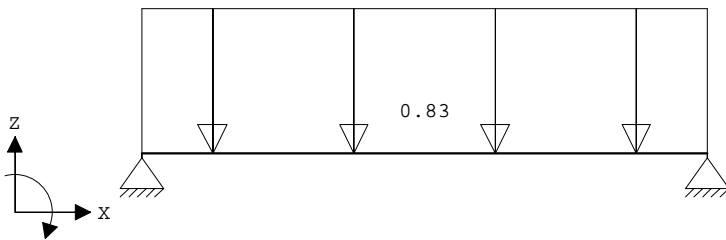
Ligger:1 B.G:1 Permanent

| Stp | F | M |
|-----|------|------|
| 1 | 4.91 | 0.00 |
| 2 | 4.91 | 0.00 |

9.83 : Som reacties
-9.83 : Som belastingen

VELDBELASTINGEN

Ligger:1 B.G:2 Veranderlijk



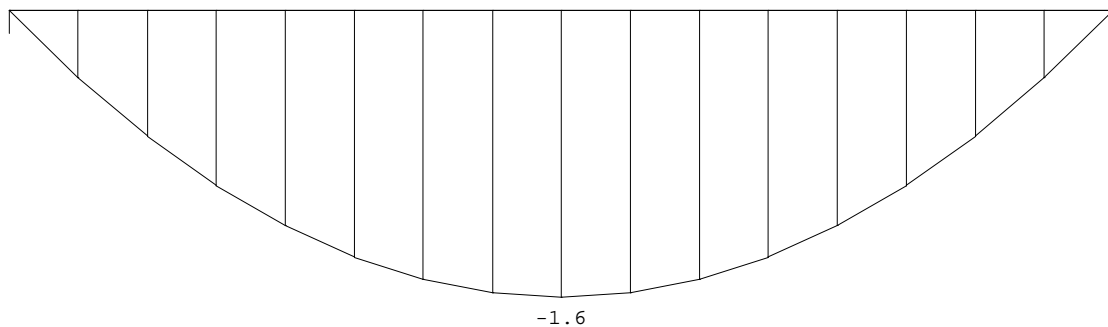
VELDBELASTINGEN

Ligger:1 B.G:2 Veranderlijk

| Last Ref. | Type | Omschrijving | q1/p/m | q2 | psi | Afstand | Lengte |
|-----------|----------|--------------|--------|--------|-----|---------|--------|
| 1 | 1:q-last | | -0.830 | -0.830 | | 0.000 | 0.000 |

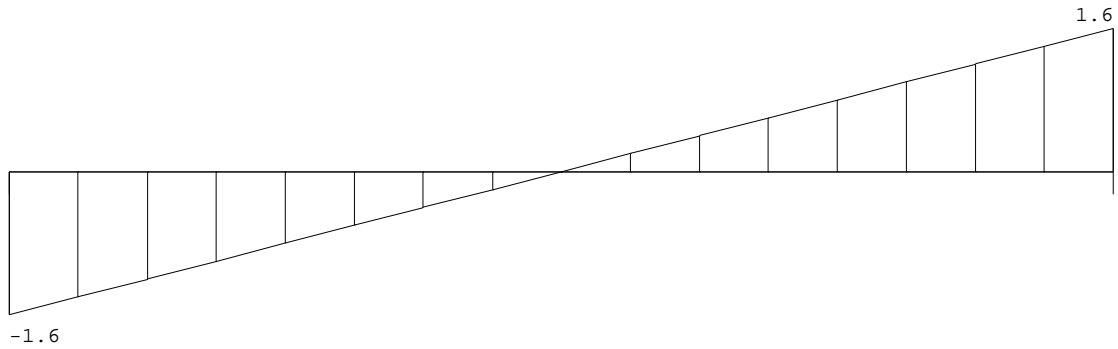
MOMENTEN

Ligger:1 B.G:2 Veranderlijk



DWARSKRACHTEN

Ligger:1 B.G:2 Veranderlijk



Fmin:0.00
Fmax:1.62

0.00
1.62

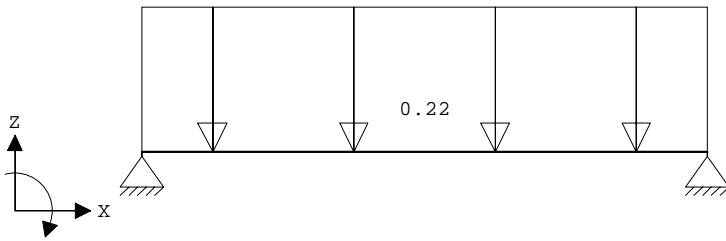
REACTIES

Ligger:1 B.G:2 Veranderlijk

| Stp | Fmin | Fmax | Mmin | Mmax |
|-----|------|------|------|------|
| 1 | 0.00 | 1.62 | 0.00 | 0.00 |
| 2 | 0.00 | 1.62 | 0.00 | 0.00 |

VELDBELASTINGEN

Ligger:1 B.G:3 Veranderlijk dak



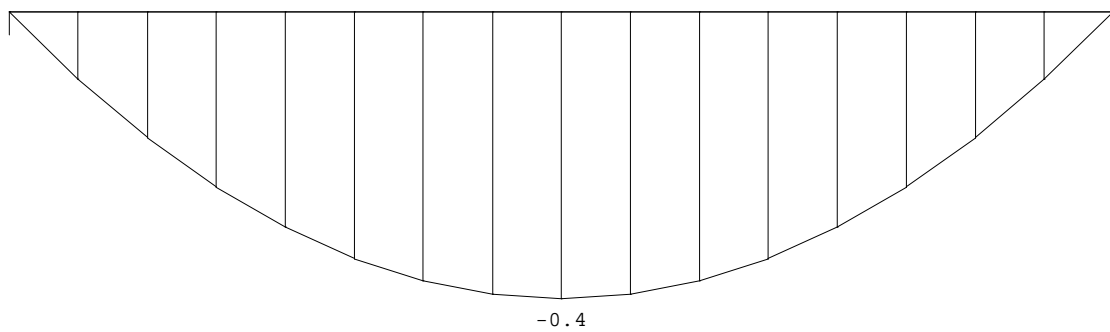
VELDBELASTINGEN

Ligger:1 B.G:3 Veranderlijk dak

| Last Ref. | Type | Omschrijving | q1/p/m | q2 | psi | Afstand | Lengte |
|-----------|----------|--------------|--------|--------|-----|---------|--------|
| 1 | 1:q-last | | -0.220 | -0.220 | | 0.000 | 0.000 |

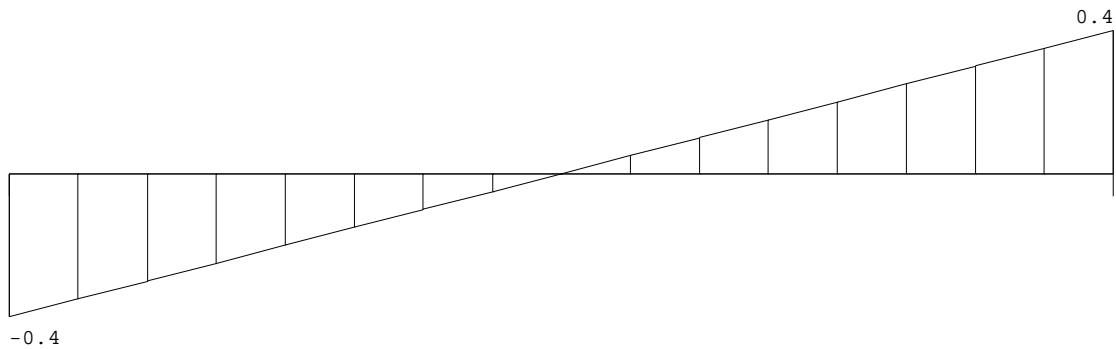
MOMENTEN

Ligger:1 B.G:3 Veranderlijk dak



DWARSKRACHTEN

Ligger:1 B.G:3 Veranderlijk dak



Fmin:0.00
Fmax:0.43

0.00
0.43

REACTIES

Ligger:1 B.G:3 Veranderlijk dak

| Stp | Fmin | Fmax | Mmin | Mmax |
|-----|------|------|------|------|
| 1 | 0.00 | 0.43 | 0.00 | 0.00 |
| 2 | 0.00 | 0.43 | 0.00 | 0.00 |

BELASTINGCOMBINATIES

| BC Type | BG | Gen. | Factor | BG | Gen. | Factor | BG | Gen. | Factor | BG | Gen. | Factor |
|---------|-------|------|--------|------|------|--------|------|------|--------|------|------|--------|
| 1 | Fund. | 1 | Perm | 1.20 | | | | | | | | |
| 2 | Fund. | 1 | Perm | 1.20 | 2 | psi0 | 1.30 | | | | | |
| 3 | Fund. | 1 | Perm | 1.15 | 2 | Extr | 1.30 | | | | | |
| 4 | Fund. | 1 | Perm | 1.15 | 3 | Extr | 1.30 | | | | | |
| 5 | Fund. | 1 | Perm | 1.15 | 3 | Extr | 1.30 | 2 | psi0 | 1.30 | | |
| 6 | Fund. | 1 | Perm | 0.90 | | | | | | | | |
| 7 | Fund. | 1 | Perm | 0.90 | 2 | psi0 | 1.30 | | | | | |
| 8 | Fund. | 1 | Perm | 0.90 | 2 | Extr | 1.30 | | | | | |
| 9 | Fund. | 1 | Perm | 0.90 | 3 | Extr | 1.30 | | | | | |
| 10 | Fund. | 1 | Perm | 0.90 | 3 | Extr | 1.30 | 2 | psi0 | 1.30 | | |
| 11 | Kar. | 1 | Perm | 1.00 | 2 | Extr | 1.00 | | | | | |
| 12 | Kar. | 1 | Perm | 1.00 | 3 | Extr | 1.00 | | | | | |
| 13 | Kar. | 1 | Perm | 1.00 | 3 | Extr | 1.00 | 2 | psi0 | 1.00 | | |
| 14 | Freq. | 1 | Perm | 1.00 | | | | | | | | |
| 15 | Freq. | 1 | Perm | 1.00 | 2 | psi1 | 1.00 | | | | | |
| 16 | Freq. | 1 | Perm | 1.00 | 3 | psi1 | 1.00 | | | | | |
| 17 | Freq. | 1 | Perm | 1.00 | 3 | psi1 | 1.00 | 2 | psi2 | 1.00 | | |
| 18 | Quas. | 1 | Perm | 1.00 | | | | | | | | |
| 19 | Quas. | 1 | Perm | 1.00 | 2 | psi2 | 1.00 | | | | | |
| 20 | Blij. | 1 | Perm | 1.00 | | | | | | | | |

GUNSTIGE WERKING PERMANENTE BELASTINGEN

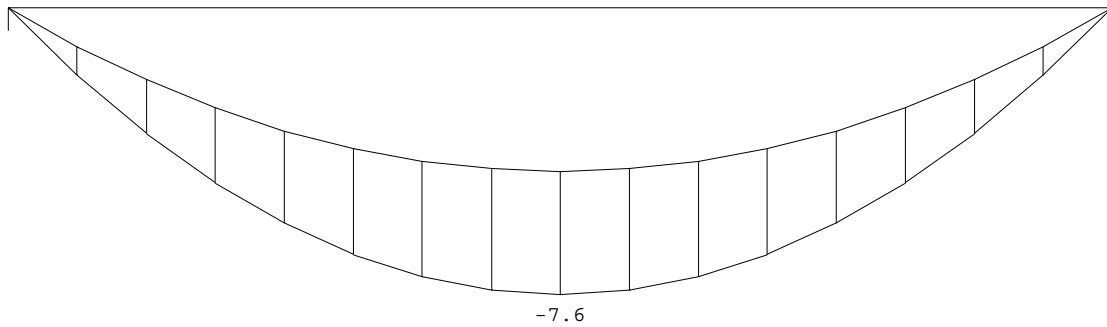
BC Velden met gunstige werking

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

OMHULLENDE VAN DE FUNDAMENTELE COMBINATIES

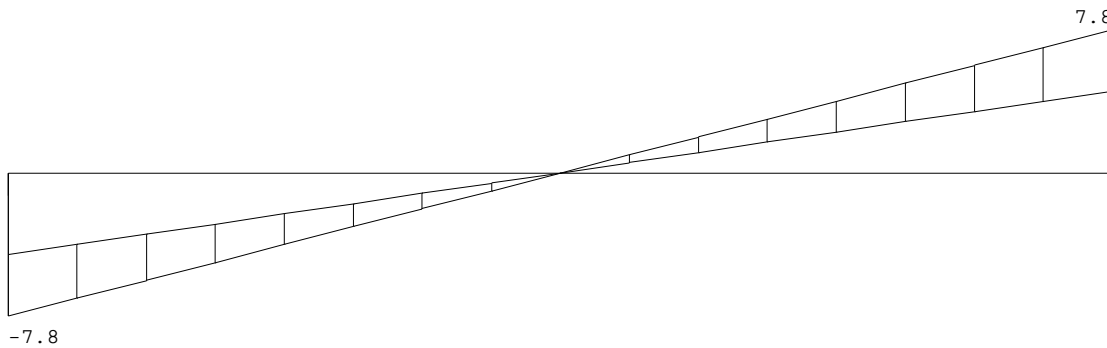
MOMENTEN

Ligger:1 Fundamentele combinatie



DWARSKRACHTEN

Ligger:1 Fundamentele combinatie



Fmin:4.42
Fmax:7.8

4.42
7.8

REACTIES

Ligger:1 Fundamentele combinatie

| Stp | Fmin | Fmax | Mmin | Mmax |
|-----|------|------|------|------|
| 1 | 4.42 | 7.76 | 0.00 | 0.00 |
| 2 | 4.42 | 7.76 | 0.00 | 0.00 |

MATERIAALGEGEVENS

| Mt | Kwaliteit | $f_{m,y,k}$ [N/mm ²] | ρ_k [kg/m ³] | ρ_{mean} [kg/m ³] | $f_{t,0,k}$ [N/mm ²] | $f_{t,90,k}$ [N/mm ²] | $f_{c,0,k}$ [N/mm ²] | $f_{c,90,k}$ [N/mm ²] | $f_{v,k}$ [N/mm ²] |
|----|-----------|-------------------------------------|----------------------------------|---------------------------------------|-------------------------------------|--------------------------------------|-------------------------------------|--------------------------------------|-----------------------------------|
| 1 | C20 | 20 | 330 | 400 | 11.5 | 0.4 | 19.0 | 2.3 | 3.6 |

MATERIAALGEGEVENS (vervolg)

| Mt | Kwaliteit | G_{mean} [N/mm ²] | $E_{0,05}$ [N/mm ²] | $E_{90,mean}$ [N/mm ²] | $E_{0,mean}$ [N/mm ²] | Klimaatklasse | k_{def} | $E_{0,mean,fin}$ [N/mm ²] |
|----|-----------|------------------------------------|------------------------------------|---------------------------------------|--------------------------------------|---------------|-----------|--|
| 1 | C20 | 590 | 6400 | 320 | 9500 | I | 0.60 | 5938 |

KIPSTABILITEIT

Ligger:1

| StAAF | Plts. aangr. | 1 sys. | Kipsteunafstanden [m] |
|-------|-----------------|------------------|--|
| 1 | 1.0*h | boven: onder: | 3.90 0.000;4*0.975 3.90 0.000;3.900 |

STABILITEIT

| Staaf | positie [mm] | $l_{ef,y}$ [mm] | $\sigma_{m,y,crit}$ [N/mm ²] | $\lambda_{rel,m,y}$ | $\kappa_{crit,y}$ |
|-------|-----------------|--------------------|---|---------------------|-------------------|
| 1 | 1950 | 1375 | 436.12 | 0.21 | 1.00 |

TOETSING SPANNINGEN

| | | | | | |
|-------|---|-----------|-------|--------------|------|
| Staaf | 1 | BC / Sit. | 1 / 1 | UC frm(6.11) | 0.60 |
|-------|---|-----------|-------|--------------|------|

TOETSING DOORBUIGING

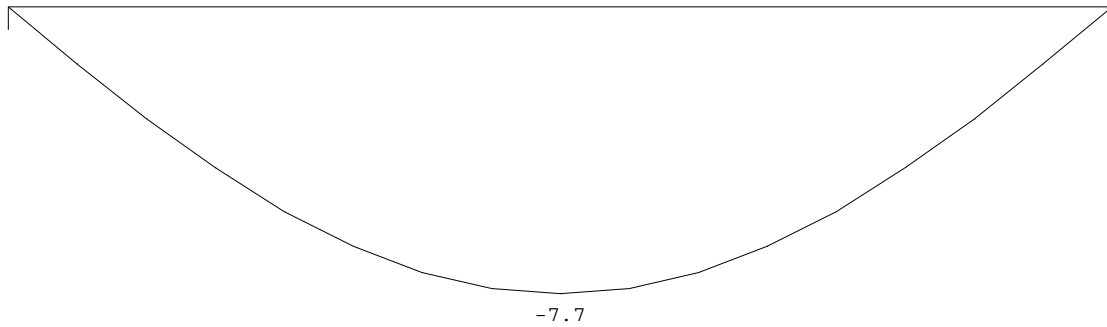
| Stf | Soort | Mtg | l_{sys} [mm] | Overstek i j | BC | Sit | u_{bij} [mm] | Toelaatbaar [mm] | $u_{fin,net}$ [mm] | Toelaatbaar [mm] | | |
|-----|-------|-----|-------------------|-----------------|----|-----|-------------------|---------------------|-----------------------|---------------------|-------|-------|
| 1 | Vloer | db | 3900 | Nee Nee | 19 | 1 | -7.6 | -11.7 | 0.003 | -15.4 | -15.6 | 0.004 |

TOETSING DOORBUIGING (vervolg)

| Stf | Soort | Mtg | l_{sys} [mm] | Overstek i j | Zeeg [mm] | BC | Sit | u_{inst} [mm] | Toelaatbaar [mm] | |
|-----|-------|-----|-------------------|-----------------|--------------|----|-----|--------------------|---------------------|-------|
| 1 | Vloer | db | 3900 | Nee Nee | 0.0 | 11 | 1 | -10.3 | -15.6 | 0.004 |

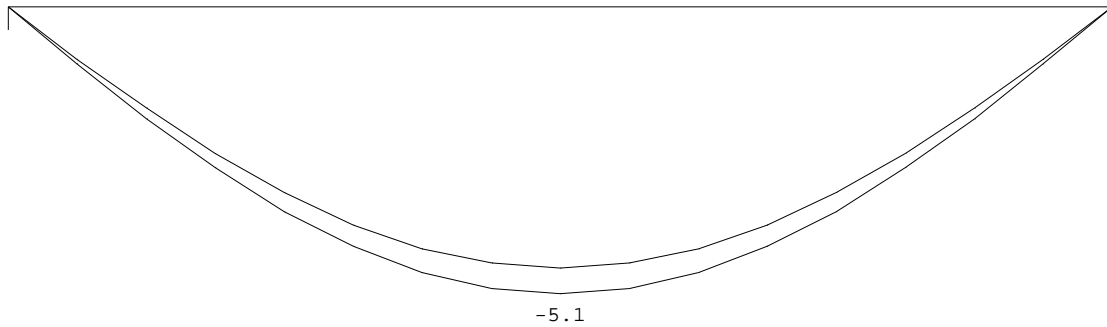
DOORBUIGINGEN w1 [mm]

Ligger:1 Blijvende combinatie



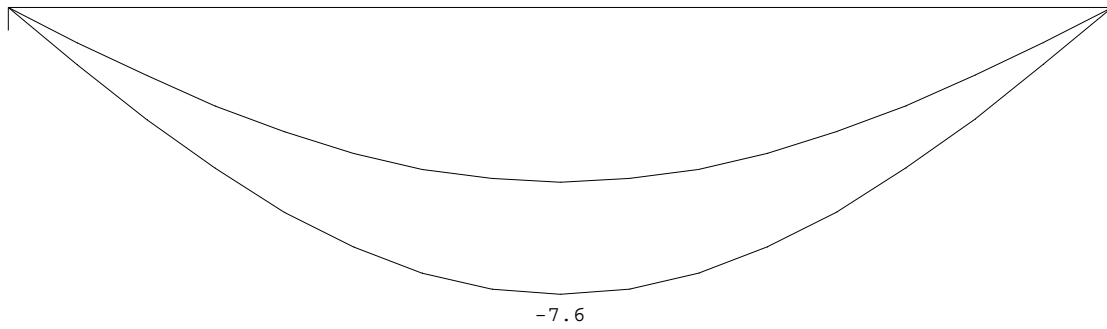
DOORBUIGINGEN w2 [mm]

Ligger:1 Quasi-blijvende combinatie



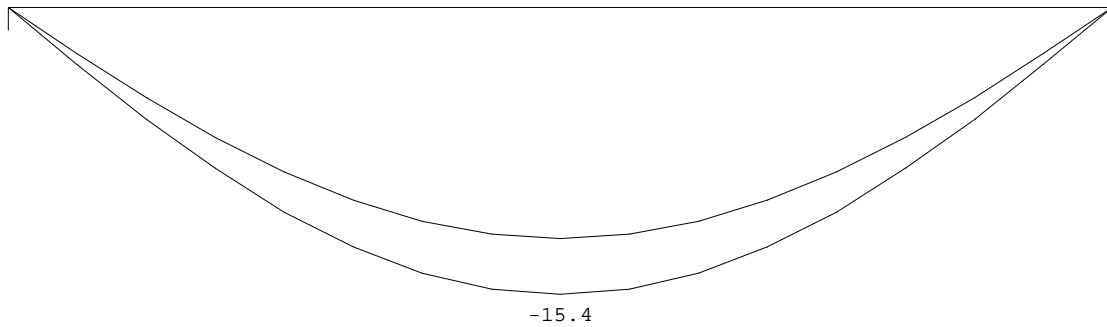
DOORBUIGINGEN W_{bij} [mm]

Ligger:1 Karakteristieke combinatie



DOORBUIGINGEN W_{max} [mm]

Ligger:1 Karakteristieke combinatie



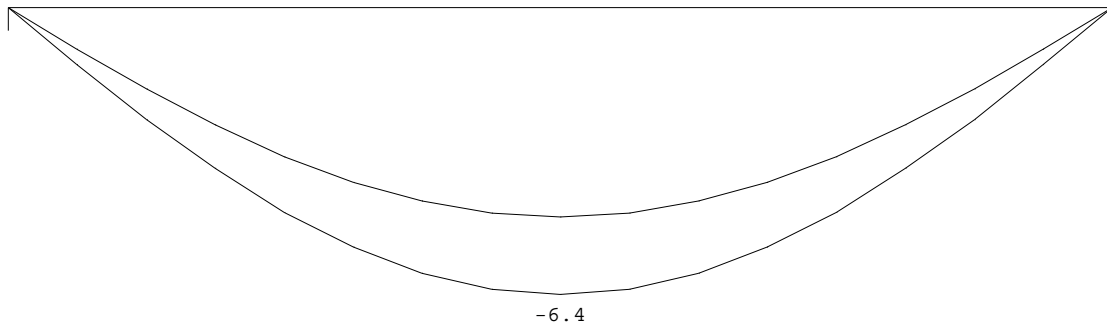
DOORBUIGINGEN

Karakteristieke combinatie

| Veld | Zijde | positie | l_{rep} | W_1 | W_2 | W_{bij} | W_{tot} | W_c | W_{max} |
|------|-------|---------|-----------|-------|-------|-------------|-----------|-------|-------------|
| | | [m] | [mm] | [mm] | [mm] | [mm][lrep/] | [mm] | [mm] | [mm][lrep/] |
| 1 | Neg. | 1.950 | 3900 | -7.7 | -5.1 | -7.6 | 510 | -15.4 | -15.4 |
| | | | | | | | | | 254 |

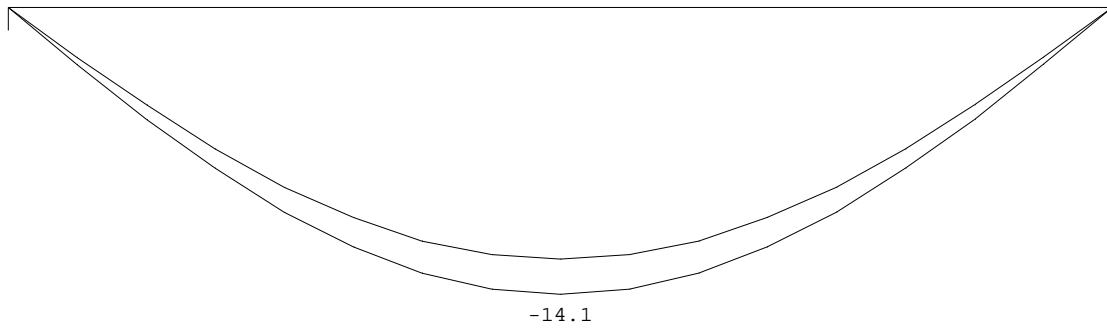
DOORBUIGINGEN W_{bij} [mm]

Ligger:1 Frequente combinatie



DOORBUIGINGEN W_{max} [mm]

Ligger:1 Frequente combinatie



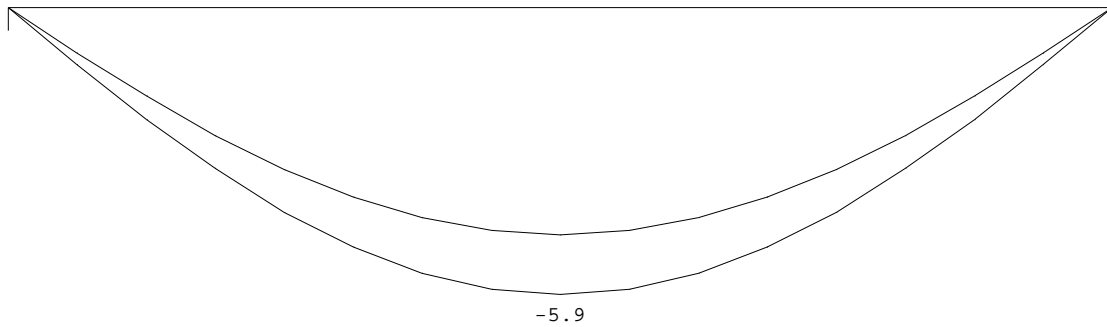
DOORBUIGINGEN

Frequente combinatie

| Veld | Zijde | positie | l_{rep} | W_1 | W_2 | -- W_{bij} -- | W_{tot} | W_c | -- W_{max} -- | |
|------|-------|---------|-----------|-------|-------|-----------------|-----------|-------|-----------------|-----|
| | | [m] | [mm] | [mm] | [mm] | [mm][lrep/] | [mm] | [mm] | [mm][lrep/] | |
| 1 | Neg. | 1.950 | 3900 | -7.7 | -5.1 | -6.4 | 612 | -14.1 | -14.1 | 277 |

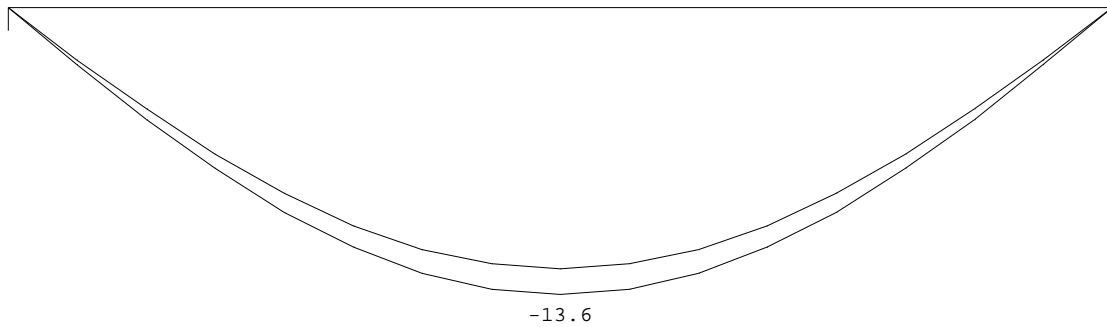
DOORBUIGINGEN W_{bij} [mm]

Ligger:1 Quasi-blijvende combinatie



DOORBUIGINGEN W_{max} [mm]

Ligger:1 Quasi-blijvende combinatie



DOORBUIGINGEN

Quasi-blijvende combinatie

| Veld | Zijde | positie | l_{rep} | W_1 | W_2 | -- W_{bij} -- | W_{tot} | W_c | -- W_{max} -- | |
|------|-------|---------|-----------|-------|-------|-----------------|-----------|-------|-----------------|-----|
| | | [m] | [mm] | [mm] | [mm] | [mm][lrep/] | [mm] | [mm] | [mm][lrep/] | |
| 1 | Neg. | 1.950 | 3900 | -7.7 | -5.1 | -5.9 | 665 | -13.6 | -13.6 | 287 |

DOORBUIGINGEN

Quasi-blijvende combinatie

| Veld | Zijde | positie | l_{rep} | W_1 | W_2 | -- W_{bij} -- | W_{tot} | W_c | -- W_{max} -- | |
|------|-------|---------|-----------|-------|-------|-----------------|-----------|-------|-----------------|-----|
| | | [m] | [mm] | [mm] | [mm] | [mm][lrep/] | [mm] | [mm] | [mm][lrep/] | |
| 1 | Neg. | 1.950 | 3900 | -7.7 | -5.1 | -5.9 | 665 | -13.6 | -13.6 | 287 |

A.9 L3-02 en L3-03: balk trapsparring

Technosoft Liggers release 6.80b

11 jul 2024

Project.....: 2023237 - 5.1, 2, e te Amsterdam
Onderdeel....: L3-02 balk trapgat nieuw
Constructeur.: ME
Dimensies....: kN/m/rad
Datum.....: 03/07/2024
Bestand.....: K:\Werk\2023237\Berekeningen\Technosoft\L3-02 - balk trapgat hout V2.dlw

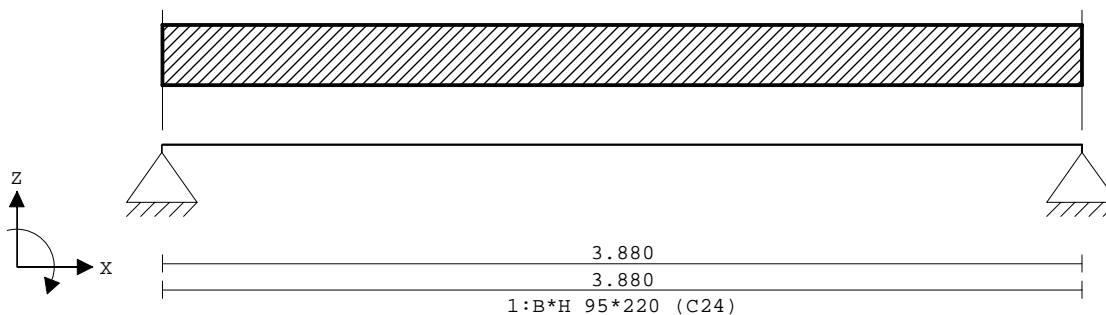
Betrouwbaarheidsklasse : 2 Referentieperiode : 50

Toegepaste normen volgens Eurocode met Nederlandse NB

| | | | |
|-------------|----------------------|-----------------|-------------|
| Belastingen | NEN-EN 1990:2002 | C2:2010,A1:2019 | NB:2019(nl) |
| | NEN-EN 1991-1-1:2002 | C1/C11:2019 | NB:2019(nl) |
| Hout | NEN-EN 1995-1-1:2005 | A1:2011,C1:2006 | NB:2013(nl) |

GEOMETRIE

Ligger:1



VELDLONGTEN

Ligger:1

| Veld | Vanaf | Tot | Lengte |
|------|-------|-------|--------|
| 1 | 0.000 | 3.880 | 3.880 |

MATERIALEN

| Mt | Kwaliteit | E-modulus[N/mm ²] | S.G. | S.G.verhoogd | Pois. | Uitz. coëff |
|----|-----------|-------------------------------|------|--------------|-------|-------------|
| 1 | C24 | 11000 | 3.5 | 4.2 | 1.00 | 5.0000e-06 |

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

PROFIELEN [mm]

| Prof. | Omschrijving | Materiaal | Oppervlak | Traagheid | Vormf. |
|-------|--------------|-----------|------------|------------|--------|
| 1 | B*H 95*220 | 1:C24 | 2.0900e+04 | 8.4297e+07 | 0.00 |

PROFIELEN vervolg [mm]

| Prof. | Staaftype | Breedte | Hoogte | e | Type | b1 | h1 | b2 | h2 |
|-------|-----------|---------|--------|-------|------|----|----|----|----|
| 1 | 0:Normaal | 95 | 220 | 110.0 | 0:RH | | | | |

PROFIELVORMEN [mm]

1 B*H 95*220



BELASTINGGEVALLEN

| B.G. | Omschrijving | Belast/onbelast | Ψ_0 | Ψ_1 | Ψ_2 | e.g. |
|------|--------------------|---------------------|----------|----------|----------|------|
| 1 | Permanent | 2:Permanent EN1991 | | | | 0.00 |
| 2 | Veranderlijk q_k | 1:Schaakbord EN1991 | 0.40 | 0.50 | 0.30 | 0.00 |
| 3 | Veranderlijk Q_k | 1:Schaakbord EN1991 | 0.40 | 0.50 | 0.30 | 0.00 |

BELASTINGGEVALLEN

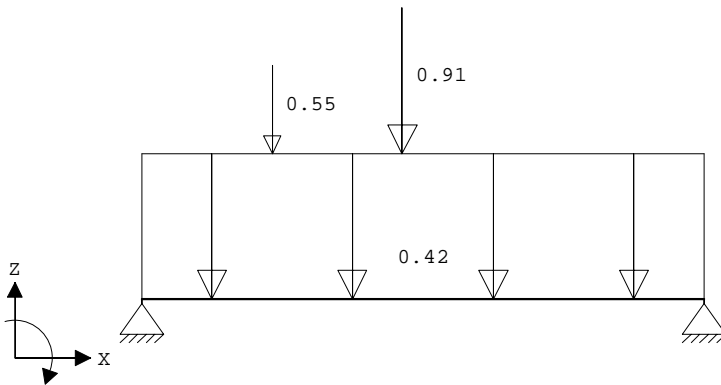
| B.G. | Omschrijving | Type |
|------|--------------------|---------------------------------|
| 1 | Permanent | 1 Permanente belasting |
| 2 | Veranderlijk q_k | 2 Ver. bel. pers. ed. (q_k) |
| 3 | Veranderlijk Q_k | 3 Ver. bel. pers. ed. (Q_k) |

BELASTINGGEVALLEN vervolg

| B.G. | Omschrijving | Belastingduurklasse |
|------|--------------------|---------------------|
| 1 | Permanent | Blijvend |
| 2 | Veranderlijk q_k | Middellang |
| 3 | Veranderlijk Q_k | Middellang |

VELDBELASTINGEN

Ligger:1 B.G:1 Permanent



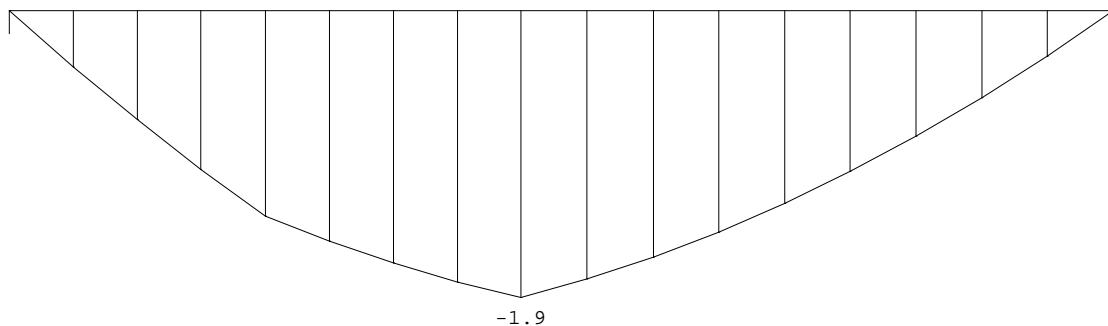
VELDBELASTINGEN

Ligger:1 B.G:1 Permanent

| Last Ref. | Type | Omschrijving | $q_1/p/m$ | q_2 | psi | Afstand | Lengte |
|-----------|------------|--------------|-----------|--------|-----|---------|--------|
| 1 | 1:q-last | | -0.420 | -0.420 | | 0.000 | 3.880 |
| 2 | 8:Puntlast | | | | | 0.900 | |
| 3 | 8:Puntlast | | | | | 1.800 | |

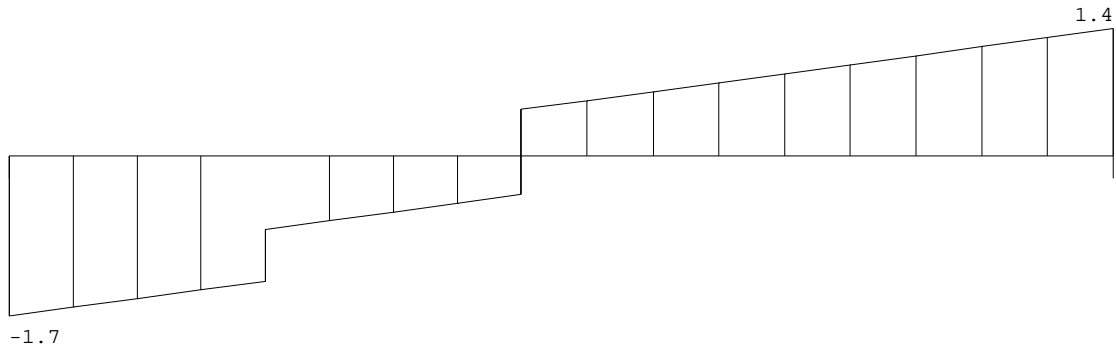
MOMENTEN

Ligger:1 B.G:1 Permanent



DWARSKRACHTEN

Ligger:1 B.G:1 Permanent



F:1.73

1.36

REACTIES

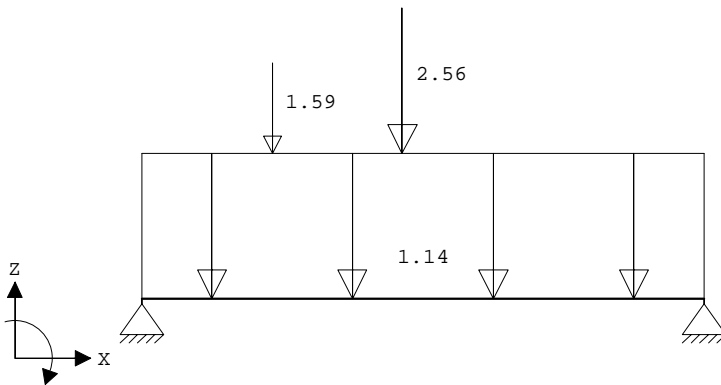
Ligger:1 B.G:1 Permanent

| Stp | F | M |
|-----|------|------|
| 1 | 1.73 | 0.00 |
| 2 | 1.36 | 0.00 |

3.09 : Som reacties
-3.09 : Som belastingen

VELDBELASTINGEN

Ligger:1 B.G:2 Veranderlijk q_k



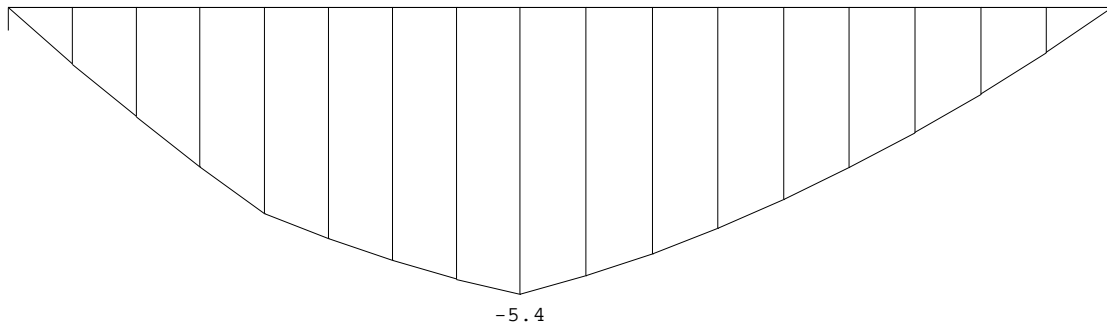
VELDBELASTINGEN

Ligger:1 B.G:2 Veranderlijk q_k

| Last Ref. | Type | Omschrijving | q1/p/m | q2 psi | Afstand | Lengte |
|-----------|------------|--------------|--------|--------|---------|--------|
| 1 | 1:q-last | | -1.140 | -1.140 | 0.000 | 3.880 |
| 2 | 8:Puntlast | | -1.590 | | 0.900 | |
| 3 | 8:Puntlast | | -2.560 | | 1.800 | |

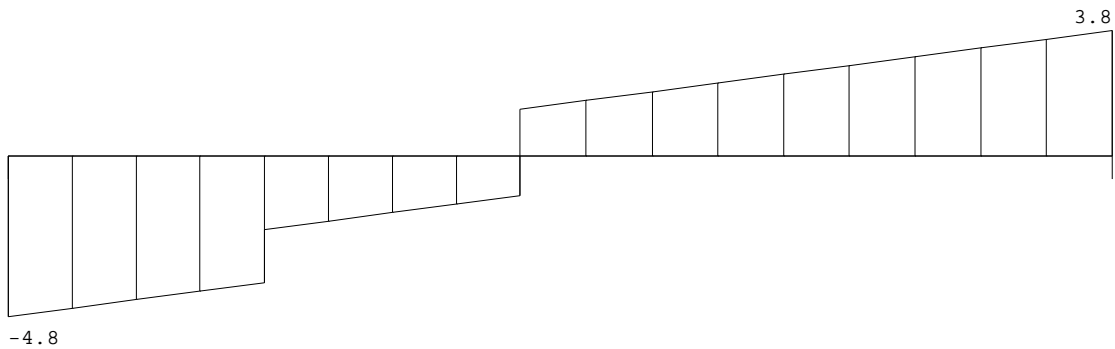
MOMENTEN

Ligger:1 B.G:2 Veranderlijk q_k



DWARSKRACHTEN

Ligger:1 B.G:2 Veranderlijk q_k



Fmin:0.00

0.00

Fmax:4.81

3.77

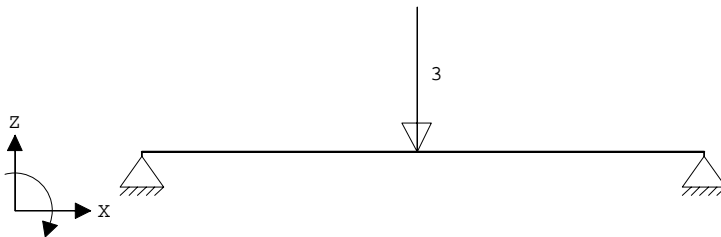
REACTIES

Ligger:1 B.G:2 Veranderlijk q_k

| Stp | Fmin | Fmax | Mmin | Mmax |
|-----|------|------|------|------|
| 1 | 0.00 | 4.81 | 0.00 | 0.00 |
| 2 | 0.00 | 3.77 | 0.00 | 0.00 |

VELDBELASTINGEN

Ligger:1 B.G:3 Veranderlijk Q_k



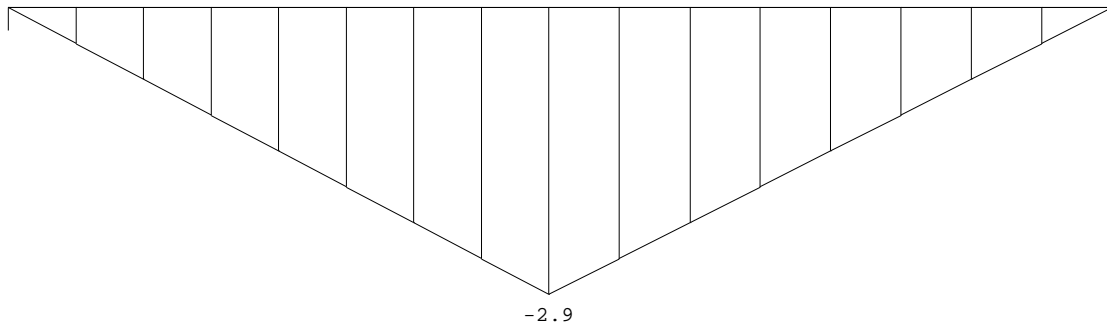
VELDBELASTINGEN

Ligger:1 B.G:3 Veranderlijk Q_k

| Last Ref. | Type | Omschrijving | q1/p/m | q2 | psi | Afstand | Lengte |
|-----------|------------|--------------|--------|----|-----|---------|--------|
| 1 | 8:Puntlast | | -3.000 | | | 1.900 | |

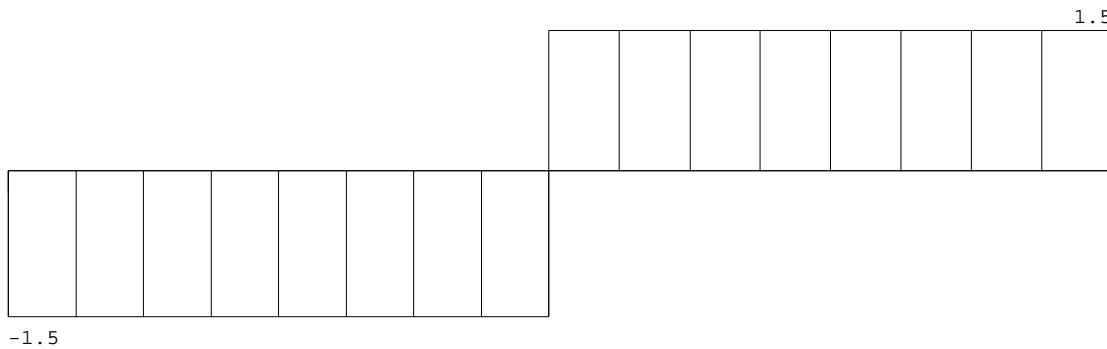
MOMENTEN

Ligger:1 B.G:3 Veranderlijk Q_k



DWARSKRACHTEN

Ligger:1 B.G:3 Veranderlijk Q_k



Fmin:0.00

0.00

Fmax:1.53

1.47

REACTIES

Ligger:1 B.G:3 Veranderlijk Q_k

| Stp | Fmin | Fmax | Mmin | Mmax |
|-----|------|------|------|------|
| 1 | 0.00 | 1.53 | 0.00 | 0.00 |
| 2 | 0.00 | 1.47 | 0.00 | 0.00 |

BELASTINGCOMBINATIES

| BC | Type | BG | Gen. | Factor | BG | Gen. | Factor | BG | Gen. | Factor | BG | Gen. | Factor |
|----|-------|----|------|--------|----|------|--------|----|------|--------|----|------|--------|
| 1 | Fund. | 1 | Perm | 1.35 | | | | | | | | | |
| 2 | Fund. | 1 | Perm | 1.35 | 2 | psi0 | 1.50 | | | | | | |
| 3 | Fund. | 1 | Perm | 1.35 | 3 | psi0 | 1.50 | | | | | | |
| 4 | Fund. | 1 | Perm | 1.20 | 2 | Extr | 1.50 | | | | | | |
| 5 | Fund. | 1 | Perm | 1.20 | 3 | Extr | 1.50 | | | | | | |
| 6 | Fund. | 1 | Perm | 0.90 | | | | | | | | | |
| 7 | Fund. | 1 | Perm | 0.90 | 2 | psi0 | 1.50 | | | | | | |
| 8 | Fund. | 1 | Perm | 0.90 | 3 | psi0 | 1.50 | | | | | | |
| 9 | Fund. | 1 | Perm | 0.90 | 2 | Extr | 1.50 | | | | | | |
| 10 | Fund. | 1 | Perm | 0.90 | 3 | Extr | 1.50 | | | | | | |
| 11 | Kar. | 1 | Perm | 1.00 | 2 | Extr | 1.00 | | | | | | |
| 12 | Kar. | 1 | Perm | 1.00 | 3 | Extr | 1.00 | | | | | | |
| 13 | Freq. | 1 | Perm | 1.00 | | | | | | | | | |
| 14 | Freq. | 1 | Perm | 1.00 | 2 | psi1 | 1.00 | | | | | | |
| 15 | Freq. | 1 | Perm | 1.00 | 3 | psi1 | 1.00 | | | | | | |
| 16 | Quas. | 1 | Perm | 1.00 | | | | | | | | | |
| 17 | Quas. | 1 | Perm | 1.00 | 2 | psi2 | 1.00 | | | | | | |
| 18 | Quas. | 1 | Perm | 1.00 | 3 | psi2 | 1.00 | | | | | | |
| 19 | Blij. | 1 | Perm | 1.00 | | | | | | | | | |

GUNSTIGE WERKING PERMANENTE BELASTINGEN

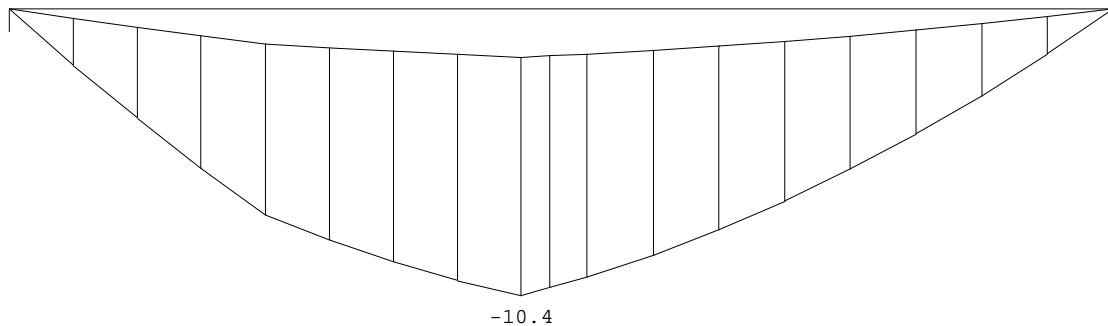
BC Velden met gunstige werking

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

OMHULLENDE VAN DE FUNDAMENTELE COMBINATIES

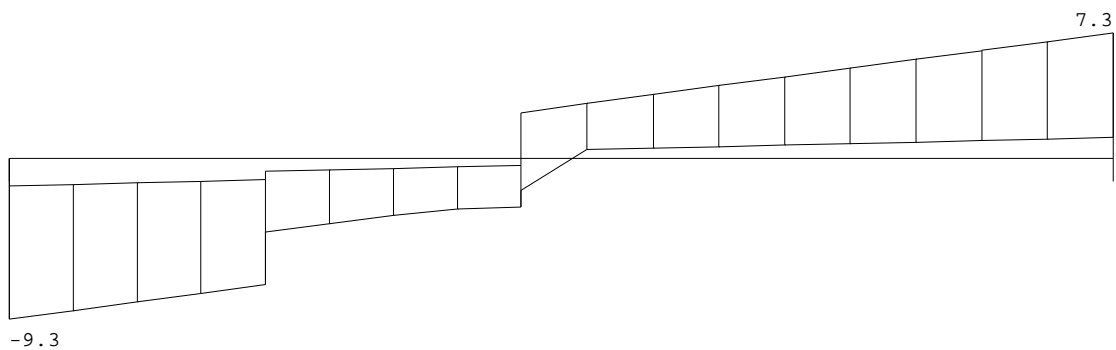
MOMENTEN

Ligger:1 Fundamentele combinatie



DWARSKRACHTEN

Ligger:1 Fundamentele combinatie

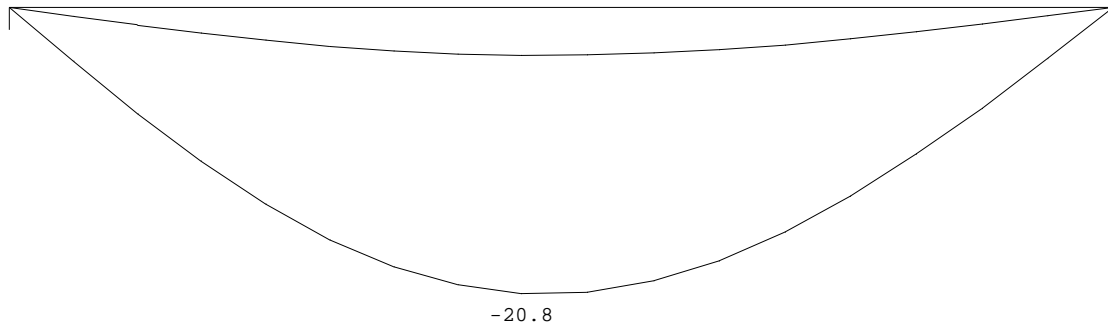


Fmin:1.55
Fmax:9.3

1.23
7.3

VERPLAATSINGEN [mm]

Ligger:1 Fundamentele combinatie



REACTIES

Ligger:1 Fundamentele combinatie

| Stp | Fmin | Fmax | Mmin | Mmax |
|-----|------|------|------|------|
| 1 | 1.55 | 9.28 | 0.00 | 0.00 |
| 2 | 1.23 | 7.29 | 0.00 | 0.00 |

MATERIAALGEGEVENS

| Mt | Kwaliteit | $f_{m,y,k}$ [N/mm ²] | ρ_k [kg/m ³] | ρ_{mean} [kg/m ³] | $f_{t,0,k}$ [N/mm ²] | $f_{t,90,k}$ [N/mm ²] | $f_{c,0,k}$ [N/mm ²] | $f_{c,90,k}$ [N/mm ²] | $f_{v,k}$ [N/mm ²] |
|----|-----------|-------------------------------------|----------------------------------|---------------------------------------|-------------------------------------|--------------------------------------|-------------------------------------|--------------------------------------|-----------------------------------|
| 1 | C24 | 24 | 350 | 420 | 14.5 | 0.4 | 21.0 | 2.5 | 4.0 |

MATERIAALGEGEVENS (vervolg)

| Mt | Kwaliteit | G_{mean} [N/mm ²] | $E_{0,05}$ [N/mm ²] | $E_{0,mean}$ [N/mm ²] | Klimaatklasse | k_{def} | $E_{0,mean,fin}$ [N/mm ²] |
|----|-----------|------------------------------------|------------------------------------|--------------------------------------|---------------|-----------|--|
| 1 | C24 | 690 | 7400 | 370 | 11000 I | 0.60 | 6875 |

KIPSTABILITEIT

Ligger:1

| Staafl | Plts. aangr. | l sys. [m] | Kipsteunafstanden [m] |
|--------|---------------------------|---------------|--|
| 1 | 1.0*h boven: onder: | 3.88 | 0.000;0,9;0,9;2,08 0.000;0,9;0,9;2,08 |

STABILITEIT

| Staafl | positie [mm] | $l_{ef,y}$ [mm] | $\sigma_{my,crit}$ [N/mm ²] | $\lambda_{rel,my}$ | $k_{crit,y}$ |
|--------|-----------------|--------------------|--|--------------------|--------------|
| 1 | 1800 | 1340 | 176.70 | 0.37 | 1.00 |

TOETSING SPANNINGEN

| Staafl | 1 | BC / Sit. | 4 / 1 | UC frm(6.11) | 0.92 |
|--------|---|-----------|-------|--------------|------|
|--------|---|-----------|-------|--------------|------|

TOETSING DOORBUIGING

| Stf | Soort | Mtg | l_{sys} [mm] | Overstek i j | BC | Sit | u_{bij} [mm] | Toelaatbaar [mm] | $u_{fin,net}$ [mm] | Toelaatbaar [mm] | | |
|-----|-------|-----|-------------------|-----------------|----|-----|-------------------|---------------------|-----------------------|---------------------|-------|-------|
| 1 | Vloer | db | 3880 | Nee Nee | 17 | 1 | -11.6 | -11.6 | 0.003 | -14.6 | -15.5 | 0.004 |

TOETSING DOORBUIGING (vervolg)

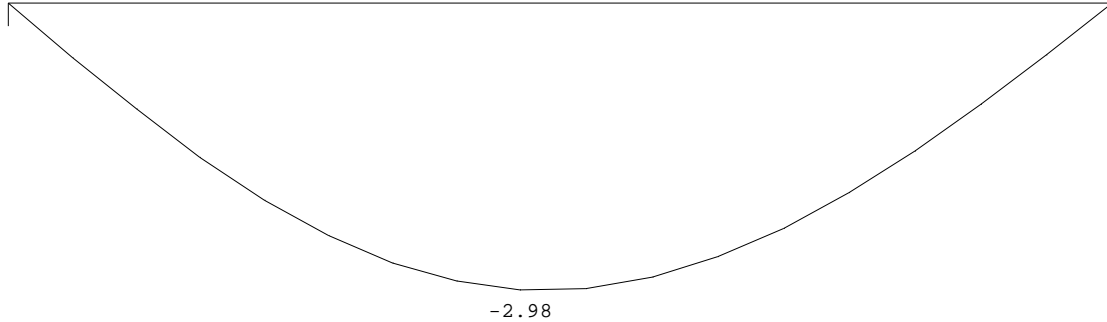
| Stf | Soort | Mtg | l_{sys} [mm] | Overstek i j | Zeeg [mm] | BC | Sit | u_{inst} [mm] | Toelaatbaar [mm] |
|-----|-------|-----|-------------------|-----------------|--------------|----|-----|--------------------|---------------------|
|-----|-------|-----|-------------------|-----------------|--------------|----|-----|--------------------|---------------------|

TOETSING DOORBUIGING (vervolg)

| Stf | Soort | Mtg | l_{sys} | Overstek | Zeeg | BC | Sit | u_{inst} | Toelaatbaar |
|-----|-------|-----|-----------|----------|------|----|-----|------------|-------------|
| | | | [mm] | i j | [mm] | | | [mm] | [mm] *1 |
| 1 | Vloer | db | 3880 | Nee Nee | 0.0 | 11 | 1 | -11.3 | -15.5 0.004 |

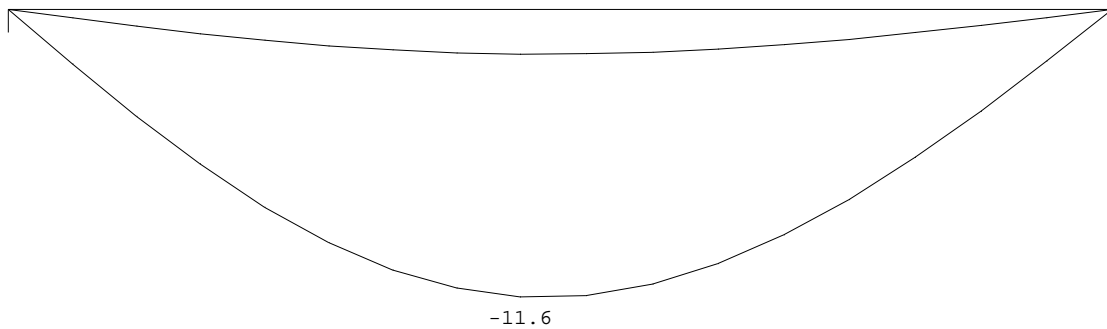
DOORBUIGINGEN w_1 [mm]

Ligger:1 Blijvende combinatie



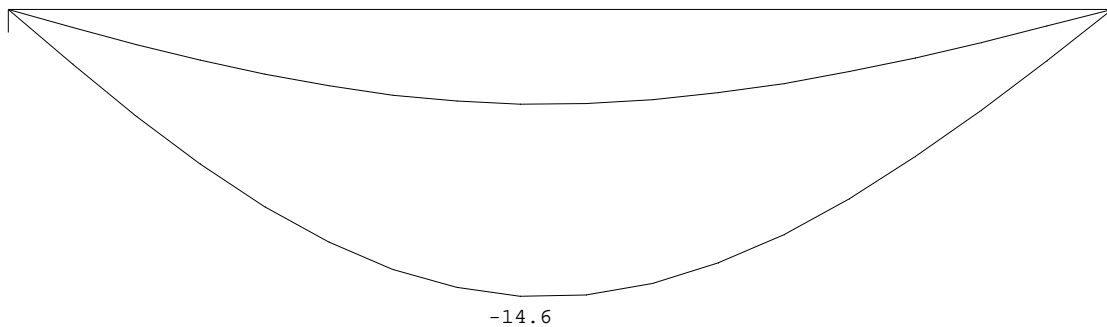
DOORBUIGINGEN w_{bij} [mm]

Ligger:1 Karakteristieke combinatie



DOORBUIGINGEN w_{max} [mm]

Ligger:1 Karakteristieke combinatie



DOORBUIGINGEN

Karakteristieke combinatie

| Veld | Zijde | positie | l_{rep} | w_1 | w_2 | w_{bij} | w_{tot} | w_c | w_{max} |
|------|-------|---------|-----------|-------|-------|-------------|-----------|-------|-------------|
| | | [m] | [mm] | [mm] | [mm] | [mm][lrep/] | [mm] | [mm] | [mm][lrep/] |

DOORBUIGINGEN

Karakteristieke combinatie

| | | | | | | | | | |
|---|------|-------|------|------|------|-------|-----|-------|-----------|
| 1 | Neg. | 1.800 | 3880 | -3.0 | -3.3 | -11.6 | 335 | -14.6 | -14.6 266 |
|---|------|-------|------|------|------|-------|-----|-------|-----------|

A.10 L3-04 en L3-05: raveling trapsparring

Technosoft Liggers release 6.80b

11 jul 2024

Project.....: 2023237 - 5.1, 2, e te Amsterdam
Onderdeel....: L3-04: ravelbalk
Constructeur.: ME
Dimensies....: kN/m/rad
Datum.....: 03/07/2024
Bestand.....: K:\Werk\2023237\Berekeningen\Technosoft\L3-04.dlw

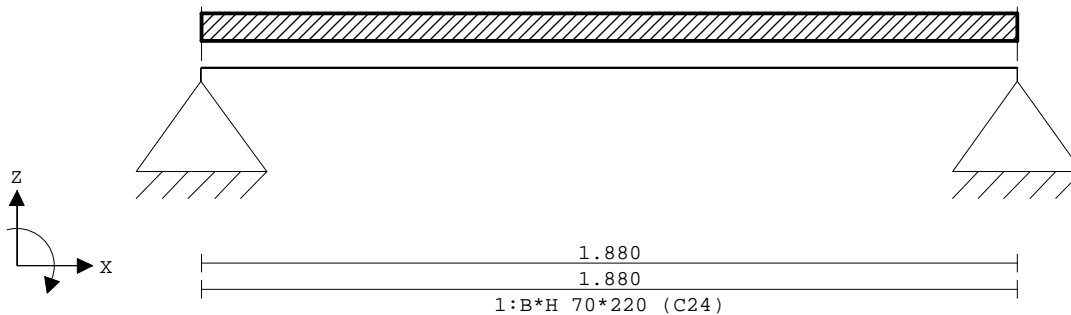
Betrouwbaarheidsklasse : 2 Referentieperiode : 50

Toegepaste normen volgens Eurocode met Nederlandse NB

| | | | |
|-------------|----------------------|-----------------|-------------|
| Belastingen | NEN-EN 1990:2002 | C2:2010,A1:2019 | NB:2019(nl) |
| | NEN-EN 1991-1-1:2002 | C1/C11:2019 | NB:2019(nl) |
| Hout | NEN-EN 1995-1-1:2005 | A1:2011,C1:2006 | NB:2013(nl) |

GEOMETRIE

Ligger:1



VELDLENGTEN

Ligger:1

| Veld | Vanaf | Tot | Lengte |
|------|-------|-------|--------|
| 1 | 0.000 | 1.880 | 1.880 |

MATERIALEN

| Mt | Kwaliteit | E-modulus[N/mm ²] | S.G. | S.G.verhoogd | Pois. | Uitz. coëff |
|----|-----------|-------------------------------|------|--------------|-------|-------------|
| 1 | C24 | 11000 | 3.5 | 4.2 | 1.00 | 5.0000e-06 |

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

PROFIELEN [mm]

| Prof. | Omschrijving | Materiaal | Oppervlak | Traagheid | Vormf. |
|-------|--------------|-----------|------------|------------|--------|
| 1 | B*H 70*220 | 1:C24 | 1.5400e+04 | 6.2113e+07 | 0.00 |

PROFIELEN vervolg [mm]

| Prof. | Staaftype | Breedte | Hoogte | e | Type | b1 | h1 | b2 | h2 |
|-------|-----------|---------|--------|-------|------|----|----|----|----|
| 1 | 0:Normaal | 70 | 220 | 110.0 | 0:RH | | | | |

PROFIELVORMEN [mm]

1 B*H 70*220



BELASTINGGEVALLEN

| B.G. | Omschrijving | Belast/onbelast | Ψ_0 | Ψ_1 | Ψ_2 | e.g. |
|------|--------------------|---------------------|----------|----------|----------|------|
| 1 | Permanent | 2:Permanent EN1991 | | | | 0.00 |
| 2 | Veranderlijk | 1:Schaakbord EN1991 | 0.40 | 0.50 | 0.30 | 0.00 |
| 3 | Veranderlijk Q_k | 1:Schaakbord EN1991 | 0.40 | 0.50 | 0.30 | 0.00 |

BELASTINGGEVALLEN

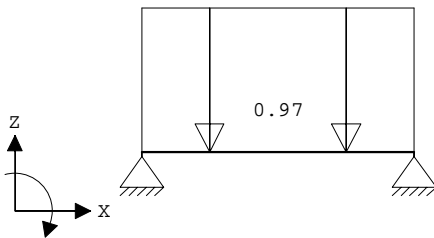
| B.G. | Omschrijving | Type |
|------|--------------------|---------------------------------|
| 1 | Permanent | 1 Permanente belasting |
| 2 | Veranderlijk | 2 Ver. bel. pers. ed. (q_k) |
| 3 | Veranderlijk Q_k | 3 Ver. bel. pers. ed. (Q_k) |

BELASTINGGEVALLEN vervolg

| B.G. | Omschrijving | Belastingduurklasse |
|------|--------------------|---------------------|
| 1 | Permanent | Blijvend |
| 2 | Veranderlijk | Middellang |
| 3 | Veranderlijk Q_k | Middellang |

VELDBELASTINGEN

Ligger:1 B.G:1 Permanent



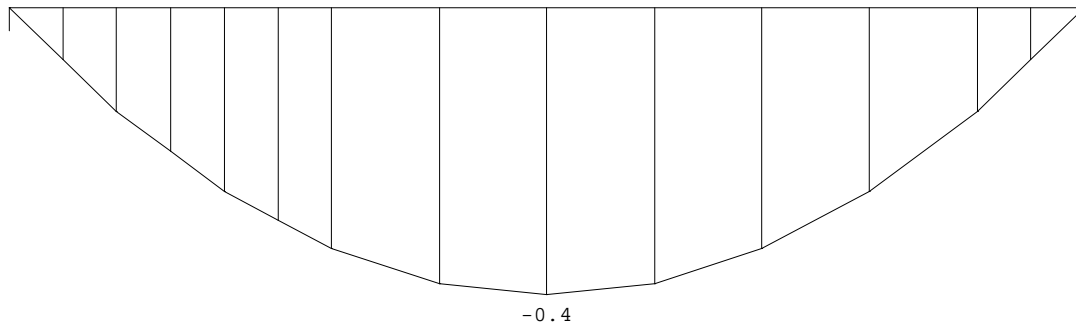
VELDBELASTINGEN

Ligger:1 B.G:1 Permanent

| Last Ref. | Type | Omschrijving | $q_1/p/m$ | q_2 | psi | Afstand | Lengte |
|-----------|----------|--------------|-----------|--------|-----|---------|--------|
| 1 | 1:q-last | | -0.970 | -0.970 | | 0.000 | 1.880 |

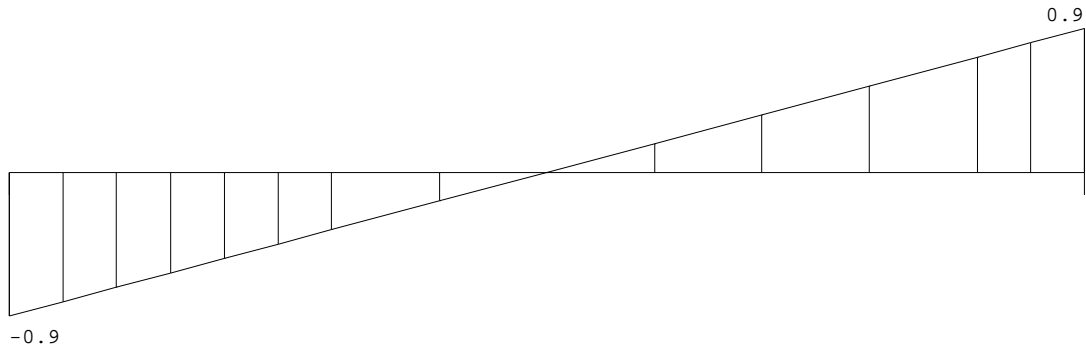
MOMENTEN

Ligger:1 B.G:1 Permanent



DWARSKRACHTEN

Ligger:1 B.G:1 Permanent



F:0.91

0.91

REACTIES

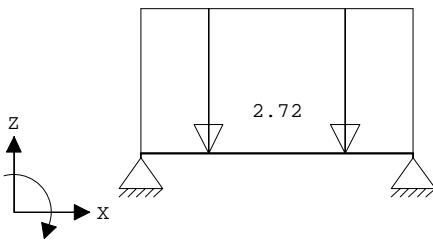
Ligger:1 B.G:1 Permanent

| Stp | F | M |
|-----|------|------|
| 1 | 0.91 | 0.00 |
| 2 | 0.91 | 0.00 |

1.82 : Som reacties
-1.82 : Som belastingen

VELDBELASTINGEN

Ligger:1 B.G:2 Veranderlijk



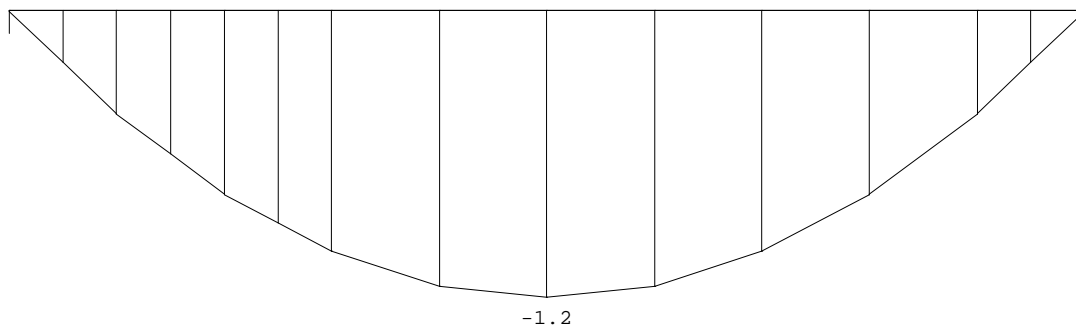
VELDBELASTINGEN

Ligger:1 B.G:2 Veranderlijk

| Last Ref. | Type | Omschrijving | q1/p/m | q2 psi | Afstand | Lengte |
|-----------|----------|--------------|--------|--------|---------|--------|
| 1 | 1:q-last | | -2.720 | -2.720 | 0.000 | 1.880 |

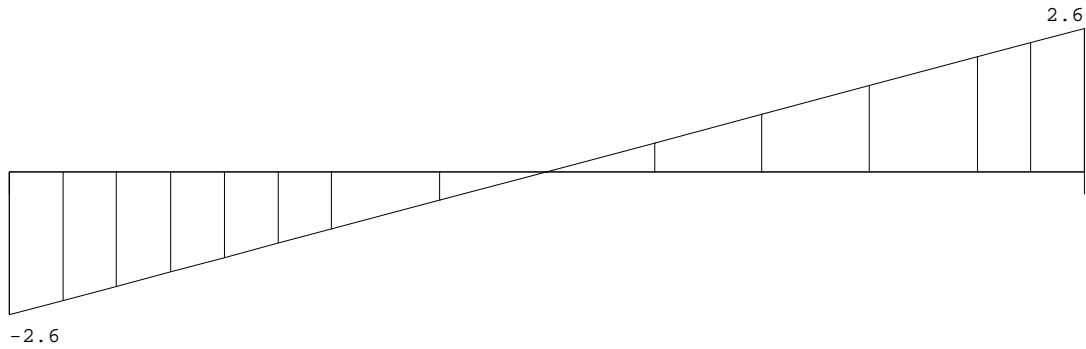
MOMENTEN

Ligger:1 B.G:2 Veranderlijk



DWARSKRACHTEN

Ligger:1 B.G:2 Veranderlijk



Fmin:0.00
Fmax:2.56

0.00
2.56

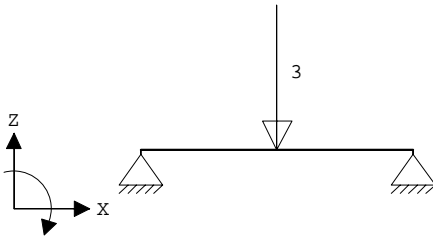
REACTIES

Ligger:1 B.G:2 Veranderlijk

| Stp | Fmin | Fmax | Mmin | Mmax |
|-----|------|------|------|------|
| 1 | 0.00 | 2.56 | 0.00 | 0.00 |
| 2 | 0.00 | 2.56 | 0.00 | 0.00 |

VELDBELASTINGEN

Ligger:1 B.G:3 Veranderlijk Q_k



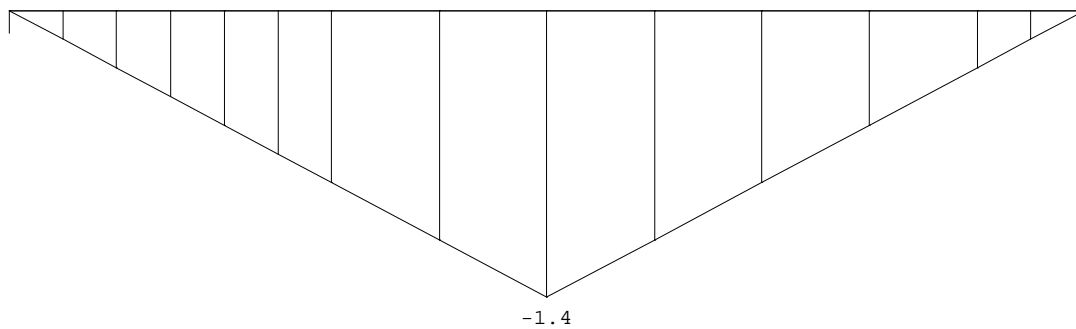
VELDBELASTINGEN

Ligger:1 B.G:3 Veranderlijk Q_k

| Last Ref. | Type | Omschrijving | q1/p/m | q2 psi | Afstand | Lengte |
|-----------|------------|--------------|--------|--------|---------|--------|
| 1 | 8:Puntlast | | -3.000 | | 0.940 | |

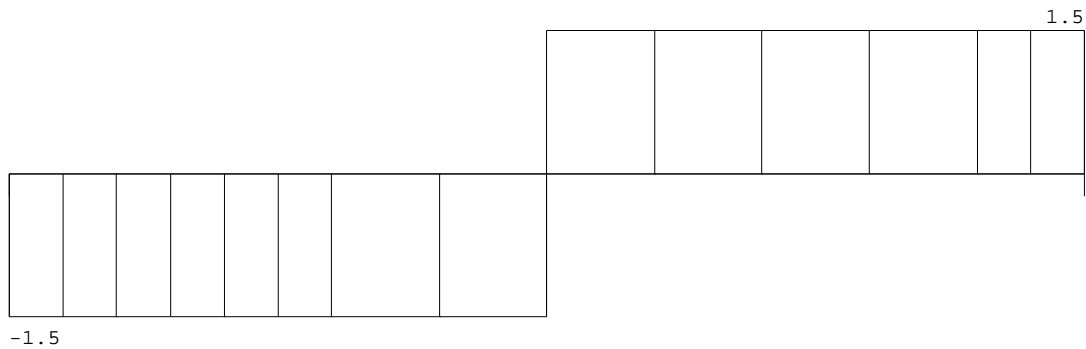
MOMENTEN

Ligger:1 B.G:3 Veranderlijk Q_k



DWARSKRACHTEN

Ligger:1 B.G:3 Veranderlijk Q_k



Fmin:0.00
Fmax:1.50

0.00
1.50

REACTIES

Ligger:1 B.G:3 Veranderlijk Q_k

| Stp | Fmin | Fmax | Mmin | Mmax |
|-----|------|------|------|------|
| 1 | 0.00 | 1.50 | 0.00 | 0.00 |
| 2 | 0.00 | 1.50 | 0.00 | 0.00 |

BELASTINGCOMBINATIES

| BC Type | BG Gen. | Factor | BG Gen. | Factor | BG Gen. | Factor | BG Gen. | Factor |
|---------|---------|--------|---------|--------|---------|--------|---------|--------|
| 1 | Fund. | 1 | Perm | 1.35 | | | | |
| 2 | Fund. | 1 | Perm | 1.35 | 2 | psi0 | 1.50 | |
| 3 | Fund. | 1 | Perm | 1.35 | 3 | psi0 | 1.50 | |
| 4 | Fund. | 1 | Perm | 1.20 | 2 | Extr | 1.50 | |
| 5 | Fund. | 1 | Perm | 1.20 | 3 | Extr | 1.50 | |
| 6 | Fund. | 1 | Perm | 0.90 | | | | |
| 7 | Fund. | 1 | Perm | 0.90 | 2 | psi0 | 1.50 | |
| 8 | Fund. | 1 | Perm | 0.90 | 3 | psi0 | 1.50 | |
| 9 | Fund. | 1 | Perm | 0.90 | 2 | Extr | 1.50 | |
| 10 | Fund. | 1 | Perm | 0.90 | 3 | Extr | 1.50 | |
| 11 | Kar. | 1 | Perm | 1.00 | 2 | Extr | 1.00 | |
| 12 | Kar. | 1 | Perm | 1.00 | 3 | Extr | 1.00 | |
| 13 | Freq. | 1 | Perm | 1.00 | | | | |
| 14 | Freq. | 1 | Perm | 1.00 | 2 | psi1 | 1.00 | |
| 15 | Freq. | 1 | Perm | 1.00 | 3 | psi1 | 1.00 | |
| 16 | Quas. | 1 | Perm | 1.00 | | | | |
| 17 | Quas. | 1 | Perm | 1.00 | 2 | psi2 | 1.00 | |
| 18 | Quas. | 1 | Perm | 1.00 | 3 | psi2 | 1.00 | |
| 19 | Blij. | 1 | Perm | 1.00 | | | | |

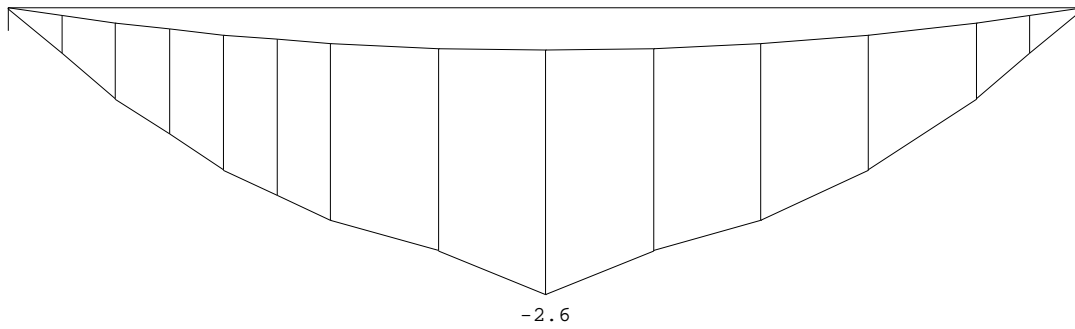
GUNSTIGE WERKING PERMANENTE BELASTINGEN

| BC | Velden met gunstige werking |
|----|-----------------------------|
| 1 | Geen |
| 2 | Geen |
| 3 | Geen |
| 4 | Geen |
| 5 | Geen |
| 6 | Alle velden de factor:0.90 |
| 7 | Alle velden de factor:0.90 |
| 8 | Alle velden de factor:0.90 |
| 9 | Alle velden de factor:0.90 |
| 10 | Alle velden de factor:0.90 |

OMHULLENDE VAN DE FUNDAMENTELE COMBINATIES

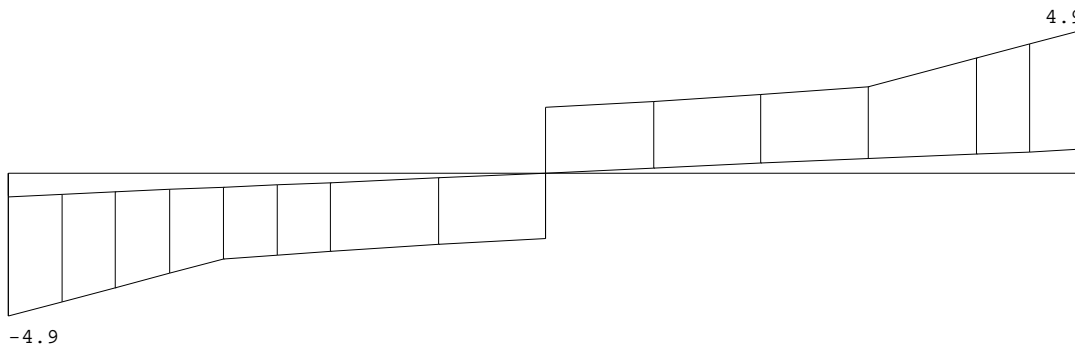
MOMENTEN

Ligger:1 Fundamentele combinatie



DWARSKRACHTEN

Ligger:1 Fundamentele combinatie



Fmin:0.82

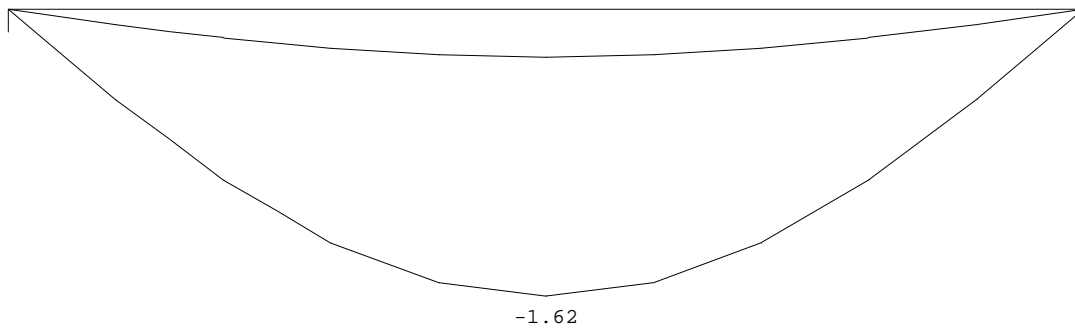
0.82

Fmax:4.93

4.93

VERPLAATSINGEN [mm]

Ligger:1 Fundamentele combinatie



REACTIES

Ligger:1 Fundamentele combinatie

| Stp | Fmin | Fmax | Mmin | Mmax |
|-----|------|------|------|------|
| 1 | 0.82 | 4.93 | 0.00 | 0.00 |
| 2 | 0.82 | 4.93 | 0.00 | 0.00 |

MATERIAALGEGEVENS

| Mt | Kwaliteit | $f_{m,y,k}$ [N/mm ²] | ρ_k [kg/m ³] | ρ_{mean} [kg/m ³] | $f_{t,0,k}$ [N/mm ²] | $f_{t,90,k}$ [N/mm ²] | $f_{c,0,k}$ [N/mm ²] | $f_{c,90,k}$ [N/mm ²] | $f_{v,k}$ [N/mm ²] |
|----|-----------|-------------------------------------|----------------------------------|---------------------------------------|-------------------------------------|--------------------------------------|-------------------------------------|--------------------------------------|-----------------------------------|
| 1 | C24 | 24 | 350 | 420 | 14.5 | 0.4 | 21.0 | 2.5 | 4.0 |

MATERIAALGEGEVENS (vervolg)

| Mt | Kwaliteit | G_{mean} [N/mm ²] | $E_{0,05}$ [N/mm ²] | $E_{90,mean}$ [N/mm ²] | $E_{0,mean}$ [N/mm ²] | Klimaatklasse | k_{def} | $E_{0,mean,fin}$ [N/mm ²] |
|----|-----------|------------------------------------|------------------------------------|---------------------------------------|--------------------------------------|---------------|-----------|--|
| 1 | C24 | 690 | 7400 | 370 | 11000 | I | 0.60 | 6875 |

KIPSTABILITEIT

Ligger:1

| Staaft | Plts. aangr. | 1 sys. | Kipsteunafstanden [m] [m] |
|--------|-----------------|------------------|--------------------------------------|
| 1 | 1.0*h | boven: onder: | 1.88 0.000;1.880 1.88 0.000;1.880 |

STABILITEIT

| Staaft | positie [mm] | $l_{ef,y}$ [mm] | $\sigma_{my,crit}$ [N/mm ²] | $\lambda_{rel,my}$ | $k_{crit,y}$ |
|--------|-----------------|--------------------|--|--------------------|--------------|
| 1 | 940 | 2320 | 55.41 | 0.66 | 1.00 |

TOETSING SPANNINGEN

| | | | | | |
|--------|---|-----------|-------|--------------|------|
| Staaft | 1 | BC / Sit. | 5 / 1 | UC frm(6.11) | 0.32 |
|--------|---|-----------|-------|--------------|------|

TOETSING DOORBUIGING

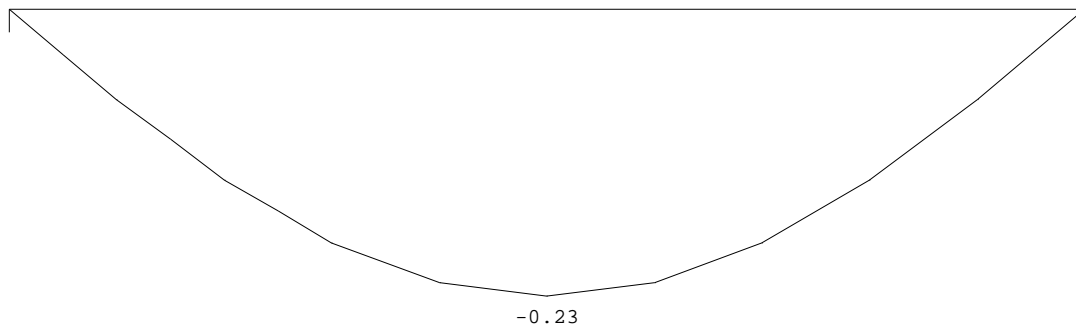
| Stf | Soort | Mtg | l_{sys} [mm] | Overstek i j | BC | Sit | u_{bij} [mm] | Toelaatbaar [mm] | $u_{fin,net}$ [mm] | Toelaatbaar [mm] | | |
|-----|-------|-----|-------------------|-----------------|----|-----|-------------------|---------------------|-----------------------|---------------------|------|-------|
| 1 | Vloer | db | 1880 | Nee Nee | 17 | 1 | -0.9 | -5.6 | 0.003 | -1.1 | -7.5 | 0.004 |

TOETSING DOORBUIGING (vervolg)

| Stf | Soort | Mtg | l_{sys} [mm] | Overstek i j | Zeeg [mm] | BC | Sit | $u_{in,net}$ [mm] | Toelaatbaar [mm] | |
|-----|-------|-----|-------------------|-----------------|--------------|----|-----|----------------------|---------------------|-------|
| 1 | Vloer | db | 1880 | Nee Nee | 0.0 | 11 | 1 | -0.9 | -7.5 | 0.004 |

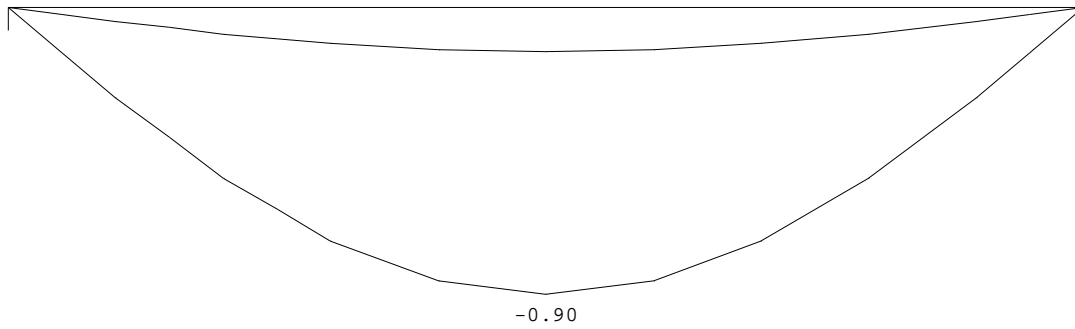
DOORBUIGINGEN w1 [mm]

Ligger:1 Blijvende combinatie



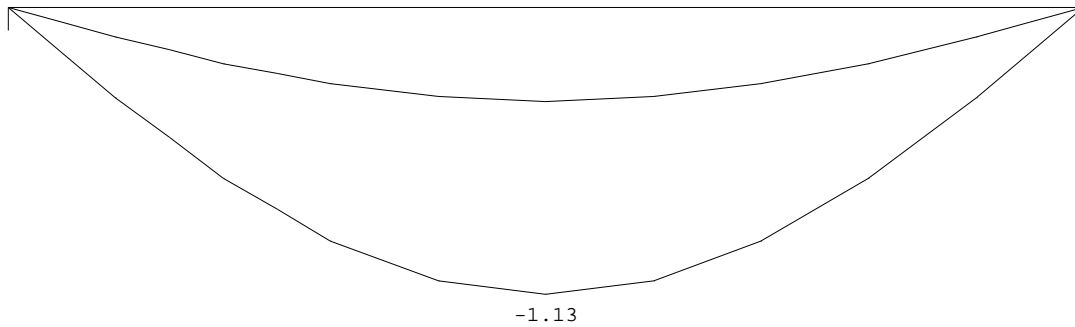
DOORBUIGINGEN W_{bij} [mm]

Ligger:1 Karakteristieke combinatie



DOORBUIGINGEN W_{max} [mm]

Ligger:1 Karakteristieke combinatie



DOORBUIGINGEN

Karakteristieke combinatie

| Veld | Zijde | positie | l_{rep} | w_1 | w_2 | W_{bij} | W_{tot} | w_c | W_{max} |
|------|-------|---------|-----------|-------|-------|-------------|-----------|-------|-------------|
| | | [m] | [mm] | [mm] | [mm] | [mm][lrep/] | [mm] | [mm] | [mm][lrep/] |
| 1 | Neg. | 0.940 | 1880 | -0.2 | -0.3 | -0.9 | 2083 | -1.1 | -1.1 1658 |

A.11 B1-01: balklaag dakterras

Technosoft Construct release

8 mrt 2024

Project : 2023237 - 5.1, 2, e te Amsterdam
Onderdeel : Balklagen
Datum : 27/11/2023
Eenheden : kN/m/rad
Bestand : K:\Werk\2023237\Berekeningen\Technosoft\Balklagen.cnw

Toegepaste normen volgens Eurocode met Nederlandse NB

| | | | |
|-------------|----------------------|-----------------|-------------|
| Belastingen | NEN-EN 1990:2002 | C2:2010,A1:2019 | NB:2019(nl) |
| | NEN-EN 1991-1-1:2002 | C1/C11:2019 | NB:2019(nl) |
| Hout | NEN-EN 1995-1-1:2005 | A1:2011,C1:2006 | NB:2013(nl) |
| | NEN-EN 14080:2013 | | |

Balklaag dakterras

Algemene gegevens

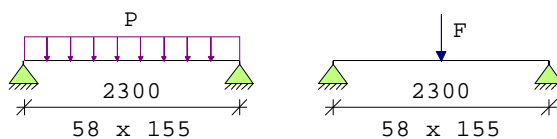
| | | | |
|------------------------|-----------------|--|--------|
| B x H | [mm] : 58 x 155 | Sterkteklasse | : C24 |
| Overspanning | [mm] : 2300 | Klimaatklasse | : I |
| Oplegglengte | [mm] : 75 | Referentie periode [j] | : 50 |
| H.o.h. afstand | [mm] : 610 | Min. eigenfreq. [Hz] | : 3 |
| Beschot sterkteklasse: | C24 | | |
| Dikte beschot | [mm] : 20 | $E_{0,mean} \times I$ [Nm ² /m] | : 7333 |

Permanente belastingen G_{rep}

| | |
|-----------------------------|---------|
| EG balklaag | : 0.95 |
| Extra belasting | : 0.00+ |
| Totaal [kN/m ²] | : 0.95 |

Veranderlijke belastingen

| | |
|-------------------------------------|----------------------|
| q_k +Pwanden [kN/m ²] | : 2.50 = 2.50 + 0.00 |
| Ψ_0 [-] | : 0.40 |
| Ψ_2 [-] | : 0.30 |
| Q_k [kN] | : 3.00 |
| Q_k oppervlak [m ²] | : 0.10 x 0.10 |
| Reductiefactor | : 0.71 |



Belastingfactoren (NEN-EN 1990)

| | | |
|----------------|----------------------|-------------------|
| Formule 6.10a: | γ_G : 1.35 | γ_Q : 1.50 |
| Formule 6.10b: | $\xi\gamma_G$: 1.20 | γ_Q : 1.50 |

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

γ_M [-]: 1.30

| Meegenomen combinaties in de berekening : | k_{mod} [-] | b_{ef} [mm] | $k_{c,90,q}$ | $k_{c,90,F}$ |
|--|---------------|---------------|--------------|--------------|
| * Permanent (G_{rep}) | 0.60 | 58 | | |
| * Perm. + q-last (6.10a) ($G_{rep} + q_k$) | 0.80 | 58 | 1.00 | |
| * Perm. + q-last (6.10b) ($G_{rep} + q_k$) | 0.80 | 58 | 1.00 | |
| * Perm. + puntlast (6.10a) ($G_{rep} + Q_k$) | 0.80 | 58 | 1.00 | 1.00 |
| * Perm. + puntlast (6.10b) ($G_{rep} + Q_k$) | 0.80 | 58 | 1.00 | 1.00 |

| Resultaten (maatgevende combinaties) | | | eis | u.c. |
|--------------------------------------|-----------|---|--|------|
| Perm + plast(6.10b) | frm(6.11) | $\sigma_{m,y,d}$ | = 9.73 < 14.77 [N/mm ²] | 0.66 |
| Perm + plast(6.10b) | frm(6.13) | $\tau_{v,d}$ | = 0.81 < 2.46 [N/mm ²] | 0.33 |
| Perm + plast(6.10b) | frm(6.3) | $\sigma_{c,90,q,d} / (k_{c,90,q} * f_{c,90,d}) +$ $\sigma_{c,90,F,d} / (k_{c,90,F} * f_{c,90,d}) < 1.00$ | = 0.18 / 1.54 + 1.00 / 1.54 = 0.77 | |
| Verdeelde belasting | | u_{bij} | = 3.95 < 4.60 [mm] | 0.86 |
| Verdeelde belasting | | $u_{net,fin}$ | = 5.02 < 9.20 [mm] | 0.55 |
| Trillingen | | | eis | u.c. |
| f1 | frm(7.5) | [Hz] : | 17.19 | |
| Lage frequentie | frm(7.3) | w/F | = 0.911 < 1.000 [mm/kN] | 0.91 |
| Hoge frequentie | frm(7.4) | v | = 0.016 < 0.019 [m/(Ns ²)] | 0.83 |

A.12 L1-01: ligger dakterras (daklicht)

Technosoft Liggers release 6.80

8 mrt 2024

Project.....: 2023237 - 5.1, 2, e te Amsterdam
Onderdeel....: ligger lichtstraat
Constructeur.: ME
Dimensies....: kN/m/rad
Datum.....: 26/02/2024
Bestand.....: K:\Werk\2023237\Berekeningen\Technosoft\L1-01 - ligger
dakterras.dlw

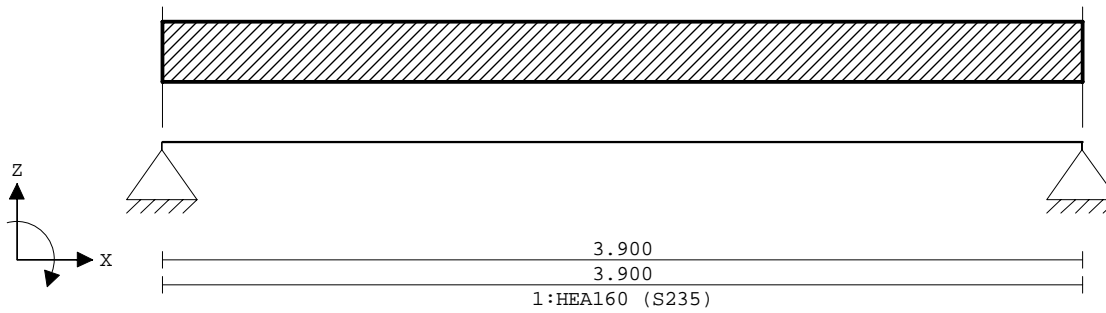
Betrouwbaarheidsklasse : 2 Referentieperiode : 50

Toegepaste normen volgens Eurocode met Nederlandse NB

| | | | |
|-------------|----------------------|-----------------|-------------|
| Belastingen | NEN-EN 1990:2002 | C2:2010,A1:2019 | NB:2019(nl) |
| | NEN-EN 1991-1-1:2002 | C1/C11:2019 | NB:2019(nl) |
| Staal | NEN-EN 1993-1-1:2006 | C2:2011,A1:2016 | NB:2016(nl) |

GEOMETRIE

Ligger:1



VELDLENGTEN

Ligger:1

| Veld | Vanaf | Tot | Lengte |
|------|-------|-------|--------|
| 1 | 0.000 | 3.900 | 3.900 |

MATERIALEN

| Mt | Kwaliteit | E-modulus[N/mm ²] | S.G. | Pois. | Uitz. coëff |
|----|-----------|-------------------------------|------|-------|-------------|
| 1 | S235 | 210000 | 78.5 | 0.30 | 1.2000e-05 |

PROFIELEN [mm]

| Prof. | Omschrijving | Materiaal | Oppervlak | Traagheid | Vormf. |
|-------|--------------|-----------|------------|------------|--------|
| 1 | HEA160 | 1:S235 | 3.8800e+03 | 1.6730e+07 | 0.00 |

PROFIELEN vervolg [mm]

| Prof. | Staaftype | Breedte | Hoogte | e | Type | b1 | h1 | b2 | h2 |
|-------|-----------|---------|--------|------|------|----|----|----|----|
| 1 | 0:Normaal | 160 | 152 | 76.0 | | | | | |

PROFIELVORMEN [mm]

1 HEA160



BELASTINGGEVALLEN

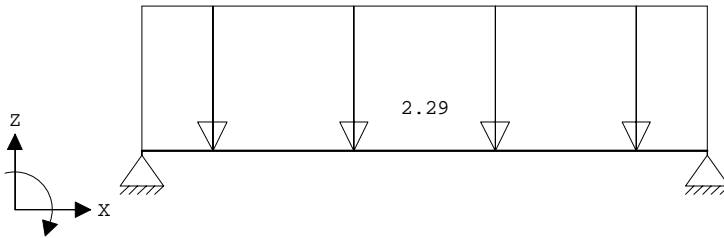
| B.G. | Omschrijving | Belast/onbelast | Ψ_0 | Ψ_1 | Ψ_2 | e.g. |
|------|--------------|---------------------|----------|----------|----------|-------|
| 1 | Permanent | 2:Permanent EN1991 | | | | -1.00 |
| 2 | Veranderlijk | 1:Schaakbord EN1991 | 0.40 | 0.50 | 0.30 | 0.00 |

BELASTINGGEVALLEN

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

VELDBELASTINGEN

Ligger:1 B.G:1 Permanent



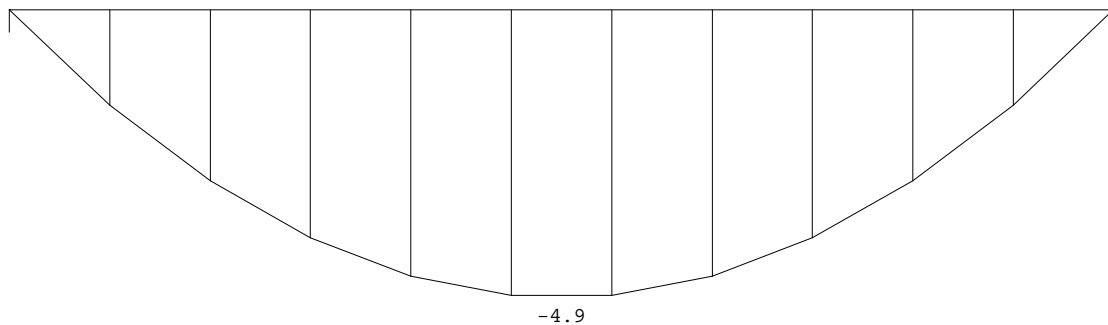
VELDBELASTINGEN

Ligger:1 B.G:1 Permanent

| Last Ref. | Type | Omschrijving | $q_1/p/m$ | q_2 | psi | Afstand | Lengte |
|-----------|----------|--------------|-----------|--------|-----|---------|--------|
| 1 | 1:q-last | | -2.290 | -2.290 | | 0.000 | 3.900 |

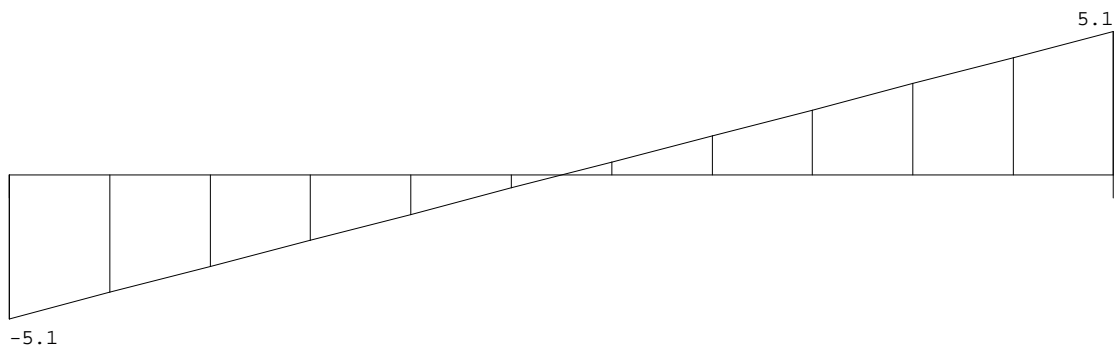
MOMENTEN

Ligger:1 B.G:1 Permanent



DWARSKRACHTEN

Ligger:1 B.G:1 Permanent



F:5.1

5.1

REACTIES

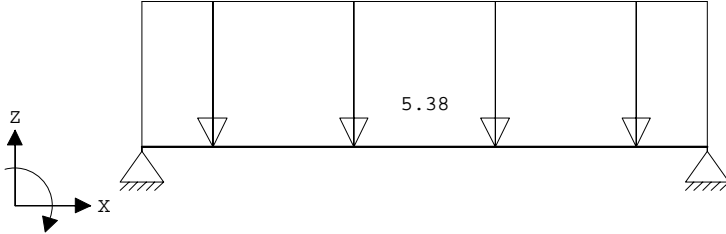
Ligger:1 B.G:1 Permanent

| Stp | F | M |
|-----|------|------|
| 1 | 5.06 | 0.00 |
| 2 | 5.06 | 0.00 |

10.12 : Som reacties
-10.12 : Som belastingen

VELDBELASTINGEN

Ligger:1 B.G:2 Veranderlijk



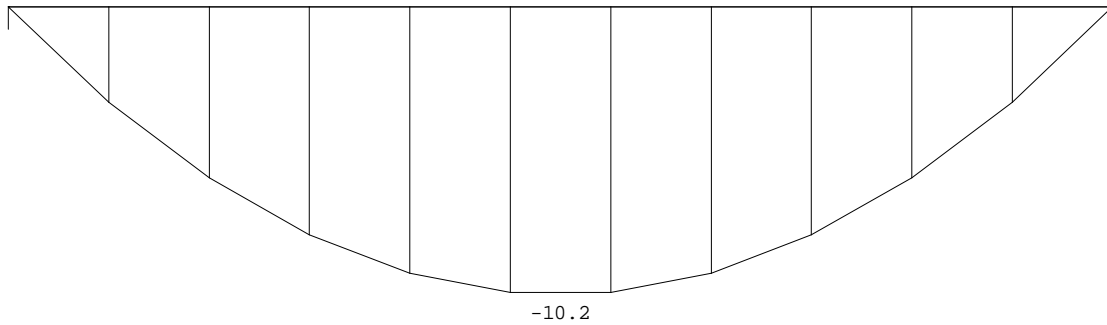
VELDBELASTINGEN

Ligger:1 B.G:2 Veranderlijk

| Last Ref. | Type | Omschrijving | q1/p/m | q2 psi | Afstand | Lengte |
|-----------|----------|--------------|--------|--------|---------|--------|
| 1 | 1:q-last | | -5.380 | -5.380 | 0.000 | 0.000 |

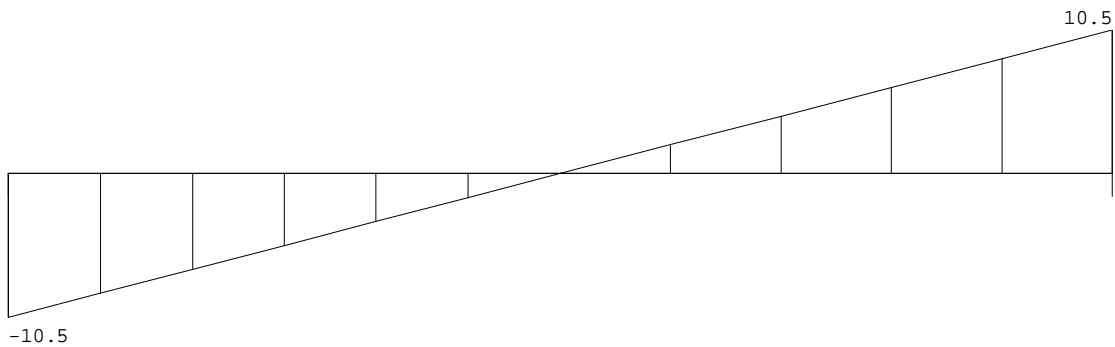
MOMENTEN

Ligger:1 B.G:2 Veranderlijk



DWARSKRACHTEN

Ligger:1 B.G:2 Veranderlijk



Fmin:0.00 0.00
Fmax:10.5 10.5

REACTIES

Ligger:1 B.G:2 Veranderlijk

REACTIES

Ligger:1 B.G:2 Veranderlijk

| Stp | Fmin | Fmax | Mmin | Mmax |
|-----|------|-------|------|------|
| 1 | 0.00 | 10.49 | 0.00 | 0.00 |
| 2 | 0.00 | 10.49 | 0.00 | 0.00 |

BELASTINGCOMBINATIES

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

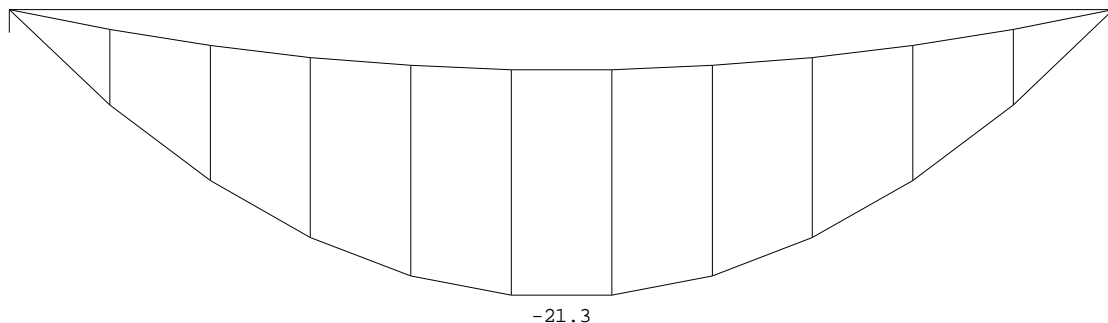
GUNSTIGE WERKING PERMANENTE BELASTINGEN

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

OMHULLENDE VAN DE FUNDAMENTELE COMBINATIES

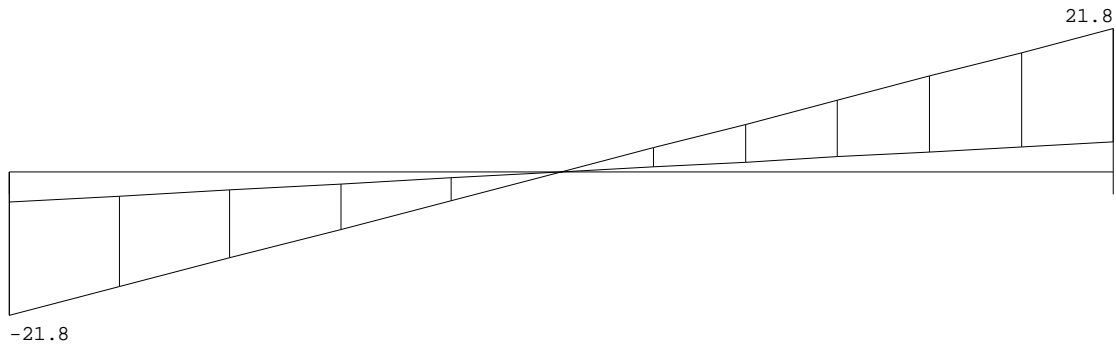
MOMENTEN

Ligger:1 Fundamentele combinatie



DWARSKRACHTEN

Ligger:1 Fundamentele combinatie



Fmin:4.55

4.55

Fmax:21.8

21.8

REACTIES

Ligger:1 Fundamentele combinatie

| Stp | Fmin | Fmax | Mmin | Mmax |
|-----|------|-------|------|------|
| 1 | 4.55 | 21.81 | 0.00 | 0.00 |
| 2 | 4.55 | 21.81 | 0.00 | 0.00 |

STAALPROFIELEN - ALGEMENE GEGEVENS

Ligger:1

Stabiliteit: Classificatie gehele constructie: Geschoord

PROFIEL/MATERIAAL

| P/M nr. | Profielnaam | Vloeisp. [N/mm ²] | Productie methode | Min. drsn. klasse |
|---------|-------------|-------------------------------|-------------------|-------------------|
| 1 | HEA160 | 235 | Gewalst | 1 |

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

KIPSTABILITEIT

Ligger:1

| Staal nr. | Plts. aangr. | l gaffel | Kipsteunafstanden [m] |
|-----------|--------------|------------------|-----------------------|
| 1 | 1.0*h | boven: onder: | 3.90 0;3,9 0;3,9 |

TOETSING SPANNINGEN

Ligger:1

| Staal nr. | P/M | BC | Sit | Kl | Plaats | Norm | Artikel | Formule | Hoogste toetsing U.C. [N/mm ²] | Opm. |
|-----------|-----|----|-----|----|--------|---------|---------|---------|--|------|
| 1 | 1 | 3 | 1 | 1 | Staal | EN3-1-1 | 6.3.2 | (6.54) | 0.432 | 101 |

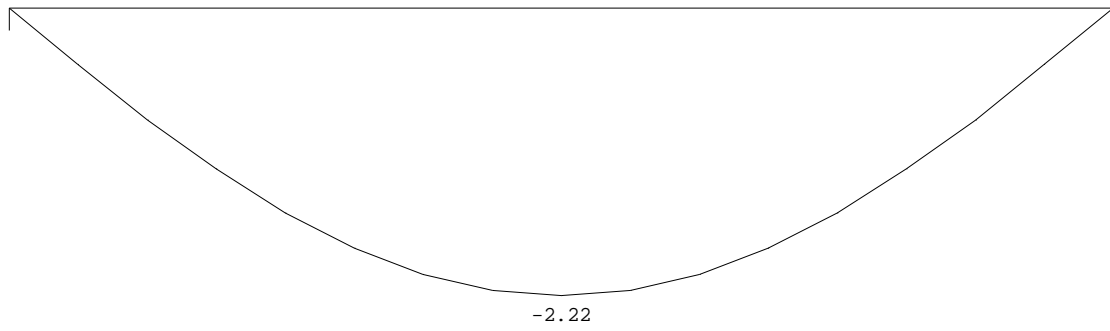
TOETSING DOORBUIGING

Ligger:1

| Staal nr. | Soort | Mtg | Lengte [m] | Overst I | Zeeg J | u _{tot} [mm] | BC | Sit | u [mm] | Toelaatbaar [mm] | *1 | |
|-----------|-------|-----|------------|----------|--------|-----------------------|------|-----|--------|------------------|-------|-------|
| 1 | Vlr+w | db | 3.90 | N | N | 0.0 | -3.6 | 11 | 1 Eind | -3.6 | ±15.6 | 0.004 |
| | | db | | | | | | 9 | 1 Bijk | -2.3 | ±7.8 | 0.002 |

DOORBUIGINGEN w1 [mm]

Ligger:1 Blijvende combinatie



A.13 B0-01: balklaag BG nieuw

Technosoft Construct release

8 mrt 2024

Project : 2023237 - 5.1, 2, e te Amsterdam
Onderdeel : Balklagen
Datum : 27/11/2023
Eenheden : kN/m/rad
Bestand : K:\Werk\2023237\Berekeningen\Technosoft\Balklagen.cnw

Toegepaste normen volgens Eurocode met Nederlandse NB

| | | | |
|-------------|----------------------|-----------------|-------------|
| Belastingen | NEN-EN 1990:2002 | C2:2010,A1:2019 | NB:2019(nl) |
| | NEN-EN 1991-1-1:2002 | C1/C11:2019 | NB:2019(nl) |
| Hout | NEN-EN 1995-1-1:2005 | A1:2011,C1:2006 | NB:2013(nl) |
| | NEN-EN 14080:2013 | | |

Balklaag beg. grond (nieuw)

Algemene gegevens

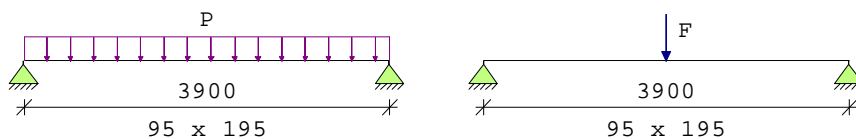
| | | | |
|------------------------|------------|--|--------|
| B x H [mm] | : 95 x 195 | Sterkteklasse | : C24 |
| Overspanning [mm] | : 3900 | Klimaatklasse | : I |
| Oplegglengte [mm] | : 75 | Referentie periode [j] | : 50 |
| H.o.h. afstand [mm] | : 408 | Min. eigenfreq. [Hz] | : 3 |
| Beschot sterkteklasse: | C24 | | |
| Dikte beschot [mm] | : 22 | $E_{0,mean} \times I$ [Nm ² /m] | : 9761 |

Permanente belastingen G_{rep}

| | |
|-----------------------------|---------|
| EG balklaag | : 1.45 |
| Extra belasting | : 0.00+ |
| Totaal [kN/m ²] | : 1.45 |

Veranderlijke belastingen

| | |
|---|----------------------|
| $q_k + P_{wanden}$ [kN/m ²] | : 2.55 = 1.75 + 0.80 |
| Ψ_0 [-] | : 0.40 |
| Ψ_2 [-] | : 0.30 |
| Q_k [kN] | : 3.00 |
| Q_k oppervlak [m ²] | : 0.10 x 0.10 |
| Reductiefactor | : 0.50 |



Belastingfactoren (NEN-EN 1990)

| | | |
|----------------|----------------------|-------------------|
| Formule 6.10a: | γ_G : 1.35 | γ_Q : 1.50 |
| Formule 6.10b: | $\xi\gamma_G$: 1.20 | γ_Q : 1.50 |

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

γ_M [-]: 1.30

| Meegenomen combinaties in de berekening : | k_{mod} [-] | b_{ef} [mm] | $k_{c,90,q}$ | $k_{c,90,F}$ |
|--|---------------|---------------|--------------|--------------|
| * Permanent (G_{rep}) | 0.60 | 95 | | |
| * Perm. + q-last (6.10a) ($G_{rep} + q_k$) | 0.80 | 95 | 1.00 | |
| * Perm. + q-last (6.10b) ($G_{rep} + q_k$) | 0.80 | 95 | 1.00 | |
| * Perm. + puntlast (6.10a) ($G_{rep} + Q_k$) | 0.80 | 95 | 1.00 | 1.00 |
| * Perm. + puntlast (6.10b) ($G_{rep} + Q_k$) | 0.80 | 95 | 1.00 | 1.00 |

| Resultaten (maatgevende combinaties) | eis | u.c. |
|--|---|------|
| Perm + qlast(6.10b) frm(6.11) $\sigma_{m,y,d}$ | = 7.17 < 14.77 [N/mm ²] | 0.49 |
| Perm + plast(6.10b) frm(6.13) $\tau_{v,d}$ | = 0.45 < 2.46 [N/mm ²] | 0.18 |
| Perm + plast(6.10b) frm(6.3) | $\sigma_{c,90,q,d} / (k_{c,90,q} * f_{c,90,d}) +$ $\sigma_{c,90,F,d} / (k_{c,90,F} * f_{c,90,d}) < 1.00$ = 0.19 / 1.54 + 0.62 / 1.54 = 0.53 | |
| Verdeelde belasting | u_{bij} = 7.38 < 7.80 [mm] | 0.95 |
| Verdeelde belasting | $u_{net,fin}$ = 10.14 < 15.60 [mm] | 0.65 |

A.14 Stabiliteitsportaal achtergevel hoofdvolume

Technosoft Raamwerken release 6.80

7 mrt 2024

Project.....: 2023237 - 5.1, 2, e te Amsterdam
Onderdeel....: Stabiliteitsspannt voorgevel
Constructeur.: ME
Dimensies....: kN;m;rad (tenzij anders aangegeven)
Datum.....: 22/02/2024
Bestand.....: K:\Werk\2023237\Berekeningen\Technosoft\Stabiliteitsspannt
achtergevel nieuw.rww

Belastingbreedte.: 4.500
Rekenmodel.....: 1e-orde-elastisch.
Theorie voor de bepaling van de krachtsverdeling:
Geometrisch lineair.
Fysisch lineair.

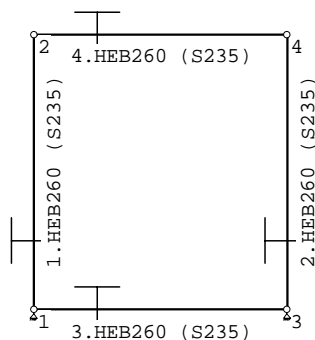
Gunstige werking van de permanente belasting wordt automatisch verwerkt.

Toegepaste normen volgens Eurocode met Nederlandse NB

| | | | |
|-------------|----------------------|-----------------|-------------|
| Belastingen | NEN-EN 1990:2002 | C2:2010,A1:2019 | NB:2019(nl) |
| | NEN-EN 1991-1-1:2002 | C1/C11:2019 | NB:2019(nl) |
| Staal | NEN-EN 1993-1-1:2006 | C2:2011,A1:2016 | NB:2016(nl) |



GEOMETRIE



MATERIALEN

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

PROFIELEN [mm]

| Prof. | Omschrijving | Materiaal | Oppervlak | Traagheid | Vormf. |
|-------|--------------|-----------|------------|------------|--------|
| 1 | HEB260 | 1:S235 | 1.1840e+04 | 1.4920e+08 | 0.00 |

PROFIELEN vervolg [mm]

| Prof. | Staaftype | Breedte | Hoogte | e | Type | b1 | h1 | b2 | h2 |
|-------|-----------|---------|--------|-------|------|----|----|----|----|
| 1 | 0:Normaal | 260 | 260 | 130.0 | | | | | |

PROFIELVORMEN [mm]

1 HEB260



KNOPEN

| Knoop | X | Z |
|-------|-------|-------|
| 1 | 0.000 | 0.000 |
| 2 | 0.000 | 4.000 |
| 3 | 3.700 | 0.000 |
| 4 | 3.700 | 4.000 |

STAVEN

| St. | ki | kj | Profiel | Aansl.i | Aansl.j | Lengte | Opm. |
|-----|----|----|----------|---------|---------|--------|------|
| 1 | 1 | 2 | 1:HEB260 | NDM | NDM | 4.000 | |
| 2 | 3 | 4 | 1:HEB260 | NDM | NDM | 4.000 | |
| 3 | 1 | 3 | 1:HEB260 | NDM | NDM | 3.700 | |
| 4 | 2 | 4 | 1:HEB260 | NDM | NDM | 3.700 | |

VASTE STEUNPUNTEN

| Nr. | knoop | Kode | XZR | 1=vast | 0=vrij | Hoek |
|-----|-------|------|-----|--------|--------|------|
| 1 | 1 | 110 | | | | 0.00 |
| 2 | 3 | 110 | | | | 0.00 |

BELASTINGGENERATIE ALGEMEEN.

| | | | |
|------------------------------|------|-------------------------|------|
| Betrouwbaarheidsklasse.....: | 2 | Referentieperiode.....: | 50 |
| Gebouwdiepte.....: | 0.00 | Gebouwhoogte.....: | 4.00 |
| Niveau aansl.terrein.....: | 0.00 | E.g. scheid.w. [kN/m2]: | 0.00 |

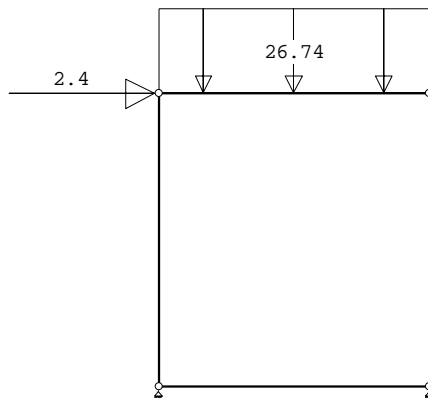
BELASTINGGEVALLEN

| B.G. | Omschrijving | EGZ=-1.00 | Type |
|------|---------------------------------|-----------|-----------------------------|
| 1 | Permanente belasting | | 1 |
| 2 | Veranderlijke belasting (vloer) | | 2 Ver. bel. pers. ed. (q_k) |
| 3 | Veranderlijke belasting (Fhor) | | 8 Wind van links overdruk A |
| 4 | Knik | | 0 Onbekend |

BELASTINGEN

B.G:1 Permanente belasting

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



KNOOPBELASTINGEN

B.G:1 Permanente belasting

| Last | Knoop | Richting | waarde | ψ_0 | ψ_1 | ψ_2 |
|------|-------|----------|--------|----------|----------|----------|
| 1 | 2 | X | 2.400 | | | |

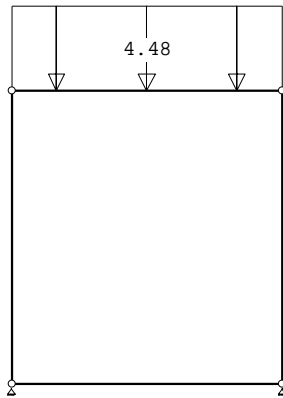
STAAFBELASTINGEN

B.G:1 Permanente belasting

| StAAF | Type | q1/p/m | q2 | A | B | ψ_0 | ψ_1 | ψ_2 |
|-------|-------------|--------|--------|-------|-------|----------|----------|----------|
| 4 | 3:QZgeProj. | -26.74 | -26.74 | 0.000 | 0.000 | | | |

BELASTINGEN

B.G:2 Veranderlijke belasting (vloer)



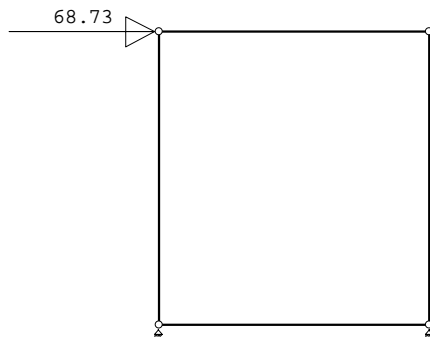
STAAFBELASTINGEN

B.G:2 Veranderlijke belasting (vloer)

| StAAF | Type | q1/p/m | q2 | A | B | Ψ_0 | Ψ_1 | Ψ_2 |
|-------|------------|--------|-------|-------|-------|----------|----------|----------|
| 4 | 1:QZLokaal | -4.48 | -4.48 | 0.000 | 0.000 | 0.40 | 0.50 | 0.30 |

BELASTINGEN

B.G:3 Veranderlijke belasting (Fhor)



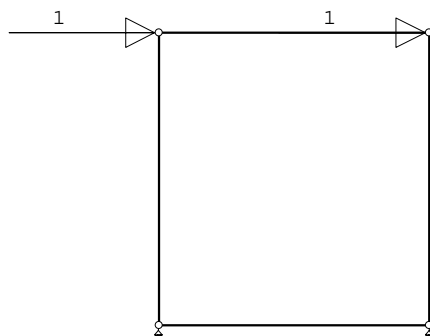
KNOOPBELASTINGEN

B.G:3 Veranderlijke belasting (Fhor)

| Last | Knoop | Richting | waarde | Ψ_0 | Ψ_1 | Ψ_2 |
|------|-------|----------|--------|----------|----------|----------|
| 1 | 2 | X | 68.730 | 0.40 | 0.50 | 0.30 |

BELASTINGEN

B.G:4 Knik



KNOOPBELASTINGEN

B.G:4 Knik

| Last | Knoop | Richting | waarde | Ψ_0 | Ψ_1 | Ψ_2 |
|------|-------|----------|--------|----------|----------|----------|
| 1 | 2 | X | 1.000 | | | |
| 2 | 4 | X | 1.000 | | | |

BELASTINGCOMBINATIES

| BC | Type | | | | | | |
|----|-------|------|-----------|---|------|----------|-------------------------------------|
| 1 | Fund. | 1.35 | $G_{k,1}$ | | | | |
| 2 | Fund. | 0.90 | $G_{k,1}$ | | | | |
| 3 | Fund. | 1.35 | $G_{k,1}$ | + | 1.50 | ψ_0 | $Q_{k,2}$ |
| 4 | Fund. | 1.35 | $G_{k,1}$ | + | 1.50 | ψ_0 | $Q_{k,3}$ |
| 5 | Fund. | 1.20 | $G_{k,1}$ | + | 1.50 | | $Q_{k,2}$ |
| 6 | Fund. | 1.20 | $G_{k,1}$ | + | 1.50 | | $Q_{k,3}$ |
| 7 | Fund. | 0.90 | $G_{k,1}$ | + | 1.50 | | $Q_{k,2}$ |
| 8 | Fund. | 0.90 | $G_{k,1}$ | + | 1.50 | ψ_0 | $Q_{k,2}$ |
| 9 | Fund. | 0.90 | $G_{k,1}$ | + | 1.50 | ψ_0 | $Q_{k,3}$ |
| 10 | Fund. | 0.90 | $G_{k,1}$ | + | 1.50 | | $Q_{k,3}$ |
| 11 | Fund. | 1.35 | $G_{k,1}$ | + | 1.50 | ψ_0 | $Q_{k,2}$ + 1.50 ψ_0 $Q_{k,3}$ |

BELASTINGCOMBINATIES

| BC | Type | | | | | | |
|----|-------|------|-----------|---|------|-----------|-------------------------------------|
| 12 | Fund. | 1.20 | $G_{k,1}$ | + | 1.50 | $Q_{k,2}$ | + 1.50 ψ_0 $Q_{k,3}$ |
| 13 | Fund. | 1.20 | $G_{k,1}$ | + | 1.50 | $Q_{k,3}$ | + 1.50 ψ_0 $Q_{k,2}$ |
| 14 | Fund. | 0.90 | $G_{k,1}$ | + | 1.50 | $Q_{k,2}$ | + 1.50 ψ_0 $Q_{k,3}$ |
| 15 | Fund. | 0.90 | $G_{k,1}$ | + | 1.50 | ψ_0 | $Q_{k,2}$ + 1.50 ψ_0 $Q_{k,3}$ |
| 16 | Fund. | 0.90 | $G_{k,1}$ | + | 1.50 | $Q_{k,3}$ | + 1.50 ψ_0 $Q_{k,2}$ |
| 17 | Kar. | 1.00 | $G_{k,1}$ | + | 1.00 | $Q_{k,2}$ | |
| 18 | Kar. | 1.00 | $G_{k,1}$ | + | 1.00 | $Q_{k,3}$ | |
| 19 | Kar. | 1.00 | $G_{k,1}$ | + | 1.00 | $Q_{k,2}$ | + 1.00 ψ_0 $Q_{k,3}$ |
| 20 | Kar. | 1.00 | $G_{k,1}$ | + | 1.00 | $Q_{k,3}$ | + 1.00 ψ_0 $Q_{k,2}$ |
| 21 | Quas. | 1.00 | $G_{k,1}$ | | | | |
| 22 | Quas. | 1.00 | $G_{k,1}$ | + | 1.00 | ψ_2 | $Q_{k,2}$ |
| 23 | Quas. | 1.00 | $G_{k,1}$ | + | 1.00 | ψ_2 | $Q_{k,3}$ |
| 24 | Quas. | 1.00 | $G_{k,1}$ | + | 1.00 | ψ_2 | $Q_{k,2}$ + 1.00 ψ_2 $Q_{k,3}$ |
| 25 | Freq. | 1.00 | $G_{k,1}$ | | | | |
| 26 | Freq. | 1.00 | $G_{k,1}$ | + | 1.00 | ψ_1 | $Q_{k,2}$ |
| 27 | Freq. | 1.00 | $G_{k,1}$ | + | 1.00 | ψ_1 | $Q_{k,3}$ |
| 28 | Freq. | 1.00 | $G_{k,1}$ | + | 1.00 | ψ_1 | $Q_{k,2}$ + 1.00 ψ_2 $Q_{k,3}$ |
| 29 | Freq. | 1.00 | $G_{k,1}$ | + | 1.00 | ψ_1 | $Q_{k,3}$ + 1.00 ψ_2 $Q_{k,2}$ |
| 30 | Blij. | 1.00 | $G_{k,1}$ | | | | |

GUNSTIGE WERKING PERMANENTE BELASTINGEN

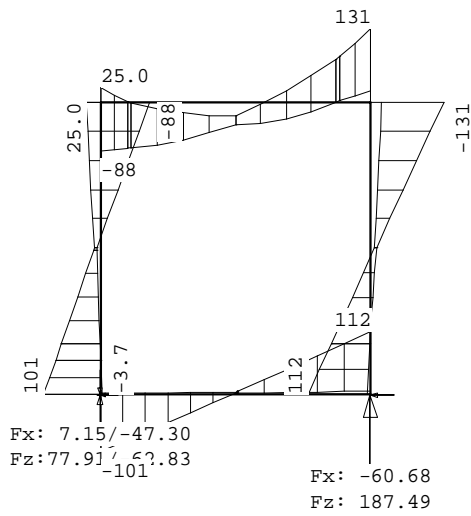
BC Staven met gunstige werking

- 1 Geen
- 2 Alle staven de factor:0.90
- 3 Geen
- 4 Geen
- 5 Geen
- 6 Geen
- 7 Alle staven de factor:0.90
- 8 Alle staven de factor:0.90
- 9 Alle staven de factor:0.90
- 10 Alle staven de factor:0.90
- 11 Geen
- 12 Geen
- 13 Geen
- 14 Alle staven de factor:0.90
- 15 Alle staven de factor:0.90
- 16 Alle staven de factor:0.90

OMHULLENDE VAN DE FUNDAMENTELE COMBINATIES

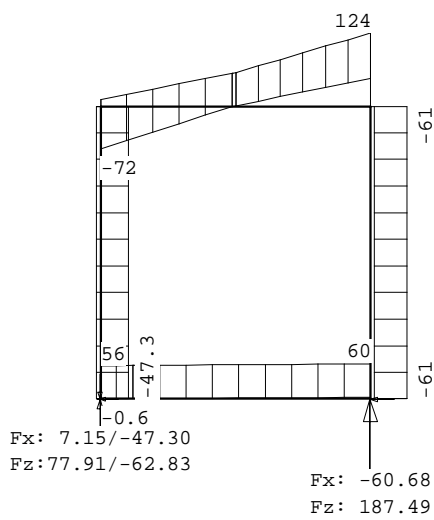
MOMENTEN

Fundamentele combinatie



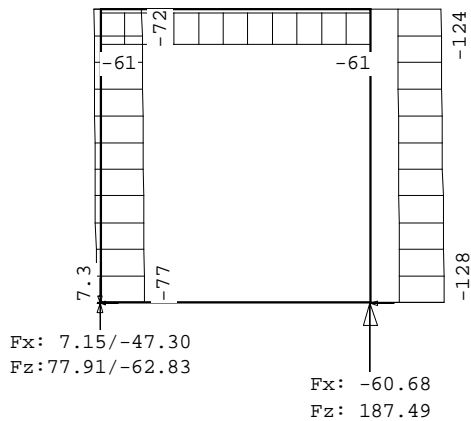
DWARSKRACHTEN

Fundamentele combinatie



NORMAALKRACHTEN

Fundamentele combinatie



REACTIES

Fundamentele combinatie

| Kn. | X-min | X-max | Z-min | Z-max | M-min | M-max |
|-----|--------|-------|--------|--------|-------|-------|
| 1 | -47.30 | 7.15 | -62.83 | 77.91 | | |
| 3 | -60.68 | -6.47 | 53.30 | 187.49 | | |

STAALPROFIELEN - ALGEMENE GEGEVENS

Stabiliteit: Classificatie gehele constructie: Ongeschoord
 Belastinggeval m.b.t. bepaling kniklengte: 4=Knik
 Aanpassing inkl. parameter C : Steunpunten
 Tweede-orde-effect:
 Aan te houden verhouding $n/(n-1)$
 voor steunmomenten en verplaatsingen: 1.10
 Doorbuiging en verplaatsing:
 Aantal bouwlagen: 4
 Gebouwtype: Overig
 Toel. horiz. verplaatsing gehele gebouw: $h/300$
 Kleinste gevelhoogte [m]: 0.0

PROFIEL/MATERIAAL

| P/M nr. | Profielnaam | Vloeisp. [N/mm ²] | Productie methode | Min. drsn. klasse |
|-------------------------------|-------------|-------------------------------|-------------------|-------------------|
| 1 | HEB260 | 235 | Gewalst | 1 |
| Partiële veiligheidsfactoren: | | | | |
| Gamma M;0 | : | 1.00 | Gamma M;1 | : 1.00 |
| Gamma M;fi;mech | : | 1.00 | Gamma M;fi;therm | : 1.00 |

KNIKSTABILITEIT

| Staal | l_{sys} [m] | Classif. y sterke as | $l_{knik;y}$ [m] | Extra | | Extra | |
|-------|---------------|----------------------|------------------|--------------|----------------------|------------------|--------------|
| | | | | aanp. y [kN] | Classif. z zwakke as | $l_{knik;z}$ [m] | aanp. z [kN] |
| 1 | 4.000 | Ongeschoord | 5.193 | 0.0 | Geschoord | 4.000 | 0.0 |
| 2 | 4.000 | Ongeschoord | 5.193 | 0.0 | Geschoord | 4.000 | 0.0 |
| 3 | 3.700 | Geschoord | 3.700 | 0.0 | Geschoord | 3.700 | 0.0 |
| 4 | 3.700 | Ongeschoord | 4.900 | 0.0 | Geschoord | 3.700 | 0.0 |

KIPSTABILITEIT

| Staal | Plts. aangr. | l gaffel [m] | Kipsteunafstanden [m] |
|-------|--------------|--------------|-----------------------|
| 1 | 1.0*h | boven: | 4.00 4 |
| | | onder: | 4 |
| 2 | 1.0*h | boven: | 4.00 4 |
| | | onder: | 4 |

KIPSTABILITEIT

| Staal | Plts. aangr. | l gaffel | Kipsteunafstanden | |
|-------|--------------|----------|-------------------|-----|
| | | | [m] | [m] |
| 3 | 1.0*h | boven: | 3.70 | 3,7 |
| | | onder: | | 3,7 |
| 4 | 1.0*h | boven: | 3.70 | 3,7 |
| | | onder: | | 3,7 |

KRACHTEN UIT HET VLAK

| Staal | Mbegin | Mmidden | Meinde | Vbegin | Vtpv | Mmax | Veinde | Mx |
|-------|--------|---------|--------|--------|------|------|--------|-------|
| | [kNm] | [kNm] | [kNm] | [kN] | [kN] | [kN] | [kN] | [kNm] |
| 4 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 2.5 |

TOETSING SPANNINGEN

| Staal nr. | P/M | BC | Sit | Kl | Plaats | Norm | Artikel | Formule | Hoogste toetsing U.C. [N/mm ²] | Opm. |
|-----------|-----|----|-----|----|--------|---------|---------|--------------|--|------|
| 1 | 1 | 10 | 1 | 1 | Begin | EN3-1-1 | 6.2.10 | (6.45+6.31y) | 0.371 | 87 |
| 2 | 1 | 13 | 1 | 1 | Einde | EN3-1-1 | 6.2.10 | (6.45+6.31y) | 0.477 | 112 |
| 3 | 1 | 13 | 1 | 1 | Staal | EN3-1-1 | 6.3.2 | (6.54) | 0.409 | 96 |
| 4 | 1 | 13 | 1 | 1 | Einde | EN3-1-1 | 6.2.1 | (6.1) | 0.825 | 194 |

TOETSING DOORBUIGING

| Staal | Soort | Mtg | Lengte | Overst | Zeeg | u _{tot} | BC | Sit | u | Toelaatbaar | |
|-------|-------|-----|--------|--------|------|------------------|------|-----|--------|-------------|-------|
| | | | [m] | I | J | [mm] | | | [mm] | [mm] | |
| 3 | Vlr+w | db | 3.70 | N | N | 0.0 | 0.7 | 20 | 1 Eind | 0.7 ±14.8 | 0.004 |
| | | | | | | | | | 1 Bijk | 0.5 ±7.4 | 0.002 |
| 4 | Vlr+w | db | 3.70 | N | N | 0.0 | -1.5 | 20 | 1 Eind | -1.5 ±14.8 | 0.004 |
| | | | | | | | | | 1 Bijk | -0.3 ±7.4 | 0.002 |

TOETSING HORIZONTALE VERPLAATSING

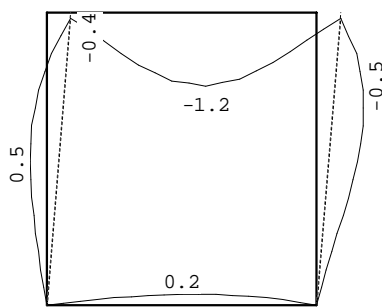
| Staal | BC | Sit | Lengte | u _{eind} | Toelaatbaar | Maatgevend |
|-------|----|-----|--------|-------------------|-------------|-----------------|
| | | | [m] | [mm] | [mm] | [h/] |
| 1 | 20 | 1 | 4.000 | -12.9 | 13.3 | 300 scheefstand |
| 2 | 18 | 1 | 4.000 | -12.9 | 13.3 | 300 scheefstand |

TOETSING HOR. VERPLAATSING GLOBAAL

Er is een maximale horizontale verplaatsing van 0.0129 [m] gevonden bij knoop 2 en combinatie 20; belastingsituatie 1 (combinatietype 2). Bij een hoogte van 4.000 [m] levert dit h / 309 (toel.: h / 300).

VERVORMINGEN w1

Blijvende combinatie



A.15 L2-05: ligger stabiliteitswanden

Technosoft Liggers release 6.80b

11 jul 2024

Project.....: 2023237 - 5.1, 2, e te Amsterdam
 Constructeur.: ME
 Dimensies...: kN/m/rad
 Datum.....: 29/02/2024
 Bestand.....: K:\Werk\2023237\Berekeningen\Technosoft\L2-05 - ligger
 stabiliteitswanden.dlw

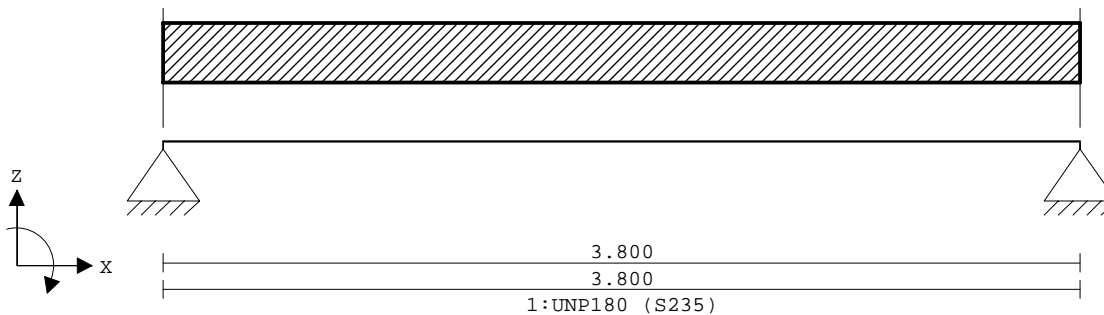
Betrouwbaarheidsklasse : 2 Referentieperiode : 50

Toegepaste normen volgens Eurocode met Nederlandse NB

| | | | |
|-------------|----------------------|-----------------|-------------|
| Belastingen | NEN-EN 1990:2002 | C2:2010,A1:2019 | NB:2019(nl) |
| | NEN-EN 1991-1-1:2002 | C1/C11:2019 | NB:2019(nl) |
| Staal | NEN-EN 1993-1-1:2006 | C2:2011,A1:2016 | NB:2016(nl) |

GEOMETRIE

Ligger:1



VELDLENGTEN

Ligger:1

| Veld | Vanaf | Tot | Lengte |
|------|-------|-------|--------|
| 1 | 0.000 | 3.800 | 3.800 |

MATERIALEN

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

PROFIELEN [mm]

| Prof. | Omschrijving | Materiaal | Oppervlak | Traagheid | Vormf. |
|-------|--------------|-----------|------------|------------|--------|
| 1 | UNP180 | 1:S235 | 2.7960e+03 | 1.3540e+07 | 0.00 |

PROFIELEN vervolg [mm]

| Prof. | Staaftype | Breedte | Hoogte | e | Type | b1 | h1 | b2 | h2 |
|-------|-----------|---------|--------|------|------|----|----|----|----|
| 1 | 0:Normaal | 70 | 180 | 90.0 | | | | | |

PROFIELVORMEN [mm]

1 UNP180



BELASTINGGEVALLEN

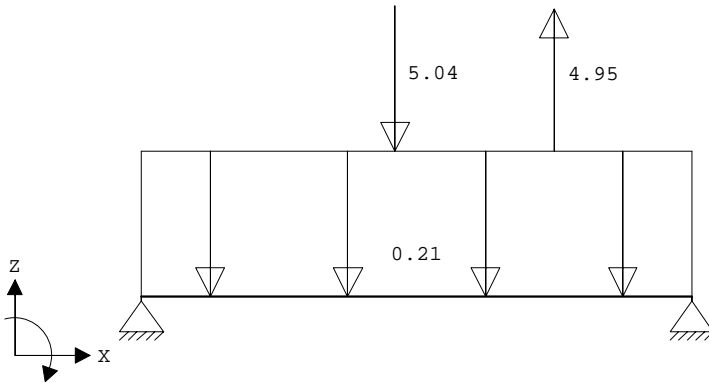
| B.G. | Omschrijving | Belast/onbelast | Ψ_0 | Ψ_1 | Ψ_2 | e.g. |
|------|-------------------|---------------------|----------|----------|----------|-------|
| 1 | Permanent | 2:Permanent EN1991 | | | | -1.00 |
| 2 | Veranderlijk wind | 1:Schaakbord EN1991 | 0.00 | 0.20 | 0.00 | 0.00 |
| 3 | Veranderlijk | 1:Schaakbord EN1991 | 0.40 | 0.50 | 0.30 | 0.00 |

BELASTINGGEVALLEN

| B.G. | Omschrijving | Type |
|------|-------------------|---------------------------------|
| 1 | Permanent | 1 Permanente belasting |
| 2 | Veranderlijk wind | 8 Wind van links overdruk A |
| 3 | Veranderlijk | 2 Ver. bel. pers. ed. (q_k) |

VELDBELASTINGEN

Ligger:1 B.G:1 Permanent



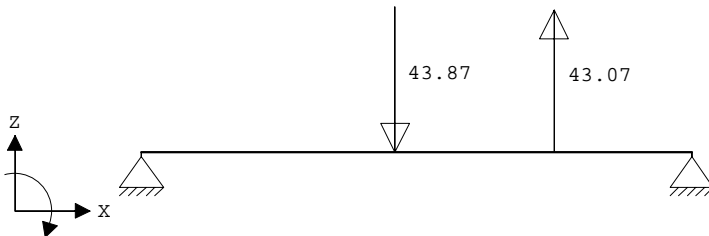
VELDBELASTINGEN

Ligger:1 B.G:1 Permanent

| Last Ref. | Type | Omschrijving | $q_1/p/m$ | q_2 | psi | Afstand | Lengte |
|-----------|------------|--------------|-----------|--------|-----|---------|--------|
| 1 | 8:Puntlast | | -5.040 | | | 1.750 | |
| 2 | 8:Puntlast | | 4.950 | | | 2.850 | |
| 3 | 1:q-last | | -0.210 | -0.210 | | 0.000 | 3.800 |

VELDBELASTINGEN

Ligger:1 B.G:2 Veranderlijk wind



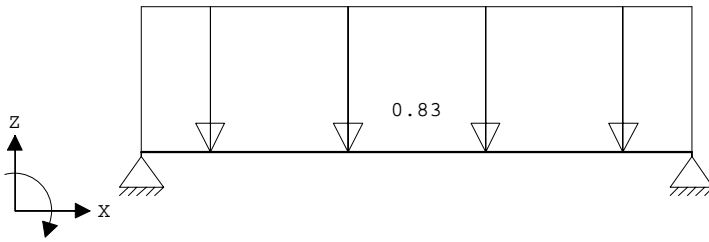
VELDBELASTINGEN

Ligger:1 B.G:2 Veranderlijk wind

| Last Ref. | Type | Omschrijving | $q_1/p/m$ | q_2 | psi | Afstand | Lengte |
|-----------|------------|--------------|-----------|-------|-----|---------|--------|
| 1 | 8:Puntlast | | -43.870 | | | 1.750 | |
| 2 | 8:Puntlast | | 43.070 | | | 2.850 | |

VELDBELASTINGEN

Ligger:1 B.G:3 Veranderlijk



VELDBELASTINGEN

Ligger:1 B.G:3 Veranderlijk

| Last Ref. | Type | Omschrijving | q1/p/m | q2 | psi | Afstand | Lengte |
|-----------|----------|--------------|--------|--------|-----|---------|--------|
| 1 | 1:q-last | | -0.830 | -0.830 | | 0.000 | 3.800 |

BELASTINGCOMBINATIES

| BC | Type | BG | Gen. | Factor | BG | Gen. | Factor | BG | Gen. | Factor | BG | Gen. | Factor |
|----|-------|----|------|--------|----|------|--------|----|------|--------|----|------|--------|
| 1 | Fund. | 1 | Perm | 1.35 | | | | | | | | | |
| 2 | Fund. | 1 | Perm | 1.35 | 3 | psi0 | 1.50 | | | | | | |
| 3 | Fund. | 1 | Perm | 1.20 | 2 | Extr | 1.50 | | | | | | |
| 4 | Fund. | 1 | Perm | 1.20 | 3 | Extr | 1.50 | | | | | | |
| 5 | Fund. | 1 | Perm | 1.20 | 2 | Extr | 1.50 | 3 | psi0 | 1.50 | | | |
| 6 | Fund. | 1 | Perm | 0.90 | | | | | | | | | |
| 7 | Fund. | 1 | Perm | 0.90 | 3 | psi0 | 1.50 | | | | | | |
| 8 | Fund. | 1 | Perm | 0.90 | 2 | Extr | 1.50 | | | | | | |
| 9 | Fund. | 1 | Perm | 0.90 | 3 | Extr | 1.50 | | | | | | |
| 10 | Fund. | 1 | Perm | 0.90 | 2 | Extr | 1.50 | 3 | psi0 | 1.50 | | | |
| 11 | Kar. | 1 | Perm | 1.00 | 2 | Extr | 1.00 | | | | | | |
| 12 | Kar. | 1 | Perm | 1.00 | 3 | Extr | 1.00 | | | | | | |
| 13 | Kar. | 1 | Perm | 1.00 | 2 | Extr | 1.00 | 3 | psi0 | 1.00 | | | |
| 14 | Freq. | 1 | Perm | 1.00 | | | | | | | | | |
| 15 | Freq. | 1 | Perm | 1.00 | 2 | psi1 | 1.00 | | | | | | |
| 16 | Freq. | 1 | Perm | 1.00 | 3 | psi1 | 1.00 | | | | | | |
| 17 | Freq. | 1 | Perm | 1.00 | 2 | psi1 | 1.00 | 3 | psi2 | 1.00 | | | |
| 18 | Quas. | 1 | Perm | 1.00 | | | | | | | | | |
| 19 | Quas. | 1 | Perm | 1.00 | 3 | psi2 | 1.00 | | | | | | |
| 20 | Blij. | 1 | Perm | 1.00 | | | | | | | | | |

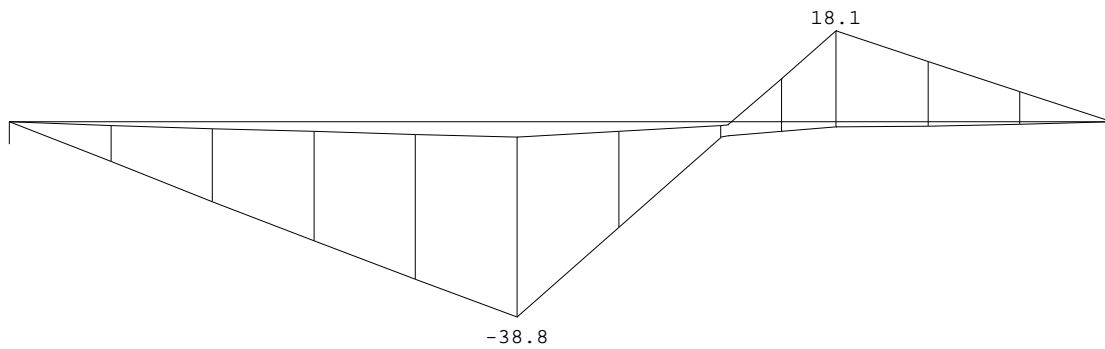
GUNSTIGE WERKING PERMANENTE BELASTINGEN

| BC | Velden met gunstige werking |
|----|-----------------------------|
| 1 | Geen |
| 2 | Geen |
| 3 | Geen |
| 4 | Geen |
| 5 | Geen |
| 6 | Alle velden de factor:0.90 |
| 7 | Alle velden de factor:0.90 |
| 8 | Alle velden de factor:0.90 |
| 9 | Alle velden de factor:0.90 |
| 10 | Alle velden de factor:0.90 |

OMHULLENDE VAN DE FUNDAMENTELE COMBINATIES

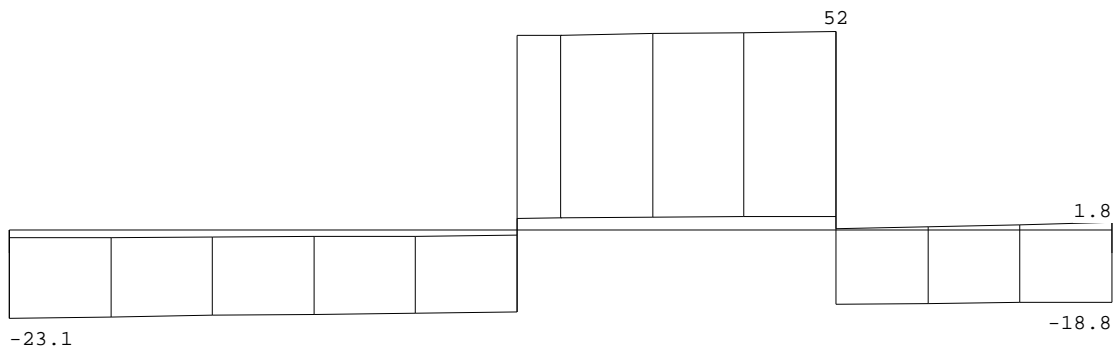
MOMENTEN

Ligger:1 Fundamentele combinatie



DWARSKRACHTEN

Ligger:1 Fundamentele combinatie



Fmin:2.07

-18.8

Fmax:23.1

1.85

REACTIES

Ligger:1 Fundamentele combinatie

| Stp | Fmin | Fmax | Mmin | Mmax |
|-----|--------|-------|------|------|
| 1 | 2.07 | 23.05 | 0.00 | 0.00 |
| 2 | -18.84 | 1.85 | 0.00 | 0.00 |

STAALPROFIELEN - ALGEMENE GEGEVENS

Ligger:1

Stabiliteit: Classificatie gehele constructie: Geschoord

PROFIEL/MATERIAAL

| P/M nr. | Profielnaam | Vloeisp. [N/mm ²] | Productie methode | Min. drsn. klasse | |
|-------------------------------|-------------|-------------------------------|-------------------|-------------------|------|
| 1 | UNP180 | 235 | Gewalst | 1 | |
| Partiële veiligheidsfactoren: | | | | | |
| Gamma M;0 | : | 1.00 | Gamma M;1 | : | 1.00 |

KIPSTABILITEIT

Ligger:1

| Staafl. nr. | Plts. aangr. | l gaffel | Kipsteunafstanden [m] |
|-------------|--------------|----------|-----------------------|
| 1 | 1.0*h | boven: | 3.80 3.800 |
| | | onder: | 3.800 |

TOETSING SPANNINGEN

Ligger:1

| Staafl. nr. | P/M | BC | Sit | Kl | Plaats | Norm | Artikel | Formule | Hoogste toetsing U.C. [N/mm ²] | Opm. |
|-------------|-----|----|-----|----|--------|---------|---------|--------------|--|------|
| 1 | 1 | 5 | 1 | 1 | My-max | EN3-1-1 | 6.2.8 | (6.29+6.12y) | 0.922 217 | 76 |

Opmerkingen:

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

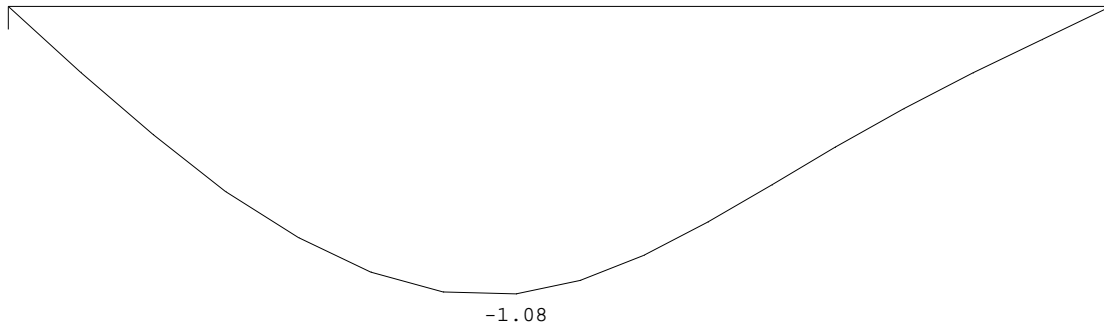
TOETSING DOORBUIGING

Ligger:1

| Staafl. nr. | Soort | Mtg | Lengte [m] | Overst I | Zeeg J | Zeeg [mm] | u _{tot} [mm] | BC | Sit | u [mm] | Toelaatbaar [mm] | *1 |
|-------------|-------|-----|------------|----------|--------|-----------|-----------------------|----|--------|--------|------------------|-------|
| 1 | Vloer | db | 3.80 | N | N | 0.0 | -1.3 | 19 | 1 Eind | -1.3 | ±15.2 | 0.004 |
| | | db | | | | | | 17 | 1 Bijk | -1.4 | ±11.4 | 0.003 |

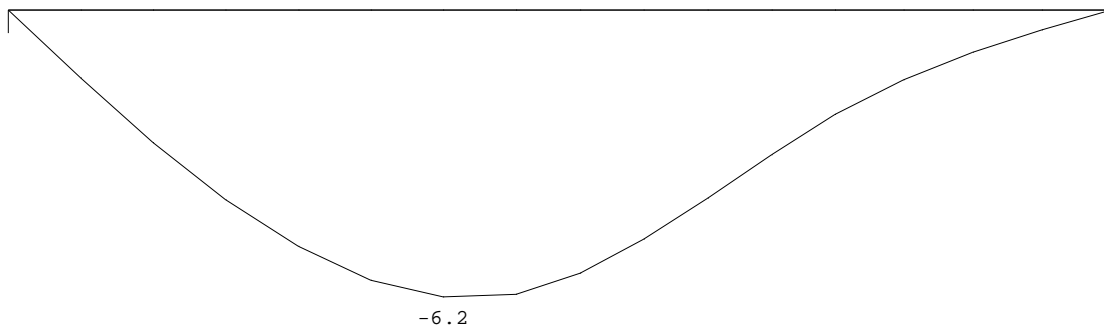
DOORBUIGINGEN w₁ [mm]

Ligger:1 Blijvende combinatie



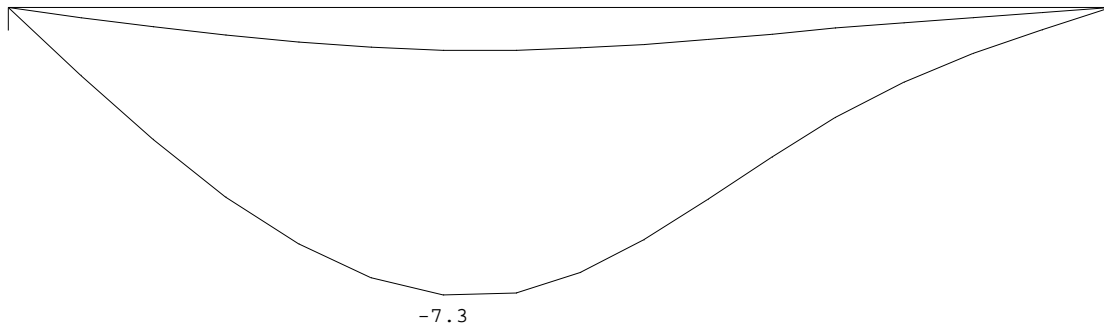
DOORBUIGINGEN w_{bij} [mm]

Ligger:1 Karakteristieke combinatie



DOORBUIGINGEN W_{max} [mm]

Ligger:1 Karakteristieke combinatie



DOORBUIGINGEN

Karakteristieke combinatie

| Veld | Zijde | positie | l_{rep} | W_1 | W_2 | W_{bij} | W_{tot} | W_c | W_{max} |
|------|-------|---------|-----------|-------|-------|-------------|-----------|-------|-------------|
| | | [m] | [mm] | [mm] | [mm] | [mm][lrep/] | [mm] | [mm] | [mm][lrep/] |
| 1 | Neg. | 1.500 | 3800 | -1.1 | | -6.2 | 609 | -7.3 | -7.3 |
| | | | | | | | | | 520 |

A.16 Eindstijl stabiliteitswanden verdieping 1 en 2

Technosoft Construct release 6.74

11 jul 2024

Project : 2023237 - 5.1, 2, e te Amsterdam
Onderdeel : Eindstijl stabiliteitswanden
Datum : 28/02/2024
Eenheden : kN/m/rad
Bestand : K:\Werk\2023237\Berekeningen\Technosoft\
Stabiliteitswanden HSB.cnw

Toegepaste normen volgens Eurocode met Nederlandse NB

| | | | |
|-------------|----------------------|-----------------|-------------|
| Belastingen | NEN-EN 1990:2002 | C2:2010,A1:2019 | NB:2019(nl) |
| | NEN-EN 1991-1-1:2002 | C1/C11:2019 | NB:2019(nl) |
| Hout | NEN-EN 1995-1-1:2005 | A1:2011,C1:2006 | NB:2013(nl) |
| | NEN-EN 14080:2013 | | |

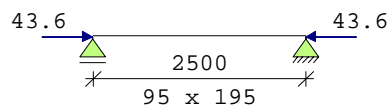
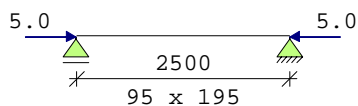
W1-1: eindstijl

Algemene gegevens

| | | | | |
|------------------|--------|-----------|-------------------------|-------|
| B x H | [mm] : | 95 x 195 | Referentie periode [j]: | 50 |
| l_{sys} | [mm] : | 2500 | | |
| $l_{buc;y}$ | [mm] : | 2500 | Toelaatbare doorbuiging | |
| $l_{buc;z}$ | [mm] : | 2500 | Bijkomend [* 1] : | 0.003 |
| Plaats kipsteun | : | Bovenkant | | |
| Steunpunt links | : | Rol | Eind [* 1] : | 0.003 |
| Steunpunt rechts | : | Scharnier | | |
| Sterkteklasse | : | C24 | Klimaatklasse : | I |

Belastingen

| | Permanent | Veranderlijk |
|------------------------|-----------|--------------|
| q_z [kN/m] : | 0.00 | 0.00 |
| Ψ_0 [-] : | | 0.00 |
| Ψ_2 [-] : | | 0.00 |
| F_z [kN] : | 0.00 | 0.00 |
| Vanaf links [mm] : | 2000 | |
| N_x [kN] : | 5.04 | 43.57 |
| $M_{y;links}$ [kNm] : | 0.00 | 0.00 |
| $M_{y;rechts}$ [kNm] : | 0.00 | 0.00 |



Belastingfactoren (NEN-EN 1990)

| | | | | |
|----------------|-----------------|------|--------------|------|
| Formule 6.10a: | γ_G : | 1.35 | γ_Q : | 1.50 |
| Formule 6.10b: | $\xi\gamma_G$: | 1.20 | γ_Q : | 1.50 |
| Permanent: | γ_G : | 1.35 | | |

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

$\gamma_M[-]$: 1.30

Stabiliteit

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

| | | | |
|-------------|----------------|-----------------|----------------|
| k_y [-] : | 0.83 frm(6.27) | $k_{c,y}$ [-] : | 0.85 frm(6.25) |
| k_z [-] : | 1.82 frm(6.28) | $k_{c,z}$ [-] : | 0.36 frm(6.26) |

2. Toetsing kipstabiliteit volgens par. 6.3.3. is n.v.t.:

- geen buigend moment op de staaf.

| Fundamentele combinatie (6.10a) | | | frm(6.24) | | u.c. | | 0.11 |
|----------------------------------|------|------------------|----------------------|-----------|-----------|----------|------------|
| Normaalkracht [kN] | 6.8 | $\sigma_{c,0,d}$ | [N/mm ²] | 0.37 | | | |
| Dwarskracht [kN] | 0.0 | $\tau_{v,d}$ | [N/mm ²] | 0.00 | | | |
| Moment [kNm] | 0.0 | $\sigma_{m,y,d}$ | [N/mm ²] | 0.00 | | | |
| $f_{m,y,d}$ [N/mm ²] | 11.1 | $f_{c,0,d}$ | [N/mm ²] | 9.69 | b_{ef} | 95[mm] | frm(6.13a) |
| $f_{t,0,d}$ [N/mm ²] | 6.7 | $f_{v,d}$ | [N/mm ²] | 1.85 | k_{mod} | 0.60 [-] | tab(3.1) |
| Fundamentele combinatie (6.10b) | | | frm(6.24) | | u.c. | | 0.74 |
| Normaalkracht [kN] | 71.4 | $\sigma_{c,0,d}$ | [N/mm ²] | 3.85 | | | |
| Dwarskracht [kN] | 0.0 | $\tau_{v,d}$ | [N/mm ²] | 0.00 | | | |
| Moment [kNm] | 0.0 | $\sigma_{m,y,d}$ | [N/mm ²] | 0.00 | | | |
| $f_{m,y,d}$ [N/mm ²] | 16.6 | $f_{c,0,d}$ | [N/mm ²] | 14.54 | b_{ef} | 95[mm] | frm(6.13a) |
| $f_{t,0,d}$ [N/mm ²] | 10.0 | $f_{v,d}$ | [N/mm ²] | 2.77 | k_{mod} | 0.90 [-] | tab(3.1) |
| Permanente combinatie (6.10a) | | | frm(6.24) | | u.c. | | 0.11 |
| Normaalkracht [kN] | 6.8 | $\sigma_{c,0,d}$ | [N/mm ²] | 0.37 | | | |
| Dwarskracht [kN] | 0.0 | $\tau_{v,d}$ | [N/mm ²] | 0.00 | | | |
| Moment [kNm] | 0.0 | $\sigma_{m,y,d}$ | [N/mm ²] | 0.00 | | | |
| $f_{m,y,d}$ [N/mm ²] | 11.1 | $f_{c,0,d}$ | [N/mm ²] | 9.69 | b_{ef} | 95[mm] | frm(6.13a) |
| $f_{t,0,d}$ [N/mm ²] | 6.7 | $f_{v,d}$ | [N/mm ²] | 1.85 | k_{mod} | 0.60 [-] | tab(3.1) |
| Doorbuiging | | | | | u.c. | | |
| u_{bij} | = | 0.00 | < | 7.50 [mm] | | | 0.00 |
| $u_{net,fin}$ | = | 0.00 | < | 7.50 [mm] | | | 0.00 |

A.17 Stabiliteitsportaal aanbouw achterzijde

Technosoft Raamwerken release 6.80

8 mrt 2024

Project.....: 2023237 - 5.1, 2, e te Amsterdam
Onderdeel....: Stabiliteitsportaal achtergevel
Constructeur.: ME
Dimensies....: kN/m/rad (tenzij anders aangegeven)
Datum.....: 29/02/2024
Bestand.....: K:\Werk\2023237\Berekeningen\Technosoft\Stabiliteitsspan
aanbouw.rww

Belastingbreedte.: 2.500
Rekenmodel.....: 1e-orde-elastisch.
Theorie voor de bepaling van de krachtsverdeling:
Geometrisch lineair.
Fysisch lineair.

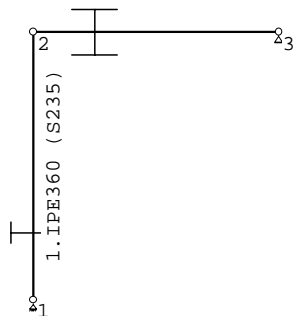
Gunstige werking van de permanente belasting wordt automatisch verwerkt.

Toegepaste normen volgens Eurocode met Nederlandse NB

| | | | |
|-------------|----------------------|-----------------|-------------|
| Belastingen | NEN-EN 1990:2002 | C2:2010,A1:2019 | NB:2019(nl) |
| | NEN-EN 1991-1-1:2002 | C1/C11:2019 | NB:2019(nl) |
| Staal | NEN-EN 1993-1-1:2006 | C2:2011,A1:2016 | NB:2016(nl) |



GEOMETRIE



MATERIALEN

| Mt | Kwaliteit | E-modulus[N/mm ²] | S.G. | Pois. | Uitz. coëff |
|----|-----------|-------------------------------|------|-------|-------------|
| 1 | S235 | 210000 | 78.5 | 0.30 | 1.2000e-05 |

PROFIELEN [mm]

| Prof. | Omschrijving | Materiaal | Oppervlak | Traagheid | Vormf. |
|-------|--------------|-----------|------------|------------|--------|
| 1 | HEB220 | 1:S235 | 9.1000e+03 | 8.0910e+07 | 0.00 |
| 2 | IPE360 | 1:S235 | 7.2700e+03 | 1.6270e+08 | 0.00 |

PROFIELEN vervolg [mm]

| Prof. | Staaftype | Breedte | Hoogte | e | Type | b1 | h1 | b2 | h2 |
|-------|-----------|---------|--------|-------|------|----|----|----|----|
| 1 | 0:Normaal | 220 | 220 | 110.0 | | | | | |
| 2 | 0:Normaal | 170 | 360 | 180.0 | | | | | |

PROFIELVORMEN [mm]

1 HEB220



2 IPE360



KNOPEN

| Knoop | X | Z |
|-------|-------|-------|
| 1 | 0.000 | 0.000 |
| 2 | 0.000 | 3.800 |
| 3 | 3.500 | 3.800 |

STAVEN

| St. | ki | kj | Profiel | Aansl.i | Aansl.j | Lengte | Opm. |
|-----|----|----|----------|---------|---------|--------|------|
| 1 | 1 | 2 | 2:IPE360 | NDM | NDM | 3.800 | |
| 2 | 2 | 3 | 1:HEB220 | NDM | NDM | 3.500 | |

VASTE STEUNPUNTEN

| Nr. | knoop | Kode | XZR | l=vast | 0=vrij | Hoek |
|-----|-------|------|-----|--------|--------|------|
| 1 | 1 | 110 | | | | 0.00 |
| 2 | 3 | 010 | | | | 0.00 |

BELASTINGENERATIE ALGEMEEN.

| | | | |
|------------------------------|------|-------------------------|------|
| Betrouwbaarheidsklasse.....: | 2 | Referentieperiode.....: | 50 |
| Gebouwdiepte.....: | 0.00 | Gebouwhoogte.....: | 3.80 |
| Niveau aansl.terrein.....: | 0.00 | E.g. scheid.w. [kN/m2]: | 0.00 |

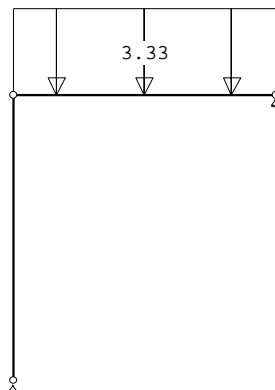
BELASTINGGEVALLEN

| B.G. | Omschrijving | EGZ | Type |
|------|-------------------------|-----------|---|
| 1 | Permanente belasting | EGZ=-1.00 | 1 |
| 2 | Veranderlijke belasting | | 2 Ver. bel. pers. ed. (q _k) |
| 3 | Wind van links | | 8 Wind van links overdruk A |
| 4 | Wind van rechts | | 12 Wind van rechts overdruk A |
| 5 | Knik | | 0 Onbekend |

BELASTINGEN

B.G:1 Permanente belasting

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



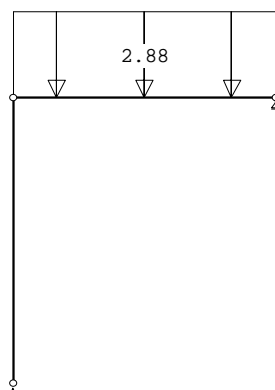
STAAFBELASTINGEN

B.G:1 Permanente belasting

| StAAF | Type | q1/p/m | q2 | A | B | ψ ₀ | ψ ₁ | ψ ₂ |
|-------|------------|--------|-------|-------|-------|----------------|----------------|----------------|
| 2 | 1:QZLokaal | -3.33 | -3.33 | 0.000 | 0.000 | | | |

BELASTINGEN

B.G:2 Veranderlijke belasting



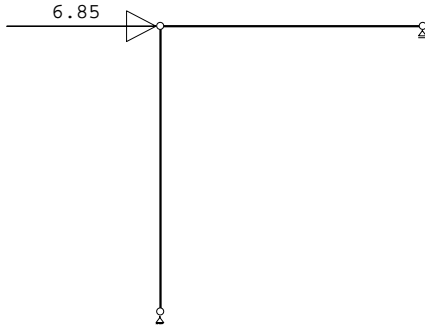
STAAFBELASTINGEN

B.G:2 Veranderlijke belasting

| StAAF | Type | q1/p/m | q2 | A | B | ψ_0 | ψ_1 | ψ_2 |
|-------|------------|--------|-------|-------|-------|----------|----------|----------|
| 2 | 1:QZLokaal | -2.88 | -2.88 | 0.000 | 0.000 | 0.40 | 0.50 | 0.30 |

BELASTINGEN

B.G:3 Wind van links



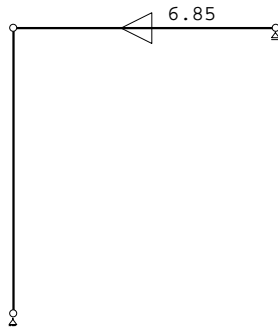
KNOOPBELASTINGEN

B.G:3 Wind van links

| Last | Knoop | Richting | waarde | ψ_0 | ψ_1 | ψ_2 |
|------|-------|----------|--------|----------|----------|----------|
| 1 | 2 | X | 6.850 | 0.00 | 0.20 | 0.00 |

BELASTINGEN

B.G:4 Wind van rechts



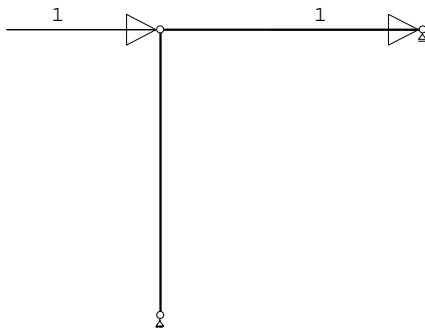
KNOOPBELASTINGEN

B.G:4 Wind van rechts

| Last | Knoop | Richting | waarde | ψ_0 | ψ_1 | ψ_2 |
|------|-------|----------|--------|----------|----------|----------|
| 1 | 3 | X | -6.850 | 0.00 | 0.20 | 0.00 |

BELASTINGEN

B.G:5 Knik



KNOOPBELASTINGEN

B.G:5 Knik

| Last | Knoop | Richting | waarde | ψ_0 | ψ_1 | ψ_2 |
|------|-------|----------|--------|----------|----------|----------|
| 1 | 2 | X | 1.000 | | | |
| 2 | 3 | X | 1.000 | | | |

BELASTINGCOMBINATIES

| BC | Type | | | | | | |
|----|-------|------|-----------|---|------|----------|-----------|
| 1 | Fund. | 1.35 | $G_{k,1}$ | | | | |
| 2 | Fund. | 1.20 | $G_{k,1}$ | | | | |
| 3 | Fund. | 0.90 | $G_{k,1}$ | | | | |
| 4 | Fund. | 1.35 | $G_{k,1}$ | + | 1.50 | ψ_0 | $Q_{k,2}$ |
| 5 | Fund. | 1.20 | $G_{k,1}$ | + | 1.50 | | $Q_{k,2}$ |
| 6 | Fund. | 1.20 | $G_{k,1}$ | + | 1.50 | | $Q_{k,3}$ |
| 7 | Fund. | 1.20 | $G_{k,1}$ | + | 1.50 | | $Q_{k,4}$ |
| 8 | Fund. | 0.90 | $G_{k,1}$ | + | 1.50 | ψ_0 | $Q_{k,2}$ |
| 9 | Fund. | 0.90 | $G_{k,1}$ | + | 1.50 | | $Q_{k,2}$ |
| 10 | Fund. | 0.90 | $G_{k,1}$ | + | 1.50 | | $Q_{k,3}$ |
| 11 | Fund. | 0.90 | $G_{k,1}$ | + | 1.50 | | $Q_{k,4}$ |
| 12 | Fund. | 1.20 | $G_{k,1}$ | + | 1.50 | | $Q_{k,3}$ |
| 13 | Fund. | 1.20 | $G_{k,1}$ | + | 1.50 | | $Q_{k,4}$ |
| 14 | Fund. | 0.90 | $G_{k,1}$ | + | 1.50 | | $Q_{k,3}$ |
| 15 | Fund. | 0.90 | $G_{k,1}$ | + | 1.50 | | $Q_{k,4}$ |
| 16 | Kar. | 1.00 | $G_{k,1}$ | + | 1.00 | | $Q_{k,2}$ |
| 17 | Kar. | 1.00 | $G_{k,1}$ | + | 1.00 | | $Q_{k,3}$ |
| 18 | Kar. | 1.00 | $G_{k,1}$ | + | 1.00 | | $Q_{k,4}$ |
| 19 | Kar. | 1.00 | $G_{k,1}$ | + | 1.00 | | $Q_{k,3}$ |
| 20 | Kar. | 1.00 | $G_{k,1}$ | + | 1.00 | | $Q_{k,4}$ |
| 21 | Quas. | 1.00 | $G_{k,1}$ | | | | |
| 22 | Quas. | 1.00 | $G_{k,1}$ | + | 1.00 | ψ_2 | $Q_{k,2}$ |
| 23 | Freq. | 1.00 | $G_{k,1}$ | | | | |
| 24 | Freq. | 1.00 | $G_{k,1}$ | + | 1.00 | ψ_1 | $Q_{k,2}$ |
| 25 | Freq. | 1.00 | $G_{k,1}$ | + | 1.00 | ψ_1 | $Q_{k,3}$ |
| 26 | Freq. | 1.00 | $G_{k,1}$ | + | 1.00 | ψ_1 | $Q_{k,4}$ |
| 27 | Freq. | 1.00 | $G_{k,1}$ | + | 1.00 | ψ_1 | $Q_{k,3}$ |
| 28 | Freq. | 1.00 | $G_{k,1}$ | + | 1.00 | ψ_1 | $Q_{k,4}$ |
| 29 | Blij. | 1.00 | $G_{k,1}$ | | | | |

GUNSTIGE WERKING PERMANENTE BELASTINGEN

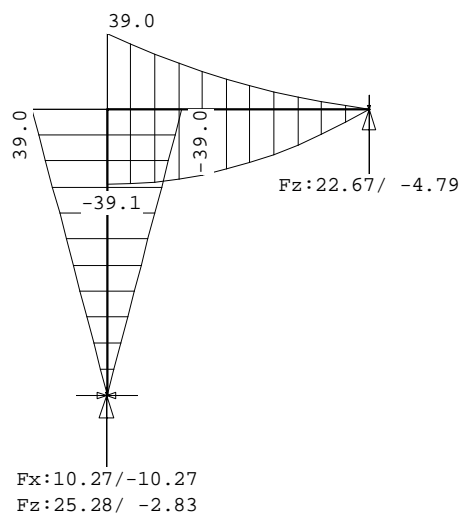
BC Staven met gunstige werking

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

OMHULLENDE VAN DE FUNDAMENTELE COMBINATIES

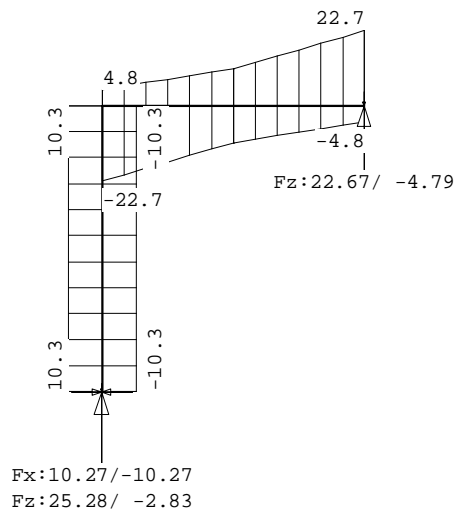
MOMENTEN

Fundamentele combinatie



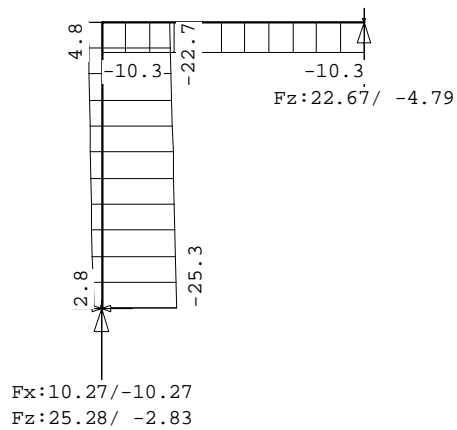
DWARSKRACHTEN

Fundamentele combinatie



NORMAALKRACHTEN

Fundamentele combinatie



STAALPROFIELEN - ALGEMENE GEGEVENS

| | | |
|------------------------------|--|-------------|
| Stabiliteit: | Classificatie gehele constructie: | Ongeschoord |
| | Belastinggeval m.b.t. bepaling kniklengte: | 5=Knik |
| | Aanpassing inkl. parameter C : | Steunpunten |
| Tweede-orde-effect: | | |
| | Aan te houden verhouding $n/(n-1)$ | |
| | voor steunmomenten en verplaatsingen: | 1.10 |
| Doorbuiging en verplaatsing: | | |
| | Aantal bouwlagen: | 1 |
| | Gebouwtype: | Overig |
| | Toel. horiz. verplaatsing gehele gebouw: | $h/300$ |
| | Kleinste gevelhoogte [m]: | 0.0 |

PROFIEL/MATERIAAL

| P/M nr. | Profielnaam | Vloeisp. [N/mm ²] | Productie methode | Min. drsn. klasse |
|---------|-------------|-------------------------------|-------------------|-------------------|
| 1 | HEB220 | 235 | Gewalst | 1 |
| 2 | IPE360 | 235 | Gewalst | 1 |

Partiële veiligheidsfactoren:

| | | | | | |
|-----------------|---|------|------------------|---|------|
| Gamma M;0 | : | 1.00 | Gamma M;1 | : | 1.00 |
| Gamma M;fi;mech | : | 1.00 | Gamma M;fi;therm | : | 1.00 |

KNIKSTABILITEIT

| Staal nr. | l_{sys} [m] | Classif. y sterke as | $l_{knik;y}$ [m] | Extra | | Extra | |
|-----------|---------------|----------------------|------------------|--------------|----------------------|------------------|--------------|
| | | | | aanp. y [kN] | Classif. z zwakke as | $l_{knik;z}$ [m] | aanp. z [kN] |
| 1 | 3.800 | Ongeschoord | 10.532 | 0.0 | Geschoord | 3.800 | 0.0 |
| 2 | 3.500 | Ongeschoord | 8.396 | 0.0 | Geschoord | 3.500 | 0.0 |

KIPSTABILITEIT

| Staal nr. | Plts. aangr. | l gaffel [m] | Kipsteunafstanden [m] |
|-----------|--------------|--------------|-----------------------|
| 1 | 1.0*h | boven: 3.80 | 3,8 |
| | | onder: 3,8 | |
| 2 | 1.0*h | boven: 3.50 | 3.500 |
| | | onder: 3.500 | |

TOETSING SPANNINGEN

| Staal nr. | P/M | BC | Sit | Kl | Plaats | Norm | Artikel | Formule | Hoogste toetsing U.C. [N/mm ²] | Opm. |
|-----------|-----|----|-----|----|--------|---------|---------|---------|--|------|
| 1 | 2 | 13 | 1 | 1 | Staal | EN3-1-1 | 6.3.3 | (6.62) | 0.188 | 44 |
| 2 | 1 | 12 | 1 | 1 | My-max | EN3-1-1 | 6.2.5 | (6.12y) | 0.221 | 52 |

TOETSING DOORBUIGING

| Staal nr. | Soort | Mtg | Lengte [m] | Overst I | Zeeg J | u_{tot} [mm] | BC | Sit | u [mm] | Toelaatbaar [mm] | *1 | |
|-----------|-------|-----|------------|----------|--------|----------------|------|-----|--------|------------------|-------|-------|
| 2 | Vlr+w | db | 3.50 | N | N | 0.0 | -2.0 | 19 | 1 Eind | -2.0 | ±14.0 | 0.004 |
| | | db | | | | | | 19 | 1 Bijk | -1.5 | ±7.0 | 0.002 |

TOETSING HORIZONTALE VERPLAATSING

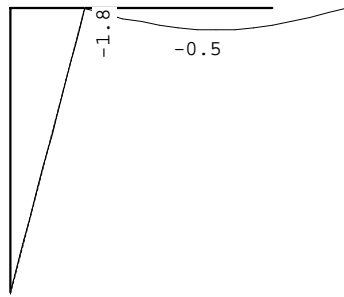
| Staal nr. | BC | Sit | Lengte [m] | u_{eind} [mm] | Toelaatbaar [mm] | Maatgevend [h/] |
|-----------|----|-----|------------|-----------------|------------------|-----------------|
| 1 | 19 | 1 | 3.800 | -13.8 | 12.7 | 300 scheefstand |

TOETSING HOR. VERPLAATSING GLOBAAL

Er is een maximale horizontale verplaatsing van 0.0138 [m] gevonden bij knoop 2 en combinatie 19; belastingsituatie 1 (combinatietype 2). Bij een hoogte van 3.800 [m] levert dit $h / 276$ (toel.: $h / 300$).

VERVORMINGEN w1

Blijvende combinatie



A.18 Oplegging stabiliteitsportaal metselwerk

Technosoft Construct release

11 mrt 2024

Project : 2023237 - 5.1, 2, e te Amsterdam
Onderdeel : Oplegging portaal aanbouw
Datum : 06/03/2024
Eenheden : kN/m/rad
Bestand : K:\Werk\2023237\Berekeningen\Technosoft\oplegging.cnw

Toegepaste normen volgens Eurocode met Nederlandse NB

| | | | |
|-------------|----------------------|------------------|-------------|
| Belastingen | NEN-EN 1990:2002 | C2:2010, A1:2019 | NB:2019(nl) |
| | NEN-EN 1991-1-1:2002 | C1/C11:2019 | NB:2019(nl) |
| Metselwerk | NEN-EN 1996-1-1:2006 | A1:2013 | NB:2018(nl) |

Oplegging portaal aanbouw

MATERIAAL

| | | | |
|-----------------------------------|---|--------------|-------------------|
| Steensoort | : | Baksteen | |
| Gemiddelde druksterkte f_b | : | 10.00 | N/mm ² |
| Soort mortel | : | Metselmortel | |
| Druksterkte f_m | : | 2.50 | N/mm ² |
| Totaal volume aan perforaties | : | 0.00 | % |
| Steen categorie | : | II | |
| Gevolgsklasse | : | CC2 | |
| Factor K (art. 3.6.1.2(1)) | : | 0.60 | |
| Factor α | : | 0.65 | |
| Factor β | : | 0.25 | |
| Materiaalfactor γ_M | : | 2.2 | |
| Karakteristieke druksterkte f_k | : | 3.37 | N/mm ² |
| Rekenwaarde druksterkte f_d | : | 1.53 | N/mm ² |

GEOMETRIE

| | | | |
|--------------------------------|---|-------|-----------------|
| Dikte muur t | : | 220 | mm |
| Hoogte muur h_c | : | 3800 | mm |
| Breedte muur b | : | 1000 | mm |
| Opleglengte l_{op1} | : | 100 | mm |
| Oplegbreedte b_{op1} | : | 220 | mm |
| Randafstand links $a_{1,li}$ | : | 250 | mm |
| Randafstand rechts $a_{1,re}$ | : | 530 | mm |
| Belast oppervlak A_b | : | 22000 | mm ² |
| Aantal zijden $gest_e$ | : | 2 | |
| Excentriciteit M_{Ed}/N_{Ed} | : | 0 | mm |

BELASTINGEN

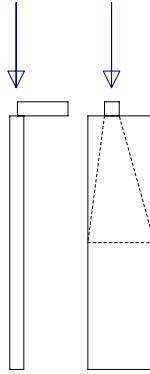
(omlaag = negatief)

| | | | | |
|----------------------------------|----------|---|-------|----|
| BG1 : Permanent eigen gewicht | G_{eg} | : | -7.08 | kN |
| BG2 : Permanent rustend | G_r | : | 0.00 | kN |
| BG3 : Veranderlijk 1 (vloer/dak) | Q_1 | : | -9.45 | kN |
| BG4 : Veranderlijk 2 (wind) | Q_2 | : | 0.00 | kN |

BELASTINGCOMBINATIES

(EN 1990 art. 6.4.3.2)

| | | |
|---------------------|---|---|
| BC1 : frm. 6.10a(1) | : | $1.20 * (G_{eg} + G_r) + 1.30 * Q_1 * 0.40$ |
| BC2 : frm. 6.10b(1) | : | $1.15 * (G_{eg} + G_r) + 1.30 * Q_1$ |
| BC3 : frm. 6.10a(2) | : | $1.20 * (G_{eg} + G_r) + 1.30 * Q_2 * 0.00$ |
| BC4 : frm. 6.10b(2) | : | $1.15 * (G_{eg} + G_r) + 1.30 * Q_2$ |



OPLEGGING

| | | | |
|---------------------------------------|---|-------|----------------|
| Effectieve lengte draagvlak l_{efm} | : | 1000 | mm |
| Effectief draagoppervlakte A_{ef} | : | 0.22 | m ² |
| Vergrotingsfactor puntlasten β | : | 1.28 | (groep 1) |
| Puntlastweerstand wand N_{Rdc} | : | 43.23 | kN |

TOETSING OPLEGGING

| | BC1 | BC2 | BC3 | BC4 | (art. 6.1.3) |
|-------------------------------|--------|--------|-------|-------|----------------------|
| Kracht N_{Edc} | -13.41 | -20.43 | -8.50 | -8.14 | [kN] |
| Spanning | 0.48 | 0.72 | 0.30 | 0.29 | [N/mm ²] |
| Unity-check N_{Edc}/N_{Rdc} | 0.31 | 0.47 | 0.20 | 0.19 | |

DRUK + BUIGING

| | | | |
|---|---|--------|-------------------|
| Reductiefactor afsteuning wand ρ_2 | : | 1.00 | |
| Effectieve hoogte wand h_{eff} | : | 3800 | mm |
| Uiteindelijke kruipcoëfficiënt ϕ | : | 0.70 | |
| Excentriciteit M_{Ed}/N_{Ed} | : | 0.00 | mm |
| Initiële excentriciteit e_{init} | : | 8 | mm |
| Excentriciteit kruip e_k | : | 0 | mm |
| Excentriciteit midden wand e_{mk} | : | 13 | mm |
| Elasticiteitsmodulus korte duur E | : | 2359 | N/mm ² |
| Reductiefactor weerstand ϕ_m | : | 0.60 | |
| Rekenwaarde weerstand N_{Rd} | : | 200.53 | kN |

TOETSING DRUK + BUIGING

| | BC1 | BC2 | BC3 | BC4 | (art. 6.1.2) |
|-----------------------------|--------|--------|-------|-------|----------------------|
| Kracht N_{Ed} | -13.41 | -20.43 | -8.50 | -8.14 | [kN] |
| Spanning | 0.10 | 0.16 | 0.06 | 0.06 | [N/mm ²] |
| Unity-check N_{Ed}/N_{Rd} | 0.07 | 0.10 | 0.04 | 0.04 | |

MAATGEVENDE TOETSING

| | | | |
|---------------------|---|----------|-------------------|
| Belastingcombinatie | : | 6.10b(1) | |
| Artikel | : | 6.1.3 | |
| Spanning | : | 0.72 | N/mm ² |
| Unity-check | : | 0.47 | |

LET OP:

[m71] $e_k=0$ mm omdat $h_{ef}/t_{ef}<\lambda_{dc}$.

[m56] De actuele opleglengte dient handmatig te worden getoetst aan de hand van het materiaal van de vloer of ligger.

Bijlage B

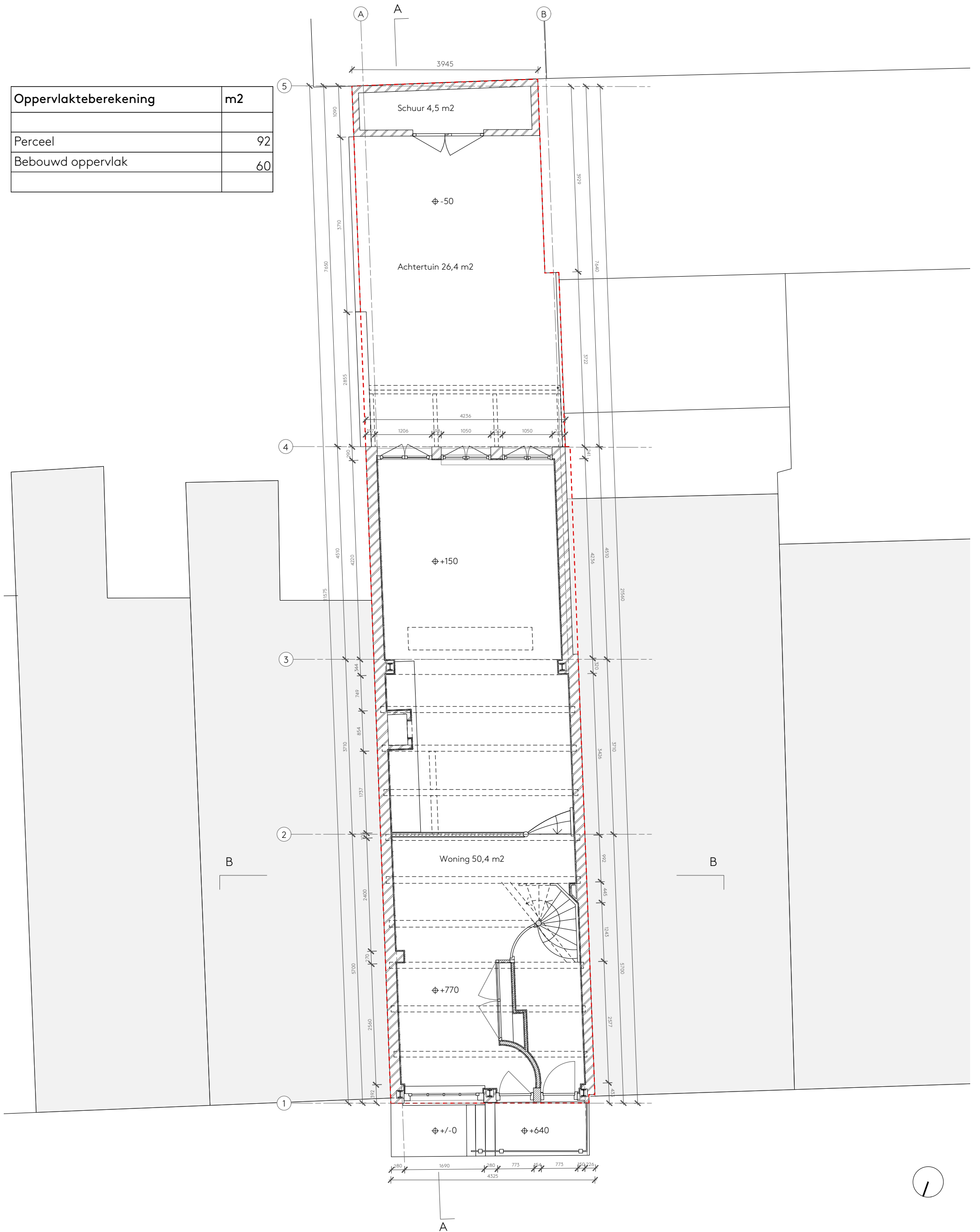
Bouwkundige tekeningen







| Oppervlakteberekening | m2 |
|-----------------------|----|
| Perceel | 92 |
| Bebouwd oppervlak | 60 |



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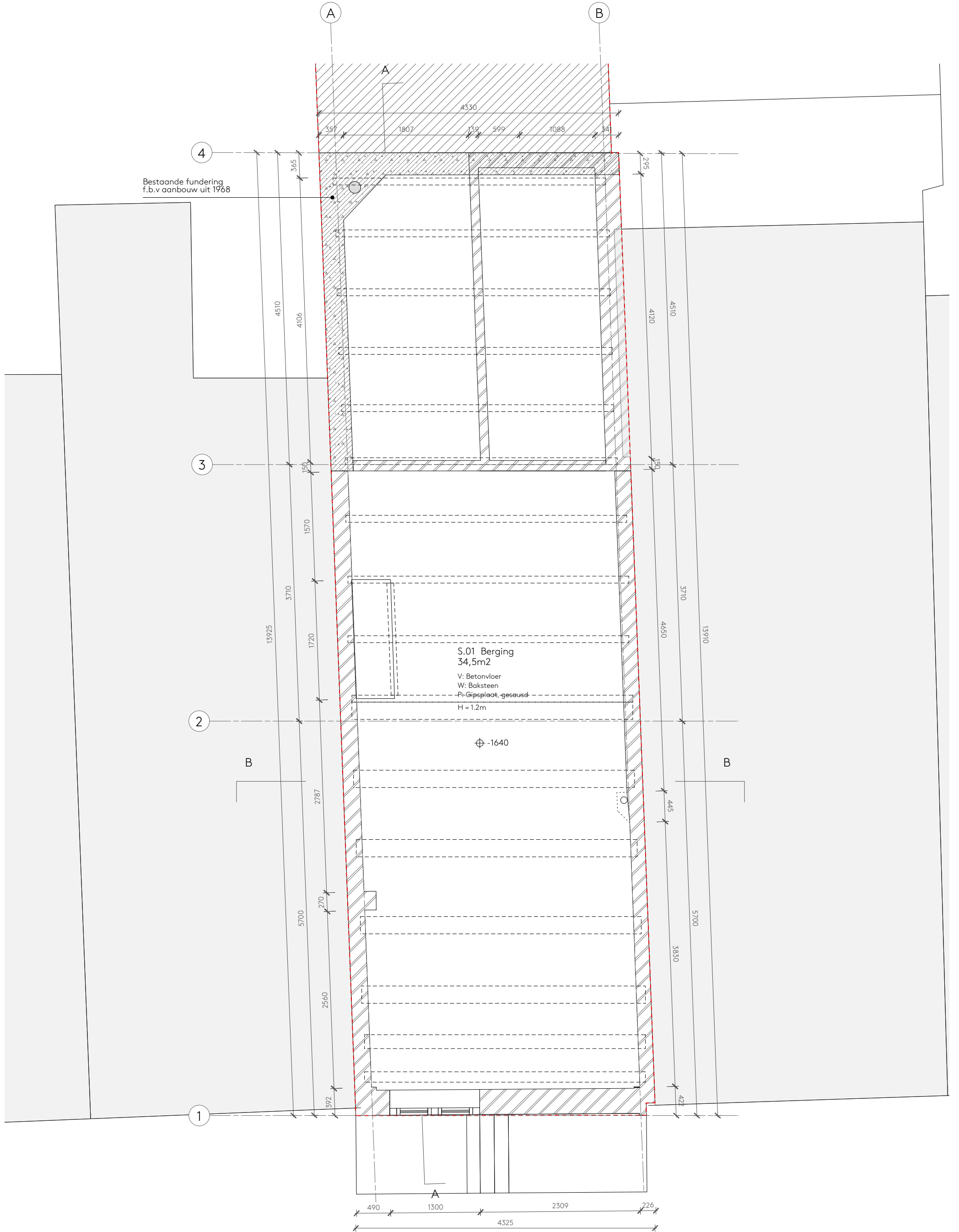
Verbouwing 5.1, 2, e Amsterdam

BESTAANDE SITUATIE

Plattegrond - Perceel
Schaal 1:75

Project 094
Tekening B2001

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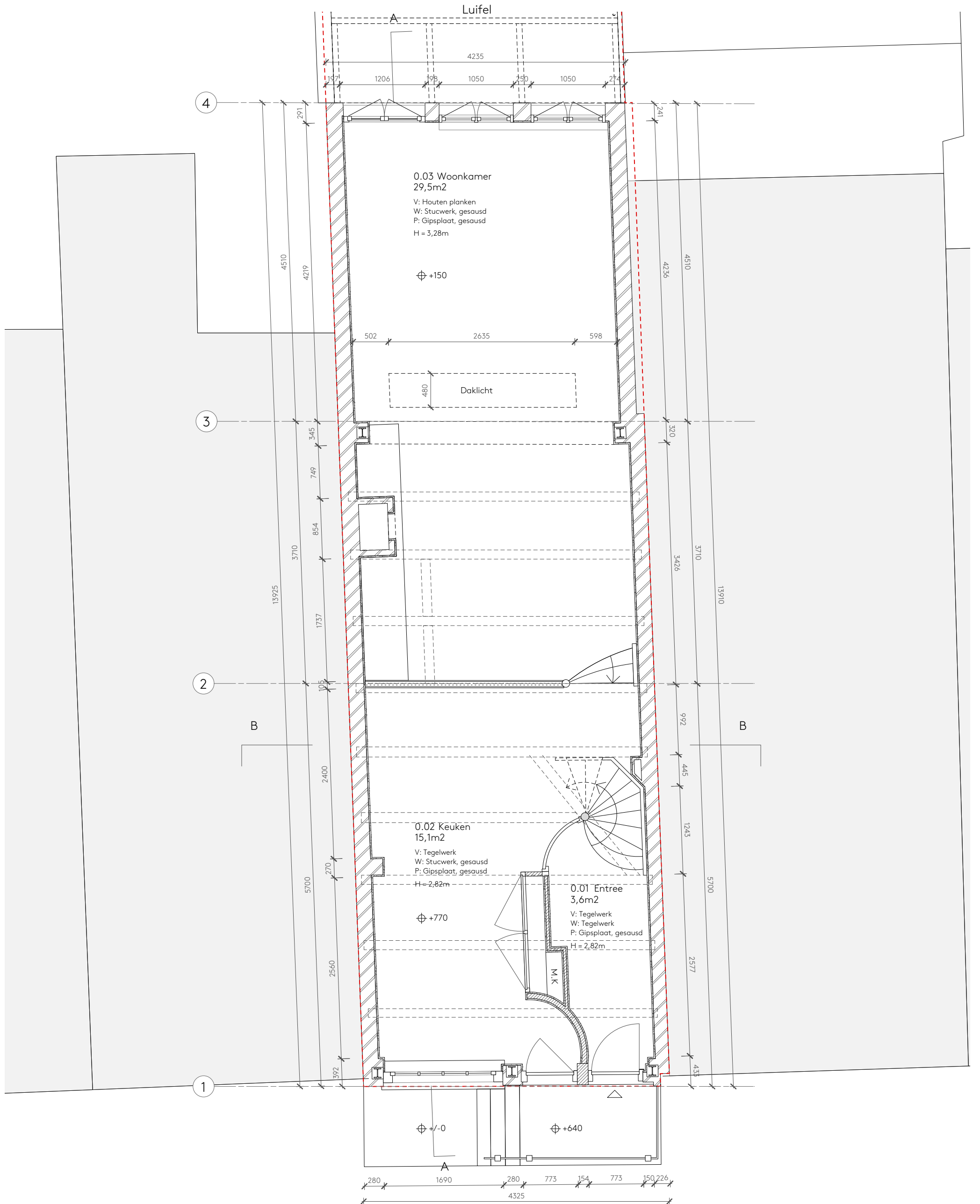
Verbouwing 5.1, 2, e Amsterdam

BESTAANDE SITUATIE

Plattegrond - Souterrain
Schaal 1:50

Project 094
Tekening B2002

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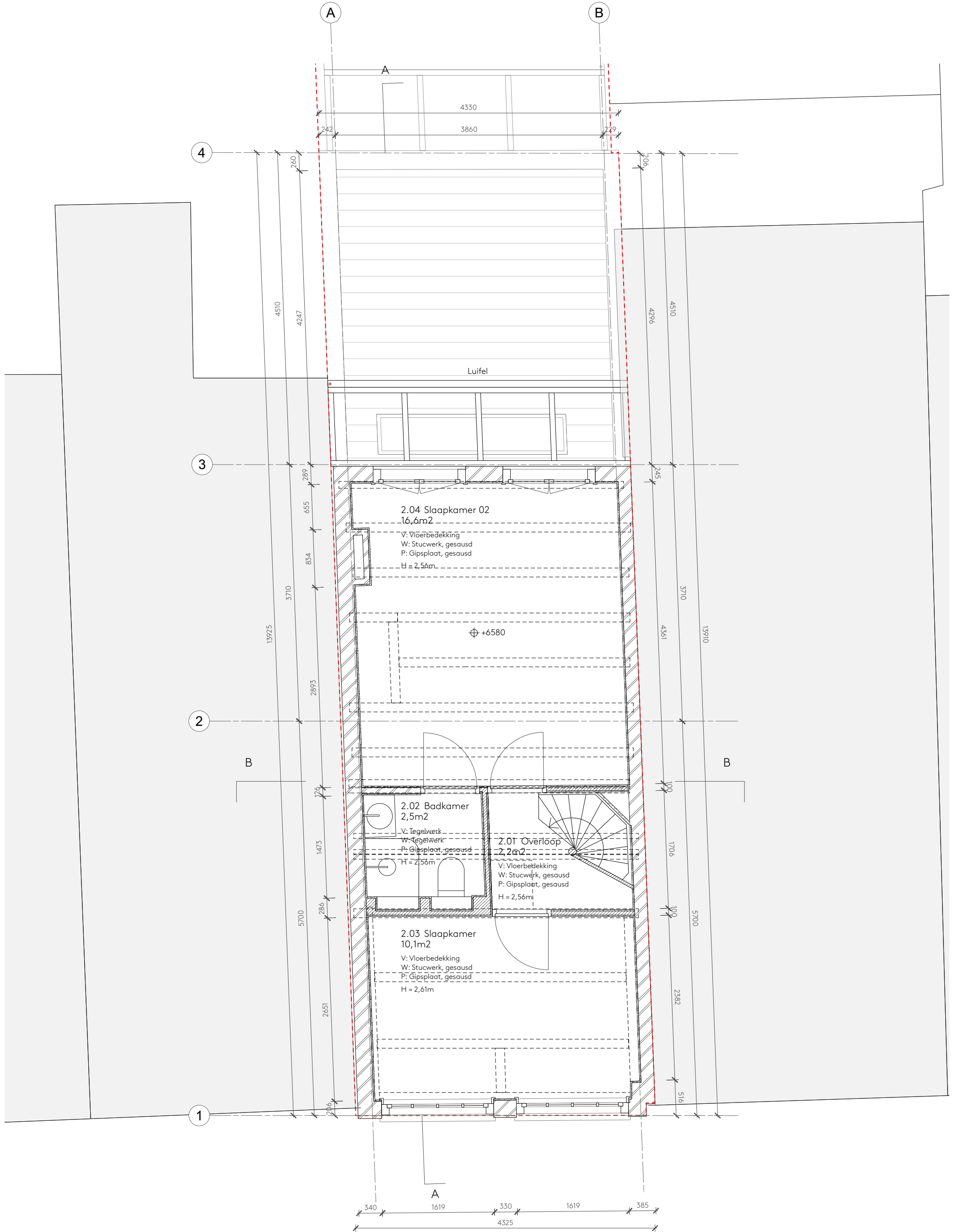
Verbouwing 5.1, 2, e Amsterdam

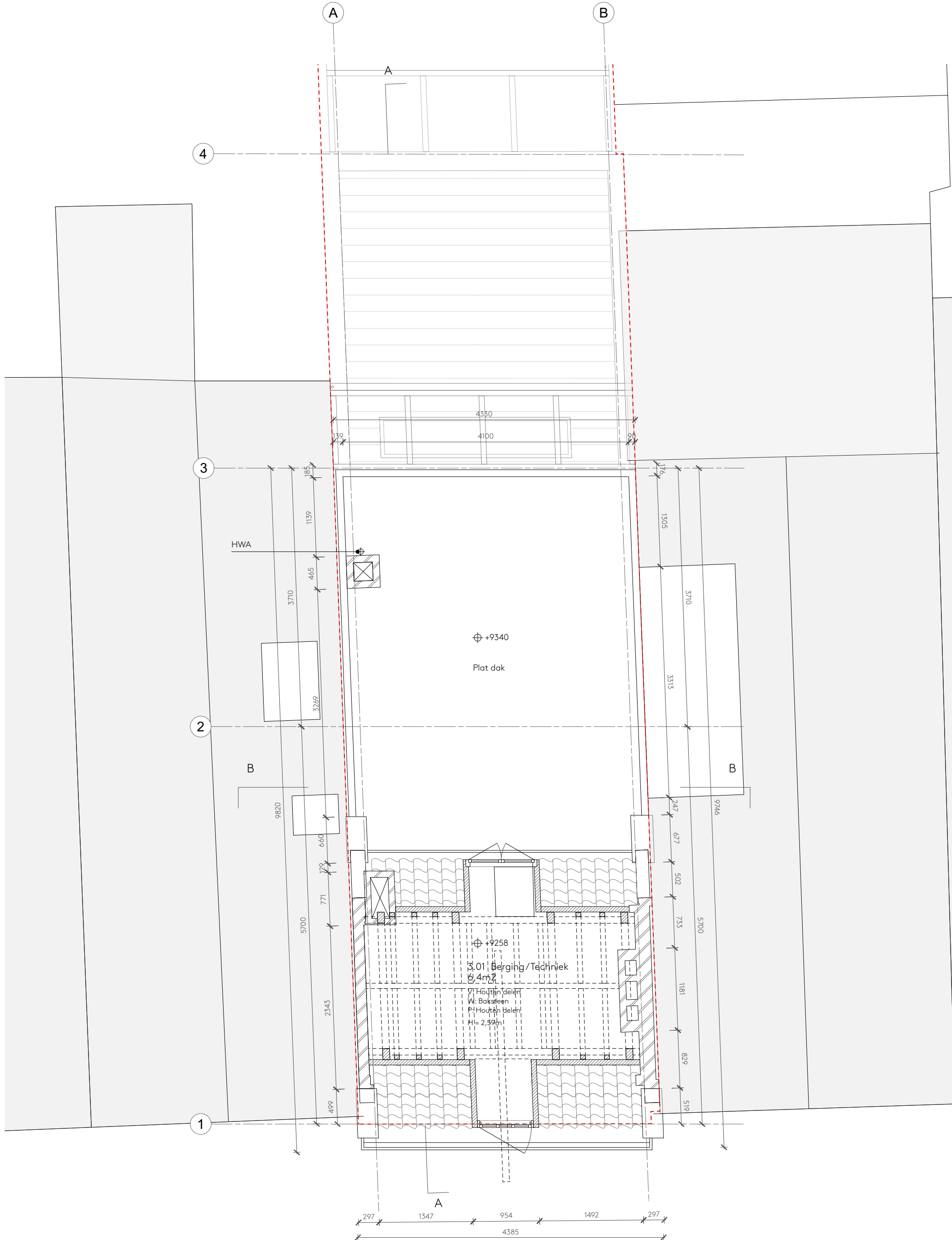
BESTAANDE SITUATIE

Plattegrond - Begane Grond
Schaal 1:50

Project 094
Tekening B2003

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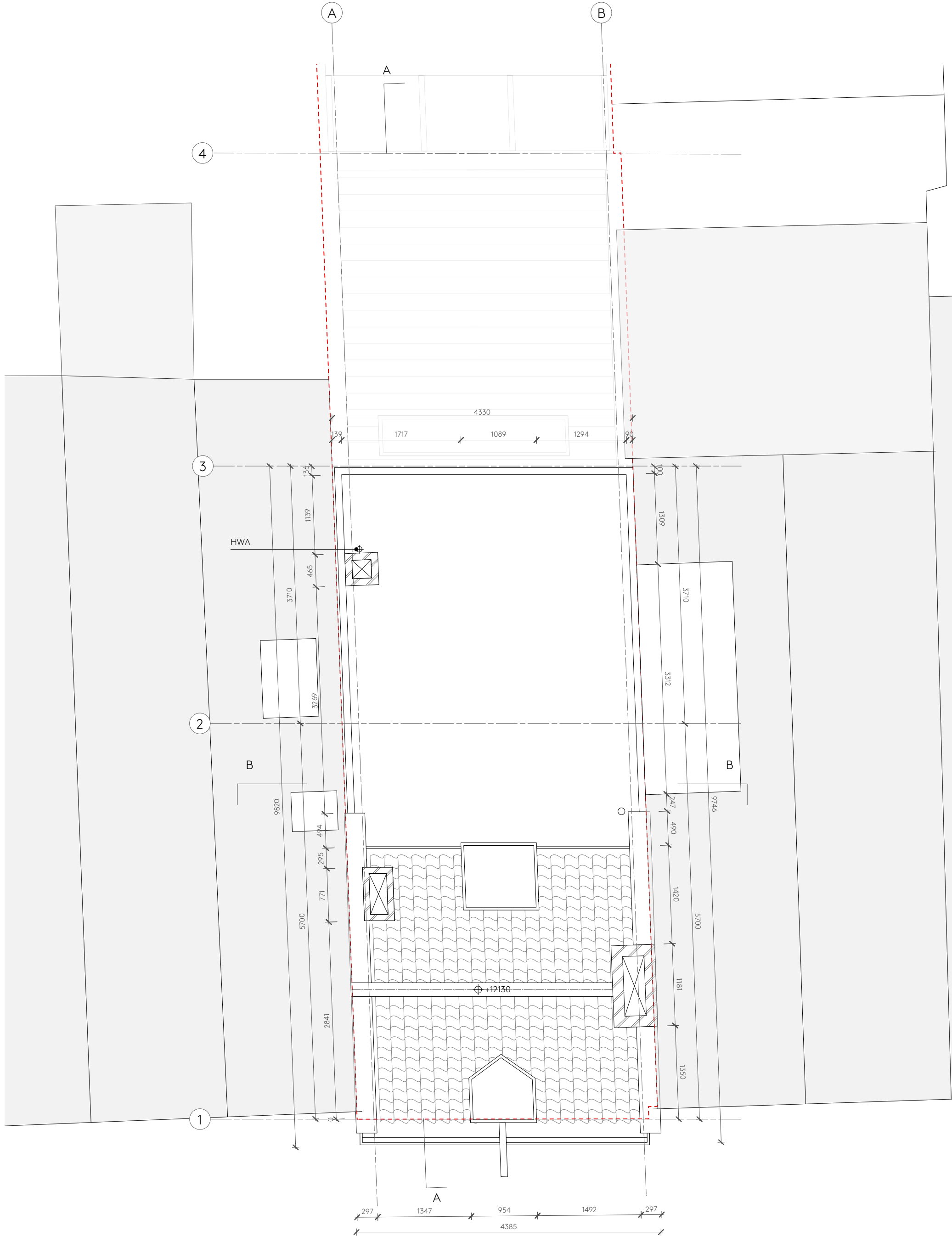
Verbouwing 5.1, 2, e Amsterdam

BESTAANDE SITUATIE

Plattegrond - Zolder
Schaal 1:50

Project 094
Tekening B2006

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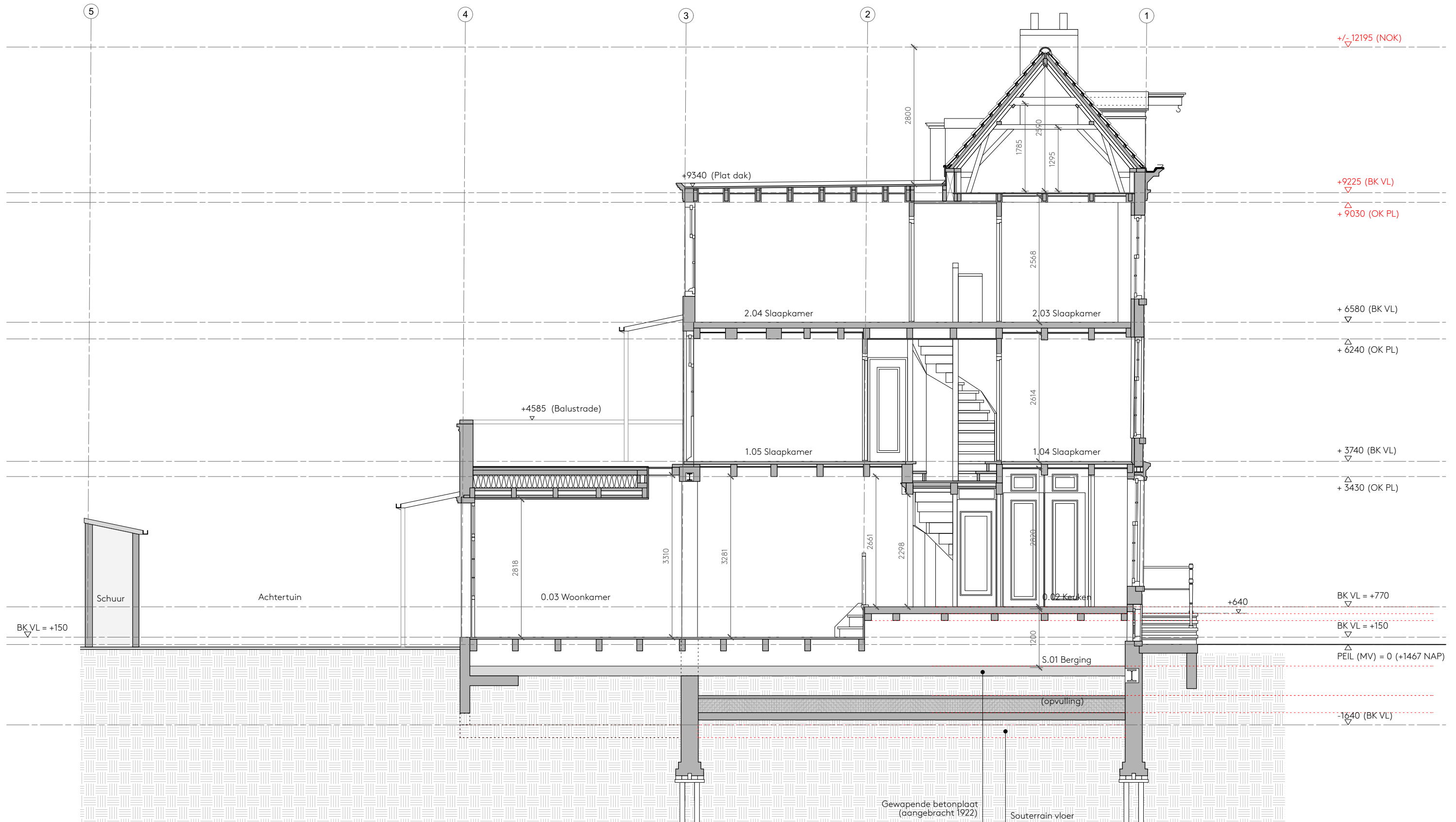
Verbouwing 5.1, 2, e Amsterdam

BESTAANDE SITUATIE

Plattegrond - Bovenanzicht
Schaal 1:50

Project 094
Tekening B2007

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Verbouwing 5.1, 2, e Amsterdam

BESTAANDE SITUATIE

Doorsnede A-A'
Schaal 1:75

Project 094
Tekening B3001

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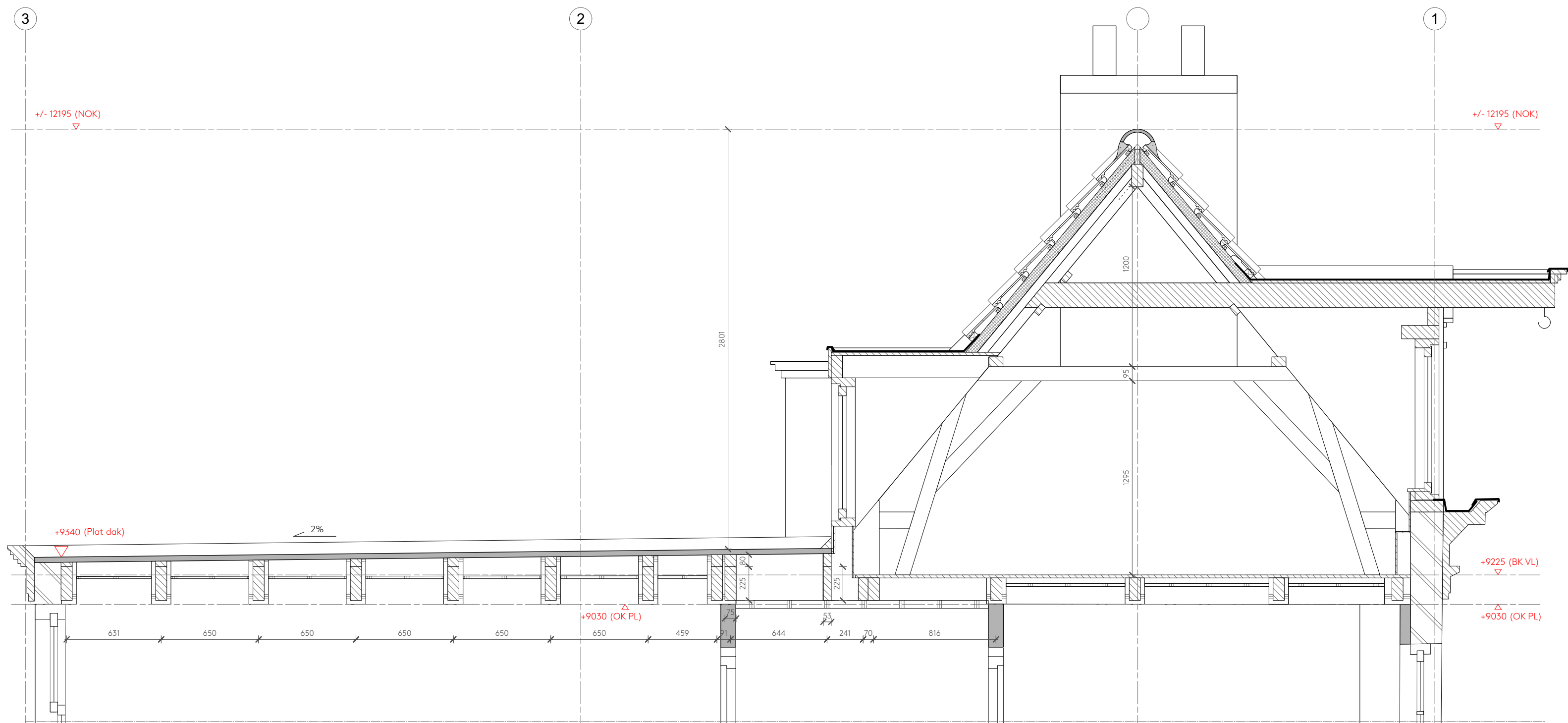
Verbouwing 5.1, 2, e Amsterdam

BESTAANDE SITUATIE

Doorsnede B-B'
Schaal 1:50

Project 094
Tekening B3002

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Verbouwing 5.1, 2, e Amsterdam

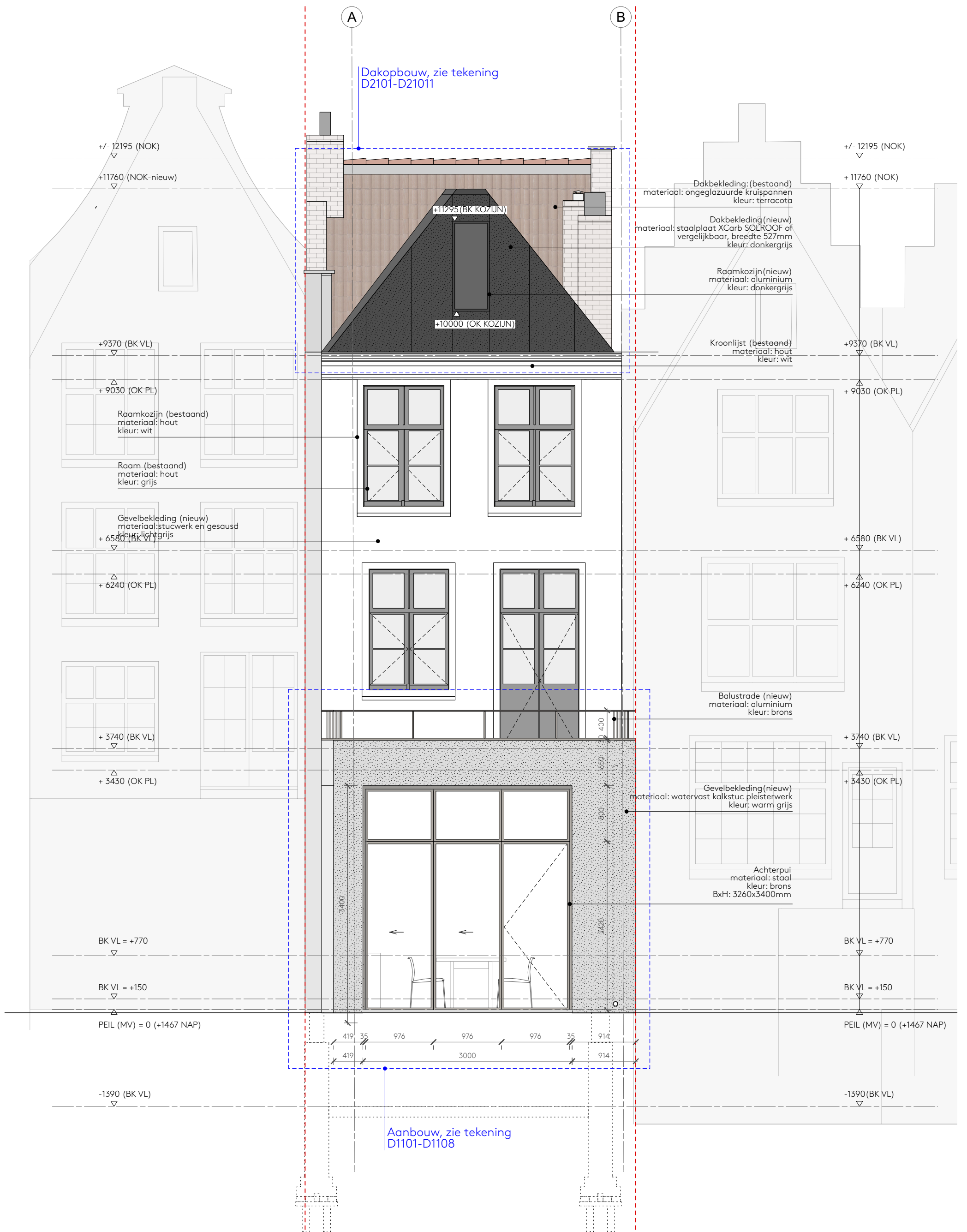
BESTAANDE SITUATIE

Doorsnede A-A' - Dak
Schaal 1:25

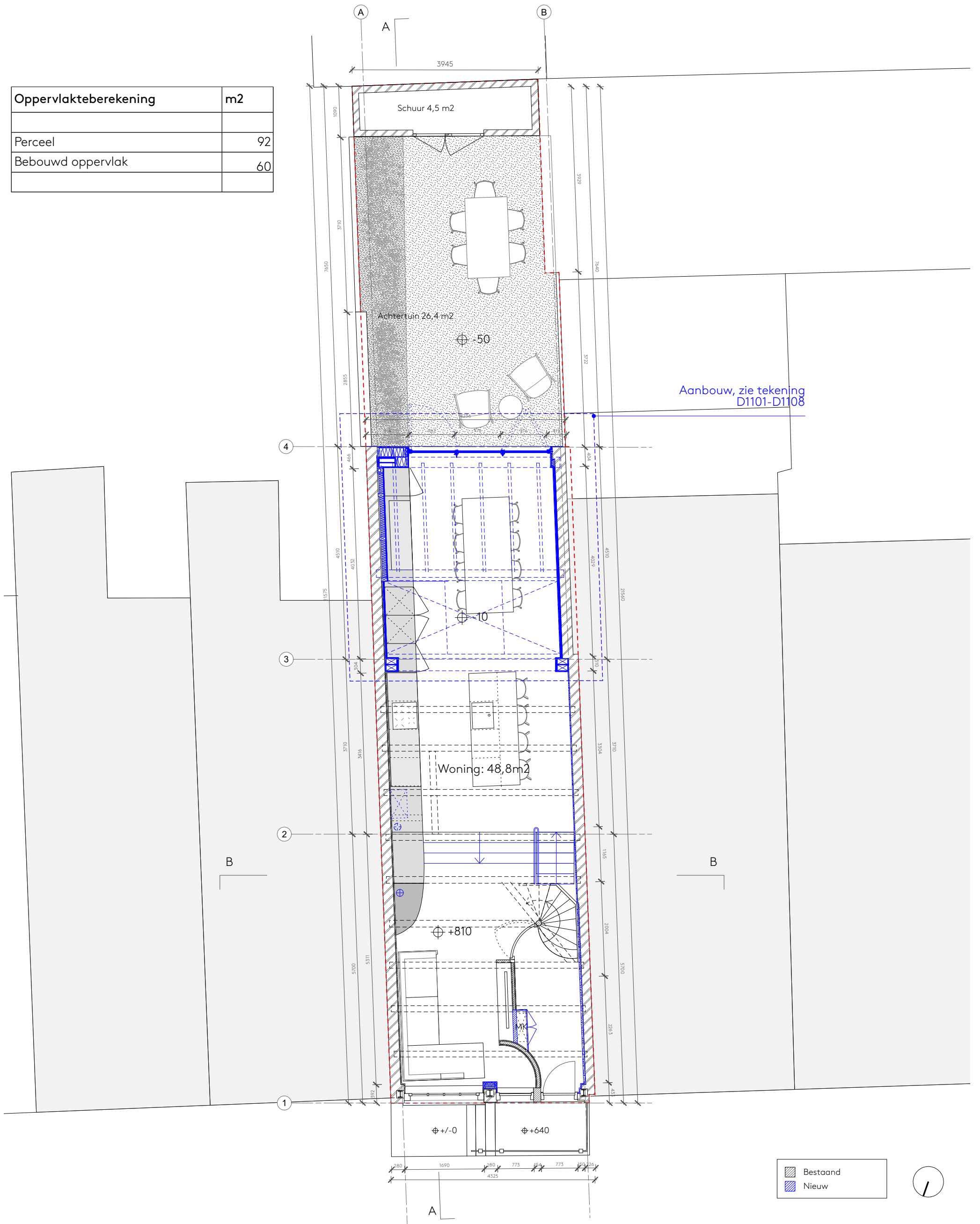
Project 094
Tekening B3004

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Revisie





| Oppervlakteberekening | m2 |
|-----------------------|----|
| Perceel | 92 |
| Bebouwd oppervlak | 60 |



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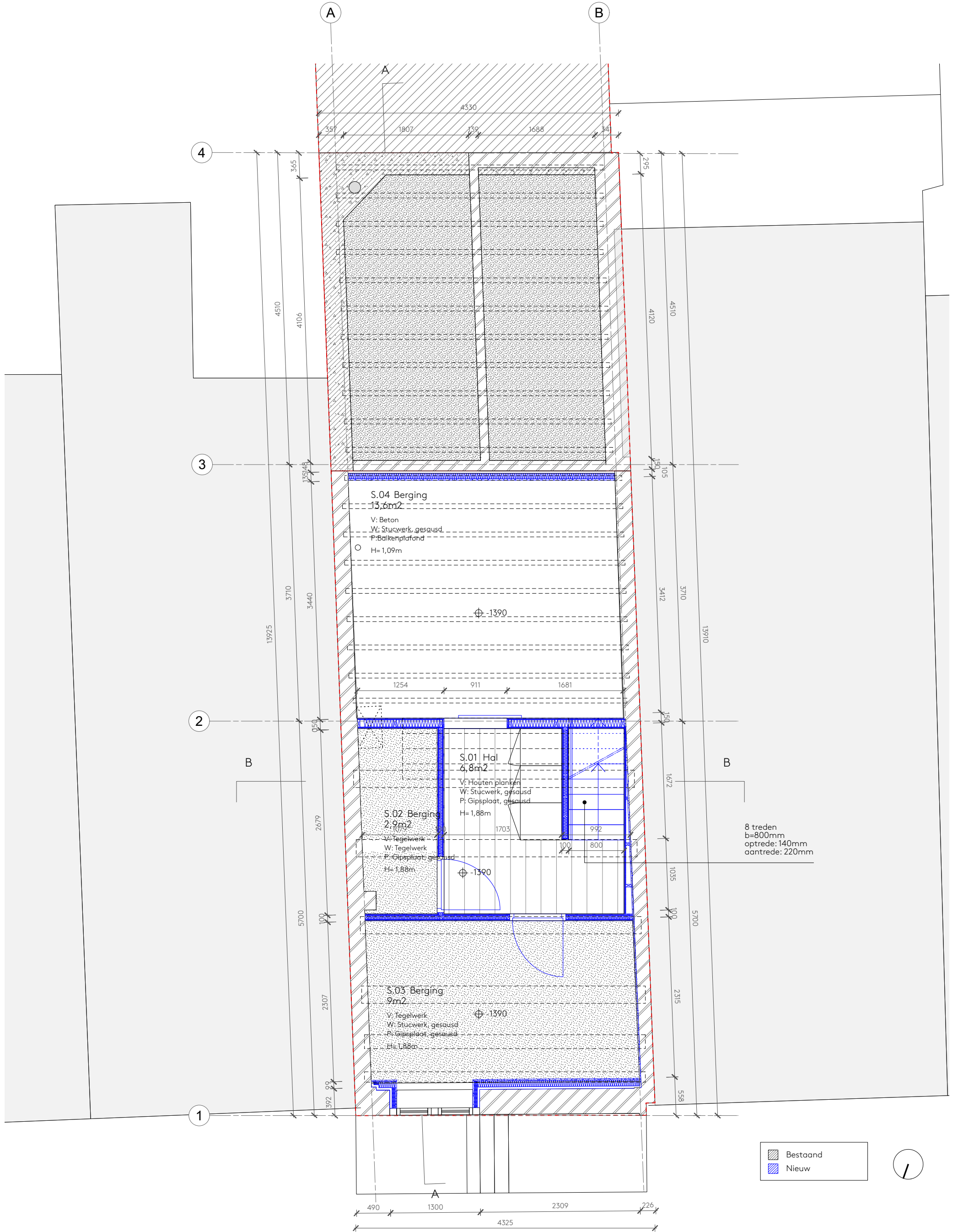
Verbouwing 5.1, 2, e Amsterdam

NIEUWE SITUATIE

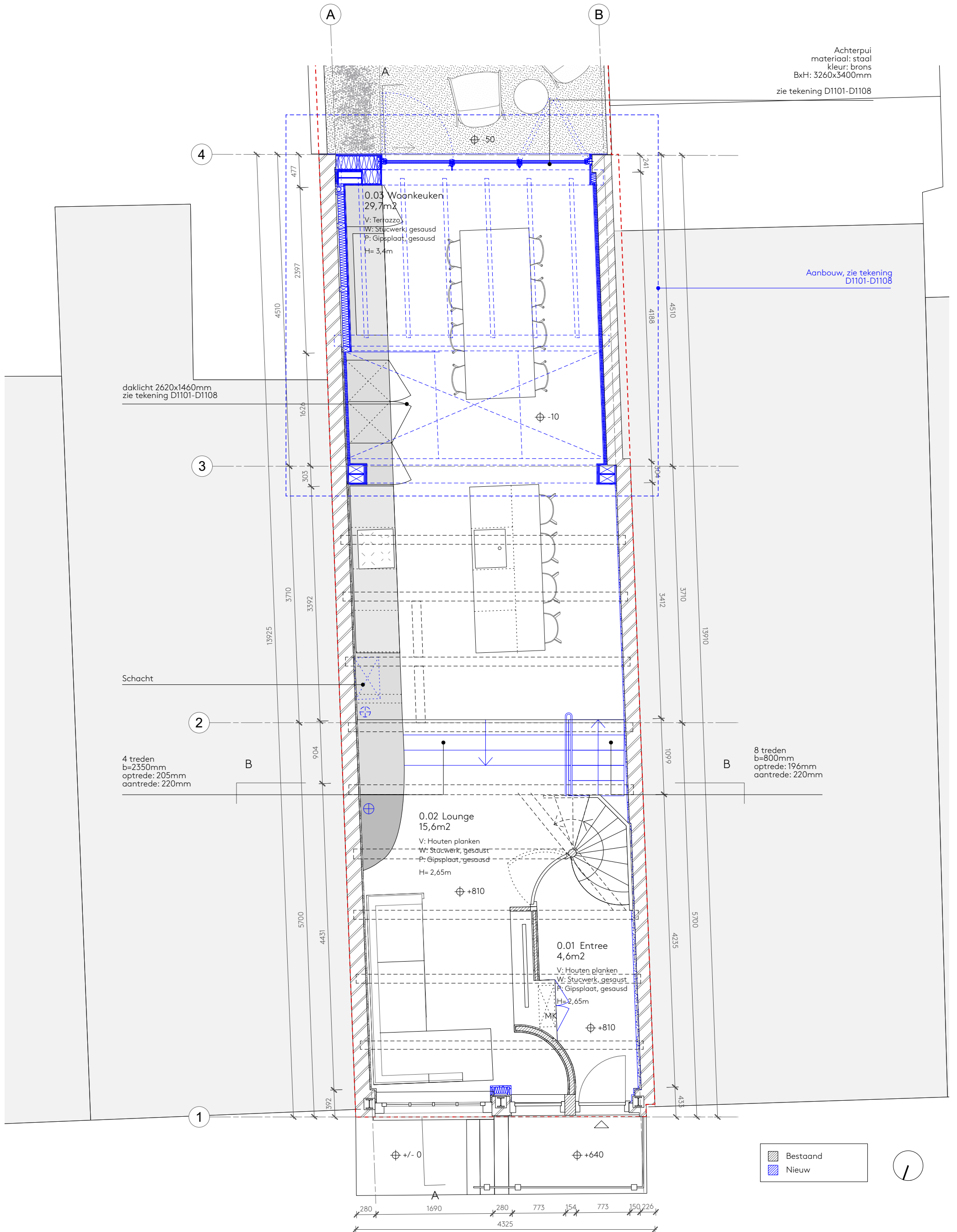
Plattegrond - Perceel
Schaal 1:75

Project 094
Tekening B2101

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Achterpui
materiaal: staal
kleur: brons
BxH: 3260x3400mm
zie tekening D1101-D1108



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Verbouwing 5.1, 2, e Amsterdam

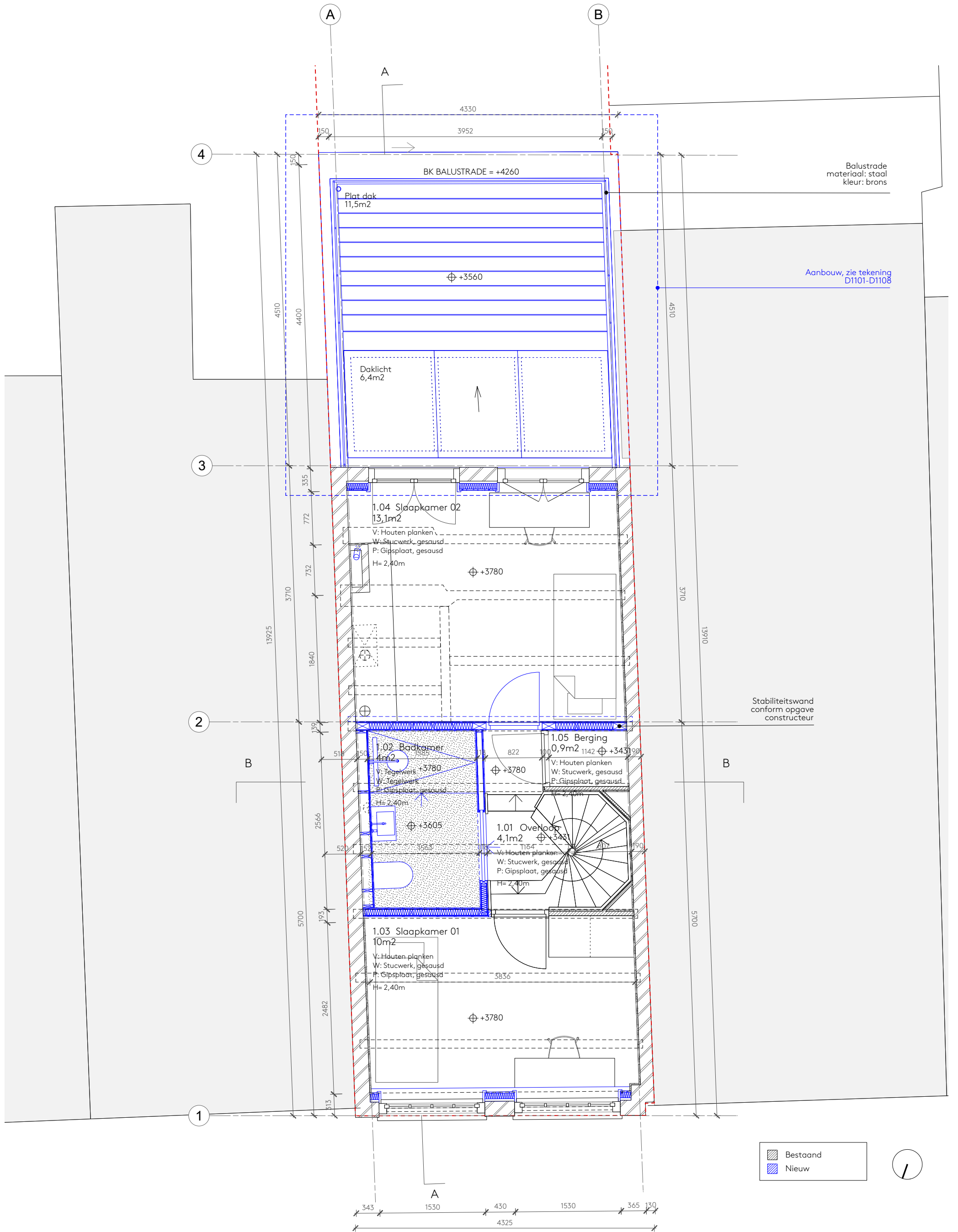
NIEUWE SITUATIE

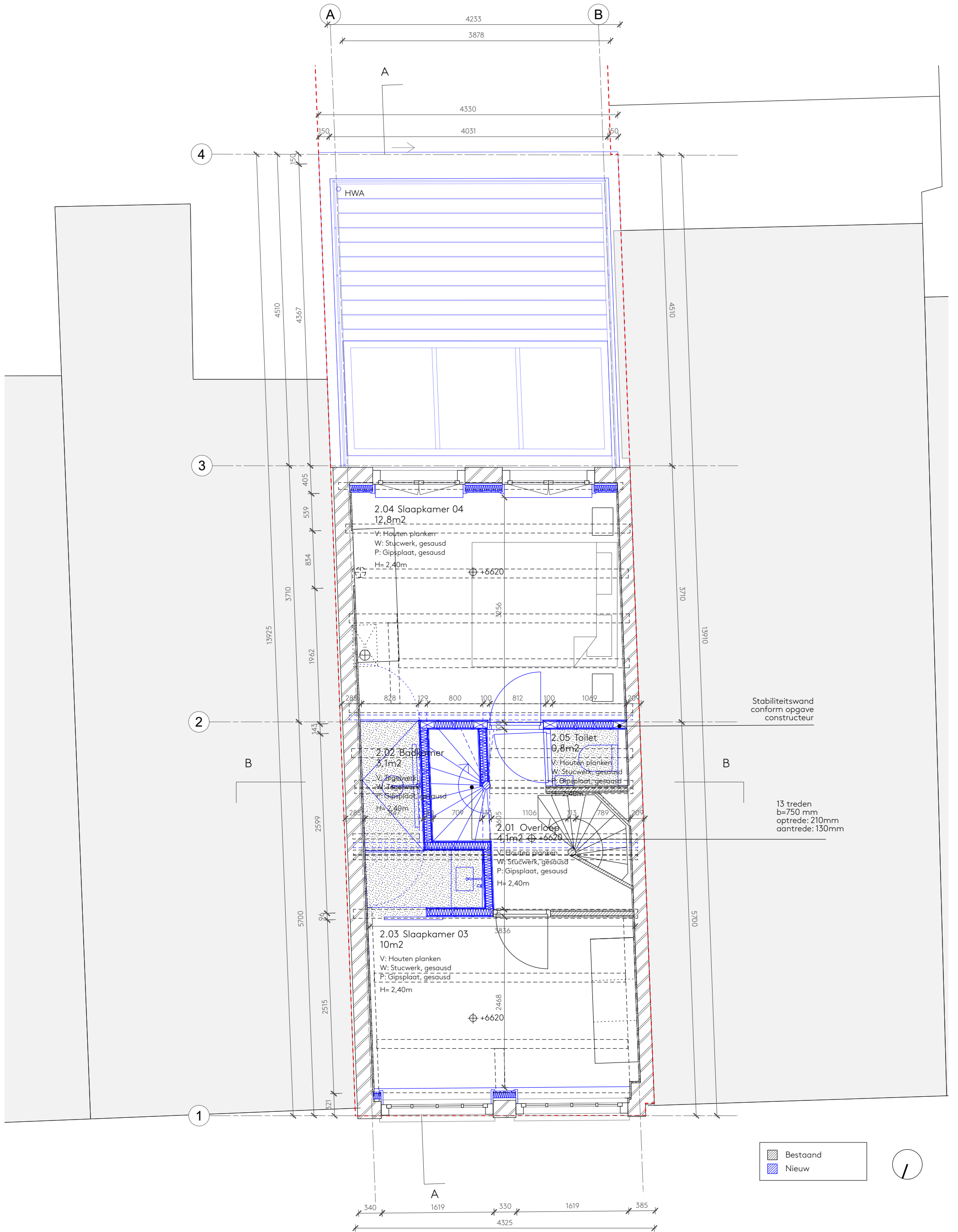
Plattegrond - Begane grond
Schaal 1:50

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Tekening B2103

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Verbouwing 5.1, 2, e Amsterdam

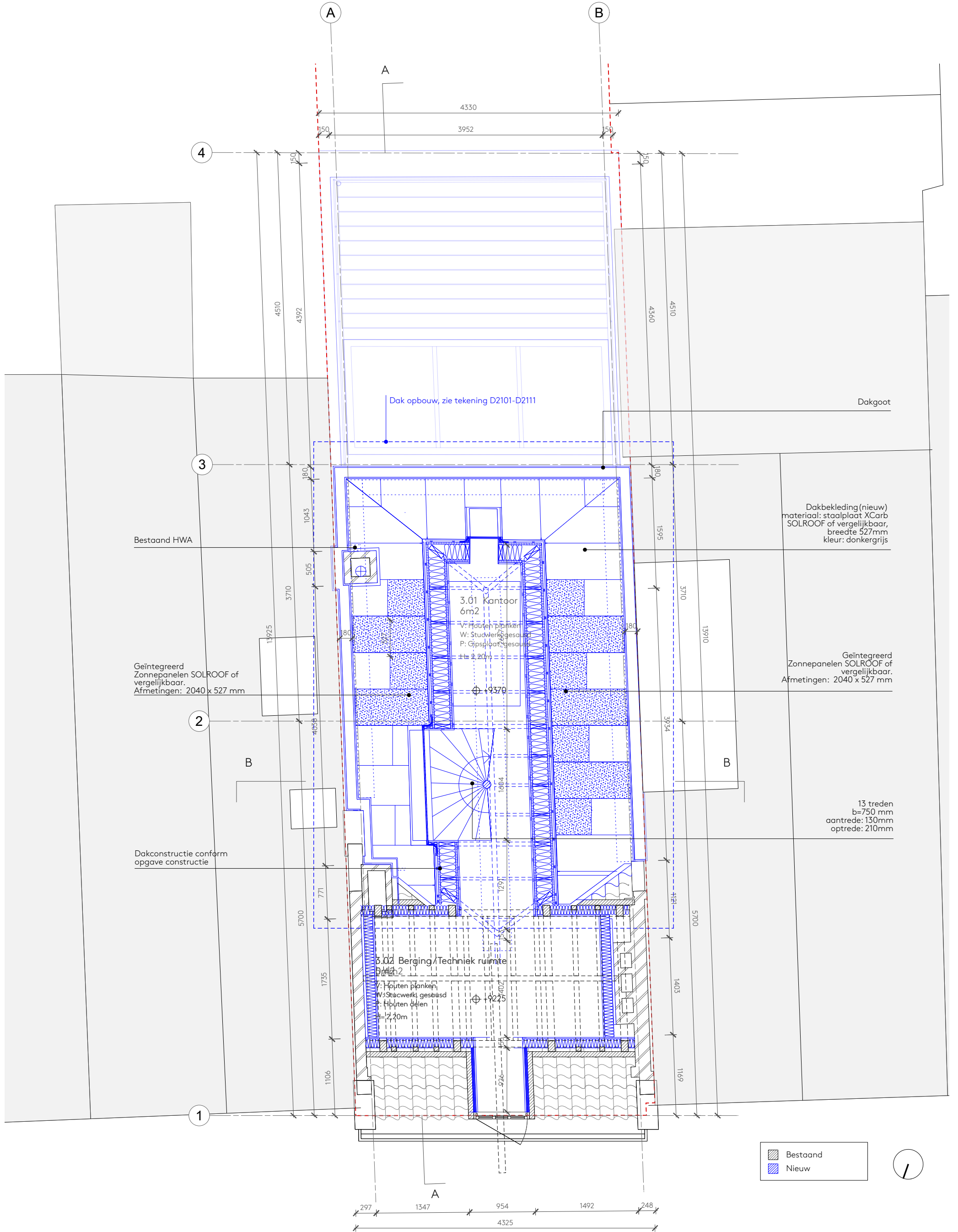
NIEUWE SITUATIE

Plattegrond - Tweede verdieping
Schaal 1:50

Project 094
Tekening B2105

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Verbouwing 5.1, 2, e Amsterdam

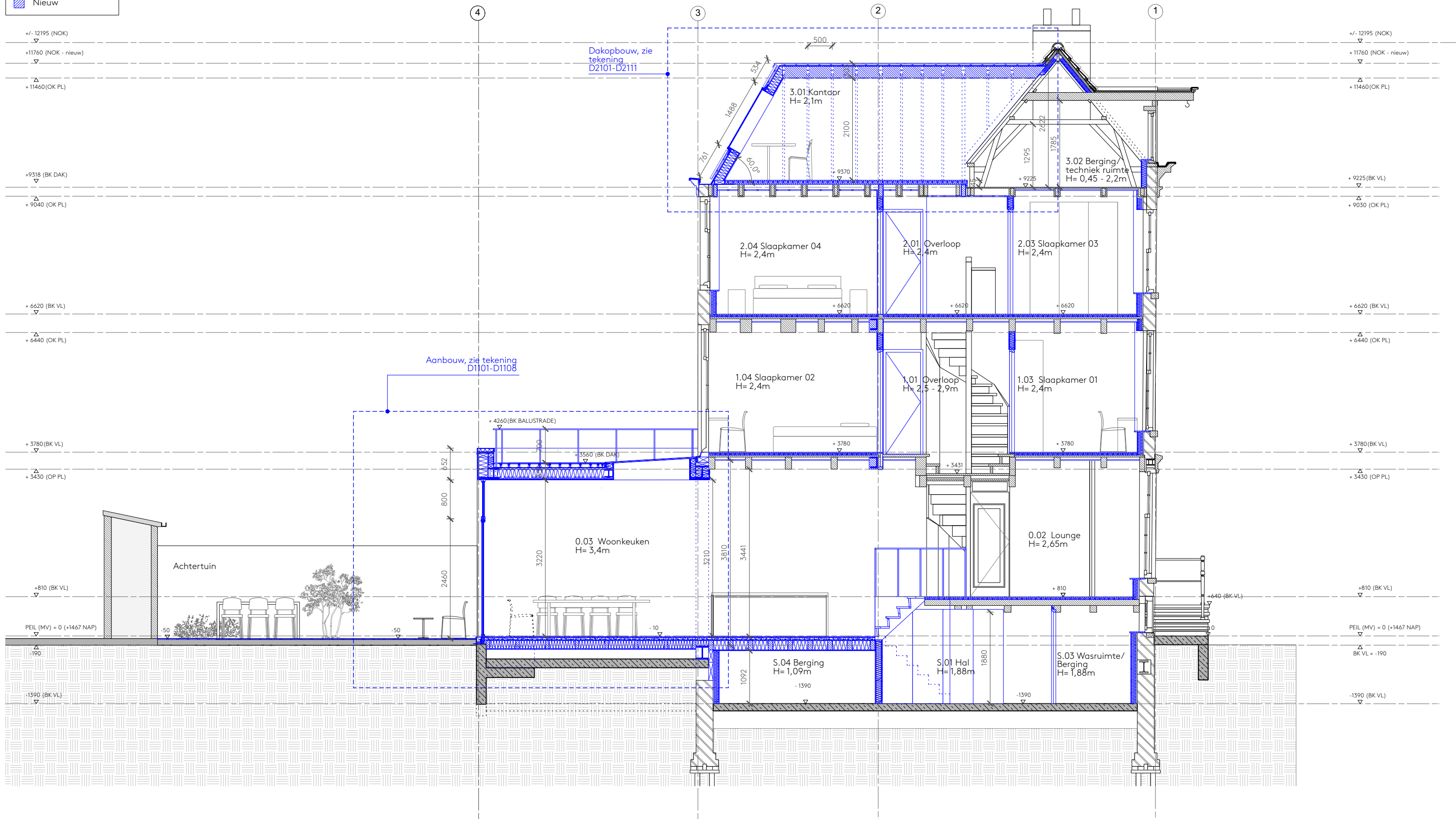
NIEUWE SITUATIE

Plattegrond - Zolder
Schaal 1:50

Project 094
Tekening B2106

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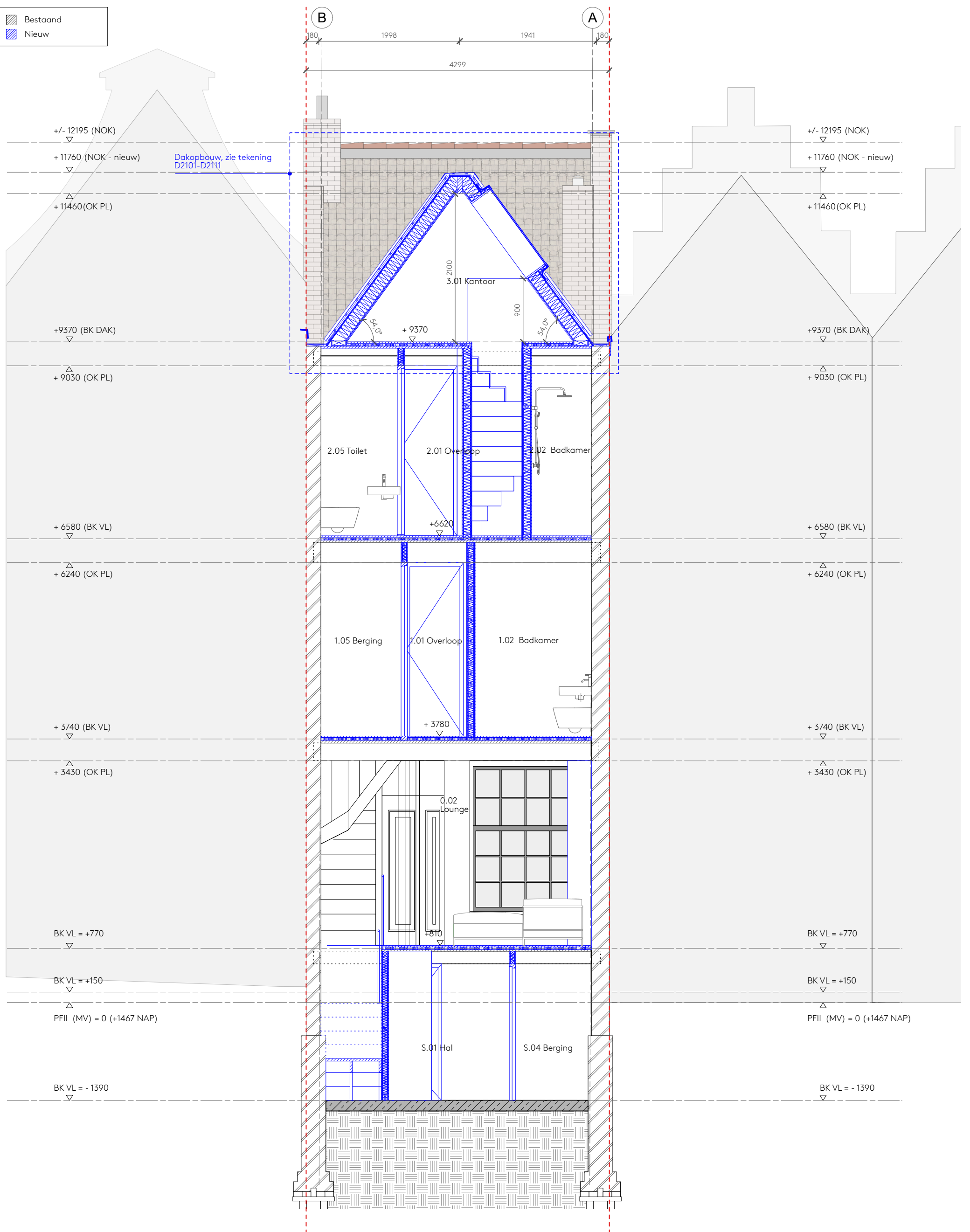
Verbouwing 5.1, 2, e Amsterdam

NIEUWE SITUATIE

Doorsnede A-A'
 Schaal 1:75

Project 094
 Tekening B3101

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Verbouwing 5.1, 2, e Amsterdam

NIEUWE SITUATIE

Doorsnede B-B''
Schaal 1:50

Project 094
Tekening B3102

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Formaat A3
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Bijlage C

Constructieschetsen

Souterrainvloer:
 Staat te controleren na
 verwijderen puinvulling.
 Eventuele aanpassingen van
 constructieve aard worden te
 zijner tijd voorgelegd.

2023237 - 5.1, 2, e te Amsterdam
 Constructievoorstel
 Onderdeel: Souterrain
 Blad: 1 van 7



Constructief in Erfgoed

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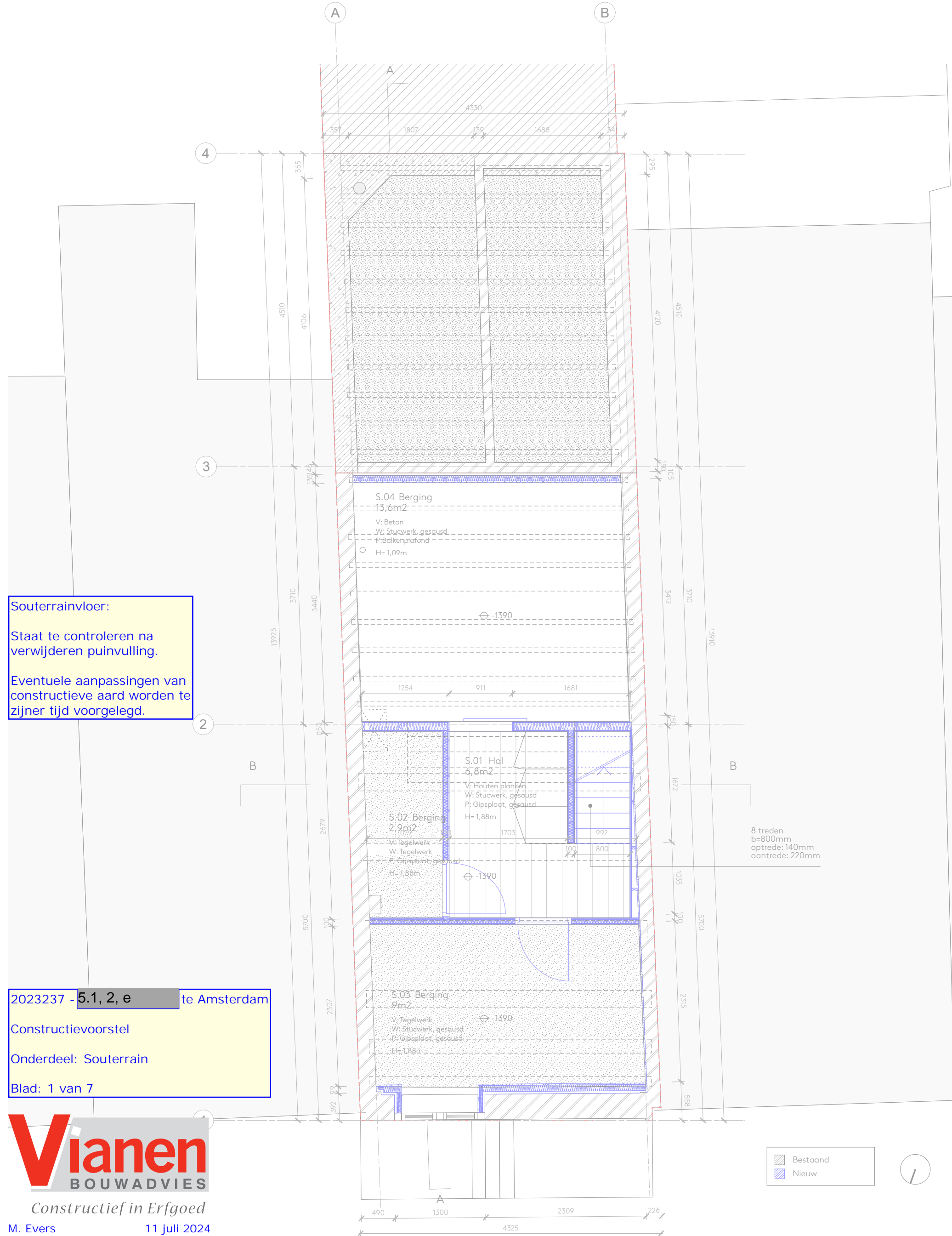
Verbouwing 5.1, 2, e Amsterdam

NIEUWE SITUATIE

Plattegrond - Souterrain
 Schaal 1:50

Project 094
 Tekening B2102

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Bestaand
 Nieuw



Portaal:

- Ligger HEB220 (in dakvlak opgelegd op metselwerk)
- Kolom IPE360 voetplaat op bestaande betonconstructie op betonpaal

Betonconstructie fundering bestaand.

BO-02:

Balklaag begane grondvloer nieuw: praktisch van aard, zwevend aangebracht middels vulblokjes of regels op betonplaat.

70 x 170 mm² C24 (hoh: 610 mm)

BO-01:

Balklaag begane grondvloer nieuw: 95 x 195 mm² C24 (hoh: 408 mm)

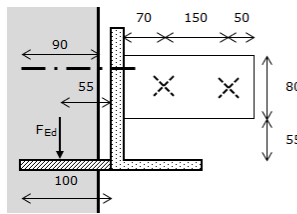
BO-01:

Oplegging op doorgaande hoeklijn.

handjes: aangelaste plaat: 100 x 250 mm² (t = 10 mm) h.o.h.: 1000 mm

chemische ankers: praktisch

Dimensionering handje



plaat: 100 x 250 mm²
dikte: 10 mm
h.o.h.: 1000 mm
meewerkende breedte: 250 mm

stalen strips: t = 10 mm (hoh: 813 mm)
2 bouten M10 (4.8)

4 treden
b=2350mm
optrede: 205mm
aantrede: 220mm

Achterpui
materiaal: staal
kleur: brons
BxH: 3260x3400mm
zie tekening D1101-D1108

Aanbouw, zie tekening D1101-D1108

Portaal vervangen:

- kolommen HEB260
- ligger onder en boven: HEB260
- kolommen en liggers momentvast verbonden

8 treden
b=800mm
optrede: 196mm
aantrede: 220mm

2023237 - 5.1, 2, e te Amsterdam

Constructievoorstel

Onderdeel: Begane grond

Blad: 2 van 7



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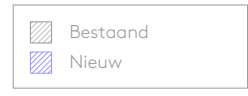
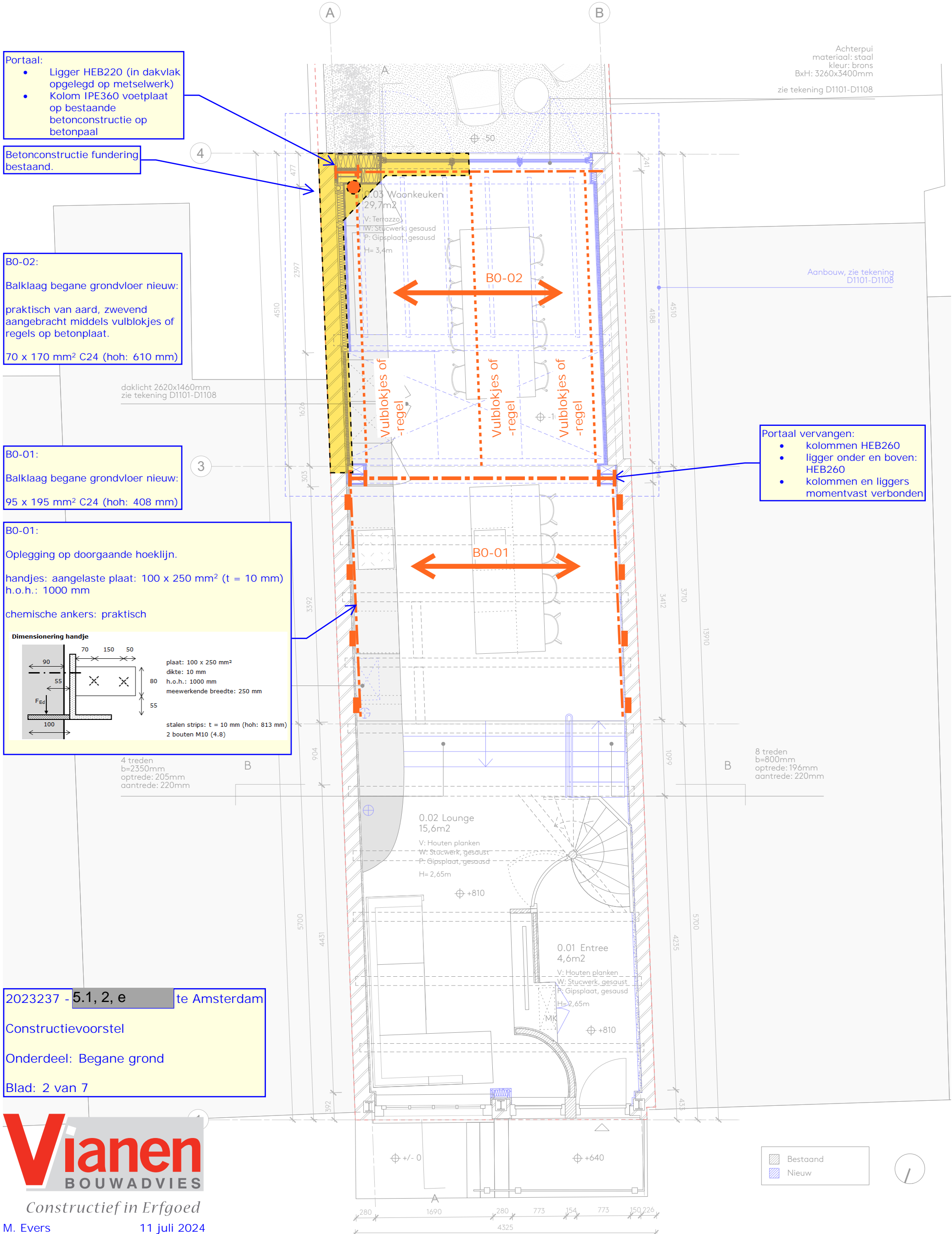
Verbouwing 5.1, 2, e Amsterdam

NIEUWE SITUATIE

Plattegrond - Begane grond
Schaal 1:50

Project 094
Tekening B2103

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Formaat A3
Revisie - D. 10.07.2024



Portaal:

- L1-03: Ligger HEB220 (in dakvlak opgelegd op metselwerk)
- Kolom IPE360
- opwaaianker: strip 80 x 10 met haak 100 mm;
- lengte opwaaianker min. 2,1 m

B1-01:

Balklaag dakterras:

58 x 155 mm² C24 (hoh: 610)

Balustrade
materiaal: staal
kleur: brons

Aanbouw, zie tekening
D1101-D1108

Balklaag verdieping 1
bestaand:

Controle in het werk:
bestaande vloerplaten
geschroefd of genageld.

Ligger portaal
(bovenregel)

L1-05: UNP180

Oplegging bouwmuren hamerstuk
UNP180: l_{eff}: 220 mm

Boutverbinding ligger - hamerstuk:
aangelaste plaat en kopplaat.

Boven- en onderflens ondersabelen
of -gieten met krimparme mortel

Stabiliteitswand
conform opgave
construëtor

HSB-wanden met stabiliteitsfunctie:

Eindstijlen: 95 x 195 mm² (C24)

Eindstijlen op verdieping 1 en 2
verbinden met rothblaas brackets
aan UNP180 (L1-05)

Tussenstijlen 45 x 95 mm² (C24)

Beplating tweezijdig:
constructieplaat geschroefd op
stijlen

2023237 - 5.1, 2, e te Amsterdam

Constructievoorstel

Onderdeel: 1^e verdieping

Blad: 3 van 7



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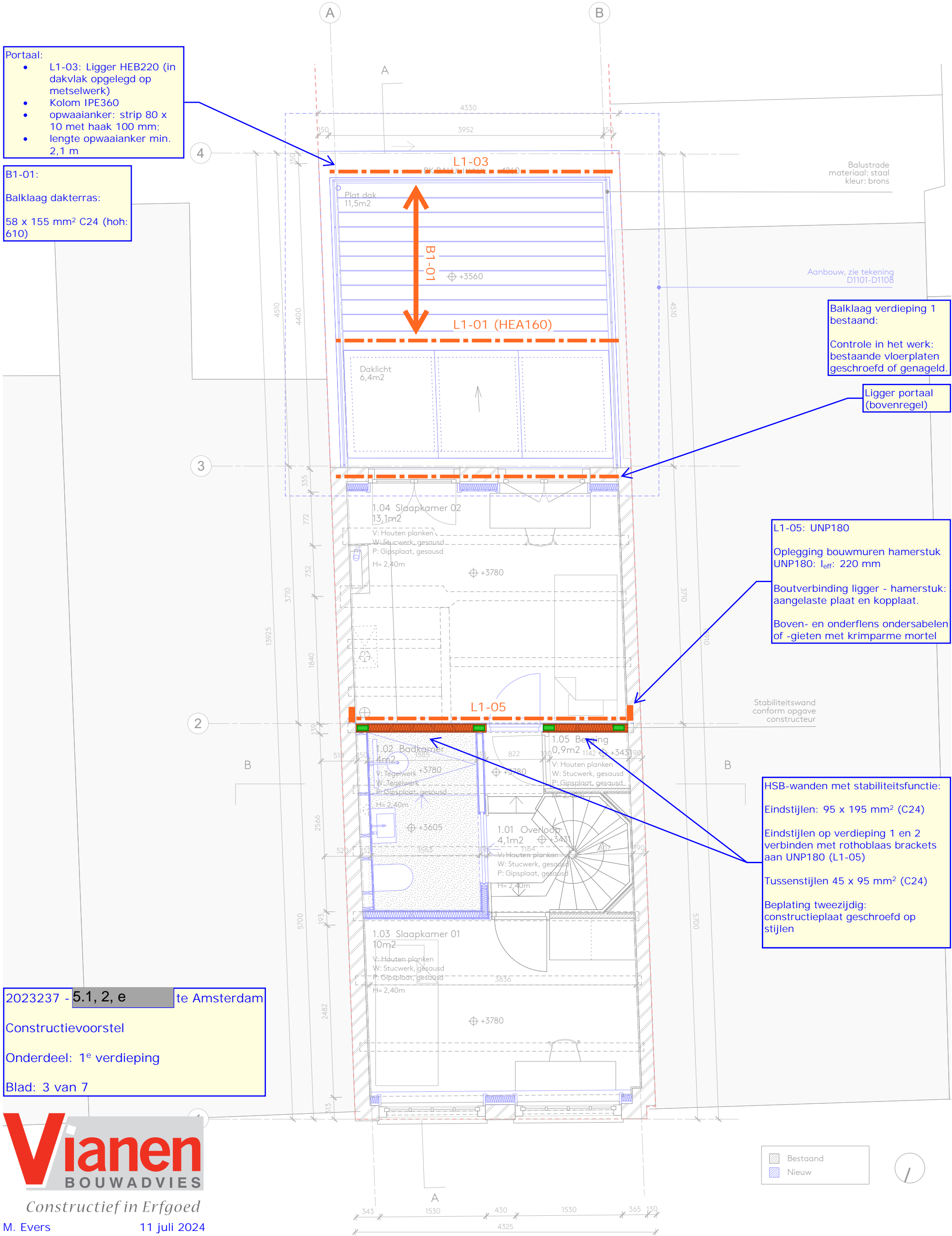
Verbouwing 5.1, 2, e Amsterdam

NIEUWE SITUATIE

Plattegrond - Eerste verdieping
Schaal 1:50

Project 094
Tekening B2104

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2023237 - 5.1, 2, e te Amsterdam
 Constructievoorstel
 Onderdeel: 2^e verdieping
 Blad: 4 van 7



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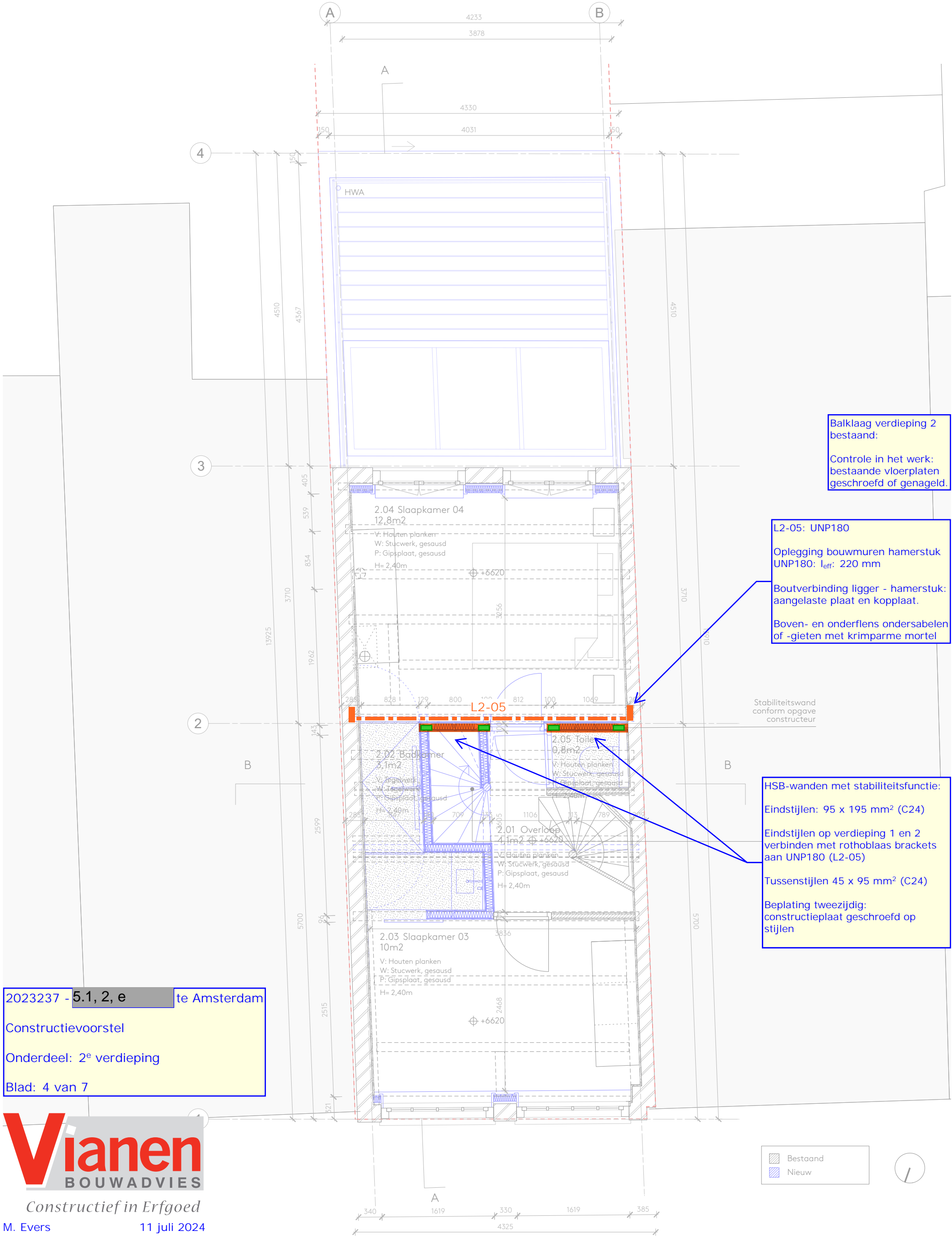
Verbouwing 5.1, 2, e Amsterdam

NIEUWE SITUATIE

Plattegrond - Tweede verdieping
 Schaal 1:50

Project 094
 Tekening B2105

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Balklaag verdieping 2
 bestaand:
 Controle in het werk:
 bestaande vloerplaten
 geschroefd of genagel.

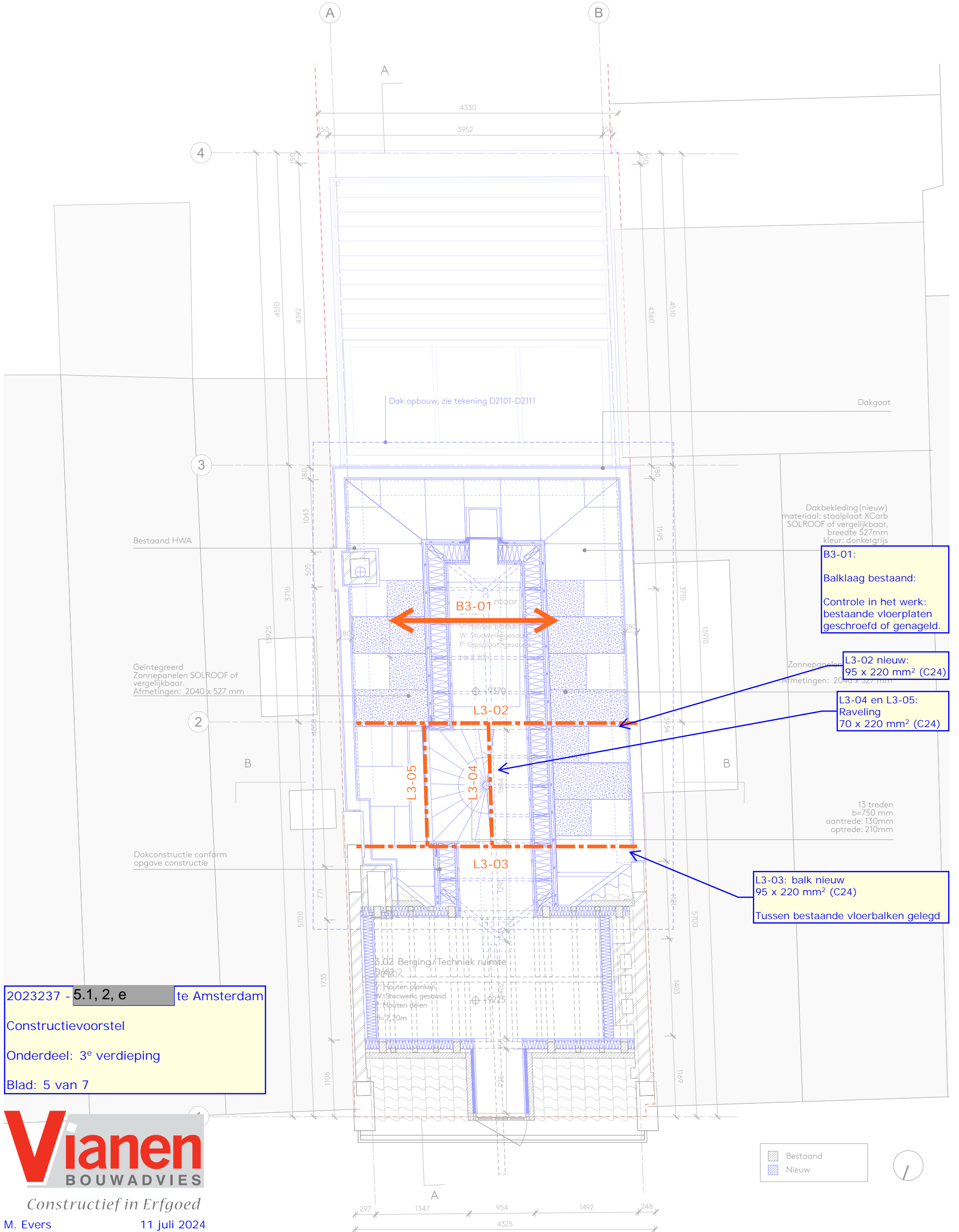
L2-05: UNP180
 Oplegging bouwmuren hamerstuk
 UNP180: l_{eff}: 220 mm
 Boutverbinding ligger - hamerstuk:
 aangelaste plaat en kopplaat.
 Boven- en onderflens ondersabelen
 of -gieten met krimparme mortel

HSB-wanden met stabiliteitsfunctie:
 Eindstijlen: 95 x 195 mm² (C24)
 Eindstijlen op verdieping 1 en 2
 verbinden met rothoblaas brackets
 aan UNP180 (L2-05)
 Tussenstijlen 45 x 95 mm² (C24)
 Beplating tweezijdig:
 constructieplaat geschroefd op
 stijlen

Stabiliteitswand
 conform opgave
 constructeur

Bestaand
 Nieuw





B3-01:
 Balklaag bestaat:
 Controle in het werk:
 bestaande vloerplaten
 geschroefd of genageld.

L3-02 nieuw:
 95 x 220 mm² (C24)

L3-04 en L3-05:
 Raveling
 70 x 220 mm² (C24)

L3-03: balk nieuw
 95 x 220 mm² (C24)
 Tussen bestaande vloerbalken gelegd

2023237 - 5.1, 2, e te Amsterdam
 Constructievoorstel
 Onderdeel: 3^e verdieping
 Blad: 5 van 7



Constructief in Erfgoed

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Verbouwing 5.1, 2, e Amsterdam

NIEUWE SITUATIE

Plattegrond - Zolder
 Schaal 1:50

Project 094
 Tekening B2106

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Dak nieuw (sporenkap)
alles C24

Sporen:
38 x 170 mm² (hoh 500 mm)

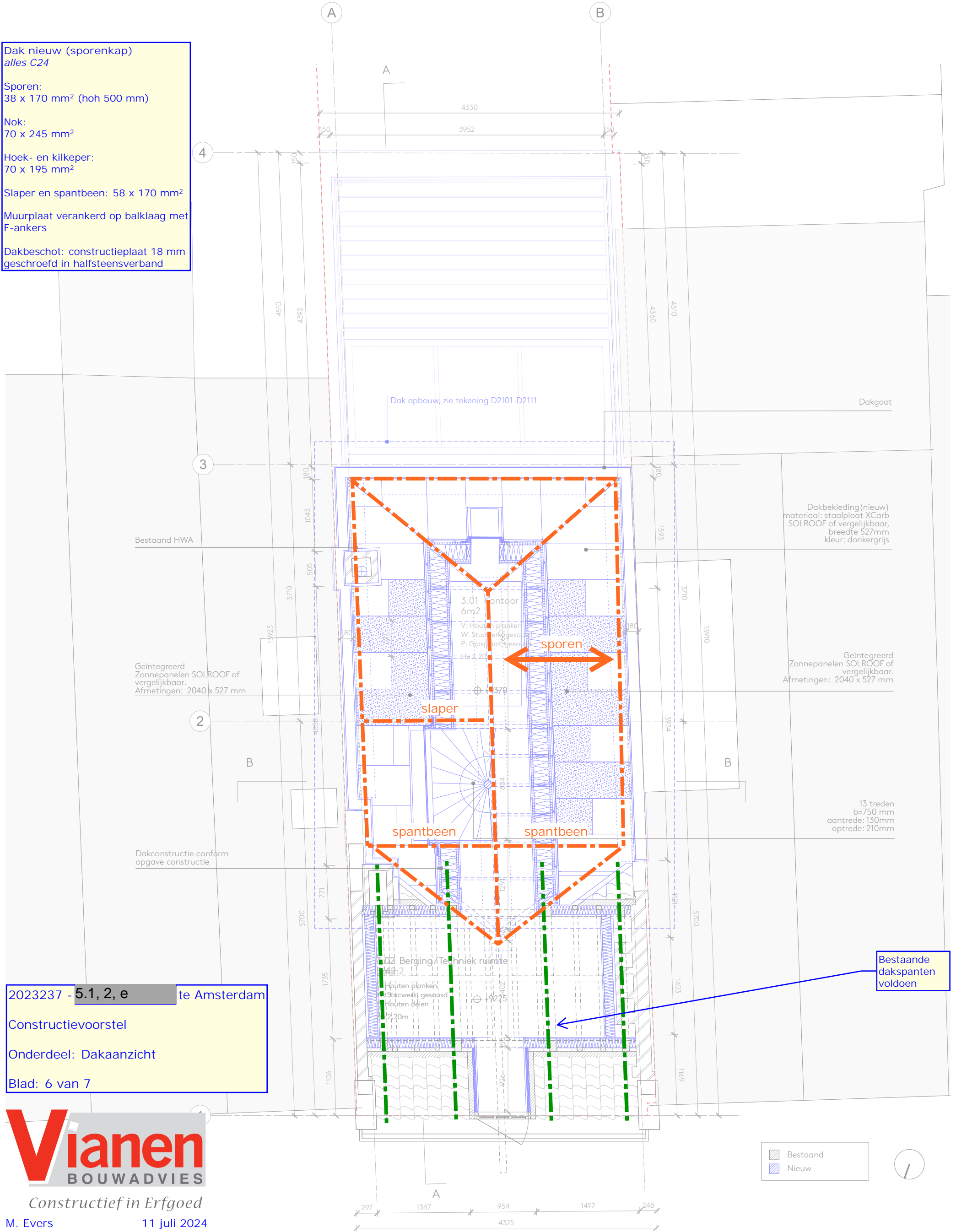
Nok:
70 x 245 mm²

Hoek- en kilkeper:
70 x 195 mm²

Slaper en spantbeen: 58 x 170 mm²

Muurplaat verankerd op balklaag met F-ankers

Dakbeschot: constructieplaat 18 mm geschroefd in halfsteensverband



2023237 - 5.1, 2, e te Amsterdam

Constructievoorstel

Onderdeel: Dakaanzicht

Blad: 6 van 7



Constructief in Erfgoed

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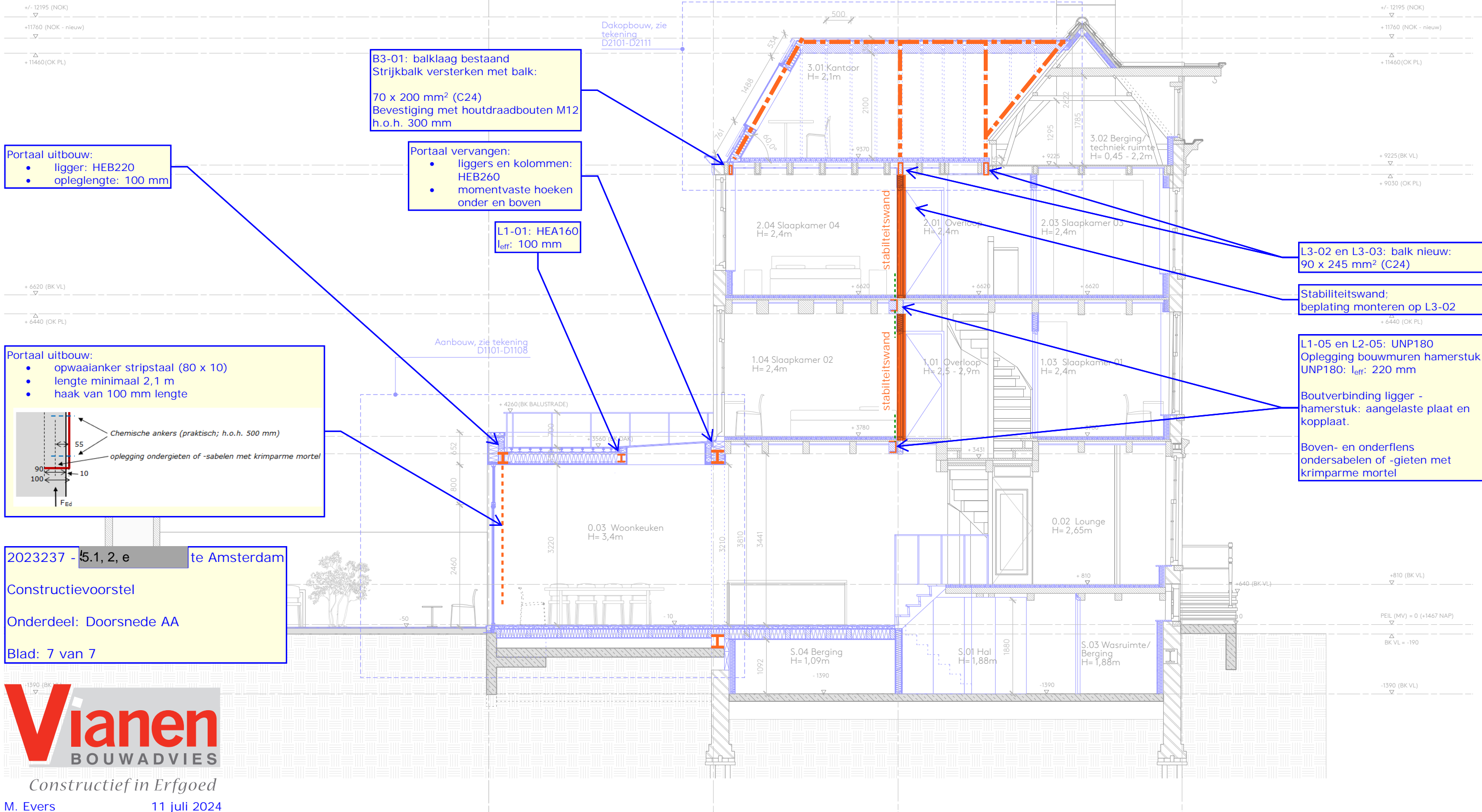
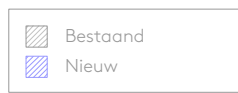
Verbouwing 5.1, 2, e Amsterdam

NIEUWE SITUATIE

Plattegrond - Zolder
Schaal 1:50

Project 094
Tekening B2106

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Formaat A3
Revisie - D. 10.07.2024



Portaal uitbouw:
• ligger: HEB220
• oplegglengte: 100 mm

B3-01: balklaag bestaand
Strijkbalk versterken met balk:
70 x 200 mm² (C24)
Bevestiging met houtdraadbouten M12
h.o.h. 300 mm

Portaal vervangen:
• liggers en kolommen:
HEB260
• momentvaste hoeken
onder en boven

L1-01: HEA160
l_{eff}: 100 mm

L3-02 en L3-03: balk nieuw:
90 x 245 mm² (C24)

Stabiliteitswand;
beplating monteren op L3-02

Portaal uitbouw:
• opwaaianker stripstaal (80 x 10)
• lengte minimaal 2,1 m
• haak van 100 mm lengte

Chemische ankers (praktisch; h.o.h. 500 mm)
oplegging ondergieten of -sabelen met krimparme mortel

L1-05 en L2-05: UNP180
Oplegging bouwmuren hamerstuk
UNP180: l_{eff}: 220 mm

Boutverbinding ligger -
hamerstuk: aangelaste plaat en
kopplaat.

Boven- en onderflens
ondersabelen of -gieten met
krimparme mortel

2023237 - 5.1, 2, e te Amsterdam
Constructievoorstel
Onderdeel: Doorsnede AA
Blad: 7 van 7



Constructief in Erfgoed
M. Evers 11 juli 2024

Wilgenweg 20c
1031 HV Amsterdam
The Netherlands



+31 20 221 61 77
office@sergeschoemaker.com
www.sergeschoemaker.com

Verbouwing 5.1, 2, e Amsterdam

NIEUWE SITUATIE

Doorsnede A-A'
Schaal 1:75

Project 094
Tekening B3101

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