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18107 – Statische berekening constructie

Project: 18107
Nieuwbouw 14 woningen
Zuideinde 83
1551 EC Westzaan

Berekening: 01

Datum: 13-11-2024

Opdrachtgever KPO Planontwikkeling BV
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Inhoudsopgave

| | |
|---|-----|
| Projectomschrijving: | 2 |
| Algemene gegevens: | 3 |
| Normen: | 3 |
| Veiligheidsklasse: | 3 |
| Geluidseisen: | 3 |
| Brandwerendheid: | 3 |
| Uitgangspunten: | 4 |
| Constructieprincipe: | 4 |
| Fundering en palen: | 4 |
| Toegepaste materialen (met minimale kwaliteit): | 4 |
| Vervormingen: | 5 |
| Hoogtematen en palen | 5 |
| Peil: | 5 |
| Grondwater: | 5 |
| Belastingen: | 6 |
| Permanente belastingen: | 6 |
| Variabele belastingen: | 6 |
| Windbelasting: | 6 |
| Uitgangspunten gewichtsberekening: | 7 |
| Stabiliteitsbeschouwing: | 11 |
| Woning type A en B: | 11 |
| Woning type E en F: | 17 |
| Kapconstructie: | 18 |
| Woning type A en B: | 18 |
| Woning type E en F: | 41 |
| Zoldervloer: | 66 |
| Woning type A en B: | 66 |
| Woning type E en F: | 72 |
| Verdiepingsvloer: | 75 |
| Woning type A en B: | 75 |
| Woning type E en F: | 79 |
| Fundering: | 82 |
| Toelaatbare paalbelastingen: | 87 |
| Woning type A en B - balkwapening: | 88 |
| Woning type A en B - balkbelastingen: | 90 |
| Woning type A en B – uitvoer TS Balkroosters: | 98 |
| Woning type E en F - balkwapening: | 157 |
| Woningtype E en F – balkbelastingen: | 159 |
| Woningtype E en F – uitvoer TS Balkroosters blok 3: | 164 |
| Woningtype E en F – uitvoer TS Balkroosters blok 4: | 209 |
| Woningtype E en F – uitvoer TS Balkroosters blok 5: | 267 |

Projectomschrijving:

Het project bevat de nieuwbouw van 14 woningen te Westzaan.

De woningen worden gebouwd met kanaalplaatvloeren en dragende wanden van prefab beton. Het bouwplan van 14 woningen is te verdelen in verschillende typen woningen over 5 blokken.

Woningen A en B zijn vrijstaande woningen met een langskap.

De woningen hebben een breedte van 6,48 (type A) en 7,25 (type B) meter, en een lengte van circa 12,5 meter.

Woningen van het type E en F hebben een beukmaat van 6 meter en een diepte van 12,0 meter. De woningen zijn in drie blokken verdeeld van 3 (bouwnummer 3 t/m 5), 4 (bouwnummer 6 t/m 9) en 5 (bouwnummer 10 t/m 14) woningen. Deze woningen hebben een langskap.

In deze rapportage wordt de constructie van de woningen berekend.



Algemene gegevens:

Normen:

| | |
|-------------------------|---|
| NEN-EN 1990, Eurocode 0 | Grondslagen constructief ontwerp |
| NEN-EN 1991, Eurocode 1 | Belastingen op constructies |
| NEN-EN 1992, Eurocode 2 | Ontwerp en berekening van betonconstructies |
| NEN-EN 1993, Eurocode 3 | Ontwerp en berekening van staalconstructies |
| NEN-EN 1995, Eurocode 5 | Ontwerp en berekening van houtconstructies |
| NEN-EN 1996, Eurocode 6 | Ontwerp en berekening van constructies van metselwerk |
| NEN-EN 1997, Eurocode 7 | Geotechnisch ontwerp |

Veiligheidsklasse:

Volgens NEN-EN 1990 geldt voor de woningen:

- Standaard eengezinswoningen
- Gevolgklasse CC1
- Referentieperiode 50 jaar
- Ontwerplevensduurklasse: 3
- Categorie: A (woon- en verblijfsruimte)
H (daken)

Belastingfactoren:

Bruikbaarheidsgrenstoestand

STR CC1 1,08 G + 1,35 (Q_{extr} + Q_{mom})
1,22 G + 1,35 Q_{mom}

Geluidseisen:

Geluidseisen en minimale afmetingen van wanden, vloeren, etc. zijn volgens bouwbesluit.
Dit betekend voor contactgeluid: $L_{n,T,A} < 54$ dB en voor luchtgeluid: $D_{n,T,A,k} > 52$ dB

Brandwerendheid:

Voor de eengezinswoningen geldt dat er voor het belastinggeval bij brand geen hoofddraagconstructie is. Er is dan ook geen brandwerendheidseis hiervoor.
Er wordt echter een eis van minimaal 30 minuten gehanteerd.

Voor de verschillende constructieonderdelen wordt de brandwerendheidseis dan:

Begane grondvloer : 30 minuten
Verdiepingsvloer : 30 minuten
Dakvloer : 30 minuten
Dragende wanden : 30 minuten

Uitgangspunten:

Constructieprincipe:

De woningen zijn opgebouwd uit prefab betonnen wanden met kanaalplaatvloer ter plaatse van de verdiepingsvloer. Deze vloer heeft een dikte van 260 mm. De begane grondvloer is een PS isolatievloer van 210 mm dikte. De vloeren worden afgewerkt met een dekvloer van 70 mm.

De kap wordt opgebouwd als een prefab kap. De kap rust op een randligger in de zoldervloer als er een houten zoldervloer is en op een muurplaat op de zoldervloer als dit een betonvloer is. De houten borstwering is verticaal dragend.

Fundering en palen:

Gezien de bodemgesteldheid komt alleen een fundering op palen in aanmerking. De funderingen hebben een breedte van 400 / 450 / 500 mm met een hoogte van 500 mm.

Het beoogde paalsysteem is een prefab betonpaal
Onder de stabiliteitswanden kan een paal op trek belast worden.

De sonderingen moeten nog gemaakt worden, deze kunnen nog gevolgen hebben voor het paaltype en de fundering.

Toegepaste materialen (met minimale kwaliteit):

| | | |
|---------------------------------|--------------------------------------|---------------------|
| Funderingspalen | : prefab betonpaal | C45/55 |
| Funderingsbalken | : betonbalk | C20/25 |
| Begane grond | : isolatievloer h=210mm | C20/25 |
| 1 ^e Verdiepingsvloer | : kanaalplaatvloer h=260 mm | C35/45 |
| 2 ^e Verdiepingsvloer | : kanaalplaatvloer h=260 mm | C35/45 |
| Zoldervloer | : houten balklaag met beschot | C18 |
| Dak | : prefab sporenkap met dakpannen | C18 |
| | Met verticaal dragende borstwering | |
| Betonwanden | : prefab betonwanden, 120/140/160 mm | volgens leverancier |

Algemeen:

| | | |
|--------------------|-----------|------------------------|
| - Staalconstructie | : liggers | S235 |
| | kokers | S355 |
| | bouten | 8.8 |
| | ankers | 4.6 |
| - Betonstaal | : B500A | |
| - betonsteen | : BIA | 15 N/mm ² . |

Vervormingen:

Als toelaatbare vervorming wordt aangehouden:

Horizontaal

$$U_{\text{totaal}} \leq 1/500 H \quad (\text{gehele gebouw})$$

$$U_{\text{bij}} \leq 1/300 H \quad (\text{verdieping})$$

Verticaal:

$$W_{\text{totaal}} \leq 0,004 \times l$$

$$W_{\text{bij}} \leq 0,003 \times l$$

$$W_{\text{bij}} \leq 0,002 \times l \quad W_{\text{bij};\text{max}} \leq 15 \text{ mm} \quad (\text{voor vloeren met steenachtige wanden})$$

$$W_{\text{bij}} \leq 0,001 \times l \quad W_{\text{bij};\text{max}} \leq 10 \text{ mm} \quad (\text{voor overstekken})$$

Hoogtematen en palen

Peil:

Ten tijde van het opstellen van deze rapportage is het peil van de woning nog niet bekend.

Grondwater:

Ten tijde van het sonderen is de grondwaterstand gemeten op 930 mm -NAP.

De invloed van de grondwaterstand is in dit geval niet groot aangezien er geen trekbelastingen zijn als gevolg van deze grondwaterstand (zoals bij bijvoorbeeld kelders).

Opgemerkt dient te worden dat de opname van de grondwaterstand een eenmalige opname is en dat de grondwaterstand kan fluctueren.

Belastingen:

Permanente belastingen:

De gewichtsberekening wordt gemaakt met behulp van software van Qec.
Voor de permanente belastingen wordt verwezen naar deze bijlage.

Als verdeelde wandlast is in de gewichtsberekening 0,8 kN/m² meegenomen.
Wanden zwaarder dan 2,0 kN/m¹ dienen als lijnlast te worden berekend.

Variabele belastingen:

Woonfunctie : 1,75 kN/m² ($\Psi_0 = 0,4$ / $\Psi_1 = 0,5$ / $\Psi_2 = 0,3$)

Daken : 1,00 kN/m² ($\Psi_0 = 0,0$ / $\Psi_1 = 0,0$ / $\Psi_2 = 0,0$)

Windbelasting:

Windgebied II, onbebouwde omgeving (Westzaan)

Voor de verschillen de blokken wordt aangehouden:

- vrijstaande woningen, gebouwhoogte 9,35 m¹ + MV -> $q_p = 0,83$ kN/m²
- rijwoningen, gebouwhoogte 8,50 m¹ + MV -> $q_p = 0,80$ kN/m²

Factoren conform de NEN-EN 1991-1-4 en de NB.

Bijzondere belasting:

Volgens de NEN-EN1991-1-7 is voor de woning in CC1 geen verdere beschouwing nodig voor buitengewone belastingen door onbekende oorzaken.

Uitgangspunten gewichtsberekening:

werk: **14 woningen Zuideinde 83 te Westzaan**
 werknummer: **18107**
 onderdeel: **Gewichtsberekening**

soort gebouwfunctie 5:
 soort gebouwfunctie 4:
 soort gebouwfunctie 3:
 soort gebouwfunctie 2:
 soort gebouwfunctie 1: **eengezinswoning**

maatgevend:

| duurklasse | gevolgklasse | categorie |
|------------|--------------|-----------|
| 3 | CC1b | A |
| 3 | CC1b | |

ontwerplevens- ook cnrm 1991-1-7 gebruiks-
 ontwerp- ook cnrm 1991-1-7 gebruiks-

toegepaste norm = NEN-EN 1990 eurocode nieuwbouw
 gevolgklasse = CC1b (Consequence Class = gevolgklasse)
 ontwerplevensduurklasse = 3 => ontwerplevensduur = 50 jaar
 huidige ouderdom gebouw = jaar => restlevensduur = 50 jaar
 referentieperiode = 50 jaar
 correctiefactor $\xi = 0,89$ correctiefactor eigen gewicht voor formule 6.10.b
 Keuze voor 6.10b: combinatie met: 2 vloeren extreem in de gebouwfunctie A t/m G of H (NEN-EN 1991-1-1+C1/N1)

omschrijving = CC1b: Geringe gevolgen t.a.v. verlies van mensenlevens en kleine of verwaarloosbare economische of sociale of voor (

toepassing = gebouwen en andere gewone constructies
 voorbeelden = eengezinswoning 1-3 bouwlagen, landbouwbedrijfsgebouw en tuinbouwkas en industriegebouw tot 2 verdiepingen, uitsl
 betrouwbaarheidsklasse = RC1 (Reliability Class = betrouwbaarheidsklasse)
 betrouwbaarheidsfactor $\beta = 3,30$ (tabel B2 blz 87 NEN-EN 1990 voor een referentieperiode van 50 jaar)
 K_{F1} -factor = 0,9 (tabel B3 blz 87 NEN-EN 1990)
 sneeuwbelasting op de grond (incl. f) $s_n = 0,70$ kN/m²

ψ -waarden voor gebouwen

| gebruikscategorie = | A | B | C | D | E | F | G | H |
|---|-----|-----|-----|-----|-----|-----|-----|--|
| factor combinatie-waarde van de veranderlijke belasting: $\psi_0 =$ | 0,4 | 0,5 | 0,4 | 0,4 | 1 | 0,7 | 0,7 | 0 |
| factor frequent aanwezige veranderlijke belasting: $\psi_1 =$ | 0,5 | 0,5 | 0,7 | 0,7 | 0,9 | 0,7 | 0,5 | 0 |
| factor quasi-blijvende veranderlijke belasting: $\psi_2 =$ | 0,3 | 0,3 | 0,6 | 0,6 | 0,8 | 0,6 | 0,3 | 0 |
| correctiefactor voor levensduur F_t/F_{t0} $\psi_t =$ | 1 | 1 | 1 | 1 | 1 | 1 | 1 | $\{1+(1-\psi_0)/9 \cdot \ln(t/t_0)\}$ (niet voor wind-, sneeuw-, thermische belasting) |

| belastingfactoren γ (NEN-EN 1990) | blijvende belasting | | overheersend variabele belasting | gelijktijdig optredende variabele belasting | | |
|--|------------------------|------------------------|-------------------------------------|---|---------------------------|----------------|
| | ongunstig | gunstig | | belangrijk | andere ongunstig | andere gunstig |
| formules van belastingcombinaties | $\gamma * G_{k,j;sup}$ | $\gamma * G_{k,j;inf}$ | γ | $\gamma * Q_{k,i}$ | γ | γ |
| tabel A1.2(A) (EQU) (groep A) formule 6.10 | 1,10 | 0,9 | 1,50 $Q_{k,1}$ | 0 | 1,50 $\psi_{0,i} Q_{k,i}$ | 0 |
| tabel A1.2(B) (STR/GEO) (groep B) formule 6.10a | 1,22 | 0,9 | | 0 | 1,35 $\psi_{0,i} Q_{k,i}$ | 0 |
| tabel A1.2(B) (STR/GEO) (groep B) formule 6.10b | 1,08 | 0,9 | 1,35 $Q_{k,1}$ | 0 | 1,35 $\psi_{0,i} Q_{k,i}$ | 0 |
| tabel A1.3 buitengewone sit. form. 6.11b (brand,schok,herstel) | 1 | 1 | 1 A_d | 1 $\psi_{1,1} Q_{k,1}$ | 1 $\psi_{2,1} Q_{k,i}$ | 0 |
| tabel A1.3 buitengewone sit. form. 6.12b (aardbeving) | 1 | 1 | 1 A_{ek} | 0 | 1 $\psi_{2,1} Q_{k,i}$ | 0 |
| tabel A1.4 bruikbaarheidsgrenstoestand form. 6.14b | 1 | 1 | 1 $Q_{k,1}$ | 0 | 1 $\psi_{0,1} Q_{k,i}$ | 0 |
| tabel A1.4 frequente waarde formule 6.15b | 1 | 1 | 1 $\psi_{1,1} Q_{k,1}$ | 0 | 1 $\psi_{2,1} Q_{k,i}$ | 0 |
| tabel A1.4 quasi blijvend formule 6.16b | 1 | 1 | 1 $\psi_{2,1} Q_{k,1}$ | 0 | 1 $\psi_{2,1} Q_{k,i}$ | 0 |

| 1.1 belastingaannamen vloeren e.d. kN/m ² | | G | | Q | ψ ₀ |
|--|---|--------------------------------|-----------------------------|-------------------------------|------------------|
| | | [kN/m ²] | | [kN/m ²] | |
| | | helling van vlak | | | |
| 1 | hellend dak 40 graden | dakhelling: 40 gr. | [kN/m ² dakvlak] | [kN/m ² grondvlak] | |
| | sporenkap met dakpannen en beschot | 0,70 | | 0,91 | |
| | toeslag zonnepanelen | 0,10 | | 0,14 | |
| | | | | | |
| | H1 t/m H3: dakhelling 0<=a<20 onderhoud of sneeuw | categorie: H | ψ _t = 1,00 | v.b. = | 0,37 |
| | | Totaal hellend dak 40 graden : | | 1,05 | 0,37 |
| 2 | hellend dak 58 graden | dakhelling: 58 gr. | [kN/m ² dakvlak] | [kN/m ² grondvlak] | |
| | sporenkap met dakpannen en beschot | 0,70 | | 1,32 | |
| | toeslag zonnepanelen | 0,10 | | 0,18 | |
| | | | | | |
| | H1 t/m H3: dakhelling 0<=a<20 onderhoud of sneeuw | categorie: H | ψ _t = 1,00 | v.b. = | 0,04 |
| | | Totaal hellend dak 58 graden : | | 1,50 | 0,04 |
| 3 | hellend dak 65 graden | dakhelling: 65 gr. | [kN/m ² dakvlak] | [kN/m ² grondvlak] | |
| | sporenkap met dakpannen en beschot | 0,70 | | 1,66 | |
| | toeslag zonnepanelen | 0,10 | | 0,25 | |
| | | | | | |
| | H1 t/m H3: dakhelling 0<=a<20 onderhoud of sneeuw | categorie: H | ψ _t = 1,00 | v.b. = | |
| | | Totaal hellend dak 65 graden : | | 1,90 | |
| 4 | zoldervloer | | | | |
| | balklaag met beschot | | | 0,30 | |
| | isolatie tussen de balken | | | 0,05 | |
| | gipsplaat op rachsels | | | 0,15 | |
| | | | | | |
| | A2: Kamer in een woonhuis | categorie: A | ψ _t = 1,00 | v.b. = | 1,75 |
| | | Totaal zoldervloer : | | 0,50 | 1,75 0,40 |
| 5 | 2e verdiepingsvloer | | | | |
| | kanaalplaat 200 mm (zwaar) | | h/d = 260 | 3,50 | |
| | cementdekvloer | | h/d = 50 mm | 1,00 | |
| | | | | | |
| | scheidingswanden (<=1,0kN/m) in v.b. | | | 0,50 | |
| | A2: Kamer in een woonhuis | categorie: A | ψ _t = 1,00 | v.b. = | 1,75 |
| | | Totaal 2e verdiepingsvloer : | | 4,50 | 2,25 0,40 |
| 6 | 1e verdiepingsvloer | | | | |
| | kanaalplaatvloer 260 | | | 3,80 | |
| | cementdekvloer | | h/d = 70 mm | 1,40 | |
| | | | | | |
| | scheidingswanden (<=2,0kN/m) in v.b. | | | 0,80 | |
| | A2: Kamer in een woonhuis | categorie: A | ψ _t = 1,00 | v.b. = | 1,75 |
| | | Totaal 1e verdiepingsvloer : | | 5,20 | 2,55 0,40 |
| 7 | plat dak hout | | | | |
| | balklaag met beschot | | | 0,30 | |
| | gipsplaat op rachsels | | | 0,15 | |
| | isolatie en bitumen | | | 0,10 | |
| | toeslag zonnepanelen | | | 0,25 | |
| | | | | | |
| | H1 t/m H3: dakhelling 0<=a<20 onderhoud of sneeuw | categorie: H | ψ _t = 1,00 | v.b. = | 1,00 |
| | | Totaal plat dak hout : | | 0,80 | 1,00 |

A

H[kN/m² grondvlak]H

21 pui
22 gevel
23 gevel
24 gevel
25 stab wand
26 woningscheiding
27 gevel
28 borstwering
29 hsb gevel
30 dragend hsb
31
32 buitenblad
33 stab wand 120
34

[illegible]

| gevolgklasse | $\gamma_{f,g}$ | | $\gamma_{f,q}$ | | |
|------------------------------|----------------|-------------|----------------|----------|--|
| CC1a/b - CC2a/b - CC3 | 1,00 | | 1,00 | | SLS: Serviceability Limit State |
| | gunstig | ongunstig | ongunstig | gunstig | |
| CC1b | 0,9 | 1,22 | 1,35 | 0 | ULS(a): Ultimate Limit State (formule 6.10a) |
| CC1b | 0,9 | 1,08 | 1,35 | 0 | ULS(b): Ultimate Limit State (formule 6.10b) |

[illegible]

Stabiliteitsbeschouwing:

Windbelasting:

- Windgebied II, onbebouwde situatie,
- gebouwhoogte vanaf maaiveld maximaal 9,35 meter
- $P_w = 0,83 \text{ kN/m}^2$ $C_s C_d = 1,0$
- Druk en zuiging: $0,83 * 1,30 * 0,85 = 0,92 \text{ kN/m}^2$
- Wrijving: $0,83 * 0,04 = 0,03 \text{ kN/m}^2$

Woning type A en B:

Bij de woningen wordt de stabiliteit in de lengterichting verzorgd door de betonnen bouwmuren. In de breedterichting van de woningen door de prefab betonwanden bij de trap. De voorgevel en de achtergevel zijn niet stabiliserend.

De kanaalplaatvloer zorgt voor schijfwerking en verdeling naar de betonwanden.

- Windwrijving treedt niet op over 2 x de breedte van het aanblaasvlak, daar door is er geen windwrijving aanwezig.
- De stabiliteit wordt gewaarborgd door de betonnen stab.wanden.

Woning 1 is een vrijstaande woningen van 6,0 x 12,48 meter exclusief aanbouwen. Woning 2 heeft een maat van 7,25 x 12,54 meter en is qua aanblaasoppervlakte maatgevend en zodoende representatief mede voor woning 1.

In de woningen worden per woning 2 betonwanden van 150 mm dikte opgenomen op de begane grond. Deze wanden zijn gelegen rondom de trap. De wanden worden door middel van stekken aan de fundering bevestigd.

De belasting op de betonwand zal resulteren in een windkoppel op de fundering. Bij woning 1 staan de stekken 935 mm uit elkaar en bij woning 2 staan deze 1255 mm uit elkaar. Als gevolg van het windkoppel ontstaan trekpalen, de trekbelasting mag gereduceerd worden met het eigen gewicht van de paal vermenigvuldigd met 0,90.

$$F_{w;2} = 0,92 \text{ kN/m}^2 * 12,54 \text{ m1} * 5,0 \text{ m1} * 4,85 / 12,54 = 22,25 \text{ kN}$$

is kracht aangrijpend op 2^e verdiepingsniveau

$$F_{w;1} = 0,92 \text{ kN/m}^2 * 12,54 \text{ m1} * 5,0 \text{ m1} * 7,69 / 12,54 = 35,25$$

$$+ 0,92 \text{ kN/m}^2 * 12,54 \text{ m1} * 3,0 \text{ m1} = \underline{34,50 +}$$

is kracht aangrijpend op 1^e verdiepingsniveau 69,75 kN

$$\text{Windmoment } M_{kar} = ((22,25 * 6,0) + (69,75 * 3,0)) = 342,75 \text{ kNm}$$

Windkoppel op de fundering:

$$\text{Woning 1} \rightarrow \frac{1}{2} * 342,75 / 0,935 = \pm 183,5 \text{ kN}$$

$$\text{Woning 2} \rightarrow \frac{1}{2} * 342,75 / 1,255 = \pm 140 \text{ kN}$$

stekken:

Stekken op 1^e verd:

Stek op afschuiving,

$$\text{Maximale afschuifkracht } H_{w,tot;d} = 1,35 * (69,75 + 22,25) = 124,2 \text{ kN}$$

$$A_{s,ben} = (124,2 \cdot 10^3 / (0,58 * 435)) * 1/2 \text{ (per wand)} = 246 \text{ mm}^2$$

$$\text{Toepassen 2 stekken } \varnothing 16 \text{ per wand} = 402 \text{ mm}^2$$

Stekken op begane grond:

Als het ene stek op afschuiving wordt belast wordt het andere stek op trek belast.

Stek op afschuiving,

$$\text{Maximale afschuifkracht } H_{w,tot;d} = 1,35 * (69,75 + 22,25) = 124,2 \text{ kN}$$

$$A_{s,ben} = 124,2 \cdot 10^3 / (0,58 * 435) * 1/2 \text{ (per wand)} = 246 \text{ mm}^2$$

$$\text{Toepassen 1 stek } \varnothing 32 = 804 \text{ mm}^2$$

Stek op trek,

De belasting gereduceerd door de belasting uit en op de betonwand

Er wordt uitgegaan van een gereduceerde trekkracht van de wand en de opgelegde vloer.

Het stek het dichtst bij de zijgevel is hiervoor maatgevend

Permanente belasting op het stek bij de zijgevel:

| | | | |
|------|---------------------------------|--|---------------|
| R.B. | e.g. betonwand: | $3,73 \text{ kN/m}^2 * 2,90 \text{ m}^1 * 1,135 \text{ m}^1 =$ | 12,3 |
| | e.g. 1 ^e verd.vloer: | $5,22 \text{ kN/m}^2 * 0,60 \text{ m}^1 * 1,625 \text{ m}^1 =$ | <u>5,10</u> + |
| | | | 17,4 kN |

$$\text{Gereduceerde trekkracht } V_{E;d} = 1,35 * 183,5 - 0,90 * 1/2 * 17,4 = 239,6 \text{ kN}$$

$$A_{s,ben} = 239,6 \cdot 10^3 / 435 = 551 \text{ mm}^2$$

$$\text{Toepassen 1 stek } \varnothing 32 = 804 \text{ mm}^2$$

| | | |
|------------------------|---|--------------------|
| Verankeringslengte in: | C20/25: $47 * \varnothing 32 * 551/804 =$ | 1050 mm (met haak) |
| | C30/37: $36 * \varnothing 32 * 551/804 =$ | 800 mm |

Conclusie stekken per wand (2 wanden per woning):

Stekken uit wand in 1^e verdiepingsvloer: 2 x 1 stek $\varnothing 16$

Stekken uit wand in fundering: 2 x 1 stek $\varnothing 32$

Wapening in de betonwand:

De wapening voor druk in de wand is niet maatgevend.

De wapening van het stek dient verankerd te worden in de wand, er wordt daarom aan beide zijden van de wand 2 $\varnothing 16$ bijgelegd.

Technosoft Kolomwapening release 6.71b

Project : 18107 - 14 woningen te Westzaan
Onderdeel : betonwand woning 1 en 2
Dimensies : kN;m;rad (tenzij anders aangegeven)
Referentieperiode: 50

Toegepaste normen volgens Eurocode met Nederlandse NB

Beton NEN-EN 1992-1-1:2011 (nl) C2/A1:2015 (nl) NB:2016 (nl)



Geometrie

Type constructie : Wand
Wandbreedte [mm] : 320
Wanddikte in buigingsricht. [mm] : 160
Wandhoogte (L) [mm] : 2700
Belastingsschema : Geschoord met dwarsbelasting
Kniklengtefactor X : 1.00
Krommingsverdeling factor c X : 10.00



Belasting

| | BG1 | BG2 | BG3 | Maatgevend BC |
|-----------------------------|-----------|----------|--------|---------------|
| Omschrijving belastinggeval | Permanent | Variabel | vloer | Variabel wind |
| Normaalkracht N Ek [kN] | 8.70 | 1.25 | 240.00 | 334.07 |
| MEk, X boven [kNm] | 0.00 | 0.00 | 0.00 | 0.00 |
| MEk, X midden [kNm] | 0.00 | 0.00 | 0.00 | 0.00 |
| MEk, X onder [kNm] | 0.00 | 0.00 | 0.00 | 0.00 |
| Belastingfactoren | | | | |
| BC1 Fundamenteel | 1.08 | 0.54 | 1.35 | Maatgevend X |

Beton en Wapening

| | | | | |
|-------------------------------|--------------------------------------|---------------------|-------------|-----|
| Betonkwaliteit | C30/37 | Prefab | : | Nee |
| Soort spanningsrekdiagram | Parabolisch - rechthoekig diagram | | | |
| Staalsoort | B500A | Symm.wapening: | 2-zijdig | |
| f_{yk} [N/mm ²] | 500 | ϵ_{uk} [%] | 2.5 | |
| Productiewijze | Koudgevormd | | | |
| Soort spanningsrekdiagram | Bi-lineair diagram met klimmende tak | | | |
| Basiswapening [mm] | ø8.0 hoh 150 | Bijlegw. [mm] | ø16.0, 12.0 | |
| Hoofdwapening in laag | 2 | Verdeelw. [mm] | ø 8.0 | |

Betondekking

| | | |
|---------------------------------|---|---------------|
| Milieu | : | XC1 |
| Gestort tegen bestaand beton | : | Nee |
| Element met plaatgeometrie | : | Nee |
| Specifieke kwaliteitsbeheersing | : | Nee |
| Oneffen beton oppervlak | : | Nee |
| Ondergrond | : | Glad / N.v.t. |
| Constructieklasse | : | S3 |
| Grootste korrel | : | 31.5 |

| | | |
|--|---|----------|
| Hoofdwapening | : | 2de laag |
| Nominale dekking | : | 21 |
| Toegepaste dekking | : | 23 |
| Gelijkwaardige diameter | : | 16 |
| $C_{min, b}$ $C_{min, dur}$ ΔC_{dur} | : | 16 10 0 |
| C_{min} ΔC_{dev} C_{nom} | : | 16 5 21 |

Betondekking

| | | |
|--|---|-----------|
| Beugel / Verdeelwapening | : | 1ste laag |
| Nominale dekking | : | 15 |
| Toegepaste dekking | : | 15 |
| Gelijkwaardige diameter | : | 8 |
| $C_{min, b}$ $C_{min, dur}$ ΔC_{dur} | : | 8 10 0 |
| C_{min} ΔC_{dev} C_{nom} | : | 10 5 15 |

Maatgevende belastingcombinatie 1: (Fundamenteel)

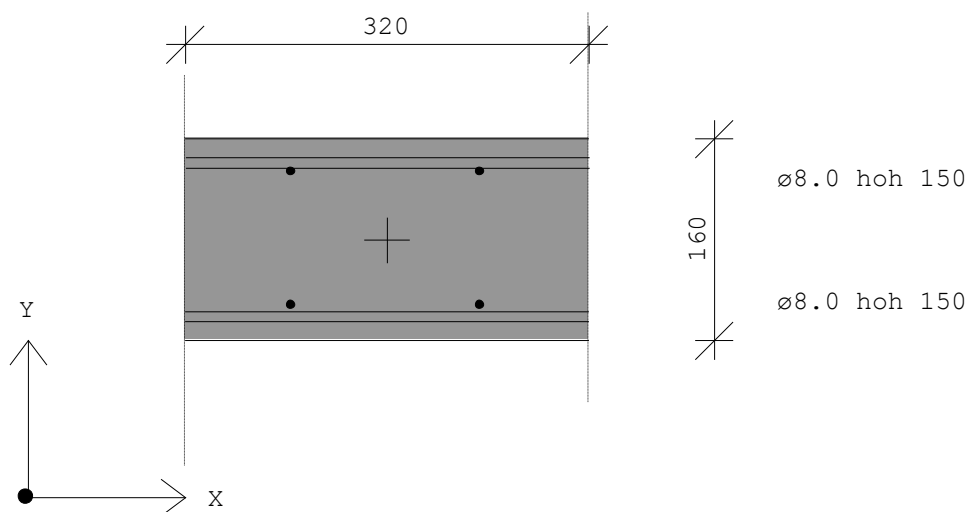
Berekende gegevens

| | X-as | BC1 |
|--|---|-----|
| Berekend moment $M_{Ed, ber}$ [kNm] : | 13.18 | |
| Min. wapening art. 9.6.2(1) [mm ²] : | 0.0 (= 0.0 [mm ² /m]) | |
| Min. wap. art. 9.6.2(1)&(3) [mm ²] : | 31.4 = 2x(ø5.0 hoh 400) (= 98.2 [mm ² /m]) | |
| Min. wap. trekzone 7.3.2 [mm ²] : | 0.0 (= 0.0 [mm ² /m]) | |
| Totaal ber. wap. 1e/2e orde [mm ²] : | 0.0 (= 0.0 [mm ² /m]) | |
| Maatgevende wapening [mm ²] : | 31.4 (= 98.2 [mm ² /m]) | |

Gevonden wapening

| | basiswapening | extra staven |
|---|------------------|--------------|
| Bijlegcombinatie 1 214 [mm ²] : | 2x(ø8.0 hoh 150) |) |

Grafische uitvoer bijlegcombinatie 1



Opmerkingen

- [10] * = Minimum wapening X-ri (bel.comb. 1).
- [101] De berekende wapening is de totale wapening in de doorsnede.
- [123] De lengte/dikteverhouding is kleiner dan 4.0, zie (art. 9.6.1(1)) (bel.comb. 1)
- [113] Twee-zijdige wapening (bel.comb. 1)

Technosoft Kolomwapening release 6.70

Project : 18006 - 3 woningen te Zuiderwoude
 Onderdeel : betonwand woning 1 en 2
 Dimensies : kN;m;rad (tenzij anders aangegeven)
 Referentieperiode: 50

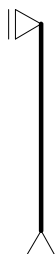
Toegepaste normen volgens Eurocode met Nederlandse NB

Beton NEN-EN 1992-1-1:2011 (nl) C2/A1:2015 (nl) NB:2016 (nl)



Geometrie

Type constructie : Wand
 Wandbreedte [mm] : 300
 Wanddikte in buigingsricht. [mm] : 150
 Wandhoogte (L) [mm] : 2700
 Belastingsschema : Geschoord
 Kniklengtefactor X : 1.00
 Krommingsverdeling factor c X : 10.00



Belasting

| | | BG1 | BG2 | BG3 | Maatgevend BC |
|-----------------------------|----------------------|-------|-------|--------|---------------|
| Omschrijving belastinggeval | : permanent variabel | | | wind | |
| Normaalkracht N Ek | [kN] : | 50.00 | 19.80 | 160.00 | 280.69 |
| MEk, X boven | [kNm] : | 0.00 | 0.00 | 0.00 | 0.00 |
| MEk, X onder | [kNm] : | 0.00 | 0.00 | 0.00 | 0.00 |
| Belastingfactoren | | | | | |
| BC1 | Fundamenteel : | 1.08 | 1.35 | 0.00 | |
| BC2 | Fundamenteel : | 1.08 | 0.54 | 1.35 | Maatgevend X |
| BC3 | Fundamenteel : | 1.22 | 0.54 | 0.00 | |
| BC4 | Quasi-blijvend: | 1.00 | 1.00 | 0.00 | |
| BC5 | Quasi-blijvend: | 1.00 | 0.40 | 1.00 | |

Beton en Wapening

| | | | | | |
|---------------------------|------------------------|--------------------------------------|-----------------|-------------|-----|
| Betonkwaliteit | : | C30/37 | Prefab | : | Nee |
| Soort spanningsrekdiagram | : | Parabolisch - rechthoekig diagram | | | |
| Staalsoort | : | B500A | Symm.wapening: | 2-zijdig | |
| f_{yk} | [N/mm ²] : | 500 | ϵ_{uk} | [%] : | 2.5 |
| Soort spanningsrekdiagram | : | Bi-lineair diagram met klimmende tak | | | |
| Basiswapening | [mm] : | ø8.0 hoh 150 | Bijlegw.[mm] : | ø16.0, 12.0 | |
| Hoofdwapening in laag | : | 2 | Verdeelw.[mm] : | ø 8.0 | |

Betondekking

| | | |
|---------------------------------|---|---------------|
| Milieu | : | XC1 |
| Gestort tegen bestaand beton | : | Nee |
| Element met plaatgeometrie | : | Nee |
| Specifieke kwaliteitsbeheersing | : | Nee |
| Oneffen beton oppervlak | : | Nee |
| Ondergrond | : | Glad / N.v.t. |
| Constructieklasse | : | S3 |
| Grootste korrel | : | 31.5 |

Betondekking

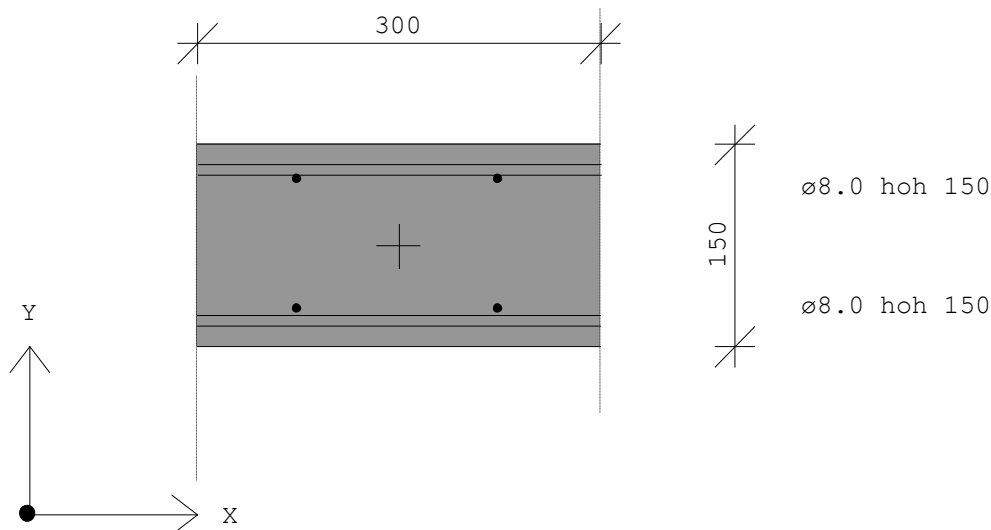
| | | | | |
|--|---|-----------|----|----|
| Hoofdwapening | : | 2de laag | | |
| Nominale dekking | : | 21 | | |
| Toegepaste dekking | : | 23 | | |
| Gelijkwaardige diameter | : | 16 | | |
| $C_{min,b}$ $C_{min,dur}$ ΔC_{dur} | : | 16 | 10 | 0 |
| C_{min} ΔC_{dev} C_{nom} | : | 16 | 5 | 21 |
| Beugel / Verdeelwapening | : | 1ste laag | | |
| Nominale dekking | : | 15 | | |
| Toegepaste dekking | : | 15 | | |
| Gelijkwaardige diameter | : | 8 | | |
| $C_{min,b}$ $C_{min,dur}$ ΔC_{dur} | : | 8 | 10 | 0 |
| C_{min} ΔC_{dev} C_{nom} | : | 10 | 5 | 15 |

Maatgevende belastingcombinatie 2: (Fundamenteel)

| Berekende gegevens | X-as | BC2 |
|--|---|-----|
| Berekend moment $M_{Ed,ber}$ [kNm] : | 9.79 | |
| Min. wapening art. 9.6.2(1) [mm ²] : | 0.0 (= 0.0 [mm ² /m]) | |
| Min. wap. art. 9.6.2(1)&(3) [mm ²] : | 29.5 = 2x(ø5.0 hoh 400) (= 98.2 [mm ² /m]) | |
| Min. wap. trekzone 7.3.2 [mm ²] : | 0.0 (= 0.0 [mm ² /m]) | |
| Totaal ber. wap. 1e/2e orde [mm ²] : | 0.0 (= 0.0 [mm ² /m]) | |
| Maatgevende wapening [mm ²] : | 29.5 (= 98.2 [mm ² /m]) | |

| Gevonden wapening | basiswapening | extra staven |
|---|------------------|--------------|
| Bijlegcombinatie 1 201 [mm ²] : | 2x(ø8.0 hoh 150) |) |

Grafische uitvoer bijlegcombinatie 1

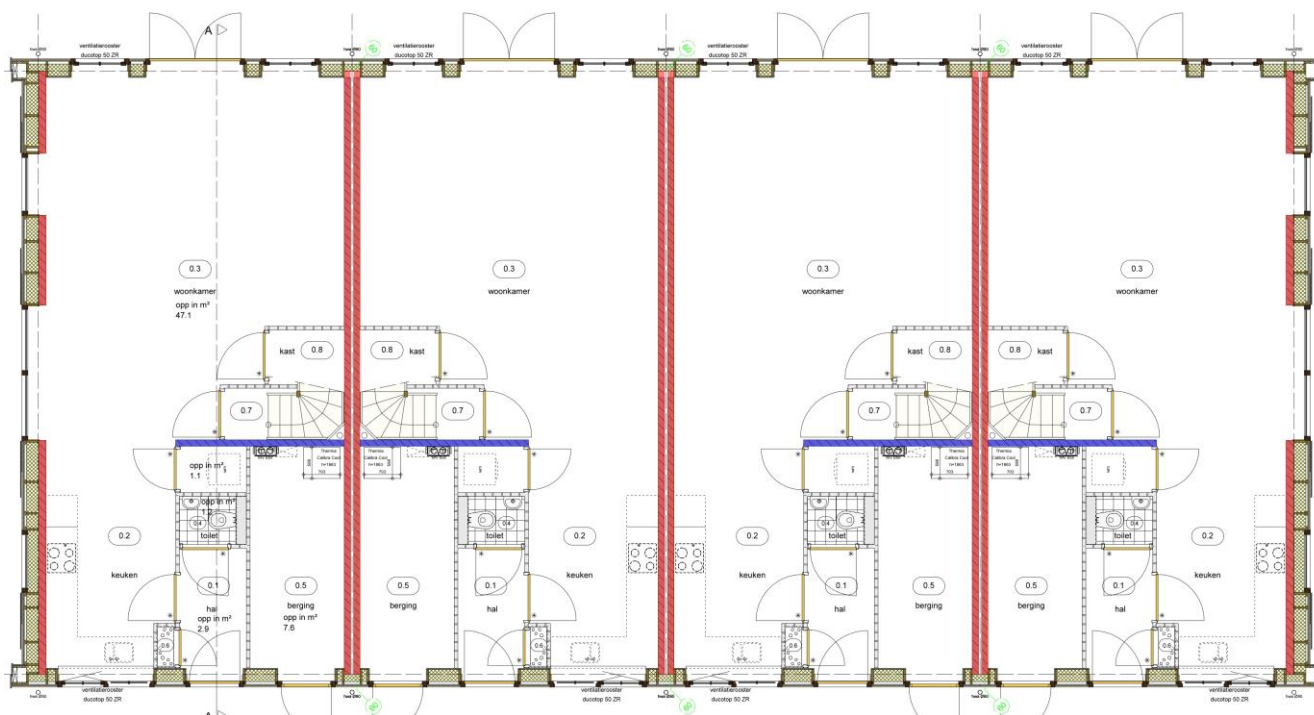


Opmerkingen

- [10] * = Minimum wapening X-ri (bel.comb. 1,2,3).
- [101] De berekende wapening is de totale wapening in de doorsnede.
- [123] De lengte/dikteverhouding is kleiner dan 4.0, zie (art. 9.6.1(1)) (bel.comb. 2)
- [113] Twee-zijdige wapening (bel.comb. 2)

Woning type E en F:

Bij woning E en F wordt de stabiliteit gegarandeerd door de betonstenen binnenbladen.



De rood gemarkeerde wanden zijn stabiliserend voor wind op de voorgevel en achtergevel.
De blauw gemarkeerde voor wind op de zijgevels.

De betonwanden worden door de leverancier berekend. Door de maatvoering van de wanden en de neerwaartse belasting ontstaat geen trek op de fundering.

Kapconstructie:

Woning type A en B:

De kapconstructie is een prefab sporenkap die ligt op de randbalk van de zoldervloer en ter plaatse van de verdiepingsvloer op dragend stijl en regelwerk.

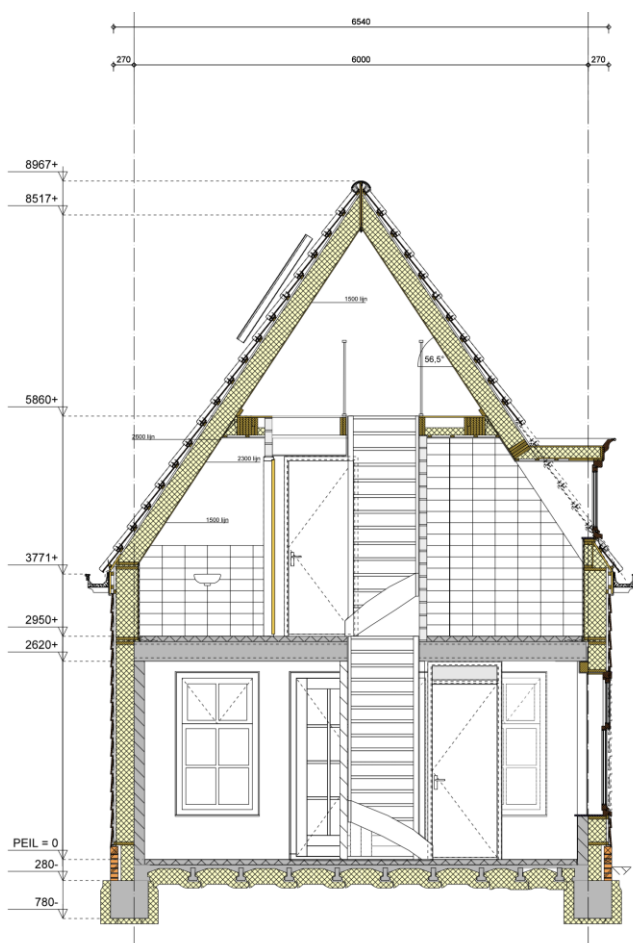
De sporenkap wordt door de leverancier verder uitgewerkt.

Ten behoeve van belasting afdracht wordt het kapschema in TS Raamwerken ingevoerd.

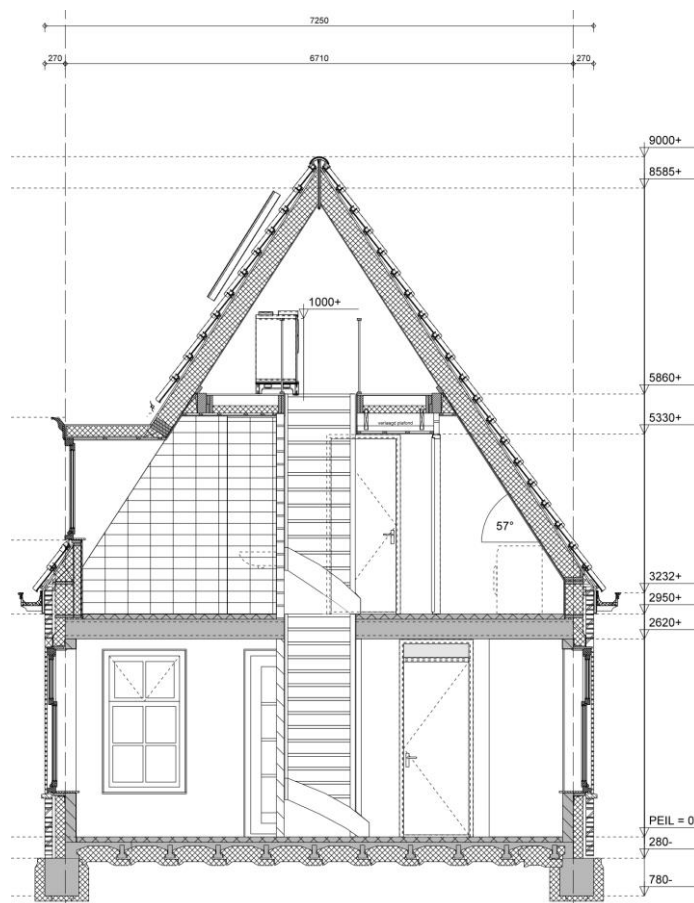
De reacties op de randligger in de zoldervloer (type B maatgevend):

R.B. = 5,00 kN/m1

V.B. = 2,75 kN/m1



Type A



Type B

Technosoft Raamwerken release 6.81a

Project.....: 18107 - 14 woningen te Westzaan
 Onderdeel....: kapdoorsnede woning A en B
 Dimensies....: kN;m;rad (tenzij anders aangegeven)
 Bestand.....: G:\7000 project\18107-KPO 24 woningen
 Westzaan\Documenten\Constructie\18107-afdracht kap type A
 en B wt.rww

Belastingbreedte.: 1.000

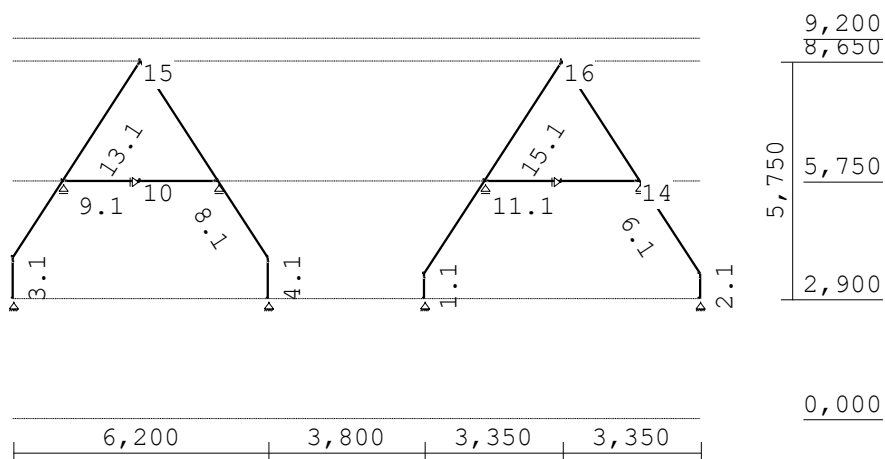
Theorie voor de bepaling van de krachtsverdeling: Geometrisch lineair.

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) |
| | NEN-EN 1991-1-3:2003 | C1:2009 | NB:2011(nl) |
| | NEN-EN 1991-1-4:2005 | C2:2011 | NB:2011(nl) |

GEOMETRIE



NIVEAUS

| Nr. | Z | X-min | X-max |
|-----|-------|-------|--------|
| 1 | 0.000 | 0.000 | 16.700 |
| 2 | 2.900 | 0.000 | 16.700 |
| 3 | 5.750 | 0.000 | 16.700 |
| 4 | 8.650 | 0.000 | 16.700 |
| 5 | 9.200 | 0.000 | 16.700 |

MATERIALEN

| Mt | Kwaliteit | E-modulus[N/mm2] | 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 62*235 | 1:C18 | 1.4570e+04 | 6.7052e+07 | 0.00 |

PROFIELEN vervolg [mm]

| Prof. | Staaftype | Breedte | Hoogte | e | Type | b1 | h1 | b2 | h2 |
|-------|-----------|---------|--------|-------|------|----|----|----|----|
| 1 | 0:Normaal | 62 | 235 | 117.5 | 0:RH | | | | |

KNOPEN

| Knoop | X | Z | Knoop | X | Z |
|-------|--------|-------|-------|--------|-------|
| 1 | 0.000 | 2.900 | 6 | 16.700 | 3.500 |
| 2 | 6.200 | 2.900 | 7 | 0.000 | 3.900 |
| 3 | 10.000 | 2.900 | 8 | 6.200 | 3.900 |
| 4 | 16.700 | 2.900 | 9 | 1.207 | 5.750 |
| 5 | 10.000 | 3.500 | 10 | 3.100 | 5.750 |
| 11 | 4.993 | 5.750 | 16 | 13.350 | 8.650 |
| 12 | 11.464 | 5.750 | | | |
| 13 | 13.350 | 5.750 | | | |
| 14 | 15.236 | 5.750 | | | |
| 15 | 3.100 | 8.650 | | | |

STAVEN

| St. | ki | kj | Profiel | Aansl.i | Aansl.j | Lengte | Opm. |
|-----|----|----|--------------|---------|---------|--------|------|
| 1 | 3 | 5 | 1:B*H 62*235 | NDM | ND- | 0.600 | |
| 2 | 4 | 6 | 1:B*H 62*235 | NDM | ND- | 0.600 | |
| 3 | 1 | 7 | 1:B*H 62*235 | NDM | ND- | 1.000 | |
| 4 | 2 | 8 | 1:B*H 62*235 | NDM | ND- | 1.000 | |
| 5 | 5 | 12 | 1:B*H 62*235 | NDM | NDM | 2.684 | |
| 6 | 14 | 6 | 1:B*H 62*235 | NDM | NDM | 2.684 | |
| 7 | 7 | 9 | 1:B*H 62*235 | NDM | NDM | 2.209 | |
| 8 | 11 | 8 | 1:B*H 62*235 | NDM | NDM | 2.209 | |
| 9 | 9 | 10 | 1:B*H 62*235 | ND- | NDM | 1.893 | |
| 10 | 10 | 11 | 1:B*H 62*235 | NDM | ND- | 1.893 | |
| 11 | 12 | 13 | 1:B*H 62*235 | ND- | NDM | 1.886 | |
| 12 | 13 | 14 | 1:B*H 62*235 | NDM | ND- | 1.886 | |
| 13 | 9 | 15 | 1:B*H 62*235 | NDM | ND- | 3.463 | |
| 14 | 15 | 11 | 1:B*H 62*235 | NDM | NDM | 3.463 | |
| 15 | 12 | 16 | 1:B*H 62*235 | NDM | ND- | 3.460 | |
| 16 | 16 | 14 | 1:B*H 62*235 | NDM | NDM | 3.460 | |

VASTE STEUNPUNTEN

| Nr. | knoop | Kode | XZR | l=vast | 0=vrij | Hoek |
|-----|-------|------|-----|--------|--------|------|
| 1 | 1 | 110 | | | | 0.00 |
| 2 | 2 | 110 | | | | 0.00 |
| 3 | 3 | 110 | | | | 0.00 |
| 4 | 4 | 110 | | | | 0.00 |
| 5 | 10 | 100 | | | | 0.00 |
| 6 | 13 | 100 | | | | 0.00 |
| 7 | 9 | 010 | | | | 0.00 |
| 8 | 11 | 010 | | | | 0.00 |
| 9 | 12 | 010 | | | | 0.00 |
| 10 | 14 | 010 | | | | 0.00 |

BELASTINGGENERATIE ALGEMEEN.

| | | | |
|------------------------------|-------|-------------------------|------|
| Betrouwbaarheidsklasse.....: | 1 | Referentieperiode.....: | 50 |
| Gebouwdiepte.....: | 10.50 | Gebouwhoogte.....: | 9.20 |
| 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.... | 2.000 | Kr[4.3.2]..... | 0.209 |
| z0[4.3.2].... | 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 |

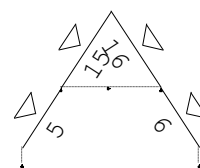
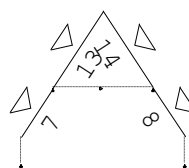
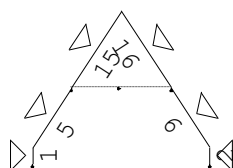
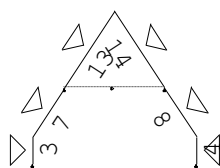
STAAFTYPEN

| Type | staven |
|------------------|-------------|
| 1:Vloer. | : 9-12 |
| 5:Linker gevel. | : 1,3 |
| 6:Rechter gevel. | : 2,4 |
| 7:Dak. | : 5-8,13-16 |

LASTVELDEN

Wind staven

Sneeuw staven



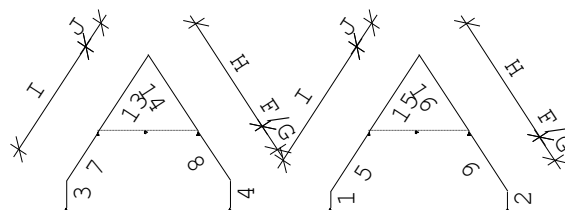
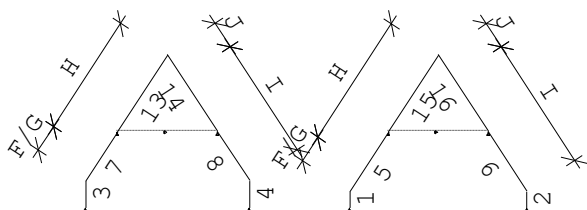
WIND DAKTYPES

| Nr. | Staaft Type | reductie bij wind van links | reductie bij wind van rechts | Cpe volgens art: |
|-----|---------------|--------------------------------|---------------------------------|------------------|
| 1 | 3 Gevel | 1.000 | 1.000 | 7.2.2 |
| 2 | 7-13 Zadeldak | 1.000 | 1.000 | 7.2.5 |
| 3 | 14-8 Zadeldak | 1.000 | 1.000 | 7.2.5 |
| 4 | 4 Gevel | 1.000 | 1.000 | 7.2.2 |
| 5 | 1 Gevel | 1.000 | 1.000 | 7.2.2 |
| 6 | 5-15 Zadeldak | 1.000 | 1.000 | 7.2.5 |
| 7 | 16-6 Zadeldak | 1.000 | 1.000 | 7.2.5 |
| 8 | 2 Gevel | 1.000 | 1.000 | 7.2.2 |

WIND ZONES

Wind van links

Wind van rechts



WIND VAN LINKS ZONES

| Nr. | Staaf | Positie | Lengte | Zone |
|-----|-------|---------|--------|------|
| 1 | 3 | 0.000 | 1.000 | D |
| 2 | 7-13 | 0.000 | 1.050 | F/G |
| 3 | 7-13 | 1.050 | 4.622 | H |
| 4 | 14-8 | 0.000 | 1.050 | J |
| 5 | 14-8 | 1.050 | 4.622 | I |
| 6 | 4 | 0.000 | 1.000 | E |
| 7 | 1 | 0.000 | 0.600 | D |
| 8 | 5-15 | 0.000 | 1.050 | F/G |
| 9 | 5-15 | 1.050 | 5.094 | H |
| 10 | 16-6 | 0.000 | 1.050 | J |
| 11 | 16-6 | 1.050 | 5.094 | I |
| 12 | 2 | 0.000 | 0.600 | E |

WIND VAN RECHTS ZONES

| Nr. | Staaf | Positie | Lengte | Zone |
|-----|-------|---------|--------|------|
| 1 | 2 | 0.000 | 0.600 | D |
| 2 | 16-6 | 0.000 | 1.050 | F/G |
| 3 | 16-6 | 1.050 | 5.094 | H |
| 4 | 5-15 | 0.000 | 1.050 | J |
| 5 | 5-15 | 1.050 | 5.094 | I |
| 6 | 1 | 0.000 | 0.600 | E |
| 7 | 4 | 0.000 | 1.000 | D |
| 8 | 14-8 | 0.000 | 1.050 | F/G |
| 9 | 14-8 | 1.050 | 4.622 | H |
| 10 | 7-13 | 0.000 | 1.050 | J |
| 11 | 7-13 | 1.050 | 4.622 | I |
| 12 | 3 | 0.000 | 1.000 | E |

Wind indexen

| Index | CsCd | Cpe/Cpi | qp | breedte | reductie | Qw | Zone | Hoek(en) |
|-------|------|---------|-------|---------|----------|--------|------|-----------|
| Qw1 | | 0.300 | 0.825 | 1.000 | | -0.248 | -i | |
| Qw2 | | -0.300 | 0.825 | 1.000 | | 0.248 | -i | |
| Qw3 | 1.00 | 0.800 | 0.825 | 1.000 | | -0.660 | D | |
| Qw4 | 1.00 | 0.700 | 0.825 | 1.000 | | -0.578 | F | 56.9 57.0 |
| Qw5 | 1.00 | 0.679 | 0.825 | 1.000 | | -0.560 | H | 56.9 57.0 |
| Qw6 | 1.00 | -0.300 | 0.825 | 1.000 | | 0.248 | J | 56.9 57.0 |
| Qw7 | 1.00 | -0.200 | 0.825 | 1.000 | | 0.165 | I | 56.9 57.0 |
| Qw8 | 1.00 | 0.500 | 0.825 | 1.000 | | -0.413 | E | |
| Qw9 | | -0.200 | 0.825 | 1.000 | | 0.165 | +i | |
| Qw10 | | 0.200 | 0.825 | 1.000 | | -0.165 | +i | |
| Qw11 | 1.00 | -0.800 | 0.825 | 1.000 | | 0.660 | D | |
| Qw12 | 1.00 | -0.500 | 0.825 | 1.000 | | 0.413 | E | |
| Qw13 | 1.00 | -1.200 | 0.825 | 1.000 | | 0.990 | A | |
| Qw14 | 1.00 | 1.200 | 0.825 | 1.000 | | -0.990 | A | |
| Qw15 | 1.00 | -1.100 | 0.825 | 0.170 | | 0.154 | F | 56.9 57.0 |
| Qw16 | 1.00 | -0.821 | 0.825 | 0.830 | | 0.562 | H | 56.9 57.0 |
| Qw17 | 1.00 | -1.241 | 0.825 | 0.170 | | 0.174 | G | 56.9 |
| Qw18 | 1.00 | -1.240 | 0.825 | 0.170 | | 0.174 | G | 57.0 |
| Qw19 | 1.00 | -0.800 | 0.825 | 1.000 | | 0.660 | B | |
| Qw20 | 1.00 | 0.800 | 0.825 | 1.000 | | -0.660 | B | |
| Qw21 | 1.00 | -0.821 | 0.825 | 0.350 | | 0.237 | H | 56.9 57.0 |
| Qw22 | 1.00 | -0.500 | 0.825 | 0.650 | | 0.268 | I | 56.9 57.0 |

SNEEUW DAKTYPEN

| Staaf | artikel |
|-------|----------------|
| 7-13 | 5.3.3 Zadeldak |
| 14-8 | 5.3.3 Zadeldak |
| 5-15 | 5.3.3 Zadeldak |
| 16-6 | 5.3.3 Zadeldak |

Sneeuw indexen

| Index | art | μ | s_k | red. | posfac | breedte | Q_s | hoek |
|-------|-------|-------|-------|------|--------|---------|-------|------|
| Qs1 | 5.3.3 | 0.081 | 0.70 | 1.00 | | 1.000 | 0.057 | 57.0 |
| Qs2 | 5.3.3 | 0.083 | 0.70 | 1.00 | | 1.000 | 0.058 | 56.9 |
| Qs3 | 5.3.3 | 0.041 | 0.70 | 1.00 | | 1.000 | 0.028 | 57.0 |
| Qs4 | 5.3.3 | 0.042 | 0.70 | 1.00 | | 1.000 | 0.029 | 56.9 |

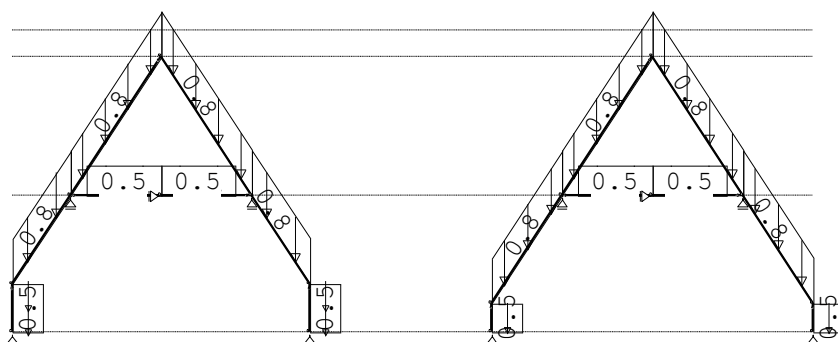
BELASTINGGEVALLEN

| B.G. | Omschrijving | EGZ=0.00 | Type |
|------|-------------------------------|----------|---------------------------------|
| | 1 Permanente belasting | | 1 |
| | 2 variabele belasting | | 2 Ver. bel. pers. ed. (q_k) |
| g | 3 Wind van links onderdruk A | | 7 |
| g | 4 Wind van links overdruk A | | 8 |
| g | 5 Wind van rechts onderdruk A | | 11 |
| g | 6 Wind van rechts overdruk A | | 12 |
| g | 7 Wind loodrecht onderdruk A | | 15 |
| g | 8 Wind loodrecht overdruk A | | 16 |
| g | 9 Wind loodrecht onderdruk B | | 45 |
| g | 10 Wind loodrecht overdruk B | | 46 |
| g | 11 Sneeuw A | | 22 |
| g | 12 Sneeuw B | | 23 |
| g | 13 Sneeuw C | | 33 |

g = gegenereerd belastinggeval

BELASTINGEN

B.G:1 Permanente belasting



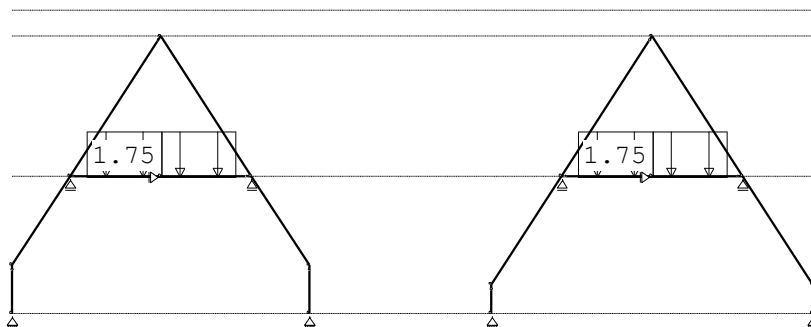
STAAFBELASTINGEN

B.G:1 Permanente belasting

| Staat | Type | $q_1/p/m$ | q_2 | A | B | ψ_0 | ψ_1 | ψ_2 |
|-------|-------------|-----------|-------|-------|-------|----------|----------|----------|
| 7 | 5:QZGlobaal | -0.80 | -0.80 | 0.000 | 0.000 | | | |
| 14 | 5:QZGlobaal | -0.80 | -0.80 | 0.000 | 0.000 | | | |
| 5 | 5:QZGlobaal | -0.80 | -0.80 | 0.000 | 0.000 | | | |
| 16 | 5:QZGlobaal | -0.80 | -0.80 | 0.000 | 0.000 | | | |
| 3 | 2:QXLokaal | -0.50 | -0.50 | 0.000 | 0.000 | | | |
| 4 | 2:QXLokaal | -0.50 | -0.50 | 0.000 | 0.000 | | | |
| 1 | 2:QXLokaal | -0.50 | -0.50 | 0.000 | 0.000 | | | |
| 2 | 2:QXLokaal | -0.50 | -0.50 | 0.000 | 0.000 | | | |
| 13 | 5:QZGlobaal | -0.80 | -0.80 | 0.000 | 0.000 | | | |
| 8 | 5:QZGlobaal | -0.80 | -0.80 | 0.000 | 0.000 | | | |
| 15 | 5:QZGlobaal | -0.80 | -0.80 | 0.000 | 0.000 | | | |
| 6 | 5:QZGlobaal | -0.80 | -0.80 | 0.000 | 0.000 | | | |
| 9 | 1:QZLokaal | -0.50 | -0.50 | 0.343 | 0.000 | | | |
| 10 | 1:QZLokaal | -0.50 | -0.50 | 0.000 | 0.343 | | | |
| 11 | 1:QZLokaal | -0.50 | -0.50 | 0.336 | 0.000 | | | |
| 12 | 1:QZLokaal | -0.50 | -0.50 | 0.000 | 0.336 | | | |

BELASTINGEN

B.G:2 variabele belasting



STAAFBELASTINGEN

B.G:2 variabele belasting

| Staaftype | q1/p/m | q2 | A | B | ψ_0 | ψ_1 | ψ_2 |
|---------------|--------|-------|-------|-------|----------|----------|----------|
| 9 1:QZLokaal | -1.75 | -1.75 | 0.343 | 0.000 | 0.40 | 0.50 | 0.30 |
| 10 1:QZLokaal | -1.75 | -1.75 | 0.000 | 0.343 | 0.40 | 0.50 | 0.30 |
| 11 1:QZLokaal | -1.75 | -1.75 | 0.336 | 0.000 | 0.40 | 0.50 | 0.30 |
| 12 1:QZLokaal | -1.75 | -1.75 | 0.000 | 0.336 | 0.40 | 0.50 | 0.30 |

SITUATIES BELAST/ONBELAST

Belastingtype: q_k

| Nr Lastvelden belast | Lastvelden onbelast |
|----------------------|---------------------|
| 1 2-12 | 1 |
| 2 1,3-12 | 2 |
| 3 1-12 | |
| 4 1,2,4-12 | 3 |
| 5 1-3,5-12 | 4 |
| 6 1-4,6-12 | 5 |
| 7 1-5,7-12 | 6 |
| 8 1-6,8-12 | 7 |
| 9 1-7,9-12 | 8 |
| 10 1-8,10-12 | 9 |
| 11 1-9,11,12 | 10 |
| 12 1-10,12 | 11 |
| 13 1-11 | 12 |

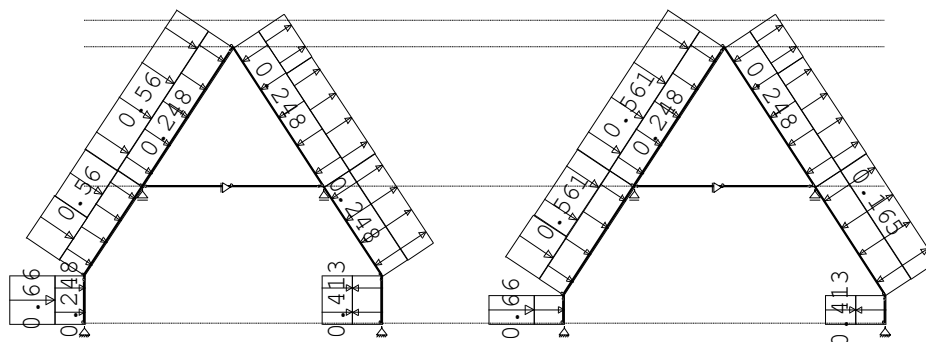
SITUATIES EXTREME VERDIEPINGSVLOEREN

Belastingtype: q_k

| Nr Verdieping extreem belast | Verdieping *Psi0 belast |
|------------------------------|-------------------------|
| 1 0,1 | 2 |
| 2 0,2 | 1 |
| 3 1,2 | 0 |

BELASTINGEN

B.G:3 Wind van links onderdruk A



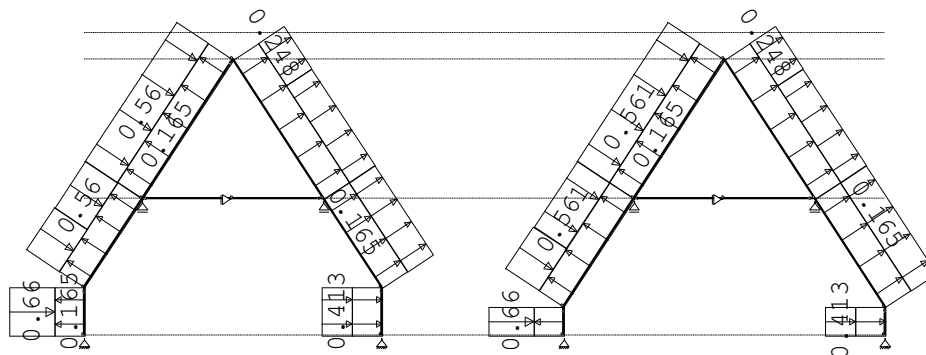
STAAFBELASTINGEN

B.G:3 Wind van links onderdruk A

| Staafl | Type | Index | q1/p/m | q2 | A | B | ψ_0 | ψ_1 | ψ_2 |
|--------|------------|-------|--------|-------|-------|-------|----------|----------|----------|
| 3 | 1:QZLokaal | Qw1 | -0.25 | -0.25 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 7 | 1:QZLokaal | Qw1 | -0.25 | -0.25 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 13 | 1:QZLokaal | Qw1 | -0.25 | -0.25 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 14 | 1:QZLokaal | Qw1 | -0.25 | -0.25 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 8 | 1:QZLokaal | Qw1 | -0.25 | -0.25 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 4 | 1:QZLokaal | Qw2 | 0.25 | 0.25 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 1 | 1:QZLokaal | Qw1 | -0.25 | -0.25 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 5 | 1:QZLokaal | Qw1 | -0.25 | -0.25 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 15 | 1:QZLokaal | Qw1 | -0.25 | -0.25 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 16 | 1:QZLokaal | Qw1 | -0.25 | -0.25 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 6 | 1:QZLokaal | Qw1 | -0.25 | -0.25 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 2 | 1:QZLokaal | Qw2 | 0.25 | 0.25 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 3 | 1:QZLokaal | Qw3 | -0.66 | -0.66 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 7 | 1:QZLokaal | Qw4 | -0.58 | -0.58 | 0.000 | 1.159 | 0.00 | 0.20 | 0.00 |
| 7 | 1:QZLokaal | Qw5 | -0.56 | -0.56 | 1.050 | 0.000 | 0.00 | 0.20 | 0.00 |
| 13 | 1:QZLokaal | Qw5 | -0.56 | -0.56 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 14 | 1:QZLokaal | Qw6 | 0.25 | 0.25 | 0.000 | 2.413 | 0.00 | 0.20 | 0.00 |
| 14 | 1:QZLokaal | Qw7 | 0.17 | 0.17 | 1.050 | 0.000 | 0.00 | 0.20 | 0.00 |
| 8 | 1:QZLokaal | Qw7 | 0.17 | 0.17 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 4 | 1:QZLokaal | Qw8 | -0.41 | -0.41 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 1 | 1:QZLokaal | Qw3 | -0.66 | -0.66 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 5 | 1:QZLokaal | Qw4 | -0.58 | -0.58 | 0.000 | 1.634 | 0.00 | 0.20 | 0.00 |
| 5 | 1:QZLokaal | Qw5 | -0.56 | -0.56 | 1.050 | 0.000 | 0.00 | 0.20 | 0.00 |
| 15 | 1:QZLokaal | Qw5 | -0.56 | -0.56 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 16 | 1:QZLokaal | Qw6 | 0.25 | 0.25 | 0.000 | 2.410 | 0.00 | 0.20 | 0.00 |
| 16 | 1:QZLokaal | Qw7 | 0.17 | 0.17 | 1.050 | 0.000 | 0.00 | 0.20 | 0.00 |
| 6 | 1:QZLokaal | Qw7 | 0.17 | 0.17 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 2 | 1:QZLokaal | Qw8 | -0.41 | -0.41 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |

BELASTINGEN

B.G:4 Wind van links overdruk A



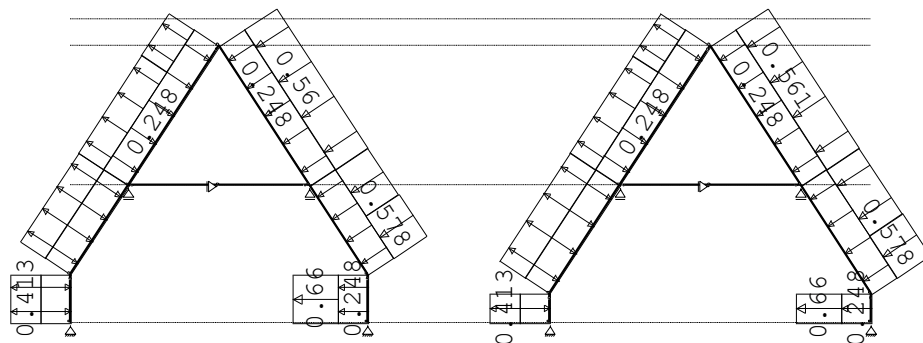
STAAFBELASTINGEN

B.G:4 Wind van links overdruk A

| Staafl | Type | Index | q1/p/m | q2 | A | B | Ψ_0 | Ψ_1 | Ψ_2 |
|--------|------------|-------|--------|-------|-------|-------|----------|----------|----------|
| 3 | 1:QZLokaal | Qw9 | 0.17 | 0.17 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 7 | 1:QZLokaal | Qw9 | 0.17 | 0.17 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 13 | 1:QZLokaal | Qw9 | 0.17 | 0.17 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 14 | 1:QZLokaal | Qw9 | 0.17 | 0.17 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 8 | 1:QZLokaal | Qw9 | 0.17 | 0.17 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 4 | 1:QZLokaal | Qw10 | -0.17 | -0.17 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 1 | 1:QZLokaal | Qw9 | 0.17 | 0.17 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 5 | 1:QZLokaal | Qw9 | 0.17 | 0.17 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 15 | 1:QZLokaal | Qw9 | 0.17 | 0.17 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 16 | 1:QZLokaal | Qw9 | 0.17 | 0.17 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 6 | 1:QZLokaal | Qw9 | 0.17 | 0.17 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 2 | 1:QZLokaal | Qw10 | -0.17 | -0.17 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 3 | 1:QZLokaal | Qw3 | -0.66 | -0.66 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 7 | 1:QZLokaal | Qw4 | -0.58 | -0.58 | 0.000 | 1.159 | 0.00 | 0.20 | 0.00 |
| 7 | 1:QZLokaal | Qw5 | -0.56 | -0.56 | 1.050 | 0.000 | 0.00 | 0.20 | 0.00 |
| 13 | 1:QZLokaal | Qw5 | -0.56 | -0.56 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 14 | 1:QZLokaal | Qw6 | 0.25 | 0.25 | 0.000 | 2.413 | 0.00 | 0.20 | 0.00 |
| 14 | 1:QZLokaal | Qw7 | 0.17 | 0.17 | 1.050 | 0.000 | 0.00 | 0.20 | 0.00 |
| 8 | 1:QZLokaal | Qw7 | 0.17 | 0.17 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 4 | 1:QZLokaal | Qw8 | -0.41 | -0.41 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 1 | 1:QZLokaal | Qw3 | -0.66 | -0.66 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 5 | 1:QZLokaal | Qw4 | -0.58 | -0.58 | 0.000 | 1.634 | 0.00 | 0.20 | 0.00 |
| 5 | 1:QZLokaal | Qw5 | -0.56 | -0.56 | 1.050 | 0.000 | 0.00 | 0.20 | 0.00 |
| 15 | 1:QZLokaal | Qw5 | -0.56 | -0.56 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 16 | 1:QZLokaal | Qw6 | 0.25 | 0.25 | 0.000 | 2.410 | 0.00 | 0.20 | 0.00 |
| 16 | 1:QZLokaal | Qw7 | 0.17 | 0.17 | 1.050 | 0.000 | 0.00 | 0.20 | 0.00 |
| 6 | 1:QZLokaal | Qw7 | 0.17 | 0.17 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 2 | 1:QZLokaal | Qw8 | -0.41 | -0.41 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |

BELASTINGEN

B.G:5 Wind van rechts onderdruk A



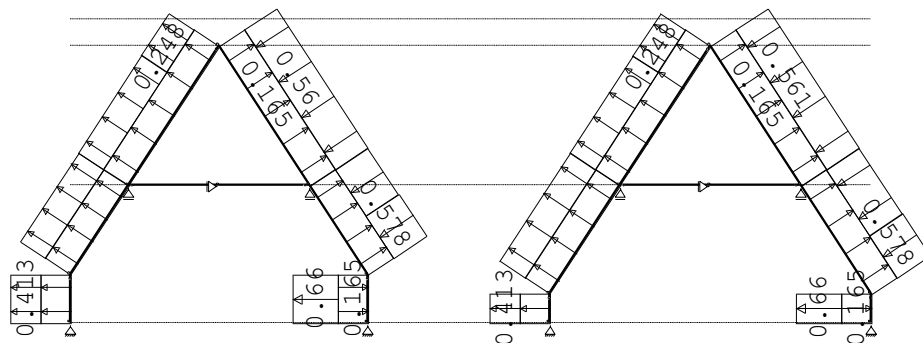
STAAFBELASTINGEN

B.G:5 Wind van rechts onderdruk A

| Staaftype | Type | Index | q1/p/m | q2 | A | B | ψ_0 | ψ_1 | ψ_2 |
|-----------|------------|-------|--------|-------|-------|-------|----------|----------|----------|
| 3 | 1:QZLokaal | Qw1 | -0.25 | -0.25 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 7 | 1:QZLokaal | Qw1 | -0.25 | -0.25 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 13 | 1:QZLokaal | Qw1 | -0.25 | -0.25 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 14 | 1:QZLokaal | Qw1 | -0.25 | -0.25 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 8 | 1:QZLokaal | Qw1 | -0.25 | -0.25 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 4 | 1:QZLokaal | Qw2 | 0.25 | 0.25 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 1 | 1:QZLokaal | Qw1 | -0.25 | -0.25 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 5 | 1:QZLokaal | Qw1 | -0.25 | -0.25 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 15 | 1:QZLokaal | Qw1 | -0.25 | -0.25 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 16 | 1:QZLokaal | Qw1 | -0.25 | -0.25 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 6 | 1:QZLokaal | Qw1 | -0.25 | -0.25 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 2 | 1:QZLokaal | Qw2 | 0.25 | 0.25 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 2 | 1:QZLokaal | Qw11 | 0.66 | 0.66 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 6 | 1:QZLokaal | Qw4 | -0.58 | -0.58 | 1.634 | 0.000 | 0.00 | 0.20 | 0.00 |
| 6 | 1:QZLokaal | Qw5 | -0.56 | -0.56 | 0.000 | 1.050 | 0.00 | 0.20 | 0.00 |
| 16 | 1:QZLokaal | Qw5 | -0.56 | -0.56 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 15 | 1:QZLokaal | Qw6 | 0.25 | 0.25 | 2.410 | 0.000 | 0.00 | 0.20 | 0.00 |
| 15 | 1:QZLokaal | Qw7 | 0.17 | 0.17 | 0.000 | 1.050 | 0.00 | 0.20 | 0.00 |
| 5 | 1:QZLokaal | Qw7 | 0.17 | 0.17 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 1 | 1:QZLokaal | Qw12 | 0.41 | 0.41 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 4 | 1:QZLokaal | Qw11 | 0.66 | 0.66 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 8 | 1:QZLokaal | Qw4 | -0.58 | -0.58 | 1.159 | 0.000 | 0.00 | 0.20 | 0.00 |
| 8 | 1:QZLokaal | Qw5 | -0.56 | -0.56 | 0.000 | 1.050 | 0.00 | 0.20 | 0.00 |
| 14 | 1:QZLokaal | Qw5 | -0.56 | -0.56 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 13 | 1:QZLokaal | Qw6 | 0.25 | 0.25 | 2.413 | 0.000 | 0.00 | 0.20 | 0.00 |
| 13 | 1:QZLokaal | Qw7 | 0.17 | 0.17 | 0.000 | 1.050 | 0.00 | 0.20 | 0.00 |
| 7 | 1:QZLokaal | Qw7 | 0.17 | 0.17 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 3 | 1:QZLokaal | Qw12 | 0.41 | 0.41 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |

BELASTINGEN

B.G:6 Wind van rechts overdruk A



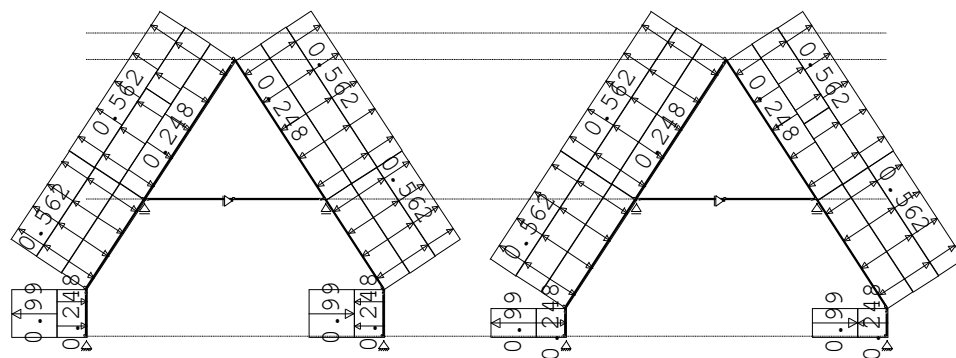
STAAFBELASTINGEN

B.G:6 Wind van rechts overdruk A

| Staafl | Type | Index | q1/p/m | q2 | A | B | Ψ_0 | Ψ_1 | Ψ_2 |
|--------|------------|-------|--------|-------|-------|-------|----------|----------|----------|
| 3 | 1:QZLokaal | Qw9 | 0.17 | 0.17 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 7 | 1:QZLokaal | Qw9 | 0.17 | 0.17 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 13 | 1:QZLokaal | Qw9 | 0.17 | 0.17 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 14 | 1:QZLokaal | Qw9 | 0.17 | 0.17 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 8 | 1:QZLokaal | Qw9 | 0.17 | 0.17 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 4 | 1:QZLokaal | Qw10 | -0.17 | -0.17 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 1 | 1:QZLokaal | Qw9 | 0.17 | 0.17 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 5 | 1:QZLokaal | Qw9 | 0.17 | 0.17 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 15 | 1:QZLokaal | Qw9 | 0.17 | 0.17 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 16 | 1:QZLokaal | Qw9 | 0.17 | 0.17 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 6 | 1:QZLokaal | Qw9 | 0.17 | 0.17 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 2 | 1:QZLokaal | Qw10 | -0.17 | -0.17 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 2 | 1:QZLokaal | Qw11 | 0.66 | 0.66 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 6 | 1:QZLokaal | Qw4 | -0.58 | -0.58 | 1.634 | 0.000 | 0.00 | 0.20 | 0.00 |
| 6 | 1:QZLokaal | Qw5 | -0.56 | -0.56 | 0.000 | 1.050 | 0.00 | 0.20 | 0.00 |
| 16 | 1:QZLokaal | Qw5 | -0.56 | -0.56 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 15 | 1:QZLokaal | Qw6 | 0.25 | 0.25 | 2.410 | 0.000 | 0.00 | 0.20 | 0.00 |
| 15 | 1:QZLokaal | Qw7 | 0.17 | 0.17 | 0.000 | 1.050 | 0.00 | 0.20 | 0.00 |
| 5 | 1:QZLokaal | Qw7 | 0.17 | 0.17 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 1 | 1:QZLokaal | Qw12 | 0.41 | 0.41 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 4 | 1:QZLokaal | Qw11 | 0.66 | 0.66 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 8 | 1:QZLokaal | Qw4 | -0.58 | -0.58 | 1.159 | 0.000 | 0.00 | 0.20 | 0.00 |
| 8 | 1:QZLokaal | Qw5 | -0.56 | -0.56 | 0.000 | 1.050 | 0.00 | 0.20 | 0.00 |
| 14 | 1:QZLokaal | Qw5 | -0.56 | -0.56 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 13 | 1:QZLokaal | Qw6 | 0.25 | 0.25 | 2.413 | 0.000 | 0.00 | 0.20 | 0.00 |
| 13 | 1:QZLokaal | Qw7 | 0.17 | 0.17 | 0.000 | 1.050 | 0.00 | 0.20 | 0.00 |
| 7 | 1:QZLokaal | Qw7 | 0.17 | 0.17 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 3 | 1:QZLokaal | Qw12 | 0.41 | 0.41 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |

BELASTINGEN

B.G:7 Wind loodrecht onderdruk A



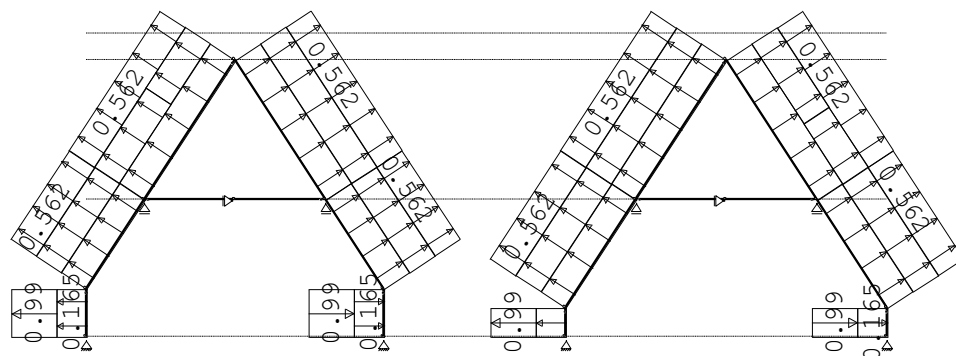
STAAFBELASTINGEN

B.G:7 Wind loodrecht onderdruk A

| Staaft | Type | Index | q1/p/m | q2 | A | B | Ψ_0 | Ψ_1 | Ψ_2 |
|--------|------------|-------|--------|-------|-------|-------|----------|----------|----------|
| 3 | 1:QZLokaal | Qw1 | -0.25 | -0.25 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 7 | 1:QZLokaal | Qw1 | -0.25 | -0.25 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 13 | 1:QZLokaal | Qw1 | -0.25 | -0.25 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 14 | 1:QZLokaal | Qw1 | -0.25 | -0.25 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 8 | 1:QZLokaal | Qw1 | -0.25 | -0.25 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 4 | 1:QZLokaal | Qw2 | 0.25 | 0.25 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 1 | 1:QZLokaal | Qw1 | -0.25 | -0.25 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 5 | 1:QZLokaal | Qw1 | -0.25 | -0.25 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 15 | 1:QZLokaal | Qw1 | -0.25 | -0.25 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 16 | 1:QZLokaal | Qw1 | -0.25 | -0.25 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 6 | 1:QZLokaal | Qw1 | -0.25 | -0.25 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 2 | 1:QZLokaal | Qw2 | 0.25 | 0.25 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 3 | 1:QZLokaal | Qw13 | 0.99 | 0.99 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 4 | 1:QZLokaal | Qw14 | -0.99 | -0.99 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 1 | 1:QZLokaal | Qw13 | 0.99 | 0.99 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 2 | 1:QZLokaal | Qw14 | -0.99 | -0.99 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 7 | 1:QZLokaal | Qw15 | 0.15 | 0.15 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 7 | 1:QZLokaal | Qw16 | 0.56 | 0.56 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 13 | 1:QZLokaal | Qw17 | 0.17 | 0.17 | 1.963 | 0.000 | 0.00 | 0.20 | 0.00 |
| 13 | 1:QZLokaal | Qw15 | 0.15 | 0.15 | 0.000 | 1.500 | 0.00 | 0.20 | 0.00 |
| 13 | 1:QZLokaal | Qw16 | 0.56 | 0.56 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 14 | 1:QZLokaal | Qw17 | 0.17 | 0.17 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 14 | 1:QZLokaal | Qw16 | 0.56 | 0.56 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 8 | 1:QZLokaal | Qw17 | 0.17 | 0.17 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 8 | 1:QZLokaal | Qw16 | 0.56 | 0.56 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 5 | 1:QZLokaal | Qw18 | 0.17 | 0.17 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 5 | 1:QZLokaal | Qw16 | 0.56 | 0.56 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 15 | 1:QZLokaal | Qw18 | 0.17 | 0.17 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 15 | 1:QZLokaal | Qw16 | 0.56 | 0.56 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 16 | 1:QZLokaal | Qw15 | 0.15 | 0.15 | 1.974 | 0.000 | 0.00 | 0.20 | 0.00 |
| 16 | 1:QZLokaal | Qw18 | 0.17 | 0.17 | 0.000 | 1.486 | 0.00 | 0.20 | 0.00 |
| 16 | 1:QZLokaal | Qw16 | 0.56 | 0.56 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 6 | 1:QZLokaal | Qw15 | 0.15 | 0.15 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 6 | 1:QZLokaal | Qw16 | 0.56 | 0.56 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |

BELASTINGEN

B.G:8 Wind loodrecht overdruk A



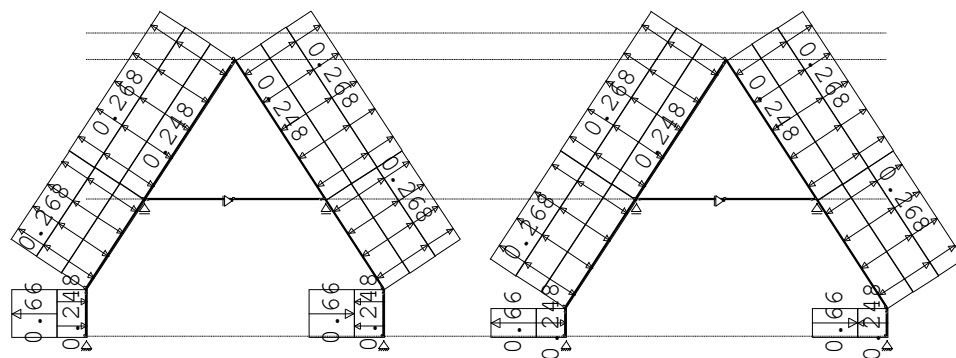
STAAFBELASTINGEN

B.G:8 Wind loodrecht overdruk A

| Staaftype | Type | Index | q1/p/m | q2 | A | B | Ψ_0 | Ψ_1 | Ψ_2 |
|-----------|------------|-------|--------|-------|-------|-------|----------|----------|----------|
| 3 | 1:QZLokaal | Qw9 | 0.17 | 0.17 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 7 | 1:QZLokaal | Qw9 | 0.17 | 0.17 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 13 | 1:QZLokaal | Qw9 | 0.17 | 0.17 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 14 | 1:QZLokaal | Qw9 | 0.17 | 0.17 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 8 | 1:QZLokaal | Qw9 | 0.17 | 0.17 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 4 | 1:QZLokaal | Qw10 | -0.17 | -0.17 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 1 | 1:QZLokaal | Qw9 | 0.17 | 0.17 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 5 | 1:QZLokaal | Qw9 | 0.17 | 0.17 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 15 | 1:QZLokaal | Qw9 | 0.17 | 0.17 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 16 | 1:QZLokaal | Qw9 | 0.17 | 0.17 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 6 | 1:QZLokaal | Qw9 | 0.17 | 0.17 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 2 | 1:QZLokaal | Qw10 | -0.17 | -0.17 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 3 | 1:QZLokaal | Qw13 | 0.99 | 0.99 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 4 | 1:QZLokaal | Qw14 | -0.99 | -0.99 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 1 | 1:QZLokaal | Qw13 | 0.99 | 0.99 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 2 | 1:QZLokaal | Qw14 | -0.99 | -0.99 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 7 | 1:QZLokaal | Qw15 | 0.15 | 0.15 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 7 | 1:QZLokaal | Qw16 | 0.56 | 0.56 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 13 | 1:QZLokaal | Qw17 | 0.17 | 0.17 | 1.963 | 0.000 | 0.00 | 0.20 | 0.00 |
| 13 | 1:QZLokaal | Qw15 | 0.15 | 0.15 | 0.000 | 1.500 | 0.00 | 0.20 | 0.00 |
| 13 | 1:QZLokaal | Qw16 | 0.56 | 0.56 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 14 | 1:QZLokaal | Qw17 | 0.17 | 0.17 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 14 | 1:QZLokaal | Qw16 | 0.56 | 0.56 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 8 | 1:QZLokaal | Qw17 | 0.17 | 0.17 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 8 | 1:QZLokaal | Qw16 | 0.56 | 0.56 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 5 | 1:QZLokaal | Qw18 | 0.17 | 0.17 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 5 | 1:QZLokaal | Qw16 | 0.56 | 0.56 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 15 | 1:QZLokaal | Qw18 | 0.17 | 0.17 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 15 | 1:QZLokaal | Qw16 | 0.56 | 0.56 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 16 | 1:QZLokaal | Qw15 | 0.15 | 0.15 | 1.974 | 0.000 | 0.00 | 0.20 | 0.00 |
| 16 | 1:QZLokaal | Qw18 | 0.17 | 0.17 | 0.000 | 1.486 | 0.00 | 0.20 | 0.00 |
| 16 | 1:QZLokaal | Qw16 | 0.56 | 0.56 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 6 | 1:QZLokaal | Qw15 | 0.15 | 0.15 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 6 | 1:QZLokaal | Qw16 | 0.56 | 0.56 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |

BELASTINGEN

B.G:9 Wind loodrecht onderdruk B



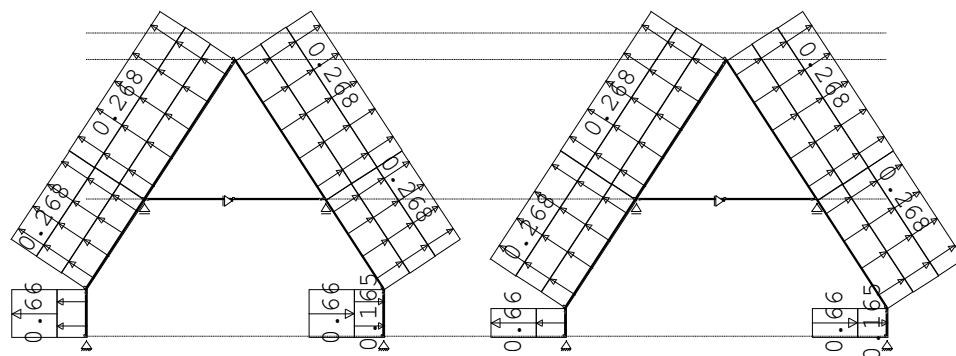
STAAFBELASTINGEN

B.G:9 Wind loodrecht onderdruk B

| Staaftype | Type | Index | q1/p/m | q2 | A | B | Ψ_0 | Ψ_1 | Ψ_2 |
|-----------|------------|-------|--------|-------|-------|-------|----------|----------|----------|
| 3 | 1:QZLokaal | Qw1 | -0.25 | -0.25 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 7 | 1:QZLokaal | Qw1 | -0.25 | -0.25 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 13 | 1:QZLokaal | Qw1 | -0.25 | -0.25 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 14 | 1:QZLokaal | Qw1 | -0.25 | -0.25 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 8 | 1:QZLokaal | Qw1 | -0.25 | -0.25 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 4 | 1:QZLokaal | Qw2 | 0.25 | 0.25 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 1 | 1:QZLokaal | Qw1 | -0.25 | -0.25 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 5 | 1:QZLokaal | Qw1 | -0.25 | -0.25 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 15 | 1:QZLokaal | Qw1 | -0.25 | -0.25 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 16 | 1:QZLokaal | Qw1 | -0.25 | -0.25 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 6 | 1:QZLokaal | Qw1 | -0.25 | -0.25 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 2 | 1:QZLokaal | Qw2 | 0.25 | 0.25 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 3 | 1:QZLokaal | Qw19 | 0.66 | 0.66 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 4 | 1:QZLokaal | Qw20 | -0.66 | -0.66 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 1 | 1:QZLokaal | Qw19 | 0.66 | 0.66 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 2 | 1:QZLokaal | Qw20 | -0.66 | -0.66 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 7 | 1:QZLokaal | Qw21 | 0.24 | 0.24 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 7 | 1:QZLokaal | Qw22 | 0.27 | 0.27 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 13 | 1:QZLokaal | Qw21 | 0.24 | 0.24 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 13 | 1:QZLokaal | Qw22 | 0.27 | 0.27 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 14 | 1:QZLokaal | Qw21 | 0.24 | 0.24 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 14 | 1:QZLokaal | Qw22 | 0.27 | 0.27 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 8 | 1:QZLokaal | Qw21 | 0.24 | 0.24 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 8 | 1:QZLokaal | Qw22 | 0.27 | 0.27 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 5 | 1:QZLokaal | Qw21 | 0.24 | 0.24 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 5 | 1:QZLokaal | Qw22 | 0.27 | 0.27 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 15 | 1:QZLokaal | Qw21 | 0.24 | 0.24 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 15 | 1:QZLokaal | Qw22 | 0.27 | 0.27 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 16 | 1:QZLokaal | Qw21 | 0.24 | 0.24 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 16 | 1:QZLokaal | Qw22 | 0.27 | 0.27 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 6 | 1:QZLokaal | Qw21 | 0.24 | 0.24 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 6 | 1:QZLokaal | Qw22 | 0.27 | 0.27 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |

BELASTINGEN

B.G:10 Wind loodrecht overdruk B



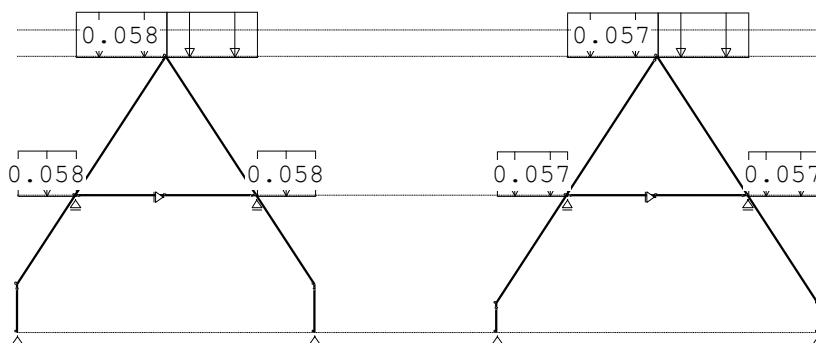
STAAFBELASTINGEN

B.G:10 Wind loodrecht overdruk B

| Staaftype | Type | Index | q1/p/m | q2 | A | B | Ψ_0 | Ψ_1 | Ψ_2 |
|-----------|------------|-------|--------|-------|-------|-------|----------|----------|----------|
| 3 | 1:QZLokaal | Qw9 | 0.17 | 0.17 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 7 | 1:QZLokaal | Qw9 | 0.17 | 0.17 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 13 | 1:QZLokaal | Qw9 | 0.17 | 0.17 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 14 | 1:QZLokaal | Qw9 | 0.17 | 0.17 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 8 | 1:QZLokaal | Qw9 | 0.17 | 0.17 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 4 | 1:QZLokaal | Qw10 | -0.17 | -0.17 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 1 | 1:QZLokaal | Qw9 | 0.17 | 0.17 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 5 | 1:QZLokaal | Qw9 | 0.17 | 0.17 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 15 | 1:QZLokaal | Qw9 | 0.17 | 0.17 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 16 | 1:QZLokaal | Qw9 | 0.17 | 0.17 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 6 | 1:QZLokaal | Qw9 | 0.17 | 0.17 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 2 | 1:QZLokaal | Qw10 | -0.17 | -0.17 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 3 | 1:QZLokaal | Qw19 | 0.66 | 0.66 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 4 | 1:QZLokaal | Qw20 | -0.66 | -0.66 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 1 | 1:QZLokaal | Qw19 | 0.66 | 0.66 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 2 | 1:QZLokaal | Qw20 | -0.66 | -0.66 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 7 | 1:QZLokaal | Qw21 | 0.24 | 0.24 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 7 | 1:QZLokaal | Qw22 | 0.27 | 0.27 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 13 | 1:QZLokaal | Qw21 | 0.24 | 0.24 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 13 | 1:QZLokaal | Qw22 | 0.27 | 0.27 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 14 | 1:QZLokaal | Qw21 | 0.24 | 0.24 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 14 | 1:QZLokaal | Qw22 | 0.27 | 0.27 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 8 | 1:QZLokaal | Qw21 | 0.24 | 0.24 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 8 | 1:QZLokaal | Qw22 | 0.27 | 0.27 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 5 | 1:QZLokaal | Qw21 | 0.24 | 0.24 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 5 | 1:QZLokaal | Qw22 | 0.27 | 0.27 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 15 | 1:QZLokaal | Qw21 | 0.24 | 0.24 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 15 | 1:QZLokaal | Qw22 | 0.27 | 0.27 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 16 | 1:QZLokaal | Qw21 | 0.24 | 0.24 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 16 | 1:QZLokaal | Qw22 | 0.27 | 0.27 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 6 | 1:QZLokaal | Qw21 | 0.24 | 0.24 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 6 | 1:QZLokaal | Qw22 | 0.27 | 0.27 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |

BELASTINGEN

B.G:11 Sneeuw A



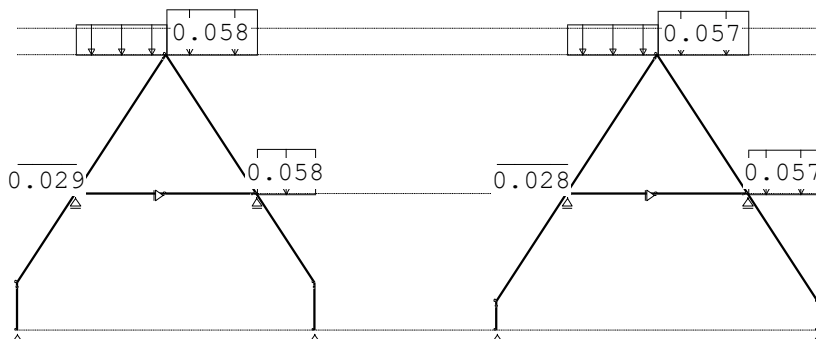
STAAFBELASTINGEN

B.G:11 Sneeuw A

| Staafl | Type | Index | q1/p/m | q2 | A | B | Ψ_0 | Ψ_1 | Ψ_2 |
|--------|-------------|-------|--------|-------|-------|-------|----------|----------|----------|
| 5 | 3:QZgeProj. | Qs1 | -0.06 | -0.06 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 6 | 3:QZgeProj. | Qs1 | -0.06 | -0.06 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 7 | 3:QZgeProj. | Qs2 | -0.06 | -0.06 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 8 | 3:QZgeProj. | Qs2 | -0.06 | -0.06 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 13 | 3:QZgeProj. | Qs2 | -0.06 | -0.06 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 14 | 3:QZgeProj. | Qs2 | -0.06 | -0.06 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 15 | 3:QZgeProj. | Qs1 | -0.06 | -0.06 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 16 | 3:QZgeProj. | Qs1 | -0.06 | -0.06 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |

BELASTINGEN

B.G:12 Sneeuw B



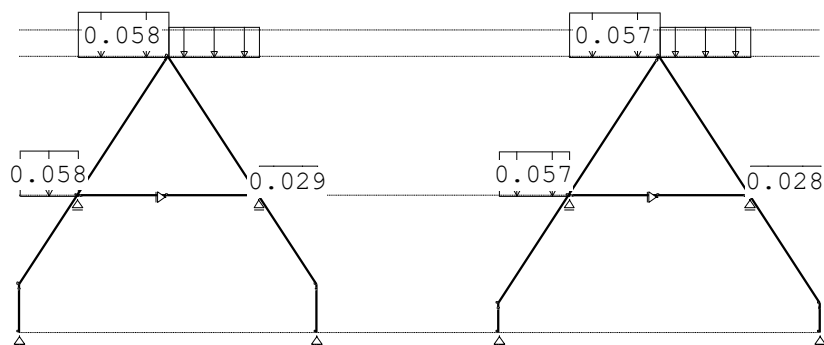
STAAFBELASTINGEN

B.G:12 Sneeuw B

| Staafl | Type | Index | q1/p/m | q2 | A | B | Ψ_0 | Ψ_1 | Ψ_2 |
|--------|-------------|-------|--------|-------|-------|-------|----------|----------|----------|
| 5 | 3:QZgeProj. | Qs3 | -0.03 | -0.03 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 6 | 3:QZgeProj. | Qs1 | -0.06 | -0.06 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 7 | 3:QZgeProj. | Qs4 | -0.03 | -0.03 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 8 | 3:QZgeProj. | Qs2 | -0.06 | -0.06 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 13 | 3:QZgeProj. | Qs4 | -0.03 | -0.03 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 14 | 3:QZgeProj. | Qs2 | -0.06 | -0.06 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 15 | 3:QZgeProj. | Qs3 | -0.03 | -0.03 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 16 | 3:QZgeProj. | Qs1 | -0.06 | -0.06 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |

BELASTINGEN

B.G:13 Sneeuw C



STAAFBELASTINGEN

B.G:13 Sneeuw C

| Staf | Type | Index | q1/p/m | q2 | A | B | Ψ_0 | Ψ_1 | Ψ_2 |
|------|-------------|-------|--------|-------|-------|-------|----------|----------|----------|
| 5 | 3:QZgeProj. | Qs1 | -0.06 | -0.06 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 6 | 3:QZgeProj. | Qs3 | -0.03 | -0.03 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 7 | 3:QZgeProj. | Qs2 | -0.06 | -0.06 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 8 | 3:QZgeProj. | Qs4 | -0.03 | -0.03 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 13 | 3:QZgeProj. | Qs2 | -0.06 | -0.06 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 14 | 3:QZgeProj. | Qs4 | -0.03 | -0.03 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 15 | 3:QZgeProj. | Qs1 | -0.06 | -0.06 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 16 | 3:QZgeProj. | Qs3 | -0.03 | -0.03 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |

REACTIES

| Kn. | B.G. | X-min | X-max | Z-min | Z-max | M-min | M-max |
|-----|------|-------|-------|-------|-------|-------|-------|
| 1 | 1 | 0.00 | | 0.96 | | | |
| 1 | 2 | 0.00 | | 0.00 | | | |
| 1 | 3 | -0.45 | | 1.57 | | | |
| 1 | 4 | -0.25 | | 0.82 | | | |
| 1 | 5 | 0.08 | | -0.02 | | | |
| 1 | 6 | 0.29 | | -0.78 | | | |
| 1 | 7 | 0.37 | | -1.06 | | | |
| 1 | 8 | 0.58 | | -1.81 | | | |
| 1 | 9 | 0.21 | | -0.59 | | | |
| 1 | 10 | 0.41 | | -1.34 | | | |
| 1 | 11 | 0.00 | | 0.02 | | | |
| 1 | 12 | 0.00 | | 0.01 | | | |
| 1 | 13 | 0.00 | | 0.02 | | | |
| 2 | 1 | 0.00 | | 0.96 | | | |
| 2 | 2 | 0.00 | | 0.00 | | | |
| 2 | 3 | -0.08 | | -0.02 | | | |
| 2 | 4 | -0.29 | | -0.78 | | | |
| 2 | 5 | 0.45 | | 1.57 | | | |
| 2 | 6 | 0.25 | | 0.82 | | | |
| 2 | 7 | -0.37 | | -1.09 | | | |
| 2 | 8 | -0.58 | | -1.84 | | | |
| 2 | 9 | -0.21 | | -0.59 | | | |
| 2 | 10 | -0.41 | | -1.34 | | | |
| 2 | 11 | 0.00 | | 0.02 | | | |
| 2 | 12 | 0.00 | | 0.02 | | | |
| 2 | 13 | 0.00 | | 0.01 | | | |

REACTIES

| Kn. | B.G. | X-min | X-max | Z-min | Z-max | M-min | M-max |
|-----|------|-------|-------|-------|-------|-------|-------|
| 3 | 1 | 0.00 | | 1.00 | | | |
| 3 | 2 | 0.00 | | 0.00 | | | |
| 3 | 3 | -0.27 | | 1.74 | | | |
| 3 | 4 | -0.15 | | 0.89 | | | |
| 3 | 5 | 0.05 | | 0.07 | | | |
| 3 | 6 | 0.17 | | -0.79 | | | |
| 3 | 7 | 0.22 | | -1.13 | | | |
| 3 | 8 | 0.35 | | -1.99 | | | |
| 3 | 9 | 0.12 | | -0.61 | | | |
| 3 | 10 | 0.25 | | -1.46 | | | |
| 3 | 11 | 0.00 | | 0.03 | | | |
| 3 | 12 | 0.00 | | 0.01 | | | |
| 3 | 13 | 0.00 | | 0.03 | | | |
| | | | | | | | |
| 4 | 1 | 0.00 | | 1.00 | | | |
| 4 | 2 | 0.00 | | 0.00 | | | |
| 4 | 3 | -0.05 | | 0.07 | | | |
| 4 | 4 | -0.17 | | -0.79 | | | |
| 4 | 5 | 0.27 | | 1.74 | | | |
| 4 | 6 | 0.15 | | 0.89 | | | |
| 4 | 7 | -0.22 | | -1.09 | | | |
| 4 | 8 | -0.35 | | -1.95 | | | |
| 4 | 9 | -0.12 | | -0.61 | | | |
| 4 | 10 | -0.25 | | -1.46 | | | |
| 4 | 11 | 0.00 | | 0.03 | | | |
| 4 | 12 | 0.00 | | 0.03 | | | |
| 4 | 13 | 0.00 | | 0.01 | | | |
| | | | | | | | |
| 9 | 1 | | | 4.85 | | | |
| 9 | 2 | | | 0.32 | 2.71 | | |
| 9 | 3 | | | -0.05 | | | |
| 9 | 4 | | | -0.57 | | | |
| 9 | 5 | | | 1.22 | | | |
| 9 | 6 | | | 0.69 | | | |
| 9 | 7 | | | -0.41 | | | |
| 9 | 8 | | | -0.94 | | | |
| 9 | 9 | | | -0.21 | | | |
| 9 | 10 | | | -0.73 | | | |
| 9 | 11 | | | 0.16 | | | |
| 9 | 12 | | | 0.09 | | | |
| 9 | 13 | | | 0.15 | | | |
| | | | | | | | |
| 10 | 1 | 0.00 | | | | | |
| 10 | 2 | 0.00 | | | | | |
| 10 | 3 | -4.07 | | | | | |
| 10 | 4 | -4.07 | | | | | |
| 10 | 5 | 4.07 | | | | | |
| 10 | 6 | 4.07 | | | | | |
| 10 | 7 | -0.07 | | | | | |
| 10 | 8 | -0.07 | | | | | |
| 10 | 9 | -0.00 | | | | | |
| 10 | 10 | -0.00 | | | | | |
| 10 | 11 | 0.00 | | | | | |
| 10 | 12 | 0.00 | | | | | |
| 10 | 13 | 0.00 | | | | | |

REACTIES

| Kn. | B.G. | X-min | X-max | Z-min | Z-max | M-min | M-max |
|-----|------|-------|-------|-------|-------|-------|-------|
| 11 | 1 | | | 4.85 | | | |
| 11 | 2 | | | 0.32 | 2.71 | | |
| 11 | 3 | | | 1.22 | | | |
| 11 | 4 | | | 0.69 | | | |
| 11 | 5 | | | -0.05 | | | |
| 11 | 6 | | | -0.57 | | | |
| 11 | 7 | | | -0.42 | | | |
| 11 | 8 | | | -0.95 | | | |
| 11 | 9 | | | -0.21 | | | |
| 11 | 10 | | | -0.73 | | | |
| 11 | 11 | | | 0.16 | | | |
| 11 | 12 | | | 0.15 | | | |
| 11 | 13 | | | 0.09 | | | |
| | | | | | | | |
| 12 | 1 | | | 4.99 | | | |
| 12 | 2 | | | 0.32 | 2.71 | | |
| 12 | 3 | | | -0.00 | | | |
| 12 | 4 | | | -0.53 | | | |
| 12 | 5 | | | 1.13 | | | |
| 12 | 6 | | | 0.61 | | | |
| 12 | 7 | | | -0.50 | | | |
| 12 | 8 | | | -1.03 | | | |
| 12 | 9 | | | -0.26 | | | |
| 12 | 10 | | | -0.78 | | | |
| 12 | 11 | | | 0.16 | | | |
| 12 | 12 | | | 0.09 | | | |
| 12 | 13 | | | 0.15 | | | |
| | | | | | | | |
| 13 | 1 | 0.00 | | | | | |
| 13 | 2 | 0.00 | | | | | |
| 13 | 3 | -4.15 | | | | | |
| 13 | 4 | -4.15 | | | | | |
| 13 | 5 | 4.15 | | | | | |
| 13 | 6 | 4.15 | | | | | |
| 13 | 7 | 0.07 | | | | | |
| 13 | 8 | 0.07 | | | | | |
| 13 | 9 | -0.00 | | | | | |
| 13 | 10 | -0.00 | | | | | |
| 13 | 11 | 0.00 | | | | | |
| 13 | 12 | 0.00 | | | | | |
| 13 | 13 | 0.00 | | | | | |
| | | | | | | | |
| 14 | 1 | | | 4.99 | | | |
| 14 | 2 | | | 0.32 | 2.71 | | |
| 14 | 3 | | | 1.13 | | | |
| 14 | 4 | | | 0.61 | | | |
| 14 | 5 | | | -0.00 | | | |
| 14 | 6 | | | -0.53 | | | |
| 14 | 7 | | | -0.50 | | | |
| 14 | 8 | | | -1.03 | | | |
| 14 | 9 | | | -0.26 | | | |
| 14 | 10 | | | -0.78 | | | |
| 14 | 11 | | | 0.16 | | | |
| 14 | 12 | | | 0.15 | | | |
| 14 | 13 | | | 0.09 | | | |

BELASTINGCOMBINATIES

| BC Type | | | | | | | | | |
|---------|-------|------|-----------|---|------|----------|------------|---|-------------------------|
| 1 | Fund. | 1.22 | $G_{k,1}$ | | | | | | |
| 2 | Fund. | 0.90 | $G_{k,1}$ | | | | | | |
| 3 | Fund. | 1.22 | $G_{k,1}$ | + | 1.35 | ψ_0 | $Q_{k,2}$ | | |
| 4 | Fund. | 1.08 | $G_{k,1}$ | + | 1.35 | | $Q_{k,2}$ | | |
| 5 | Fund. | 1.08 | $G_{k,1}$ | + | 1.35 | | $Q_{k,3}$ | | |
| 6 | Fund. | 1.08 | $G_{k,1}$ | + | 1.35 | | $Q_{k,4}$ | | |
| 7 | Fund. | 1.08 | $G_{k,1}$ | + | 1.35 | | $Q_{k,5}$ | | |
| 8 | Fund. | 1.08 | $G_{k,1}$ | + | 1.35 | | $Q_{k,6}$ | | |
| 9 | Fund. | 1.08 | $G_{k,1}$ | + | 1.35 | | $Q_{k,7}$ | | |
| 10 | Fund. | 1.08 | $G_{k,1}$ | + | 1.35 | | $Q_{k,8}$ | | |
| 11 | Fund. | 1.08 | $G_{k,1}$ | + | 1.35 | | $Q_{k,9}$ | | |
| 12 | Fund. | 1.08 | $G_{k,1}$ | + | 1.35 | | $Q_{k,10}$ | | |
| 13 | Fund. | 1.08 | $G_{k,1}$ | + | 1.35 | | $Q_{k,11}$ | | |
| 14 | Fund. | 1.08 | $G_{k,1}$ | + | 1.35 | | $Q_{k,12}$ | | |
| 15 | Fund. | 1.08 | $G_{k,1}$ | + | 1.35 | | $Q_{k,13}$ | | |
| 16 | Fund. | 0.90 | $G_{k,1}$ | + | 1.35 | ψ_0 | $Q_{k,2}$ | | |
| 17 | Fund. | 0.90 | $G_{k,1}$ | + | 1.35 | | $Q_{k,2}$ | | |
| 18 | Fund. | 0.90 | $G_{k,1}$ | + | 1.35 | | $Q_{k,3}$ | | |
| 19 | Fund. | 0.90 | $G_{k,1}$ | + | 1.35 | | $Q_{k,4}$ | | |
| 20 | Fund. | 0.90 | $G_{k,1}$ | + | 1.35 | | $Q_{k,5}$ | | |
| 21 | Fund. | 0.90 | $G_{k,1}$ | + | 1.35 | | $Q_{k,6}$ | | |
| 22 | Fund. | 0.90 | $G_{k,1}$ | + | 1.35 | | $Q_{k,7}$ | | |
| 23 | Fund. | 0.90 | $G_{k,1}$ | + | 1.35 | | $Q_{k,8}$ | | |
| 24 | Fund. | 0.90 | $G_{k,1}$ | + | 1.35 | | $Q_{k,9}$ | | |
| 25 | Fund. | 0.90 | $G_{k,1}$ | + | 1.35 | | $Q_{k,10}$ | | |
| 26 | Fund. | 0.90 | $G_{k,1}$ | + | 1.35 | | $Q_{k,11}$ | | |
| 27 | Fund. | 0.90 | $G_{k,1}$ | + | 1.35 | | $Q_{k,12}$ | | |
| 28 | Fund. | 0.90 | $G_{k,1}$ | + | 1.35 | | $Q_{k,13}$ | | |
| 29 | Fund. | 1.08 | $G_{k,1}$ | + | 1.35 | | $Q_{k,3}$ | + | 1.35 ψ_0 $Q_{k,2}$ |
| 30 | Fund. | 1.08 | $G_{k,1}$ | + | 1.35 | | $Q_{k,4}$ | + | 1.35 ψ_0 $Q_{k,2}$ |
| 31 | Fund. | 1.08 | $G_{k,1}$ | + | 1.35 | | $Q_{k,5}$ | + | 1.35 ψ_0 $Q_{k,2}$ |
| 32 | Fund. | 1.08 | $G_{k,1}$ | + | 1.35 | | $Q_{k,6}$ | + | 1.35 ψ_0 $Q_{k,2}$ |
| 33 | Fund. | 1.08 | $G_{k,1}$ | + | 1.35 | | $Q_{k,7}$ | + | 1.35 ψ_0 $Q_{k,2}$ |
| 34 | Fund. | 1.08 | $G_{k,1}$ | + | 1.35 | | $Q_{k,8}$ | + | 1.35 ψ_0 $Q_{k,2}$ |
| 35 | Fund. | 1.08 | $G_{k,1}$ | + | 1.35 | | $Q_{k,9}$ | + | 1.35 ψ_0 $Q_{k,2}$ |
| 36 | Fund. | 1.08 | $G_{k,1}$ | + | 1.35 | | $Q_{k,10}$ | + | 1.35 ψ_0 $Q_{k,2}$ |
| 37 | Fund. | 1.08 | $G_{k,1}$ | + | 1.35 | | $Q_{k,11}$ | + | 1.35 ψ_0 $Q_{k,2}$ |
| 38 | Fund. | 1.08 | $G_{k,1}$ | + | 1.35 | | $Q_{k,12}$ | + | 1.35 ψ_0 $Q_{k,2}$ |
| 39 | Fund. | 1.08 | $G_{k,1}$ | + | 1.35 | | $Q_{k,13}$ | + | 1.35 ψ_0 $Q_{k,2}$ |
| 40 | Fund. | 0.90 | $G_{k,1}$ | + | 1.35 | | $Q_{k,3}$ | + | 1.35 ψ_0 $Q_{k,2}$ |
| 41 | Fund. | 0.90 | $G_{k,1}$ | + | 1.35 | | $Q_{k,4}$ | + | 1.35 ψ_0 $Q_{k,2}$ |
| 42 | Fund. | 0.90 | $G_{k,1}$ | + | 1.35 | | $Q_{k,5}$ | + | 1.35 ψ_0 $Q_{k,2}$ |
| 43 | Fund. | 0.90 | $G_{k,1}$ | + | 1.35 | | $Q_{k,6}$ | + | 1.35 ψ_0 $Q_{k,2}$ |
| 44 | Fund. | 0.90 | $G_{k,1}$ | + | 1.35 | | $Q_{k,7}$ | + | 1.35 ψ_0 $Q_{k,2}$ |
| 45 | Fund. | 0.90 | $G_{k,1}$ | + | 1.35 | | $Q_{k,8}$ | + | 1.35 ψ_0 $Q_{k,2}$ |
| 46 | Fund. | 0.90 | $G_{k,1}$ | + | 1.35 | | $Q_{k,9}$ | + | 1.35 ψ_0 $Q_{k,2}$ |
| 47 | Fund. | 0.90 | $G_{k,1}$ | + | 1.35 | | $Q_{k,10}$ | + | 1.35 ψ_0 $Q_{k,2}$ |
| 48 | Fund. | 0.90 | $G_{k,1}$ | + | 1.35 | | $Q_{k,11}$ | + | 1.35 ψ_0 $Q_{k,2}$ |
| 49 | Fund. | 0.90 | $G_{k,1}$ | + | 1.35 | | $Q_{k,12}$ | + | 1.35 ψ_0 $Q_{k,2}$ |
| 50 | Fund. | 0.90 | $G_{k,1}$ | + | 1.35 | | $Q_{k,13}$ | + | 1.35 ψ_0 $Q_{k,2}$ |
| 51 | Kar. | 1.00 | $G_{k,1}$ | + | 1.00 | | $Q_{k,2}$ | | |

BELASTINGCOMBINATIES

| BC Type | | | | | |
|-----------|------|-----------|---|------|---|
| 52 Kar. | 1.00 | $G_{k,1}$ | + | 1.00 | $Q_{k,3}$ |
| 53 Kar. | 1.00 | $G_{k,1}$ | + | 1.00 | $Q_{k,4}$ |
| 54 Kar. | 1.00 | $G_{k,1}$ | + | 1.00 | $Q_{k,5}$ |
| 55 Kar. | 1.00 | $G_{k,1}$ | + | 1.00 | $Q_{k,6}$ |
| 56 Kar. | 1.00 | $G_{k,1}$ | + | 1.00 | $Q_{k,7}$ |
| 57 Kar. | 1.00 | $G_{k,1}$ | + | 1.00 | $Q_{k,8}$ |
| 58 Kar. | 1.00 | $G_{k,1}$ | + | 1.00 | $Q_{k,9}$ |
| 59 Kar. | 1.00 | $G_{k,1}$ | + | 1.00 | $Q_{k,10}$ |
| 60 Kar. | 1.00 | $G_{k,1}$ | + | 1.00 | $Q_{k,11}$ |
| 61 Kar. | 1.00 | $G_{k,1}$ | + | 1.00 | $Q_{k,12}$ |
| 62 Kar. | 1.00 | $G_{k,1}$ | + | 1.00 | $Q_{k,13}$ |
| 63 Kar. | 1.00 | $G_{k,1}$ | + | 1.00 | $Q_{k,3} + 1.00 \psi_0 Q_{k,2}$ |
| 64 Kar. | 1.00 | $G_{k,1}$ | + | 1.00 | $Q_{k,4} + 1.00 \psi_0 Q_{k,2}$ |
| 65 Kar. | 1.00 | $G_{k,1}$ | + | 1.00 | $Q_{k,5} + 1.00 \psi_0 Q_{k,2}$ |
| 66 Kar. | 1.00 | $G_{k,1}$ | + | 1.00 | $Q_{k,6} + 1.00 \psi_0 Q_{k,2}$ |
| 67 Kar. | 1.00 | $G_{k,1}$ | + | 1.00 | $Q_{k,7} + 1.00 \psi_0 Q_{k,2}$ |
| 68 Kar. | 1.00 | $G_{k,1}$ | + | 1.00 | $Q_{k,8} + 1.00 \psi_0 Q_{k,2}$ |
| 69 Kar. | 1.00 | $G_{k,1}$ | + | 1.00 | $Q_{k,9} + 1.00 \psi_0 Q_{k,2}$ |
| 70 Kar. | 1.00 | $G_{k,1}$ | + | 1.00 | $Q_{k,10} + 1.00 \psi_0 Q_{k,2}$ |
| 71 Kar. | 1.00 | $G_{k,1}$ | + | 1.00 | $Q_{k,11} + 1.00 \psi_0 Q_{k,2}$ |
| 72 Kar. | 1.00 | $G_{k,1}$ | + | 1.00 | $Q_{k,12} + 1.00 \psi_0 Q_{k,2}$ |
| 73 Kar. | 1.00 | $G_{k,1}$ | + | 1.00 | $Q_{k,13} + 1.00 \psi_0 Q_{k,2}$ |
| 74 Quas. | 1.00 | $G_{k,1}$ | | | |
| 75 Quas. | 1.00 | $G_{k,1}$ | + | 1.00 | $\psi_2 Q_{k,2}$ |
| 76 Freq. | 1.00 | $G_{k,1}$ | | | |
| 77 Freq. | 1.00 | $G_{k,1}$ | + | 1.00 | $\psi_1 Q_{k,2}$ |
| 78 Freq. | 1.00 | $G_{k,1}$ | + | 1.00 | $\psi_1 Q_{k,3}$ |
| 79 Freq. | 1.00 | $G_{k,1}$ | + | 1.00 | $\psi_1 Q_{k,4}$ |
| 80 Freq. | 1.00 | $G_{k,1}$ | + | 1.00 | $\psi_1 Q_{k,5}$ |
| 81 Freq. | 1.00 | $G_{k,1}$ | + | 1.00 | $\psi_1 Q_{k,6}$ |
| 82 Freq. | 1.00 | $G_{k,1}$ | + | 1.00 | $\psi_1 Q_{k,7}$ |
| 83 Freq. | 1.00 | $G_{k,1}$ | + | 1.00 | $\psi_1 Q_{k,8}$ |
| 84 Freq. | 1.00 | $G_{k,1}$ | + | 1.00 | $\psi_1 Q_{k,9}$ |
| 85 Freq. | 1.00 | $G_{k,1}$ | + | 1.00 | $\psi_1 Q_{k,10}$ |
| 86 Freq. | 1.00 | $G_{k,1}$ | + | 1.00 | $\psi_1 Q_{k,11}$ |
| 87 Freq. | 1.00 | $G_{k,1}$ | + | 1.00 | $\psi_1 Q_{k,12}$ |
| 88 Freq. | 1.00 | $G_{k,1}$ | + | 1.00 | $\psi_1 Q_{k,13}$ |
| 89 Freq. | 1.00 | $G_{k,1}$ | + | 1.00 | $\psi_1 Q_{k,3} + 1.00 \psi_2 Q_{k,2}$ |
| 90 Freq. | 1.00 | $G_{k,1}$ | + | 1.00 | $\psi_1 Q_{k,4} + 1.00 \psi_2 Q_{k,2}$ |
| 91 Freq. | 1.00 | $G_{k,1}$ | + | 1.00 | $\psi_1 Q_{k,5} + 1.00 \psi_2 Q_{k,2}$ |
| 92 Freq. | 1.00 | $G_{k,1}$ | + | 1.00 | $\psi_1 Q_{k,6} + 1.00 \psi_2 Q_{k,2}$ |
| 93 Freq. | 1.00 | $G_{k,1}$ | + | 1.00 | $\psi_1 Q_{k,7} + 1.00 \psi_2 Q_{k,2}$ |
| 94 Freq. | 1.00 | $G_{k,1}$ | + | 1.00 | $\psi_1 Q_{k,8} + 1.00 \psi_2 Q_{k,2}$ |
| 95 Freq. | 1.00 | $G_{k,1}$ | + | 1.00 | $\psi_1 Q_{k,9} + 1.00 \psi_2 Q_{k,2}$ |
| 96 Freq. | 1.00 | $G_{k,1}$ | + | 1.00 | $\psi_1 Q_{k,10} + 1.00 \psi_2 Q_{k,2}$ |
| 97 Freq. | 1.00 | $G_{k,1}$ | + | 1.00 | $\psi_1 Q_{k,11} + 1.00 \psi_2 Q_{k,2}$ |
| 98 Freq. | 1.00 | $G_{k,1}$ | + | 1.00 | $\psi_1 Q_{k,12} + 1.00 \psi_2 Q_{k,2}$ |
| 99 Freq. | 1.00 | $G_{k,1}$ | + | 1.00 | $\psi_1 Q_{k,13} + 1.00 \psi_2 Q_{k,2}$ |
| 100 Blij. | 1.00 | $G_{k,1}$ | | | |

GUNSTIGE WERKING PERMANENTE BELASTINGEN

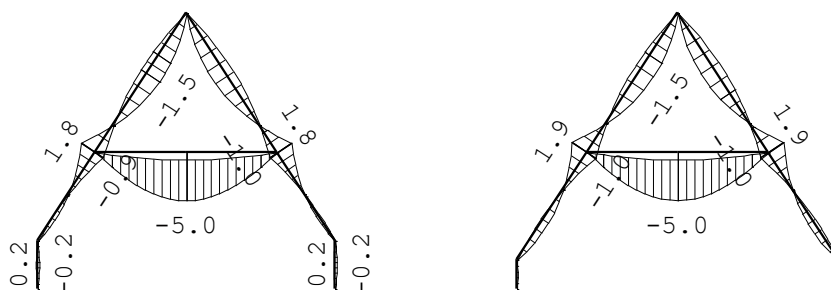
BC Staven met gunstige werking

- 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 Geen
- 12 Geen
- 13 Geen
- 14 Geen
- 15 Geen
- 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
- 20 Alle staven de factor:0.90
- 21 Alle staven de factor:0.90
- 22 Alle staven de factor:0.90
- 23 Alle staven de factor:0.90
- 24 Alle staven de factor:0.90
- 25 Alle staven de factor:0.90
- 26 Alle staven de factor:0.90
- 27 Alle staven de factor:0.90
- 28 Alle staven de factor:0.90
- 29 t/m 39 Geen
- 40 t/m 50 Alle staven de factor:0.90

OMHULLENDE VAN DE FUNDAMENTELE COMBINATIES

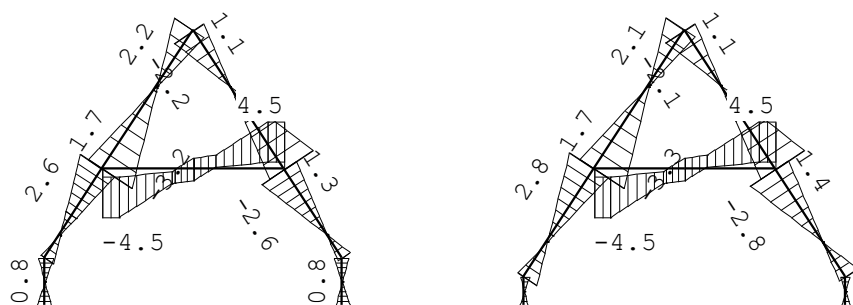
MOMENTEN

Fundamentele combinatie



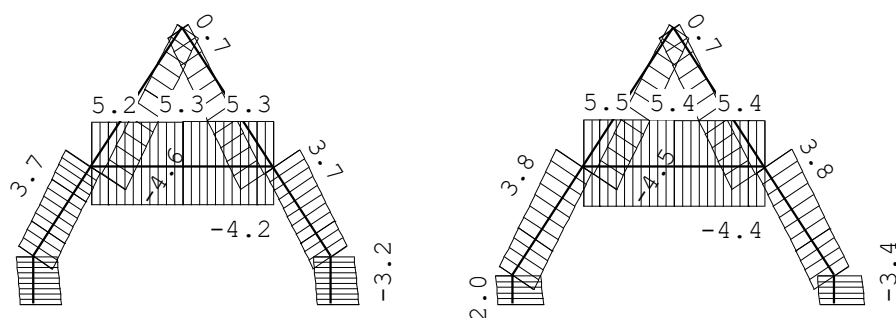
DWARSKRACHTEN

Fundamentele combinatie



NORMAALKRACHTEN

Fundamentele combinatie



REACTIES

Fundamentele combinatie

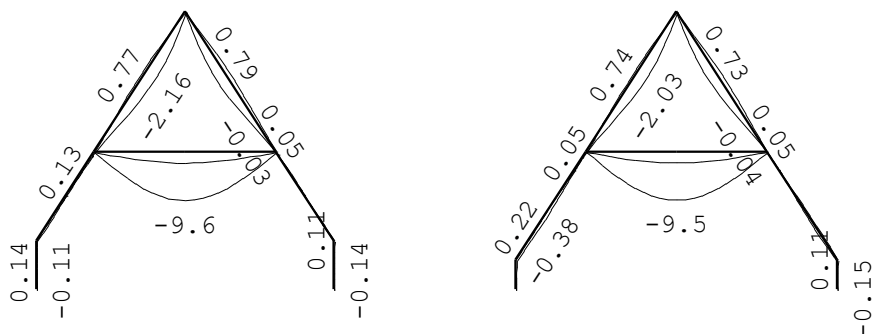
| Kn. | X-min | X-max | Z-min | Z-max | M-min | M-max |
|-----|-------|-------|-------|-------|-------|-------|
| 1 | -0.61 | 0.78 | -1.58 | 3.16 | | |
| 2 | -0.78 | 0.61 | -1.62 | 3.16 | | |
| 3 | -0.37 | 0.47 | -1.78 | 3.44 | | |
| 4 | -0.47 | 0.37 | -1.73 | 3.44 | | |
| 9 | | | 3.10 | 8.90 | | |
| 10 | -5.49 | 5.49 | | | | |
| 11 | | | 3.09 | 8.90 | | |
| 12 | | | 3.10 | 9.05 | | |
| 13 | -5.60 | 5.60 | | | | |
| 14 | | | 3.10 | 9.05 | | |

OMHULLENDE VAN DE KARAKTERISTIEKE COMBINATIES

VERPLAATSINGEN

[mm]

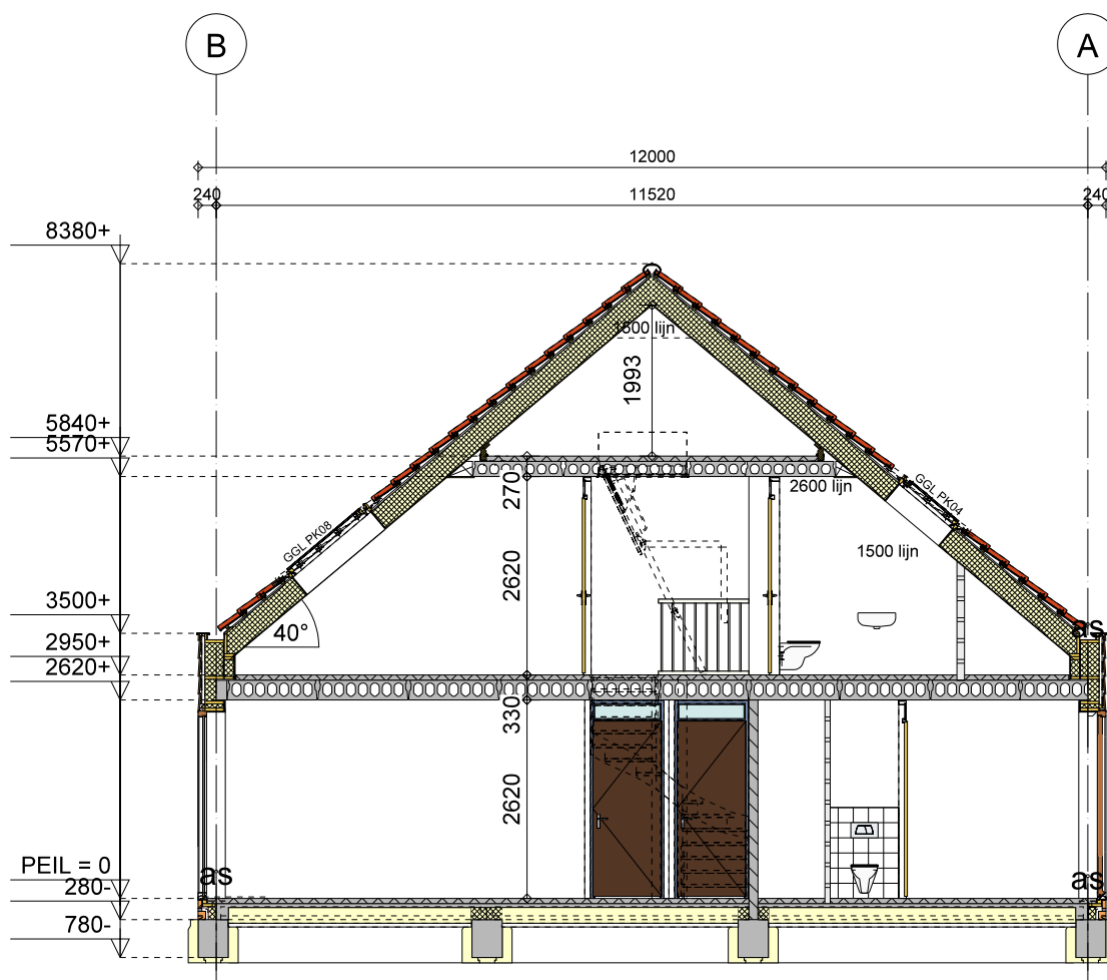
Karakteristieke combinatie



De kapconstructie is een prefab sporenkap die ligt op de zoldervloer en ter plaatse van de verdiepingvloer op een muurplaat. De sporenkap wordt door de leverancier verder uitgewerkt.

R.B. = 5,00 kN/m1
V.B. = 3,00 kN/m1

R.B. = 2,00 kN/m1
V.B. = 2,00 kN/m1



Technosoft Raamwerken release 6.81a

Project.....: 18107 - 14 woningen te Westzaan
 Onderdeel.....: afdracht kap type E en F
 Dimensies.....: kN;m;rad (tenzij anders aangegeven)
 Bestand.....: G:\7000 project\18107-KPO 24 woningen
 Westzaan\Documenten\Constructie\18107-afdracht kap type
 E.rww

Belastingbreedte.: 1.000

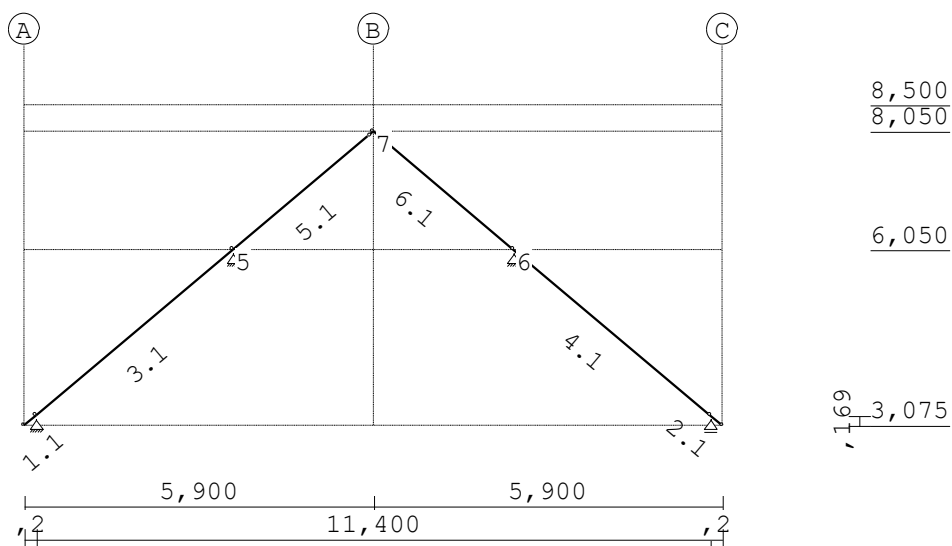
Theorie voor de bepaling van de krachtsverdeling: Geometrisch lineair.

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) |
| | NEN-EN 1991-1-3:2003 | C1:2009 | NB:2011(nl) |
| | NEN-EN 1991-1-4:2005 | C2:2011 | NB:2011(nl) |

GEOMETRIE



STRAMIENLIJNEN

| Nr. | Naam | X | Z-min | Z-max |
|-----|------|--------|-------|-------|
| 1 | A | 0.000 | 3.075 | 8.500 |
| 2 | B | 5.900 | 3.075 | 8.500 |
| 3 | C | 11.800 | 3.075 | 8.500 |

NIVEAUS

| Nr. | Z | X-min | X-max |
|-----|-------|-------|--------|
| 1 | 3.075 | 0.000 | 11.800 |
| 2 | 6.050 | 0.000 | 11.800 |
| 3 | 8.050 | 0.000 | 11.800 |
| 4 | 8.500 | 0.000 | 11.800 |

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 56*245 | 1:C18 | 1.3720e+04 | 6.8629e+07 | 0.00 |

PROFIELEN vervolg [mm]

| Prof. | Staaftype | Breedte | Hoogte | e | Type | b1 | h1 | b2 | h2 |
|-------|-----------|---------|--------|-------|------|----|----|----|----|
| 1 | 0:Normaal | 56 | 245 | 122.5 | 0:RH | | | | |

KNOPEN

| Knoop | X | Z | Knoop | X | Z |
|-------|--------|-------|-------|-------|-------|
| 1 | 0.000 | 3.075 | 6 | 8.272 | 6.050 |
| 2 | 11.800 | 3.075 | 7 | 5.900 | 8.050 |
| 3 | 0.200 | 3.244 | | | |
| 4 | 11.600 | 3.244 | | | |
| 5 | 3.528 | 6.050 | | | |

STAVEN

| St. | ki | kj | Profiel | Aansl.i | Aansl.j | Lengte | Opm. |
|-----|----|----|--------------|---------|---------|--------|------|
| 1 | 1 | 3 | 1:B*H 56*245 | NDM | NDM | 0.262 | |
| 2 | 4 | 2 | 1:B*H 56*245 | NDM | NDM | 0.262 | |
| 3 | 3 | 5 | 1:B*H 56*245 | NDM | NDM | 4.353 | |
| 4 | 6 | 4 | 1:B*H 56*245 | NDM | NDM | 4.353 | |
| 5 | 5 | 7 | 1:B*H 56*245 | NDM | ND- | 3.103 | |
| 6 | 7 | 6 | 1:B*H 56*245 | NDM | NDM | 3.103 | |

VASTE STEUNPUNTEN

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

BELASTINGGENERATIE ALGEMEEN.

| | | | |
|------------------------------|-------|--------------------------------------|------|
| Betrouwbaarheidsklasse.....: | 1 | Referentieperiode.....: | 50 |
| Gebouwdiepte.....: | 24.00 | Gebouwhoogte.....: | 8.50 |
| Niveau aansl.terrein.....: | 0.00 | E.g. scheid.w. [kN/m ²]: | 0.00 |

WIND

| | |
|-----------------------------------|----------------------------------|
| Terrein categorie ...[4.3.2]...: | Onbebouwd |
| Windgebied | 2 Vb,0 ..[4.2].....: 27.000 |
| Positie spant in het gebouw.....: | 2.000 Kr[4.3.2].....: 0.209 |
| z0[4.3.2]...: | 0.200 Zmin ..[4.3.2].....: 4.000 |

WIND

| | | | |
|-----------------------------------|-------|-------------------------|-------|
| 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

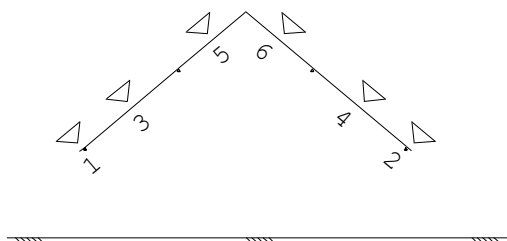
| | |
|--------------------------------|------|
| Sneeuwbelasting (sk) 50 jaar : | 0.70 |
| Sneeuwbelasting (sn) n jaar : | 0.70 |

STAAFTYPEN

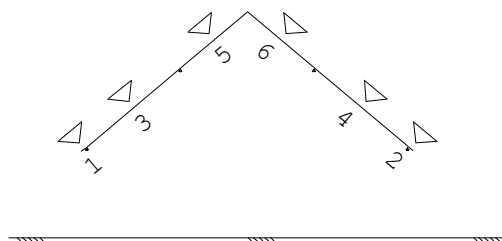
| | |
|--------|--------|
| Type | staven |
| 7:Dak. | : 1-6 |

LASTVELDEN

Wind staven



Sneeuw staven

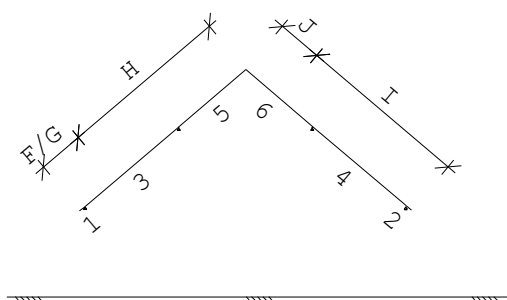


WIND DAKTYPES

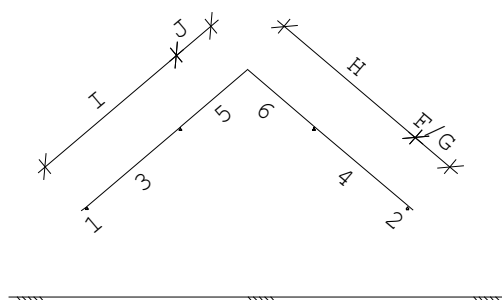
| Nr. | Staaft Type | reductie bij wind van links | reductie bij wind van rechts | Cpe volgens art: |
|-----|--------------|--------------------------------|---------------------------------|------------------|
| 1 | 1-5 Zadeldak | 1.000 | 1.000 | 7.2.5 |
| 2 | 6-2 Zadeldak | 1.000 | 1.000 | 7.2.5 |

WIND ZONES

Wind van links



Wind van rechts



WIND VAN LINKS ZONES

| Nr. | Staaft | Positie | Lengte | Zone |
|-----|--------|---------|--------|------|
| 1 | 1-5 | 0.000 | 1.610 | F/G |
| 2 | 1-5 | 1.610 | 6.108 | H |
| 3 | 6-2 | 0.000 | 1.610 | J |
| 4 | 6-2 | 1.610 | 6.108 | I |

WIND VAN RECHTS ZONES

| Nr. | Staaft | Positie | Lengte | Zone |
|-----|--------|---------|--------|------|
| 1 | 6-2 | 0.000 | 1.610 | F/G |
| 2 | 6-2 | 1.610 | 6.108 | H |
| 3 | 1-5 | 0.000 | 1.610 | J |
| 4 | 1-5 | 1.610 | 6.108 | I |

Wind indexen

| Index | CsCd | Cpe/Cpi | qp | breedte | reductie | Qw | Zone | Hoek(en) |
|-------|------|---------|-------|---------|----------|--------|------|----------|
| Qw1 | | 0.300 | 0.802 | 1.000 | | -0.241 | -i | |
| Qw2 | 1.00 | 0.700 | 0.802 | 1.000 | | -0.562 | F | 40.1 |
| Qw3 | 1.00 | 0.535 | 0.802 | 1.000 | | -0.429 | H | 40.1 |
| Qw4 | 1.00 | -0.365 | 0.802 | 1.000 | | 0.293 | J | 40.1 |
| Qw5 | 1.00 | -0.265 | 0.802 | 1.000 | | 0.213 | I | 40.1 |
| Qw6 | | -0.200 | 0.802 | 1.000 | | 0.160 | +i | |
| Qw7 | 1.00 | -0.163 | 0.802 | 1.000 | | 0.131 | F | 40.1 |
| Qw8 | 1.00 | -0.065 | 0.802 | 1.000 | | 0.052 | H | 40.1 |
| Qw9 | 1.00 | 1.200 | 0.802 | 0.860 | | -0.828 | A | 40.1 |
| Qw10 | 1.00 | 0.800 | 0.802 | 0.140 | | -0.090 | B | 40.1 |
| Qw11 | 1.00 | -0.867 | 0.802 | 1.000 | | 0.696 | H | 40.1 |
| Qw12 | 1.00 | 0.500 | 0.802 | 1.000 | | -0.401 | C | 40.1 |
| Qw13 | 1.00 | -0.500 | 0.802 | 1.000 | | 0.401 | I | 40.1 |

SNEEUW DAKTYPEN

| Staafl | artikel |
|--------|-----------------|
| 1-5 | 5.3.3 Zadelldak |
| 6-2 | 5.3.3 Zadelldak |

Sneeuw indexen

| Index | art | μ | s_k | red. posfac | breedte | Q_s | hoek |
|-------|-------|-------|-------|-------------|---------|-------|------|
| Qs1 | 5.3.3 | 0.530 | 0.70 | 1.00 | 1.000 | 0.371 | 40.1 |
| Qs2 | 5.3.3 | 0.530 | 0.70 | 1.00 | 1.000 | 0.371 | 40.1 |
| Qs3 | 5.3.3 | 0.265 | 0.70 | 1.00 | 1.000 | 0.185 | 40.1 |
| Qs4 | 5.3.3 | 0.265 | 0.70 | 1.00 | 1.000 | 0.185 | 40.1 |

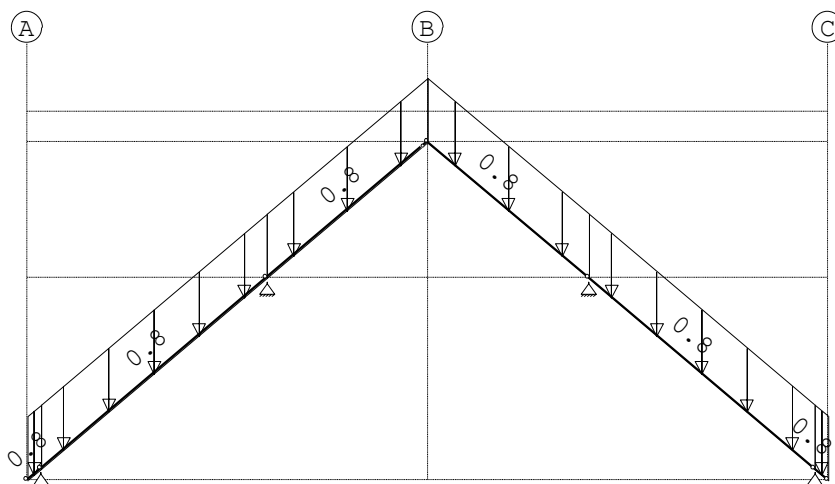
BELASTINGGEVALLEN

| B.G. | Omschrijving | Type |
|------|---------------------------------|------|
| | 1 Permanente belasting EGZ=0.00 | 1 |
| g | 2 Wind van links onderdruk A | 7 |
| g | 3 Wind van links overdruk A | 8 |
| g | 4 Wind van links onderdruk B | 9 |
| g | 5 Wind van links overdruk B | 10 |
| g | 6 Wind van links onderdruk C | 37 |
| g | 7 Wind van links overdruk C | 38 |
| g | 8 Wind van links onderdruk D | 39 |
| g | 9 Wind van links overdruk D | 40 |
| g | 10 Wind van rechts onderdruk A | 11 |
| g | 11 Wind van rechts overdruk A | 12 |
| g | 12 Wind van rechts onderdruk B | 13 |
| g | 13 Wind van rechts overdruk B | 14 |
| g | 14 Wind van rechts onderdruk C | 41 |
| g | 15 Wind van rechts overdruk C | 42 |
| g | 16 Wind van rechts onderdruk D | 43 |
| g | 17 Wind van rechts overdruk D | 44 |
| g | 18 Wind loodrecht onderdruk A | 15 |
| g | 19 Wind loodrecht overdruk A | 16 |
| g | 20 Wind loodrecht onderdruk B | 45 |
| g | 21 Wind loodrecht overdruk B | 46 |
| g | 22 Sneeuw A | 22 |
| g | 23 Sneeuw B | 23 |
| g | 24 Sneeuw C | 33 |

g = gegenereerd belastinggeval

BELASTINGEN

B.G:1 Permanente belasting



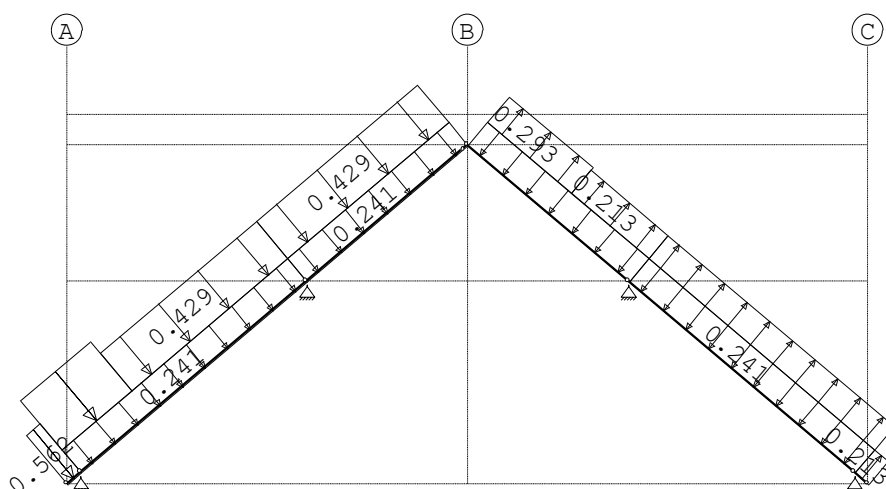
STAAFBELASTINGEN

B.G:1 Permanente belasting

| Staaftype | Type | q1/p/m | q2 | A | B | ψ_0 | ψ_1 | ψ_2 |
|-----------|-------------|--------|-------|-------|-------|----------|----------|----------|
| 1 | 5:QZGlobaal | -0.80 | -0.80 | 0.000 | 0.000 | | | |
| 3 | 5:QZGlobaal | -0.80 | -0.80 | 0.000 | 0.000 | | | |
| 5 | 5:QZGlobaal | -0.80 | -0.80 | 0.000 | 0.000 | | | |
| 6 | 5:QZGlobaal | -0.80 | -0.80 | 0.000 | 0.000 | | | |
| 4 | 5:QZGlobaal | -0.80 | -0.80 | 0.000 | 0.000 | | | |
| 2 | 5:QZGlobaal | -0.80 | -0.80 | 0.000 | 0.000 | | | |

BELASTINGEN

B.G:2 Wind van links onderdruk A



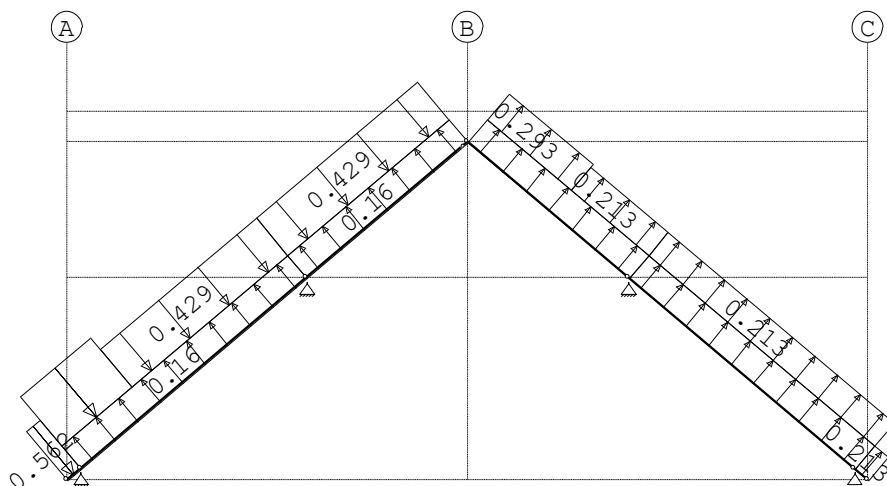
STAAFBELASTINGEN

B.G:2 Wind van links onderdruk A

| Staaftype | Type | Index | q1/p/m | q2 | A | B | ψ_0 | ψ_1 | ψ_2 |
|-----------|------------|-------|--------|-------|-------|-------|----------|----------|----------|
| 3 | 1:QZLokaal | Qw1 | -0.24 | -0.24 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 5 | 1:QZLokaal | Qw1 | -0.24 | -0.24 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 6 | 1:QZLokaal | Qw1 | -0.24 | -0.24 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 4 | 1:QZLokaal | Qw1 | -0.24 | -0.24 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 1 | 1:QZLokaal | Qw2 | -0.56 | -0.56 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 3 | 1:QZLokaal | Qw2 | -0.56 | -0.56 | 0.000 | 3.005 | 0.00 | 0.20 | 0.00 |
| 3 | 1:QZLokaal | Qw3 | -0.43 | -0.43 | 1.348 | 0.000 | 0.00 | 0.20 | 0.00 |
| 5 | 1:QZLokaal | Qw3 | -0.43 | -0.43 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 6 | 1:QZLokaal | Qw4 | 0.29 | 0.29 | 0.000 | 1.493 | 0.00 | 0.20 | 0.00 |
| 6 | 1:QZLokaal | Qw5 | 0.21 | 0.21 | 1.610 | 0.000 | 0.00 | 0.20 | 0.00 |
| 4 | 1:QZLokaal | Qw5 | 0.21 | 0.21 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 2 | 1:QZLokaal | Qw5 | 0.21 | 0.21 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |

BELASTINGEN

B.G:3 Wind van links overdruk A



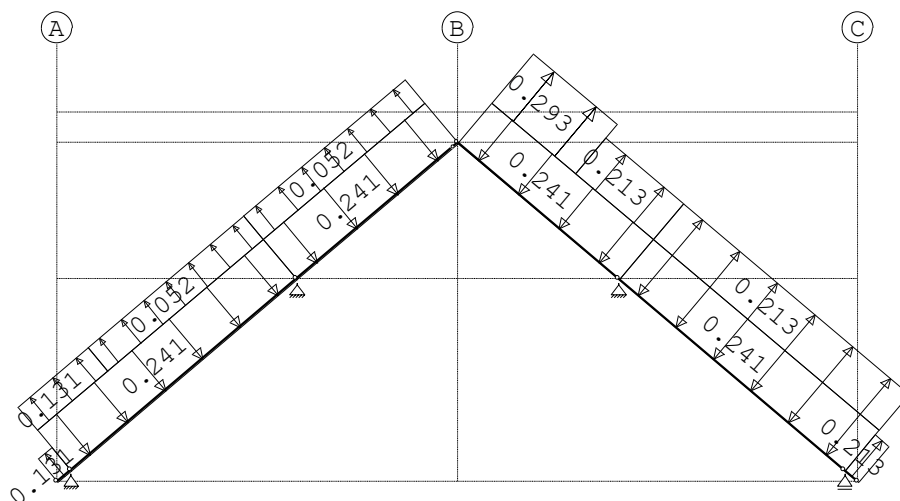
STAAFBELASTINGEN

B.G:3 Wind van links overdruk A

| Staaftype | Type | Index | q1/p/m | q2 | A | B | Ψ_0 | Ψ_1 | Ψ_2 |
|-----------|------------|-------|--------|-------|-------|-------|----------|----------|----------|
| 3 | 1:QZLokaal | Qw6 | 0.16 | 0.16 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 5 | 1:QZLokaal | Qw6 | 0.16 | 0.16 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 6 | 1:QZLokaal | Qw6 | 0.16 | 0.16 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 4 | 1:QZLokaal | Qw6 | 0.16 | 0.16 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 1 | 1:QZLokaal | Qw2 | -0.56 | -0.56 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 3 | 1:QZLokaal | Qw2 | -0.56 | -0.56 | 0.000 | 3.005 | 0.00 | 0.20 | 0.00 |
| 3 | 1:QZLokaal | Qw3 | -0.43 | -0.43 | 1.348 | 0.000 | 0.00 | 0.20 | 0.00 |
| 5 | 1:QZLokaal | Qw3 | -0.43 | -0.43 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 6 | 1:QZLokaal | Qw4 | 0.29 | 0.29 | 0.000 | 1.493 | 0.00 | 0.20 | 0.00 |
| 6 | 1:QZLokaal | Qw5 | 0.21 | 0.21 | 1.610 | 0.000 | 0.00 | 0.20 | 0.00 |
| 4 | 1:QZLokaal | Qw5 | 0.21 | 0.21 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 2 | 1:QZLokaal | Qw5 | 0.21 | 0.21 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |

BELASTINGEN

B.G:4 Wind van links onderdruk B



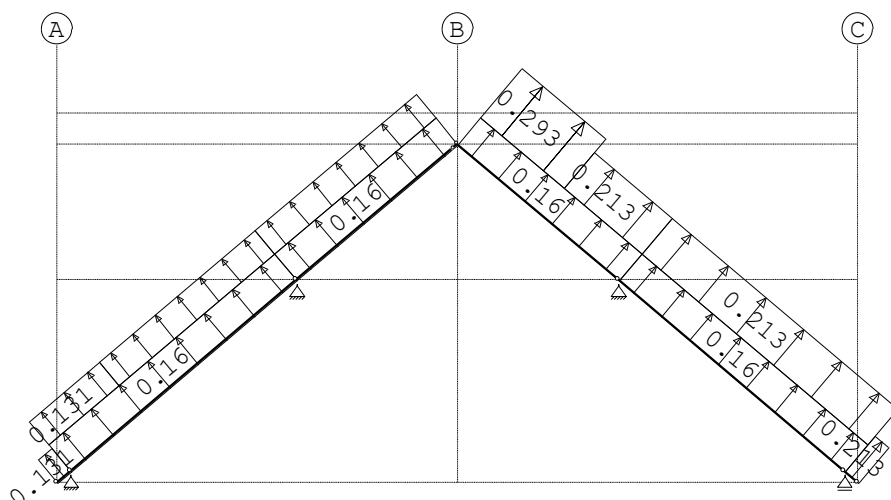
STAAFBELASTINGEN

B.G:4 Wind van links onderdruk B

| Staaft | Type | Index | q1/p/m | q2 | A | B | Ψ_0 | Ψ_1 | Ψ_2 |
|--------|------------|-------|--------|-------|-------|-------|----------|----------|----------|
| 3 | 1:QZLokaal | Qw1 | -0.24 | -0.24 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 5 | 1:QZLokaal | Qw1 | -0.24 | -0.24 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 6 | 1:QZLokaal | Qw1 | -0.24 | -0.24 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 4 | 1:QZLokaal | Qw1 | -0.24 | -0.24 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 1 | 1:QZLokaal | Qw7 | 0.13 | 0.13 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 3 | 1:QZLokaal | Qw7 | 0.13 | 0.13 | 0.000 | 3.005 | 0.00 | 0.20 | 0.00 |
| 3 | 1:QZLokaal | Qw8 | 0.05 | 0.05 | 1.348 | 0.000 | 0.00 | 0.20 | 0.00 |
| 5 | 1:QZLokaal | Qw8 | 0.05 | 0.05 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 6 | 1:QZLokaal | Qw4 | 0.29 | 0.29 | 0.000 | 1.493 | 0.00 | 0.20 | 0.00 |
| 6 | 1:QZLokaal | Qw5 | 0.21 | 0.21 | 1.610 | 0.000 | 0.00 | 0.20 | 0.00 |
| 4 | 1:QZLokaal | Qw5 | 0.21 | 0.21 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 2 | 1:QZLokaal | Qw5 | 0.21 | 0.21 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |

BELASTINGEN

B.G:5 Wind van links overdruk B



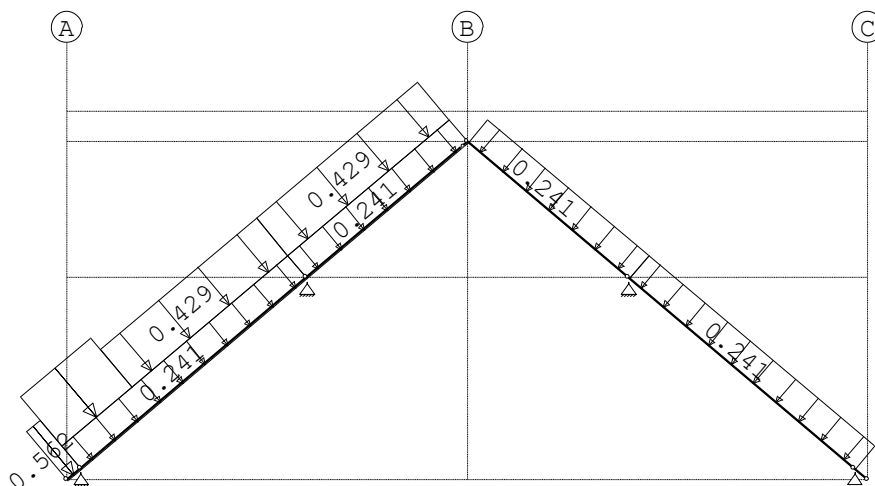
STAAFBELASTINGEN

B.G:5 Wind van links overdruk B

| Staaft | Type | Index | q1/p/m | q2 | A | B | Ψ_0 | Ψ_1 | Ψ_2 |
|--------|------------|-------|--------|------|-------|-------|----------|----------|----------|
| 3 | 1:QZLokaal | Qw6 | 0.16 | 0.16 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 5 | 1:QZLokaal | Qw6 | 0.16 | 0.16 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 6 | 1:QZLokaal | Qw6 | 0.16 | 0.16 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 4 | 1:QZLokaal | Qw6 | 0.16 | 0.16 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 1 | 1:QZLokaal | Qw7 | 0.13 | 0.13 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 3 | 1:QZLokaal | Qw7 | 0.13 | 0.13 | 0.000 | 3.005 | 0.00 | 0.20 | 0.00 |
| 3 | 1:QZLokaal | Qw8 | 0.05 | 0.05 | 1.348 | 0.000 | 0.00 | 0.20 | 0.00 |
| 5 | 1:QZLokaal | Qw8 | 0.05 | 0.05 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 6 | 1:QZLokaal | Qw4 | 0.29 | 0.29 | 0.000 | 1.493 | 0.00 | 0.20 | 0.00 |
| 6 | 1:QZLokaal | Qw5 | 0.21 | 0.21 | 1.610 | 0.000 | 0.00 | 0.20 | 0.00 |
| 4 | 1:QZLokaal | Qw5 | 0.21 | 0.21 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 2 | 1:QZLokaal | Qw5 | 0.21 | 0.21 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |

BELASTINGEN

B.G:6 Wind van links onderdruk C



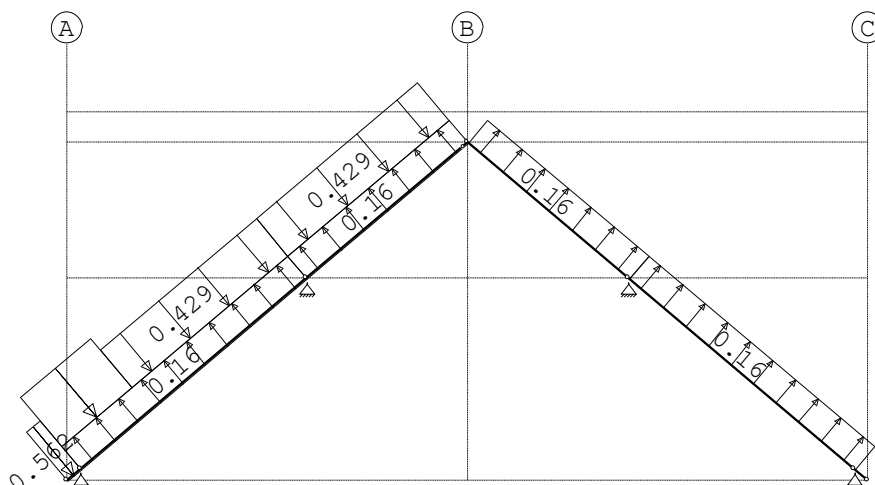
STAAFBELASTINGEN

B.G:6 Wind van links onderdruk C

| Staaftype | Type | Index | q1/p/m | q2 | A | B | Ψ_0 | Ψ_1 | Ψ_2 |
|-----------|------------|-------|--------|-------|-------|-------|----------|----------|----------|
| 3 | 1:QZLokaal | Qw1 | -0.24 | -0.24 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 5 | 1:QZLokaal | Qw1 | -0.24 | -0.24 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 6 | 1:QZLokaal | Qw1 | -0.24 | -0.24 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 4 | 1:QZLokaal | Qw1 | -0.24 | -0.24 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 1 | 1:QZLokaal | Qw2 | -0.56 | -0.56 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 3 | 1:QZLokaal | Qw2 | -0.56 | -0.56 | 0.000 | 3.005 | 0.00 | 0.20 | 0.00 |
| 3 | 1:QZLokaal | Qw3 | -0.43 | -0.43 | 1.348 | 0.000 | 0.00 | 0.20 | 0.00 |
| 5 | 1:QZLokaal | Qw3 | -0.43 | -0.43 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |

BELASTINGEN

B.G:7 Wind van links overdruk C



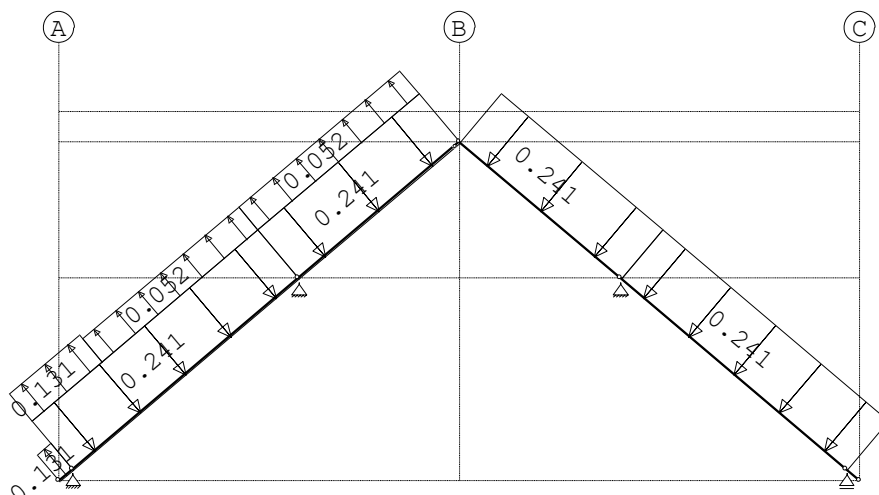
STAAFBELASTINGEN

B.G:7 Wind van links overdruk C

| Staaftype | Type | Index | q1/p/m | q2 | A | B | Ψ_0 | Ψ_1 | Ψ_2 |
|-----------|------------|-------|--------|-------|-------|-------|----------|----------|----------|
| 3 | 1:QZLokaal | Qw6 | 0.16 | 0.16 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 5 | 1:QZLokaal | Qw6 | 0.16 | 0.16 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 6 | 1:QZLokaal | Qw6 | 0.16 | 0.16 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 4 | 1:QZLokaal | Qw6 | 0.16 | 0.16 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 1 | 1:QZLokaal | Qw2 | -0.56 | -0.56 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 3 | 1:QZLokaal | Qw2 | -0.56 | -0.56 | 0.000 | 3.005 | 0.00 | 0.20 | 0.00 |
| 3 | 1:QZLokaal | Qw3 | -0.43 | -0.43 | 1.348 | 0.000 | 0.00 | 0.20 | 0.00 |
| 5 | 1:QZLokaal | Qw3 | -0.43 | -0.43 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |

BELASTINGEN

B.G:8 Wind van links onderdruk D



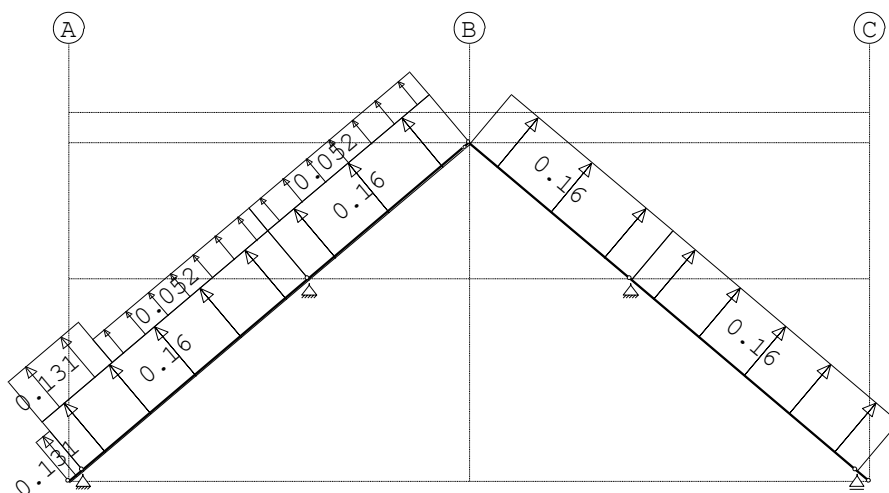
STAAFBELASTINGEN

B.G:8 Wind van links onderdruk D

| Staaftype | Type | Index | q1/p/m | q2 | A | B | ψ_0 | ψ_1 | ψ_2 |
|-----------|------------|-------|--------|-------|-------|-------|----------|----------|----------|
| 3 | 1:QZLokaal | Qw1 | -0.24 | -0.24 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 5 | 1:QZLokaal | Qw1 | -0.24 | -0.24 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 6 | 1:QZLokaal | Qw1 | -0.24 | -0.24 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 4 | 1:QZLokaal | Qw1 | -0.24 | -0.24 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 1 | 1:QZLokaal | Qw7 | 0.13 | 0.13 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 3 | 1:QZLokaal | Qw7 | 0.13 | 0.13 | 0.000 | 3.005 | 0.00 | 0.20 | 0.00 |
| 3 | 1:QZLokaal | Qw8 | 0.05 | 0.05 | 1.348 | 0.000 | 0.00 | 0.20 | 0.00 |
| 5 | 1:QZLokaal | Qw8 | 0.05 | 0.05 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |

BELASTINGEN

B.G:9 Wind van links overdruk D



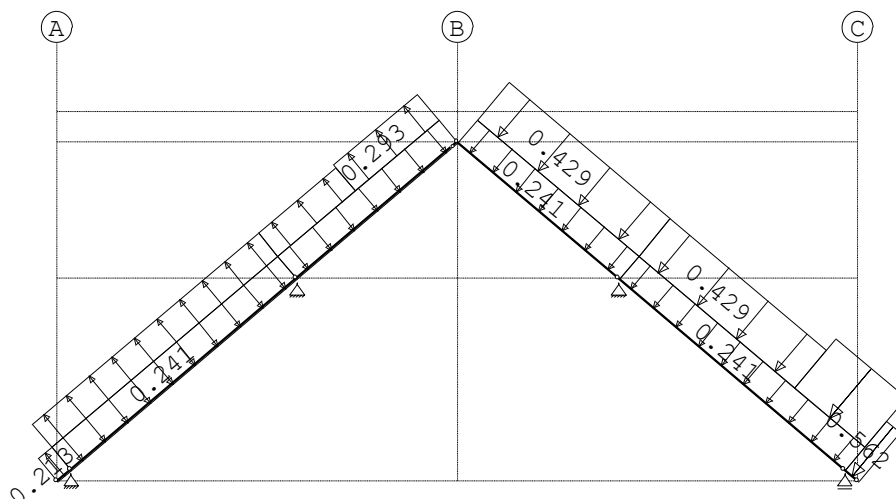
STAAFBELASTINGEN

B.G:9 Wind van links overdruk D

| Staaftype | Type | Index | q1/p/m | q2 | A | B | ψ_0 | ψ_1 | ψ_2 |
|-----------|------------|-------|--------|------|-------|-------|----------|----------|----------|
| 3 | 1:QZLokaal | Qw6 | 0.16 | 0.16 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 5 | 1:QZLokaal | Qw6 | 0.16 | 0.16 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 6 | 1:QZLokaal | Qw6 | 0.16 | 0.16 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 4 | 1:QZLokaal | Qw6 | 0.16 | 0.16 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 1 | 1:QZLokaal | Qw7 | 0.13 | 0.13 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 3 | 1:QZLokaal | Qw7 | 0.13 | 0.13 | 0.000 | 3.005 | 0.00 | 0.20 | 0.00 |
| 3 | 1:QZLokaal | Qw8 | 0.05 | 0.05 | 1.348 | 0.000 | 0.00 | 0.20 | 0.00 |
| 5 | 1:QZLokaal | Qw8 | 0.05 | 0.05 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |

BELASTINGEN

B.G:10 Wind van rechts onderdruk A



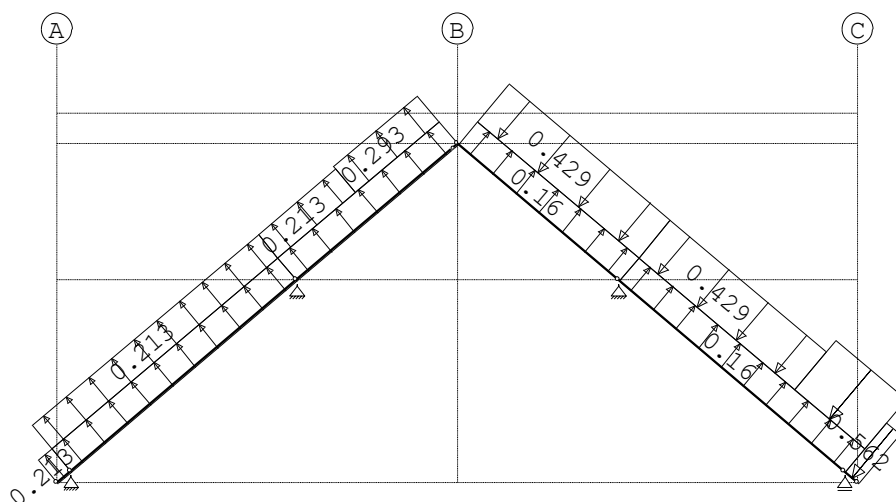
STAAFBELASTINGEN

B.G:10 Wind van rechts onderdruk A

| Staaftype | Type | Index | q1/p/m | q2 | A | B | ψ_0 | ψ_1 | ψ_2 |
|-----------|------------|-------|--------|-------|-------|-------|----------|----------|----------|
| 3 | 1:QZLokaal | Qw1 | -0.24 | -0.24 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 5 | 1:QZLokaal | Qw1 | -0.24 | -0.24 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 6 | 1:QZLokaal | Qw1 | -0.24 | -0.24 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 4 | 1:QZLokaal | Qw1 | -0.24 | -0.24 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 2 | 1:QZLokaal | Qw2 | -0.56 | -0.56 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 4 | 1:QZLokaal | Qw2 | -0.56 | -0.56 | 3.005 | 0.000 | 0.00 | 0.20 | 0.00 |
| 4 | 1:QZLokaal | Qw3 | -0.43 | -0.43 | 0.000 | 1.348 | 0.00 | 0.20 | 0.00 |
| 6 | 1:QZLokaal | Qw3 | -0.43 | -0.43 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 5 | 1:QZLokaal | Qw4 | 0.29 | 0.29 | 1.493 | 0.000 | 0.00 | 0.20 | 0.00 |
| 5 | 1:QZLokaal | Qw5 | 0.21 | 0.21 | 0.000 | 1.610 | 0.00 | 0.20 | 0.00 |
| 3 | 1:QZLokaal | Qw5 | 0.21 | 0.21 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 1 | 1:QZLokaal | Qw5 | 0.21 | 0.21 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |

BELASTINGEN

B.G:11 Wind van rechts overdruk A



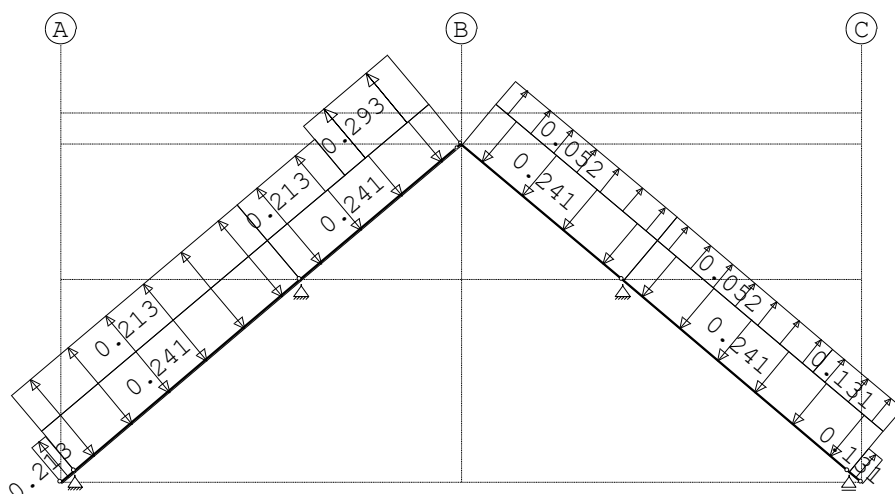
STAAFBELASTINGEN

B.G:11 Wind van rechts overdruk A

| Staaftype | Type | Index | q1/p/m | q2 | A | B | Ψ_0 | Ψ_1 | Ψ_2 |
|-----------|------------|-------|--------|-------|-------|-------|----------|----------|----------|
| 3 | 1:QZLokaal | Qw6 | 0.16 | 0.16 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 5 | 1:QZLokaal | Qw6 | 0.16 | 0.16 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 6 | 1:QZLokaal | Qw6 | 0.16 | 0.16 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 4 | 1:QZLokaal | Qw6 | 0.16 | 0.16 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 2 | 1:QZLokaal | Qw2 | -0.56 | -0.56 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 4 | 1:QZLokaal | Qw2 | -0.56 | -0.56 | 3.005 | 0.000 | 0.00 | 0.20 | 0.00 |
| 4 | 1:QZLokaal | Qw3 | -0.43 | -0.43 | 0.000 | 1.348 | 0.00 | 0.20 | 0.00 |
| 6 | 1:QZLokaal | Qw3 | -0.43 | -0.43 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 5 | 1:QZLokaal | Qw4 | 0.29 | 0.29 | 1.493 | 0.000 | 0.00 | 0.20 | 0.00 |
| 5 | 1:QZLokaal | Qw5 | 0.21 | 0.21 | 0.000 | 1.610 | 0.00 | 0.20 | 0.00 |
| 3 | 1:QZLokaal | Qw5 | 0.21 | 0.21 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 1 | 1:QZLokaal | Qw5 | 0.21 | 0.21 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |

BELASTINGEN

B.G:12 Wind van rechts onderdruk B



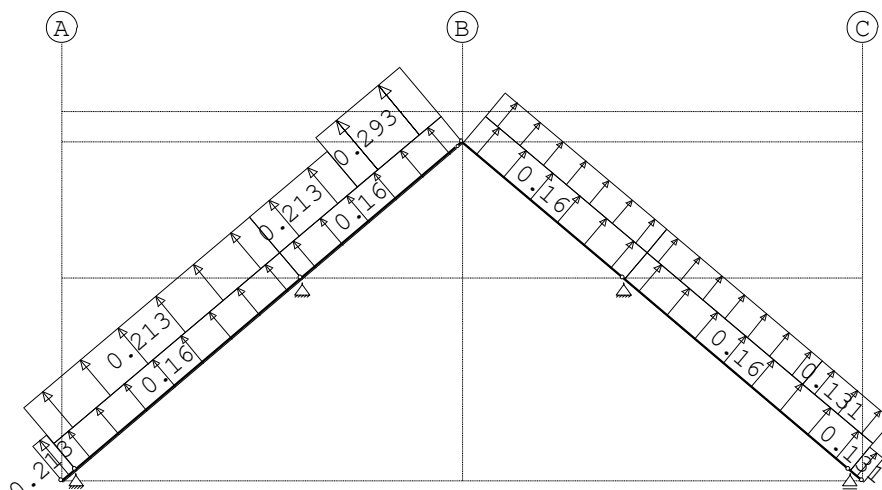
STAAFBELASTINGEN

B.G:12 Wind van rechts onderdruk B

| Staaftype | Type | Index | q1/p/m | q2 | A | B | Ψ_0 | Ψ_1 | Ψ_2 |
|-----------|------------|-------|--------|-------|-------|-------|----------|----------|----------|
| 3 | 1:QZLokaal | Qw1 | -0.24 | -0.24 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 5 | 1:QZLokaal | Qw1 | -0.24 | -0.24 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 6 | 1:QZLokaal | Qw1 | -0.24 | -0.24 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 4 | 1:QZLokaal | Qw1 | -0.24 | -0.24 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 2 | 1:QZLokaal | Qw7 | 0.13 | 0.13 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 4 | 1:QZLokaal | Qw7 | 0.13 | 0.13 | 3.005 | 0.000 | 0.00 | 0.20 | 0.00 |
| 4 | 1:QZLokaal | Qw8 | 0.05 | 0.05 | 0.000 | 1.348 | 0.00 | 0.20 | 0.00 |
| 6 | 1:QZLokaal | Qw8 | 0.05 | 0.05 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 5 | 1:QZLokaal | Qw4 | 0.29 | 0.29 | 1.493 | 0.000 | 0.00 | 0.20 | 0.00 |
| 5 | 1:QZLokaal | Qw5 | 0.21 | 0.21 | 0.000 | 1.610 | 0.00 | 0.20 | 0.00 |
| 3 | 1:QZLokaal | Qw5 | 0.21 | 0.21 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 1 | 1:QZLokaal | Qw5 | 0.21 | 0.21 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |

BELASTINGEN

B.G:13 Wind van rechts overdruk B



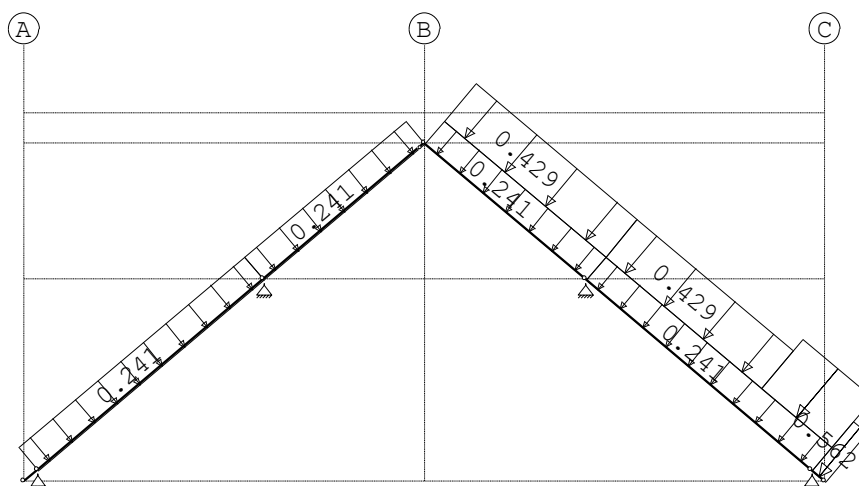
STAAFBELASTINGEN

B.G:13 Wind van rechts overdruk B

| Staaftype | Type | Index | q1/p/m | q2 | A | B | Ψ_0 | Ψ_1 | Ψ_2 |
|-----------|------------|-------|--------|------|-------|-------|----------|----------|----------|
| 3 | 1:QZLokaal | Qw6 | 0.16 | 0.16 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 5 | 1:QZLokaal | Qw6 | 0.16 | 0.16 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 6 | 1:QZLokaal | Qw6 | 0.16 | 0.16 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 4 | 1:QZLokaal | Qw6 | 0.16 | 0.16 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 2 | 1:QZLokaal | Qw7 | 0.13 | 0.13 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 4 | 1:QZLokaal | Qw7 | 0.13 | 0.13 | 3.005 | 0.000 | 0.00 | 0.20 | 0.00 |
| 4 | 1:QZLokaal | Qw8 | 0.05 | 0.05 | 0.000 | 1.348 | 0.00 | 0.20 | 0.00 |
| 6 | 1:QZLokaal | Qw8 | 0.05 | 0.05 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 5 | 1:QZLokaal | Qw4 | 0.29 | 0.29 | 1.493 | 0.000 | 0.00 | 0.20 | 0.00 |
| 5 | 1:QZLokaal | Qw5 | 0.21 | 0.21 | 0.000 | 1.610 | 0.00 | 0.20 | 0.00 |
| 3 | 1:QZLokaal | Qw5 | 0.21 | 0.21 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 1 | 1:QZLokaal | Qw5 | 0.21 | 0.21 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |

BELASTINGEN

B.G:14 Wind van rechts onderdruk C



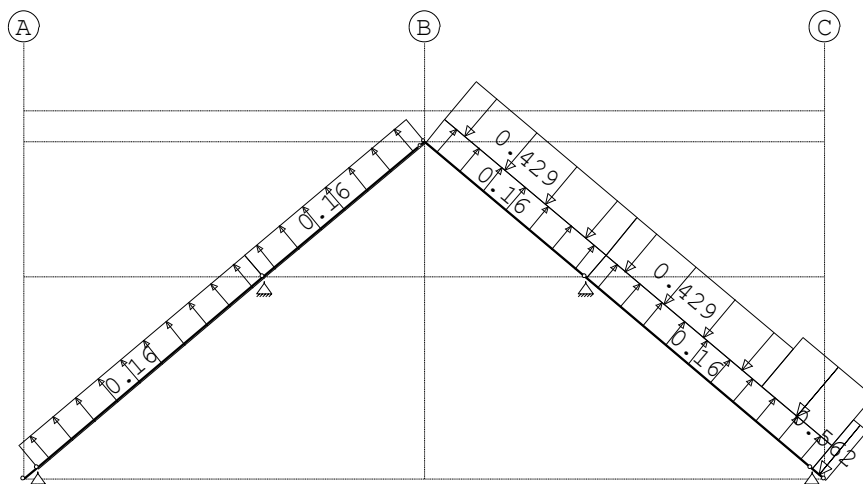
STAAFBELASTINGEN

B.G:14 Wind van rechts onderdruk C

| Staaf | Type | Index | q1/p/m | q2 | A | B | Ψ_0 | Ψ_1 | Ψ_2 |
|-------|------------|-------|--------|-------|-------|-------|----------|----------|----------|
| 3 | 1:QZLokaal | Qw1 | -0.24 | -0.24 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 5 | 1:QZLokaal | Qw1 | -0.24 | -0.24 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 6 | 1:QZLokaal | Qw1 | -0.24 | -0.24 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 4 | 1:QZLokaal | Qw1 | -0.24 | -0.24 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 2 | 1:QZLokaal | Qw2 | -0.56 | -0.56 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 4 | 1:QZLokaal | Qw2 | -0.56 | -0.56 | 3.005 | 0.000 | 0.00 | 0.20 | 0.00 |
| 4 | 1:QZLokaal | Qw3 | -0.43 | -0.43 | 0.000 | 1.348 | 0.00 | 0.20 | 0.00 |
| 6 | 1:QZLokaal | Qw3 | -0.43 | -0.43 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |

BELASTINGEN

B.G:15 Wind van rechts overdruk C



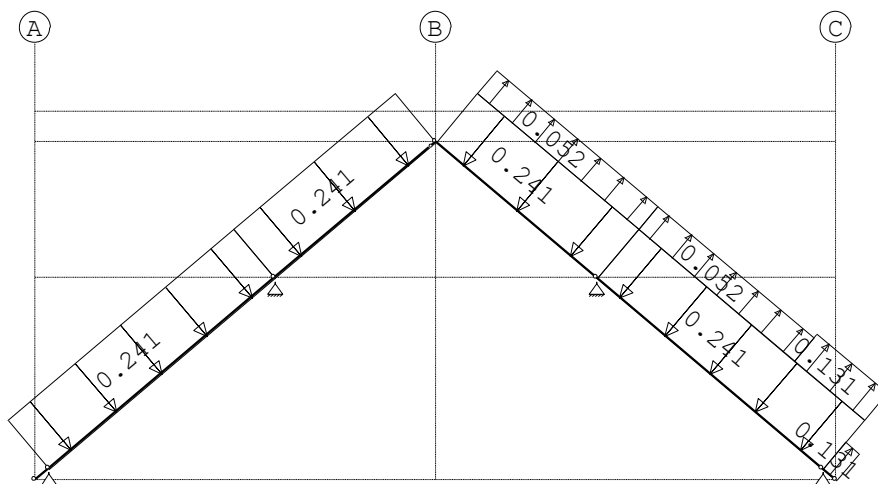
STAAFBELASTINGEN

B.G:15 Wind van rechts overdruk C

| Staaf | Type | Index | q1/p/m | q2 | A | B | Ψ_0 | Ψ_1 | Ψ_2 |
|-------|------------|-------|--------|-------|-------|-------|----------|----------|----------|
| 3 | 1:QZLokaal | Qw6 | 0.16 | 0.16 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 5 | 1:QZLokaal | Qw6 | 0.16 | 0.16 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 6 | 1:QZLokaal | Qw6 | 0.16 | 0.16 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 4 | 1:QZLokaal | Qw6 | 0.16 | 0.16 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 2 | 1:QZLokaal | Qw2 | -0.56 | -0.56 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 4 | 1:QZLokaal | Qw2 | -0.56 | -0.56 | 3.005 | 0.000 | 0.00 | 0.20 | 0.00 |
| 4 | 1:QZLokaal | Qw3 | -0.43 | -0.43 | 0.000 | 1.348 | 0.00 | 0.20 | 0.00 |
| 6 | 1:QZLokaal | Qw3 | -0.43 | -0.43 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |

BELASTINGEN

B.G:16 Wind van rechts onderdruk D



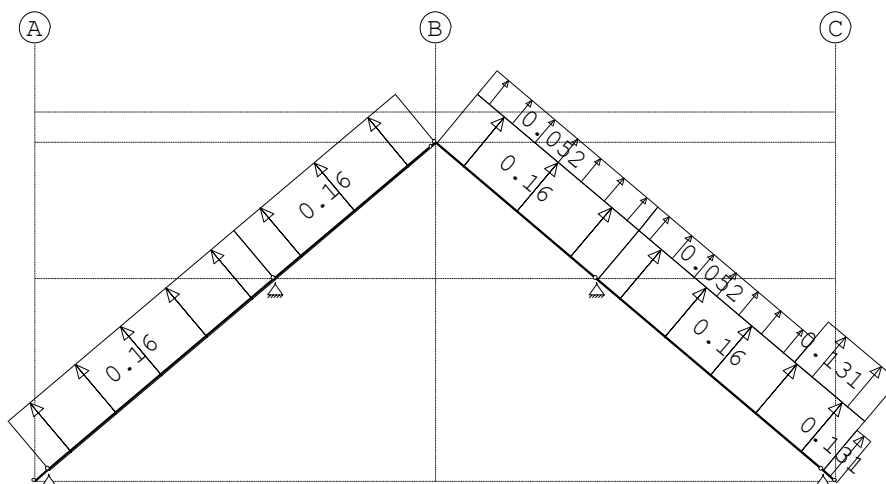
STAAFBELASTINGEN

B.G:16 Wind van rechts onderdruk D

| Staaftype | Type | Index | q1/p/m | q2 | A | B | Ψ_0 | Ψ_1 | Ψ_2 |
|-----------|------------|-------|--------|-------|-------|-------|----------|----------|----------|
| 3 | 1:QZLokaal | Qw1 | -0.24 | -0.24 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 5 | 1:QZLokaal | Qw1 | -0.24 | -0.24 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 6 | 1:QZLokaal | Qw1 | -0.24 | -0.24 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 4 | 1:QZLokaal | Qw1 | -0.24 | -0.24 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 2 | 1:QZLokaal | Qw7 | 0.13 | 0.13 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 4 | 1:QZLokaal | Qw7 | 0.13 | 0.13 | 3.005 | 0.000 | 0.00 | 0.20 | 0.00 |
| 4 | 1:QZLokaal | Qw8 | 0.05 | 0.05 | 0.000 | 1.348 | 0.00 | 0.20 | 0.00 |
| 6 | 1:QZLokaal | Qw8 | 0.05 | 0.05 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |

BELASTINGEN

B.G:17 Wind van rechts overdruk D



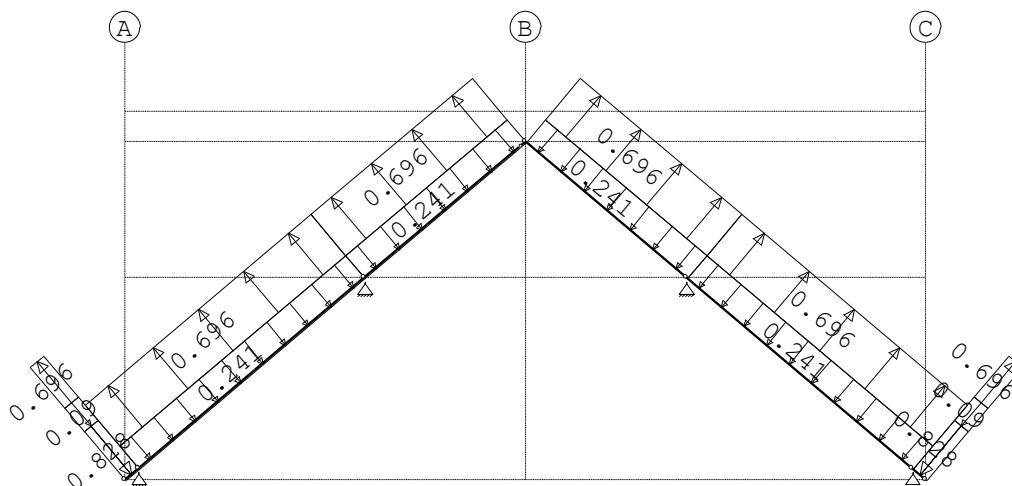
STAAFBELASTINGEN

B.G:17 Wind van rechts overdruk D

| Staaftype | Type | Index | q1/p/m | q2 | A | B | Ψ_0 | Ψ_1 | Ψ_2 |
|-----------|------------|-------|--------|------|-------|-------|----------|----------|----------|
| 3 | 1:QZLokaal | Qw6 | 0.16 | 0.16 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 5 | 1:QZLokaal | Qw6 | 0.16 | 0.16 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 6 | 1:QZLokaal | Qw6 | 0.16 | 0.16 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 4 | 1:QZLokaal | Qw6 | 0.16 | 0.16 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 2 | 1:QZLokaal | Qw7 | 0.13 | 0.13 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 4 | 1:QZLokaal | Qw7 | 0.13 | 0.13 | 3.005 | 0.000 | 0.00 | 0.20 | 0.00 |
| 4 | 1:QZLokaal | Qw8 | 0.05 | 0.05 | 0.000 | 1.348 | 0.00 | 0.20 | 0.00 |
| 6 | 1:QZLokaal | Qw8 | 0.05 | 0.05 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |

BELASTINGEN

B.G:18 Wind loodrecht onderdruk A



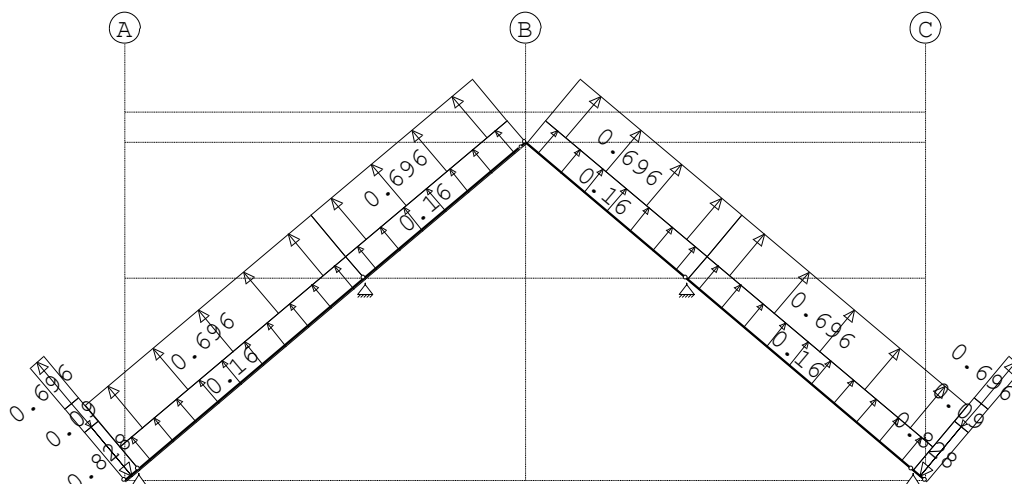
STAAFBELASTINGEN

B.G:18 Wind loodrecht onderdruk A

| Staaft | Type | Index | q1/p/m | q2 | A | B | Ψ_0 | Ψ_1 | Ψ_2 |
|--------|------------|-------|--------|-------|-------|-------|----------|----------|----------|
| 3 | 1:QZLokaal | Qw1 | -0.24 | -0.24 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 5 | 1:QZLokaal | Qw1 | -0.24 | -0.24 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 6 | 1:QZLokaal | Qw1 | -0.24 | -0.24 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 4 | 1:QZLokaal | Qw1 | -0.24 | -0.24 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 1 | 1:QZLokaal | Qw9 | -0.83 | -0.83 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 1 | 1:QZLokaal | Qw10 | -0.09 | -0.09 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 1 | 1:QZLokaal | Qw11 | 0.70 | 0.70 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 3 | 1:QZLokaal | Qw11 | 0.70 | 0.70 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 5 | 1:QZLokaal | Qw11 | 0.70 | 0.70 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 6 | 1:QZLokaal | Qw11 | 0.70 | 0.70 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 4 | 1:QZLokaal | Qw11 | 0.70 | 0.70 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 2 | 1:QZLokaal | Qw9 | -0.83 | -0.83 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 2 | 1:QZLokaal | Qw10 | -0.09 | -0.09 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 2 | 1:QZLokaal | Qw11 | 0.70 | 0.70 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |

BELASTINGEN

B.G:19 Wind loodrecht overdruk A



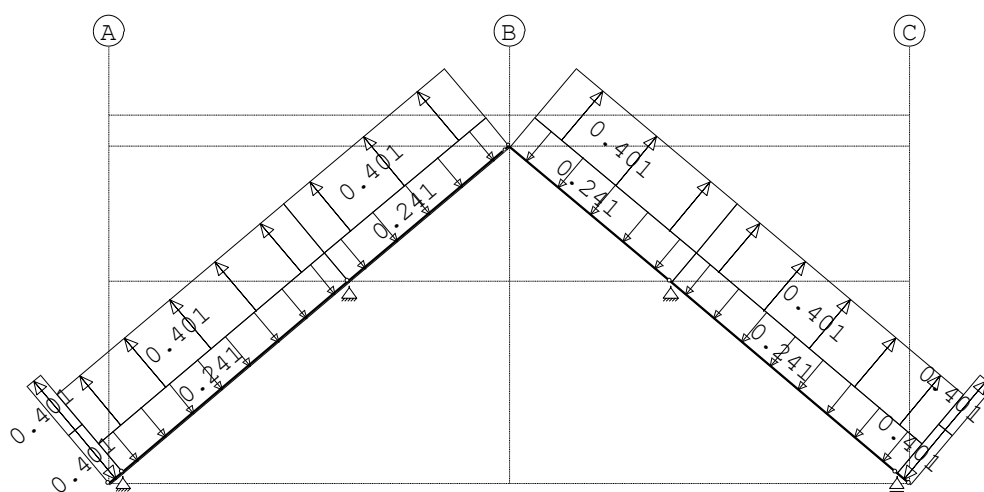
STAAFBELASTINGEN

B.G:19 Wind loodrecht overdruk A

| Staaf | Type | Index | q1/p/m | q2 | A | B | Ψ_0 | Ψ_1 | Ψ_2 |
|-------|------------|-------|--------|-------|-------|-------|----------|----------|----------|
| 3 | 1:QZLokaal | Qw6 | 0.16 | 0.16 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 5 | 1:QZLokaal | Qw6 | 0.16 | 0.16 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 6 | 1:QZLokaal | Qw6 | 0.16 | 0.16 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 4 | 1:QZLokaal | Qw6 | 0.16 | 0.16 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 1 | 1:QZLokaal | Qw9 | -0.83 | -0.83 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 1 | 1:QZLokaal | Qw10 | -0.09 | -0.09 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 1 | 1:QZLokaal | Qw11 | 0.70 | 0.70 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 3 | 1:QZLokaal | Qw11 | 0.70 | 0.70 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 5 | 1:QZLokaal | Qw11 | 0.70 | 0.70 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 6 | 1:QZLokaal | Qw11 | 0.70 | 0.70 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 4 | 1:QZLokaal | Qw11 | 0.70 | 0.70 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 2 | 1:QZLokaal | Qw9 | -0.83 | -0.83 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 2 | 1:QZLokaal | Qw10 | -0.09 | -0.09 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 2 | 1:QZLokaal | Qw11 | 0.70 | 0.70 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |

BELASTINGEN

B.G:20 Wind loodrecht onderdruk B



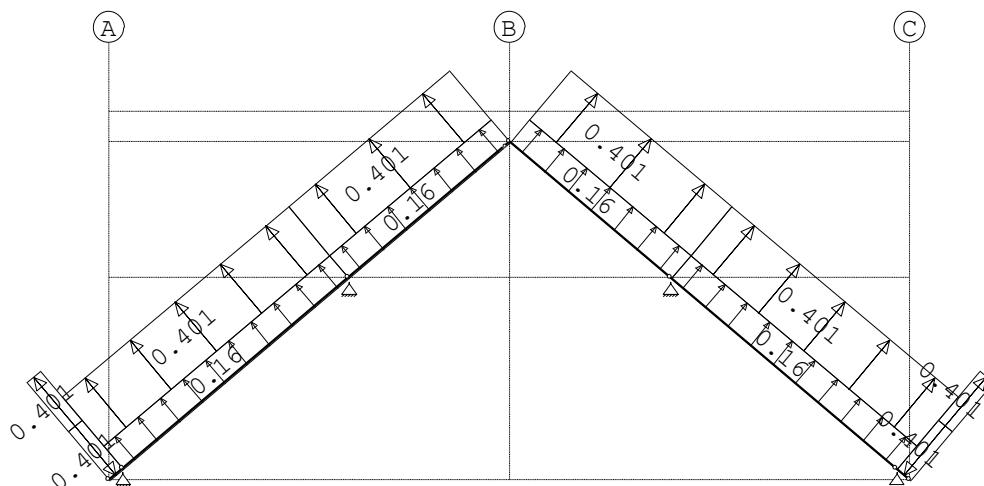
STAAFBELASTINGEN

B.G:20 Wind loodrecht onderdruk B

| Staaf | Type | Index | q1/p/m | q2 | A | B | Ψ_0 | Ψ_1 | Ψ_2 |
|-------|------------|-------|--------|-------|-------|-------|----------|----------|----------|
| 3 | 1:QZLokaal | Qw1 | -0.24 | -0.24 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 5 | 1:QZLokaal | Qw1 | -0.24 | -0.24 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 6 | 1:QZLokaal | Qw1 | -0.24 | -0.24 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 4 | 1:QZLokaal | Qw1 | -0.24 | -0.24 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 1 | 1:QZLokaal | Qw12 | -0.40 | -0.40 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 1 | 1:QZLokaal | Qw13 | 0.40 | 0.40 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 3 | 1:QZLokaal | Qw13 | 0.40 | 0.40 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 5 | 1:QZLokaal | Qw13 | 0.40 | 0.40 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 6 | 1:QZLokaal | Qw13 | 0.40 | 0.40 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 4 | 1:QZLokaal | Qw13 | 0.40 | 0.40 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 2 | 1:QZLokaal | Qw12 | -0.40 | -0.40 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 2 | 1:QZLokaal | Qw13 | 0.40 | 0.40 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |

BELASTINGEN

B.G:21 Wind loodrecht overdruk B



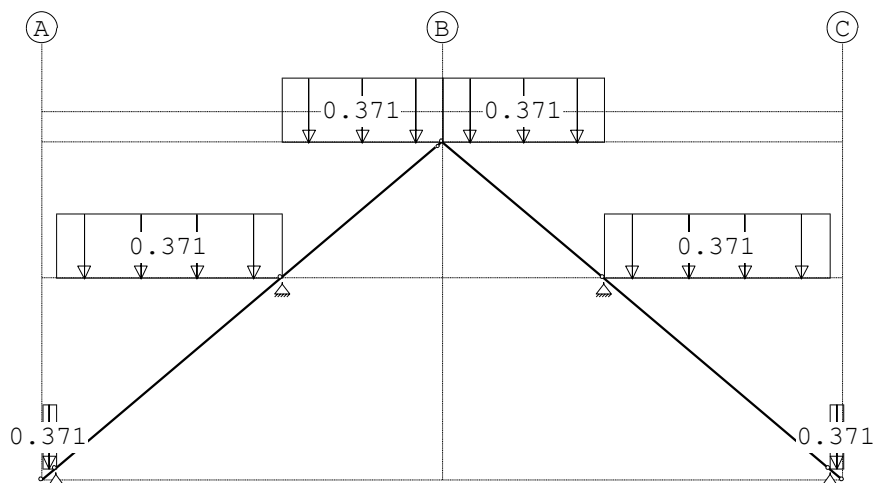
STAAFBELASTINGEN

B.G:21 Wind loodrecht overdruk B

| Staafl | Type | Index | q1/p/m | q2 | A | B | Ψ_0 | Ψ_1 | Ψ_2 |
|--------|------------|-------|--------|-------|-------|-------|----------|----------|----------|
| 3 | 1:QZLokaal | Qw6 | 0.16 | 0.16 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 5 | 1:QZLokaal | Qw6 | 0.16 | 0.16 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 6 | 1:QZLokaal | Qw6 | 0.16 | 0.16 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 4 | 1:QZLokaal | Qw6 | 0.16 | 0.16 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 1 | 1:QZLokaal | Qw12 | -0.40 | -0.40 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 1 | 1:QZLokaal | Qw13 | 0.40 | 0.40 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 3 | 1:QZLokaal | Qw13 | 0.40 | 0.40 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 5 | 1:QZLokaal | Qw13 | 0.40 | 0.40 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 6 | 1:QZLokaal | Qw13 | 0.40 | 0.40 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 4 | 1:QZLokaal | Qw13 | 0.40 | 0.40 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 2 | 1:QZLokaal | Qw12 | -0.40 | -0.40 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 2 | 1:QZLokaal | Qw13 | 0.40 | 0.40 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |

BELASTINGEN

B.G:22 Sneeuw A



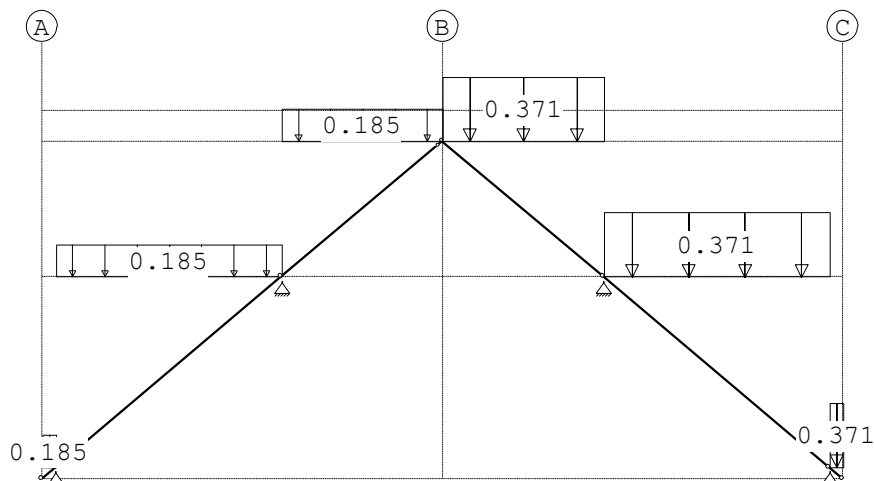
STAAFBELASTINGEN

B.G:22 Sneeuw A

| Staaftype | Index | q1/p/m | q2 | A | B | Ψ_0 | Ψ_1 | Ψ_2 |
|---------------|-------|--------|-------|-------|-------|----------|----------|----------|
| 1 3:QZgeProj. | Qs1 | -0.37 | -0.37 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 2 3:QZgeProj. | Qs2 | -0.37 | -0.37 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 3 3:QZgeProj. | Qs1 | -0.37 | -0.37 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 4 3:QZgeProj. | Qs1 | -0.37 | -0.37 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 5 3:QZgeProj. | Qs1 | -0.37 | -0.37 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 6 3:QZgeProj. | Qs1 | -0.37 | -0.37 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |

BELASTINGEN

B.G:23 Sneeuw B



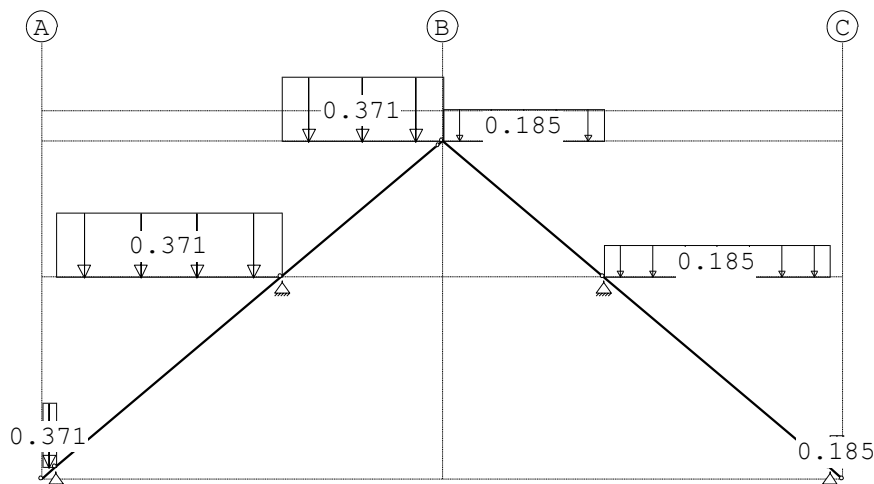
STAAFBELASTINGEN

B.G:23 Sneeuw B

| Staaftype | Index | q1/p/m | q2 | A | B | Ψ_0 | Ψ_1 | Ψ_2 |
|---------------|-------|--------|-------|-------|-------|----------|----------|----------|
| 1 3:QZgeProj. | Qs3 | -0.19 | -0.19 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 2 3:QZgeProj. | Qs2 | -0.37 | -0.37 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 3 3:QZgeProj. | Qs3 | -0.19 | -0.19 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 4 3:QZgeProj. | Qs1 | -0.37 | -0.37 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 5 3:QZgeProj. | Qs3 | -0.19 | -0.19 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 6 3:QZgeProj. | Qs1 | -0.37 | -0.37 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |

BELASTINGEN

B.G:24 Sneeuw C



STAAFBELASTINGEN

B.G:24 Sneeuw C

| Staaf | Type | Index | q1/p/m | q2 | A | B | Ψ_0 | Ψ_1 | Ψ_2 |
|-------|-------------|-------|--------|-------|-------|-------|----------|----------|----------|
| 1 | 3:QZgeProj. | Qs1 | -0.37 | -0.37 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 2 | 3:QZgeProj. | Qs4 | -0.19 | -0.19 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 3 | 3:QZgeProj. | Qs1 | -0.37 | -0.37 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 4 | 3:QZgeProj. | Qs3 | -0.19 | -0.19 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 5 | 3:QZgeProj. | Qs1 | -0.37 | -0.37 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |
| 6 | 3:QZgeProj. | Qs3 | -0.19 | -0.19 | 0.000 | 0.000 | 0.00 | 0.20 | 0.00 |

REACTIES

| Kn. | B.G. | X | Z | M |
|-----|------|-------|-------|---|
| 3 | 1 | 0.17 | 1.75 | |
| 3 | 2 | -0.94 | 1.12 | |
| 3 | 3 | -0.49 | 0.58 | |
| 3 | 4 | -0.13 | 0.16 | |
| 3 | 5 | 0.32 | -0.38 | |
| 3 | 6 | -0.94 | 1.12 | |
| 3 | 7 | -0.49 | 0.58 | |
| 3 | 8 | -0.13 | 0.16 | |
| 3 | 9 | 0.32 | -0.38 | |
| 3 | 10 | 0.00 | -0.00 | |
| 3 | 11 | 0.45 | -0.54 | |
| 3 | 12 | 0.00 | -0.00 | |
| 3 | 13 | 0.45 | -0.54 | |
| 3 | 14 | -0.27 | 0.32 | |
| 3 | 15 | 0.18 | -0.21 | |
| 3 | 16 | -0.27 | 0.32 | |
| 3 | 17 | 0.18 | -0.21 | |
| 3 | 18 | 0.47 | -0.56 | |
| 3 | 19 | 0.92 | -1.09 | |
| 3 | 20 | 0.18 | -0.21 | |
| 3 | 21 | 0.63 | -0.75 | |
| 3 | 22 | 0.06 | 0.62 | |
| 3 | 23 | 0.03 | 0.31 | |
| 3 | 24 | 0.06 | 0.62 | |
| 4 | 1 | | 1.61 | |
| 4 | 2 | | -0.01 | |
| 4 | 3 | | -0.92 | |
| 4 | 4 | | -0.01 | |
| 4 | 5 | | -0.92 | |
| 4 | 6 | | 0.55 | |
| 4 | 7 | | -0.37 | |
| 4 | 8 | | 0.55 | |
| 4 | 9 | | -0.37 | |
| 4 | 10 | | 1.91 | |
| 4 | 11 | | 1.00 | |
| 4 | 12 | | 0.27 | |
| 4 | 13 | | -0.64 | |
| 4 | 14 | | 1.91 | |
| 4 | 15 | | 1.00 | |
| 4 | 16 | | 0.27 | |
| 4 | 17 | | -0.64 | |
| 4 | 18 | | -0.96 | |
| 4 | 19 | | -1.87 | |
| 4 | 20 | | -0.37 | |
| 4 | 21 | | -1.28 | |
| 4 | 22 | | 0.57 | |
| 4 | 23 | | 0.57 | |
| 4 | 24 | | 0.29 | |

REACTIES

| Kn. | B.G. | X | Z | M |
|-----|------|-------|-------|---|
| 5 | 1 | 0.73 | 4.42 | |
| 5 | 2 | -2.05 | 2.50 | |
| 5 | 3 | -1.16 | 0.75 | |
| 5 | 4 | -0.59 | 0.65 | |
| 5 | 5 | 0.30 | -1.11 | |
| 5 | 6 | -1.83 | 2.69 | |
| 5 | 7 | -0.94 | 0.94 | |
| 5 | 8 | -0.36 | 0.84 | |
| 5 | 9 | 0.53 | -0.92 | |
| 5 | 10 | 0.41 | 0.47 | |
| 5 | 11 | 1.31 | -1.28 | |
| 5 | 12 | 0.07 | 0.18 | |
| 5 | 13 | 0.97 | -1.57 | |
| 5 | 14 | -0.23 | 1.31 | |
| 5 | 15 | 0.66 | -0.44 | |
| 5 | 16 | -0.57 | 1.02 | |
| 5 | 17 | 0.32 | -0.73 | |
| 5 | 18 | 1.01 | -1.99 | |
| 5 | 19 | 1.90 | -3.74 | |
| 5 | 20 | 0.36 | -0.70 | |
| 5 | 21 | 1.25 | -2.45 | |
| 5 | 22 | 0.26 | 1.57 | |
| 5 | 23 | 0.21 | 0.85 | |
| 5 | 24 | 0.18 | 1.50 | |
| | | | | |
| 6 | 1 | -0.90 | 4.56 | |
| 6 | 2 | -0.42 | 0.47 | |
| 6 | 3 | -1.76 | -0.90 | |
| 6 | 4 | -0.08 | 0.19 | |
| 6 | 5 | -1.42 | -1.19 | |
| 6 | 6 | 0.50 | 1.08 | |
| 6 | 7 | -0.84 | -0.29 | |
| 6 | 8 | 0.84 | 0.79 | |
| 6 | 9 | -0.50 | -0.58 | |
| 6 | 10 | 3.00 | 1.70 | |
| 6 | 11 | 1.65 | 0.33 | |
| 6 | 12 | 0.72 | 0.53 | |
| 6 | 13 | -0.62 | -0.84 | |
| 6 | 14 | 2.77 | 1.89 | |
| 6 | 15 | 1.43 | 0.52 | |
| 6 | 16 | 0.50 | 0.72 | |
| 6 | 17 | -0.85 | -0.65 | |
| 6 | 18 | -1.49 | -1.59 | |
| 6 | 19 | -2.83 | -2.96 | |
| 6 | 20 | -0.54 | -0.55 | |
| 6 | 21 | -1.88 | -1.92 | |
| 6 | 22 | -0.32 | 1.62 | |
| 6 | 23 | -0.24 | 1.55 | |
| 6 | 24 | -0.24 | 0.88 | |

BELASTINGCOMBINATIES

| BC | Type | | | | |
|----|-------|------|-----------|---|----------------|
| 1 | Fund. | 1.22 | $G_{k,1}$ | | |
| 2 | Fund. | 0.90 | $G_{k,1}$ | | |
| 3 | Fund. | 1.08 | $G_{k,1}$ | + | 1.35 $Q_{k,2}$ |
| 4 | Fund. | 1.08 | $G_{k,1}$ | + | 1.35 $Q_{k,3}$ |
| 5 | Fund. | 1.08 | $G_{k,1}$ | + | 1.35 $Q_{k,4}$ |
| | | | | | |
| 6 | Fund. | 1.08 | $G_{k,1}$ | + | 1.35 $Q_{k,5}$ |
| 7 | Fund. | 1.08 | $G_{k,1}$ | + | 1.35 $Q_{k,6}$ |

BELASTINGCOMBINATIES

| BC Type | | | | | |
|---------|-------|------|-----------|---|-----------------|
| 8 | Fund. | 1.08 | $G_{k,1}$ | + | 1.35 $Q_{k,7}$ |
| 9 | Fund. | 1.08 | $G_{k,1}$ | + | 1.35 $Q_{k,8}$ |
| 10 | Fund. | 1.08 | $G_{k,1}$ | + | 1.35 $Q_{k,9}$ |
| 11 | Fund. | 1.08 | $G_{k,1}$ | + | 1.35 $Q_{k,10}$ |
| 12 | Fund. | 1.08 | $G_{k,1}$ | + | 1.35 $Q_{k,11}$ |
| 13 | Fund. | 1.08 | $G_{k,1}$ | + | 1.35 $Q_{k,12}$ |
| 14 | Fund. | 1.08 | $G_{k,1}$ | + | 1.35 $Q_{k,13}$ |
| 15 | Fund. | 1.08 | $G_{k,1}$ | + | 1.35 $Q_{k,14}$ |
| 16 | Fund. | 1.08 | $G_{k,1}$ | + | 1.35 $Q_{k,15}$ |
| 17 | Fund. | 1.08 | $G_{k,1}$ | + | 1.35 $Q_{k,16}$ |
| 18 | Fund. | 1.08 | $G_{k,1}$ | + | 1.35 $Q_{k,17}$ |
| 19 | Fund. | 1.08 | $G_{k,1}$ | + | 1.35 $Q_{k,18}$ |
| 20 | Fund. | 1.08 | $G_{k,1}$ | + | 1.35 $Q_{k,19}$ |
| 21 | Fund. | 1.08 | $G_{k,1}$ | + | 1.35 $Q_{k,20}$ |
| 22 | Fund. | 1.08 | $G_{k,1}$ | + | 1.35 $Q_{k,21}$ |
| 23 | Fund. | 1.08 | $G_{k,1}$ | + | 1.35 $Q_{k,22}$ |
| 24 | Fund. | 1.08 | $G_{k,1}$ | + | 1.35 $Q_{k,23}$ |
| 25 | Fund. | 1.08 | $G_{k,1}$ | + | 1.35 $Q_{k,24}$ |
| 26 | Fund. | 0.90 | $G_{k,1}$ | + | 1.35 $Q_{k,2}$ |
| 27 | Fund. | 0.90 | $G_{k,1}$ | + | 1.35 $Q_{k,3}$ |
| 28 | Fund. | 0.90 | $G_{k,1}$ | + | 1.35 $Q_{k,4}$ |
| 29 | Fund. | 0.90 | $G_{k,1}$ | + | 1.35 $Q_{k,5}$ |
| 30 | Fund. | 0.90 | $G_{k,1}$ | + | 1.35 $Q_{k,6}$ |
| 31 | Fund. | 0.90 | $G_{k,1}$ | + | 1.35 $Q_{k,7}$ |
| 32 | Fund. | 0.90 | $G_{k,1}$ | + | 1.35 $Q_{k,8}$ |
| 33 | Fund. | 0.90 | $G_{k,1}$ | + | 1.35 $Q_{k,9}$ |
| 34 | Fund. | 0.90 | $G_{k,1}$ | + | 1.35 $Q_{k,10}$ |
| 35 | Fund. | 0.90 | $G_{k,1}$ | + | 1.35 $Q_{k,11}$ |
| 36 | Fund. | 0.90 | $G_{k,1}$ | + | 1.35 $Q_{k,12}$ |
| 37 | Fund. | 0.90 | $G_{k,1}$ | + | 1.35 $Q_{k,13}$ |
| 38 | Fund. | 0.90 | $G_{k,1}$ | + | 1.35 $Q_{k,14}$ |
| 39 | Fund. | 0.90 | $G_{k,1}$ | + | 1.35 $Q_{k,15}$ |
| 40 | Fund. | 0.90 | $G_{k,1}$ | + | 1.35 $Q_{k,16}$ |
| 41 | Fund. | 0.90 | $G_{k,1}$ | + | 1.35 $Q_{k,17}$ |
| 42 | Fund. | 0.90 | $G_{k,1}$ | + | 1.35 $Q_{k,18}$ |
| 43 | Fund. | 0.90 | $G_{k,1}$ | + | 1.35 $Q_{k,19}$ |
| 44 | Fund. | 0.90 | $G_{k,1}$ | + | 1.35 $Q_{k,20}$ |
| 45 | Fund. | 0.90 | $G_{k,1}$ | + | 1.35 $Q_{k,21}$ |
| 46 | Fund. | 0.90 | $G_{k,1}$ | + | 1.35 $Q_{k,22}$ |
| 47 | Fund. | 0.90 | $G_{k,1}$ | + | 1.35 $Q_{k,23}$ |
| 48 | Fund. | 0.90 | $G_{k,1}$ | + | 1.35 $Q_{k,24}$ |
| 49 | Kar. | 1.00 | $G_{k,1}$ | + | 1.00 $Q_{k,2}$ |
| 50 | Kar. | 1.00 | $G_{k,1}$ | + | 1.00 $Q_{k,3}$ |
| 51 | Kar. | 1.00 | $G_{k,1}$ | + | 1.00 $Q_{k,4}$ |
| 52 | Kar. | 1.00 | $G_{k,1}$ | + | 1.00 $Q_{k,5}$ |
| 53 | Kar. | 1.00 | $G_{k,1}$ | + | 1.00 $Q_{k,6}$ |
| 54 | Kar. | 1.00 | $G_{k,1}$ | + | 1.00 $Q_{k,7}$ |
| 55 | Kar. | 1.00 | $G_{k,1}$ | + | 1.00 $Q_{k,8}$ |
| 56 | Kar. | 1.00 | $G_{k,1}$ | + | 1.00 $Q_{k,9}$ |
| 57 | Kar. | 1.00 | $G_{k,1}$ | + | 1.00 $Q_{k,10}$ |
| 58 | Kar. | 1.00 | $G_{k,1}$ | + | 1.00 $Q_{k,11}$ |

BELASTINGCOMBINATIES

| BC Type | | | | | |
|---------|-------|------|-----------|---|------------------------|
| 59 | Kar. | 1.00 | $G_{k,1}$ | + | 1.00 $Q_{k,12}$ |
| 60 | Kar. | 1.00 | $G_{k,1}$ | + | 1.00 $Q_{k,13}$ |
| 61 | Kar. | 1.00 | $G_{k,1}$ | + | 1.00 $Q_{k,14}$ |
| 62 | Kar. | 1.00 | $G_{k,1}$ | + | 1.00 $Q_{k,15}$ |
| 63 | Kar. | 1.00 | $G_{k,1}$ | + | 1.00 $Q_{k,16}$ |
| 64 | Kar. | 1.00 | $G_{k,1}$ | + | 1.00 $Q_{k,17}$ |
| 65 | Kar. | 1.00 | $G_{k,1}$ | + | 1.00 $Q_{k,18}$ |
| 66 | Kar. | 1.00 | $G_{k,1}$ | + | 1.00 $Q_{k,19}$ |
| 67 | Kar. | 1.00 | $G_{k,1}$ | + | 1.00 $Q_{k,20}$ |
| 68 | Kar. | 1.00 | $G_{k,1}$ | + | 1.00 $Q_{k,21}$ |
| 69 | Kar. | 1.00 | $G_{k,1}$ | + | 1.00 $Q_{k,22}$ |
| 70 | Kar. | 1.00 | $G_{k,1}$ | + | 1.00 $Q_{k,23}$ |
| 71 | Kar. | 1.00 | $G_{k,1}$ | + | 1.00 $Q_{k,24}$ |
| 72 | Quas. | 1.00 | $G_{k,1}$ | | |
| 73 | Freq. | 1.00 | $G_{k,1}$ | | |
| 74 | Freq. | 1.00 | $G_{k,1}$ | + | 1.00 $\psi_1 Q_{k,2}$ |
| 75 | Freq. | 1.00 | $G_{k,1}$ | + | 1.00 $\psi_1 Q_{k,3}$ |
| 76 | Freq. | 1.00 | $G_{k,1}$ | + | 1.00 $\psi_1 Q_{k,4}$ |
| 77 | Freq. | 1.00 | $G_{k,1}$ | + | 1.00 $\psi_1 Q_{k,5}$ |
| 78 | Freq. | 1.00 | $G_{k,1}$ | + | 1.00 $\psi_1 Q_{k,6}$ |
| 79 | Freq. | 1.00 | $G_{k,1}$ | + | 1.00 $\psi_1 Q_{k,7}$ |
| 80 | Freq. | 1.00 | $G_{k,1}$ | + | 1.00 $\psi_1 Q_{k,8}$ |
| 81 | Freq. | 1.00 | $G_{k,1}$ | + | 1.00 $\psi_1 Q_{k,9}$ |
| 82 | Freq. | 1.00 | $G_{k,1}$ | + | 1.00 $\psi_1 Q_{k,10}$ |
| 83 | Freq. | 1.00 | $G_{k,1}$ | + | 1.00 $\psi_1 Q_{k,11}$ |
| 84 | Freq. | 1.00 | $G_{k,1}$ | + | 1.00 $\psi_1 Q_{k,12}$ |
| 85 | Freq. | 1.00 | $G_{k,1}$ | + | 1.00 $\psi_1 Q_{k,13}$ |
| 86 | Freq. | 1.00 | $G_{k,1}$ | + | 1.00 $\psi_1 Q_{k,14}$ |
| 87 | Freq. | 1.00 | $G_{k,1}$ | + | 1.00 $\psi_1 Q_{k,15}$ |
| 88 | Freq. | 1.00 | $G_{k,1}$ | + | 1.00 $\psi_1 Q_{k,16}$ |
| 89 | Freq. | 1.00 | $G_{k,1}$ | + | 1.00 $\psi_1 Q_{k,17}$ |
| 90 | Freq. | 1.00 | $G_{k,1}$ | + | 1.00 $\psi_1 Q_{k,18}$ |
| 91 | Freq. | 1.00 | $G_{k,1}$ | + | 1.00 $\psi_1 Q_{k,19}$ |
| 92 | Freq. | 1.00 | $G_{k,1}$ | + | 1.00 $\psi_1 Q_{k,20}$ |
| 93 | Freq. | 1.00 | $G_{k,1}$ | + | 1.00 $\psi_1 Q_{k,21}$ |
| 94 | Freq. | 1.00 | $G_{k,1}$ | + | 1.00 $\psi_1 Q_{k,22}$ |
| 95 | Freq. | 1.00 | $G_{k,1}$ | + | 1.00 $\psi_1 Q_{k,23}$ |
| 96 | Freq. | 1.00 | $G_{k,1}$ | + | 1.00 $\psi_1 Q_{k,24}$ |
| 97 | 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 |

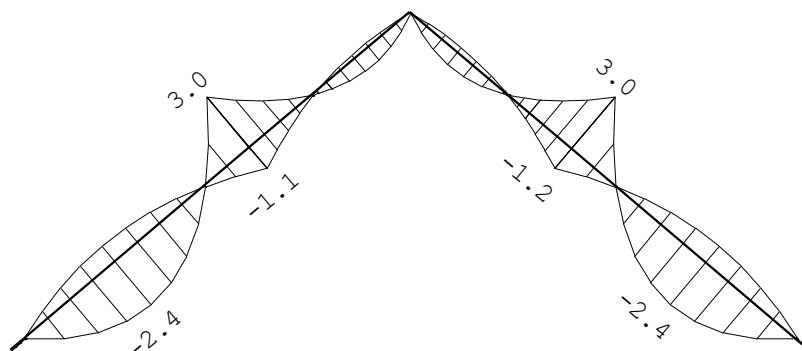
GUNSTIGE WERKING PERMANENTE BELASTINGEN

| BC Staven met gunstige werking | |
|--------------------------------|----------------------------|
| 10 | Geen |
| 11 | Geen |
| 12 | Geen |
| 13 | Geen |
| 14 | Geen |
| 15 | Geen |
| 16 | Geen |
| 17 | Geen |
| 18 | Geen |
| 19 | Geen |
| 20 | Geen |
| 21 | Geen |
| 22 | Geen |
| 23 | Geen |
| 24 | Geen |
| 25 | Geen |
| 26 | Alle staven de factor:0.90 |
| 27 | Alle staven de factor:0.90 |
| 28 | Alle staven de factor:0.90 |
| 29 | Alle staven de factor:0.90 |
| 30 | Alle staven de factor:0.90 |
| 31 | Alle staven de factor:0.90 |
| 32 | Alle staven de factor:0.90 |
| 33 | Alle staven de factor:0.90 |
| 34 | Alle staven de factor:0.90 |
| 35 | Alle staven de factor:0.90 |
| 36 | Alle staven de factor:0.90 |
| 37 | Alle staven de factor:0.90 |
| 38 | Alle staven de factor:0.90 |
| 39 | Alle staven de factor:0.90 |
| 40 | Alle staven de factor:0.90 |
| 41 | Alle staven de factor:0.90 |
| 42 | Alle staven de factor:0.90 |
| 43 | Alle staven de factor:0.90 |
| 44 | Alle staven de factor:0.90 |
| 45 | Alle staven de factor:0.90 |
| 46 | Alle staven de factor:0.90 |
| 47 | Alle staven de factor:0.90 |
| 48 | Alle staven de factor:0.90 |

OMHULLENDE VAN DE FUNDAMENTELE COMBINATIES

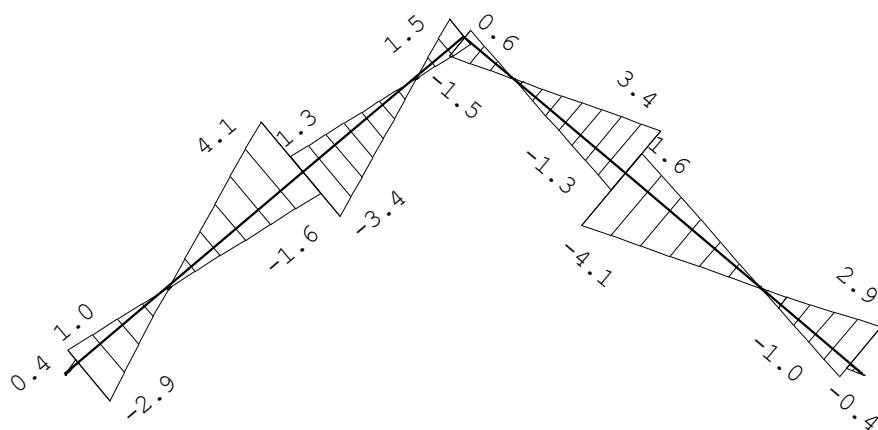
MOMENTEN

Fundamentele combinatie



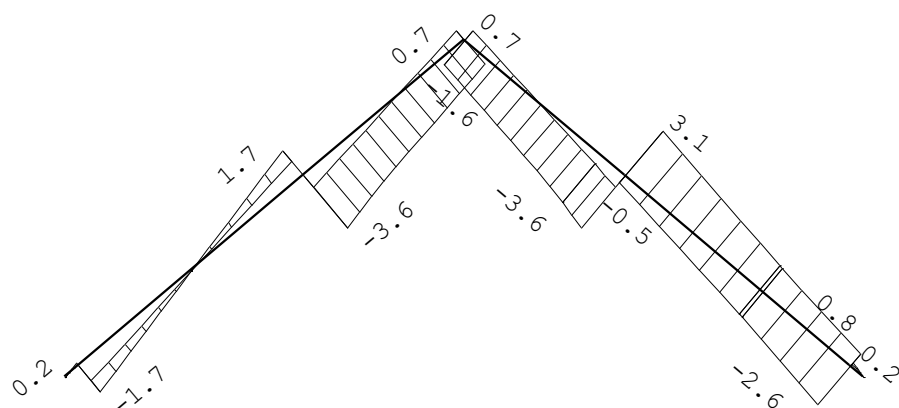
DWARSKRACHTEN

Fundamentele combinatie



NORMAALKRACHTEN

Fundamentele combinatie



REACTIES

Fundamentele combinatie

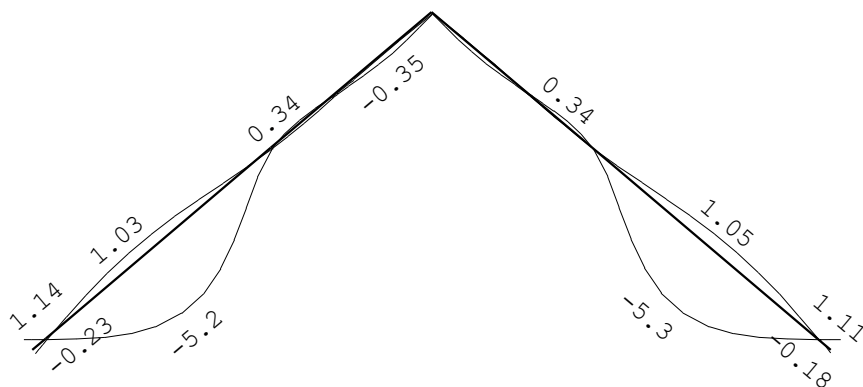
| Kn. | X-min | X-max | Z-min | Z-max | M-min | M-max |
|-----|-------|-------|-------|-------|-------|-------|
| 3 | -1.12 | 1.43 | 0.10 | 3.40 | | |
| 4 | | | -1.08 | 4.32 | | |
| 5 | -2.11 | 3.36 | -1.07 | 8.40 | | |
| 6 | -4.78 | 3.24 | 0.11 | 7.48 | | |

OMHULLENDE VAN DE KARAKTERISTIEKE COMBINATIES

VERPLAATSINGEN

[mm]

Karakteristieke combinatie



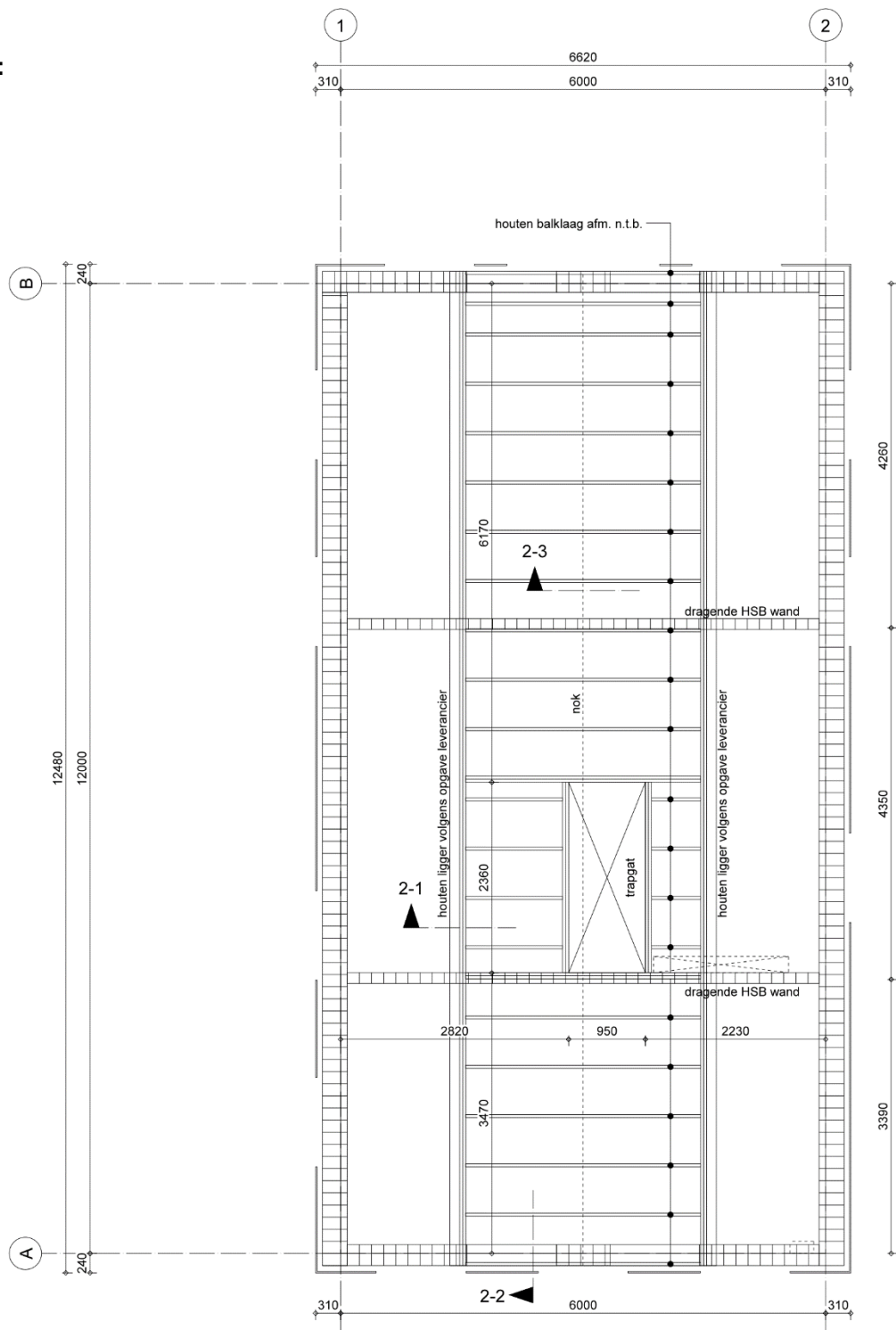
Zoldervloer:

Woning type A en B:

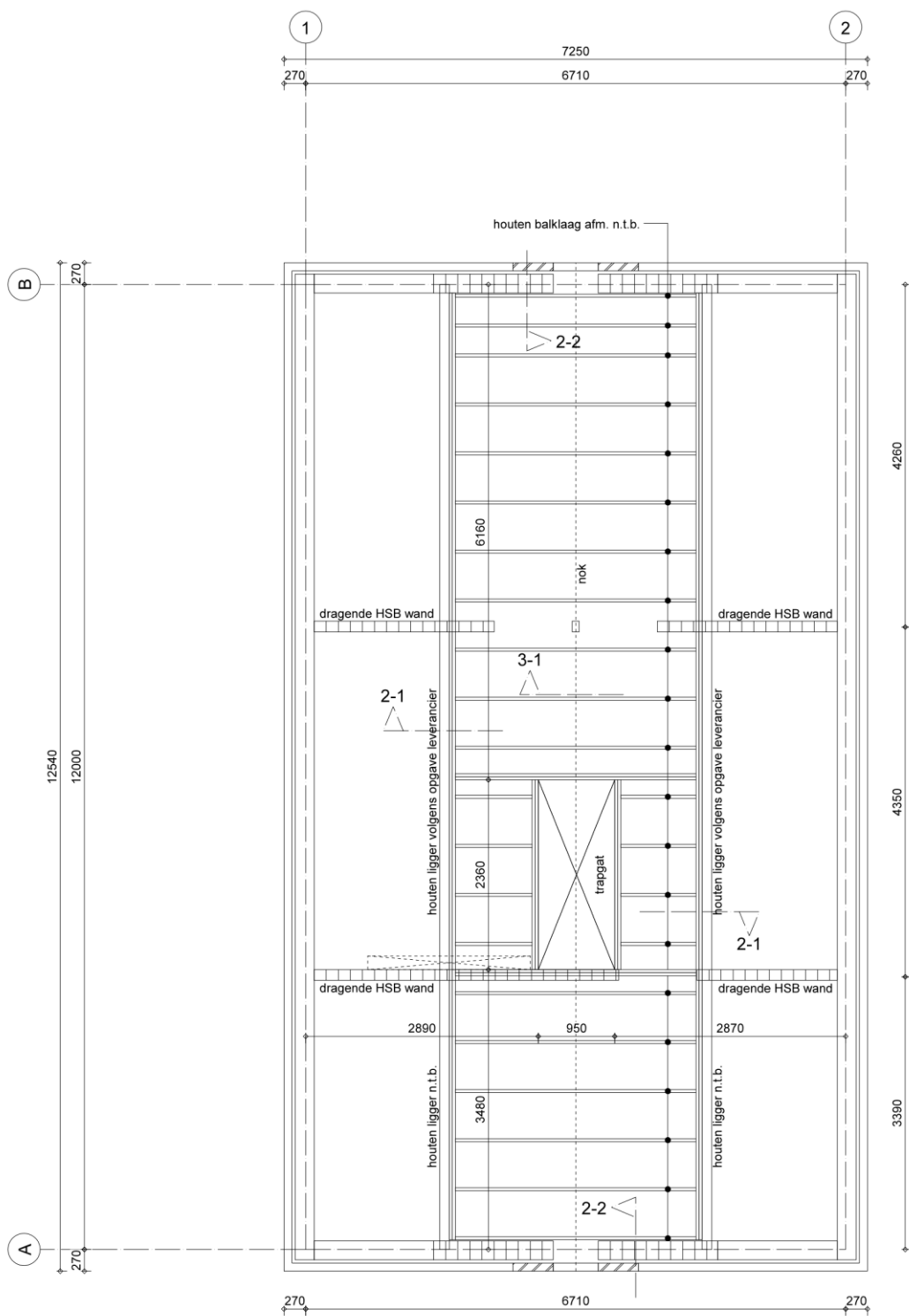
De 2^e verdiepingvloer is een houten balklaag die opgelegd op een randbalk waar ook het dak op ligt. Deze balklaag en de randbalk wordt door de leverancier verder uitgewerkt. De balklaag heeft een hoogte van 235 mm. De randliggers liggen op in de kopgevels en op de dragende tussenwanden. De zoldervloer dient middels schijfwerking de wandbelasting af te dragen richting de kopgevels en de dragende tussenwanden.

Ten behoeve van de afdracht zijn de randbalken ingevoerd in TS Raamwerken. De reacties moeten gecontroleerd worden met de berekening van de kapleverancier.

Type A:



Type B:



Technosoft Raamwerken release 6.81a

Project.....: 18107 - 14 woningen te Westzaan
 Onderdeel.....: W1 en W2 - randbalk zoldervloer
 Dimensies.....: kN;m;rad (tenzij anders aangegeven)
 Bestand.....: G:\7000 project\18107-KPO 24 woningen
 Westzaan\Documenten\Constructie\18107-ligger zoldervloer
 vrijstaand.rww

Belastingbreedte.: 1.000
 Rekenmodel.....: 2e-orde-elastisch.
 Theorieën voor de bepaling van de krachtsverdeling:
 1) Losse belastinggevallen:
 Lineaire-elasticiteitstheorie
 2) Uiterste grenstoestand:
 Geometrisch niet lineair alle staven.
 Fysisch lineair alle staven.
 3) Gebruiksgrenstoestand:
 Geometrisch niet lineair alle staven.
 Fysisch lineair alle staven.

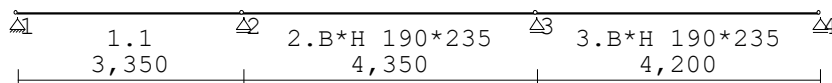
Maximum aantal iteraties.....: 50
 Max.deellengte kolommen/wanden: 0.500 Max.deellengte balken/vloeren: 0.500
 Max. X-verplaatsing in UGT.....: 0.500 Max. Z-verplaatsing in UGT....: 0.250

Gunstige werking van de permanente belasting wordt automatisch verwerkt.

Toegepaste normen volgens Eurocode met Nederlandse NB

| | | | |
|-------------|----------------------|-----------------|-------------|
| Belastingen | NEN-EN 1990:2002 | C2:2010,A1:2019 | NB:2019(nl) |
| | NEN-EN 1991-1-1:2002 | C1/C11:2019 | NB:2019(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 190*235 | 1:C24 | 4.4650e+04 | 2.0548e+08 | 0.00 |

PROFIELEN vervolg [mm]

| Prof. | Staaftype | Breedte | Hoogte | e | Type | b1 | h1 | b2 | h2 |
|-------|-----------|---------|--------|-------|------|----|----|----|----|
| 1 | 0:Normaal | 190 | 235 | 117.5 | 0:RH | | | | |

KNOPEN

| Knoop | X | Z |
|-------|--------|-------|
| 1 | 0.000 | 5.700 |
| 2 | 3.350 | 5.700 |
| 3 | 7.700 | 5.700 |
| 4 | 11.900 | 5.700 |

STAVEN

| St. | ki | kj | Profiel | Aansl.i | Aansl.j | Lengte | Opm. |
|-----|----|----|---------------|---------|---------|--------|------|
| 1 | 1 | 2 | 1:B*H 190*235 | NDM | NDM | 3.350 | |
| 2 | 2 | 3 | 1:B*H 190*235 | NDM | NDM | 4.350 | |
| 3 | 3 | 4 | 1:B*H 190*235 | NDM | NDM | 4.200 | |

VASTE STEUNPUNTEN

| Nr. | knoop | Kode | XZR 1=vast 0=vrij | Hoek |
|-----|-------|------|-------------------|------|
| 1 | 1 | 110 | | 0.00 |
| 2 | 2 | 010 | | 0.00 |
| 3 | 3 | 010 | | 0.00 |
| 4 | 4 | 010 | | 0.00 |

BELASTINGGENERATIE ALGEMEEN.

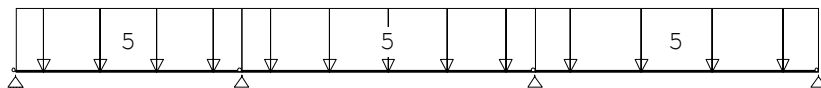
| | | | |
|------------------------------|------|-------------------------|------|
| Betrouwbaarheidsklasse.....: | 1 | Referentieperiode.....: | 50 |
| Gebouwdiepte.....: | 0.00 | Gebouwhoogte.....: | 5.70 |
| Niveau aansl.terrein.....: | 0.00 | E.g. scheid.w. [kN/m2]: | 1.20 |

BELASTINGGEVALLEN

| B.G. | Omschrijving | Type |
|------|----------------------|-----------------------------|
| 1 | Permanente belasting | EGZ=0.00 1 |
| 2 | Variabele belasting | 2 Ver. bel. pers. ed. (q_k) |

BELASTINGEN

B.G:1 Permanente belasting



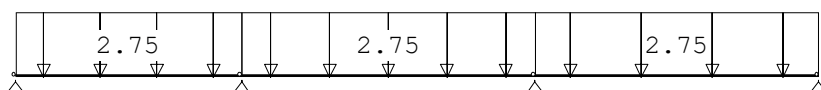
STAAFBELASTINGEN

B.G:1 Permanente belasting

| Staaft | Type | q1/p/m | q2 | A | B | Ψ_0 | Ψ_1 | Ψ_2 |
|--------|------------|--------|-------|-------|-------|----------|----------|----------|
| 1 | 1:QZLokaal | -5.00 | -5.00 | 0.000 | 0.000 | | | |
| 2 | 1:QZLokaal | -5.00 | -5.00 | 0.000 | 0.000 | | | |
| 3 | 1:QZLokaal | -5.00 | -5.00 | 0.000 | 0.000 | | | |

BELASTINGEN

B.G:2 Variabele belasting



STAAFBELASTINGEN

B.G:2 Variabele belasting

| Staaft | Type | q1/p/m | q2 | A | B | Ψ_0 | Ψ_1 | Ψ_2 |
|--------|------------|--------|-------|-------|-------|----------|----------|----------|
| 1 | 1:QZLokaal | -2.75 | -2.75 | 0.000 | 0.000 | 0.40 | 0.50 | 0.30 |
| 2 | 1:QZLokaal | -2.75 | -2.75 | 0.000 | 0.000 | 0.40 | 0.50 | 0.30 |
| 3 | 1:QZLokaal | -2.75 | -2.75 | 0.000 | 0.000 | 0.40 | 0.50 | 0.30 |

REACTIES

1e orde

| Kn. | B.G. | X | Z | M |
|-----|------|------|-------|---|
| 1 | 1 | 0.00 | 6.28 | |
| 1 | 2 | 0.00 | 3.46 | |
| 2 | 1 | | 20.73 | |
| 2 | 2 | | 11.40 | |
| 3 | 1 | | 24.28 | |
| 3 | 2 | | 13.35 | |

REACTIES

1e orde

| Kn. | B.G. | X | Z | M |
|-----|------|---|------|---|
| 4 | 1 | | 8.20 | |
| 4 | 2 | | 4.51 | |

BEREKENINGSTATUS

Controlerende berekening

| B.C. | Iteratie | Status |
|------|----------|------------------------|
| 1 | 3 | Nauwkeurigheid bereikt |
| 2 | 3 | Nauwkeurigheid bereikt |
| 3 | 3 | Nauwkeurigheid bereikt |
| 4 | 3 | Nauwkeurigheid bereikt |
| 5 | 3 | Nauwkeurigheid bereikt |
| 6 | 3 | Nauwkeurigheid bereikt |
| 7 | 3 | Nauwkeurigheid bereikt |
| 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 |

BELASTINGCOMBINATIES

| BC | Type |
|----------|--|
| 1 Fund. | 1.22 $G_{k,1}$ |
| 2 Fund. | 1.08 $G_{k,1}$ |
| 3 Fund. | 0.90 $G_{k,1}$ |
| 4 Fund. | 1.22 $G_{k,1}$ + 1.35 $\psi_0 Q_{k,2}$ |
| 5 Fund. | 1.08 $G_{k,1}$ + 1.35 $Q_{k,2}$ |
| 6 Fund. | 0.90 $G_{k,1}$ + 1.35 $Q_{k,2}$ |
| 7 Fund. | 0.90 $G_{k,1}$ + 1.35 $\psi_0 Q_{k,2}$ |
| 8 Kar. | 1.60 $G_{k,1}$ + 1.24 $Q_{k,2}$ |
| 9 Kar. | 1.00 $G_{k,1}$ + 1.00 $Q_{k,2}$ |
| 10 Quas. | 1.00 $G_{k,1}$ |
| 11 Quas. | 1.00 $G_{k,1}$ + 1.00 $\psi_2 Q_{k,2}$ |
| 12 Freq. | 1.00 $G_{k,1}$ |
| 13 Freq. | 1.00 $G_{k,1}$ + 1.00 $\psi_1 Q_{k,2}$ |
| 14 Blij. | 1.00 $G_{k,1}$ |

GUNSTIGE WERKING PERMANENTE BELASTINGEN

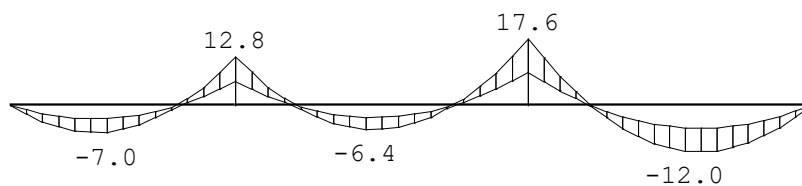
| BC | Staven met gunstige werking |
|----|-----------------------------|
| 1 | Geen |
| 2 | Geen |
| 3 | Alle staven de factor:0.90 |
| 4 | Geen |
| 5 | Geen |
| 6 | Alle staven de factor:0.90 |
| 7 | Alle staven de factor:0.90 |

OMHULLENDE VAN DE FUNDAMENTELE COMBINATIES

MOMENTEN

2e orde

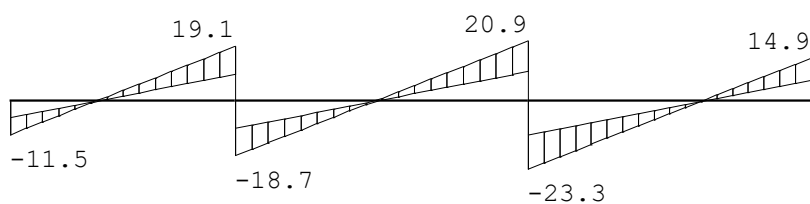
Fundamentele combinatie



DWARSKRACHTEN

2e orde

Fundamentele combinatie



REACTIES

2e orde

Fundamentele combinatie

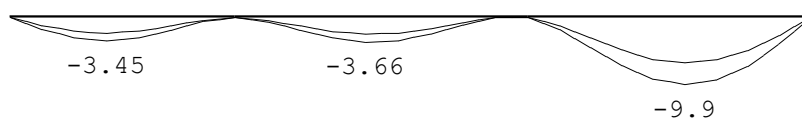
| Kn. | X-min | X-max | Z-min | Z-max | M-min | M-max |
|-----|-------|-------|-------|-------|-------|-------|
| 1 | -0.00 | 0.00 | 5.66 | 11.45 | | |
| 2 | | | 18.66 | 37.79 | | |
| 3 | | | 21.85 | 44.25 | | |
| 4 | | | 7.38 | 14.95 | | |

OMHULLENDE VAN DE KARAKTERISTIEKE COMBINATIES

VERPLAATSINGEN

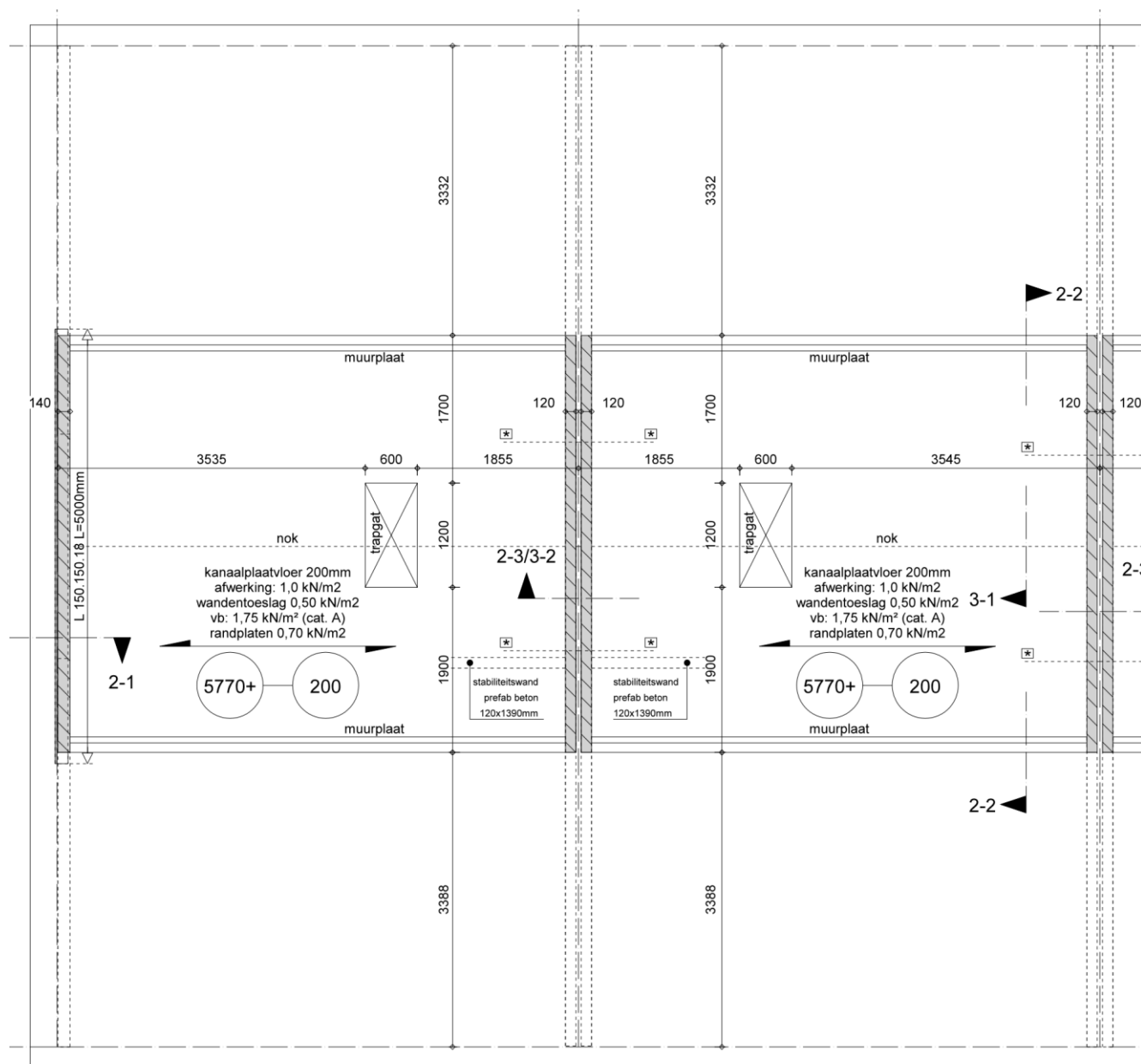
2e orde [mm]

Karakteristieke combinatie



Woning type E en F:

De 2^e verdiepingsvloer is kanaalplaatvloer van 200 mm dikte.
Deze vloer wordt door de leverancier verder uitgewerkt.

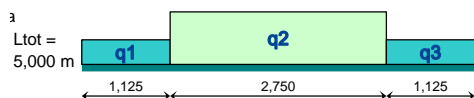


Latei zijgevel:

De kozijnen in de zijgevels hebben allemaal een dagmaat van 2600 mm.
De systeemplengte van de latei is 2750 mm.
Er wordt voor gekozen de latei door te leggen zodat een inklemming ontstaat.

Belastingen:

W4 - latei zijgevel 2e verd



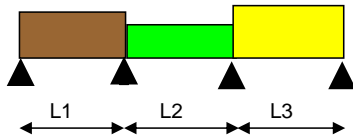

| q1 : | | | | | | | | | | | | | | |
|---------------------------------|----------------|----------------|----------------|-------------|---------|--------|--------|-----------------------|-------------------------|----------------------------|--------------|-----------------|-------------------------|-----------------|
| cat. | G _k | Q _k | ψ ₀ | factor * | breedte | lengte | aantal | G _{rep} | Q _{rep} | Q _{rep} | 6.10a | 6.10b | stabiliteit / opdrijven | |
| | kar. | kar. | factor | | | | | rep. | rep. | rep. | 1,22 G + | 1,08 G + | 1,08 G + | 0,90 G |
| | [kN/m²] | [kN/m²] | comb.w | - | [m] | [m] | - | perm. | comb. (ψ ₀) | extr+comb(ψ ₀) | 1,35 * Qcomb | 1,35 Qextr+comb | 1,35 * Qcomb | 1,35 * Qgunstig |
| hellend dak 40 graden | H | 1,05 | 0,37 | 1,00 | 1,00 | 1,20 | 1 | 1,26 | | | 1,5 | 1,4 | 1,4 | 1,1 |
| 2e verdiepingsvloer | A | 4,50 | 2,25 | 0,40 | 1,00 | 1,00 | 2,90 | 13,05 | 2,61 | 6,53 | 19,4 | 22,9 | 17,6 | 11,7 |
| gevel; betimm.; 140mm beton | | 4,11 | | 1,00 | 1,00 | 0,65 | 1 | 2,67 | | | 3,2 | 2,9 | 2,9 | 2,4 |
| q 1 : [kN/m²] | | | | | | | | 17,0 | 2,6 | 6,5 | 24,2 | 27,2 | 21,9 | 15,3 |
| lengte van de q-last: 1,125 [m] | | | | | | | | UGT / Frequentie aanw | | | 1,19 | 1,34 | | |
| | | | | | | | | totaal Qd [kN]: | | | 27 | 31 | | |

| q2 : | | | | | | | | | | | | | | |
|---------------------------------|----------------|----------------|----------------|-------------|---------|--------|--------|-----------------------|-------------------------|----------------------------|--------------|-----------------|-------------------------|-----------------|
| cat. | G _k | Q _k | ψ ₀ | factor * | breedte | lengte | aantal | G _{rep} | Q _{rep} | Q _{rep} | 6.10a | 6.10b | stabiliteit / opdrijven | |
| | kar. | kar. | factor | | | | | rep. | rep. | rep. | 1,22 G + | 1,08 G + | 1,08 G + | 0,90 G |
| | [kN/m²] | [kN/m²] | comb.w | - | [m] | [m] | - | perm. | comb. (ψ ₀) | extr+comb(ψ ₀) | 1,35 * Qcomb | 1,35 Qextr+comb | 1,35 * Qcomb | 1,35 * Qgunstig |
| hellend dak 40 graden | H | 1,05 | 0,37 | 1,00 | 1,00 | 1,20 | 1 | 1,26 | | | 1,5 | 1,4 | 1,4 | 1,1 |
| 2e verdiepingsvloer | A | 4,50 | 2,25 | 0,40 | 1,00 | 1,00 | 2,90 | 13,05 | 2,61 | 6,53 | 19,4 | 22,9 | 17,6 | 11,7 |
| gevel; betimm.; 140mm beton | | 4,11 | | 1,00 | 1,00 | 1,75 | 1 | 7,20 | | | 8,7 | 7,8 | 7,8 | 6,5 |
| q 2 : [N/m²] | | | | | | | | 21,5 | 2,6 | 6,5 | 29,7 | 32,0 | 26,8 | 19,4 |
| lengte van de q-last: 2,750 [m] | | | | | | | | UGT / Frequentie aanw | | | 1,20 | 1,29 | | |
| | | | | | | | | totaal Qd [kN]: | | | 82 | 88 | | |

| q3 : | | | | | | | | | | | | | | |
|---------------------------------|----------------|----------------|----------------|-------------|---------|--------|--------|-----------------------|-------------------------|----------------------------|--------------|-----------------|-------------------------|-----------------|
| cat. | G _k | Q _k | ψ ₀ | factor * | breedte | lengte | aantal | G _{rep} | Q _{rep} | Q _{rep} | 6.10a | 6.10b | stabiliteit / opdrijven | |
| | kar. | kar. | factor | | | | | rep. | rep. | rep. | 1,22 G + | 1,08 G + | 1,08 G + | 0,90 G |
| | [kN/m²] | [kN/m²] | comb.w | - | [m] | [m] | - | perm. | comb. (ψ ₀) | extr+comb(ψ ₀) | 1,35 * Qcomb | 1,35 Qextr+comb | 1,35 * Qcomb | 1,35 * Qgunstig |
| hellend dak 40 graden | H | 1,05 | 0,37 | 1,00 | 1,00 | 1,20 | 1 | 1,26 | | | 1,5 | 1,4 | 1,4 | 1,1 |
| 2e verdiepingsvloer | A | 4,50 | 2,25 | 0,40 | 1,00 | 1,00 | 2,90 | 13,05 | 2,61 | 6,53 | 19,4 | 22,9 | 17,6 | 11,7 |
| gevel; betimm.; 140mm beton | | 4,11 | | 1,00 | 1,00 | 0,65 | 1 | 2,67 | | | 3,2 | 2,9 | 2,9 | 2,4 |
| q 3 : [N/m²] | | | | | | | | 17,0 | 2,6 | 6,5 | 24,2 | 27,2 | 21,9 | 15,3 |
| lengte van de q-last: 1,125 [m] | | | | | | | | UGT / Frequentie aanw | | | 1,19 | 1,34 | | |
| | | | | | | | | totaal Qd [kN]: | | | 27 | 31 | | |

| | | | | ongunstig | | stabiliteit / opdrijven | | | | |
|--|--|--|--|------------------------|--------------------|-------------------------|----------------|-----------------|--------------|-----------------|
| | | | | ΣG_{rep} | ΣQ_{rep} | ΣQ_{rep} | $\Sigma 6.10a$ | $\Sigma 6.10b$ | Σ | Σ |
| | | | | rep. | rep. | rep. | 1,22 G + | 1,08 G + | 1,08 G + | 0,90 G |
| | | | | perm. | comb. (ψ_0) | extr+comb(ψ_0) | 1,35 * Qcomb | 1,35 Qextr+comb | 1,35 * Qcomb | 1,35 * Qgunstig |
| Totale belasting op W4 - latei zijgevel 2e verd [kN] | | | | 97 | 13 | 33 | 136 | 149 | 123 | 88 |
| | | | | zwaartepunt belasting: | | | 2,500 m | 2,500 m | 2,500 m | 2,500 m |

Profielkeuze: L 150 x 150 x 18:

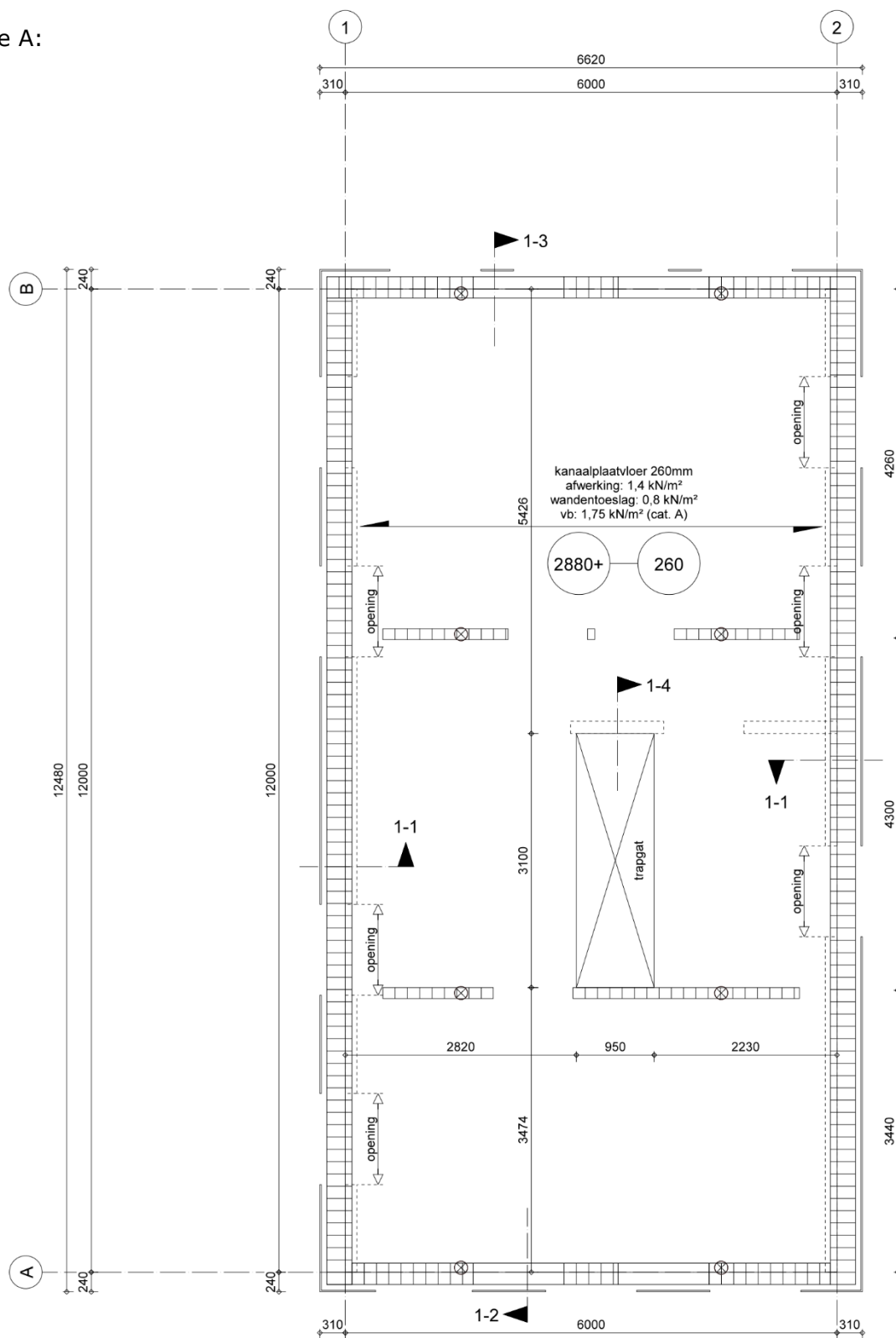
| | | | | | | | | | | | | | | | | | | | |
|---|--|------|--|---|--|------|--|---|--|------|--|------------------|--|------|--|-----------------|--|----------------|--|
| latei woning E - 2e verd | | | | S ligger 4 stpt EC | | | | profiel 1 profiel 2 | | | | L 150 x 150 x 18 | | | | | | | |
| 14 woningen Zuideinde 83 te Westzaan 18107 Eurocode NIEUWBOUW A: woon- en verblijfsruimtes ontwerplevensduur 50 jaar veiligheidsklasse CC1 - | | | |  | | | |  | | | | | | | | | | | |
| | | | | | | | | $M_{Ed,max}$ 17,2 $V_{Ed,max}$ 44,9 $R_{Ed,max}$ 75,8 u_{eind} -0,2 u_{bij} 0,1 | | | | | | | | | | | |
| buiging | | 0,74 | | dwarskracht | | 0,55 | | onderflens | | 0,16 | | kip | | 0,74 | | u_{eind} 0,30 | | u_{bij} 0,15 | |
| opmerking | | | | | | | | | | | | | | | | | | | |
| materiaal S235 | | | | liggerlengte L1 1,125 m | | | | resultaten | | | | | | | | | | | |
| klasse 3 - | | | | liggerlengte L2 2,75 m | | | | $M_{Ed,stpt,max}$ 17,2 kNm | | | | | | | | | | | |
| f_y 235 N/mm ² | | | | liggerlengte L3 1,125 m | | | | $M_{Ed,veld,max}$ 14,1 kNm | | | | | | | | | | | |
| E 210000 N/mm ² | | | | | | | | $M_{c,Rd}$ 23,2 kNm | | | | | | | | | | | |
| doorbuiging eind 1: 250 * L | | | | q1 G_{rep} 17 kN/m | | | | $M_{b,Rd}$ 23,2 kNm | | | | | | | | | | | |
| doorbuiging bij 1: 500 * L | | | | $Q_{extr+mom}$ 6,5 kN/m | | | | $V_{Ed,max}$ 44,9 kN | | | | | | | | | | | |
| zeeg veld 1 0 mm | | | | Q_{mom} 2,6 kN/m | | | | $V_{c,Rd}$ 81,9 kN | | | | | | | | | | | |
| zeeg veld 2 0 mm | | | | q2 G_{rep} 21,5 kN/m | | | | $R_{Ed,max}$ 75,8 kN | | | | | | | | | | | |
| zeeg veld 3 0 mm | | | | $Q_{extr+mom}$ 6,5 kN/m | | | | $N_{b,Rd}$ 460,4 kN | | | | | | | | | | | |
| profiel 1 L 150 x 150 x 18 | | | | Q_{mom} 2,6 kN/m | | | | | | | | | | | | | | | |
| richting sterke as | | | | q3 G_{rep} 17 kN/m | | | | doorbuiging u_{eind} -0,2 mm veld 1 | | | | | | | | | | | |
| aantal 1xprofiel 1: | | | | $Q_{extr+mom}$ 6,5 kN/m | | | | doorbuiging u_{bij} 0,1 mm veld 1 | | | | | | | | | | | |
| profiel 2 | | | | Q_{mom} 2,6 kN/m | | | | doorbuiging u_{eind} 3,3 mm veld 2 | | | | | | | | | | | |
| | | | | | | | | doorbuiging u_{bij} 0,8 mm veld 2 | | | | | | | | | | | |
| | | | | | | | | doorbuiging u_{eind} -0,2 mm veld 3 | | | | | | | | | | | |
| | | | | | | | | doorbuiging u_{bij} 0,1 mm veld 3 | | | | | | | | | | | |

Verdiepingsvloer:

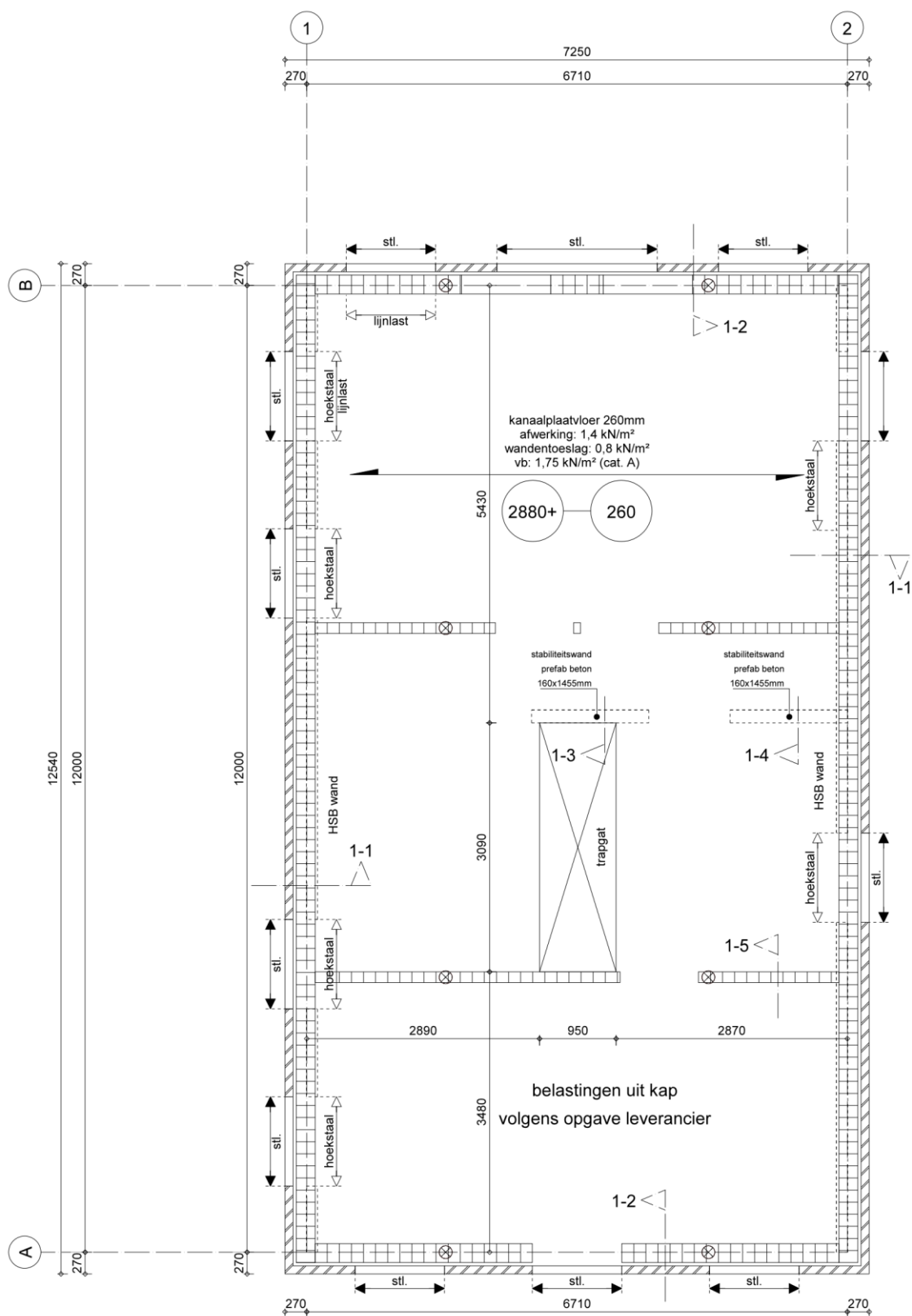
Woning type A en B:

De 1^e verdiepingsvloer is een kanaalplaatvloer met een dikte van 260 mm.
Op de vloer komen puntlasten uit de randbalk van de zoldervloer te rusten.
Deze vloer wordt door de leverancier verder uitgewerkt.

Type A:



Type B:



Latei vrijstaande woningen:

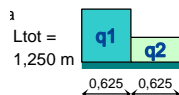
De kozijnen in de zijgevels hebben allemaal een dagmaat van 1110 mm.

De systeemplengte van de lateien is 1250 mm.

De maatgevende latei zit bij de puntlast uit de zoldervloer in woning B.

Belastingen:

Woning B - latei

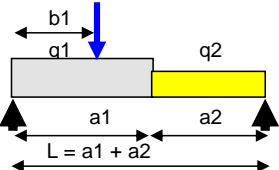


| q1 : | cat. | G _k | Q _k | ψ ₀ | factor * lengte | breedte | lengte | aantal | G _{rep} | Q _{rep} | Q _{rep} | 6.10a | 6.10b | stabiliteit / opdrijven | |
|---------------------------------|---------|----------------|----------------|----------------|--------------------|---------|--------|--------|-----------------------|-------------------------|----------------------------|--------------|-----------------|-------------------------|-----------------|
| | kar. | kar. | factor | | | | | | rep. | rep. | rep. | 1,22 G + | 1,08 G + | 1,08 G + | 0,90 G |
| | [kN/m²] | [kN/m²] | comb.w | - | [m] | [m] | - | | perm. | comb. (ψ ₀) | extr+comb(ψ ₀) | 1,35 * Qcomb | 1,35 Qextr+comb | 1,35 * Qcomb | 1,35 * Qgunstig |
| hellend dak 58 graden | H | 1,50 | 0,04 | | 0,83 | 4,35 | 2,95 | 1 | 16,06 | | | 19,5 | 17,3 | 17,3 | 14,5 |
| zoldervloer | A | 0,50 | 1,75 | 0,40 | 0,83 | 4,35 | 1,60 | 1 | 2,90 | 4,06 | 10,15 | 9,0 | 16,8 | 8,6 | 2,6 |
| hellend dak 58 graden | H | 1,50 | 0,04 | | 1,00 | 1,00 | 1,15 | 1 | 1,73 | | | 2,1 | 1,9 | 1,9 | 1,6 |
| 1e verdiepingvloer | A | 5,22 | 2,55 | 0,40 | 1,00 | 1,00 | 3,25 | 1 | 16,97 | 3,32 | 8,29 | 25,1 | 29,5 | 22,8 | 15,3 |
| dragend hsb; houten bi.bl. | | 0,50 | | | 1,00 | 1,00 | 0,85 | 1 | 0,43 | | | 0,5 | 0,5 | 0,5 | 0,4 |
| q 1 : tN/m | | | | | | | | | 38,1 | 7,4 | 18,4 | 56,2 | 66,0 | 51,1 | 34,3 |
| lengte van de q-last: 0,625 [m] | | | | | | | | | UGT / Frequentie aanw | | | 1,19 | 1,40 | | |
| | | | | | | | | | totaal Qd [kN]: | | | 35 | 41 | | |

| q2 : | cat. | G _k | Q _k | ψ ₀ | factor * lengte | breedte | lengte | aantal | G _{rep} | Q _{rep} | Q _{rep} | 6.10a | 6.10b | stabiliteit / opdrijven | |
|---------------------------------|---------|----------------|----------------|----------------|--------------------|---------|--------|--------|-----------------------|-------------------------|----------------------------|--------------|-----------------|-------------------------|-----------------|
| | kar. | kar. | factor | | | | | | rep. | rep. | rep. | 1,22 G + | 1,08 G + | 1,08 G + | 0,90 G |
| | [kN/m²] | [kN/m²] | comb.w | - | [m] | [m] | - | | perm. | comb. (ψ ₀) | extr+comb(ψ ₀) | 1,35 * Qcomb | 1,35 Qextr+comb | 1,35 * Qcomb | 1,35 * Qgunstig |
| hellend dak 58 graden | H | 1,50 | 0,04 | | 1,00 | 1,00 | 1,15 | 1 | 1,73 | | | 2,1 | 1,9 | 1,9 | 1,6 |
| 1e verdiepingvloer | A | 5,22 | 2,55 | 0,40 | 1,00 | 1,00 | 3,25 | 1 | 16,97 | 3,32 | 8,29 | 25,1 | 29,5 | 22,8 | 15,3 |
| dragend hsb; houten bi.bl. | | 0,50 | | | 1,00 | 1,00 | 0,85 | 1 | 0,43 | | | 0,5 | 0,5 | 0,5 | 0,4 |
| q 2 : tN/m | | | | | | | | | 19,1 | 3,3 | 8,3 | 27,7 | 31,8 | 25,1 | 17,2 |
| lengte van de q-last: 0,625 [m] | | | | | | | | | UGT / Frequentie aanw | | | 1,19 | 1,37 | | |
| | | | | | | | | | totaal Qd [kN]: | | | 17 | 20 | | |

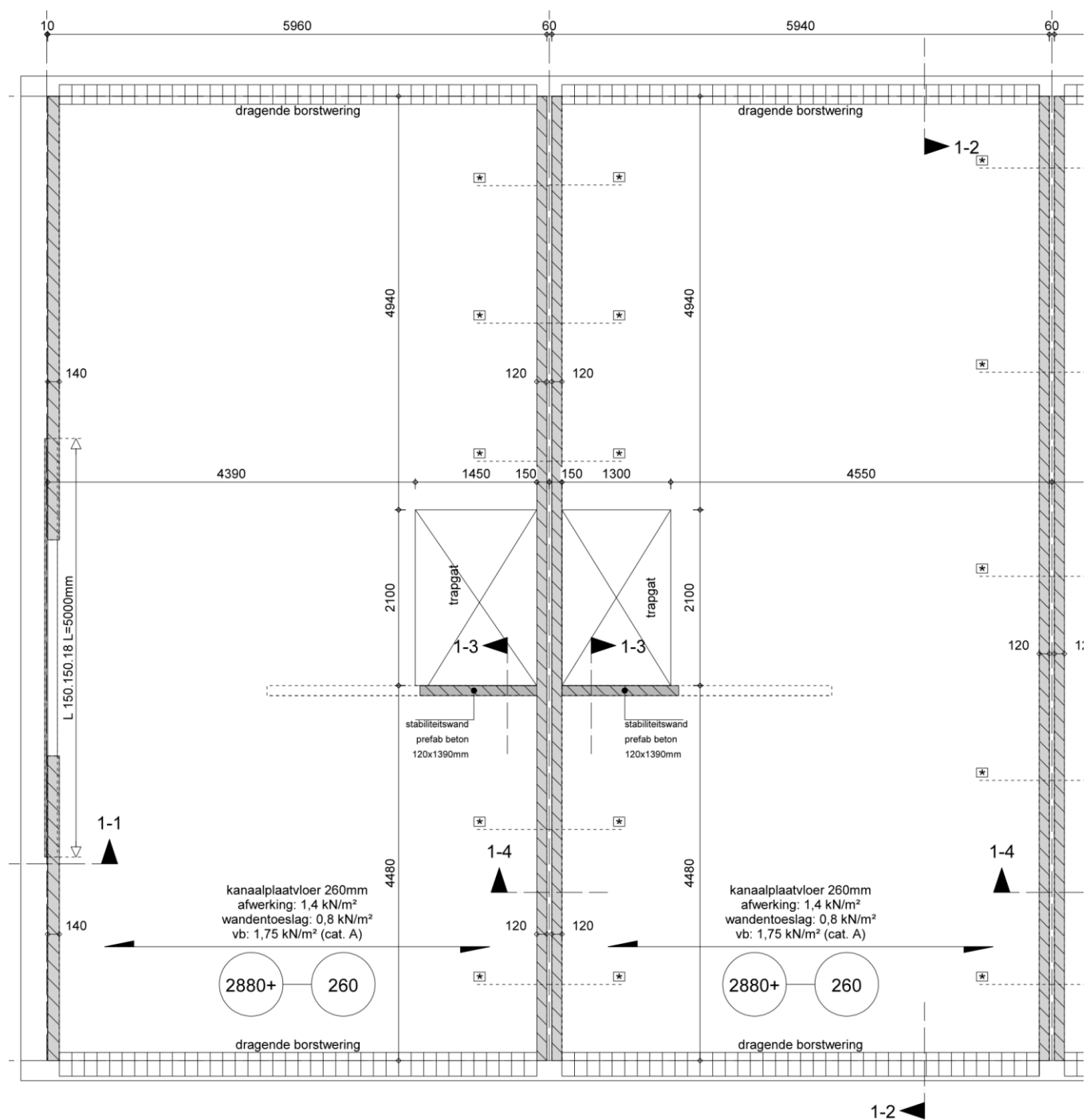
| | | | | | | | | | | ongunstig | | stabiliteit / opdrijven | | | | |
|---|--|--|--|--|--|--|--|--|--|------------------------|--------------------|-------------------------|----------------|-----------------|--------------|-----------------|
| | | | | | | | | | | ΣG_{rep} | ΣQ_{rep} | ΣQ_{rep} | $\Sigma 6.10a$ | $\Sigma 6.10b$ | Σ | Σ |
| | | | | | | | | | | rep. | rep. | rep. | 1,22 G + | 1,08 G + | 1,08 G + | 0,90 G |
| | | | | | | | | | | perm. | comb. (ψ_0) | extr+comb(ψ_0) | 1,35 * Qcomb | 1,35 Qextr+comb | 1,35 * Qcomb | 1,35 * Qgunstig |
| Totale belasting op Woning B - latei [kN] | | | | | | | | | | 36 | 7 | 17 | 52 | 61 | 48 | 32 |
| | | | | | | | | | | zwaartepunt belasting: | | 0,519 m | 0,516 m | 0,519 m | 0,521 m | |

Profielkeuze: L200x100x10

| | | | | | | | | | | | |
|---|------------------|-------------------|------|---|----------------|-------|-------------------|--|-------|-----------|------|
| latei woning A en B 14 woningen Zuideinde 83 te Westzaan 18107 Eurocode NIEUWBOUW A: woon- en verblijfsruimtes ontwerplevensduur 50 jaar veiligheidsklasse CC1 - | | | |  | | | | profiel 1 L 200 x 100 x 10 profiel 2 $M_{Ed,max}$ 9,8 $V_{Ed,max}$ 36,1 $R_{Ed,max}$ 36,1 u_{eind} 0,5 u_{bij} 0,2 | | | |
| buiging | 0,45 | dwarskracht | 0,20 | onderflens | 0,29 | kip | 0,46 | u_{eind} | 0,10 | u_{bij} | 0,07 |
| opmerking | | | | | | | | | | | |
| materiaal | S235 | | | liggerlengte L | 1,25 | m | resultaten | | | | |
| klasse | 3 | - | | a1 | lengte q1 | 0,625 | m | $M_{Ed,stpt,max}$ | 0 | kNm | |
| f_y | 235 | N/mm ² | | a2 | lengte q2 | 0,625 | m | $M_{Ed,veld,max}$ | 9,8 | kNm | |
| E | 210000 | N/mm ² | | b1 | afstand F1 | 0 | m | $M_{c,Rd}$ | 21,9 | kNm | |
| doorbuiging eind 1: | 250 | * L | | q1 | G_{rep} | 38,1 | kN/m | $M_{b,Rd}$ | 21,4 | kNm | |
| doorbuiging bij 1: | 500 | * L | | | $Q_{extr+mom}$ | 18,4 | kN/m | $V_{Ed,max}$ | 36,1 | kN | |
| zeeg veld | 0 | mm | | | Q_{mom} | 7,4 | kN/m | $V_{c,Rd}$ | 179,7 | kN | |
| profiel 1 | L 200 x 100 x 10 | | | q2 | G_{rep} | 19,1 | kN | $R_{Ed,max}$ | 36,1 | kN | |
| richting | sterke as | | | | $Q_{extr+mom}$ | 8,3 | kN | $N_{b,Rd}$ | 122,7 | kN | |
| aantal | 1xprofiel 1: | | | | Q_{mom} | 3,3 | kN | doorbuiging u_{eind} | 0,5 | mm | |
| profiel 2 | | | | F1 | G_{rep} | 0 | kN | doorbuiging u_{bij} | 0,2 | mm | |
| richting | | | | | $Q_{extr+mom}$ | 0 | kN | | | | |
| aantal | | | | | Q_{mom} | 0 | kN | | | | |

Woning type E en F

De 1^e verdiepingsvloer is kanaalplaatvloer van 260 mm dikte.
Deze vloer wordt door de leverancier verder uitgewerkt.



Latei zijgevel:

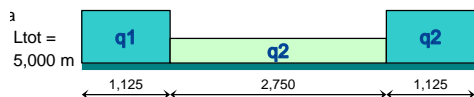
De kozijnen in de zijgevels hebben allemaal een dagmaat van 2600 mm.

De systeemplengte van de latei is 2750 mm.

Er wordt voor gekozen de latei door te leggen zodat een inklemming ontstaat.

Belastingen:

W4 - latei zijgevel 1e verd



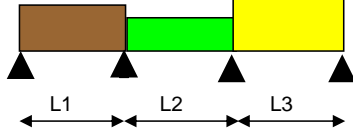

| q1 : | cat. | G _k | Q _k | ψ ₀ | factor * lengte | breedte | lengte | aantal | G _{rep} | Q _{rep} | Q _{rep} | 6.10a | 6.10b | stabiliteit / opdrijven |
|---------------------------------|---------|----------------|----------------|----------------|-----------------------|---------|--------|--------|-----------------------|-------------------------|----------------------------|--------------|-----------------|------------------------------|
| | kar. | kar. | factor | | | | | | rep. | rep. | rep. | 1,22 G + | 1,08 G + | 1,08 G + 0,90 G |
| | [kN/m²] | [kN/m²] | comb.w | - | [m] | [m] | - | | perm. | comb. (ψ ₀) | extr+comb(ψ ₀) | 1,35 * Qcomb | 1,35 Qextr+comb | 1,35 * Qcomb 1,35 * Qgunstig |
| 1e verdiepingvloer | A | 5,20 | 2,55 | 0,40 | 1,00 | 1,00 | 2,90 | 1 | 15,08 | 2,96 | 7,40 | 22,3 | 26,3 | 20,3 13,6 |
| gevel; betimm.; 140mm beton | | 4,11 | | | 1,00 | 1,00 | 2,65 | 1 | 10,90 | | | 13,2 | 11,8 | 11,8 9,8 |
| q 1 :N/m² | | | | | | | | | 26,0 | 3,0 | 7,4 | 35,6 | 38,0 | 32,1 23,4 |
| lengte van de q-last: 1,125 [m] | | | | | | | | | UGT / Frequentie aanw | | | 1,20 | 1,28 | |
| | | | | | | | | | totaal Qd [kN]: | | | 40 | 43 | |

| q2 : | cat. | G _k | Q _k | ψ ₀ | factor * lengte | breedte | lengte | aantal | G _{rep} | Q _{rep} | Q _{rep} | 6.10a | 6.10b | stabiliteit / opdrijven |
|---------------------------------|---------|----------------|----------------|----------------|-----------------------|---------|--------|--------|-----------------------|-------------------------|----------------------------|--------------|-----------------|------------------------------|
| | kar. | kar. | factor | | | | | | rep. | rep. | rep. | 1,22 G + | 1,08 G + | 1,08 G + 0,90 G |
| | [kN/m²] | [kN/m²] | comb.w | - | [m] | [m] | - | | perm. | comb. (ψ ₀) | extr+comb(ψ ₀) | 1,35 * Qcomb | 1,35 Qextr+comb | 1,35 * Qcomb 1,35 * Qgunstig |
| 1e verdiepingvloer | A | 5,20 | 2,55 | 0,40 | 1,00 | 1,00 | 2,90 | 1 | 15,08 | 2,96 | 7,40 | 22,3 | 26,3 | 20,3 13,6 |
| q 2 :N/m² | | | | | | | | | 15,1 | 3,0 | 7,4 | 22,3 | 26,3 | 20,3 13,6 |
| lengte van de q-last: 2,750 [m] | | | | | | | | | UGT / Frequentie aanw | | | 1,19 | 1,40 | |
| | | | | | | | | | totaal Qd [kN]: | | | 61 | 72 | |

| q2 : | cat. | G _k | Q _k | ψ ₀ | factor * lengte | breedte | lengte | aantal | G _{rep} | Q _{rep} | Q _{rep} | 6.10a | 6.10b | stabiliteit / opdrijven |
|---------------------------------|---------|----------------|----------------|----------------|-----------------------|---------|--------|--------|-----------------------|-------------------------|----------------------------|--------------|-----------------|------------------------------|
| | kar. | kar. | factor | | | | | | rep. | rep. | rep. | 1,22 G + | 1,08 G + | 1,08 G + 0,90 G |
| | [kN/m²] | [kN/m²] | comb.w | - | [m] | [m] | - | | perm. | comb. (ψ ₀) | extr+comb(ψ ₀) | 1,35 * Qcomb | 1,35 Qextr+comb | 1,35 * Qcomb 1,35 * Qgunstig |
| 1e verdiepingvloer | A | 5,20 | 2,55 | 0,40 | 1,00 | 1,00 | 2,90 | 1 | 15,08 | 2,96 | 7,40 | 22,3 | 26,3 | 20,3 13,6 |
| gevel; betimm.; 140mm beton | | 4,11 | | | 1,00 | 1,00 | 2,65 | 1 | 10,90 | | | 13,2 | 11,8 | 11,8 9,8 |
| q 2 :N/m² | | | | | | | | | 26,0 | 3,0 | 7,4 | 35,6 | 38,0 | 32,1 23,4 |
| lengte van de q-last: 1,125 [m] | | | | | | | | | UGT / Frequentie aanw | | | 1,20 | 1,28 | |
| | | | | | | | | | totaal Qd [kN]: | | | 40 | 43 | |

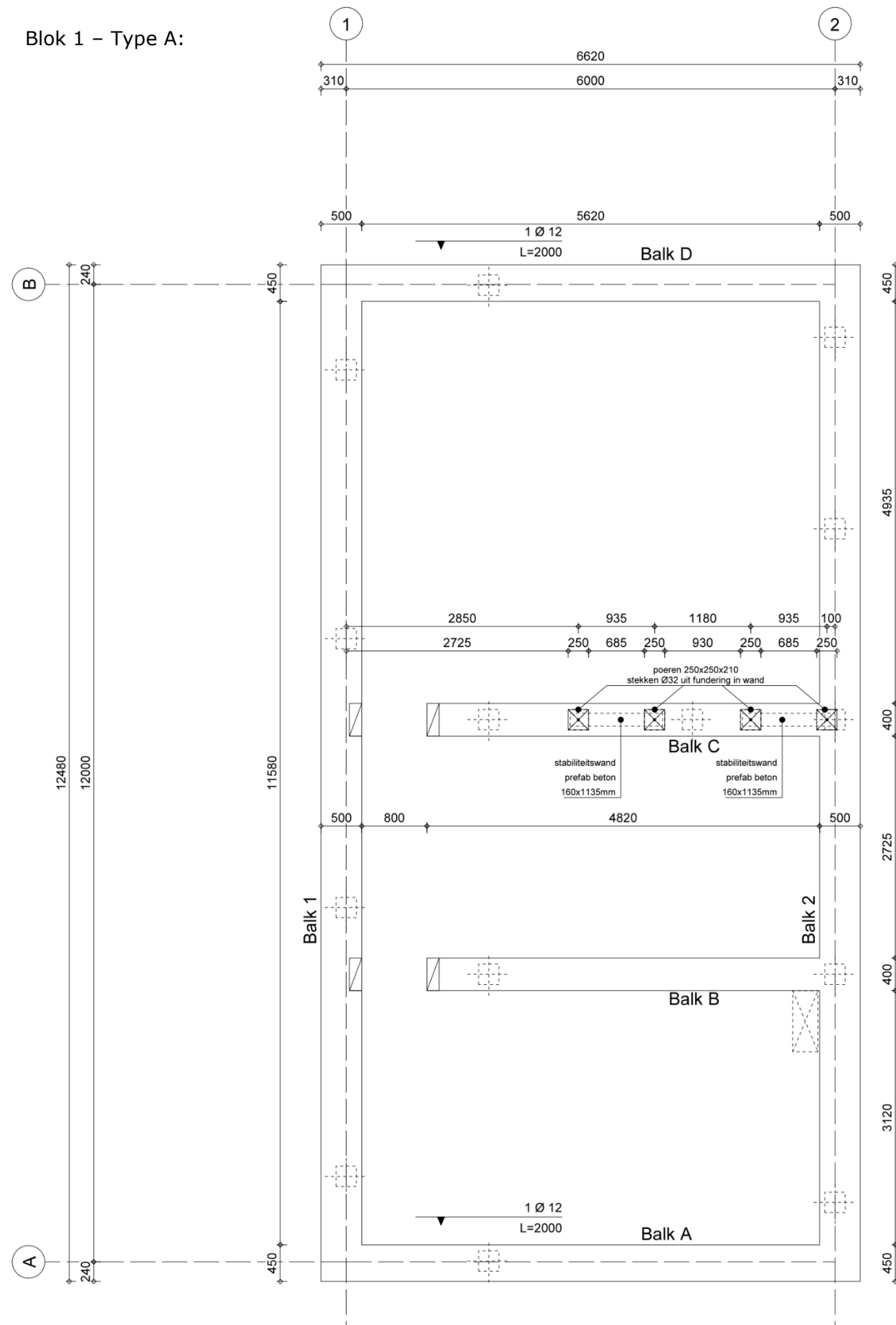
| | | | | | | | | | ongunstig | | stabiliteit / opdrijven | |
|--|--|--|--|--|--|--|--|--|--|-------------------------|----------------------------|---|
| | | | | | | | | | Σ G _{rep} | Σ Q _{rep} | Σ Q _{rep} | Σ 6.10a Σ 6.10b |
| | | | | | | | | | rep. | rep. | rep. | 1,22 G + 1,08 G + 1,08 G + 0,90 G |
| | | | | | | | | | perm. | comb. (ψ ₀) | extr+comb(ψ ₀) | 1,35 * Qcomb 1,35 Qextr+comb 1,35 * Qcomb 1,35 * Qgunstig |
| Totale belasting op W4 - latei zijgevel 1e verd [kN] | | | | | | | | | 100 | 15 | 37 | 141 158 128 90 |
| | | | | | | | | | zwaartepunt belasting: 2,500 m 2,500 m 2,500 m 2,500 m | | | |

Profielkeuze: L 150 x 150 x 18:

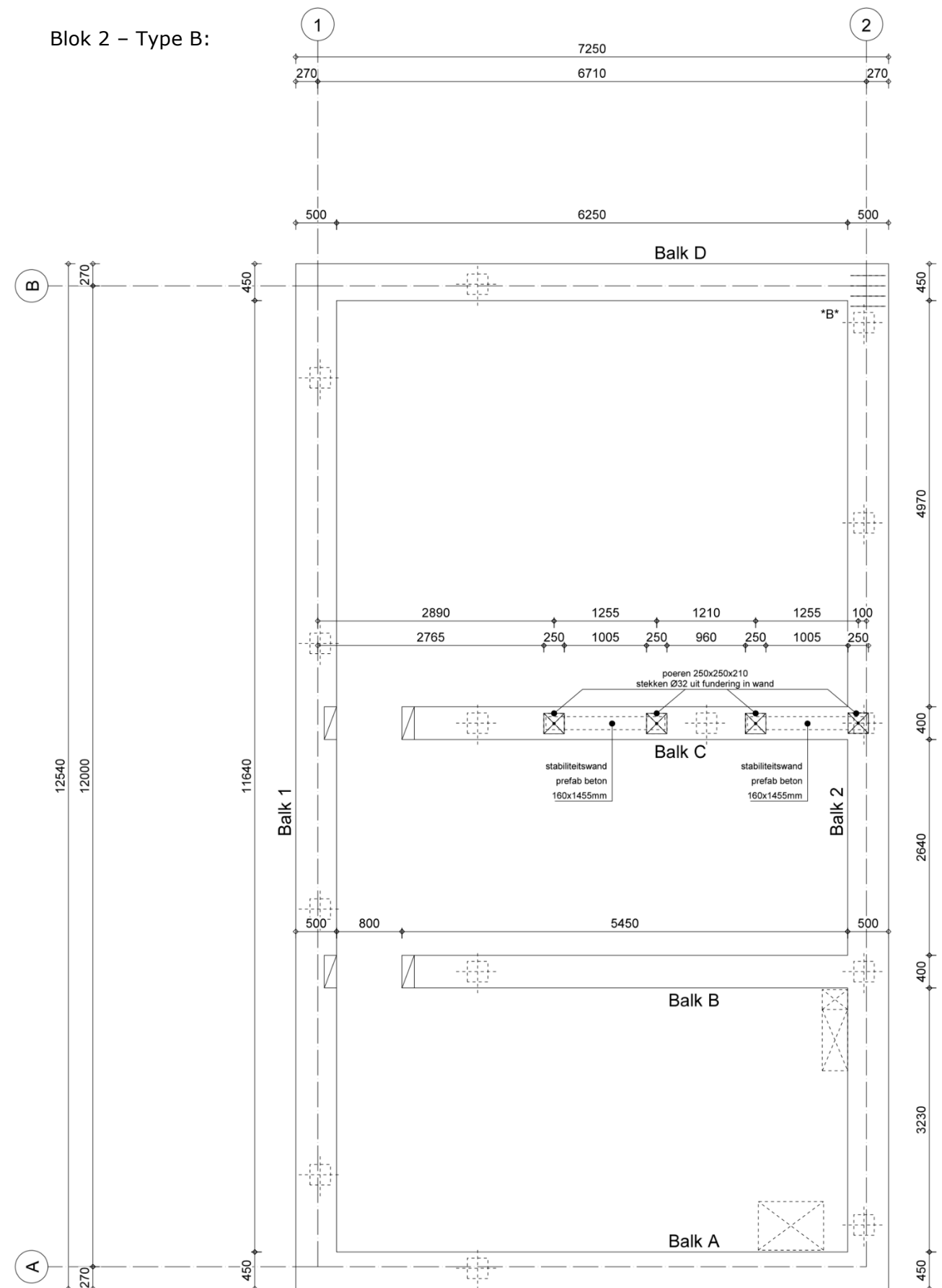
| | | | | | | | | | | | | | | | | | | | | | | | |
|--|--|------|--|---|--|------|--|---|--|------|--|-----|--|------|--|------------|--|------|--|-----------|--|------|--|
| latei woning E - 1e verd 14 woningen Zuideinde 83 te Westzaan 18107 Eurocode NIEUWBOUW A: woon- en verblijfsruimtes ontwerplevensduur 50 jaar veiligheidsklasse CC1 - | | | | <div>S ligger 4 stpt EC</div>  | | | | <div>profiel 1 L 150 x 150 x 18</div> <div>profiel 2</div> <div>$M_{Ed,max}$ 14,8</div> <div>$V_{Ed,max}$ 37,2</div> <div>$R_{Ed,max}$ 72,0</div> <div>u_{eind} 0,0</div> <div>u_{bij} 0,1</div>  | | | | | | | | | | | | | | | |
| buiging | | 0,64 | | dwarskracht | | 0,45 | | onderflens | | 0,16 | | kip | | 0,64 | | u_{eind} | | 0,23 | | u_{bij} | | 0,17 | |
| opmerking | | | | | | | | | | | | | | | | | | | | | | | |
| materiaal S235 | | | | liggerlengte L1 1,125 m | | | | resultaten | | | | | | | | | | | | | | | |
| klasse 3 - | | | | liggerlengte L2 2,75 m | | | | $M_{Ed,stpt,max}$ 14,8 kNm | | | | | | | | | | | | | | | |
| f_y 235 N/mm ² | | | | liggerlengte L3 1,125 m | | | | $M_{Ed,veld,max}$ 11,2 kNm | | | | | | | | | | | | | | | |
| E 210000 N/mm ² | | | | | | | | $M_{c,Rd}$ 23,2 kNm | | | | | | | | | | | | | | | |
| doorbuiging eind 1: 250 * L | | | | q1 G_{rep} 26 kN/m | | | | $M_{b,Rd}$ 23,2 kNm | | | | | | | | | | | | | | | |
| doorbuiging bij 1: 500 * L | | | | $Q_{extr+mom}$ 7,4 kN/m | | | | $V_{Ed,max}$ 37,2 kN | | | | | | | | | | | | | | | |
| zeeg veld 1 0 mm | | | | Q_{mom} 3 kN/m | | | | $V_{c,Rd}$ 81,9 kN | | | | | | | | | | | | | | | |
| zeeg veld 2 0 mm | | | | q2 G_{rep} 15,1 kN/m | | | | $R_{Ed,max}$ 72,0 kN | | | | | | | | | | | | | | | |
| zeeg veld 3 0 mm | | | | $Q_{extr+mom}$ 7,4 kN/m | | | | $N_{b,Rd}$ 460,4 kN | | | | | | | | | | | | | | | |
| profiel 1 L 150 x 150 x 18 | | | | Q_{mom} 3 kN/m | | | | | | | | | | | | | | | | | | | |
| richting sterke as | | | | q3 G_{rep} 26 kN/m | | | | doorbuiging u_{eind} 0,0 mm veld 1 | | | | | | | | | | | | | | | |
| aantal 1xprofiel 1: | | | | $Q_{extr+mom}$ 7,4 kN/m | | | | doorbuiging u_{bij} 0,1 mm veld 1 | | | | | | | | | | | | | | | |
| profiel 2 | | | | Q_{mom} 3 kN/m | | | | doorbuiging u_{eind} 2,4 mm veld 2 | | | | | | | | | | | | | | | |
| richting | | | | | | | | doorbuiging u_{bij} 0,9 mm veld 2 | | | | | | | | | | | | | | | |
| aantal | | | | | | | | doorbuiging u_{eind} 0,0 mm veld 3 | | | | | | | | | | | | | | | |
| | | | | | | | | doorbuiging u_{bij} 0,1 mm veld 3 | | | | | | | | | | | | | | | |

Fundering:

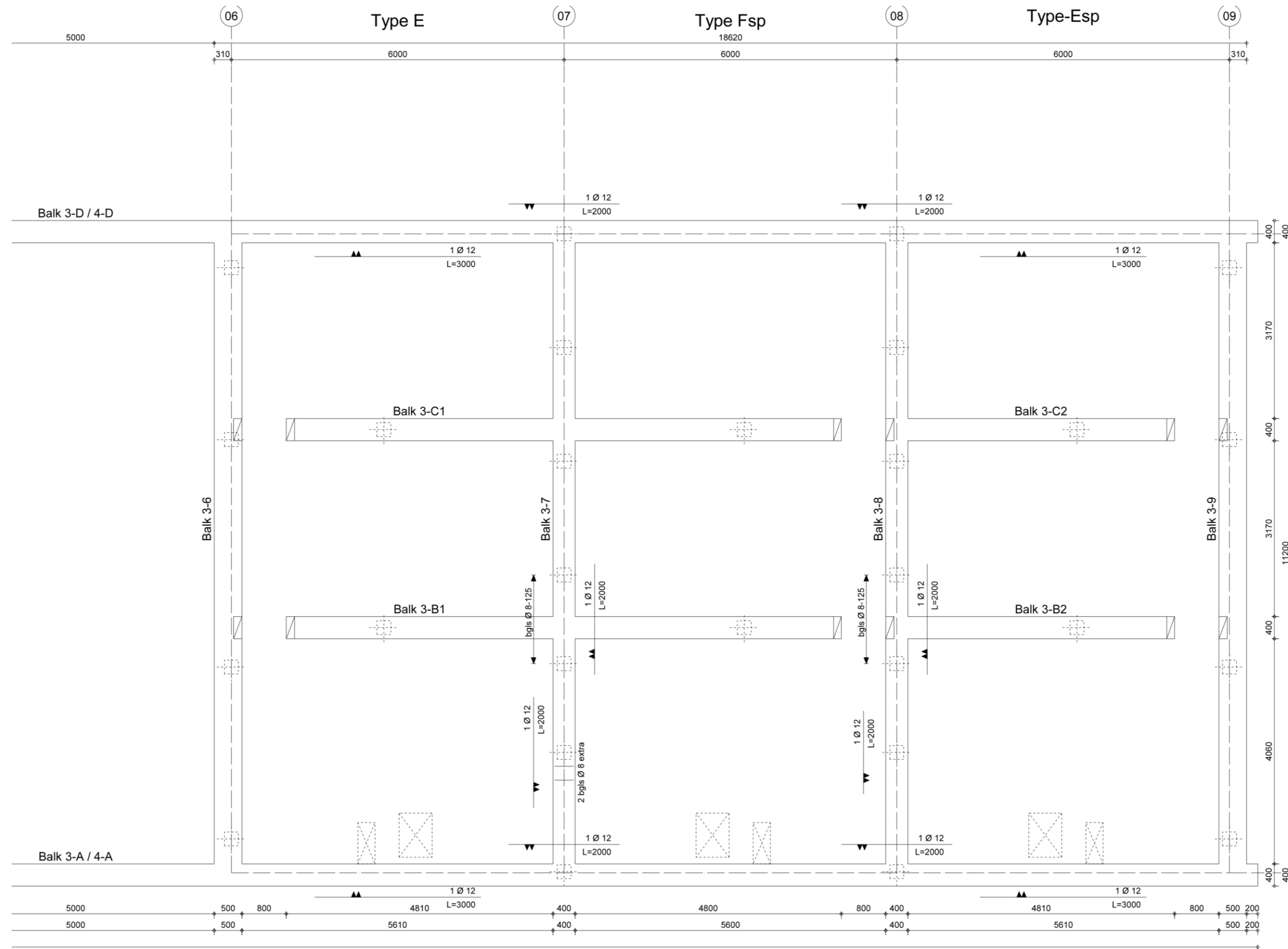
Blok 1 – Type A:



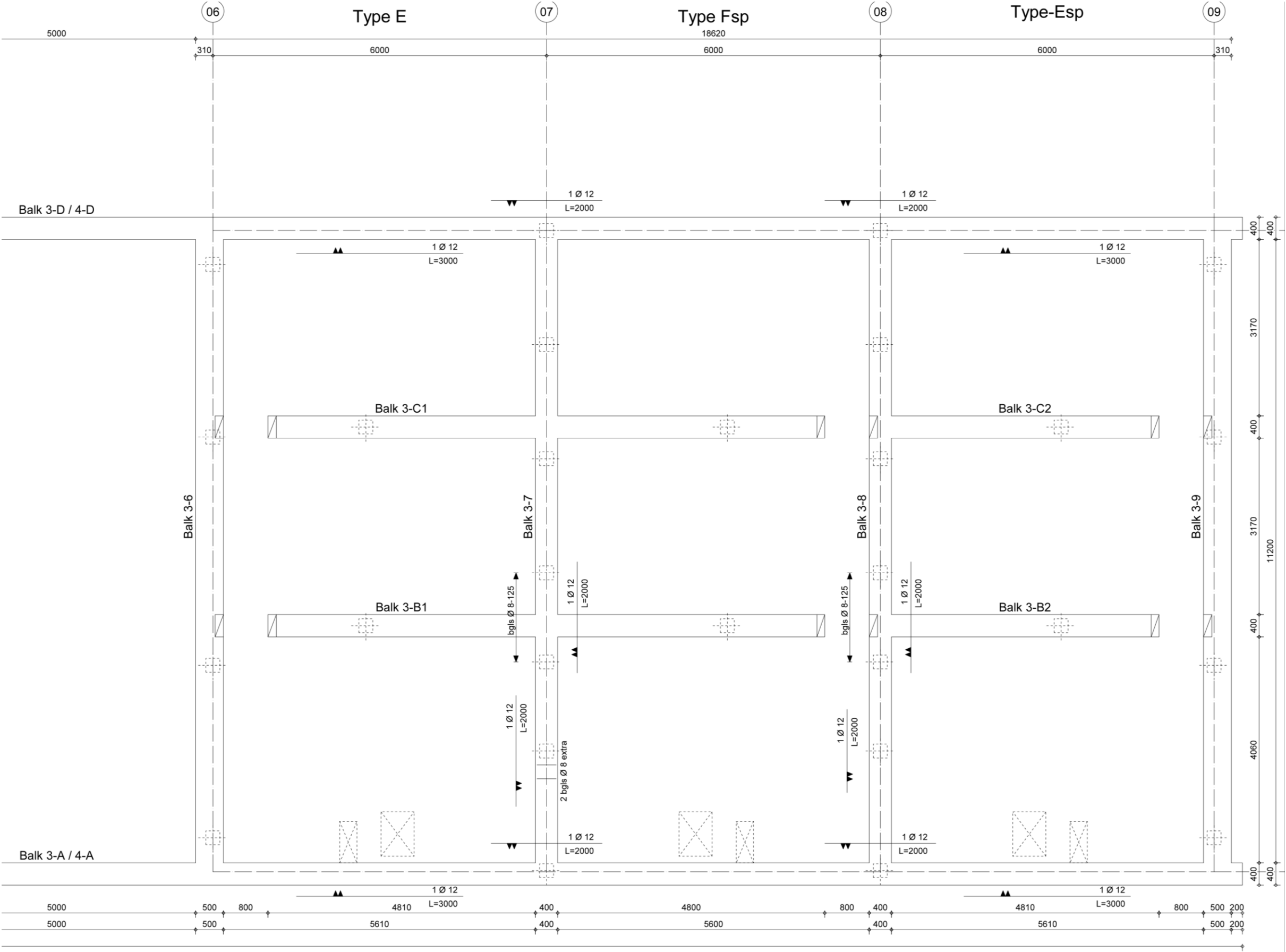
Blok 2 – Type B:



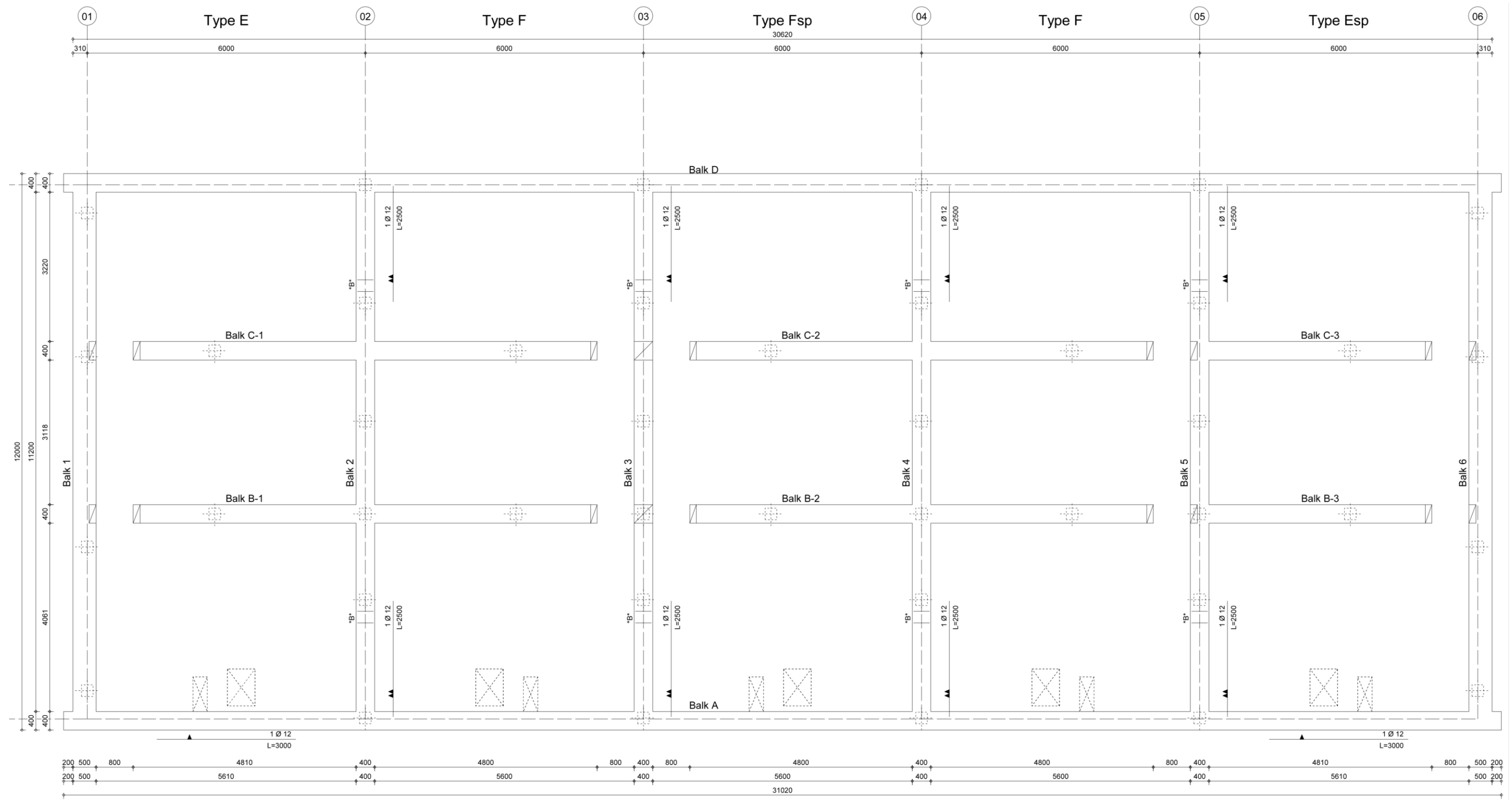
Blok 3 (fragment) – Type E / F:



Blok 4 (fragment) – Type E / F:



Blok 5 – Type E / F:



Toelaatbare paalbelastingen:

Het inheinvio van de palen en de diameter van de palen is bepaald aan de hand van het funderingsadvies, uitgezet in onderstaande tabel.

| Sond. nummer | Basis- niveau in m tov N.A.P. | 220x220 mm ² | | 250x250 mm ² | |
|-----------------|--|---------------------------------|---|---------------------------------|---|
| | | R _{c;d;netto} in kN | W _{1;d+el;d} toest.B in mm | R _{c;d;netto} in kN | W _{1;d+el;d} toest.B in mm |
| 1 | a) -16.00 | 367 | --- | 458 | --- |
| | b) -16.50 | 427 | --- | 529 | --- |
| 2 | a) -16.00 | 382 | --- | 468 | --- |
| | b) -16.50 | 442 | --- | 540 | --- |
| 3 | a) -17.00 | 380 | --- | 462 | --- |
| | b) -17.50 | 359 | --- | 428 | --- |
| 4 | a) -17.00 | 409 | --- | 496 | --- |
| | b) -17.50 | 398 | --- | 475 | --- |
| 5 | a) -17.50 | 387 | --- | 465 | --- |
| 6 | a) -17.50 | 461 | --- | 547 | --- |
| 7 | a) -17.50 | 336 | --- | 400 | --- |
| 8 | a) -17.00 | 411 | --- | 489 | --- |
| | b) -17.50 | 435 | --- | 515 | --- |
| | c) -18.00 | 459 | --- | 541 | --- |
| | a) -17.00 | 502 | --- | 608 | --- |
| 9 | b) -17.50 | 461 | --- | 549 | --- |
| | c) -18.00 | 500 | --- | 593 | --- |
| | a) -17.00 | 374 | --- | 448 | --- |
| 10 | b) -17.50 | 416 | --- | 498 | --- |
| | c) -18.00 | 458 | --- | 547 | --- |

Er wordt gekozen voor de volgende inheinvio's:

| | | | | |
|--------------|-----------------|------------------|---------------|------------------|
| Blok 1 en 2: | Palen 220 x 220 | 17,00 meter -NAP | Fmax = 290 kN | |
| Blok 3: | Palen 220 x 220 | 17,50 meter -NAP | Fmax = 290 kN | |
| | Palen 250 x 250 | 17,50 meter -NAP | Fmax = 350 kN | |
| Blok 4: | Palen 220 x 220 | 17,50 meter -NAP | Fmax = 258 kN | (290 kN op as 5) |
| | Palen 250 x 250 | 17,50 meter -NAP | Fmax = 300 kN | |
| Blok 5: | Palen 220 x 220 | 17,50 meter -NAP | Fmax = 320 kN | |
| | Palen 250 x 250 | 17,50 meter -NAP | Fmax = 400 kN | |

Woning type A en B - balkwapening:

| | |
|-----------------|--|
| Betonkwaliteit: | C20/25 |
| Betonstaal: | B500B |
| Milieuklasse: | XC4 |
| Dekking: | boven en zijkant 35 mm, onder 40 mm |

type A:

| | |
|---------------|-----------|
| balk 1 / 2: | 500 x 500 |
| onderwapening | 4Ø12 |
| bovenwapening | 4Ø12 |
| beugels | Ø8-250 |
| flank | 2Ø8 |

| | |
|---------------|-----------|
| balk A / D: | 450 x 500 |
| onderwapening | 4Ø12 |
| bovenwapening | 4Ø12 |
| beugels | Ø8-250 |
| flank | 2Ø8 |

| | |
|---------------|-----------|
| balk B: | 400 x 500 |
| onderwapening | 4Ø12 |
| bovenwapening | 4Ø12 |
| beugels | Ø8-250 |
| flank | 2Ø8 |

| | |
|---------------|-----------|
| balk C: | 400 x 500 |
| onderwapening | 4Ø16 |
| bovenwapening | 4Ø16 |
| beugels | Ø8-200 |
| flank | 2Ø8 |

Voor bijlegwapening zie de tekening.

type B:

| | |
|---------------|-----------|
| balk 1 / 2: | 500 x 500 |
| onderwapening | 4Ø12 |
| bovenwapening | 5Ø12 |
| beugels | Ø8-250 |
| flank | 2Ø8 |

| | |
|---------------|-----------|
| balk A / D: | 450 x 500 |
| onderwapening | 2Ø12+2Ø16 |
| bovenwapening | 4Ø16 |
| beugels | Ø8-250 |
| flank | 2Ø8 |

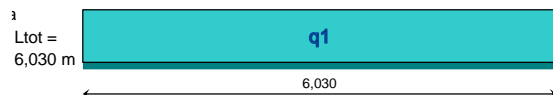
| | |
|---------------|-----------|
| balk B: | 400 x 500 |
| onderwapening | 4Ø12 |
| bovenwapening | 4Ø12 |
| beugels | Ø8-250 |
| flank | 2Ø8 |

| | |
|---------------|-----------|
| balk C: | 400 x 500 |
| onderwapening | 4Ø16 |
| bovenwapening | 4Ø16 |
| beugels | Ø8-200 |
| flank | 2Ø8 |

Voor bijlegwapening zie de tekening.

Woning type A en B - balkbelastingen:

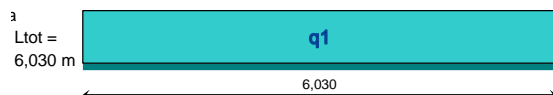
Woning A - Balk A



| q1 : | cat. | G _k | Q _k | ψ ₀ | factor * lengte | breedte | lengte | aantal | G _{rep} | Q _{rep} | Q _{rep} | 6.10a | 6.10b | stabiliteit / opdrijven | |
|-----------------------------------|------|----------------|----------------|----------------|--------------------|---------|--------|--------|-----------------------|-------------------------|----------------------------|--------------|-----------------|-------------------------|-----------------|
| | | kar. | kar. | factor | | | | | rep. | rep. | rep. | 1,22 G + | 1,08 G + | 1,08 G + | 0,90 G |
| | | [kN/m²] | [kN/m²] | comb.w | - | [m] | [m] | - | perm. | comb. (ψ ₀) | extr+comb(ψ ₀) | 1,35 * Qcomb | 1,35 Qextr+comb | 1,35 * Qcomb | 1,35 * Qgunstig |
| begane grondvloer | A | 3,40 | 2,55 | 0,40 | 1,00 | 1,00 | 1,80 | 1 | 6,12 | 1,84 | 4,59 | 9,9 | 12,8 | 9,1 | 5,5 |
| gevel; 100mm bakst; houten bi.bl. | | 2,50 | | | 1,00 | 1,00 | 0,55 | 1 | 1,38 | | | 1,7 | 1,5 | 1,5 | 1,2 |
| hsb gevel; betimm.; houten bi.bl. | | 1,00 | | | 1,00 | 1,00 | 2,50 | 1 | 2,50 | | | 3,0 | 2,7 | 2,7 | 2,3 |
| q 1 :N/m² | | | | | | | | | 10,0 | 1,8 | 4,6 | 14,6 | 17,0 | 13,3 | 9,0 |
| lengte van de q-last: 6,030 [m] | | | | | | | | | UGT / Frequentie aanw | | | 1,19 | 1,38 | | |
| | | | | | | | | | totaal Qd [kN]: | | | 88 | 102 | | |

| | | | ongunstig | | stabiliteit / opdrijven | |
|------------------------|-------------------------|----------------------------|--------------|-----------------|-------------------------|-----------------|
| Σ G _{rep} | Σ Q _{rep} | Σ Q _{rep} | Σ 6.10a | Σ 6.10b | Σ | Σ |
| rep. | rep. | rep. | 1,22 G + | 1,08 G + | 1,08 G + | 0,90 G |
| perm. | comb. (ψ ₀) | extr+comb(ψ ₀) | 1,35 * Qcomb | 1,35 Qextr+comb | 1,35 * Qcomb | 1,35 * Qgunstig |
| 60 | 11 | 28 | 88 | 102 | 80 | 54 |
| zwaartepunt belasting: | | | 3,015 m | 3,015 m | 3,015 m | 3,015 m |

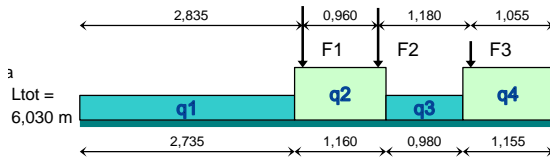
Woning A - Balk B



| q1 : | cat. | G _k | Q _k | ψ ₀ | factor * lengte | breedte | lengte | aantal | G _{rep} | Q _{rep} | Q _{rep} | 6.10a | 6.10b | stabiliteit / opdrijven | |
|---------------------------------|------|----------------|----------------|----------------|--------------------|---------|--------|--------|-----------------------|-------------------------|----------------------------|--------------|-----------------|-------------------------|-----------------|
| | | kar. | kar. | factor | | | | | rep. | rep. | rep. | 1,22 G + | 1,08 G + | 1,08 G + | 0,90 G |
| | | [kN/m²] | [kN/m²] | comb.w | - | [m] | [m] | - | perm. | comb. (ψ ₀) | extr+comb(ψ ₀) | 1,35 * Qcomb | 1,35 Qextr+comb | 1,35 * Qcomb | 1,35 * Qgunstig |
| begane grondvloer | A | 3,40 | 2,55 | 0,40 | 1,00 | 1,00 | 3,35 | 1 | 11,39 | 3,42 | 8,54 | 18,5 | 23,8 | 16,9 | 10,3 |
| q 1 :N/m² | | | | | | | | | 11,4 | 3,4 | 8,5 | 18,5 | 23,8 | 16,9 | 10,3 |
| lengte van de q-last: 6,030 [m] | | | | | | | | | UGT / Frequentie aanw | | | 1,18 | 1,52 | | |
| | | | | | | | | | totaal Qd [kN]: | | | 111 | 144 | | |

| | | | ongunstig | | stabiliteit / opdrijven | |
|------------------------|-------------------------|----------------------------|--------------|-----------------|-------------------------|-----------------|
| Σ G _{rep} | Σ Q _{rep} | Σ Q _{rep} | Σ 6.10a | Σ 6.10b | Σ | Σ |
| rep. | rep. | rep. | 1,22 G + | 1,08 G + | 1,08 G + | 0,90 G |
| perm. | comb. (ψ ₀) | extr+comb(ψ ₀) | 1,35 * Qcomb | 1,35 Qextr+comb | 1,35 * Qcomb | 1,35 * Qgunstig |
| 69 | 21 | 52 | 111 | 144 | 102 | 62 |
| zwaartepunt belasting: | | | 3,015 m | 3,015 m | 3,015 m | 3,015 m |

W1 - Balk C



| q1 : | cat. | G _k | Q _k | ψ ₀ | factor * lengte | breedte | lengte | aantal | G _{rep} | Q _{rep} | Q _{rep} | 6.10a | 6.10b | stabiliteit / opdrijven |
|---------------------------------|------|----------------|----------------|----------------|-----------------------|---------|--------|--------|-----------------------|-------------------------|----------------------------|--------------|-----------------|------------------------------|
| | kar. | [kN/m²] | [kN/m²] | comb.w | - | [m] | [m] | - | rep. | rep. | rep. | 1,22 G + | 1,08 G + | 1,08 G + 0,90 G |
| | | | | | | | | | perm. | comb. (ψ ₀) | extr+comb(ψ ₀) | 1,35 * Qcomb | 1,35 Qextr+comb | 1,35 * Qcomb 1,35 * Qgunstig |
| begane grondvloer | A | 3,40 | 2,55 | 0,40 | 1,00 | 1,00 | 4,25 | 1 | 14,45 | 4,34 | 10,84 | 23,4 | 30,2 | 21,5 13,0 |
| q 1 : :N/m² | | | | | | | | | 14,5 | 4,3 | 10,8 | 23,4 | 30,2 | 21,5 13,0 |
| lengte van de q-last: 2,735 [m] | | | | | | | | | UGT / Frequentie aanw | | 1,18 | 1,52 | | |
| | | | | | | | | | totaal Qd [kN]: | | 64 | 83 | | |

| q2 : | cat. | G _k | Q _k | ψ ₀ | factor * lengte | breedte | lengte | aantal | G _{rep} | Q _{rep} | Q _{rep} | 6.10a | 6.10b | stabiliteit / opdrijven |
|---------------------------------|------|----------------|----------------|----------------|-----------------------|---------|--------|--------|-----------------------|-------------------------|----------------------------|--------------|-----------------|------------------------------|
| | kar. | [kN/m²] | [kN/m²] | comb.w | - | [m] | [m] | - | rep. | rep. | rep. | 1,22 G + | 1,08 G + | 1,08 G + 0,90 G |
| | | | | | | | | | perm. | comb. (ψ ₀) | extr+comb(ψ ₀) | 1,35 * Qcomb | 1,35 Qextr+comb | 1,35 * Qcomb 1,35 * Qgunstig |
| 1e verdiepingvloer | A | 5,22 | 2,55 | 0,40 | 1,00 | 1,00 | 0,60 | 1 | 3,13 | 0,61 | 1,53 | 4,6 | 5,4 | 4,2 2,8 |
| begane grondvloer | A | 3,40 | 2,55 | 0,40 | 1,00 | 1,00 | 4,25 | 1 | 14,45 | 4,34 | 10,84 | 23,4 | 30,2 | 21,5 13,0 |
| stab wand; 160mm beton | | 4,23 | | | 1,00 | 1,00 | 2,90 | 1 | 12,26 | | | 14,9 | 13,2 | 13,2 11,0 |
| q 2 : :N/m² | | | | | | | | | 29,8 | 4,9 | 12,4 | 42,9 | 48,9 | 38,9 26,9 |
| lengte van de q-last: 1,160 [m] | | | | | | | | | UGT / Frequentie aanw | | 1,19 | 1,36 | | |
| | | | | | | | | | totaal Qd [kN]: | | 50 | 57 | | |

| q3 : | cat. | G _k | Q _k | ψ ₀ | factor * lengte | breedte | lengte | aantal | G _{rep} | Q _{rep} | Q _{rep} | 6.10a | 6.10b | stabiliteit / opdrijven |
|---------------------------------|------|----------------|----------------|----------------|-----------------------|---------|--------|--------|-----------------------|-------------------------|----------------------------|--------------|-----------------|------------------------------|
| | kar. | [kN/m²] | [kN/m²] | comb.w | - | [m] | [m] | - | rep. | rep. | rep. | 1,22 G + | 1,08 G + | 1,08 G + 0,90 G |
| | | | | | | | | | perm. | comb. (ψ ₀) | extr+comb(ψ ₀) | 1,35 * Qcomb | 1,35 Qextr+comb | 1,35 * Qcomb 1,35 * Qgunstig |
| begane grondvloer | A | 3,40 | 2,55 | 0,40 | 1,00 | 1,00 | 4,25 | 1 | 14,45 | 4,34 | 10,84 | 23,4 | 30,2 | 21,5 13,0 |
| q 3 : :N/m² | | | | | | | | | 14,5 | 4,3 | 10,8 | 23,4 | 30,2 | 21,5 13,0 |
| lengte van de q-last: 0,980 [m] | | | | | | | | | UGT / Frequentie aanw | | 1,18 | 1,52 | | |
| | | | | | | | | | totaal Qd [kN]: | | 23 | 30 | | |

| q4 : | cat. | G _k | Q _k | ψ ₀ | factor * lengte | breedte | lengte | aantal | G _{rep} | Q _{rep} | Q _{rep} | 6.10a | 6.10b | stabiliteit / opdrijven |
|---------------------------------|------|----------------|----------------|----------------|-----------------------|---------|--------|--------|-----------------------|-------------------------|----------------------------|--------------|-----------------|------------------------------|
| | kar. | [kN/m²] | [kN/m²] | comb.w | - | [m] | [m] | - | rep. | rep. | rep. | 1,22 G + | 1,08 G + | 1,08 G + 0,90 G |
| | | | | | | | | | perm. | comb. (ψ ₀) | extr+comb(ψ ₀) | 1,35 * Qcomb | 1,35 Qextr+comb | 1,35 * Qcomb 1,35 * Qgunstig |
| 1e verdiepingvloer | A | 5,22 | 2,55 | 0,40 | 1,00 | 1,00 | 0,60 | 1 | 3,13 | 0,61 | 1,53 | 4,6 | 5,4 | 4,2 2,8 |
| begane grondvloer | A | 3,40 | 2,55 | 0,40 | 1,00 | 1,00 | 4,25 | 1 | 14,45 | 4,34 | 10,84 | 23,4 | 30,2 | 21,5 13,0 |
| stab wand; 160mm beton | | 4,23 | | | 1,00 | 1,00 | 2,90 | 1 | 12,26 | | | 14,9 | 13,2 | 13,2 11,0 |
| q 4 : :N/m² | | | | | | | | | 29,8 | 4,9 | 12,4 | 42,9 | 48,9 | 38,9 26,9 |
| lengte van de q-last: 1,155 [m] | | | | | | | | | UGT / Frequentie aanw | | 1,19 | 1,36 | | |
| | | | | | | | | | totaal Qd [kN]: | | 50 | 57 | | |

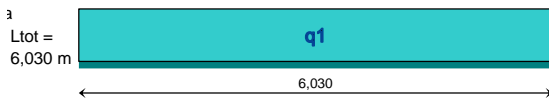
| F1 : | cat. | G _k | Q _k | ψ ₀ | factor * lengte | breedte | lengte | aantal | G _{rep} | Q _{rep} | Q _{rep} | 6.10a | 6.10b | stabiliteit / opdrijven |
|-------------------------------------|------|----------------|----------------|----------------|-----------------------|---------|--------|--------|-----------------------|-------------------------|----------------------------|--------------|-----------------|------------------------------|
| | kar. | [kN/m²] | [kN/m²] | comb.w | - | [m] | [m] | - | rep. | rep. | rep. | 1,22 G + | 1,08 G + | 1,08 G + 0,90 G |
| | | | | | | | | | perm. | comb. (ψ ₀) | extr+comb(ψ ₀) | 1,35 * Qcomb | 1,35 Qextr+comb | 1,35 * Qcomb 1,35 * Qgunstig |
| 1e verdiepingvloer | A | 5,22 | 2,55 | 0,40 | 1,00 | 1,40 | 1,55 | 1 | 11,33 | 2,21 | 5,53 | 16,8 | 19,7 | 15,2 10,2 |
| F 1 : [kN] | | | | | | | | | 11,3 | 2,2 | 5,5 | 16,8 | 19,7 | 15,2 10,2 |
| afstand tot begin schema: 2,835 [m] | | | | | | | | | UGT / Frequentie aanw | | 1,19 | 1,40 | | |

| F2 : | cat. | G _k | Q _k | ψ ₀ | factor * lengte | breedte | lengte | aantal | G _{rep} | Q _{rep} | Q _{rep} | 6.10a | 6.10b | stabiliteit / opdrijven |
|--|------|----------------|----------------|----------------|-----------------------|---------|--------|--------|-----------------------|-------------------------|----------------------------|--------------|-----------------|------------------------------|
| | kar. | [kN/m²] | [kN/m²] | comb.w | - | [m] | [m] | - | rep. | rep. | rep. | 1,22 G + | 1,08 G + | 1,08 G + 0,90 G |
| | | | | | | | | | perm. | comb. (ψ ₀) | extr+comb(ψ ₀) | 1,35 * Qcomb | 1,35 Qextr+comb | 1,35 * Qcomb 1,35 * Qgunstig |
| 1e verdiepingvloer | A | 5,22 | 2,55 | 0,40 | 1,00 | 1,15 | 1,55 | 1 | 9,30 | 1,82 | 4,55 | 13,8 | 16,2 | 12,5 8,4 |
| 1e verdiepingvloer | A | 5,22 | 2,55 | 0,40 | 1,00 | 0,49 | 0,60 | 1 | 1,53 | 0,30 | 0,75 | 2,3 | 2,7 | 2,1 1,4 |
| F 2 : [kN] | | | | | | | | | 10,8 | 2,1 | 5,3 | 16,0 | 18,9 | 14,6 9,8 |
| afstand tot vorige puntlast: 0,960 [m] | | | | | | | | | UGT / Frequentie aanw | | 1,19 | 1,40 | | |

| F3 : | | | | | | | | | | | | | | | | | | | | |
|------------------------------|----------------|----------------|----------------|-----------------------|---------|--------|--------|-----------------------|-------------------------|----------------------------|--------------|-----------------|------------------------------|-----|-----|----|--|--|--|--|
| cat. | G _k | Q _k | ψ ₀ | factor * lengte | breedte | lengte | aantal | G _{rep} | Q _{rep} | Q _{rep} | 6.10a | 6.10b | stabiliteit / opdrijven | | | | | | | |
| kar. | kar. | factor | | | | | | rep. | rep. | rep. | 1,22 G + | 1,08 G + | 1,08 G + 0,90 G | | | | | | | |
| [kN/m²] | [kN/m²] | comb.w | - | [m] | [m] | - | | perm. | comb. (ψ ₀) | extr+comb(ψ ₀) | 1,35 * Qcomb | 1,35 Qextr+comb | 1,35 * Qcomb 1,35 * Qgunstig | | | | | | | |
| 1e verdiepingvloer | A | 5,22 | 2,55 | 0,40 | 1,00 | 0,60 | 0,49 | 1 | 1,53 | 0,30 | 0,75 | 2,3 | 2,7 | 2,1 | 1,4 | ex | | | | |
| F 3 [kN] | | | | | | | | 1,5 | 0,3 | 0,7 | 2,3 | 2,7 | 2,1 | 1,4 | | | | | | |
| | | | | | | | | UGT / Frequentie aanw | | 1,19 | 1,40 | | | | | | | | | |
| afstand tot vorige puntlast: | | | | | | | | 1,180 [m] | | | | | | | | | | | | |

| | | | | | | | | | | ongunstig | | stabiliteit / opdrijven | |
|---|--|--|--|--|--|--|--|--|--|--------------------|-------------------------|----------------------------|---|
| | | | | | | | | | | Σ G _{rep} | Σ Q _{rep} | Σ Q _{rep} | Σ |
| | | | | | | | | | | rep. | rep. | rep. | 1,22 G + 1,08 G + 1,08 G + 0,90 G |
| | | | | | | | | | | perm. | comb. (ψ ₀) | extr+comb(ψ ₀) | 1,35 * Qcomb 1,35 Qextr+comb 1,35 * Qcomb 1,35 * Qgunstig |
| Totale belasting op W1 - Balk C [kN] | | | | | | | | | | 146 | 32 | 80 | 221 267 202 132 |
| zwaartepunt belasting: | | | | | | | | | | 3,357 m | | 3,298 m | 3,352 m 3,412 m |

W1 - Balk D



| q1 : | | | | | | | | | | | | | | | |
|-----------------------------------|----------------|----------------|----------------|-----------------------|---------|--------|--------|------------------|-------------------------|----------------------------|--------------|-----------------|-------------------------|-----------------|------|
| cat. | G _k | Q _k | ψ ₀ | factor * lengte | breedte | lengte | aantal | G _{rep} | Q _{rep} | Q _{rep} | 6.10a | 6.10b | stabiliteit / opdrijven | | |
| kar. | kar. | factor | | | | | | rep. | rep. | rep. | 1,22 G + | 1,08 G + | 1,08 G + | 0,90 G | |
| [kN/m²] | [kN/m²] | comb.w | - | [m] | [m] | - | | perm. | comb. (ψ ₀) | extr+comb(ψ ₀) | 1,35 * Qcomb | 1,35 Qextr+comb | 1,35 * Qcomb | 1,35 * Qgunstig | |
| begane grondvloer | A | 3,40 | 2,55 | 0,40 | 1,00 | 1,00 | 2,70 | 1 | 9,18 | 2,75 | 6,89 | 14,9 | 19,2 | 13,6 | 8,3 |
| gevel; 100mm bakst; houten bi.bl. | | 2,50 | | | 1,00 | 1,00 | 0,52 | 1 | 1,30 | | | 1,6 | 1,4 | 1,4 | 1,2 |
| hsb gevel; betimm.; houten bi.bl. | | 1,00 | | | 1,00 | 1,00 | 2,50 | 1 | 2,50 | | | 3,0 | 2,7 | 2,7 | 2,3 |
| q 1 : N/m' | | | | | | | | | 13,0 | 2,8 | 6,9 | 19,5 | 23,3 | 17,7 | 11,7 |
| lengte van de q-last: 6,030 [m] | | | | | | | | | UGT / Frequentie aanw | | 1,19 | 1,42 | | | |
| | | | | | | | | | totaal Qd [kN]: | | 118 | 141 | | | |

| | | | | | | | | | | ongunstig | | stabiliteit / opdrijven | |
|---|--|--|--|--|--|--|--|--|--|--------------------|-------------------------|----------------------------|---|
| | | | | | | | | | | Σ G _{rep} | Σ Q _{rep} | Σ Q _{rep} | Σ |
| | | | | | | | | | | rep. | rep. | rep. | 1,22 G + 1,08 G + 1,08 G + 0,90 G |
| | | | | | | | | | | perm. | comb. (ψ ₀) | extr+comb(ψ ₀) | 1,35 * Qcomb 1,35 Qextr+comb 1,35 * Qcomb 1,35 * Qgunstig |
| Totale belasting op W1 - Balk D [kN] | | | | | | | | | | 78 | 17 | 42 | 118 141 107 70 |
| zwaartepunt belasting: | | | | | | | | | | 3,015 m | | 3,015 m | 3,015 m 3,015 m |

The diagram shows a continuous beam with four supports, labeled F1, F2, F3, and F4 from left to right. The beam is divided into three spans with lengths of 3,420, 4,380, and 4,230. A distributed load, labeled q1, is applied downwards along the entire length of the beam. The total length of the beam is indicated as Ltot = 12,030 m. The beam is highlighted in light blue.

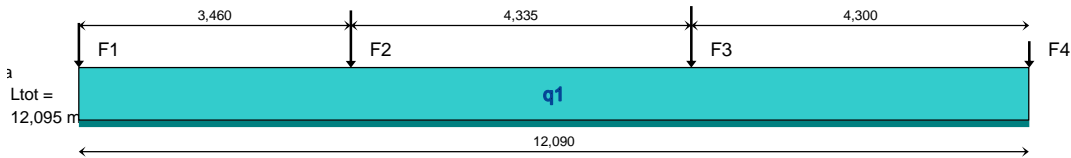
ex
ex

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or

| | | | | |
|------------------------|---------|---------|---------|---------|
| zwaartepunt belasting: | 6,013 m | 6,012 m | 6,013 m | 6,013 m |
|------------------------|---------|---------|---------|---------|

Woning B - Balk 1 en 2



| q1 : | cat. | G _k | Q _k | ψ ₀ | factor * lengte | breedte | lengte | aantal | G _{rep} | Q _{rep} | Q _{rep} | 6.10a | 6.10b | stabiliteit / opdrijven |
|-----------------------------------|---------|----------------|----------------|----------------|-----------------------|---------|--------|--------|-----------------------|-------------------------|----------------------------|--------------|-----------------|------------------------------|
| | kar. | kar. | factor | | | | | | rep. | rep. | rep. | 1,22 G + | 1,08 G + | 1,08 G + 0,90 G |
| | [kN/m²] | [kN/m²] | comb.w | - | [m] | [m] | - | | perm. | comb. (ψ ₀) | extr+comb(ψ ₀) | 1,35 * Qcomb | 1,35 Qextr+comb | 1,35 * Qcomb 1,35 * Qgunstig |
| hellend dak 58 graden | H | 1,50 | 0,04 | 1,00 | 1,00 | 1,15 | 1 | | 1,73 | | | 2,1 | 1,9 | 1,9 1,6 |
| 1e verdiepingvloer | A | 5,22 | 2,55 | 0,40 | 1,00 | 1,00 | 3,25 | 1 | 16,97 | 3,32 | 8,29 | 25,1 | 29,5 | 22,8 15,3 |
| begane grondvloer | A | 3,40 | 2,55 | 0,40 | 1,00 | 1,00 | 0,60 | 1 | 2,04 | 0,61 | 1,53 | 3,3 | 4,3 | 3,0 1,8 |
| gevel; 100mm bakst; 140mm beton | | 5,61 | | | 1,00 | 1,00 | 2,90 | 1 | 16,28 | | | 19,8 | 17,6 | 17,6 14,7 |
| gevel; 100mm bakst; houten bi.bl. | | 2,50 | | | 1,00 | 1,00 | 0,78 | 1 | 1,95 | | | 2,4 | 2,1 | 2,1 1,8 |
| q 1 [N/m] | | | | | | | | | 39,0 | 3,9 | 9,8 | 52,6 | 55,3 | 47,4 35,1 |
| lengte van de q-last: 12,090 [m] | | | | | | | | | UGT / Frequentie aanw | | | 1,20 | 1,26 | |
| | | | | | | | | | totaal Qd [kN]: | | | 636 | 669 | |

| F1 : | cat. | G _k | Q _k | ψ ₀ | factor * lengte | breedte | lengte | aantal | G _{rep} | Q _{rep} | Q _{rep} | 6.10a | 6.10b | stabiliteit / opdrijven |
|-------------------------------|---------|----------------|----------------|----------------|-----------------------|---------|--------|--------|-----------------------|-------------------------|----------------------------|--------------|-----------------|------------------------------|
| | kar. | kar. | factor | | | | | | rep. | rep. | rep. | 1,22 G + | 1,08 G + | 1,08 G + 0,90 G |
| | [kN/m²] | [kN/m²] | comb.w | - | [m] | [m] | - | | perm. | comb. (ψ ₀) | extr+comb(ψ ₀) | 1,35 * Qcomb | 1,35 Qextr+comb | 1,35 * Qcomb 1,35 * Qgunstig |
| hellend dak 58 graden | H | 1,50 | 0,04 | 1,00 | 1,90 | 2,95 | 1 | | 8,42 | | | 10,2 | 9,1 | 9,1 7,6 |
| zoldervloer | A | 0,50 | 1,75 | 0,40 | 1,00 | 1,75 | 1,60 | 1 | 1,40 | 1,96 | 4,90 | 4,3 | 8,1 | 4,2 1,3 |
| dragend hsb; houten bi.bl. | | 0,50 | | | 1,00 | 3,40 | 4,20 | 1 | 7,14 | | | 8,7 | 7,7 | 7,7 6,4 |
| F 1 [kN] | | | | | | | | | 17,0 | 2,0 | 4,9 | 23,3 | 24,9 | 21,0 15,3 |
| afstand tot begin schema: [m] | | | | | | | | | UGT / Frequentie aanw | | | 1,20 | 1,28 | |

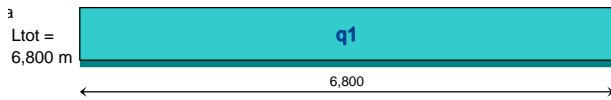
| F2 : | cat. | G _k | Q _k | ψ ₀ | factor * lengte | breedte | lengte | aantal | G _{rep} | Q _{rep} | Q _{rep} | 6.10a | 6.10b | stabiliteit / opdrijven |
|--|---------|----------------|----------------|----------------|-----------------------|---------|--------|--------|-----------------------|-------------------------|----------------------------|--------------|-----------------|------------------------------|
| | kar. | kar. | factor | | | | | | rep. | rep. | rep. | 1,22 G + | 1,08 G + | 1,08 G + 0,90 G |
| | [kN/m²] | [kN/m²] | comb.w | - | [m] | [m] | - | | perm. | comb. (ψ ₀) | extr+comb(ψ ₀) | 1,35 * Qcomb | 1,35 Qextr+comb | 1,35 * Qcomb 1,35 * Qgunstig |
| hellend dak 58 graden | H | 1,50 | 0,04 | 1,00 | 4,35 | 2,95 | 1 | | 19,28 | | | 23,4 | 20,8 | 20,8 17,3 |
| zoldervloer | A | 0,50 | 1,75 | 0,40 | 1,00 | 4,35 | 1,60 | 1 | 3,48 | 4,87 | 12,18 | 10,8 | 20,2 | 10,3 3,1 |
| F 2 [kN] | | | | | | | | | 22,8 | 4,9 | 12,2 | 34,2 | 41,0 | 31,2 20,5 |
| afstand tot vorige puntlast: 3,460 [m] | | | | | | | | | UGT / Frequentie aanw | | | 1,19 | 1,42 | |

| F3 : | cat. | G _k | Q _k | ψ ₀ | factor * lengte | breedte | lengte | aantal | G _{rep} | Q _{rep} | Q _{rep} | 6.10a | 6.10b | stabiliteit / opdrijven |
|--|---------|----------------|----------------|----------------|-----------------------|---------|--------|--------|-----------------------|-------------------------|----------------------------|--------------|-----------------|------------------------------|
| | kar. | kar. | factor | | | | | | rep. | rep. | rep. | 1,22 G + | 1,08 G + | 1,08 G + 0,90 G |
| | [kN/m²] | [kN/m²] | comb.w | - | [m] | [m] | - | | perm. | comb. (ψ ₀) | extr+comb(ψ ₀) | 1,35 * Qcomb | 1,35 Qextr+comb | 1,35 * Qcomb 1,35 * Qgunstig |
| hellend dak 58 graden | H | 1,50 | 0,04 | 1,00 | 4,85 | 2,95 | 1 | | 21,49 | | | 26,1 | 23,2 | 23,2 19,3 |
| zoldervloer | A | 0,50 | 1,75 | 0,40 | 1,00 | 4,85 | 1,60 | 1 | 3,88 | 5,43 | 13,58 | 12,0 | 22,5 | 11,5 3,5 |
| F 3 [kN] | | | | | | | | | 25,4 | 5,4 | 13,6 | 38,2 | 45,7 | 34,7 22,8 |
| afstand tot vorige puntlast: 4,335 [m] | | | | | | | | | UGT / Frequentie aanw | | | 1,19 | 1,42 | |

| F4 : | cat. | G _k | Q _k | ψ ₀ | factor * lengte | breedte | lengte | aantal | G _{rep} | Q _{rep} | Q _{rep} | 6.10a | 6.10b | stabiliteit / opdrijven |
|--|---------|----------------|----------------|----------------|-----------------------|---------|--------|--------|-----------------------|-------------------------|----------------------------|--------------|-----------------|------------------------------|
| | kar. | kar. | factor | | | | | | rep. | rep. | rep. | 1,22 G + | 1,08 G + | 1,08 G + 0,90 G |
| | [kN/m²] | [kN/m²] | comb.w | - | [m] | [m] | - | | perm. | comb. (ψ ₀) | extr+comb(ψ ₀) | 1,35 * Qcomb | 1,35 Qextr+comb | 1,35 * Qcomb 1,35 * Qgunstig |
| hellend dak 58 graden | H | 1,50 | 0,04 | 1,00 | 2,30 | 2,95 | 1 | | 10,19 | | | 12,4 | 11,0 | 11,0 9,2 |
| zoldervloer | A | 0,50 | 1,75 | 0,40 | 1,00 | 2,15 | 1,60 | 1 | 1,72 | 2,41 | 6,02 | 5,3 | 10,0 | 5,1 1,5 |
| dragend hsb; houten bi.bl. | | 0,50 | | | 1,00 | 3,40 | 4,20 | 1 | 7,14 | | | 8,7 | 7,7 | 7,7 6,4 |
| F 4 [kN] | | | | | | | | | 19,1 | 2,4 | 6,0 | 26,4 | 28,7 | 23,8 17,1 |
| afstand tot vorige puntlast: 4,300 [m] | | | | | | | | | UGT / Frequentie aanw | | | 1,20 | 1,30 | |

| | | | | | | | | | | | | | | | | |
|---|--|--|--|--|--|--|--|--|--|------------------|--------------------|-------------------------|-------------------|----------------------|-------------------|----------------------|
| | | | | | | | | | | ongunstig | | stabiliteit / opdrijven | | | | |
| | | | | | | | | | | ΣG_{rep} | ΣQ_{rep} | ΣQ_{rep} | $\Sigma 6.10a$ | $\Sigma 6.10b$ | Σ | Σ |
| | | | | | | | | | | rep. | rep. | rep. | 1,22 G + | 1,08 G + | 1,08 G + | 0,90 G |
| | | | | | | | | | | perm. | comb. (ψ_0) | extr+comb(ψ_0) | $1,35 * Q_{comb}$ | $1,35 Q_{extr+comb}$ | $1,35 * Q_{comb}$ | $1,35 * Q_{gunstig}$ |
| Totale belasting op Woning B - Balk 1 en 2 [kN] | | | | | | | | | | 555 | 62 | 155 | 758 | 809 | 684 | 500 |
| zwaartepunt belasting: | | | | | | | | | | 6.042 m | 6.041 m | 6.042 m | 6.042 m | 6.042 m | 6.042 m | 6.042 m |

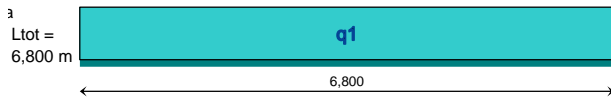
Woning B - Balk A



| q1 : | cat. | G _k | Q _k | ψ ₀ | factor * lengte | breedte | lengte | aantal | G _{rep} | Q _{rep} | Q _{rep} | 6.10a | 6.10b | stabiliteit / opdrijven | |
|-----------------------------------|------|----------------|----------------|----------------|-----------------------|---------|--------|--------|-----------------------|-------------------------|----------------------------|--------------|-----------------|-------------------------|-----------------|
| | | kar. | kar. | factor | | | | | rep. | rep. | rep. | 1,22 G + | 1,08 G + | 1,08 G + | 0,90 G |
| | | [kN/m²] | [kN/m²] | comb.w | - | [m] | [m] | - | perm. | comb. (ψ ₀) | extr+comb(ψ ₀) | 1,35 * Qcomb | 1,35 Qextr+comb | 1,35 * Qcomb | 1,35 * Qgunstig |
| begane grondvloer | A | 3,40 | 2,55 | 0,40 | 1,00 | 1,00 | 1,80 | 1 | 6,12 | 1,84 | 4,59 | 9,9 | 12,8 | 9,1 | 5,5 |
| gevel; 100mm bakst; houten bi.bl. | | 2,50 | | | 1,00 | 1,00 | 2,90 | 1 | 7,25 | | | 8,8 | 7,8 | 7,8 | 6,5 |
| buitenblad; 100mm bakst | | 2,00 | | | 1,00 | 1,00 | 4,30 | 1 | 8,60 | | | 10,4 | 9,3 | 9,3 | 7,7 |
| q 1 : N/m | | | | | | | | | 22,0 | 1,8 | 4,6 | 29,2 | 29,9 | 26,2 | 19,8 |
| lengte van de q-last: 6,800 [m] | | | | | | | | | UGT / Frequentie aanw | | | 1,20 | 1,23 | | |
| | | | | | | | | | totaal Qd [kN]: | | | 198 | 203 | | |

| | | | | | | | | | | | | | | | | |
|--|--|--|--|--|--|--|--|--|--|------------------|--------------------|-------------------------|----------------|-----------------|--------------|-----------------|
| | | | | | | | | | | ongunstig | | stabiliteit / opdrijven | | | | |
| | | | | | | | | | | ΣG_{rep} | ΣQ_{rep} | ΣQ_{rep} | $\Sigma 6.10a$ | $\Sigma 6.10b$ | Σ | Σ |
| | | | | | | | | | | rep. | rep. | rep. | 1,22 G + | 1,08 G + | 1,08 G + | 0,90 G |
| | | | | | | | | | | perm. | comb. (ψ_0) | extr+comb(ψ_0) | 1,35 * Qcomb | 1,35 Qextr+comb | 1,35 * Qcomb | 1,35 * Qgunstig |
| Totale belasting op Woning B - Balk A [kN] | | | | | | | | | | 149 | 12 | 31 | 198 | 203 | 178 | 134 |
| zwaartepunt belasting: | | | | | | | | | | 3,400 m | 3,400 m | 3,400 m | 3,400 m | | | |

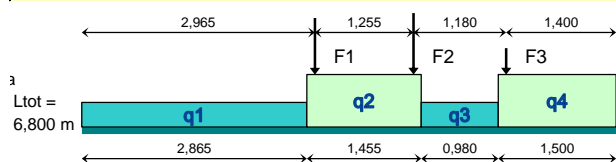
Woning B - Balk B



| q1 : | cat. | G _k | Q _k | ψ ₀ | factor * lengte | breedte | lengte | aantal | G _{rep} | Q _{rep} | Q _{rep} | 6.10a | 6.10b | stabiliteit / opdrijven | |
|---------------------------------|------|----------------|----------------|----------------|-----------------------|---------|--------|--------|-----------------------|-------------------------|----------------------------|--------------|-----------------|-------------------------|-----------------|
| | | kar. | kar. | factor | | | | | rep. | rep. | rep. | 1,22 G + | 1,08 G + | 1,08 G + | 0,90 G |
| | | [kN/m²] | [kN/m²] | comb.w | - | [m] | [m] | - | perm. | comb. (ψ ₀) | extr+comb(ψ ₀) | 1,35 * Qcomb | 1,35 Qextr+comb | 1,35 * Qcomb | 1,35 * Qgunstig |
| begane grondvloer | A | 3,40 | 2,55 | 0,40 | 1,00 | 1,00 | 3,35 | 1 | 11,39 | 3,42 | 8,54 | 18,5 | 23,8 | 16,9 | 10,3 |
| q 1 : N/m | | | | | | | | | 11,4 | 3,4 | 8,5 | 18,5 | 23,8 | 16,9 | 10,3 |
| lengte van de q-last: 6,800 [m] | | | | | | | | | UGT / Frequentie aanw | | | 1,18 | 1,52 | | |
| | | | | | | | | | totaal Qd [kN]: | | | 125 | 162 | | |

| | | | | | | | | | | | | | | | | |
|--|--|--|--|--|--|--|--|--|--|------------------|------------------|--------------------------------|-----------------------|----------------------|-----------------------|--------------------------|
| | | | | | | | | | | ongunstig | | stabiliteit / opdrijven | | | | |
| | | | | | | | | | | ΣG_{rep} | ΣQ_{rep} | ΣQ_{rep} | $\Sigma 6.10a$ | $\Sigma 6.10b$ | Σ | Σ |
| | | | | | | | | | | rep. | rep. | rep. | 1,22 G + | 1,08 G + | 1,08 G + | 0,90 G |
| | | | | | | | | | | perm. | comb. | $(\psi_0)_{extr+comb}(\psi_0)$ | $1,35 \cdot Q_{comb}$ | $1,35 Q_{extr+comb}$ | $1,35 \cdot Q_{comb}$ | $1,35 \cdot Q_{gunstig}$ |
| Totale belasting op Woning B - Balk B [kN] | | | | | | | | | | 77 | 23 | 58 | 125 | 162 | 115 | 70 |
| zwaartepunt belasting: | | | | | | | | | | 3,400 m | 3,400 m | 3,400 m | 3,400 m | | | |

Woning B - Balk C



| q1 : | cat. | G _k | Q _k | ψ ₀ | factor * lengte | breedte | lengte | aantal | G _{rep} | Q _{rep} | Q _{rep} | 6.10a | 6.10b | stabiliteit / opdrijven |
|---------------------------------|---------|----------------|----------------|----------------|-----------------------|---------|--------|--------|-----------------------|-------------------------|----------------------------|--------------|-----------------|------------------------------|
| | kar. | kar. | factor | | | | | | rep. | rep. | rep. | 1,22 G + | 1,08 G + | 1,08 G + 0,90 G |
| | [kN/m²] | [kN/m²] | comb.w | - | [m] | [m] | - | | perm. | comb. (ψ ₀) | extr+comb(ψ ₀) | 1,35 * Qcomb | 1,35 Qextr+comb | 1,35 * Qcomb 1,35 * Qgunstig |
| begane grondvloer | A | 3,40 | 2,55 | 0,40 | 1,00 | 1,00 | 4,25 | 1 | 14,45 | 4,34 | 10,84 | 23,4 | 30,2 | 21,5 13,0 |
| q 1 : :N/m² | | | | | | | | | 14,5 | 4,3 | 10,8 | 23,4 | 30,2 | 21,5 13,0 |
| lengte van de q-last: 2,865 [m] | | | | | | | | | UGT / Frequentie aanw | | 1,18 | 1,52 | | |
| | | | | | | | | | totaal Qd [kN]: | | 67 | 87 | | |

| q2 : | cat. | G _k | Q _k | ψ ₀ | factor * lengte | breedte | lengte | aantal | G _{rep} | Q _{rep} | Q _{rep} | 6.10a | 6.10b | stabiliteit / opdrijven |
|---------------------------------|---------|----------------|----------------|----------------|-----------------------|---------|--------|--------|-----------------------|-------------------------|----------------------------|--------------|-----------------|------------------------------|
| | kar. | kar. | factor | | | | | | rep. | rep. | rep. | 1,22 G + | 1,08 G + | 1,08 G + 0,90 G |
| | [kN/m²] | [kN/m²] | comb.w | - | [m] | [m] | - | | perm. | comb. (ψ ₀) | extr+comb(ψ ₀) | 1,35 * Qcomb | 1,35 Qextr+comb | 1,35 * Qcomb 1,35 * Qgunstig |
| 1e verdiepingvloer | A | 5,22 | 2,55 | 0,40 | 1,00 | 1,00 | 0,60 | 1 | 3,13 | 0,61 | 1,53 | 4,6 | 5,4 | 4,2 2,8 |
| begane grondvloer | A | 3,40 | 2,55 | 0,40 | 1,00 | 1,00 | 4,25 | 1 | 14,45 | 4,34 | 10,84 | 23,4 | 30,2 | 21,5 13,0 |
| stab wand; 160mm beton | | 4,23 | | | 1,00 | 1,00 | 2,90 | 1 | 12,26 | | | 14,9 | 13,2 | 13,2 11,0 |
| q 2 : :N/m² | | | | | | | | | 29,8 | 4,9 | 12,4 | 42,9 | 48,9 | 38,9 26,9 |
| lengte van de q-last: 1,455 [m] | | | | | | | | | UGT / Frequentie aanw | | 1,19 | 1,36 | | |
| | | | | | | | | | totaal Qd [kN]: | | 62 | 71 | | |

| q3 : | cat. | G _k | Q _k | ψ ₀ | factor * lengte | breedte | lengte | aantal | G _{rep} | Q _{rep} | Q _{rep} | 6.10a | 6.10b | stabiliteit / opdrijven |
|---------------------------------|---------|----------------|----------------|----------------|-----------------------|---------|--------|--------|-----------------------|-------------------------|----------------------------|--------------|-----------------|------------------------------|
| | kar. | kar. | factor | | | | | | rep. | rep. | rep. | 1,22 G + | 1,08 G + | 1,08 G + 0,90 G |
| | [kN/m²] | [kN/m²] | comb.w | - | [m] | [m] | - | | perm. | comb. (ψ ₀) | extr+comb(ψ ₀) | 1,35 * Qcomb | 1,35 Qextr+comb | 1,35 * Qcomb 1,35 * Qgunstig |
| begane grondvloer | A | 3,40 | 2,55 | 0,40 | 1,00 | 1,00 | 4,25 | 1 | 14,45 | 4,34 | 10,84 | 23,4 | 30,2 | 21,5 13,0 |
| q 3 : :N/m² | | | | | | | | | 14,5 | 4,3 | 10,8 | 23,4 | 30,2 | 21,5 13,0 |
| lengte van de q-last: 0,980 [m] | | | | | | | | | UGT / Frequentie aanw | | 1,18 | 1,52 | | |
| | | | | | | | | | totaal Qd [kN]: | | 23 | 30 | | |

| q4 : | cat. | G _k | Q _k | ψ ₀ | factor * lengte | breedte | lengte | aantal | G _{rep} | Q _{rep} | Q _{rep} | 6.10a | 6.10b | stabiliteit / opdrijven |
|---------------------------------|---------|----------------|----------------|----------------|-----------------------|---------|--------|--------|-----------------------|-------------------------|----------------------------|--------------|-----------------|------------------------------|
| | kar. | kar. | factor | | | | | | rep. | rep. | rep. | 1,22 G + | 1,08 G + | 1,08 G + 0,90 G |
| | [kN/m²] | [kN/m²] | comb.w | - | [m] | [m] | - | | perm. | comb. (ψ ₀) | extr+comb(ψ ₀) | 1,35 * Qcomb | 1,35 Qextr+comb | 1,35 * Qcomb 1,35 * Qgunstig |
| 1e verdiepingvloer | A | 5,22 | 2,55 | 0,40 | 1,00 | 1,00 | 0,60 | 1 | 3,13 | 0,61 | 1,53 | 4,6 | 5,4 | 4,2 2,8 |
| begane grondvloer | A | 3,40 | 2,55 | 0,40 | 1,00 | 1,00 | 4,25 | 1 | 14,45 | 4,34 | 10,84 | 23,4 | 30,2 | 21,5 13,0 |
| stab wand; 160mm beton | | 4,23 | | | 1,00 | 1,00 | 2,90 | 1 | 12,26 | | | 14,9 | 13,2 | 13,2 11,0 |
| q 4 : :N/m² | | | | | | | | | 29,8 | 4,9 | 12,4 | 42,9 | 48,9 | 38,9 26,9 |
| lengte van de q-last: 1,500 [m] | | | | | | | | | UGT / Frequentie aanw | | 1,19 | 1,36 | | |
| | | | | | | | | | totaal Qd [kN]: | | 64 | 73 | | |

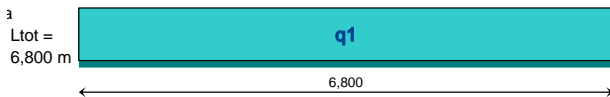
| F1 : | cat. | G _k | Q _k | ψ ₀ | factor * lengte | breedte | lengte | aantal | G _{rep} | Q _{rep} | Q _{rep} | 6.10a | 6.10b | stabiliteit / opdrijven |
|-------------------------------------|---------|----------------|----------------|----------------|-----------------------|---------|--------|--------|-----------------------|-------------------------|----------------------------|--------------|-----------------|------------------------------|
| | kar. | kar. | factor | | | | | | rep. | rep. | rep. | 1,22 G + | 1,08 G + | 1,08 G + 0,90 G |
| | [kN/m²] | [kN/m²] | comb.w | - | [m] | [m] | - | | perm. | comb. (ψ ₀) | extr+comb(ψ ₀) | 1,35 * Qcomb | 1,35 Qextr+comb | 1,35 * Qcomb 1,35 * Qgunstig |
| 1e verdiepingvloer | A | 5,22 | 2,55 | 0,40 | 1,00 | 1,40 | 1,55 | 1 | 11,33 | 2,21 | 5,53 | 16,8 | 19,7 | 15,2 10,2 |
| F 1 : [kN] | | | | | | | | | 11,3 | 2,2 | 5,5 | 16,8 | 19,7 | 15,2 10,2 |
| afstand tot begin schema: 2,965 [m] | | | | | | | | | UGT / Frequentie aanw | | 1,19 | 1,40 | | |

| F2 : | cat. | G _k | Q _k | ψ ₀ | factor * lengte | breedte | lengte | aantal | G _{rep} | Q _{rep} | Q _{rep} | 6.10a | 6.10b | stabiliteit / opdrijven |
|--|---------|----------------|----------------|----------------|-----------------------|---------|--------|--------|-----------------------|-------------------------|----------------------------|--------------|-----------------|------------------------------|
| | kar. | kar. | factor | | | | | | rep. | rep. | rep. | 1,22 G + | 1,08 G + | 1,08 G + 0,90 G |
| | [kN/m²] | [kN/m²] | comb.w | - | [m] | [m] | - | | perm. | comb. (ψ ₀) | extr+comb(ψ ₀) | 1,35 * Qcomb | 1,35 Qextr+comb | 1,35 * Qcomb 1,35 * Qgunstig |
| 1e verdiepingvloer | A | 5,22 | 2,55 | 0,40 | 1,00 | 1,40 | 1,55 | 1 | 11,33 | 2,21 | 5,53 | 16,8 | 19,7 | 15,2 10,2 |
| 1e verdiepingvloer | A | 5,22 | 2,55 | 0,40 | 1,00 | 0,49 | 0,60 | 1 | 1,53 | 0,30 | 0,75 | 2,3 | 2,7 | 2,1 1,4 |
| F 2 : [kN] | | | | | | | | | 12,9 | 2,5 | 6,3 | 19,0 | 22,4 | 17,3 11,6 |
| afstand tot vorige puntlast: 1,255 [m] | | | | | | | | | UGT / Frequentie aanw | | 1,19 | 1,40 | | |

| F3 : | | | | | | | | | | | | | | | |
|--|----------------|----------------|----------------|-----------------------|---------|--------|--------|-----------------------|-------------------------|----------------------------|--------------|-----------------|-------------------------|-----------------|-----|
| cat. | G _k | Q _k | ψ ₀ | factor * lengte | breedte | lengte | aantal | G _{rep} | Q _{rep} | Q _{rep} | 6.10a | 6.10b | stabiliteit / opdrijven | | |
| kar. | kar. | factor | | | | | | rep. | rep. | rep. | 1,22 G + | 1,08 G + | 1,08 G + | 0,90 G | |
| [kN/m²] | [kN/m²] | comb.w | - | [m] | [m] | - | | perm. | comb. (ψ ₀) | extr+comb(ψ ₀) | 1,35 * Qcomb | 1,35 Qextr+comb | 1,35 * Qcomb | 1,35 * Qgunstig | |
| 1e verdiepingsvloer | A | 5,22 | 2,55 | 0,40 | 1,00 | 0,60 | 0,49 | 1 | 1,53 | 0,30 | 0,75 | 2,3 | 2,7 | 2,1 | 1,4 |
| F 3 [kN] | | | | | | | | 1,5 | 0,3 | 0,7 | 2,3 | 2,7 | 2,1 | 1,4 | |
| afstand tot vorige puntlast: 1,180 [m] | | | | | | | | UGT / Frequentie aanw | | | 1,19 | 1,40 | | | |

| | | | | | | | | | | ongunstig | | stabiliteit / opdrijven | |
|--|--|--|--|--|--|--|--|--|--|--------------------|-------------------------|----------------------------|---|
| | | | | | | | | | | Σ G _{rep} | Σ Q _{rep} | Σ Q _{rep} | Σ |
| | | | | | | | | | | rep. | rep. | rep. | 1,22 G + 1,08 G + 1,08 G + 0,90 G |
| | | | | | | | | | | perm. | comb. (ψ ₀) | extr+comb(ψ ₀) | 1,35 * Qcomb 1,35 Qextr+comb 1,35 * Qcomb 1,35 * Qgunstig |
| Totale belasting op Woning B - Balk C [kN] | | | | | | | | | | 169 | 36 | 91 | 255 306 232 153 |
| zwaartepunt belasting: | | | | | | | | | | 3,776 m | | 3,710 m | 3,770 m 3,838 m |

Woning B - Balk D



| q1 : | | | | | | | | | | | | | | | |
|-----------------------------------|----------------|----------------|----------------|-----------------------|---------|--------|--------|------------------|-------------------------|----------------------------|--------------|-----------------|-------------------------|-----------------|------|
| cat. | G _k | Q _k | ψ ₀ | factor * lengte | breedte | lengte | aantal | G _{rep} | Q _{rep} | Q _{rep} | 6.10a | 6.10b | stabiliteit / opdrijven | | |
| kar. | kar. | factor | | | | | | rep. | rep. | rep. | 1,22 G + | 1,08 G + | 1,08 G + | 0,90 G | |
| [kN/m²] | [kN/m²] | comb.w | - | [m] | [m] | - | | perm. | comb. (ψ ₀) | extr+comb(ψ ₀) | 1,35 * Qcomb | 1,35 Qextr+comb | 1,35 * Qcomb | 1,35 * Qgunstig | |
| begane grondvloer | A | 3,40 | 2,55 | 0,40 | 1,00 | 1,00 | 2,70 | 1 | 9,18 | 2,75 | 6,89 | 14,9 | 19,2 | 13,6 | 8,3 |
| gevel; 100mm bakst; houten bi.bl. | | 2,50 | | | 1,00 | 1,00 | 2,90 | 1 | 7,25 | | | 8,8 | 7,8 | 7,8 | 6,5 |
| buitenblad; 100mm bakst | | 2,00 | | | 1,00 | 1,00 | 4,30 | 1 | 8,60 | | | 10,4 | 9,3 | 9,3 | 7,7 |
| q 1 [N/m] | | | | | | | | | 25,0 | 2,8 | 6,9 | 34,1 | 36,3 | 30,8 | 22,5 |
| lengte van de q-last: 6,800 [m] | | | | | | | | | UGT / Frequentie aanw | | | 1,20 | 1,28 | | |
| | | | | | | | | | totaal Qd [kN]: | | | 232 | 247 | | |

| | | | | | | | | | | ongunstig | | stabiliteit / opdrijven | |
|--|--|--|--|--|--|--|--|--|--|--------------------|-------------------------|----------------------------|---|
| | | | | | | | | | | Σ G _{rep} | Σ Q _{rep} | Σ Q _{rep} | Σ |
| | | | | | | | | | | rep. | rep. | rep. | 1,22 G + 1,08 G + 1,08 G + 0,90 G |
| | | | | | | | | | | perm. | comb. (ψ ₀) | extr+comb(ψ ₀) | 1,35 * Qcomb 1,35 Qextr+comb 1,35 * Qcomb 1,35 * Qgunstig |
| Totale belasting op Woning B - Balk D [kN] | | | | | | | | | | 170 | 19 | 47 | 232 247 209 153 |
| zwaartepunt belasting: | | | | | | | | | | 3,400 m | | 3,400 m | 3,400 m 3,400 m |

Woning type A en B – uitvoer TS Balkroosters:

Technosoft Balkroosters release 6.80c

Project.....: 18107 - 14 woningen te Westzaan
 Onderdeel.....: Woning type A en B - fundering
 Dimensies.....: kN/m/rad
 Bestand.....: G:\7000 project\18107-KPO 24 woningen
 Westzaan\Documenten\Constructie\18107-Blok 1 en
 2-fundering.grw
 Torsiefac.....: 20 %

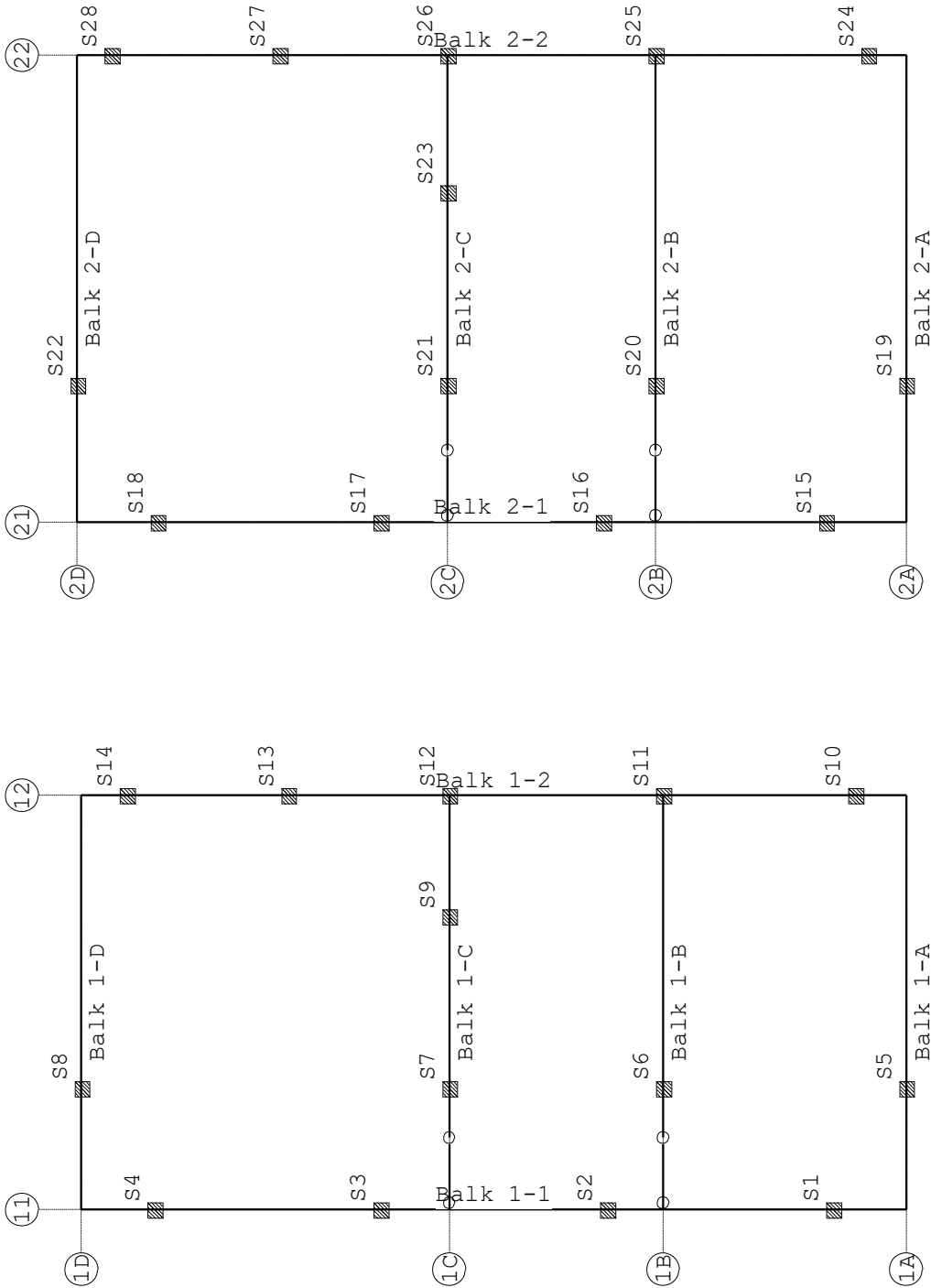
Betrouwbaarheidsklasse : 1 Referentieperiode : 50
 Ouderdom bij belasten : 28 Relatieve vochtigheid : 50%
 Doorbuigingen(beton) zijn dmv gecorrigeerde stijfheden berekend.

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

Toegepaste normen volgens Eurocode met Nederlandse NB

| | | | |
|-------------|--------------------------|-----------------|-------------|
| Belastingen | NEN-EN 1990:2002 | C2:2010,A1:2019 | NB:2019(nl) |
| | NEN-EN 1991-1-1:2002 | C1/C11:2019 | NB:2019(nl) |
| Beton | NEN-EN 1992-1-1:2011(nl) | C2/A1:2015(nl) | NB:2016(nl) |

GEOMETRIE



MATERIALEN

| Mt | Kwaliteit | E-modulus[N/mm2] | S.G. | Pois. | Uitz. coëff |
|----|-----------|------------------|------|-------|-------------|
| 1 | C20/25 | 7480 | 25.0 | 0.20 | 1.0000e-05 |

MATERIALEN vervolg

| Mt | Kwaliteit | Cement | Kruipfac. |
|----|-----------|--------|-----------|
| 1 | C20/25 | | 3.01 |

PROFIELEN [mm]

| Prof. | Omschrijving | Materiaal | Oppervlak | Torsietr. | Traagheid | Vormf. |
|-------|--------------|-----------|-----------|-----------|-----------|--------|
| 1 | B*H 400*500 | 1:C20/25 | 2.000e+05 | 5.577e+09 | 4.167e+09 | 0.00 |
| 2 | B*H 400*500 | 1:C20/25 | 2.000e+05 | 5.577e+09 | 4.167e+09 | 0.00 |
| 3 | B*H 450*500 | 1:C20/25 | 2.250e+05 | 7.157e+09 | 4.687e+09 | 0.00 |
| 4 | B*H 450*500 | 1:C20/25 | 2.250e+05 | 7.157e+09 | 4.687e+09 | 0.00 |
| 5 | B*H 500*500 | 1:C20/25 | 2.500e+05 | 8.802e+09 | 5.208e+09 | 0.00 |
| 6 | B*H 500*500 | 1:C20/25 | 2.500e+05 | 8.802e+09 | 5.208e+09 | 0.00 |

PROFIELEN vervolg [mm]

| Prof. | Staaftype | Breedte | Hoogte | Zs | Rek.As | Type | b1 | h1 | b2 | h2 |
|-------|-----------|---------|--------|-----|--------|------|----|----|----|----|
| 1 | 0:Normaal | 400 | 500 | 250 | 0.00 | 0:RH | | | | |
| 2 | 0:Normaal | 400 | 500 | 250 | 0.00 | 0:RH | | | | |
| 3 | 0:Normaal | 450 | 500 | 250 | 0.00 | 0:RH | | | | |
| 4 | 0:Normaal | 450 | 500 | 250 | 0.00 | 0:RH | | | | |
| 5 | 0:Normaal | 500 | 500 | 250 | 0.00 | 0:RH | | | | |
| 6 | 0:Normaal | 500 | 500 | 250 | 0.00 | 0:RH | | | | |

STRAMIENLIJNEN

| Nr. | Naam | X-begin | Y-begin | X-eind | Y-Eind |
|-----|------|---------|---------|--------|--------|
| 1 | 11 | 0.000 | 12.030 | 0.000 | 0.000 |
| 2 | 12 | 6.030 | 12.030 | 6.030 | 0.000 |
| 3 | 1A | 0.000 | 0.000 | 6.030 | 0.000 |
| 4 | 1B | 0.000 | 3.545 | 6.030 | 3.545 |
| 5 | 1C | 0.000 | 6.665 | 6.030 | 6.665 |
| 6 | 1D | 0.000 | 12.030 | 6.030 | 12.030 |
| 7 | 21 | 10.000 | 12.030 | 10.000 | 0.000 |
| 8 | 22 | 16.800 | 12.030 | 16.800 | 0.000 |
| 9 | 2A | 10.000 | 0.000 | 16.800 | 0.000 |
| 10 | 2B | 10.000 | 3.655 | 16.800 | 3.655 |
| 11 | 2C | 10.000 | 6.690 | 16.800 | 6.690 |
| 12 | 2D | 10.000 | 12.090 | 16.800 | 12.090 |

BALKEN

| Nr. | Naam | Begin | Eind | Profiel |
|-----|----------|-------|-------|-----------------------|
| 1 | Balk 1-1 | 11;1A | 11;1D | 5:B*H 500*500 |
| 2 | Balk 1-2 | 12;1A | 12;1D | 5:B*H 500*500 |
| 3 | Balk 1-A | 11;1A | 12;1A | 3:B*H 450*500 |
| 4 | Balk 1-B | 11;1B | 12;1B | Zie Doorsnedesectoren |
| 5 | Balk 1-C | 11;1C | 12;1C | Zie Doorsnedesectoren |
| 6 | Balk 1-D | 11;1D | 12;1D | 3:B*H 450*500 |
| 7 | Balk 2-1 | 2A;21 | 2D;21 | 6:B*H 500*500 |
| 8 | Balk 2-2 | 2A;22 | 22;2D | 6:B*H 500*500 |
| 9 | Balk 2-A | 2A;21 | 2A;22 | 4:B*H 450*500 |
| 10 | Balk 2-B | 21;2B | 2B;22 | Zie Doorsnedesectoren |
| 11 | Balk 2-C | 2C;21 | 2C;22 | Zie Doorsnedesectoren |
| 12 | Balk 2-D | 2D;21 | 22;2D | 4:B*H 450*500 |

BALKEN vervolg

| Nr. | Naam | Aansl.begin | Aansl.eind | Excentr. | Pasm.begin | Pasm.eind | Opm. |
|-----|----------|-------------|------------|----------|------------|-----------|------|
| 1 | Balk 1-1 | WDM | WDM | 0.000 | 0.000 | 0.000 | |
| 2 | Balk 1-2 | WDM | WDM | 0.000 | 0.000 | 0.000 | |
| 3 | Balk 1-A | WDM | WDM | 0.000 | 0.000 | 0.000 | |
| 4 | Balk 1-B | WD- | WDM | 0.000 | 0.000 | 0.000 | |
| 5 | Balk 1-C | WD- | WDM | 0.000 | 0.000 | 0.000 | |
| 6 | Balk 1-D | WDM | WDM | 0.000 | 0.000 | 0.000 | |
| 7 | Balk 2-1 | WDM | WDM | 0.000 | 0.000 | 0.000 | |
| 8 | Balk 2-2 | WDM | WDM | 0.000 | 0.000 | 0.000 | |
| 9 | Balk 2-A | WDM | WDM | 0.000 | 0.000 | 0.000 | |
| 10 | Balk 2-B | WD- | WDM | 0.000 | 0.000 | 0.000 | |
| 11 | Balk 2-C | WD- | WDM | 0.000 | 0.000 | 0.000 | |
| 12 | Balk 2-D | WDM | WDM | 0.000 | 0.000 | 0.000 | |

Opmerkingen:

De torsie traagheid van alle balken is tot 20% gereduceerd

DOORSNEDESECTOREN

| Balk | Vanaf | Tot | Lengte | Profiel | Eindcode |
|----------|-------|-------|--------|---------------|-------------|
| Balk 1-B | 0.000 | 1.050 | 1.050 | 1:B*H 400*500 | 0:Scharnier |
| Balk 1-B | 1.050 | 6.030 | 4.980 | 1:B*H 400*500 | 1:Vast |
| Balk 1-C | 0.000 | 1.050 | 1.050 | 2:B*H 400*500 | 0:Scharnier |
| Balk 1-C | 1.050 | 6.030 | 4.980 | 2:B*H 400*500 | 1:Vast |
| Balk 2-B | 0.000 | 1.050 | 1.050 | 1:B*H 400*500 | 0:Scharnier |
| Balk 2-B | 1.050 | 6.800 | 5.750 | 1:B*H 400*500 | 1:Vast |
| Balk 2-C | 0.000 | 1.050 | 1.050 | 2:B*H 400*500 | 0:Scharnier |
| Balk 2-C | 1.050 | 6.800 | 5.750 | 2:B*H 400*500 | 1:Vast |

STEUNPUNTTYPE

Nr. : 1 Assenstelsel: Globaal
 Afmeting : 220*220 Rotatie X:Vrij
 Inheinv.: 17,0 -NAP Verplaatsing Z:Veerwaarde: 32500
 FRd : 290.000000 Rotatie Y:Vrij
 Min.afst.: 0.750

STEUNPUNTEN

| Nr. | Naam | Steunpunttype | Balk | Positie | Excentr. | Hoek | Opm: |
|-----|------|---------------|----------|---------|----------|-------|------|
| 1 | | 1:220*220 | Balk 1-1 | 1.065 | 0.000 | 0.000 | |
| 2 | | 1:220*220 | Balk 1-1 | 4.365 | 0.000 | 0.000 | |
| 3 | | 1:220*220 | Balk 1-1 | 7.665 | 0.000 | 0.000 | |
| 4 | | 1:220*220 | Balk 1-1 | 10.965 | 0.000 | 0.000 | |
| 5 | | 1:220*220 | Balk 1-A | 1.765 | 0.000 | 0.000 | |
| 6 | | 1:220*220 | Balk 1-B | 1.765 | 0.000 | 0.000 | |
| 7 | | 1:220*220 | Balk 1-C | 1.765 | 0.000 | 0.000 | |
| 8 | | 1:220*220 | Balk 1-D | 1.765 | 0.000 | 0.000 | |
| 9 | | 1:220*220 | Balk 1-C | 4.265 | 0.000 | 0.000 | |
| 10 | | 1:220*220 | Balk 1-2 | 0.745 | 0.000 | 0.000 | |
| 11 | | 1:220*220 | Balk 1-2 | 3.545 | 0.000 | 0.000 | |
| 12 | | 1:220*220 | Balk 1-2 | 6.665 | 0.000 | 0.000 | |
| 13 | | 1:220*220 | Balk 1-2 | 9.015 | 0.000 | 0.000 | |
| 14 | | 1:220*220 | Balk 1-2 | 11.365 | 0.000 | 0.000 | |
| 15 | | 1:220*220 | Balk 2-1 | 1.17 | 0.000 | 0.000 | |
| 16 | | 1:220*220 | Balk 2-1 | 4.42 | 0.000 | 0.000 | |
| 17 | | 1:220*220 | Balk 2-1 | 7.67 | 0.000 | 0.000 | |
| 18 | | 1:220*220 | Balk 2-1 | 10.92 | 0.000 | 0.000 | |
| 19 | | 1:220*220 | Balk 2-A | 2.0 | 0.000 | 0.000 | |

STEUNPUNTEN

| Nr. | Naam | Steunpunttype | Balk | Positie | Excentr. | Hoek Opm: |
|-----|------|---------------|----------|---------|----------|-----------|
| 20 | | 1:220*220 | Balk 2-B | 2.0 | 0.000 | 0.000 |
| 21 | | 1:220*220 | Balk 2-C | 2.0 | 0.000 | 0.000 |
| 22 | | 1:220*220 | Balk 2-D | 2.0 | 0.000 | 0.000 |
| 23 | | 1:220*220 | Balk 2-C | 4.80 | 0.000 | 0.000 |
| 24 | | 1:220*220 | Balk 2-2 | 0.555 | 0.000 | 0.000 |
| 25 | | 1:220*220 | Balk 2-2 | 3.655 | 0.000 | 0.000 |
| 26 | | 1:220*220 | Balk 2-2 | 6.69 | 0.000 | 0.000 |
| 27 | | 1:220*220 | Balk 2-2 | 9.14 | 0.000 | 0.000 |
| 28 | | 1:220*220 | Balk 2-2 | 11.59 | 0.000 | 0.000 |

BELASTINGGEVALLEN

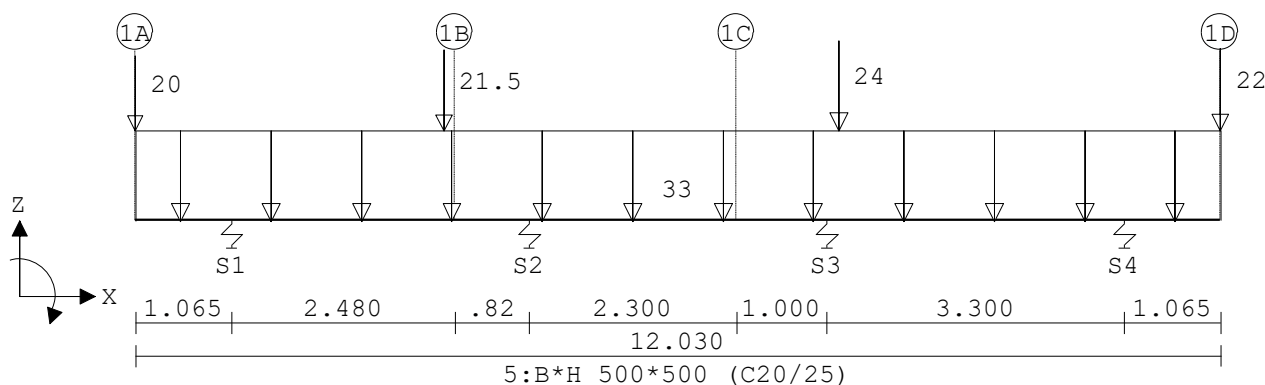
| B.G. | Omschrijving | Belast/onbelast | ψ_0 | ψ_1 | ψ_2 | e.g. |
|------|-----------------|--------------------|----------|----------|----------|-------|
| 1 | permanent | 2:Permanent EN1991 | | | | -1.00 |
| 2 | variabel bg | 0:Alles tegelijk | 0.40 | 0.50 | 0.30 | 0.00 |
| 3 | variabel le | 0:Alles tegelijk | 0.40 | 0.50 | 0.30 | 0.00 |
| 4 | variabel zolder | 0:Alles tegelijk | 0.40 | 0.50 | 0.30 | 0.00 |
| 5 | wind links | 0:Alles tegelijk | 0.00 | 0.20 | 0.00 | 0.00 |
| 6 | wind rechts | 0:Alles tegelijk | 0.00 | 0.20 | 0.00 | 0.00 |

BELASTINGGEVALLEN

| B.G. | Omschrijving | Type |
|------|-----------------|---------------------------------|
| 1 | permanent | 1 Permanente belasting |
| 2 | variabel bg | 2 Ver. bel. pers. ed. (q_k) |
| 3 | variabel le | 2 Ver. bel. pers. ed. (q_k) |
| 4 | variabel zolder | 2 Ver. bel. pers. ed. (q_k) |
| 5 | wind links | 7 Wind van links onderdruk A |
| 6 | wind rechts | 11 Wind van rechts onderdruk A |

VELDBELASTINGEN

Balk 1-1 B.G:1 permanent



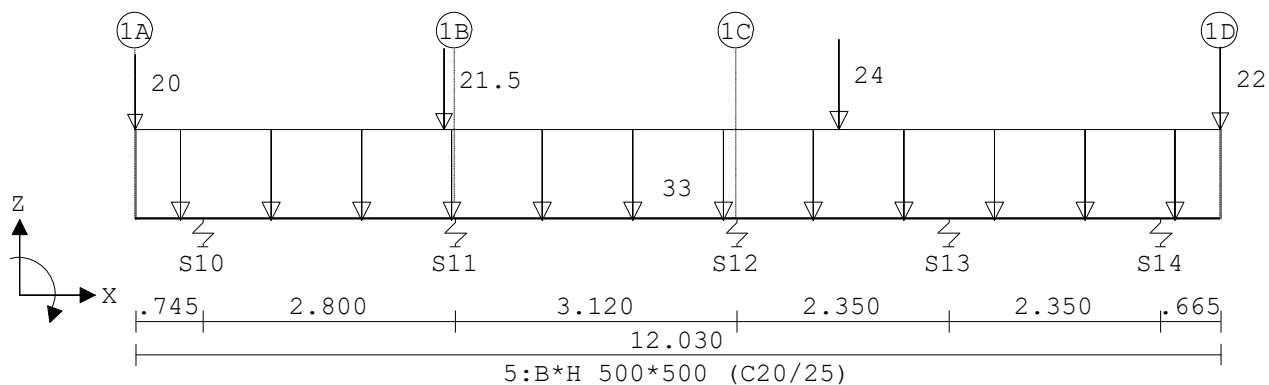
VELDBELASTINGEN

B.G:1 permanent

| Balk | Last Type | $q_1/p/m$ | q_2 | Afstand | Lengte | Exc. |
|----------|--------------|-----------|---------|---------|--------|-------|
| Balk 1-1 | 1 1:q-last | -33.000 | -33.000 | 0.000 | 12.030 | 0.000 |
| Balk 1-1 | 2 8:Puntlast | -20.000 | | 0.000 | | 0.000 |
| Balk 1-1 | 3 8:Puntlast | -21.500 | | 3.420 | | 0.000 |
| Balk 1-1 | 4 8:Puntlast | -24.000 | | 7.800 | | 0.000 |
| Balk 1-1 | 5 8:Puntlast | -22.000 | | 12.030 | | 0.000 |

VELDBELASTINGEN

Balk 1-2 B.G:1 permanent



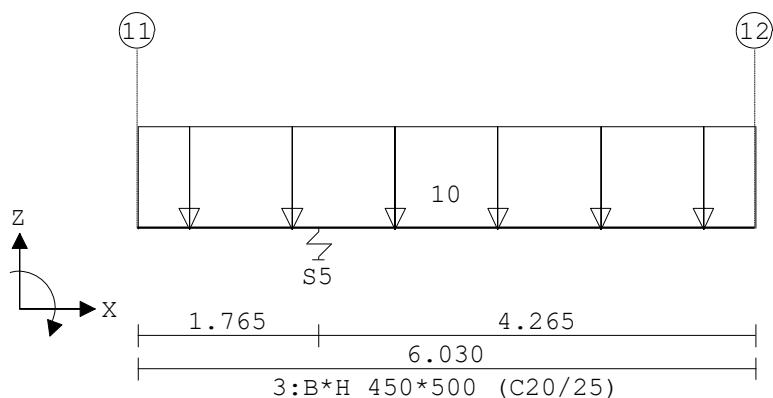
VELDBELASTINGEN

B.G:1 permanent

| Balk | Last | Type | q1/p/m | q2 | Afstand | Lengte | Exc. |
|----------|------|------------|---------|---------|---------|--------|-------|
| Balk 1-2 | 1 | 1:q-last | -33.000 | -33.000 | 0.000 | 12.030 | 0.000 |
| Balk 1-2 | 2 | 8:Puntlast | -20.000 | | 0.000 | | 0.000 |
| Balk 1-2 | 3 | 8:Puntlast | -21.500 | | 3.420 | | 0.000 |
| Balk 1-2 | 4 | 8:Puntlast | -24.000 | | 7.800 | | 0.000 |
| Balk 1-2 | 5 | 8:Puntlast | -22.000 | | 12.030 | | 0.000 |

VELDBELASTINGEN

Balk 1-A B.G:1 permanent



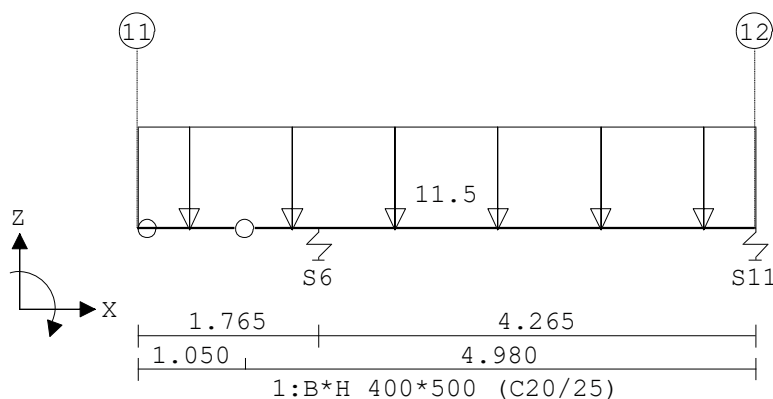
VELDBELASTINGEN

B.G:1 permanent

| Balk | Last | Type | q1/p/m | q2 | Afstand | Lengte | Exc. |
|----------|------|----------|---------|---------|---------|--------|-------|
| Balk 1-A | 1 | 1:q-last | -10.000 | -10.000 | 0.000 | 6.030 | 0.100 |

VELDBELASTINGEN

Balk 1-B B.G:1 permanent



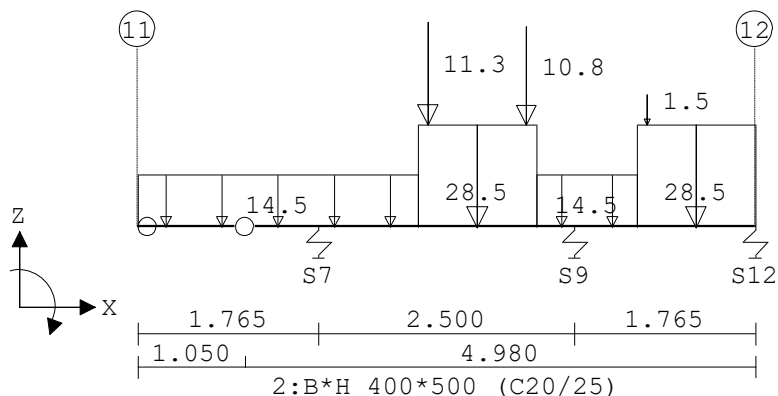
VELDBELASTINGEN

B.G:1 permanent

| Balk | Last | Type | q1/p/m | q2 | Afstand | Lengte | Exc. |
|----------|------|----------|---------|---------|---------|--------|-------|
| Balk 1-B | 1 | 1:q-last | -11.500 | -11.500 | 0.000 | 6.030 | 0.000 |

VELDBELASTINGEN

Balk 1-C B.G:1 permanent



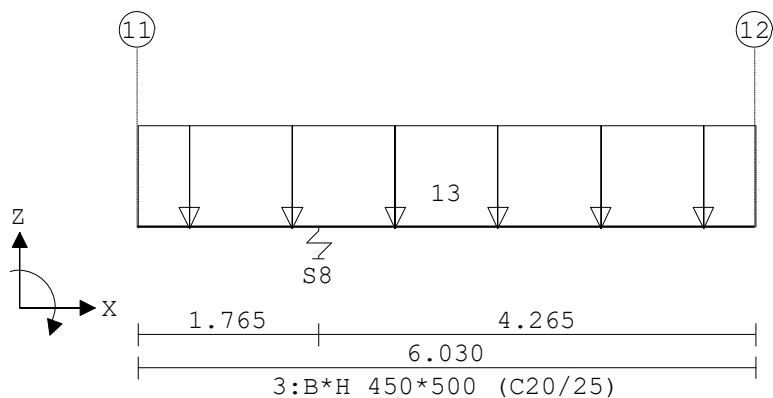
VELDBELASTINGEN

B.G:1 permanent

| Balk | Last | Type | q1/p/m | q2 | Afstand | Lengte | Exc. |
|----------|------|------------|---------|---------|---------|--------|-------|
| Balk 1-C | 1 | 1:q-last | -14.500 | -14.500 | 0.000 | 2.735 | 0.000 |
| Balk 1-C | 2 | 1:q-last | -28.500 | -28.500 | 2.735 | 1.160 | 0.000 |
| Balk 1-C | 3 | 1:q-last | -14.500 | -14.500 | 3.895 | 0.980 | 0.000 |
| Balk 1-C | 4 | 1:q-last | -28.500 | -28.500 | 4.875 | 1.155 | 0.000 |
| Balk 1-C | 5 | 8:Puntlast | -11.300 | | 2.835 | | 0.000 |
| Balk 1-C | 6 | 8:Puntlast | -10.800 | | 3.795 | | 0.000 |
| Balk 1-C | 7 | 8:Puntlast | -1.500 | | 4.975 | | 0.000 |

VELDBELASTINGEN

Balk 1-D B.G:1 permanent



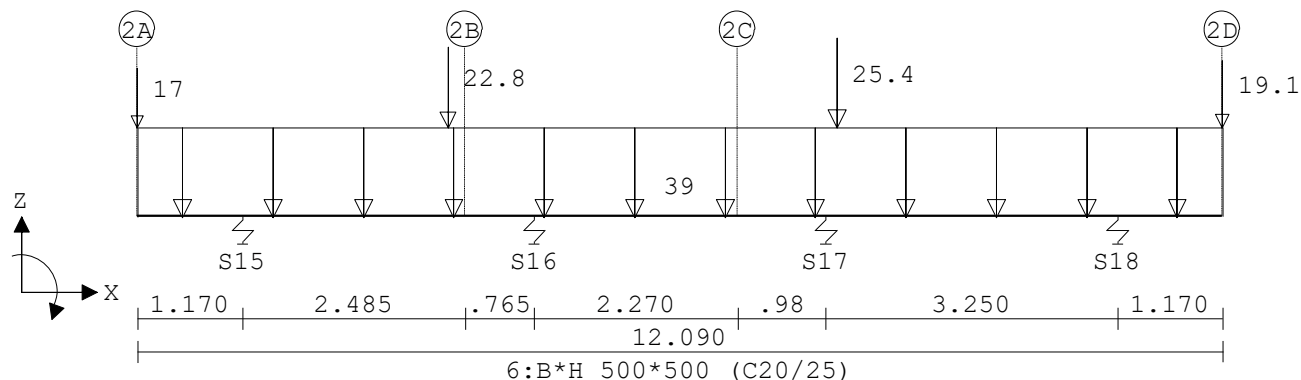
VELDBELASTINGEN

B.G:1 permanent

| Balk | Last | Type | q1/p/m | q2 | Afstand | Lengte | Exc. |
|----------|------|----------|---------|---------|---------|--------|--------|
| Balk 1-D | 1 | 1:q-last | -13.000 | -13.000 | 0.000 | 6.030 | -0.100 |

VELDBELASTINGEN

Balk 2-1 B.G:1 permanent



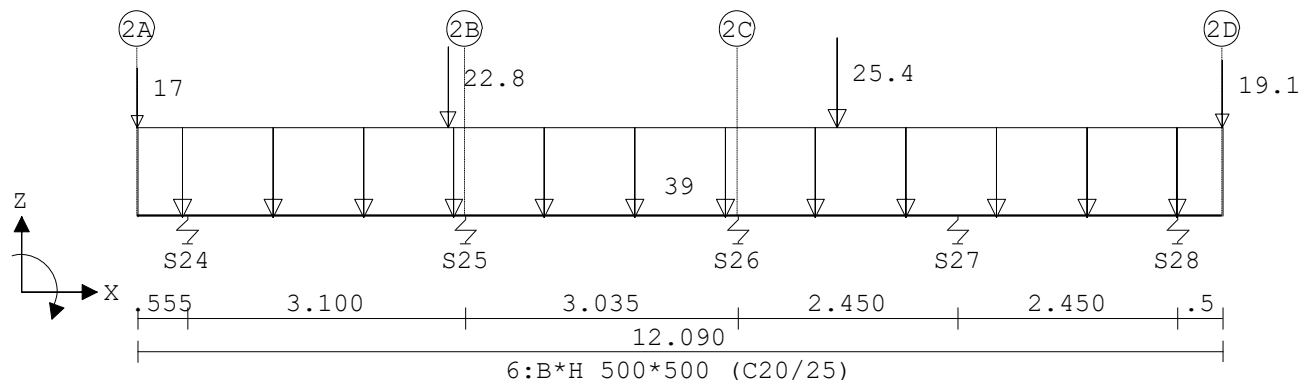
VELDBELASTINGEN

B.G:1 permanent

| Balk | Last | Type | q1/p/m | q2 | Afstand | Lengte | Exc. |
|----------|------|------------|---------|---------|---------|--------|-------|
| Balk 2-1 | 1 | 1:q-last | -39.000 | -39.000 | 0.000 | 12.090 | 0.000 |
| Balk 2-1 | 2 | 8:Puntlast | -17.000 | | 0.000 | | 0.000 |
| Balk 2-1 | 3 | 8:Puntlast | -22.800 | | 3.460 | | 0.000 |
| Balk 2-1 | 4 | 8:Puntlast | -25.400 | | 7.795 | | 0.000 |
| Balk 2-1 | 5 | 8:Puntlast | -19.100 | | 12.090 | | 0.000 |

VELDBELASTINGEN

Balk 2-2 B.G:1 permanent



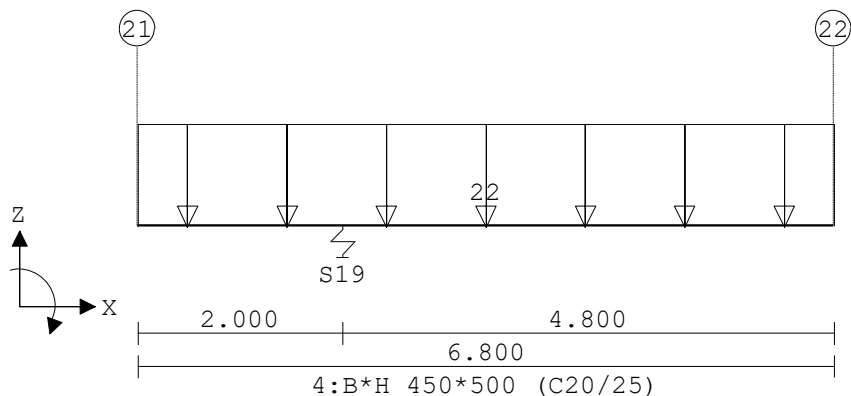
VELDBELASTINGEN

B.G:1 permanent

| Balk | Last | Type | q1/p/m | q2 | Afstand | Lengte | Exc. |
|----------|------|------------|---------|---------|---------|--------|-------|
| Balk 2-2 | 1 | 1:q-last | -39.000 | -39.000 | 0.000 | 12.090 | 0.000 |
| Balk 2-2 | 2 | 8:Puntlast | -17.000 | | 0.000 | | 0.000 |
| Balk 2-2 | 3 | 8:Puntlast | -22.800 | | 3.460 | | 0.000 |
| Balk 2-2 | 4 | 8:Puntlast | -25.400 | | 7.795 | | 0.000 |
| Balk 2-2 | 5 | 8:Puntlast | -19.100 | | 12.090 | | 0.000 |

VELDBELASTINGEN

Balk 2-A B.G:1 permanent



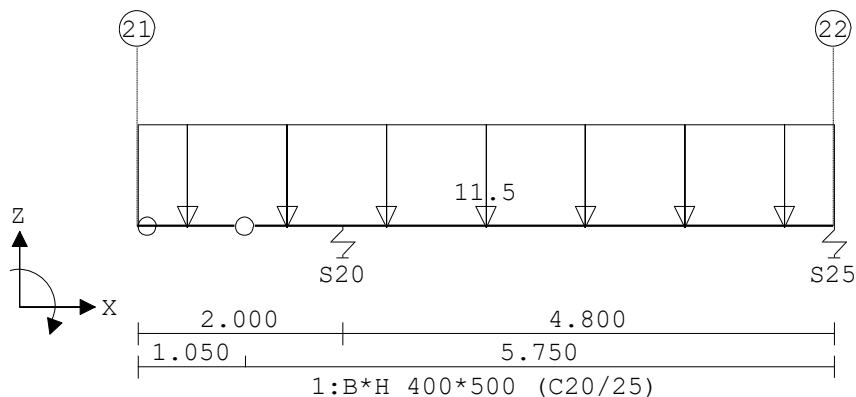
VELDBELASTINGEN

B.G:1 permanent

| Balk | Last Type | q1/p/m | q2 | Afstand | Lengte | Exc. |
|----------|------------|---------|---------|---------|--------|-------|
| Balk 2-A | 1 1:q-last | -22.000 | -22.000 | 0.000 | 6.800 | 0.100 |

VELDBELASTINGEN

Balk 2-B B.G:1 permanent



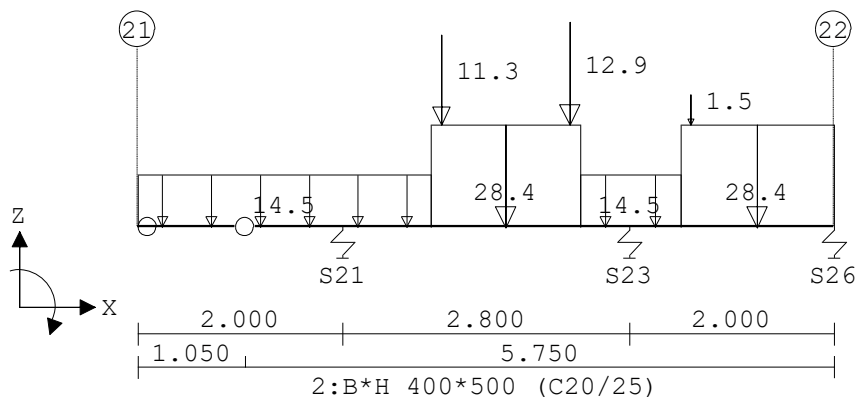
VELDBELASTINGEN

B.G:1 permanent

| Balk | Last Type | q1/p/m | q2 | Afstand | Lengte | Exc. |
|----------|------------|---------|---------|---------|--------|-------|
| Balk 2-B | 1 1:q-last | -11.500 | -11.500 | 0.000 | 6.800 | 0.000 |

VELDBELASTINGEN

Balk 2-C B.G:1 permanent



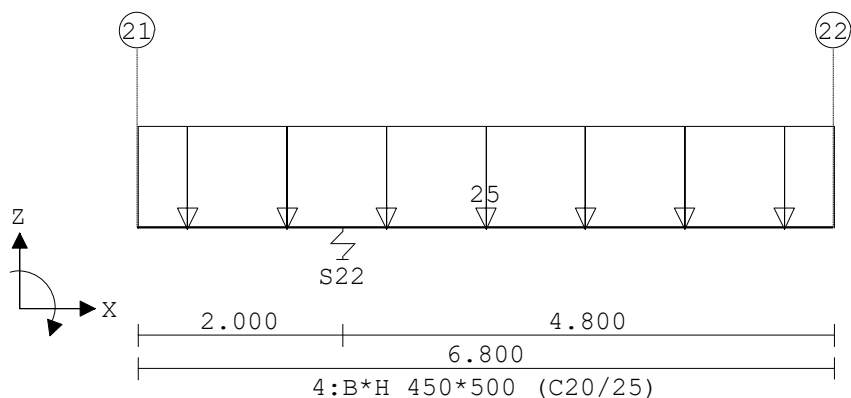
VELDBELASTINGEN

B.G:1 permanent

| Balk | Last | Type | q1/p/m | q2 | Afstand | Lengte | Exc. |
|----------|------|------------|---------|---------|---------|--------|-------|
| Balk 2-C | 1 | 1:q-last | -14.500 | -14.500 | 0.000 | 2.865 | 0.000 |
| Balk 2-C | 2 | 1:q-last | -28.400 | -28.400 | 2.865 | 1.455 | 0.000 |
| Balk 2-C | 3 | 1:q-last | -14.500 | -14.500 | 4.320 | 0.980 | 0.000 |
| Balk 2-C | 4 | 1:q-last | -28.400 | -28.400 | 5.300 | 1.500 | 0.000 |
| Balk 2-C | 5 | 8:Puntlast | -11.300 | | 2.965 | | 0.000 |
| Balk 2-C | 6 | 8:Puntlast | -12.900 | | 4.220 | | 0.000 |
| Balk 2-C | 7 | 8:Puntlast | -1.500 | | 5.400 | | 0.000 |

VELDBELASTINGEN

Balk 2-D B.G:1 permanent



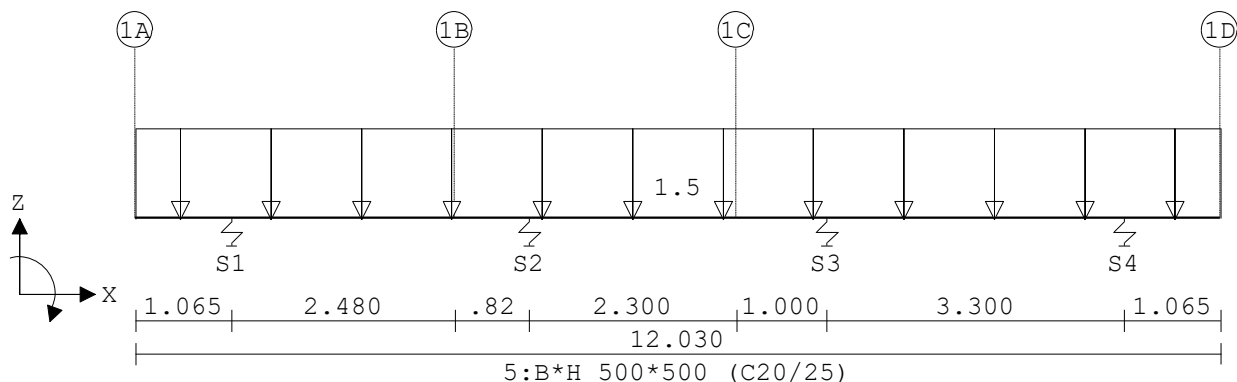
VELDBELASTINGEN

B.G:1 permanent

| Balk | Last | Type | q1/p/m | q2 | Afstand | Lengte | Exc. |
|----------|------|----------|---------|---------|---------|--------|--------|
| Balk 2-D | 1 | 1:q-last | -25.000 | -25.000 | 0.000 | 6.800 | -0.100 |

VELDBELASTINGEN

Balk 1-1 B.G:2 variabel bg



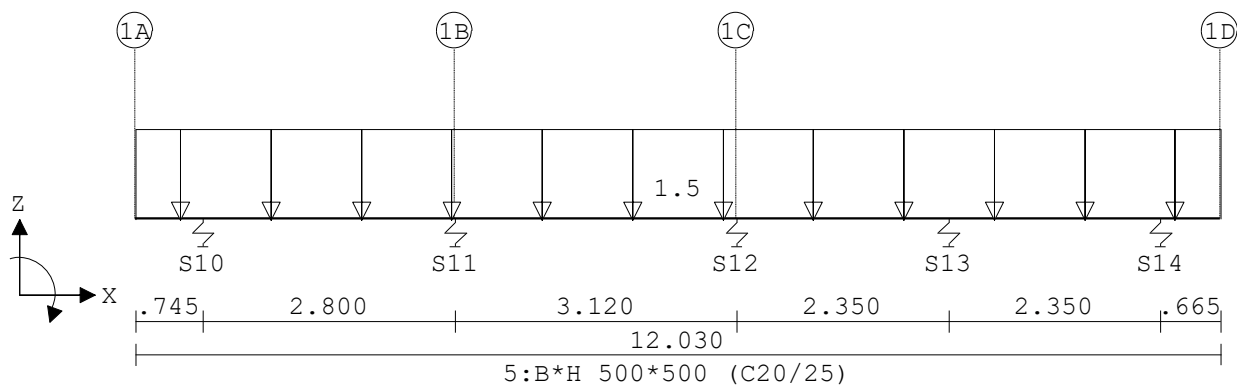
VELDBELASTINGEN

B.G:2 variabel bg

| Balk | Last | Type | q1/p/m | q2 | Afstand | Lengte | Exc. |
|----------|------|----------|--------|--------|---------|--------|-------|
| Balk 1-1 | 1 | 1:q-last | -1.500 | -1.500 | 0.000 | 12.030 | 0.000 |

VELDBELASTINGEN

Balk 1-2 B.G:2 variabel bg



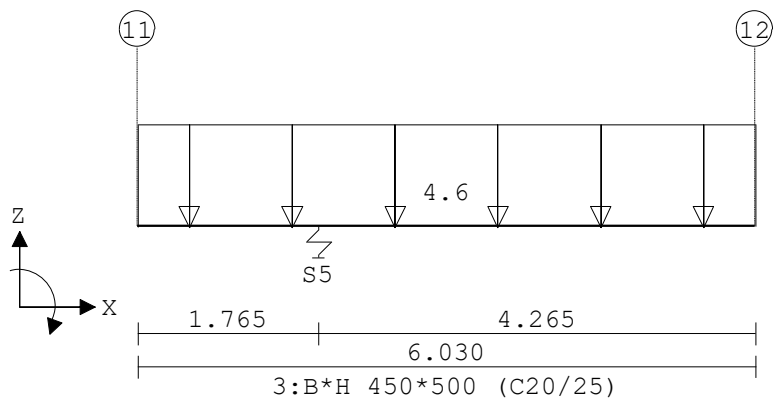
VELDBELASTINGEN

B.G:2 variabel bg

| Balk | Last Type | q1/p/m | q2 | Afstand | Lengte | Exc. |
|----------|------------|--------|--------|---------|--------|-------|
| Balk 1-2 | 1 1:q-last | -1.500 | -1.500 | 0.000 | 12.030 | 0.000 |

VELDBELASTINGEN

Balk 1-A B.G:2 variabel bg



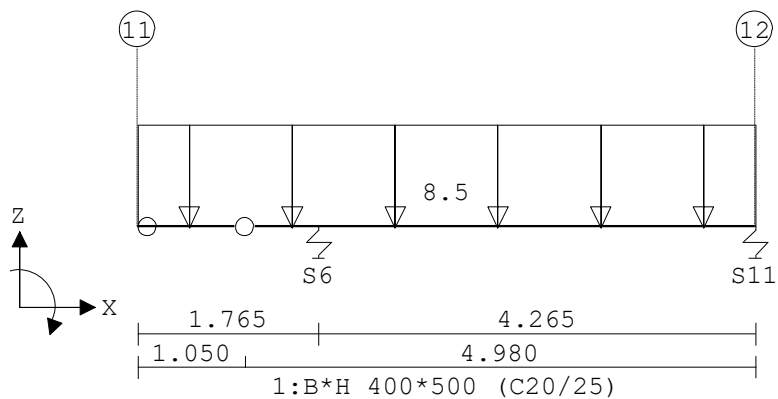
VELDBELASTINGEN

B.G:2 variabel bg

| Balk | Last Type | q1/p/m | q2 | Afstand | Lengte | Exc. |
|----------|------------|--------|--------|---------|--------|-------|
| Balk 1-A | 1 1:q-last | -4.600 | -4.600 | 0.000 | 6.030 | 0.100 |

VELDBELASTINGEN

Balk 1-B B.G:2 variabel bg



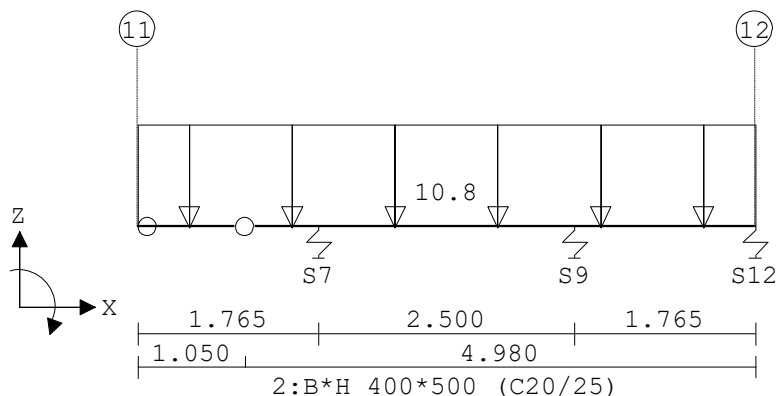
VELDBELASTINGEN

B.G:2 variabel bg

| Balk | Last | Type | q1/p/m | q2 | Afstand | Lengte | Exc. |
|----------|------|----------|--------|--------|---------|--------|-------|
| Balk 1-B | 1 | 1:q-last | -8.500 | -8.500 | 0.000 | 6.030 | 0.000 |

VELDBELASTINGEN

Balk 1-C B.G:2 variabel bg



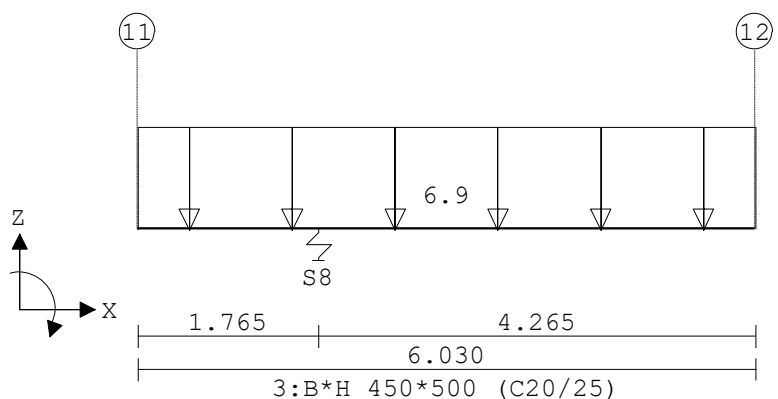
VELDBELASTINGEN

B.G:2 variabel bg

| Balk | Last | Type | q1/p/m | q2 | Afstand | Lengte | Exc. |
|----------|------|----------|---------|---------|---------|--------|-------|
| Balk 1-C | 1 | 1:q-last | -10.800 | -10.800 | 0.000 | 6.030 | 0.000 |

VELDBELASTINGEN

Balk 1-D B.G:2 variabel bg



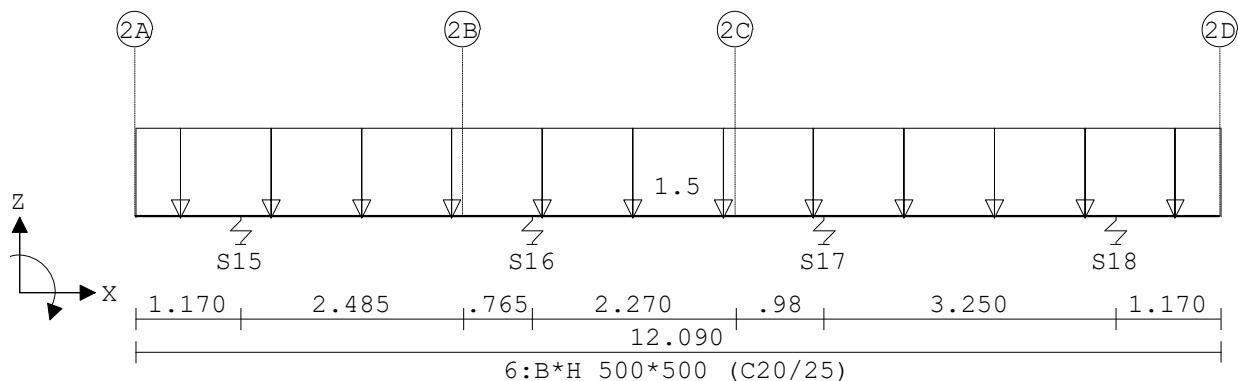
VELDBELASTINGEN

B.G:2 variabel bg

| Balk | Last | Type | q1/p/m | q2 | Afstand | Lengte | Exc. |
|----------|------|----------|--------|--------|---------|--------|--------|
| Balk 1-D | 1 | 1:q-last | -6.900 | -6.900 | 0.000 | 6.030 | -0.100 |

VELDBELASTINGEN

Balk 2-1 B.G:2 variabel bg



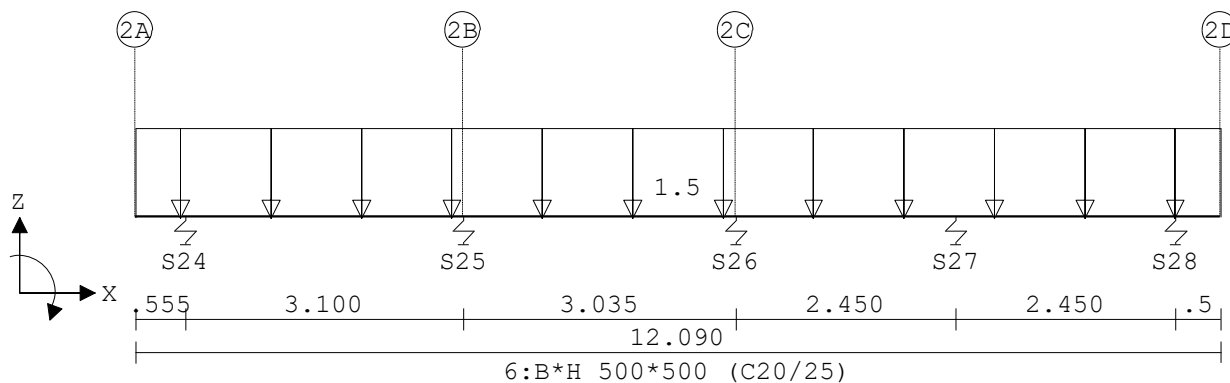
VELDBELASTINGEN

B.G:2 variabel bg

| Balk | Last Type | q1/p/m | q2 | Afstand | Lengte | Exc. |
|----------|------------|--------|--------|---------|--------|-------|
| Balk 2-1 | 1 1:q-last | -1.500 | -1.500 | 0.000 | 12.090 | 0.000 |

VELDBELASTINGEN

Balk 2-2 B.G:2 variabel bg



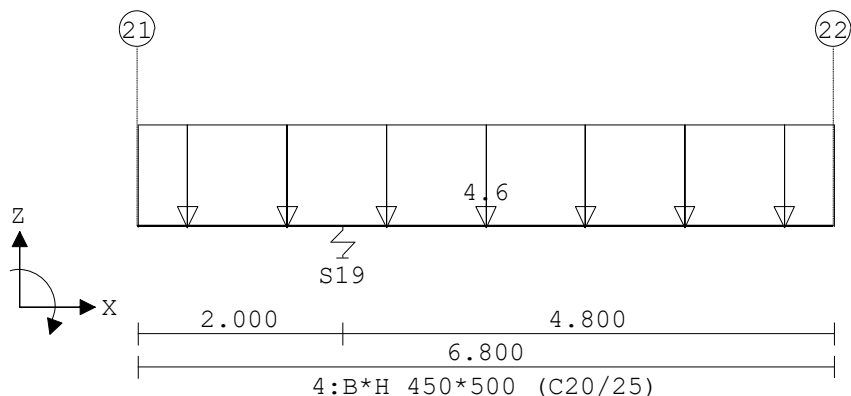
VELDBELASTINGEN

B.G:2 variabel bg

| Balk | Last Type | q1/p/m | q2 | Afstand | Lengte | Exc. |
|----------|------------|--------|--------|---------|--------|-------|
| Balk 2-2 | 1 1:q-last | -1.500 | -1.500 | 0.000 | 12.090 | 0.000 |

VELDBELASTINGEN

Balk 2-A B.G:2 variabel bg



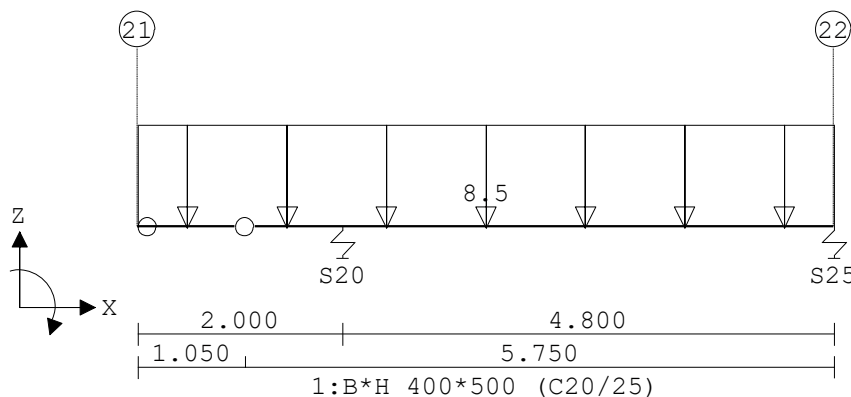
VELDBELASTINGEN

B.G:2 variabel bg

| Balk | Last Type | q1/p/m | q2 | Afstand | Lengte | Exc. |
|----------|------------|--------|--------|---------|--------|-------|
| Balk 2-A | 1 1:q-last | -4.600 | -4.600 | 0.000 | 6.800 | 0.100 |

VELDBELASTINGEN

Balk 2-B B.G:2 variabel bg



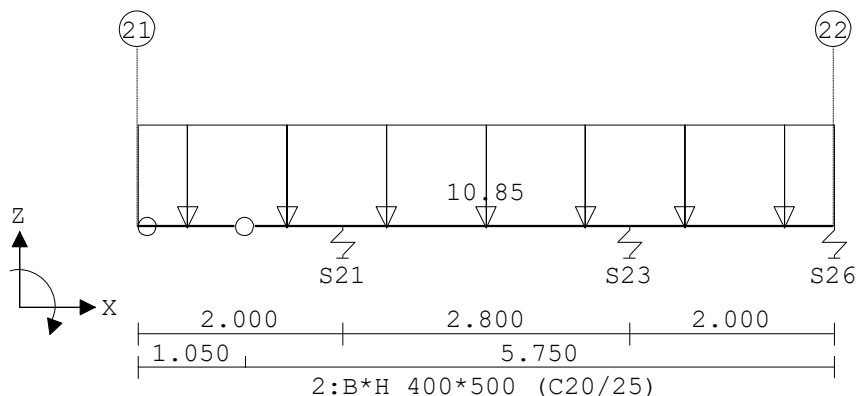
VELDBELASTINGEN

B.G:2 variabel bg

| Balk | Last Type | q1/p/m | q2 | Afstand | Lengte | Exc. |
|----------|------------|--------|--------|---------|--------|-------|
| Balk 2-B | 1 1:q-last | -8.500 | -8.500 | 0.000 | 6.800 | 0.000 |

VELDBELASTINGEN

Balk 2-C B.G:2 variabel bg



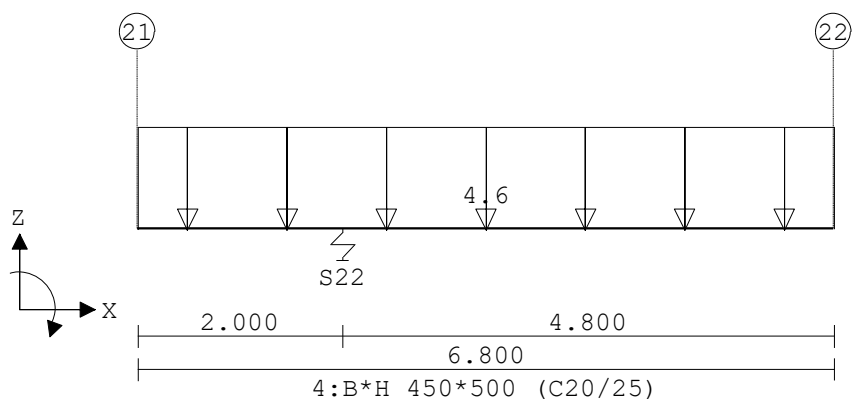
VELDBELASTINGEN

B.G:2 variabel bg

| Balk | Last Type | q1/p/m | q2 | Afstand | Lengte | Exc. |
|----------|------------|---------|---------|---------|--------|-------|
| Balk 2-C | 1 1:q-last | -10.850 | -10.850 | 0.000 | 6.800 | 0.000 |

VELDBELASTINGEN

Balk 2-D B.G:2 variabel bg



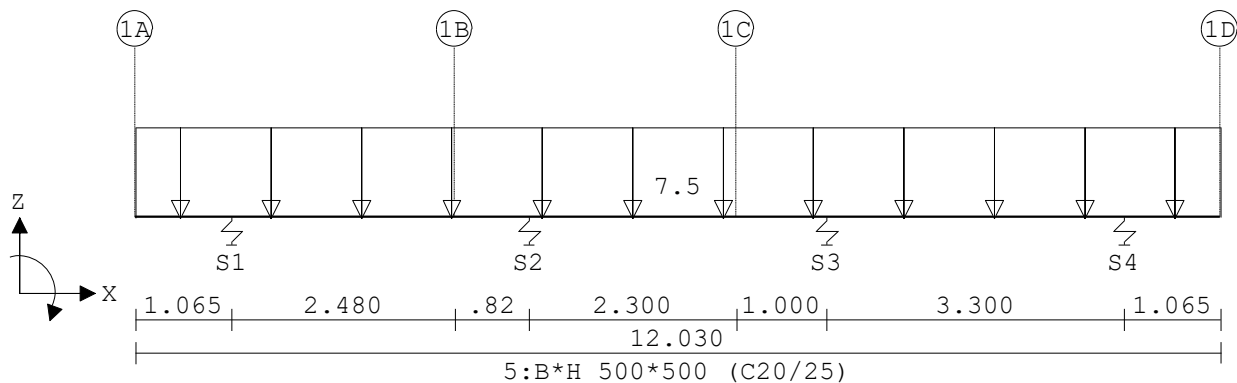
VELDBELASTINGEN

B.G:2 variabel bg

| Balk | Last Type | q1/p/m | q2 | Afstand | Lengte | Exc. |
|----------|------------|--------|--------|---------|--------|--------|
| Balk 2-D | 1 1:q-last | -4.600 | -4.600 | 0.000 | 6.800 | -0.100 |

VELDBELASTINGEN

Balk 1-1 B.G:3 variabel 1e



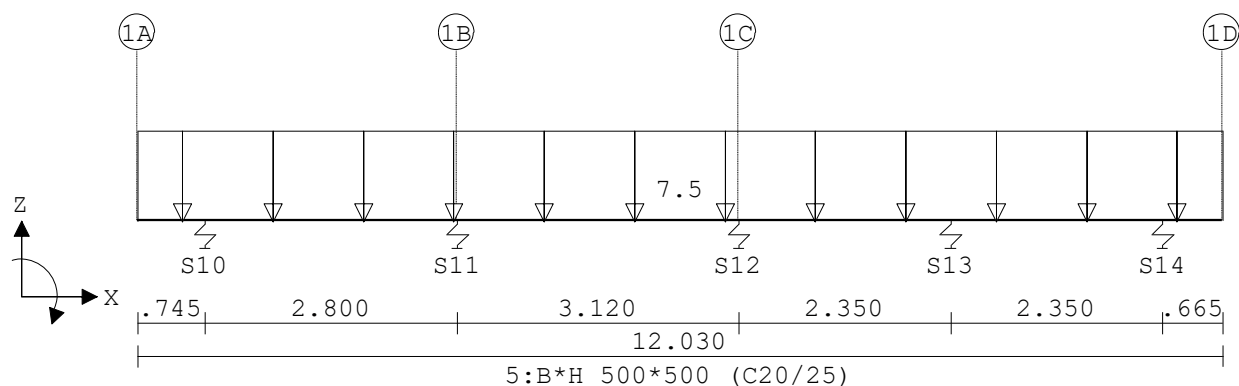
VELDBELASTINGEN

B.G:3 variabel 1e

| Balk | Last | Type | q1/p/m | q2 | Afstand | Lengte | Exc. |
|----------|------|----------|--------|--------|---------|--------|-------|
| Balk 1-1 | 1 | 1:q-last | -7.500 | -7.500 | 0.000 | 12.030 | 0.000 |

VELDBELASTINGEN

Balk 1-2 B.G:3 variabel 1e

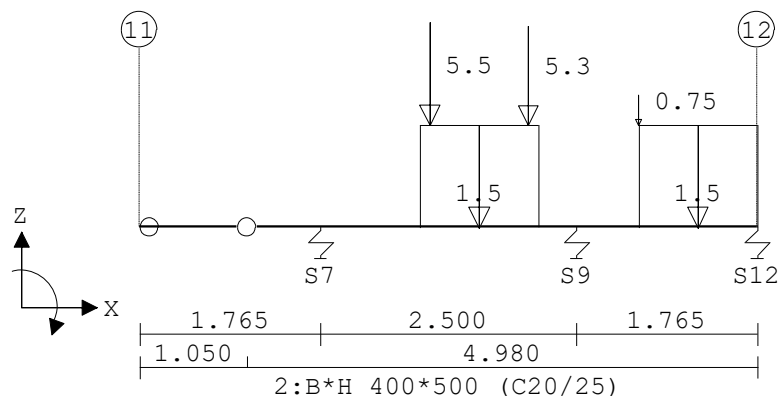

VELDBELASTINGEN

B.G:3 variabel 1e

| Balk | Last | Type | q1/p/m | q2 | Afstand | Lengte | Exc. |
|----------|------|----------|--------|--------|---------|--------|-------|
| Balk 1-2 | 1 | 1:q-last | -7.500 | -7.500 | 0.000 | 12.030 | 0.000 |

VELDBELASTINGEN

Balk 1-C B.G:3 variabel 1e

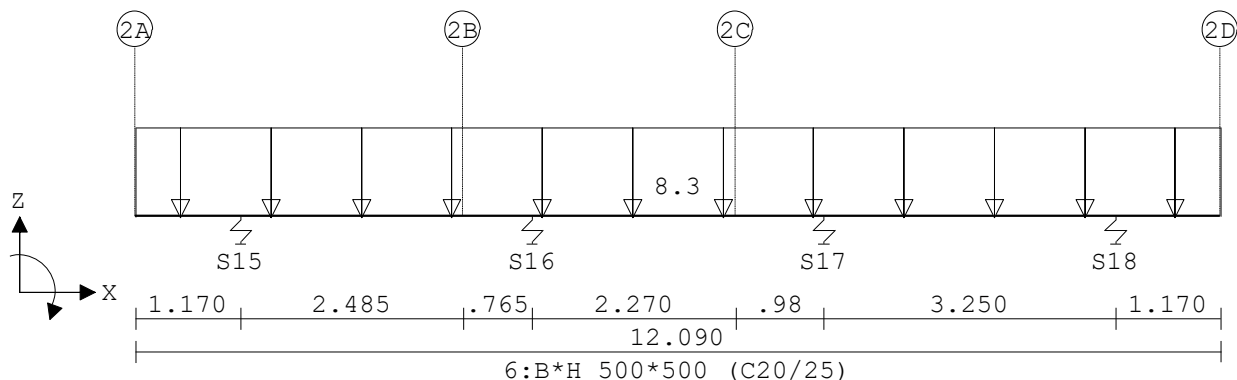

VELDBELASTINGEN

B.G:3 variabel 1e

| Balk | Last | Type | q1/p/m | q2 | Afstand | Lengte | Exc. |
|----------|------|------------|--------|--------|---------|--------|-------|
| Balk 1-C | 1 | 1:q-last | -1.500 | -1.500 | 2.735 | 1.160 | 0.000 |
| Balk 1-C | 2 | 1:q-last | -1.500 | -1.500 | 4.875 | 1.155 | 0.000 |
| Balk 1-C | 3 | 8:Puntlast | -5.500 | | 2.835 | | 0.000 |
| Balk 1-C | 4 | 8:Puntlast | -5.300 | | 3.795 | | 0.000 |
| Balk 1-C | 5 | 8:Puntlast | -0.750 | | 4.875 | | 0.000 |

VELDBELASTINGEN

Balk 2-1 B.G:3 variabel 1e



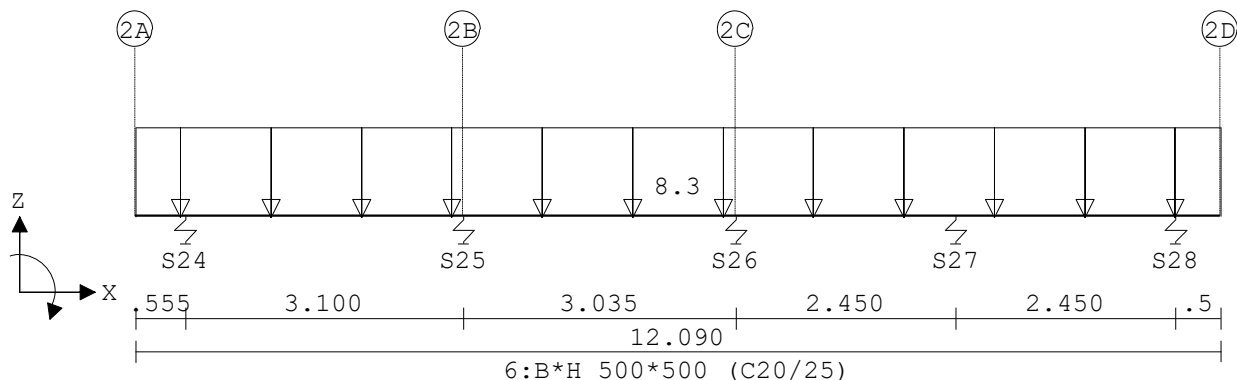
VELDBELASTINGEN

B.G:3 variabel 1e

| Balk | Last Type | q1/p/m | q2 | Afstand | Lengte | Exc. |
|----------|------------|--------|--------|---------|--------|-------|
| Balk 2-1 | 1 1:q-last | -8.300 | -8.300 | 0.000 | 12.090 | 0.000 |

VELDBELASTINGEN

Balk 2-2 B.G:3 variabel 1e



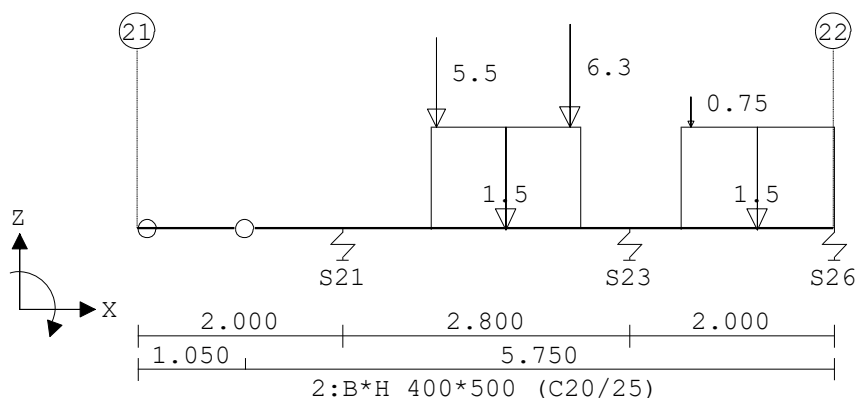
VELDBELASTINGEN

B.G:3 variabel 1e

| Balk | Last Type | q1/p/m | q2 | Afstand | Lengte | Exc. |
|----------|------------|--------|--------|---------|--------|-------|
| Balk 2-2 | 1 1:q-last | -8.300 | -8.300 | 0.000 | 12.090 | 0.000 |

VELDBELASTINGEN

Balk 2-C B.G:3 variabel 1e



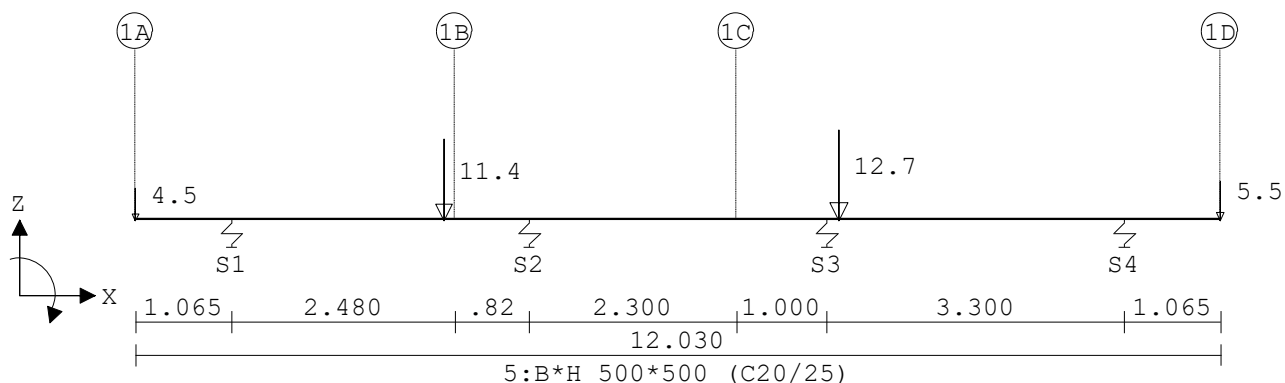
VELDBELASTINGEN

B.G:3 variabel 1e

| Balk | Last | Type | q1/p/m | q2 | Afstand | Lengte | Exc. |
|----------|------|------------|--------|--------|---------|--------|-------|
| Balk 2-C | 1 | 1:q-last | -1.500 | -1.500 | 2.865 | 1.455 | 0.000 |
| Balk 2-C | 2 | 1:q-last | -1.500 | -1.500 | 5.300 | 1.500 | 0.000 |
| Balk 2-C | 3 | 8:Puntlast | -5.500 | | 2.915 | | 0.000 |
| Balk 2-C | 4 | 8:Puntlast | -6.300 | | 4.220 | | 0.000 |
| Balk 2-C | 5 | 8:Puntlast | -0.750 | | 5.400 | | 0.000 |

VELDBELASTINGEN

Balk 1-1 B.G:4 variabel zolder

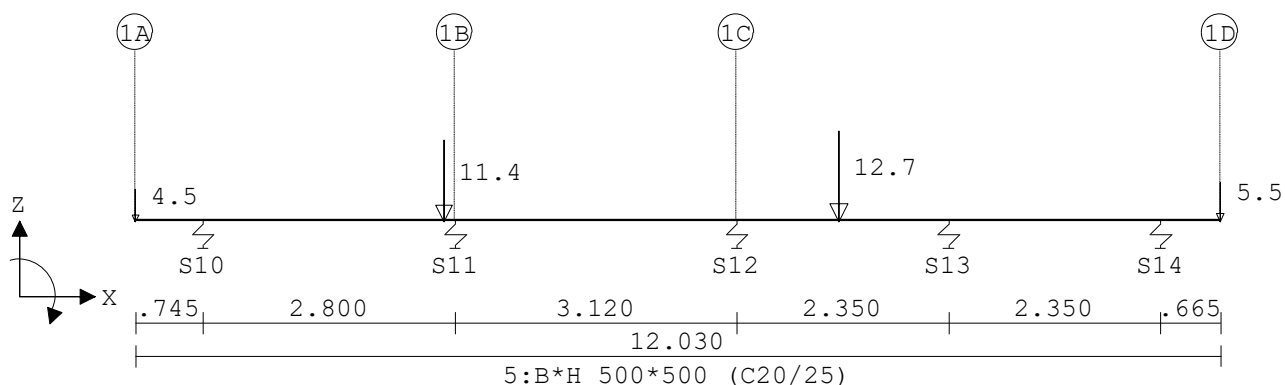

VELDBELASTINGEN

B.G:4 variabel zolder

| Balk | Last | Type | q1/p/m | q2 | Afstand | Lengte | Exc. |
|----------|------|------------|---------|----|---------|--------|-------|
| Balk 1-1 | 1 | 8:Puntlast | -4.500 | | 0.000 | | 0.000 |
| Balk 1-1 | 2 | 8:Puntlast | -11.400 | | 3.420 | | 0.000 |
| Balk 1-1 | 3 | 8:Puntlast | -12.700 | | 7.800 | | 0.000 |
| Balk 1-1 | 4 | 8:Puntlast | -5.500 | | 12.030 | | 0.000 |

VELDBELASTINGEN

Balk 1-2 B.G:4 variabel zolder

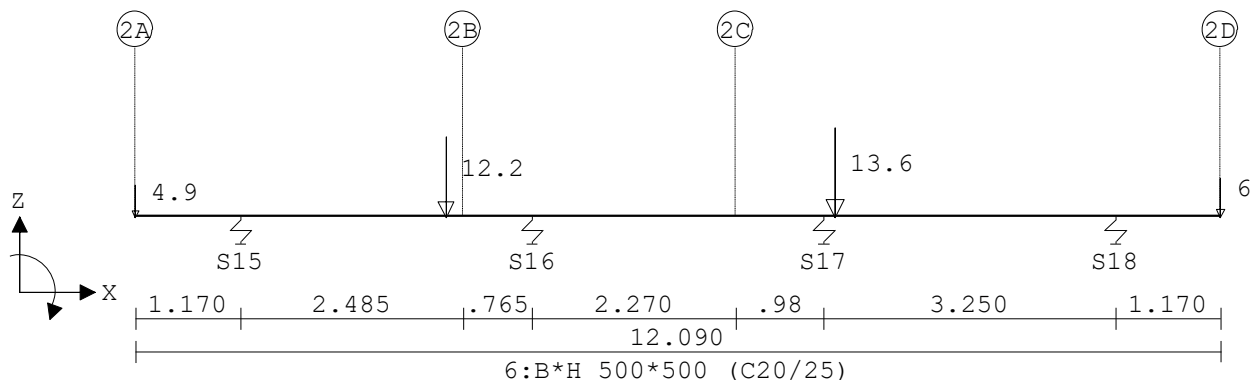

VELDBELASTINGEN

B.G:4 variabel zolder

| Balk | Last | Type | q1/p/m | q2 | Afstand | Lengte | Exc. |
|----------|------|------------|---------|----|---------|--------|-------|
| Balk 1-2 | 1 | 8:Puntlast | -4.500 | | 0.000 | | 0.000 |
| Balk 1-2 | 2 | 8:Puntlast | -11.400 | | 3.420 | | 0.000 |
| Balk 1-2 | 3 | 8:Puntlast | -12.700 | | 7.800 | | 0.000 |
| Balk 1-2 | 4 | 8:Puntlast | -5.500 | | 12.030 | | 0.000 |

VELDBELASTINGEN

Balk 2-1 B.G:4 variabel zolder



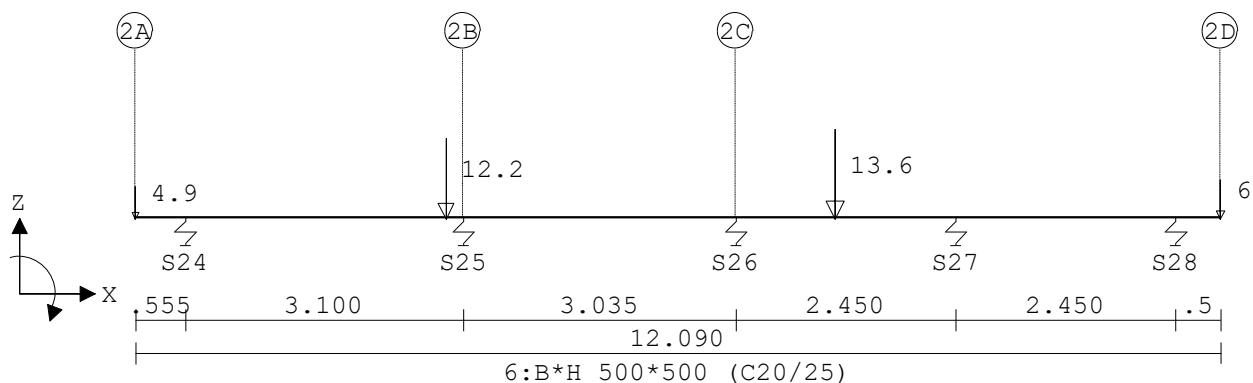
VELDBELASTINGEN

B.G:4 variabel zolder

| Balk | Last | Type | q1/p/m | q2 | Afstand | Lengte | Exc. |
|----------|------|------------|---------|----|---------|--------|-------|
| Balk 2-1 | 1 | 8:Puntlast | -4.900 | | 0.000 | | 0.000 |
| Balk 2-1 | 2 | 8:Puntlast | -12.200 | | 3.460 | | 0.000 |
| Balk 2-1 | 3 | 8:Puntlast | -13.600 | | 7.795 | | 0.000 |
| Balk 2-1 | 4 | 8:Puntlast | -6.000 | | 12.090 | | 0.000 |

VELDBELASTINGEN

Balk 2-2 B.G:4 variabel zolder



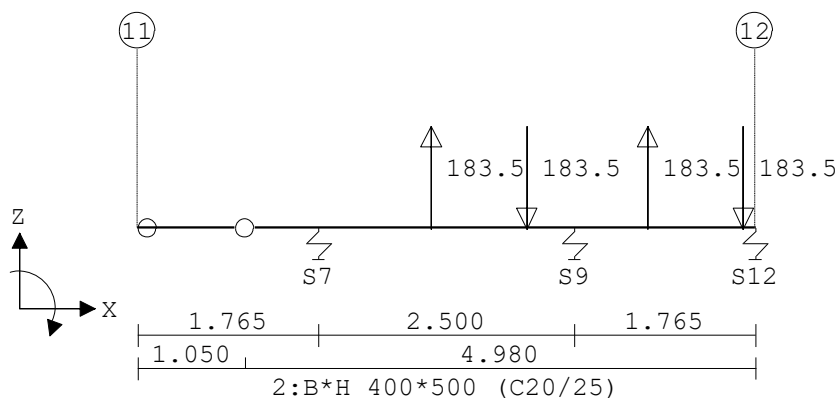
VELDBELASTINGEN

B.G:4 variabel zolder

| Balk | Last | Type | q1/p/m | q2 | Afstand | Lengte | Exc. |
|----------|------|------------|---------|----|---------|--------|-------|
| Balk 2-2 | 1 | 8:Puntlast | -4.900 | | 0.000 | | 0.000 |
| Balk 2-2 | 2 | 8:Puntlast | -12.200 | | 3.460 | | 0.000 |
| Balk 2-2 | 3 | 8:Puntlast | -13.600 | | 7.795 | | 0.000 |
| Balk 2-2 | 4 | 8:Puntlast | -6.000 | | 12.090 | | 0.000 |

VELDBELASTINGEN

Balk 1-C B.G:5 wind links



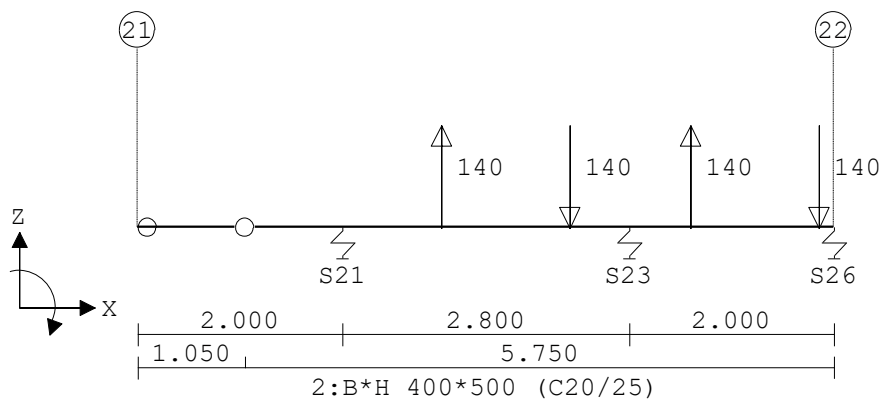
VELDBELASTINGEN

B.G:5 wind links

| Balk | Last | Type | q1/p/m | q2 | Afstand | Lengte | Exc. |
|----------|------|------------|----------|----|---------|--------|-------|
| Balk 1-C | 1 | 8:Puntlast | 183.500 | | 2.865 | | 0.000 |
| Balk 1-C | 2 | 8:Puntlast | -183.500 | | 3.800 | | 0.000 |
| Balk 1-C | 3 | 8:Puntlast | 183.500 | | 4.980 | | 0.000 |
| Balk 1-C | 4 | 8:Puntlast | -183.500 | | 5.915 | | 0.000 |

VELDBELASTINGEN

Balk 2-C B.G:5 wind links



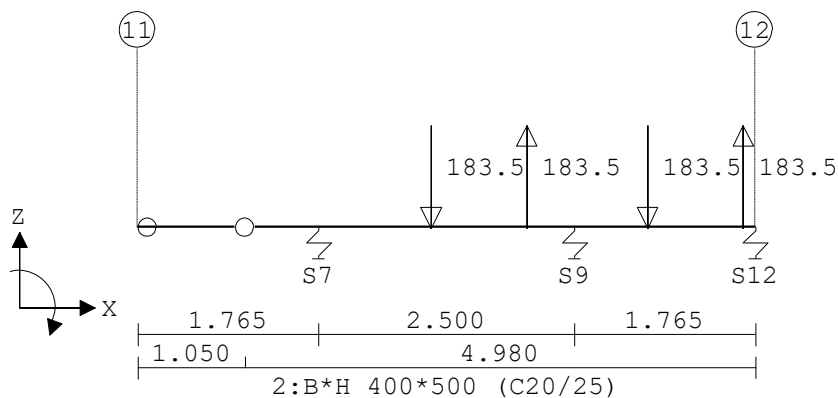
VELDBELASTINGEN

B.G:5 wind links

| Balk | Last | Type | q1/p/m | q2 | Afstand | Lengte | Exc. |
|----------|------|------------|----------|----|---------|--------|-------|
| Balk 2-C | 1 | 8:Puntlast | 140.000 | | 2.965 | | 0.000 |
| Balk 2-C | 2 | 8:Puntlast | -140.000 | | 4.220 | | 0.000 |
| Balk 2-C | 3 | 8:Puntlast | 140.000 | | 5.400 | | 0.000 |
| Balk 2-C | 4 | 8:Puntlast | -140.000 | | 6.655 | | 0.000 |

VELDBELASTINGEN

Balk 1-C B.G:6 wind rechts



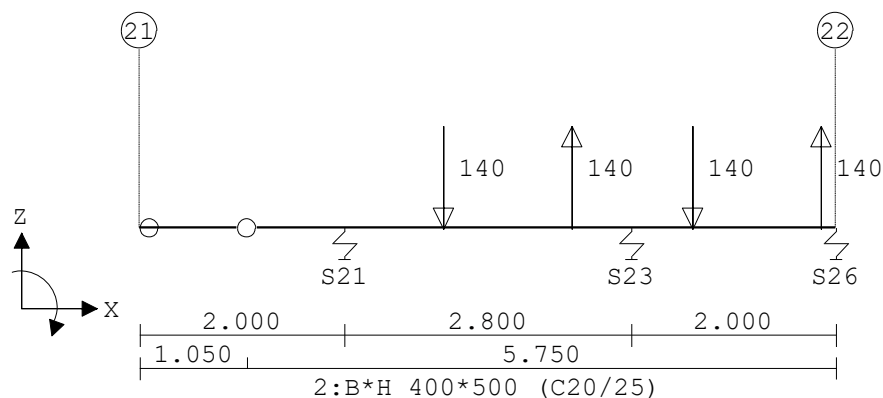
VELDBELASTINGEN

B.G:6 wind rechts

| Balk | Last | Type | q1/p/m | q2 | Afstand | Lengte | Exc. |
|----------|------|------------|----------|----|---------|--------|-------|
| Balk 1-C | 1 | 8:Puntlast | -183.500 | | 2.865 | | 0.000 |
| Balk 1-C | 2 | 8:Puntlast | 183.500 | | 3.800 | | 0.000 |
| Balk 1-C | 3 | 8:Puntlast | -183.500 | | 4.980 | | 0.000 |
| Balk 1-C | 4 | 8:Puntlast | 183.500 | | 5.915 | | 0.000 |

VELDBELASTINGEN

Balk 2-C B.G:6 wind rechts



VELDBELASTINGEN

B.G:6 wind rechts

| Balk | Last | Type | q1/p/m | q2 | Afstand | Lengte | Exc. |
|----------|------|------------|----------|----|---------|--------|-------|
| Balk 2-C | 1 | 8:Puntlast | -140.000 | | 2.965 | | 0.000 |
| Balk 2-C | 2 | 8:Puntlast | 140.000 | | 4.220 | | 0.000 |
| Balk 2-C | 3 | 8:Puntlast | -140.000 | | 5.400 | | 0.000 |
| Balk 2-C | 4 | 8:Puntlast | 140.000 | | 6.655 | | 0.000 |

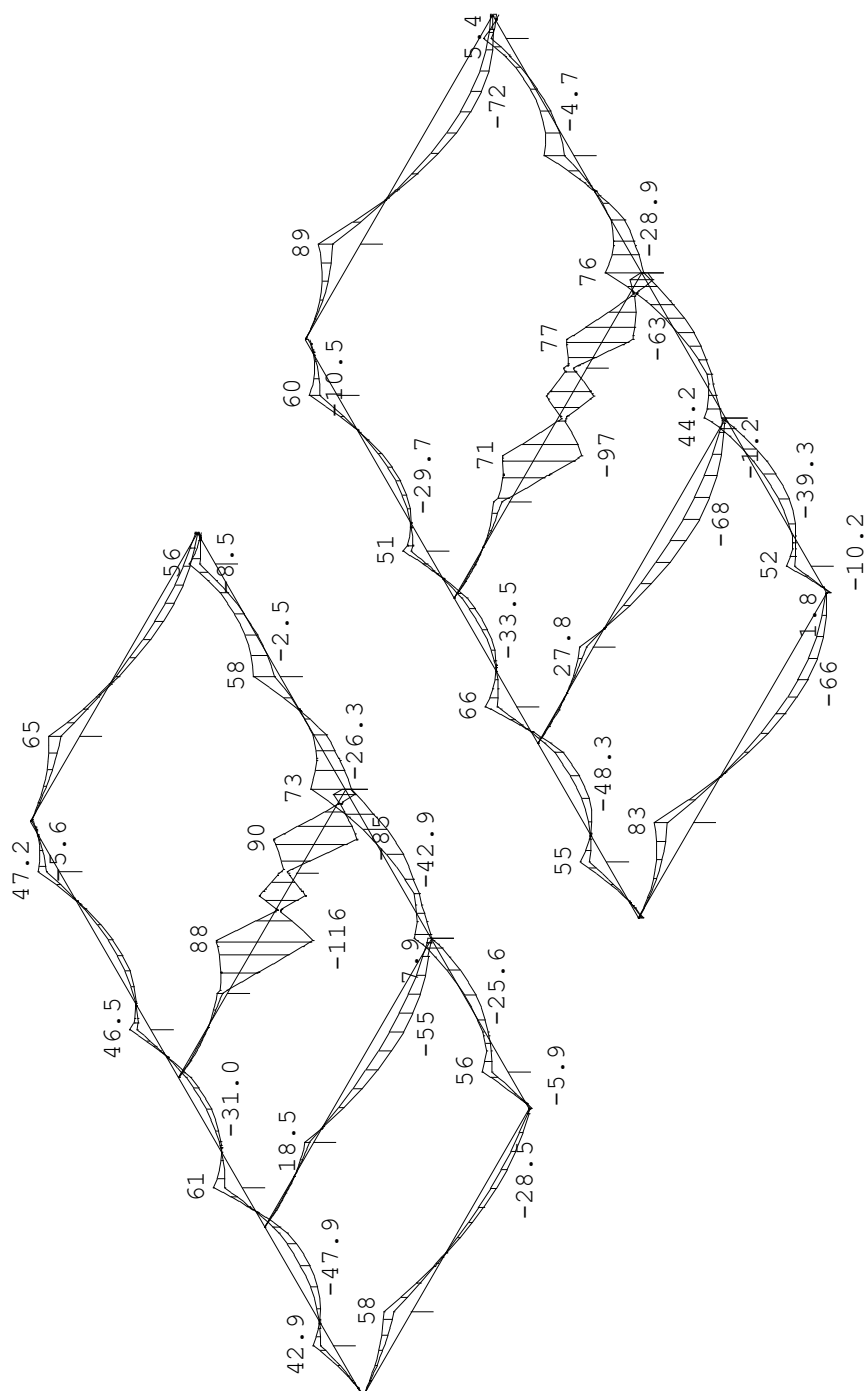
BELASTINGCOMBINATIES

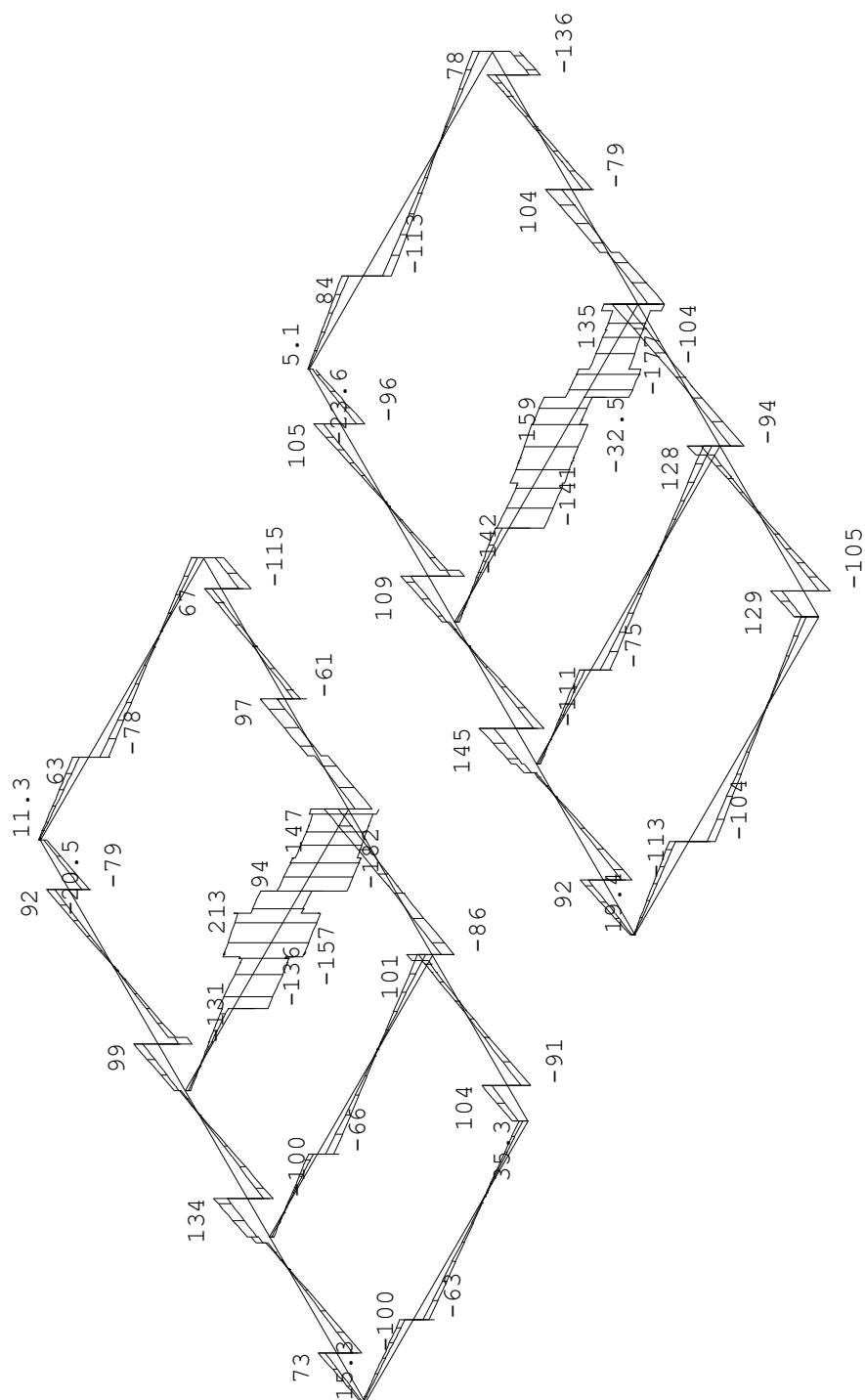
[illegible]

OMHULLENDE VAN DE FUNDAMENTELE COMBINATIES

MOMENTEN Fysisch lineair

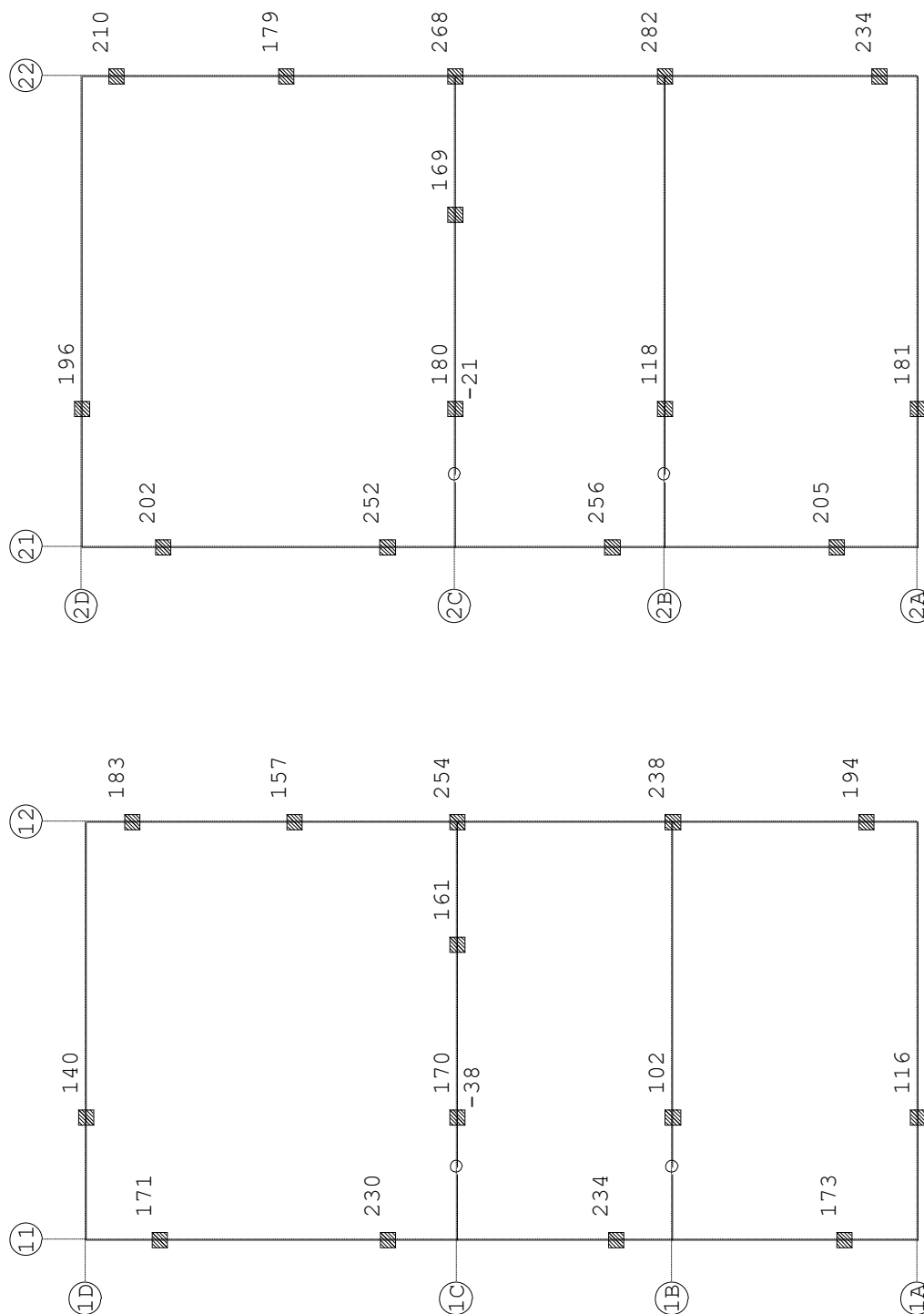
Fundamentele combinatie





REACTIES Fysisch lineair

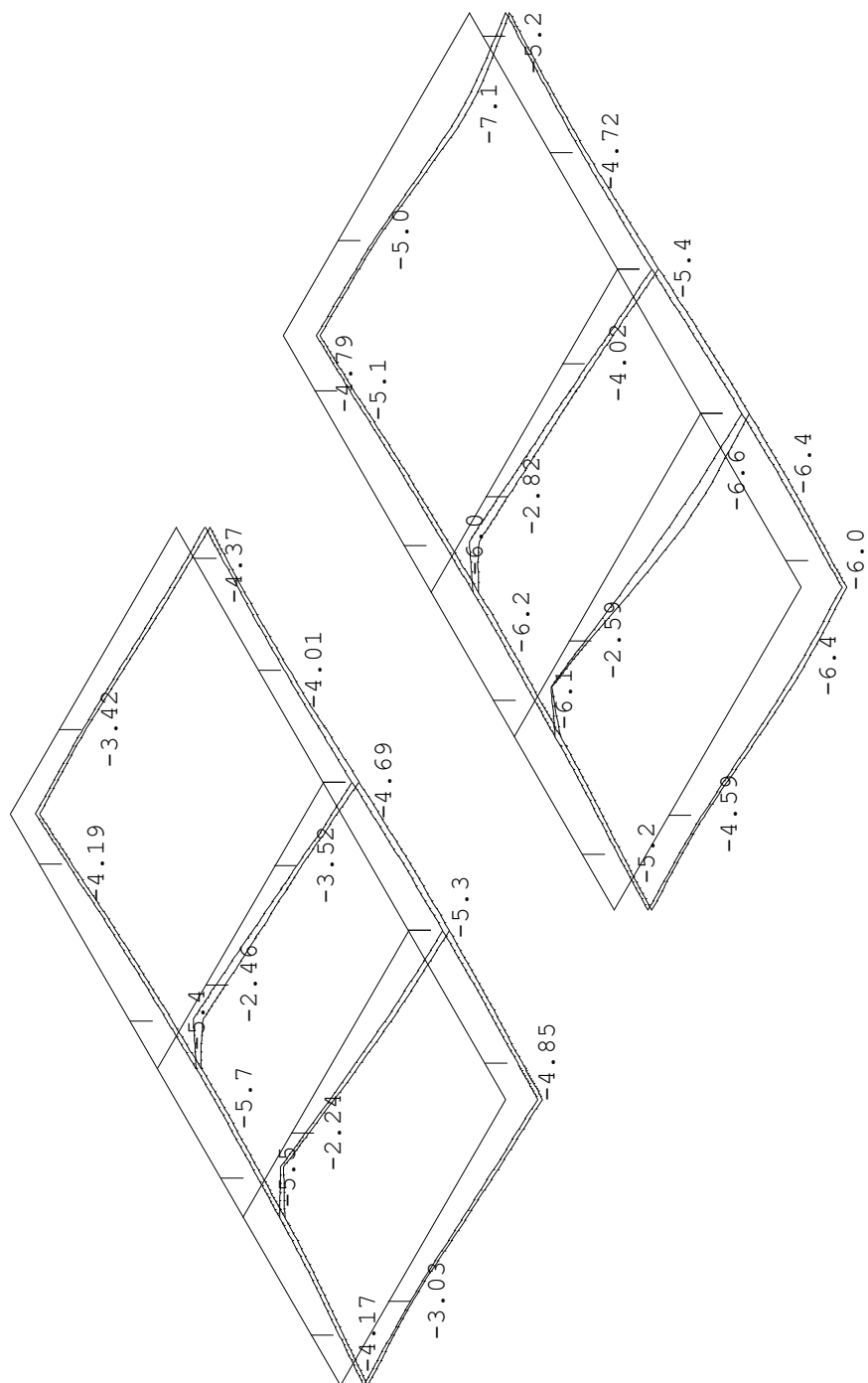
Fundamentele combinatie



OMHULLENDE VAN DE FREQUENTE COMBINATIES

VERPLAATSINGEN [mm] Fys.NLE.kort

Frequente combinatie



PROFIELGEGEVENS Balk
[N] [mm]

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

Algemeen

Materiaal : C20/25

Doorsnede

breedte : 400 hoogte : 500 zwaartepunt tov onderkant : 250

Fictieve dikte : 222.2

Betonkwaliteit element : C20/25 Kruipcoëf. : 3.010

Staalkwaliteit hoofdwapening : 500 ϵ_{uk} : 2.50

Staalkwaliteit beugels : 500

Betondekking

Milieu : Boven XC4 Onder XC4

Hoofdwapening : 2de laag 2de laag

Nominale dekking : 35 35

Toegepaste dekking : 43 48

Toegepaste zijdekking : 43

Beugel / Verdeelwapening : 1ste laag 1ste laag

Nominale dekking : 35 35

Toegepaste dekking : 35 40

Toegepaste zijdekking : 35

Wapening

Basiswapening buitenste laag : Boven 4x12 Onder 4x12

H.o.h.afstand 2e laag : 0 0

Beugels

Beugeldiameter : 8

Min. hoek betondrukdiagonaal θ : 21.8 z berekenen via: MEd

PROFIELGEGEVENS Balk
[N] [mm]

t.b.v. profiel:2 B*H 400*500

Algemeen

Materiaal : C20/25

Doorsnede

breedte : 400 hoogte : 500 zwaartepunt tov onderkant : 250

Fictieve dikte : 222.2

Betonkwaliteit element : C20/25 Kruipcoëf. : 3.010

Staalkwaliteit hoofdwapening : 500 ϵ_{uk} : 2.50

Staalkwaliteit beugels : 500

Betondekking

Milieu : Boven XC4 Onder XC4

Hoofdwapening : 2de laag 2de laag

Nominale dekking : 35 35

Toegepaste dekking : 43 48

Toegepaste zijdekking : 43

Beugel / Verdeelwapening : 1ste laag 1ste laag

Nominale dekking : 35 35

Toegepaste dekking : 35 40

Toegepaste zijdekking : 35

Wapening

Basiswapening buitenste laag : Boven 4x16 Onder 4x16

H.o.h.afstand 2e laag : 0 0

Beugels

Beugeldiameter : 8

Min. hoek betondrukdiagonaal θ : 21.8 z berekenen via: MEd

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

t.b.v. profiel:3 B*H 450*500

Algemeen

Materiaal : C20/25

Doorsnede

breedte : 450 hoogte : 500 zwaartepunt tov onderkant : 250

Fictieve dikte : 236.8

Betonkwaliteit element : C20/25 Kruipcoëf. : 3.010

Staalkwaliteit hoofdwapening : 500 ϵ_{uk} : 2.50

Staalkwaliteit beugels : 500

Betondekking

Milieu : Boven XC4 Onder XC4

Hoofdwapening : 2de laag 2de laag

Nominale dekking : 35 35

Toegepaste dekking : 43 48

Toegepaste zijdekking : 43

Beugel / Verdeelwapening : 1ste laag 1ste laag

Nominale dekking : 35 35

Toegepaste dekking : 35 40

Toegepaste zijdekking : 35

Wapening

Basiswapening buitenste laag : Boven 4x12 Onder 4x12

H.o.h.afstand 2e laag : 0 0

Beugels

Beugeldiameter : 8

Min. hoek betondrukdiagonaal θ : 21.8 z berekenen via: MEd**PROFIELGEGEVENS Balk****[N] [mm]**

t.b.v. profiel:4 B*H 450*500

Algemeen

Materiaal : C20/25

Doorsnede

breedte : 450 hoogte : 500 zwaartepunt tov onderkant : 250

Fictieve dikte : 236.8

Betonkwaliteit element : C20/25 Kruipcoëf. : 3.010

Staalkwaliteit hoofdwapening : 500 ϵ_{uk} : 2.50

Staalkwaliteit beugels : 500

Betondekking

Milieu : Boven XC4 Onder XC4

Hoofdwapening : 2de laag 2de laag

Nominale dekking : 35 35

Toegepaste dekking : 43 48

Toegepaste zijdekking : 43

Beugel / Verdeelwapening : 1ste laag 1ste laag

Nominale dekking : 35 35

Toegepaste dekking : 35 40

Toegepaste zijdekking : 35

Wapening

Basiswapening buitenste laag : Boven 4x16 Onder 2x12+2x16

H.o.h.afstand 2e laag : 0 0

Beugels

Beugeldiameter : 8

Min. hoek betondrukdiagonaal θ : 21.8 z berekenen via: MEd

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

t.b.v. profiel:5 B*H 500*500

Algemeen

Materiaal : C20/25

Doorsnede

breedte : 500 hoogte : 500 zwaartepunt tov onderkant : 250

Fictieve dikte : 250.0

Betonkwaliteit element : C20/25 Kruipcoëf. : 3.010

Staalkwaliteit hoofdwapening : 500 ϵ_{uk} : 2.50

Staalkwaliteit beugels : 500

Betondekking

Milieu : Boven XC4 Onder XC4

Hoofdwapening : 2de laag 2de laag

Nominale dekking : 35 35

Toegepaste dekking : 43 48

Toegepaste zijdekking : 43

Beugel / Verdeelwapening : 1ste laag 1ste laag

Nominale dekking : 35 35

Toegepaste dekking : 35 40

Toegepaste zijdekking : 35

Wapening

Basiswapening buitenste laag : Boven 4x12 Onder 4x12

H.o.h.afstand 2e laag : 0 0

Beugels

Beugeldiameter : 8

Min. hoek betondrukdiagonaal θ : 21.8 z berekenen via: MEd**PROFIELGEGEVENS Balk****[N] [mm]**

t.b.v. profiel:6 B*H 500*500

Algemeen

Materiaal : C20/25

Doorsnede

breedte : 500 hoogte : 500 zwaartepunt tov onderkant : 250

Fictieve dikte : 250.0

Betonkwaliteit element : C20/25 Kruipcoëf. : 3.010

Staalkwaliteit hoofdwapening : 500 ϵ_{uk} : 2.50

Staalkwaliteit beugels : 500

Betondekking

Milieu : Boven XC4 Onder XC4

Hoofdwapening : 2de laag 2de laag

Nominale dekking : 35 35

Toegepaste dekking : 43 48

Toegepaste zijdekking : 43

Beugel / Verdeelwapening : 1ste laag 1ste laag

Nominale dekking : 35 35

Toegepaste dekking : 35 40

Toegepaste zijdekking : 35

Wapening

Basiswapening buitenste laag : Boven 5x12 Onder 4x12

H.o.h.afstand 2e laag : 0 0

Beugels

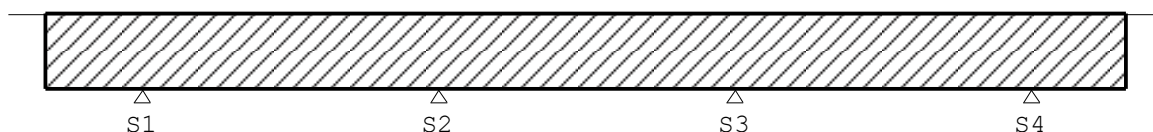
Beugeldiameter : 8

Min. hoek betondrukdiagonaal θ : 21.8 z berekenen via: MEd

Hoofdwapening Fysisch lineair

Balk 1-1

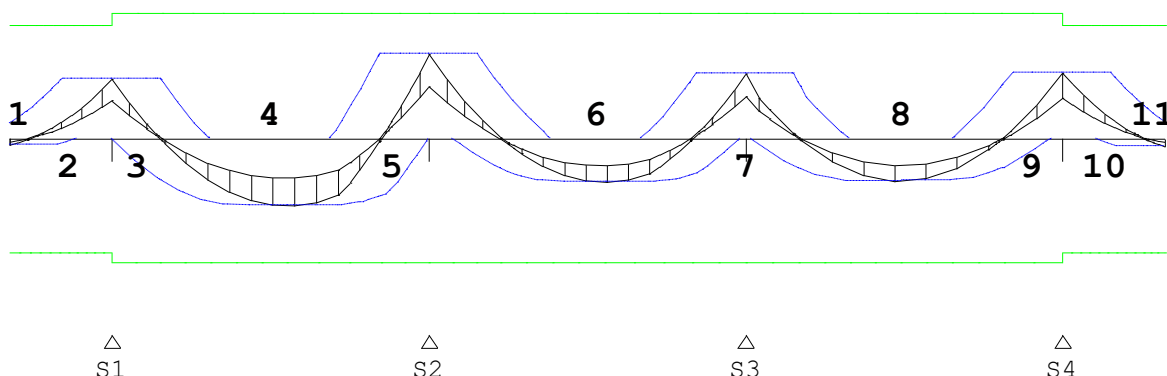
4x12 a



4x12 b

MEd dekkingslijn Fysisch lineair

Balk 1-1



Hoofdwapening

Balk 1-1

| Geb. | Pos. [mm] | M_{Ed} [kNm] | M_{Rd} [kNm] | z | B/O | A_b [mm ²] | A_a [mm ²] | Basiswapening +Bijlegwapening | Opm. |
|------|--------------|-------------------|-------------------|-----|-----|-----------------------------|-----------------------------|----------------------------------|------------|
| 1 | S1-1065 | -4.34 | -81.23 | 413 | Ond | 191* | 453 | 4x12 | 2, 54, 110 |
| 2 | S1-0 | 42.89 | 81.23 | 413 | Bov | 283* | 453 | 4x12 | 1, 2, 110 |
| 3 | S1+0 | 42.89 | 89.92 | 378 | Bov | 254* | 453 | 4x12 | 1 |
| 4 | S2-1475 | -47.90 | -88.54 | 395 | Ond | 257* | 453 | 4x12 | 1 |
| 5 | S2+0 | 60.55 | 89.92 | 378 | Bov | 304 | 453 | 4x12 | |
| 6 | S3-1468 | -30.97 | -88.54 | 395 | Ond | 198* | 453 | 4x12 | 1 |
| 7 | S3+0 | 46.52 | 89.92 | 378 | Bov | 254* | 453 | 4x12 | 1 |
| 8 | S3+1614 | -30.32 | -88.54 | 395 | Ond | 194* | 453 | 4x12 | 1 |
| 9 | S4-0 | 47.21 | 89.92 | 378 | Bov | 254* | 453 | 4x12 | 1 |
| 10 | S4+0 | 47.21 | 81.23 | 412 | Bov | 283* | 453 | 4x12 | 1, 2, 110 |
| 11 | S4+1065 | -5.57 | -81.23 | 412 | Ond | 191* | 453 | 4x12 | 2, 54, 110 |

Opmerkingen

- [1] * = Eisen met betrekking tot minimum wapening zijn toegepast, zie nationale bijlage art. 9.2.1.1(1).
- [2] Benodigde wapening en inwendige hefboomsarm zijn bepaald volgens gedrongen ligger detaillering, zie nationale bijlage art. 6.1(10).
- [54] * = Eisen met betrekking tot minimum wapening ten behoeve van gecontroleerde scheurvorming zijn toegepast volgens art. 7.3.2.
- [110] **Art. 9.7 (1), (2): Een orthogonaal wapeningsnet dient toegepast te worden aan iedere zijde van de gedrongen liggers:**
Profiel 5 - B*H 500*500: 500 mm²/m aan elke zijde en in elke richting met een maximaal hoh 300 mm.

Scheurvorming volgens artikel 7.3.4

Balk 1-1

| Geb. | Pos. [mm] | Zijde | $M_E; freq$ [kNm] | $S_{r, max}$ [mm] | $\epsilon_{sm} - \epsilon_{cm}$ [%] | w_k [mm] | k_x | w_{max} [mm] | U.C. | Opm. |
|------|--------------|-------|----------------------|----------------------|--|---------------|-------|-------------------|------|------|
| 1 | S1-1065 | Bov | 8.65 | 408 | 0.134 | 0.055 | 1.00 | 0.300 | 0.18 | |
| 1 | S1-510 | Bov | 34.33 | 408 | 0.532 | 0.217 | 1.00 | 0.300 | 0.72 | |
| 1 | S1-1065 | Ond | -3.08 | 408 | 0.048 | 0.020 | 1.14 | 0.343 | 0.06 | |
| 1 | S1-647 | Ond | -3.08 | 408 | 0.048 | 0.020 | 1.14 | 0.343 | 0.06 | |
| 2 | S1+260 | Bov | 34.33 | 408 | 0.532 | 0.217 | 1.00 | 0.300 | 0.72 | |
| 2 | S2-304 | Bov | 47.30 | 408 | 0.734 | 0.299 | 1.00 | 0.300 | 1.00 | |
| 2 | S1+1294 | Ond | -36.55 | 408 | 0.573 | 0.234 | 1.14 | 0.343 | 0.68 | |
| 2 | S2-1475 | Ond | -36.54 | 408 | 0.573 | 0.234 | 1.14 | 0.343 | 0.68 | |
| 3 | S2+256 | Bov | 47.30 | 408 | 0.734 | 0.299 | 1.00 | 0.300 | 1.00 | |
| 3 | S3-290 | Bov | 37.42 | 408 | 0.580 | 0.237 | 1.00 | 0.300 | 0.79 | |
| 3 | S2+1289 | Ond | -24.28 | 408 | 0.381 | 0.155 | 1.14 | 0.343 | 0.45 | |
| 3 | S3-1468 | Ond | -24.28 | 408 | 0.381 | 0.155 | 1.14 | 0.343 | 0.45 | |
| 4 | S3+291 | Bov | 37.42 | 408 | 0.580 | 0.237 | 1.00 | 0.300 | 0.79 | |
| 4 | S4-318 | Bov | 37.38 | 408 | 0.580 | 0.237 | 1.00 | 0.300 | 0.79 | |
| 4 | S3+1614 | Ond | -24.22 | 408 | 0.380 | 0.155 | 1.14 | 0.343 | 0.45 | |
| 5 | S4+510 | Bov | 37.38 | 408 | 0.580 | 0.237 | 1.00 | 0.300 | 0.79 | |
| 5 | S4+563 | Ond | -3.85 | 408 | 0.060 | 0.025 | 1.14 | 0.343 | 0.07 | |
| 5 | S4+1065 | Ond | -3.85 | 408 | 0.060 | 0.025 | 1.14 | 0.343 | 0.07 | |

Verloop hoofdwapening

Balk 1-1

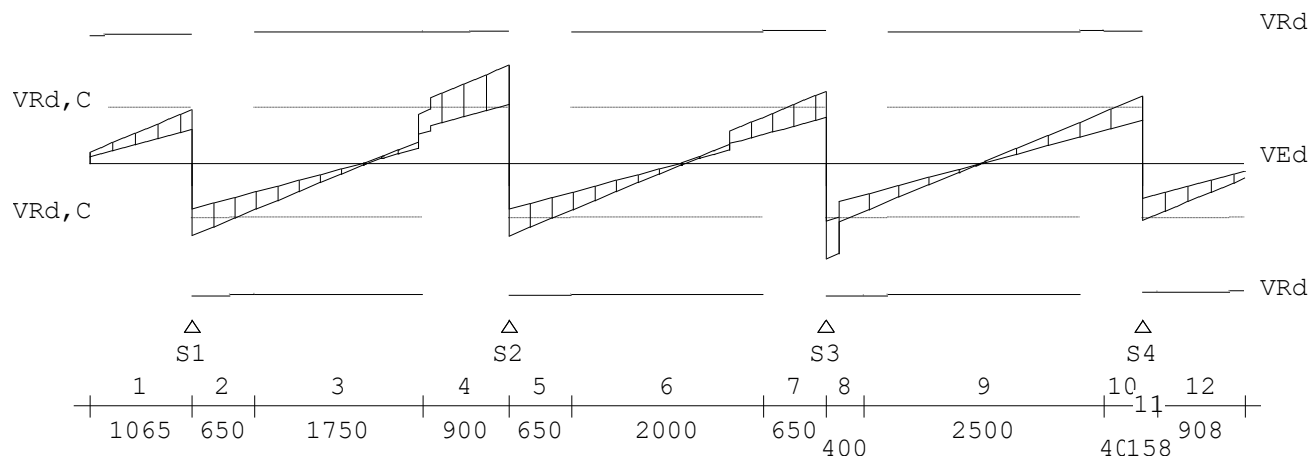
| Merk | B/O | Wapening | Vanaf [mm] | Tot [mm] | Lengte [mm] | $L_{bd; begin}$ [mm] | $L_{bd; eind}$ [mm] |
|------|-------|----------|---------------|-------------|----------------|-------------------------|------------------------|
| a | Boven | 4x12 | S1-1217 | S4+1235 | 12352 | 152 | 170 |
| b | Onder | 4x12 | S1-1185 | S4+1185 | 12270 | 120 | 120 |

Opmerkingen

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

DWARSKRACHTEN Fysisch lineair

Balk 1-1 Fundamentele combinatie



Wring- en dwarskrachtwapening

Balk 1-1

| Geb. | Vanaf | Tot | Beugels | Lengte | <Wringing> | <Dwarskr.> | | | | | |
|------|---------|---------|---------|--------|--|-----------------------------------|---------------------------------|---------------------------------|------------------|-------------------|----------|
| | [mm] | [mm] | | [mm] | $A_{l\text{angs}}$ [mm ²] | A_{bg1} [mm ² /m] | A_{bg1} [mm ²] | A_{opg} [mm ²] | V_{Ed} [kN] | T_{Ed} [kNm] | Opm. |
| 1 | S1-1065 | S1+0 | Ø8-250 | 1065 | 0 | 0 | 358 | 0 | 73.2 | 0 | 58,109 |
| 2 | S1+0 | S1+650 | Ø8-250 | 650 | 2 | 0 | 358 | 0 | 99.4 | 0 | 6 |
| 3 | S1+650 | S2-900 | Ø8-250 | 1750 | 0 | 0 | 358 | 0 | 69.8 | 0 | |
| 4 | S2-900 | S2+0 | Ø8-250 | 900 | 2 | 0 | 358 | 0 | 134.3 | 0 | 6 |
| 5 | S2+0 | S2+650 | Ø8-250 | 650 | 2 | 0 | 358 | 0 | 99.8 | 0 | 6 |
| 6 | S2+650 | S3-650 | Ø8-250 | 2000 | 0 | 0 | 358 | 0 | 64.3 | 0 | |
| 7 | S3-650 | S3+0 | Ø8-250 | 650 | 2 | 0 | 358 | 0 | 98.6 | 0 | 6 |
| 8 | S3+0 | S3+400 | Ø8-250 | 400 | 2 | 0 | 358 | 0 | 130.9 | 0 | 6 |
| 9 | S3+400 | S4-400 | Ø8-250 | 2500 | 0 | 0 | 358 | 0 | 70.0 | 0 | |
| 10 | S4-400 | S4+0 | Ø8-250 | 400 | 2 | 0 | 358 | 0 | 91.8 | 0 | 6 |
| 11 | S4+0 | S4+158 | Ø8-250 | 158 | 2 | 0 | 358 | 0 | 78.4 | 0 | 6,58,109 |
| 12 | S4+158 | S4+1065 | Ø8-250 | 908 | 0 | 0 | 358 | 0 | 69.8 | 0 | 58,109 |

Opmerkingen

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

[58] 6.2.3: Z is berekend m.b.v. 0.9d

[109] Bij de berekening van de beugels is geen rekening gehouden met de detailleringsregels van art 9.7 voor de gedrongen liggers.

Wring- en dwarskrachten

Balk 1-1

| Geb. | Vanaf | Tot | θ | V_{Rd} | V_{Ed} | $V_{Rd,C}$ | $V_{Rd,Max}$ | T_{Ed} | $T_{Rd,C}$ | $T_{Rd,Max}$ | V_{opg} | Opm. |
|------|---------|---------|----------|----------|----------|------------|--------------|----------|------------|--------------|-----------|----------|
| | [mm] | [mm] | [°] | [kN] | | | | | | | | |
| 1 | S1-1065 | S1+0 | 21.8 | 177 | 73 | 76 | 515 | 0 | 36 | 89 | 0 | 58,109 |
| 2 | S1+0 | S1+650 | 21.8 | 182 | 99 | 76 | 528 | 0 | 36 | 89 | 0 | 6 |
| 3 | S1+650 | S2-900 | 21.8 | 180 | 70 | 75 | 524 | 0 | 36 | 89 | 0 | |
| 4 | S2-900 | S2+0 | 21.8 | 182 | 134 | 76 | 528 | 0 | 36 | 89 | 0 | 6 |
| 5 | S2+0 | S2+650 | 21.8 | 182 | 100 | 76 | 528 | 0 | 36 | 89 | 0 | 6 |
| 6 | S2+650 | S3-650 | 21.8 | 181 | 64 | 75 | 524 | 0 | 36 | 89 | 0 | |
| 7 | S3-650 | S3+0 | 21.8 | 182 | 99 | 76 | 529 | 0 | 36 | 89 | 0 | 6 |
| 8 | S3+0 | S3+400 | 21.8 | 182 | 131 | 76 | 528 | 0 | 36 | 89 | 0 | 6 |
| 9 | S3+400 | S4-400 | 21.8 | 182 | 70 | 76 | 529 | 0 | 36 | 89 | 0 | |
| 10 | S4-400 | S4+0 | 21.8 | 182 | 92 | 76 | 529 | 0 | 36 | 89 | 0 | 6 |
| 11 | S4+0 | S4+158 | 21.8 | 177 | 78 | 76 | 515 | 0 | 36 | 89 | 0 | 6,58,109 |
| 12 | S4+158 | S4+1065 | 21.8 | 177 | 70 | 76 | 515 | 0 | 36 | 89 | 0 | 58,109 |

Opmerkingen

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

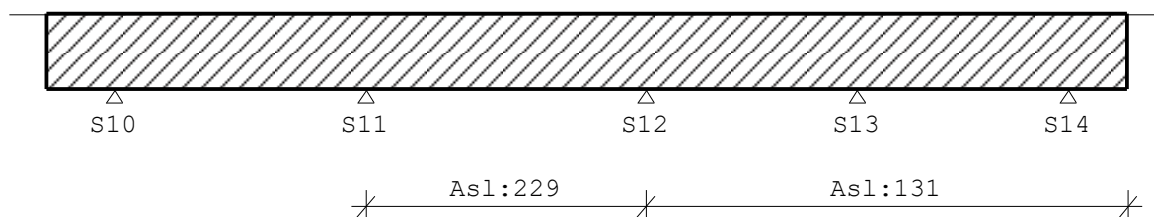
[58] 6.2.3: Z is berekend m.b.v. 0.9d

[109] Bij de berekening van de beugels is geen rekening gehouden met de detailleringsregels van art 9.7 voor de gedrongen liggers.

Hoofdwapening Fysisch lineair

Balk 1-2

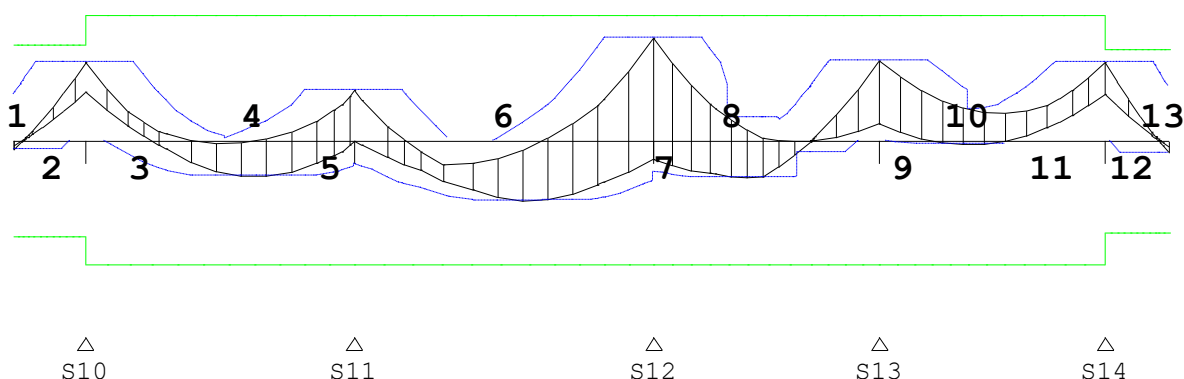
4x12 a



4x12 b

MEd dekkingslijn Fysisch lineair

Balk 1-2



Hoofdwapening

Balk 1-2

| Geb. | Pos. [mm] | M _{E d} [kNm] | M _{R d} [kNm] | z B/O [mm] | A _b [mm ²] | A _a [mm ²] | Basiswapening +Bijlegwapening | Opm. |
|------|--------------|---------------------------|---------------------------|---------------|--------------------------------------|--------------------------------------|----------------------------------|----------|
| 1 | S10-745 | -5.91 | -68.65 | 349 Ond | 191* | 453 | 4x12 | 2,54,110 |
| 2 | S10-0 | 56.17 | 68.65 | 349 Bov | 371 | 453 | 4x12 | 2,110 |
| 3 | S10+0 | 56.17 | 89.92 | 378 Bov | 282 | 453 | 4x12 | |
| 4 | S11-1037 | -25.60 | -88.54 | 395 Ond | 191* | 453 | 4x12 | 54 |
| 5 | S11+0 | 36.07 | 89.92 | 378 Bov | 228* | 453 | 4x12 | 1 |
| 6 | S12-1292 | -42.91 | -88.54 | 395 Ond | 257* | 453 | 4x12 | 1 |
| 7 | S12+0 | 73.42 | 89.92 | 378 Bov | 371 | 453 | 4x12 | |
| 8 | S12+983 | -26.34 | -88.54 | 395 Ond | 191* | 453 | 4x12 | 54 |
| 9 | S13+0 | 57.64 | 89.92 | 378 Bov | 290 | 453 | 4x12 | |
| 10 | S13+926 | -2.48 | -88.54 | 395 Ond | 191* | 453 | 4x12 | 54 |
| 11 | S14-0 | 56.16 | 89.92 | 378 Bov | 282 | 453 | 4x12 | |
| 12 | S14+0 | 56.16 | 65.50 | 333 Bov | 388 | 453 | 4x12 | 2,110 |
| 13 | S14+665 | -8.51 | -65.50 | 333 Ond | 191* | 453 | 4x12 | 2,54,110 |

Opmerkingen

- [1] * = Eisen met betrekking tot minimum wapening zijn toegepast, zie nationale bijlage art. 9.2.1.1(1).
- [2] Benodigde wapening en inwendige hefboomsarm zijn bepaald volgens gedrongen ligger detaillering, zie nationale bijlage art. 6.1(10).
- [54] * = Eisen met betrekking tot minimum wapening ten behoeve van gecontroleerde scheurvorming zijn toegepast volgens art. 7.3.2.
- [110] Art. 9.7 (1),(2): Een orthogonaal wapeningsnet dient toegepast te worden aan iedere zijde van de gedrongen liggers:
Profiel 5 - B*H 500*500: 500 mm²/m aan elke zijde en in elke richting met een maximaal hoh 300 mm.

Scheurvorming volgens artikel 7.3.4

Balk 1-2

| Geb. | Pos. [mm] | Zijde | $M_E; freq$ [kNm] | $S_{r, max}$ [mm] | $\epsilon_{sm} - \epsilon_{cm}$ [%] | w_k [mm] | k_x | w_{max} [mm] | U.C. Opm. |
|------|--------------|-------|----------------------|----------------------|--|---------------|-------|-------------------|-----------|
| 1 | S10-745 | Bov | 26.58 | 408 | 0.412 | 0.168 | 1.00 | 0.300 | 0.56 |
| 1 | S10-463 | Bov | 44.61 | 408 | 0.692 | 0.282 | 1.00 | 0.300 | 0.94 |
| 1 | S10-745 | Ond | -4.34 | 408 | 0.068 | 0.028 | 1.14 | 0.343 | 0.08 |
| 1 | S10-270 | Ond | -4.34 | 408 | 0.068 | 0.028 | 1.14 | 0.343 | 0.08 |
| 2 | S10+460 | Bov | 44.61 | 408 | 0.692 | 0.282 | 1.00 | 0.300 | 0.94 |
| 2 | S11-257 | Bov | 20.53 | 408 | 0.318 | 0.130 | 1.00 | 0.300 | 0.43 |
| 2 | S10+1230 | Ond | -14.78 | 408 | 0.232 | 0.095 | 1.14 | 0.343 | 0.28 |
| 2 | S11-1037 | Ond | -14.66 | 408 | 0.230 | 0.094 | 1.14 | 0.343 | 0.27 |
| 2 | S11-518 | Ond | -14.53 | 408 | 0.228 | 0.093 | 1.14 | 0.343 | 0.27 |
| 3 | S11+269 | Bov | 20.53 | 408 | 0.318 | 0.130 | 1.00 | 0.300 | 0.43 |
| 3 | S12-290 | Bov | 36.45 | 408 | 0.565 | 0.231 | 1.00 | 0.300 | 0.77 |
| 3 | S11+914 | Ond | -28.10 | 408 | 0.441 | 0.180 | 1.14 | 0.343 | 0.52 |
| 3 | S11+1524 | Ond | -28.28 | 408 | 0.444 | 0.181 | 1.14 | 0.343 | 0.53 |
| 3 | S12-775 | Ond | -24.11 | 408 | 0.378 | 0.154 | 1.14 | 0.343 | 0.45 |
| 4 | S12+467 | Bov | 36.45 | 408 | 0.565 | 0.231 | 1.00 | 0.300 | 0.77 |
| 4 | S13-378 | Bov | 38.28 | 408 | 0.594 | 0.242 | 1.00 | 0.300 | 0.81 |
| 4 | S12+590 | Ond | -13.35 | 408 | 0.209 | 0.085 | 1.14 | 0.343 | 0.25 |
| 4 | S13-1149 | Ond | -12.62 | 408 | 0.198 | 0.081 | 1.14 | 0.343 | 0.24 |
| 4 | S13-356 | Ond | -4.74 | 408 | 0.074 | 0.030 | 1.14 | 0.343 | 0.09 |
| 5 | S13+421 | Bov | 38.28 | 408 | 0.594 | 0.242 | 1.00 | 0.300 | 0.81 |
| 5 | S14-435 | Bov | 43.61 | 408 | 0.676 | 0.276 | 1.00 | 0.300 | 0.92 |
| 6 | S14+447 | Bov | 43.61 | 408 | 0.676 | 0.276 | 1.00 | 0.300 | 0.92 |
| 6 | S14+197 | Ond | -6.07 | 408 | 0.095 | 0.039 | 1.14 | 0.343 | 0.11 |
| 6 | S14+665 | Ond | -6.07 | 408 | 0.095 | 0.039 | 1.14 | 0.343 | 0.11 |

Verloop hoofdwapening

Balk 1-2

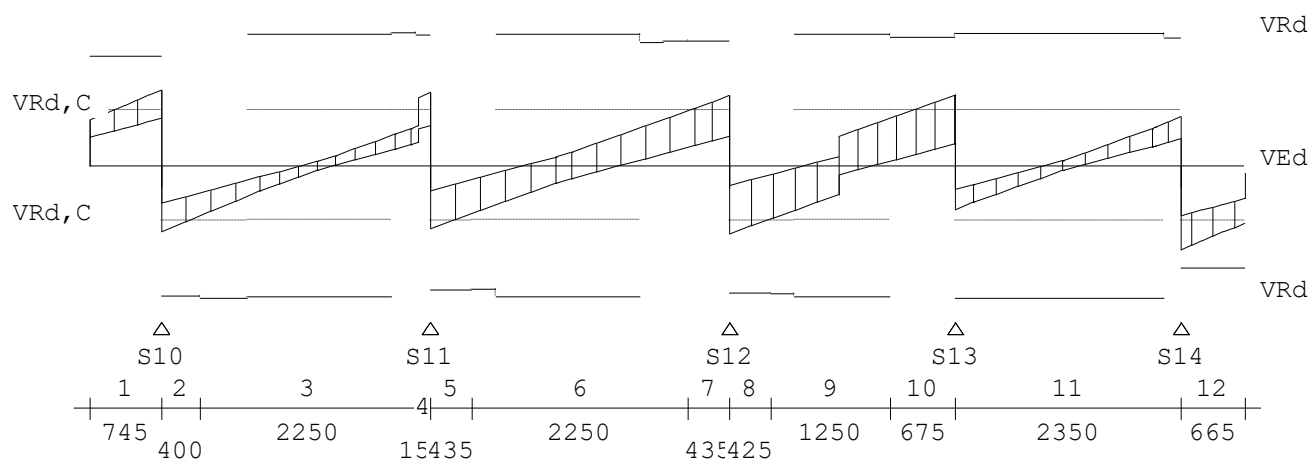
| Merk | B/O | Wapening | Vanaf [mm] | Tot [mm] | Lengte [mm] | $L_{bd; begin}$ [mm] | $L_{bd; eind}$ [mm] |
|------|-------|----------|---------------|-------------|----------------|-------------------------|------------------------|
| a | Boven | 4x12 | S10-1212 | S14+1198 | 13031 | 467 | 533 |
| b | Onder | 4x12 | S10-865 | S14+785 | 12270 | 120 | 120 |

Opmerkingen

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

DWARSKRACHTEN Fysisch lineair

Balk 1-2 Fundamentele combinatie



Wring- en dwarskrachtwapening

Balk 1-2

| Geb. | Vanaf | Tot | Beugels | Lengte | <Wringing> | <Dwarskr.> | | | | | |
|------|---------|---------|---------|--------|--|-----------------------------------|---------------------------------|---------------------------------|------------------|-------------------|----------|
| | [mm] | [mm] | | [mm] | $A_{l\text{angs}}$ [mm ²] | A_{bg1} [mm ² /m] | A_{bg1} [mm ²] | A_{opg} [mm ²] | V_{Ed} [kN] | T_{Ed} [kNm] | Opm. |
| 1 | S10-745 | S10+0 | Ø8-250 | 745 | 50 | 5 | 358 | 0 | 103.5 | 2 | 6,59,109 |
| 2 | S10+0 | S10+400 | Ø8-250 | 400 | 50 | 5 | 358 | 0 | 90.6 | 2 | 6 |
| 3 | S10+400 | S11-150 | Ø8-250 | 2250 | 0 | 0 | 358 | 0 | 68.8 | 2 | |
| 4 | S11-150 | S11+0 | Ø8-250 | 150 | 50 | 5 | 358 | 0 | 100.4 | 2 | 6 |
| 5 | S11+0 | S11+435 | Ø8-250 | 435 | 229 | 24 | 358 | 0 | 86.3 | 7 | 6 |
| 6 | S11+435 | S12-435 | Ø8-250 | 2250 | 229 | 24 | 358 | 0 | 75.4 | 7 | |
| 7 | S12-435 | S12+0 | Ø8-250 | 435 | 229 | 24 | 358 | 0 | 96.0 | 7 | 6 |
| 8 | S12+0 | S12+425 | Ø8-250 | 425 | 131 | 14 | 358 | 0 | 93.4 | 7 | 6 |
| 9 | S12+425 | S13-675 | Ø8-250 | 1250 | 131 | 14 | 358 | 0 | 73.3 | 4 | |
| 10 | S13-675 | S13+0 | Ø8-250 | 675 | 131 | 14 | 358 | 0 | 97.2 | 4 | 6 |
| 11 | S13+0 | S14+0 | Ø8-250 | 2350 | 131 | 14 | 358 | 0 | 67.0 | 4 | |
| 12 | S14+0 | S14+665 | Ø8-250 | 665 | 131 | 14 | 358 | 0 | 115.2 | 4 | 6,59,109 |

Opmerkingen

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

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

[109] Bij de berekening van de beugels is geen rekening gehouden met de detailleringsregels van art 9.7 voor de gedrongen liggers.

Wring- en dwarskrachten

Balk 1-2

| Geb. | Vanaf | Tot | θ | V_{Rd} | V_{Ed} | $V_{Rd,C}$ | $V_{Rd,Max}$ | T_{Ed} | $T_{Rd,C}$ | $T_{Rd,Max}$ | V_{opg} | Opm. |
|------|---------|---------|----------|----------|----------|------------|--------------|----------|------------|--------------|-----------|----------|
| | [mm] | [mm] | [°] | [kN] | | | | | | | | |
| 1 | S10-745 | S10+0 | 21.8 | 148 | 103 | 76 | 443 | 2 | 36 | 89 | 0 | 6,59,109 |
| 2 | S10+0 | S10+400 | 21.8 | 177 | 91 | 76 | 528 | 2 | 36 | 89 | 0 | 6 |
| 3 | S10+400 | S11-150 | 21.8 | 182 | 69 | 76 | 529 | 2 | 36 | 89 | 0 | |
| 4 | S11-150 | S11+0 | 21.8 | 177 | 100 | 76 | 529 | 2 | 36 | 89 | 0 | 6 |
| 5 | S11+0 | S11+435 | 21.8 | 160 | 86 | 76 | 529 | 7 | 36 | 89 | 0 | 6 |
| 6 | S11+435 | S12-435 | 21.8 | 160 | 75 | 76 | 529 | 7 | 36 | 89 | 0 | |
| 7 | S12-435 | S12+0 | 21.8 | 160 | 96 | 76 | 528 | 7 | 36 | 89 | 0 | 6 |
| 8 | S12+0 | S12+425 | 21.8 | 169 | 93 | 76 | 527 | 7 | 36 | 89 | 0 | 6 |
| 9 | S12+425 | S13-675 | 21.8 | 169 | 73 | 76 | 529 | 4 | 36 | 89 | 0 | |
| 10 | S13-675 | S13+0 | 21.8 | 169 | 97 | 76 | 529 | 4 | 36 | 89 | 0 | 6 |
| 11 | S13+0 | S14+0 | 21.8 | 169 | 67 | 76 | 528 | 4 | 36 | 89 | 0 | |
| 12 | S14+0 | S14+665 | 21.8 | 135 | 115 | 76 | 423 | 4 | 36 | 89 | 0 | 6,59,109 |

Opmerkingen

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

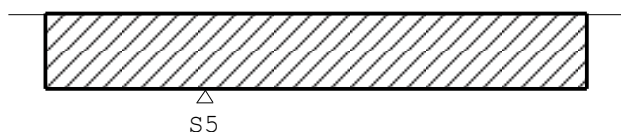
[59] 6.2.3: Z is berekend m.b.v. de gedrongen ligger berekening art 6.1 (10)

[109] Bij de berekening van de beugels is geen rekening gehouden met de detailleringsregels van art 9.7 voor de gedrongen liggers.

Hoofdwapening Fysisch lineair

Balk 1-A

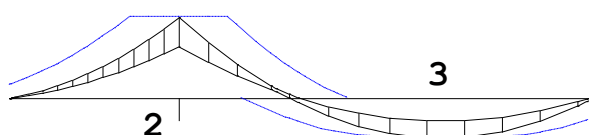
4x12 a



4x12 b

MEd dekkingslijn Fysisch lineair

Balk 1-A


△
S5

Hoofdwapening

Balk 1-A

| Geb. | Pos. [mm] | M_{Ed} [kNm] | M_{Rd} [kNm] | z | B/O | A_b [mm ²] | A_a [mm ²] | Basiswapening +Bijlegwapening | Opm. |
|------|--------------|-------------------|-------------------|-----|-----|-----------------------------|-----------------------------|----------------------------------|------|
| 1 | S5-1765 | -0.05 | -88.02 | 412 | Ond | 179* | 453 | 4x12 | 54 |
| 2 | S5+0 | 57.72 | 89.32 | 393 | Bov | 291 | 453 | 4x12 | |
| 3 | S5+2734 | -28.55 | -88.02 | 412 | Ond | 183* | 453 | 4x12 | 1 |

Opmerkingen

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

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

Scheurvorming volgens artikel 7.3.4

Balk 1-A

| Geb. | Pos. [mm] | Zijde | $M_{E,freq}$ [kNm] | $S_{r,max}$ [mm] | $\epsilon_{sm}-\epsilon_{cm}$ [%] | W_k [mm] | k_x | w_{max} [mm] | U.C. | Opm. |
|------|--------------|-------|-----------------------|---------------------|--------------------------------------|---------------|-------|-------------------|------|------|
| 1 | S5-1765 | Bov | 7.63 | 394 | 0.119 | 0.047 | 1.00 | 0.300 | 0.16 | |
| 1 | S5-471 | Bov | 46.29 | 394 | 0.720 | 0.284 | 1.00 | 0.300 | 0.95 | |
| 1 | S5-1765 | Ond | -0.03 | 408 | 0.001 | 0.000 | 1.14 | 0.343 | 0.00 | |
| 1 | S5-1357 | Ond | -0.03 | 408 | 0.001 | 0.000 | 1.14 | 0.343 | 0.00 | |
| 2 | S5+0 | Bov | 46.29 | 394 | 0.720 | 0.284 | 1.00 | 0.300 | 0.95 | |
| 2 | S5+417 | Bov | 46.29 | 394 | 0.720 | 0.284 | 1.00 | 0.300 | 0.95 | |
| 2 | S5+2734 | Ond | -21.50 | 408 | 0.338 | 0.138 | 1.14 | 0.343 | 0.40 | |

Verloop hoofdwapening

Balk 1-A

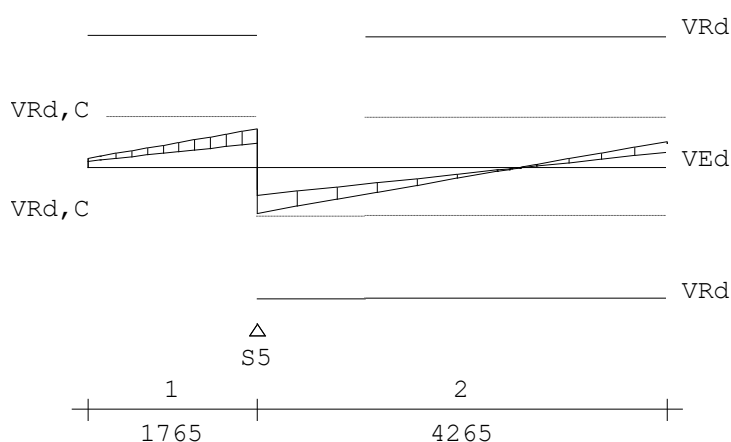
| Merk | B/O | Wapening | Vanaf [mm] | Tot [mm] | Lengte [mm] | $L_{bd,begin}$ [mm] | $L_{bd,eind}$ [mm] |
|------|-------|----------|---------------|-------------|----------------|------------------------|-----------------------|
| a | Boven | 4x12 | S5-1895 | S5+4385 | 6280 | 130 | 120 |
| b | Onder | 4x12 | S5-1885 | S5+4401 | 6286 | 120 | 136 |

Opmerkingen

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

DWARSKRACHTEN Fysisch lineair

Balk 1-A Fundamentele combinatie


Wring- en dwarskrachtwapening

Balk 1-A

| Geb. | Vanaf | Tot | Beugels | Lengte | <Wringing > <Dwarskr.> | | | | V _{Ed} | T _{Ed} | Opm. |
|------|---------|---------|---------|--------|------------------------|--------------------|--------------------|--------------------|-----------------|-----------------|------|
| | [mm] | [mm] | | [mm] | A _{l a n g s} | A _{b g l} | A _{b g l} | A _{o p g} | [kN] | [kNm] | |
| 1 | S5-1765 | S5+0 | Ø8-250 | 1765 | 0 | 0 | 322 | 0 | 53.0 | 4 | |
| 2 | S5+0 | S5+4265 | Ø8-250 | 4265 | 0 | 0 | 322 | 0 | 63.0 | 4 | |

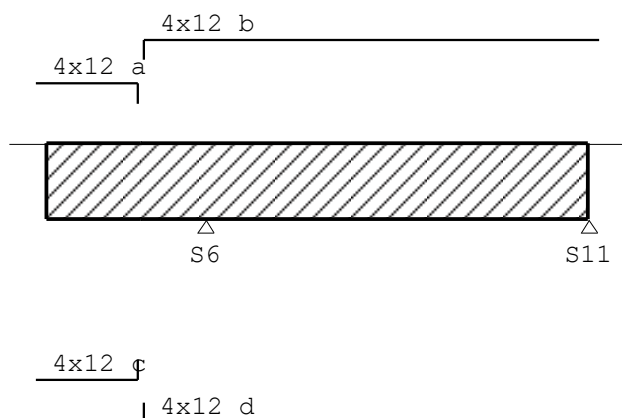
Wring- en dwarskrachten

Balk 1-A

| Geb. | Vanaf | Tot | θ | V _{Rd} | V _{Ed} | V _{Rd, C} | V _{Rd, Max} | T _{Ed} | T _{Rd, C} | T _{Rd, Max} | V _{o p g} | Opm. |
|------|---------|---------|------|-----------------|-----------------|--------------------|----------------------|-----------------|--------------------|----------------------|--------------------|------|
| | [mm] | [mm] | [°] | [kN] | | | | | | | | |
| 1 | S5-1765 | S5+0 | 21.8 | 181 | 53 | 68 | 475 | 4 | 31 | 76 | 0 | |
| 2 | S5+0 | S5+4265 | 21.8 | 181 | 63 | 68 | 473 | 4 | 31 | 76 | 0 | |

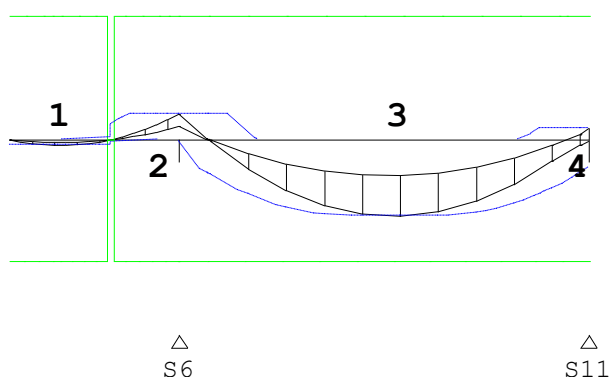
Hoofdwapening Fysisch lineair

Balk 1-B



MEd dekkingslijn Fysisch lineair

Balk 1-B



Hoofdwapening

Balk 1-B

| Geb. | Pos. [mm] | M_{Ed} [kNm] | M_{Rd} [kNm] | z B/O [mm] | A_b [mm ²] | A_a [mm ²] | Basiswapening +Bijlegwapening | Opm. |
|------|--------------|-------------------|-------------------|---------------|-----------------------------|-----------------------------|----------------------------------|-------------|
| 1 | S6-1240 | -4.04 | -87.45 | 425 Ond | 165* | 453 | 4x12 | 2,54,68,110 |
| 2 | S6+0 | 18.48 | 88.65 | 412 Bov | 165* | 453 | 4x12 | 2,54,68,110 |
| 3 | S11-2026 | -54.96 | -87.45 | 425 Ond | 280 | 453 | 4x12 | |
| 4 | S11-0 | 7.87 | 88.65 | 412 Bov | 165* | 453 | 4x12 | 54 |

Opmerkingen

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

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

[68] **MRd als gevolg van de gedrongen ligger berekening (NB. 6.1(10)) is groter dan MRd volgens 6.1(P). De momentweerstand en inwendige hefboomsarm volgens 6.1(P) zijn maatgevend en daarom alsnog toegepast.**

[110] Art. 9.7 (1), (2): Een orthogonaal wapeningsnet dient toegepast te worden aan iedere zijde van de gedrongen liggers:

Profiel 1 - B*H 400*500: 400 mm²/m aan elke zijde en in elke richting met een maximaal hoh 300 mm.

Scheurvorming volgens artikel 7.3.4

Balk 1-B

| Geb. | Pos. | Zijde | $M_E; freq$ [kNm] | $S_{r, max}$ [mm] | $\epsilon_{sm} - \epsilon_{cm}$ [%] | w_k [mm] | k_x | w_{max} [mm] | U.C. | Opm. |
|------|----------|-------|----------------------|----------------------|--|---------------|-------|-------------------|------|------|
| 1 | S6-385 | Bov | 13.09 | 367 | 0.204 | 0.075 | 1.00 | 0.300 | 0.25 | |
| 1 | S6-1616 | Ond | -2.86 | 406 | 0.045 | 0.018 | 1.14 | 0.343 | 0.05 | |
| 1 | S6-750 | Ond | -2.86 | 406 | 0.045 | 0.018 | 1.14 | 0.343 | 0.05 | |
| 2 | S6+0 | Bov | 13.09 | 367 | 0.204 | 0.075 | 1.00 | 0.300 | 0.25 | |
| 2 | S6+312 | Bov | 13.09 | 367 | 0.204 | 0.075 | 1.00 | 0.300 | 0.25 | |
| 2 | S11-307 | Bov | 3.91 | 367 | 0.061 | 0.022 | 1.00 | 0.300 | 0.07 | |
| 2 | S11+0 | Bov | 3.91 | 367 | 0.061 | 0.022 | 1.00 | 0.300 | 0.07 | |
| 2 | S11-2026 | Ond | -38.94 | 406 | 0.615 | 0.250 | 1.14 | 0.343 | 0.73 | |

Verloop hoofdwapening

Balk 1-B

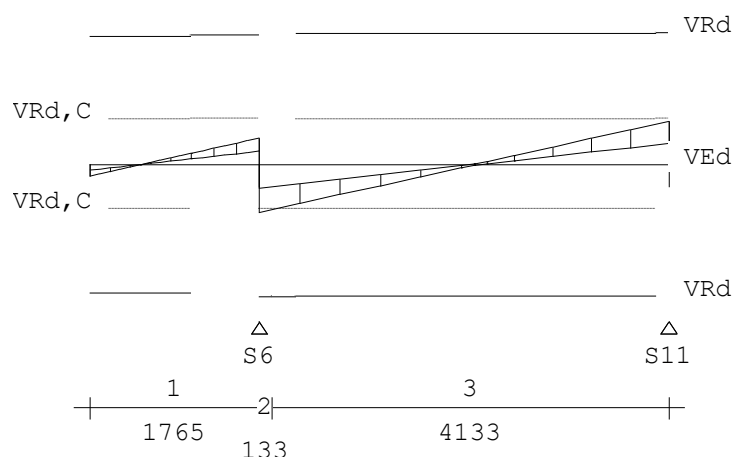
| Merk | B/O | Wapening | Vanaf [mm] | Tot [mm] | Lengte [mm] | $L_{bd, begin}$ [mm] | $L_{bd, eind}$ [mm] |
|------|-------|----------|---------------|-------------|----------------|-------------------------|------------------------|
| a | Boven | 4x12 | S6-1885 | S6-750 | 1135 | 120 | 120 |
| b | Boven | 4x12 | S6-680 | S11+120 | 5065 | 120 | 120 |
| c | Onder | 4x12 | S6-1885 | S6-750 | 1135 | 120 | 120 |
| d | Onder | 4x12 | S6-680 | S11+164 | 5109 | 120 | 164 |

Opmerkingen

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

DWARSKRACHTEN Fysisch lineair

Balk 1-B Fundamentele combinatie



Wring- en dwarskrachtwapening

Balk 1-B

| Geb. | Vanaf [mm] | Tot [mm] | Beugels | Lengte [mm] | <Wringing> <Dwarskr.> | | | | V_{Ed} [kN] | T_{Ed} [kNm] | Opm. |
|------|---------------|-------------|---------|----------------|--------------------------------------|-------------------------------------|-----------------------------------|-----------------------------------|------------------|-------------------|--------|
| | | | | | $A_{l, langs}$ [mm ²] | $A_{b, gl}$ [mm ² /m] | $A_{b, gl}$ [mm ²] | $A_{op, g}$ [mm ²] | | | |
| 1 | S6-1765 | S6+0 | Ø8-250 | 1765 | 0 | 0 | 286 | 0 | 36.2 | 0 | 58,109 |
| 2 | S6+0 | S6+133 | Ø8-250 | 132 | 0 | 0 | 286 | 0 | 65.5 | 0 | 6,109 |
| 3 | S6+133 | S11+0 | Ø8-250 | 4132 | 0 | 0 | 286 | 0 | 61.6 | 0 | 109 |

Opmerkingen

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

[58] 6.2.3: λ is berekend m.b.v. 0.9d

[109] Bij de berekening van de beugels is geen rekening gehouden met de detailleringregels van art 9.7 voor de gedrongen liggers.

Wring- en dwarskrachten

Balk 1-B

| Geb. | Vanaf [mm] | Tot [mm] | θ [°] | V_{Rd} [kN] | V_{Ed} | $V_{Rd,C}$ | $V_{Rd,Max}$ | T_{Ed} | $T_{Rd,C}$ | $T_{Rd,Max}$ | V_{opg} | Opm. |
|------|---------------|-------------|-----------------|------------------|----------|------------|--------------|---------------|------------|--------------|-----------|--------|
| | | | | -----kN----- | | | | -----kNm----- | | | | |
| 1 | S6-1765 | S6+0 | 21.8 | 177 | 36 | 62 | 412 | 0 | 26 | 63 | 0 | 58,109 |
| 2 | S6+0 | S6+133 | 21.8 | 181 | 66 | 62 | 420 | 0 | 26 | 63 | 0 | 6,109 |
| 3 | S6+133 | S11+0 | 21.8 | 181 | 62 | 62 | 420 | 0 | 26 | 63 | 0 | 109 |

Opmerkingen

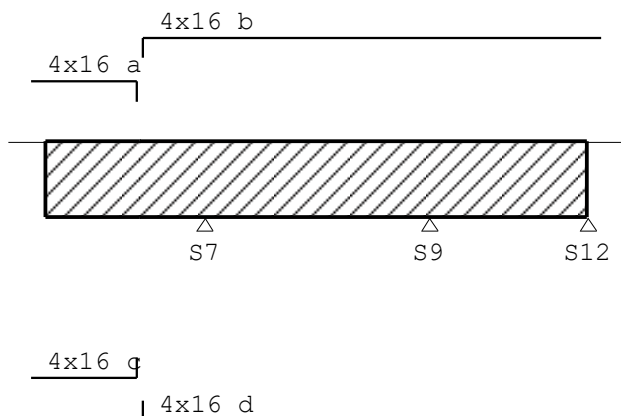
[6] 9.2.2 (4) 50% van de dwarskrachtwapening moet uit beugels bestaan.

[58] 6.2.3: Z is berekend m.b.v. 0.9d

[109] Bij de berekening van de beugels is geen rekening gehouden met de detailleringsregels van art 9.7 voor de gedrongen liggers.

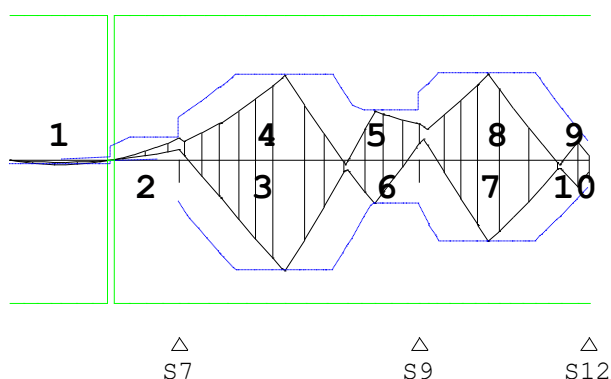
Hoofdwapening Fysisch lineair

Balk 1-C



MEd dekkingslijn Fysisch lineair

Balk 1-C



Hoofdwapening

Balk 1-C

| Geb. | Pos. [mm] | M_{Ed} [kNm] | M_{Rd} [kNm] | z | B/O | A_b [mm ²] | A_a [mm ²] | Basiswapening +Bijlegwapening | Opm. |
|------|--------------|-------------------|-------------------|-----|-----|-----------------------------|-----------------------------|----------------------------------|-------------|
| 1 | S7-1240 | -4.91 | -150.04 | 411 | Ond | 165* | 805 | 4x16 | 2,54,68,110 |
| 2 | S7+0 | 43.62 | 151.07 | 415 | Bov | 220 | 805 | 4x16 | 2,68,110 |
| 3 | S7+1100 | 88.09 | 151.07 | 415 | Bov | 453 | 805 | 4x16 | |
| 4 | S7+1100 | -116.14 | -150.04 | 411 | Ond | 616 | 805 | 4x16 | |
| 5 | S9-465 | -45.91 | -150.04 | 411 | Ond | 234 | 805 | 4x16 | |
| 6 | S9-465 | 51.36 | 151.07 | 415 | Bov | 260 | 805 | 4x16 | |
| 7 | S9+715 | 89.78 | 151.07 | 415 | Bov | 462 | 805 | 4x16 | |
| 8 | S9+715 | -85.49 | -150.04 | 411 | Ond | 444 | 805 | 4x16 | |
| 9 | S12-115 | -42.28 | -150.04 | 411 | Ond | 216 | 805 | 4x16 | |
| 10 | S12-115 | 32.78 | 151.07 | 415 | Bov | 205* | 805 | 4x16 | 1 |

Opmerkingen

- [1] * = Eisen met betrekking tot minimum wapening zijn toegepast, zie nationale bijlage art. 9.2.1.1(1).
- [2] Benodigde wapening en inwendige hefboomsarm zijn bepaald volgens gedrongen ligger detaillering, zie nationale bijlage art. 6.1(10).
- [54] * = Eisen met betrekking tot minimum wapening ten behoeve van gecontroleerde scheurvorming zijn toegepast volgens art. 7.3.2.
- [68] M_{Rd} als gevolg van de gedrongen ligger berekening (NB. 6.1(10)) is groter dan M_{Rd} volgens 6.1(P). De momentweerstand en inwendige hefboomsarm volgens 6.1(P) zijn maatgevend en daarom alsnog toegepast.
- [110] Art. 9.7 (1), (2): Een orthogonaal wapeningsnet dient toegepast te worden aan iedere zijde van de gedrongen liggers:
Profiel 2 - B*H 400*500: 400 mm²/m aan elke zijde en in elke richting met een maximaal hoh 300 mm.

Scheurvorming volgens artikel 7.3.4

Balk 1-C

| Geb. | Pos. [mm] | Zijde | $M_E; freq$ [kNm] | $S_{r, max}$ [mm] | $\epsilon_{sm} - \epsilon_{cm}$ [%] | w_k [mm] | k_x | w_{max} [mm] | U.C. | Opm. |
|------|--------------|-------|----------------------|----------------------|--|---------------|-------|-------------------|------|------|
| 1 | S7-347 | Bov | 15.71 | 318 | 0.141 | 0.045 | 1.00 | 0.300 | 0.15 | |
| 1 | S7-1622 | Ond | -3.43 | 347 | 0.031 | 0.011 | 1.14 | 0.343 | 0.03 | |
| 1 | S7-750 | Ond | -3.43 | 347 | 0.031 | 0.011 | 1.14 | 0.343 | 0.03 | |
| 2 | S7+472 | Bov | 15.71 | 318 | 0.141 | 0.045 | 1.00 | 0.300 | 0.15 | |
| 2 | S9-465 | Bov | 29.52 | 318 | 0.265 | 0.084 | 1.00 | 0.300 | 0.28 | |
| 2 | S7+500 | Ond | -26.78 | 347 | 0.243 | 0.084 | 1.14 | 0.343 | 0.25 | |
| 2 | S7+1100 | Ond | -29.01 | 347 | 0.263 | 0.091 | 1.14 | 0.343 | 0.27 | |
| 2 | S9-966 | Ond | -27.78 | 347 | 0.252 | 0.088 | 1.14 | 0.343 | 0.26 | |
| 3 | S9+399 | Bov | 29.52 | 318 | 0.265 | 0.084 | 1.00 | 0.300 | 0.28 | |
| 3 | S9+446 | Ond | -11.54 | 347 | 0.105 | 0.036 | 1.14 | 0.343 | 0.11 | |
| 3 | S12-820 | Ond | -11.55 | 347 | 0.105 | 0.036 | 1.14 | 0.343 | 0.11 | |
| 3 | S12-290 | Ond | -11.50 | 347 | 0.104 | 0.036 | 1.14 | 0.343 | 0.11 | |

Verloop hoofdwapening

Balk 1-C

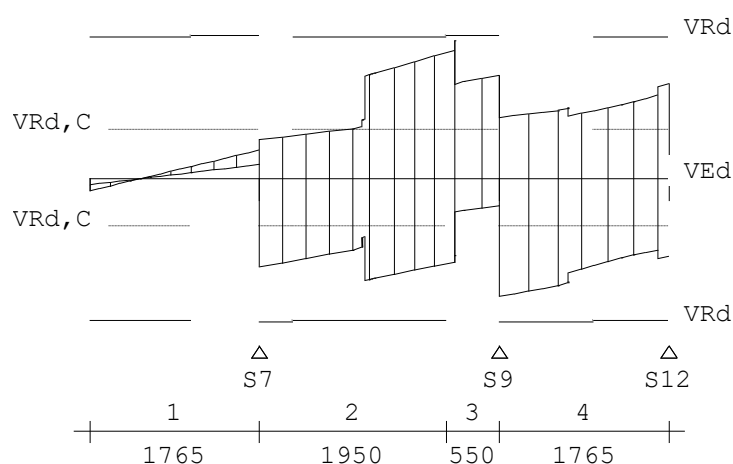
| Merk | B/O | Wapening | Vanaf [mm] | Tot [mm] | Lengte [mm] | $L_{bd; begin}$ [mm] | $L_{bd; eind}$ [mm] |
|------|-------|----------|---------------|-------------|----------------|-------------------------|------------------------|
| a | Boven | 4x16 | S7-1925 | S7-750 | 1175 | 160 | 160 |
| b | Boven | 4x16 | S7-680 | S12+160 | 5105 | 160 | 160 |
| c | Onder | 4x16 | S7-1925 | S7-750 | 1175 | 160 | 160 |
| d | Onder | 4x16 | S7-680 | S12+169 | 5114 | 160 | 169 |

Opmerkingen

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

DWARSKRACHTEN Fysisch lineair

Balk 1-C Fundamentele combinatie



Wring- en dwarskrachtwapening

Balk 1-C

| Geb. | Vanaf | Tot | Beugels | Lengte | <Wringing> | | <Dwarskr.> | | V _{Ed} | T _{Ed} | Opm. |
|------|---------|--------|---------|--------|---------------------|----------------------|--------------------|--------------------|-----------------|-----------------|--------|
| | [mm] | [mm] | | [mm] | A _{l,angs} | A _{b,g1} | A _{b,g1} | A _{o,p,g} | [kN] | [kNm] | |
| | | | | | [mm ²] | [mm ² /m] | [mm ²] | | | | |
| 1 | S7-1765 | S7+0 | Ø8-200 | 1765 | 0 | 0 | 286 | 0 | 44.1 | 0 | 58,109 |
| 2 | S7+0 | S9-550 | Ø8-200 | 1950 | 0 | 0 | 447 | 0 | 194.5 | 0 | 6,109 |
| 3 | S9-550 | S9+0 | Ø8-200 | 550 | 0 | 0 | 485 | 0 | 212.8 | 0 | 6 |
| 4 | S9+0 | S12+0 | Ø8-200 | 1765 | 0 | 0 | 414 | 0 | 181.7 | 0 | 6 |

Opmerkingen

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

[58] 6.2.3: Z is berekend m.b.v. 0.9d

[109] Bij de berekening van de beugels is geen rekening gehouden met de detailleringregels van art 9.7 voor de gedrongen liggers.

Wring- en dwarskrachten

Balk 1-C

| Geb. | Vanaf | Tot | θ | V _{Rd} | V _{Ed} | V _{Rd,C} | V _{Rd,Max} | T _{Ed} | T _{Rd,C} | T _{Rd,Max} | V _{o,p,g} | Opm. |
|------|---------|--------|------|-----------------|-----------------|-------------------|---------------------|-----------------|-------------------|---------------------|--------------------|--------|
| | [mm] | [mm] | [°] | [kN] | | | | | | | | |
| | | | | | | | | | | | | |
| 1 | S7-1765 | S7+0 | 21.8 | 221 | 44 | 75 | 410 | 0 | 26 | 64 | 0 | 58,109 |
| 2 | S7+0 | S9-550 | 21.8 | 219 | 194 | 74 | 406 | 0 | 26 | 63 | 0 | 6,109 |
| 3 | S9-550 | S9+0 | 21.8 | 220 | 213 | 75 | 409 | 0 | 26 | 63 | 0 | 6 |
| 4 | S9+0 | S12+0 | 21.8 | 221 | 182 | 75 | 410 | 0 | 26 | 63 | 0 | 6 |

Opmerkingen

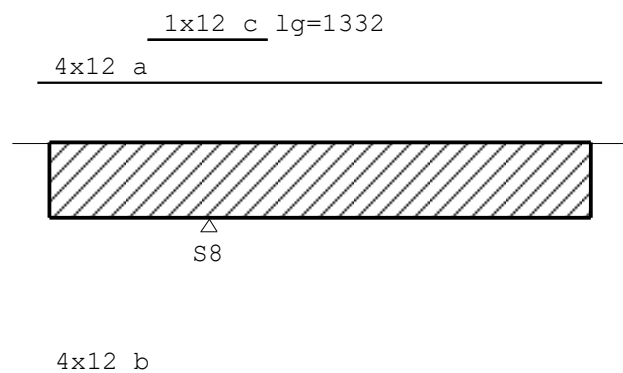
[6] 9.2.2 (4) 50% van de dwarskrachtwapening moet uit beugels bestaan.

[58] 6.2.3: Z is berekend m.b.v. 0.9d

[109] Bij de berekening van de beugels is geen rekening gehouden met de detailleringregels van art 9.7 voor de gedrongen liggers.

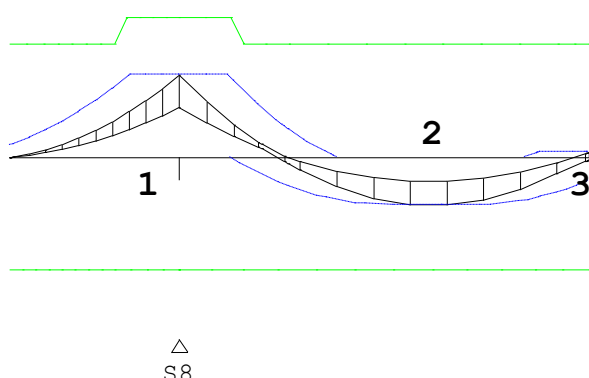
Hoofdwapening Fysisch lineair

Balk 1-D



MEd dekkingslijn Fysisch lineair

Balk 1-D



Hoofdwapening

Balk 1-D

| Geb. | Pos. [mm] | M _{E d} [kNm] | M _{R d} [kNm] | z | B/O | A _b [mm ²] | A _a [mm ²] | Basiswapening +Bijlegwapening | Opm. |
|------|--------------|---------------------------|---------------------------|-----|-----|--------------------------------------|--------------------------------------|----------------------------------|------|
| 1 | S8+0 | 64.73 | 110.10 | 428 | Bov | 327 | 453 | 4x12 | |
| | | | | | Bov | | 114 | +1x12 | |
| 2 | S8+2636 | -37.54 | -88.02 | 412 | Ond | 232* | 453 | 4x12 | 1 |
| 3 | S8+4265 | 4.28 | 89.32 | 393 | Bov | 179* | 453 | 4x12 | 54 |

Opmerkingen

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

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

Scheurvorming volgens artikel 7.3.4

Balk 1-D

| Geb. | Pos. [mm] | Zijde | M _{E, freq} [kNm] | S _{r, max} [mm] | ε _{sm} -ε _{cm} [%] | w _k [mm] | k _x | w _{max} [mm] | U.C. | Opm. |
|------|--------------|-------|-------------------------------|-----------------------------|---|------------------------|----------------|--------------------------|------|------|
| 1 | S8-1765 | Bov | 7.67 | 394 | 0.119 | 0.047 | 1.00 | 0.300 | 0.16 | |
| 1 | S8-670 | Bov | 43.19 | 394 | 0.672 | 0.265 | 1.00 | 0.300 | 0.88 | |
| 1 | S8-413 | Bov | 50.89 | 345 | 0.637 | 0.220 | 1.00 | 0.300 | 0.73 | |
| 2 | S8+0 | Bov | 50.89 | 345 | 0.637 | 0.220 | 1.00 | 0.300 | 0.73 | |
| 2 | S8+271 | Bov | 50.89 | 345 | 0.637 | 0.220 | 1.00 | 0.300 | 0.73 | |
| 2 | S8+662 | Bov | 41.89 | 394 | 0.651 | 0.257 | 1.00 | 0.300 | 0.86 | |
| 2 | S8+3947 | Bov | 1.56 | 394 | 0.024 | 0.010 | 1.00 | 0.300 | 0.03 | |
| 2 | S8+2636 | Ond | -27.23 | 408 | 0.428 | 0.175 | 1.14 | 0.343 | 0.51 | |

Verloop hoofdwapening

Balk 1-D

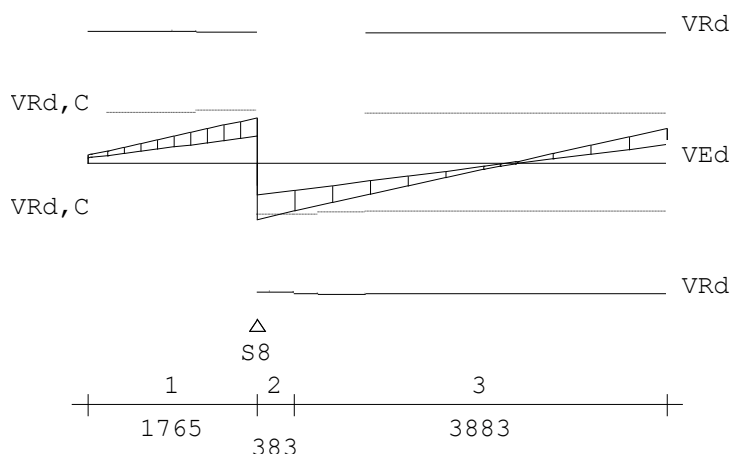
| Merk | B/O | Wapening | Vanaf [mm] | Tot [mm] | Lengte [mm] | $L_{bd, begin}$ [mm] | $L_{bd, eind}$ [mm] |
|------|-------|----------|---------------|-------------|----------------|-------------------------|------------------------|
| a | Boven | 4x12 | S8-1896 | S8+4385 | 6281 | 131 | 120 |
| c | Boven | 1x12 | S8-670 | S8+662 | 1332 | 120 | 120 |
| b | Onder | 4x12 | S8-1885 | S8+4417 | 6302 | 120 | 152 |

Opmerkingen

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

DWARSKRACHTEN Fysisch lineair

Balk 1-D Fundamentele combinatie



Wring- en dwarskrachtwapening

Balk 1-D

| Geb. | Vanaf [mm] | Tot [mm] | Beugels | Lengte [mm] | <Wringing > <Dwarskr.> | | | | V_{Ed} [kN] | T_{Ed} [kNm] | Opm. |
|------|---------------|-------------|---------|----------------|----------------------------------|-----------------------------------|---------------------------------|---------------------------------|------------------|-------------------|------|
| | | | | | A_{lang} [mm ²] | A_{bg1} [mm ² /m] | A_{bg1} [mm ²] | A_{opg} [mm ²] | | | |
| 1 | S8-1765 | S8+0 | Ø8-250 | 1765 | 0 | 0 | 322 | 0 | 62.5 | 6 | |
| 2 | S8+0 | S8+383 | Ø8-250 | 382 | 47 | 5 | 322 | 0 | 77.5 | 3 | 6 |
| 3 | S8+383 | S8+4265 | Ø8-250 | 3882 | 0 | 0 | 322 | 0 | 66.2 | 9 | |

Opmerkingen

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

Wring- en dwarskrachten

Balk 1-D

| Geb. | Vanaf [mm] | Tot [mm] | θ [°] | V_{Rd} [kN] | V_{Ed} [kN] | $V_{Rd, C}$ [kN] | $V_{Rd, Max}$ [kN] | T_{Ed} [kNm] | $T_{Rd, C}$ [kNm] | $T_{Rd, Max}$ [kNm] | V_{opg} [kN] | Opm. |
|------|---------------|-------------|-----------------|------------------|------------------|---------------------|-----------------------|-------------------|----------------------|------------------------|-------------------|------|
| 1 | S8-1765 | S8+0 | 21.8 | 180 | 63 | 72 | 471 | 6 | 31 | 76 | 0 | |
| 2 | S8+0 | S8+383 | 21.8 | 175 | 77 | 72 | 470 | 3 | 31 | 76 | 0 | 6 |
| 3 | S8+383 | S8+4265 | 21.8 | 180 | 66 | 72 | 471 | 9 | 31 | 76 | 0 | |

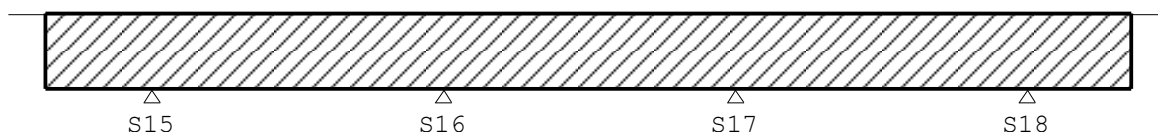
Opmerkingen

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

Hoofdwapening Fysisch lineair

Balk 2-1

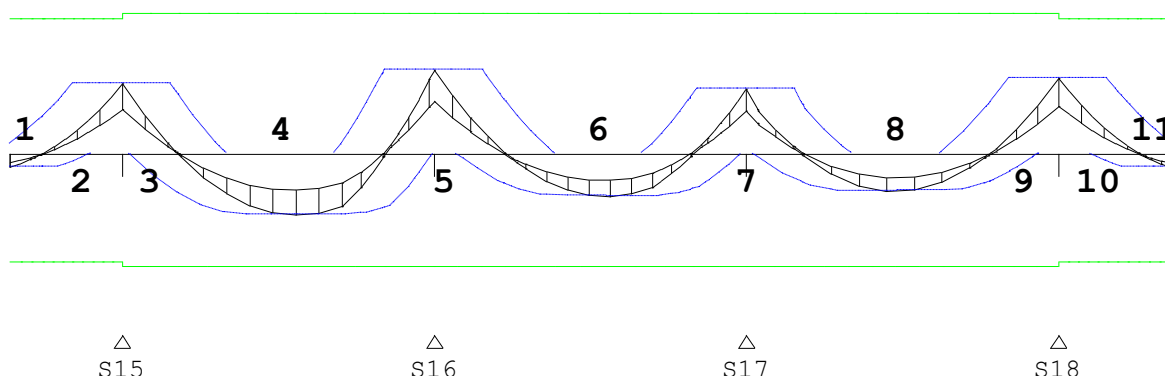
5x12 a



4x12 b

MEd dekkingslijn Fysisch lineair

Balk 2-1



Hoofdwapening

Balk 2-1

| Geb. | Pos. [mm] | $M_{E,d}$ [kNm] | $M_{R,d}$ [kNm] | z | B/O | A_b [mm ²] | A_a [mm ²] | Basiswapening +Bijlegwapening | Opm. |
|------|--------------|--------------------|--------------------|-----|-----|-----------------------------|-----------------------------|----------------------------------|----------|
| 1 | S15-1170 | -10.19 | -85.36 | 434 | Ond | 191* | 453 | 4x12 | 2,54,110 |
| 2 | S15-0 | 55.06 | 106.70 | 434 | Bov | 292 | 566 | 5x12 | 2,110 |
| 3 | S15+0 | 55.06 | 110.80 | 414 | Bov | 276 | 566 | 5x12 | |
| 4 | S16-1426 | -48.28 | -88.57 | 391 | Ond | 257* | 453 | 4x12 | 1 |
| 5 | S16+0 | 66.05 | 110.80 | 414 | Bov | 333 | 566 | 5x12 | |
| 6 | S17-1459 | -33.52 | -88.57 | 391 | Ond | 214* | 453 | 4x12 | 1 |
| 7 | S17+0 | 50.98 | 110.80 | 414 | Bov | 256 | 566 | 5x12 | |
| 8 | S17+1554 | -29.73 | -88.57 | 391 | Ond | 191* | 453 | 4x12 | 54 |
| 9 | S18-0 | 59.59 | 110.80 | 414 | Bov | 299 | 566 | 5x12 | |
| 10 | S18+0 | 59.59 | 106.70 | 434 | Bov | 316 | 566 | 5x12 | 2,110 |
| 11 | S18+1170 | -10.52 | -85.36 | 434 | Ond | 191* | 453 | 4x12 | 2,54,110 |

Opmerkingen

- [1] * = Eisen met betrekking tot minimum wapening zijn toegepast, zie nationale bijlage art. 9.2.1.1(1).
- [2] Benodigde wapening en inwendige hefboomsarm zijn bepaald volgens gedrongen ligger detaillering, zie nationale bijlage art. 6.1(10).
- [54] * = Eisen met betrekking tot minimum wapening ten behoeve van gecontroleerde scheurvorming zijn toegepast volgens art. 7.3.2.
- [110] Art. 9.7 (1), (2): Een orthogonaal wapeningsnet dient toegepast te worden aan iedere zijde van de gedrongen liggers:**
Profiel 6 - B*H 500*500: 500 mm²/m aan elke zijde en in elke richting met een maximaal hoh 300 mm.

Scheurvorming volgens artikel 7.3.4

Balk 2-1

| Geb. | Pos. | Zijde | $M_E; \text{freq}$ [kNm] | $S_{r, \max}$ [mm] | $\epsilon_{sm} - \epsilon_{cm}$ [%] | w_k [mm] | k_x | w_{\max} [mm] | U.C. | Opm. |
|------|----------|-------|-----------------------------|-----------------------|--|---------------|-------|--------------------|------|------|
| 1 | S15-1170 | Bov | 6.14 | 367 | 0.077 | 0.028 | 1.00 | 0.300 | 0.09 | |
| 1 | S15-410 | Bov | 44.02 | 367 | 0.549 | 0.202 | 1.00 | 0.300 | 0.67 | |
| 1 | S15-1170 | Ond | -8.20 | 408 | 0.129 | 0.053 | 1.14 | 0.343 | 0.15 | |
| 1 | S15-720 | Ond | -8.20 | 408 | 0.129 | 0.053 | 1.14 | 0.343 | 0.15 | |
| 2 | S15+296 | Bov | 44.02 | 367 | 0.549 | 0.202 | 1.00 | 0.300 | 0.67 | |
| 2 | S16-267 | Bov | 52.00 | 367 | 0.649 | 0.238 | 1.00 | 0.300 | 0.79 | |
| 2 | S16-1426 | Ond | -36.97 | 408 | 0.580 | 0.237 | 1.14 | 0.343 | 0.69 | |
| 3 | S16+503 | Bov | 52.00 | 367 | 0.649 | 0.238 | 1.00 | 0.300 | 0.79 | |
| 3 | S17-289 | Bov | 41.46 | 367 | 0.517 | 0.190 | 1.00 | 0.300 | 0.63 | |
| 3 | S16+1262 | Ond | -26.41 | 408 | 0.414 | 0.169 | 1.14 | 0.343 | 0.49 | |
| 3 | S17-1459 | Ond | -26.40 | 408 | 0.414 | 0.169 | 1.14 | 0.343 | 0.49 | |
| 4 | S17+300 | Bov | 41.46 | 367 | 0.517 | 0.190 | 1.00 | 0.300 | 0.63 | |
| 4 | S18-480 | Bov | 47.41 | 367 | 0.592 | 0.217 | 1.00 | 0.300 | 0.72 | |
| 4 | S17+1063 | Ond | -23.88 | 408 | 0.375 | 0.153 | 1.14 | 0.343 | 0.45 | |
| 4 | S17+1554 | Ond | -23.88 | 408 | 0.375 | 0.153 | 1.14 | 0.343 | 0.45 | |
| 4 | S18-1196 | Ond | -23.88 | 408 | 0.375 | 0.153 | 1.14 | 0.343 | 0.45 | |
| 5 | S18+410 | Bov | 47.41 | 367 | 0.592 | 0.217 | 1.00 | 0.300 | 0.72 | |
| 5 | S18+729 | Ond | -8.63 | 408 | 0.135 | 0.055 | 1.14 | 0.343 | 0.16 | |
| 5 | S18+1170 | Ond | -8.63 | 408 | 0.135 | 0.055 | 1.14 | 0.343 | 0.16 | |

Verloop hoofdwapening

Balk 2-1

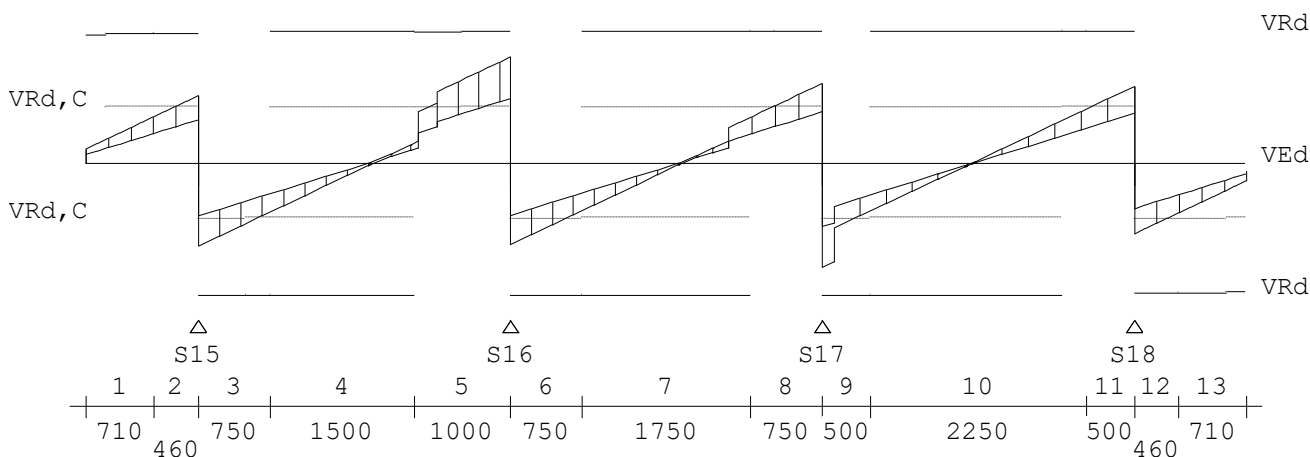
| Merk | B/O | Wapening | Vanaf [mm] | Tot [mm] | Lengte [mm] | $L_{bd, \text{begin}}$ [mm] | $L_{bd, \text{eind}}$ [mm] |
|------|-------|----------|---------------|-------------|----------------|--------------------------------|-------------------------------|
| a | Boven | 5x12 | S15-1290 | S18+1290 | 12330 | 120 | 120 |
| b | Onder | 4x12 | S15-1290 | S18+1290 | 12330 | 120 | 120 |

Opmerkingen

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

DWARSKRACHTEN Fysisch lineair

Balk 2-1 Fundamentele combinatie



Wring- en dwarskrachtwapening

Balk 2-1

| Geb. | Vanaf | Tot | Beugels | Lengte | <Wringing> | <Dwarskr.> | | | | | |
|------|----------|----------|---------|--------|--|-----------------------------------|---------------------------------|---------------------------------|------------------|-------------------|----------|
| | [mm] | [mm] | | [mm] | $A_{l\text{angs}}$ [mm ²] | A_{bg1} [mm ² /m] | A_{bg1} [mm ²] | A_{opg} [mm ²] | V_{Ed} [kN] | T_{Ed} [kNm] | Opm. |
| 1 | S15-1170 | S15-460 | Ø8-250 | 710 | 0 | 0 | 358 | 0 | 63.3 | 0 | 58,109 |
| 2 | S15-460 | S15+0 | Ø8-250 | 460 | 1 | 0 | 358 | 0 | 91.9 | 0 | 6,58,109 |
| 3 | S15+0 | S15+750 | Ø8-250 | 750 | 1 | 0 | 358 | 0 | 113.1 | 0 | 6 |
| 4 | S15+750 | S16-1000 | Ø8-250 | 1500 | 0 | 0 | 358 | 0 | 66.5 | 0 | |
| 5 | S16-1000 | S16+0 | Ø8-250 | 1000 | 1 | 0 | 358 | 0 | 144.8 | 0 | 6 |
| 6 | S16+0 | S16+750 | Ø8-250 | 750 | 1 | 0 | 358 | 0 | 111.0 | 0 | 6 |
| 7 | S16+750 | S17-750 | Ø8-250 | 1750 | 0 | 0 | 358 | 0 | 64.4 | 0 | |
| 8 | S17-750 | S17+0 | Ø8-250 | 750 | 1 | 0 | 358 | 0 | 109.2 | 0 | 6 |
| 9 | S17+0 | S17+500 | Ø8-250 | 500 | 1 | 0 | 358 | 0 | 142.1 | 0 | 6 |
| 10 | S17+500 | S18-500 | Ø8-250 | 2250 | 0 | 0 | 358 | 0 | 74.1 | 0 | |
| 11 | S18-500 | S18+0 | Ø8-250 | 500 | 1 | 0 | 358 | 0 | 105.1 | 0 | 6 |
| 12 | S18+0 | S18+460 | Ø8-250 | 460 | 1 | 0 | 358 | 0 | 96.1 | 0 | 6,58,109 |
| 13 | S18+460 | S18+1170 | Ø8-250 | 710 | 0 | 0 | 358 | 0 | 67.5 | 0 | 58,109 |

Opmerkingen

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

[58] 6.2.3: Z is berekend m.b.v. 0.9d

[109] Bij de berekening van de beugels is geen rekening gehouden met de detailleringsregels van art 9.7 voor de gedrongen liggers.

Wring- en dwarskrachten

Balk 2-1

| Geb. | Vanaf | Tot | θ | V_{Rd} | V_{Ed} | $V_{Rd,C}$ | $V_{Rd,Max}$ | T_{Ed} | $T_{Rd,C}$ | $T_{Rd,Max}$ | V_{opg} | Opm. |
|------|----------|----------|----------|----------|----------|------------|--------------|----------|------------|--------------|-----------|----------|
| | [mm] | [mm] | [°] | [kN] | | | | | | | | |
| 1 | S15-1170 | S15-460 | 21.8 | 177 | 63 | 77 | 515 | 0 | 36 | 89 | 0 | 58,109 |
| 2 | S15-460 | S15+0 | 21.8 | 177 | 92 | 77 | 515 | 0 | 36 | 89 | 0 | 6,58,109 |
| 3 | S15+0 | S15+750 | 21.8 | 181 | 113 | 77 | 524 | 0 | 36 | 89 | 0 | 6 |
| 4 | S15+750 | S16-1000 | 21.8 | 180 | 67 | 75 | 523 | 0 | 36 | 89 | 0 | |
| 5 | S16-1000 | S16+0 | 21.8 | 180 | 145 | 77 | 525 | 0 | 36 | 89 | 0 | 6 |
| 6 | S16+0 | S16+750 | 21.8 | 180 | 111 | 77 | 524 | 0 | 36 | 89 | 0 | 6 |
| 7 | S16+750 | S17-750 | 21.8 | 180 | 64 | 75 | 524 | 0 | 36 | 89 | 0 | |
| 8 | S17-750 | S17+0 | 21.8 | 181 | 109 | 77 | 525 | 0 | 36 | 89 | 0 | 6 |
| 9 | S17+0 | S17+500 | 21.8 | 181 | 142 | 77 | 525 | 0 | 36 | 89 | 0 | 6 |
| 10 | S17+500 | S18-500 | 21.8 | 181 | 74 | 77 | 526 | 0 | 36 | 89 | 0 | |
| 11 | S18-500 | S18+0 | 21.8 | 181 | 105 | 77 | 525 | 0 | 36 | 89 | 0 | 6 |
| 12 | S18+0 | S18+460 | 21.8 | 177 | 96 | 77 | 515 | 0 | 36 | 89 | 0 | 6,58,109 |
| 13 | S18+460 | S18+1170 | 21.8 | 177 | 67 | 77 | 515 | 0 | 36 | 89 | 0 | 58,109 |

Opmerkingen

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

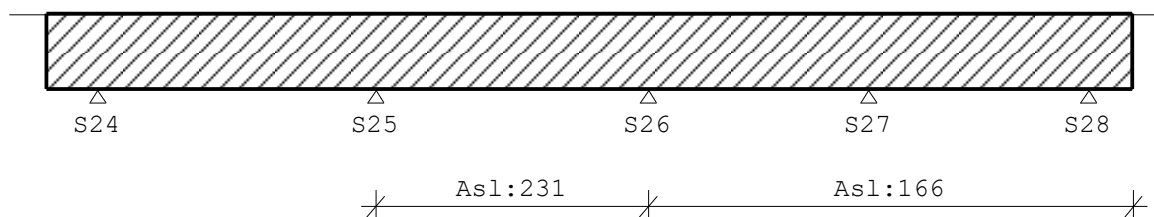
[58] 6.2.3: Z is berekend m.b.v. 0.9d

[109] Bij de berekening van de beugels is geen rekening gehouden met de detailleringsregels van art 9.7 voor de gedrongen liggers.

Hoofdwapening Fysisch lineair

Balk 2-2

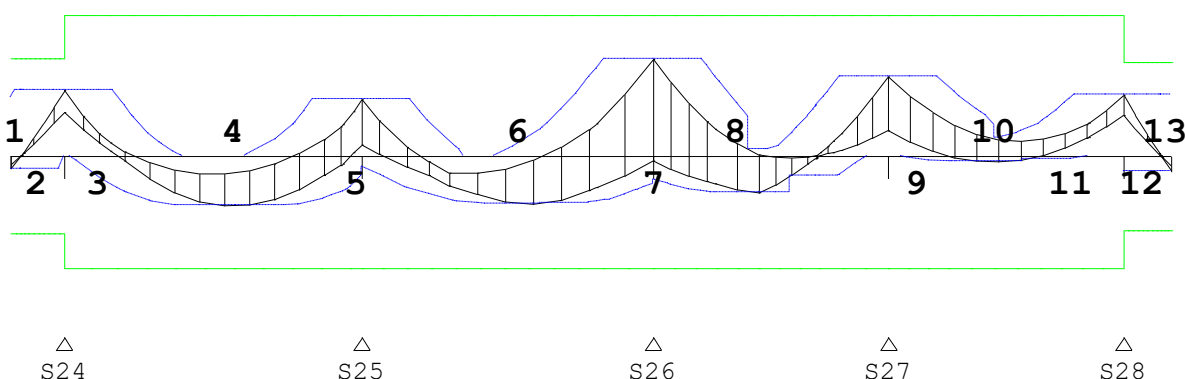
5x12 a



4x12 b

MEd dekkingslijn Fysisch lineair

Balk 2-2



Hoofdwapening

Balk 2-2

| Geb. | Pos. [mm] | M_{Ed} [kNm] | M_{Rd} [kNm] | z B/O [mm] | A_b [mm ²] | A_a [mm ²] | Basiswapening +Bijlegwapening | Opm. |
|------|--------------|-------------------|-------------------|---------------|-----------------------------|-----------------------------|----------------------------------|------------|
| 1 | S24-555 | -10.19 | -61.17 | 311 Ond | 191* | 453 | 4x12 | 2, 54, 110 |
| 2 | S24-0 | 51.67 | 76.46 | 311 Bov | 383 | 566 | 5x12 | 2, 110 |
| 3 | S24+0 | 51.67 | 110.80 | 414 Bov | 259 | 566 | 5x12 | |
| 4 | S25-1330 | -39.33 | -88.57 | 391 Ond | 249* | 453 | 4x12 | 1 |
| 5 | S25+0 | 44.22 | 110.80 | 414 Bov | 254* | 566 | 5x12 | 1 |
| 6 | S26-1295 | -37.80 | -88.57 | 391 Ond | 239* | 453 | 4x12 | 1 |
| 7 | S26+0 | 76.34 | 110.80 | 414 Bov | 386 | 566 | 5x12 | |
| 8 | S26+1105 | -28.94 | -88.57 | 391 Ond | 191* | 453 | 4x12 | 54 |
| 9 | S27+0 | 62.61 | 110.80 | 414 Bov | 315 | 566 | 5x12 | |
| 10 | S27+1106 | -4.71 | -88.57 | 391 Ond | 191* | 453 | 4x12 | 54 |
| 11 | S28-0 | 48.32 | 110.80 | 414 Bov | 254* | 566 | 5x12 | 1 |
| 12 | S28+0 | 48.32 | 73.76 | 300 Bov | 389* | 566 | 5x12 | 1, 2, 110 |
| 13 | S28+500 | -12.06 | -59.01 | 300 Ond | 191* | 453 | 4x12 | 2, 54, 110 |

Opmerkingen

- [1] * = Eisen met betrekking tot minimum wapening zijn toegepast, zie nationale bijlage art. 9.2.1.1(1).
- [2] Benodigde wapening en inwendige hefboomsarm zijn bepaald volgens gedrongen ligger detaillering, zie nationale bijlage art. 6.1(10).
- [54] * = Eisen met betrekking tot minimum wapening ten behoeve van gecontroleerde scheurvorming zijn toegepast volgens art. 7.3.2.
- [110] Art. 9.7 (1),(2): Een orthogonaal wapeningsnet dient toegepast te worden aan iedere zijde van de gedrongen liggers:
Profiel 6 - B*H 500*500: 500 mm²/m aan elke zijde en in elke richting met een maximaal hoh 300 mm.

Scheurvorming volgens artikel 7.3.4

Balk 2-2

| Geb. | Pos. [mm] | Zijde | $M_E; freq$ [kNm] | S_r, max [mm] | $\epsilon_{sm} - \epsilon_{cm}$ [%] | w_k [mm] | k_x | w_{max} [mm] | U.C. | Opm. |
|------|--------------|-------|----------------------|--------------------|--|---------------|-------|-------------------|------|------|
| 1 | S24-555 | Bov | 37.64 | 367 | 0.470 | 0.172 | 1.00 | 0.300 | 0.57 | |
| 1 | S24-505 | Bov | 42.28 | 367 | 0.528 | 0.194 | 1.00 | 0.300 | 0.65 | |
| 1 | S24-555 | Ond | -8.32 | 408 | 0.131 | 0.053 | 1.14 | 0.343 | 0.16 | |
| 1 | S24-54 | Ond | -8.32 | 408 | 0.131 | 0.053 | 1.14 | 0.343 | 0.16 | |
| 2 | S24+477 | Bov | 42.28 | 367 | 0.528 | 0.194 | 1.00 | 0.300 | 0.65 | |
| 2 | S25-472 | Bov | 29.03 | 367 | 0.362 | 0.133 | 1.00 | 0.300 | 0.44 | |
| 2 | S24+1163 | Ond | -28.73 | 408 | 0.451 | 0.184 | 1.14 | 0.343 | 0.54 | |
| 2 | S25-1330 | Ond | -28.56 | 408 | 0.448 | 0.183 | 1.14 | 0.343 | 0.53 | |
| 3 | S25+303 | Bov | 29.03 | 367 | 0.362 | 0.133 | 1.00 | 0.300 | 0.44 | |
| 3 | S26-285 | Bov | 42.09 | 367 | 0.525 | 0.193 | 1.00 | 0.300 | 0.64 | |
| 3 | S25+981 | Ond | -25.03 | 408 | 0.393 | 0.160 | 1.14 | 0.343 | 0.47 | |
| 3 | S25+1487 | Ond | -25.03 | 408 | 0.393 | 0.160 | 1.14 | 0.343 | 0.47 | |
| 3 | S26-777 | Ond | -21.92 | 408 | 0.344 | 0.140 | 1.14 | 0.343 | 0.41 | |
| 4 | S26+0 | Bov | 42.09 | 367 | 0.525 | 0.193 | 1.00 | 0.300 | 0.64 | |
| 4 | S26+468 | Bov | 42.09 | 367 | 0.525 | 0.193 | 1.00 | 0.300 | 0.64 | |
| 4 | S27-387 | Bov | 44.31 | 367 | 0.553 | 0.203 | 1.00 | 0.300 | 0.68 | |
| 4 | S26+663 | Ond | -15.40 | 408 | 0.242 | 0.099 | 1.14 | 0.343 | 0.29 | |
| 4 | S26+1105 | Ond | -16.16 | 408 | 0.254 | 0.103 | 1.14 | 0.343 | 0.30 | |
| 4 | S27-716 | Ond | -9.76 | 408 | 0.153 | 0.063 | 1.14 | 0.343 | 0.18 | |
| 5 | S27+0 | Bov | 44.31 | 367 | 0.553 | 0.203 | 1.00 | 0.300 | 0.68 | |
| 5 | S27+457 | Bov | 44.31 | 367 | 0.553 | 0.203 | 1.00 | 0.300 | 0.68 | |
| 5 | S28-432 | Bov | 39.61 | 367 | 0.494 | 0.181 | 1.00 | 0.300 | 0.60 | |
| 5 | S28+0 | Bov | 39.61 | 367 | 0.494 | 0.181 | 1.00 | 0.300 | 0.60 | |
| 6 | S28+500 | Bov | 39.61 | 367 | 0.494 | 0.181 | 1.00 | 0.300 | 0.60 | |
| 6 | S28+0 | Ond | -9.93 | 408 | 0.156 | 0.064 | 1.14 | 0.343 | 0.19 | |
| 6 | S28+500 | Ond | -9.93 | 408 | 0.156 | 0.064 | 1.14 | 0.343 | 0.19 | |

Verloop hoofdwapening

Balk 2-2

| Merk | B/O | Wapening | Vanaf [mm] | Tot [mm] | Lengte [mm] | $L_{bd; begin}$ [mm] | $L_{bd; eind}$ [mm] |
|------|-------|----------|---------------|-------------|----------------|-------------------------|------------------------|
| a | Boven | 5x12 | S24-1047 | S28+1022 | 13104 | 492 | 522 |
| b | Onder | 4x12 | S24-675 | S28+620 | 12330 | 120 | 120 |

Verloop hoofdwapening

Balk 2-2

| Merk | B/O | Wapening | Vanaf [mm] | Tot [mm] | Lengte [mm] | $L_{bd; begin}$ [mm] | $L_{bd; eind}$ [mm] |
|------|-----|----------|---------------|-------------|----------------|-------------------------|------------------------|
|------|-----|----------|---------------|-------------|----------------|-------------------------|------------------------|

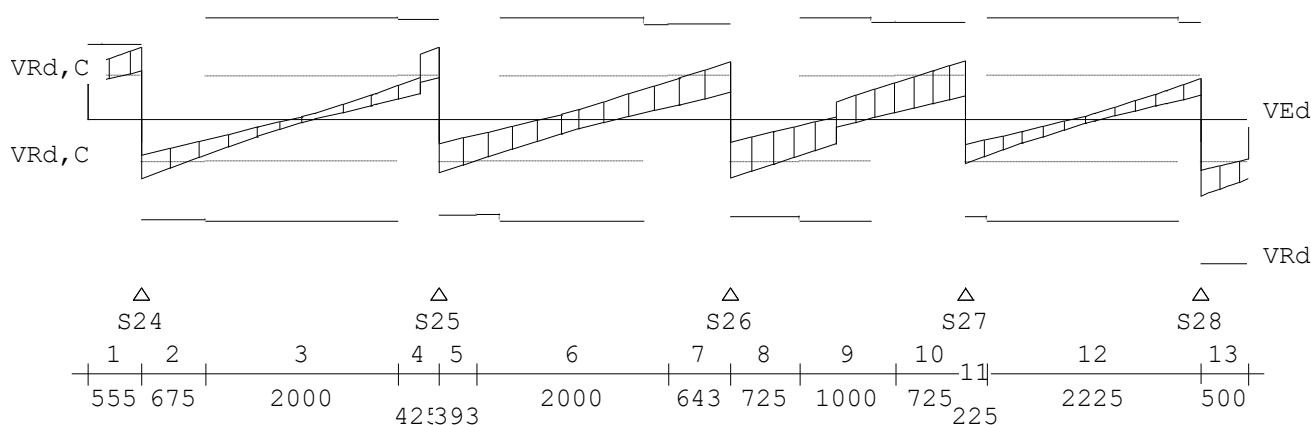
Opmerkingen

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

DWARSKRACHTEN Fysisch lineair

Balk 2-2 Fundamentele combinatie

VRd



Wring- en dwarskrachtwapening

Balk 2-2

| Geb. | Vanaf | Tot | Beugels | Lengte | <Wringing> | | <Dwarskr.> | | V _{Ed} | T _{Ed} | Opm. |
|------|---------|---------|---------|--------|----------------------|----------------------|--------------------|--------------------|-----------------|-----------------|----------|
| | [mm] | [mm] | | [mm] | A _{l,ang s} | A _{b,g l} | A _{b,g l} | A _{o,p g} | [kN] | [kNm] | |
| | | | | | [mm ²] | [mm ² /m] | [mm ²] | | | | |
| 1 | S24-555 | S24+0 | Ø8-250 | 555 | 55 | 6 | 380 | 0 | 128.5 | 2 | 6,59,109 |
| 2 | S24+0 | S24+675 | Ø8-250 | 675 | 55 | 6 | 358 | 0 | 105.3 | 2 | 6 |
| 3 | S24+675 | S25-425 | Ø8-250 | 2000 | 0 | 0 | 358 | 0 | 63.4 | 2 | |
| 4 | S25-425 | S25+0 | Ø8-250 | 425 | 55 | 6 | 358 | 0 | 128.0 | 2 | 6 |
| 5 | S25+0 | S25+393 | Ø8-250 | 392 | 231 | 25 | 358 | 0 | 94.1 | 8 | 6 |
| 6 | S25+393 | S26-642 | Ø8-250 | 2000 | 231 | 25 | 358 | 0 | 72.8 | 8 | |
| 7 | S26-642 | S26+0 | Ø8-250 | 642 | 231 | 25 | 358 | 0 | 102.4 | 8 | 6 |
| 8 | S26+0 | S26+725 | Ø8-250 | 725 | 166 | 18 | 358 | 0 | 103.2 | 8 | 6 |
| 9 | S26+725 | S27-725 | Ø8-250 | 1000 | 166 | 18 | 358 | 0 | 65.1 | 5 | |
| 10 | S27-725 | S27+0 | Ø8-250 | 725 | 166 | 18 | 358 | 0 | 104.3 | 5 | 6 |
| 11 | S27+0 | S27+225 | Ø8-250 | 225 | 166 | 18 | 358 | 0 | 78.7 | 5 | 6 |
| 12 | S27+225 | S28+0 | Ø8-250 | 2225 | 166 | 18 | 358 | 0 | 73.0 | 5 | |
| 13 | S28+0 | S28+500 | Ø8-125 | 500 | 166 | 18 | 417 | 0 | 136.1 | 5 | 6,59,109 |

Opmerkingen

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

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

[109] Bij de berekening van de beugels is geen rekening gehouden met de detailleringregels van art 9.7 voor de gedrongen liggers.

Wring- en dwarskrachten

Balk 2-2

| Geb. | Vanaf | Tot | θ | V _{Rd} | V _{Ed} | V _{Rd,C} | V _{Rd,Max} | T _{Ed} | T _{Rd,C} | T _{Rd,Max} | V _{Op g} | Opm. |
|------|---------|---------|------|-----------------|-----------------|-------------------|---------------------|-----------------|-------------------|---------------------|-------------------|----------|
| | [mm] | [mm] | [°] | [kN] | | | | | | | | |
| | | | | | -----kN----- | | | -----kNm----- | | | | |
| 1 | S24-555 | S24+0 | 21.8 | 132 | 129 | 77 | 395 | 2 | 36 | 89 | 0 | 6,59,109 |
| 2 | S24+0 | S24+675 | 21.8 | 175 | 105 | 77 | 525 | 2 | 36 | 89 | 0 | 6 |
| 3 | S24+675 | S25-425 | 21.8 | 180 | 63 | 75 | 524 | 2 | 36 | 89 | 0 | |
| 4 | S25-425 | S25+0 | 21.8 | 176 | 128 | 77 | 525 | 2 | 36 | 89 | 0 | 6 |
| 5 | S25+0 | S25+393 | 21.8 | 159 | 94 | 77 | 525 | 8 | 36 | 89 | 0 | 6 |
| 6 | S25+393 | S26-642 | 21.8 | 158 | 73 | 75 | 524 | 8 | 36 | 89 | 0 | |
| 7 | S26-642 | S26+0 | 21.8 | 158 | 102 | 77 | 525 | 8 | 36 | 89 | 0 | 6 |
| 8 | S26+0 | S26+725 | 21.8 | 165 | 103 | 77 | 524 | 8 | 36 | 89 | 0 | 6 |
| 9 | S26+725 | S27-725 | 21.8 | 165 | 65 | 75 | 524 | 5 | 36 | 89 | 0 | |
| 10 | S27-725 | S27+0 | 21.8 | 165 | 104 | 77 | 526 | 5 | 36 | 89 | 0 | 6 |
| 11 | S27+0 | S27+225 | 21.8 | 165 | 79 | 77 | 524 | 5 | 36 | 89 | 0 | 6 |
| 12 | S27+225 | S28+0 | 21.8 | 165 | 73 | 77 | 525 | 5 | 36 | 89 | 0 | |
| 13 | S28+0 | S28+500 | 21.8 | 251 | 136 | 77 | 381 | 5 | 36 | 89 | 0 | 6,59,109 |

Opmerkingen

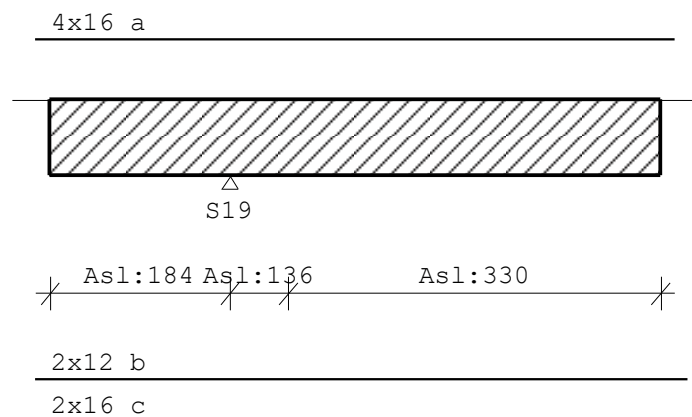
[6] 9.2.2 (4) 50% van de dwarskrachtwapening moet uit beugels bestaan.

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

[109] Bij de berekening van de beugels is geen rekening gehouden met de detailleringregels van art 9.7 voor de gedrongen liggers.

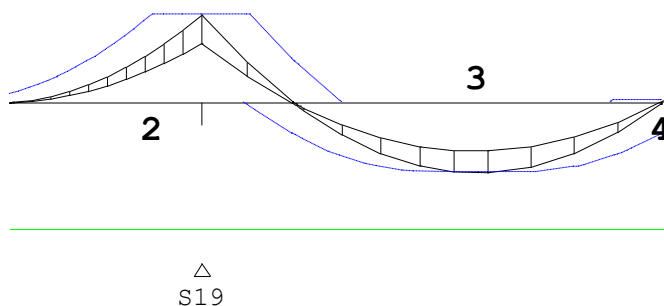
Hoofdwapening Fysisch lineair

Balk 2-A



MEd dekkingslijn Fysisch lineair

Balk 2-A



Hoofdwapening

Balk 2-A

| Geb. | Pos. [mm] | M_{Ed} [kNm] | M_{Rd} [kNm] | z B/O [mm] | A_b [mm ²] | A_a [mm ²] | Basiswapening +Bijlegwapening | Opm. |
|------|--------------|-------------------|-------------------|---------------|-----------------------------|-----------------------------|----------------------------------|------|
| 1 | S19-2000 | -0.02 | -119.72 | 419 Ond | 179* | 629 | 2x16 + 2x12 | 54 |
| 2 | S19+0 | 83.19 | 152.35 | 418 Bov | 425 | 805 | 4x16 | |
| 3 | S19+2868 | -66.21 | -119.72 | 419 Ond | 338 | 629 | 2x16 + 2x12 | |
| 4 | S19+4800 | 1.79 | 152.35 | 418 Bov | 179* | 805 | 4x16 | 54 |

Opmerkingen

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

Scheurvorming volgens artikel 7.3.4

Balk 2-A

| Geb. | Pos. [mm] | Zijde | $M_{E, freq}$ [kNm] | $S_{r, max}$ [mm] | $\epsilon_{sm} - \epsilon_{cm}$ [‰] | w_k [mm] | k_x | w_{max} [mm] | U.C. | Opm. |
|------|--------------|-------|------------------------|----------------------|--|---------------|-------|-------------------|------|------|
| 1 | S19-2000 | Bov | 5.98 | 340 | 0.053 | 0.018 | 1.00 | 0.300 | 0.06 | |
| 1 | S19-368 | Bov | 68.15 | 340 | 0.670 | 0.228 | 1.00 | 0.300 | 0.76 | |
| 1 | S19-2000 | Ond | -0.01 | 405 | 0.000 | 0.000 | 1.14 | 0.343 | 0.00 | |
| 1 | S19-1506 | Ond | -0.01 | 405 | 0.000 | 0.000 | 1.14 | 0.343 | 0.00 | |
| 2 | S19+322 | Bov | 68.15 | 340 | 0.670 | 0.228 | 1.00 | 0.300 | 0.76 | |
| 2 | S19+4419 | Bov | 1.29 | 340 | 0.012 | 0.004 | 1.00 | 0.300 | 0.01 | |
| 2 | S19+4800 | Bov | 1.29 | 340 | 0.012 | 0.004 | 1.00 | 0.300 | 0.01 | |
| 2 | S19+2868 | Ond | -54.96 | 403 | 0.633 | 0.255 | 1.14 | 0.343 | 0.74 | |

Verloop hoofdwapening

Balk 2-A

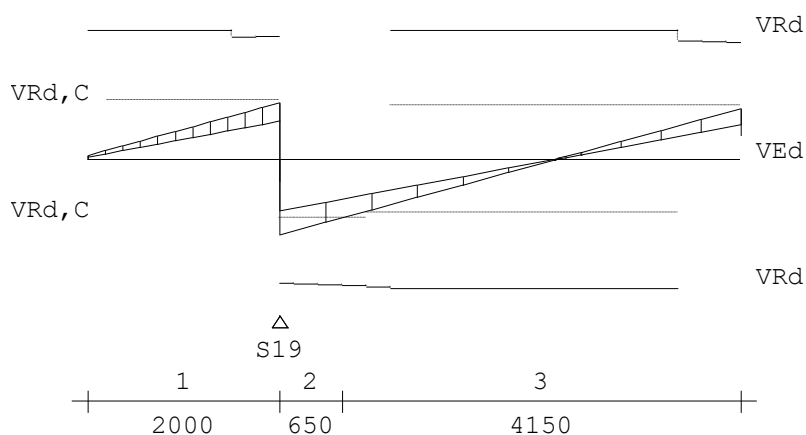
| Merk | B/O | Wapening | Vanaf [mm] | Tot [mm] | Lengte [mm] | $L_{bd, begin}$ [mm] | $L_{bd, eind}$ [mm] |
|------|-------|----------|---------------|-------------|----------------|-------------------------|------------------------|
| a | Boven | 4x16 | S19-2160 | S19+4960 | 7120 | 160 | 160 |
| b | Onder | 2x12 | S19-2160 | S19+5105 | 7265 | 160 | 305 |
| c | Onder | 2x16 | S19-2160 | S19+5105 | 7265 | 160 | 305 |

Opmerkingen

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

DWARSKRACHTEN Fysisch lineair

Balk 2-A Fundamentele combinatie



Wring- en dwarskrachtwapening

Balk 2-A

| Geb. | Vanaf [mm] | Tot [mm] | Beugels | Lengte [mm] | <Wringing> | | <Dwarskr.> | | V_{Ed} [kN] | T_{Ed} [kNm] | Opm. |
|------|---------------|-------------|---------|----------------|----------------------------------|----------------------------------|---------------------------------|---|------------------|-------------------|------|
| | | | | | A_{lang} [mm ²] | A_{bg} [mm ² /m] | A_{opg} [mm ²] | | | | |
| 1 | S19-2000 | S19+0 | Ø8-250 | 2000 | 184 | 21 | 322 | 0 | 77.5 | 10 | |
| 2 | S19+0 | S19+650 | Ø8-250 | 650 | 136 | 15 | 322 | 0 | 103.7 | 5 | 6 |
| 3 | S19+650 | S19+4800 | Ø8-250 | 4150 | 330 | 37 | 322 | 0 | 80.2 | 10 | |

Opmerkingen

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

Wring- en dwarskrachten

Balk 2-A

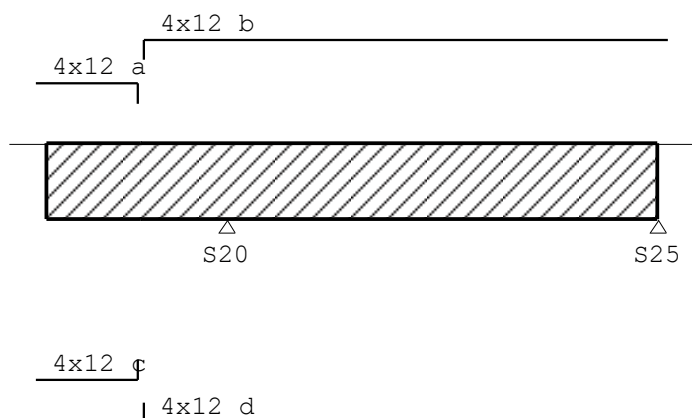
| Geb. | Vanaf [mm] | Tot [mm] | θ [°] | V_{Rd} [kN] | V_{Ed} [kN] | $V_{Rd, C}$ [kN] | $V_{Rd, Max}$ [kN] | T_{Ed} [kNm] | $T_{Rd, C}$ [kNm] | $T_{Rd, Max}$ [kNm] | V_{opg} [kN] | Opm. |
|------|---------------|-------------|-----------------|------------------|------------------|---------------------|-----------------------|-------------------|----------------------|------------------------|-------------------|------|
| 1 | S19-2000 | S19+0 | 21.8 | 161 | 78 | 81 | 462 | 10 | 31 | 76 | 0 | |
| 2 | S19+0 | S19+650 | 21.8 | 163 | 104 | 81 | 462 | 5 | 31 | 76 | 0 | 6 |
| 3 | S19+650 | S19+4800 | 21.8 | 170 | 80 | 81 | 463 | 10 | 31 | 76 | 0 | |

Opmerkingen

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

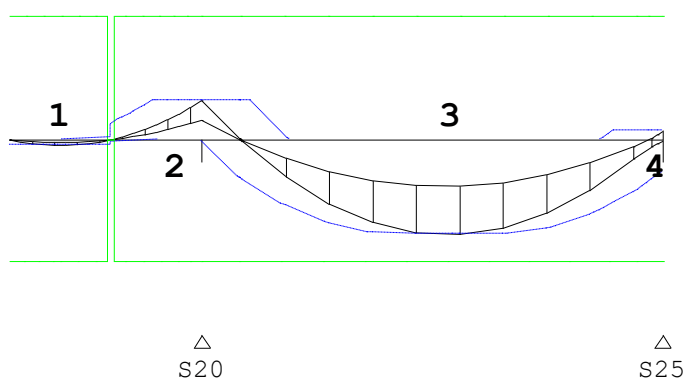
Hoofdwapening Fysisch lineair

Balk 2-B



MEd dekkingslijn Fysisch lineair

Balk 2-B



Hoofdwapening

Balk 2-B

| Geb. | Pos. [mm] | M_{Ed} [kNm] | M_{Rd} [kNm] | z B/O [mm] | A_b [mm ²] | A_a [mm ²] | Basiswapening +Bijlegwapening | Opm. |
|------|--------------|-------------------|-------------------|-----------------|-----------------------------|-----------------------------|----------------------------------|-------------|
| 1 | S20-1475 | -4.04 | -87.45 | 425 Ond | 165* | 453 | 4x12 | 2,54,68,110 |
| 2 | S20+0 | 27.83 | 88.65 | 412 Bov | 176* | 453 | 4x12 | 1,2,68,110 |
| 3 | S25-2237 | -68.38 | -87.45 | 425 Ond | 351 | 453 | 4x12 | |
| 4 | S25-0 | 6.14 | 88.65 | 412 Bov | 165* | 453 | 4x12 | 54 |

Opmerkingen

- [1] * = Eisen met betrekking tot minimum wapening zijn toegepast, zie nationale bijlage art. 9.2.1.1(1).
- [2] Benodigde wapening en inwendige hefboomsarm zijn bepaald volgens gedrongen ligger detaillering, zie nationale bijlage art. 6.1(10).
- [54] * = Eisen met betrekking tot minimum wapening ten behoeve van gecontroleerde scheurvorming zijn toegepast volgens art. 7.3.2.
- [68] **MRd als gevolg van de gedrongen ligger berekening (NB. 6.1(10)) is groter dan MRd volgens 6.1(P). De momentweerstand en inwendige hefboomsarm volgens 6.1(P) zijn maatgevend en daarom alsnog toegepast.**
- [110] **Art. 9.7 (1),(2): Een orthogonaal wapeningsnet dient toegepast te worden aan iedere zijde van de gedrongen liggers:
Profiel 1 - B*H 400*500: 400 mm²/m aan elke zijde en in elke richting met een maximaal hoh 300 mm.**

Scheurvorming volgens artikel 7.3.4

Balk 2-B

| Geb. | Pos. [mm] | Zijde | $M_{E, freq}$ [kNm] | $S_{r, max}$ [mm] | $\epsilon_{sm} - \epsilon_{cm}$ [%] | w_k [mm] | k_x | w_{max} [mm] | U.C. | Opm. |
|------|--------------|-------|------------------------|----------------------|--|---------------|-------|-------------------|------|------|
| 1 | S20-444 | Bov | 19.71 | 367 | 0.308 | 0.113 | 1.00 | 0.300 | 0.38 | |
| 1 | S20-1851 | Ond | -2.86 | 406 | 0.045 | 0.018 | 1.14 | 0.343 | 0.05 | |
| 1 | S20-985 | Ond | -2.86 | 406 | 0.045 | 0.018 | 1.14 | 0.343 | 0.05 | |
| 2 | S20+408 | Bov | 19.71 | 367 | 0.308 | 0.113 | 1.00 | 0.300 | 0.38 | |
| 2 | S25-276 | Bov | 3.00 | 367 | 0.047 | 0.017 | 1.00 | 0.300 | 0.06 | |
| 2 | S25+0 | Bov | 3.00 | 367 | 0.047 | 0.017 | 1.00 | 0.300 | 0.06 | |
| 2 | S25-2237 | Ond | -48.70 | 406 | 0.769 | 0.313 | 1.14 | 0.343 | 0.91 | |

Verloop hoofdwapening

Balk 2-B

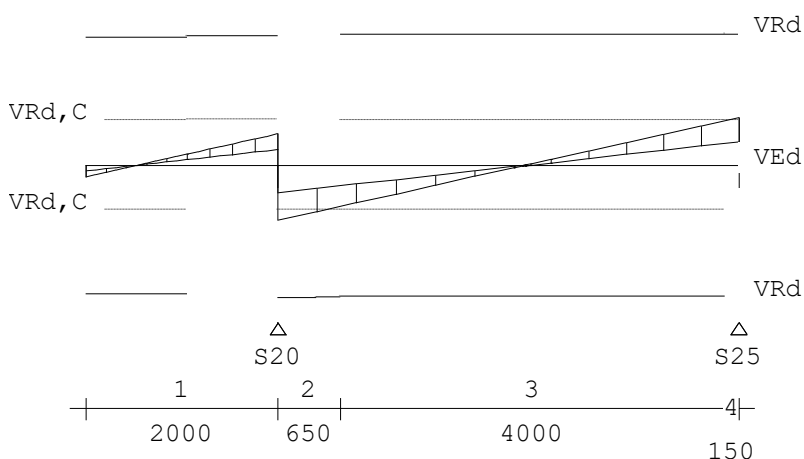
| Merk | B/O | Wapening | Vanaf [mm] | Tot [mm] | Lengte [mm] | $L_{bd, begin}$ [mm] | $L_{bd, eind}$ [mm] |
|------|-------|----------|---------------|-------------|----------------|-------------------------|------------------------|
| a | Boven | 4x12 | S20-2120 | S20-985 | 1135 | 120 | 120 |
| b | Boven | 4x12 | S20-915 | S25+120 | 5835 | 120 | 120 |
| c | Onder | 4x12 | S20-2120 | S20-985 | 1135 | 120 | 120 |
| d | Onder | 4x12 | S20-915 | S25+195 | 5910 | 120 | 195 |

Opmerkingen

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

DWARSKRACHTEN Fysisch lineair

Balk 2-B Fundamentele combinatie



Wring- en dwarskrachtwapening

Balk 2-B

| Geb. | Vanaf [mm] | Tot [mm] | Beugels | Lengte [mm] | <Wringing> <Dwarskr.> | | | | V_{Ed} [kN] | T_{Ed} [kNm] | Opm. |
|------|---------------|-------------|---------|----------------|--------------------------------------|-------------------------------------|-----------------------------------|-----------------------------------|------------------|-------------------|--------|
| | | | | | $A_{l, langs}$ [mm ²] | $A_{b, gl}$ [mm ² /m] | $A_{b, gl}$ [mm ²] | $A_{o, pg}$ [mm ²] | | | |
| 1 | S20-2000 | S20+0 | Ø8-250 | 2000 | 0 | 0 | 286 | 0 | 43.1 | 0 | 58,109 |
| 2 | S20+0 | S20+650 | Ø8-250 | 650 | 0 | 0 | 286 | 0 | 75.0 | 0 | 6,109 |
| 3 | S20+650 | S25-150 | Ø8-250 | 4000 | 0 | 0 | 286 | 0 | 61.1 | 0 | |
| 4 | S25-150 | S25+0 | Ø8-250 | 150 | 0 | 0 | 286 | 0 | 65.4 | 0 | 6 |

Opmerkingen

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

[58] 6.2.3: λ is berekend m.b.v. 0.9d

[109] Bij de berekening van de beugels is geen rekening gehouden met de detailleringregels van art 9.7 voor de gedrongen liggers.

Wring- en dwarskrachten

Balk 2-B

| Geb. | Vanaf [mm] | Tot [mm] | θ [°] | V_{Rd} [kN] | V_{Ed} | $V_{Rd,C}$ | $V_{Rd,Max}$ | T_{Ed} | $T_{Rd,C}$ | $T_{Rd,Max}$ | V_{opg} | Opm. |
|------|---------------|-------------|-----------------|------------------|----------|------------|--------------|---------------|------------|--------------|-----------|--------|
| | | | | -----kN----- | | | | -----kNm----- | | | | |
| 1 | S20-2000 | S20+0 | 21.8 | 177 | 43 | 62 | 412 | 0 | 26 | 63 | 0 | 58,109 |
| 2 | S20+0 | S20+650 | 21.8 | 181 | 75 | 62 | 420 | 0 | 26 | 63 | 0 | 6,109 |
| 3 | S20+650 | S25-150 | 21.8 | 179 | 61 | 61 | 416 | 0 | 26 | 63 | 0 | |
| 4 | S25-150 | S25+0 | 21.8 | 179 | 65 | 61 | 416 | 0 | 26 | 63 | 0 | 6 |

Opmerkingen

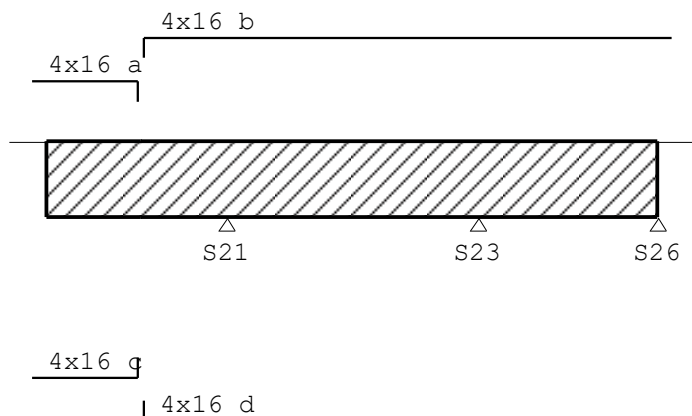
[6] 9.2.2 (4) 50% van de dwarskrachtwapening moet uit beugels bestaan.

[58] 6.2.3: Z is berekend m.b.v. 0.9d

[109] Bij de berekening van de beugels is geen rekening gehouden met de detailleringsregels van art 9.7 voor de gedrongen liggers.

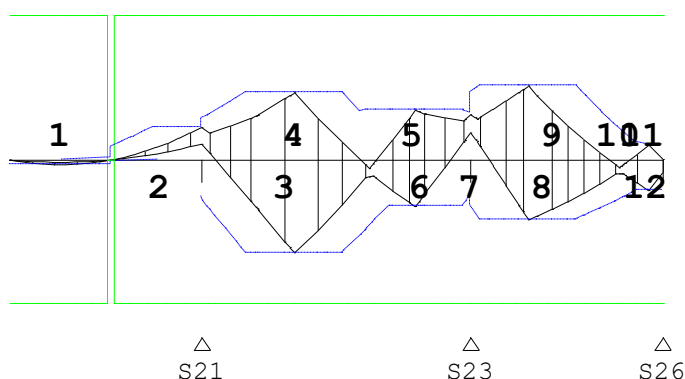
Hoofdwapening Fysisch lineair

Balk 2-C



MEd dekkingslijn Fysisch lineair

Balk 2-C



Hoofdwapening

Balk 2-C

| Geb. | Pos. [mm] | M_{Ed} [kNm] | M_{Rd} [kNm] | z B/O [mm] | A_b [mm ²] | A_a [mm ²] | Basiswapening +Bijlegwapening | Opm. |
|------|--------------|-------------------|-------------------|---------------|-----------------------------|-----------------------------|----------------------------------|----------------|
| 1 | S21-1475 | -4.92 | -150.04 | 411 Ond | 165* | 805 | 4x16 | 2, 54, 68, 110 |
| 2 | S21+0 | 43.33 | 151.07 | 415 Bov | 219 | 805 | 4x16 | 2, 68, 110 |
| 3 | S21+965 | 70.57 | 151.07 | 415 Bov | 360 | 805 | 4x16 | |
| 4 | S21+965 | -97.37 | -150.04 | 411 Ond | 509 | 805 | 4x16 | |
| 5 | S23-580 | -48.97 | -150.04 | 411 Ond | 250 | 805 | 4x16 | |
| 6 | S23-580 | 51.64 | 151.07 | 415 Bov | 261 | 805 | 4x16 | |
| 7 | S23+0 | 70.50 | 151.07 | 415 Bov | 359 | 805 | 4x16 | |
| 8 | S23+600 | 77.24 | 151.07 | 415 Bov | 395 | 805 | 4x16 | |
| 9 | S23+600 | -62.62 | -150.04 | 411 Ond | 322 | 805 | 4x16 | |
| 10 | S26-461 | -42.76 | -150.04 | 411 Ond | 218 | 805 | 4x16 | |
| 11 | S26-145 | -32.07 | -150.04 | 411 Ond | 204* | 805 | 4x16 | 1 |
| 12 | S26-145 | 15.47 | 151.07 | 415 Bov | 165* | 805 | 4x16 | 54 |

Opmerkingen

- [1] * = Eisen met betrekking tot minimum wapening zijn toegepast, zie nationale bijlage art. 9.2.1.1(1).
- [2] Benodigde wapening en inwendige hefboomsarm zijn bepaald volgens gedrongen ligger detaillering, zie nationale bijlage art. 6.1(10).
- [54] * = Eisen met betrekking tot minimum wapening ten behoeve van gecontroleerde scheurvorming zijn toegepast volgens art. 7.3.2.
- [68] **MRd als gevolg van de gedrongen ligger berekening (NB. 6.1(10)) is groter dan MRd volgens 6.1(P). De momentweerstand en inwendige hefboomsarm volgens 6.1(P) zijn maatgevend en daarom alsnog toegepast.**
- [110] **Art. 9.7 (1), (2): Een orthogonaal wapeningsnet dient toegepast te worden aan iedere zijde van de gedrongen liggers:
Profiel 2 - B*H 400*500: 400 mm²/m aan elke zijde en in elke richting met een maximaal hoh 300 mm.**

Scheurvorming volgens artikel 7.3.4

Balk 2-C

| Geb. | Pos. | Zijde | $M_E; freq$ [kNm] | $S_{r, max}$ [mm] | $\epsilon_{sm} - \epsilon_{cm}$ [%] | w_k [mm] | k_x | w_{max} [mm] | U.C. | Opm. |
|------|----------|-------|----------------------|----------------------|--|---------------|-------|-------------------|------|------|
| 1 | S21-404 | Bov | 23.68 | 318 | 0.213 | 0.068 | 1.00 | 0.300 | 0.23 | |
| 1 | S21-1858 | Ond | -3.43 | 347 | 0.031 | 0.011 | 1.14 | 0.343 | 0.03 | |
| 1 | S21-985 | Ond | -3.43 | 347 | 0.031 | 0.011 | 1.14 | 0.343 | 0.03 | |
| 2 | S21+303 | Bov | 23.68 | 318 | 0.213 | 0.068 | 1.00 | 0.300 | 0.23 | |
| 2 | S23-325 | Bov | 36.81 | 318 | 0.330 | 0.105 | 1.00 | 0.300 | 0.35 | |
| 2 | S21+414 | Ond | -24.00 | 347 | 0.218 | 0.076 | 1.14 | 0.343 | 0.22 | |
| 2 | S21+965 | Ond | -25.73 | 347 | 0.233 | 0.081 | 1.14 | 0.343 | 0.24 | |
| 2 | S23-1288 | Ond | -25.53 | 347 | 0.232 | 0.080 | 1.14 | 0.343 | 0.23 | |
| 3 | S23+422 | Bov | 36.81 | 318 | 0.330 | 0.105 | 1.00 | 0.300 | 0.35 | |
| 3 | S23+793 | Ond | -11.32 | 347 | 0.103 | 0.036 | 1.14 | 0.343 | 0.10 | |
| 3 | S26-656 | Ond | -11.77 | 347 | 0.107 | 0.037 | 1.14 | 0.343 | 0.11 | |
| 3 | S26-145 | Ond | -11.77 | 347 | 0.107 | 0.037 | 1.14 | 0.343 | 0.11 | |

Verloop hoofdwapening

Balk 2-C

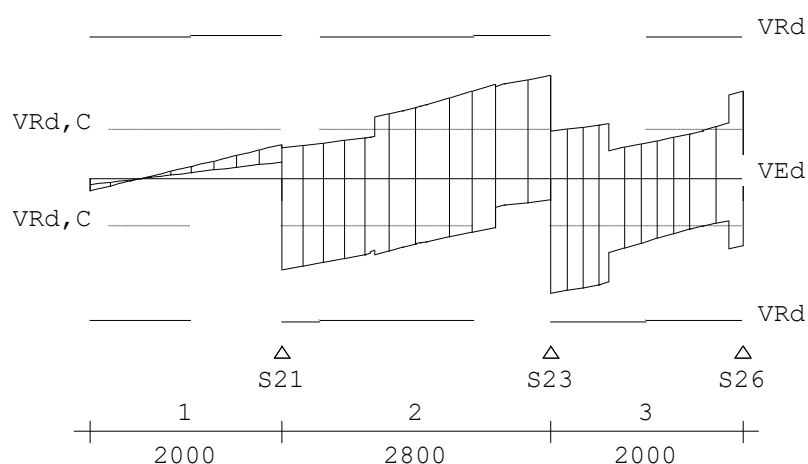
| Merk | B/O | Wapening | Vanaf [mm] | Tot [mm] | Lengte [mm] | $L_{bd; begin}$ [mm] | $L_{bd; eind}$ [mm] |
|------|-------|----------|---------------|-------------|----------------|-------------------------|------------------------|
| a | Boven | 4x16 | S21-2160 | S21-985 | 1175 | 160 | 160 |
| b | Boven | 4x16 | S21-915 | S26+160 | 5875 | 160 | 160 |
| c | Onder | 4x16 | S21-2160 | S21-985 | 1175 | 160 | 160 |
| d | Onder | 4x16 | S21-915 | S26+183 | 5898 | 160 | 183 |

Opmerkingen

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

DWARSKRACHTEN Fysisch lineair

Balk 2-C Fundamentele combinatie



Wring- en dwarskrachtwapening

Balk 2-C

| Geb. | Vanaf | Tot | Beugels | Lengte | <Wringing > | <Dwarskr.> | | | | | |
|------|----------|-------|---------|--------|------------------------|----------------------|--------------------|--------------------|------------------|------------------|--------|
| | | | | | A _{l a n g s} | A _{b g 1} | A _{b g 1} | A _{o p g} | V _{E d} | T _{E d} | Opm. |
| | [mm] | [mm] | | [mm] | [mm ²] | [mm ² /m] | [mm ²] | | [kN] | [kNm] | |
| 1 | S21-2000 | S21+0 | Ø8-200 | 2000 | 0 | 0 | 286 | 0 | 52.6 | 0 | 58,109 |
| 2 | S21+0 | S23+0 | Ø8-200 | 2800 | 0 | 0 | 363 | 0 | 159.2 | 0 | 6,109 |
| 3 | S23+0 | S26+0 | Ø8-200 | 2000 | 0 | 0 | 403 | 0 | 176.9 | 0 | 6 |

Opmerkingen

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

[58] 6.2.3: Z is berekend m.b.v. 0.9d

[109] Bij de berekening van de beugels is geen rekening gehouden met de detailleringsregels van art 9.7 voor de gedrongen liggers.

Wring- en dwarskrachten

Balk 2-C

| Geb. | Vanaf | Tot | θ | V_{Rd} | V_{Ed} | $V_{Rd,C}$ | $V_{Rd,Max}$ | T_{Ed} | $T_{Rd,C}$ | $T_{Rd,Max}$ | V_{opg} | Opm. |
|------|----------|-------|----------|----------|----------|------------|--------------|----------|------------|--------------|-----------|--------|
| | [mm] | [mm] | [°] | [kN] | | | | | | | | |
| 1 | S21-2000 | S21+0 | 21.8 | 221 | 53 | 75 | 410 | 0 | 26 | 64 | 0 | 58,109 |
| 2 | S21+0 | S23+0 | 21.8 | 220 | 159 | 75 | 410 | 0 | 26 | 63 | 0 | 6,109 |
| 3 | S23+0 | S26+0 | 21.8 | 220 | 177 | 75 | 409 | 0 | 26 | 63 | 0 | 6 |

Opmerkingen

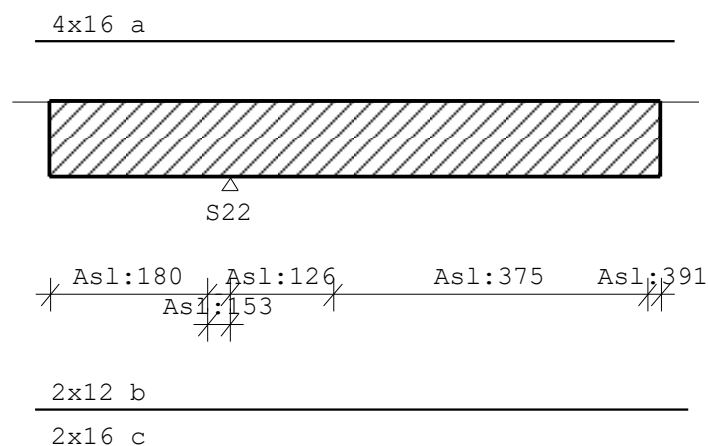
[6] 9.2.2 (4) 50% van de dwarskrachtwapening moet uit beugels bestaan.

[58] 6.2.3: Z is berekend m.b.v. 0.9d

[109] Bij de berekening van de beugels is geen rekening gehouden met de detailleringsregels van art 9.7 voor de gedrongen liggers.

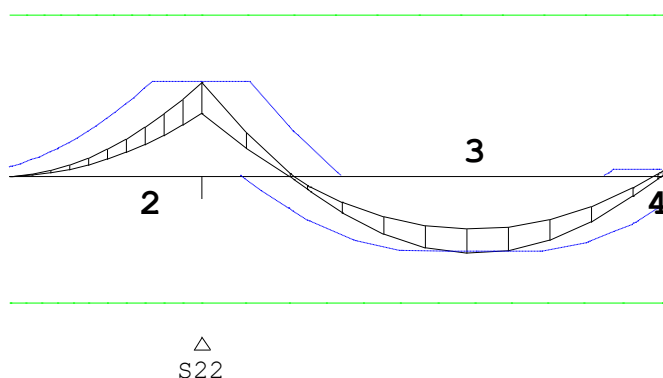
Hoofdwapening Fysisch lineair

Balk 2-D



MEd dekkingslijn Fysisch lineair

Balk 2-D



Hoofdwapening

Balk 2-D

| Geb. | Pos. [mm] | M_{Ed} [kNm] | M_{Rd} [kNm] | z B/O [mm] | A_b [mm ²] | A_a [mm ²] | Basiswapening +Bijlegwapening | Opm. |
|------|--------------|-------------------|-------------------|---------------|-----------------------------|-----------------------------|----------------------------------|------|
| 1 | S22-2000 | -0.03 | -119.72 | 419 Ond | 179* | 629 | 2x16 + 2x12 | 54 |
| 2 | S22+0 | 88.81 | 152.35 | 418 Bov | 455 | 805 | 4x16 | |
| 3 | S22+2842 | -72.50 | -119.72 | 419 Ond | 371 | 629 | 2x16 + 2x12 | |
| 4 | S22+4800 | 5.41 | 152.35 | 418 Bov | 179* | 805 | 4x16 | 54 |

Opmerkingen

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

Scheurvorming volgens artikel 7.3.4

Balk 2-D

| Geb. | Pos. [mm] | Zijde | $M_{E, freq}$ [kNm] | $s_{r, max}$ [mm] | $\epsilon_{sm} - \epsilon_{cm}$ [‰] | w_k [mm] | k_x | w_{max} [mm] | U.C. | Opm. |
|------|--------------|-------|------------------------|----------------------|--|---------------|-------|-------------------|------|------|
| 1 | S22-2000 | Bov | 6.04 | 340 | 0.054 | 0.018 | 1.00 | 0.300 | 0.06 | |
| 1 | S22-368 | Bov | 72.92 | 340 | 0.741 | 0.252 | 1.00 | 0.300 | 0.84 | |
| 2 | S22+478 | Bov | 72.92 | 340 | 0.741 | 0.252 | 1.00 | 0.300 | 0.84 | |
| 2 | S22+4429 | Bov | 3.27 | 340 | 0.029 | 0.010 | 1.00 | 0.300 | 0.03 | |
| 2 | S22+4800 | Bov | 3.27 | 340 | 0.029 | 0.010 | 1.00 | 0.300 | 0.03 | |
| 2 | S22+2842 | Ond | -60.09 | 403 | 0.692 | 0.279 | 1.14 | 0.343 | 0.81 | |

Verloop hoofdwapening

Balk 2-D

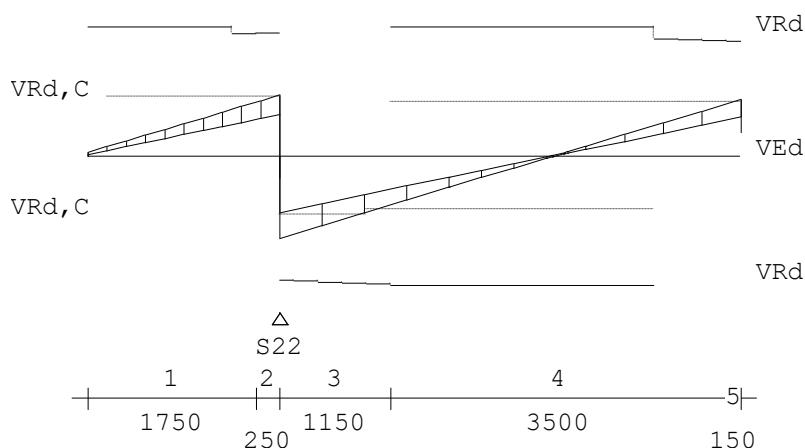
| Merk | B/O | Wapening | Vanaf [mm] | Tot [mm] | Lengte [mm] | $L_{bd, begin}$ [mm] | $L_{bd, eind}$ [mm] |
|------|-------|----------|---------------|-------------|----------------|-------------------------|------------------------|
| a | Boven | 4x16 | S22-2160 | S22+4960 | 7120 | 160 | 160 |
| b | Onder | 2x12 | S22-2160 | S22+5115 | 7275 | 160 | 315 |
| c | Onder | 2x16 | S22-2160 | S22+5115 | 7275 | 160 | 315 |

Opmerkingen

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

DWARSKRACHTEN Fysisch lineair

Balk 2-D Fundamentele combinatie



Wring- en dwarskrachtwapening

Balk 2-D

| Geb. | Vanaf [mm] | Tot [mm] | Beugels | Lengte [mm] | <Wringing> <Dwarskr.> | | | | V_{Ed} [kN] | T_{Ed} [kNm] | Opm. |
|------|---------------|-------------|---------|----------------|----------------------------------|-----------------------------------|---------------------------------|---------------------------------|------------------|-------------------|------|
| | | | | | A_{lang} [mm ²] | A_{bg1} [mm ² /m] | A_{bg1} [mm ²] | A_{opg} [mm ²] | | | |
| 1 | S22-2000 | S22-250 | Ø8-250 | 1750 | 180 | 20 | 322 | 0 | 73.8 | 11 | |
| 2 | S22-250 | S22+0 | Ø8-250 | 250 | 153 | 17 | 322 | 0 | 83.6 | 5 | 6 |
| 3 | S22+0 | S22+1150 | Ø8-250 | 1150 | 126 | 14 | 322 | 0 | 112.7 | 5 | 6 |
| 4 | S22+1150 | S22+4650 | Ø8-250 | 3500 | 375 | 42 | 322 | 0 | 71.7 | 12 | |
| 5 | S22+4650 | S22+4800 | Ø8-250 | 150 | 391 | 44 | 322 | 0 | 77.6 | 12 | 6 |

Dwarskrachtwapening

Balk 2-D

| Geb. | Vanaf [mm] | Tot [mm] | Beugels | Lengte [mm] | A_{sw} [mm ² /m] | V_{Ed} [kN] | A_{opg} [mm ²] | Opm. |
|------|---------------|-------------|---------|----------------|----------------------------------|------------------|---------------------------------|------|
|------|---------------|-------------|---------|----------------|----------------------------------|------------------|---------------------------------|------|

Opmerkingen

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

Wring- en dwarskrachten

Balk 2-D

| Geb. | Vanaf [mm] | Tot [mm] | θ [°] | V_{Rd} [kN] | V_{Ed} [kN] | $V_{Rd,C}$ [kN] | $V_{Rd,Max}$ [kN] | T_{Ed} [kNm] | $T_{Rd,C}$ [kNm] | $T_{Rd,Max}$ [kNm] | V_{opg} [kN] | Opm. |
|------|---------------|-------------|-----------------|------------------|------------------|--------------------|----------------------|-------------------|---------------------|-----------------------|-------------------|------|
| 1 | S22-2000 | S22-250 | 21.8 | 159 | 74 | 81 | 462 | 11 | 31 | 76 | 0 | |
| 2 | S22-250 | S22+0 | 21.8 | 162 | 84 | 81 | 461 | 5 | 31 | 76 | 0 | 6 |
| 3 | S22+0 | S22+1150 | 21.8 | 164 | 113 | 81 | 461 | 5 | 31 | 76 | 0 | 6 |
| 4 | S22+1150 | S22+4650 | 21.8 | 140 | 72 | 74 | 463 | 12 | 31 | 76 | 0 | |
| 5 | S22+4650 | S22+4800 | 21.8 | 139 | 78 | 74 | 464 | 12 | 31 | 76 | 0 | 6 |

Opmerkingen

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

Woning type E en F - balkwapening:

| | |
|-----------------|--|
| Betonkwaliteit: | C20/25 |
| Betonstaal: | B500B |
| Milieuklasse: | XC4 |
| Dekking: | boven en zijkant 35 mm, onder 40 mm |

Blok 3 en 4:

| | |
|---------------------|-----------|
| balk 1 / 5 / 6 / 9: | 500 x 500 |
| onderwapening | 4Ø12 |
| bovenwapening | 5Ø12 |
| beugels | Ø8-250 |
| flank | 2Ø8 |

| | |
|-----------------|-----------|
| balk 2/3/4/7/8: | 400 x 500 |
| onderwapening | 4Ø12 |
| bovenwapening | 4Ø12 |
| beugels | Ø8-250 |
| flank | 2Ø8 |

| | |
|---------------|-------------|
| balk A en D: | 400 x 500 |
| onderwapening | 4Ø12 |
| bovenwapening | 2Ø12 + 2Ø16 |
| beugels | Ø8-250 |
| flank | 2Ø8 |

| | |
|---------------|-------------|
| balk B en C: | 400 x 500 |
| onderwapening | 4Ø12 |
| bovenwapening | 3Ø12 + 1Ø16 |
| beugels | Ø8-250 |
| flank | 2Ø8 |

Voor bijlegwapening zie de tekening.

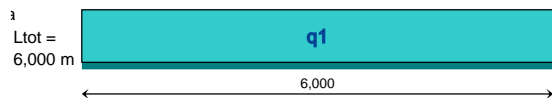
Blok 5:

| | |
|---------------------|-------------|
| balk 1 / 5 / 6 / 9: | 500 x 500 |
| onderwapening | 4Ø12 |
| bovenwapening | 5Ø12 |
| beugels | Ø8-250 |
| flank | 2Ø8 |
| | |
| balk 2/3/4/5: | 400 x 500 |
| onderwapening | 4Ø12 |
| bovenwapening | 3Ø16 + 1Ø12 |
| beugels | Ø8-250 |
| flank | 2Ø8 |
| | |
| balk A en D: | 400 x 500 |
| onderwapening | 4Ø12 |
| bovenwapening | 2Ø12 + 2Ø16 |
| beugels | Ø8-250 |
| flank | 2Ø8 |
| | |
| balk B en C: | 400 x 500 |
| onderwapening | 4Ø12 |
| bovenwapening | 3Ø12 + 1Ø16 |
| beugels | Ø8-250 |
| flank | 2Ø8 |

Voor bijlegwapening zie de tekening.

Woningtype E en F – balkbelastingen:

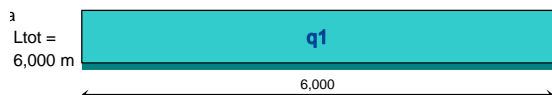
Woning E en F - Balk voorgevel



| q1 : | cat. | G _k | Q _k | ψ ₀ | factor * lengte | breedte | lengte | aantal | G _{rep} | Q _{rep} | Q _{rep} | 6.10a | 6.10b | stabiliteit / opdrijven | |
|-----------------------------------|------|----------------|----------------|----------------|-----------------------|---------|--------|--------|-----------------------|-------------------------|----------------------------|--------------|-----------------|-------------------------|-----------------|
| | | kar. | kar. | factor | | | | | rep. | rep. | rep. | 1,22 G + | 1,08 G + | 1,08 G + | 0,90 G |
| | | [kN/m²] | [kN/m²] | comb.w | - | [m] | [m] | - | perm. | comb. (ψ ₀) | extr+comb(ψ ₀) | 1,35 * Qcomb | 1,35 Qextr+comb | 1,35 * Qcomb | 1,35 * Qgunstig |
| begane grondvloer | A | 3,40 | 2,55 | 0,40 | 1,00 | 1,00 | 2,25 | 1 | 7,65 | 2,30 | 5,74 | 12,4 | 16,0 | 11,4 | 6,9 |
| gevel; 100mm bakst; houten bi.bl. | | 2,50 | | | 1,00 | 1,00 | 0,55 | 1 | 1,38 | | | 1,7 | 1,5 | 1,5 | 1,2 |
| hsb gevel; betimm.; houten bi.bl. | | 1,00 | | | 1,00 | 1,00 | 2,50 | 1 | 2,50 | | | 3,0 | 2,7 | 2,7 | 2,3 |
| q 1 : N/m | | | | | | | | | 11,5 | 2,3 | 5,7 | 17,1 | 20,2 | 15,5 | 10,4 |
| lengte van de q-last: 6,000 [m] | | | | | | | | | UGT / Frequentie aanw | | | 1,19 | 1,40 | | |
| | | | | | | | | | totaal Qd [kN]: | | | 103 | 121 | | |

| | | | | | | | | | | | | | | | | |
|---|--|--|--|--|--|--|--|--|--|------------------------|--------------------|-------------------------|----------------|-----------------|--------------|-----------------|
| | | | | | | | | | | ongunstig | | stabiliteit / opdrijven | | | | |
| | | | | | | | | | | ΣG_{rep} | ΣQ_{rep} | ΣQ_{rep} | $\Sigma 6.10a$ | $\Sigma 6.10b$ | Σ | Σ |
| | | | | | | | | | | rep. | rep. | rep. | 1,22 G + | 1,08 G + | 1,08 G + | 0,90 G |
| | | | | | | | | | | perm. | comb. (ψ_0) | extr+comb(ψ_0) | 1,35 * Qcomb | 1,35 Qextr+comb | 1,35 * Qcomb | 1,35 * Qgunstig |
| Totale belasting op Woning E en F - Balk voorgevel [kN] | | | | | | | | | | 69 | 14 | 34 | 103 | 121 | 93 | 62 |
| | | | | | | | | | | zwaartepunt belasting: | | 3,000 m | 3,000 m | 3,000 m | 3,000 m | |

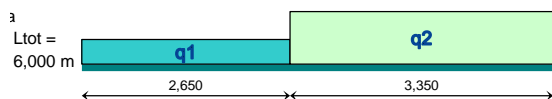
Woning E en F - Balk achtergevel



| q1 : | cat. | G _k | Q _k | ψ ₀ | factor * lengte | breedte | lengte | aantal | G _{rep} | Q _{rep} | Q _{rep} | 6.10a | 6.10b | stabiliteit / opdrijven | |
|-----------------------------------|------|----------------|----------------|----------------|-----------------------|---------|--------|--------|-----------------------|-------------------------|----------------------------|--------------|-----------------|-------------------------|-----------------|
| | | kar. | kar. | factor | | | | | rep. | rep. | rep. | 1,22 G + | 1,08 G + | 1,08 G + | 0,90 G |
| | | [kN/m²] | [kN/m²] | comb.w | - | [m] | [m] | - | perm. | comb. (ψ ₀) | extr+comb(ψ ₀) | 1,35 * Qcomb | 1,35 Qextr+comb | 1,35 * Qcomb | 1,35 * Qgunstig |
| begane grondvloer | A | 3,40 | 2,55 | 0,40 | 1,00 | 1,00 | 1,80 | 1 | 6,12 | 1,84 | 4,59 | 9,9 | 12,8 | 9,1 | 5,5 |
| gevel; 100mm bakst; houten bi.bl. | | 2,50 | | | 1,00 | 1,00 | 0,50 | 1 | 1,25 | | | 1,5 | 1,4 | 1,4 | 1,1 |
| hsb gevel; betimm.; houten bi.bl. | | 1,00 | | | 1,00 | 1,00 | 2,60 | 1 | 2,60 | | | 3,2 | 2,8 | 2,8 | 2,3 |
| q 1 : N/m | | | | | | | | | 10,0 | 1,8 | 4,6 | 14,6 | 17,0 | 13,2 | 9,0 |
| lengte van de q-last: 6,000 [m] | | | | | | | | | UGT / Frequentie aanw | | | 1,19 | 1,38 | | |
| | | | | | | | | | totaal Qd [kN]: | | | 88 | 102 | | |

| | | | | | | | | | | | | | | | | |
|---|--|--|--|--|--|--|--|--|--|------------------------|--------------------|-------------------------|-------------------|----------------------|-------------------|----------------------|
| | | | | | | | | | | ongunstig | | stabiliteit / opdrijven | | | | |
| | | | | | | | | | | ΣG_{rep} | ΣQ_{rep} | ΣQ_{rep} | $\Sigma 6.10a$ | $\Sigma 6.10b$ | Σ | Σ |
| | | | | | | | | | | rep. | rep. | rep. | 1,22 G + | 1,08 G + | 1,08 G + | 0,90 G |
| | | | | | | | | | | perm. | comb. (ψ_0) | extr+comb(ψ_0) | $1,35 * Q_{comb}$ | $1,35 Q_{extr+comb}$ | $1,35 * Q_{comb}$ | $1,35 * Q_{gunstig}$ |
| Totale belasting op Woning E en F - Balk achtergevel [kN] | | | | | | | | | | 60 | 11 | 28 | 88 | 102 | 79 | 54 |
| | | | | | | | | | | zwaartepunt belasting: | | 3,000 m | 3,000 m | 3,000 m | 3,000 m | |

Woning E en F - tussenbalk voorzijde

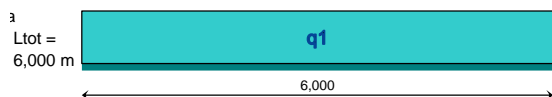


| q1 : | cat. | G _k | Q _k | ψ ₀ | factor * lengte | breedte | lengte | aantal | G _{rep} | Q _{rep} | Q _{rep} | 6.10a | 6.10b | stabiliteit / opdrijven |
|---------------------------------|---------|----------------|----------------|----------------|--------------------|---------|--------|--------|----------------------|-------------------------|----------------------------|--------------|-----------------|------------------------------|
| | kar. | kar. | factor | | | | | | rep. | rep. | rep. | 1,22 G + | 1,08 G + | 1,08 G + 0,90 G |
| | [kN/m²] | [kN/m²] | comb.w | - | [m] | [m] | - | | perm. | comb. (ψ ₀) | extr+comb(ψ ₀) | 1,35 * Qcomb | 1,35 Qextr+comb | 1,35 * Qcomb 1,35 * Qgunstig |
| begane grondvloer | A | 3,40 | 2,55 | 0,40 | 1,00 | 1,00 | 4,08 | 1 | 13,87 | 4,16 | 10,40 | 22,5 | 29,0 | 20,6 12,5 |
| q 1 :N/m² | | | | | | | | | 13,9 | 4,2 | 10,4 | 22,5 | 29,0 | 20,6 12,5 |
| lengte van de q-last: 2,650 [m] | | | | | | | | | UGT / Frequente aanw | | 1,18 | 1,52 | | |
| | | | | | | | | | totaal Qd [kN]: | | 60 | 77 | | |

| q2 : | cat. | G _k | Q _k | ψ ₀ | factor * lengte | breedte | lengte | aantal | G _{rep} | Q _{rep} | Q _{rep} | 6.10a | 6.10b | stabiliteit / opdrijven |
|---------------------------------|---------|----------------|----------------|----------------|--------------------|---------|--------|--------|----------------------|-------------------------|----------------------------|--------------|-----------------|------------------------------|
| | kar. | kar. | factor | | | | | | rep. | rep. | rep. | 1,22 G + | 1,08 G + | 1,08 G + 0,90 G |
| | [kN/m²] | [kN/m²] | comb.w | - | [m] | [m] | - | | perm. | comb. (ψ ₀) | extr+comb(ψ ₀) | 1,35 * Qcomb | 1,35 Qextr+comb | 1,35 * Qcomb 1,35 * Qgunstig |
| 2e verdiepingvloer | A | 4,50 | 2,25 | 0,40 | 0,30 | 3,75 | 1,20 | 1 | 6,08 | 1,22 | 3,04 | 9,0 | 10,7 | 8,2 5,5 |
| stab wand 120; 120mm beton | | 3,23 | | | 0,30 | 1,50 | 2,70 | 1 | 3,92 | | | 4,8 | 4,2 | 4,2 3,5 |
| 1e verdiepingvloer | A | 5,20 | 2,55 | 0,40 | 0,30 | 3,00 | 1,80 | 1 | 8,42 | 1,65 | 4,13 | 12,5 | 14,7 | 11,3 7,6 |
| stab wand 120; 120mm beton | | 3,23 | | | 1,00 | 1,00 | 2,70 | 1 | 8,72 | | | 10,6 | 9,4 | 9,4 7,8 |
| begane grondvloer | A | 3,40 | 2,55 | 0,40 | 1,00 | 1,00 | 4,08 | 1 | 13,87 | 4,16 | 10,40 | 22,5 | 29,0 | 20,6 12,5 |
| q 2 :N/m² | | | | | | | | | 41,0 | 7,0 | 17,6 | 59,3 | 68,0 | 53,8 36,9 |
| lengte van de q-last: 3,350 [m] | | | | | | | | | UGT / Frequente aanw | | 1,19 | 1,37 | | |
| | | | | | | | | | totaal Qd [kN]: | | 199 | 228 | | |

| | | | | | | | | | ongunstig | | stabiliteit / opdrijven | |
|---|--|--|--|--|--|--|--|--|--|-------------------------|----------------------------|---|
| | | | | | | | | | Σ G _{rep} | Σ Q _{rep} | Σ Q _{rep} | Σ 6.10a Σ 6.10b Σ Σ |
| | | | | | | | | | rep. | rep. | rep. | 1,22 G + 1,08 G + 1,08 G + 0,90 G |
| | | | | | | | | | perm. | comb. (ψ ₀) | extr+comb(ψ ₀) | 1,35 * Qcomb 1,35 Qextr+comb 1,35 * Qcomb 1,35 * Qgunstig |
| Totale belasting op Woning E en F - tussenbalk voorzijde [kN] | | | | | | | | | 174 | 35 | 86 | 258 305 235 157 |
| | | | | | | | | | zwaartepunt belasting: 3,633 m 3,568 m 3,627 m 3,692 m | | | |

Woning E en F - tussenbalk achterzijde



| q1 : | cat. | G _k | Q _k | ψ ₀ | factor * lengte | breedte | lengte | aantal | G _{rep} | Q _{rep} | Q _{rep} | 6.10a | 6.10b | stabiliteit / opdrijven |
|---------------------------------|---------|----------------|----------------|----------------|--------------------|---------|--------|--------|----------------------|-------------------------|----------------------------|--------------|-----------------|------------------------------|
| | kar. | kar. | factor | | | | | | rep. | rep. | rep. | 1,22 G + | 1,08 G + | 1,08 G + 0,90 G |
| | [kN/m²] | [kN/m²] | comb.w | - | [m] | [m] | - | | perm. | comb. (ψ ₀) | extr+comb(ψ ₀) | 1,35 * Qcomb | 1,35 Qextr+comb | 1,35 * Qcomb 1,35 * Qgunstig |
| begane grondvloer | A | 3,40 | 2,55 | 0,40 | 1,00 | 1,00 | 3,60 | 1 | 12,24 | 3,67 | 9,18 | 19,8 | 25,6 | 18,2 11,0 |
| q 1 :N/m² | | | | | | | | | 12,2 | 3,7 | 9,2 | 19,8 | 25,6 | 18,2 11,0 |
| lengte van de q-last: 6,000 [m] | | | | | | | | | UGT / Frequente aanw | | 1,18 | 1,52 | | |
| | | | | | | | | | totaal Qd [kN]: | | 119 | 154 | | |

| | | | | | | | | | ongunstig | | stabiliteit / opdrijven | |
|---|--|--|--|--|--|--|--|--|--|-------------------------|----------------------------|---|
| | | | | | | | | | Σ G _{rep} | Σ Q _{rep} | Σ Q _{rep} | Σ 6.10a Σ 6.10b Σ Σ |
| | | | | | | | | | rep. | rep. | rep. | 1,22 G + 1,08 G + 1,08 G + 0,90 G |
| | | | | | | | | | perm. | comb. (ψ ₀) | extr+comb(ψ ₀) | 1,35 * Qcomb 1,35 Qextr+comb 1,35 * Qcomb 1,35 * Qgunstig |
| Totale belasting op Woning E en F - tussenbalk achterzijde [kN] | | | | | | | | | 73 | 22 | 55 | 119 154 109 66 |
| | | | | | | | | | zwaartepunt belasting: 3,000 m 3,000 m 3,000 m 3,000 m | | | |

a

$L_{tot} = 11,600 \text{ mm}$

q_1 q_2 q_3

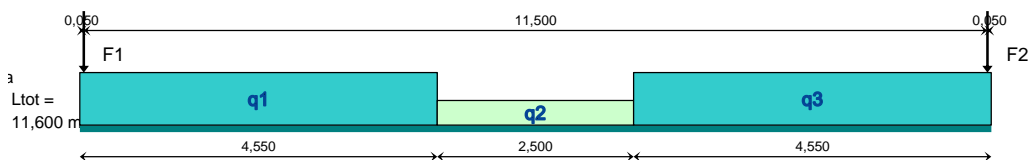
4,550 2,500 4,550

ex
ex
ex

exex
ex

| | | | | |
|------------------------|---------|---------|---------|---------|
| zwaartepunt belasting: | 5,800 m | 5,775 m | 5,800 m | 5,800 m |
|------------------------|---------|---------|---------|---------|

Woning E en F - zijgevel tpv pergola



| q1 : | cat. | G _k | Q _k | ψ ₀ | factor * lengte | breedte | lengte | aantal | G _{rep} | Q _{rep} | Q _{rep} | 6.10a | 6.10b | stabiliteit / opdrijven |
|---------------------------------|---------|----------------|----------------|----------------|-----------------------|---------|--------|--------|----------------------|-------------------------|----------------------------|--------------|-----------------|------------------------------|
| | kar. | kar. | factor | | | | | | rep. | rep. | rep. | 1,22 G + | 1,08 G + | 1,08 G + 0,90 G |
| | [kN/m²] | [kN/m²] | comb.w | - | [m] | [m] | - | | perm. | comb. (ψ ₀) | extr+comb(ψ ₀) | 1,35 * Qcomb | 1,35 Qextr+comb | 1,35 * Qcomb 1,35 * Qgunstig |
| hellend dak 40 graden | H | 1,05 | 0,37 | | 1,35 | 1,00 | 3,30 | 1 | 4,68 | | | 5,7 | 5,0 | 5,0 4,2 |
| pergola | | 0,50 | | | 1,35 | 1,00 | 1,50 | 1 | 1,01 | | | 1,2 | 1,1 | 1,1 0,9 |
| 2e verdiepingvloer | A | 4,50 | 2,25 | 0,40 | 0,65 | 1,00 | 2,90 | 1 | 8,48 | 1,70 | 4,24 | 12,6 | 14,9 | 11,5 7,6 |
| 1e verdiepingvloer | A | 5,20 | 2,55 | 0,40 | 1,35 | 1,00 | 2,90 | 1 | 20,36 | 3,99 | 9,98 | 30,1 | 35,5 | 27,4 18,3 |
| begane grondvloer | A | 3,40 | 2,55 | 0,40 | 1,00 | 1,00 | 0,60 | 1 | 2,04 | 0,61 | 1,53 | 3,3 | 4,3 | 3,0 1,8 |
| gevel; 100mm bakst; 140mm beton | | 5,61 | | | 1,00 | 1,00 | 0,35 | 1 | 1,96 | | | 2,4 | 2,1 | 2,1 1,8 |
| gevel; betimm.; 140mm beton | | 4,11 | | | 1,00 | 1,00 | 5,35 | 1 | 22,01 | | | 26,7 | 23,8 | 23,8 19,8 |
| q 1 :N/m] | | | | | | | | | 60,5 | 6,3 | 15,8 | 82,1 | 86,7 | 73,9 54,5 |
| lengte van de q-last: 4,550 [m] | | | | | | | | | UGT / Frequente aanw | | | 1,20 | 1,27 | |
| | | | | | | | | | totaal Qd [kN]: | | | 373 | 394 | |

| q2 : | cat. | G _k | Q _k | ψ ₀ | factor * lengte | breedte | lengte | aantal | G _{rep} | Q _{rep} | Q _{rep} | 6.10a | 6.10b | stabiliteit / opdrijven |
|---------------------------------|---------|----------------|----------------|----------------|-----------------------|---------|--------|--------|----------------------|-------------------------|----------------------------|--------------|-----------------|------------------------------|
| | kar. | kar. | factor | | | | | | rep. | rep. | rep. | 1,22 G + | 1,08 G + | 1,08 G + 0,90 G |
| | [kN/m²] | [kN/m²] | comb.w | - | [m] | [m] | - | | perm. | comb. (ψ ₀) | extr+comb(ψ ₀) | 1,35 * Qcomb | 1,35 Qextr+comb | 1,35 * Qcomb 1,35 * Qgunstig |
| begane grondvloer | A | 3,40 | 2,55 | 0,40 | 1,00 | 1,00 | 0,60 | 1 | 2,04 | 0,61 | 1,53 | 3,3 | 4,3 | 3,0 1,8 |
| pui; pui 100% | | 0,60 | | | 1,00 | 1,00 | 2,50 | 1 | 1,50 | | | 1,8 | 1,6 | 1,6 1,4 |
| gevel; 100mm bakst; 140mm beton | | 5,61 | | | 1,00 | 1,00 | 0,43 | 1 | 2,41 | | | 2,9 | 2,6 | 2,6 2,2 |
| q 2 :N/m] | | | | | | | | | 6,0 | 0,6 | 1,5 | 8,1 | 8,5 | 7,3 5,4 |
| lengte van de q-last: 2,500 [m] | | | | | | | | | UGT / Frequente aanw | | | 1,20 | 1,26 | |
| | | | | | | | | | totaal Qd [kN]: | | | 20 | 21 | |

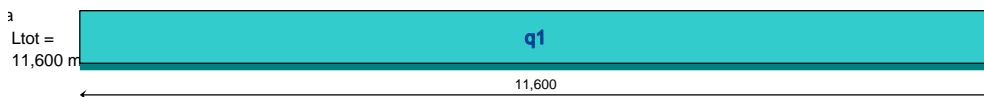
| q3 : | cat. | G _k | Q _k | ψ ₀ | factor * lengte | breedte | lengte | aantal | G _{rep} | Q _{rep} | Q _{rep} | 6.10a | 6.10b | stabiliteit / opdrijven |
|---------------------------------|---------|----------------|----------------|----------------|-----------------------|---------|--------|--------|----------------------|-------------------------|----------------------------|--------------|-----------------|------------------------------|
| | kar. | kar. | factor | | | | | | rep. | rep. | rep. | 1,22 G + | 1,08 G + | 1,08 G + 0,90 G |
| | [kN/m²] | [kN/m²] | comb.w | - | [m] | [m] | - | | perm. | comb. (ψ ₀) | extr+comb(ψ ₀) | 1,35 * Qcomb | 1,35 Qextr+comb | 1,35 * Qcomb 1,35 * Qgunstig |
| hellend dak 40 graden | H | 1,05 | 0,37 | | 1,35 | 1,00 | 3,30 | 1 | 4,68 | | | 5,7 | 5,0 | 5,0 4,2 |
| pergola | | 0,50 | | | 1,35 | 1,00 | 1,50 | 1 | 1,01 | | | 1,2 | 1,1 | 1,1 0,9 |
| 2e verdiepingvloer | A | 4,50 | 2,25 | 0,40 | 0,65 | 1,00 | 2,90 | 1 | 8,48 | 1,70 | 4,24 | 12,6 | 14,9 | 11,5 7,6 |
| 1e verdiepingvloer | A | 5,20 | 2,55 | 0,40 | 1,35 | 1,00 | 2,90 | 1 | 20,36 | 3,99 | 9,98 | 30,1 | 35,5 | 27,4 18,3 |
| begane grondvloer | A | 3,40 | 2,55 | 0,40 | 1,00 | 1,00 | 0,60 | 1 | 2,04 | 0,61 | 1,53 | 3,3 | 4,3 | 3,0 1,8 |
| gevel; 100mm bakst; 140mm beton | | 5,61 | | | 1,00 | 1,00 | 0,35 | 1 | 1,96 | | | 2,4 | 2,1 | 2,1 1,8 |
| gevel; betimm.; 140mm beton | | 4,11 | | | 1,00 | 1,00 | 5,35 | 1 | 22,01 | | | 26,7 | 23,8 | 23,8 19,8 |
| q 3 :N/m] | | | | | | | | | 60,5 | 6,3 | 15,8 | 82,1 | 86,7 | 73,9 54,5 |
| lengte van de q-last: 4,550 [m] | | | | | | | | | UGT / Frequente aanw | | | 1,20 | 1,27 | |
| | | | | | | | | | totaal Qd [kN]: | | | 373 | 394 | |

| F1 : | cat. | G _k | Q _k | ψ ₀ | factor * lengte | breedte | lengte | aantal | G _{rep} | Q _{rep} | Q _{rep} | 6.10a | 6.10b | stabiliteit / opdrijven |
|-------------------------------------|---------|----------------|----------------|----------------|-----------------------|---------|--------|--------|----------------------|-------------------------|----------------------------|--------------|-----------------|------------------------------|
| | kar. | kar. | factor | | | | | | rep. | rep. | rep. | 1,22 G + | 1,08 G + | 1,08 G + 0,90 G |
| | [kN/m²] | [kN/m²] | comb.w | - | [m] | [m] | - | | perm. | comb. (ψ ₀) | extr+comb(ψ ₀) | 1,35 * Qcomb | 1,35 Qextr+comb | 1,35 * Qcomb 1,35 * Qgunstig |
| pergola | | 0,50 | | | 1,00 | 6,00 | 2,50 | 1 | 7,50 | | | 9,1 | 8,1 | 8,1 6,8 |
| betonbalk 400x500 | | 5,00 | | | 1,00 | 1,00 | 2,50 | 1 | 12,50 | | | 15,2 | 13,5 | 13,5 11,3 |
| F 1 [kN] | | | | | | | | | 20,0 | | | 24,3 | 21,6 | 21,6 18,0 |
| afstand tot begin schema: 0,050 [m] | | | | | | | | | UGT / Frequente aanw | | | 1,22 | 1,08 | |

| F2 : | | | | factor | breedte | lengte | aantal | G _{rep} | Q _{rep} | Q _{rep} | 6.10a | 6.10b | stabiliteit / opdrijven | |
|---|----------------|----------------|----------------|--------|---------|--------|--------|-----------------------|-------------------------|----------------------------|--------------|-----------------|-------------------------|-----------------|
| cat. | G _k | Q _k | ψ ₀ | * | lengte | | | | | | | | | |
| kar. | kar. | factor | | | | | | rep. | rep. | rep. | 1,22 G + | 1,08 G + | 1,08 G + | 0,90 G |
| [kN/m²] | [kN/m²] | comb.w | - | [m] | [m] | - | | perm. | comb. (ψ ₀) | extr+comb(ψ ₀) | 1,35 * Qcomb | 1,35 Qextr+comb | 1,35 * Qcomb | 1,35 * Qgunstig |
| pergola | 0,50 | | | 1,00 | 6,00 | 2,50 | 1 | 7,50 | | | 9,1 | 8,1 | 8,1 | 6,8 |
| betonbalk 400 x 500 | 5,00 | | | 1,00 | 1,00 | 2,50 | 1 | 12,50 | | | 15,2 | 13,5 | 13,5 | 11,3 |
| F 2 [kN] | | | | | | | | 20,0 | | | 24,3 | 21,6 | 21,6 | 18,0 |
| afstand tot vorige puntlast: 11,500 [m] | | | | | | | | UGT / Frequentie aanw | | | 1,22 | 1,08 | | |

| | | | | ongunstig | | stabiliteit / opdrijven | |
|------------------------|-------------------------|----------------------------|--------------|-----------------|--------------|-------------------------|---------|
| Σ G _{rep} | Σ Q _{rep} | Σ Q _{rep} | Σ 6.10a | Σ 6.10b | Σ | Σ | |
| rep. | rep. | rep. | 1,22 G + | 1,08 G + | 1,08 G + | 0,90 G | |
| perm. | comb. (ψ ₀) | extr+comb(ψ ₀) | 1,35 * Qcomb | 1,35 Qextr+comb | 1,35 * Qcomb | 1,35 * Qgunstig | |
| 606 | 59 | 147 | 816 | 853 | 734 | 545 | |
| zwaartepunt belasting: | | | | 5,800 m | 5,800 m | 5,800 m | 5,800 m |

Woning E en F - woningscheiding



| q1 : | | | | factor | breedte | lengte | aantal | G _{rep} | Q _{rep} | Q _{rep} | 6.10a | 6.10b | stabiliteit / opdrijven | |
|----------------------------------|----------------|----------------|----------------|--------|---------|--------|--------|-----------------------|-------------------------|----------------------------|--------------|-----------------|-------------------------|-----------------|
| cat. | G _k | Q _k | ψ ₀ | * | lengte | | | | | | | | | |
| kar. | kar. | factor | | | | | | rep. | rep. | rep. | 1,22 G + | 1,08 G + | 1,08 G + | 0,90 G |
| [kN/m²] | [kN/m²] | comb.w | - | [m] | [m] | - | | perm. | comb. (ψ ₀) | extr+comb(ψ ₀) | 1,35 * Qcomb | 1,35 Qextr+comb | 1,35 * Qcomb | 1,35 * Qgunstig |
| hellend dak 40 graden | H | 1,05 | 0,37 | 1,00 | 1,00 | 6,00 | 1 | 6,30 | | | 7,7 | 6,8 | 6,8 | 5,7 |
| 2e verdiepingvloer | A | 4,50 | 2,25 | 0,40 | 0,50 | 1,00 | 5,80 | 13,05 | 2,61 | 6,53 | 19,4 | 22,9 | 17,6 | 11,7 |
| 1e verdiepingvloer | A | 5,20 | 2,55 | 0,40 | 1,00 | 1,00 | 5,80 | 30,16 | 5,92 | 14,79 | 44,6 | 52,5 | 40,6 | 27,1 |
| begane grondvloer | A | 3,40 | 2,55 | 0,40 | 1,00 | 1,00 | 1,20 | 4,08 | 1,22 | 3,06 | 6,6 | 8,5 | 6,1 | 3,7 |
| woningscheiding; 240mm beton | | 6,23 | | 1,00 | 1,00 | 5,68 | 1 | 35,38 | | | 43,0 | 38,2 | 38,2 | 31,8 |
| q 1 [N/m] | | | | | | | | 89,0 | 9,8 | 24,4 | 121,3 | 129,0 | 109,2 | 80,1 |
| lengte van de q-last: 11,600 [m] | | | | | | | | UGT / Frequentie aanw | | | 1,20 | 1,28 | | |
| | | | | | | | | totaal Qd [kN]: | | | 1.407 | 1.496 | | |

| | | | | ongunstig | | stabiliteit / opdrijven | |
|------------------------|-------------------------|----------------------------|--------------|-----------------|--------------|-------------------------|---------|
| Σ G _{rep} | Σ Q _{rep} | Σ Q _{rep} | Σ 6.10a | Σ 6.10b | Σ | Σ | |
| rep. | rep. | rep. | 1,22 G + | 1,08 G + | 1,08 G + | 0,90 G | |
| perm. | comb. (ψ ₀) | extr+comb(ψ ₀) | 1,35 * Qcomb | 1,35 Qextr+comb | 1,35 * Qcomb | 1,35 * Qgunstig | |
| 1.032 | 113 | 283 | 1.407 | 1.496 | 1.267 | 929 | |
| zwaartepunt belasting: | | | | 5,800 m | 5,800 m | 5,800 m | 5,800 m |

Woningtype E en F – uitvoer TS Balkroosters blok 3:

Technosoft Balkroosters release 6.80c

Project.....: 18107 - 14 woningen te Westzaan
 Onderdeel....: Blok 3 - fundering
 Dimensies....: kN/m/rad
 Bestand.....: G:\7000 project\18107-KPO 24 woningen
 Westzaan\Documenten\Constructie\18107-Blok
 3-fundering.grw
 Torsiefac.....: 20 %

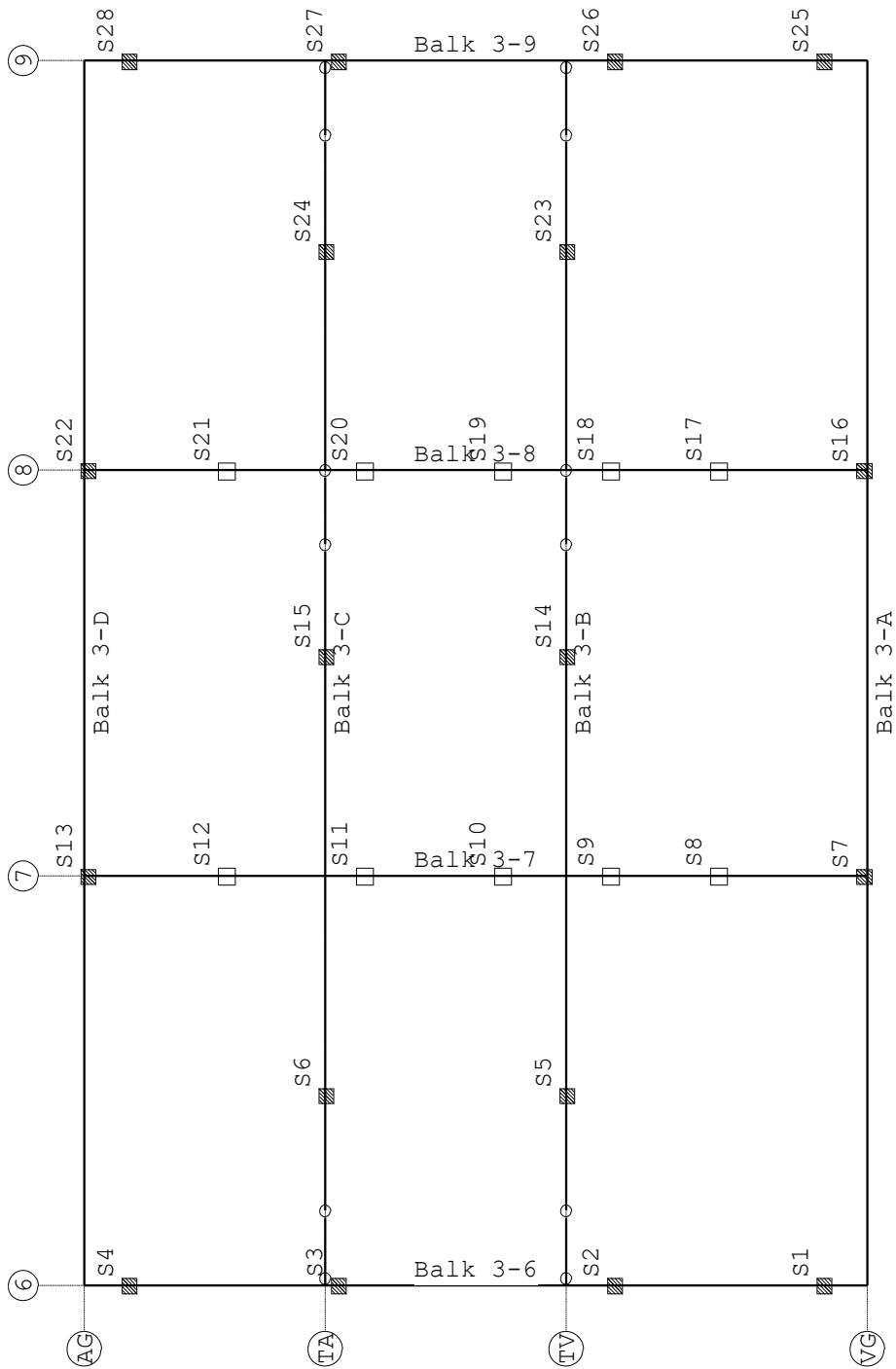
Ouderdom bij belasten : 28 Relatieve vochtigheid : 50%
 Doorbuigingen(beton) zijn dmv gecorrigeerde stijfheden berekend.

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

Toegepaste normen volgens Eurocode met Nederlandse NB

| | | | |
|-------------|---------------------------|-----------------|--------------|
| Belastingen | NEN-EN 1990:2002 | C2:2010,A1:2019 | NB:2019 (nl) |
| | NEN-EN 1991-1-1:2002 | C1/C11:2019 | NB:2019 (nl) |
| Beton | NEN-EN 1992-1-1:2011 (nl) | C2/A1:2015 (nl) | NB:2016 (nl) |

GEOMETRIE



MATERIALEN

| Mt | Kwaliteit | E-modulus[N/mm2] | S.G. | Pois. | Uitz. coëff |
|----|-----------|------------------|------|-------|-------------|
| 1 | C20/25 | 7480 | 25.0 | 0.20 | 1.0000e-05 |

MATERIALEN vervolg

| Mt | Kwaliteit | Cement | Kruipfac. |
|----|-----------|--------|-----------|
| 1 | C20/25 | | 3.01 |

PROFIELEN [mm]

| Prof. | Omschrijving | Materiaal | Oppervlak | Torsietr. | Traagheid | Vormf. |
|-------|--------------|-----------|-----------|-----------|-----------|--------|
| 1 | B*H 400*500 | 1:C20/25 | 2.000e+05 | 5.577e+09 | 4.167e+09 | 0.00 |
| 2 | B*H 400*500 | 1:C20/25 | 2.000e+05 | 5.577e+09 | 4.167e+09 | 0.00 |
| 3 | B*H 400*500 | 1:C20/25 | 2.000e+05 | 5.577e+09 | 4.167e+09 | 0.00 |
| 4 | B*H 500*500 | 1:C20/25 | 2.500e+05 | 8.802e+09 | 5.208e+09 | 0.00 |

PROFIELEN vervolg [mm]

| Prof. | Staaftype | Breedte | Hoogte | Zs | Rek.As | Type | b1 | h1 | b2 | h2 |
|-------|-----------|---------|--------|-----|--------|------|----|----|----|----|
| 1 | 0:Normaal | 400 | 500 | 250 | 0.00 | 0:RH | | | | |
| 2 | 0:Normaal | 400 | 500 | 250 | 0.00 | 0:RH | | | | |
| 3 | 0:Normaal | 400 | 500 | 250 | 0.00 | 0:RH | | | | |
| 4 | 0:Normaal | 500 | 500 | 250 | 0.00 | 0:RH | | | | |

STRAMIENLIJNEN

| Nr. | Naam | X-begin | Y-begin | X-eind | Y-Eind |
|-----|------|---------|---------|--------|--------|
| 1 | 6 | 0.000 | 11.600 | 0.000 | 0.000 |
| 2 | 7 | 6.060 | 11.600 | 6.060 | 0.000 |
| 3 | 8 | 12.060 | 11.600 | 12.060 | 0.000 |
| 4 | 9 | 18.120 | 11.600 | 18.120 | 0.000 |
| 5 | VG | 0.000 | 0.000 | 18.120 | 0.000 |
| 6 | TV | 0.000 | 4.460 | 18.120 | 4.460 |
| 7 | TA | 0.000 | 8.030 | 18.120 | 8.030 |
| 8 | AG | 0.000 | 11.600 | 18.120 | 11.600 |

BALKEN

| Nr. | Naam | Begin | Eind | Profiel |
|-----|----------|-------|------|-----------------------|
| 1 | Balk 3-6 | 6;VG | 6;AG | 4:B*H 500*500 |
| 2 | Balk 3-7 | 7;VG | 7;AG | 1:B*H 400*500 |
| 3 | Balk 3-8 | 8;VG | 8;AG | 1:B*H 400*500 |
| 4 | Balk 3-9 | 9;VG | 9;AG | 4:B*H 500*500 |
| 5 | Balk 3-A | 6;VG | 9;VG | 3:B*H 400*500 |
| 6 | Balk 3-B | 6;TV | 9;TV | Zie Doorsnedesectoren |
| 7 | Balk 3-C | 6;TA | 9;TA | Zie Doorsnedesectoren |
| 8 | Balk 3-D | 6;AG | 9;AG | 3:B*H 400*500 |

BALKEN vervolg

| Nr. | Naam | Aansl.begin | Aansl.eind | Excentr. | Pasm.begin | Pasm.eind | Opm. |
|-----|----------|-------------|------------|----------|------------|-----------|------|
| 1 | Balk 3-6 | WDM | WDM | 0.000 | 0.000 | 0.000 | |
| 2 | Balk 3-7 | WDM | WDM | 0.000 | 0.000 | 0.000 | |
| 3 | Balk 3-8 | WDM | WDM | 0.000 | 0.000 | 0.000 | |
| 4 | Balk 3-9 | WDM | WDM | 0.000 | 0.000 | 0.000 | |
| 5 | Balk 3-A | WDM | WDM | 0.000 | 0.000 | 0.000 | |
| 6 | Balk 3-B | WD- | WD- | 0.000 | 0.000 | 0.000 | |
| 7 | Balk 3-C | WD- | WD- | 0.000 | 0.000 | 0.000 | |
| 8 | Balk 3-D | WDM | WDM | 0.000 | 0.000 | 0.000 | |

Opmerkingen:

De torsie traagheid van alle balken is tot 20% gereduceerd

DOORSNEDESECTOREN

| Balk | Vanaf | Tot | Lengte | Profiel | Eindcode |
|----------|--------|--------|--------|---------------|-------------|
| Balk 3-B | 0.000 | 1.100 | 1.100 | 2:B*H 400*500 | 0:Scharnier |
| Balk 3-B | 1.100 | 10.960 | 9.860 | 2:B*H 400*500 | 0:Scharnier |
| Balk 3-B | 10.960 | 12.060 | 1.100 | 2:B*H 400*500 | 0:Scharnier |
| Balk 3-B | 12.060 | 17.020 | 4.960 | 2:B*H 400*500 | 0:Scharnier |
| Balk 3-B | 17.020 | 18.120 | 1.100 | 2:B*H 400*500 | 1:Vast |
| Balk 3-C | 0.000 | 1.100 | 1.100 | 2:B*H 400*500 | 0:Scharnier |
| Balk 3-C | 1.100 | 10.960 | 9.860 | 2:B*H 400*500 | 0:Scharnier |
| Balk 3-C | 10.960 | 12.060 | 1.100 | 2:B*H 400*500 | 0:Scharnier |
| Balk 3-C | 12.060 | 17.020 | 4.960 | 2:B*H 400*500 | 0:Scharnier |
| Balk 3-C | 17.020 | 18.120 | 1.100 | 2:B*H 400*500 | 1:Vast |

STEUNPUNTTYPE

| | | |
|-----------|--------------|----------------------------------|
| Nr. | : 1 | Assenstelsel: Globaal |
| Afmeting | : 220*220 | Rotatie X:Vrij |
| Inheinv. | : 17,50 -NAP | Verplaatsing Z:Veerwaarde: 35000 |
| FRd | : 290.000000 | Rotatie Y:Vrij |
| Min.afst. | : 0.750 | |
| Nr. | : 2 | Assenstelsel: Globaal |
| Afmeting | : 250*250 | Rotatie X:Vrij |
| Inheinv. | : 17,50 -NAP | Verplaatsing Z:Veerwaarde: 45000 |
| FRd | : 350.000000 | Rotatie Y:Vrij |
| Min.afst. | : 0.850 | |

STEUNPUNTEN

| Nr. | Naam | Steunpunttype | Balk | Positie | Excentr. | Hoek Opm: |
|-----|------|---------------|----------|---------|----------|-----------|
| 1 | | 1:220*220 | Balk 3-6 | 0.65 | 0.000 | 0.000 |
| 2 | | 1:220*220 | Balk 3-6 | 3.75 | 0.000 | 0.000 |
| 3 | | 1:220*220 | Balk 3-6 | 7.85 | 0.000 | 0.000 |
| 4 | | 1:220*220 | Balk 3-6 | 10.95 | 0.000 | 0.000 |
| 5 | | 1:220*220 | Balk 3-B | 2.81 | 0.000 | 0.000 |
| 6 | | 1:220*220 | Balk 3-C | 2.81 | 0.000 | 0.000 |
| 7 | | 1:220*220 | Balk 3-7 | 0.06 | 0.000 | 0.000 |
| 8 | | 2:250*250 | Balk 3-7 | 2.21 | 0.000 | 0.000 |
| 9 | | 2:250*250 | Balk 3-7 | 3.81 | 0.000 | 0.000 |
| 10 | | 2:250*250 | Balk 3-7 | 5.41 | 0.000 | 0.000 |
| 11 | | 2:250*250 | Balk 3-7 | 7.46 | 0.000 | 0.000 |
| 12 | | 2:250*250 | Balk 3-7 | 9.51 | 0.000 | 0.000 |
| 13 | | 1:220*220 | Balk 3-7 | 11.56 | 0.000 | 0.000 |
| 14 | | 1:220*220 | Balk 3-B | 9.31 | 0.000 | 0.000 |
| 15 | | 1:220*220 | Balk 3-C | 9.31 | 0.000 | 0.000 |
| 16 | | 1:220*220 | Balk 3-8 | 0.06 | 0.000 | 0.000 |
| 17 | | 2:250*250 | Balk 3-8 | 2.21 | 0.000 | 0.000 |
| 18 | | 2:250*250 | Balk 3-8 | 3.81 | 0.000 | 0.000 |
| 19 | | 2:250*250 | Balk 3-8 | 5.41 | 0.000 | 0.000 |
| 20 | | 2:250*250 | Balk 3-8 | 7.46 | 0.000 | 0.000 |
| 21 | | 2:250*250 | Balk 3-8 | 9.51 | 0.000 | 0.000 |
| 22 | | 1:220*220 | Balk 3-8 | 11.56 | 0.000 | 0.000 |
| 23 | | 1:220*220 | Balk 3-B | 15.31 | 0.000 | 0.000 |
| 24 | | 1:220*220 | Balk 3-C | 15.31 | 0.000 | 0.000 |
| 25 | | 1:220*220 | Balk 3-9 | 0.65 | 0.000 | 0.000 |
| 26 | | 1:220*220 | Balk 3-9 | 3.75 | 0.000 | 0.000 |
| 27 | | 1:220*220 | Balk 3-9 | 7.85 | 0.000 | 0.000 |
| 28 | | 1:220*220 | Balk 3-9 | 10.95 | 0.000 | 0.000 |

BELASTINGGEVALLEN

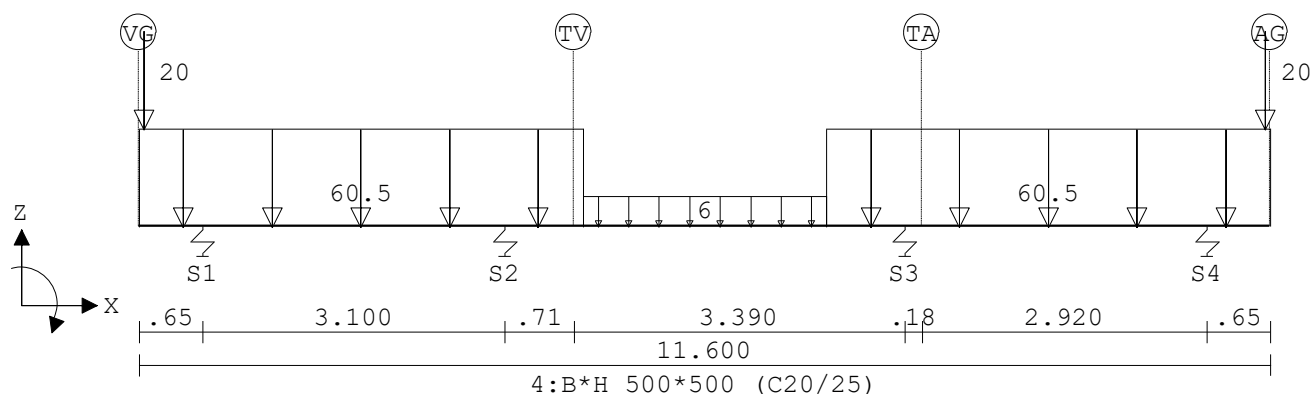
| B.G. | Omschrijving | Belast/onbelast | Ψ_0 | Ψ_1 | Ψ_2 | e.g. |
|------|--------------|--------------------|----------|----------|----------|-------|
| 1 | permanent | 2:Permanent EN1991 | | | | -1.00 |
| 2 | variabel bg | 0:Alles tegelijk | 0.40 | 0.50 | 0.30 | 0.00 |
| 3 | variabel 1e | 0:Alles tegelijk | 0.40 | 0.50 | 0.30 | 0.00 |
| 4 | variabel 2e | 0:Alles tegelijk | 0.40 | 0.50 | 0.30 | 0.00 |

BELASTINGGEVALLEN

| B.G. | Omschrijving | Type |
|------|--------------|---------------------------------|
| 1 | permanent | 1 Permanente belasting |
| 2 | variabel bg | 2 Ver. bel. pers. ed. (q_k) |
| 3 | variabel 1e | 2 Ver. bel. pers. ed. (q_k) |
| 4 | variabel 2e | 2 Ver. bel. pers. ed. (q_k) |

VELDBELASTINGEN

Balk 3-6 B.G:1 permanent



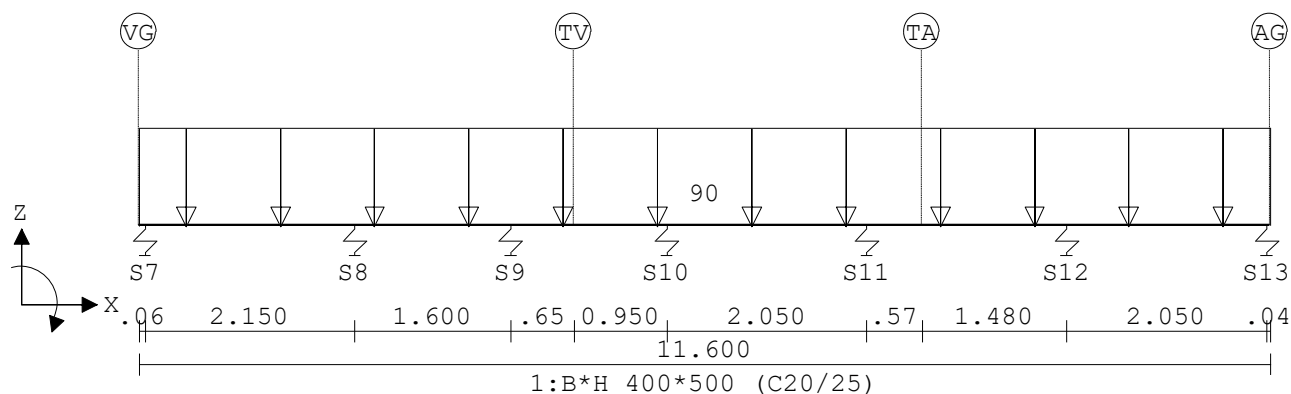
VELDBELASTINGEN

B.G:1 permanent

| Balk | Last | Type | $q_1/p/m$ | q_2 | Afstand | Lengte | Exc. |
|----------|------|------------|-----------|---------|---------|--------|-------|
| Balk 3-6 | 1 | 1:q-last | -60.500 | -60.500 | 0.000 | 4.550 | 0.000 |
| Balk 3-6 | 2 | 1:q-last | -6.000 | -6.000 | 4.550 | 2.500 | 0.000 |
| Balk 3-6 | 3 | 1:q-last | -60.500 | -60.500 | 7.050 | 4.550 | 0.000 |
| Balk 3-6 | 4 | 8:Puntlast | -20.000 | | 0.050 | | 0.000 |
| Balk 3-6 | 5 | 8:Puntlast | -20.000 | | 11.550 | | 0.000 |

VELDBELASTINGEN

Balk 3-7 B.G:1 permanent



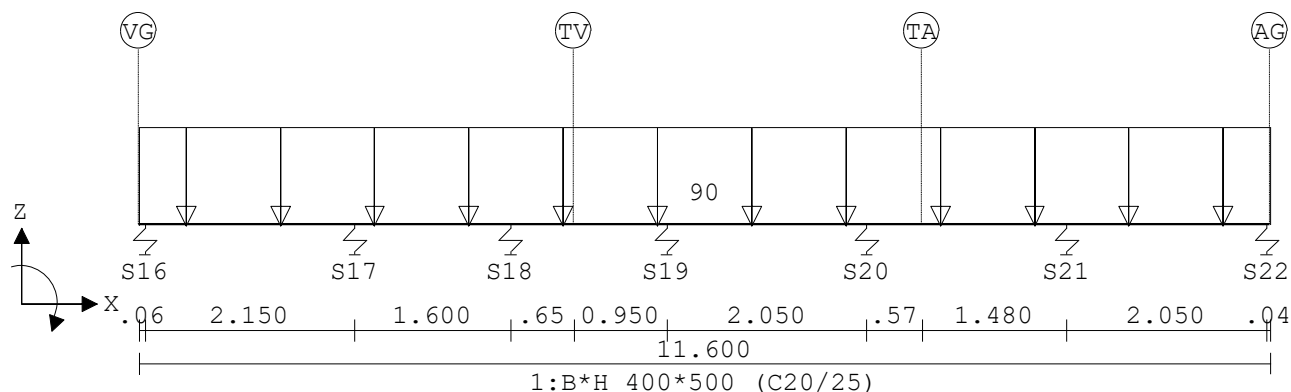
VELDBELASTINGEN

B.G:1 permanent

| Balk | Last Type | q1/p/m | q2 | Afstand | Lengte | Exc. |
|----------|------------|---------|---------|---------|--------|-------|
| Balk 3-7 | 1 1:q-last | -90.000 | -90.000 | 0.000 | 11.600 | 0.000 |

VELDBELASTINGEN

Balk 3-8 B.G:1 permanent



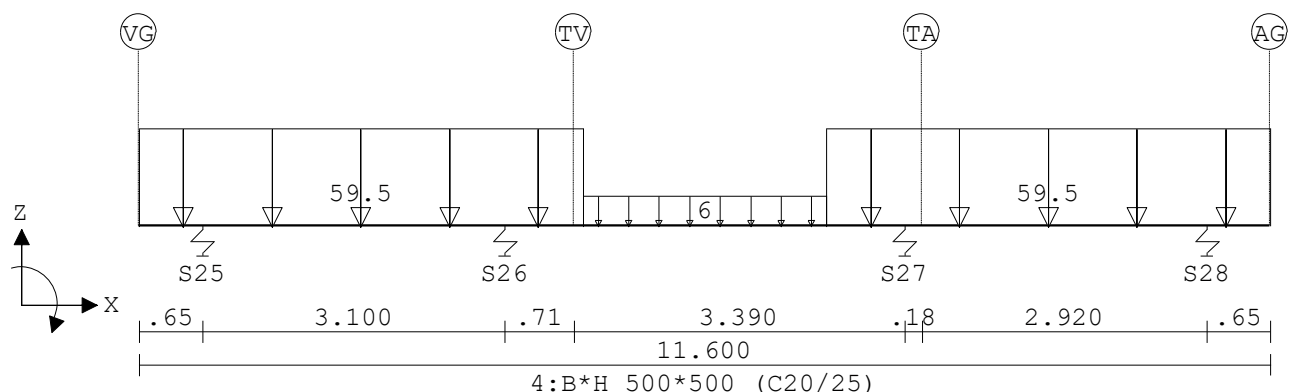
VELDBELASTINGEN

B.G:1 permanent

| Balk | Last Type | q1/p/m | q2 | Afstand | Lengte | Exc. |
|----------|------------|---------|---------|---------|--------|-------|
| Balk 3-8 | 1 1:q-last | -90.000 | -90.000 | 0.000 | 11.600 | 0.000 |

VELDBELASTINGEN

Balk 3-9 B.G:1 permanent



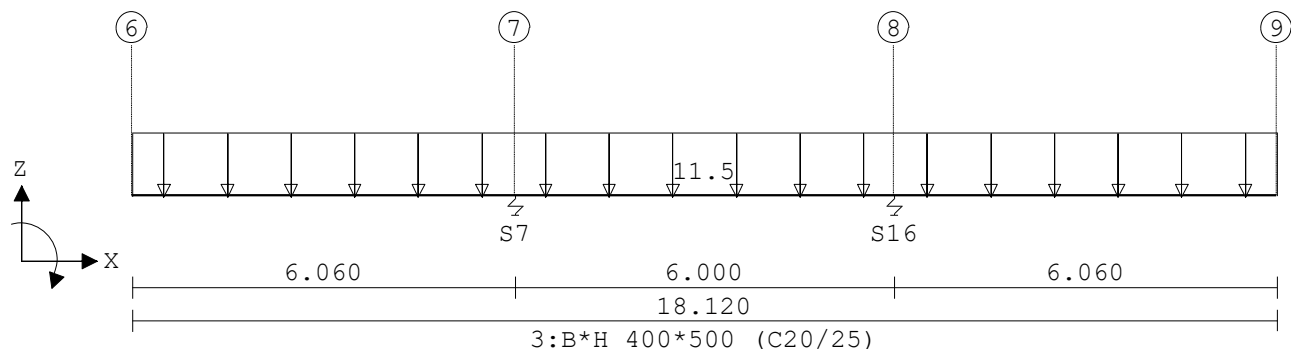
VELDBELASTINGEN

B.G:1 permanent

| Balk | Last Type | q1/p/m | q2 | Afstand | Lengte | Exc. |
|----------|------------|---------|---------|---------|--------|-------|
| Balk 3-9 | 1 1:q-last | -59.500 | -59.500 | 0.000 | 4.550 | 0.000 |
| Balk 3-9 | 2 1:q-last | -6.000 | -6.000 | 4.550 | 2.500 | 0.000 |
| Balk 3-9 | 3 1:q-last | -59.500 | -59.500 | 7.050 | 4.550 | 0.000 |

VELDBELASTINGEN

Balk 3-A B.G:1 permanent



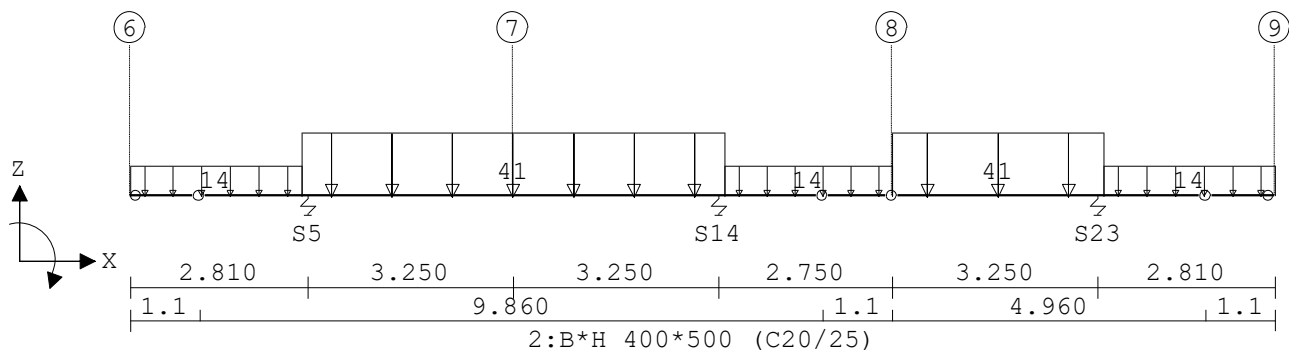
VELDBELASTINGEN

B.G:1 permanent

| Balk | Last Type | q1/p/m | q2 | Afstand | Lengte | Exc. |
|----------|------------|---------|---------|---------|--------|-------|
| Balk 3-A | 1 1:q-last | -11.500 | -11.500 | 0.000 | 18.120 | 0.100 |

VELDBELASTINGEN

Balk 3-B B.G:1 permanent



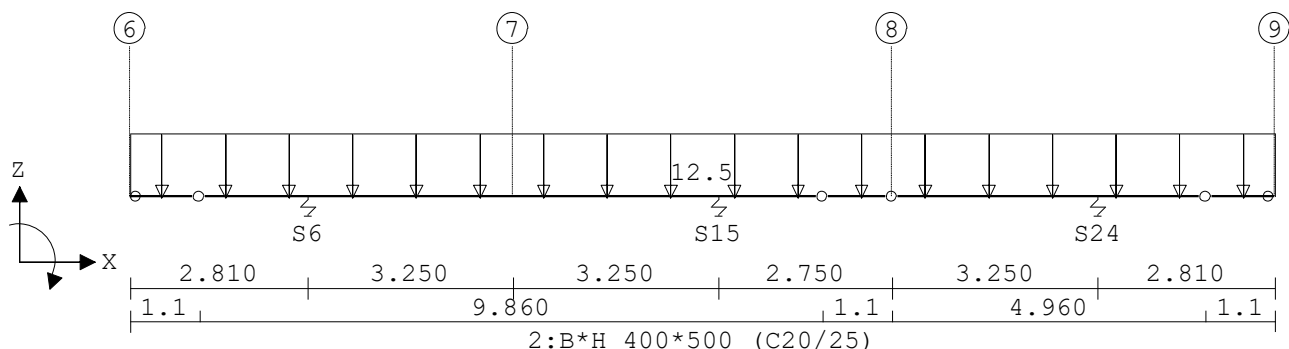
VELDBELASTINGEN

B.G:1 permanent

| Balk | Last Type | q1/p/m | q2 | Afstand | Lengte | Exc. |
|----------|------------|---------|---------|---------|--------|-------|
| Balk 3-B | 1 1:q-last | -14.000 | -14.000 | 0.000 | 2.710 | 0.000 |
| Balk 3-B | 2 1:q-last | -41.000 | -41.000 | 2.710 | 6.700 | 0.000 |
| Balk 3-B | 3 1:q-last | -14.000 | -14.000 | 9.410 | 2.650 | 0.000 |
| Balk 3-B | 4 1:q-last | -41.000 | -41.000 | 12.060 | 3.350 | 0.000 |
| Balk 3-B | 5 1:q-last | -14.000 | -14.000 | 15.410 | 2.710 | 0.000 |

VELDBELASTINGEN

Balk 3-C B.G:1 permanent



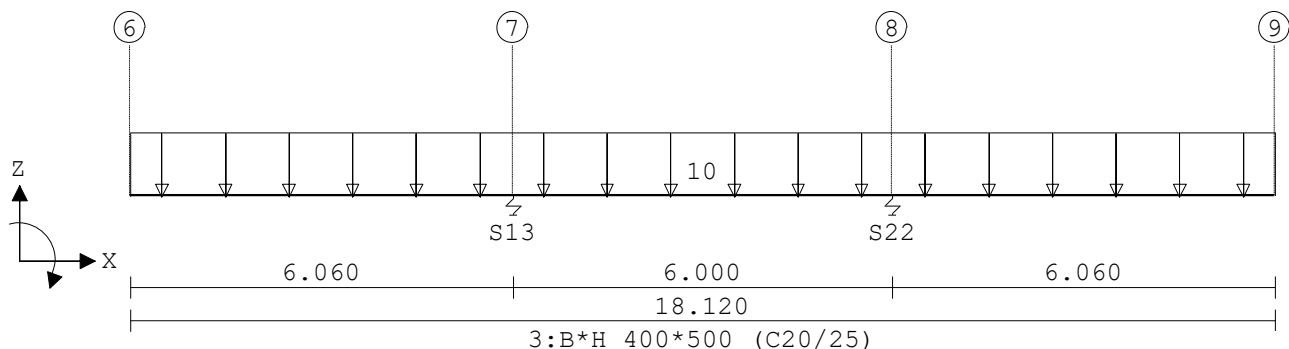
VELDBELASTINGEN

B.G:1 permanent

| Balk | Last Type | q1/p/m | q2 | Afstand | Lengte | Exc. |
|----------|------------|---------|---------|---------|--------|-------|
| Balk 3-C | 1 1:q-last | -12.500 | -12.500 | 0.000 | 18.120 | 0.000 |

VELDBELASTINGEN

Balk 3-D B.G:1 permanent



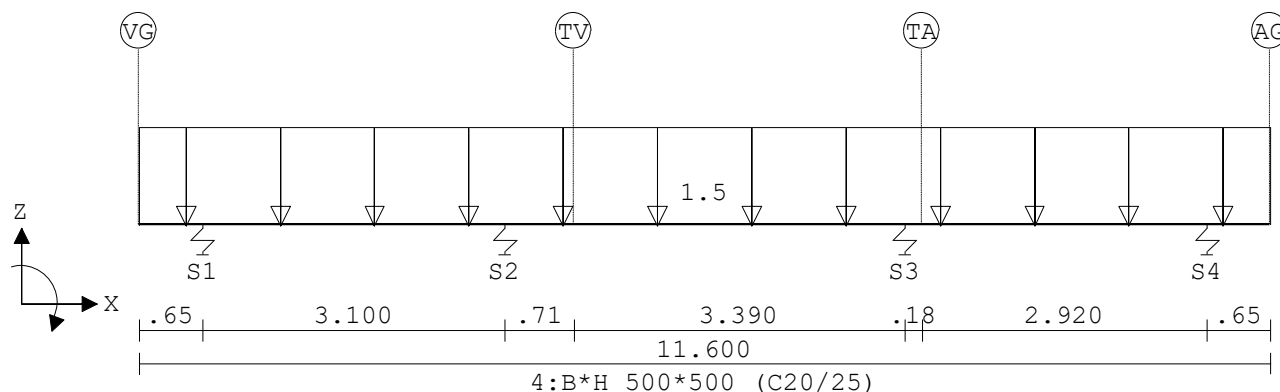
VELDBELASTINGEN

B.G:1 permanent

| Balk | Last Type | q1/p/m | q2 | Afstand | Lengte | Exc. |
|----------|------------|---------|---------|---------|--------|--------|
| Balk 3-D | 1 1:q-last | -10.000 | -10.000 | 0.000 | 18.120 | -0.100 |

VELDBELASTINGEN

Balk 3-6 B.G:2 variabel bg

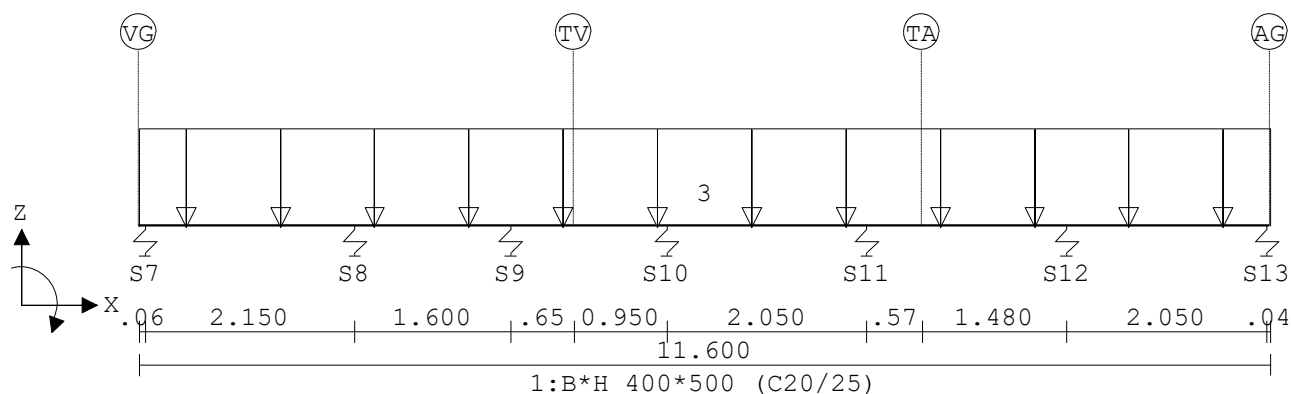

VELDBELASTINGEN

B.G:2 variabel bg

| Balk | Last Type | q1/p/m | q2 | Afstand | Lengte | Exc. |
|----------|------------|--------|--------|---------|--------|-------|
| Balk 3-6 | 1 1:q-last | -1.500 | -1.500 | 0.000 | 11.600 | 0.000 |

VELDBELASTINGEN

Balk 3-7 B.G:2 variabel bg

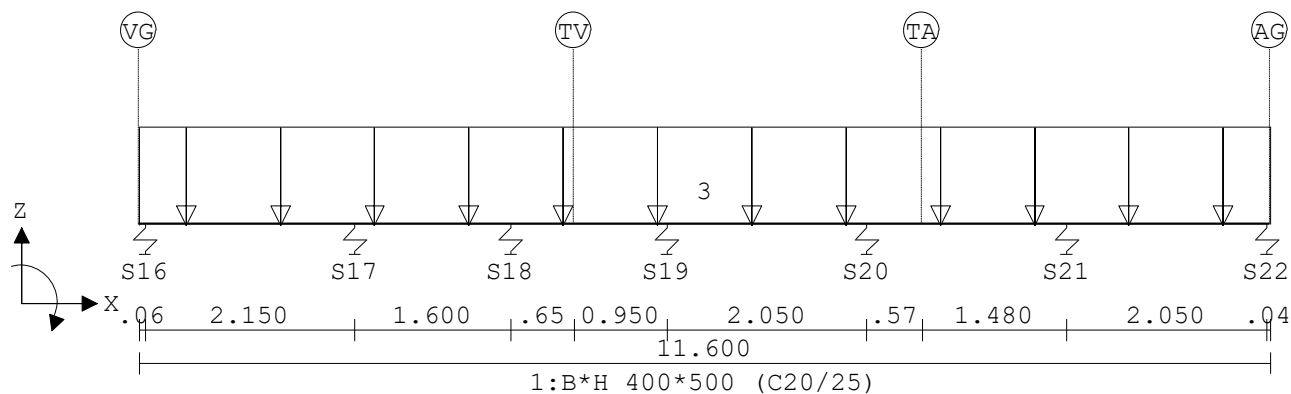

VELDBELASTINGEN

B.G:2 variabel bg

| Balk | Last Type | q1/p/m | q2 | Afstand | Lengte | Exc. |
|----------|------------|--------|--------|---------|--------|-------|
| Balk 3-7 | 1 1:q-last | -3.000 | -3.000 | 0.000 | 11.600 | 0.000 |

VELDBELASTINGEN

Balk 3-8 B.G:2 variabel bg



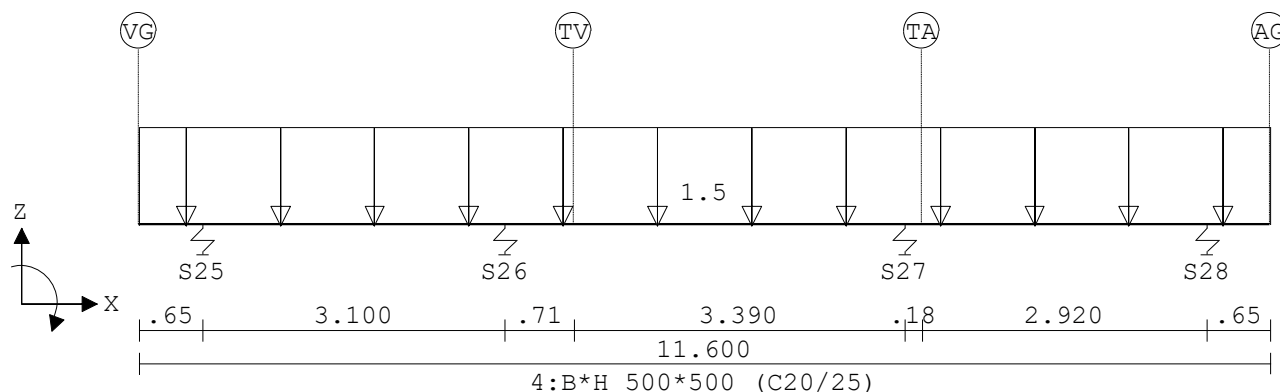
VELDBELASTINGEN

B.G:2 variabel bg

| Balk | Last Type | q1/p/m | q2 | Afstand | Lengte | Exc. |
|----------|------------|--------|--------|---------|--------|-------|
| Balk 3-8 | 1 1:q-last | -3.000 | -3.000 | 0.000 | 11.600 | 0.000 |

VELDBELASTINGEN

Balk 3-9 B.G:2 variabel bg



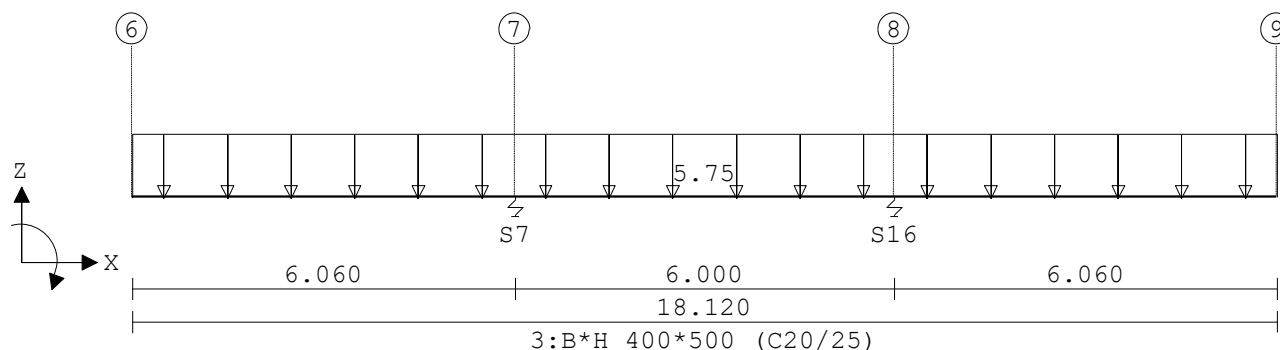
VELDBELASTINGEN

B.G:2 variabel bg

| Balk | Last Type | q1/p/m | q2 | Afstand | Lengte | Exc. |
|----------|------------|--------|--------|---------|--------|-------|
| Balk 3-9 | 1 1:q-last | -1.500 | -1.500 | 0.000 | 11.600 | 0.000 |

VELDBELASTINGEN

Balk 3-A B.G:2 variabel bg



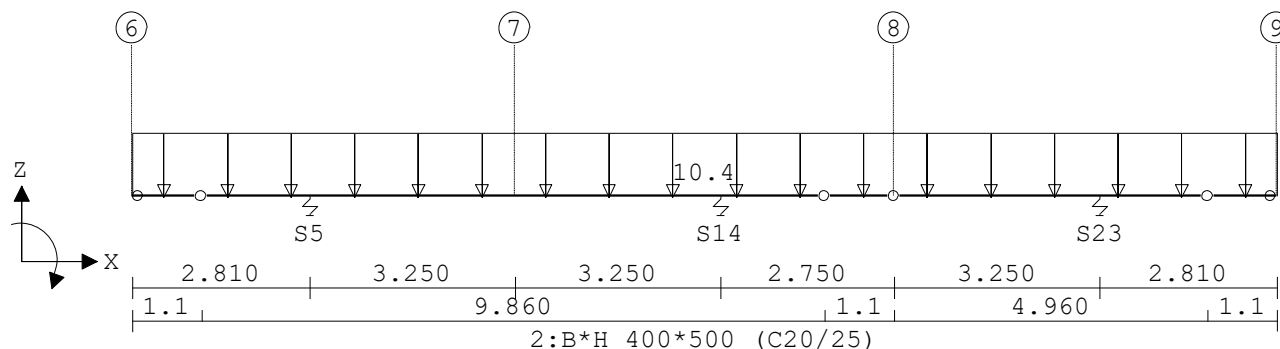
VELDBELASTINGEN

B.G:2 variabel bg

| Balk | Last Type | q1/p/m | q2 | Afstand | Lengte | Exc. |
|----------|------------|--------|--------|---------|--------|-------|
| Balk 3-A | 1 1:q-last | -5.750 | -5.750 | 0.000 | 18.120 | 0.100 |

VELDBELASTINGEN

Balk 3-B B.G:2 variabel bg



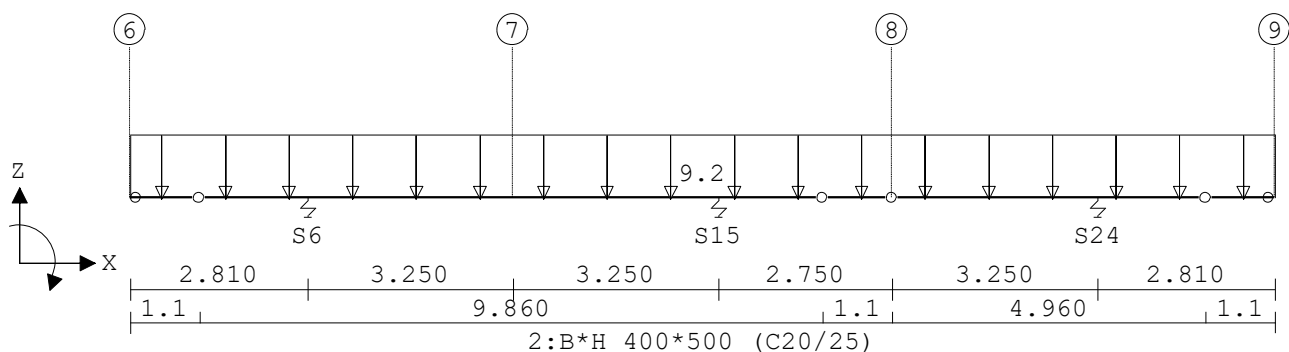
VELDBELASTINGEN

B.G:2 variabel bg

| Balk | Last Type | q1/p/m | q2 | Afstand | Lengte | Exc. |
|----------|------------|---------|---------|---------|--------|-------|
| Balk 3-B | 1 1:q-last | -10.400 | -10.400 | 0.000 | 18.120 | 0.000 |

VELDBELASTINGEN

Balk 3-C B.G:2 variabel bg

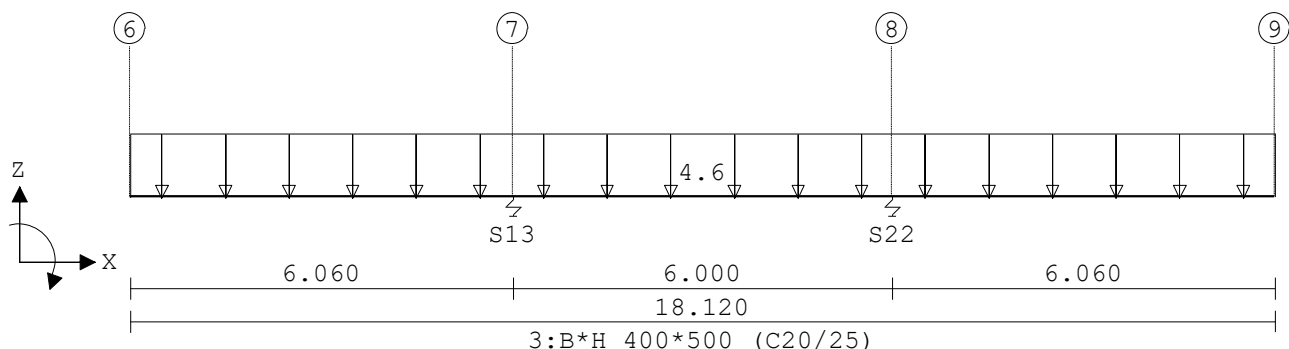

VELDBELASTINGEN

B.G:2 variabel bg

| Balk | Last Type | q1/p/m | q2 | Afstand | Lengte | Exc. |
|----------|------------|--------|--------|---------|--------|-------|
| Balk 3-C | 1 1:q-last | -9.200 | -9.200 | 0.000 | 18.120 | 0.000 |

VELDBELASTINGEN

Balk 3-D B.G:2 variabel bg

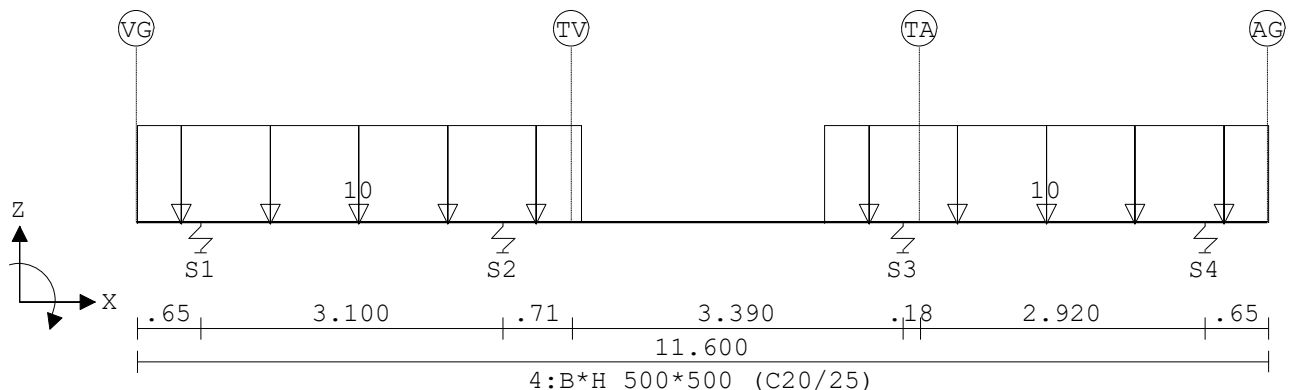

VELDBELASTINGEN

B.G:2 variabel bg

| Balk | Last Type | q1/p/m | q2 | Afstand | Lengte | Exc. |
|----------|------------|--------|--------|---------|--------|--------|
| Balk 3-D | 1 1:q-last | -4.600 | -4.600 | 0.000 | 18.120 | -0.100 |

VELDBELASTINGEN

Balk 3-6 B.G:3 variabel 1e



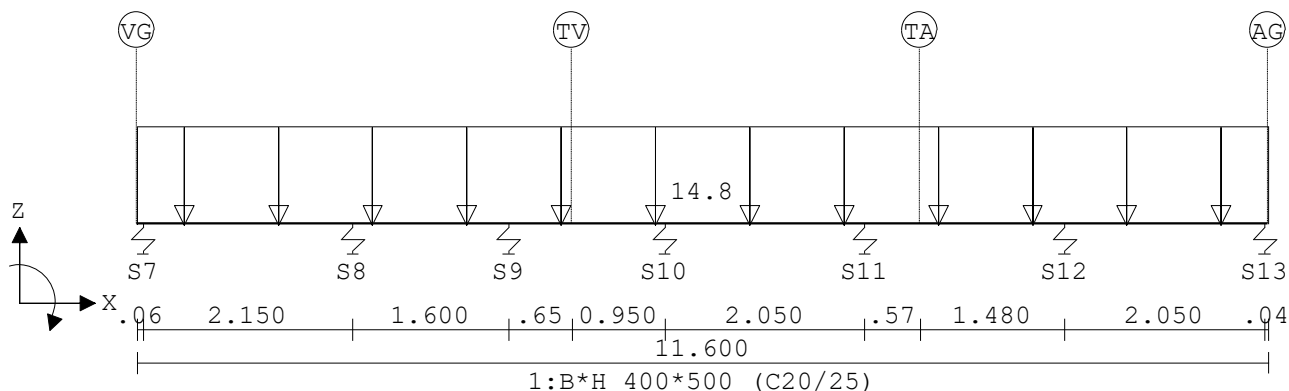
VELDBELASTINGEN

B.G:3 variabel 1e

| Balk | Last | Type | q1/p/m | q2 | Afstand | Lengte | Exc. |
|----------|------|----------|---------|---------|---------|--------|-------|
| Balk 3-6 | 1 | 1:q-last | -10.000 | -10.000 | 0.000 | 4.550 | 0.000 |
| Balk 3-6 | 2 | 1:q-last | -10.000 | -10.000 | 7.050 | 4.550 | 0.000 |

VELDBELASTINGEN

Balk 3-7 B.G:3 variabel 1e

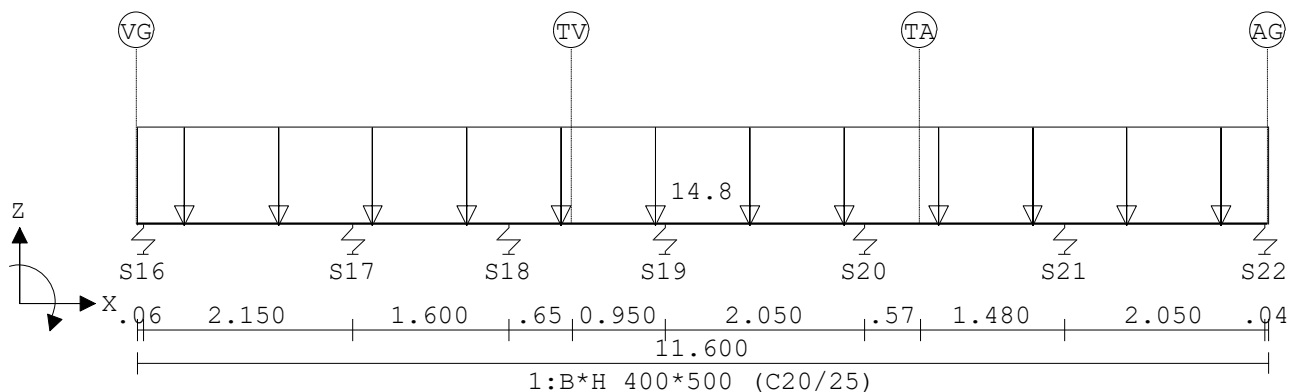

VELDBELASTINGEN

B.G:3 variabel 1e

| Balk | Last | Type | q1/p/m | q2 | Afstand | Lengte | Exc. |
|----------|------|----------|---------|---------|---------|--------|-------|
| Balk 3-7 | 1 | 1:q-last | -14.800 | -14.800 | 0.000 | 11.600 | 0.000 |

VELDBELASTINGEN

Balk 3-8 B.G:3 variabel 1e

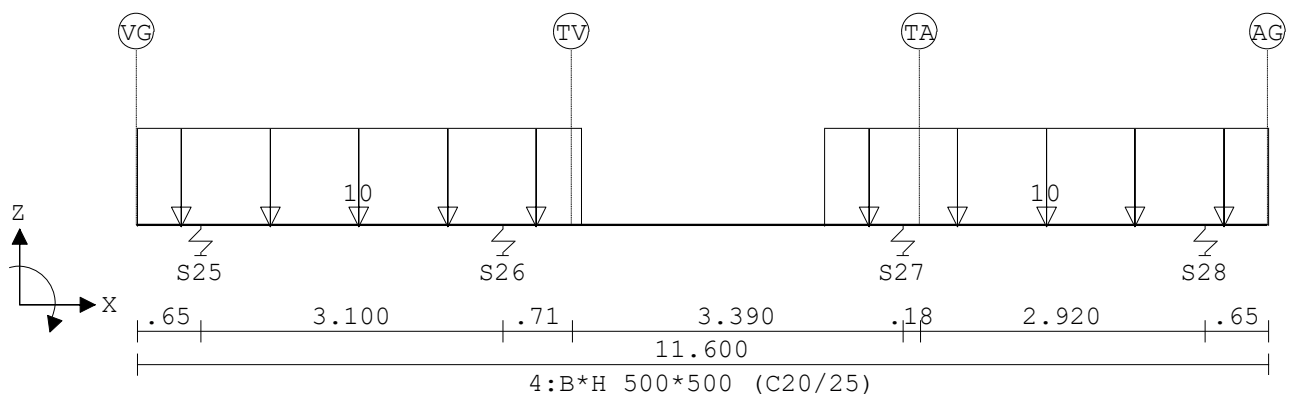

VELDBELASTINGEN

B.G:3 variabel 1e

| Balk | Last | Type | q1/p/m | q2 | Afstand | Lengte | Exc. |
|----------|------|----------|---------|---------|---------|--------|-------|
| Balk 3-8 | 1 | 1:q-last | -14.800 | -14.800 | 0.000 | 11.600 | 0.000 |

VELDBELASTINGEN

Balk 3-9 B.G:3 variabel 1e



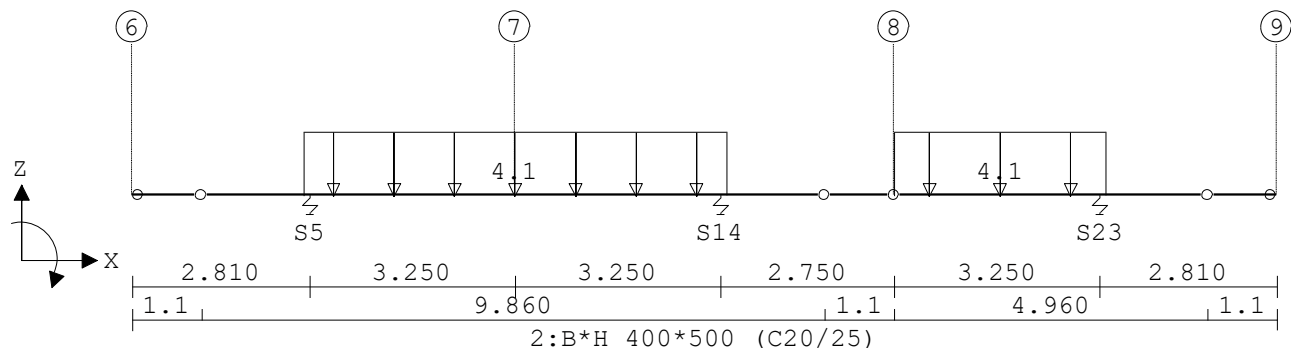
VELDBELASTINGEN

B.G:3 variabel 1e

| Balk | Last | Type | q1/p/m | q2 | Afstand | Lengte | Exc. |
|----------|------|----------|---------|---------|---------|--------|-------|
| Balk 3-9 | 1 | 1:q-last | -10.000 | -10.000 | 0.000 | 4.550 | 0.000 |
| Balk 3-9 | 2 | 1:q-last | -10.000 | -10.000 | 7.050 | 4.550 | 0.000 |

VELDBELASTINGEN

Balk 3-B B.G:3 variabel 1e

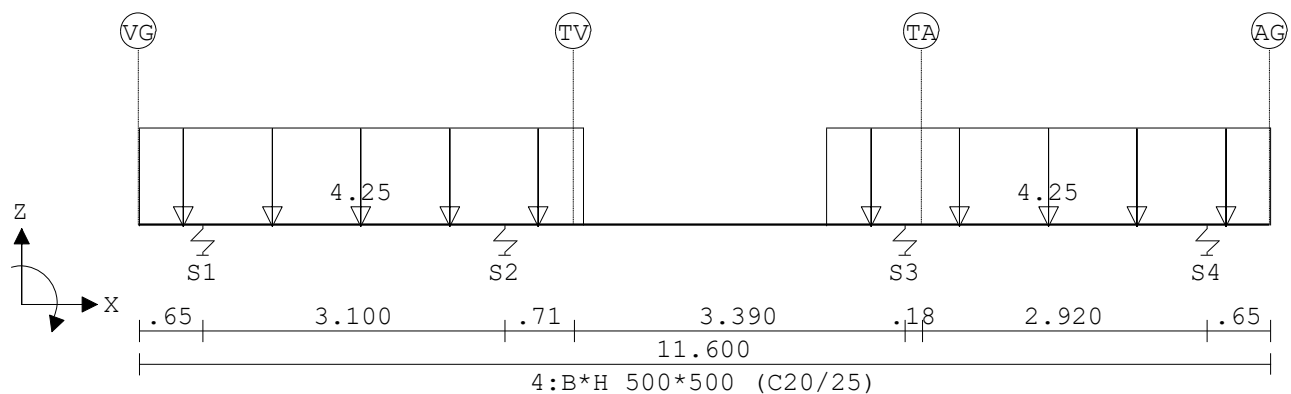

VELDBELASTINGEN

B.G:3 variabel 1e

| Balk | Last | Type | q1/p/m | q2 | Afstand | Lengte | Exc. |
|----------|------|----------|--------|--------|---------|--------|-------|
| Balk 3-B | 1 | 1:q-last | -4.100 | -4.100 | 2.710 | 6.700 | 0.000 |
| Balk 3-B | 2 | 1:q-last | -4.100 | -4.100 | 12.060 | 3.350 | 0.000 |

VELDBELASTINGEN

Balk 3-6 B.G:4 variabel 2e

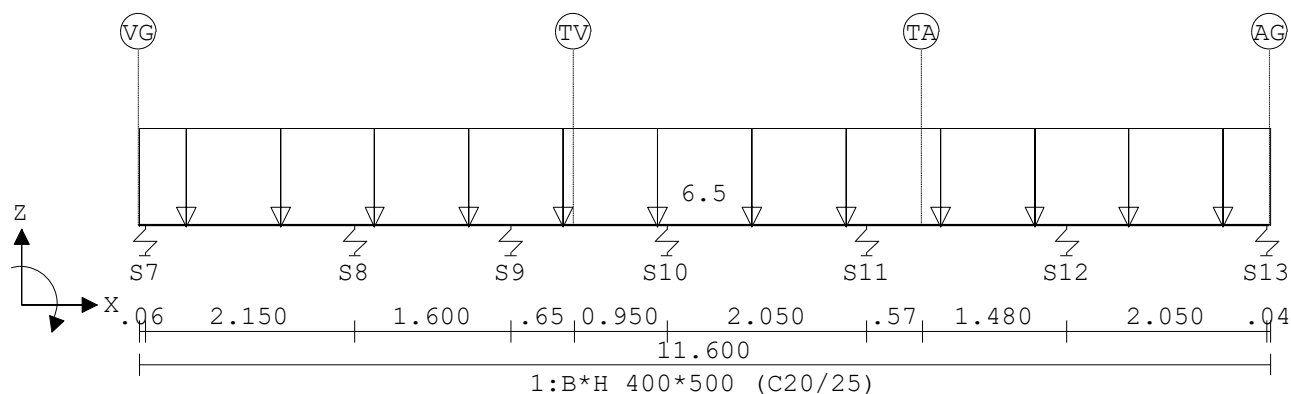

VELDBELASTINGEN

B.G:4 variabel 2e

| Balk | Last | Type | q1/p/m | q2 | Afstand | Lengte | Exc. |
|----------|------|----------|--------|--------|---------|--------|-------|
| Balk 3-6 | 1 | 1:q-last | -4.250 | -4.250 | 0.000 | 4.550 | 0.000 |
| Balk 3-6 | 2 | 1:q-last | -4.250 | -4.250 | 7.050 | 4.550 | 0.000 |

VELDBELASTINGEN

Balk 3-7 B.G:4 variabel 2e



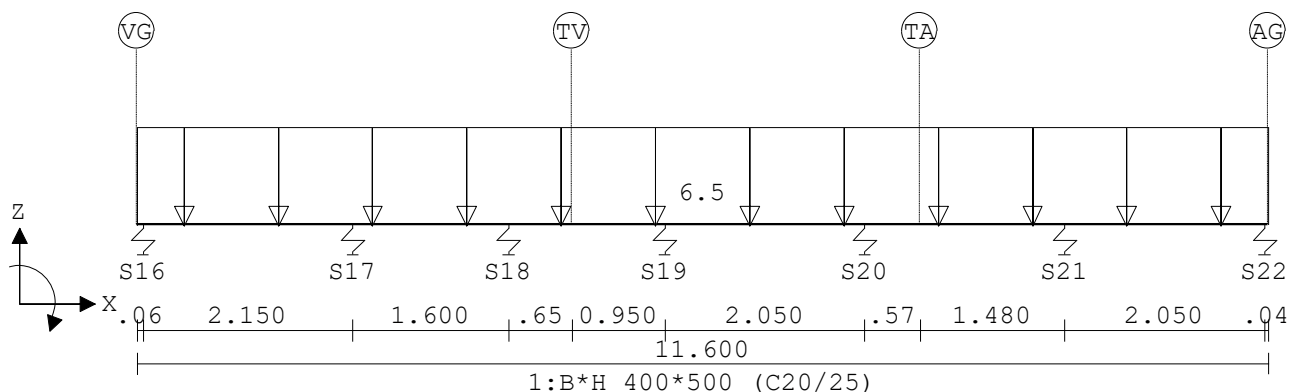
VELDBELASTINGEN

B.G:4 variabel 2e

| Balk | Last Type | q1/p/m | q2 | Afstand | Lengte | Exc. |
|----------|------------|--------|--------|---------|--------|-------|
| Balk 3-7 | 1 1:q-last | -6.500 | -6.500 | 0.000 | 11.600 | 0.000 |

VELDBELASTINGEN

Balk 3-8 B.G:4 variabel 2e



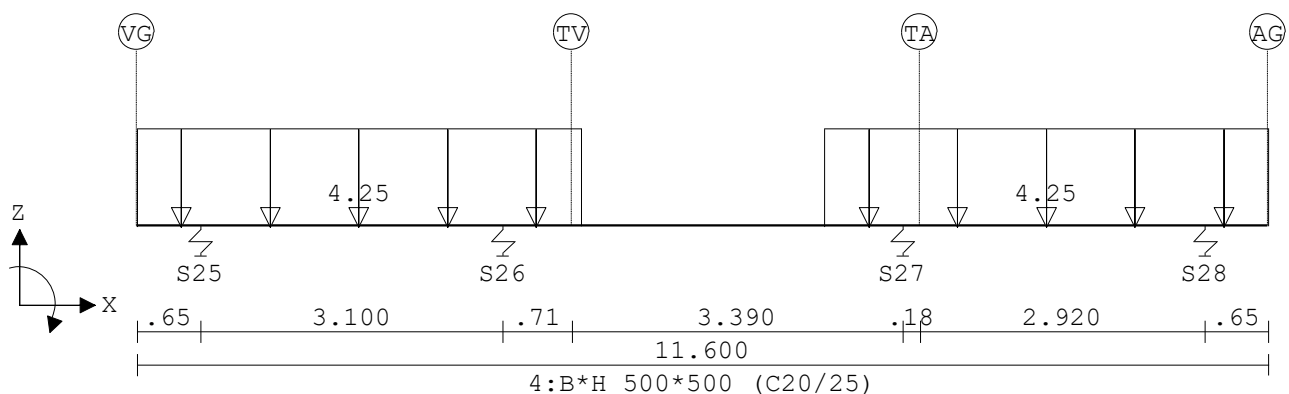
VELDBELASTINGEN

B.G:4 variabel 2e

| Balk | Last Type | q1/p/m | q2 | Afstand | Lengte | Exc. |
|----------|------------|--------|--------|---------|--------|-------|
| Balk 3-8 | 1 1:q-last | -6.500 | -6.500 | 0.000 | 11.600 | 0.000 |

VELDBELASTINGEN

Balk 3-9 B.G:4 variabel 2e



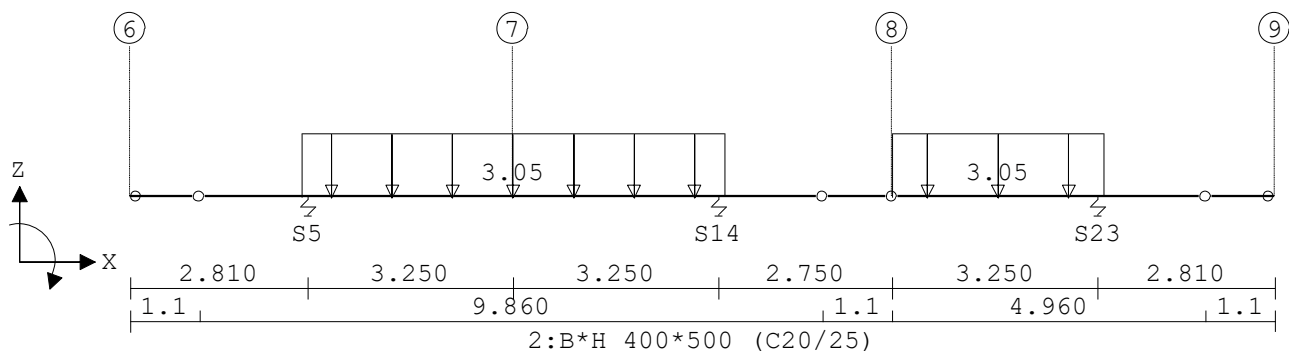
VELDBELASTINGEN

B.G:4 variabel 2e

| Balk | Last Type | q1/p/m | q2 | Afstand | Lengte | Exc. |
|----------|------------|--------|--------|---------|--------|-------|
| Balk 3-9 | 1 1:q-last | -4.250 | -4.250 | 0.000 | 4.550 | 0.000 |
| Balk 3-9 | 2 1:q-last | -4.250 | -4.250 | 7.050 | 4.550 | 0.000 |

VELDBELASTINGEN

Balk 3-B B.G:4 variabel 2e



VELDBELASTINGEN

B.G:4 variabel 2e

| Balk | Last Type | q1/p/m | q2 | Afstand | Lengte | Exc. |
|----------|------------|--------|--------|---------|--------|-------|
| Balk 3-B | 1 1:q-last | -3.050 | -3.050 | 2.710 | 6.700 | 0.000 |
| Balk 3-B | 2 1:q-last | -3.050 | -3.050 | 12.060 | 3.350 | 0.000 |

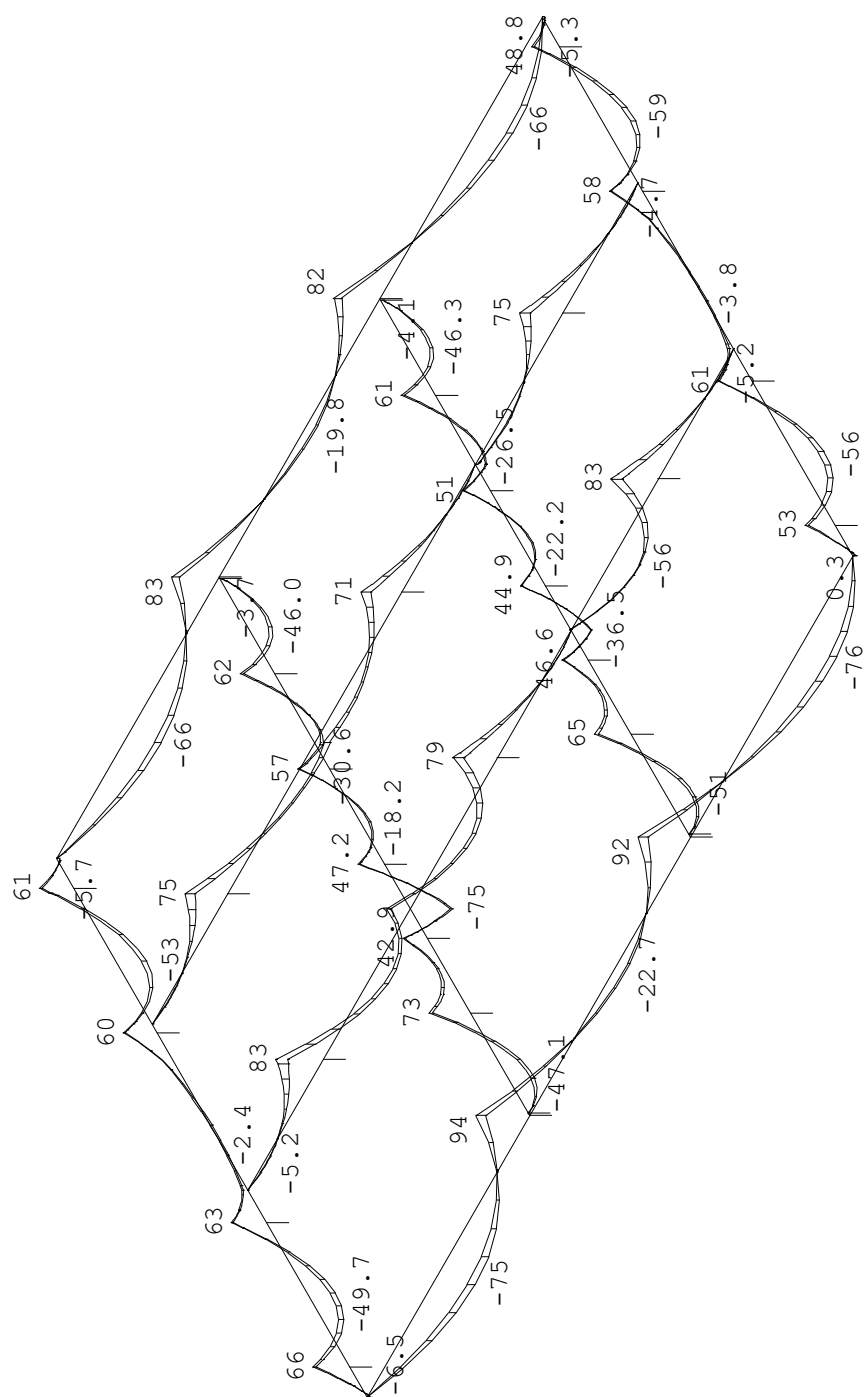
BELASTINGCOMBINATIES

| BC Type | BG Gen. | Factor | BG Gen. | Factor | BG Gen. | Factor | BG Gen. | Factor |
|----------|---------|--------|---------|--------|---------|--------|---------|--------|
| 1 Fund. | 1 Perm | 1.22 | 2 psi0 | 1.35 | 3 psi0 | 1.35 | 4 psi0 | 1.35 |
| 2 Fund. | 1 Perm | 1.08 | 2 Extr | 1.35 | 3 Extr | 1.35 | 4 psi0 | 1.35 |
| 3 Fund. | 1 Perm | 1.08 | 2 Extr | 1.35 | 3 psi0 | 1.35 | 4 Extr | 1.35 |
| 4 Fund. | 1 Perm | 1.08 | 2 psi0 | 1.35 | 3 Extr | 1.35 | 4 Extr | 1.35 |
| 5 Kar. | 1 Perm | 1.00 | 2 Extr | 1.00 | 3 Extr | 1.00 | 4 psi0 | 1.00 |
| 6 Kar. | 1 Perm | 1.00 | 2 Extr | 1.00 | 3 psi0 | 1.00 | 4 Extr | 1.00 |
| 7 Kar. | 1 Perm | 1.00 | 2 psi0 | 1.00 | 3 Extr | 1.00 | 4 Extr | 1.00 |
| 8 Freq. | 1 Perm | 1.00 | | | | | | |
| 9 Freq. | 1 Perm | 1.00 | 2 psi1 | 1.00 | 3 psi1 | 1.00 | 4 psi1 | 1.00 |
| 10 Quas. | 1 Perm | 1.00 | | | | | | |
| 11 Quas. | 1 Perm | 1.00 | 2 psi2 | 1.00 | 3 psi2 | 1.00 | 4 psi2 | 1.00 |
| 12 Blij. | 1 Perm | 1.00 | | | | | | |

OMHULLENDE VAN DE FUNDAMENTELE COMBINATIES

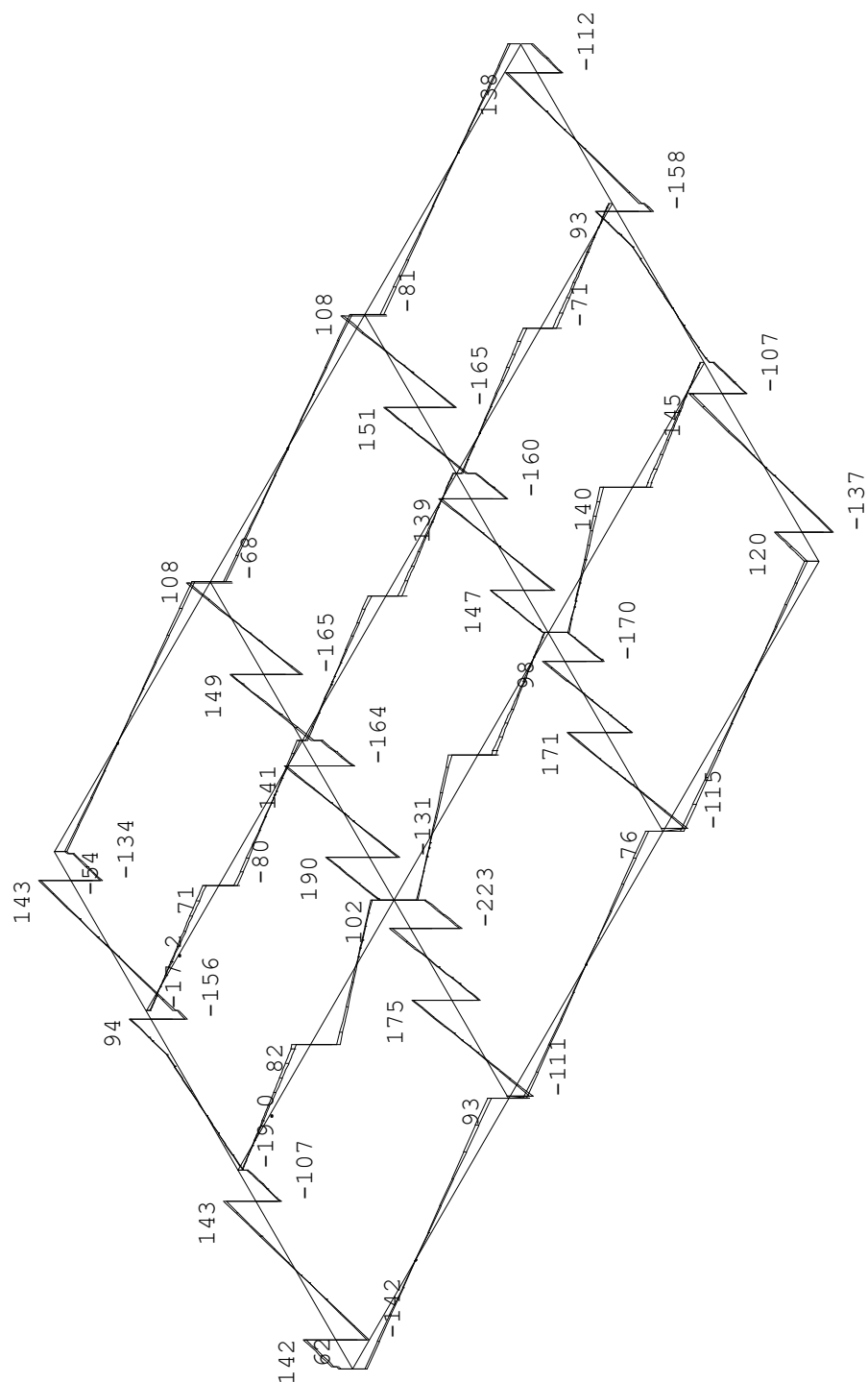
MOMENTEN Fysisch lineair

Fundamentele combinatie



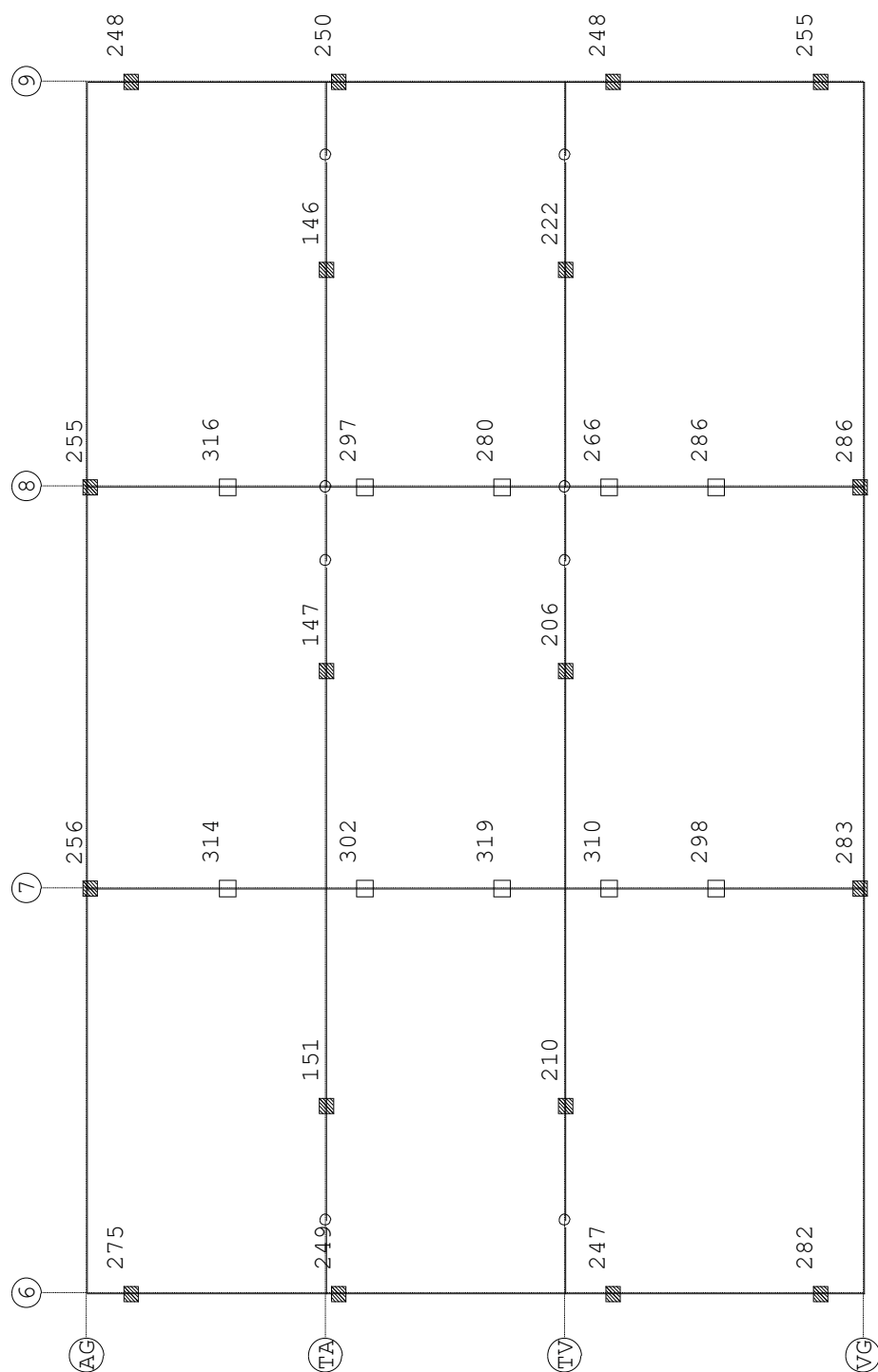
DWARSKRACHTEN Fysisch lineair

Fundamentele combinatie



REACTIES Fysisch lineair

Fundamentele combinatie



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

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

Algemeen

Materiaal : C20/25

Doorsnede

breedte : 400 hoogte : 500 zwaartepunt tov onderkant : 250

Fictieve dikte : 222.2

Betonkwaliteit element : C20/25 Kruipcoëf. : 3.010

Staalkwaliteit hoofdwapening : 500 ϵ_{uk} : 2.50

Staalkwaliteit beugels : 500

Betondekking

Milieu : Boven XC4 Onder XC4

Hoofdwapening : 2de laag 2de laag

Nominale dekking : 35 35

Toegepaste dekking : 43 48

Toegepaste zijdekking : 43

Beugel / Verdeelwapening : 1ste laag 1ste laag

Nominale dekking : 35 35

Toegepaste dekking : 35 40

Toegepaste zijdekking : 35

Wapening

Basiswapening buitenste laag : Boven 4x12 Onder 4x12

H.o.h.afstand 2e laag : 0 0

Beugels

Beugeldiameter : 8

Min. hoek betondrukdiagonaal θ : 21.8 z berekenen via: MEd**PROFIELGEGEVENS Balk****[N] [mm]**

t.b.v. profiel:2 B*H 400*500

Algemeen

Materiaal : C20/25

Doorsnede

breedte : 400 hoogte : 500 zwaartepunt tov onderkant : 250

Fictieve dikte : 222.2

Betonkwaliteit element : C20/25 Kruipcoëf. : 3.010

Staalkwaliteit hoofdwapening : 500 ϵ_{uk} : 2.50

Staalkwaliteit beugels : 500

Betondekking

Milieu : Boven XC4 Onder XC4

Hoofdwapening : 2de laag 2de laag

Nominale dekking : 35 35

Toegepaste dekking : 43 48

Toegepaste zijdekking : 43

Beugel / Verdeelwapening : 1ste laag 1ste laag

Nominale dekking : 35 35

Toegepaste dekking : 35 40

Toegepaste zijdekking : 35

Wapening

Basiswapening buitenste laag : Boven 3x12+1x16 Onder 4x12

H.o.h.afstand 2e laag : 0 0

Beugels

Beugeldiameter : 8

Min. hoek betondrukdiagonaal θ : 21.8 z berekenen via: MEd

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

t.b.v. profiel:3 B*H 400*500

Algemeen

Materiaal : C20/25

Doorsnede

breedte : 400 hoogte : 500 zwaartepunt tov onderkant : 250

Fictieve dikte : 222.2

Betonkwaliteit element : C20/25 Kruipcoëf. : 3.010

Staalkwaliteit hoofwapening : 500 ϵ_{uk} : 2.50

Staalkwaliteit beugels : 500

Betondekking

Milieu : Boven XC4 Onder XC4

Hoofdwapening : 2de laag 2de laag

Nominale dekking : 35 35

Toegepaste dekking : 43 48

Toegepaste zijdekking : 43

Beugel / Verdeelwapening : 1ste laag 1ste laag

Nominale dekking : 35 35

Toegepaste dekking : 35 40

Toegepaste zijdekking : 35

Wapening

Basiswapening buitenste laag : Boven 2x12+2x16 Onder 4x12

H.o.h.afstand 2e laag : 0 0

Beugels

Beugeldiameter : 8

Min. hoek betondrukdiagonaal θ : 21.8 z berekenen via: MEd**PROFIELGEGEVENS Balk****[N] [mm]**

t.b.v. profiel:4 B*H 500*500

Algemeen

Materiaal : C20/25

Doorsnede

breedte : 500 hoogte : 500 zwaartepunt tov onderkant : 250

Fictieve dikte : 250.0

Betonkwaliteit element : C20/25 Kruipcoëf. : 3.010

Staalkwaliteit hoofwapening : 500 ϵ_{uk} : 2.50

Staalkwaliteit beugels : 500

Betondekking

Milieu : Boven XC4 Onder XC4

Hoofdwapening : 2de laag 2de laag

Nominale dekking : 35 35

Toegepaste dekking : 43 48

Toegepaste zijdekking : 43

Beugel / Verdeelwapening : 1ste laag 1ste laag

Nominale dekking : 35 35

Toegepaste dekking : 35 40

Toegepaste zijdekking : 35

Wapening

Basiswapening buitenste laag : Boven 5x12 Onder 4x12

H.o.h.afstand 2e laag : 0 0

Beugels

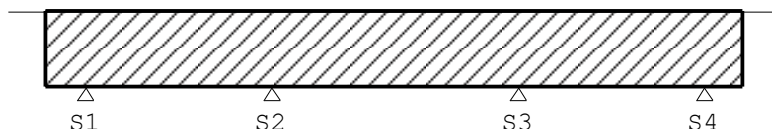
Beugeldiameter : 8

Min. hoek betondrukdiagonaal θ : 21.8 z berekenen via: MEd

Hoofdwapening Fysisch lineair

Balk 3-6

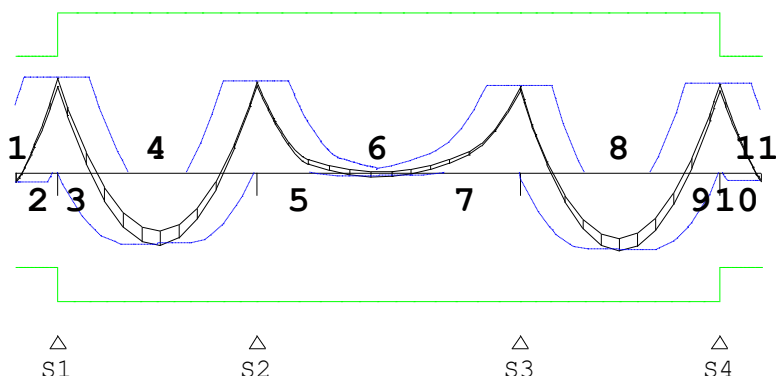
5x12 a



4x12 b

MEd dekkingslijn Fysisch lineair

Balk 3-6



Hoofdwapening

Balk 3-6

| Geb. | Pos. [mm] | M_{Ed} [kNm] | M_{Rd} [kNm] | z | B/O | A_b [mm ²] | A_a [mm ²] | Basiswapening +Bijlegwapening | Opm. |
|------|--------------|-------------------|-------------------|-----|-----|-----------------------------|-----------------------------|----------------------------------|----------|
| 1 | S1-650 | -6.52 | -64.91 | 330 | Ond | 191* | 453 | 4x12 | 2,54,110 |
| 2 | S1-0 | 65.72 | 81.14 | 330 | Bov | 459 | 566 | 5x12 | 2,110 |
| 3 | S1+0 | 65.72 | 110.80 | 414 | Bov | 331 | 566 | 5x12 | |
| 4 | S1+1544 | -49.67 | -88.57 | 391 | Ond | 257* | 453 | 4x12 | 1 |
| 5 | S2+0 | 62.87 | 110.80 | 414 | Bov | 316 | 566 | 5x12 | |
| 6 | S2+1881 | -2.40 | -88.57 | 391 | Ond | 191* | 453 | 4x12 | 54 |
| 7 | S3+0 | 59.94 | 110.80 | 414 | Bov | 301 | 566 | 5x12 | |
| 8 | S3+1550 | -53.47 | -88.57 | 391 | Ond | 271 | 453 | 4x12 | |
| 9 | S4-0 | 61.43 | 110.80 | 414 | Bov | 309 | 566 | 5x12 | |
| 10 | S4+0 | 61.43 | 81.14 | 330 | Bov | 429 | 566 | 5x12 | 2,110 |
| 11 | S4+650 | -5.67 | -64.91 | 330 | Ond | 191* | 453 | 4x12 | 2,54,110 |

Opmerkingen

- [1] * = Eisen met betrekking tot minimum wapening zijn toegepast, zie nationale bijlage art. 9.2.1.1(1).
- [2] Benodigde wapening en inwendige hefboomsarm zijn bepaald volgens gedrongen ligger detaillering, zie nationale bijlage art. 6.1(10).
- [54] * = Eisen met betrekking tot minimum wapening ten behoeve van gecontroleerde scheurvorming zijn toegepast volgens art. 7.3.2.
- [110] Art. 9.7 (1), (2): Een orthogonaal wapeningsnet dient toegepast te worden aan iedere zijde van de gedrongen liggers:**
Profiel 4 - B×H 500×500: 500 mm²/m aan elke zijde en in elke richting met een maximaal hoh 300 mm.

Scheurvorming volgens artikel 7.3.4

Balk 3-6

| Geb. | Pos. [mm] | Zijde | $M_{E, \text{freq}}$ [kNm] | $S_{r, \text{max}}$ [mm] | $\epsilon_{sm} - \epsilon_{cm}$ [%] | w_k [mm] | k_x | w_{max} [mm] | U.C. | Opm. |
|------|--------------|-------|-------------------------------|-----------------------------|--|---------------|-------|-------------------|------|------|
| 1 | S1-650 | Bov | 38.13 | 367 | 0.476 | 0.175 | 1.00 | 0.300 | 0.58 | |
| 1 | S1-461 | Bov | 53.51 | 367 | 0.668 | 0.245 | 1.00 | 0.300 | 0.82 | |
| 1 | S1-650 | Ond | -4.73 | 408 | 0.074 | 0.030 | 1.14 | 0.343 | 0.09 | |
| 1 | S1-179 | Ond | -4.73 | 408 | 0.074 | 0.030 | 1.14 | 0.343 | 0.09 | |
| 2 | S1+300 | Bov | 53.51 | 367 | 0.668 | 0.245 | 1.00 | 0.300 | 0.82 | |
| 2 | S2-284 | Bov | 51.76 | 367 | 0.646 | 0.237 | 1.00 | 0.300 | 0.79 | |
| 2 | S1+1285 | Ond | -37.00 | 408 | 0.581 | 0.237 | 1.14 | 0.343 | 0.69 | |
| 2 | S2-1036 | Ond | -37.00 | 408 | 0.581 | 0.237 | 1.14 | 0.343 | 0.69 | |
| 3 | S2+382 | Bov | 51.76 | 367 | 0.646 | 0.237 | 1.00 | 0.300 | 0.79 | |
| 3 | S3-365 | Bov | 49.74 | 367 | 0.621 | 0.228 | 1.00 | 0.300 | 0.76 | |
| 3 | S2+1600 | Ond | -1.38 | 408 | 0.022 | 0.009 | 1.14 | 0.343 | 0.03 | |
| 3 | S3-1658 | Ond | -1.38 | 408 | 0.022 | 0.009 | 1.14 | 0.343 | 0.03 | |
| 4 | S3+500 | Bov | 49.74 | 367 | 0.621 | 0.228 | 1.00 | 0.300 | 0.76 | |
| 4 | S4-273 | Bov | 50.69 | 367 | 0.633 | 0.232 | 1.00 | 0.300 | 0.77 | |
| 4 | S3+1550 | Ond | -40.52 | 408 | 0.636 | 0.259 | 1.14 | 0.343 | 0.76 | |
| 5 | S4+462 | Bov | 50.69 | 367 | 0.633 | 0.232 | 1.00 | 0.300 | 0.77 | |
| 5 | S4+192 | Ond | -4.18 | 408 | 0.066 | 0.027 | 1.14 | 0.343 | 0.08 | |
| 5 | S4+650 | Ond | -4.18 | 408 | 0.066 | 0.027 | 1.14 | 0.343 | 0.08 | |

Verloop hoofdwapening

Balk 3-6

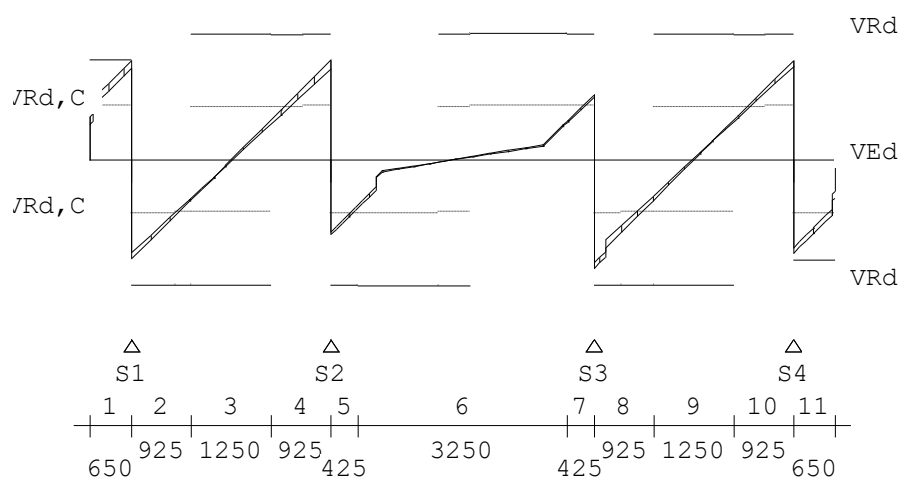
| Merk | B/O | Wapening | Vanaf [mm] | Tot [mm] | Lengte [mm] | $L_{bd, \text{begin}}$ [mm] | $L_{bd, \text{eind}}$ [mm] |
|------|-------|----------|---------------|-------------|----------------|--------------------------------|-------------------------------|
| a | Boven | 5x12 | S1-1149 | S4+1121 | 12570 | 499 | 471 |
| b | Onder | 4x12 | S1-770 | S4+770 | 11840 | 120 | 120 |

Opmerkingen

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

DWARSKRACHTEN Fysisch lineair

Balk 3-6 Fundamentele combinatie



Wring- en dwarskrachtwapening

Balk 3-6

| Geb. | Vanaf | Tot | Beugels | Lengte | <Wringing> | <Dwarskr.> | | | | | |
|------|--------|--------|---------|--------|--|-----------------------------------|---------------------------------|---------------------------------|------------------|-------------------|----------|
| | [mm] | [mm] | | [mm] | $A_{l\text{angs}}$ [mm ²] | A_{bg1} [mm ² /m] | A_{bg1} [mm ²] | A_{opg} [mm ²] | V_{Ed} [kN] | T_{Ed} [kNm] | Opm. |
| 1 | S1-650 | S1+0 | Ø8-250 | 650 | 9 | 1 | 395 | 0 | 141.8 | 0 | 6,59,109 |
| 2 | S1+0 | S1+925 | Ø8-250 | 925 | 9 | 1 | 358 | 0 | 142.0 | 0 | 6 |
| 3 | S1+925 | S2-925 | Ø8-250 | 1250 | 0 | 0 | 358 | 0 | 57.8 | 0 | |
| 4 | S2-925 | S2+0 | Ø8-250 | 925 | 9 | 1 | 358 | 0 | 143.1 | 0 | 6 |
| 5 | S2+0 | S2+425 | Ø8-250 | 425 | 9 | 1 | 358 | 0 | 107.2 | 0 | 6 |
| 6 | S2+425 | S3-425 | Ø8-250 | 3250 | 0 | 0 | 358 | 0 | 68.9 | 0 | |
| 7 | S3-425 | S3+0 | Ø8-250 | 425 | 9 | 1 | 358 | 0 | 93.3 | 0 | 6 |
| 8 | S3+0 | S3+925 | Ø8-250 | 925 | 9 | 1 | 358 | 0 | 155.7 | 0 | 6 |
| 9 | S3+925 | S4-925 | Ø8-250 | 1250 | 0 | 0 | 358 | 0 | 57.4 | 0 | |
| 10 | S4-925 | S4+0 | Ø8-250 | 925 | 9 | 1 | 358 | 0 | 142.5 | 0 | 6 |
| 11 | S4+0 | S4+650 | Ø8-250 | 650 | 9 | 1 | 373 | 0 | 133.9 | 0 | 6,59,109 |

Opmerkingen

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

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

[109] Bij de berekening van de beugels is geen rekening gehouden met de detailleringsregels van art 9.7 voor de gedrongen liggers.

Wring- en dwarskrachten

Balk 3-6

| Geb. | Vanaf | Tot | θ | V_{Rd} | V_{Ed} | $V_{Rd,C}$ | $V_{Rd,Max}$ | T_{Ed} | $T_{Rd,C}$ | $T_{Rd,Max}$ | V_{opg} | Opm. |
|------|--------|--------|----------|----------|----------|------------|--------------|----------|------------|--------------|-----------|----------|
| | [mm] | [mm] | [°] | [kN] | | | | | | | | |
| 1 | S1-650 | S1+0 | 21.8 | 144 | 142 | 77 | 419 | 0 | 36 | 89 | 0 | 6,59,109 |
| 2 | S1+0 | S1+925 | 21.8 | 180 | 142 | 77 | 524 | 0 | 36 | 89 | 0 | 6 |
| 3 | S1+925 | S2-925 | 21.8 | 180 | 58 | 75 | 523 | 0 | 36 | 89 | 0 | |
| 4 | S2-925 | S2+0 | 21.8 | 180 | 143 | 77 | 525 | 0 | 36 | 89 | 0 | 6 |
| 5 | S2+0 | S2+425 | 21.8 | 180 | 107 | 77 | 524 | 0 | 36 | 89 | 0 | 6 |
| 6 | S2+425 | S3-425 | 21.8 | 181 | 69 | 77 | 525 | 0 | 36 | 89 | 0 | |
| 7 | S3-425 | S3+0 | 21.8 | 180 | 93 | 77 | 525 | 0 | 36 | 89 | 0 | 6 |
| 8 | S3+0 | S3+925 | 21.8 | 180 | 156 | 77 | 524 | 0 | 36 | 89 | 0 | 6 |
| 9 | S3+925 | S4-925 | 21.8 | 180 | 57 | 75 | 523 | 0 | 36 | 89 | 0 | |
| 10 | S4-925 | S4+0 | 21.8 | 180 | 142 | 77 | 525 | 0 | 36 | 89 | 0 | 6 |
| 11 | S4+0 | S4+650 | 21.8 | 144 | 134 | 77 | 419 | 0 | 36 | 89 | 0 | 6,59,109 |

Opmerkingen

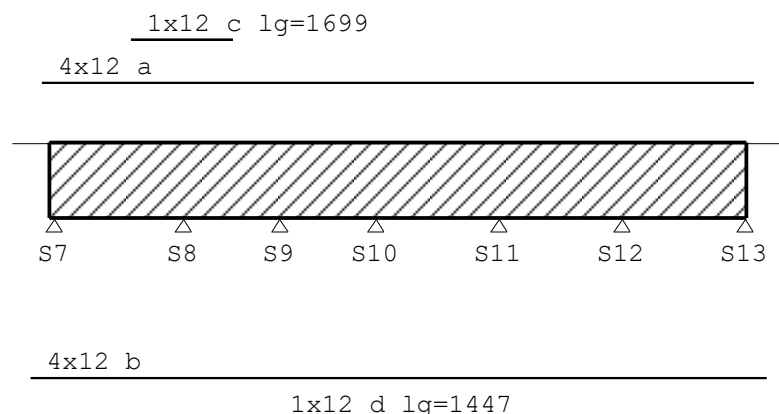
[6] 9.2.2 (4) 50% van de dwarskrachtwapening moet uit beugels bestaan.

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

[109] Bij de berekening van de beugels is geen rekening gehouden met de detailleringsregels van art 9.7 voor de gedrongen liggers.

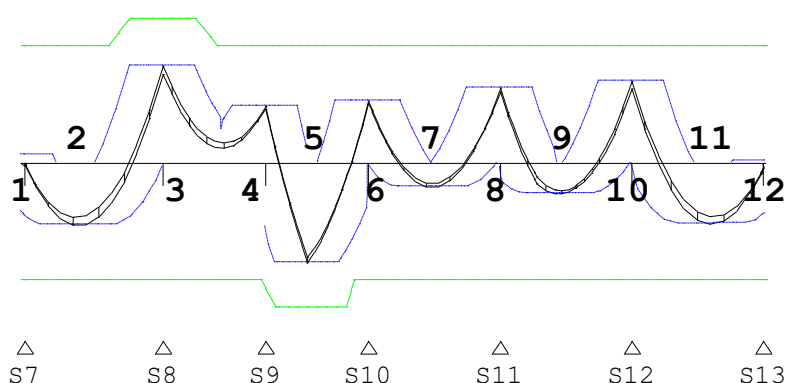
Hoofdwapening Fysisch lineair

Balk 3-7



MEd dekkingslijn Fysisch lineair

Balk 3-7



Hoofdwapening

Balk 3-7

| Geb. | Pos. [mm] | M_{Ed} [kNm] | M_{Rd} [kNm] | z [mm] | B/O | A_b [mm ²] | A_a [mm ²] | Basiswapening +Bijlegwapening | Opm. |
|------|--------------|-------------------|-------------------|-----------|-----|-----------------------------|-----------------------------|----------------------------------|------|
| 1 | S7-60 | 6.62 | 88.65 | 412 | Bov | 165* | 453 | 4x12 | 54 |
| 2 | S7+838 | -47.06 | -87.45 | 425 | Ond | 239 | 453 | 4x12 | |
| 3 | S8+0 | 73.12 | 109.35 | 425 | Bov | 372 | 453 | 4x12 | |
| | | | | | Bov | | 114 | +1x12 | |
| 4 | S9+0 | 42.89 | 88.66 | 411 | Bov | 215 | 453 | 4x12 | 54 |
| 5 | S9+650 | -74.89 | -108.08 | 420 | Ond | 385 | 453 | 4x12 | |
| | | | | | Ond | | 114 | +1x12 | |
| 6 | S10+0 | 47.21 | 88.65 | 412 | Bov | 237 | 453 | 4x12 | 54 |
| 7 | S10+986 | -18.23 | -87.45 | 425 | Ond | 165* | 453 | 4x12 | |
| 8 | S11+0 | 56.99 | 88.65 | 412 | Bov | 288 | 453 | 4x12 | |
| 9 | S11+908 | -22.99 | -87.45 | 425 | Ond | 165* | 453 | 4x12 | 54 |
| 10 | S12+0 | 61.81 | 88.65 | 412 | Bov | 312 | 453 | 4x12 | |
| 11 | S13-809 | -46.00 | -87.45 | 425 | Ond | 234 | 453 | 4x12 | |
| 12 | S13+40 | 1.97 | 88.65 | 412 | Bov | 165* | 453 | 4x12 | 54 |

Opmerkingen

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

Scheurvorming volgens artikel 7.3.4

Balk 3-7

| Geb. | Pos. [mm] | Zijde | $M_{E, freq}$ [kNm] | $S_{r, max}$ [mm] | $\epsilon_{sm} - \epsilon_{cm}$ [%] | w_k [mm] | k_x | w_{max} [mm] | U.C. | Opm. |
|------|--------------|-------|------------------------|----------------------|--|---------------|-------|-------------------|------|------|
| 1 | S7-60 | Bov | 5.14 | 367 | 0.080 | 0.029 | 1.00 | 0.300 | 0.10 | |
| 2 | S7+293 | Bov | 5.14 | 367 | 0.080 | 0.029 | 1.00 | 0.300 | 0.10 | |
| 2 | S8-507 | Bov | 57.61 | 322 | 0.793 | 0.256 | 1.00 | 0.300 | 0.85 | |
| 2 | S7+328 | Ond | -36.67 | 406 | 0.579 | 0.235 | 1.14 | 0.343 | 0.69 | |
| 2 | S7+838 | Ond | -36.67 | 406 | 0.579 | 0.235 | 1.14 | 0.343 | 0.69 | |
| 2 | S8-849 | Ond | -36.66 | 406 | 0.579 | 0.235 | 1.14 | 0.343 | 0.69 | |
| 3 | S8+507 | Bov | 57.61 | 322 | 0.793 | 0.256 | 1.00 | 0.300 | 0.85 | |
| 3 | S9-500 | Bov | 34.81 | 367 | 0.543 | 0.199 | 1.00 | 0.300 | 0.66 | |
| 4 | S9+207 | Bov | 34.81 | 367 | 0.543 | 0.200 | 1.00 | 0.300 | 0.67 | |
| 4 | S9+403 | Bov | 34.81 | 367 | 0.543 | 0.200 | 1.00 | 0.300 | 0.67 | |
| 4 | S10-413 | Bov | 37.97 | 367 | 0.593 | 0.218 | 1.00 | 0.300 | 0.73 | |
| 4 | S9+148 | Ond | -59.36 | 358 | 0.805 | 0.288 | 1.14 | 0.343 | 0.84 | |
| 4 | S10-493 | Ond | -59.36 | 358 | 0.805 | 0.288 | 1.14 | 0.343 | 0.84 | |
| 4 | S10-221 | Ond | -45.13 | 405 | 0.708 | 0.287 | 1.14 | 0.343 | 0.84 | |
| 5 | S10+0 | Bov | 37.97 | 367 | 0.592 | 0.218 | 1.00 | 0.300 | 0.73 | |
| 5 | S10+493 | Bov | 37.97 | 367 | 0.592 | 0.218 | 1.00 | 0.300 | 0.73 | |
| 5 | S11-376 | Bov | 46.25 | 367 | 0.722 | 0.265 | 1.00 | 0.300 | 0.88 | |
| 5 | S10+637 | Ond | -14.25 | 406 | 0.225 | 0.091 | 1.14 | 0.343 | 0.27 | |
| 5 | S10+986 | Ond | -14.25 | 406 | 0.225 | 0.091 | 1.14 | 0.343 | 0.27 | |
| 5 | S11-715 | Ond | -14.25 | 406 | 0.225 | 0.091 | 1.14 | 0.343 | 0.27 | |
| 6 | S11+452 | Bov | 46.25 | 367 | 0.722 | 0.265 | 1.00 | 0.300 | 0.88 | |
| 6 | S12-373 | Bov | 48.74 | 367 | 0.761 | 0.279 | 1.00 | 0.300 | 0.93 | |
| 6 | S11+411 | Ond | -17.29 | 406 | 0.273 | 0.111 | 1.14 | 0.343 | 0.32 | |
| 6 | S11+908 | Ond | -17.28 | 406 | 0.273 | 0.111 | 1.14 | 0.343 | 0.32 | |
| 6 | S12-672 | Ond | -17.27 | 406 | 0.273 | 0.111 | 1.14 | 0.343 | 0.32 | |
| 7 | S12+469 | Bov | 48.74 | 367 | 0.761 | 0.279 | 1.00 | 0.300 | 0.93 | |
| 7 | S13-469 | Bov | 1.56 | 367 | 0.024 | 0.009 | 1.00 | 0.300 | 0.03 | |
| 7 | S12+742 | Ond | -35.95 | 406 | 0.567 | 0.231 | 1.14 | 0.343 | 0.67 | |
| 7 | S13-809 | Ond | -35.95 | 406 | 0.567 | 0.231 | 1.14 | 0.343 | 0.67 | |
| 7 | S13-342 | Ond | -35.93 | 406 | 0.567 | 0.231 | 1.14 | 0.343 | 0.67 | |
| 8 | S13+40 | Bov | 1.56 | 367 | 0.024 | 0.009 | 1.00 | 0.300 | 0.03 | |

Verloop hoofdwapening

Balk 3-7

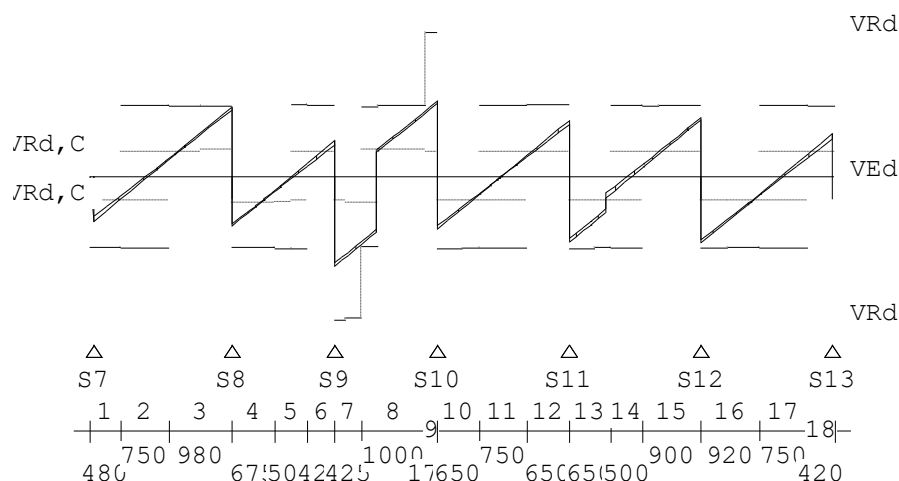
| Merk | B/O | Wapening | Vanaf [mm] | Tot [mm] | Lengte [mm] | $L_{bd, begin}$ [mm] | $L_{bd, eind}$ [mm] |
|------|-------|----------|---------------|-------------|----------------|-------------------------|------------------------|
| a | Boven | 4x12 | S7-180 | S13+160 | 11840 | 120 | 120 |
| c | Boven | 1x12 | S8-849 | S9-751 | 1699 | 342 | 342 |
| b | Onder | 4x12 | S7-379 | S13+373 | 12252 | 319 | 333 |
| d | Onder | 1x12 | S9-68 | S10-221 | 1447 | 216 | 120 |

Opmerkingen

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

DWARSKRACHTEN Fysisch lineair

Balk 3-7 Fundamentele combinatie



Wring- en dwarskrachtwapening

Balk 3-7

| Geb. Vanaf | Tot | Beugels | Lengte | <Wringing> | | <Dwarskr.> | | | | | |
|------------|---------|---------|--------|--------------------|----------------------|--------------------|--------------------|----------|----------|------|--|
| [mm] | [mm] | | [mm] | $A_{l\text{angs}}$ | $A_{b\text{gl}}$ | $A_{b\text{gl}}$ | $A_{o\text{pg}}$ | V_{Ed} | T_{Ed} | Opm. | |
| | | | | [mm ²] | [mm ² /m] | [mm ²] | [mm ²] | [kN] | [kNm] | | |
| 1 S7-60 | S7+420 | Ø8-250 | 480 | 41 | 5 | 286 | 0 | 119.1 | 1 | 6 | |
| 2 S7+420 | S8-980 | Ø8-250 | 750 | 0 | 0 | 286 | 0 | 55.2 | 1 | | |
| 3 S8-980 | S8+0 | Ø8-250 | 980 | 41 | 5 | 391 | 0 | 174.1 | 1 | 6 | |
| 4 S8+0 | S8+675 | Ø8-250 | 675 | 41 | 5 | 286 | 0 | 122.6 | 1 | 6 | |
| 5 S8+675 | S9-425 | Ø8-250 | 500 | 0 | 0 | 286 | 0 | 34.8 | 1 | | |
| 6 S9-425 | S9+0 | Ø8-250 | 425 | 41 | 5 | 286 | 0 | 90.3 | 1 | 6 | |
| 7 S9+0 | S9+425 | Ø8-125 | 425 | 41 | 5 | 497 | 0 | 223.1 | 1 | 6 | |
| 8 S9+425 | S10-175 | Ø8-250 | 1000 | 41 | 5 | 381 | 0 | 167.8 | 1 | 6 | |
| 9 S10-175 | S10+0 | Ø8-125 | 175 | 0 | 0 | 423 | 0 | 190.0 | 0 | 6 | |
| 10 S10+0 | S10+650 | Ø8-250 | 650 | 0 | 0 | 291 | 0 | 130.8 | 0 | 6 | |
| 11 S10+650 | S11-650 | Ø8-250 | 750 | 0 | 0 | 286 | 0 | 54.6 | 0 | | |
| 12 S11-650 | S11+0 | Ø8-250 | 650 | 0 | 0 | 314 | 0 | 141.0 | 0 | 6 | |
| 13 S11+0 | S11+650 | Ø8-250 | 650 | 46 | 5 | 364 | 0 | 163.2 | 1 | 6 | |
| 14 S11+650 | S12-900 | Ø8-250 | 500 | 0 | 0 | 286 | 0 | 42.3 | 1 | | |
| 15 S12-900 | S12+0 | Ø8-250 | 900 | 46 | 5 | 330 | 0 | 148.2 | 1 | 6 | |
| 16 S12+0 | S12+920 | Ø8-250 | 920 | 46 | 5 | 368 | 0 | 165.0 | 1 | 6 | |
| 17 S12+920 | S13-380 | Ø8-250 | 750 | 0 | 0 | 286 | 0 | 56.7 | 1 | | |
| 18 S13-380 | S13+40 | Ø8-250 | 420 | 46 | 5 | 286 | 0 | 112.6 | 1 | 6 | |

Opmerkingen

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

Wring- en dwarskrachten

Balk 3-7

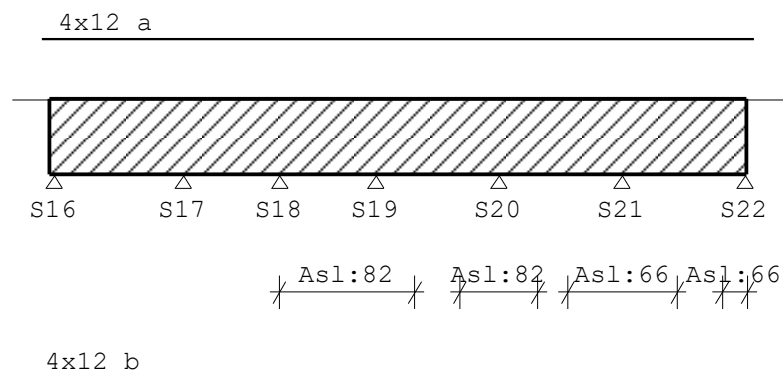
| Geb. | Vanaf [mm] | Tot [mm] | θ [°] | V_{Rd} [kN] | V_{Ed} | $V_{Rd,C}$ | $V_{Rd,Max}$ | T_{Ed} | $T_{Rd,C}$ | $T_{Rd,Max}$ | V_{opg} | Opm. |
|------|---------------|-------------|-----------------|------------------|--------------|------------|--------------|---------------|------------|--------------|-----------|------|
| | | | | | -----kN----- | | | -----kNm----- | | | | |
| 1 | S7-60 | S7+420 | 21.8 | 175 | 119 | 61 | 416 | 1 | 26 | 63 | 0 | 6 |
| 2 | S7+420 | S8-980 | 21.8 | 179 | 55 | 61 | 415 | 1 | 26 | 63 | 0 | |
| 3 | S8-980 | S8+0 | 21.8 | 175 | 174 | 66 | 416 | 1 | 26 | 63 | 0 | 6 |
| 4 | S8+0 | S8+675 | 21.8 | 175 | 123 | 66 | 416 | 1 | 26 | 63 | 0 | 6 |
| 5 | S8+675 | S9-425 | 21.8 | 180 | 35 | 64 | 419 | 1 | 26 | 63 | 0 | |
| 6 | S9-425 | S9+0 | 21.8 | 176 | 90 | 62 | 420 | 1 | 26 | 63 | 0 | 6 |
| 7 | S9+0 | S9+425 | 21.8 | 357 | 223 | 62 | 419 | 1 | 26 | 63 | 0 | 6 |
| 8 | S9+425 | S10-175 | 21.8 | 173 | 168 | 66 | 412 | 1 | 26 | 63 | 0 | 6 |
| 9 | S10-175 | S10+0 | 21.8 | 361 | 190 | 62 | 419 | 0 | 26 | 63 | 0 | 6 |
| 10 | S10+0 | S10+650 | 21.8 | 181 | 131 | 62 | 419 | 0 | 26 | 63 | 0 | 6 |
| 11 | S10+650 | S11-650 | 21.8 | 179 | 55 | 61 | 416 | 0 | 26 | 63 | 0 | |
| 12 | S11-650 | S11+0 | 21.8 | 180 | 141 | 62 | 419 | 0 | 26 | 63 | 0 | 6 |
| 13 | S11+0 | S11+650 | 21.8 | 180 | 163 | 62 | 419 | 1 | 26 | 63 | 0 | 6 |
| 14 | S11+650 | S12-900 | 21.8 | 179 | 42 | 61 | 416 | 1 | 26 | 63 | 0 | |
| 15 | S12-900 | S12+0 | 21.8 | 175 | 148 | 62 | 419 | 1 | 26 | 63 | 0 | 6 |
| 16 | S12+0 | S12+920 | 21.8 | 175 | 165 | 62 | 419 | 1 | 26 | 63 | 0 | 6 |
| 17 | S12+920 | S13-380 | 21.8 | 179 | 57 | 61 | 415 | 1 | 26 | 63 | 0 | |
| 18 | S13-380 | S13+40 | 21.8 | 174 | 113 | 61 | 416 | 1 | 26 | 63 | 0 | 6 |

Opmerkingen

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

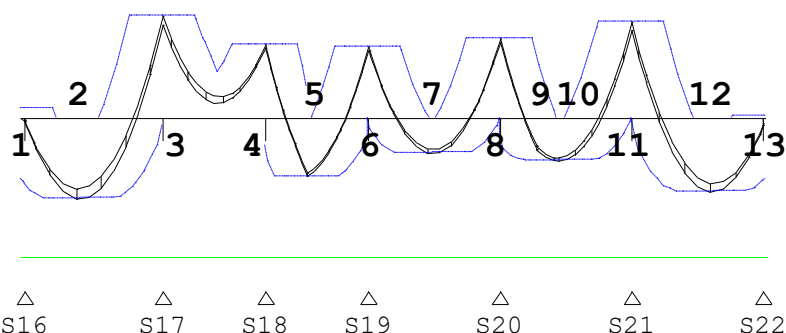
Hoofdwapening Fysisch lineair

Balk 3-8



MEd dekkingslijn Fysisch lineair

Balk 3-8



Hoofdwapening

Balk 3-8

| Geb. | Pos. [mm] | M_{Ed} [kNm] | M_{Rd} [kNm] | z B/O [mm] | A_b [mm ²] | A_a [mm ²] | Basiswapening +Bijlegwapening | Opm. |
|------|--------------|-------------------|-------------------|---------------|-----------------------------|-----------------------------|----------------------------------|------|
| 1 | S16-60 | 6.32 | 88.65 | 412 Bov | 165* | 453 | 4x12 | 54 |
| 2 | S16+866 | -50.68 | -87.45 | 425 Ond | 258 | 453 | 4x12 | |
| 3 | S17+0 | 64.51 | 88.65 | 412 Bov | 327 | 453 | 4x12 | |
| 4 | S18+0 | 46.60 | 88.65 | 412 Bov | 234 | 453 | 4x12 | |
| 5 | S18+650 | -36.51 | -87.45 | 425 Ond | 206* | 453 | 4x12 | 1 |
| 6 | S19+0 | 44.90 | 88.65 | 412 Bov | 226 | 453 | 4x12 | |
| 7 | S19+1004 | -22.15 | -87.45 | 425 Ond | 165* | 453 | 4x12 | 54 |
| 8 | S20+0 | 50.56 | 88.65 | 412 Bov | 254 | 453 | 4x12 | |
| 9 | S20+892 | -26.51 | -87.45 | 425 Ond | 170* | 453 | 4x12 | 1 |
| 10 | S20+936 | -26.51 | -87.45 | 425 Ond | 170* | 453 | 4x12 | 1 |
| 11 | S21+0 | 60.76 | 88.65 | 412 Bov | 307 | 453 | 4x12 | |
| 12 | S22-810 | -46.33 | -87.45 | 425 Ond | 236 | 453 | 4x12 | |
| 13 | S22+40 | 1.67 | 88.65 | 412 Bov | 165* | 453 | 4x12 | 54 |

Opmerkingen

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

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

Scheurvorming volgens artikel 7.3.4

Balk 3-8

| Geb. | Pos. [mm] | Zijde | $M_{E, \text{freq}}$ [kNm] | $S_{r, \text{max}}$ [mm] | $\epsilon_{sm} - \epsilon_{cm}$ [%] | w_k [mm] | k_x | w_{max} [mm] | U.C. | Opm. |
|------|--------------|-------|-------------------------------|-----------------------------|--|---------------|-------|-------------------|------|------|
| 1 | S16-60 | Bov | 4.85 | 367 | 0.076 | 0.028 | 1.00 | 0.300 | 0.09 | |
| 2 | S16+273 | Bov | 4.85 | 367 | 0.076 | 0.028 | 1.00 | 0.300 | 0.09 | |
| 2 | S17-472 | Bov | 50.73 | 367 | 0.811 | 0.298 | 1.00 | 0.300 | 0.99 | |
| 2 | S16+492 | Ond | -39.63 | 406 | 0.625 | 0.254 | 1.14 | 0.343 | 0.74 | |
| 2 | S16+866 | Ond | -39.63 | 406 | 0.625 | 0.254 | 1.14 | 0.343 | 0.74 | |
| 2 | S17-935 | Ond | -39.63 | 406 | 0.625 | 0.254 | 1.14 | 0.343 | 0.74 | |
| 3 | S17+447 | Bov | 50.73 | 367 | 0.811 | 0.298 | 1.00 | 0.300 | 0.99 | |
| 3 | S18-423 | Bov | 37.86 | 367 | 0.591 | 0.217 | 1.00 | 0.300 | 0.72 | |
| 4 | S18+0 | Bov | 37.86 | 367 | 0.591 | 0.217 | 1.00 | 0.300 | 0.72 | |
| 4 | S18+468 | Bov | 37.86 | 367 | 0.591 | 0.217 | 1.00 | 0.300 | 0.72 | |
| 4 | S19-367 | Bov | 36.42 | 367 | 0.568 | 0.209 | 1.00 | 0.300 | 0.70 | |
| 4 | S18+153 | Ond | -28.62 | 406 | 0.452 | 0.184 | 1.14 | 0.343 | 0.54 | |
| 4 | S19-506 | Ond | -28.62 | 406 | 0.452 | 0.184 | 1.14 | 0.343 | 0.54 | |
| 5 | S19+442 | Bov | 36.42 | 367 | 0.568 | 0.209 | 1.00 | 0.300 | 0.70 | |
| 5 | S20-484 | Bov | 41.09 | 367 | 0.641 | 0.235 | 1.00 | 0.300 | 0.78 | |
| 5 | S19+619 | Ond | -17.56 | 406 | 0.277 | 0.113 | 1.14 | 0.343 | 0.33 | |
| 5 | S20-661 | Ond | -17.56 | 406 | 0.277 | 0.113 | 1.14 | 0.343 | 0.33 | |
| 6 | S20+383 | Bov | 41.09 | 367 | 0.641 | 0.235 | 1.00 | 0.300 | 0.78 | |
| 6 | S21-355 | Bov | 48.18 | 367 | 0.752 | 0.276 | 1.00 | 0.300 | 0.92 | |
| 6 | S20+544 | Ond | -21.04 | 406 | 0.332 | 0.135 | 1.14 | 0.343 | 0.39 | |
| 6 | S20+907 | Ond | -21.07 | 406 | 0.333 | 0.135 | 1.14 | 0.343 | 0.39 | |
| 6 | S21-640 | Ond | -21.04 | 406 | 0.332 | 0.135 | 1.14 | 0.343 | 0.39 | |
| 7 | S21+0 | Bov | 48.18 | 367 | 0.752 | 0.276 | 1.00 | 0.300 | 0.92 | |
| 7 | S21+459 | Bov | 48.18 | 367 | 0.752 | 0.276 | 1.00 | 0.300 | 0.92 | |
| 7 | S22-468 | Bov | 1.26 | 367 | 0.020 | 0.007 | 1.00 | 0.300 | 0.02 | |
| 7 | S21+739 | Ond | -36.35 | 406 | 0.574 | 0.233 | 1.14 | 0.343 | 0.68 | |
| 7 | S22-810 | Ond | -36.35 | 406 | 0.574 | 0.233 | 1.14 | 0.343 | 0.68 | |
| 7 | S22-342 | Ond | -36.34 | 406 | 0.574 | 0.233 | 1.14 | 0.343 | 0.68 | |
| 8 | S22+40 | Bov | 1.26 | 367 | 0.020 | 0.007 | 1.00 | 0.300 | 0.02 | |

Verloop hoofdwapening

Balk 3-8

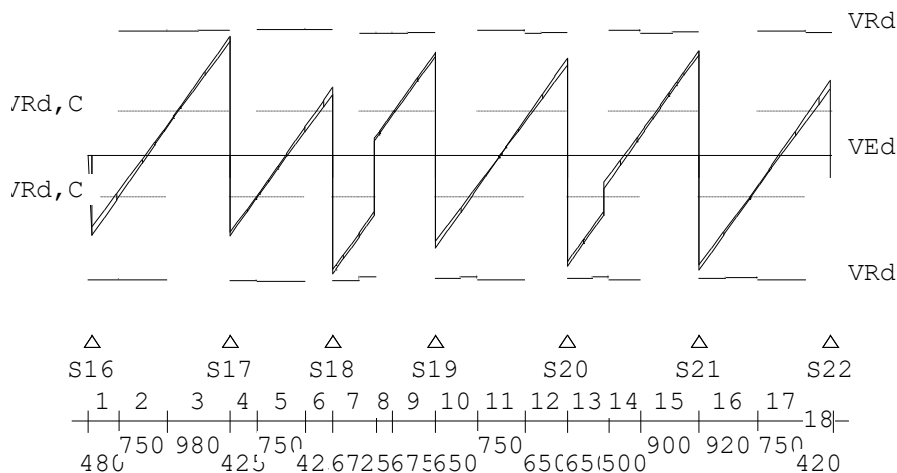
| Merk | B/O | Wapening | Vanaf [mm] | Tot [mm] | Lengte [mm] | $L_{bd, \text{begin}}$ [mm] | $L_{bd, \text{eind}}$ [mm] |
|------|-------|----------|---------------|-------------|----------------|--------------------------------|-------------------------------|
| a | Boven | 4x12 | S16-180 | S22+160 | 11840 | 120 | 120 |
| b | Onder | 4x12 | S16-399 | S22+377 | 12275 | 339 | 337 |

Opmerkingen

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

DWARSKRACHTEN Fysisch lineair

Balk 3-8 Fundamentele combinatie



Wring- en dwarskrachtwapening

Balk 3-8

| Geb. | Vanaf | Tot | Beugels | Lengte | <Wringing> | <Dwarskr.> | | | | | |
|------|---------|---------|---------|--------|--|-----------------------------------|---------------------------------|---------------------------------|------------------|-------------------|------|
| | [mm] | [mm] | | [mm] | $A_{l\text{angs}}$ [mm ²] | A_{bg1} [mm ² /m] | A_{bg1} [mm ²] | A_{opg} [mm ²] | V_{Ed} [kN] | T_{Ed} [kNm] | Opm. |
| 1 | S16-60 | S16+420 | Ø8-250 | 480 | 8 | 1 | 286 | 0 | 122.7 | 0 | 6 |
| 2 | S16+420 | S17-980 | Ø8-250 | 750 | 0 | 0 | 286 | 0 | 58.9 | 0 | |
| 3 | S17-980 | S17+0 | Ø8-250 | 980 | 8 | 1 | 380 | 0 | 170.4 | 0 | 6 |
| 4 | S17+0 | S17+425 | Ø8-250 | 425 | 8 | 1 | 286 | 0 | 114.9 | 0 | 6 |
| 5 | S17+425 | S18-425 | Ø8-250 | 750 | 0 | 0 | 286 | 0 | 59.6 | 0 | |
| 6 | S18-425 | S18+0 | Ø8-250 | 425 | 8 | 1 | 286 | 0 | 97.9 | 0 | 6 |
| 7 | S18+0 | S18+675 | Ø8-250 | 675 | 82 | 10 | 378 | 0 | 169.8 | 2 | 6 |
| 8 | S18+675 | S19-675 | Ø8-250 | 250 | 82 | 10 | 286 | 0 | 59.2 | 2 | |
| 9 | S19-675 | S19+0 | Ø8-250 | 675 | 82 | 10 | 327 | 0 | 147.1 | 2 | 6 |
| 10 | S19+0 | S19+650 | Ø8-250 | 650 | 82 | 10 | 296 | 0 | 133.1 | 2 | 6 |
| 11 | S19+650 | S20-650 | Ø8-250 | 750 | 0 | 0 | 286 | 0 | 52.2 | 2 | |
| 12 | S20-650 | S20+0 | Ø8-250 | 650 | 82 | 10 | 309 | 0 | 138.7 | 2 | 6 |
| 13 | S20+0 | S20+650 | Ø8-250 | 650 | 82 | 10 | 355 | 0 | 159.4 | 2 | 6 |
| 14 | S20+650 | S21-900 | Ø8-250 | 500 | 0 | 0 | 286 | 0 | 37.7 | 2 | |
| 15 | S21-900 | S21+0 | Ø8-250 | 900 | 66 | 8 | 335 | 0 | 150.3 | 2 | 6 |
| 16 | S21+0 | S21+920 | Ø8-250 | 920 | 66 | 8 | 367 | 0 | 164.6 | 2 | 6 |
| 17 | S21+920 | S22-380 | Ø8-250 | 750 | 0 | 0 | 286 | 0 | 56.7 | 2 | |
| 18 | S22-380 | S22+40 | Ø8-250 | 420 | 66 | 8 | 286 | 0 | 112.6 | 2 | 6 |

Opmerkingen

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

Wring- en dwarskrachten

Balk 3-8

| Geb. | Vanaf | Tot | θ | V_{Rd} | V_{Ed} | $V_{Rd,C}$ | $V_{Rd,Max}$ | T_{Ed} | $T_{Rd,C}$ | $T_{Rd,Max}$ | V_{opg} | Opm. |
|------|---------|---------|----------|----------|----------|------------|--------------|----------|------------|--------------|-----------|------|
| | [mm] | [mm] | [°] | [kN] | | | | | | | | |
| 1 | S16-60 | S16+420 | 21.8 | 178 | 123 | 61 | 416 | 0 | 26 | 63 | 0 | 6 |
| 2 | S16+420 | S17-980 | 21.8 | 179 | 59 | 61 | 415 | 0 | 26 | 63 | 0 | |
| 3 | S17-980 | S17+0 | 21.8 | 179 | 170 | 62 | 419 | 0 | 26 | 63 | 0 | 6 |
| 4 | S17+0 | S17+425 | 21.8 | 179 | 115 | 62 | 419 | 0 | 26 | 63 | 0 | 6 |
| 5 | S17+425 | S18-425 | 21.8 | 181 | 60 | 62 | 420 | 0 | 26 | 63 | 0 | |
| 6 | S18-425 | S18+0 | 21.8 | 180 | 98 | 62 | 420 | 0 | 26 | 63 | 0 | 6 |
| 7 | S18+0 | S18+675 | 21.8 | 180 | 170 | 62 | 419 | 2 | 26 | 63 | 0 | 6 |
| 8 | S18+675 | S19-675 | 21.8 | 170 | 59 | 61 | 416 | 2 | 26 | 63 | 0 | |
| 9 | S19-675 | S19+0 | 21.8 | 172 | 147 | 62 | 419 | 2 | 26 | 63 | 0 | 6 |
| 10 | S19+0 | S19+650 | 21.8 | 172 | 133 | 62 | 419 | 2 | 26 | 63 | 0 | 6 |
| 11 | S19+650 | S20-650 | 21.8 | 179 | 52 | 61 | 416 | 2 | 26 | 63 | 0 | |
| 12 | S20-650 | S20+0 | 21.8 | 172 | 139 | 62 | 419 | 2 | 26 | 63 | 0 | 6 |
| 13 | S20+0 | S20+650 | 21.8 | 172 | 159 | 62 | 419 | 2 | 26 | 63 | 0 | 6 |
| 14 | S20+650 | S21-900 | 21.8 | 179 | 38 | 61 | 416 | 2 | 26 | 63 | 0 | |
| 15 | S21-900 | S21+0 | 21.8 | 173 | 150 | 62 | 419 | 2 | 26 | 63 | 0 | 6 |
| 16 | S21+0 | S21+920 | 21.8 | 173 | 165 | 62 | 419 | 2 | 26 | 63 | 0 | 6 |
| 17 | S21+920 | S22-380 | 21.8 | 179 | 57 | 61 | 415 | 2 | 26 | 63 | 0 | |
| 18 | S22-380 | S22+40 | 21.8 | 172 | 113 | 61 | 416 | 2 | 26 | 63 | 0 | 6 |

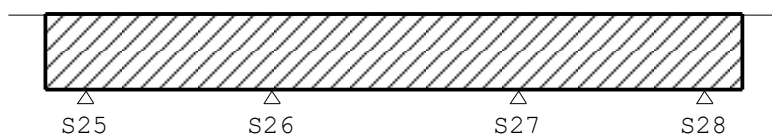
Opmerkingen

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

Hoofdwapening Fysisch lineair

Balk 3-9

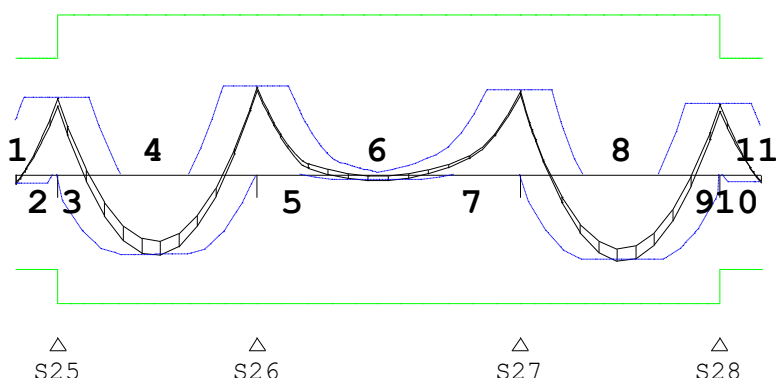
5x12 a



4x12 b

MEd dekkingslijn Fysisch lineair

Balk 3-9



Hoofdwapening

Balk 3-9

| Geb. | Pos. [mm] | M_{Ed} [kNm] | M_{Rd} [kNm] | z B/O [mm] | A_b [mm ²] | A_a [mm ²] | Basiswapening +Bijlegwapening | Opm. |
|------|--------------|-------------------|-------------------|-----------------|-----------------------------|-----------------------------|----------------------------------|----------|
| 1 | S25-650 | -6.11 | -64.91 | 330 Ond | 191* | 453 | 4x12 | 2,54,110 |
| 2 | S25-0 | 53.26 | 81.14 | 330 Bov | 372 | 566 | 5x12 | 2,110 |
| 3 | S25+0 | 53.26 | 110.80 | 414 Bov | 267 | 566 | 5x12 | |
| 4 | S25+1506 | -55.59 | -88.57 | 391 Ond | 282 | 453 | 4x12 | |
| 5 | S26+0 | 61.08 | 110.80 | 414 Bov | 307 | 566 | 5x12 | |
| 6 | S26+1881 | -3.85 | -88.57 | 391 Ond | 191* | 453 | 4x12 | 54 |
| 7 | S27+0 | 58.14 | 110.80 | 414 Bov | 292 | 566 | 5x12 | |
| 8 | S28-1511 | -59.48 | -88.57 | 391 Ond | 302 | 453 | 4x12 | |
| 9 | S28-0 | 48.79 | 110.80 | 414 Bov | 254* | 566 | 5x12 | 1 |
| 10 | S28+0 | 48.79 | 81.14 | 330 Bov | 354* | 566 | 5x12 | 1,2,110 |
| 11 | S28+650 | -5.31 | -64.91 | 330 Ond | 191* | 453 | 4x12 | 2,54,110 |

Opmerkingen

- [1] * = Eisen met betrekking tot minimum wapening zijn toegepast, zie nationale bijlage art. 9.2.1.1(1).
- [2] Benodigde wapening en inwendige hefboomsarm zijn bepaald volgens gedrongen ligger detaillering, zie nationale bijlage art. 6.1(10).
- [54] * = Eisen met betrekking tot minimum wapening ten behoeve van gecontroleerde scheurvorming zijn toegepast volgens art. 7.3.2.
- [110] Art. 9.7 (1),(2): Een orthogonaal wapeningsnet dient toegepast te worden aan iedere zijde van de gedrongen liggers:
Profiel 4 - B*H 500*500: 500 mm²/m aan elke zijde en in elke richting met een maximaal hoh 300 mm.

Scheurvorming volgens artikel 7.3.4

Balk 3-9

| Geb. | Pos. [mm] | Zijde | $M_{E, \text{freq}}$ [kNm] | $S_{r, \text{max}}$ [mm] | $\epsilon_{sm} - \epsilon_{cm}$ [%] | w_k [mm] | k_x | w_{max} [mm] | U.C. | Opm. |
|------|--------------|-------|-------------------------------|-----------------------------|--|---------------|-------|-------------------|------|------|
| 1 | S25-650 | Bov | 29.38 | 367 | 0.367 | 0.135 | 1.00 | 0.300 | 0.45 | |
| 1 | S25-458 | Bov | 41.95 | 367 | 0.523 | 0.192 | 1.00 | 0.300 | 0.64 | |
| 1 | S25-650 | Ond | -4.35 | 408 | 0.068 | 0.028 | 1.14 | 0.343 | 0.08 | |
| 1 | S25-181 | Ond | -4.35 | 408 | 0.068 | 0.028 | 1.14 | 0.343 | 0.08 | |
| 2 | S25+0 | Bov | 41.95 | 367 | 0.523 | 0.192 | 1.00 | 0.300 | 0.64 | |
| 2 | S25+484 | Bov | 41.95 | 367 | 0.523 | 0.192 | 1.00 | 0.300 | 0.64 | |
| 2 | S26-267 | Bov | 50.11 | 367 | 0.625 | 0.230 | 1.00 | 0.300 | 0.77 | |
| 2 | S25+1506 | Ond | -42.46 | 408 | 0.666 | 0.272 | 1.14 | 0.343 | 0.79 | |
| 3 | S26+331 | Bov | 50.11 | 367 | 0.625 | 0.230 | 1.00 | 0.300 | 0.77 | |
| 3 | S27-387 | Bov | 48.07 | 367 | 0.600 | 0.220 | 1.00 | 0.300 | 0.73 | |
| 3 | S26+1526 | Ond | -2.72 | 408 | 0.043 | 0.017 | 1.14 | 0.343 | 0.05 | |
| 3 | S27-1864 | Ond | -2.72 | 408 | 0.043 | 0.017 | 1.14 | 0.343 | 0.05 | |
| 4 | S27+0 | Bov | 48.07 | 367 | 0.600 | 0.220 | 1.00 | 0.300 | 0.73 | |
| 4 | S27+469 | Bov | 48.07 | 367 | 0.600 | 0.220 | 1.00 | 0.300 | 0.73 | |
| 4 | S28-432 | Bov | 38.98 | 367 | 0.486 | 0.179 | 1.00 | 0.300 | 0.60 | |
| 4 | S28-1511 | Ond | -46.04 | 408 | 0.723 | 0.295 | 1.14 | 0.343 | 0.86 | |
| 5 | S28+0 | Bov | 38.98 | 367 | 0.486 | 0.179 | 1.00 | 0.300 | 0.60 | |
| 5 | S28+459 | Bov | 38.98 | 367 | 0.486 | 0.179 | 1.00 | 0.300 | 0.60 | |
| 5 | S28+166 | Ond | -3.85 | 408 | 0.060 | 0.025 | 1.14 | 0.343 | 0.07 | |
| 5 | S28+650 | Ond | -3.85 | 408 | 0.060 | 0.025 | 1.14 | 0.343 | 0.07 | |

Verloop hoofdwapening

Balk 3-9

| Merk | B/O | Wapening | Vanaf [mm] | Tot [mm] | Lengte [mm] | $L_{bd, \text{begin}}$ [mm] | $L_{bd, \text{eind}}$ [mm] |
|------|-------|----------|---------------|-------------|----------------|--------------------------------|-------------------------------|
| a | Boven | 5x12 | S25-1034 | S28+1005 | 12339 | 384 | 355 |
| b | Onder | 4x12 | S25-770 | S28+770 | 11840 | 120 | 120 |

Verloop hoofdwapening

Balk 3-9

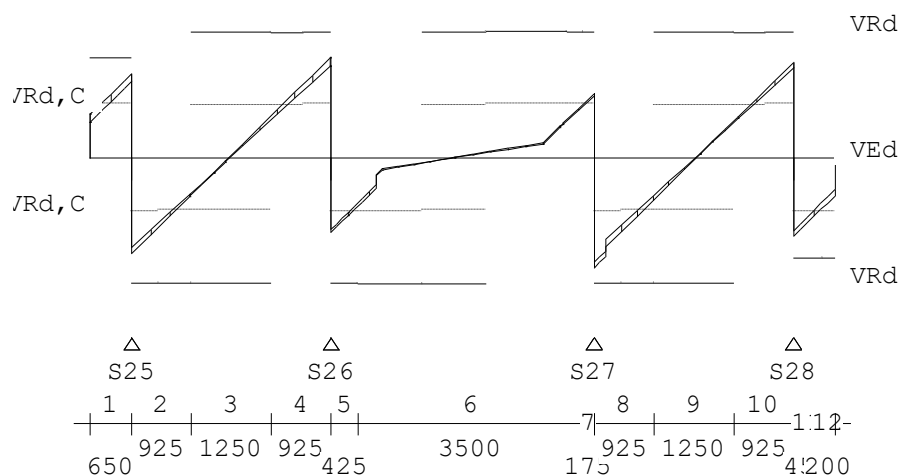
| Merk | B/O | Wapening | Vanaf [mm] | Tot [mm] | Lengte [mm] | $L_{bd, \text{begin}}$ [mm] | $L_{bd, \text{eind}}$ [mm] |
|------|-----|----------|---------------|-------------|----------------|--------------------------------|-------------------------------|
|------|-----|----------|---------------|-------------|----------------|--------------------------------|-------------------------------|

Opmerkingen

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

DWARSKRACHTEN Fysisch lineair

Balk 3-9 Fundamentele combinatie



Wring- en dwarskrachtwapening

Balk 3-9

| Geb. | Vanaf | Tot | Beugels | Lengte | <Wringing> | <Dwarskr.> | | | | | |
|------|---------|---------|---------|--------|--|-----------------------------------|---------------------------------|---------------------------------|------------------|-------------------|----------|
| | [mm] | [mm] | | [mm] | $A_{l\text{angs}}$ [mm ²] | A_{bg1} [mm ² /m] | A_{bg1} [mm ²] | A_{opg} [mm ²] | V_{Ed} [kN] | T_{Ed} [kNm] | Opm. |
| 1 | S25-650 | S25+0 | Ø8-250 | 650 | 10 | 1 | 358 | 0 | 119.9 | 0 | 6,59,109 |
| 2 | S25+0 | S25+925 | Ø8-250 | 925 | 10 | 1 | 358 | 0 | 136.9 | 0 | 6 |
| 3 | S25+925 | S26-925 | Ø8-250 | 1250 | 0 | 0 | 358 | 0 | 60.6 | 0 | |
| 4 | S26-925 | S26+0 | Ø8-250 | 925 | 10 | 1 | 358 | 0 | 144.8 | 0 | 6 |
| 5 | S26+0 | S26+425 | Ø8-250 | 425 | 10 | 1 | 358 | 0 | 106.3 | 0 | 6 |
| 6 | S26+425 | S27-175 | Ø8-250 | 3500 | 10 | 1 | 358 | 0 | 76.9 | 0 | |
| 7 | S27-175 | S27+0 | Ø8-250 | 175 | 10 | 1 | 358 | 0 | 92.4 | 0 | 6 |
| 8 | S27+0 | S27+925 | Ø8-250 | 925 | 10 | 1 | 358 | 0 | 157.5 | 0 | 6 |
| 9 | S27+925 | S28-925 | Ø8-250 | 1250 | 0 | 0 | 358 | 0 | 60.2 | 0 | |
| 10 | S28-925 | S28+0 | Ø8-250 | 925 | 10 | 1 | 358 | 0 | 137.3 | 0 | 6 |
| 11 | S28+0 | S28+450 | Ø8-250 | 450 | 10 | 1 | 358 | 0 | 111.8 | 0 | 6,59,109 |
| 12 | S28+450 | S28+650 | Ø8-250 | 200 | 0 | 0 | 358 | 0 | 71.9 | 0 | 59,109 |

Opmerkingen

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

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

[109] Bij de berekening van de beugels is geen rekening gehouden met de detailleringsregels van art 9.7 voor de gedrongen liggers.

Wring- en dwarskrachten

Balk 3-9

| Geb. | Vanaf | Tot | θ | V_{Rd} | V_{Ed} | $V_{Rd,C}$ | $V_{Rd,Max}$ | T_{Ed} | $T_{Rd,C}$ | $T_{Rd,Max}$ | V_{opg} | Opm. |
|------|---------|---------|----------|----------|----------|------------|--------------|----------|------------|--------------|-----------|----------|
| | [mm] | [mm] | [°] | [kN] | | | | | | | | |
| 1 | S25-650 | S25+0 | 21.8 | 144 | 120 | 77 | 419 | 0 | 36 | 89 | 0 | 6,59,109 |
| 2 | S25+0 | S25+925 | 21.8 | 180 | 137 | 77 | 524 | 0 | 36 | 89 | 0 | 6 |
| 3 | S25+925 | S26-925 | 21.8 | 180 | 61 | 75 | 523 | 0 | 36 | 89 | 0 | |
| 4 | S26-925 | S26+0 | 21.8 | 180 | 145 | 77 | 525 | 0 | 36 | 89 | 0 | 6 |
| 5 | S26+0 | S26+425 | 21.8 | 180 | 106 | 77 | 524 | 0 | 36 | 89 | 0 | 6 |
| 6 | S26+425 | S27-175 | 21.8 | 180 | 77 | 77 | 525 | 0 | 36 | 89 | 0 | |
| 7 | S27-175 | S27+0 | 21.8 | 180 | 92 | 77 | 524 | 0 | 36 | 89 | 0 | 6 |
| 8 | S27+0 | S27+925 | 21.8 | 180 | 158 | 77 | 524 | 0 | 36 | 89 | 0 | 6 |
| 9 | S27+925 | S28-925 | 21.8 | 180 | 60 | 75 | 523 | 0 | 36 | 89 | 0 | |
| 10 | S28-925 | S28+0 | 21.8 | 180 | 137 | 77 | 525 | 0 | 36 | 89 | 0 | 6 |
| 11 | S28+0 | S28+450 | 21.8 | 144 | 112 | 77 | 419 | 0 | 36 | 89 | 0 | 6,59,109 |
| 12 | S28+450 | S28+650 | 21.8 | 144 | 72 | 77 | 419 | 0 | 36 | 89 | 0 | 59,109 |

Opmerkingen

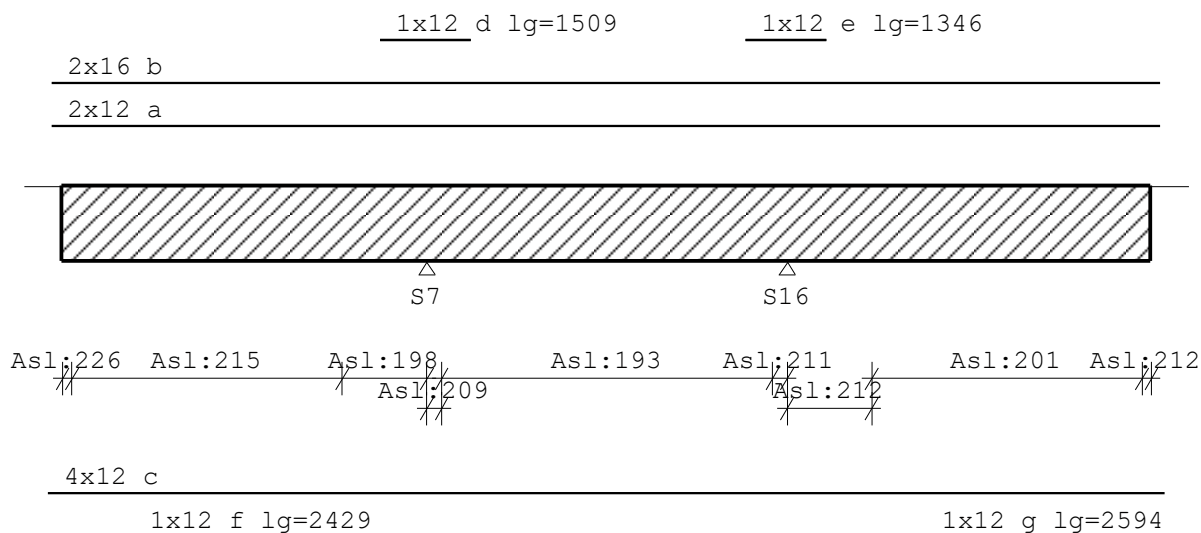
[6] 9.2.2 (4) 50% van de dwarskrachtwapening moet uit beugels bestaan.

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

[109] Bij de berekening van de beugels is geen rekening gehouden met de detailleringsregels van art 9.7 voor de gedrongen liggers.

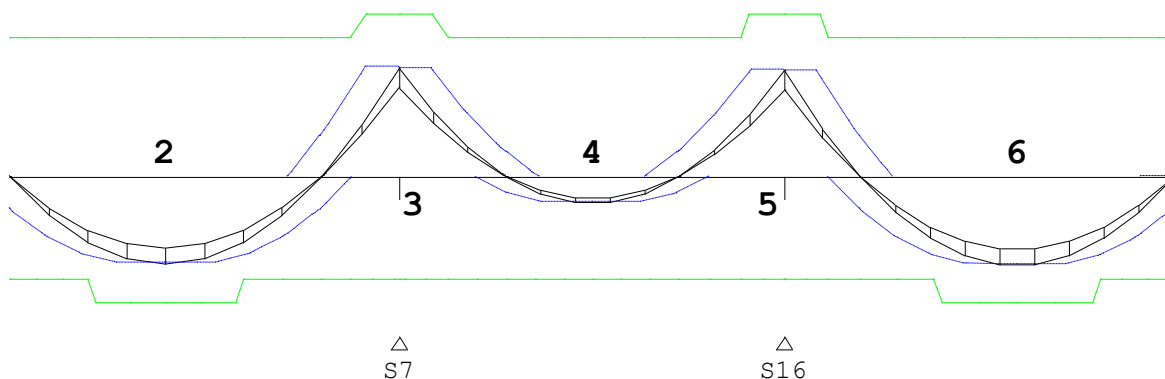
Hoofdwapening Fysisch lineair

Balk 3-A



MEd dekkingslijn Fysisch lineair

Balk 3-A



Hoofdwapening

Balk 3-A

| Geb. | Pos. [mm] | M_{Ed} [kNm] | M_{Rd} [kNm] | z B/O [mm] | A_b [mm ²] | A_a [mm ²] | Basiswapening +Bijlegwapening | Opm. |
|------|--------------|-------------------|-------------------|---------------|-----------------------------|-----------------------------|----------------------------------|------|
| 1 | S7-6060 | 0.29 | 120.40 | 422 Bov | 165* | 629 | 2x16 + 2x12 | 54 |
| 2 | S7-3637 | -74.82 | -108.04 | 420 Ond | 385 | 453 | 4x12 | |
| | | | | Ond | | 114 | +1x12 | |
| 3 | S7+0 | 94.39 | 140.36 | 418 Bov | 484 | 629 | 2x16 + 2x12 | |
| | | | | Bov | | 114 | +1x12 | |
| 4 | S7+3010 | -22.69 | -87.50 | 419 Ond | 165* | 453 | 4x12 | 54 |
| 5 | S16+0 | 91.69 | 140.36 | 418 Bov | 470 | 629 | 2x16 + 2x12 | |
| | | | | Bov | | 114 | +1x12 | |
| 6 | S16+3618 | -75.98 | -108.04 | 420 Ond | 391 | 453 | 4x12 | |
| | | | | Ond | | 114 | +1x12 | |
| 7 | S16+6060 | 0.31 | 120.40 | 422 Bov | 165* | 629 | 2x16 + 2x12 | 54 |

Opmerkingen

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

Scheurvorming volgens artikel 7.3.4

Balk 3-A

| Geb. | Pos. [mm] | Zijde | M_E, freq [kNm] | S_r, max [mm] | $\epsilon_{sm} - \epsilon_{cm}$ [%] | w_k [mm] | k_x | w_{max} [mm] | U.C. | Opm. |
|------|--------------|-------|-----------------------------|---------------------------|--|---------------|-------|-------------------|------|------|
| 1 | S7-6060 | Bov | 0.19 | 340 | 0.002 | 0.001 | 1.00 | 0.300 | 0.00 | |
| 1 | S7-5821 | Bov | 0.19 | 340 | 0.002 | 0.001 | 1.00 | 0.300 | 0.00 | |
| 1 | S7-507 | Bov | 71.82 | 305 | 0.834 | 0.255 | 1.00 | 0.300 | 0.85 | |
| 1 | S7-4855 | Ond | -51.57 | 406 | 0.815 | 0.331 | 1.14 | 0.343 | 0.97 | |
| 1 | S7-3637 | Ond | -56.54 | 358 | 0.746 | 0.267 | 1.14 | 0.343 | 0.78 | |
| 1 | S7-2425 | Ond | -51.57 | 406 | 0.815 | 0.331 | 1.14 | 0.343 | 0.97 | |
| 2 | S7+507 | Bov | 71.82 | 305 | 0.834 | 0.255 | 1.00 | 0.300 | 0.85 | |
| 2 | S16-678 | Bov | 59.64 | 340 | 0.751 | 0.256 | 1.00 | 0.300 | 0.85 | |
| 2 | S16+0 | Bov | 69.42 | 305 | 0.795 | 0.243 | 1.00 | 0.300 | 0.81 | |
| 2 | S7+3010 | Ond | -17.03 | 406 | 0.269 | 0.109 | 1.14 | 0.343 | 0.32 | |
| 3 | S16+0 | Bov | 69.42 | 305 | 0.795 | 0.243 | 1.00 | 0.300 | 0.81 | |
| 3 | S16+667 | Bov | 58.11 | 340 | 0.722 | 0.246 | 1.00 | 0.300 | 0.82 | |
| 3 | S16+5823 | Bov | 0.21 | 340 | 0.002 | 0.001 | 1.00 | 0.300 | 0.00 | |
| 3 | S16+6060 | Bov | 0.21 | 340 | 0.002 | 0.001 | 1.00 | 0.300 | 0.00 | |
| 3 | S16+2321 | Ond | -51.38 | 406 | 0.811 | 0.330 | 1.14 | 0.343 | 0.96 | |
| 3 | S16+3618 | Ond | -57.55 | 358 | 0.767 | 0.275 | 1.14 | 0.343 | 0.80 | |
| 3 | S16+4915 | Ond | -51.38 | 406 | 0.811 | 0.330 | 1.14 | 0.343 | 0.96 | |

Verloop hoofdwapening

Balk 3-A

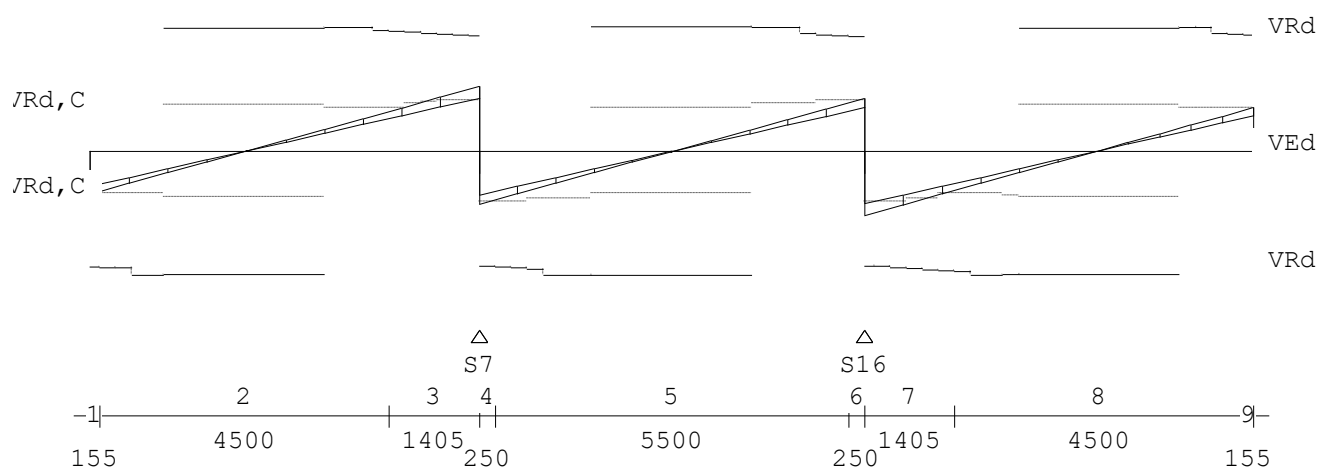
| Merk | B/O | Wapening | Vanaf [mm] | Tot [mm] | Lengte [mm] | $L_{bd, \text{begin}}$ [mm] | $L_{bd, \text{eind}}$ [mm] |
|------|-------|----------|---------------|-------------|----------------|--------------------------------|-------------------------------|
| a | Boven | 2x12 | S7-6220 | S16+6220 | 18440 | 160 | 160 |
| b | Boven | 2x16 | S7-6220 | S16+6220 | 18440 | 160 | 160 |
| d | Boven | 1x12 | S7-755 | S7+755 | 1509 | 247 | 247 |
| e | Boven | 1x12 | S16-678 | S16+667 | 1346 | 120 | 120 |
| c | Onder | 4x12 | S7-6291 | S16+6293 | 18585 | 231 | 233 |
| f | Onder | 1x12 | S7-4855 | S7-2425 | 2429 | 120 | 120 |
| g | Onder | 1x12 | S16+2321 | S16+4915 | 2594 | 120 | 120 |

Opmerkingen

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

DWARSKRACHTEN Fysisch lineair

Balk 3-A Fundamentele combinatie



Wring- en dwarskrachtwapening

Balk 3-A

| Geb. | Vanaf | Tot | Beugels | Lengte | <Wringing> | | <Dwarskr.> | | V _{Ed} | T _{Ed} | Opm. |
|------|----------|----------|---------|--------|---------------------|----------------------|--------------------|--------------------|-----------------|-----------------|------|
| | [mm] | [mm] | | [mm] | A _{l,angs} | A _{b,g1} | A _{b,g1} | A _{o,p,g} | [kN] | [kNm] | |
| | | | | | [mm ²] | [mm ² /m] | [mm ²] | | | | |
| 1 | S7-6060 | S7-5905 | Ø8-250 | 155 | 226 | 27 | 286 | 0 | 61.9 | 7 | 6 |
| 2 | S7-5905 | S7-1405 | Ø8-250 | 4500 | 215 | 25 | 286 | 0 | 57.9 | 6 | |
| 3 | S7-1405 | S7+0 | Ø8-250 | 1405 | 198 | 23 | 286 | 0 | 93.0 | 6 | 6 |
| 4 | S7+0 | S7+250 | Ø8-250 | 250 | 209 | 25 | 286 | 0 | 76.9 | 6 | 6 |
| 5 | S7+250 | S16-250 | Ø8-250 | 5500 | 193 | 23 | 286 | 0 | 70.5 | 6 | |
| 6 | S16-250 | S16+0 | Ø8-250 | 250 | 211 | 25 | 286 | 0 | 76.4 | 6 | 6 |
| 7 | S16+0 | S16+1405 | Ø8-250 | 1405 | 212 | 25 | 286 | 0 | 92.5 | 6 | 6 |
| 8 | S16+1405 | S16+5905 | Ø8-250 | 4500 | 201 | 24 | 286 | 0 | 58.4 | 6 | |
| 9 | S16+5905 | S16+6060 | Ø8-250 | 155 | 212 | 25 | 286 | 0 | 62.4 | 6 | 6 |

Opmerkingen

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

Wring- en dwarskrachten

Balk 3-A

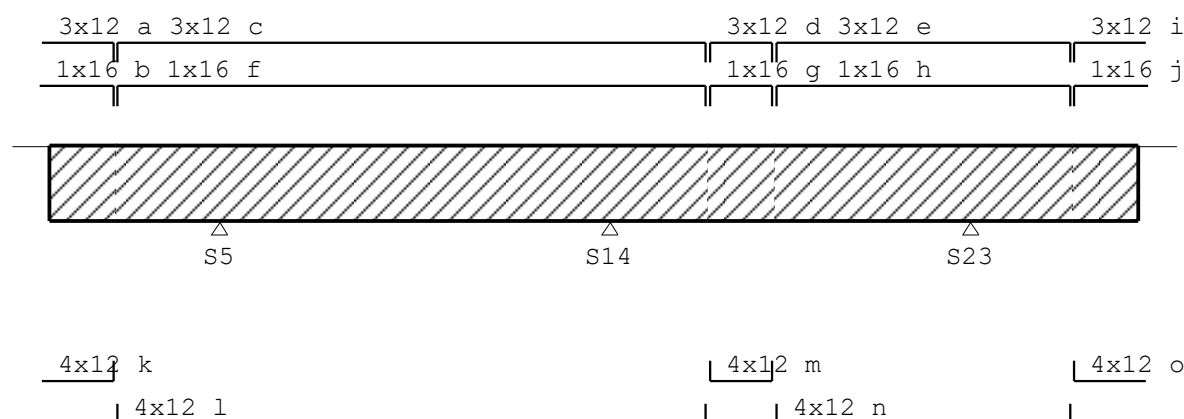
| Geb. | Vanaf | Tot | θ | V _{Rd} | V _{Ed} | V _{Rd,C} | V _{Rd,Max} | T _{Ed} | T _{Rd,C} | T _{Rd,Max} | V _{o,p,g} | Opm. |
|------|----------|----------|------|-----------------|-----------------|-------------------|---------------------|-----------------|-------------------|---------------------|--------------------|------|
| | [mm] | [mm] | [°] | [kN] | | | | | | | | |
| | | | | | -----kN----- | | | -----kNm----- | | | | |
| 1 | S7-6060 | S7-5905 | 21.8 | 155 | 62 | 61 | 416 | 7 | 26 | 63 | 0 | 6 |
| 2 | S7-5905 | S7-1405 | 21.8 | 156 | 58 | 61 | 416 | 6 | 26 | 63 | 0 | |
| 3 | S7-1405 | S7+0 | 21.8 | 156 | 93 | 73 | 410 | 6 | 26 | 63 | 0 | 6 |
| 4 | S7+0 | S7+250 | 21.8 | 155 | 77 | 73 | 410 | 6 | 26 | 63 | 0 | 6 |
| 5 | S7+250 | S16-250 | 21.8 | 157 | 71 | 73 | 411 | 6 | 26 | 63 | 0 | |
| 6 | S16-250 | S16+0 | 21.8 | 155 | 76 | 73 | 410 | 6 | 26 | 63 | 0 | 6 |
| 7 | S16+0 | S16+1405 | 21.8 | 155 | 92 | 73 | 410 | 6 | 26 | 63 | 0 | 6 |
| 8 | S16+1405 | S16+5905 | 21.8 | 158 | 58 | 61 | 416 | 6 | 26 | 63 | 0 | |
| 9 | S16+5905 | S16+6060 | 21.8 | 157 | 62 | 61 | 416 | 6 | 26 | 63 | 0 | 6 |

Opmerkingen

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

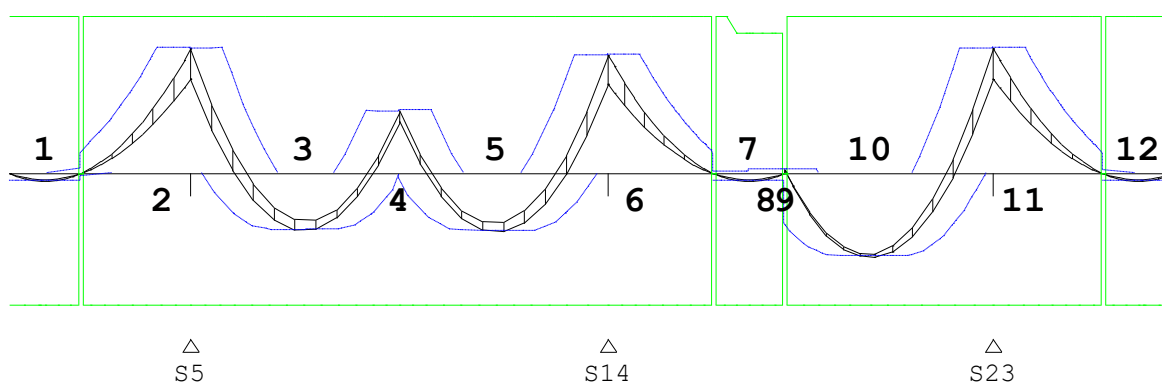
Hoofdwapening Fysisch lineair

Balk 3-B



MEd dekkingslijn Fysisch lineair

Balk 3-B



Hoofdwapening

Balk 3-B

| Geb. | Pos. [mm] | M_{Ed} [kNm] | M_{Rd} [kNm] | z B/O [mm] | A_b [mm ²] | A_a [mm ²] | Basiswapening +Bijlegwapening | Opm. |
|------|--------------|-------------------|-------------------|---------------|-----------------------------|-----------------------------|----------------------------------|----------------|
| 1 | S5-2260 | -5.23 | -87.48 | 421 Ond | 165* | 453 | 4x12 | 2, 54, 68, 110 |
| 2 | S5+0 | 83.21 | 104.57 | 426 Bov | 425 | 541 | 1x16 + 3x12 | |
| 3 | S5+1763 | -37.96 | -87.48 | 421 Ond | 206* | 453 | 4x12 | 1 |
| 4 | S5+3250 | 42.11 | 104.57 | 426 Bov | 211 | 541 | 1x16 + 3x12 | |
| 5 | S14-1742 | -39.04 | -87.48 | 421 Ond | 206* | 453 | 4x12 | 1 |
| 6 | S14+0 | 78.59 | 104.57 | 426 Bov | 400 | 541 | 1x16 + 3x12 | |
| 7 | S14+2200 | -5.23 | -87.48 | 421 Ond | 165* | 453 | 4x12 | 2, 54, 68, 110 |
| 8 | S14+2750 | 2.58 | 93.39 | 397 Bov | 165* | 541 | 1x16 + 3x12 | 2, 54, 110 |
| 9 | S14+2750 | 2.58 | 104.57 | 426 Bov | 165* | 541 | 1x16 + 3x12 | 54 |
| 10 | S23-1911 | -55.63 | -87.48 | 421 Ond | 284 | 453 | 4x12 | |
| 11 | S23+0 | 83.21 | 104.57 | 426 Bov | 425 | 541 | 1x16 + 3x12 | |
| 12 | S23+2260 | -5.23 | -87.48 | 421 Ond | 165* | 453 | 4x12 | 2, 54, 68, 110 |

Opmerkingen

- [1] * = Eisen met betrekking tot minimum wapening zijn toegepast, zie nationale bijlage art. 9.2.1.1(1).
- [2] Benodigde wapening en inwendige hefboomsarm zijn bepaald volgens gedrongen ligger detaillering, zie nationale bijlage art. 6.1(10).
- [54] * = Eisen met betrekking tot minimum wapening ten behoeve van gecontroleerde scheurvorming zijn toegepast volgens art. 7.3.2.
- [68] **MRd als gevolg van de gedrongen ligger berekening (NB. 6.1(10)) is groter dan MRd volgens 6.1(P). De momentweerstand en inwendige hefboomsarm volgens 6.1(P) zijn maatgevend en daarom alsnog toegepast.**
- [110] **Art. 9.7 (1), (2): Een orthogonaal wapeningsnet dient toegepast te worden aan iedere zijde van de gedrongen liggers:
Profiel 2 - B*H 400*500: 400 mm²/m aan elke zijde en in elke richting met een maximaal hoh 300 mm.**

Scheurvorming volgens artikel 7.3.4

Balk 3-B

| Geb. | Pos. [mm] | Zijde | $M_{E, freq}$ [kNm] | $S_{r, max}$ [mm] | $\epsilon_{sm} - \epsilon_{cm}$ [%] | w_k [mm] | k_x | w_{max} [mm] | U.C. | Opm. |
|------|--------------|-------|------------------------|----------------------|--|---------------|-------|-------------------|------|------|
| 1 | S5-482 | Bov | 58.29 | 353 | 0.844 | 0.298 | 1.00 | 0.300 | 0.99 | |
| 1 | S5-2584 | Ond | -3.66 | 406 | 0.058 | 0.024 | 1.14 | 0.343 | 0.07 | |
| 1 | S5-1865 | Ond | -3.66 | 406 | 0.058 | 0.024 | 1.14 | 0.343 | 0.07 | |
| 2 | S5+0 | Bov | 58.29 | 353 | 0.844 | 0.298 | 1.00 | 0.300 | 0.99 | |
| 2 | S5+287 | Bov | 58.29 | 353 | 0.844 | 0.298 | 1.00 | 0.300 | 0.99 | |
| 2 | S5+2761 | Bov | 30.46 | 353 | 0.401 | 0.142 | 1.00 | 0.300 | 0.47 | |
| 2 | S5+1763 | Ond | -29.11 | 406 | 0.460 | 0.187 | 1.14 | 0.343 | 0.55 | |
| 2 | S5+2304 | Ond | -29.10 | 406 | 0.459 | 0.187 | 1.14 | 0.343 | 0.54 | |
| 3 | S14-2756 | Bov | 30.46 | 353 | 0.401 | 0.142 | 1.00 | 0.300 | 0.47 | |
| 3 | S14-271 | Bov | 55.06 | 353 | 0.773 | 0.273 | 1.00 | 0.300 | 0.91 | |
| 3 | S14-1742 | Ond | -30.08 | 406 | 0.475 | 0.193 | 1.14 | 0.343 | 0.56 | |
| 4 | S14+458 | Bov | 55.06 | 353 | 0.773 | 0.273 | 1.00 | 0.300 | 0.91 | |
| 4 | S14+2244 | Bov | 2.02 | 353 | 0.027 | 0.009 | 1.00 | 0.300 | 0.03 | |
| 4 | S14+2715 | Bov | 2.02 | 353 | 0.027 | 0.009 | 1.00 | 0.300 | 0.03 | |
| 4 | S14+1805 | Ond | -3.66 | 406 | 0.058 | 0.024 | 1.14 | 0.343 | 0.07 | |
| 4 | S14+2595 | Ond | -3.66 | 406 | 0.058 | 0.024 | 1.14 | 0.343 | 0.07 | |
| 5 | S14+2785 | Bov | 2.02 | 353 | 0.027 | 0.009 | 1.00 | 0.300 | 0.03 | |
| 5 | S23-2744 | Bov | 2.02 | 353 | 0.027 | 0.009 | 1.00 | 0.300 | 0.03 | |
| 5 | S23-492 | Bov | 58.29 | 353 | 0.844 | 0.298 | 1.00 | 0.300 | 0.99 | |
| 5 | S23-1911 | Ond | -44.88 | 406 | 0.709 | 0.288 | 1.14 | 0.343 | 0.84 | |
| 6 | S23+482 | Bov | 58.29 | 353 | 0.844 | 0.298 | 1.00 | 0.300 | 0.99 | |
| 6 | S23+1865 | Ond | -3.66 | 406 | 0.058 | 0.024 | 1.14 | 0.343 | 0.07 | |
| 6 | S23+2584 | Ond | -3.66 | 406 | 0.058 | 0.024 | 1.14 | 0.343 | 0.07 | |

Verloop hoofdwapening

Balk 3-B

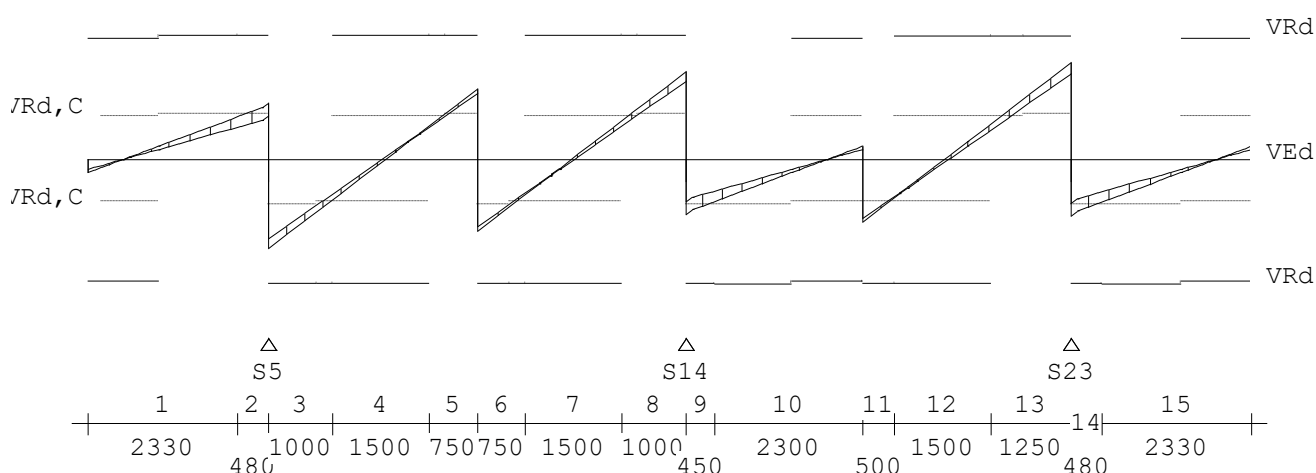
| Merk | B/O | Wapening | Vanaf [mm] | Tot [mm] | Lengte [mm] | $L_{bd, begin}$ [mm] | $L_{bd, eind}$ [mm] |
|------|-------|----------|---------------|-------------|----------------|-------------------------|------------------------|
| a | Boven | 3x12 | S5-2930 | S5-1745 | 1185 | 120 | 120 |
| b | Boven | 1x16 | S5-2970 | S5-1745 | 1225 | 160 | 160 |
| c | Boven | 3x12 | S5-1675 | S14+1615 | 9790 | 125 | 125 |
| d | Boven | 3x12 | S14+1685 | S14+2715 | 1030 | 120 | 120 |
| e | Boven | 3x12 | S14+2785 | S23+1675 | 4890 | 120 | 125 |
| f | Boven | 1x16 | S5-1675 | S14+1615 | 9790 | 182 | 182 |
| g | Boven | 1x16 | S14+1685 | S14+2715 | 1030 | 160 | 160 |
| h | Boven | 1x16 | S14+2785 | S23+1675 | 4890 | 160 | 182 |
| i | Boven | 3x12 | S23+1745 | S23+2930 | 1185 | 120 | 120 |
| j | Boven | 1x16 | S23+1745 | S23+2970 | 1225 | 160 | 160 |
| k | Onder | 4x12 | S5-2930 | S5-1745 | 1185 | 120 | 120 |
| l | Onder | 4x12 | S5-1675 | S14+1615 | 9790 | 120 | 120 |
| m | Onder | 4x12 | S14+1685 | S14+2715 | 1030 | 120 | 120 |
| n | Onder | 4x12 | S14+2785 | S23+1675 | 4890 | 254 | 120 |
| o | Onder | 4x12 | S23+1745 | S23+2930 | 1185 | 120 | 120 |

Opmerkingen

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

DWARSKRACHTEN Fysisch lineair

Balk 3-B Fundamentele combinatie



Wring- en dwarskrachtwapening

Balk 3-B

| Geb. Vanaf | Tot | Beugels | Lengte | <Wringing> | | <Dwarskr.> | | | | | |
|------------|----------|----------|--------|--------------------|----------------------|--------------------|--------------------|----------|----------|------|--------|
| [mm] | [mm] | | [mm] | $A_{l\text{angs}}$ | A_{bg1} | A_{bg1} | A_{opg} | V_{Ed} | T_{Ed} | Opm. | |
| | | | | [mm ²] | [mm ² /m] | [mm ²] | [mm ²] | [kN] | [kNm] | | |
| 1 | S5-2810 | S5-480 | Ø8-250 | 2330 | 0 | 0 | 286 | 0 | 61.4 | 0 | 58,109 |
| 2 | S5-480 | S5+0 | Ø8-250 | 480 | 0 | 0 | 286 | 0 | 81.5 | 0 | 6 |
| 3 | S5+0 | S5+1000 | Ø8-250 | 1000 | 0 | 0 | 289 | 0 | 128.3 | 0 | 6 |
| 4 | S5+1000 | S5+2500 | Ø8-250 | 1500 | 0 | 0 | 286 | 0 | 57.4 | 0 | |
| 5 | S5+2500 | S5+3250 | Ø8-250 | 750 | 0 | 0 | 286 | 0 | 101.7 | 0 | 6 |
| 6 | S5+3250 | S14-2500 | Ø8-250 | 750 | 0 | 0 | 286 | 0 | 103.5 | 0 | 6 |
| 7 | S14-2500 | S14-1000 | Ø8-250 | 1500 | 0 | 0 | 286 | 0 | 55.6 | 0 | |
| 8 | S14-1000 | S14+0 | Ø8-250 | 1000 | 0 | 0 | 286 | 0 | 126.5 | 0 | 6 |
| 9 | S14+0 | S14+450 | Ø8-250 | 450 | 0 | 0 | 286 | 0 | 79.5 | 0 | 6 |
| 10 | S14+450 | S14+2750 | Ø8-250 | 2300 | 0 | 0 | 286 | 0 | 60.4 | 0 | |
| 11 | S14+2750 | S23-2750 | Ø8-250 | 500 | 0 | 0 | 286 | 0 | 90.2 | 0 | 6 |
| 12 | S23-2750 | S23-1250 | Ø8-250 | 1500 | 0 | 0 | 286 | 0 | 54.7 | 0 | |
| 13 | S23-1250 | S23+0 | Ø8-250 | 1250 | 0 | 0 | 315 | 0 | 139.8 | 0 | 6 |
| 14 | S23+0 | S23+480 | Ø8-250 | 480 | 0 | 0 | 286 | 0 | 81.5 | 0 | 6 |
| 15 | S23+480 | S23+2810 | Ø8-250 | 2330 | 0 | 0 | 286 | 0 | 61.4 | 0 | |

Opmerkingen

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

[58] 6.2.3: Z is berekend m.b.v. 0.9d

[109] Bij de berekening van de beugels is geen rekening gehouden met de detailleringregels van art 9.7 voor de gedrongen liggers.

Wring- en dwarskrachten

Balk 3-B

| Geb. | Vanaf [mm] | Tot [mm] | θ [°] | V_{Rd} [kN] | V_{Ed} | $V_{Rd,C}$ | $V_{Rd,Max}$ | T_{Ed} | $T_{Rd,C}$ | $T_{Rd,Max}$ | V_{opg} | Opm. |
|------|---------------|-------------|-----------------|------------------|--------------|------------|--------------|---------------|------------|--------------|-----------|--------|
| | | | | | -----kN----- | | | -----kNm----- | | | | |
| 1 | S5-2810 | S5-480 | 21.8 | 179 | 61 | 65 | 418 | 0 | 26 | 63 | 0 | 58,109 |
| 2 | S5-480 | S5+0 | 21.8 | 179 | 82 | 65 | 416 | 0 | 26 | 63 | 0 | 6 |
| 3 | S5+0 | S5+1000 | 21.8 | 179 | 128 | 65 | 415 | 0 | 26 | 63 | 0 | 6 |
| 4 | S5+1000 | S5+2500 | 21.8 | 179 | 57 | 61 | 416 | 0 | 26 | 63 | 0 | |
| 5 | S5+2500 | S5+3250 | 21.8 | 179 | 102 | 65 | 417 | 0 | 26 | 63 | 0 | 6 |
| 6 | S5+3250 | S14-2500 | 21.8 | 179 | 103 | 65 | 416 | 0 | 26 | 63 | 0 | 6 |
| 7 | S14-2500 | S14-1000 | 21.8 | 179 | 56 | 61 | 416 | 0 | 26 | 63 | 0 | |
| 8 | S14-1000 | S14+0 | 21.8 | 179 | 127 | 65 | 417 | 0 | 26 | 63 | 0 | 6 |
| 9 | S14+0 | S14+450 | 21.8 | 179 | 79 | 65 | 415 | 0 | 26 | 63 | 0 | 6 |
| 10 | S14+450 | S14+2750 | 21.8 | 179 | 60 | 65 | 416 | 0 | 26 | 63 | 0 | |
| 11 | S14+2750 | S23-2750 | 21.8 | 179 | 90 | 61 | 416 | 0 | 26 | 63 | 0 | 6 |
| 12 | S23-2750 | S23-1250 | 21.8 | 179 | 55 | 61 | 415 | 0 | 26 | 63 | 0 | |
| 13 | S23-1250 | S23+0 | 21.8 | 179 | 140 | 65 | 415 | 0 | 26 | 63 | 0 | 6 |
| 14 | S23+0 | S23+480 | 21.8 | 179 | 82 | 65 | 415 | 0 | 26 | 63 | 0 | 6 |
| 15 | S23+480 | S23+2810 | 21.8 | 179 | 61 | 65 | 416 | 0 | 26 | 63 | 0 | |

Opmerkingen

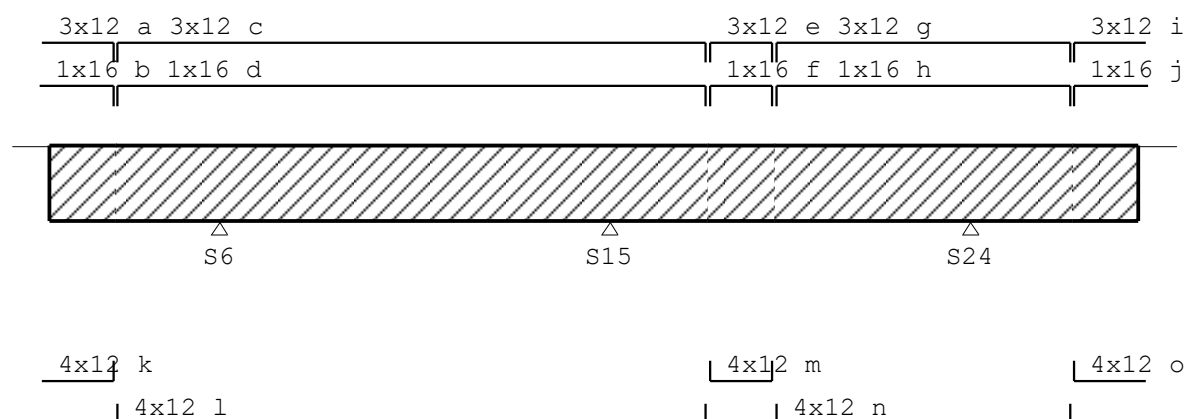
[6] 9.2.2 (4) 50% van de dwarskrachtwapening moet uit beugels bestaan.

[58] 6.2.3: λ is berekend m.b.v. 0.9d

[109] Bij de berekening van de beugels is geen rekening gehouden met de detailleringsregels van art 9.7 voor de gedrongen liggers.

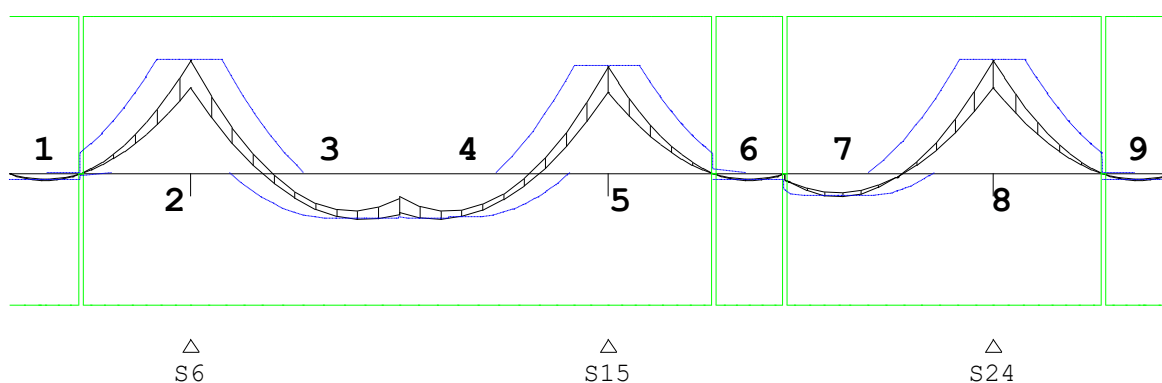
Hoofdwapening Fysisch lineair

Balk 3-C



MEd dekkingslijn Fysisch lineair

Balk 3-C



Hoofdwapening

Balk 3-C

| Geb. | Pos. [mm] | M_{Ed} [kNm] | M_{Rd} [kNm] | z B/O [mm] | A_b [mm ²] | A_a [mm ²] | Basiswapening +Bijlegwapening | Opm. |
|------|--------------|-------------------|-------------------|---------------|-----------------------------|-----------------------------|----------------------------------|----------------|
| 1 | S6-2260 | -4.74 | -87.48 | 421 Ond | 165* | 453 | 4x12 | 2, 54, 68, 110 |
| 2 | S6+0 | 75.25 | 104.57 | 426 Bov | 383 | 541 | 1x16 + 3x12 | |
| 3 | S6+2714 | -30.58 | -87.48 | 421 Ond | 194* | 453 | 4x12 | 1 |
| 4 | S15-2659 | -30.20 | -87.48 | 421 Ond | 191* | 453 | 4x12 | 1 |
| 5 | S15+0 | 71.06 | 104.57 | 426 Bov | 361 | 541 | 1x16 + 3x12 | |
| 6 | S15+2200 | -4.74 | -87.48 | 421 Ond | 165* | 453 | 4x12 | 2, 54, 68, 110 |
| 7 | S24-2404 | -15.27 | -87.48 | 421 Ond | 165* | 453 | 4x12 | 54 |
| 8 | S24+0 | 75.25 | 104.57 | 426 Bov | 383 | 541 | 1x16 + 3x12 | |
| 9 | S24+2260 | -4.74 | -87.48 | 421 Ond | 165* | 453 | 4x12 | 2, 54, 68, 110 |

Opmerkingen

- [1] * = Eisen met betrekking tot minimum wapening zijn toegepast, zie nationale bijlage art. 9.2.1.1(1).
- [2] Benodigde wapening en inwendige hefboomsarm zijn bepaald volgens gedrongen ligger detaillering, zie nationale bijlage art. 6.1(10).
- [54] * = Eisen met betrekking tot minimum wapening ten behoeve van gecontroleerde scheurvorming zijn toegepast volgens art. 7.3.2.
- [68] **MRd als gevolg van de gedrongen ligger berekening (NB. 6.1(10)) is groter dan MRd volgens 6.1(P). De momentweerstand en inwendige hefboomsarm volgens 6.1(P) zijn maatgevend en daarom alsnog toegepast.**
- [110] Art. 9.7 (1), (2): Een orthogonaal wapeningsnet dient toegepast te worden aan iedere zijde van de gedrongen liggers:
Profiel 2 - B×H 400×500: 400 mm²/m aan elke zijde en in elke richting met een maximaal hoh 300 mm.

Scheurvorming volgens artikel 7.3.4

Balk 3-C

| Geb. | Pos. [mm] | Zijde | $M_E; freq$ [kNm] | $S_{r, max}$ [mm] | $\epsilon_{sm} - \epsilon_{cm}$ [%] | w_k [mm] | k_x | w_{max} [mm] | U.C. | Opm. |
|------|--------------|-------|----------------------|----------------------|--|---------------|-------|-------------------|------|------|
| 1 | S6-482 | Bov | 53.10 | 353 | 0.730 | 0.258 | 1.00 | 0.300 | 0.86 | |
| 1 | S6-2584 | Ond | -3.34 | 406 | 0.053 | 0.021 | 1.14 | 0.343 | 0.06 | |
| 1 | S6-1865 | Ond | -3.34 | 406 | 0.053 | 0.021 | 1.14 | 0.343 | 0.06 | |
| 2 | S6+0 | Bov | 53.10 | 353 | 0.730 | 0.258 | 1.00 | 0.300 | 0.86 | |
| 2 | S6+317 | Bov | 53.10 | 353 | 0.730 | 0.258 | 1.00 | 0.300 | 0.86 | |
| 2 | S6+2074 | Ond | -23.40 | 406 | 0.369 | 0.150 | 1.14 | 0.343 | 0.44 | |
| 2 | S6+2714 | Ond | -23.36 | 406 | 0.369 | 0.150 | 1.14 | 0.343 | 0.44 | |
| 3 | S15-304 | Bov | 50.14 | 353 | 0.665 | 0.235 | 1.00 | 0.300 | 0.78 | |
| 3 | S15-2659 | Ond | -23.11 | 406 | 0.365 | 0.148 | 1.14 | 0.343 | 0.43 | |
| 3 | S15-2022 | Ond | -23.07 | 406 | 0.364 | 0.148 | 1.14 | 0.343 | 0.43 | |
| 4 | S15+458 | Bov | 50.14 | 353 | 0.665 | 0.235 | 1.00 | 0.300 | 0.78 | |
| 4 | S15+1805 | Ond | -3.34 | 406 | 0.053 | 0.021 | 1.14 | 0.343 | 0.06 | |
| 4 | S15+2398 | Ond | -3.43 | 406 | 0.054 | 0.022 | 1.14 | 0.343 | 0.06 | |
| 5 | S24-284 | Bov | 53.10 | 353 | 0.730 | 0.258 | 1.00 | 0.300 | 0.86 | |
| 5 | S24-2865 | Ond | -11.19 | 406 | 0.177 | 0.072 | 1.14 | 0.343 | 0.21 | |
| 5 | S24-2404 | Ond | -11.19 | 406 | 0.177 | 0.072 | 1.14 | 0.343 | 0.21 | |
| 5 | S24-1955 | Ond | -11.19 | 406 | 0.177 | 0.072 | 1.14 | 0.343 | 0.21 | |
| 6 | S24+482 | Bov | 53.10 | 353 | 0.730 | 0.258 | 1.00 | 0.300 | 0.86 | |
| 6 | S24+1865 | Ond | -3.34 | 406 | 0.053 | 0.021 | 1.14 | 0.343 | 0.06 | |
| 6 | S24+2584 | Ond | -3.34 | 406 | 0.053 | 0.021 | 1.14 | 0.343 | 0.06 | |

Verloop hoofdwapening

Balk 3-C

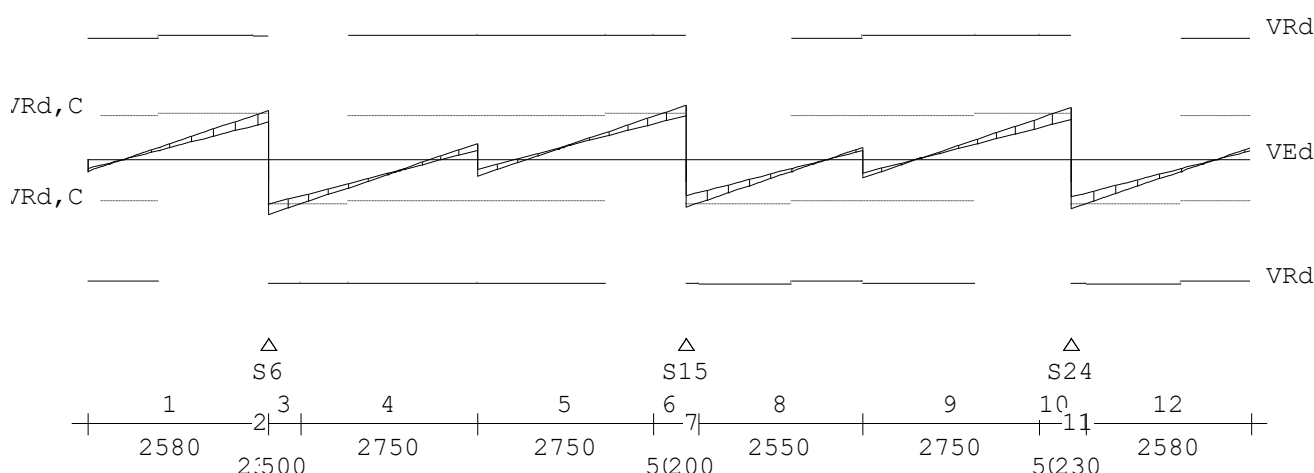
| Merk | B/O | Wapening | Vanaf [mm] | Tot [mm] | Lengte [mm] | $L_{bd; begin}$ [mm] | $L_{bd; eind}$ [mm] |
|------|-------|----------|---------------|-------------|----------------|-------------------------|------------------------|
| a | Boven | 3x12 | S6-2930 | S6-1745 | 1185 | 120 | 120 |
| b | Boven | 1x16 | S6-2970 | S6-1745 | 1225 | 160 | 160 |
| c | Boven | 3x12 | S6-1675 | S15+1615 | 9790 | 120 | 120 |
| d | Boven | 1x16 | S6-1675 | S15+1615 | 9790 | 166 | 166 |
| e | Boven | 3x12 | S15+1685 | S15+2715 | 1030 | 120 | 120 |
| f | Boven | 1x16 | S15+1685 | S15+2715 | 1030 | 160 | 160 |
| g | Boven | 3x12 | S15+2785 | S24+1675 | 4890 | 120 | 120 |
| h | Boven | 1x16 | S15+2785 | S24+1675 | 4890 | 160 | 166 |
| i | Boven | 3x12 | S24+1745 | S24+2930 | 1185 | 120 | 120 |
| j | Boven | 1x16 | S24+1745 | S24+2970 | 1225 | 160 | 160 |
| k | Onder | 4x12 | S6-2930 | S6-1745 | 1185 | 120 | 120 |
| l | Onder | 4x12 | S6-1675 | S15+1615 | 9790 | 120 | 120 |
| m | Onder | 4x12 | S15+1685 | S15+2715 | 1030 | 120 | 120 |
| n | Onder | 4x12 | S15+2785 | S24+1675 | 4890 | 120 | 120 |
| o | Onder | 4x12 | S24+1745 | S24+2930 | 1185 | 120 | 120 |

Opmerkingen

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

DWARSKRACHTEN Fysisch lineair

Balk 3-C Fundamentele combinatie


Wring- en dwarskrachtwapening

Balk 3-C

| Geb. | Vanaf | Tot | Beugels | Lengte | <Wringing> | | <Dwarskr.> | | V _{Ed} | T _{Ed} | Opm. |
|------|----------|----------|---------|--------|--------------------|----------------------|--------------------|------------------|-----------------|-----------------|--------|
| | [mm] | [mm] | | [mm] | A _{langs} | A _{bg1} | A _{bg1} | A _{opg} | [kN] | [kNm] | |
| | | | | | [mm ²] | [mm ² /m] | [mm ²] | | | | |
| 1 | S6-2810 | S6-230 | Ø8-250 | 2580 | 0 | 0 | 286 | 0 | 63.5 | 0 | 58,109 |
| 2 | S6-230 | S6+0 | Ø8-250 | 230 | 0 | 0 | 286 | 0 | 70.7 | 0 | 6 |
| 3 | S6+0 | S6+500 | Ø8-250 | 500 | 0 | 0 | 286 | 0 | 79.9 | 0 | 6 |
| 4 | S6+500 | S6+3250 | Ø8-250 | 2750 | 0 | 0 | 286 | 0 | 64.2 | 0 | |
| 5 | S6+3250 | S15-500 | Ø8-250 | 2750 | 0 | 0 | 286 | 0 | 62.5 | 0 | |
| 6 | S15-500 | S15+0 | Ø8-250 | 500 | 0 | 0 | 286 | 0 | 78.2 | 0 | 6 |
| 7 | S15+0 | S15+200 | Ø8-250 | 200 | 0 | 0 | 286 | 0 | 68.8 | 0 | 6 |
| 8 | S15+200 | S15+2750 | Ø8-250 | 2550 | 0 | 0 | 286 | 0 | 62.5 | 0 | |
| 9 | S15+2750 | S24-500 | Ø8-250 | 2750 | 0 | 0 | 286 | 0 | 59.5 | 0 | |
| 10 | S24-500 | S24+0 | Ø8-250 | 500 | 0 | 0 | 286 | 0 | 75.2 | 0 | 6 |
| 11 | S24+0 | S24+230 | Ø8-250 | 230 | 0 | 0 | 286 | 0 | 70.7 | 0 | 6 |
| 12 | S24+230 | S24+2810 | Ø8-250 | 2580 | 0 | 0 | 286 | 0 | 63.5 | 0 | |

Opmerkingen

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

[58] 6.2.3: Z is berekend m.b.v. 0.9d

[109] Bij de berekening van de beugels is geen rekening gehouden met de detailleringregels van art 9.7 voor de gedrongen liggers.

Wring- en dwarskrachten

Balk 3-C

| Geb. | Vanaf | Tot | θ | V _{Rd} | V _{Ed} | V _{Rd,C} | V _{Rd,Max} | T _{Ed} | T _{Rd,C} | T _{Rd,Max} | V _{opg} | Opm. |
|------|----------|----------|------|-----------------|-----------------|-------------------|---------------------|-----------------|-------------------|---------------------|------------------|--------|
| | [mm] | [mm] | [°] | [kN] | | | | | | | | |
| | | | | | | | | | | | | |
| 1 | S6-2810 | S6-230 | 21.8 | 179 | 63 | 65 | 418 | 0 | 26 | 63 | 0 | 58,109 |
| 2 | S6-230 | S6+0 | 21.8 | 179 | 71 | 65 | 415 | 0 | 26 | 63 | 0 | 6 |
| 3 | S6+0 | S6+500 | 21.8 | 179 | 80 | 65 | 415 | 0 | 26 | 63 | 0 | 6 |
| 4 | S6+500 | S6+3250 | 21.8 | 179 | 64 | 65 | 417 | 0 | 26 | 63 | 0 | |
| 5 | S6+3250 | S15-500 | 21.8 | 179 | 63 | 65 | 417 | 0 | 26 | 63 | 0 | |
| 6 | S15-500 | S15+0 | 21.8 | 179 | 78 | 65 | 416 | 0 | 26 | 63 | 0 | 6 |
| 7 | S15+0 | S15+200 | 21.8 | 179 | 69 | 65 | 416 | 0 | 26 | 63 | 0 | 6 |
| 8 | S15+200 | S15+2750 | 21.8 | 179 | 63 | 65 | 416 | 0 | 26 | 63 | 0 | |
| 9 | S15+2750 | S24-500 | 21.8 | 179 | 60 | 65 | 418 | 0 | 26 | 63 | 0 | |
| 10 | S24-500 | S24+0 | 21.8 | 179 | 75 | 65 | 416 | 0 | 26 | 63 | 0 | 6 |
| 11 | S24+0 | S24+230 | 21.8 | 179 | 71 | 65 | 415 | 0 | 26 | 63 | 0 | 6 |
| 12 | S24+230 | S24+2810 | 21.8 | 179 | 63 | 65 | 416 | 0 | 26 | 63 | 0 | |

Opmerkingen

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

[58] 6.2.3: Z is berekend m.b.v. 0.9d

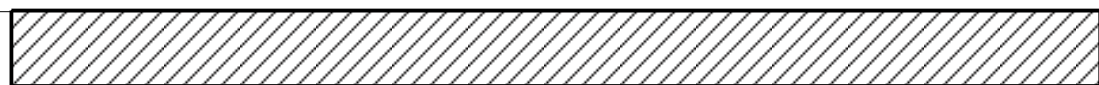
[109] Bij de berekening van de beugels is geen rekening gehouden met de detailleringregels van art 9.7 voor de gedrongen liggers.

Hoofdwapening Fysisch lineair

Balk 3-D

2x16 b

2x12 a



S13

S22

Asl:197

Asl:161

Asl:178

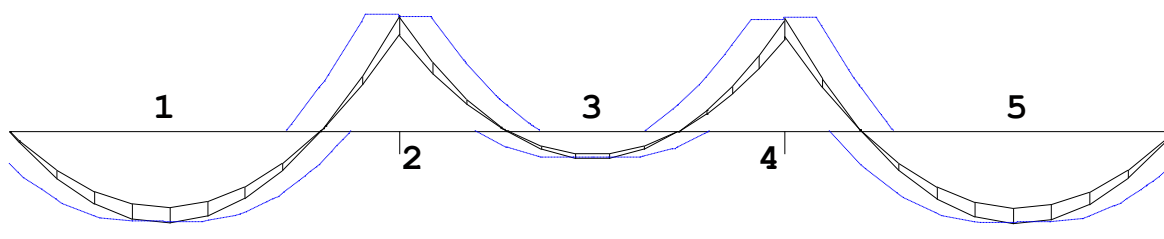
Asl:174

Asl:184

4x12 c

MEd dekkingslijn Fysisch lineair

Balk 3-D



S13

S22

Hoofdwapening

Balk 3-D

| Geb. | Pos. [mm] | M_{Ed} [kNm] | M_{Rd} [kNm] | z B/O [mm] | A_b [mm ²] | A_a [mm ²] | Basiswapening +Bijlegwapening | Opm. |
|------|--------------|-------------------|-------------------|---------------|-----------------------------|-----------------------------|----------------------------------|------|
| 1 | S13-3646 | -65.56 | -87.50 | 419 Ond | 336 | 453 | 4x12 | |
| 2 | S13+0 | 83.47 | 120.40 | 422 Bov | 426 | 629 | 2x16 + 2x12 | |
| 3 | S22-2984 | -19.84 | -87.50 | 419 Ond | 165* | 453 | 4x12 | 54 |
| 4 | S22+0 | 81.70 | 120.40 | 422 Bov | 417 | 629 | 2x16 + 2x12 | |
| 5 | S22+3633 | -66.30 | -87.50 | 419 Ond | 340 | 453 | 4x12 | |

Opmerkingen

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

Scheurvorming volgens artikel 7.3.4

Balk 3-D

| Geb. | Pos. [mm] | Zijde | $M_E; freq$ [kNm] | $S_{r, max}$ [mm] | $\epsilon_{sm} - \epsilon_{cm}$ [%] | w_k [mm] | k_x | w_{max} [mm] | U.C. | Opm. |
|------|-----------|-------|-------------------|-------------------|-------------------------------------|------------|-------|----------------|------|------|
| 1 | S13-412 | Bov | 64.73 | 340 | 0.848 | 0.289 | 1.00 | 0.300 | 0.96 | |
| 1 | S13-3646 | Ond | -50.46 | 406 | 0.797 | 0.324 | 1.14 | 0.343 | 0.95 | |
| 2 | S13+0 | Bov | 64.73 | 340 | 0.848 | 0.289 | 1.00 | 0.300 | 0.96 | |
| 2 | S22+0 | Bov | 63.15 | 340 | 0.818 | 0.278 | 1.00 | 0.300 | 0.93 | |
| 2 | S22-2984 | Ond | -15.21 | 406 | 0.240 | 0.098 | 1.14 | 0.343 | 0.28 | |
| 3 | S22+0 | Bov | 63.15 | 340 | 0.818 | 0.278 | 1.00 | 0.300 | 0.93 | |
| 3 | S22+3147 | Ond | -51.11 | 406 | 0.807 | 0.328 | 1.14 | 0.343 | 0.96 | |
| 3 | S22+3633 | Ond | -51.11 | 406 | 0.807 | 0.328 | 1.14 | 0.343 | 0.96 | |

Verloop hoofdwapening

Balk 3-D

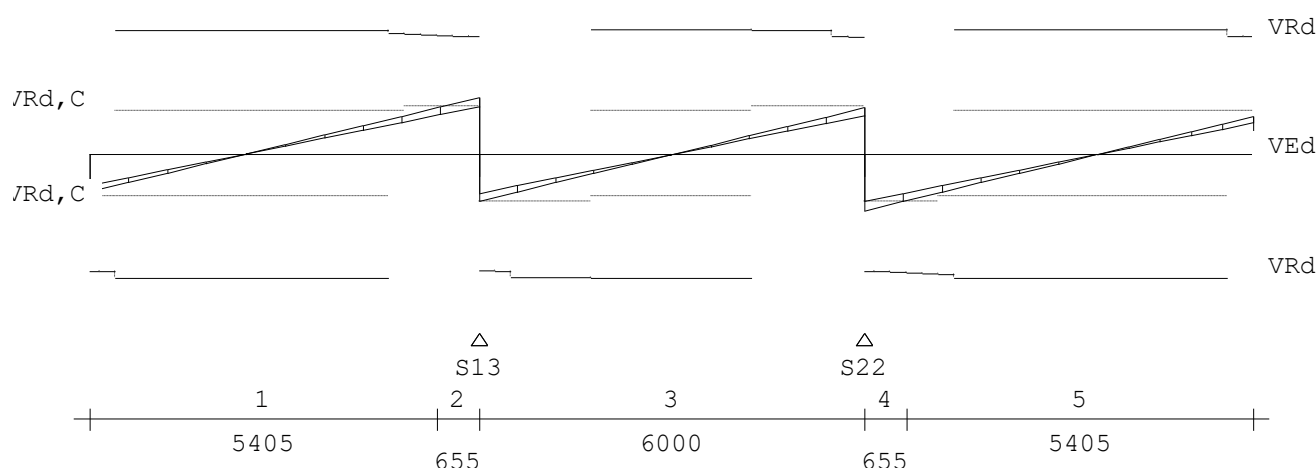
| Merk | B/O | Wapening | Vanaf [mm] | Tot [mm] | Lengte [mm] | $L_{bd, begin}$ [mm] | $L_{bd, eind}$ [mm] |
|------|-------|----------|------------|----------|-------------|----------------------|---------------------|
| a | Boven | 2x12 | S13-6220 | S22+6220 | 18440 | 160 | 160 |
| b | Boven | 2x16 | S13-6220 | S22+6220 | 18440 | 160 | 160 |
| c | Onder | 4x12 | S13-6270 | S22+6271 | 18541 | 210 | 211 |

Opmerkingen

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

DWARSKRACHTEN Fysisch lineair

Balk 3-D Fundamentele combinatie



Wring- en dwarskrachtwapening

Balk 3-D

| Geb. | Vanaf [mm] | Tot [mm] | Beugels | Lengte [mm] | <Wringing> | | | | <Dwarskr.> | | Opm. |
|------|------------|----------|---------|-------------|---------------------------------|---------------------------------|-------------------------------|-------------------------------|---------------|----------------|------|
| | | | | | $A_{lang s}$ [mm ²] | $A_{bg l}$ [mm ² /m] | $A_{bg l}$ [mm ²] | $A_{op g}$ [mm ²] | V_{Ed} [kN] | T_{Ed} [kNm] | |
| 1 | S13-6060 | S13-655 | Ø8-250 | 5405 | 197 | 23 | 286 | 0 | 67.0 | 6 | |
| 2 | S13-655 | S13+0 | Ø8-250 | 655 | 161 | 19 | 286 | 0 | 81.7 | 5 | 6 |
| 3 | S13+0 | S22+0 | Ø8-250 | 6000 | 178 | 21 | 286 | 0 | 67.5 | 5 | |
| 4 | S22+0 | S22+655 | Ø8-250 | 655 | 174 | 21 | 286 | 0 | 81.4 | 5 | 6 |
| 5 | S22+655 | S22+6060 | Ø8-250 | 5405 | 184 | 22 | 286 | 0 | 66.7 | 5 | |

Opmerkingen

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

Wring- en dwarskrachten

Balk 3-D

| Geb. | Vanaf [mm] | Tot [mm] | θ [°] | V_{Rd} [kN] | V_{Ed} | $V_{Rd,C}$ | $V_{Rd,Max}$ | T_{Ed} | $T_{Rd,C}$ | $T_{Rd,Max}$ | V_{opg} | Opm. |
|------|---------------|-------------|-----------------|------------------|--------------|------------|--------------|---------------|------------|--------------|-----------|------|
| | | | | | -----kN----- | | | -----kNm----- | | | | |
| 1 | S13-6060 | S13-655 | 21.8 | 165 | 67 | 69 | 414 | 6 | 26 | 63 | 0 | |
| 2 | S13-655 | S13+0 | 21.8 | 161 | 82 | 69 | 413 | 5 | 26 | 63 | 0 | 6 |
| 3 | S13+0 | S22+0 | 21.8 | 159 | 68 | 69 | 413 | 5 | 26 | 63 | 0 | |
| 4 | S22+0 | S22+655 | 21.8 | 160 | 81 | 69 | 413 | 5 | 26 | 63 | 0 | 6 |
| 5 | S22+655 | S22+6060 | 21.8 | 164 | 67 | 69 | 414 | 5 | 26 | 63 | 0 | |

Opmerkingen

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

Woningtype E en F – uitvoer TS Balkroosters blok 4:

Technosoft Balkroosters release 6.80c

Project.....: 18107 - 14 woningen te Westzaan
 Onderdeel....: Blok 4 - fundering
 Dimensies....: kN/m/rad
 Bestand.....: G:\7000 project\18107-KPO 24 woningen
 Westzaan\Documenten\Constructie\18107-Blok
 4-fundering.grw
 Torsiefac.....: 20 %

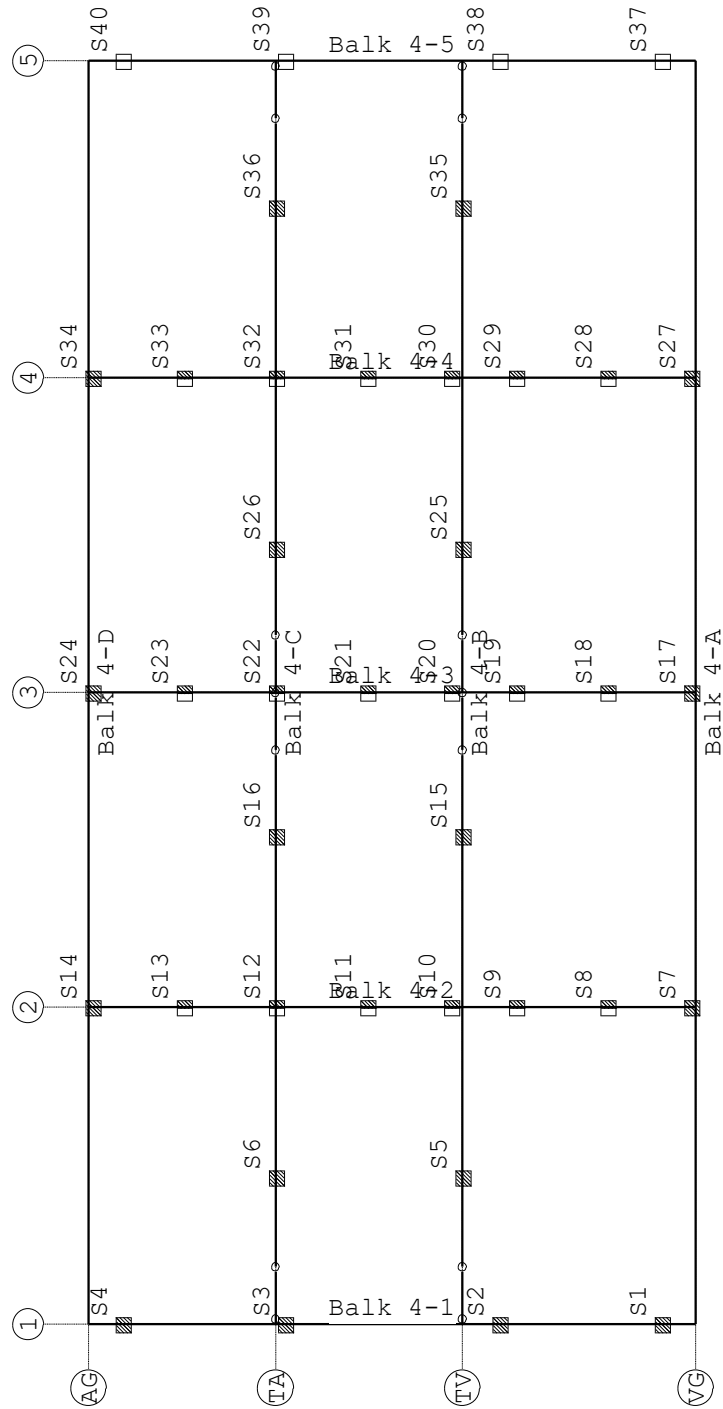
Ouderdom bij belasten : 28 Relatieve vochtigheid : 50%
 Doorbuigingen(beton) zijn dmv gecorrigeerde stijfheden berekend.

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

Toegepaste normen volgens Eurocode met Nederlandse NB

| | | | |
|-------------|--------------------------|-----------------|-------------|
| Belastingen | NEN-EN 1990:2002 | C2:2010,A1:2019 | NB:2019(nl) |
| | NEN-EN 1991-1-1:2002 | C1/C11:2019 | NB:2019(nl) |
| Beton | NEN-EN 1992-1-1:2011(nl) | C2/A1:2015(nl) | NB:2016(nl) |

GEOMETRIE



MATERIALEN

| Mt | Kwaliteit | E-modulus[N/mm ²] | S.G. | Pois. | Uitz. coëff |
|----|-----------|-------------------------------|------|-------|-------------|
| 1 | C20/25 | 7480 | 25.0 | 0.20 | 1.0000e-05 |

MATERIALEN vervolg

| Mt | Kwaliteit | Cement | Kruipfac. |
|----|-----------|--------|-----------|
| 1 | C20/25 | | 3.01 |

PROFIELEN [mm]

| Prof. | Omschrijving | Materiaal | Oppervlak | Torsietr. | Traagheid | Vormf. |
|-------|--------------|-----------|-----------|-----------|-----------|--------|
| 1 | B*H 400*500 | 1:C20/25 | 2.000e+05 | 5.577e+09 | 4.167e+09 | 0.00 |
| 2 | B*H 400*500 | 1:C20/25 | 2.000e+05 | 5.577e+09 | 4.167e+09 | 0.00 |
| 3 | B*H 400*500 | 1:C20/25 | 2.000e+05 | 5.577e+09 | 4.167e+09 | 0.00 |
| 4 | B*H 500*500 | 1:C20/25 | 2.500e+05 | 8.802e+09 | 5.208e+09 | 0.00 |

PROFIELEN vervolg [mm]

| Prof. | Staaftype | Breedte | Hoogte | Zs | Rek.As | Type | b1 | h1 | b2 | h2 |
|-------|-----------|---------|--------|-----|--------|------|----|----|----|----|
| 1 | 0:Normaal | 400 | 500 | 250 | 0.00 | 0:RH | | | | |
| 2 | 0:Normaal | 400 | 500 | 250 | 0.00 | 0:RH | | | | |
| 3 | 0:Normaal | 400 | 500 | 250 | 0.00 | 0:RH | | | | |
| 4 | 0:Normaal | 500 | 500 | 250 | 0.00 | 0:RH | | | | |

STRAMIENLIJNEN

| Nr. | Naam | X-begin | Y-begin | X-eind | Y-Eind |
|-----|------|---------|---------|--------|--------|
| 1 | 1 | 0.000 | 11.600 | 0.000 | 0.000 |
| 2 | 2 | 6.060 | 11.600 | 6.060 | 0.000 |
| 3 | 3 | 12.060 | 11.600 | 12.060 | 0.000 |
| 4 | 4 | 18.060 | 11.600 | 18.060 | 0.000 |
| 5 | 5 | 24.120 | 11.600 | 24.120 | 0.000 |
| 6 | VG | 0.000 | 0.000 | 24.120 | 0.000 |
| 7 | TV | 0.000 | 4.460 | 24.120 | 4.460 |
| 8 | TA | 0.000 | 8.030 | 24.120 | 8.030 |
| 9 | AG | 0.000 | 11.600 | 24.120 | 11.600 |

BALKEN

| Nr. | Naam | Begin | Eind | Profiel |
|-----|----------|-------|------|-----------------------|
| 1 | Balk 4-1 | 1;VG | 1;AG | 4:B*H 500*500 |
| 2 | Balk 4-2 | 2;VG | 2;AG | 1:B*H 400*500 |
| 3 | Balk 4-3 | 3;VG | 3;AG | 1:B*H 400*500 |
| 4 | Balk 4-4 | 4;VG | 4;AG | 1:B*H 400*500 |
| 5 | Balk 4-5 | 5;VG | 5;AG | 4:B*H 500*500 |
| 6 | Balk 4-A | 1;VG | 5;VG | 3:B*H 400*500 |
| 7 | Balk 4-B | 1;TV | 5;TV | Zie Doorsnedesectoren |
| 8 | Balk 4-C | 1;TA | 5;TA | Zie Doorsnedesectoren |
| 9 | Balk 4-D | 1;AG | 5;AG | 3:B*H 400*500 |

BALKEN vervolg

| Nr. | Naam | Aansl.begin | Aansl.eind | Excentr. | Pasm.begin | Pasm.eind | Opm. |
|-----|----------|-------------|------------|----------|------------|-----------|------|
| 1 | Balk 4-1 | WDM | WDM | 0.000 | 0.000 | 0.000 | |
| 2 | Balk 4-2 | WDM | WDM | 0.000 | 0.000 | 0.000 | |
| 3 | Balk 4-3 | WDM | WDM | 0.000 | 0.000 | 0.000 | |
| 4 | Balk 4-4 | WDM | WDM | 0.000 | 0.000 | 0.000 | |
| 5 | Balk 4-5 | WDM | WDM | 0.000 | 0.000 | 0.000 | |
| 6 | Balk 4-A | WDM | WDM | 0.000 | 0.000 | 0.000 | |
| 7 | Balk 4-B | WD- | WD- | 0.000 | 0.000 | 0.000 | |
| 8 | Balk 4-C | WD- | WD- | 0.000 | 0.000 | 0.000 | |
| 9 | Balk 4-D | WDM | WDM | 0.000 | 0.000 | 0.000 | |

Opmerkingen:

De torsie traagheid van alle balken is tot 20% gereduceerd

DOORSNEDESECTOREN

| Balk | Vanaf | Tot | Lengte | Profiel | Eindcode |
|----------|--------|--------|--------|---------------|-------------|
| Balk 4-B | 0.000 | 1.100 | 1.100 | 2:B*H 400*500 | 0:Scharnier |
| Balk 4-B | 1.100 | 10.960 | 9.860 | 2:B*H 400*500 | 0:Scharnier |
| Balk 4-B | 10.960 | 12.060 | 1.100 | 2:B*H 400*500 | 0:Scharnier |
| Balk 4-B | 12.060 | 13.160 | 1.100 | 2:B*H 400*500 | 0:Scharnier |
| Balk 4-B | 13.160 | 23.020 | 9.860 | 2:B*H 400*500 | 0:Scharnier |
| Balk 4-B | 23.020 | 24.120 | 1.100 | 2:B*H 400*500 | 1:Vast |
| Balk 4-C | 0.000 | 1.100 | 1.100 | 2:B*H 400*500 | 0:Scharnier |
| Balk 4-C | 1.100 | 10.960 | 9.860 | 2:B*H 400*500 | 0:Scharnier |
| Balk 4-C | 10.960 | 12.060 | 1.100 | 2:B*H 400*500 | 0:Scharnier |
| Balk 4-C | 12.060 | 13.160 | 1.100 | 2:B*H 400*500 | 0:Scharnier |
| Balk 4-C | 13.160 | 23.020 | 9.860 | 2:B*H 400*500 | 0:Scharnier |
| Balk 4-C | 23.020 | 24.120 | 1.100 | 2:B*H 400*500 | 1:Vast |

STEUNPUNTTYPE

| | | |
|-----------|--------------|----------------------------------|
| Nr. | : 1 | Assenstelsel: Globaal |
| Afmeting | : 220*220 | Rotatie X:Vrij |
| Inheinv. | : 17,50 -NAP | Verplaatsing Z:Veerwaarde: 30000 |
| FRd | : 258.000000 | Rotatie Y:Vrij |
| Min.afst. | : 0.750 | |
| Nr. | : 2 | Assenstelsel: Globaal |
| Afmeting | : 220*220 | Rotatie X:Vrij |
| Inheinv. | : 17,50 -NAP | Verplaatsing Z:Veerwaarde: 30000 |
| FRd | : 290.000000 | Rotatie Y:Vrij |
| Min.afst. | : 0.750 | |
| Nr. | : 3 | Assenstelsel: Globaal |
| Afmeting | : 250*250 | Rotatie X:Vrij |
| Inheinv. | : 17,50 -NAP | Verplaatsing Z:Veerwaarde: 35000 |
| FRd | : 300.000000 | Rotatie Y:Vrij |
| Min.afst. | : 0.850 | |

STEUNPUNTEN

| Nr. | Naam | Steunpunttype | Balk | Positie | Excentr. | Hoek Opm: |
|-----|------|---------------|----------|---------|----------|-----------|
| 1 | | 1:220*220 | Balk 4-1 | 0.65 | 0.000 | 0.000 |
| 2 | | 1:220*220 | Balk 4-1 | 3.75 | 0.000 | 0.000 |
| 3 | | 1:220*220 | Balk 4-1 | 7.85 | 0.000 | 0.000 |
| 4 | | 1:220*220 | Balk 4-1 | 10.95 | 0.000 | 0.000 |
| 5 | | 1:220*220 | Balk 4-B | 2.81 | 0.000 | 0.000 |
| 6 | | 1:220*220 | Balk 4-C | 2.81 | 0.000 | 0.000 |
| 7 | | 1:220*220 | Balk 4-2 | 0.08 | 0.000 | 0.000 |
| 8 | | 3:250*250 | Balk 4-2 | 1.68 | 0.000 | 0.000 |
| 9 | | 3:250*250 | Balk 4-2 | 3.43 | 0.000 | 0.000 |
| 10 | | 3:250*250 | Balk 4-2 | 4.68 | 0.000 | 0.000 |
| 11 | | 3:250*250 | Balk 4-2 | 6.28 | 0.000 | 0.000 |
| 12 | | 3:250*250 | Balk 4-2 | 8.03 | 0.000 | 0.000 |
| 13 | | 3:250*250 | Balk 4-2 | 9.78 | 0.000 | 0.000 |
| 14 | | 1:220*220 | Balk 4-2 | 11.53 | 0.000 | 0.000 |
| 15 | | 1:220*220 | Balk 4-B | 9.31 | 0.000 | 0.000 |
| 16 | | 1:220*220 | Balk 4-C | 9.31 | 0.000 | 0.000 |
| 17 | | 1:220*220 | Balk 4-3 | 0.08 | 0.000 | 0.000 |
| 18 | | 3:250*250 | Balk 4-3 | 1.68 | 0.000 | 0.000 |
| 19 | | 3:250*250 | Balk 4-3 | 3.43 | 0.000 | 0.000 |
| 20 | | 3:250*250 | Balk 4-3 | 4.68 | 0.000 | 0.000 |
| 21 | | 3:250*250 | Balk 4-3 | 6.28 | 0.000 | 0.000 |
| 22 | | 3:250*250 | Balk 4-3 | 8.03 | 0.000 | 0.000 |

STEUNPUNTEN

| Nr. | Naam | Steunpunttype | Balk | Positie | Excentr. | Hoek Opm: |
|-----|------|---------------|----------|---------|----------|-----------|
| 23 | | 3:250*250 | Balk 4-3 | 9.78 | 0.000 | 0.000 |
| 24 | | 1:220*220 | Balk 4-3 | 11.53 | 0.000 | 0.000 |
| 25 | | 1:220*220 | Balk 4-B | 14.81 | 0.000 | 0.000 |
| 26 | | 1:220*220 | Balk 4-C | 14.81 | 0.000 | 0.000 |
| 27 | | 1:220*220 | Balk 4-4 | 0.08 | 0.000 | 0.000 |
| 28 | | 3:250*250 | Balk 4-4 | 1.68 | 0.000 | 0.000 |
| 29 | | 3:250*250 | Balk 4-4 | 3.43 | 0.000 | 0.000 |
| 30 | | 3:250*250 | Balk 4-4 | 4.68 | 0.000 | 0.000 |
| 31 | | 3:250*250 | Balk 4-4 | 6.28 | 0.000 | 0.000 |
| 32 | | 3:250*250 | Balk 4-4 | 8.03 | 0.000 | 0.000 |
| 33 | | 3:250*250 | Balk 4-4 | 9.78 | 0.000 | 0.000 |
| 34 | | 1:220*220 | Balk 4-4 | 11.53 | 0.000 | 0.000 |
| 35 | | 1:220*220 | Balk 4-B | 21.31 | 0.000 | 0.000 |
| 36 | | 1:220*220 | Balk 4-C | 21.31 | 0.000 | 0.000 |
| 37 | | 2:220*220 | Balk 4-5 | 0.65 | 0.000 | 0.000 |
| 38 | | 2:220*220 | Balk 4-5 | 3.75 | 0.000 | 0.000 |
| 39 | | 2:220*220 | Balk 4-5 | 7.85 | 0.000 | 0.000 |
| 40 | | 2:220*220 | Balk 4-5 | 10.95 | 0.000 | 0.000 |

BELASTINGGEVALLEN

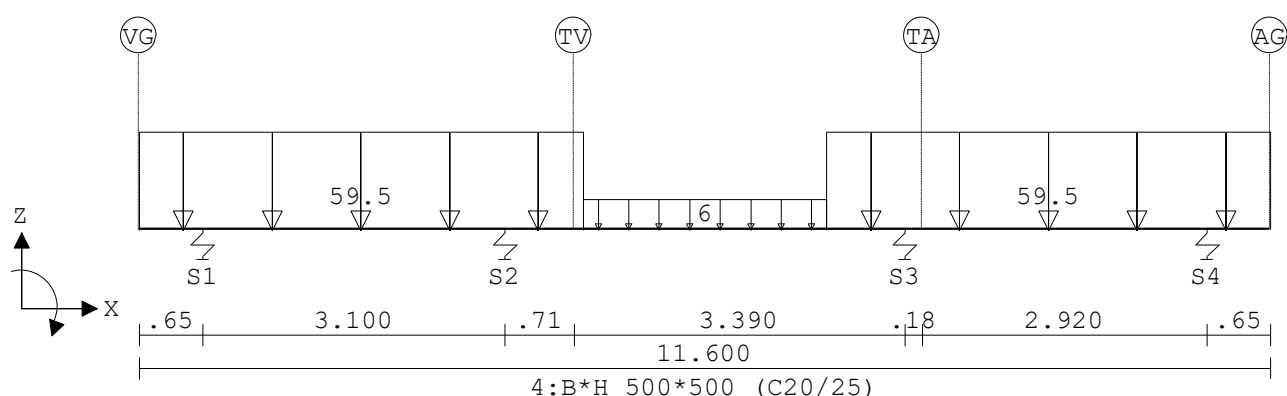
| B.G. | Omschrijving | Belast/onbelast | ψ_0 | ψ_1 | ψ_2 | e.g. |
|------|--------------|--------------------|----------|----------|----------|-------|
| 1 | permanent | 2:Permanent EN1991 | | | | -1.00 |
| 2 | variabel bg | 0:Alles tegelijk | 0.40 | 0.50 | 0.30 | 0.00 |
| 3 | variabel 1e | 0:Alles tegelijk | 0.40 | 0.50 | 0.30 | 0.00 |
| 4 | variabel 2e | 0:Alles tegelijk | 0.40 | 0.50 | 0.30 | 0.00 |

BELASTINGGEVALLEN

| B.G. | Omschrijving | Type |
|------|--------------|---------------------------------|
| 1 | permanent | 1 Permanente belasting |
| 2 | variabel bg | 2 Ver. bel. pers. ed. (q_k) |
| 3 | variabel 1e | 2 Ver. bel. pers. ed. (q_k) |
| 4 | variabel 2e | 2 Ver. bel. pers. ed. (q_k) |

VELDBELASTINGEN

Balk 4-1 B.G:1 permanent



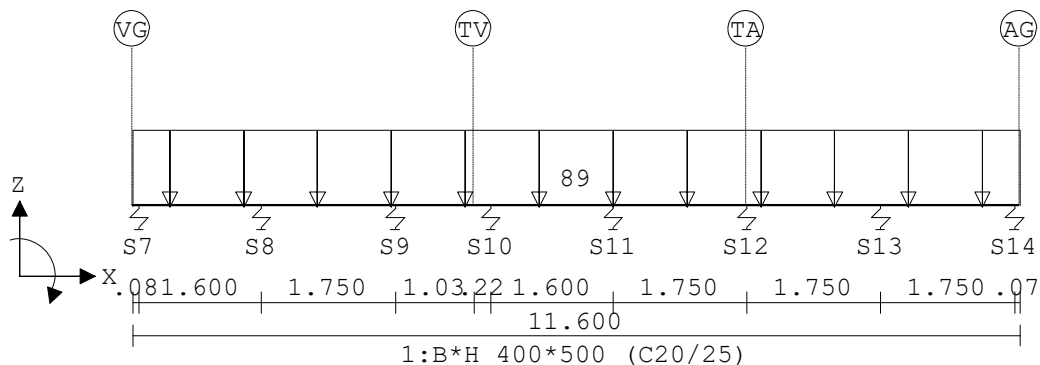
VELDBELASTINGEN

B.G:1 permanent

| Balk | Last | Type | q1/p/m | q2 | Afstand | Lengte | Exc. |
|----------|------|----------|---------|---------|---------|--------|-------|
| Balk 4-1 | 1 | 1:q-last | -59.500 | -59.500 | 0.000 | 4.550 | 0.000 |
| Balk 4-1 | 2 | 1:q-last | -6.000 | -6.000 | 4.550 | 2.500 | 0.000 |
| Balk 4-1 | 3 | 1:q-last | -59.500 | -59.500 | 7.050 | 4.550 | 0.000 |

VELDBELASTINGEN

Balk 4-2 B.G:1 permanent



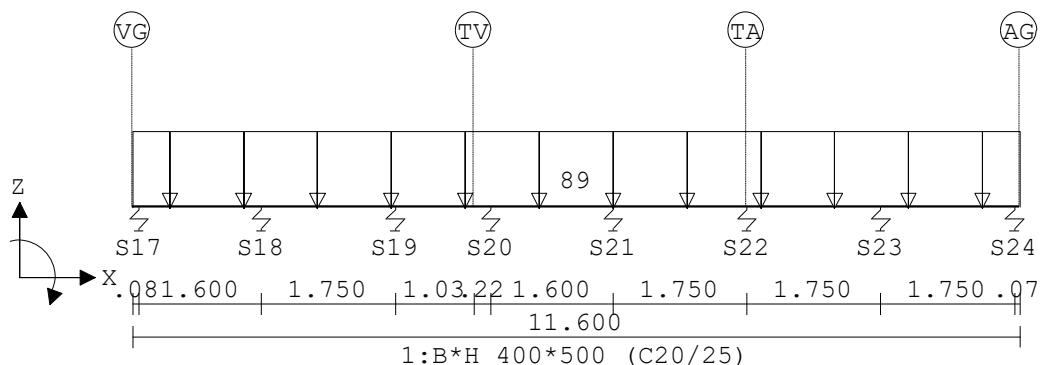
VELDBELASTINGEN

B.G:1 permanent

| Balk | Last | Type | q1/p/m | q2 | Afstand | Lengte | Exc. |
|----------|------|----------|---------|---------|---------|--------|-------|
| Balk 4-2 | 1 | 1:q-last | -89.000 | -89.000 | 0.000 | 11.600 | 0.000 |

VELDBELASTINGEN

Balk 4-3 B.G:1 permanent



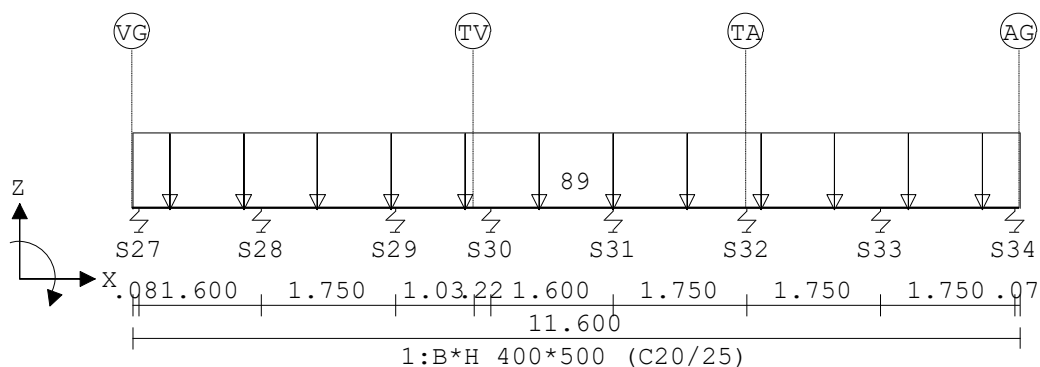
VELDBELASTINGEN

B.G:1 permanent

| Balk | Last | Type | q1/p/m | q2 | Afstand | Lengte | Exc. |
|----------|------|----------|---------|---------|---------|--------|-------|
| Balk 4-3 | 1 | 1:q-last | -89.000 | -89.000 | 0.000 | 11.600 | 0.000 |

VELDBELASTINGEN

Balk 4-4 B.G:1 permanent



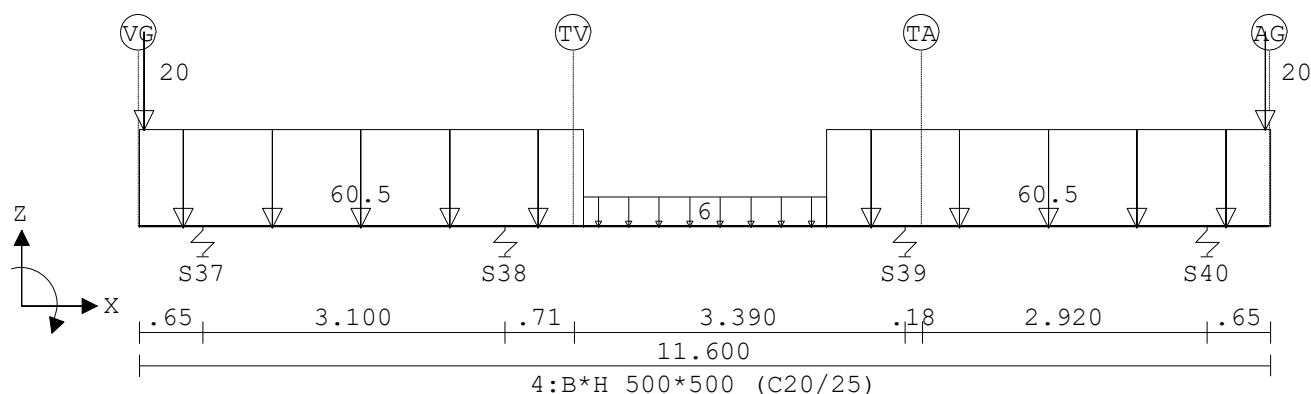
VELDBELASTINGEN

B.G:1 permanent

| Balk | Last Type | q1/p/m | q2 | Afstand | Lengte | Exc. |
|----------|------------|---------|---------|---------|--------|-------|
| Balk 4-4 | 1 1:q-last | -89.000 | -89.000 | 0.000 | 11.600 | 0.000 |

VELDBELASTINGEN

Balk 4-5 B.G:1 permanent

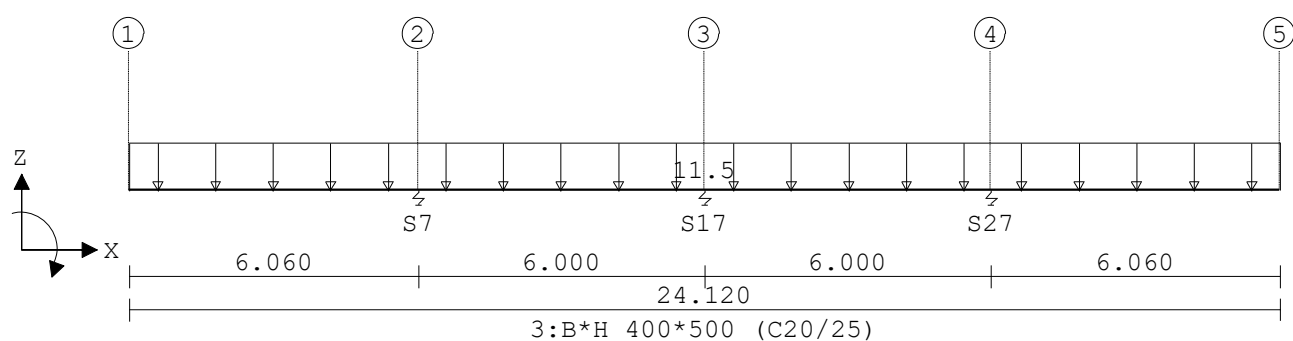

VELDBELASTINGEN

B.G:1 permanent

| Balk | Last Type | q1/p/m | q2 | Afstand | Lengte | Exc. |
|----------|--------------|---------|---------|---------|--------|-------|
| Balk 4-5 | 1 1:q-last | -60.500 | -60.500 | 0.000 | 4.550 | 0.000 |
| Balk 4-5 | 2 1:q-last | -6.000 | -6.000 | 4.550 | 2.500 | 0.000 |
| Balk 4-5 | 3 1:q-last | -60.500 | -60.500 | 7.050 | 4.550 | 0.000 |
| Balk 4-5 | 4 8:Puntlast | -20.000 | | 0.050 | | 0.000 |
| Balk 4-5 | 5 8:Puntlast | -20.000 | | 11.550 | | 0.000 |

VELDBELASTINGEN

Balk 4-A B.G:1 permanent


VELDBELASTINGEN

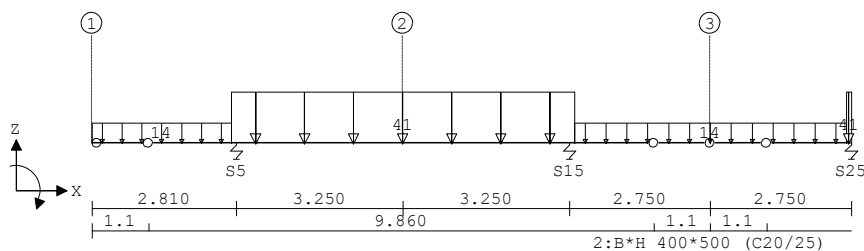
B.G:1 permanent

| Balk | Last Type | q1/p/m | q2 | Afstand | Lengte | Exc. |
|----------|------------|---------|---------|---------|--------|-------|
| Balk 4-A | 1 1:q-last | -11.500 | -11.500 | 0.000 | 24.120 | 0.100 |

VELDBELASTINGEN

Balk 4-B B.G:1 permanent

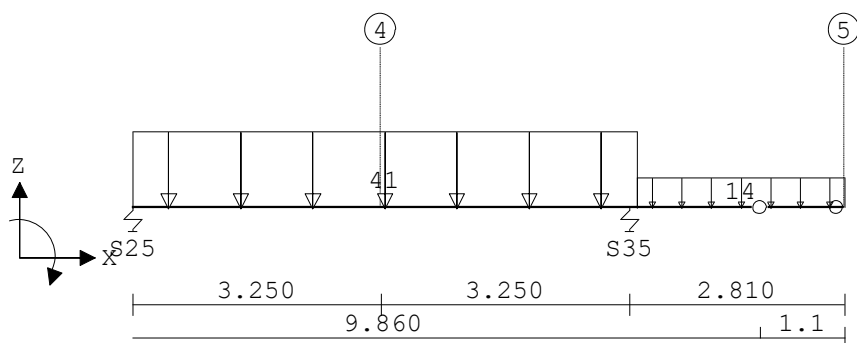
Velden: 1 t/m 5



VELDBELASTINGEN

Balk 4-B B.G:1 permanent

Velden: 6 t/m 8



VELDBELASTINGEN

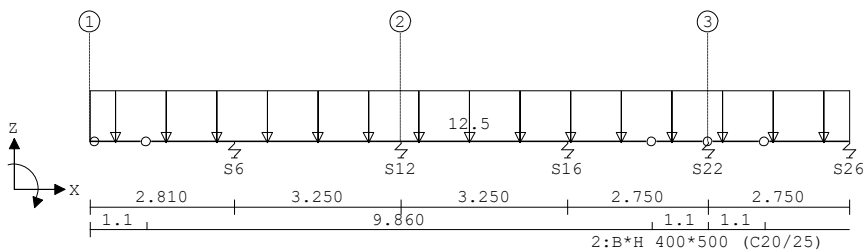
B.G:1 permanent

| Balk | Last Type | q1/p/m | q2 | Afstand | Lengte | Exc. |
|----------|------------|---------|---------|---------|--------|-------|
| Balk 4-B | 1 1:q-last | -14.000 | -14.000 | 0.000 | 2.710 | 0.000 |
| Balk 4-B | 2 1:q-last | -41.000 | -41.000 | 2.710 | 6.700 | 0.000 |
| Balk 4-B | 3 1:q-last | -14.000 | -14.000 | 9.410 | 5.300 | 0.000 |
| Balk 4-B | 4 1:q-last | -41.000 | -41.000 | 14.710 | 6.700 | 0.000 |
| Balk 4-B | 5 1:q-last | -14.000 | -14.000 | 21.410 | 2.710 | 0.000 |

VELDBELASTINGEN

Balk 4-C B.G:1 permanent

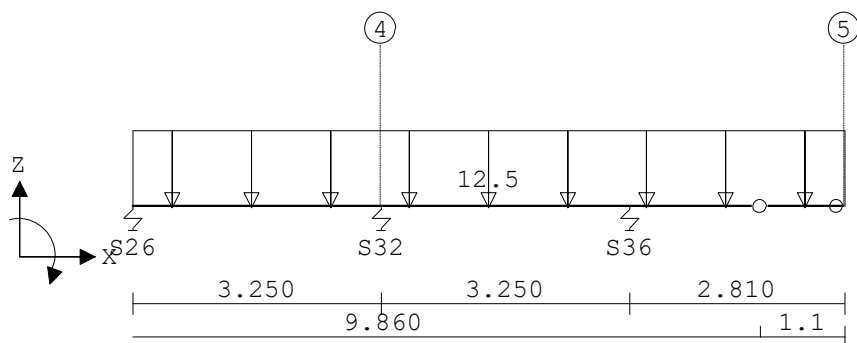
Velden: 1 t/m 5



VELDBELASTINGEN

Balk 4-C B.G:1 permanent

Velden: 6 t/m 8



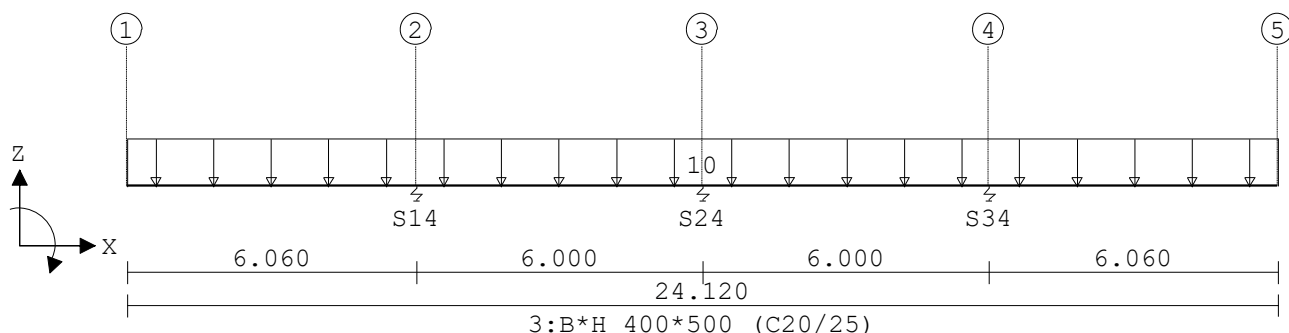
VELDBELASTINGEN

B.G:1 permanent

| Balk | Last Type | q1/p/m | q2 | Afstand | Lengte | Exc. |
|----------|------------|---------|---------|---------|--------|-------|
| Balk 4-C | 1 1:q-last | -12.500 | -12.500 | 0.000 | 24.120 | 0.000 |

VELDBELASTINGEN

Balk 4-D B.G:1 permanent



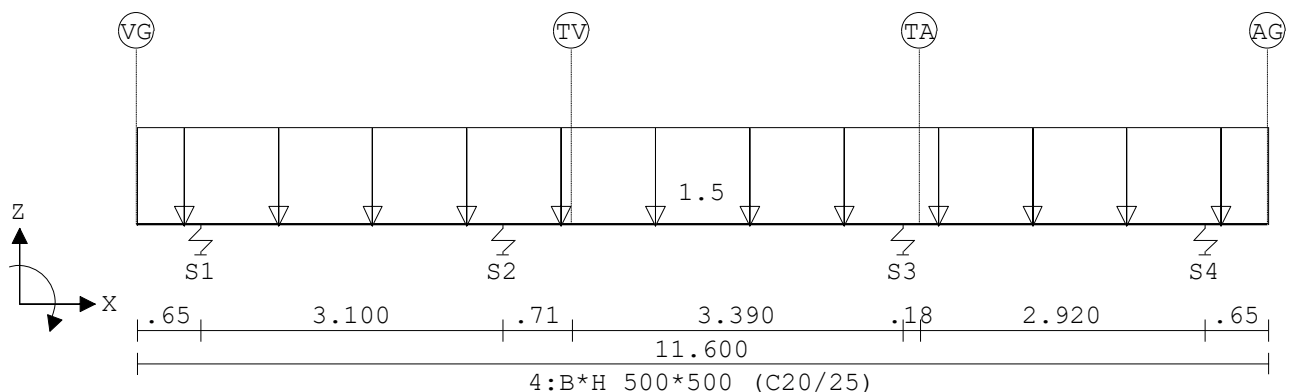
VELDBELASTINGEN

B.G:1 permanent

| Balk | Last Type | q1/p/m | q2 | Afstand | Lengte | Exc. |
|----------|------------|---------|---------|---------|--------|--------|
| Balk 4-D | 1 1:q-last | -10.000 | -10.000 | 0.000 | 24.120 | -0.100 |

VELDBELASTINGEN

Balk 4-1 B.G:2 variabel bg



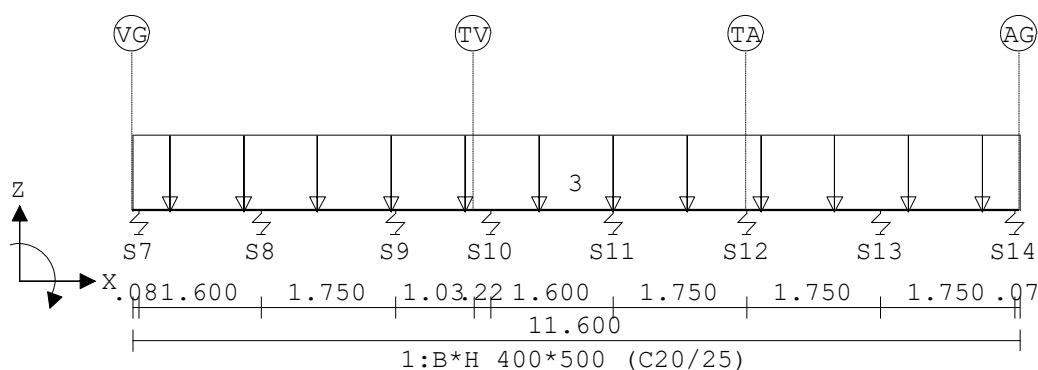
VELDBELASTINGEN

B.G:2 variabel bg

| Balk | Last Type | q1/p/m | q2 | Afstand | Lengte | Exc. |
|----------|------------|--------|--------|---------|--------|-------|
| Balk 4-1 | 1 1:q-last | -1.500 | -1.500 | 0.000 | 11.600 | 0.000 |

VELDBELASTINGEN

Balk 4-2 B.G:2 variabel bg



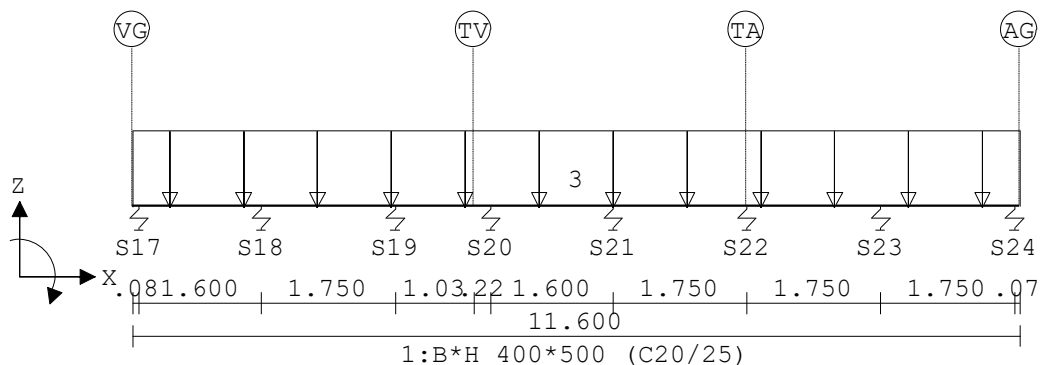
VELDBELASTINGEN

B.G:2 variabel bg

| Balk | Last Type | q1/p/m | q2 | Afstand | Lengte | Exc. |
|----------|------------|--------|--------|---------|--------|-------|
| Balk 4-2 | 1 1:q-last | -3.000 | -3.000 | 0.000 | 11.600 | 0.000 |

VELDBELASTINGEN

Balk 4-3 B.G:2 variabel bg



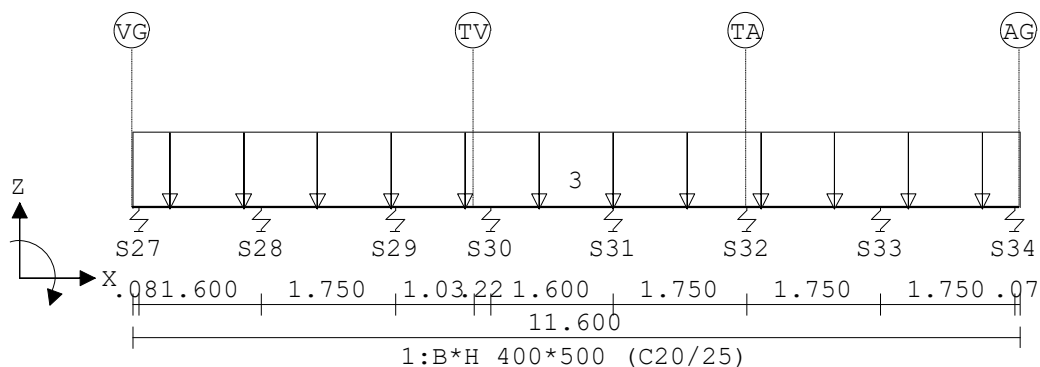
VELDBELASTINGEN

B.G:2 variabel bg

| Balk | Last Type | q1/p/m | q2 | Afstand | Lengte | Exc. |
|----------|------------|--------|--------|---------|--------|-------|
| Balk 4-3 | 1 1:q-last | -3.000 | -3.000 | 0.000 | 11.600 | 0.000 |

VELDBELASTINGEN

Balk 4-4 B.G:2 variabel bg



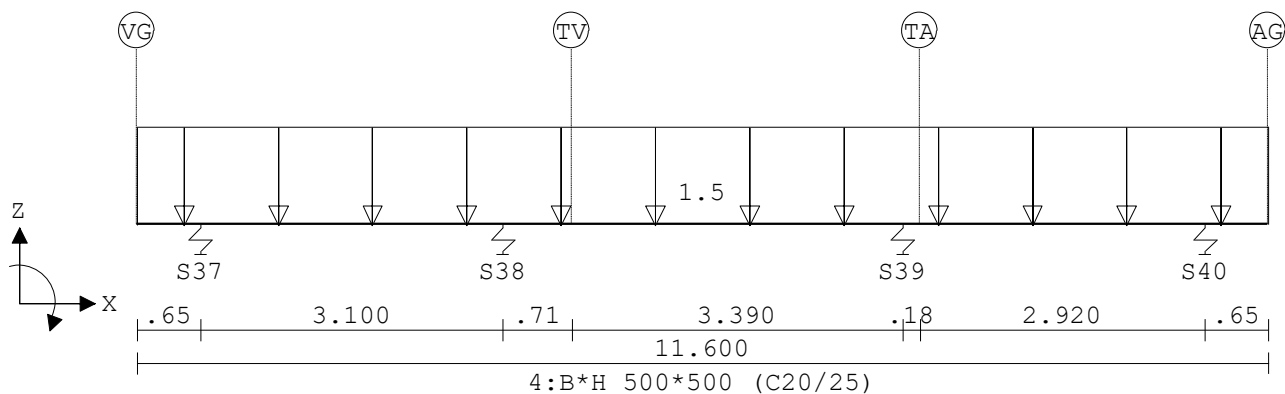
VELDBELASTINGEN

B.G:2 variabel bg

| Balk | Last Type | q1/p/m | q2 | Afstand | Lengte | Exc. |
|----------|------------|--------|--------|---------|--------|-------|
| Balk 4-4 | 1 1:q-last | -3.000 | -3.000 | 0.000 | 11.600 | 0.000 |

VELDBELASTINGEN

Balk 4-5 B.G:2 variabel bg



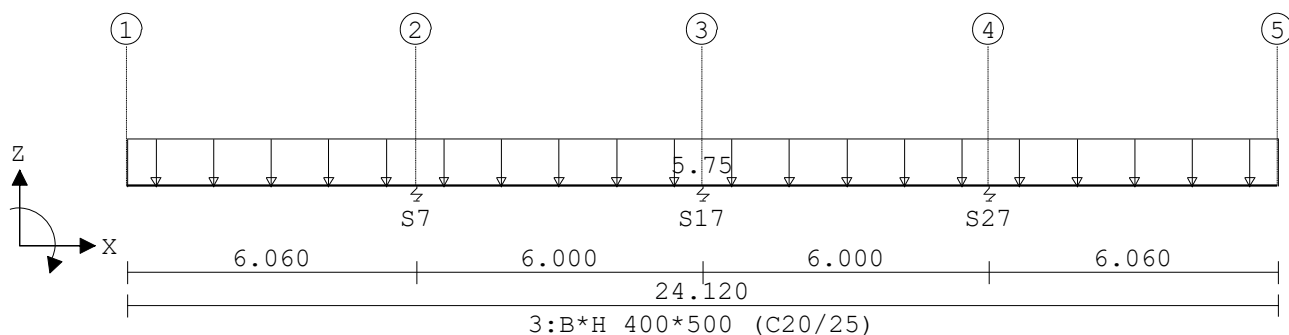
VELDBELASTINGEN

B.G:2 variabel bg

| Balk | Last Type | q1/p/m | q2 | Afstand | Lengte | Exc. |
|----------|------------|--------|--------|---------|--------|-------|
| Balk 4-5 | 1 1:q-last | -1.500 | -1.500 | 0.000 | 11.600 | 0.000 |

VELDBELASTINGEN

Balk 4-A B.G:2 variabel bg



VELDBELASTINGEN

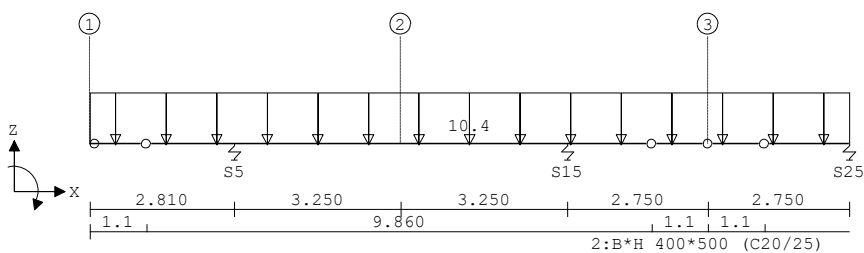
B.G:2 variabel bg

| Balk | Last Type | q1/p/m | q2 | Afstand | Lengte | Exc. |
|----------|------------|--------|--------|---------|--------|-------|
| Balk 4-A | 1 1:q-last | -5.750 | -5.750 | 0.000 | 24.120 | 0.100 |

VELDBELASTINGEN

Balk 4-B B.G:2 variabel bg

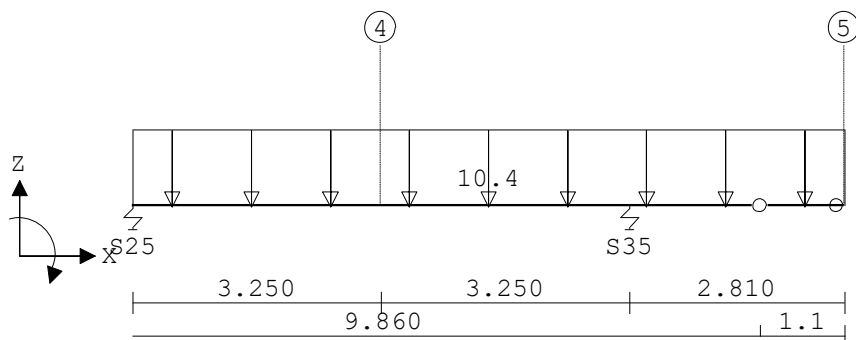
Velden: 1 t/m 5



VELDBELASTINGEN

Balk 4-B B.G:2 variabel bg

Velden: 6 t/m 8



VELDBELASTINGEN

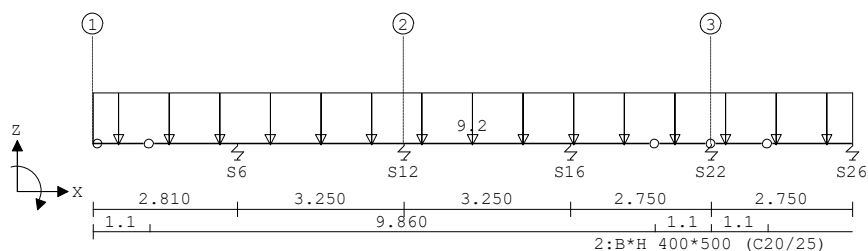
B.G:2 variabel bg

| Balk | Last Type | q1/p/m | q2 | Afstand | Lengte | Exc. |
|----------|------------|---------|---------|---------|--------|-------|
| Balk 4-B | 1 1:q-last | -10.400 | -10.400 | 0.000 | 24.120 | 0.000 |

VELDBELASTINGEN

Balk 4-C B.G:2 variabel bg

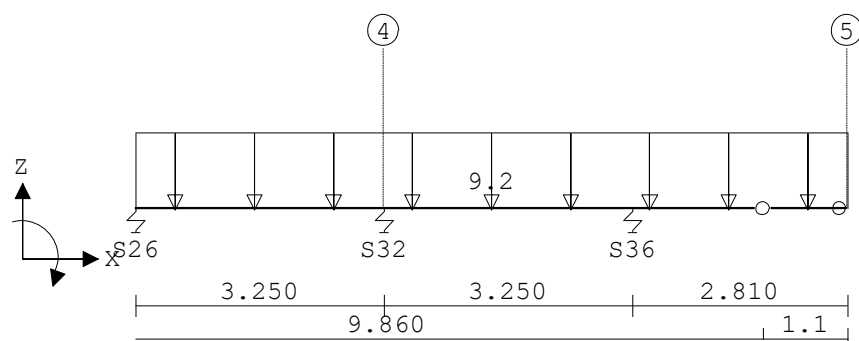
Velden: 1 t/m 5



VELDBELASTINGEN

Balk 4-C B.G:2 variabel bg

Velden: 6 t/m 8



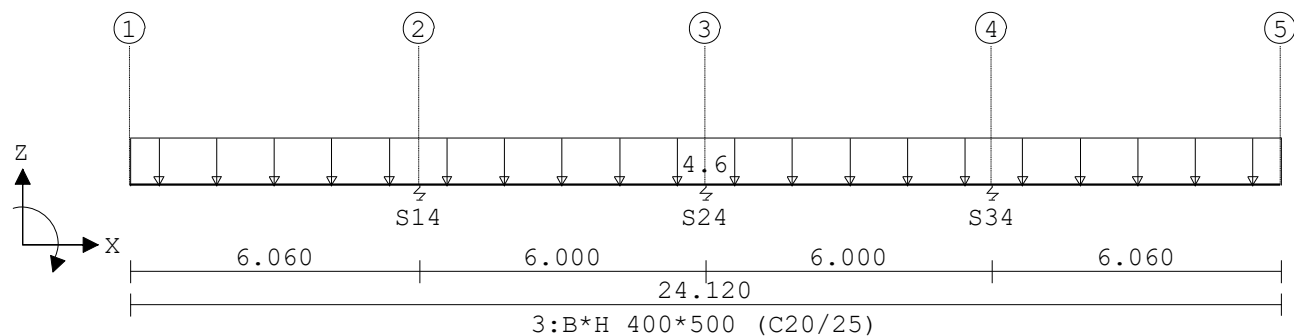
VELDBELASTINGEN

B.G:2 variabel bg

| Balk | Last Type | q1/p/m | q2 | Afstand | Lengte | Exc. |
|----------|------------|--------|--------|---------|--------|-------|
| Balk 4-C | 1 1:q-last | -9.200 | -9.200 | 0.000 | 24.120 | 0.000 |

VELDBELASTINGEN

Balk 4-D B.G:2 variabel bg



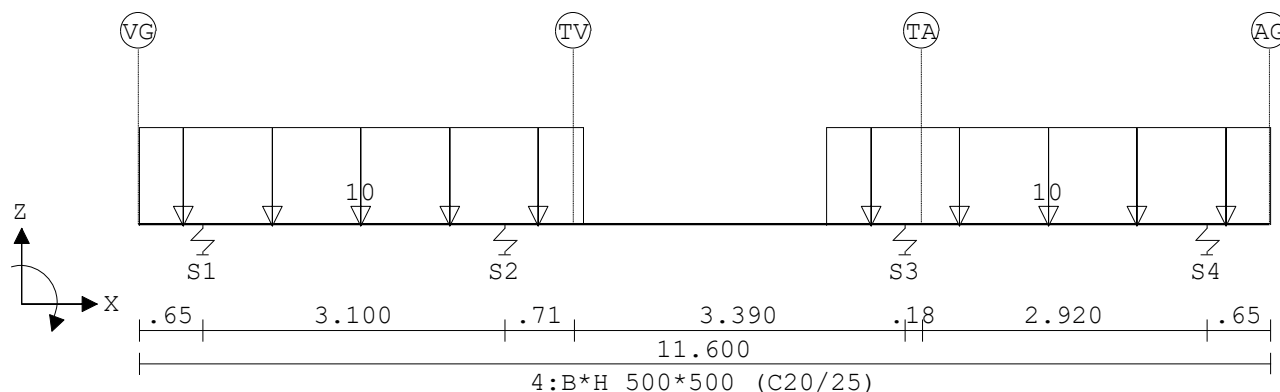
VELDBELASTINGEN

B.G:2 variabel bg

| Balk | Last | Type | q1/p/m | q2 | Afstand | Lengte | Exc. |
|----------|------|----------|--------|--------|---------|--------|--------|
| Balk 4-D | 1 | 1:q-last | -4.600 | -4.600 | 0.000 | 24.120 | -0.100 |

VELDBELASTINGEN

Balk 4-1 B.G:3 variabel 1e



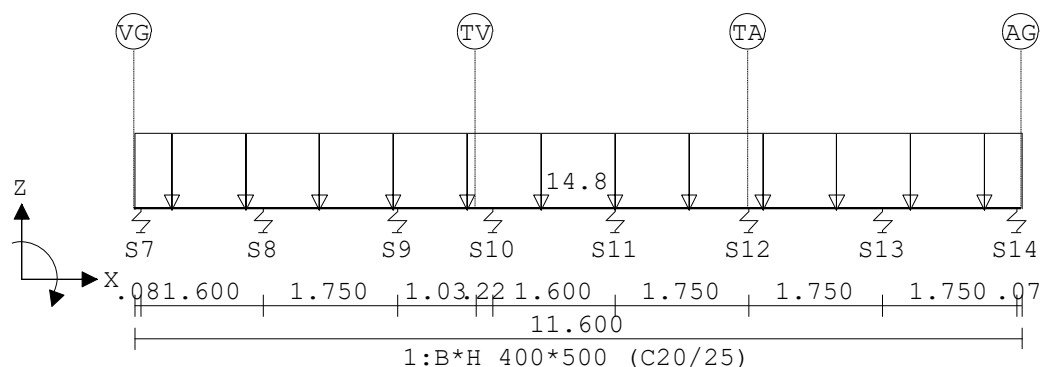
VELDBELASTINGEN

B.G:3 variabel 1e

| Balk | Last | Type | q1/p/m | q2 | Afstand | Lengte | Exc. |
|----------|------|----------|---------|---------|---------|--------|-------|
| Balk 4-1 | 1 | 1:q-last | -10.000 | -10.000 | 0.000 | 4.550 | 0.000 |
| Balk 4-1 | 2 | 1:q-last | -10.000 | -10.000 | 7.050 | 4.550 | 0.000 |

VELDBELASTINGEN

Balk 4-2 B.G:3 variabel 1e



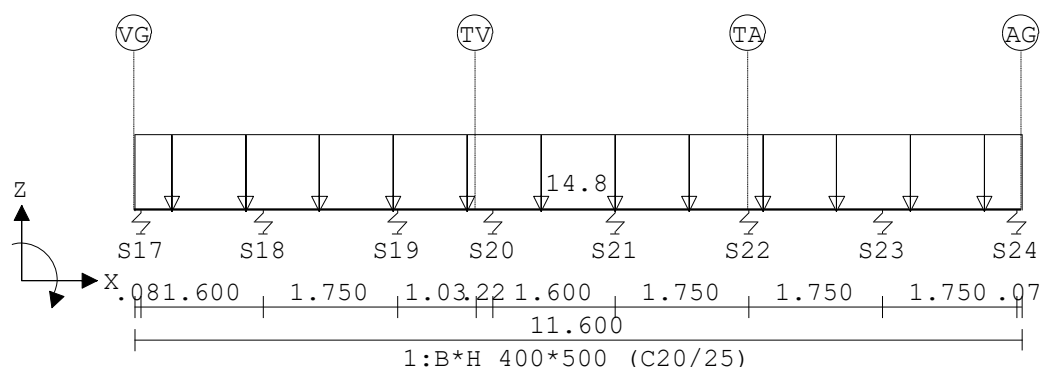
VELDBELASTINGEN

B.G:3 variabel 1e

| Balk | Last | Type | q1/p/m | q2 | Afstand | Lengte | Exc. |
|----------|------|----------|---------|---------|---------|--------|-------|
| Balk 4-2 | 1 | 1:q-last | -14.800 | -14.800 | 0.000 | 11.600 | 0.000 |

VELDBELASTINGEN

Balk 4-3 B.G:3 variabel 1e



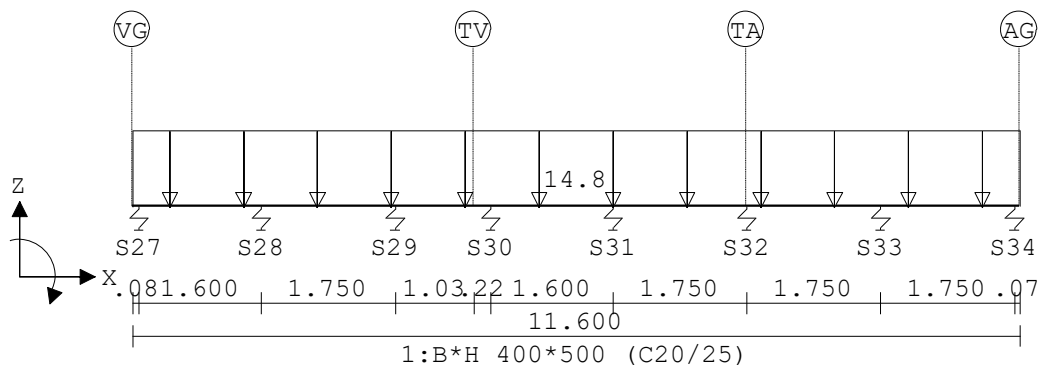
VELDBELASTINGEN

B.G:3 variabel 1e

| Balk | Last | Type | q1/p/m | q2 | Afstand | Lengte | Exc. |
|----------|------|----------|---------|---------|---------|--------|-------|
| Balk 4-3 | 1 | 1:q-last | -14.800 | -14.800 | 0.000 | 11.600 | 0.000 |

VELDBELASTINGEN

Balk 4-4 B.G:3 variabel 1e



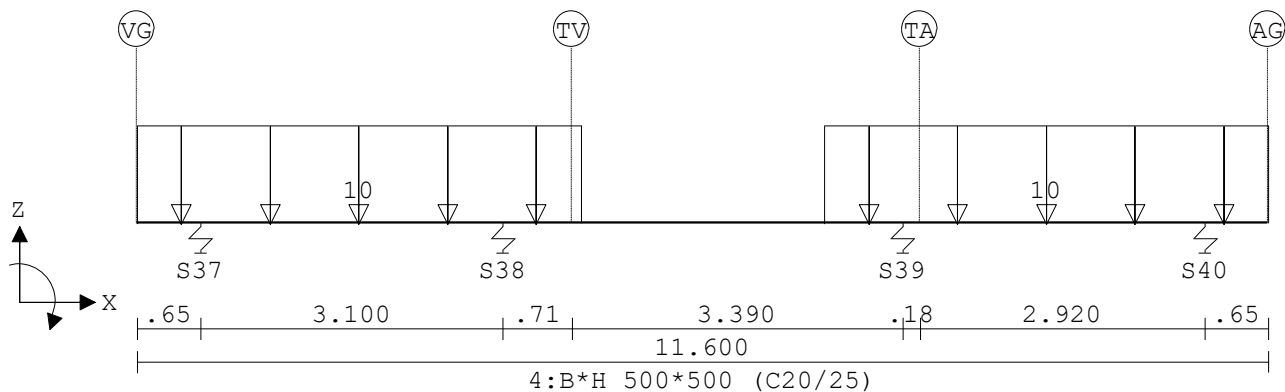
VELDBELASTINGEN

B.G:3 variabel 1e

| Balk | Last | Type | q1/p/m | q2 | Afstand | Lengte | Exc. |
|----------|------|----------|---------|---------|---------|--------|-------|
| Balk 4-4 | 1 | 1:q-last | -14.800 | -14.800 | 0.000 | 11.600 | 0.000 |

VELDBELASTINGEN

Balk 4-5 B.G:3 variabel 1e



VELDBELASTINGEN

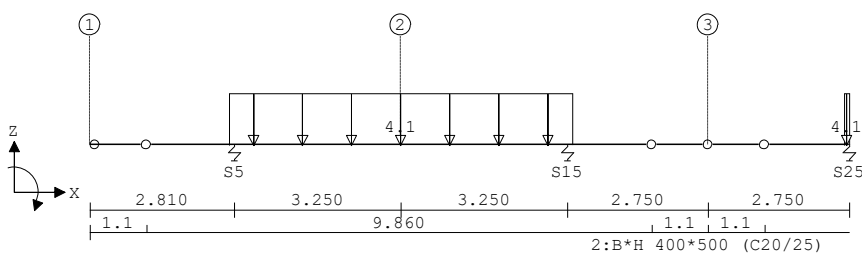
B.G:3 variabel 1e

| Balk | Last | Type | q1/p/m | q2 | Afstand | Lengte | Exc. |
|----------|------|----------|---------|---------|---------|--------|-------|
| Balk 4-5 | 1 | 1:q-last | -10.000 | -10.000 | 0.000 | 4.550 | 0.000 |
| Balk 4-5 | 2 | 1:q-last | -10.000 | -10.000 | 7.050 | 4.550 | 0.000 |

VELDBELASTINGEN

Balk 4-B B.G:3 variabel 1e

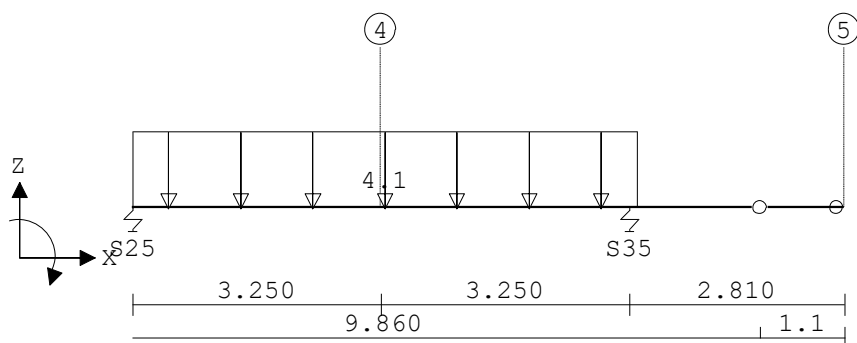
Velden: 1 t/m 5



VELDBELASTINGEN

Balk 4-B B.G:3 variabel 1e

Velden: 6 t/m 8



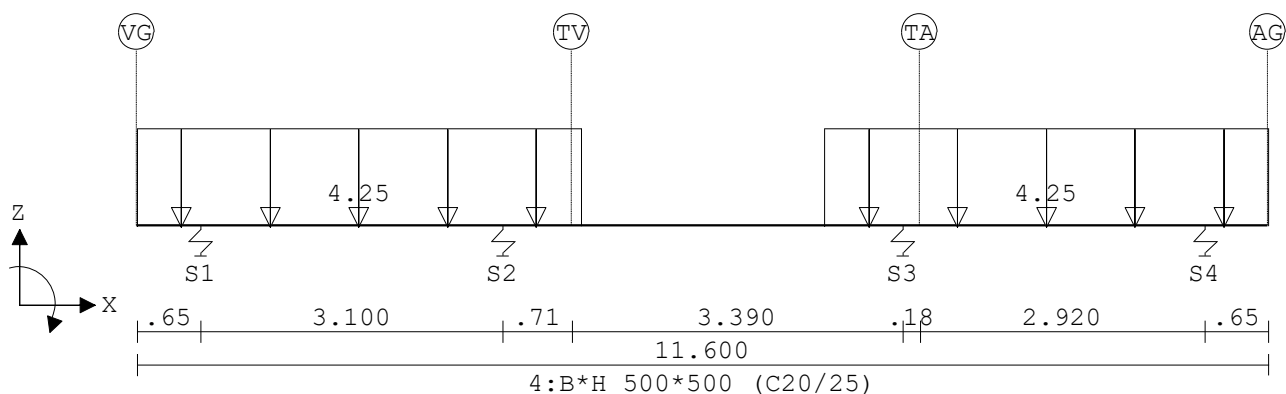
VELDBELASTINGEN

B.G:3 variabel 1e

| Balk | Last | Type | q1/p/m | q2 | Afstand | Lengte | Exc. |
|----------|------|----------|--------|--------|---------|--------|-------|
| Balk 4-B | 1 | 1:q-last | -4.100 | -4.100 | 2.710 | 6.700 | 0.000 |
| Balk 4-B | 2 | 1:q-last | -4.100 | -4.100 | 14.710 | 6.700 | 0.000 |

VELDBELASTINGEN

Balk 4-1 B.G:4 variabel 2e



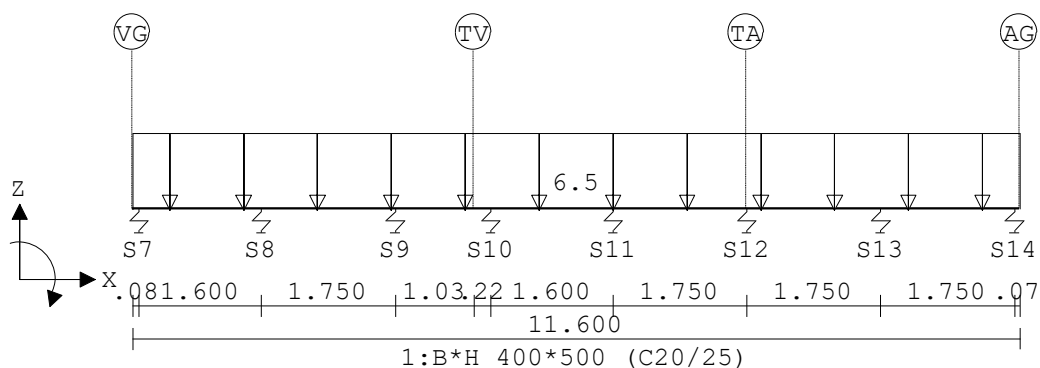
VELDBELASTINGEN

B.G:4 variabel 2e

| Balk | Last | Type | q1/p/m | q2 | Afstand | Lengte | Exc. |
|----------|------|----------|--------|--------|---------|--------|-------|
| Balk 4-1 | 1 | 1:q-last | -4.250 | -4.250 | 0.000 | 4.550 | 0.000 |
| Balk 4-1 | 2 | 1:q-last | -4.250 | -4.250 | 7.050 | 4.550 | 0.000 |

VELDBELASTINGEN

Balk 4-2 B.G:4 variabel 2e



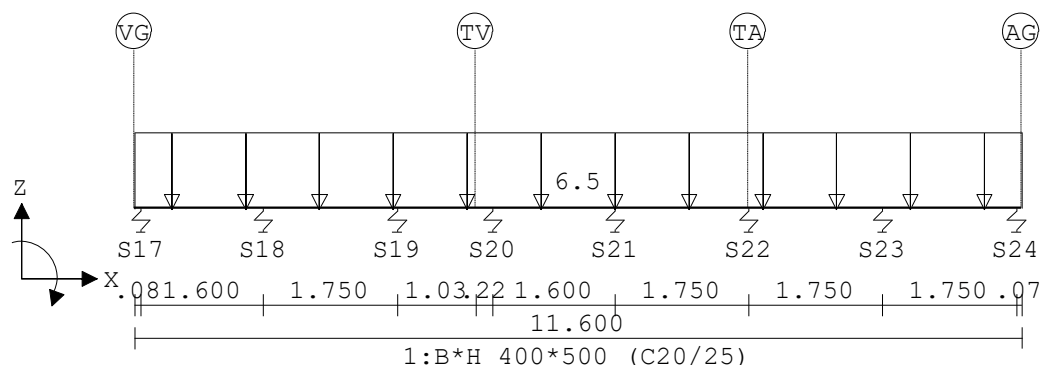
VELDBELASTINGEN

B.G:4 variabel 2e

| Balk | Last Type | q1/p/m | q2 | Afstand | Lengte | Exc. |
|----------|------------|--------|--------|---------|--------|-------|
| Balk 4-2 | 1 1:q-last | -6.500 | -6.500 | 0.000 | 11.600 | 0.000 |

VELDBELASTINGEN

Balk 4-3 B.G:4 variabel 2e



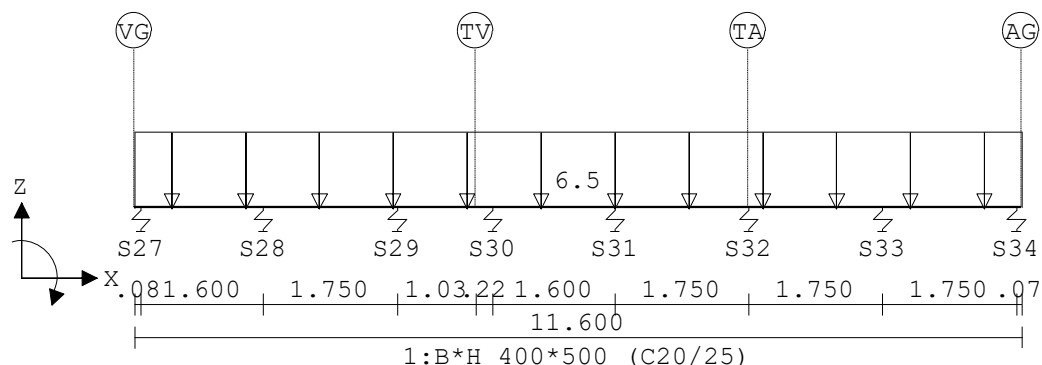
VELDBELASTINGEN

B.G:4 variabel 2e

| Balk | Last Type | q1/p/m | q2 | Afstand | Lengte | Exc. |
|----------|------------|--------|--------|---------|--------|-------|
| Balk 4-3 | 1 1:q-last | -6.500 | -6.500 | 0.000 | 11.600 | 0.000 |

VELDBELASTINGEN

Balk 4-4 B.G:4 variabel 2e



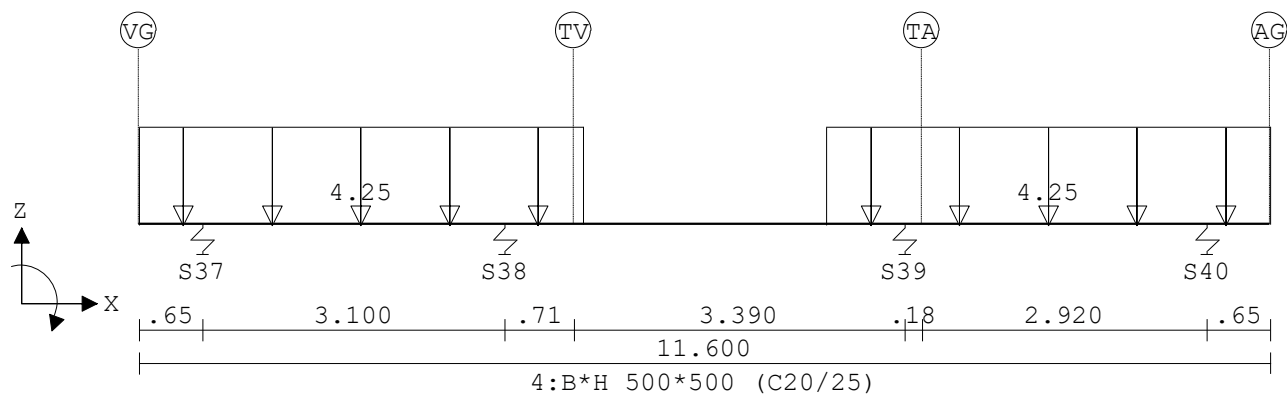
VELDBELASTINGEN

B.G:4 variabel 2e

| Balk | Last Type | q1/p/m | q2 | Afstand | Lengte | Exc. |
|----------|------------|--------|--------|---------|--------|-------|
| Balk 4-4 | 1 1:q-last | -6.500 | -6.500 | 0.000 | 11.600 | 0.000 |

VELDBELASTINGEN

Balk 4-5 B.G:4 variabel 2e



VELDBELASTINGEN

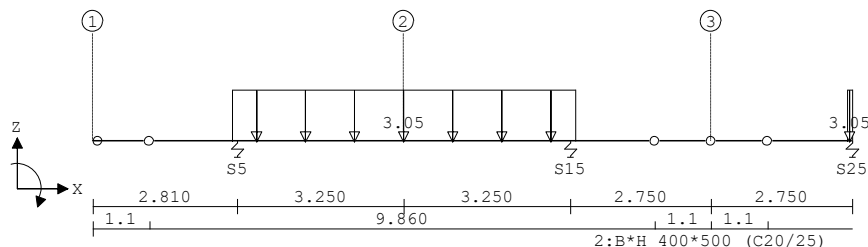
B.G:4 variabel 2e

| Balk | Last | Type | q1/p/m | q2 | Afstand | Lengte | Exc. |
|----------|------|----------|--------|--------|---------|--------|-------|
| Balk 4-5 | 1 | 1:q-last | -4.250 | -4.250 | 0.000 | 4.550 | 0.000 |
| Balk 4-5 | 2 | 1:q-last | -4.250 | -4.250 | 7.050 | 4.550 | 0.000 |

VELDBELASTINGEN

Balk 4-B B.G:4 variabel 2e

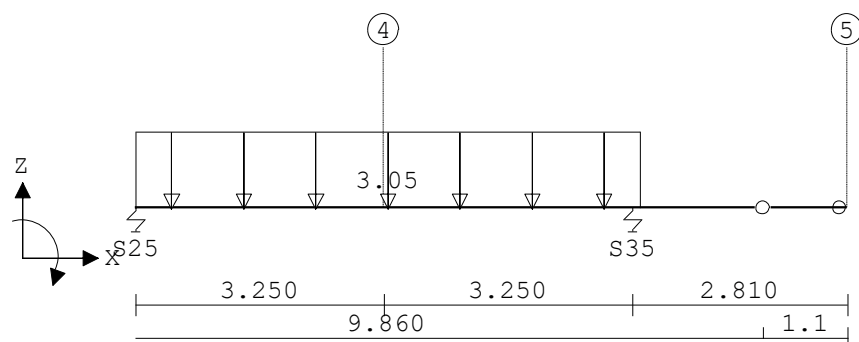
Velden: 1 t/m 5



VELDBELASTINGEN

Balk 4-B B.G:4 variabel 2e

Velden: 6 t/m 8



VELDBELASTINGEN

B.G:4 variabel 2e

| Balk | Last | Type | q1/p/m | q2 | Afstand | Lengte | Exc. |
|----------|------|----------|--------|--------|---------|--------|-------|
| Balk 4-B | 1 | 1:q-last | -3.050 | -3.050 | 2.710 | 6.700 | 0.000 |
| Balk 4-B | 2 | 1:q-last | -3.050 | -3.050 | 14.710 | 6.700 | 0.000 |

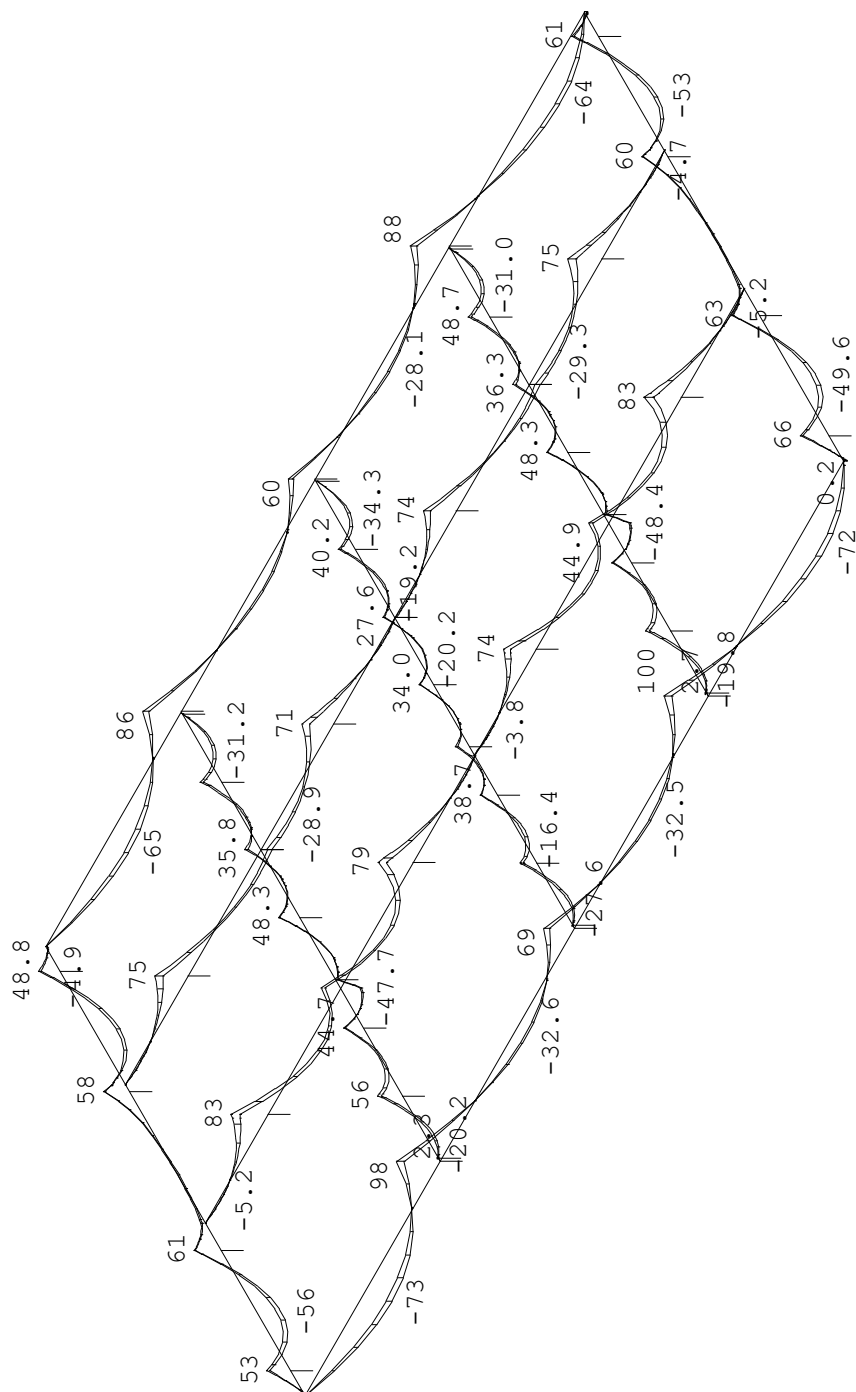
BELASTINGCOMBINATIES

[illegible]

OMHULLENDE VAN DE FUNDAMENTELE COMBINATIES

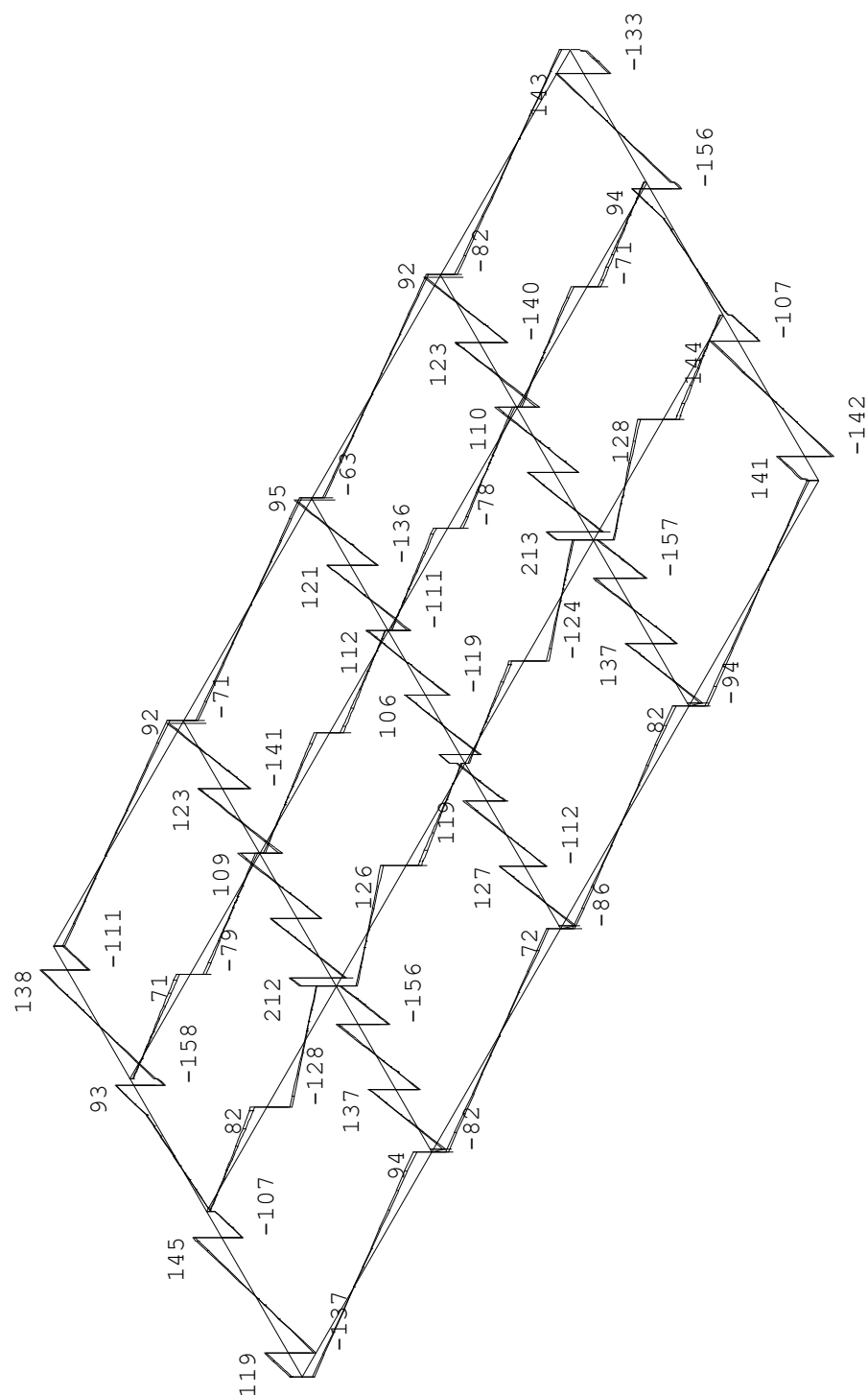
MOMENTEN Fysisch lineair

Fundamentele combinatie



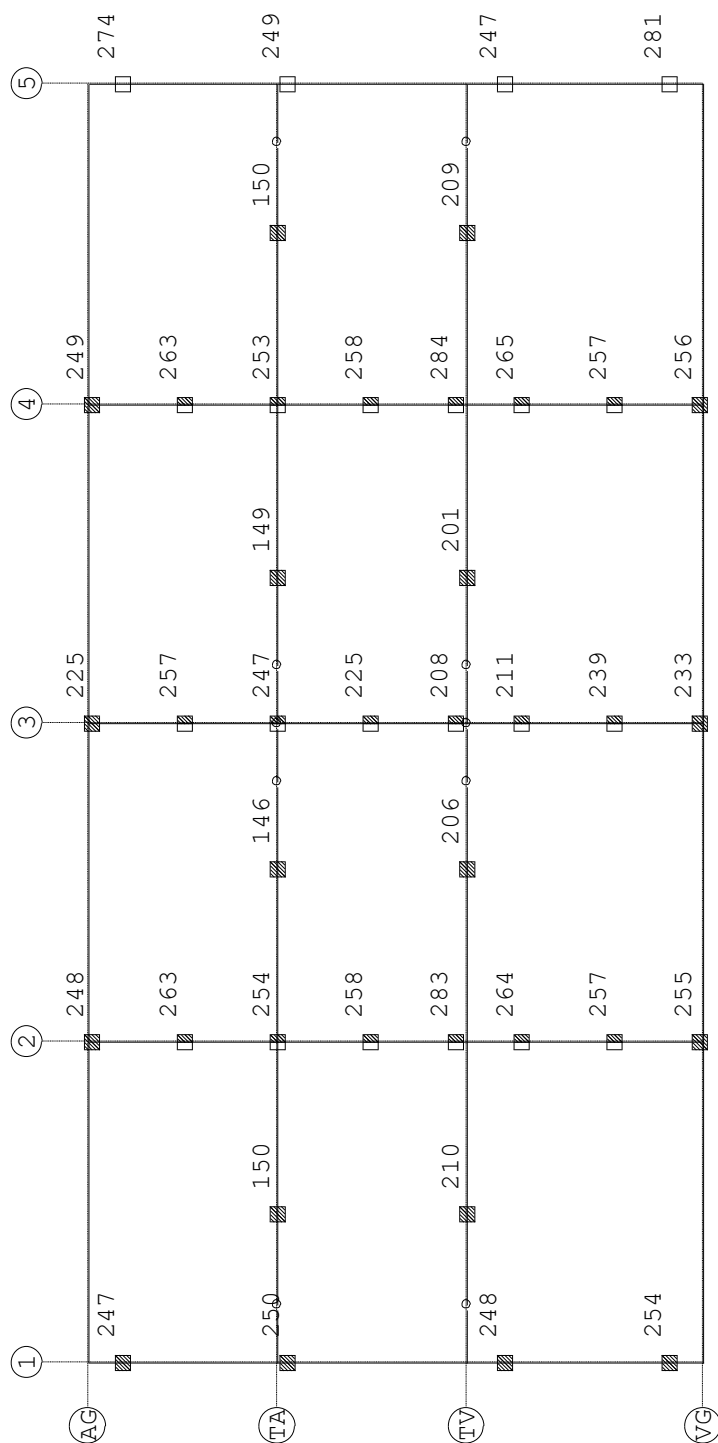
DWARSKRACHTEN Fysisch lineair

Fundamentele combinatie



REACTIES Fysisch lineair

Fundamentele combinatie



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

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

Algemeen

Materiaal : C20/25

Doorsnede

breedte : 400 hoogte : 500 zwaartepunt tov onderkant : 250

Fictieve dikte : 222.2

Betonkwaliteit element : C20/25 Kruipcoëf. : 3.010

Staalkwaliteit hoofdwapening : 500 ϵ_{uk} : 2.50

Staalkwaliteit beugels : 500

Betondekking

Milieu : Boven XC4 Onder XC4

Hoofdwapening : 2de laag 2de laag

Nominale dekking : 35 35

Toegepaste dekking : 43 48

Toegepaste zijdekking : 43

Beugel / Verdeelwapening : 1ste laag 1ste laag

Nominale dekking : 35 35

Toegepaste dekking : 35 40

Toegepaste zijdekking : 35

Wapening

Basiswapening buitenste laag : Boven 4x12 Onder 4x12

H.o.h.afstand 2e laag : 0 0

Beugels

Beugeldiameter : 8

Min. hoek betondrukdiagonaal θ : 21.8 z berekenen via: MEd**PROFIELGEGEVENS Balk****[N] [mm]**

t.b.v. profiel:2 B*H 400*500

Algemeen

Materiaal : C20/25

Doorsnede

breedte : 400 hoogte : 500 zwaartepunt tov onderkant : 250

Fictieve dikte : 222.2

Betonkwaliteit element : C20/25 Kruipcoëf. : 3.010

Staalkwaliteit hoofdwapening : 500 ϵ_{uk} : 2.50

Staalkwaliteit beugels : 500

Betondekking

Milieu : Boven XC4 Onder XC4

Hoofdwapening : 2de laag 2de laag

Nominale dekking : 35 35

Toegepaste dekking : 43 48

Toegepaste zijdekking : 43

Beugel / Verdeelwapening : 1ste laag 1ste laag

Nominale dekking : 35 35

Toegepaste dekking : 35 40

Toegepaste zijdekking : 35

Wapening

Basiswapening buitenste laag : Boven 3x12+1x16 Onder 4x12

H.o.h.afstand 2e laag : 0 0

Beugels

Beugeldiameter : 8

Min. hoek betondrukdiagonaal θ : 21.8 z berekenen via: MEd

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

t.b.v. profiel:3 B*H 400*500

Algemeen

Materiaal : C20/25

Doorsnede

breedte : 400 hoogte : 500 zwaartepunt tov onderkant : 250

Fictieve dikte : 222.2

Betonkwaliteit element : C20/25 Kruipcoëf. : 3.010

Staalkwaliteit hoofdwapening : 500 ϵ_{uk} : 2.50

Staalkwaliteit beugels : 500

Betondekking

Milieu : Boven XC4 Onder XC4

Hoofdwapening : 2de laag 2de laag

Nominale dekking : 35 35

Toegepaste dekking : 43 48

Toegepaste zijdekking : 43

Beugel / Verdeelwapening : 1ste laag 1ste laag

Nominale dekking : 35 35

Toegepaste dekking : 35 40

Toegepaste zijdekking : 35

Wapening

Basiswapening buitenste laag : Boven 2x12+2x16 Onder 4x12

H.o.h.afstand 2e laag : 0 0

Beugels

Beugeldiameter : 8

Min. hoek betondrukdiagonaal θ : 21.8 z berekenen via: MEd**PROFIELGEGEVENS Balk****[N] [mm]**

t.b.v. profiel:4 B*H 500*500

Algemeen

Materiaal : C20/25

Doorsnede

breedte : 500 hoogte : 500 zwaartepunt tov onderkant : 250

Fictieve dikte : 250.0

Betonkwaliteit element : C20/25 Kruipcoëf. : 3.010

Staalkwaliteit hoofdwapening : 500 ϵ_{uk} : 2.50

Staalkwaliteit beugels : 500

Betondekking

Milieu : Boven XC3 Onder XC3

Hoofdwapening : 2de laag 2de laag

Nominale dekking : 30 30

Toegepaste dekking : 43 48

Toegepaste zijdekking : 43

Beugel / Verdeelwapening : 1ste laag 1ste laag

Nominale dekking : 30 30

Toegepaste dekking : 35 40

Toegepaste zijdekking : 35

Wapening

Basiswapening buitenste laag : Boven 5x12 Onder 4x12

H.o.h.afstand 2e laag : 0 0

Beugels

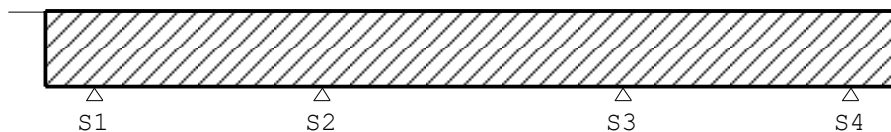
Beugeldiameter : 8

Min. hoek betondrukdiagonaal θ : 21.8 z berekenen via: MEd

Hoofdwapening Fysisch lineair

Balk 4-1

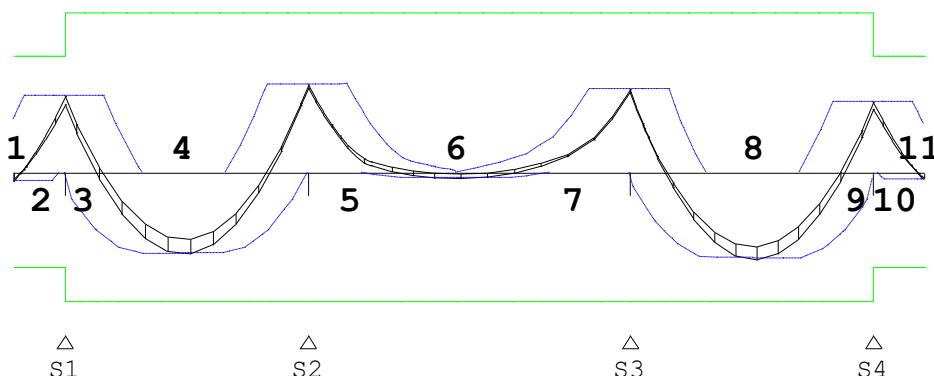
5x12 a



4x12 b

MEd dekkingslijn Fysisch lineair

Balk 4-1



Hoofdwapening

Balk 4-1

| Geb. | Pos. [mm] | M_{Ed} [kNm] | M_{Rd} [kNm] | z | B/O | A_b [mm ²] | A_a [mm ²] | Basiswapening +Bijlegwapening | Opm. |
|------|--------------|-------------------|-------------------|-----|-----|-----------------------------|-----------------------------|----------------------------------|----------|
| 1 | S1-650 | -5.69 | -64.91 | 330 | Ond | 191* | 453 | 4x12 | 2,54,110 |
| 2 | S1-0 | 52.93 | 81.14 | 330 | Bov | 369 | 566 | 5x12 | 2,110 |
| 3 | S1+0 | 52.93 | 110.80 | 414 | Bov | 265 | 566 | 5x12 | |
| 4 | S1+1506 | -55.79 | -88.57 | 391 | Ond | 283 | 453 | 4x12 | |
| 5 | S2+0 | 61.17 | 110.80 | 414 | Bov | 308 | 566 | 5x12 | |
| 6 | S2+1885 | -3.85 | -88.57 | 391 | Ond | 191* | 453 | 4x12 | 54 |
| 7 | S3+0 | 57.97 | 110.80 | 414 | Bov | 291 | 566 | 5x12 | |
| 8 | S4-1512 | -59.59 | -88.57 | 391 | Ond | 303 | 453 | 4x12 | |
| 9 | S4-0 | 48.79 | 110.80 | 414 | Bov | 254* | 566 | 5x12 | 1 |
| 10 | S4+0 | 48.79 | 81.14 | 330 | Bov | 354* | 566 | 5x12 | 1,2,110 |
| 11 | S4+650 | -4.88 | -64.91 | 330 | Ond | 191* | 453 | 4x12 | 2,54,110 |

Opmerkingen

- [1] * = Eisen met betrekking tot minimum wapening zijn toegepast, zie nationale bijlage art. 9.2.1.1(1).
- [2] Benodigde wapening en inwendige hefboomsarm zijn bepaald volgens gedrongen ligger detaillering, zie nationale bijlage art. 6.1(10).
- [54] * = Eisen met betrekking tot minimum wapening ten behoeve van gecontroleerde scheurvorming zijn toegepast volgens art. 7.3.2.
- [110] **Art. 9.7 (1), (2): Een orthogonaal wapeningsnet dient toegepast te worden aan iedere zijde van de gedrongen liggers:**
Profiel 4 - B*H 500*500: 500 mm²/m aan elke zijde en in elke richting met een maximaal hoh 300 mm.

Scheurvorming volgens artikel 7.3.4

Balk 4-1

| Geb. | Pos. [mm] | Zijde | $M_{E, freq}$ [kNm] | $S_{r, max}$ [mm] | $\epsilon_{sm} - \epsilon_{cm}$ [%] | w_k [mm] | k_x | w_{max} [mm] | U.C. | Opm. |
|------|--------------|-------|------------------------|----------------------|--|---------------|-------|-------------------|------|------|
| 1 | S1-650 | Bov | 29.24 | 367 | 0.365 | 0.134 | 1.17 | 0.350 | 0.38 | |
| 1 | S1-461 | Bov | 41.68 | 367 | 0.520 | 0.191 | 1.17 | 0.350 | 0.55 | |
| 1 | S1-650 | Ond | -4.03 | 408 | 0.063 | 0.026 | 1.33 | 0.400 | 0.06 | |
| 1 | S1-180 | Ond | -4.03 | 408 | 0.063 | 0.026 | 1.33 | 0.400 | 0.06 | |
| 2 | S1+481 | Bov | 41.68 | 367 | 0.520 | 0.191 | 1.17 | 0.350 | 0.55 | |
| 2 | S2-267 | Bov | 50.11 | 367 | 0.625 | 0.230 | 1.17 | 0.350 | 0.66 | |
| 2 | S1+1506 | Ond | -42.59 | 408 | 0.668 | 0.273 | 1.33 | 0.400 | 0.68 | |
| 3 | S2+404 | Bov | 50.11 | 367 | 0.625 | 0.230 | 1.17 | 0.350 | 0.66 | |
| 3 | S3-378 | Bov | 47.90 | 367 | 0.598 | 0.219 | 1.17 | 0.350 | 0.63 | |
| 3 | S2+1530 | Ond | -2.82 | 408 | 0.044 | 0.018 | 1.33 | 0.400 | 0.05 | |
| 3 | S3-1860 | Ond | -2.82 | 408 | 0.044 | 0.018 | 1.33 | 0.400 | 0.05 | |
| 4 | S3+468 | Bov | 47.90 | 367 | 0.598 | 0.219 | 1.17 | 0.350 | 0.63 | |
| 4 | S4-432 | Bov | 38.98 | 367 | 0.486 | 0.179 | 1.17 | 0.350 | 0.51 | |
| 4 | S4-1512 | Ond | -46.13 | 408 | 0.724 | 0.295 | 1.33 | 0.400 | 0.74 | |
| 5 | S4+463 | Bov | 38.98 | 367 | 0.486 | 0.179 | 1.17 | 0.350 | 0.51 | |
| 5 | S4+164 | Ond | -3.49 | 408 | 0.055 | 0.022 | 1.33 | 0.400 | 0.06 | |
| 5 | S4+650 | Ond | -3.49 | 408 | 0.055 | 0.022 | 1.33 | 0.400 | 0.06 | |

Verloop hoofdwapening

Balk 4-1

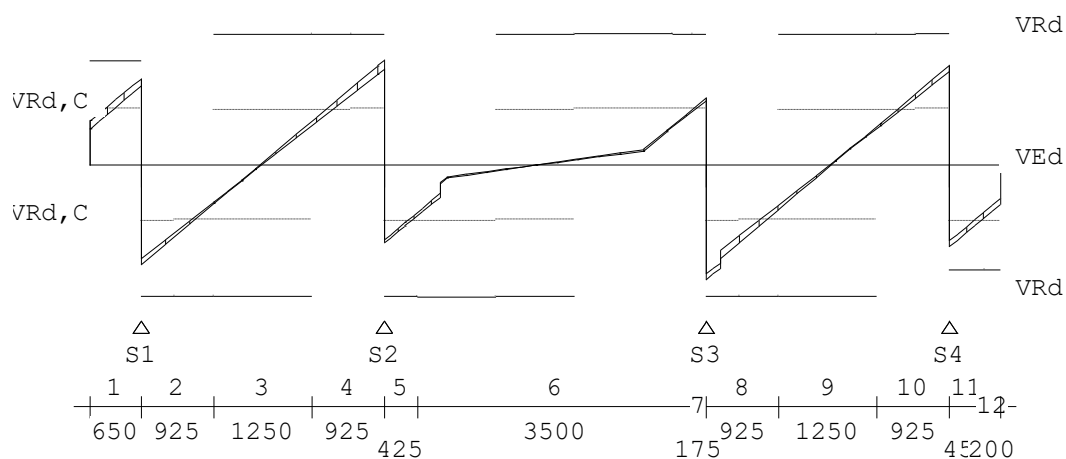
| Merk | B/O | Wapening | Vanaf [mm] | Tot [mm] | Lengte [mm] | $L_{bd, begin}$ [mm] | $L_{bd, eind}$ [mm] |
|------|-------|----------|---------------|-------------|----------------|-------------------------|------------------------|
| a | Boven | 5x12 | S1-1032 | S4+1000 | 12332 | 382 | 350 |
| b | Onder | 4x12 | S1-770 | S4+770 | 11840 | 120 | 120 |

Opmerkingen

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

DWARSKRACHTEN Fysisch lineair

Balk 4-1 Fundamentele combinatie



Wring- en dwarskrachtwapening

Balk 4-1

| Geb. | Vanaf | Tot | Beugels | Lengte | <Wringing> | <Dwarskr.> | | | | | |
|------|--------|--------|---------|--------|--|-----------------------------------|---------------------------------|---------------------------------|------------------|-------------------|----------|
| | [mm] | [mm] | | [mm] | $A_{l\text{angs}}$ [mm ²] | A_{bg1} [mm ² /m] | A_{bg1} [mm ²] | A_{opg} [mm ²] | V_{Ed} [kN] | T_{Ed} [kNm] | Opm. |
| 1 | S1-650 | S1+0 | Ø8-250 | 650 | 7 | 1 | 358 | 0 | 118.8 | 0 | 6,59,109 |
| 2 | S1+0 | S1+925 | Ø8-250 | 925 | 7 | 1 | 358 | 0 | 136.8 | 0 | 6 |
| 3 | S1+925 | S2-925 | Ø8-250 | 1250 | 0 | 0 | 358 | 0 | 60.7 | 0 | |
| 4 | S2-925 | S2+0 | Ø8-250 | 925 | 7 | 1 | 358 | 0 | 144.9 | 0 | 6 |
| 5 | S2+0 | S2+425 | Ø8-250 | 425 | 7 | 1 | 358 | 0 | 106.4 | 0 | 6 |
| 6 | S2+425 | S3-175 | Ø8-250 | 3500 | 7 | 1 | 358 | 0 | 76.8 | 0 | |
| 7 | S3-175 | S3+0 | Ø8-250 | 175 | 7 | 1 | 358 | 0 | 92.4 | 0 | 6 |
| 8 | S3+0 | S3+925 | Ø8-250 | 925 | 7 | 1 | 358 | 0 | 157.4 | 0 | 6 |
| 9 | S3+925 | S4-925 | Ø8-250 | 1250 | 0 | 0 | 358 | 0 | 60.1 | 0 | |
| 10 | S4-925 | S4+0 | Ø8-250 | 925 | 7 | 1 | 358 | 0 | 137.4 | 0 | 6 |
| 11 | S4+0 | S4+450 | Ø8-250 | 450 | 7 | 1 | 358 | 0 | 111.2 | 0 | 6,59,109 |
| 12 | S4+450 | S4+650 | Ø8-250 | 200 | 0 | 0 | 358 | 0 | 71.2 | 0 | 59,109 |

Opmerkingen

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

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

[109] Bij de berekening van de beugels is geen rekening gehouden met de detailleringregels van art 9.7 voor de gedrongen liggers.

Wring- en dwarskrachten

Balk 4-1

| Geb. | Vanaf | Tot | θ | V_{Rd} | V_{Ed} | $V_{Rd,C}$ | $V_{Rd,Max}$ | T_{Ed} | $T_{Rd,C}$ | $T_{Rd,Max}$ | V_{opg} | Opm. |
|------|--------|--------|----------|----------|----------|------------|--------------|----------|------------|--------------|-----------|----------|
| | [mm] | [mm] | [°] | [kN] | | | | | | | | |
| 1 | S1-650 | S1+0 | 21.8 | 144 | 119 | 77 | 419 | 0 | 36 | 89 | 0 | 6,59,109 |
| 2 | S1+0 | S1+925 | 21.8 | 180 | 137 | 77 | 524 | 0 | 36 | 89 | 0 | 6 |
| 3 | S1+925 | S2-925 | 21.8 | 180 | 61 | 75 | 523 | 0 | 36 | 89 | 0 | |
| 4 | S2-925 | S2+0 | 21.8 | 180 | 145 | 77 | 525 | 0 | 36 | 89 | 0 | 6 |
| 5 | S2+0 | S2+425 | 21.8 | 180 | 106 | 77 | 524 | 0 | 36 | 89 | 0 | 6 |
| 6 | S2+425 | S3-175 | 21.8 | 180 | 77 | 77 | 525 | 0 | 36 | 89 | 0 | |
| 7 | S3-175 | S3+0 | 21.8 | 180 | 92 | 77 | 524 | 0 | 36 | 89 | 0 | 6 |
| 8 | S3+0 | S3+925 | 21.8 | 180 | 157 | 77 | 524 | 0 | 36 | 89 | 0 | 6 |
| 9 | S3+925 | S4-925 | 21.8 | 180 | 60 | 75 | 523 | 0 | 36 | 89 | 0 | |
| 10 | S4-925 | S4+0 | 21.8 | 180 | 137 | 77 | 525 | 0 | 36 | 89 | 0 | 6 |
| 11 | S4+0 | S4+450 | 21.8 | 144 | 111 | 77 | 419 | 0 | 36 | 89 | 0 | 6,59,109 |
| 12 | S4+450 | S4+650 | 21.8 | 144 | 71 | 77 | 419 | 0 | 36 | 89 | 0 | 59,109 |

Opmerkingen

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

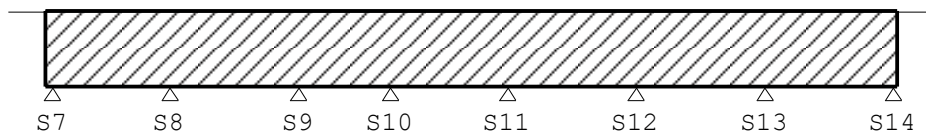
[59] 6.2.3: Z is berekend m.b.v. de gedrongen ligger berekening art 6.1 (10)

[109] Bij de berekening van de beugels is geen rekening gehouden met de detailleringregels van art 9.7 voor de gedrongen liggers.

Hoofdwapening Fysisch lineair

Balk 4-2

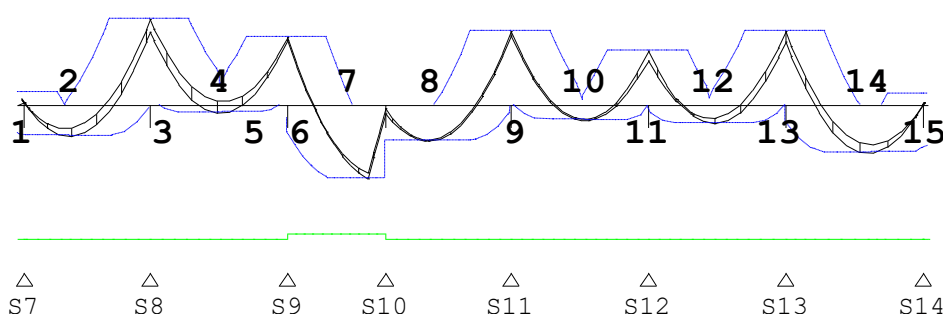
4x12 a



4x12 b

MEd dekkingslijn Fysisch lineair

Balk 4-2



Hoofdwapening

Balk 4-2

| Geb. | Pos. [mm] | M _{E d} [kNm] | M _{R d} [kNm] | z B/O [mm] | A _b [mm ²] | A _a [mm ²] | Basiswapening +Bijlegwapening | Opm. |
|------|--------------|---------------------------|---------------------------|---------------|--------------------------------------|--------------------------------------|----------------------------------|----------|
| 1 | S7-80 | 8.64 | 88.65 | 412 Bov | 165* | 453 | 4x12 | 54 |
| 2 | S7+581 | -20.18 | -87.45 | 425 Ond | 165* | 453 | 4x12 | 54 |
| 3 | S8+0 | 56.17 | 88.65 | 412 Bov | 283 | 453 | 4x12 | |
| 4 | S9-850 | -5.14 | -87.45 | 425 Ond | 165* | 453 | 4x12 | 54 |
| 5 | S9-0 | 44.73 | 88.65 | 412 Bov | 225 | 453 | 4x12 | |
| 6 | S9+0 | 44.73 | 88.65 | 412 Bov | 225 | 453 | 4x12 | 2,68,110 |
| 7 | S10-220 | -47.72 | -84.11 | 427 Ond | 257 | 453 | 4x12 | 2,110 |
| 8 | S10+570 | -23.39 | -87.45 | 425 Ond | 165* | 453 | 4x12 | 54 |
| 9 | S11+0 | 48.29 | 88.65 | 412 Bov | 243 | 453 | 4x12 | |
| 10 | S12-801 | -9.88 | -87.45 | 425 Ond | 165* | 453 | 4x12 | 54 |
| 11 | S12+0 | 35.78 | 88.65 | 412 Bov | 204* | 453 | 4x12 | 1 |
| 12 | S12+849 | -11.70 | -87.45 | 425 Ond | 165* | 453 | 4x12 | 54 |
| 13 | S13+0 | 48.57 | 88.65 | 412 Bov | 244 | 453 | 4x12 | |
| 14 | S14-697 | -31.23 | -87.45 | 425 Ond | 198* | 453 | 4x12 | 1 |
| 15 | S14+70 | 7.57 | 88.65 | 412 Bov | 165* | 453 | 4x12 | 54 |

Opmerkingen

- [1] * = Eisen met betrekking tot minimum wapening zijn toegepast, zie nationale bijlage art. 9.2.1.1(1).
- [2] Benodigde wapening en inwendige hefboomsarm zijn bepaald volgens gedrongen ligger detaillering, zie nationale bijlage art. 6.1(10).
- [54] * = Eisen met betrekking tot minimum wapening ten behoeve van gecontroleerde scheurvorming zijn toegepast volgens art. 7.3.2.
- [68] **MRd als gevolg van de gedrongen ligger berekening (NB. 6.1(10)) is groter dan MRd volgens 6.1(P). De momentweerstand en inwendige hefboomsarm volgens 6.1(P) zijn maatgevend en daarom alsnog toegepast.**
- [110] **Art. 9.7 (1), (2): Een orthogonaal wapeningsnet dient toegepast te worden aan iedere zijde van de gedrongen liggers:
Profiel 1 - B*H 400*500: 400 mm²/m aan elke zijde en in elke richting met een maximaal hoh 300 mm.**

Scheurvorming volgens artikel 7.3.4

Balk 4-2

| Geb. | Pos. [mm] | Zijde | $M_E, freq$ [kNm] | S_r, max [mm] | $\epsilon_{sm} - \epsilon_{cm}$ [%] | w_k [mm] | k_x | w_{max} [mm] | U.C. | Opm. |
|------|--------------|-------|----------------------|--------------------|--|---------------|-------|-------------------|------|------|
| 1 | S7-80 | Bov | 6.90 | 367 | 0.108 | 0.040 | 1.00 | 0.300 | 0.13 | |
| 2 | S7+396 | Bov | 6.90 | 367 | 0.108 | 0.040 | 1.00 | 0.300 | 0.13 | |
| 2 | S8-436 | Bov | 43.23 | 367 | 0.675 | 0.248 | 1.00 | 0.300 | 0.83 | |
| 2 | S7+174 | Ond | -14.55 | 406 | 0.230 | 0.093 | 1.14 | 0.343 | 0.27 | |
| 2 | S7+581 | Ond | -14.56 | 406 | 0.230 | 0.093 | 1.14 | 0.343 | 0.27 | |
| 2 | S8-604 | Ond | -14.55 | 406 | 0.230 | 0.093 | 1.14 | 0.343 | 0.27 | |
| 3 | S8+467 | Bov | 43.23 | 367 | 0.675 | 0.248 | 1.00 | 0.300 | 0.83 | |
| 3 | S9-490 | Bov | 35.64 | 367 | 0.556 | 0.204 | 1.00 | 0.300 | 0.68 | |
| 3 | S8+466 | Ond | -2.05 | 406 | 0.032 | 0.013 | 1.14 | 0.343 | 0.04 | |
| 3 | S9-850 | Ond | -2.07 | 406 | 0.033 | 0.013 | 1.14 | 0.343 | 0.04 | |
| 3 | S9-428 | Ond | -2.05 | 406 | 0.032 | 0.013 | 1.14 | 0.343 | 0.04 | |
| 4 | S9+447 | Bov | 35.64 | 367 | 0.556 | 0.204 | 1.00 | 0.300 | 0.68 | |
| 4 | S9+560 | Ond | -37.04 | 406 | 0.585 | 0.238 | 1.14 | 0.343 | 0.69 | |
| 4 | S10+0 | Ond | -37.04 | 406 | 0.585 | 0.238 | 1.14 | 0.343 | 0.69 | |
| 5 | S11-456 | Bov | 38.35 | 367 | 0.598 | 0.220 | 1.00 | 0.300 | 0.73 | |
| 5 | S10+143 | Ond | -18.94 | 406 | 0.299 | 0.122 | 1.14 | 0.343 | 0.35 | |
| 5 | S10+570 | Ond | -18.94 | 406 | 0.299 | 0.122 | 1.14 | 0.343 | 0.35 | |
| 5 | S11-583 | Ond | -18.94 | 406 | 0.299 | 0.122 | 1.14 | 0.343 | 0.35 | |
| 6 | S11+427 | Bov | 38.35 | 367 | 0.598 | 0.220 | 1.00 | 0.300 | 0.73 | |
| 6 | S12-449 | Bov | 27.79 | 367 | 0.434 | 0.159 | 1.00 | 0.300 | 0.53 | |
| 6 | S11+407 | Ond | -7.71 | 406 | 0.122 | 0.050 | 1.14 | 0.343 | 0.14 | |
| 6 | S12-801 | Ond | -7.72 | 406 | 0.122 | 0.050 | 1.14 | 0.343 | 0.14 | |
| 6 | S12-409 | Ond | -7.71 | 406 | 0.122 | 0.049 | 1.14 | 0.343 | 0.14 | |
| 7 | S12+0 | Bov | 27.79 | 367 | 0.434 | 0.159 | 1.00 | 0.300 | 0.53 | |
| 7 | S12+434 | Bov | 27.79 | 367 | 0.434 | 0.159 | 1.00 | 0.300 | 0.53 | |
| 7 | S13-442 | Bov | 37.67 | 367 | 0.588 | 0.216 | 1.00 | 0.300 | 0.72 | |
| 7 | S12+411 | Ond | -8.02 | 406 | 0.127 | 0.051 | 1.14 | 0.343 | 0.15 | |
| 7 | S12+849 | Ond | -8.03 | 406 | 0.127 | 0.052 | 1.14 | 0.343 | 0.15 | |
| 7 | S13-480 | Ond | -8.02 | 406 | 0.127 | 0.051 | 1.14 | 0.343 | 0.15 | |
| 8 | S13+450 | Bov | 37.67 | 367 | 0.588 | 0.216 | 1.00 | 0.300 | 0.72 | |
| 8 | S14-336 | Bov | 5.99 | 367 | 0.093 | 0.034 | 1.00 | 0.300 | 0.11 | |
| 8 | S13+709 | Ond | -23.52 | 406 | 0.371 | 0.151 | 1.14 | 0.343 | 0.44 | |
| 8 | S14-697 | Ond | -23.53 | 406 | 0.371 | 0.151 | 1.14 | 0.343 | 0.44 | |
| 8 | S14-163 | Ond | -23.52 | 406 | 0.371 | 0.151 | 1.14 | 0.343 | 0.44 | |
| 9 | S14+70 | Bov | 5.99 | 367 | 0.093 | 0.034 | 1.00 | 0.300 | 0.11 | |

Verloop hoofdwapening

Balk 4-2

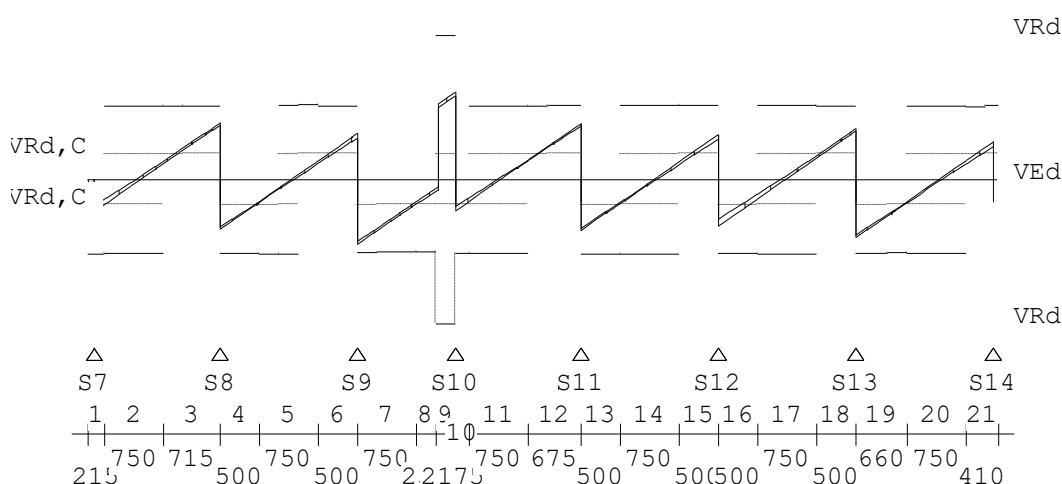
| Merk | B/O | Wapening | Vanaf [mm] | Tot [mm] | Lengte [mm] | $L_{bd, begin}$ [mm] | $L_{bd, eind}$ [mm] |
|------|-------|----------|---------------|-------------|----------------|-------------------------|------------------------|
| a | Boven | 4x12 | S7-200 | S14+190 | 11840 | 120 | 120 |
| b | Onder | 4x12 | S7-231 | S14+295 | 11976 | 151 | 225 |

Opmerkingen

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

DWARSKRACHTEN Fysisch lineair

Balk 4-2 Fundamentele combinatie



Wring- en dwarskrachtwapening

Balk 4-2

| Geb. Vanaf | Tot | Beugels | Lengte | <Wringing> | | <Dwarskr.> | | | V _{Ed} | T _{Ed} | Opm. |
|------------|---------|---------|--------|---------------------|-------------------|-------------------|-------------------|-------|-----------------|-----------------|------|
| [mm] | [mm] | | [mm] | A _{l,angs} | A _{b,gl} | A _{b,gl} | A _{o,pg} | | [kN] | [kNm] | |
| 1 S7-80 | S7+135 | Ø8-250 | 215 | 32 | 4 | 286 | 0 | 86.8 | 1 | 6 | |
| 2 S7+135 | S8-715 | Ø8-250 | 750 | 0 | 0 | 286 | 0 | 58.4 | 1 | | |
| 3 S8-715 | S8+0 | Ø8-250 | 715 | 32 | 4 | 305 | 0 | 136.9 | 1 | 6 | |
| 4 S8+0 | S8+500 | Ø8-250 | 500 | 32 | 4 | 286 | 0 | 119.1 | 1 | 6 | |
| 5 S8+500 | S9-500 | Ø8-250 | 750 | 0 | 0 | 286 | 0 | 54.5 | 1 | | |
| 6 S9-500 | S9+0 | Ø8-250 | 500 | 32 | 4 | 286 | 0 | 111.7 | 1 | 6 | |
| 7 S9+0 | S10-500 | Ø8-250 | 750 | 32 | 4 | 353 | 0 | 155.6 | 1 | 6,58,109 | |
| 8 S10-500 | S10-250 | Ø8-250 | 250 | 32 | 4 | 286 | 0 | 59.2 | 1 | 58,109 | |
| 9 S10-250 | S10+0 | Ø8-125 | 250 | 32 | 4 | 486 | 0 | 211.9 | 1 | 6,58,109 | |
| 10 S10+0 | S10+175 | Ø8-250 | 175 | 0 | 0 | 286 | 0 | 74.8 | 1 | 6 | |
| 11 S10+175 | S11-675 | Ø8-250 | 750 | 0 | 0 | 286 | 0 | 51.7 | 0 | | |
| 12 S11-675 | S11+0 | Ø8-250 | 675 | 0 | 0 | 302 | 0 | 135.5 | 0 | 6 | |
| 13 S11+0 | S11+500 | Ø8-250 | 500 | 0 | 0 | 286 | 0 | 122.1 | 0 | 6 | |
| 14 S11+500 | S12-500 | Ø8-250 | 750 | 0 | 0 | 286 | 0 | 57.6 | 0 | | |
| 15 S12-500 | S12+0 | Ø8-250 | 500 | 0 | 0 | 286 | 0 | 108.9 | 0 | 6 | |
| 16 S12+0 | S12+500 | Ø8-250 | 500 | 35 | 4 | 286 | 0 | 111.5 | 1 | 6 | |
| 17 S12+500 | S13-500 | Ø8-250 | 750 | 0 | 0 | 286 | 0 | 57.8 | 1 | | |
| 18 S13-500 | S13+0 | Ø8-250 | 500 | 35 | 4 | 286 | 0 | 122.3 | 1 | 6 | |
| 19 S13+0 | S13+660 | Ø8-250 | 660 | 35 | 4 | 312 | 0 | 140.1 | 1 | 6 | |
| 20 S13+660 | S14-340 | Ø8-250 | 750 | 0 | 0 | 286 | 0 | 55.0 | 1 | | |
| 21 S14-340 | S14+70 | Ø8-250 | 410 | 35 | 4 | 286 | 0 | 100.8 | 1 | 6 | |

Opmerkingen

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

[58] 6.2.3: Z is berekend m.b.v. 0.9d

[109] Bij de berekening van de beugels is geen rekening gehouden met de detailleringregels van art 9.7 voor de gedrongen liggers.

Wring- en dwarskrachten

Balk 4-2

| Geb. | Vanaf [mm] | Tot [mm] | θ [°] | V_{Rd} [kN] | V_{Ed} | $V_{Rd,C}$ | $V_{Rd,Max}$ | T_{Ed} | $T_{Rd,C}$ | $T_{Rd,Max}$ | V_{opg} | Opm. |
|------|---------------|-------------|-----------------|------------------|--------------|------------|--------------|---------------|------------|--------------|-----------|------------|
| | | | | | -----kN----- | | | -----kNm----- | | | | |
| 1 | S7-80 | S7+135 | 21.8 | 178 | 87 | 62 | 421 | 1 | 26 | 63 | 0 | 6 |
| 2 | S7+135 | S8-715 | 21.8 | 179 | 58 | 61 | 416 | 1 | 26 | 63 | 0 | |
| 3 | S8-715 | S8+0 | 21.8 | 177 | 137 | 62 | 419 | 1 | 26 | 63 | 0 | 6 |
| 4 | S8+0 | S8+500 | 21.8 | 177 | 119 | 62 | 419 | 1 | 26 | 63 | 0 | 6 |
| 5 | S8+500 | S9-500 | 21.8 | 181 | 55 | 62 | 420 | 1 | 26 | 63 | 0 | |
| 6 | S9-500 | S9+0 | 21.8 | 177 | 112 | 62 | 420 | 1 | 26 | 63 | 0 | 6 |
| 7 | S9+0 | S10-500 | 21.8 | 174 | 156 | 62 | 412 | 1 | 26 | 63 | 0 | 6, 58, 109 |
| 8 | S10-500 | S10-250 | 21.8 | 172 | 59 | 61 | 407 | 1 | 26 | 63 | 0 | 58, 109 |
| 9 | S10-250 | S10+0 | 21.8 | 348 | 212 | 61 | 407 | 1 | 26 | 63 | 0 | 6, 58, 109 |
| 10 | S10+0 | S10+175 | 21.8 | 179 | 75 | 61 | 416 | 1 | 26 | 63 | 0 | 6 |
| 11 | S10+175 | S11-675 | 21.8 | 179 | 52 | 61 | 416 | 0 | 26 | 63 | 0 | |
| 12 | S11-675 | S11+0 | 21.8 | 181 | 135 | 62 | 419 | 0 | 26 | 63 | 0 | 6 |
| 13 | S11+0 | S11+500 | 21.8 | 181 | 122 | 62 | 419 | 0 | 26 | 63 | 0 | 6 |
| 14 | S11+500 | S12-500 | 21.8 | 179 | 58 | 61 | 416 | 0 | 26 | 63 | 0 | |
| 15 | S12-500 | S12+0 | 21.8 | 181 | 109 | 62 | 420 | 0 | 26 | 63 | 0 | 6 |
| 16 | S12+0 | S12+500 | 21.8 | 177 | 112 | 62 | 420 | 1 | 26 | 63 | 0 | 6 |
| 17 | S12+500 | S13-500 | 21.8 | 179 | 58 | 61 | 416 | 1 | 26 | 63 | 0 | |
| 18 | S13-500 | S13+0 | 21.8 | 177 | 122 | 62 | 420 | 1 | 26 | 63 | 0 | 6 |
| 19 | S13+0 | S13+660 | 21.8 | 177 | 140 | 62 | 419 | 1 | 26 | 63 | 0 | 6 |
| 20 | S13+660 | S14-340 | 21.8 | 179 | 55 | 61 | 416 | 1 | 26 | 63 | 0 | |
| 21 | S14-340 | S14+70 | 21.8 | 177 | 101 | 62 | 421 | 1 | 26 | 63 | 0 | 6 |

Opmerkingen

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

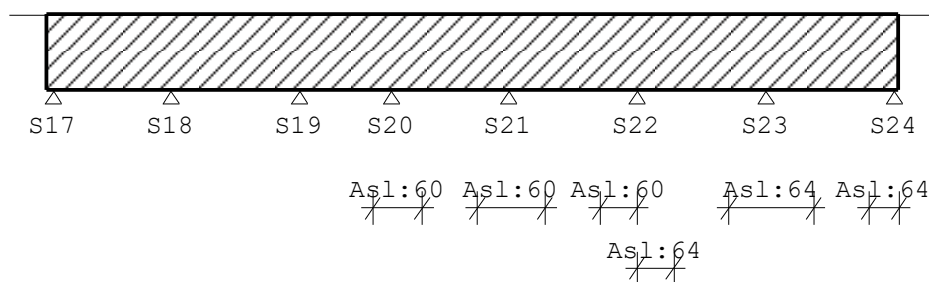
[58] 6.2.3: Z is berekend m.b.v. 0.9d

[109] Bij de berekening van de beugels is geen rekening gehouden met de detailleringsregels van art 9.7 voor de gedrongen liggers.

Hoofdwapening Fysisch lineair

Balk 4-3

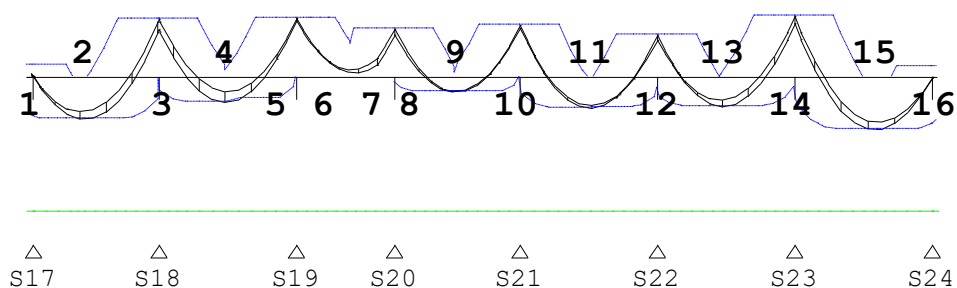
4x12 a



4x12 b

MEd dekkingslijn Fysisch lineair

Balk 4-3



Hoofdwapening

Balk 4-3

| Geb. | Pos. [mm] | $M_{E,d}$ [kNm] | $M_{R,d}$ [kNm] | z | B/O | A_b [mm ²] | A_a [mm ²] | Basiswapening +Bijlegwapening | Opm. |
|------|--------------|--------------------|--------------------|-----|-----|-----------------------------|-----------------------------|----------------------------------|---------------|
| 1 | S17-80 | 8.08 | 88.65 | 412 | Bov | 165* | 453 | 4x12 | 54 |
| 2 | S17+656 | -27.60 | -87.45 | 425 | Ond | 177* | 453 | 4x12 | 1 |
| 3 | S18+0 | 37.86 | 88.65 | 412 | Bov | 204* | 453 | 4x12 | 1 |
| 4 | S18+850 | -16.41 | -87.45 | 425 | Ond | 165* | 453 | 4x12 | 54 |
| 5 | S19-0 | 38.70 | 88.65 | 412 | Bov | 204* | 453 | 4x12 | 1 |
| 6 | S19+0 | 38.70 | 88.65 | 412 | Bov | 204* | 453 | 4x12 | 1, 2, 68, 110 |
| 7 | S20-0 | 31.91 | 88.65 | 412 | Bov | 200* | 453 | 4x12 | 1, 2, 68, 110 |
| 8 | S20+0 | 31.91 | 88.65 | 412 | Bov | 200* | 453 | 4x12 | 1 |
| 9 | S20+794 | -9.70 | -87.45 | 425 | Ond | 165* | 453 | 4x12 | 54 |
| 10 | S21+0 | 33.96 | 88.65 | 412 | Bov | 204* | 453 | 4x12 | 1 |
| 11 | S22-851 | -20.17 | -87.45 | 425 | Ond | 165* | 453 | 4x12 | 54 |
| 12 | S22+0 | 27.62 | 88.65 | 412 | Bov | 175* | 453 | 4x12 | 1 |
| 13 | S22+842 | -19.17 | -87.45 | 425 | Ond | 165* | 453 | 4x12 | 54 |
| 14 | S23+0 | 40.22 | 88.65 | 412 | Bov | 204* | 453 | 4x12 | 1 |
| 15 | S24-723 | -34.34 | -87.45 | 425 | Ond | 206* | 453 | 4x12 | 1 |
| 16 | S24+70 | 7.18 | 88.65 | 412 | Bov | 165* | 453 | 4x12 | 54 |

Opmerkingen

- [1] * = Eisen met betrekking tot minimum wapening zijn toegepast, zie nationale bijlage art. 9.2.1.1(1).
- [2] Benodigde wapening en inwendige hefboomsarm zijn bepaald volgens gedrongen ligger detaillering, zie nationale bijlage art. 6.1(10).
- [54] * = Eisen met betrekking tot minimum wapening ten behoeve van gecontroleerde scheurvorming zijn toegepast volgens art. 7.3.2.
- [68] **MRd als gevolg van de gedrongen ligger berekening (NB. 6.1(10)) is groter dan MRd volgens 6.1(P). De momentweerstand en inwendige hefboomsarm volgens 6.1(P) zijn maatgevend en daarom alsnog toegepast.**
- [110] **Art. 9.7 (1),(2): Een orthogonaal wapeningsnet dient toegepast te worden aan iedere zijde van de gedrongen liggers:
Profiel 1 - B*H 400*500: 400 mm²/m aan elke zijde en in elke richting met een maximaal hoh 300 mm.**

Scheurvorming volgens artikel 7.3.4

Balk 4-3

| Geb. | Pos. [mm] | Zijde | $M_E; freq$ [kNm] | $S_{r, max}$ [mm] | $\epsilon_{sm} - \epsilon_{cm}$ [%] | w_k [mm] | k_x | w_{max} [mm] | U.C. | Opm. |
|------|--------------|-------|----------------------|----------------------|--|---------------|-------|-------------------|------|------|
| 1 | S17-80 | Bov | 6.40 | 367 | 0.100 | 0.037 | 1.00 | 0.300 | 0.12 | |
| 2 | S17+335 | Bov | 6.40 | 367 | 0.100 | 0.037 | 1.00 | 0.300 | 0.12 | |
| 2 | S18-387 | Bov | 28.73 | 367 | 0.448 | 0.165 | 1.00 | 0.300 | 0.55 | |
| 2 | S17+159 | Ond | -20.69 | 406 | 0.327 | 0.133 | 1.14 | 0.343 | 0.39 | |
| 2 | S17+656 | Ond | -20.70 | 406 | 0.327 | 0.133 | 1.14 | 0.343 | 0.39 | |
| 2 | S18-556 | Ond | -20.69 | 406 | 0.327 | 0.133 | 1.14 | 0.343 | 0.39 | |
| 3 | S18+487 | Bov | 28.73 | 367 | 0.448 | 0.165 | 1.00 | 0.300 | 0.55 | |
| 3 | S19-483 | Bov | 30.94 | 367 | 0.483 | 0.177 | 1.00 | 0.300 | 0.59 | |
| 3 | S18+351 | Ond | -10.81 | 406 | 0.171 | 0.069 | 1.14 | 0.343 | 0.20 | |
| 3 | S18+850 | Ond | -10.80 | 406 | 0.171 | 0.069 | 1.14 | 0.343 | 0.20 | |
| 3 | S19-401 | Ond | -10.80 | 406 | 0.170 | 0.069 | 1.14 | 0.343 | 0.20 | |
| 4 | S19+0 | Bov | 30.94 | 367 | 0.483 | 0.177 | 1.00 | 0.300 | 0.59 | |
| 4 | S19+464 | Bov | 30.94 | 367 | 0.483 | 0.177 | 1.00 | 0.300 | 0.59 | |
| 4 | S20-443 | Bov | 25.05 | 367 | 0.391 | 0.144 | 1.00 | 0.300 | 0.48 | |
| 5 | S20+411 | Bov | 25.05 | 367 | 0.391 | 0.144 | 1.00 | 0.300 | 0.48 | |
| 5 | S21-438 | Bov | 27.13 | 367 | 0.423 | 0.155 | 1.00 | 0.300 | 0.52 | |
| 5 | S20+388 | Ond | -7.88 | 406 | 0.124 | 0.051 | 1.14 | 0.343 | 0.15 | |
| 5 | S20+794 | Ond | -7.88 | 406 | 0.124 | 0.051 | 1.14 | 0.343 | 0.15 | |
| 5 | S21-422 | Ond | -7.88 | 406 | 0.124 | 0.051 | 1.14 | 0.343 | 0.15 | |
| 6 | S21+0 | Bov | 27.13 | 367 | 0.423 | 0.155 | 1.00 | 0.300 | 0.52 | |
| 6 | S21+363 | Bov | 27.13 | 367 | 0.423 | 0.155 | 1.00 | 0.300 | 0.52 | |
| 6 | S22-454 | Bov | 22.08 | 367 | 0.345 | 0.126 | 1.00 | 0.300 | 0.42 | |
| 6 | S21+484 | Ond | -16.06 | 406 | 0.254 | 0.103 | 1.14 | 0.343 | 0.30 | |
| 6 | S22-851 | Ond | -16.07 | 406 | 0.254 | 0.103 | 1.14 | 0.343 | 0.30 | |
| 6 | S22-429 | Ond | -16.06 | 406 | 0.254 | 0.103 | 1.14 | 0.343 | 0.30 | |
| 7 | S22+476 | Bov | 22.08 | 367 | 0.345 | 0.126 | 1.00 | 0.300 | 0.42 | |
| 7 | S23-450 | Bov | 31.40 | 367 | 0.490 | 0.180 | 1.00 | 0.300 | 0.60 | |
| 7 | S22+303 | Ond | -14.02 | 406 | 0.221 | 0.090 | 1.14 | 0.343 | 0.26 | |
| 7 | S22+842 | Ond | -14.02 | 406 | 0.221 | 0.090 | 1.14 | 0.343 | 0.26 | |
| 7 | S23-503 | Ond | -14.02 | 406 | 0.221 | 0.090 | 1.14 | 0.343 | 0.26 | |
| 8 | S23+370 | Bov | 31.40 | 367 | 0.490 | 0.180 | 1.00 | 0.300 | 0.60 | |
| 8 | S24-307 | Bov | 5.62 | 367 | 0.088 | 0.032 | 1.00 | 0.300 | 0.11 | |
| 8 | S23+594 | Ond | -26.37 | 406 | 0.416 | 0.169 | 1.14 | 0.343 | 0.49 | |
| 8 | S24-723 | Ond | -26.38 | 406 | 0.416 | 0.169 | 1.14 | 0.343 | 0.49 | |
| 8 | S24-322 | Ond | -26.37 | 406 | 0.416 | 0.169 | 1.14 | 0.343 | 0.49 | |
| 9 | S24+70 | Bov | 5.62 | 367 | 0.088 | 0.032 | 1.00 | 0.300 | 0.11 | |

Verloop hoofdwapening

Balk 4-3

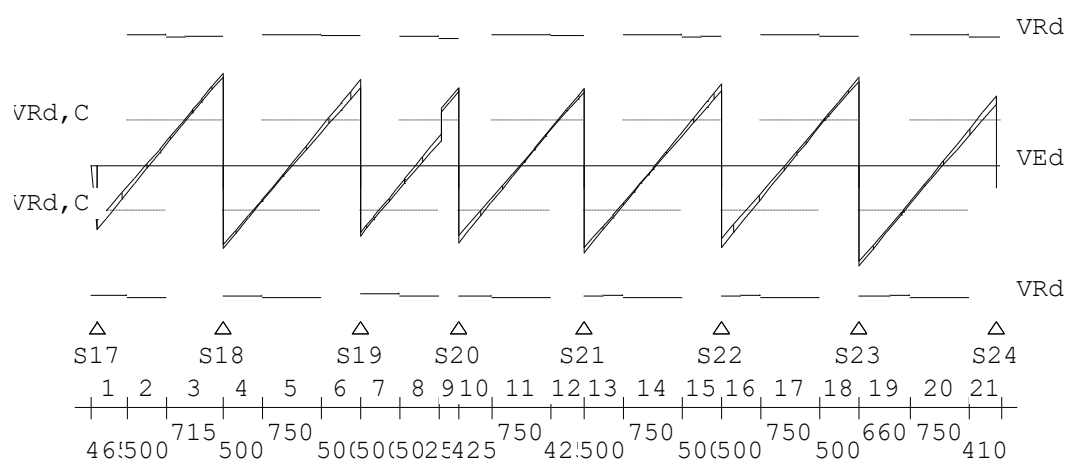
| Merk | B/O | Wapening | Vanaf [mm] | Tot [mm] | Lengte [mm] | $L_{bd, begin}$ [mm] | $L_{bd, eind}$ [mm] |
|------|-------|----------|---------------|-------------|----------------|-------------------------|------------------------|
| a | Boven | 4x12 | S17-200 | S24+190 | 11840 | 120 | 120 |
| b | Onder | 4x12 | S17-282 | S24+317 | 12050 | 202 | 247 |

Opmerkingen

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

DWARSKRACHTEN Fysisch lineair

Balk 4-3 Fundamentele combinatie


Wring- en dwarskrachtwapening

Balk 4-3

| Geb. | Vanaf | Tot | Beugels | Lengte | <Wringing> | | <Dwarskr.> | | | | |
|------|---------|---------|---------|--------|----------------------------------|-----------------------------------|---------------------------------|---------------------------------|------------------|-------------------|----------|
| | [mm] | [mm] | | [mm] | A_{lang} [mm ²] | A_{bg1} [mm ² /m] | A_{bg1} [mm ²] | A_{opg} [mm ²] | V_{Ed} [kN] | T_{Ed} [kNm] | Opm. |
| 1 | S17-80 | S17+385 | Ø8-250 | 465 | 59 | 7 | 286 | 0 | 96.6 | 2 | 6 |
| 2 | S17+385 | S18-715 | Ø8-250 | 500 | 0 | 0 | 286 | 0 | 35.3 | 2 | |
| 3 | S18-715 | S18+0 | Ø8-250 | 715 | 59 | 7 | 286 | 0 | 126.4 | 2 | 6 |
| 4 | S18+0 | S18+500 | Ø8-250 | 500 | 59 | 7 | 286 | 0 | 112.1 | 2 | 6 |
| 5 | S18+500 | S19-500 | Ø8-250 | 750 | 0 | 0 | 286 | 0 | 52.4 | 2 | |
| 6 | S19-500 | S19+0 | Ø8-250 | 500 | 59 | 7 | 286 | 0 | 118.3 | 2 | 6 |
| 7 | S19+0 | S19+500 | Ø8-250 | 500 | 59 | 7 | 286 | 0 | 94.8 | 2 | 6,58,109 |
| 8 | S19+500 | S20-250 | Ø8-250 | 500 | 0 | 0 | 286 | 0 | 39.7 | 2 | 58,109 |
| 9 | S20-250 | S20+0 | Ø8-250 | 250 | 60 | 7 | 286 | 0 | 106.6 | 2 | 6,58,109 |
| 10 | S20+0 | S20+425 | Ø8-250 | 425 | 60 | 7 | 286 | 0 | 104.4 | 2 | 6 |
| 11 | S20+425 | S21-425 | Ø8-250 | 750 | 0 | 0 | 286 | 0 | 50.8 | 2 | |
| 12 | S21-425 | S21+0 | Ø8-250 | 425 | 60 | 7 | 286 | 0 | 105.9 | 2 | 6 |
| 13 | S21+0 | S21+500 | Ø8-250 | 500 | 60 | 7 | 286 | 0 | 118.1 | 2 | 6 |
| 14 | S21+500 | S22-500 | Ø8-250 | 750 | 0 | 0 | 286 | 0 | 52.6 | 2 | |
| 15 | S22-500 | S22+0 | Ø8-250 | 500 | 60 | 7 | 286 | 0 | 111.9 | 2 | 6 |
| 16 | S22+0 | S22+500 | Ø8-250 | 500 | 64 | 8 | 286 | 0 | 110.7 | 2 | 6 |
| 17 | S22+500 | S23-500 | Ø8-250 | 750 | 0 | 0 | 286 | 0 | 56.2 | 2 | |
| 18 | S23-500 | S23+0 | Ø8-250 | 500 | 64 | 8 | 286 | 0 | 120.7 | 2 | 6 |
| 19 | S23+0 | S23+660 | Ø8-250 | 660 | 64 | 8 | 302 | 0 | 135.8 | 2 | 6 |
| 20 | S23+660 | S24-340 | Ø8-250 | 750 | 0 | 0 | 286 | 0 | 50.7 | 2 | |
| 21 | S24-340 | S24+70 | Ø8-250 | 410 | 64 | 8 | 286 | 0 | 104.3 | 2 | 6 |

Opmerkingen

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

[58] 6.2.3: Z is berekend m.b.v. 0.9d

[109] Bij de berekening van de beugels is geen rekening gehouden met de detailleringregels van art 9.7 voor de gedrongen liggers.

Wring- en dwarskrachten

Balk 4-3

| Geb. | Vanaf [mm] | Tot [mm] | θ [°] | V_{Rd} [kN] | V_{Ed} | $V_{Rd,C}$ | $V_{Rd,Max}$ | T_{Ed} | $T_{Rd,C}$ | $T_{Rd,Max}$ | V_{opg} | Opm. |
|------|---------------|-------------|-----------------|------------------|--------------|------------|--------------|---------------|------------|--------------|-----------|------------|
| | | | | | -----kN----- | | | -----kNm----- | | | | |
| 1 | S17-80 | S17+385 | 21.8 | 173 | 97 | 61 | 416 | 2 | 26 | 63 | 0 | 6 |
| 2 | S17+385 | S18-715 | 21.8 | 179 | 35 | 61 | 416 | 2 | 26 | 63 | 0 | |
| 3 | S18-715 | S18+0 | 21.8 | 174 | 126 | 62 | 420 | 2 | 26 | 63 | 0 | 6 |
| 4 | S18+0 | S18+500 | 21.8 | 174 | 112 | 62 | 420 | 2 | 26 | 63 | 0 | 6 |
| 5 | S18+500 | S19-500 | 21.8 | 179 | 52 | 61 | 416 | 2 | 26 | 63 | 0 | |
| 6 | S19-500 | S19+0 | 21.8 | 174 | 118 | 62 | 420 | 2 | 26 | 63 | 0 | 6 |
| 7 | S19+0 | S19+500 | 21.8 | 171 | 95 | 62 | 412 | 2 | 26 | 63 | 0 | 6, 58, 109 |
| 8 | S19+500 | S20-250 | 21.8 | 177 | 40 | 62 | 412 | 2 | 26 | 63 | 0 | 58, 109 |
| 9 | S20-250 | S20+0 | 21.8 | 171 | 107 | 62 | 412 | 2 | 26 | 63 | 0 | 6, 58, 109 |
| 10 | S20+0 | S20+425 | 21.8 | 174 | 104 | 62 | 420 | 2 | 26 | 63 | 0 | 6 |
| 11 | S20+425 | S21-425 | 21.8 | 179 | 51 | 61 | 416 | 2 | 26 | 63 | 0 | |
| 12 | S21-425 | S21+0 | 21.8 | 174 | 106 | 62 | 420 | 2 | 26 | 63 | 0 | 6 |
| 13 | S21+0 | S21+500 | 21.8 | 174 | 118 | 62 | 420 | 2 | 26 | 63 | 0 | 6 |
| 14 | S21+500 | S22-500 | 21.8 | 179 | 53 | 61 | 416 | 2 | 26 | 63 | 0 | |
| 15 | S22-500 | S22+0 | 21.8 | 174 | 112 | 62 | 420 | 2 | 26 | 63 | 0 | 6 |
| 16 | S22+0 | S22+500 | 21.8 | 174 | 111 | 62 | 420 | 2 | 26 | 63 | 0 | 6 |
| 17 | S22+500 | S23-500 | 21.8 | 179 | 56 | 61 | 416 | 2 | 26 | 63 | 0 | |
| 18 | S23-500 | S23+0 | 21.8 | 174 | 121 | 62 | 420 | 2 | 26 | 63 | 0 | 6 |
| 19 | S23+0 | S23+660 | 21.8 | 174 | 136 | 62 | 420 | 2 | 26 | 63 | 0 | 6 |
| 20 | S23+660 | S24-340 | 21.8 | 179 | 51 | 61 | 416 | 2 | 26 | 63 | 0 | |
| 21 | S24-340 | S24+70 | 21.8 | 173 | 104 | 61 | 416 | 2 | 26 | 63 | 0 | 6 |

Opmerkingen

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

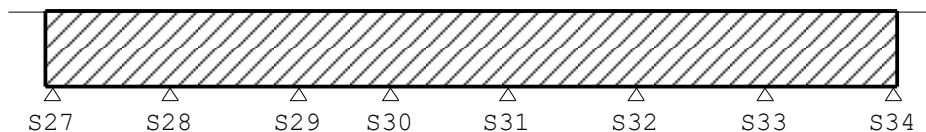
[58] 6.2.3: Z is berekend m.b.v. 0.9d

[109] Bij de berekening van de beugels is geen rekening gehouden met de detailleringsregels van art 9.7 voor de gedrongen liggers.

Hoofdwapening Fysisch lineair

Balk 4-4

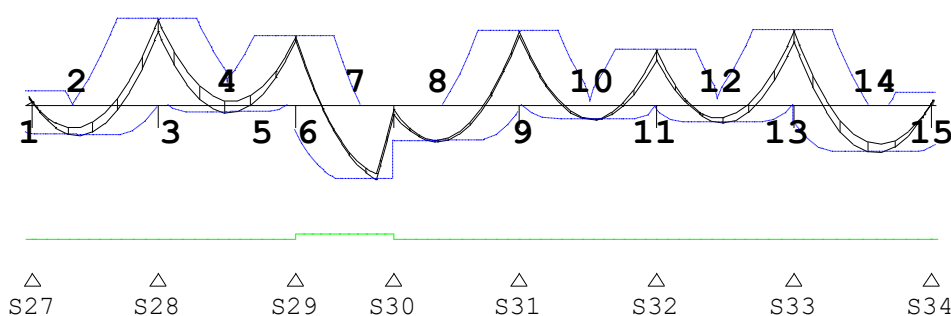
4x12 a



4x12 b

MEd dekkingslijn Fysisch lineair

Balk 4-4



Hoofdwapening

Balk 4-4

| Geb. | Pos. [mm] | M _{E d} [kNm] | M _{R d} [kNm] | z B/O [mm] | A _b [mm ²] | A _a [mm ²] | Basiswapening +Bijlegwapening | Opm. |
|------|--------------|---------------------------|---------------------------|---------------|--------------------------------------|--------------------------------------|----------------------------------|----------|
| 1 | S27-80 | 9.08 | 88.65 | 412 Bov | 165* | 453 | 4x12 | 54 |
| 2 | S27+582 | -19.82 | -87.45 | 425 Ond | 165* | 453 | 4x12 | 54 |
| 3 | S28+0 | 56.61 | 88.65 | 412 Bov | 286 | 453 | 4x12 | |
| 4 | S29-849 | -5.01 | -87.45 | 425 Ond | 165* | 453 | 4x12 | 54 |
| 5 | S29-0 | 44.79 | 88.65 | 412 Bov | 225 | 453 | 4x12 | |
| 6 | S29+0 | 44.79 | 88.65 | 412 Bov | 225 | 453 | 4x12 | 2,68,110 |
| 7 | S30-220 | -48.39 | -84.17 | 427 Ond | 261 | 453 | 4x12 | 2,110 |
| 8 | S30+569 | -23.61 | -87.45 | 425 Ond | 165* | 453 | 4x12 | 54 |
| 9 | S31+0 | 48.32 | 88.65 | 412 Bov | 243 | 453 | 4x12 | |
| 10 | S32-802 | -9.68 | -87.45 | 425 Ond | 165* | 453 | 4x12 | 54 |
| 11 | S32+0 | 36.32 | 88.65 | 412 Bov | 204* | 453 | 4x12 | 1 |
| 12 | S32+851 | -11.43 | -87.45 | 425 Ond | 165* | 453 | 4x12 | 54 |
| 13 | S33+0 | 48.74 | 88.65 | 412 Bov | 245 | 453 | 4x12 | |
| 14 | S34-699 | -31.00 | -87.45 | 425 Ond | 196* | 453 | 4x12 | 1 |
| 15 | S34+70 | 7.98 | 88.65 | 412 Bov | 165* | 453 | 4x12 | 54 |

Opmerkingen

- [1] * = Eisen met betrekking tot minimum wapening zijn toegepast, zie nationale bijlage art. 9.2.1.1(1).
- [2] Benodigde wapening en inwendige hefboomsarm zijn bepaald volgens gedrongen ligger detaillering, zie nationale bijlage art. 6.1(10).
- [54] * = Eisen met betrekking tot minimum wapening ten behoeve van gecontroleerde scheurvorming zijn toegepast volgens art. 7.3.2.
- [68] **MRd als gevolg van de gedrongen ligger berekening (NB. 6.1(10)) is groter dan MRd volgens 6.1(P). De momentweerstand en inwendige hefboomsarm volgens 6.1(P) zijn maatgevend en daarom alsnog toegepast.**
- [110] **Art. 9.7 (1), (2): Een orthogonaal wapeningsnet dient toegepast te worden aan iedere zijde van de gedrongen liggers:**
Profiel 1 - B*H 400*500: 400 mm²/m aan elke zijde en in elke richting met een maximaal hoh 300 mm.

Scheurvorming volgens artikel 7.3.4

Balk 4-4

| Geb. | Pos. [mm] | Zijde | $M_E, freq$ [kNm] | $S_{r, max}$ [mm] | $\epsilon_{sm} - \epsilon_{cm}$ [%] | w_k [mm] | k_x | w_{max} [mm] | U.C. | Opm. |
|------|--------------|-------|----------------------|----------------------|--|---------------|-------|-------------------|------|------|
| 1 | S27-80 | Bov | 7.31 | 367 | 0.114 | 0.042 | 1.00 | 0.300 | 0.14 | |
| 2 | S27+398 | Bov | 7.31 | 367 | 0.114 | 0.042 | 1.00 | 0.300 | 0.14 | |
| 2 | S28-441 | Bov | 43.53 | 367 | 0.679 | 0.249 | 1.00 | 0.300 | 0.83 | |
| 2 | S27+31 | Ond | -14.19 | 406 | 0.224 | 0.091 | 1.14 | 0.343 | 0.27 | |
| 2 | S27+582 | Ond | -14.19 | 406 | 0.224 | 0.091 | 1.14 | 0.343 | 0.27 | |
| 2 | S28-607 | Ond | -14.18 | 406 | 0.224 | 0.091 | 1.14 | 0.343 | 0.27 | |
| 3 | S28+468 | Bov | 43.53 | 367 | 0.679 | 0.249 | 1.00 | 0.300 | 0.83 | |
| 3 | S29-489 | Bov | 35.66 | 367 | 0.556 | 0.204 | 1.00 | 0.300 | 0.68 | |
| 3 | S28+469 | Ond | -1.93 | 406 | 0.030 | 0.012 | 1.14 | 0.343 | 0.04 | |
| 3 | S29-849 | Ond | -1.95 | 406 | 0.031 | 0.013 | 1.14 | 0.343 | 0.04 | |
| 3 | S29-430 | Ond | -1.93 | 406 | 0.030 | 0.012 | 1.14 | 0.343 | 0.04 | |
| 4 | S29+446 | Bov | 35.66 | 367 | 0.556 | 0.204 | 1.00 | 0.300 | 0.68 | |
| 4 | S29+559 | Ond | -37.42 | 406 | 0.591 | 0.240 | 1.14 | 0.343 | 0.70 | |
| 4 | S30+0 | Ond | -37.42 | 406 | 0.591 | 0.240 | 1.14 | 0.343 | 0.70 | |
| 5 | S31-455 | Bov | 38.29 | 367 | 0.598 | 0.219 | 1.00 | 0.300 | 0.73 | |
| 5 | S30+142 | Ond | -19.13 | 406 | 0.302 | 0.123 | 1.14 | 0.343 | 0.36 | |
| 5 | S30+569 | Ond | -19.14 | 406 | 0.302 | 0.123 | 1.14 | 0.343 | 0.36 | |
| 5 | S31-582 | Ond | -19.13 | 406 | 0.302 | 0.123 | 1.14 | 0.343 | 0.36 | |
| 6 | S31+429 | Bov | 38.29 | 367 | 0.598 | 0.219 | 1.00 | 0.300 | 0.73 | |
| 6 | S32-457 | Bov | 28.16 | 367 | 0.439 | 0.161 | 1.00 | 0.300 | 0.54 | |
| 6 | S31+408 | Ond | -7.55 | 406 | 0.119 | 0.048 | 1.14 | 0.343 | 0.14 | |
| 6 | S32-802 | Ond | -7.55 | 406 | 0.119 | 0.048 | 1.14 | 0.343 | 0.14 | |
| 6 | S32-414 | Ond | -7.53 | 406 | 0.119 | 0.048 | 1.14 | 0.343 | 0.14 | |
| 7 | S32+0 | Bov | 28.16 | 367 | 0.439 | 0.161 | 1.00 | 0.300 | 0.54 | |
| 7 | S32+441 | Bov | 28.16 | 367 | 0.439 | 0.161 | 1.00 | 0.300 | 0.54 | |
| 7 | S33-446 | Bov | 37.74 | 367 | 0.589 | 0.216 | 1.00 | 0.300 | 0.72 | |
| 7 | S32+417 | Ond | -7.78 | 406 | 0.123 | 0.050 | 1.14 | 0.343 | 0.15 | |
| 7 | S32+851 | Ond | -7.79 | 406 | 0.123 | 0.050 | 1.14 | 0.343 | 0.15 | |
| 7 | S33-483 | Ond | -7.78 | 406 | 0.123 | 0.050 | 1.14 | 0.343 | 0.15 | |
| 8 | S33+454 | Bov | 37.74 | 367 | 0.589 | 0.216 | 1.00 | 0.300 | 0.72 | |
| 8 | S34-338 | Bov | 6.38 | 367 | 0.100 | 0.037 | 1.00 | 0.300 | 0.12 | |
| 8 | S33+708 | Ond | -23.26 | 406 | 0.367 | 0.149 | 1.14 | 0.343 | 0.44 | |
| 8 | S34-699 | Ond | -23.27 | 406 | 0.367 | 0.149 | 1.14 | 0.343 | 0.44 | |
| 8 | S34-166 | Ond | -23.26 | 406 | 0.367 | 0.149 | 1.14 | 0.343 | 0.44 | |
| 9 | S34+70 | Bov | 6.38 | 367 | 0.100 | 0.037 | 1.00 | 0.300 | 0.12 | |

Verloop hoofdwapening

Balk 4-4

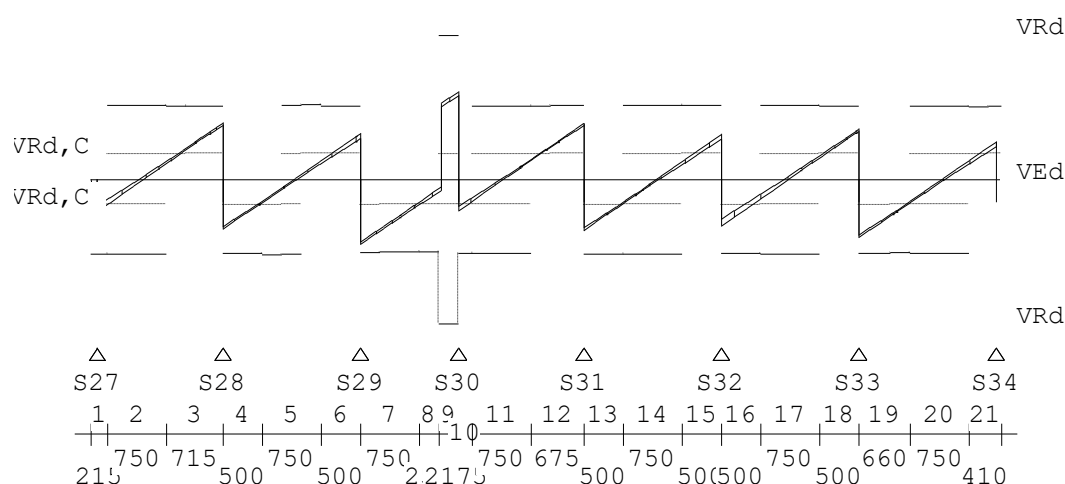
| Merk | B/O | Wapening | Vanaf [mm] | Tot [mm] | Lengte [mm] | $L_{bd, begin}$ [mm] | $L_{bd, eind}$ [mm] |
|------|-------|----------|---------------|-------------|----------------|-------------------------|------------------------|
| a | Boven | 4x12 | S27-201 | S34+190 | 11841 | 121 | 120 |
| b | Onder | 4x12 | S27-226 | S34+292 | 11968 | 146 | 222 |

Opmerkingen

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

DWARSKRACHTEN Fysisch lineair

Balk 4-4 Fundamentele combinatie



Wring- en dwarskrachtwapening

Balk 4-4

| Geb. Vanaf | Tot | Beugels | Lengte | <Wringing> | | <Dwarskr.> | | | | | |
|------------|---------|---------|--------|--|-----------------------------------|-----------------------------------|---------------------------------|------------------|-------------------|------------|--|
| [mm] | [mm] | | [mm] | $A_{l\text{angs}}$ [mm ²] | A_{bgl} [mm ² /m] | A_{bgl} [mm ² /m] | A_{opg} [mm ²] | V_{Ed} [kN] | T_{Ed} [kNm] | Opm. | |
| 1 S27-80 | S27+135 | Ø8-250 | 215 | 35 | 4 | 286 | 0 | 86.9 | 1 | 6 | |
| 2 S27+135 | S28-715 | Ø8-250 | 750 | 0 | 0 | 286 | 0 | 58.5 | 1 | | |
| 3 S28-715 | S28+0 | Ø8-250 | 715 | 35 | 4 | 305 | 0 | 136.9 | 1 | 6 | |
| 4 S28+0 | S28+500 | Ø8-250 | 500 | 35 | 4 | 286 | 0 | 119.3 | 1 | 6 | |
| 5 S28+500 | S29-500 | Ø8-250 | 750 | 0 | 0 | 286 | 0 | 54.8 | 1 | | |
| 6 S29-500 | S29+0 | Ø8-250 | 500 | 35 | 4 | 286 | 0 | 111.6 | 1 | 6 | |
| 7 S29+0 | S30-500 | Ø8-250 | 750 | 35 | 4 | 354 | 0 | 156.3 | 1 | 6, 58, 109 | |
| 8 S30-500 | S30-250 | Ø8-250 | 250 | 35 | 4 | 286 | 0 | 60.0 | 1 | 58, 109 | |
| 9 S30-250 | S30+0 | Ø8-125 | 250 | 35 | 4 | 488 | 0 | 212.9 | 1 | 6, 58, 109 | |
| 10 S30+0 | S30+175 | Ø8-250 | 175 | 1 | 0 | 286 | 0 | 74.7 | 1 | 6 | |
| 11 S30+175 | S31-675 | Ø8-250 | 750 | 0 | 0 | 286 | 0 | 51.6 | 0 | | |
| 12 S31-675 | S31+0 | Ø8-250 | 675 | 1 | 0 | 302 | 0 | 135.8 | 0 | 6 | |
| 13 S31+0 | S31+500 | Ø8-250 | 500 | 1 | 0 | 286 | 0 | 122.0 | 0 | 6 | |
| 14 S31+500 | S32-500 | Ø8-250 | 750 | 0 | 0 | 286 | 0 | 57.4 | 0 | | |
| 15 S32-500 | S32+0 | Ø8-250 | 500 | 1 | 0 | 286 | 0 | 109.2 | 0 | 6 | |
| 16 S32+0 | S32+500 | Ø8-250 | 500 | 38 | 5 | 286 | 0 | 111.8 | 1 | 6 | |
| 17 S32+500 | S33-500 | Ø8-250 | 750 | 0 | 0 | 286 | 0 | 57.7 | 1 | | |
| 18 S33-500 | S33+0 | Ø8-250 | 500 | 38 | 5 | 286 | 0 | 122.2 | 1 | 6 | |
| 19 S33+0 | S33+660 | Ø8-250 | 660 | 38 | 5 | 312 | 0 | 140.0 | 1 | 6 | |
| 20 S33+660 | S34-340 | Ø8-250 | 750 | 0 | 0 | 286 | 0 | 54.8 | 1 | | |
| 21 S34-340 | S34+70 | Ø8-250 | 410 | 38 | 5 | 286 | 0 | 101.0 | 1 | 6 | |

Opmerkingen

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

[58] 6.2.3: α is berekend m.b.v. $0.9d$

[109] Bij de berekening van de beugels is geen rekening gehouden met de detailleringsregels van art 9.7 voor de gedrongen liggers.

Wring- en dwarskrachten

Balk 4-4

| Geb. | Vanaf [mm] | Tot [mm] | θ [°] | V_{Rd} [kN] | V_{Ed} | $V_{Rd,C}$ | $V_{Rd,Max}$ | T_{Ed} | $T_{Rd,C}$ | $T_{Rd,Max}$ | V_{opg} | Opm. |
|------|---------------|-------------|-----------------|------------------|----------|--------------|--------------|----------|------------|---------------|-----------|------------|
| | | | | | | -----kN----- | | | | -----kNm----- | | |
| 1 | S27-80 | S27+135 | 21.8 | 177 | 87 | 62 | 421 | 1 | 26 | 63 | 0 | 6 |
| 2 | S27+135 | S28-715 | 21.8 | 179 | 59 | 61 | 416 | 1 | 26 | 63 | 0 | |
| 3 | S28-715 | S28+0 | 21.8 | 177 | 137 | 62 | 419 | 1 | 26 | 63 | 0 | 6 |
| 4 | S28+0 | S28+500 | 21.8 | 177 | 119 | 62 | 419 | 1 | 26 | 63 | 0 | 6 |
| 5 | S28+500 | S29-500 | 21.8 | 181 | 55 | 62 | 420 | 1 | 26 | 63 | 0 | |
| 6 | S29-500 | S29+0 | 21.8 | 177 | 112 | 62 | 420 | 1 | 26 | 63 | 0 | 6 |
| 7 | S29+0 | S30-500 | 21.8 | 174 | 156 | 62 | 412 | 1 | 26 | 63 | 0 | 6, 58, 109 |
| 8 | S30-500 | S30-250 | 21.8 | 172 | 60 | 61 | 407 | 1 | 26 | 63 | 0 | 58, 109 |
| 9 | S30-250 | S30+0 | 21.8 | 347 | 213 | 61 | 407 | 1 | 26 | 63 | 0 | 6, 58, 109 |
| 10 | S30+0 | S30+175 | 21.8 | 179 | 75 | 61 | 416 | 1 | 26 | 63 | 0 | 6 |
| 11 | S30+175 | S31-675 | 21.8 | 179 | 52 | 61 | 416 | 0 | 26 | 63 | 0 | |
| 12 | S31-675 | S31+0 | 21.8 | 180 | 136 | 62 | 419 | 0 | 26 | 63 | 0 | 6 |
| 13 | S31+0 | S31+500 | 21.8 | 180 | 122 | 62 | 419 | 0 | 26 | 63 | 0 | 6 |
| 14 | S31+500 | S32-500 | 21.8 | 179 | 57 | 61 | 416 | 0 | 26 | 63 | 0 | |
| 15 | S32-500 | S32+0 | 21.8 | 181 | 109 | 62 | 420 | 0 | 26 | 63 | 0 | 6 |
| 16 | S32+0 | S32+500 | 21.8 | 177 | 112 | 62 | 420 | 1 | 26 | 63 | 0 | 6 |
| 17 | S32+500 | S33-500 | 21.8 | 179 | 58 | 61 | 416 | 1 | 26 | 63 | 0 | |
| 18 | S33-500 | S33+0 | 21.8 | 176 | 122 | 62 | 420 | 1 | 26 | 63 | 0 | 6 |
| 19 | S33+0 | S33+660 | 21.8 | 176 | 140 | 62 | 419 | 1 | 26 | 63 | 0 | 6 |
| 20 | S33+660 | S34-340 | 21.8 | 179 | 55 | 61 | 416 | 1 | 26 | 63 | 0 | |
| 21 | S34-340 | S34+70 | 21.8 | 177 | 101 | 62 | 421 | 1 | 26 | 63 | 0 | 6 |

Schuifspanningen

Balk 4-4

| Geb. | Vanaf [mm] | Tot [mm] | θ [°] | V_{Ed} [kN] | $V_{Rd,C}$ | $V_{Rd,S}$ | $V_{Ed} < V_{Rd} < V_{Rd,Max}$ | Opm. |
|------|---------------|-------------|-----------------|------------------|-------------------|------------|--------------------------------|------|
| | | | | | -----[N/mm²]----- | | | |

Opmerkingen

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

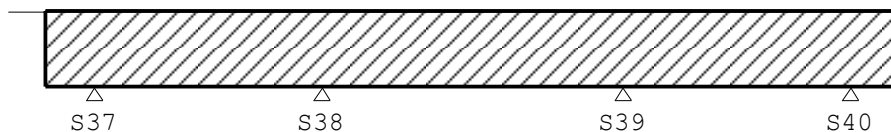
[58] 6.2.3: z is berekend m.b.v. 0.9d

[109] Bij de berekening van de beugels is geen rekening gehouden met de detailleringsregels van art 9.7 voor de gedrongen liggers.

Hoofdwapening Fysisch lineair

Balk 4-5

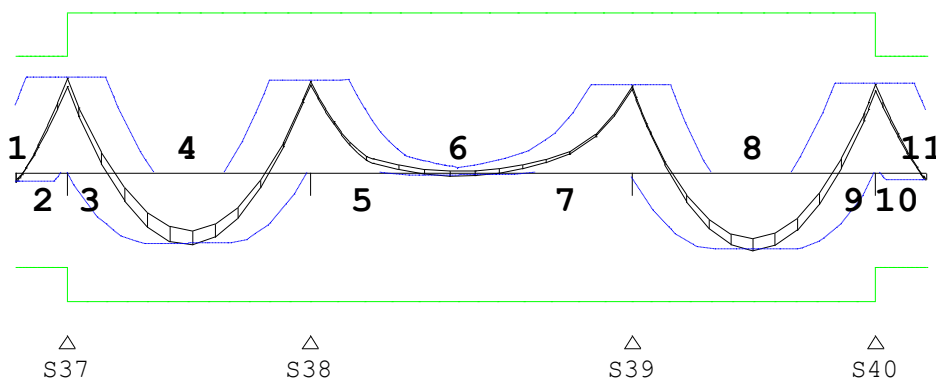
5x12 a



4x12 b

MEd dekkingslijn Fysisch lineair

Balk 4-5



Hoofdwapening

Balk 4-5

| Geb. | Pos. [mm] | $M_{E,d}$ [kNm] | $M_{R,d}$ [kNm] | z | B/O | A_b [mm ²] | A_a [mm ²] | Basiswapening +Bijlegwapening | Opm. |
|------|--------------|--------------------|--------------------|-----|-----|-----------------------------|-----------------------------|----------------------------------|----------|
| 1 | S37-650 | -6.09 | -64.91 | 330 | Ond | 191* | 453 | 4x12 | 2,54,110 |
| 2 | S37-0 | 65.50 | 81.14 | 330 | Bov | 457 | 566 | 5x12 | 2,110 |
| 3 | S37+0 | 65.50 | 110.80 | 414 | Bov | 330 | 566 | 5x12 | |
| 4 | S37+1542 | -49.55 | -88.57 | 391 | Ond | 257* | 453 | 4x12 | 1 |
| 5 | S38+0 | 63.47 | 110.80 | 414 | Bov | 319 | 566 | 5x12 | |
| 6 | S38+1885 | -1.90 | -88.57 | 391 | Ond | 191* | 453 | 4x12 | 54 |
| 7 | S39+0 | 60.27 | 110.80 | 414 | Bov | 303 | 566 | 5x12 | |
| 8 | S39+1551 | -53.35 | -88.57 | 391 | Ond | 271 | 453 | 4x12 | |
| 9 | S40-0 | 61.39 | 110.80 | 414 | Bov | 309 | 566 | 5x12 | |
| 10 | S40+0 | 61.39 | 81.14 | 330 | Bov | 428 | 566 | 5x12 | 2,110 |
| 11 | S40+650 | -5.27 | -64.91 | 330 | Ond | 191* | 453 | 4x12 | 2,54,110 |

Opmerkingen

- [1] * = Eisen met betrekking tot minimum wapening zijn toegepast, zie nationale bijlage art. 9.2.1.1(1).
- [2] Benodigde wapening en inwendige hefboomsarm zijn bepaald volgens gedrongen ligger detaillering, zie nationale bijlage art. 6.1(10).
- [54] * = Eisen met betrekking tot minimum wapening ten behoeve van gecontroleerde scheurvorming zijn toegepast volgens art. 7.3.2.
- [110] **Art. 9.7 (1), (2): Een orthogonaal wapeningsnet dient toegepast te worden aan iedere zijde van de gedrongen liggers:**
Profiel 4 - B*H 500*500: 500 mm²/m aan elke zijde en in elke richting met een maximaal hoh 300 mm.

Scheurvorming volgens artikel 7.3.4

Balk 4-5

| Geb. | Pos. [mm] | Zijde | $M_E; f_{req}$ [kNm] | $S_{r,max}$ [mm] | $\epsilon_{sm} - \epsilon_{cm}$ [%] | w_k [mm] | k_x | w_{max} [mm] | U.C. | Opm. |
|------|--------------|-------|-------------------------|---------------------|--|---------------|-------|-------------------|------|------|
| 1 | S37-650 | Bov | 38.07 | 367 | 0.475 | 0.174 | 1.17 | 0.350 | 0.50 | |
| 1 | S37-463 | Bov | 53.34 | 367 | 0.666 | 0.244 | 1.17 | 0.350 | 0.70 | |
| 1 | S37-650 | Ond | -4.40 | 408 | 0.069 | 0.028 | 1.33 | 0.400 | 0.07 | |
| 1 | S37-184 | Ond | -4.40 | 408 | 0.069 | 0.028 | 1.33 | 0.400 | 0.07 | |
| 2 | S37+0 | Bov | 53.34 | 367 | 0.666 | 0.244 | 1.17 | 0.350 | 0.70 | |
| 2 | S37+300 | Bov | 53.34 | 367 | 0.666 | 0.244 | 1.17 | 0.350 | 0.70 | |
| 2 | S38-287 | Bov | 52.24 | 367 | 0.652 | 0.239 | 1.17 | 0.350 | 0.68 | |
| 2 | S37+1283 | Ond | -36.85 | 408 | 0.578 | 0.236 | 1.33 | 0.400 | 0.59 | |
| 2 | S38-1039 | Ond | -36.85 | 408 | 0.578 | 0.236 | 1.33 | 0.400 | 0.59 | |
| 3 | S38+383 | Bov | 52.24 | 367 | 0.652 | 0.239 | 1.17 | 0.350 | 0.68 | |
| 3 | S39-364 | Bov | 50.03 | 367 | 0.624 | 0.229 | 1.17 | 0.350 | 0.65 | |
| 3 | S38+1636 | Ond | -1.01 | 408 | 0.016 | 0.006 | 1.33 | 0.400 | 0.02 | |
| 3 | S39-1716 | Ond | -1.01 | 408 | 0.016 | 0.006 | 1.33 | 0.400 | 0.02 | |
| 4 | S39+0 | Bov | 50.03 | 367 | 0.624 | 0.229 | 1.17 | 0.350 | 0.65 | |
| 4 | S39+503 | Bov | 50.03 | 367 | 0.624 | 0.229 | 1.17 | 0.350 | 0.65 | |
| 4 | S40-273 | Bov | 50.67 | 367 | 0.632 | 0.232 | 1.17 | 0.350 | 0.66 | |
| 4 | S39+1551 | Ond | -40.39 | 408 | 0.634 | 0.259 | 1.33 | 0.400 | 0.65 | |
| 5 | S40+0 | Bov | 50.67 | 367 | 0.632 | 0.232 | 1.17 | 0.350 | 0.66 | |
| 5 | S40+464 | Bov | 50.67 | 367 | 0.632 | 0.232 | 1.17 | 0.350 | 0.66 | |
| 5 | S40+174 | Ond | -3.86 | 408 | 0.061 | 0.025 | 1.33 | 0.400 | 0.06 | |
| 5 | S40+650 | Ond | -3.86 | 408 | 0.061 | 0.025 | 1.33 | 0.400 | 0.06 | |

Verloop hoofdwapening

Balk 4-5

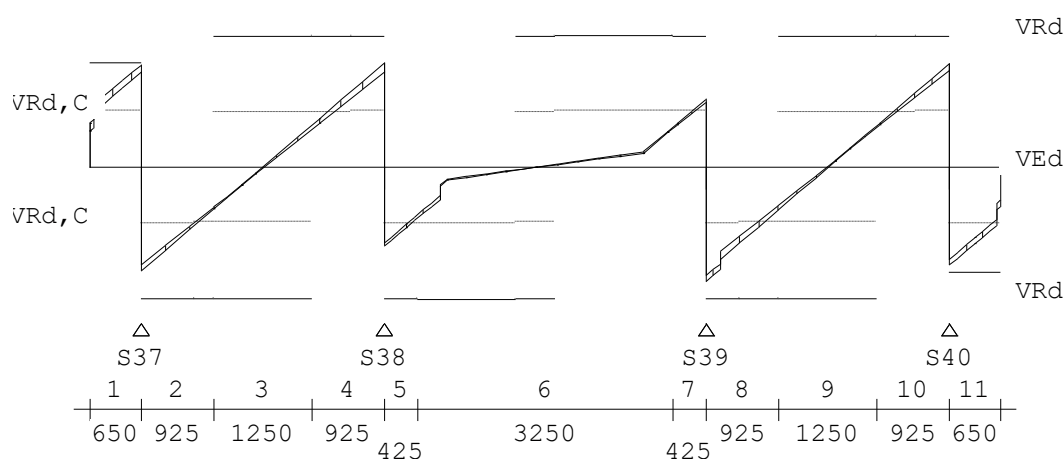
| Merk | B/O | Wapening | Vanaf [mm] | Tot [mm] | Lengte [mm] | $L_{bd;begin}$ [mm] | $L_{bd;eind}$ [mm] |
|------|-------|----------|---------------|-------------|----------------|------------------------|-----------------------|
| a | Boven | 5x12 | S37-1102 | S40+1078 | 12480 | 452 | 428 |
| b | Onder | 4x12 | S37-770 | S40+770 | 11840 | 120 | 120 |

Opmerkingen

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

DWARSKRACHTEN Fysisch lineair

Balk 4-5 Fundamentele combinatie



Wring- en dwarskrachtwapening

Balk 4-5

| Geb. | Vanaf | Tot | Beugels | Lengte | <Wringing> | | <Dwarskr.> | | | | Opm. |
|------|---------|---------|---------|--------|--|-----------------------------------|---------------------------------|---------------------------------|------------------|-------------------|----------|
| | [mm] | [mm] | | [mm] | $A_{l\text{angs}}$ [mm ²] | A_{bg1} [mm ² /m] | A_{bg1} [mm ²] | A_{opg} [mm ²] | V_{Ed} [kN] | T_{Ed} [kNm] | |
| 1 | S37-650 | S37+0 | Ø8-250 | 650 | 7 | 1 | 392 | 0 | 140.8 | 0 | 6,59,109 |
| 2 | S37+0 | S37+925 | Ø8-250 | 925 | 7 | 1 | 358 | 0 | 141.8 | 0 | 6 |
| 3 | S37+925 | S38-925 | Ø8-250 | 1250 | 0 | 0 | 358 | 0 | 58.0 | 0 | |
| 4 | S38-925 | S38+0 | Ø8-250 | 925 | 7 | 1 | 358 | 0 | 143.3 | 0 | 6 |
| 5 | S38+0 | S38+425 | Ø8-250 | 425 | 7 | 1 | 358 | 0 | 107.2 | 0 | 6 |
| 6 | S38+425 | S39-425 | Ø8-250 | 3250 | 0 | 0 | 358 | 0 | 69.0 | 0 | |
| 7 | S39-425 | S39+0 | Ø8-250 | 425 | 7 | 1 | 358 | 0 | 93.2 | 0 | 6 |
| 8 | S39+0 | S39+925 | Ø8-250 | 925 | 7 | 1 | 358 | 0 | 155.8 | 0 | 6 |
| 9 | S39+925 | S40-925 | Ø8-250 | 1250 | 0 | 0 | 358 | 0 | 57.4 | 0 | |
| 10 | S40-925 | S40+0 | Ø8-250 | 925 | 7 | 1 | 358 | 0 | 142.4 | 0 | 6 |
| 11 | S40+0 | S40+650 | Ø8-250 | 650 | 7 | 1 | 371 | 0 | 133.2 | 0 | 6,59,109 |

Opmerkingen

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

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

[109] Bij de berekening van de beugels is geen rekening gehouden met de detailleringregels van art 9.7 voor de gedrongen liggers.

Wring- en dwarskrachten

Balk 4-5

| Geb. | Vanaf | Tot | θ | V_{Rd} | V_{Ed} | $V_{Rd,C}$ | $V_{Rd,Max}$ | T_{Ed} | $T_{Rd,C}$ | $T_{Rd,Max}$ | V_{opg} | Opm. |
|------|---------|---------|----------|----------|----------|------------|--------------|----------|------------|--------------|-----------|----------|
| | [mm] | [mm] | [°] | [kN] | | | | | | | | |
| 1 | S37-650 | S37+0 | 21.8 | 144 | 141 | 77 | 419 | 0 | 36 | 89 | 0 | 6,59,109 |
| 2 | S37+0 | S37+925 | 21.8 | 180 | 142 | 77 | 524 | 0 | 36 | 89 | 0 | 6 |
| 3 | S37+925 | S38-925 | 21.8 | 180 | 58 | 75 | 523 | 0 | 36 | 89 | 0 | |
| 4 | S38-925 | S38+0 | 21.8 | 180 | 143 | 77 | 525 | 0 | 36 | 89 | 0 | 6 |
| 5 | S38+0 | S38+425 | 21.8 | 180 | 107 | 77 | 524 | 0 | 36 | 89 | 0 | 6 |
| 6 | S38+425 | S39-425 | 21.8 | 181 | 69 | 77 | 525 | 0 | 36 | 89 | 0 | |
| 7 | S39-425 | S39+0 | 21.8 | 180 | 93 | 77 | 525 | 0 | 36 | 89 | 0 | 6 |
| 8 | S39+0 | S39+925 | 21.8 | 180 | 156 | 77 | 524 | 0 | 36 | 89 | 0 | 6 |
| 9 | S39+925 | S40-925 | 21.8 | 180 | 57 | 75 | 523 | 0 | 36 | 89 | 0 | |
| 10 | S40-925 | S40+0 | 21.8 | 180 | 142 | 77 | 525 | 0 | 36 | 89 | 0 | 6 |
| 11 | S40+0 | S40+650 | 21.8 | 144 | 133 | 77 | 419 | 0 | 36 | 89 | 0 | 6,59,109 |

Opmerkingen

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

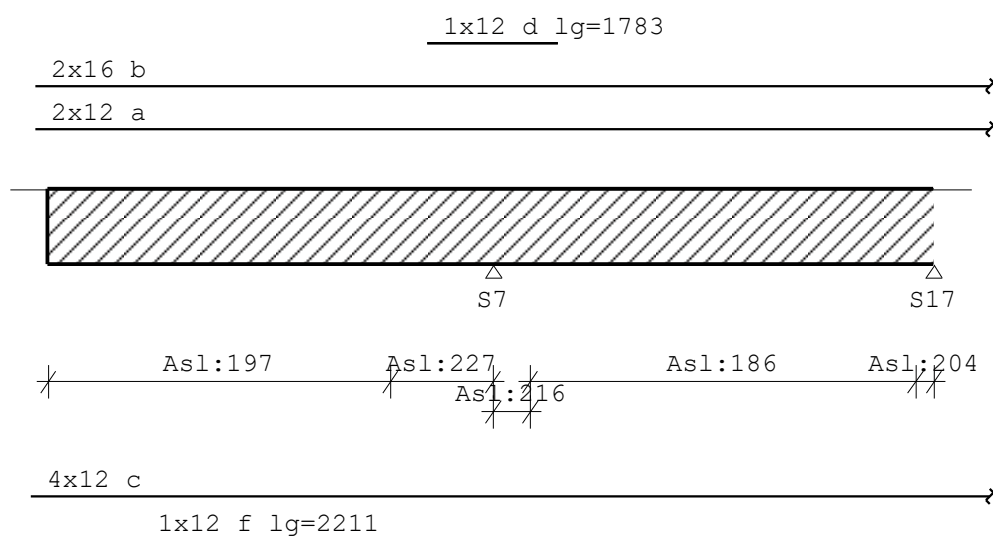
[59] 6.2.3: Z is berekend m.b.v. de gedrongen ligger berekening art 6.1 (10)

[109] Bij de berekening van de beugels is geen rekening gehouden met de detailleringregels van art 9.7 voor de gedrongen liggers.

Hoofdwapening Fysisch lineair

Balk 4-A

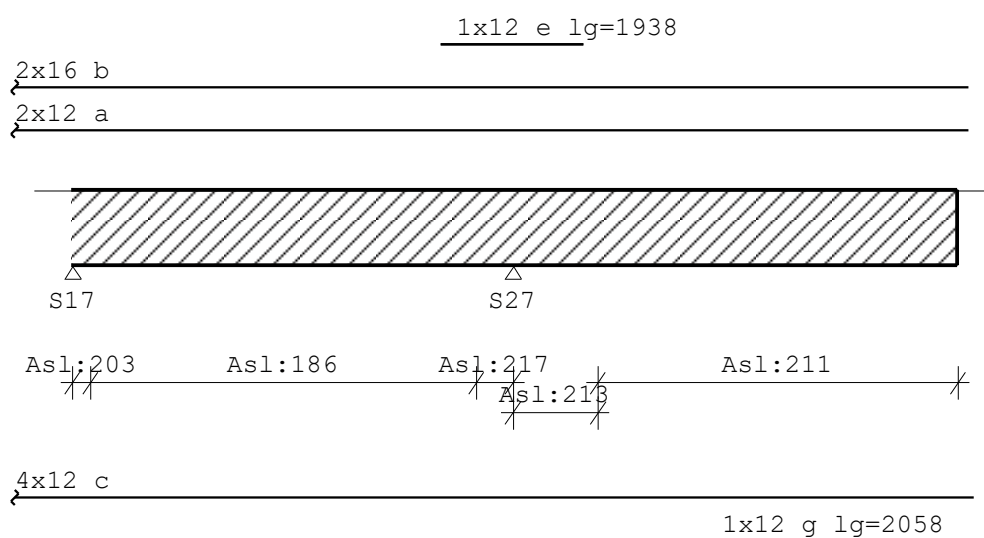
Velden: 1 t/m 2



Hoofdwapening Fysisch lineair

Balk 4-A

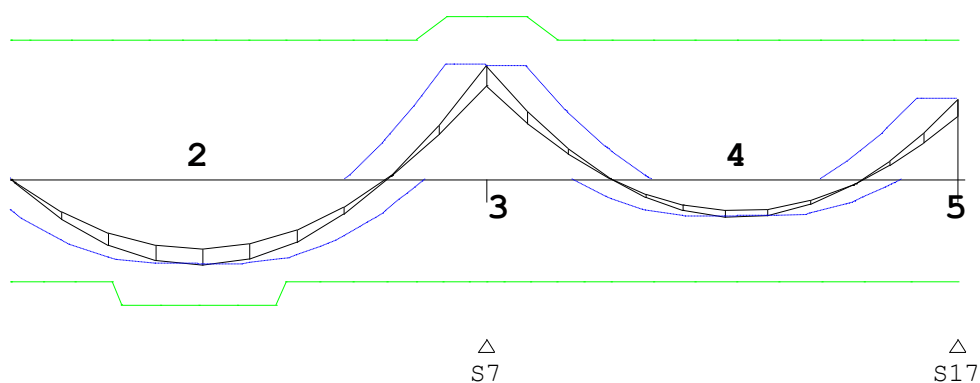
Velden: 3 t/m 4



MEd dekkingslijn Fysisch lineair

Balk 4-A

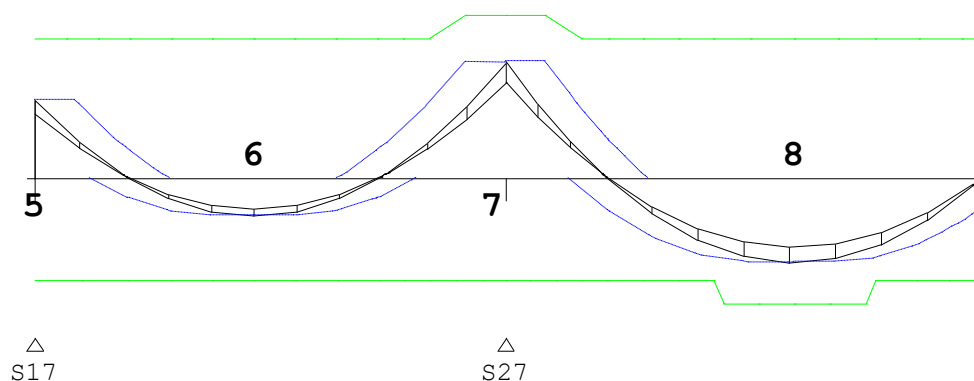
Velden: 1 t/m 2



MEd dekkingslijn Fysisch lineair

Balk 4-A

Velden: 3 t/m 4



Hoofdwapening

Balk 4-A

| Geb. | Pos. [mm] | M_{Ed} [kNm] | M_{Rd} [kNm] | z | B/O | A_b [mm ²] | A_a [mm ²] | Basiswapening +Bijlegwapening | Opm. |
|------|--------------|-------------------|-------------------|-----|-----|-----------------------------|-----------------------------|----------------------------------|------|
| 1 | S7-6060 | 0.23 | 120.40 | 422 | Bov | 165* | 629 | 2x16 + 2x12 | 54 |
| 2 | S7-3662 | -73.33 | -108.04 | 420 | Ond | 377 | 453 | 4x12 | |
| | | | | | Ond | | 114 | +1x12 | |
| 3 | S7+0 | 98.35 | 140.36 | 418 | Bov | 506 | 629 | 2x16 + 2x12 | |
| | | | | | Bov | | 114 | +1x12 | |
| 4 | S17-2812 | -32.56 | -87.50 | 419 | Ond | 206* | 453 | 4x12 | 1 |
| 5 | S17+0 | 68.80 | 120.40 | 422 | Bov | 349 | 629 | 2x16 + 2x12 | |
| 6 | S17+2790 | -32.49 | -87.50 | 419 | Ond | 206* | 453 | 4x12 | 1 |
| 7 | S27-0 | 100.39 | 140.36 | 418 | Bov | 517 | 629 | 2x16 + 2x12 | |
| | | | | | Bov | | 114 | +1x12 | |
| 8 | S27+3676 | -72.50 | -108.04 | 420 | Ond | 373 | 453 | 4x12 | |
| | | | | | Ond | | 114 | +1x12 | |
| 9 | S27+6060 | 0.23 | 120.40 | 422 | Bov | 165* | 629 | 2x16 + 2x12 | 54 |

Opmerkingen

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

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

Scheurvorming volgens artikel 7.3.4

Balk 4-A

| Geb. | Pos. [mm] | Zijde | $M_E; freq$ [kNm] | $S_{r, max}$ [mm] | $\epsilon_{sm} - \epsilon_{cm}$ [%] | w_k [mm] | k_x | w_{max} [mm] | U.C. Opm. |
|------|--------------|-------|----------------------|----------------------|--|---------------|-------|-------------------|-----------|
| 1 | S7-6060 | Bov | 0.14 | 340 | 0.002 | 0.001 | 1.00 | 0.300 | 0.00 |
| 1 | S7-5818 | Bov | 0.14 | 340 | 0.002 | 0.001 | 1.00 | 0.300 | 0.00 |
| 1 | S7-507 | Bov | 74.76 | 305 | 0.882 | 0.269 | 1.00 | 0.300 | 0.90 |
| 1 | S7-4771 | Ond | -51.84 | 406 | 0.819 | 0.333 | 1.14 | 0.343 | 0.97 |
| 1 | S7-3662 | Ond | -55.40 | 358 | 0.722 | 0.258 | 1.14 | 0.343 | 0.75 |
| 1 | S7-2560 | Ond | -51.84 | 406 | 0.819 | 0.333 | 1.14 | 0.343 | 0.97 |
| 2 | S7+507 | Bov | 74.76 | 305 | 0.882 | 0.269 | 1.00 | 0.300 | 0.90 |
| 2 | S17-407 | Bov | 51.43 | 340 | 0.595 | 0.203 | 1.00 | 0.300 | 0.68 |
| 2 | S17-2812 | Ond | -24.81 | 406 | 0.392 | 0.159 | 1.14 | 0.343 | 0.46 |
| 3 | S17+0 | Bov | 51.43 | 340 | 0.595 | 0.203 | 1.00 | 0.300 | 0.68 |
| 3 | S17+404 | Bov | 51.43 | 340 | 0.595 | 0.203 | 1.00 | 0.300 | 0.68 |
| 3 | S27-507 | Bov | 76.44 | 305 | 0.909 | 0.278 | 1.00 | 0.300 | 0.93 |
| 3 | S17+2790 | Ond | -24.27 | 406 | 0.383 | 0.156 | 1.14 | 0.343 | 0.45 |
| 4 | S27+507 | Bov | 76.44 | 305 | 0.909 | 0.278 | 1.00 | 0.300 | 0.93 |
| 4 | S27+5817 | Bov | 0.14 | 340 | 0.002 | 0.001 | 1.00 | 0.300 | 0.00 |
| 4 | S27+6060 | Bov | 0.14 | 340 | 0.002 | 0.001 | 1.00 | 0.300 | 0.00 |
| 4 | S27+2651 | Ond | -52.02 | 406 | 0.822 | 0.334 | 1.14 | 0.343 | 0.97 |
| 4 | S27+3676 | Ond | -54.74 | 358 | 0.708 | 0.253 | 1.14 | 0.343 | 0.74 |
| 4 | S27+4709 | Ond | -52.02 | 406 | 0.822 | 0.334 | 1.14 | 0.343 | 0.97 |

Verloop hoofdwapening

Balk 4-A

| Merk | B/O | Wapening | Vanaf [mm] | Tot [mm] | Lengte [mm] | $L_{bd; begin}$ [mm] | $L_{bd; eind}$ [mm] |
|------|-------|----------|---------------|-------------|----------------|-------------------------|------------------------|
| a | Boven | 2x12 | S7-6220 | S27+6220 | 24440 | 160 | 160 |
| b | Boven | 2x16 | S7-6220 | S27+6220 | 24440 | 160 | 160 |
| d | Boven | 1x12 | S7-891 | S7+891 | 1783 | 384 | 384 |
| e | Boven | 1x12 | S27-969 | S27+969 | 1938 | 462 | 462 |
| c | Onder | 4x12 | S7-6289 | S27+6288 | 24577 | 229 | 228 |
| f | Onder | 1x12 | S7-4771 | S7-2560 | 2211 | 120 | 120 |
| g | Onder | 1x12 | S27+2651 | S27+4709 | 2058 | 120 | 120 |

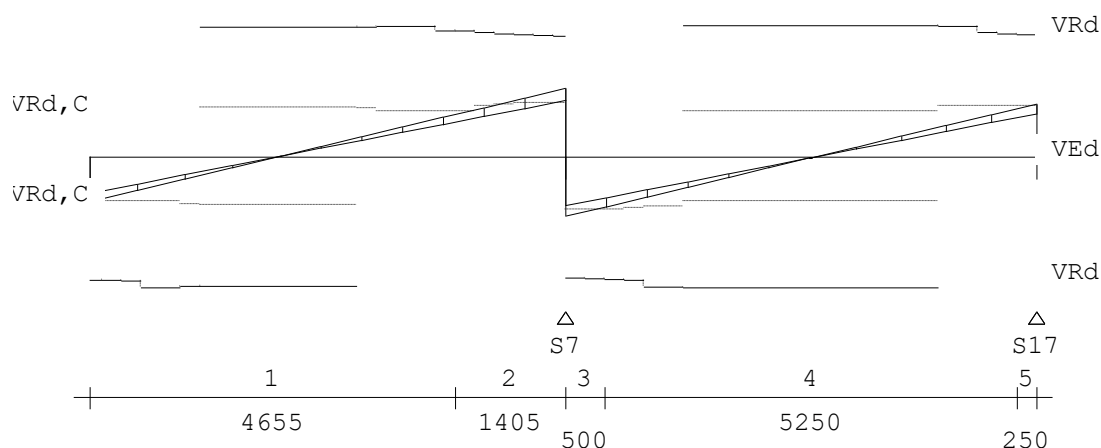
Opmerkingen

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

DWARSKRACHTEN Fysisch lineair

Balk 4-A Fundamentele combinatie

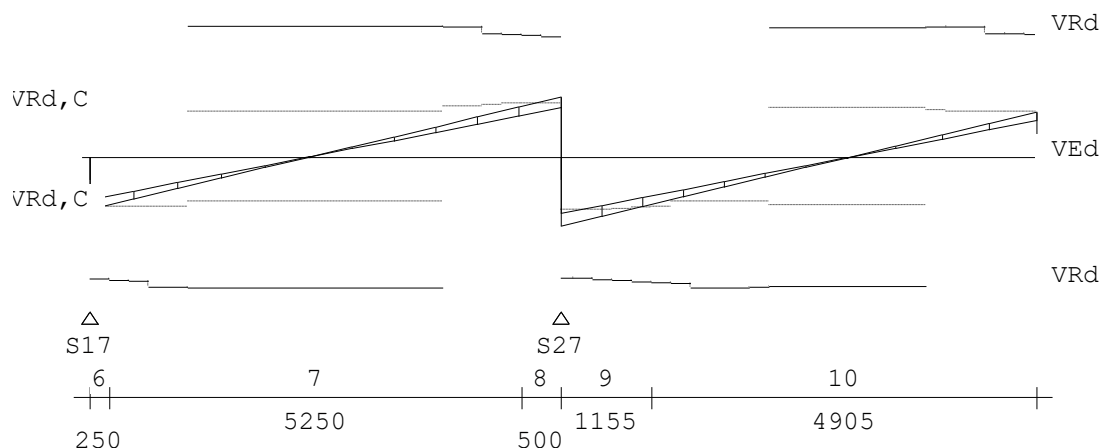
Velden: 1 t/m 2



DWARSKRACHTEN Fysisch lineair

Balk 4-A Fundamentele combinatie

Velden: 3 t/m 4


Wring- en dwarskrachtwapening

Balk 4-A

| Geb. | Vanaf | Tot | Beugels | Lengte | <Wringing> | | <Dwarskr.> | | V _{Ed} | T _{Ed} | Opm. |
|------|----------|----------|---------|--------|---------------------|-------------------|-------------------|-------------------|-----------------|-----------------|------|
| | [mm] | [mm] | | [mm] | A _{l,angs} | A _{b,gl} | A _{b,gl} | A _{o,pg} | [kN] | [kNm] | |
| 1 | S7-6060 | S7-1405 | Ø8-250 | 4655 | 197 | 23 | 286 | 0 | 61.3 | 6 | |
| 2 | S7-1405 | S7+0 | Ø8-250 | 1405 | 227 | 27 | 286 | 0 | 93.6 | 7 | 6 |
| 3 | S7+0 | S7+500 | Ø8-250 | 500 | 216 | 26 | 286 | 0 | 81.5 | 7 | 6 |
| 4 | S7+500 | S17-250 | Ø8-250 | 5250 | 186 | 22 | 286 | 0 | 68.7 | 5 | |
| 5 | S17-250 | S17+0 | Ø8-250 | 250 | 204 | 24 | 286 | 0 | 71.9 | 6 | 6 |
| 6 | S17+0 | S17+250 | Ø8-250 | 250 | 203 | 24 | 286 | 0 | 71.3 | 6 | 6 |
| 7 | S17+250 | S27-500 | Ø8-250 | 5250 | 186 | 22 | 286 | 0 | 69.2 | 5 | |
| 8 | S27-500 | S27-0 | Ø8-250 | 500 | 217 | 26 | 286 | 0 | 82.0 | 6 | 6 |
| 9 | S27-0 | S27+1155 | Ø8-250 | 1155 | 213 | 25 | 286 | 0 | 94.0 | 6 | 6 |
| 10 | S27+1155 | S27+6060 | Ø8-250 | 4905 | 211 | 25 | 286 | 0 | 64.4 | 6 | |

Opmerkingen

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

Wring- en dwarskrachten

Balk 4-A

| Geb. | Vanaf | Tot | θ | V _{Rd} | V _{Ed} | V _{Rd,C} | V _{Rd,Max} | T _{Ed} | T _{Rd,C} | T _{Rd,Max} | V _{o,pg} | Opm. |
|------|----------|----------|------|-----------------|-----------------|-------------------|---------------------|-----------------|-------------------|---------------------|-------------------|------|
| | [mm] | [mm] | [°] | [kN] | | | | | | | | |
| 1 | S7-6060 | S7-1405 | 21.8 | 158 | 61 | 61 | 416 | 6 | 26 | 63 | 0 | |
| 2 | S7-1405 | S7+0 | 21.8 | 153 | 94 | 73 | 410 | 7 | 26 | 63 | 0 | 6 |
| 3 | S7+0 | S7+500 | 21.8 | 154 | 81 | 73 | 410 | 7 | 26 | 63 | 0 | 6 |
| 4 | S7+500 | S17-250 | 21.8 | 158 | 69 | 73 | 411 | 5 | 26 | 63 | 0 | |
| 5 | S17-250 | S17+0 | 21.8 | 157 | 72 | 69 | 413 | 6 | 26 | 63 | 0 | 6 |
| 6 | S17+0 | S17+250 | 21.8 | 157 | 71 | 69 | 413 | 6 | 26 | 63 | 0 | 6 |
| 7 | S17+250 | S27-500 | 21.8 | 158 | 69 | 73 | 411 | 5 | 26 | 63 | 0 | |
| 8 | S27-500 | S27-0 | 21.8 | 154 | 82 | 73 | 410 | 6 | 26 | 63 | 0 | 6 |
| 9 | S27-0 | S27+1155 | 21.8 | 154 | 94 | 73 | 410 | 6 | 26 | 63 | 0 | 6 |
| 10 | S27+1155 | S27+6060 | 21.8 | 165 | 64 | 69 | 415 | 6 | 26 | 63 | 0 | |

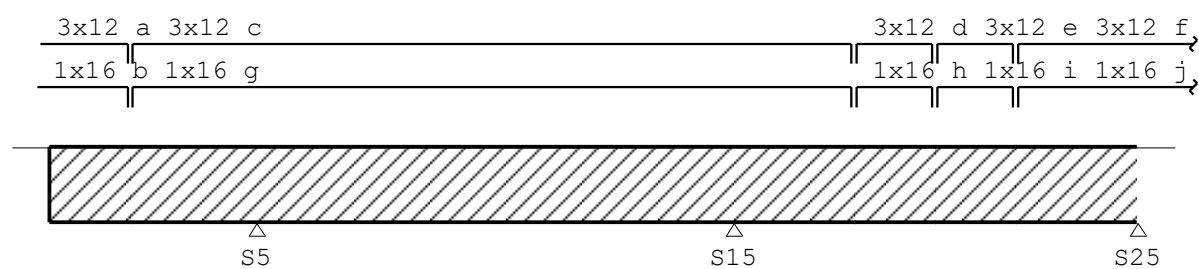
Opmerkingen

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

Hoofdwapening Fysisch lineair

Balk 4-B

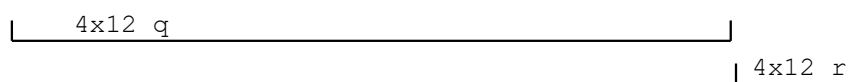
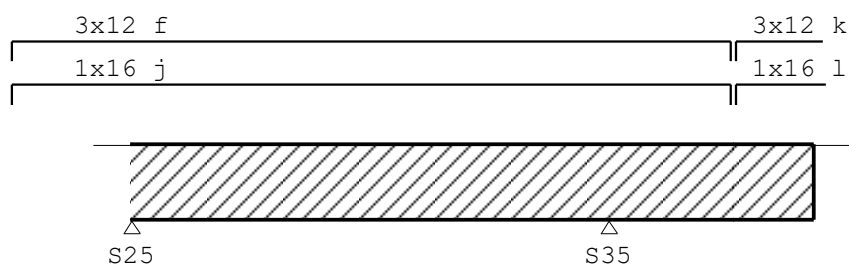
Velden: 1 t/m 5



Hoofdwapening Fysisch lineair

Balk 4-B

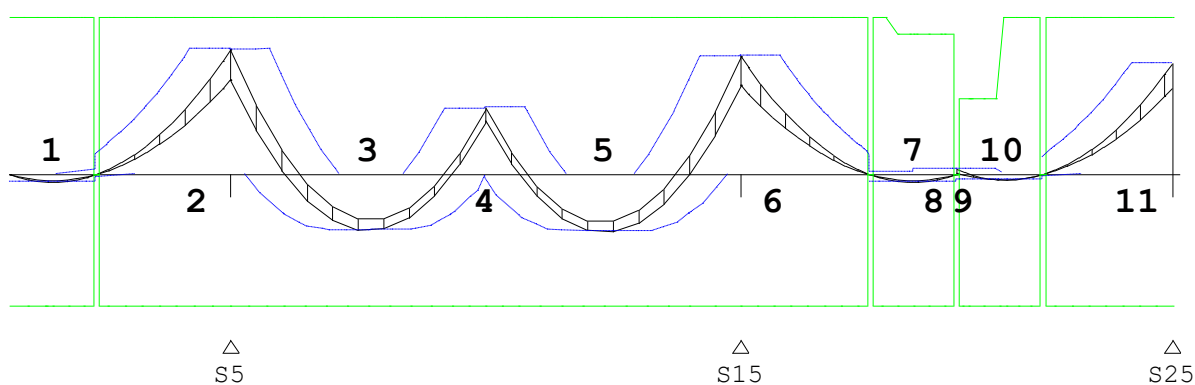
Velden: 6 t/m 8



MEd dekkingslijn Fysisch lineair

Balk 4-B

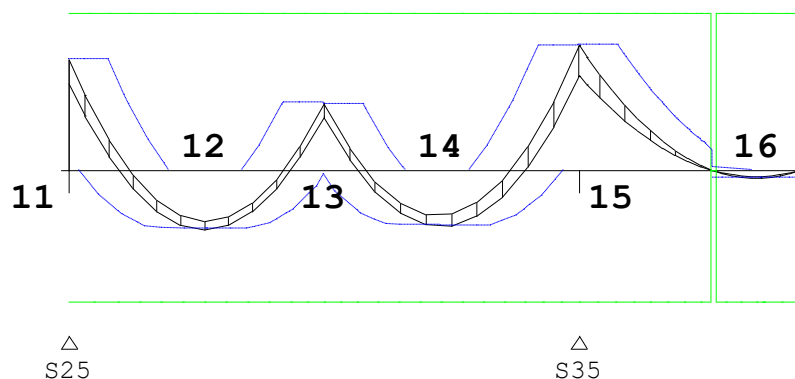
Velden: 1 t/m 5



MEd dekkingslijn Fysisch lineair

Balk 4-B

Velden: 6 t/m 8



Hoofdwapening

Balk 4-B

| Geb. | Pos. [mm] | M_{Ed} [kNm] | M_{Rd} [kNm] | z B/O [mm] | A_b [mm ²] | A_a [mm ²] | Basiswapening +Bijlegwapening | Opm. |
|------|--------------|-------------------|-------------------|---------------|-----------------------------|-----------------------------|----------------------------------|----------------|
| 1 | S5-2260 | -5.23 | -87.48 | 421 Ond | 165* | 453 | 4x12 | 2, 54, 68, 110 |
| 2 | S5+0 | 83.21 | 104.57 | 426 Bov | 425 | 541 | 1x16 + 3x12 | |
| 3 | S5+1758 | -37.35 | -87.48 | 421 Ond | 206* | 453 | 4x12 | 1 |
| 4 | S5+3250 | 44.45 | 104.57 | 426 Bov | 223 | 541 | 1x16 + 3x12 | |
| 5 | S15-1738 | -38.55 | -87.48 | 421 Ond | 206* | 453 | 4x12 | 1 |
| 6 | S15+0 | 78.59 | 104.57 | 426 Bov | 400 | 541 | 1x16 + 3x12 | |
| 7 | S15+2200 | -5.23 | -87.48 | 421 Ond | 165* | 453 | 4x12 | 2, 54, 68, 110 |
| 8 | S15+2750 | 3.41 | 93.39 | 397 Bov | 165* | 541 | 1x16 + 3x12 | 2, 54, 110 |
| 9 | S15+2750 | 3.41 | 50.56 | 215 Bov | 165* | 541 | 1x16 + 3x12 | 2, 54, 110 |
| 10 | S25-2117 | -3.76 | -87.48 | 421 Ond | 165* | 453 | 4x12 | 2, 54, 68, 110 |
| 11 | S25+0 | 73.83 | 104.57 | 426 Bov | 375 | 541 | 1x16 + 3x12 | |
| 12 | S25+1728 | -39.28 | -87.48 | 421 Ond | 206* | 453 | 4x12 | 1 |
| 13 | S25+3250 | 44.86 | 104.57 | 426 Bov | 225 | 541 | 1x16 + 3x12 | |
| 14 | S35-1757 | -37.31 | -87.48 | 421 Ond | 206* | 453 | 4x12 | 1 |
| 15 | S35+0 | 83.21 | 104.57 | 426 Bov | 425 | 541 | 1x16 + 3x12 | |
| 16 | S35+2260 | -5.23 | -87.48 | 421 Ond | 165* | 453 | 4x12 | 2, 54, 68, 110 |

Opmerkingen

- [1] * = Eisen met betrekking tot minimum wapening zijn toegepast, zie nationale bijlage art. 9.2.1.1(1).
- [2] Benodigde wapening en inwendige hefboomsarm zijn bepaald volgens gedrongen ligger detaillering, zie nationale bijlage art. 6.1(10).
- [54] * = Eisen met betrekking tot minimum wapening ten behoeve van gecontroleerde scheurvorming zijn toegepast volgens art. 7.3.2.
- [68] **MRd als gevolg van de gedrongen ligger berekening (NB. 6.1(10)) is groter dan MRd volgens 6.1(P). De momentweerstand en inwendige hefboomsarm volgens 6.1(P) zijn maatgevend en daarom alsnog toegepast.**
- [110] **Art. 9.7 (1), (2): Een orthogonaal wapeningsnet dient toegepast te worden aan iedere zijde van de gedrongen liggers:
Profiel 2 - B*H 400*500: 400 mm²/m aan elke zijde en in elke richting met een maximaal hoh 300 mm.**

Scheurvorming volgens artikel 7.3.4

Balk 4-B

| Geb. | Pos. [mm] | Zijde | $M_{E, freq}$ [kNm] | $S_{r, max}$ [mm] | $\epsilon_{sm} - \epsilon_{cm}$ [%] | w_k [mm] | k_x | w_{max} [mm] | U.C. | Opm. |
|------|--------------|-------|------------------------|----------------------|--|---------------|-------|-------------------|------|------|
| 1 | S5-482 | Bov | 58.29 | 353 | 0.844 | 0.298 | 1.00 | 0.300 | 0.99 | |
| 1 | S5-2584 | Ond | -3.66 | 406 | 0.058 | 0.024 | 1.14 | 0.343 | 0.07 | |
| 1 | S5-1865 | Ond | -3.66 | 406 | 0.058 | 0.024 | 1.14 | 0.343 | 0.07 | |
| 2 | S5+0 | Bov | 58.29 | 353 | 0.844 | 0.298 | 1.00 | 0.300 | 0.99 | |
| 2 | S5+290 | Bov | 58.29 | 353 | 0.844 | 0.298 | 1.00 | 0.300 | 0.99 | |
| 2 | S5+2989 | Bov | 31.66 | 353 | 0.417 | 0.147 | 1.00 | 0.300 | 0.49 | |
| 2 | S5+1758 | Ond | -28.33 | 406 | 0.447 | 0.182 | 1.14 | 0.343 | 0.53 | |
| 2 | S5+2294 | Ond | -28.32 | 406 | 0.447 | 0.182 | 1.14 | 0.343 | 0.53 | |
| 3 | S15-2989 | Bov | 31.66 | 353 | 0.417 | 0.147 | 1.00 | 0.300 | 0.49 | |
| 3 | S15-274 | Bov | 55.06 | 353 | 0.773 | 0.273 | 1.00 | 0.300 | 0.91 | |
| 3 | S15-1738 | Ond | -29.43 | 406 | 0.465 | 0.189 | 1.14 | 0.343 | 0.55 | |
| 4 | S15+458 | Bov | 55.06 | 353 | 0.773 | 0.273 | 1.00 | 0.300 | 0.91 | |
| 4 | S15+2244 | Bov | 1.66 | 353 | 0.022 | 0.008 | 1.00 | 0.300 | 0.03 | |
| 4 | S15+1805 | Ond | -3.66 | 406 | 0.058 | 0.024 | 1.14 | 0.343 | 0.07 | |
| 4 | S15+2595 | Ond | -3.66 | 406 | 0.058 | 0.024 | 1.14 | 0.343 | 0.07 | |
| 5 | S25-2244 | Bov | 1.66 | 353 | 0.022 | 0.008 | 1.00 | 0.300 | 0.03 | |
| 5 | S25-458 | Bov | 52.57 | 353 | 0.718 | 0.254 | 1.00 | 0.300 | 0.85 | |
| 5 | S25-2668 | Ond | -2.87 | 406 | 0.045 | 0.018 | 1.14 | 0.343 | 0.05 | |
| 5 | S25-2117 | Ond | -2.88 | 406 | 0.045 | 0.018 | 1.14 | 0.343 | 0.05 | |
| 5 | S25-1685 | Ond | -2.87 | 406 | 0.045 | 0.018 | 1.14 | 0.343 | 0.05 | |
| 6 | S25+0 | Bov | 52.57 | 353 | 0.718 | 0.254 | 1.00 | 0.300 | 0.85 | |
| 6 | S25+256 | Bov | 52.57 | 353 | 0.718 | 0.254 | 1.00 | 0.300 | 0.85 | |
| 6 | S25+2992 | Bov | 31.89 | 353 | 0.420 | 0.148 | 1.00 | 0.300 | 0.49 | |
| 6 | S25+1728 | Ond | -30.45 | 406 | 0.481 | 0.196 | 1.14 | 0.343 | 0.57 | |
| 7 | S25+3250 | Bov | 31.89 | 353 | 0.420 | 0.148 | 1.00 | 0.300 | 0.49 | |
| 7 | S35-2987 | Bov | 31.89 | 353 | 0.420 | 0.148 | 1.00 | 0.300 | 0.49 | |
| 7 | S35-291 | Bov | 58.29 | 353 | 0.844 | 0.298 | 1.00 | 0.300 | 0.99 | |
| 7 | S35-2293 | Ond | -28.27 | 406 | 0.446 | 0.181 | 1.14 | 0.343 | 0.53 | |
| 7 | S35-1757 | Ond | -28.26 | 406 | 0.446 | 0.181 | 1.14 | 0.343 | 0.53 | |
| 8 | S35+482 | Bov | 58.29 | 353 | 0.844 | 0.298 | 1.00 | 0.300 | 0.99 | |
| 8 | S35+1865 | Ond | -3.66 | 406 | 0.058 | 0.024 | 1.14 | 0.343 | 0.07 | |
| 8 | S35+2584 | Ond | -3.66 | 406 | 0.058 | 0.024 | 1.14 | 0.343 | 0.07 | |

Verloop hoofdwapening

Balk 4-B

| Merk | B/O | Wapening | Vanaf [mm] | Tot [mm] | Lengte [mm] | $L_{bd, begin}$ [mm] | $L_{bd, eind}$ [mm] |
|------|-------|----------|---------------|-------------|----------------|-------------------------|------------------------|
| a | Boven | 3x12 | S5-2930 | S5-1745 | 1185 | 120 | 120 |
| b | Boven | 1x16 | S5-2970 | S5-1745 | 1225 | 160 | 160 |
| c | Boven | 3x12 | S5-1675 | S15+1615 | 9790 | 125 | 125 |
| d | Boven | 3x12 | S15+1685 | S15+2715 | 1030 | 120 | 120 |
| e | Boven | 3x12 | S25-2715 | S25-1685 | 1030 | 120 | 120 |
| f | Boven | 3x12 | S25-1615 | S35+1675 | 9790 | 120 | 125 |
| g | Boven | 1x16 | S5-1675 | S15+1615 | 9790 | 182 | 182 |
| h | Boven | 1x16 | S15+1685 | S15+2715 | 1030 | 160 | 160 |
| i | Boven | 1x16 | S25-2715 | S25-1685 | 1030 | 160 | 160 |
| j | Boven | 1x16 | S25-1615 | S35+1675 | 9790 | 168 | 182 |
| k | Boven | 3x12 | S35+1745 | S35+2930 | 1185 | 120 | 120 |
| l | Boven | 1x16 | S35+1745 | S35+2970 | 1225 | 160 | 160 |
| m | Onder | 4x12 | S5-2930 | S5-1745 | 1185 | 120 | 120 |
| n | Onder | 4x12 | S5-1675 | S15+1615 | 9790 | 120 | 120 |
| o | Onder | 4x12 | S15+1685 | S15+2715 | 1030 | 120 | 120 |
| p | Onder | 4x12 | S25-2715 | S25-1685 | 1030 | 120 | 120 |
| q | Onder | 4x12 | S25-1615 | S35+1675 | 9790 | 120 | 120 |
| r | Onder | 4x12 | S35+1745 | S35+2930 | 1185 | 120 | 120 |

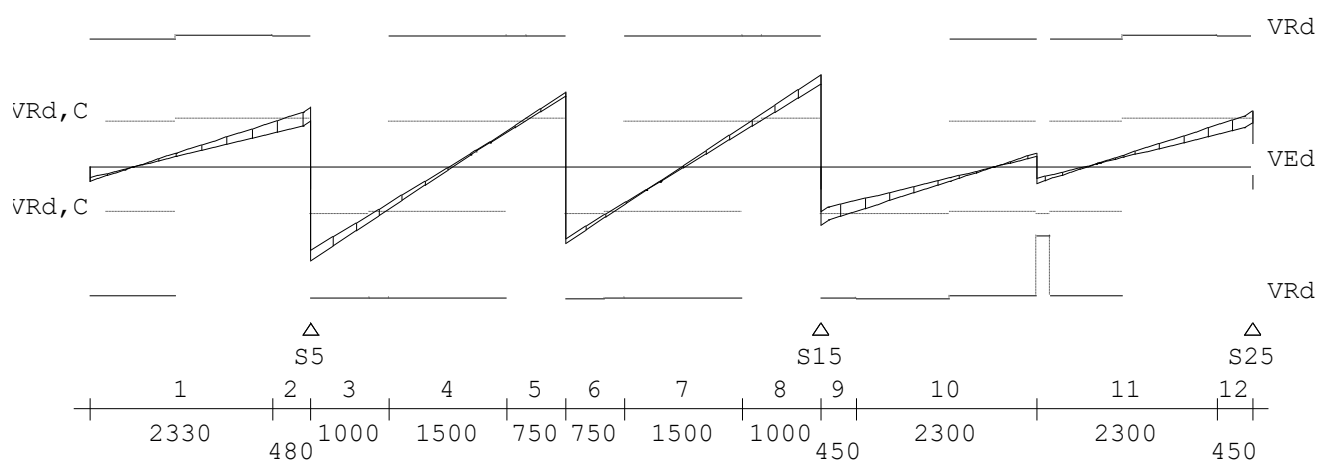
Opmerkingen

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

DWARSKRACHTEN Fysisch lineair

Balk 4-B Fundamentele combinatie

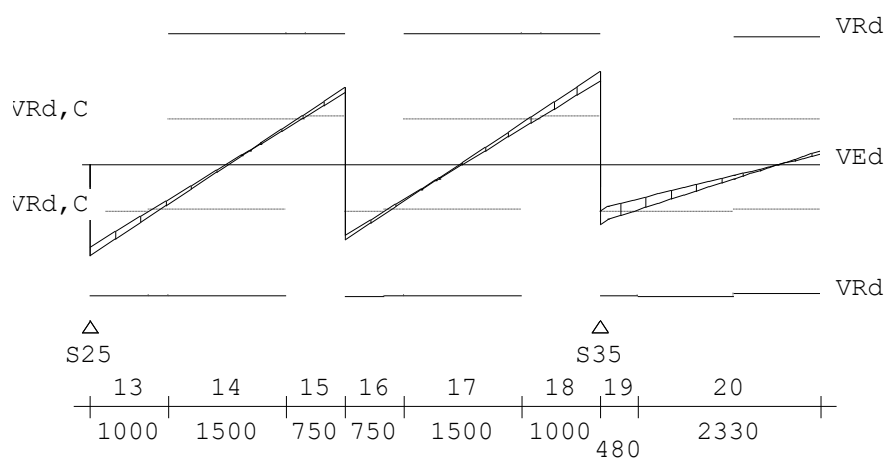
Velden: 1 t/m 5



DWARSKRACHTEN Fysisch lineair

Balk 4-B Fundamentele combinatie

Velden: 6 t/m 8



Wring- en dwarskrachtwapening

Balk 4-B

| Geb. | Vanaf | Tot | Beugels | Lengte | <Wringing> | <Dwarskr.> | | | | | |
|------|----------|----------|---------|--------|--|--|--|--|--------------------------|---------------------------|--------|
| | [mm] | [mm] | | [mm] | A _{l a n g s} [mm ²] | A _{b g l} [mm ² /m] | A _{b g l} [mm ²] | A _{o p p} [mm ²] | V _{E d} [kN] | T _{E d} [kNm] | Opm. |
| 1 | S5-2810 | S5-480 | Ø8-250 | 2330 | 0 | 0 | 286 | 0 | 61.4 | 0 | 58,109 |
| 2 | S5-480 | S5+0 | Ø8-250 | 480 | 0 | 0 | 286 | 0 | 81.5 | 0 | 6 |
| 3 | S5+0 | S5+1000 | Ø8-250 | 1000 | 0 | 0 | 287 | 0 | 127.6 | 0 | 6 |
| 4 | S5+1000 | S5+2500 | Ø8-250 | 1500 | 0 | 0 | 286 | 0 | 56.7 | 0 | |
| 5 | S5+2500 | S5+3250 | Ø8-250 | 750 | 0 | 0 | 286 | 0 | 102.4 | 0 | 6 |
| 6 | S5+3250 | S15-2500 | Ø8-250 | 750 | 0 | 0 | 286 | 0 | 104.1 | 0 | 6 |
| 7 | S15-2500 | S15-1000 | Ø8-250 | 1500 | 0 | 0 | 286 | 0 | 55.0 | 0 | |
| 8 | S15-1000 | S15+0 | Ø8-250 | 1000 | 0 | 0 | 286 | 0 | 125.9 | 0 | 6 |
| 9 | S15+0 | S15+450 | Ø8-250 | 450 | 0 | 0 | 286 | 0 | 79.5 | 0 | 6 |
| 10 | S15+450 | S15+2750 | Ø8-250 | 2300 | 0 | 0 | 286 | 0 | 60.4 | 0 | |
| 11 | S15+2750 | S25-450 | Ø8-250 | 2300 | 0 | 0 | 286 | 0 | 57.5 | 0 | 59,109 |
| 12 | S25-450 | S25+0 | Ø8-250 | 450 | 0 | 0 | 286 | 0 | 76.6 | 0 | 6 |
| 13 | S25+0 | S25+1000 | Ø8-250 | 1000 | 0 | 0 | 286 | 0 | 124.3 | 0 | 6 |
| 14 | S25+1000 | S25+2500 | Ø8-250 | 1500 | 0 | 0 | 286 | 0 | 53.4 | 0 | |
| 15 | S25+2500 | S25+3250 | Ø8-250 | 750 | 0 | 0 | 286 | 0 | 105.7 | 0 | 6 |
| 16 | S25+3250 | S35-2500 | Ø8-250 | 750 | 0 | 0 | 286 | 0 | 102.5 | 0 | 6 |
| 17 | S35-2500 | S35-1000 | Ø8-250 | 1500 | 0 | 0 | 286 | 0 | 56.6 | 0 | |
| 18 | S35-1000 | S35+0 | Ø8-250 | 1000 | 0 | 0 | 287 | 0 | 127.5 | 0 | 6 |
| 19 | S35+0 | S35+480 | Ø8-250 | 480 | 0 | 0 | 286 | 0 | 81.5 | 0 | 6 |
| 20 | S35+480 | S35+2810 | Ø8-250 | 2330 | 0 | 0 | 286 | 0 | 61.4 | 0 | |

Opmerkingen

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

[58] 6.2.3: Z is berekend m.b.v. 0.9d

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

[109] Bij de berekening van de beugels is geen rekening gehouden met de detailleringsregels van art 9.7 voor de gedrongen liggers.

Wring- en dwarskrachten

Balk 4-B

| Geb. | Vanaf | Tot | θ | V_{Rd} | V_{Ed} | $V_{Rd,C}$ | $V_{Rd,Max}$ | T_{Ed} | $T_{Rd,C}$ | $T_{Rd,Max}$ | V_{opg} | Opm. |
|------|----------|----------|----------|----------|----------|------------|--------------|----------|------------|--------------|-----------|--------|
| | [mm] | [mm] | [°] | [kN] | | | | | | | | |
| 1 | S5-2810 | S5-480 | 21.8 | 179 | 61 | 65 | 418 | 0 | 26 | 63 | 0 | 58,109 |
| 2 | S5-480 | S5+0 | 21.8 | 179 | 82 | 65 | 416 | 0 | 26 | 63 | 0 | 6 |
| 3 | S5+0 | S5+1000 | 21.8 | 179 | 128 | 65 | 415 | 0 | 26 | 63 | 0 | 6 |
| 4 | S5+1000 | S5+2500 | 21.8 | 179 | 57 | 61 | 416 | 0 | 26 | 63 | 0 | |
| 5 | S5+2500 | S5+3250 | 21.8 | 179 | 102 | 65 | 417 | 0 | 26 | 63 | 0 | 6 |
| 6 | S5+3250 | S15-2500 | 21.8 | 179 | 104 | 65 | 416 | 0 | 26 | 63 | 0 | 6 |
| 7 | S15-2500 | S15-1000 | 21.8 | 179 | 55 | 61 | 416 | 0 | 26 | 63 | 0 | |
| 8 | S15-1000 | S15+0 | 21.8 | 179 | 126 | 65 | 417 | 0 | 26 | 63 | 0 | 6 |
| 9 | S15+0 | S15+450 | 21.8 | 179 | 79 | 65 | 415 | 0 | 26 | 63 | 0 | 6 |
| 10 | S15+450 | S15+2750 | 21.8 | 179 | 60 | 65 | 416 | 0 | 26 | 63 | 0 | |
| 11 | S15+2750 | S25-450 | 21.8 | 179 | 57 | 65 | 418 | 0 | 26 | 63 | 0 | 59,109 |
| 12 | S25-450 | S25+0 | 21.8 | 179 | 77 | 65 | 416 | 0 | 26 | 63 | 0 | 6 |
| 13 | S25+0 | S25+1000 | 21.8 | 179 | 124 | 65 | 415 | 0 | 26 | 63 | 0 | 6 |
| 14 | S25+1000 | S25+2500 | 21.8 | 179 | 53 | 61 | 416 | 0 | 26 | 63 | 0 | |
| 15 | S25+2500 | S25+3250 | 21.8 | 179 | 106 | 65 | 417 | 0 | 26 | 63 | 0 | 6 |
| 16 | S25+3250 | S35-2500 | 21.8 | 179 | 103 | 65 | 416 | 0 | 26 | 63 | 0 | 6 |
| 17 | S35-2500 | S35-1000 | 21.8 | 179 | 57 | 61 | 416 | 0 | 26 | 63 | 0 | |
| 18 | S35-1000 | S35+0 | 21.8 | 179 | 127 | 65 | 415 | 0 | 26 | 63 | 0 | 6 |
| 19 | S35+0 | S35+480 | 21.8 | 179 | 82 | 65 | 415 | 0 | 26 | 63 | 0 | 6 |
| 20 | S35+480 | S35+2810 | 21.8 | 179 | 61 | 65 | 416 | 0 | 26 | 63 | 0 | |

Opmerkingen

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

[58] 6.2.3: Z is berekend m.b.v. 0.9d

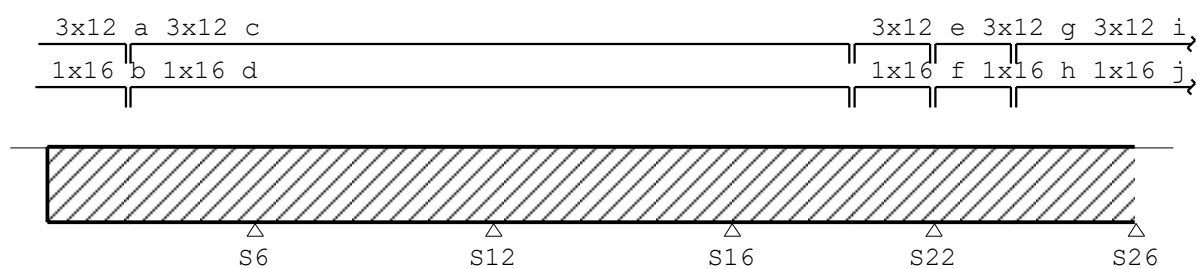
[59] 6.2.3: Z is berekend m.b.v. de gedrongen ligger berekening art 6.1 (10)

[109] Bij de berekening van de beugels is geen rekening gehouden met de detailleringsregels van art 9.7 voor de gedrongen liggers.

Hoofdwapening Fysisch lineair

Balk 4-C

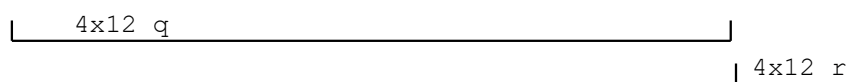
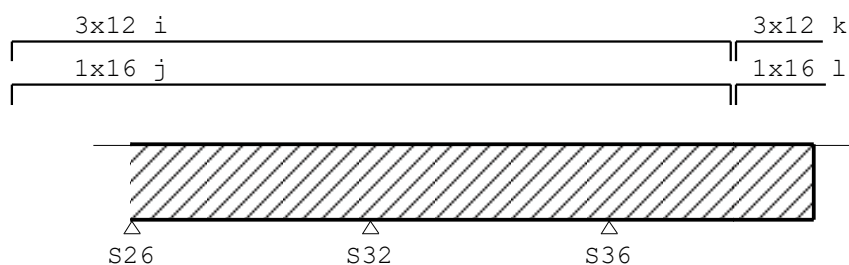
Velden: 1 t/m 5



Hoofdwapening Fysisch lineair

Balk 4-C

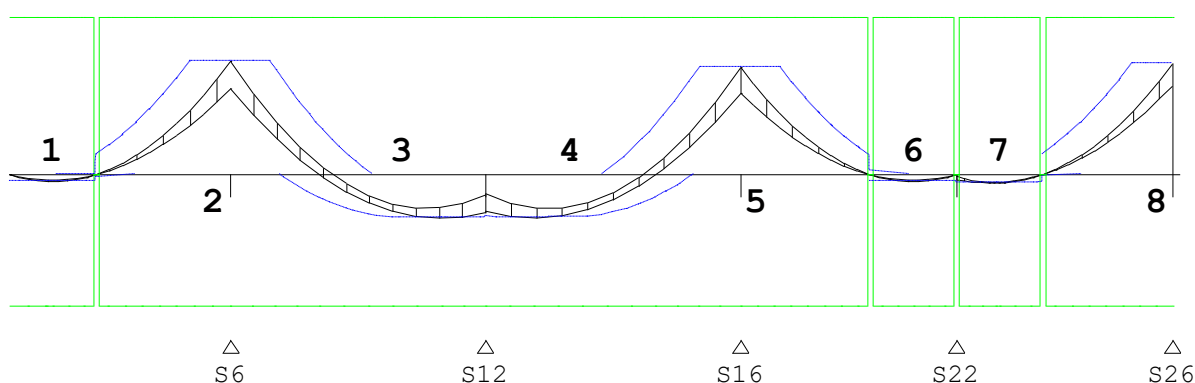
Velden: 6 t/m 8



MEd dekkingslijn Fysisch lineair

Balk 4-C

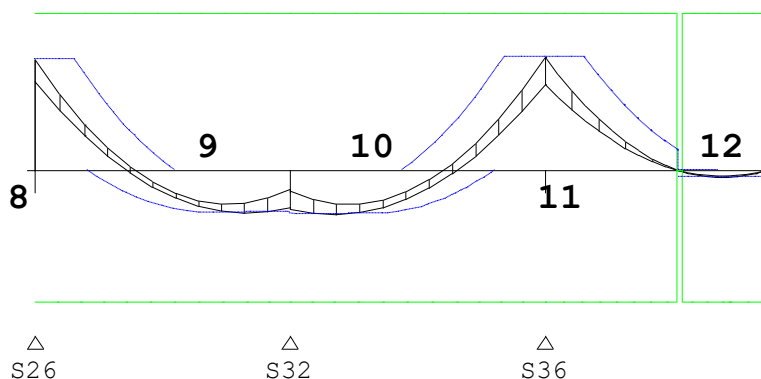
Velden: 1 t/m 5



MEd dekkingslijn Fysisch lineair

Balk 4-C

Velden: 6 t/m 8



Hoofdwapening

Balk 4-C

| Geb. | Pos. [mm] | M_{Ed} [kNm] | M_{Rd} [kNm] | z B/O [mm] | A_b [mm ²] | A_a [mm ²] | Basiswapening +Bijlegwapening | Opm. |
|------|--------------|-------------------|-------------------|---------------|-----------------------------|-----------------------------|----------------------------------|----------------|
| 1 | S6-2260 | -4.74 | -87.48 | 421 Ond | 165* | 453 | 4x12 | 2, 54, 68, 110 |
| 2 | S6+0 | 75.25 | 104.57 | 426 Bov | 383 | 541 | 1x16 + 3x12 | |
| 3 | S12-559 | -29.05 | -87.48 | 421 Ond | 184* | 453 | 4x12 | 1 |
| 4 | S12+611 | -28.93 | -87.48 | 421 Ond | 183* | 453 | 4x12 | 1 |
| 5 | S16+0 | 71.06 | 104.57 | 426 Bov | 361 | 541 | 1x16 + 3x12 | |
| 6 | S22-550 | -4.74 | -87.48 | 421 Ond | 165* | 453 | 4x12 | 2, 54, 68, 110 |
| 7 | S22+502 | -5.59 | -87.48 | 421 Ond | 165* | 453 | 4x12 | 2, 54, 68, 110 |
| 8 | S26+0 | 73.51 | 104.57 | 426 Bov | 374 | 541 | 1x16 + 3x12 | |
| 9 | S32-544 | -28.25 | -87.48 | 421 Ond | 181* | 453 | 4x12 | 1 |
| 10 | S32+555 | -29.33 | -87.48 | 421 Ond | 186* | 453 | 4x12 | 1 |
| 11 | S36+0 | 75.25 | 104.57 | 426 Bov | 383 | 541 | 1x16 + 3x12 | |
| 12 | S36+2260 | -4.74 | -87.48 | 421 Ond | 165* | 453 | 4x12 | 2, 54, 68, 110 |

Opmerkingen

- [1] * = Eisen met betrekking tot minimum wapening zijn toegepast, zie nationale bijlage art. 9.2.1.1(1).
- [2] Benodigde wapening en inwendige hefboomsarm zijn bepaald volgens gedrongen ligger detaillering, zie nationale bijlage art. 6.1(10).
- [54] * = Eisen met betrekking tot minimum wapening ten behoeve van gecontroleerde scheurvorming zijn toegepast volgens art. 7.3.2.
- [68] **MRd als gevolg van de gedrongen ligger berekening (NB. 6.1(10)) is groter dan MRd volgens 6.1(P). De momentweerstand en inwendige hefboomsarm volgens 6.1(P) zijn maatgevend en daarom alsnog toegepast.**
- [110] Art. 9.7 (1), (2): Een orthogonaal wapeningsnet dient toegepast te worden aan iedere zijde van de gedrongen liggers:
Profiel 2 - B*H 400*500: 400 mm²/m aan elke zijde en in elke richting met een maximaal hoh 300 mm.

Scheurvorming volgens artikel 7.3.4

Balk 4-C

| Geb. | Pos. | Zijde | $M_E; freq$ [kNm] | S_r, max [mm] | $\epsilon_{sm} - \epsilon_{cm}$ [%] | w_k [mm] | k_x | w_{max} [mm] | U.C. | Opm. |
|------|----------|-------|----------------------|--------------------|--|---------------|-------|-------------------|------|------|
| 1 | S6-482 | Bov | 53.10 | 353 | 0.730 | 0.258 | 1.00 | 0.300 | 0.86 | |
| 1 | S6-2584 | Ond | -3.34 | 406 | 0.053 | 0.021 | 1.14 | 0.343 | 0.06 | |
| 1 | S6-1865 | Ond | -3.34 | 406 | 0.053 | 0.021 | 1.14 | 0.343 | 0.06 | |
| 2 | S6+0 | Bov | 53.10 | 353 | 0.730 | 0.258 | 1.00 | 0.300 | 0.86 | |
| 2 | S6+260 | Bov | 53.10 | 353 | 0.730 | 0.258 | 1.00 | 0.300 | 0.86 | |
| 2 | S12-1183 | Ond | -21.81 | 406 | 0.344 | 0.140 | 1.14 | 0.343 | 0.41 | |
| 2 | S12-559 | Ond | -21.75 | 406 | 0.343 | 0.140 | 1.14 | 0.343 | 0.41 | |
| 3 | S16-311 | Bov | 50.14 | 353 | 0.665 | 0.235 | 1.00 | 0.300 | 0.78 | |
| 3 | S12+611 | Ond | -21.74 | 406 | 0.343 | 0.140 | 1.14 | 0.343 | 0.41 | |
| 3 | S12+1234 | Ond | -21.70 | 406 | 0.343 | 0.139 | 1.14 | 0.343 | 0.41 | |
| 4 | S16+458 | Bov | 50.14 | 353 | 0.665 | 0.235 | 1.00 | 0.300 | 0.78 | |
| 4 | S22-945 | Ond | -3.34 | 406 | 0.053 | 0.021 | 1.14 | 0.343 | 0.06 | |
| 4 | S22-155 | Ond | -3.34 | 406 | 0.053 | 0.021 | 1.14 | 0.343 | 0.06 | |
| 5 | S26-458 | Bov | 53.24 | 353 | 0.733 | 0.259 | 1.00 | 0.300 | 0.86 | |
| 5 | S22+35 | Ond | -4.43 | 406 | 0.070 | 0.028 | 1.14 | 0.343 | 0.08 | |
| 5 | S22+502 | Ond | -4.44 | 406 | 0.070 | 0.029 | 1.14 | 0.343 | 0.08 | |
| 5 | S22+945 | Ond | -4.43 | 406 | 0.070 | 0.028 | 1.14 | 0.343 | 0.08 | |
| 6 | S26+0 | Bov | 53.24 | 353 | 0.733 | 0.259 | 1.00 | 0.300 | 0.86 | |
| 6 | S26+318 | Bov | 53.24 | 353 | 0.733 | 0.259 | 1.00 | 0.300 | 0.86 | |
| 6 | S32-1159 | Ond | -21.28 | 406 | 0.336 | 0.137 | 1.14 | 0.343 | 0.40 | |
| 6 | S32-544 | Ond | -21.16 | 406 | 0.334 | 0.136 | 1.14 | 0.343 | 0.40 | |
| 7 | S36-325 | Bov | 53.10 | 353 | 0.730 | 0.258 | 1.00 | 0.300 | 0.86 | |
| 7 | S32+555 | Ond | -21.91 | 406 | 0.346 | 0.141 | 1.14 | 0.343 | 0.41 | |
| 7 | S32+1182 | Ond | -21.87 | 406 | 0.345 | 0.140 | 1.14 | 0.343 | 0.41 | |
| 8 | S36+0 | Bov | 53.10 | 353 | 0.730 | 0.258 | 1.00 | 0.300 | 0.86 | |
| 8 | S36+482 | Bov | 53.10 | 353 | 0.730 | 0.258 | 1.00 | 0.300 | 0.86 | |
| 8 | S36+1865 | Ond | -3.34 | 406 | 0.053 | 0.021 | 1.14 | 0.343 | 0.06 | |
| 8 | S36+2584 | Ond | -3.34 | 406 | 0.053 | 0.021 | 1.14 | 0.343 | 0.06 | |

Verloop hoofdwapening

Balk 4-C

| Merk | B/O | Wapening | Vanaf [mm] | Tot [mm] | Lengte [mm] | $L_{bd; begin}$ [mm] | $L_{bd; eind}$ [mm] |
|------|-------|----------|---------------|-------------|----------------|-------------------------|------------------------|
| a | Boven | 3x12 | S6-2930 | S6-1745 | 1185 | 120 | 120 |
| b | Boven | 1x16 | S6-2970 | S6-1745 | 1225 | 160 | 160 |
| c | Boven | 3x12 | S6-1675 | S22-1135 | 9790 | 120 | 120 |
| d | Boven | 1x16 | S6-1675 | S22-1135 | 9790 | 166 | 166 |
| e | Boven | 3x12 | S22-1065 | S22-35 | 1030 | 120 | 120 |
| f | Boven | 1x16 | S22-1065 | S22-35 | 1030 | 160 | 160 |
| g | Boven | 3x12 | S22+35 | S22+1065 | 1030 | 120 | 120 |
| h | Boven | 1x16 | S22+35 | S22+1065 | 1030 | 160 | 160 |
| i | Boven | 3x12 | S22+1135 | S36+1675 | 9790 | 126 | 120 |
| j | Boven | 1x16 | S22+1135 | S36+1675 | 9790 | 183 | 166 |
| k | Boven | 3x12 | S36+1745 | S36+2930 | 1185 | 120 | 120 |
| l | Boven | 1x16 | S36+1745 | S36+2970 | 1225 | 160 | 160 |
| m | Onder | 4x12 | S6-2930 | S6-1745 | 1185 | 120 | 120 |
| n | Onder | 4x12 | S6-1675 | S22-1135 | 9790 | 120 | 120 |
| o | Onder | 4x12 | S22-1065 | S22-35 | 1030 | 120 | 120 |
| p | Onder | 4x12 | S22+35 | S22+1065 | 1030 | 120 | 120 |
| q | Onder | 4x12 | S22+1135 | S36+1675 | 9790 | 120 | 120 |
| r | Onder | 4x12 | S36+1745 | S36+2930 | 1185 | 120 | 120 |

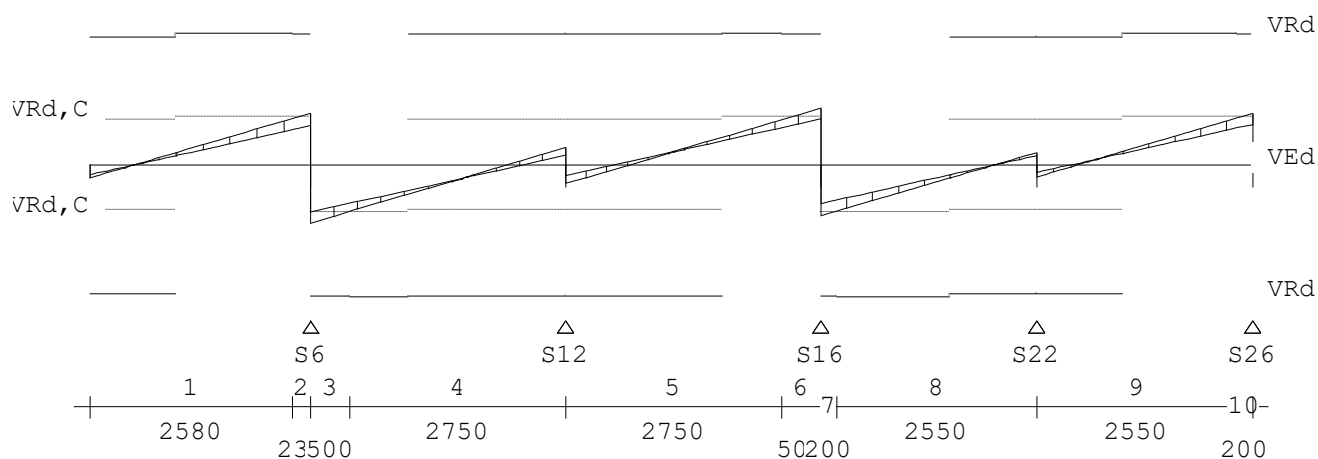
Opmerkingen

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

DWARSKRACHTEN Fysisch lineair

Balk 4-C Fundamentele combinatie

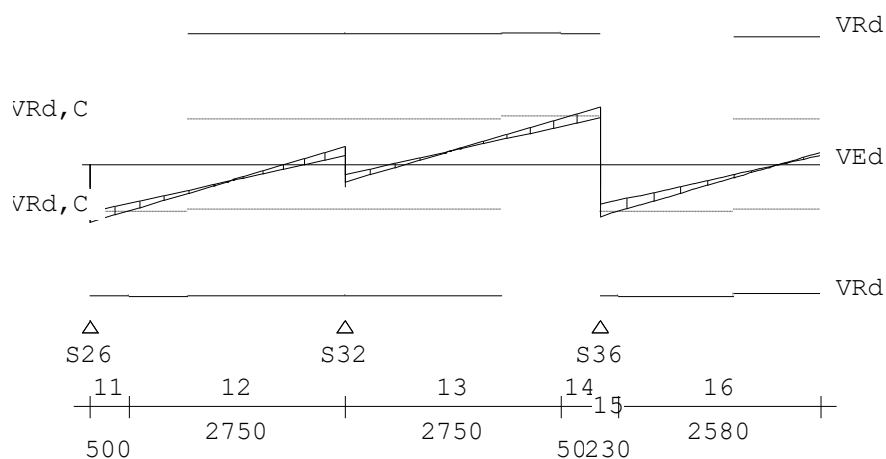
Velden: 1 t/m 5



DWARSKRACHTEN Fysisch lineair

Balk 4-C Fundamentele combinatie

Velden: 6 t/m 8



Wring- en dwarskrachtwapening

Balk 4-C

| Geb. | Vanaf | Tot | Beugels | Lengte | <Wringing> | | <Dwarskr.> | | V _{Ed} | T _{Ed} | Opm. |
|------|---------|----------|---------|--------|---------------------|----------------------|--------------------|--------------------|-----------------|-----------------|--------|
| | [mm] | [mm] | | [mm] | A _{l,angs} | A _{b,g1} | A _{b,g1} | A _{o,p,g} | [kN] | [kNm] | |
| | | | | | [mm ²] | [mm ² /m] | [mm ²] | | | | |
| 1 | S6-2810 | S6-230 | Ø8-250 | 2580 | 0 | 0 | 286 | 0 | 63.5 | 0 | 58,109 |
| 2 | S6-230 | S6+0 | Ø8-250 | 230 | 0 | 0 | 286 | 0 | 70.7 | 0 | 6 |
| 3 | S6+0 | S6+500 | Ø8-250 | 500 | 0 | 0 | 286 | 0 | 78.9 | 0 | 6 |
| 4 | S6+500 | S12+0 | Ø8-250 | 2750 | 0 | 0 | 286 | 0 | 63.3 | 0 | |
| 5 | S12+0 | S16-500 | Ø8-250 | 2750 | 0 | 0 | 286 | 0 | 61.7 | 0 | |
| 6 | S16-500 | S16+0 | Ø8-250 | 500 | 0 | 0 | 286 | 0 | 77.3 | 0 | 6 |
| 7 | S16+0 | S16+200 | Ø8-250 | 200 | 0 | 0 | 286 | 0 | 68.8 | 0 | 6 |
| 8 | S16+200 | S22+0 | Ø8-250 | 2550 | 0 | 0 | 286 | 0 | 62.5 | 0 | |
| 9 | S22+0 | S26-200 | Ø8-250 | 2550 | 0 | 0 | 286 | 0 | 64.0 | 0 | 58,109 |
| 10 | S26-200 | S26+0 | Ø8-250 | 200 | 0 | 0 | 286 | 0 | 70.4 | 0 | 6 |
| 11 | S26+0 | S26+500 | Ø8-250 | 500 | 0 | 0 | 286 | 0 | 78.1 | 0 | 6 |
| 12 | S26+500 | S32-0 | Ø8-250 | 2750 | 0 | 0 | 286 | 0 | 62.5 | 0 | |
| 13 | S32-0 | S36-500 | Ø8-250 | 2750 | 0 | 0 | 286 | 0 | 63.3 | 0 | |
| 14 | S36-500 | S36+0 | Ø8-250 | 500 | 0 | 0 | 286 | 0 | 79.0 | 0 | 6 |
| 15 | S36+0 | S36+230 | Ø8-250 | 230 | 0 | 0 | 286 | 0 | 70.7 | 0 | 6 |
| 16 | S36+230 | S36+2810 | Ø8-250 | 2580 | 0 | 0 | 286 | 0 | 63.5 | 0 | |

Opmerkingen

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

[58] 6.2.3: Z is berekend m.b.v. 0.9d

[109] Bij de berekening van de beugels is geen rekening gehouden met de detailleringsregels van art 9.7 voor de gedrongen liggers.

Wring- en dwarskrachten

Balk 4-C

| Geb. | Vanaf | Tot | θ | V _{Rd} | V _{Ed} | V _{Rd,C} | V _{Rd,Max} | T _{Ed} | T _{Rd,C} | T _{Rd,Max} | V _{o,p,g} | Opm. |
|------|---------|----------|------|-----------------|-----------------|-------------------|---------------------|-----------------|-------------------|---------------------|--------------------|--------|
| | [mm] | [mm] | [°] | [kN] | | -----kN----- | | | -----kNm----- | | | |
| 1 | S6-2810 | S6-230 | 21.8 | 179 | 63 | 65 | 418 | 0 | 26 | 63 | 0 | 58,109 |
| 2 | S6-230 | S6+0 | 21.8 | 179 | 71 | 65 | 415 | 0 | 26 | 63 | 0 | 6 |
| 3 | S6+0 | S6+500 | 21.8 | 179 | 79 | 65 | 415 | 0 | 26 | 63 | 0 | 6 |
| 4 | S6+500 | S12+0 | 21.8 | 179 | 63 | 65 | 417 | 0 | 26 | 63 | 0 | |
| 5 | S12+0 | S16-500 | 21.8 | 179 | 62 | 65 | 417 | 0 | 26 | 63 | 0 | |
| 6 | S16-500 | S16+0 | 21.8 | 179 | 77 | 65 | 416 | 0 | 26 | 63 | 0 | 6 |
| 7 | S16+0 | S16+200 | 21.8 | 179 | 69 | 65 | 416 | 0 | 26 | 63 | 0 | 6 |
| 8 | S16+200 | S22+0 | 21.8 | 179 | 63 | 65 | 416 | 0 | 26 | 63 | 0 | |
| 9 | S22+0 | S26-200 | 21.8 | 179 | 64 | 65 | 418 | 0 | 26 | 63 | 0 | 58,109 |
| 10 | S26-200 | S26+0 | 21.8 | 179 | 70 | 65 | 415 | 0 | 26 | 63 | 0 | 6 |
| 11 | S26+0 | S26+500 | 21.8 | 179 | 78 | 65 | 415 | 0 | 26 | 63 | 0 | 6 |
| 12 | S26+500 | S32-0 | 21.8 | 179 | 62 | 65 | 417 | 0 | 26 | 63 | 0 | |
| 13 | S32-0 | S36-500 | 21.8 | 179 | 63 | 65 | 417 | 0 | 26 | 63 | 0 | |
| 14 | S36-500 | S36+0 | 21.8 | 179 | 79 | 65 | 416 | 0 | 26 | 63 | 0 | 6 |
| 15 | S36+0 | S36+230 | 21.8 | 179 | 71 | 65 | 415 | 0 | 26 | 63 | 0 | 6 |
| 16 | S36+230 | S36+2810 | 21.8 | 179 | 63 | 65 | 416 | 0 | 26 | 63 | 0 | |

Opmerkingen

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

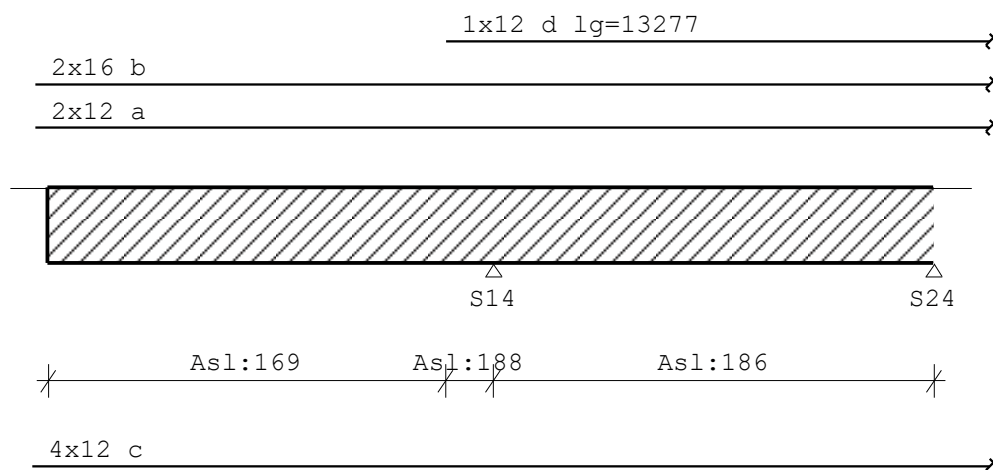
[58] 6.2.3: Z is berekend m.b.v. 0.9d

[109] Bij de berekening van de beugels is geen rekening gehouden met de detailleringsregels van art 9.7 voor de gedrongen liggers.

Hoofdwapening Fysisch lineair

Balk 4-D

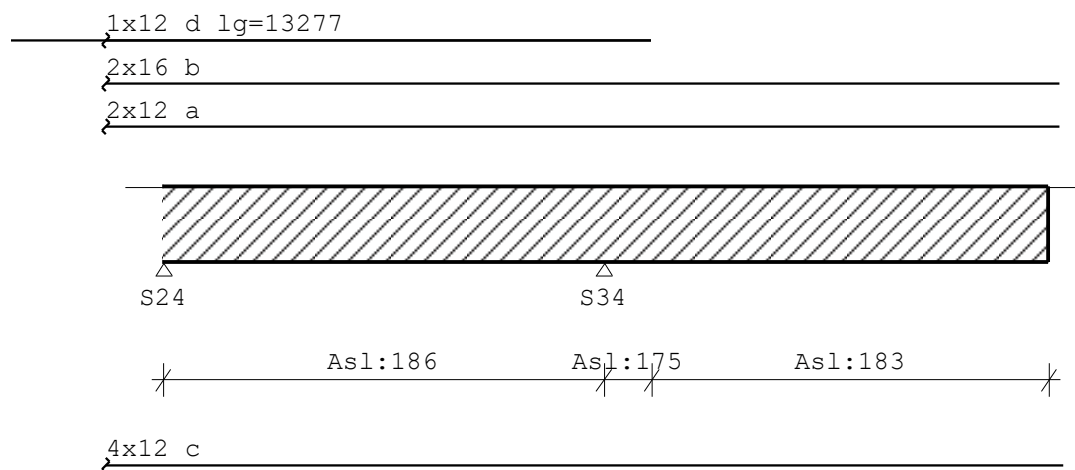
Velden: 1 t/m 2



Hoofdwapening Fysisch lineair

Balk 4-D

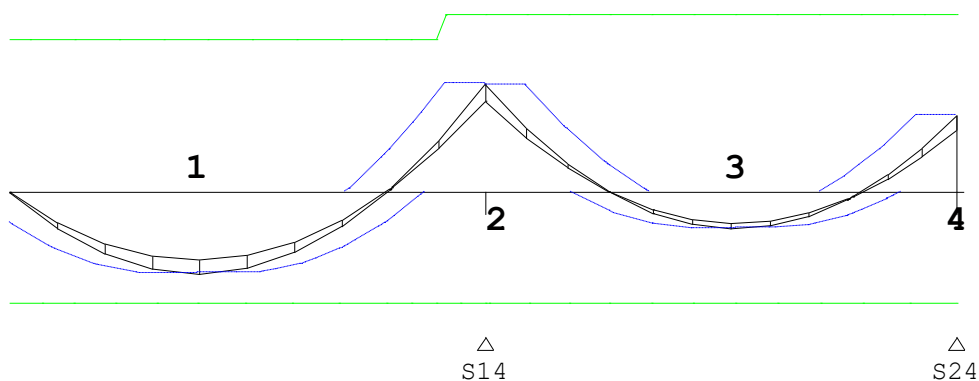
Velden: 3 t/m 4



MEd dekkingslijn Fysisch lineair

Balk 4-D

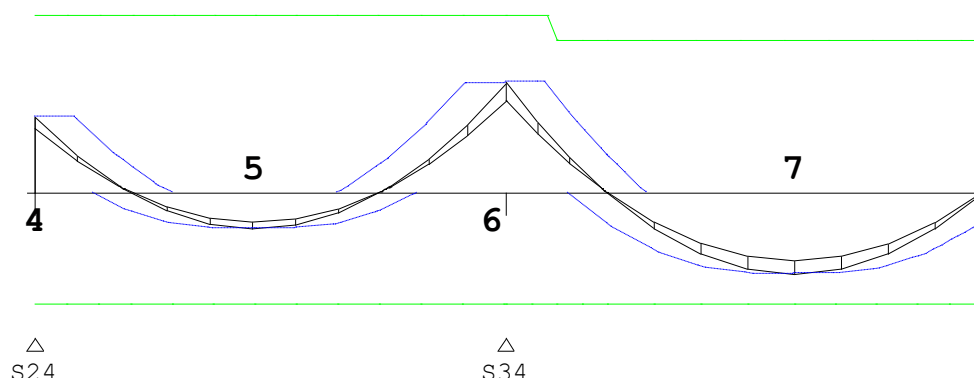
Velden: 1 t/m 2



MEd dekkingslijn Fysisch lineair

Balk 4-D

Velden: 3 t/m 4



Hoofdwapening

Balk 4-D

| Geb. | Pos. [mm] | M_{Ed} [kNm] | M_{Rd} [kNm] | z [mm] | B/O | A_b [mm ²] | A_a [mm ²] | Basiswapening +Bijlegwapening | Opm. |
|------|--------------|-------------------|-------------------|-----------|-----|-----------------------------|-----------------------------|----------------------------------|------|
| 1 | S14-3663 | -64.60 | -87.50 | 419 | Ond | 331 | 453 | 4x12 | |
| 2 | S14+0 | 85.89 | 140.36 | 418 | Bov | 439 | 629 | 2x16 + 2x12 | |
| | | | | | Bov | | 114 | +1x12 | |
| 3 | S24-2816 | -28.70 | -87.49 | 417 | Ond | 182* | 453 | 4x12 | 1 |
| 4 | S24+0 | 60.39 | 140.36 | 418 | Bov | 305 | 629 | 2x16 + 2x12 | |
| | | | | | Bov | | 114 | +1x12 | |
| 5 | S24+2802 | -28.09 | -87.49 | 417 | Ond | 180* | 453 | 4x12 | 1 |
| 6 | S34-0 | 87.62 | 140.36 | 418 | Bov | 448 | 629 | 2x16 + 2x12 | |
| | | | | | Bov | | 114 | +1x12 | |
| 7 | S34+3677 | -63.88 | -87.50 | 419 | Ond | 327 | 453 | 4x12 | |

Opmerkingen

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

Scheurvorming volgens artikel 7.3.4

Balk 4-D

| Geb. | Pos. [mm] | Zijde | $M_{E,freq}$ [kNm] | $S_{r,max}$ [mm] | $\epsilon_{sm} - \epsilon_{cm}$ [%] | w_k [mm] | k_x | w_{max} [mm] | U.C. | Opm. |
|------|--------------|-------|-----------------------|---------------------|--|---------------|-------|-------------------|------|------|
| 1 | S14-627 | Bov | 58.83 | 340 | 0.736 | 0.250 | 1.00 | 0.300 | 0.83 | |
| 1 | S14+0 | Bov | 66.50 | 305 | 0.748 | 0.229 | 1.00 | 0.300 | 0.76 | |
| 1 | S14-3663 | Ond | -49.73 | 406 | 0.785 | 0.319 | 1.14 | 0.343 | 0.93 | |
| 2 | S14+0 | Bov | 66.50 | 305 | 0.748 | 0.229 | 1.00 | 0.300 | 0.76 | |
| 2 | S24-407 | Bov | 46.72 | 305 | 0.454 | 0.139 | 1.00 | 0.300 | 0.46 | |
| 2 | S24-2816 | Ond | -22.33 | 406 | 0.353 | 0.144 | 1.14 | 0.343 | 0.42 | |
| 3 | S24+416 | Bov | 46.72 | 305 | 0.454 | 0.139 | 1.00 | 0.300 | 0.46 | |
| 3 | S34-0 | Bov | 67.91 | 305 | 0.771 | 0.236 | 1.00 | 0.300 | 0.79 | |
| 3 | S24+2802 | Ond | -21.30 | 406 | 0.337 | 0.137 | 1.14 | 0.343 | 0.40 | |
| 4 | S34-0 | Bov | 67.91 | 305 | 0.771 | 0.236 | 1.00 | 0.300 | 0.79 | |
| 4 | S34+650 | Bov | 58.84 | 340 | 0.736 | 0.251 | 1.00 | 0.300 | 0.84 | |
| 4 | S34+3677 | Ond | -49.18 | 406 | 0.777 | 0.316 | 1.14 | 0.343 | 0.92 | |

Verloop hoofdwapening

Balk 4-D

| Merk | B/O | Wapening | Vanaf [mm] | Tot [mm] | Lengte [mm] | $L_{bd,begin}$ [mm] | $L_{bd,eind}$ [mm] |
|------|-------|----------|---------------|-------------|----------------|------------------------|-----------------------|
| a | Boven | 2x12 | S14-6220 | S34+6220 | 24440 | 160 | 160 |
| b | Boven | 2x16 | S14-6220 | S34+6220 | 24440 | 160 | 160 |
| d | Boven | 1x12 | S14-627 | S34+650 | 13277 | 120 | 120 |
| c | Onder | 4x12 | S14-6268 | S34+6266 | 24534 | 208 | 206 |

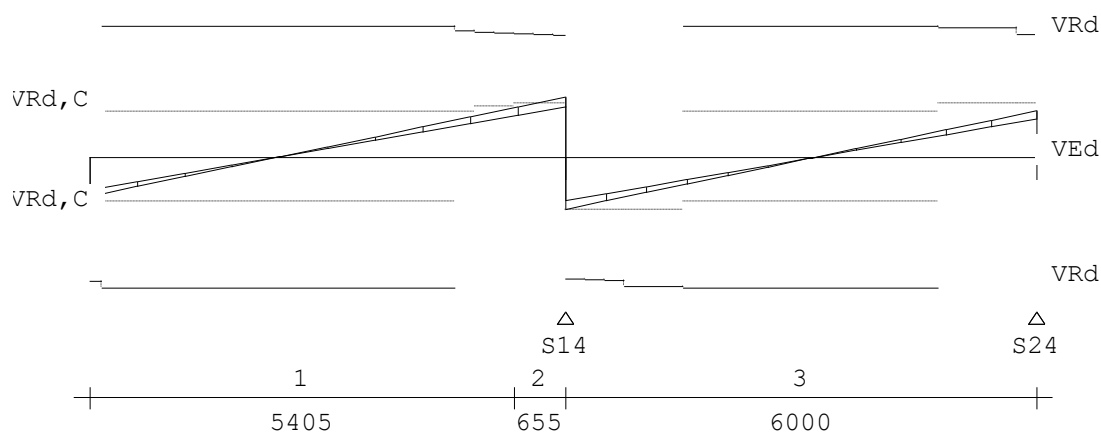
Opmerkingen

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

DWARSKRACHTEN Fysisch lineair

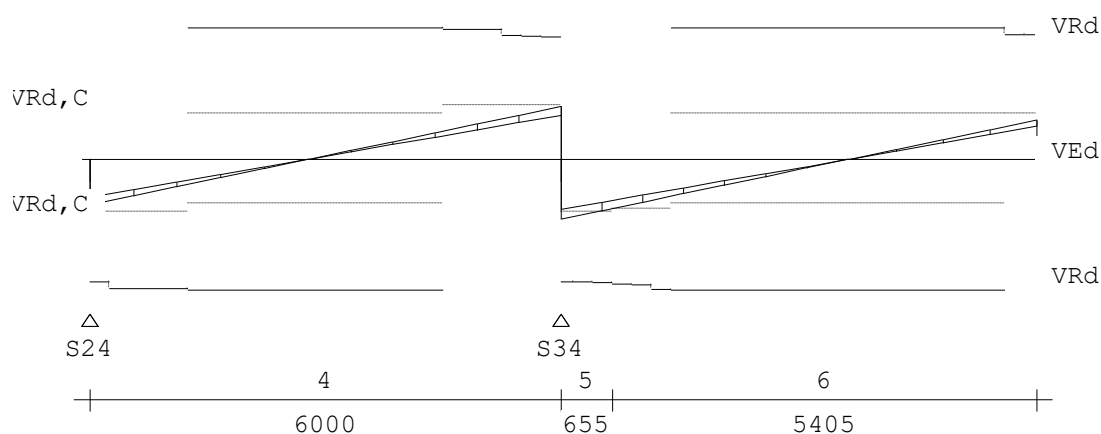
Balk 4-D Fundamentele combinatie

Velden: 1 t/m 2


DWARSKRACHTEN Fysisch lineair

Balk 4-D Fundamentele combinatie

Velden: 3 t/m 4


Wring- en dwarskrachtwapening

Balk 4-D

| Geb. | Vanaf | Tot | Beugels | Lengte | <Wringing> | | <Dwarskr.> | | V _{Ed} | T _{Ed} | Opm. |
|------|----------|----------|---------|--------|---------------------|-------------------|-------------------|-------------------|-----------------|-----------------|------|
| | [mm] | [mm] | | [mm] | A _{l,angs} | A _{b,gl} | A _{b,gl} | A _{o,pg} | [kN] | [kNm] | |
| 1 | S14-6060 | S14-655 | Ø8-250 | 5405 | 169 | 20 | 286 | 0 | 67.4 | 5 | |
| 2 | S14-655 | S14+0 | Ø8-250 | 655 | 188 | 22 | 286 | 0 | 82.0 | 5 | 6 |
| 3 | S14+0 | S24+0 | Ø8-250 | 6000 | 186 | 22 | 286 | 0 | 71.3 | 5 | |
| 4 | S24+0 | S34-0 | Ø8-250 | 6000 | 186 | 22 | 286 | 0 | 71.6 | 5 | |
| 5 | S34-0 | S34+655 | Ø8-250 | 655 | 175 | 21 | 286 | 0 | 82.3 | 5 | 6 |
| 6 | S34+655 | S34+6060 | Ø8-250 | 5405 | 183 | 22 | 286 | 0 | 67.7 | 5 | |

Opmerkingen

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

Wring- en dwarskrachten

Balk 4-D

| Geb. | Vanaf | Tot | θ | V _{Rd} | V _{Ed} | V _{Rd,C} | V _{Rd,Max} | T _{Ed} | T _{Rd,C} | T _{Rd,Max} | V _{opg} | Opm. |
|------|----------|----------|------|-----------------|-----------------|-------------------|---------------------|-----------------|-------------------|---------------------|------------------|------|
| | [mm] | [mm] | [°] | [kN] | | | | | | | | |
| 1 | S14-6060 | S14-655 | 21.8 | 163 | 67 | 69 | 414 | 5 | 26 | 63 | 0 | |
| 2 | S14-655 | S14+0 | 21.8 | 157 | 82 | 73 | 410 | 5 | 26 | 63 | 0 | 6 |
| 3 | S14+0 | S24+0 | 21.8 | 157 | 71 | 73 | 410 | 5 | 26 | 63 | 0 | |
| 4 | S24+0 | S34-0 | 21.8 | 157 | 72 | 73 | 410 | 5 | 26 | 63 | 0 | |
| 5 | S34-0 | S34+655 | 21.8 | 159 | 82 | 73 | 410 | 5 | 26 | 63 | 0 | 6 |
| 6 | S34+655 | S34+6060 | 21.8 | 164 | 68 | 69 | 414 | 5 | 26 | 63 | 0 | |

Opmerkingen

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

Woningtype E en F – uitvoer TS Balkroosters blok 5:

Technosoft Balkroosters release 6.80c

Project.....: 18107 - 14 woningen te Westzaan
Onderdeel.....: Blok 5 - fundering
Dimensies.....: kN/m/rad
Bestand.....: G:\7000 project\18107-KPO 24 woningen
 Westzaan\Documenten\Constructie\18107-Blok
 5-fundering.grw
Torsiefac.....: 20 %

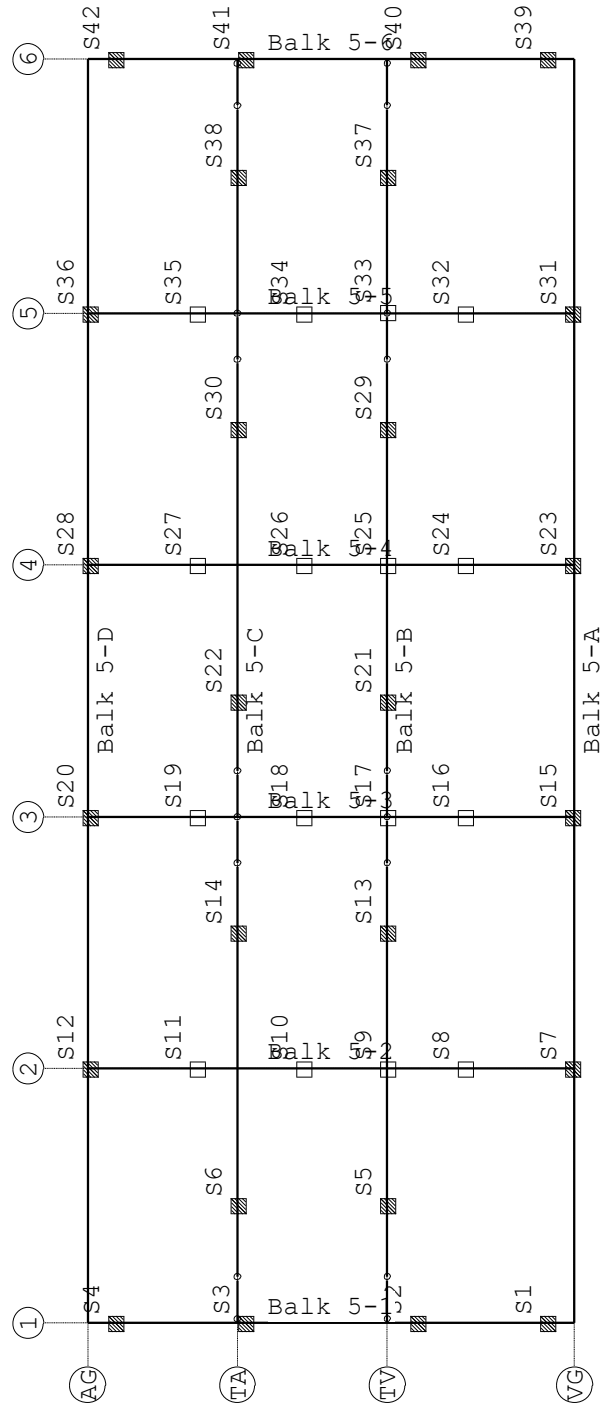
Ouderdom bij belasten : 28 Relatieve vochtigheid : 50%
Doorbuigingen(beton) zijn dmv gecorrigeerde stijfheden berekend.

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

Toegepaste normen volgens Eurocode met Nederlandse NB

| | | | |
|-------------|--------------------------|-----------------|-------------|
| Belastingen | NEN-EN 1990:2002 | C2:2010,A1:2019 | NB:2019(nl) |
| | NEN-EN 1991-1-1:2002 | C1/C11:2019 | NB:2019(nl) |
| Beton | NEN-EN 1992-1-1:2011(nl) | C2/A1:2015(nl) | NB:2016(nl) |

GEOMETRIE



MATERIALEN

| Mt | Kwaliteit | E-modulus[N/mm ²] | S.G. | Pois. | Uitz. coëff |
|----|-----------|-------------------------------|------|-------|-------------|
| 1 | C20/25 | 7480 | 25.0 | 0.20 | 1.0000e-05 |

MATERIALEN vervolg

| Mt | Kwaliteit | Cement | Kruipfac. |
|----|-----------|--------|-----------|
| 1 | C20/25 | | 3.01 |

PROFIELEN [mm]

| Prof. | Omschrijving | Materiaal | Oppervlak | Torsietr. | Traagheid | Vormf. |
|-------|--------------|-----------|-----------|-----------|-----------|--------|
| 1 | B*H 400*500 | 1:C20/25 | 2.000e+05 | 5.577e+09 | 4.167e+09 | 0.00 |
| 2 | B*H 400*500 | 1:C20/25 | 2.000e+05 | 5.577e+09 | 4.167e+09 | 0.00 |
| 3 | B*H 400*500 | 1:C20/25 | 2.000e+05 | 5.577e+09 | 4.167e+09 | 0.00 |
| 4 | B*H 500*500 | 1:C20/25 | 2.500e+05 | 8.802e+09 | 5.208e+09 | 0.00 |

PROFIELEN vervolg [mm]

| Prof. | Staaftype | Breedte | Hoogte | Zs | Rek.As | Type | b1 | h1 | b2 | h2 |
|-------|-----------|---------|--------|-----|--------|------|----|----|----|----|
| 1 | 0:Normaal | 400 | 500 | 250 | 0.00 | 0:RH | | | | |
| 2 | 0:Normaal | 400 | 500 | 250 | 0.00 | 0:RH | | | | |
| 3 | 0:Normaal | 400 | 500 | 250 | 0.00 | 0:RH | | | | |
| 4 | 0:Normaal | 500 | 500 | 250 | 0.00 | 0:RH | | | | |

STRAMIENLIJNEN

| Nr. | Naam | X-begin | Y-begin | X-eind | Y-Eind |
|-----|------|---------|---------|--------|--------|
| 1 | 1 | 0.000 | 11.600 | 0.000 | 0.000 |
| 2 | 2 | 6.060 | 11.600 | 6.060 | 0.000 |
| 3 | 3 | 12.060 | 11.600 | 12.060 | 0.000 |
| 4 | 4 | 18.060 | 11.600 | 18.060 | 0.000 |
| 5 | 5 | 24.060 | 11.600 | 24.060 | 0.000 |
| 6 | 6 | 30.120 | 11.600 | 30.120 | 0.000 |
| 7 | VG | 0.000 | 0.000 | 30.120 | 0.000 |
| 8 | TV | 0.000 | 4.460 | 30.120 | 4.460 |
| 9 | TA | 0.000 | 8.030 | 30.120 | 8.030 |
| 10 | AG | 0.000 | 11.600 | 30.120 | 11.600 |

BALKEN

| Nr. | Naam | Begin | Eind | Profiel |
|-----|----------|-------|------|-----------------------|
| 1 | Balk 5-1 | 1;VG | 1;AG | 4:B*H 500*500 |
| 2 | Balk 5-2 | 2;VG | 2;AG | 1:B*H 400*500 |
| 3 | Balk 5-3 | 3;VG | 3;AG | 1:B*H 400*500 |
| 4 | Balk 5-4 | 4;VG | 4;AG | 1:B*H 400*500 |
| 5 | Balk 5-5 | 5;VG | 5;AG | 1:B*H 400*500 |
| 6 | Balk 5-6 | 6;VG | 6;AG | 4:B*H 500*500 |
| 7 | Balk 5-A | 1;VG | 6;vg | 3:B*H 400*500 |
| 8 | Balk 5-B | 1;TV | 6;TV | Zie Doorsnedesectoren |
| 9 | Balk 5-C | 1;TA | 6;TA | Zie Doorsnedesectoren |
| 10 | Balk 5-D | 1;AG | 6;AG | 3:B*H 400*500 |

BALKEN vervolg

| Nr. | Naam | Aansl.begin | Aansl.eind | Excentr. | Pasm.begin | Pasm.eind | Opm. |
|-----|----------|-------------|------------|----------|------------|-----------|------|
| 1 | Balk 5-1 | WDM | WDM | 0.000 | 0.000 | 0.000 | |
| 2 | Balk 5-2 | WDM | WDM | 0.000 | 0.000 | 0.000 | |
| 3 | Balk 5-3 | WDM | WDM | 0.000 | 0.000 | 0.000 | |
| 4 | Balk 5-4 | WDM | WDM | 0.000 | 0.000 | 0.000 | |
| 5 | Balk 5-5 | WDM | WDM | 0.000 | 0.000 | 0.000 | |
| 6 | Balk 5-6 | WDM | WDM | 0.000 | 0.000 | 0.000 | |
| 7 | Balk 5-A | WDM | WDM | 0.000 | 0.000 | 0.000 | |
| 8 | Balk 5-B | WD- | WD- | 0.000 | 0.000 | 0.000 | |
| 9 | Balk 5-C | WD- | WD- | 0.000 | 0.000 | 0.000 | |
| 10 | Balk 5-D | WDM | WDM | 0.000 | 0.000 | 0.000 | |

Opmerkingen:

De torsie traagheid van alle balken is tot 20% gereduceerd

DOORSNEDESECTOREN

| Balk | Vanaf | Tot | Lengte | Profiel | Eindcode |
|----------|--------|--------|--------|---------------|-------------|
| Balk 5-B | 0.000 | 1.100 | 1.100 | 2:B*H 400*500 | 0:Scharnier |
| Balk 5-B | 1.100 | 10.960 | 9.860 | 2:B*H 400*500 | 0:Scharnier |
| Balk 5-B | 10.960 | 12.060 | 1.100 | 2:B*H 400*500 | 0:Scharnier |
| Balk 5-B | 12.060 | 13.160 | 1.100 | 2:B*H 400*500 | 0:Scharnier |
| Balk 5-B | 13.160 | 22.960 | 9.800 | 2:B*H 400*500 | 0:Scharnier |
| Balk 5-B | 22.960 | 24.060 | 1.100 | 2:B*H 400*500 | 0:Scharnier |
| Balk 5-B | 24.060 | 29.020 | 4.960 | 2:B*H 400*500 | 0:Scharnier |
| Balk 5-B | 29.020 | 30.120 | 1.100 | 2:B*H 400*500 | 1:Vast |
| Balk 5-C | 0.000 | 1.100 | 1.100 | 2:B*H 400*500 | 0:Scharnier |
| Balk 5-C | 1.100 | 10.960 | 9.860 | 2:B*H 400*500 | 0:Scharnier |
| Balk 5-C | 10.960 | 12.060 | 1.100 | 2:B*H 400*500 | 0:Scharnier |
| Balk 5-C | 12.060 | 13.160 | 1.100 | 2:B*H 400*500 | 0:Scharnier |
| Balk 5-C | 13.160 | 22.960 | 9.800 | 2:B*H 400*500 | 0:Scharnier |
| Balk 5-C | 22.960 | 24.060 | 1.100 | 2:B*H 400*500 | 0:Scharnier |
| Balk 5-C | 24.060 | 29.020 | 4.960 | 2:B*H 400*500 | 0:Scharnier |
| Balk 5-C | 29.020 | 30.120 | 1.100 | 2:B*H 400*500 | 1:Vast |

STEUNPUNTYPEN

| | | | |
|-----------|--------------|---------------|---------------------|
| Nr. | : 1 | Assenstelsel: | Globaal |
| Afmeting | : 220*220 | Rotatie | X:Vrij |
| Inheinv. | : 17,75 -NAP | Verplaatsing | Z:Veerwaarde: 35000 |
| FRd | : 320.000000 | Rotatie | Y:Vrij |
| Min.afst. | : 0.750 | | |
| Nr. | : 2 | Assenstelsel: | Globaal |
| Afmeting | : 250*250 | Rotatie | X:Vrij |
| Inheinv. | : 17,75 -NAP | Verplaatsing | Z:Veerwaarde: 45000 |
| FRd | : 400.000000 | Rotatie | Y:Vrij |
| Min.afst. | : 0.850 | | |

STEUNPUNTEN

| Nr. | Naam | Steunpunttype | Balk | Positie | Excentr. | Hoek Opm: |
|-----|------|---------------|----------|---------|----------|-----------|
| 1 | | 1:220*220 | Balk 5-1 | 0.65 | 0.000 | 0.000 |
| 2 | | 1:220*220 | Balk 5-1 | 3.75 | 0.000 | 0.000 |
| 3 | | 1:220*220 | Balk 5-1 | 7.85 | 0.000 | 0.000 |
| 4 | | 1:220*220 | Balk 5-1 | 10.95 | 0.000 | 0.000 |
| 5 | | 1:220*220 | Balk 5-B | 2.81 | 0.000 | 0.000 |
| 6 | | 1:220*220 | Balk 5-C | 2.81 | 0.000 | 0.000 |
| 7 | | 1:220*220 | Balk 5-2 | 0.06 | 0.000 | 0.000 |
| 8 | | 2:250*250 | Balk 5-2 | 2.61 | 0.000 | 0.000 |
| 9 | | 2:250*250 | Balk 5-2 | 4.46 | 0.000 | 0.000 |
| 10 | | 2:250*250 | Balk 5-2 | 6.46 | 0.000 | 0.000 |
| 11 | | 2:250*250 | Balk 5-2 | 9.01 | 0.000 | 0.000 |
| 12 | | 1:220*220 | Balk 5-2 | 11.56 | 0.000 | 0.000 |
| 13 | | 1:220*220 | Balk 5-B | 9.31 | 0.000 | 0.000 |
| 14 | | 1:220*220 | Balk 5-C | 9.31 | 0.000 | 0.000 |
| 15 | | 1:220*220 | Balk 5-3 | 0.06 | 0.000 | 0.000 |
| 16 | | 2:250*250 | Balk 5-3 | 2.61 | 0.000 | 0.000 |
| 17 | | 2:250*250 | Balk 5-3 | 4.46 | 0.000 | 0.000 |
| 18 | | 2:250*250 | Balk 5-3 | 6.46 | 0.000 | 0.000 |
| 19 | | 2:250*250 | Balk 5-3 | 9.01 | 0.000 | 0.000 |
| 20 | | 1:220*220 | Balk 5-3 | 11.56 | 0.000 | 0.000 |
| 21 | | 1:220*220 | Balk 5-B | 14.81 | 0.000 | 0.000 |
| 22 | | 1:220*220 | Balk 5-C | 14.81 | 0.000 | 0.000 |
| 23 | | 1:220*220 | Balk 5-4 | 0.06 | 0.000 | 0.000 |

STEUNPUNTEN

| Nr. | Naam | Steunpunttype | Balk | Positie | Excentr. | Hoek Opm: |
|-----|------|---------------|----------|---------|----------|-----------|
| 24 | | 2:250*250 | Balk 5-4 | 2.61 | 0.000 | 0.000 |
| 25 | | 2:250*250 | Balk 5-4 | 4.46 | 0.000 | 0.000 |
| 26 | | 2:250*250 | Balk 5-4 | 6.46 | 0.000 | 0.000 |
| 27 | | 2:250*250 | Balk 5-4 | 9.01 | 0.000 | 0.000 |
| 28 | | 1:220*220 | Balk 5-4 | 11.56 | 0.000 | 0.000 |
| 29 | | 1:220*220 | Balk 5-B | 21.31 | 0.000 | 0.000 |
| 30 | | 1:220*220 | Balk 5-C | 21.31 | 0.000 | 0.000 |
| 31 | | 1:220*220 | Balk 5-5 | 0.06 | 0.000 | 0.000 |
| 32 | | 2:250*250 | Balk 5-5 | 2.61 | 0.000 | 0.000 |
| 33 | | 2:250*250 | Balk 5-B | 24.1 | 0.000 | 0.000 |
| 34 | | 2:250*250 | Balk 5-5 | 6.46 | 0.000 | 0.000 |
| 35 | | 2:250*250 | Balk 5-5 | 9.01 | 0.000 | 0.000 |
| 36 | | 1:220*220 | Balk 5-5 | 11.56 | 0.000 | 0.000 |
| 37 | | 1:220*220 | Balk 5-B | 27.31 | 0.000 | 0.000 |
| 38 | | 1:220*220 | Balk 5-C | 27.31 | 0.000 | 0.000 |
| 39 | | 1:220*220 | Balk 5-6 | 0.65 | 0.000 | 0.000 |
| 40 | | 1:220*220 | Balk 5-6 | 3.75 | 0.000 | 0.000 |
| 41 | | 1:220*220 | Balk 5-6 | 7.85 | 0.000 | 0.000 |
| 42 | | 1:220*220 | Balk 5-6 | 10.95 | 0.000 | 0.000 |

BELASTINGGEVALLEN

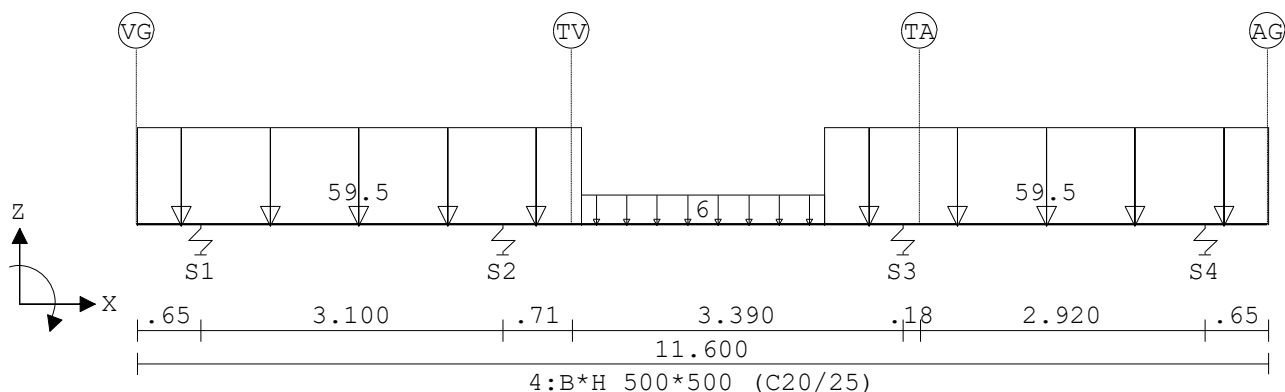
| B.G. | Omschrijving | Belast/onbelast | Ψ_0 | Ψ_1 | Ψ_2 | e.g. |
|------|--------------|--------------------|----------|----------|----------|-------|
| 1 | permanent | 2:Permanent EN1991 | | | | -1.00 |
| 2 | variabel bg | 0:Alles tegelijk | 0.40 | 0.50 | 0.30 | 0.00 |
| 3 | variabel 1e | 0:Alles tegelijk | 0.40 | 0.50 | 0.30 | 0.00 |
| 4 | variabel 2e | 0:Alles tegelijk | 0.40 | 0.50 | 0.30 | 0.00 |

BELASTINGGEVALLEN

| B.G. | Omschrijving | Type |
|------|--------------|---------------------------------|
| 1 | permanent | 1 Permanente belasting |
| 2 | variabel bg | 2 Ver. bel. pers. ed. (q_k) |
| 3 | variabel 1e | 2 Ver. bel. pers. ed. (q_k) |
| 4 | variabel 2e | 2 Ver. bel. pers. ed. (q_k) |

VELDBELASTINGEN

Balk 5-1 B.G:1 permanent



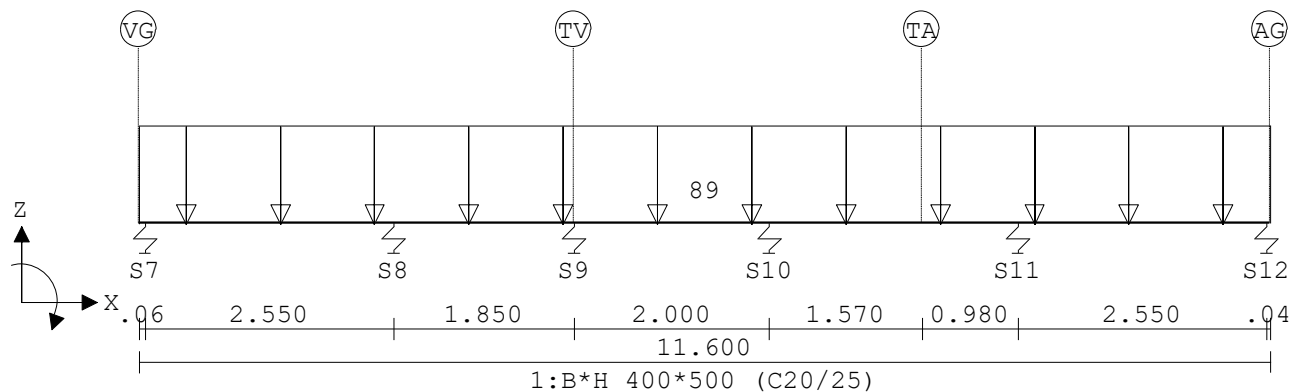
VELDBELASTINGEN

B.G:1 permanent

| Balk | Last Type | q1/p/m | q2 | Afstand | Lengte | Exc. |
|----------|------------|---------|---------|---------|--------|-------|
| Balk 5-1 | 1 1:q-last | -59.500 | -59.500 | 0.000 | 4.550 | 0.000 |
| Balk 5-1 | 2 1:q-last | -6.000 | -6.000 | 4.550 | 2.500 | 0.000 |
| Balk 5-1 | 3 1:q-last | -59.500 | -59.500 | 7.050 | 4.550 | 0.000 |

VELDBELASTINGEN

Balk 5-2 B.G:1 permanent

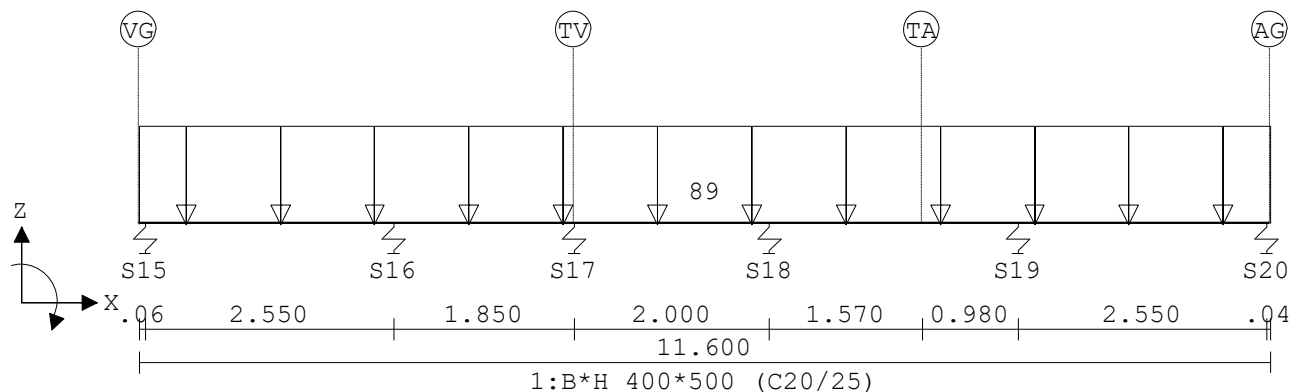

VELDBELASTINGEN

B.G:1 permanent

| Balk | Last Type | q1/p/m | q2 | Afstand | Lengte | Exc. |
|----------|------------|---------|---------|---------|--------|-------|
| Balk 5-2 | 1 1:q-last | -89.000 | -89.000 | 0.000 | 11.600 | 0.000 |

VELDBELASTINGEN

Balk 5-3 B.G:1 permanent

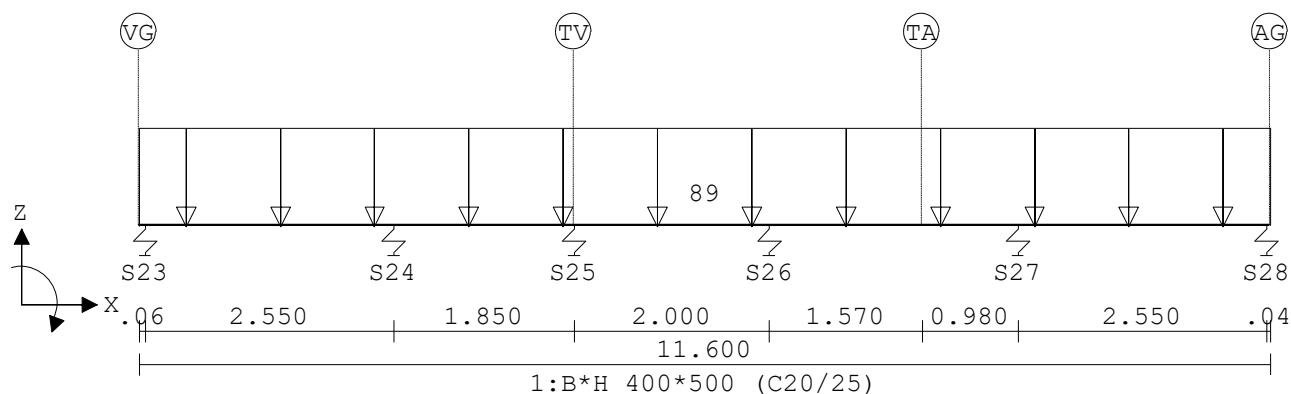

VELDBELASTINGEN

B.G:1 permanent

| Balk | Last Type | q1/p/m | q2 | Afstand | Lengte | Exc. |
|----------|------------|---------|---------|---------|--------|-------|
| Balk 5-3 | 1 1:q-last | -89.000 | -89.000 | 0.000 | 11.600 | 0.000 |

VELDBELASTINGEN

Balk 5-4 B.G:1 permanent



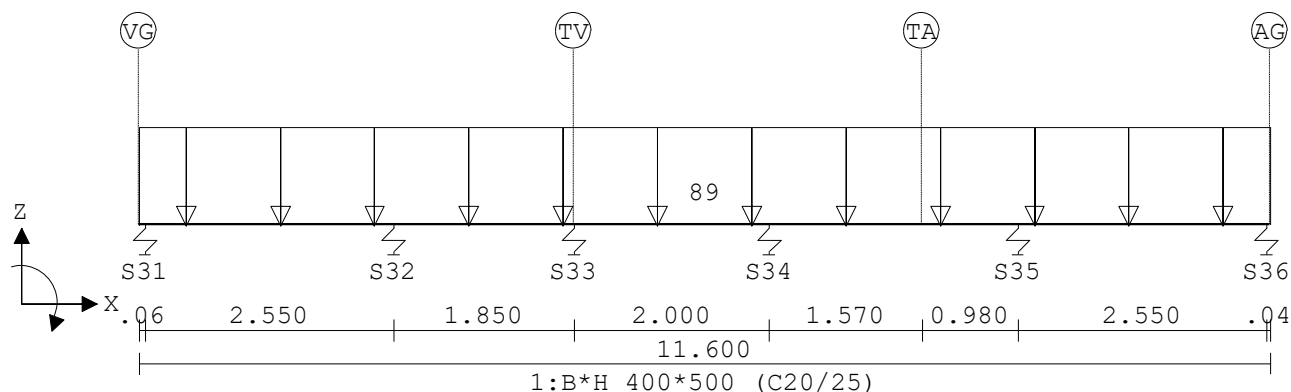
VELDBELASTINGEN

B.G:1 permanent

| Balk | Last Type | q1/p/m | q2 | Afstand | Lengte | Exc. |
|----------|------------|---------|---------|---------|--------|-------|
| Balk 5-4 | 1 1:q-last | -89.000 | -89.000 | 0.000 | 11.600 | 0.000 |

VELDBELASTINGEN

Balk 5-5 B.G:1 permanent



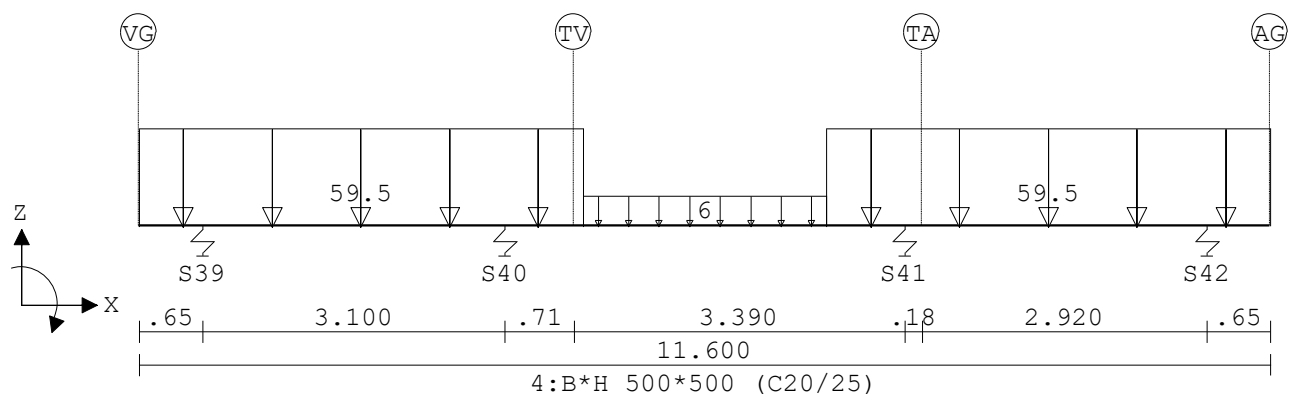
VELDBELASTINGEN

B.G:1 permanent

| Balk | Last Type | q1/p/m | q2 | Afstand | Lengte | Exc. |
|----------|------------|---------|---------|---------|--------|-------|
| Balk 5-5 | 1 1:q-last | -89.000 | -89.000 | 0.000 | 11.600 | 0.000 |

VELDBELASTINGEN

Balk 5-6 B.G:1 permanent



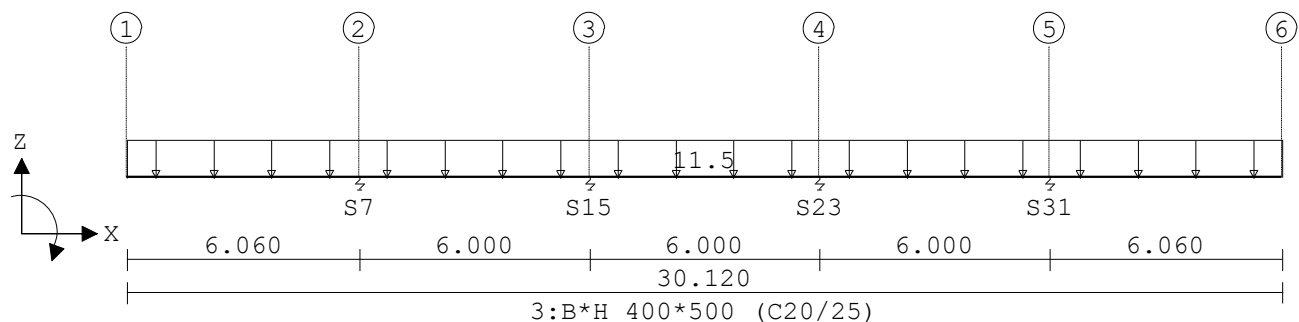
VELDBELASTINGEN

B.G:1 permanent

| Balk | Last Type | q1/p/m | q2 | Afstand | Lengte | Exc. |
|----------|------------|---------|---------|---------|--------|-------|
| Balk 5-6 | 1 1:q-last | -59.500 | -59.500 | 0.000 | 4.550 | 0.000 |
| Balk 5-6 | 2 1:q-last | -6.000 | -6.000 | 4.550 | 2.500 | 0.000 |
| Balk 5-6 | 3 1:q-last | -59.500 | -59.500 | 7.050 | 4.550 | 0.000 |

VELDBELASTINGEN

Balk 5-A B.G:1 permanent



VELDBELASTINGEN

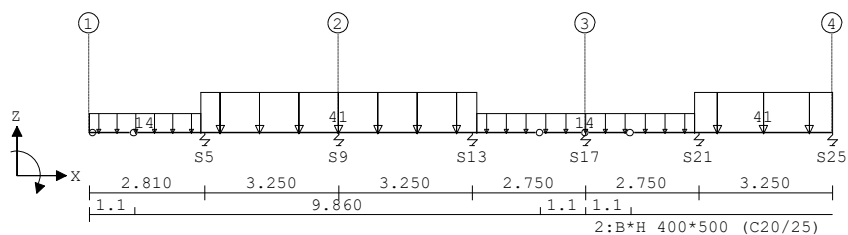
B.G:1 permanent

| Balk | Last Type | q1/p/m | q2 | Afstand | Lengte | Exc. |
|----------|------------|---------|---------|---------|--------|-------|
| Balk 5-A | 1 1:q-last | -11.500 | -11.500 | 0.000 | 30.120 | 0.100 |

VELDBELASTINGEN

Balk 5-B B.G:1 permanent

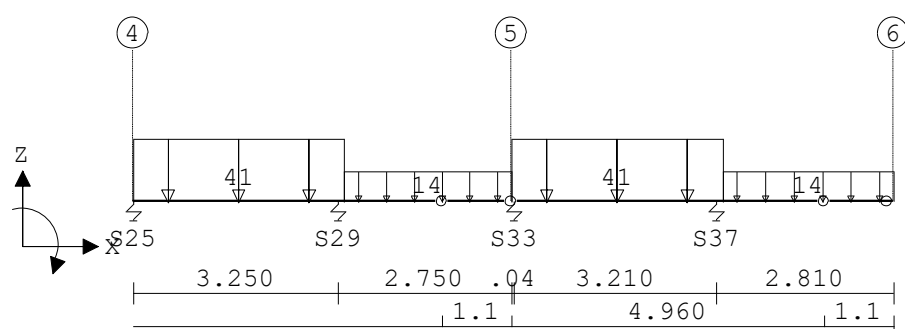
Velden: 1 t/m 6



VELDBELASTINGEN

Balk 5-B B.G:1 permanent

Velden: 7 t/m 10



VELDBELASTINGEN

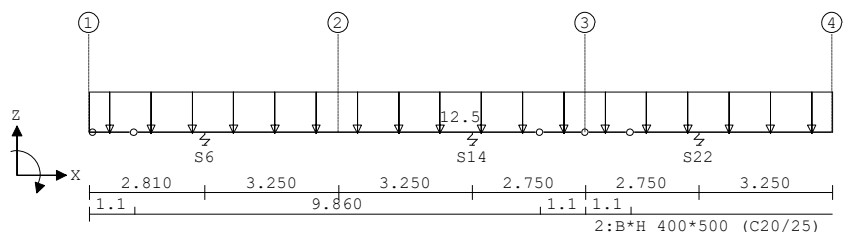
B.G:1 permanent

| Balk | Last Type | q1/p/m | q2 | Afstand | Lengte | Exc. |
|----------|------------|---------|---------|---------|--------|-------|
| Balk 5-B | 1 1:q-last | -14.000 | -14.000 | 0.000 | 2.710 | 0.000 |
| Balk 5-B | 2 1:q-last | -41.000 | -41.000 | 2.710 | 6.700 | 0.000 |
| Balk 5-B | 3 1:q-last | -14.000 | -14.000 | 9.410 | 5.300 | 0.000 |
| Balk 5-B | 4 1:q-last | -41.000 | -41.000 | 14.710 | 6.700 | 0.000 |
| Balk 5-B | 5 1:q-last | -14.000 | -14.000 | 21.410 | 2.650 | 0.000 |
| Balk 5-B | 6 1:q-last | -41.000 | -41.000 | 24.060 | 3.350 | 0.000 |
| Balk 5-B | 7 1:q-last | -14.000 | -14.000 | 27.410 | 2.710 | 0.000 |

VELDBELASTINGEN

Balk 5-C B.G:1 permanent

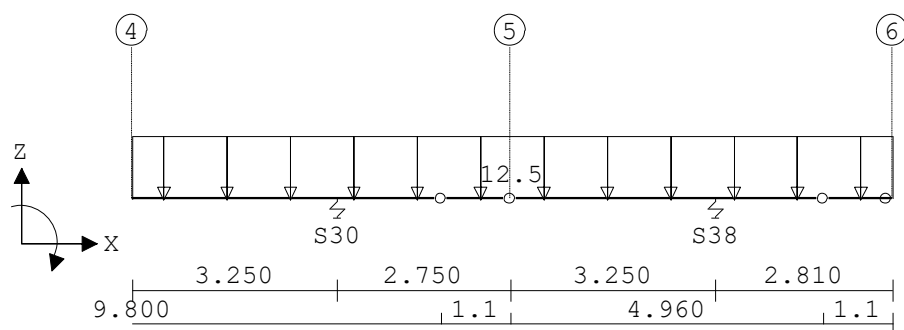
Velden: 1 t/m 6



VELDBELASTINGEN

Balk 5-C B.G:1 permanent

Velden: 7 t/m 10



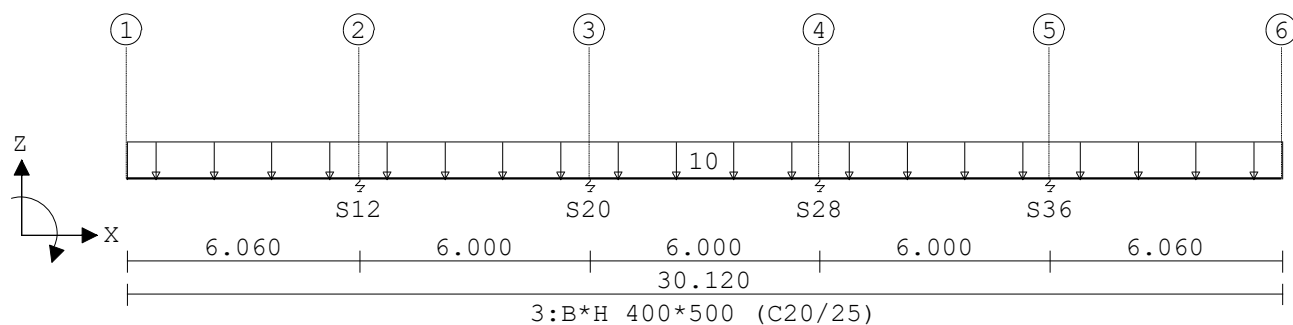
VELDBELASTINGEN

B.G:1 permanent

| Balk | Last Type | q1/p/m | q2 | Afstand | Lengte | Exc. |
|----------|------------|---------|---------|---------|--------|-------|
| Balk 5-C | 1 1:q-last | -12.500 | -12.500 | 0.000 | 30.120 | 0.000 |

VELDBELASTINGEN

Balk 5-D B.G:1 permanent



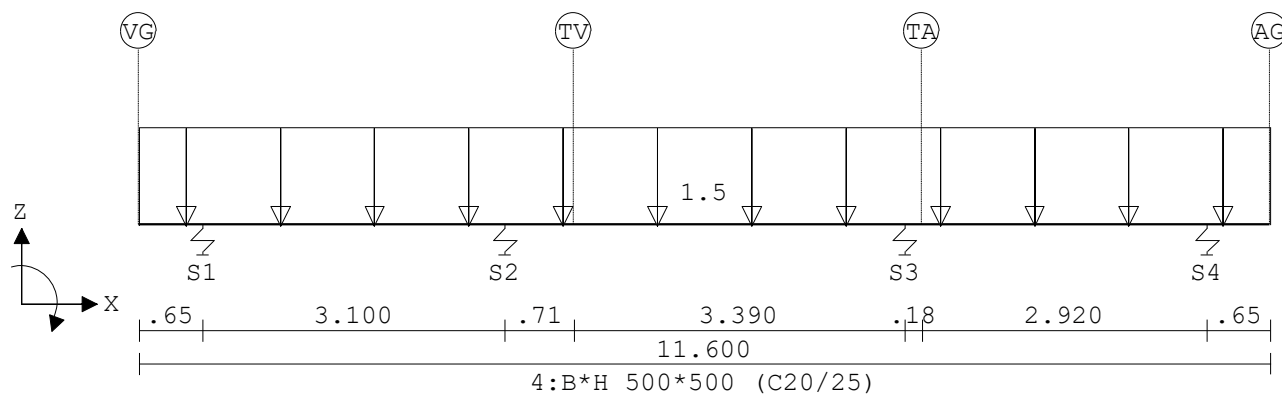
VELDBELASTINGEN

B.G:1 permanent

| Balk | Last Type | q1/p/m | q2 | Afstand | Lengte | Exc. |
|----------|------------|---------|---------|---------|--------|--------|
| Balk 5-D | 1 1:q-last | -10.000 | -10.000 | 0.000 | 30.120 | -0.100 |

VELDBELASTINGEN

Balk 5-1 B.G:2 variabel bg



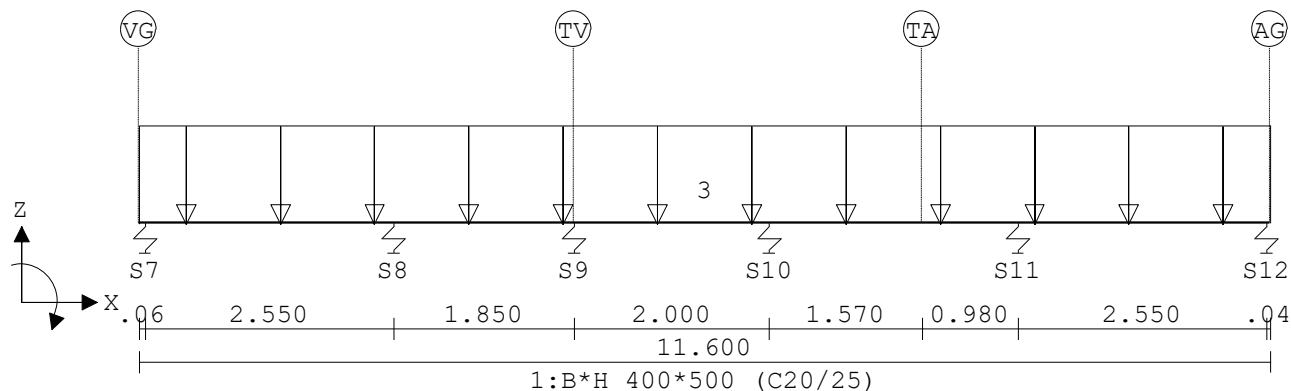
VELDBELASTINGEN

B.G:2 variabel bg

| Balk | Last Type | q1/p/m | q2 | Afstand | Lengte | Exc. |
|----------|------------|--------|--------|---------|--------|-------|
| Balk 5-1 | 1 1:q-last | -1.500 | -1.500 | 0.000 | 11.600 | 0.000 |

VELDBELASTINGEN

Balk 5-2 B.G:2 variabel bg



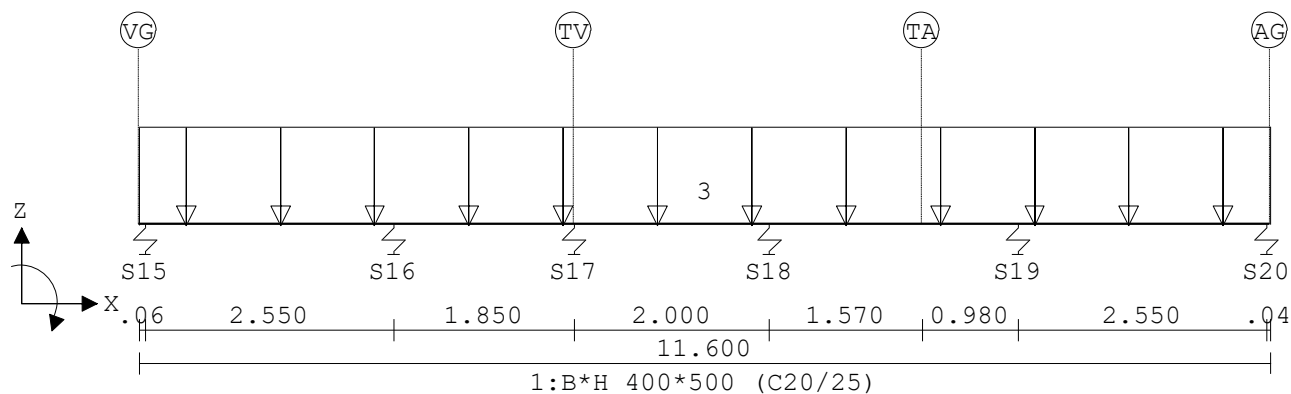
VELDBELASTINGEN

B.G:2 variabel bg

| Balk | Last Type | q1/p/m | q2 | Afstand | Lengte | Exc. |
|----------|------------|--------|--------|---------|--------|-------|
| Balk 5-2 | 1 1:q-last | -3.000 | -3.000 | 0.000 | 11.600 | 0.000 |

VELDBELASTINGEN

Balk 5-3 B.G:2 variabel bg



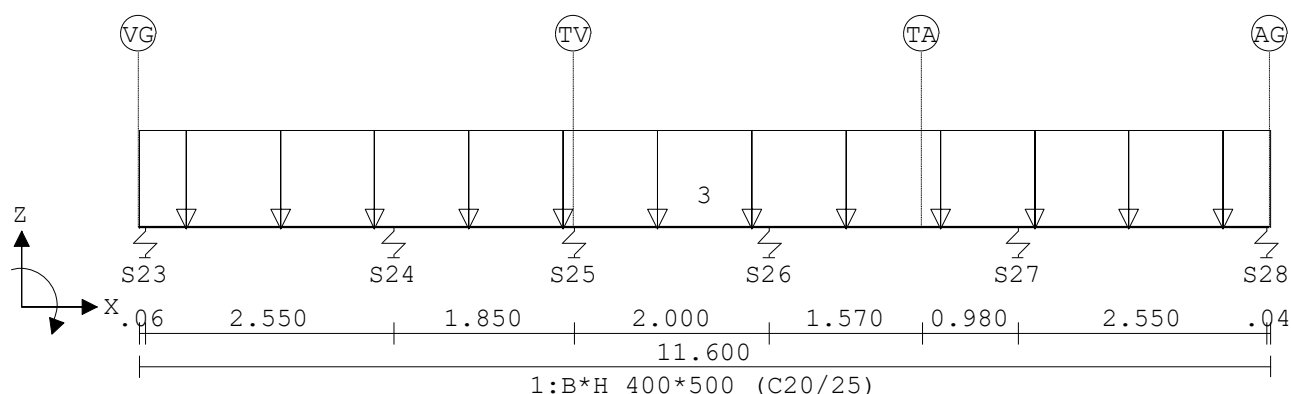
VELDBELASTINGEN

B.G:2 variabel bg

| Balk | Last Type | q1/p/m | q2 | Afstand | Lengte | Exc. |
|----------|------------|--------|--------|---------|--------|-------|
| Balk 5-3 | 1 1:q-last | -3.000 | -3.000 | 0.000 | 11.600 | 0.000 |

VELDBELASTINGEN

Balk 5-4 B.G:2 variabel bg



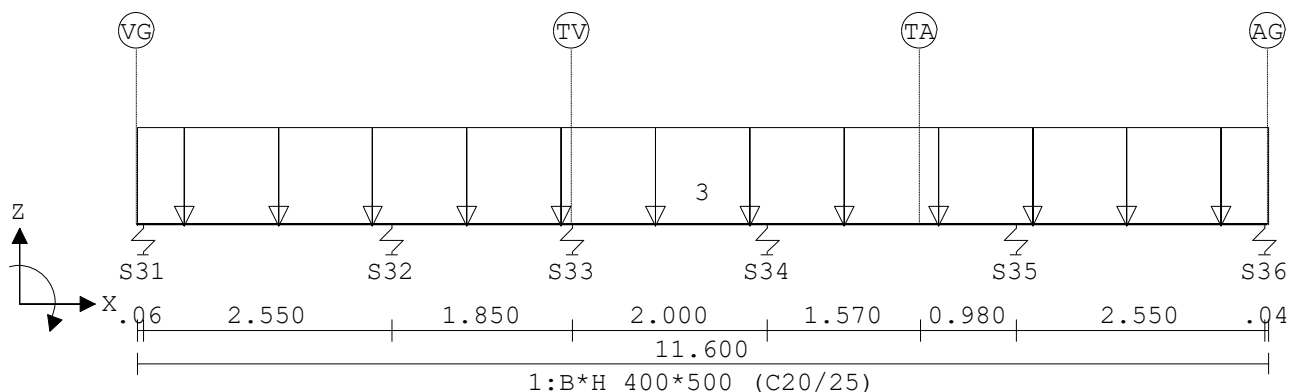
VELDBELASTINGEN

B.G:2 variabel bg

| Balk | Last Type | q1/p/m | q2 | Afstand | Lengte | Exc. |
|----------|------------|--------|--------|---------|--------|-------|
| Balk 5-4 | 1 1:q-last | -3.000 | -3.000 | 0.000 | 11.600 | 0.000 |

VELDBELASTINGEN

Balk 5-5 B.G:2 variabel bg



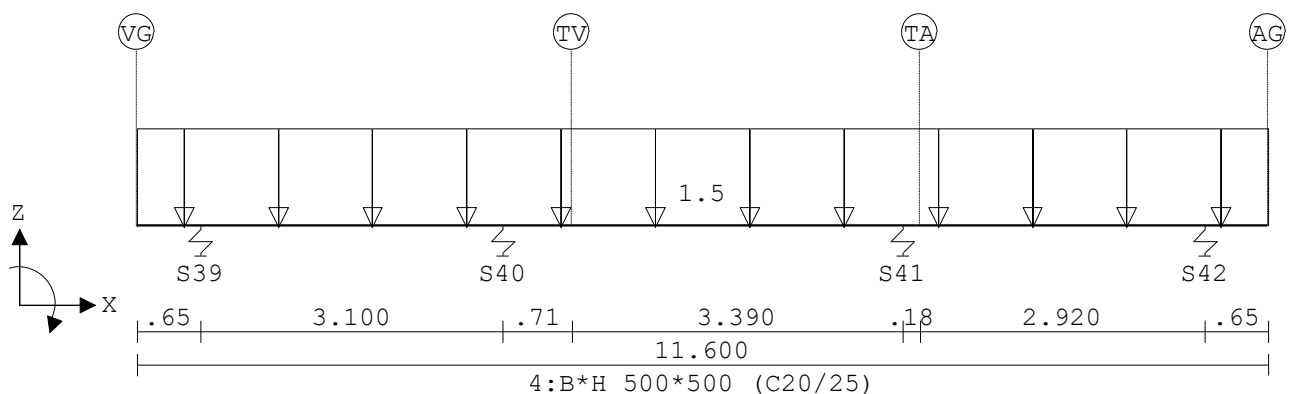
VELDBELASTINGEN

B.G:2 variabel bg

| Balk | Last Type | q1/p/m | q2 | Afstand | Lengte | Exc. |
|----------|------------|--------|--------|---------|--------|-------|
| Balk 5-5 | 1 1:q-last | -3.000 | -3.000 | 0.000 | 11.600 | 0.000 |

VELDBELASTINGEN

Balk 5-6 B.G:2 variabel bg



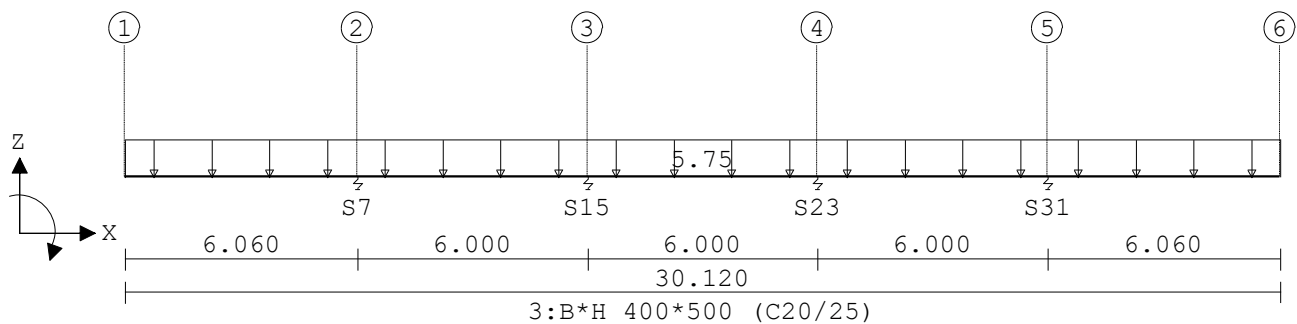
VELDBELASTINGEN

B.G:2 variabel bg

| Balk | Last Type | q1/p/m | q2 | Afstand | Lengte | Exc. |
|----------|------------|--------|--------|---------|--------|-------|
| Balk 5-6 | 1 1:q-last | -1.500 | -1.500 | 0.000 | 11.600 | 0.000 |

VELDBELASTINGEN

Balk 5-A B.G:2 variabel bg



VELDBELASTINGEN

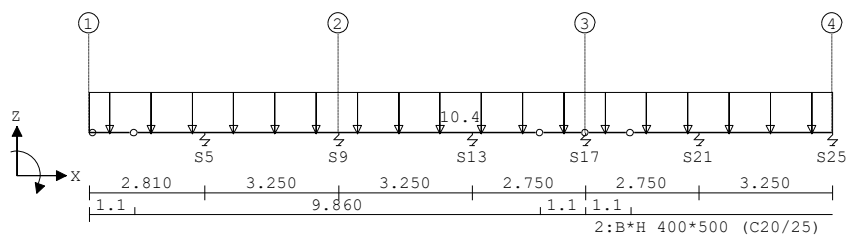
B.G:2 variabel bg

| Balk | Last Type | q1/p/m | q2 | Afstand | Lengte | Exc. |
|----------|------------|--------|--------|---------|--------|-------|
| Balk 5-A | 1 1:q-last | -5.750 | -5.750 | 0.000 | 30.120 | 0.100 |

VELDBELASTINGEN

Balk 5-B B.G:2 variabel bg

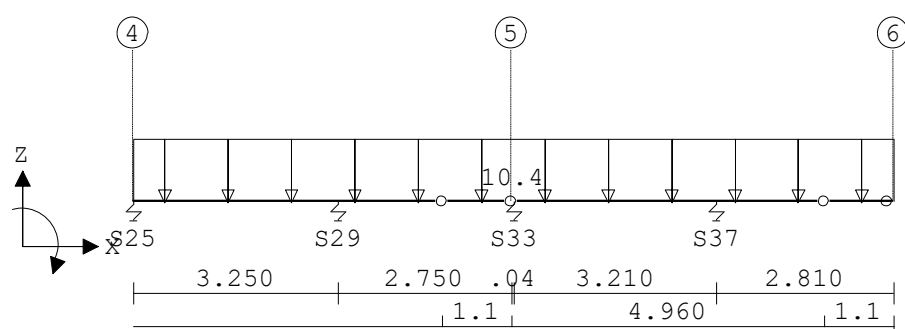
Velden: 1 t/m 6



VELDBELASTINGEN

Balk 5-B B.G:2 variabel bg

Velden: 7 t/m 10



VELDBELASTINGEN

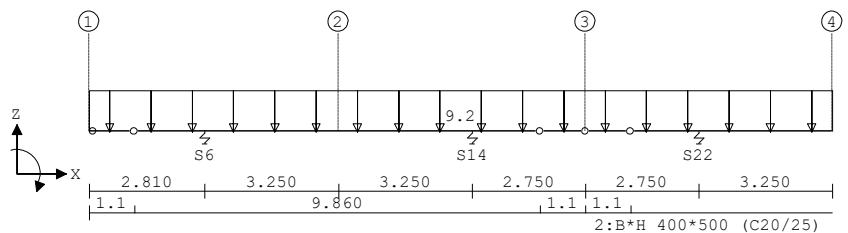
B.G:2 variabel bg

| Balk | Last Type | q1/p/m | q2 | Afstand | Lengte | Exc. |
|----------|------------|---------|---------|---------|--------|-------|
| Balk 5-B | 1 1:q-last | -10.400 | -10.400 | 0.000 | 30.120 | 0.000 |

VELDBELASTINGEN

Balk 5-C B.G:2 variabel bg

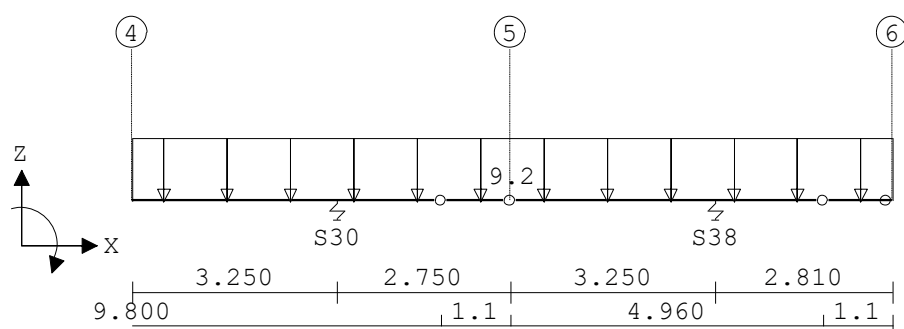
Velden: 1 t/m 6



VELDBELASTINGEN

Balk 5-C B.G:2 variabel bg

Velden: 7 t/m 10



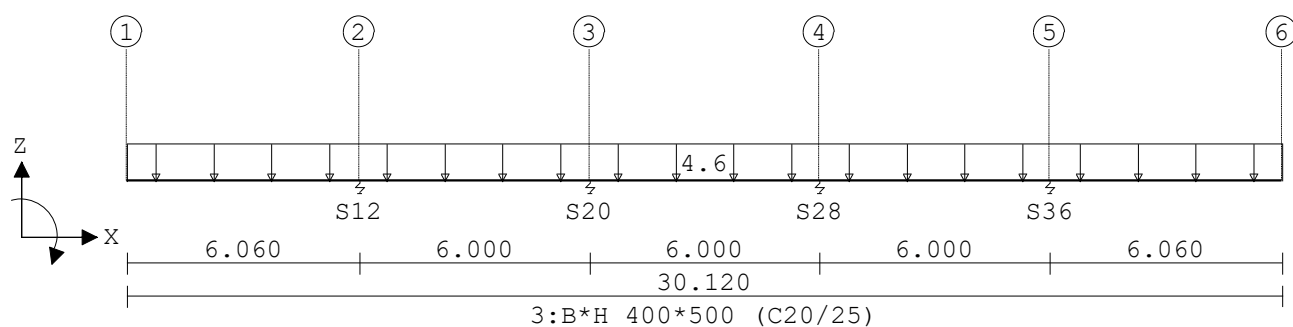
VELDBELASTINGEN

B.G:2 variabel bg

| Balk | Last Type | q1/p/m | q2 | Afstand | Lengte | Exc. |
|----------|------------|--------|--------|---------|--------|-------|
| Balk 5-C | 1 1:q-last | -9.200 | -9.200 | 0.000 | 30.120 | 0.000 |

VELDBELASTINGEN

Balk 5-D B.G:2 variabel bg



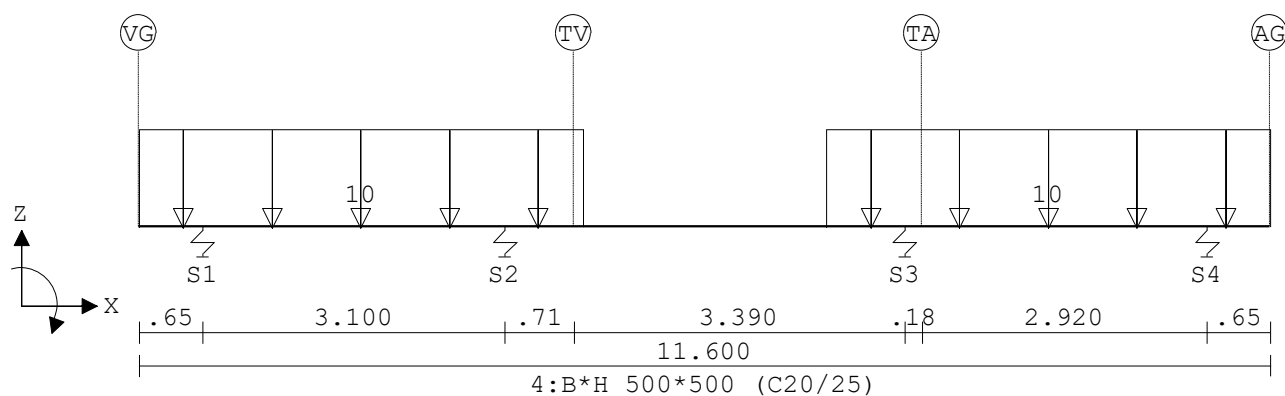
VELDBELASTINGEN

B.G:2 variabel bg

| Balk | Last Type | q1/p/m | q2 | Afstand | Lengte | Exc. |
|----------|------------|--------|--------|---------|--------|--------|
| Balk 5-D | 1 1:q-last | -4.600 | -4.600 | 0.000 | 30.120 | -0.100 |

VELDBELASTINGEN

Balk 5-1 B.G:3 variabel 1e



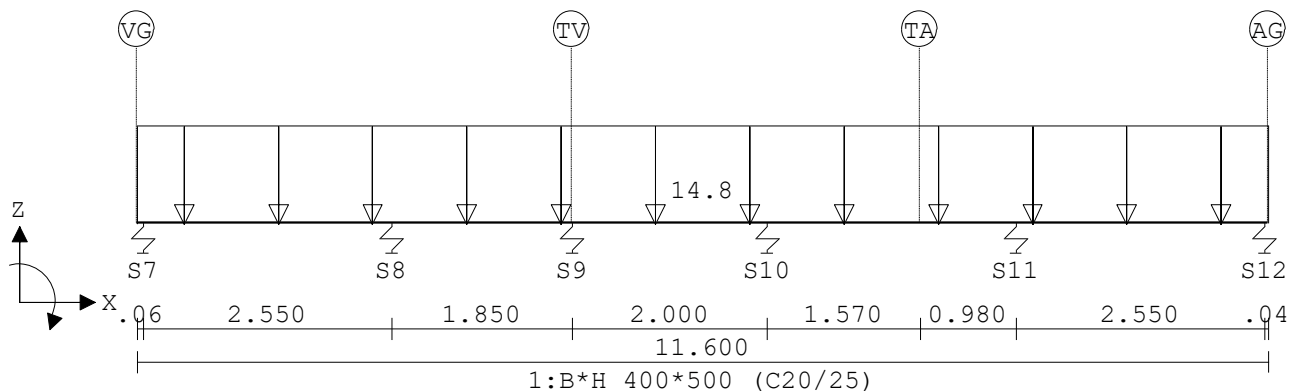
VELDBELASTINGEN

B.G:3 variabel 1e

| Balk | Last Type | q1/p/m | q2 | Afstand | Lengte | Exc. |
|----------|------------|---------|---------|---------|--------|-------|
| Balk 5-1 | 1 1:q-last | -10.000 | -10.000 | 0.000 | 4.550 | 0.000 |
| Balk 5-1 | 2 1:q-last | -10.000 | -10.000 | 7.050 | 4.550 | 0.000 |

VELDBELASTINGEN

Balk 5-2 B.G:3 variabel 1e



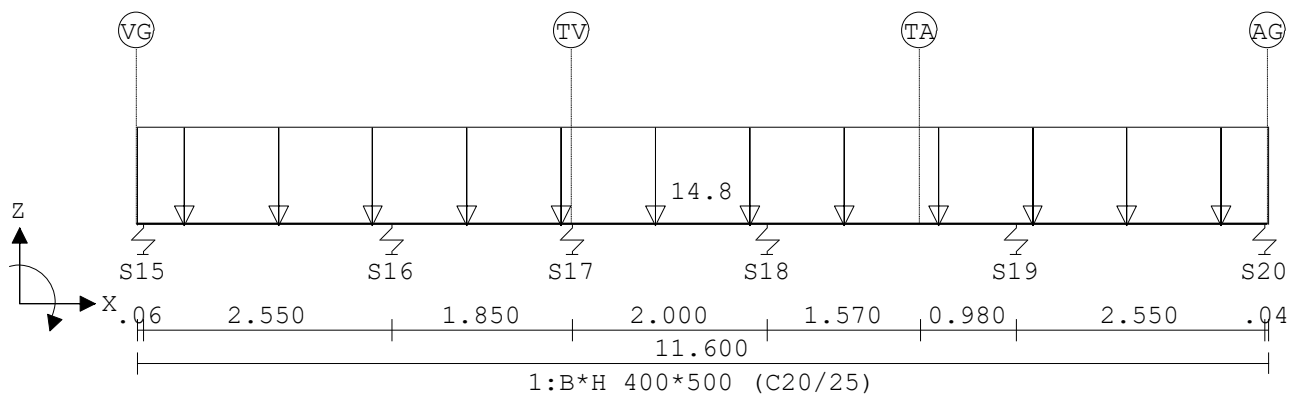
VELDBELASTINGEN

B.G:3 variabel 1e

| Balk | Last Type | q1/p/m | q2 | Afstand | Lengte | Exc. |
|----------|------------|---------|---------|---------|--------|-------|
| Balk 5-2 | 1 1:q-last | -14.800 | -14.800 | 0.000 | 11.600 | 0.000 |

VELDBELASTINGEN

Balk 5-3 B.G:3 variabel 1e



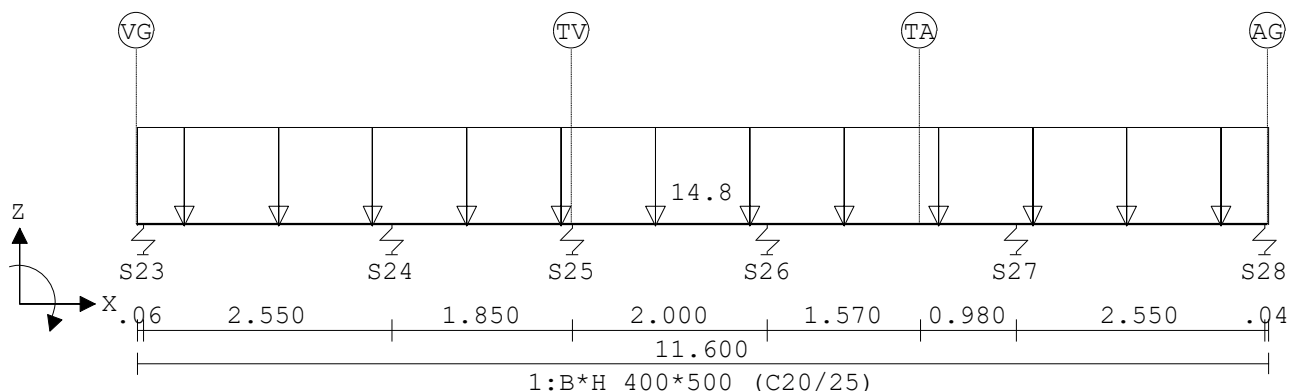
VELDBELASTINGEN

B.G:3 variabel 1e

| Balk | Last Type | q1/p/m | q2 | Afstand | Lengte | Exc. |
|----------|------------|---------|---------|---------|--------|-------|
| Balk 5-3 | 1 1:q-last | -14.800 | -14.800 | 0.000 | 11.600 | 0.000 |

VELDBELASTINGEN

Balk 5-4 B.G:3 variabel 1e



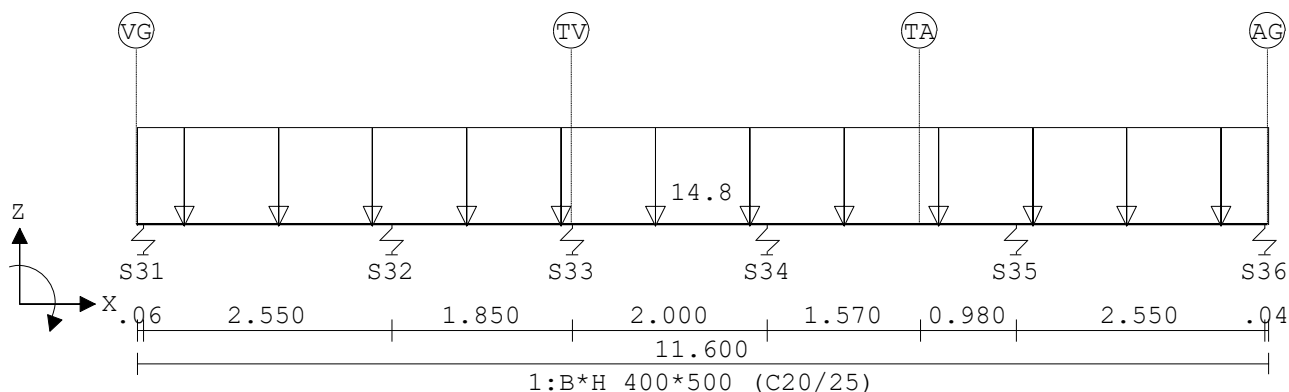
VELDBELASTINGEN

B.G:3 variabel 1e

| Balk | Last Type | q1/p/m | q2 | Afstand | Lengte | Exc. |
|----------|------------|---------|---------|---------|--------|-------|
| Balk 5-4 | 1 1:q-last | -14.800 | -14.800 | 0.000 | 11.600 | 0.000 |

VELDBELASTINGEN

Balk 5-5 B.G:3 variabel 1e

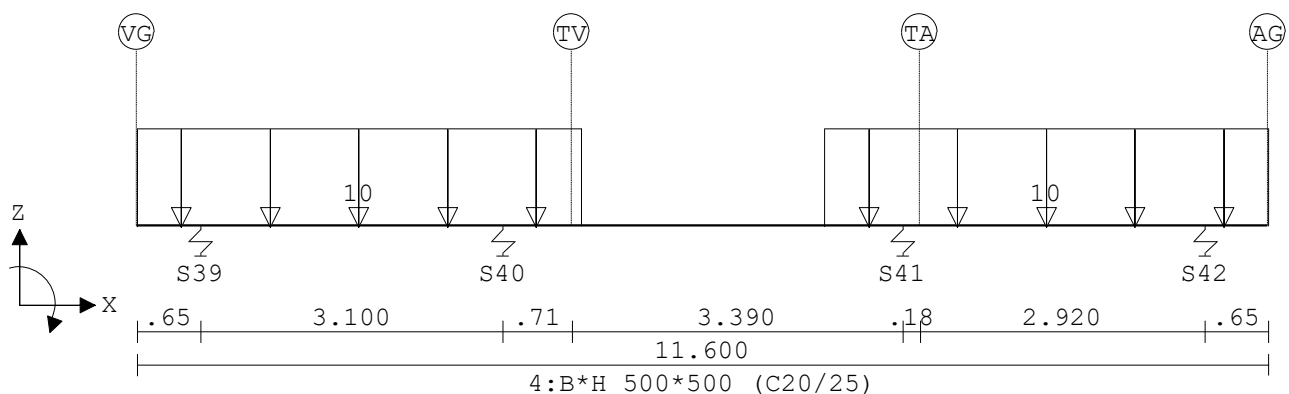

VELDBELASTINGEN

B.G:3 variabel 1e

| Balk | Last Type | q1/p/m | q2 | Afstand | Lengte | Exc. |
|----------|------------|---------|---------|---------|--------|-------|
| Balk 5-5 | 1 1:q-last | -14.800 | -14.800 | 0.000 | 11.600 | 0.000 |

VELDBELASTINGEN

Balk 5-6 B.G:3 variabel 1e


VELDBELASTINGEN

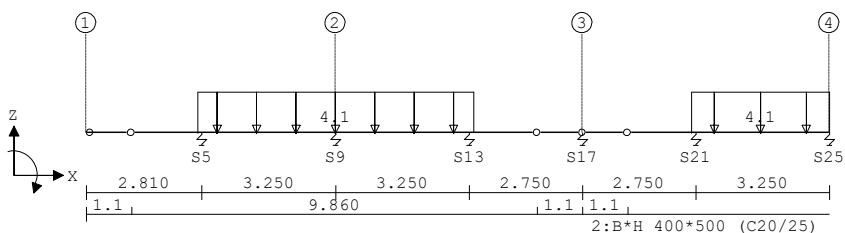
B.G:3 variabel 1e

| Balk | Last Type | q1/p/m | q2 | Afstand | Lengte | Exc. |
|----------|------------|---------|---------|---------|--------|-------|
| Balk 5-6 | 1 1:q-last | -10.000 | -10.000 | 0.000 | 4.550 | 0.000 |
| Balk 5-6 | 2 1:q-last | -10.000 | -10.000 | 7.050 | 4.550 | 0.000 |

VELDBELASTINGEN

Balk 5-B B.G:3 variabel 1e

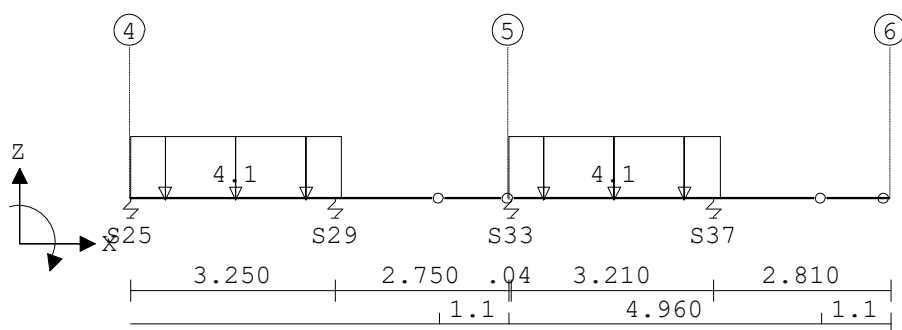
Velden: 1 t/m 6



VELDBELASTINGEN

Balk 5-B B.G:3 variabel 1e

Velden: 7 t/m 10



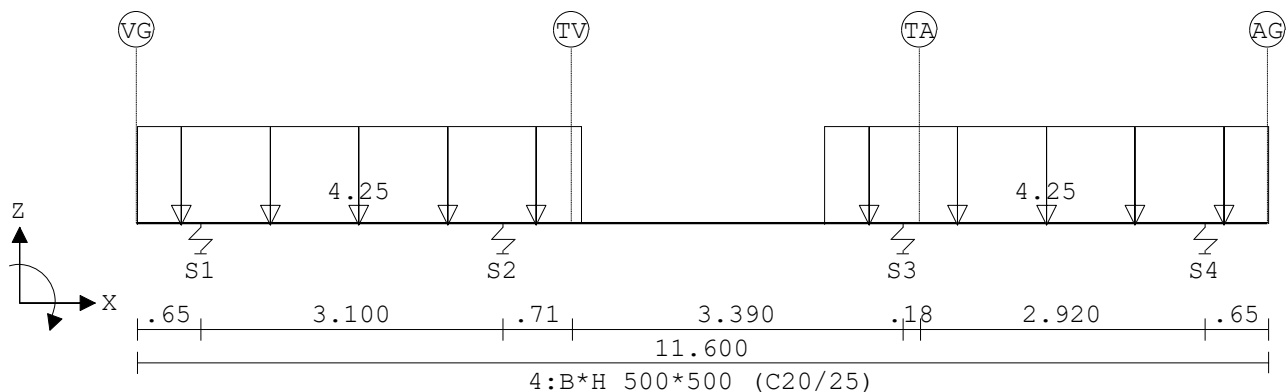
VELDBELASTINGEN

B.G:3 variabel 1e

| Balk | Last | Type | q1/p/m | q2 | Afstand | Lengte | Exc. |
|----------|------|----------|--------|--------|---------|--------|-------|
| Balk 5-B | 1 | 1:q-last | -4.100 | -4.100 | 2.710 | 6.700 | 0.000 |
| Balk 5-B | 2 | 1:q-last | -4.100 | -4.100 | 14.710 | 6.700 | 0.000 |
| Balk 5-B | 3 | 1:q-last | -4.100 | -4.100 | 24.060 | 3.350 | 0.000 |

VELDBELASTINGEN

Balk 5-1 B.G:4 variabel 2e



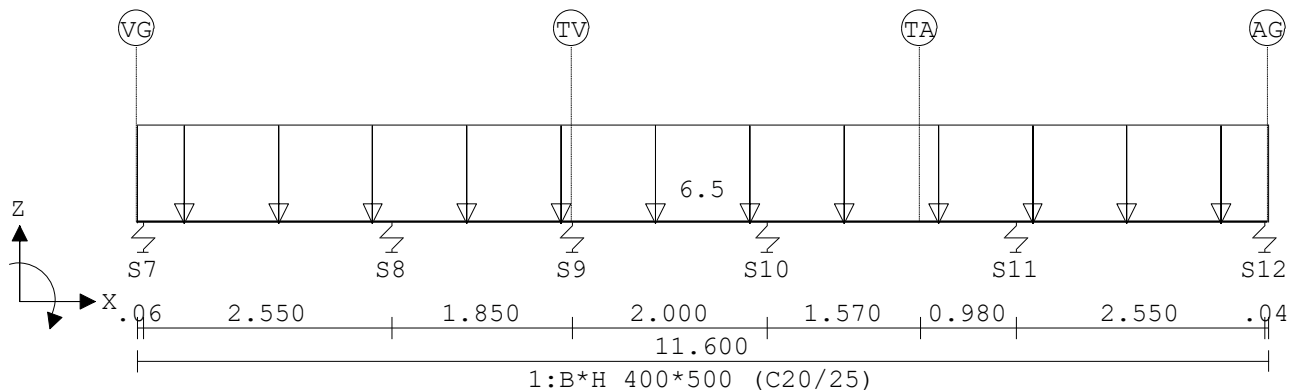
VELDBELASTINGEN

B.G:4 variabel 2e

| Balk | Last | Type | q1/p/m | q2 | Afstand | Lengte | Exc. |
|----------|------|----------|--------|--------|---------|--------|-------|
| Balk 5-1 | 1 | 1:q-last | -4.250 | -4.250 | 0.000 | 4.550 | 0.000 |
| Balk 5-1 | 2 | 1:q-last | -4.250 | -4.250 | 7.050 | 4.550 | 0.000 |

VELDBELASTINGEN

Balk 5-2 B.G:4 variabel 2e



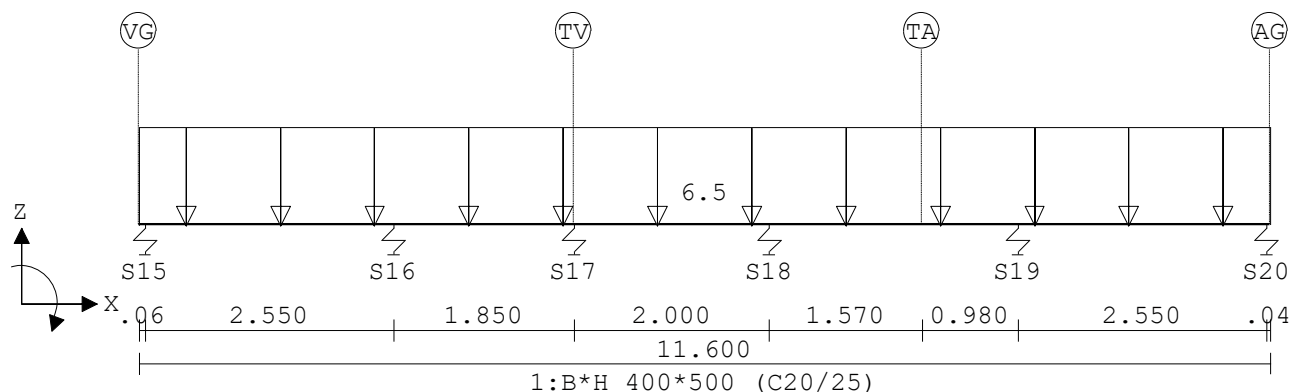
VELDBELASTINGEN

B.G:4 variabel 2e

| Balk | Last Type | q1/p/m | q2 | Afstand | Lengte | Exc. |
|----------|------------|--------|--------|---------|--------|-------|
| Balk 5-2 | 1 1:q-last | -6.500 | -6.500 | 0.000 | 11.600 | 0.000 |

VELDBELASTINGEN

Balk 5-3 B.G:4 variabel 2e

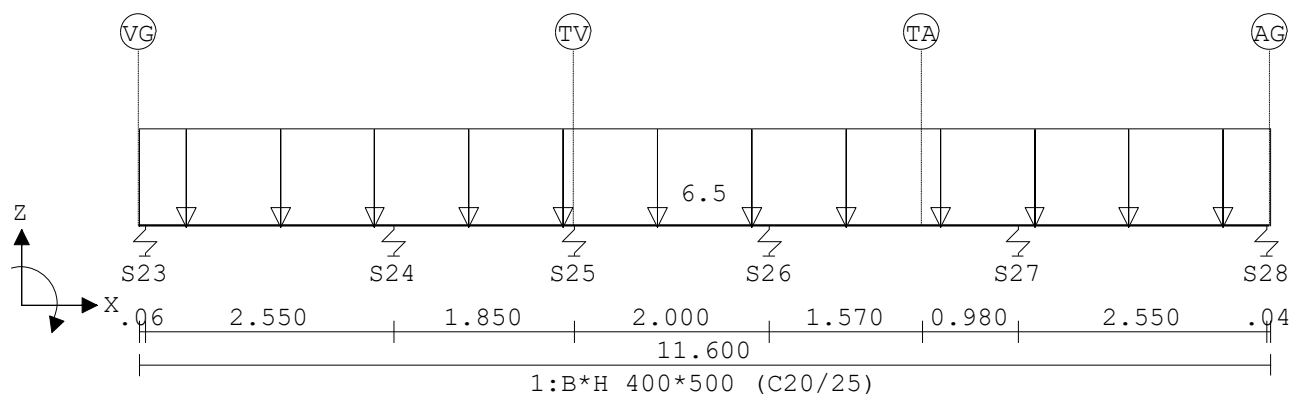

VELDBELASTINGEN

B.G:4 variabel 2e

| Balk | Last Type | q1/p/m | q2 | Afstand | Lengte | Exc. |
|----------|------------|--------|--------|---------|--------|-------|
| Balk 5-3 | 1 1:q-last | -6.500 | -6.500 | 0.000 | 11.600 | 0.000 |

VELDBELASTINGEN

Balk 5-4 B.G:4 variabel 2e

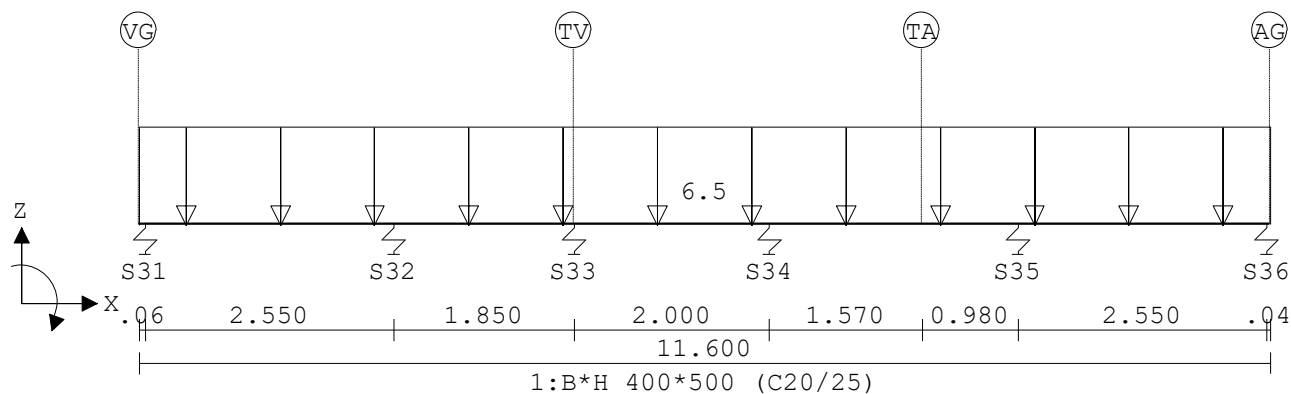

VELDBELASTINGEN

B.G:4 variabel 2e

| Balk | Last Type | q1/p/m | q2 | Afstand | Lengte | Exc. |
|----------|------------|--------|--------|---------|--------|-------|
| Balk 5-4 | 1 1:q-last | -6.500 | -6.500 | 0.000 | 11.600 | 0.000 |

VELDBELASTINGEN

Balk 5-5 B.G:4 variabel 2e



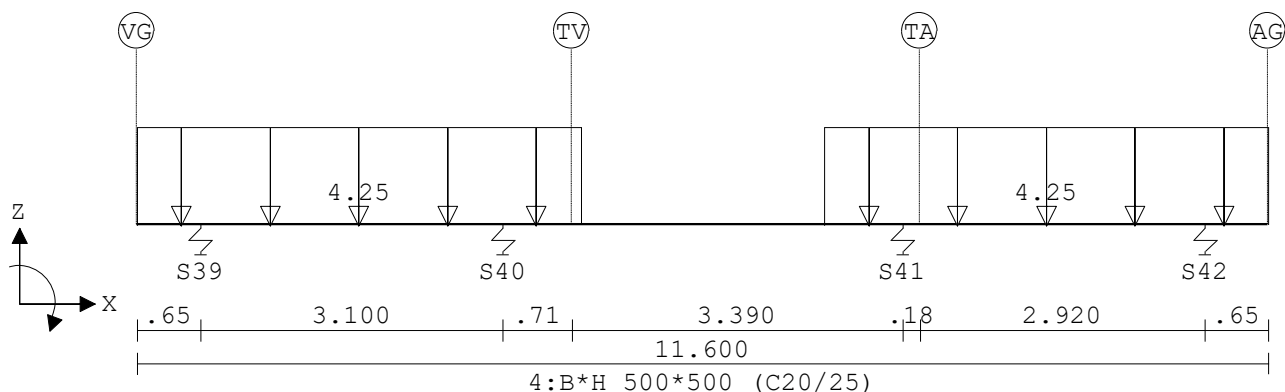
VELDBELASTINGEN

B.G:4 variabel 2e

| Balk | Last Type | q1/p/m | q2 | Afstand | Lengte | Exc. |
|----------|------------|--------|--------|---------|--------|-------|
| Balk 5-5 | 1 1:q-last | -6.500 | -6.500 | 0.000 | 11.600 | 0.000 |

VELDBELASTINGEN

Balk 5-6 B.G:4 variabel 2e



VELDBELASTINGEN

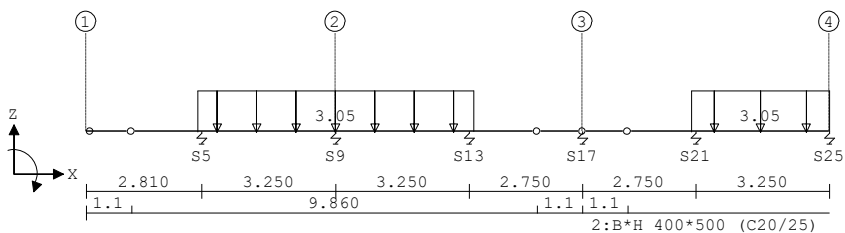
B.G:4 variabel 2e

| Balk | Last Type | q1/p/m | q2 | Afstand | Lengte | Exc. |
|----------|------------|--------|--------|---------|--------|-------|
| Balk 5-6 | 1 1:q-last | -4.250 | -4.250 | 0.000 | 4.550 | 0.000 |
| Balk 5-6 | 2 1:q-last | -4.250 | -4.250 | 7.050 | 4.550 | 0.000 |

VELDBELASTINGEN

Balk 5-B B.G:4 variabel 2e

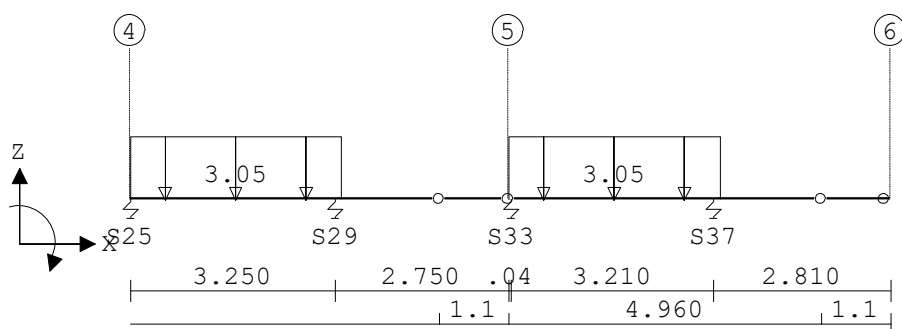
Velden: 1 t/m 6



VELDBELASTINGEN

Balk 5-B B.G:4 variabel 2e

Velden: 7 t/m 10



VELDBELASTINGEN

B.G:4 variabel 2e

| Balk | Last Type | q1/p/m | q2 | Afstand | Lengte | Exc. |
|----------|------------|--------|--------|---------|--------|-------|
| Balk 5-B | 1 1:q-last | -3.050 | -3.050 | 2.710 | 6.700 | 0.000 |
| Balk 5-B | 2 1:q-last | -3.050 | -3.050 | 14.710 | 6.700 | 0.000 |
| Balk 5-B | 3 1:q-last | -3.050 | -3.050 | 24.060 | 3.350 | 0.000 |

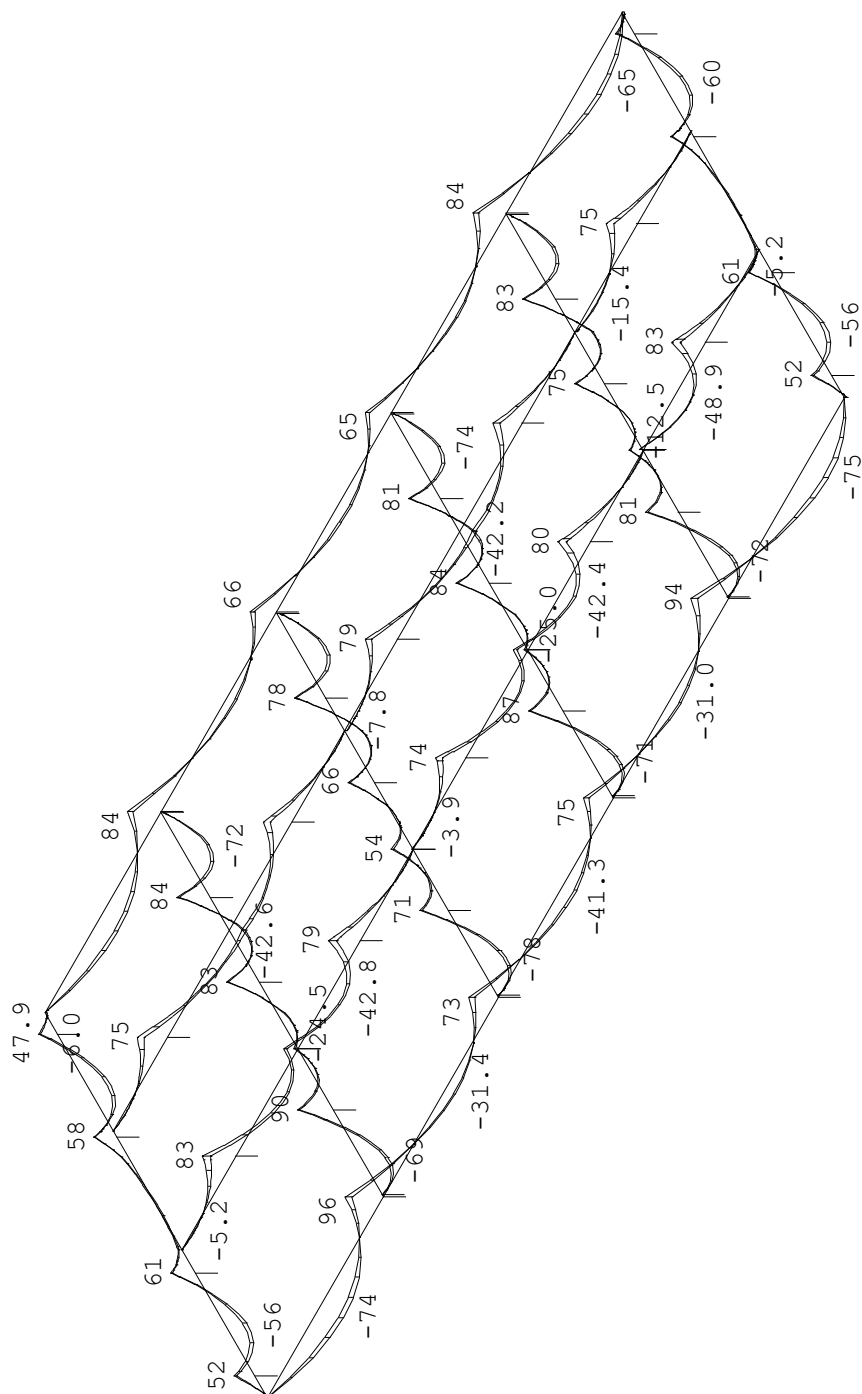
BELASTINGCOMBINATIES

| BC Type | BG Gen. Factor | BG Gen. Factor | BG Gen. Factor | BG Gen. Factor |
|----------|----------------|----------------|----------------|----------------|
| 1 Fund. | 1 Perm 1.22 | 2 psi0 1.35 | 3 psi0 1.35 | 4 psi0 1.35 |
| 2 Fund. | 1 Perm 1.08 | 2 Extr 1.35 | 3 Extr 1.35 | 4 psi0 1.35 |
| 3 Fund. | 1 Perm 1.08 | 2 Extr 1.35 | 3 psi0 1.35 | 4 Extr 1.35 |
| 4 Fund. | 1 Perm 1.08 | 2 psi0 1.35 | 3 Extr 1.35 | 4 Extr 1.35 |
| 5 Kar. | 1 Perm 1.00 | 2 Extr 1.00 | 3 Extr 1.00 | 4 psi0 1.00 |
| 6 Kar. | 1 Perm 1.00 | 2 Extr 1.00 | 3 psi0 1.00 | 4 Extr 1.00 |
| 7 Kar. | 1 Perm 1.00 | 2 psi0 1.00 | 3 Extr 1.00 | 4 Extr 1.00 |
| 8 Freq. | 1 Perm 1.00 | | | |
| 9 Freq. | 1 Perm 1.00 | 2 psi1 1.00 | 3 psi1 1.00 | 4 psi1 1.00 |
| 10 Quas. | 1 Perm 1.00 | | | |
| 11 Quas. | 1 Perm 1.00 | 2 psi2 1.00 | 3 psi2 1.00 | 4 psi2 1.00 |
| 12 Blij. | 1 Perm 1.00 | | | |

OMHULLENDE VAN DE FUNDAMENTELE COMBINATIES

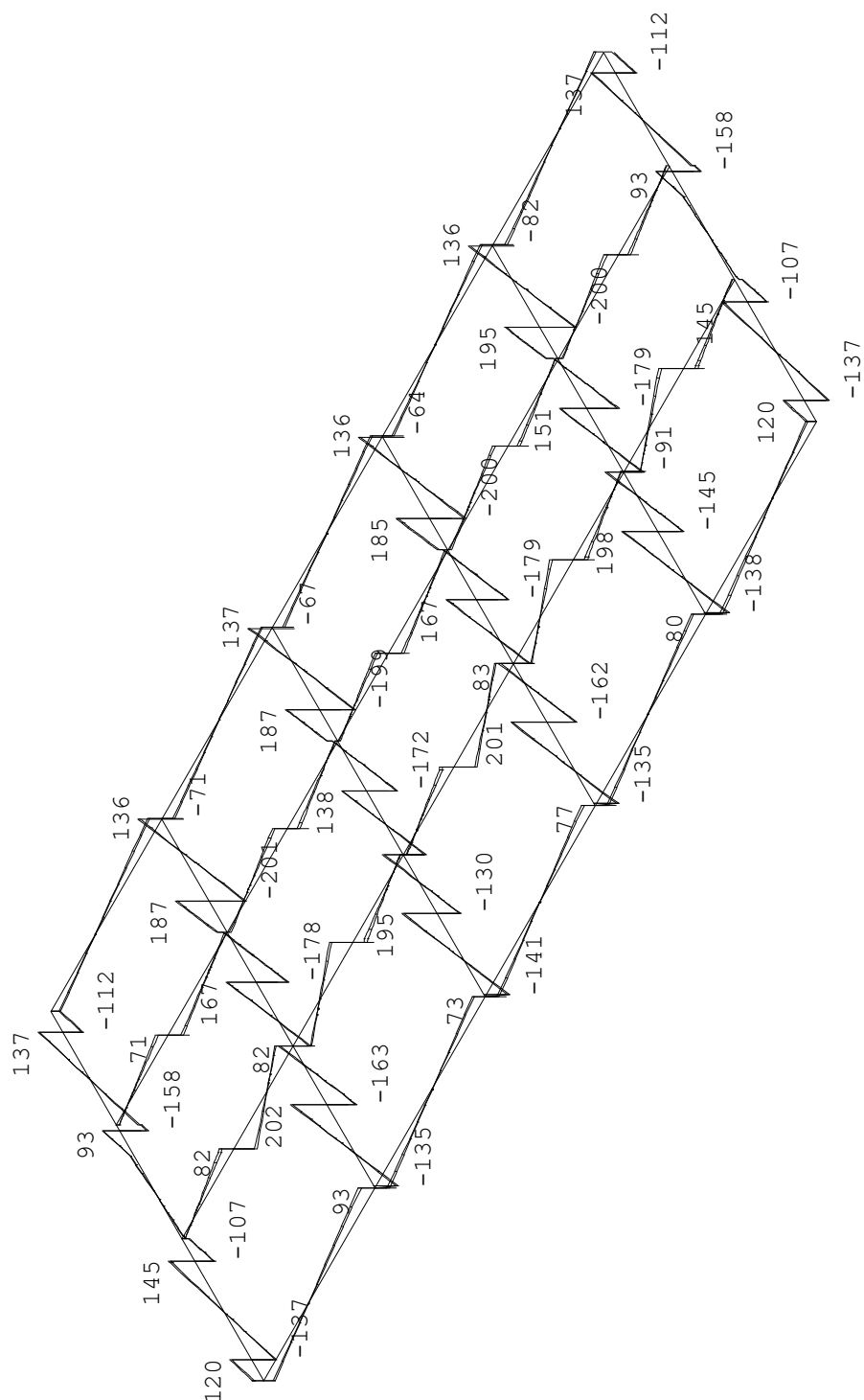
MOMENTEN Fysisch lineair

Fundamentele combinatie



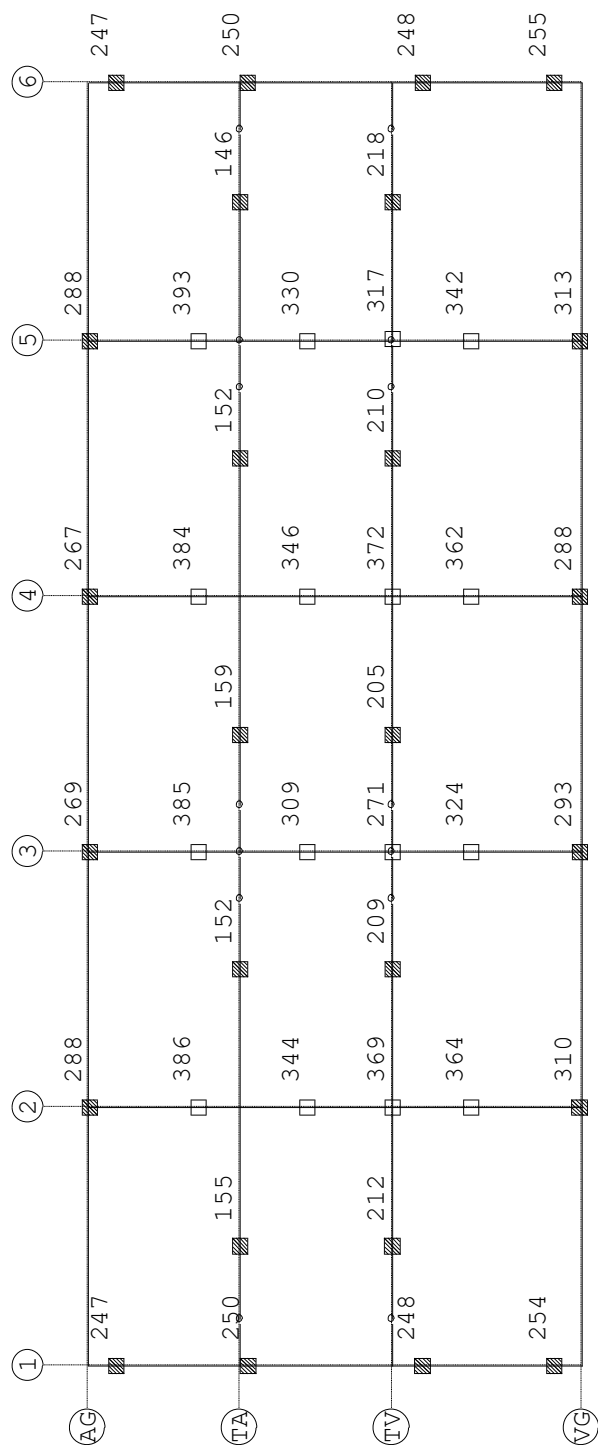
DWARSKRACHTEN Fysisch lineair

Fundamentele combinatie



REACTIES Fysisch lineair

Fundamentele combinatie



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

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

Algemeen

Materiaal : C20/25

Doorsnede

breedte : 400 hoogte : 500 zwaartepunt tov onderkant : 250

Fictieve dikte : 222.2

Betonkwaliteit element : C20/25 Kruipcoëf. : 3.010

Staalkwaliteit hoofdwapening : 500 ϵ_{uk} : 2.50

Staalkwaliteit beugels : 500

Betondekking

Milieu : Boven XC4 Onder XC4

Hoofdwapening : 2de laag 2de laag

Nominale dekking : 35 35

Toegepaste dekking : 43 43

Toegepaste zijdekking : 48

Beugel / Verdeelwapening : 1ste laag 1ste laag

Nominale dekking : 35 35

Toegepaste dekking : 35 35

Toegepaste zijdekking : 40

Wapening

Basiswapening buitenste laag : Boven 1x12+3x16 Onder 4x12

H.o.h.afstand 2e laag : 0 0

Beugels

Beugeldiameter : 8

Min. hoek betondrukdiagonaal θ : 21.8 z berekenen via: MEd**PROFIELGEGEVENS Balk****[N] [mm]**

t.b.v. profiel:2 B*H 400*500

Algemeen

Materiaal : C20/25

Doorsnede

breedte : 400 hoogte : 500 zwaartepunt tov onderkant : 250

Fictieve dikte : 222.2

Betonkwaliteit element : C20/25 Kruipcoëf. : 3.010

Staalkwaliteit hoofdwapening : 500 ϵ_{uk} : 2.50

Staalkwaliteit beugels : 500

Betondekking

Milieu : Boven XC4 Onder XC4

Hoofdwapening : 2de laag 2de laag

Nominale dekking : 35 35

Toegepaste dekking : 43 48

Toegepaste zijdekking : 43

Beugel / Verdeelwapening : 1ste laag 1ste laag

Nominale dekking : 35 35

Toegepaste dekking : 35 40

Toegepaste zijdekking : 35

Wapening

Basiswapening buitenste laag : Boven 3x12+1x16 Onder 4x12

H.o.h.afstand 2e laag : 0 0

Beugels

Beugeldiameter : 8

Min. hoek betondrukdiagonaal θ : 21.8 z berekenen via: MEd

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

t.b.v. profiel:3 B*H 400*500

Algemeen

Materiaal : C20/25

Doorsnede

breedte : 400 hoogte : 500 zwaartepunt tov onderkant : 250

Fictieve dikte : 222.2

Betonkwaliteit element : C20/25 Kruipcoëf. : 3.010

Staalkwaliteit hoofdwapening : 500 ϵ_{uk} : 2.50

Staalkwaliteit beugels : 500

Betondekking

Milieu : Boven XC4 Onder XC4

Hoofdwapening : 2de laag 2de laag

Nominale dekking : 35 35

Toegepaste dekking : 43 48

Toegepaste zijdekking : 43

Beugel / Verdeelwapening : 1ste laag 1ste laag

Nominale dekking : 35 35

Toegepaste dekking : 35 40

Toegepaste zijdekking : 35

Wapening

Basiswapening buitenste laag : Boven 2x12+2x16 Onder 4x12

H.o.h.afstand 2e laag : 0 0

Beugels

Beugeldiameter : 8

Min. hoek betondrukdiagonaal θ : 21.8 z berekenen via: MEd**PROFIELGEGEVENS Balk****[N] [mm]**

t.b.v. profiel:4 B*H 500*500

Algemeen

Materiaal : C20/25

Doorsnede

breedte : 500 hoogte : 500 zwaartepunt tov onderkant : 250

Fictieve dikte : 250.0

Betonkwaliteit element : C20/25 Kruipcoëf. : 3.010

Staalkwaliteit hoofdwapening : 500 ϵ_{uk} : 2.50

Staalkwaliteit beugels : 500

Betondekking

Milieu : Boven XC4 Onder XC4

Hoofdwapening : 2de laag 2de laag

Nominale dekking : 35 35

Toegepaste dekking : 43 48

Toegepaste zijdekking : 43

Beugel / Verdeelwapening : 1ste laag 1ste laag

Nominale dekking : 35 35

Toegepaste dekking : 35 40

Toegepaste zijdekking : 35

Wapening

Basiswapening buitenste laag : Boven 5x12 Onder 4x12

H.o.h.afstand 2e laag : 0 0

Beugels

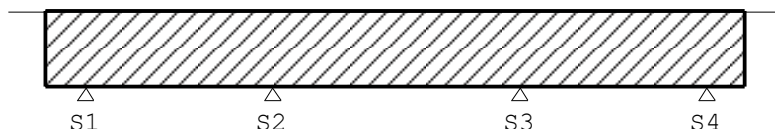
Beugeldiameter : 8

Min. hoek betondrukdiagonaal θ : 21.8 z berekenen via: MEd

Hoofdwapening Fysisch lineair

Balk 5-1

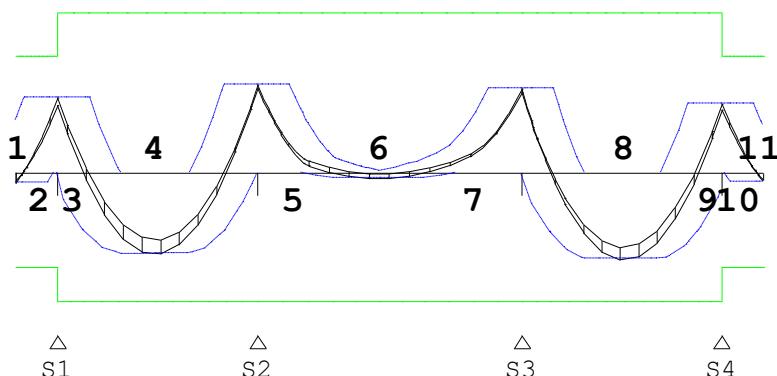
5x12 a



4x12 b

MEd dekkingslijn Fysisch lineair

Balk 5-1



Hoofdwapening

Balk 5-1

| Geb. | Pos. [mm] | M_{Ed} [kNm] | M_{Rd} [kNm] | z | B/O | A_b [mm ²] | A_a [mm ²] | Basiswapening +Bijlegwapening | Opm. |
|------|--------------|-------------------|-------------------|-----|-----|-----------------------------|-----------------------------|----------------------------------|----------|
| 1 | S1-650 | -6.75 | -64.91 | 330 | Ond | 191* | 453 | 4x12 | 2,54,110 |
| 2 | S1-0 | 52.18 | 81.14 | 330 | Bov | 364 | 566 | 5x12 | 2,110 |
| 3 | S1+0 | 52.18 | 110.80 | 414 | Bov | 262 | 566 | 5x12 | |
| 4 | S1+1503 | -56.11 | -88.57 | 391 | Ond | 285 | 453 | 4x12 | |
| 5 | S2+0 | 61.09 | 110.80 | 414 | Bov | 307 | 566 | 5x12 | |
| 6 | S2+1881 | -3.82 | -88.57 | 391 | Ond | 191* | 453 | 4x12 | 54 |
| 7 | S3+0 | 58.19 | 110.80 | 414 | Bov | 292 | 566 | 5x12 | |
| 8 | S4-1508 | -59.88 | -88.57 | 391 | Ond | 304 | 453 | 4x12 | |
| 9 | S4-0 | 47.90 | 110.80 | 414 | Bov | 254* | 566 | 5x12 | 1 |
| 10 | S4+0 | 47.90 | 81.14 | 330 | Bov | 354* | 566 | 5x12 | 1,2,110 |
| 11 | S4+650 | -5.95 | -64.91 | 330 | Ond | 191* | 453 | 4x12 | 2,54,110 |

Opmerkingen

- [1] * = Eisen met betrekking tot minimum wapening zijn toegepast, zie nationale bijlage art. 9.2.1.1(1).
- [2] Benodigde wapening en inwendige hefboomsarm zijn bepaald volgens gedrongen ligger detaillering, zie nationale bijlage art. 6.1(10).
- [54] * = Eisen met betrekking tot minimum wapening ten behoeve van gecontroleerde scheurvorming zijn toegepast volgens art. 7.3.2.
- [110] **Art. 9.7 (1), (2): Een orthogonaal wapeningsnet dient toegepast te worden aan iedere zijde van de gedrongen liggers:**
Profiel 4 - B*H 500*500: 500 mm²/m aan elke zijde en in elke richting met een maximaal hoh 300 mm.

Scheurvorming volgens artikel 7.3.4

Balk 5-1

| Geb. | Pos. [mm] | Zijde | $M_E; freq$ [kNm] | S_r, max [mm] | $\epsilon_{sm} - \epsilon_{cm}$ [%] | w_k [mm] | k_x | w_{max} [mm] | U.C. | Opm. |
|------|--------------|-------|----------------------|--------------------|--|---------------|-------|-------------------|------|------|
| 1 | S1-650 | Bov | 28.59 | 367 | 0.357 | 0.131 | 1.00 | 0.300 | 0.44 | |
| 1 | S1-490 | Bov | 41.09 | 367 | 0.513 | 0.188 | 1.00 | 0.300 | 0.63 | |
| 1 | S1-650 | Ond | -4.87 | 408 | 0.076 | 0.031 | 1.14 | 0.343 | 0.09 | |
| 1 | S1-176 | Ond | -4.87 | 408 | 0.076 | 0.031 | 1.14 | 0.343 | 0.09 | |
| 2 | S1+474 | Bov | 41.09 | 367 | 0.513 | 0.188 | 1.00 | 0.300 | 0.63 | |
| 2 | S2-266 | Bov | 50.12 | 367 | 0.625 | 0.230 | 1.00 | 0.300 | 0.77 | |
| 2 | S1+1503 | Ond | -42.90 | 408 | 0.673 | 0.275 | 1.14 | 0.343 | 0.80 | |
| 3 | S2+333 | Bov | 50.12 | 367 | 0.625 | 0.230 | 1.00 | 0.300 | 0.77 | |
| 3 | S3-389 | Bov | 48.10 | 367 | 0.600 | 0.220 | 1.00 | 0.300 | 0.73 | |
| 3 | S2+1527 | Ond | -2.70 | 408 | 0.042 | 0.017 | 1.14 | 0.343 | 0.05 | |
| 3 | S3-1865 | Ond | -2.70 | 408 | 0.042 | 0.017 | 1.14 | 0.343 | 0.05 | |
| 4 | S3+468 | Bov | 48.10 | 367 | 0.600 | 0.220 | 1.00 | 0.300 | 0.73 | |
| 4 | S4-424 | Bov | 38.27 | 367 | 0.478 | 0.175 | 1.00 | 0.300 | 0.58 | |
| 4 | S4-1508 | Ond | -46.39 | 408 | 0.728 | 0.297 | 1.14 | 0.343 | 0.87 | |
| 5 | S4+490 | Bov | 38.27 | 367 | 0.478 | 0.175 | 1.00 | 0.300 | 0.58 | |
| 5 | S4+194 | Ond | -4.36 | 408 | 0.068 | 0.028 | 1.14 | 0.343 | 0.08 | |
| 5 | S4+650 | Ond | -4.36 | 408 | 0.068 | 0.028 | 1.14 | 0.343 | 0.08 | |

Verloop hoofdwapening

Balk 5-1

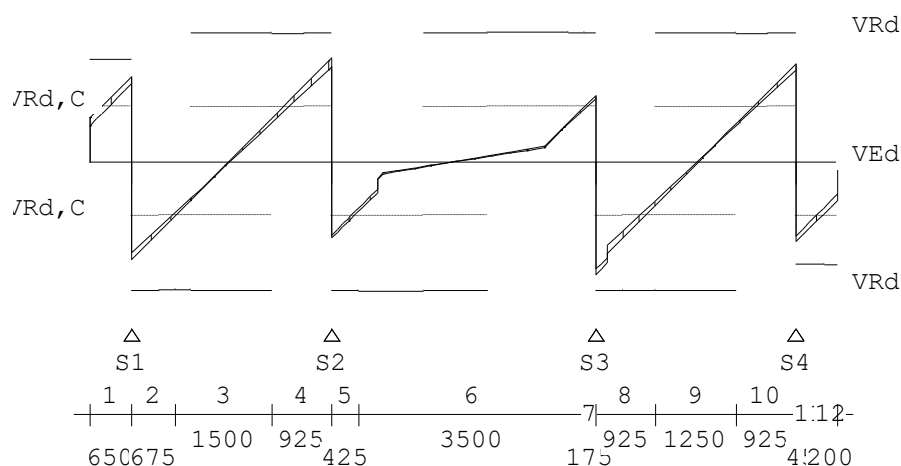
| Merk | B/O | Wapening | Vanaf [mm] | Tot [mm] | Lengte [mm] | $L_{bd, begin}$ [mm] | $L_{bd, eind}$ [mm] |
|------|-------|----------|---------------|-------------|----------------|-------------------------|------------------------|
| a | Boven | 5x12 | S1-1024 | S4+996 | 12320 | 374 | 346 |
| b | Onder | 4x12 | S1-770 | S4+770 | 11840 | 120 | 120 |

Opmerkingen

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

DWARSKRACHTEN Fysisch lineair

Balk 5-1 Fundamentele combinatie



Wring- en dwarskrachtwapening

Balk 5-1

| Geb. | Vanaf | Tot | Beugels | Lengte | <Wringing> | <Dwarskr.> | | | | | |
|------|--------|--------|---------|--------|--|-----------------------------------|---------------------------------|---------------------------------|------------------|-------------------|----------|
| | [mm] | [mm] | | [mm] | $A_{l\text{angs}}$ [mm ²] | A_{bg1} [mm ² /m] | A_{bg1} [mm ²] | A_{opg} [mm ²] | V_{Ed} [kN] | T_{Ed} [kNm] | Opm. |
| 1 | S1-650 | S1+0 | Ø8-250 | 650 | 8 | 1 | 358 | 0 | 119.3 | 0 | 6,59,109 |
| 2 | S1+0 | S1+675 | Ø8-250 | 675 | 8 | 1 | 358 | 0 | 136.6 | 0 | 6 |
| 3 | S1+675 | S2-925 | Ø8-250 | 1500 | 8 | 1 | 358 | 0 | 75.1 | 0 | |
| 4 | S2-925 | S2+0 | Ø8-250 | 925 | 8 | 1 | 358 | 0 | 145.2 | 0 | 6 |
| 5 | S2+0 | S2+425 | Ø8-250 | 425 | 8 | 1 | 358 | 0 | 106.3 | 0 | 6 |
| 6 | S2+425 | S3-175 | Ø8-250 | 3500 | 8 | 1 | 358 | 0 | 76.9 | 0 | |
| 7 | S3-175 | S3+0 | Ø8-250 | 175 | 8 | 1 | 358 | 0 | 92.4 | 0 | 6 |
| 8 | S3+0 | S3+925 | Ø8-250 | 925 | 8 | 1 | 358 | 0 | 157.8 | 0 | 6 |
| 9 | S3+925 | S4-925 | Ø8-250 | 1250 | 0 | 0 | 358 | 0 | 60.5 | 0 | |
| 10 | S4-925 | S4+0 | Ø8-250 | 925 | 8 | 1 | 358 | 0 | 137.0 | 0 | 6 |
| 11 | S4+0 | S4+450 | Ø8-250 | 450 | 8 | 1 | 358 | 0 | 111.5 | 0 | 6,59,109 |
| 12 | S4+450 | S4+650 | Ø8-250 | 200 | 0 | 0 | 358 | 0 | 71.5 | 0 | 59,109 |

Opmerkingen

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

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

[109] Bij de berekening van de beugels is geen rekening gehouden met de detailleringsregels van art 9.7 voor de gedrongen liggers.

Wring- en dwarskrachten

Balk 5-1

| Geb. | Vanaf | Tot | θ | V_{Rd} | V_{Ed} | $V_{Rd,C}$ | $V_{Rd,Max}$ | T_{Ed} | $T_{Rd,C}$ | $T_{Rd,Max}$ | V_{opg} | Opm. |
|------|--------|--------|----------|----------|----------|------------|--------------|----------|------------|--------------|-----------|----------|
| | [mm] | [mm] | [°] | [kN] | | | | | | | | |
| 1 | S1-650 | S1+0 | 21.8 | 144 | 119 | 77 | 419 | 0 | 36 | 89 | 0 | 6,59,109 |
| 2 | S1+0 | S1+675 | 21.8 | 180 | 137 | 77 | 525 | 0 | 36 | 89 | 0 | 6 |
| 3 | S1+675 | S2-925 | 21.8 | 179 | 75 | 75 | 523 | 0 | 36 | 89 | 0 | |
| 4 | S2-925 | S2+0 | 21.8 | 180 | 145 | 77 | 525 | 0 | 36 | 89 | 0 | 6 |
| 5 | S2+0 | S2+425 | 21.8 | 180 | 106 | 77 | 524 | 0 | 36 | 89 | 0 | 6 |
| 6 | S2+425 | S3-175 | 21.8 | 180 | 77 | 77 | 525 | 0 | 36 | 89 | 0 | |
| 7 | S3-175 | S3+0 | 21.8 | 180 | 92 | 77 | 524 | 0 | 36 | 89 | 0 | 6 |
| 8 | S3+0 | S3+925 | 21.8 | 180 | 158 | 77 | 524 | 0 | 36 | 89 | 0 | 6 |
| 9 | S3+925 | S4-925 | 21.8 | 180 | 60 | 75 | 523 | 0 | 36 | 89 | 0 | |
| 10 | S4-925 | S4+0 | 21.8 | 180 | 137 | 77 | 525 | 0 | 36 | 89 | 0 | 6 |
| 11 | S4+0 | S4+450 | 21.8 | 144 | 111 | 77 | 419 | 0 | 36 | 89 | 0 | 6,59,109 |
| 12 | S4+450 | S4+650 | 21.8 | 144 | 71 | 77 | 419 | 0 | 36 | 89 | 0 | 59,109 |

Opmerkingen

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

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

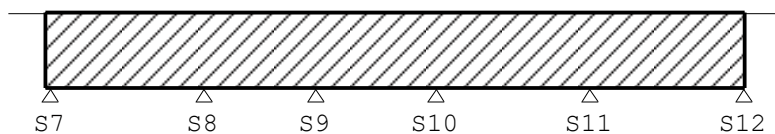
[109] Bij de berekening van de beugels is geen rekening gehouden met de detailleringsregels van art 9.7 voor de gedrongen liggers.

Hoofdwapening Fysisch lineair

Balk 5-2

3x16 b

1x12 a



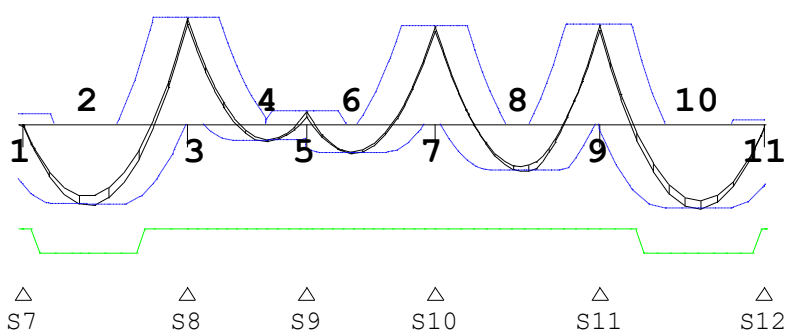
4x12 c

1x12 d lg=1756

1x12 e lg=1939

MEd dekkingslijn Fysisch lineair

Balk 5-2



Hoofdwapening

Balk 5-2

| Geb. | Pos. [mm] | M_{Ed} [kNm] | M_{Rd} [kNm] | z | B/O | A_b [mm ²] | A_a [mm ²] | Basiswapening +Bijlegwapening | Opm. |
|------|--------------|-------------------|-------------------|-----|-----|-----------------------------|-----------------------------|----------------------------------|------|
| 1 | S7-60 | 8.32 | 136.39 | 419 | Bov | 165* | 717 | 3x16 + 1x12 | 54 |
| 2 | S7+1021 | -68.78 | -109.30 | 425 | Ond | 349 | 453 | 4x12 | |
| | | | | | Ond | | 114 | +1x12 | |
| 3 | S8+0 | 90.20 | 136.39 | 419 | Bov | 462 | 717 | 3x16 + 1x12 | |
| 4 | S9-621 | -14.35 | -88.53 | 424 | Ond | 165* | 453 | 4x12 | 54 |
| 5 | S9+0 | 11.05 | 136.39 | 419 | Bov | 165* | 717 | 3x16 + 1x12 | 54 |
| 6 | S9+734 | -24.51 | -88.53 | 424 | Ond | 165* | 453 | 4x12 | 54 |
| 7 | S10+0 | 83.20 | 136.39 | 419 | Bov | 425 | 717 | 3x16 + 1x12 | |
| 8 | S11-1170 | -39.65 | -88.53 | 424 | Ond | 204* | 453 | 4x12 | 1 |
| 9 | S11+0 | 84.44 | 136.39 | 419 | Bov | 431 | 717 | 3x16 + 1x12 | |
| 10 | S12-1029 | -72.08 | -109.30 | 425 | Ond | 366 | 453 | 4x12 | |
| | | | | | Ond | | 114 | +1x12 | |
| 11 | S12+40 | 3.33 | 136.39 | 419 | Bov | 165* | 717 | 3x16 + 1x12 | 54 |

Opmerkingen

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

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

Scheurvorming volgens artikel 7.3.4

Balk 5-2

| Geb. | Pos. [mm] | Zijde | M_E, freq [kNm] | $S_{r, \max}$ [mm] | $\epsilon_{sm} - \epsilon_{cm}$ [%] | w_k [mm] | k_x | w_{\max} [mm] | U.C. | Opm. |
|------|--------------|-------|-----------------------------|-----------------------|--|---------------|-------|--------------------|------|------|
| 1 | S7-60 | Bov | 6.48 | 329 | 0.065 | 0.021 | 1.00 | 0.300 | 0.07 | |
| 2 | S7+367 | Bov | 6.48 | 329 | 0.065 | 0.021 | 1.00 | 0.300 | 0.07 | |
| 2 | S8-374 | Bov | 71.74 | 329 | 0.861 | 0.283 | 1.00 | 0.300 | 0.94 | |
| 2 | S7+131 | Ond | -46.81 | 367 | 0.731 | 0.268 | 1.00 | 0.300 | 0.89 | |
| 2 | S7+506 | Ond | -54.22 | 322 | 0.723 | 0.234 | 1.00 | 0.300 | 0.78 | |
| 2 | S7+1021 | Ond | -54.22 | 322 | 0.723 | 0.234 | 1.00 | 0.300 | 0.78 | |
| 2 | S8-1031 | Ond | -54.21 | 322 | 0.723 | 0.233 | 1.00 | 0.300 | 0.78 | |
| 3 | S8+492 | Bov | 71.74 | 329 | 0.861 | 0.283 | 1.00 | 0.300 | 0.94 | |
| 3 | S9-504 | Bov | 8.56 | 329 | 0.086 | 0.028 | 1.00 | 0.300 | 0.09 | |
| 3 | S8+763 | Ond | -10.89 | 367 | 0.170 | 0.062 | 1.00 | 0.300 | 0.21 | |
| 3 | S9-621 | Ond | -10.89 | 367 | 0.170 | 0.062 | 1.00 | 0.300 | 0.21 | |
| 3 | S9-103 | Ond | -10.84 | 367 | 0.169 | 0.062 | 1.00 | 0.300 | 0.21 | |
| 4 | S9+323 | Bov | 8.56 | 329 | 0.086 | 0.028 | 1.00 | 0.300 | 0.09 | |
| 4 | S10-341 | Bov | 66.60 | 329 | 0.775 | 0.255 | 1.00 | 0.300 | 0.85 | |
| 4 | S9+244 | Ond | -19.60 | 367 | 0.306 | 0.112 | 1.00 | 0.300 | 0.37 | |
| 4 | S9+734 | Ond | -19.60 | 367 | 0.306 | 0.112 | 1.00 | 0.300 | 0.37 | |
| 4 | S10-808 | Ond | -19.60 | 367 | 0.306 | 0.112 | 1.00 | 0.300 | 0.37 | |
| 5 | S10+401 | Bov | 66.60 | 329 | 0.775 | 0.255 | 1.00 | 0.300 | 0.85 | |
| 5 | S11-380 | Bov | 67.56 | 329 | 0.791 | 0.260 | 1.00 | 0.300 | 0.87 | |
| 5 | S10+988 | Ond | -29.90 | 367 | 0.467 | 0.172 | 1.00 | 0.300 | 0.57 | |
| 5 | S11-1170 | Ond | -29.96 | 367 | 0.468 | 0.172 | 1.00 | 0.300 | 0.57 | |
| 5 | S11-762 | Ond | -29.90 | 367 | 0.467 | 0.172 | 1.00 | 0.300 | 0.57 | |
| 6 | S11+0 | Bov | 67.56 | 329 | 0.791 | 0.260 | 1.00 | 0.300 | 0.87 | |
| 6 | S11+345 | Bov | 67.56 | 329 | 0.791 | 0.260 | 1.00 | 0.300 | 0.87 | |
| 6 | S12-285 | Bov | 2.46 | 329 | 0.025 | 0.008 | 1.00 | 0.300 | 0.03 | |
| 6 | S11+563 | Ond | -45.62 | 367 | 0.713 | 0.262 | 1.00 | 0.300 | 0.87 | |
| 6 | S11+1102 | Ond | -57.08 | 322 | 0.783 | 0.253 | 1.00 | 0.300 | 0.84 | |
| 6 | S12-1029 | Ond | -57.09 | 322 | 0.783 | 0.253 | 1.00 | 0.300 | 0.84 | |
| 6 | S12-576 | Ond | -57.08 | 322 | 0.783 | 0.253 | 1.00 | 0.300 | 0.84 | |
| 7 | S12+40 | Bov | 2.46 | 329 | 0.025 | 0.008 | 1.00 | 0.300 | 0.03 | |

Verloop hoofdwapening

Balk 5-2

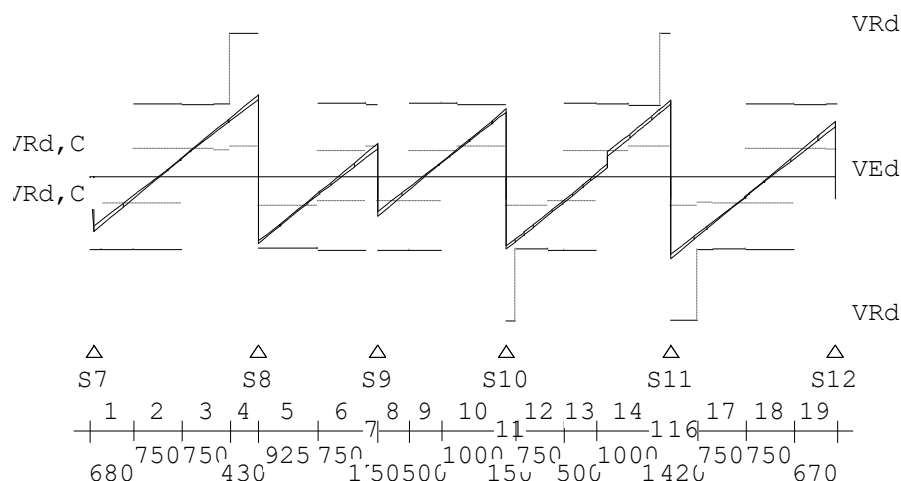
| Merk | B/O | Wapening | Vanaf [mm] | Tot [mm] | Lengte [mm] | $L_{bd, \text{begin}}$ [mm] | $L_{bd, \text{eind}}$ [mm] |
|------|-------|----------|---------------|-------------|----------------|--------------------------------|-------------------------------|
| a | Boven | 1x12 | S7-220 | S12+200 | 11920 | 160 | 160 |
| b | Boven | 3x16 | S7-220 | S12+200 | 11920 | 160 | 160 |
| c | Onder | 4x12 | S7-435 | S12+420 | 12354 | 375 | 380 |
| d | Onder | 1x12 | S7+131 | S8-663 | 1756 | 120 | 120 |
| e | Onder | 1x12 | S11+563 | S12-48 | 1939 | 120 | 120 |

Opmerkingen

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

DWARSKRACHTEN Fysisch lineair

Balk 5-2 Fundamentele combinatie



Wring- en dwarskrachtwapening

Balk 5-2

| Geb. Vanaf | Tot | Beugels | Lengte | <Wringing> | | <Dwarskr.> | | | | |
|------------|----------|----------|--------|--------------------|----------------------|--------------------|--------------------|----------|----------|------|
| [mm] | [mm] | | [mm] | $A_{l\text{angs}}$ | $A_{b\text{gl}}$ | $A_{b\text{gl}}$ | $A_{o\text{pg}}$ | V_{Ed} | T_{Ed} | Opm. |
| | | | | [mm ²] | [mm ² /m] | [mm ²] | [mm ²] | [kN] | [kNm] | |
| 1 | S7-60 | S7+620 | Ø8-250 | 680 | 31 | 4 | 316 | 0 | 142.2 | 1 6 |
| 2 | S7+620 | S8-1180 | Ø8-250 | 750 | 0 | 0 | 286 | 0 | 52.5 | 1 |
| 3 | S8-1180 | S8-430 | Ø8-250 | 750 | 31 | 4 | 321 | 0 | 144.5 | 1 6 |
| 4 | S8-430 | S8+0 | Ø8-125 | 430 | 31 | 4 | 457 | 0 | 201.2 | 1 6 |
| 5 | S8+0 | S8+925 | Ø8-250 | 925 | 31 | 4 | 371 | 0 | 163.0 | 1 6 |
| 6 | S8+925 | S9-175 | Ø8-250 | 750 | 0 | 0 | 286 | 0 | 58.4 | 1 |
| 7 | S9-175 | S9+0 | Ø8-250 | 175 | 31 | 4 | 286 | 0 | 81.5 | 1 6 |
| 8 | S9+0 | S9+500 | Ø8-250 | 500 | 0 | 0 | 286 | 0 | 96.5 | 1 6 |
| 9 | S9+500 | S9+1000 | Ø8-250 | 500 | 0 | 0 | 286 | 0 | 36.8 | 0 |
| 10 | S9+1000 | S10+0 | Ø8-250 | 1000 | 0 | 0 | 378 | 0 | 166.5 | 0 6 |
| 11 | S10+0 | S10+150 | Ø8-125 | 150 | 0 | 0 | 404 | 0 | 177.7 | 0 6 |
| 12 | S10+150 | S10+900 | Ø8-250 | 750 | 0 | 0 | 359 | 0 | 158.3 | 0 6 |
| 13 | S10+900 | S11-1150 | Ø8-250 | 500 | 0 | 0 | 286 | 0 | 61.5 | 0 |
| 14 | S11-1150 | S11-150 | Ø8-250 | 1000 | 33 | 4 | 380 | 0 | 167.7 | 1 6 |
| 15 | S11-150 | S11+0 | Ø8-125 | 150 | 33 | 4 | 425 | 0 | 187.1 | 1 6 |
| 16 | S11+0 | S11+420 | Ø8-125 | 420 | 33 | 4 | 455 | 0 | 200.2 | 1 6 |
| 17 | S11+420 | S11+1170 | Ø8-250 | 750 | 33 | 4 | 323 | 0 | 144.8 | 1 6 |
| 18 | S11+1170 | S12-630 | Ø8-250 | 750 | 0 | 0 | 286 | 0 | 52.3 | 1 |
| 19 | S12-630 | S12+40 | Ø8-250 | 670 | 33 | 4 | 314 | 0 | 140.6 | 1 6 |

Opmerkingen

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

Wring- en dwarskrachten

Balk 5-2

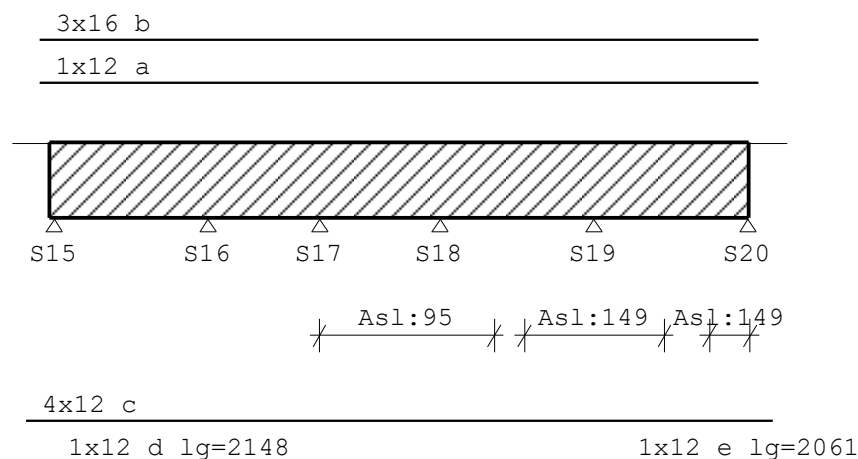
| Geb. | Vanaf [mm] | Tot [mm] | θ [°] | V_{Rd} [kN] | V_{Ed} | $V_{Rd,C}$ | $V_{Rd,Max}$ | T_{Ed} | $T_{Rd,C}$ | $T_{Rd,Max}$ | V_{opg} | Opm. |
|------|---------------|-------------|-----------------|------------------|--------------|------------|--------------|---------------|------------|--------------|-----------|------|
| | | | | | -----kN----- | | | -----kNm----- | | | | |
| 1 | S7-60 | S7+620 | 21.8 | 178 | 142 | 62 | 421 | 1 | 26 | 63 | 0 | 6 |
| 2 | S7+620 | S8-1180 | 21.8 | 179 | 53 | 66 | 417 | 1 | 26 | 63 | 0 | |
| 3 | S8-1180 | S8-430 | 21.8 | 178 | 145 | 62 | 420 | 1 | 26 | 63 | 0 | 6 |
| 4 | S8-430 | S8+0 | 21.8 | 351 | 201 | 72 | 411 | 1 | 26 | 63 | 0 | 6 |
| 5 | S8+0 | S8+925 | 21.8 | 174 | 163 | 72 | 411 | 1 | 26 | 63 | 0 | 6 |
| 6 | S8+925 | S9-175 | 21.8 | 181 | 58 | 62 | 421 | 1 | 26 | 63 | 0 | |
| 7 | S9-175 | S9+0 | 21.8 | 175 | 81 | 72 | 413 | 1 | 26 | 63 | 0 | 6 |
| 8 | S9+0 | S9+500 | 21.8 | 181 | 96 | 62 | 421 | 1 | 26 | 63 | 0 | 6 |
| 9 | S9+500 | S9+1000 | 21.8 | 181 | 37 | 62 | 420 | 0 | 26 | 63 | 0 | |
| 10 | S9+1000 | S10+0 | 21.8 | 177 | 167 | 72 | 411 | 0 | 26 | 63 | 0 | 6 |
| 11 | S10+0 | S10+150 | 21.8 | 354 | 178 | 72 | 411 | 0 | 26 | 63 | 0 | 6 |
| 12 | S10+150 | S10+900 | 21.8 | 177 | 158 | 72 | 412 | 0 | 26 | 63 | 0 | 6 |
| 13 | S10+900 | S11-1150 | 21.8 | 181 | 62 | 62 | 420 | 0 | 26 | 63 | 0 | |
| 14 | S11-1150 | S11-150 | 21.8 | 174 | 168 | 72 | 412 | 1 | 26 | 63 | 0 | 6 |
| 15 | S11-150 | S11+0 | 21.8 | 351 | 187 | 72 | 411 | 1 | 26 | 63 | 0 | 6 |
| 16 | S11+0 | S11+420 | 21.8 | 351 | 200 | 72 | 411 | 1 | 26 | 63 | 0 | 6 |
| 17 | S11+420 | S11+1170 | 21.8 | 176 | 145 | 66 | 418 | 1 | 26 | 63 | 0 | 6 |
| 18 | S11+1170 | S12-630 | 21.8 | 179 | 52 | 66 | 417 | 1 | 26 | 63 | 0 | |
| 19 | S12-630 | S12+40 | 21.8 | 177 | 141 | 65 | 419 | 1 | 26 | 63 | 0 | 6 |

Opmerkingen

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

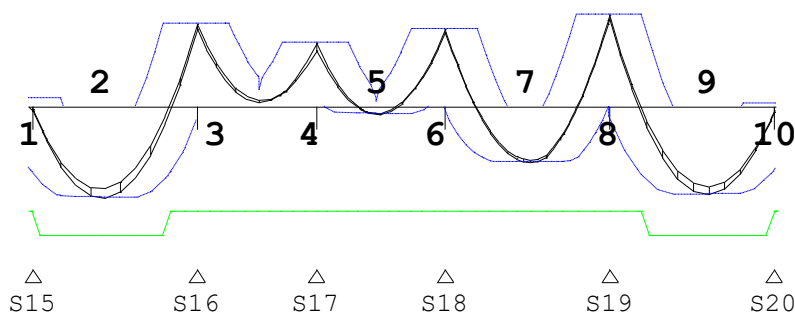
Hoofdwapening Fysisch lineair

Balk 5-3



MEd dekkingslijn Fysisch lineair

Balk 5-3



Hoofdwapening

Balk 5-3

| Geb. | Pos. [mm] | $M_{E,d}$ [kNm] | $M_{R,d}$ [kNm] | z [mm] | B/O | A_b [mm ²] | A_a [mm ²] | Basiswapening +Bijlegwapening | Opm. |
|------|--------------|--------------------|--------------------|-----------|-----|-----------------------------|-----------------------------|----------------------------------|------|
| 1 | S15-60 | 6.95 | 136.39 | 419 | Bov | 165* | 717 | 3x16 + 1x12 | 54 |
| 2 | S15+1072 | -77.60 | -109.30 | 425 | Ond | 395 | 453 | 4x12 | |
| | | | | | Ond | | 114 | +1x12 | |
| 3 | S16+0 | 70.64 | 136.39 | 419 | Bov | 359 | 717 | 3x16 + 1x12 | |
| 4 | S17+0 | 54.07 | 136.39 | 419 | Bov | 272 | 717 | 3x16 + 1x12 | |
| 5 | S17+957 | -6.38 | -88.53 | 424 | Ond | 165* | 453 | 4x12 | 54 |
| 6 | S18+0 | 66.23 | 136.39 | 419 | Bov | 335 | 717 | 3x16 + 1x12 | |
| 7 | S19-1223 | -47.37 | -88.53 | 424 | Ond | 238 | 453 | 4x12 | |
| 8 | S19+0 | 78.20 | 136.39 | 419 | Bov | 398 | 717 | 3x16 + 1x12 | |
| 9 | S20-1041 | -74.78 | -109.30 | 425 | Ond | 380 | 453 | 4x12 | |
| | | | | | Ond | | 114 | +1x12 | |
| 10 | S20+40 | 2.34 | 136.39 | 419 | Bov | 165* | 717 | 3x16 + 1x12 | 54 |

Opmerkingen

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

Scheurvorming volgens artikel 7.3.4

Balk 5-3

| Geb. | Pos. [mm] | Zijde | $M_E; freq$ [kNm] | $S_{r, max}$ [mm] | $\epsilon_{sm} - \epsilon_{cm}$ [%] | w_k [mm] | k_x | w_{max} [mm] | U.C. | Opm. |
|------|--------------|-------|----------------------|----------------------|--|---------------|-------|-------------------|------|------|
| 1 | S15-60 | Bov | 5.31 | 329 | 0.053 | 0.018 | 1.00 | 0.300 | 0.06 | |
| 1 | S15-12 | Ond | -44.25 | 367 | 0.691 | 0.254 | 1.00 | 0.300 | 0.85 | |
| 2 | S15+243 | Bov | 5.31 | 329 | 0.053 | 0.018 | 1.00 | 0.300 | 0.06 | |
| 2 | S16-434 | Bov | 56.08 | 329 | 0.598 | 0.197 | 1.00 | 0.300 | 0.66 | |
| 2 | S15+543 | Ond | -61.47 | 322 | 0.875 | 0.283 | 1.00 | 0.300 | 0.94 | |
| 2 | S15+1072 | Ond | -61.48 | 322 | 0.875 | 0.283 | 1.00 | 0.300 | 0.94 | |
| 2 | S16-1006 | Ond | -61.47 | 322 | 0.875 | 0.283 | 1.00 | 0.300 | 0.94 | |
| 2 | S16-414 | Ond | -44.25 | 367 | 0.691 | 0.254 | 1.00 | 0.300 | 0.85 | |
| 3 | S16+507 | Bov | 56.08 | 329 | 0.598 | 0.197 | 1.00 | 0.300 | 0.66 | |
| 3 | S17-501 | Bov | 42.96 | 329 | 0.432 | 0.142 | 1.00 | 0.300 | 0.47 | |
| 4 | S17+485 | Bov | 42.96 | 329 | 0.432 | 0.142 | 1.00 | 0.300 | 0.47 | |
| 4 | S18-378 | Bov | 53.35 | 329 | 0.552 | 0.182 | 1.00 | 0.300 | 0.61 | |
| 4 | S17+475 | Ond | -5.04 | 367 | 0.079 | 0.029 | 1.00 | 0.300 | 0.10 | |
| 4 | S17+957 | Ond | -5.04 | 367 | 0.079 | 0.029 | 1.00 | 0.300 | 0.10 | |
| 4 | S18-549 | Ond | -5.04 | 367 | 0.079 | 0.029 | 1.00 | 0.300 | 0.10 | |
| 5 | S18+472 | Bov | 53.35 | 329 | 0.552 | 0.182 | 1.00 | 0.300 | 0.61 | |
| 5 | S19-508 | Bov | 62.90 | 329 | 0.713 | 0.234 | 1.00 | 0.300 | 0.78 | |
| 5 | S18+894 | Ond | -37.91 | 367 | 0.592 | 0.217 | 1.00 | 0.300 | 0.72 | |
| 5 | S19-1223 | Ond | -37.92 | 367 | 0.592 | 0.217 | 1.00 | 0.300 | 0.72 | |
| 5 | S19-739 | Ond | -37.91 | 367 | 0.592 | 0.217 | 1.00 | 0.300 | 0.72 | |
| 6 | S19+0 | Bov | 62.90 | 329 | 0.713 | 0.234 | 1.00 | 0.300 | 0.78 | |
| 6 | S19+488 | Bov | 62.90 | 329 | 0.713 | 0.234 | 1.00 | 0.300 | 0.78 | |
| 6 | S20-254 | Bov | 1.73 | 329 | 0.017 | 0.006 | 1.00 | 0.300 | 0.02 | |
| 6 | S20+0 | Bov | 1.73 | 329 | 0.017 | 0.006 | 1.00 | 0.300 | 0.02 | |
| 6 | S19+488 | Ond | -44.82 | 367 | 0.700 | 0.257 | 1.00 | 0.300 | 0.86 | |
| 6 | S19+1058 | Ond | -59.50 | 322 | 0.834 | 0.269 | 1.00 | 0.300 | 0.90 | |
| 6 | S20-1041 | Ond | -59.51 | 322 | 0.834 | 0.269 | 1.00 | 0.300 | 0.90 | |
| 6 | S20-560 | Ond | -59.50 | 322 | 0.834 | 0.269 | 1.00 | 0.300 | 0.90 | |
| 7 | S20+40 | Bov | 1.73 | 329 | 0.017 | 0.006 | 1.00 | 0.300 | 0.02 | |

Verloop hoofdwapening

Balk 5-3

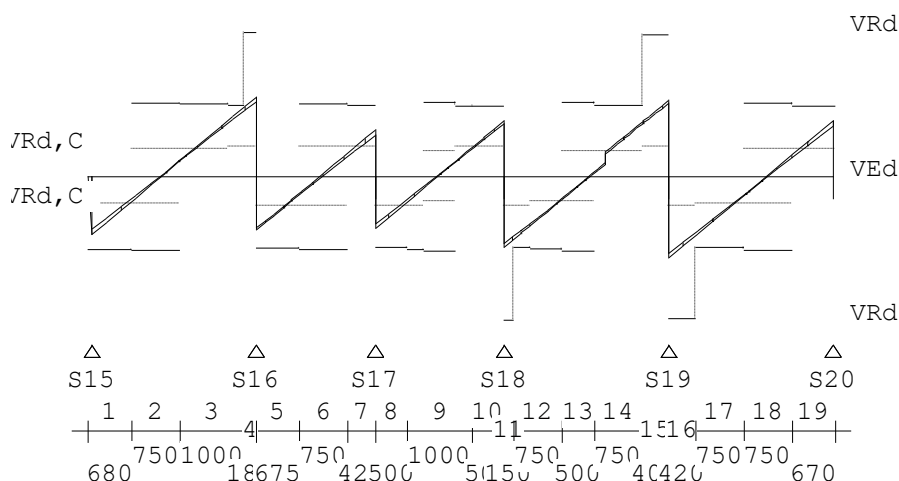
| Merk | B/O | Wapening | Vanaf [mm] | Tot [mm] | Lengte [mm] | $L_{bd; begin}$ [mm] | $L_{bd; eind}$ [mm] |
|------|-------|----------|---------------|-------------|----------------|-------------------------|------------------------|
| a | Boven | 1x12 | S15-220 | S20+200 | 11920 | 160 | 160 |
| b | Boven | 3x16 | S15-220 | S20+200 | 11920 | 160 | 160 |
| c | Onder | 4x12 | S15-443 | S20+434 | 12378 | 383 | 394 |
| d | Onder | 1x12 | S15-12 | S16-414 | 2148 | 120 | 120 |
| e | Onder | 1x12 | S19+488 | S20-1 | 2061 | 120 | 120 |

Opmerkingen

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

DWARSKRACHTEN Fysisch lineair

Balk 5-3 Fundamentele combinatie



Wring- en dwarskrachtwapening

Balk 5-3

| Geb. Vanaf | Tot | Beugels | Lengte | <Wringing> | | <Dwarskr.> | | | | | |
|-------------|----------|---------|--------|--------------------|----------------------|--------------------|--------------------|----------|----------|------|--|
| [mm] | [mm] | | [mm] | $A_{l\text{angs}}$ | $A_{b\text{gl}}$ | $A_{b\text{gl}}$ | $A_{o\text{pg}}$ | V_{Ed} | T_{Ed} | Opm. | |
| | | | | [mm ²] | [mm ² /m] | [mm ²] | [mm ²] | [kN] | [kNm] | | |
| 1 S15-60 | S15+620 | Ø8-250 | 680 | 53 | 6 | 333 | 0 | 148.9 | 2 | 6 | |
| 2 S15+620 | S16-1180 | Ø8-250 | 750 | 0 | 0 | 286 | 0 | 59.3 | 2 | 6 | |
| 3 S16-1180 | S16-180 | Ø8-250 | 1000 | 53 | 6 | 387 | 0 | 170.8 | 2 | 6 | |
| 4 S16-180 | S16+0 | Ø8-125 | 180 | 53 | 6 | 441 | 0 | 194.5 | 2 | 6 | |
| 5 S16+0 | S16+675 | Ø8-250 | 675 | 53 | 6 | 294 | 0 | 129.5 | 2 | 6 | |
| 6 S16+675 | S17-425 | Ø8-250 | 750 | 0 | 0 | 286 | 0 | 58.9 | 2 | 6 | |
| 7 S17-425 | S17+0 | Ø8-250 | 425 | 53 | 6 | 286 | 0 | 114.9 | 2 | 6 | |
| 8 S17+0 | S17+500 | Ø8-250 | 500 | 95 | 11 | 286 | 0 | 125.9 | 3 | 6 | |
| 9 S17+500 | S18-500 | Ø8-250 | 1000 | 95 | 11 | 286 | 0 | 71.7 | 3 | 6 | |
| 10 S18-500 | S18+0 | Ø8-250 | 500 | 95 | 11 | 311 | 0 | 137.1 | 3 | 6 | |
| 11 S18+0 | S18+150 | Ø8-125 | 150 | 95 | 11 | 389 | 0 | 171.6 | 3 | 6 | |
| 12 S18+150 | S18+900 | Ø8-250 | 750 | 95 | 11 | 344 | 0 | 151.8 | 3 | 6 | |
| 13 S18+900 | S19-1150 | Ø8-250 | 500 | 0 | 0 | 286 | 0 | 54.7 | 3 | 6 | |
| 14 S19-1150 | S19-400 | Ø8-250 | 750 | 149 | 18 | 301 | 0 | 135.5 | 4 | 6 | |
| 15 S19-400 | S19+0 | Ø8-125 | 400 | 149 | 18 | 425 | 0 | 187.1 | 4 | 6 | |
| 16 S19+0 | S19+420 | Ø8-125 | 420 | 149 | 18 | 451 | 0 | 198.6 | 4 | 6 | |
| 17 S19+420 | S19+1170 | Ø8-250 | 750 | 149 | 18 | 320 | 0 | 143.2 | 4 | 6 | |
| 18 S19+1170 | S20-630 | Ø8-250 | 750 | 0 | 0 | 286 | 0 | 53.9 | 4 | 6 | |
| 19 S20-630 | S20+40 | Ø8-250 | 670 | 149 | 18 | 318 | 0 | 142.2 | 4 | 6 | |

Opmerkingen

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

Wring- en dwarskrachten

Balk 5-3

| Geb. | Vanaf [mm] | Tot [mm] | θ [°] | V_{Rd} [kN] | V_{Ed} | $V_{Rd,C}$ | $V_{Rd,Max}$ | T_{Ed} | $T_{Rd,C}$ | $T_{Rd,Max}$ | V_{opg} | Opm. |
|------|---------------|-------------|-----------------|------------------|--------------|------------|--------------|---------------|------------|--------------|-----------|------|
| | | | | | -----kN----- | | | -----kNm----- | | | | |
| 1 | S15-60 | S15+620 | 21.8 | 174 | 149 | 66 | 418 | 2 | 26 | 63 | 0 | 6 |
| 2 | S15+620 | S16-1180 | 21.8 | 179 | 59 | 66 | 417 | 2 | 26 | 63 | 0 | |
| 3 | S16-1180 | S16-180 | 21.8 | 172 | 171 | 72 | 412 | 2 | 26 | 63 | 0 | 6 |
| 4 | S16-180 | S16+0 | 21.8 | 349 | 195 | 72 | 411 | 2 | 26 | 63 | 0 | 6 |
| 5 | S16+0 | S16+675 | 21.8 | 172 | 130 | 72 | 411 | 2 | 26 | 63 | 0 | 6 |
| 6 | S16+675 | S17-425 | 21.8 | 178 | 59 | 72 | 413 | 2 | 26 | 63 | 0 | |
| 7 | S17-425 | S17+0 | 21.8 | 172 | 115 | 72 | 412 | 2 | 26 | 63 | 0 | 6 |
| 8 | S17+0 | S17+500 | 21.8 | 168 | 126 | 72 | 412 | 3 | 26 | 63 | 0 | 6 |
| 9 | S17+500 | S18-500 | 21.8 | 168 | 72 | 72 | 413 | 3 | 26 | 63 | 0 | |
| 10 | S18-500 | S18+0 | 21.8 | 167 | 137 | 72 | 412 | 3 | 26 | 63 | 0 | 6 |
| 11 | S18+0 | S18+150 | 21.8 | 345 | 172 | 72 | 412 | 3 | 26 | 63 | 0 | 6 |
| 12 | S18+150 | S18+900 | 21.8 | 168 | 152 | 72 | 412 | 3 | 26 | 63 | 0 | 6 |
| 13 | S18+900 | S19-1150 | 21.8 | 181 | 55 | 62 | 420 | 3 | 26 | 63 | 0 | |
| 14 | S19-1150 | S19-400 | 21.8 | 165 | 135 | 62 | 421 | 4 | 26 | 63 | 0 | 6 |
| 15 | S19-400 | S19+0 | 21.8 | 339 | 187 | 72 | 411 | 4 | 26 | 63 | 0 | 6 |
| 16 | S19+0 | S19+420 | 21.8 | 339 | 199 | 72 | 411 | 4 | 26 | 63 | 0 | 6 |
| 17 | S19+420 | S19+1170 | 21.8 | 164 | 143 | 66 | 418 | 4 | 26 | 63 | 0 | 6 |
| 18 | S19+1170 | S20-630 | 21.8 | 179 | 54 | 66 | 417 | 4 | 26 | 63 | 0 | |
| 19 | S20-630 | S20+40 | 21.8 | 164 | 142 | 66 | 418 | 4 | 26 | 63 | 0 | 6 |

Opmerkingen

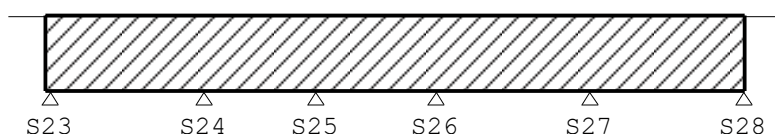
[6] 9.2.2 (4) 50% van de dwarskrachtwapening moet uit beugels bestaan.

Hoofdwapening Fysisch lineair

Balk 5-4

3x16 b

1x12 a



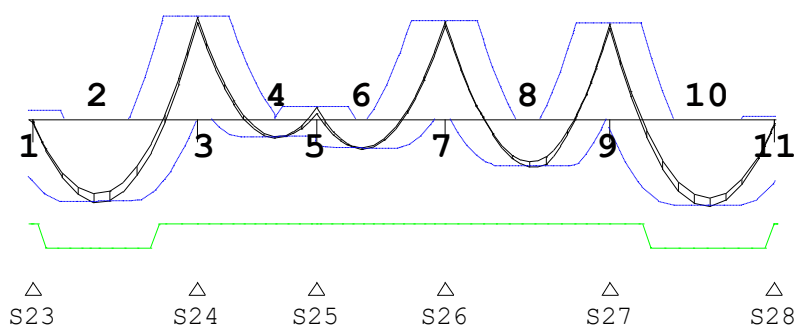
4x12 c

1x12 d lg=1871

1x12 e lg=2022

MEd dekkingslijn Fysisch lineair

Balk 5-4



Hoofdwapening

Balk 5-4

| Geb. | Pos. [mm] | M_{Ed} [kNm] | M_{Rd} [kNm] | z | B/O | A_b [mm ²] | A_a [mm ²] | Basiswapening +Bijlegwapening | Opm. |
|------|--------------|-------------------|-------------------|-----|-----|-----------------------------|-----------------------------|----------------------------------|------|
| 1 | S23-60 | 6.95 | 136.39 | 419 | Bov | 165* | 717 | 3x16 + 1x12 | 54 |
| 2 | S23+1025 | -70.71 | -109.30 | 425 | Ond | 359 | 453 | 4x12 | |
| | | | | | Ond | | 114 | +1x12 | |
| 3 | S24+0 | 87.04 | 136.39 | 419 | Bov | 445 | 717 | 3x16 + 1x12 | |
| 4 | S25-629 | -15.78 | -88.53 | 424 | Ond | 165* | 453 | 4x12 | 54 |
| 5 | S25+0 | 10.27 | 136.39 | 419 | Bov | 165* | 717 | 3x16 + 1x12 | 54 |
| 6 | S25+731 | -24.99 | -88.53 | 424 | Ond | 165* | 453 | 4x12 | 54 |
| 7 | S26+0 | 83.53 | 136.39 | 419 | Bov | 426 | 717 | 3x16 + 1x12 | |
| 8 | S27-1164 | -40.44 | -88.53 | 424 | Ond | 204* | 453 | 4x12 | 1 |
| 9 | S27+0 | 81.34 | 136.39 | 419 | Bov | 415 | 717 | 3x16 + 1x12 | |
| 10 | S28-1034 | -73.94 | -109.30 | 425 | Ond | 376 | 453 | 4x12 | |
| | | | | | Ond | | 114 | +1x12 | |
| 11 | S28+40 | 2.10 | 136.39 | 419 | Bov | 165* | 717 | 3x16 + 1x12 | 54 |

Opmerkingen

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

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

Scheurvorming volgens artikel 7.3.4

Balk 5-4

| Geb. | Pos. [mm] | Zijde | $M_E; freq$ [kNm] | $S_{r, max}$ [mm] | $\epsilon_{sm} - \epsilon_{cm}$ [%] | w_k [mm] | k_x | w_{max} [mm] | U.C. | Opm. |
|------|--------------|-------|----------------------|----------------------|--|---------------|-------|-------------------|------|------|
| 1 | S23-60 | Bov | 5.31 | 329 | 0.053 | 0.018 | 1.00 | 0.300 | 0.06 | |
| 2 | S23+314 | Bov | 5.31 | 329 | 0.053 | 0.018 | 1.00 | 0.300 | 0.06 | |
| 2 | S24-359 | Bov | 69.28 | 329 | 0.820 | 0.270 | 1.00 | 0.300 | 0.90 | |
| 2 | S23+79 | Ond | -46.06 | 367 | 0.719 | 0.264 | 1.00 | 0.300 | 0.88 | |
| 2 | S23+573 | Ond | -55.92 | 322 | 0.759 | 0.245 | 1.00 | 0.300 | 0.82 | |
| 2 | S23+1025 | Ond | -55.92 | 322 | 0.759 | 0.245 | 1.00 | 0.300 | 0.82 | |
| 2 | S24-1123 | Ond | -55.92 | 322 | 0.759 | 0.245 | 1.00 | 0.300 | 0.82 | |
| 3 | S24+469 | Bov | 69.28 | 329 | 0.820 | 0.270 | 1.00 | 0.300 | 0.90 | |
| 3 | S25-449 | Bov | 7.98 | 329 | 0.080 | 0.026 | 1.00 | 0.300 | 0.09 | |
| 3 | S24+732 | Ond | -12.22 | 367 | 0.191 | 0.070 | 1.00 | 0.300 | 0.23 | |
| 3 | S25-629 | Ond | -12.21 | 367 | 0.191 | 0.070 | 1.00 | 0.300 | 0.23 | |
| 3 | S25-82 | Ond | -12.16 | 367 | 0.190 | 0.070 | 1.00 | 0.300 | 0.23 | |
| 4 | S25+459 | Bov | 7.98 | 329 | 0.080 | 0.026 | 1.00 | 0.300 | 0.09 | |
| 4 | S26-340 | Bov | 66.73 | 329 | 0.777 | 0.256 | 1.00 | 0.300 | 0.85 | |
| 4 | S26+0 | Bov | 66.73 | 329 | 0.777 | 0.256 | 1.00 | 0.300 | 0.85 | |
| 4 | S25+232 | Ond | -20.04 | 367 | 0.313 | 0.115 | 1.00 | 0.300 | 0.38 | |
| 4 | S25+731 | Ond | -20.04 | 367 | 0.313 | 0.115 | 1.00 | 0.300 | 0.38 | |
| 4 | S26-807 | Ond | -20.04 | 367 | 0.313 | 0.115 | 1.00 | 0.300 | 0.38 | |
| 5 | S26+0 | Bov | 66.73 | 329 | 0.777 | 0.256 | 1.00 | 0.300 | 0.85 | |
| 5 | S26+399 | Bov | 66.73 | 329 | 0.777 | 0.256 | 1.00 | 0.300 | 0.85 | |
| 5 | S27-370 | Bov | 65.09 | 329 | 0.749 | 0.247 | 1.00 | 0.300 | 0.82 | |
| 5 | S27+0 | Bov | 65.09 | 329 | 0.749 | 0.247 | 1.00 | 0.300 | 0.82 | |
| 5 | S26+990 | Ond | -30.29 | 367 | 0.473 | 0.174 | 1.00 | 0.300 | 0.58 | |
| 5 | S27-1164 | Ond | -30.35 | 367 | 0.474 | 0.174 | 1.00 | 0.300 | 0.58 | |
| 5 | S27-749 | Ond | -30.29 | 367 | 0.473 | 0.174 | 1.00 | 0.300 | 0.58 | |
| 6 | S27+0 | Bov | 65.09 | 329 | 0.749 | 0.247 | 1.00 | 0.300 | 0.82 | |
| 6 | S27+496 | Bov | 65.09 | 329 | 0.749 | 0.247 | 1.00 | 0.300 | 0.82 | |
| 6 | S28-261 | Bov | 1.57 | 329 | 0.016 | 0.005 | 1.00 | 0.300 | 0.02 | |
| 6 | S27+516 | Ond | -45.07 | 367 | 0.704 | 0.258 | 1.00 | 0.300 | 0.86 | |
| 6 | S27+1076 | Ond | -58.69 | 322 | 0.817 | 0.264 | 1.00 | 0.300 | 0.88 | |
| 6 | S28-1034 | Ond | -58.70 | 322 | 0.817 | 0.264 | 1.00 | 0.300 | 0.88 | |
| 6 | S28-564 | Ond | -58.69 | 322 | 0.817 | 0.264 | 1.00 | 0.300 | 0.88 | |
| 7 | S28+40 | Bov | 1.57 | 329 | 0.016 | 0.005 | 1.00 | 0.300 | 0.02 | |

Verloop hoofdwapening

Balk 5-4

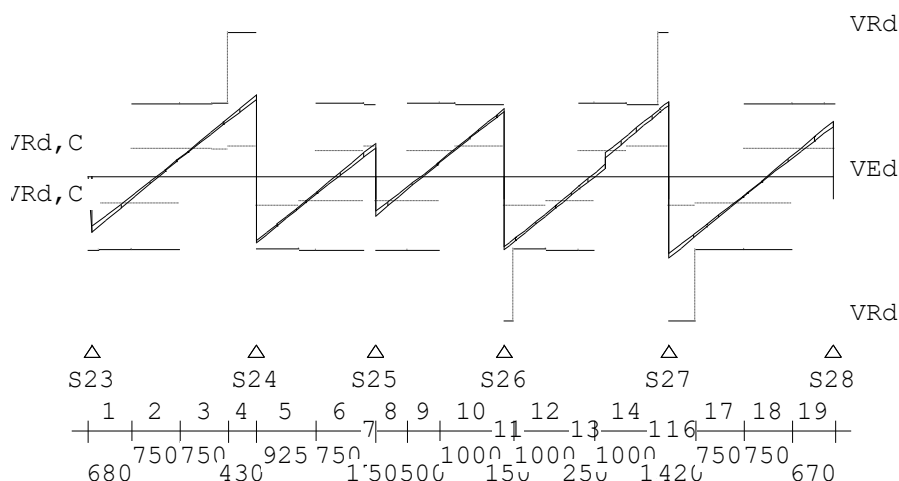
| Merk | B/O | Wapening | Vanaf [mm] | Tot [mm] | Lengte [mm] | $L_{bd; begin}$ [mm] | $L_{bd; eind}$ [mm] |
|------|-------|----------|---------------|-------------|----------------|-------------------------|------------------------|
| a | Boven | 1x12 | S23-220 | S28+200 | 11920 | 160 | 160 |
| b | Boven | 3x16 | S23-220 | S28+200 | 11920 | 160 | 160 |
| c | Onder | 4x12 | S23-435 | S28+432 | 12366 | 375 | 392 |
| d | Onder | 1x12 | S23+79 | S24-600 | 1871 | 120 | 120 |
| e | Onder | 1x12 | S27+516 | S28-12 | 2022 | 120 | 120 |

Opmerkingen

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

DWARSKRACHTEN Fysisch lineair

Balk 5-4 Fundamentele combinatie



Wring- en dwarskrachtwapening

Balk 5-4

| Geb. Vanaf | Tot | Beugels | Lengte | <Wringing> | | <Dwarskr.> | | V _{Ed} | T _{Ed} | Opm. |
|------------|----------|----------|--------|--|--|--|--|-----------------|-----------------|------|
| [mm] | [mm] | | [mm] | A _{l a n g s} [mm ²] | A _{b g l} [mm ² /m] | A _{b g l} [mm ² /m] | A _{o p g} [mm ²] | [kN] | [kNm] | |
| 1 | S23-60 | S23+620 | Ø8-250 | 680 | 7 | 1 | 318 | 0 | 142.7 | 0 6 |
| 2 | S23+620 | S24-1180 | Ø8-250 | 750 | 0 | 0 | 286 | 0 | 53.1 | 0 |
| 3 | S24-1180 | S24-430 | Ø8-250 | 750 | 7 | 1 | 321 | 0 | 144.0 | 0 6 |
| 4 | S24-430 | S24+0 | Ø8-125 | 430 | 7 | 1 | 456 | 0 | 200.7 | 0 6 |
| 5 | S24+0 | S24+925 | Ø8-250 | 925 | 7 | 1 | 368 | 0 | 161.9 | 0 6 |
| 6 | S24+925 | S25-175 | Ø8-250 | 750 | 0 | 0 | 286 | 0 | 59.4 | 0 |
| 7 | S25-175 | S25+0 | Ø8-250 | 175 | 7 | 1 | 286 | 0 | 82.5 | 0 6 |
| 8 | S25+0 | S25+500 | Ø8-250 | 500 | 2 | 0 | 286 | 0 | 96.1 | 0 6 |
| 9 | S25+500 | S25+1000 | Ø8-250 | 500 | 0 | 0 | 286 | 0 | 37.6 | 0 |
| 10 | S25+1000 | S26+0 | Ø8-250 | 1000 | 2 | 0 | 379 | 0 | 166.9 | 0 6 |
| 11 | S26+0 | S26+150 | Ø8-125 | 150 | 2 | 0 | 405 | 0 | 178.5 | 0 6 |
| 12 | S26+150 | S26+1150 | Ø8-250 | 1000 | 2 | 0 | 361 | 0 | 159.1 | 0 6 |
| 13 | S26+1150 | S27-1150 | Ø8-250 | 250 | 0 | 0 | 286 | 0 | 30.1 | 0 |
| 14 | S27-1150 | S27-150 | Ø8-250 | 1000 | 8 | 1 | 375 | 0 | 165.5 | 0 6 |
| 15 | S27-150 | S27+0 | Ø8-125 | 150 | 8 | 1 | 420 | 0 | 184.9 | 0 6 |
| 16 | S27+0 | S27+420 | Ø8-125 | 420 | 8 | 1 | 453 | 0 | 199.6 | 0 6 |
| 17 | S27+420 | S27+1170 | Ø8-250 | 750 | 8 | 1 | 322 | 0 | 144.2 | 0 6 |
| 18 | S27+1170 | S28-630 | Ø8-250 | 750 | 0 | 0 | 286 | 0 | 52.9 | 0 |
| 19 | S28-630 | S28+40 | Ø8-250 | 670 | 8 | 1 | 316 | 0 | 141.2 | 0 6 |

Opmerkingen

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

Wring- en dwarskrachten

Balk 5-4

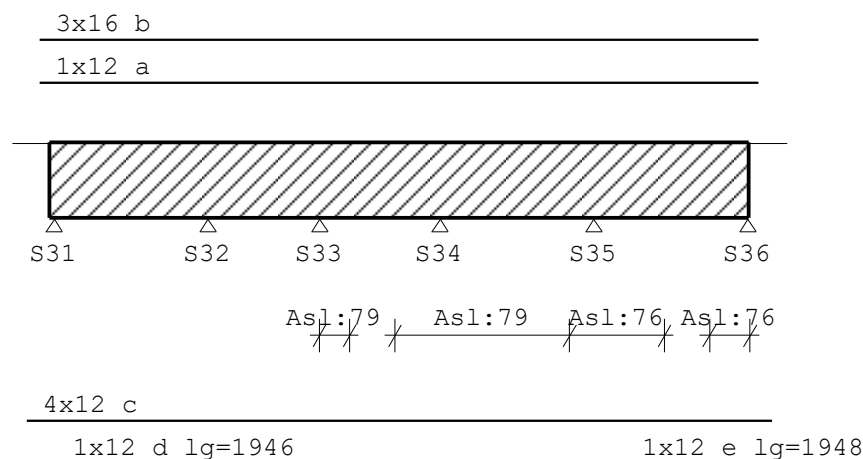
| Geb. | Vanaf [mm] | Tot [mm] | θ [°] | V_{Rd} [kN] | V_{Ed} | $V_{Rd,C}$ | $V_{Rd,Max}$ | T_{Ed} | $T_{Rd,C}$ | $T_{Rd,Max}$ | V_{opg} | Opm. |
|------|---------------|-------------|-----------------|------------------|--------------|------------|--------------|---------------|------------|--------------|-----------|------|
| | | | | | -----kN----- | | | -----kNm----- | | | | |
| 1 | S23-60 | S23+620 | 21.8 | 180 | 143 | 63 | 420 | 0 | 26 | 63 | 0 | 6 |
| 2 | S23+620 | S24-1180 | 21.8 | 179 | 53 | 66 | 417 | 0 | 26 | 63 | 0 | |
| 3 | S24-1180 | S24-430 | 21.8 | 180 | 144 | 65 | 419 | 0 | 26 | 63 | 0 | 6 |
| 4 | S24-430 | S24+0 | 21.8 | 353 | 201 | 72 | 411 | 0 | 26 | 63 | 0 | 6 |
| 5 | S24+0 | S24+925 | 21.8 | 176 | 162 | 72 | 411 | 0 | 26 | 63 | 0 | 6 |
| 6 | S24+925 | S25-175 | 21.8 | 181 | 59 | 62 | 421 | 0 | 26 | 63 | 0 | |
| 7 | S25-175 | S25+0 | 21.8 | 177 | 83 | 72 | 413 | 0 | 26 | 63 | 0 | 6 |
| 8 | S25+0 | S25+500 | 21.8 | 181 | 96 | 62 | 421 | 0 | 26 | 63 | 0 | 6 |
| 9 | S25+500 | S25+1000 | 21.8 | 181 | 38 | 62 | 420 | 0 | 26 | 63 | 0 | |
| 10 | S25+1000 | S26+0 | 21.8 | 177 | 167 | 72 | 411 | 0 | 26 | 63 | 0 | 6 |
| 11 | S26+0 | S26+150 | 21.8 | 354 | 178 | 72 | 411 | 0 | 26 | 63 | 0 | 6 |
| 12 | S26+150 | S26+1150 | 21.8 | 177 | 159 | 72 | 412 | 0 | 26 | 63 | 0 | 6 |
| 13 | S26+1150 | S27-1150 | 21.8 | 181 | 30 | 62 | 420 | 0 | 26 | 63 | 0 | |
| 14 | S27-1150 | S27-150 | 21.8 | 177 | 166 | 72 | 412 | 0 | 26 | 63 | 0 | 6 |
| 15 | S27-150 | S27+0 | 21.8 | 353 | 185 | 72 | 411 | 0 | 26 | 63 | 0 | 6 |
| 16 | S27+0 | S27+420 | 21.8 | 353 | 200 | 72 | 411 | 0 | 26 | 63 | 0 | 6 |
| 17 | S27+420 | S27+1170 | 21.8 | 179 | 144 | 66 | 418 | 0 | 26 | 63 | 0 | 6 |
| 18 | S27+1170 | S28-630 | 21.8 | 179 | 53 | 66 | 417 | 0 | 26 | 63 | 0 | |
| 19 | S28-630 | S28+40 | 21.8 | 179 | 141 | 66 | 418 | 0 | 26 | 63 | 0 | 6 |

Opmerkingen

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

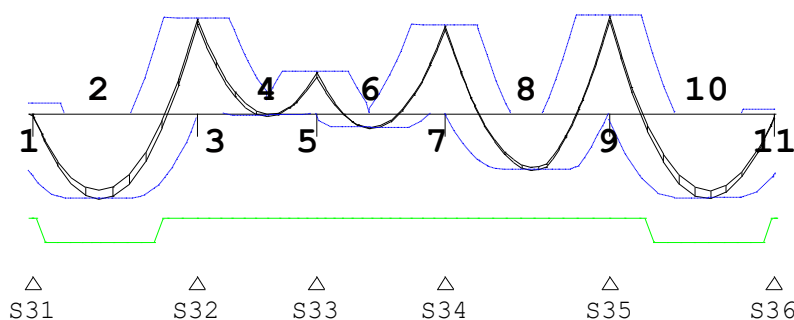
Hoofdwapening Fysisch lineair

Balk 5-5



MEd dekkingslijn Fysisch lineair

Balk 5-5



Hoofdwapening

Balk 5-5

| Geb. | Pos. [mm] | $M_{E,d}$ [kNm] | $M_{R,d}$ [kNm] | z B/O [mm] | A_b [mm ²] | A_a [mm ²] | Basiswapening +Bijlegwapening | Opm. |
|------|--------------|--------------------|--------------------|---------------|-----------------------------|-----------------------------|----------------------------------|------|
| 1 | S31-60 | 8.29 | 136.39 | 419 Bov | 165* | 717 | 3x16 + 1x12 | 54 |
| 2 | S31+1047 | -72.48 | -109.30 | 425 Ond | 368 | 453 | 4x12 | |
| | | | | Ond | | 114 | +1x12 | |
| 3 | S32+0 | 81.06 | 136.39 | 419 Bov | 413 | 717 | 3x16 + 1x12 | |
| 4 | S33-757 | -2.23 | -88.53 | 424 Ond | 165* | 453 | 4x12 | 54 |
| 5 | S33+0 | 35.56 | 136.39 | 419 Bov | 204* | 717 | 3x16 + 1x12 | 1 |
| 6 | S33+854 | -12.48 | -88.53 | 424 Ond | 165* | 453 | 4x12 | 54 |
| 7 | S34+0 | 74.89 | 136.39 | 419 Bov | 381 | 717 | 3x16 + 1x12 | |
| 8 | S35-1171 | -47.84 | -88.53 | 424 Ond | 241 | 453 | 4x12 | |
| 9 | S35+0 | 83.41 | 136.39 | 419 Bov | 426 | 717 | 3x16 + 1x12 | |
| 10 | S36-1031 | -72.17 | -109.30 | 425 Ond | 367 | 453 | 4x12 | |
| | | | | Ond | | 114 | +1x12 | |
| 11 | S36+40 | 3.48 | 136.39 | 419 Bov | 165* | 717 | 3x16 + 1x12 | 54 |

Opmerkingen

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

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

Scheurvorming volgens artikel 7.3.4

Balk 5-5

| Geb. | Pos. [mm] | Zijde | $M_E; freq$ [kNm] | $S_{r, max}$ [mm] | $\epsilon_{sm} - \epsilon_{cm}$ [%] | w_k [mm] | k_x | w_{max} [mm] | U.C. | Opm. |
|------|--------------|-------|----------------------|----------------------|--|---------------|-------|-------------------|------|------|
| 1 | S31-60 | Bov | 6.46 | 329 | 0.065 | 0.021 | 1.00 | 0.300 | 0.07 | |
| 2 | S31+298 | Bov | 6.46 | 329 | 0.065 | 0.021 | 1.00 | 0.300 | 0.07 | |
| 2 | S32-502 | Bov | 64.51 | 329 | 0.740 | 0.243 | 1.00 | 0.300 | 0.81 | |
| 2 | S31+62 | Ond | -45.57 | 367 | 0.712 | 0.261 | 1.00 | 0.300 | 0.87 | |
| 2 | S31+568 | Ond | -57.23 | 322 | 0.786 | 0.254 | 1.00 | 0.300 | 0.85 | |
| 2 | S31+1047 | Ond | -57.23 | 322 | 0.786 | 0.254 | 1.00 | 0.300 | 0.85 | |
| 2 | S32-1082 | Ond | -57.23 | 322 | 0.786 | 0.254 | 1.00 | 0.300 | 0.85 | |
| 3 | S32+365 | Bov | 64.51 | 329 | 0.740 | 0.243 | 1.00 | 0.300 | 0.81 | |
| 3 | S33-507 | Bov | 28.37 | 329 | 0.285 | 0.094 | 1.00 | 0.300 | 0.31 | |
| 3 | S32+727 | Ond | -0.74 | 367 | 0.012 | 0.004 | 1.00 | 0.300 | 0.01 | |
| 3 | S33-757 | Ond | -0.76 | 367 | 0.012 | 0.004 | 1.00 | 0.300 | 0.01 | |
| 3 | S33-287 | Ond | -0.74 | 367 | 0.012 | 0.004 | 1.00 | 0.300 | 0.01 | |
| 4 | S33+418 | Bov | 28.37 | 329 | 0.285 | 0.094 | 1.00 | 0.300 | 0.31 | |
| 4 | S34-367 | Bov | 60.48 | 329 | 0.672 | 0.221 | 1.00 | 0.300 | 0.74 | |
| 4 | S33+403 | Ond | -9.86 | 367 | 0.154 | 0.057 | 1.00 | 0.300 | 0.19 | |
| 4 | S33+854 | Ond | -9.86 | 367 | 0.154 | 0.057 | 1.00 | 0.300 | 0.19 | |
| 4 | S34-711 | Ond | -9.86 | 367 | 0.154 | 0.057 | 1.00 | 0.300 | 0.19 | |
| 5 | S34+348 | Bov | 60.48 | 329 | 0.672 | 0.221 | 1.00 | 0.300 | 0.74 | |
| 5 | S35-347 | Bov | 66.99 | 329 | 0.781 | 0.257 | 1.00 | 0.300 | 0.86 | |
| 5 | S34+946 | Ond | -37.93 | 367 | 0.592 | 0.217 | 1.00 | 0.300 | 0.72 | |
| 5 | S35-1171 | Ond | -37.94 | 367 | 0.593 | 0.218 | 1.00 | 0.300 | 0.73 | |
| 5 | S35-730 | Ond | -37.93 | 367 | 0.592 | 0.217 | 1.00 | 0.300 | 0.72 | |
| 6 | S35+0 | Bov | 66.99 | 329 | 0.781 | 0.257 | 1.00 | 0.300 | 0.86 | |
| 6 | S35+340 | Bov | 66.99 | 329 | 0.781 | 0.257 | 1.00 | 0.300 | 0.86 | |
| 6 | S36-284 | Bov | 2.56 | 329 | 0.026 | 0.008 | 1.00 | 0.300 | 0.03 | |
| 6 | S35+556 | Ond | -45.56 | 367 | 0.712 | 0.261 | 1.00 | 0.300 | 0.87 | |
| 6 | S35+1098 | Ond | -57.25 | 322 | 0.787 | 0.254 | 1.00 | 0.300 | 0.85 | |
| 6 | S36-1031 | Ond | -57.26 | 322 | 0.787 | 0.254 | 1.00 | 0.300 | 0.85 | |
| 6 | S36-575 | Ond | -57.25 | 322 | 0.787 | 0.254 | 1.00 | 0.300 | 0.85 | |
| 7 | S36+40 | Bov | 2.56 | 329 | 0.026 | 0.008 | 1.00 | 0.300 | 0.03 | |

Verloop hoofdwapening

Balk 5-5

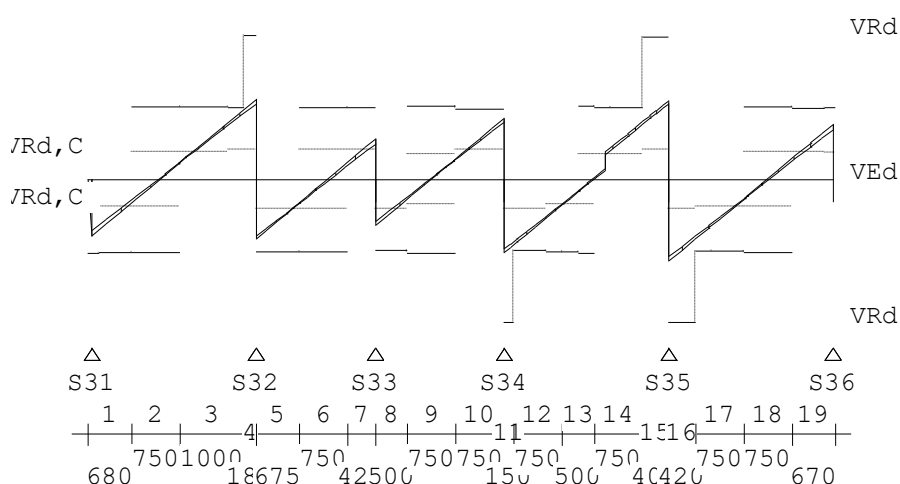
| Merk | B/O | Wapening | Vanaf [mm] | Tot [mm] | Lengte [mm] | $L_{bd; begin}$ [mm] | $L_{bd; eind}$ [mm] |
|------|-------|----------|---------------|-------------|----------------|-------------------------|------------------------|
| a | Boven | 1x12 | S31-220 | S36+200 | 11920 | 160 | 160 |
| b | Boven | 3x16 | S31-220 | S36+200 | 11920 | 160 | 160 |
| c | Onder | 4x12 | S31-435 | S36+420 | 12355 | 375 | 380 |
| d | Onder | 1x12 | S31+62 | S32-541 | 1946 | 120 | 120 |
| e | Onder | 1x12 | S35+556 | S36-46 | 1948 | 120 | 120 |

Opmerkingen

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

DWARSKRACHTEN Fysisch lineair

Balk 5-5 Fundamentele combinatie



Wring- en dwarskrachtwapening

Balk 5-5

| Geb. Vanaf | Tot | Beugels | Lengte | <Wringing> | | <Dwarskr.> | | V _{Ed} | T _{Ed} | Opm. |
|-------------|----------|---------|--------|---|---|---|---|-----------------|-----------------|------|
| [mm] | [mm] | | [mm] | A _{l,angs} [mm ²] | A _{b,gl} [mm ² /m] | A _{b,gl} [mm ² /m] | A _{o,pg} [mm ²] | [kN] | [kNm] | |
| 1 S31-60 | S31+620 | Ø8-250 | 680 | 4 | 0 | 324 | 0 | 145.6 | 0 | 6 |
| 2 S31+620 | S32-1180 | Ø8-250 | 750 | 0 | 0 | 286 | 0 | 55.9 | 0 | |
| 3 S32-1180 | S32-180 | Ø8-250 | 1000 | 4 | 0 | 395 | 0 | 174.1 | 0 | 6 |
| 4 S32-180 | S32+0 | Ø8-125 | 180 | 4 | 0 | 449 | 0 | 197.9 | 0 | 6 |
| 5 S32+0 | S32+675 | Ø8-250 | 675 | 4 | 0 | 328 | 0 | 144.6 | 0 | 6 |
| 6 S32+675 | S33-425 | Ø8-250 | 750 | 0 | 0 | 286 | 0 | 57.5 | 0 | |
| 7 S33-425 | S33+0 | Ø8-250 | 425 | 4 | 0 | 286 | 0 | 99.4 | 0 | 6 |
| 8 S33+0 | S33+500 | Ø8-250 | 500 | 79 | 9 | 286 | 0 | 112.2 | 2 | 6 |
| 9 S33+500 | S34-750 | Ø8-250 | 750 | 0 | 0 | 286 | 0 | 52.4 | 2 | |
| 10 S34-750 | S34+0 | Ø8-250 | 750 | 79 | 9 | 342 | 0 | 150.8 | 2 | 6 |
| 11 S34+0 | S34+150 | Ø8-125 | 150 | 79 | 9 | 404 | 0 | 178.1 | 2 | 6 |
| 12 S34+150 | S34+900 | Ø8-250 | 750 | 79 | 9 | 359 | 0 | 158.4 | 2 | 6 |
| 13 S34+900 | S35-1150 | Ø8-250 | 500 | 79 | 9 | 286 | 0 | 61.4 | 2 | |
| 14 S35-1150 | S35-400 | Ø8-250 | 750 | 79 | 9 | 317 | 0 | 142.8 | 2 | 6 |
| 15 S35-400 | S35+0 | Ø8-125 | 400 | 76 | 9 | 442 | 0 | 194.4 | 2 | 6 |
| 16 S35+0 | S35+420 | Ø8-125 | 420 | 76 | 9 | 454 | 0 | 199.9 | 2 | 6 |
| 17 S35+420 | S35+1170 | Ø8-250 | 750 | 76 | 9 | 323 | 0 | 144.6 | 2 | 6 |
| 18 S35+1170 | S36-630 | Ø8-250 | 750 | 0 | 0 | 286 | 0 | 52.5 | 2 | |
| 19 S36-630 | S36+40 | Ø8-250 | 670 | 76 | 9 | 314 | 0 | 140.9 | 2 | 6 |

Opmerkingen

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

Wring- en dwarskrachten

Balk 5-5

| Geb. | Vanaf [mm] | Tot [mm] | θ [°] | V_{Rd} [kN] | V_{Ed} | $V_{Rd,C}$ | $V_{Rd,Max}$ | T_{Ed} | $T_{Rd,C}$ | $T_{Rd,Max}$ | V_{opg} | Opm. |
|------|---------------|-------------|-----------------|------------------|--------------|------------|--------------|---------------|------------|--------------|-----------|------|
| | | | | | -----kN----- | | | -----kNm----- | | | | |
| 1 | S31-60 | S31+620 | 21.8 | 180 | 146 | 64 | 419 | 0 | 26 | 63 | 0 | 6 |
| 2 | S31+620 | S32-1180 | 21.8 | 179 | 56 | 66 | 417 | 0 | 26 | 63 | 0 | |
| 3 | S32-1180 | S32-180 | 21.8 | 177 | 174 | 72 | 412 | 0 | 26 | 63 | 0 | 6 |
| 4 | S32-180 | S32+0 | 21.8 | 354 | 198 | 72 | 411 | 0 | 26 | 63 | 0 | 6 |
| 5 | S32+0 | S32+675 | 21.8 | 177 | 145 | 72 | 411 | 0 | 26 | 63 | 0 | 6 |
| 6 | S32+675 | S33-425 | 21.8 | 178 | 57 | 72 | 413 | 0 | 26 | 63 | 0 | |
| 7 | S33-425 | S33+0 | 21.8 | 177 | 99 | 72 | 413 | 0 | 26 | 63 | 0 | 6 |
| 8 | S33+0 | S33+500 | 21.8 | 169 | 112 | 72 | 413 | 2 | 26 | 63 | 0 | 6 |
| 9 | S33+500 | S34-750 | 21.8 | 181 | 52 | 62 | 421 | 2 | 26 | 63 | 0 | |
| 10 | S34-750 | S34+0 | 21.8 | 169 | 151 | 72 | 411 | 2 | 26 | 63 | 0 | 6 |
| 11 | S34+0 | S34+150 | 21.8 | 346 | 178 | 72 | 411 | 2 | 26 | 63 | 0 | 6 |
| 12 | S34+150 | S34+900 | 21.8 | 169 | 158 | 72 | 412 | 2 | 26 | 63 | 0 | 6 |
| 13 | S34+900 | S35-1150 | 21.8 | 172 | 61 | 62 | 420 | 2 | 26 | 63 | 0 | |
| 14 | S35-1150 | S35-400 | 21.8 | 173 | 143 | 62 | 421 | 2 | 26 | 63 | 0 | 6 |
| 15 | S35-400 | S35+0 | 21.8 | 346 | 194 | 72 | 411 | 2 | 26 | 63 | 0 | 6 |
| 16 | S35+0 | S35+420 | 21.8 | 346 | 200 | 72 | 411 | 2 | 26 | 63 | 0 | 6 |
| 17 | S35+420 | S35+1170 | 21.8 | 172 | 145 | 66 | 418 | 2 | 26 | 63 | 0 | 6 |
| 18 | S35+1170 | S36-630 | 21.8 | 179 | 52 | 66 | 417 | 2 | 26 | 63 | 0 | |
| 19 | S36-630 | S36+40 | 21.8 | 172 | 141 | 65 | 419 | 2 | 26 | 63 | 0 | 6 |

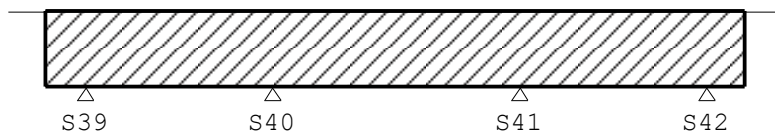
Opmerkingen

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

Hoofdwapening Fysisch lineair

Balk 5-6

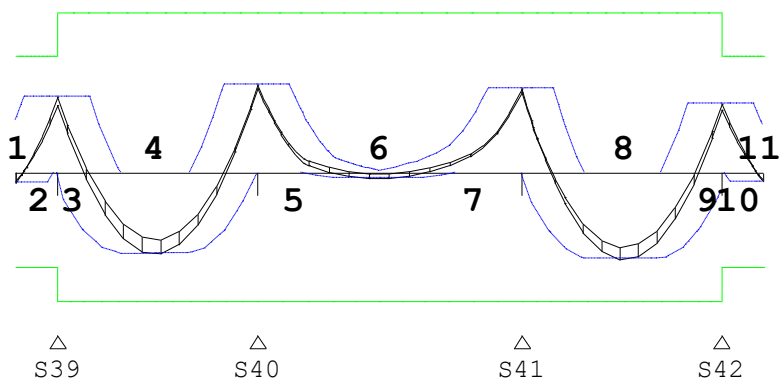
5x12 a



4x12 b

MEd dekkingslijn Fysisch lineair

Balk 5-6



Hoofdwapening

Balk 5-6

| Geb. | Pos. [mm] | $M_{E,d}$ [kNm] | $M_{R,d}$ [kNm] | z B/O [mm] | A_b [mm ²] | A_a [mm ²] | Basiswapening +Bijlegwapening | Opm. |
|------|--------------|--------------------|--------------------|---------------|-----------------------------|-----------------------------|----------------------------------|----------|
| 1 | S39-650 | -6.70 | -64.91 | 330 Ond | 191* | 453 | 4x12 | 2,54,110 |
| 2 | S39-0 | 52.35 | 81.14 | 330 Bov | 365 | 566 | 5x12 | 2,110 |
| 3 | S39+0 | 52.35 | 110.80 | 414 Bov | 263 | 566 | 5x12 | |
| 4 | S39+1503 | -56.01 | -88.57 | 391 Ond | 284 | 453 | 4x12 | |
| 5 | S40+0 | 61.11 | 110.80 | 414 Bov | 307 | 566 | 5x12 | |
| 6 | S40+1881 | -3.82 | -88.57 | 391 Ond | 191* | 453 | 4x12 | 54 |
| 7 | S41+0 | 58.18 | 110.80 | 414 Bov | 292 | 566 | 5x12 | |
| 8 | S42-1508 | -59.92 | -88.57 | 391 Ond | 305 | 453 | 4x12 | |
| 9 | S42-0 | 47.84 | 110.80 | 414 Bov | 254* | 566 | 5x12 | 1 |
| 10 | S42+0 | 47.84 | 81.14 | 330 Bov | 354* | 566 | 5x12 | 1,2,110 |
| 11 | S42+650 | -5.99 | -64.91 | 330 Ond | 191* | 453 | 4x12 | 2,54,110 |

Opmerkingen

- [1] * = Eisen met betrekking tot minimum wapening zijn toegepast, zie nationale bijlage art. 9.2.1.1(1).
- [2] Benodigde wapening en inwendige hefboomsarm zijn bepaald volgens gedrongen ligger detaillering, zie nationale bijlage art. 6.1(10).
- [54] * = Eisen met betrekking tot minimum wapening ten behoeve van gecontroleerde scheurvorming zijn toegepast volgens art. 7.3.2.
- [110] **Art. 9.7 (1),(2): Een orthogonaal wapeningsnet dient toegepast te worden aan iedere zijde van de gedrongen liggers:**
Profiel 4 - B*H 500*500: 500 mm²/m aan elke zijde en in elke richting met een maximaal hoh 300 mm.

Scheurvorming volgens artikel 7.3.4

Balk 5-6

| Geb. | Pos. [mm] | Zijde | $M_E; freq$ [kNm] | S_r, max [mm] | $\epsilon_{sm} - \epsilon_{cm}$ [%] | w_k [mm] | k_x | w_{max} [mm] | U.C. | Opm. |
|------|-----------|-------|-------------------|-----------------|-------------------------------------|------------|-------|----------------|------|------|
| 1 | S39-650 | Bov | 28.71 | 367 | 0.358 | 0.132 | 1.00 | 0.300 | 0.44 | |
| 1 | S39-491 | Bov | 41.23 | 367 | 0.514 | 0.189 | 1.00 | 0.300 | 0.63 | |
| 1 | S39-650 | Ond | -4.83 | 408 | 0.076 | 0.031 | 1.14 | 0.343 | 0.09 | |
| 1 | S39-176 | Ond | -4.83 | 408 | 0.076 | 0.031 | 1.14 | 0.343 | 0.09 | |
| 2 | S39+0 | Bov | 41.23 | 367 | 0.514 | 0.189 | 1.00 | 0.300 | 0.63 | |
| 2 | S39+476 | Bov | 41.23 | 367 | 0.514 | 0.189 | 1.00 | 0.300 | 0.63 | |
| 2 | S40-266 | Bov | 50.13 | 367 | 0.626 | 0.230 | 1.00 | 0.300 | 0.77 | |
| 2 | S40+0 | Bov | 50.13 | 367 | 0.626 | 0.230 | 1.00 | 0.300 | 0.77 | |
| 2 | S39+1503 | Ond | -42.82 | 408 | 0.672 | 0.274 | 1.14 | 0.343 | 0.80 | |
| 3 | S40+0 | Bov | 50.13 | 367 | 0.626 | 0.230 | 1.00 | 0.300 | 0.77 | |
| 3 | S40+333 | Bov | 50.13 | 367 | 0.626 | 0.230 | 1.00 | 0.300 | 0.77 | |
| 3 | S41-389 | Bov | 48.10 | 367 | 0.600 | 0.220 | 1.00 | 0.300 | 0.73 | |
| 3 | S40+1527 | Ond | -2.70 | 408 | 0.042 | 0.017 | 1.14 | 0.343 | 0.05 | |
| 3 | S41-1865 | Ond | -2.70 | 408 | 0.042 | 0.017 | 1.14 | 0.343 | 0.05 | |
| 4 | S41+0 | Bov | 48.10 | 367 | 0.600 | 0.220 | 1.00 | 0.300 | 0.73 | |
| 4 | S41+468 | Bov | 48.10 | 367 | 0.600 | 0.220 | 1.00 | 0.300 | 0.73 | |
| 4 | S42-423 | Bov | 38.22 | 367 | 0.477 | 0.175 | 1.00 | 0.300 | 0.58 | |
| 4 | S42-1508 | Ond | -46.42 | 408 | 0.729 | 0.297 | 1.14 | 0.343 | 0.87 | |
| 5 | S42+0 | Bov | 38.22 | 367 | 0.477 | 0.175 | 1.00 | 0.300 | 0.58 | |
| 5 | S42+490 | Bov | 38.22 | 367 | 0.477 | 0.175 | 1.00 | 0.300 | 0.58 | |
| 5 | S42+194 | Ond | -4.40 | 408 | 0.069 | 0.028 | 1.14 | 0.343 | 0.08 | |
| 5 | S42+650 | Ond | -4.40 | 408 | 0.069 | 0.028 | 1.14 | 0.343 | 0.08 | |

Verloop hoofdwapening

Balk 5-6

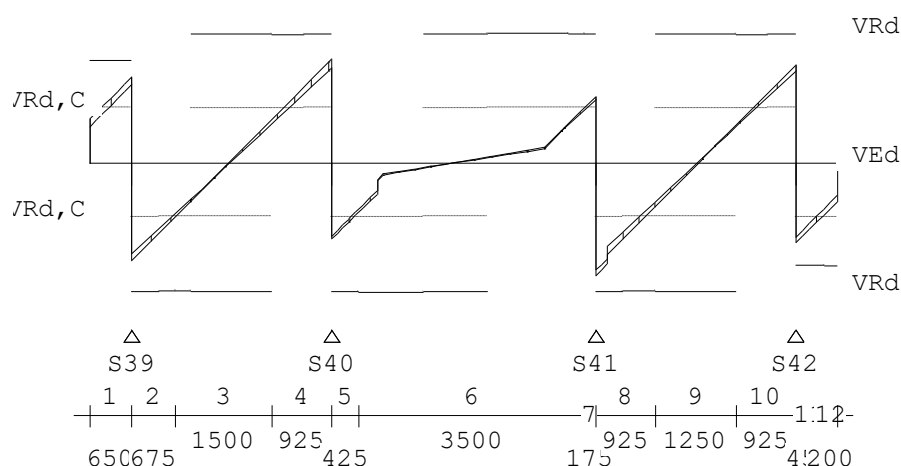
| Merk | B/O | Wapening | Vanaf [mm] | Tot [mm] | Lengte [mm] | $L_{bd, begin}$ [mm] | $L_{bd, eind}$ [mm] |
|------|-------|----------|------------|----------|-------------|----------------------|---------------------|
| a | Boven | 5x12 | S39-1025 | S42+995 | 12321 | 375 | 345 |
| b | Onder | 4x12 | S39-770 | S42+770 | 11840 | 120 | 120 |

Opmerkingen

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

DWARSKRACHTEN Fysisch lineair

Balk 5-6 Fundamentele combinatie



Wring- en dwarskrachtwapening

Balk 5-6

| Geb. | Vanaf | Tot | Beugels | Lengte | <Wringing> | <Dwarskr.> | | | | | |
|------|---------|---------|---------|--------|--|-----------------------------------|---------------------------------|---------------------------------|------------------|-------------------|----------|
| | [mm] | [mm] | | [mm] | $A_{l\text{angs}}$ [mm ²] | A_{bg1} [mm ² /m] | A_{bg1} [mm ²] | A_{opg} [mm ²] | V_{Ed} [kN] | T_{Ed} [kNm] | Opm. |
| 1 | S39-650 | S39+0 | Ø8-250 | 650 | 9 | 1 | 358 | 0 | 119.4 | 0 | 6,59,109 |
| 2 | S39+0 | S39+675 | Ø8-250 | 675 | 9 | 1 | 358 | 0 | 136.6 | 0 | 6 |
| 3 | S39+675 | S40-925 | Ø8-250 | 1500 | 9 | 1 | 358 | 0 | 75.1 | 0 | |
| 4 | S40-925 | S40+0 | Ø8-250 | 925 | 9 | 1 | 358 | 0 | 145.1 | 0 | 6 |
| 5 | S40+0 | S40+425 | Ø8-250 | 425 | 9 | 1 | 358 | 0 | 106.3 | 0 | 6 |
| 6 | S40+425 | S41-175 | Ø8-250 | 3500 | 9 | 1 | 358 | 0 | 76.9 | 0 | |
| 7 | S41-175 | S41+0 | Ø8-250 | 175 | 9 | 1 | 358 | 0 | 92.4 | 0 | 6 |
| 8 | S41+0 | S41+925 | Ø8-250 | 925 | 9 | 1 | 358 | 0 | 157.8 | 0 | 6 |
| 9 | S41+925 | S42-925 | Ø8-250 | 1250 | 0 | 0 | 358 | 0 | 60.5 | 0 | |
| 10 | S42-925 | S42+0 | Ø8-250 | 925 | 9 | 1 | 358 | 0 | 137.0 | 0 | 6 |
| 11 | S42+0 | S42+450 | Ø8-250 | 450 | 9 | 1 | 358 | 0 | 111.4 | 0 | 6,59,109 |
| 12 | S42+450 | S42+650 | Ø8-250 | 200 | 0 | 0 | 358 | 0 | 71.5 | 0 | 59,109 |

Opmerkingen

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

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

[109] Bij de berekening van de beugels is geen rekening gehouden met de detailleringsregels van art 9.7 voor de gedrongen liggers.

Wring- en dwarskrachten

Balk 5-6

| Geb. | Vanaf | Tot | θ | V_{Rd} | V_{Ed} | $V_{Rd,C}$ | $V_{Rd,Max}$ | T_{Ed} | $T_{Rd,C}$ | $T_{Rd,Max}$ | V_{opg} | Opm. |
|------|---------|---------|----------|----------|----------|------------|--------------|----------|------------|--------------|-----------|----------|
| | [mm] | [mm] | [°] | [kN] | | | | | | | | |
| 1 | S39-650 | S39+0 | 21.8 | 144 | 119 | 77 | 419 | 0 | 36 | 89 | 0 | 6,59,109 |
| 2 | S39+0 | S39+675 | 21.8 | 180 | 137 | 77 | 525 | 0 | 36 | 89 | 0 | 6 |
| 3 | S39+675 | S40-925 | 21.8 | 179 | 75 | 75 | 523 | 0 | 36 | 89 | 0 | |
| 4 | S40-925 | S40+0 | 21.8 | 180 | 145 | 77 | 525 | 0 | 36 | 89 | 0 | 6 |
| 5 | S40+0 | S40+425 | 21.8 | 180 | 106 | 77 | 524 | 0 | 36 | 89 | 0 | 6 |
| 6 | S40+425 | S41-175 | 21.8 | 180 | 77 | 77 | 525 | 0 | 36 | 89 | 0 | |
| 7 | S41-175 | S41+0 | 21.8 | 180 | 92 | 77 | 524 | 0 | 36 | 89 | 0 | 6 |
| 8 | S41+0 | S41+925 | 21.8 | 180 | 158 | 77 | 524 | 0 | 36 | 89 | 0 | 6 |
| 9 | S41+925 | S42-925 | 21.8 | 180 | 60 | 75 | 523 | 0 | 36 | 89 | 0 | |
| 10 | S42-925 | S42+0 | 21.8 | 180 | 137 | 77 | 525 | 0 | 36 | 89 | 0 | 6 |
| 11 | S42+0 | S42+450 | 21.8 | 144 | 111 | 77 | 419 | 0 | 36 | 89 | 0 | 6,59,109 |
| 12 | S42+450 | S42+650 | 21.8 | 144 | 71 | 77 | 419 | 0 | 36 | 89 | 0 | 59,109 |

Opmerkingen

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

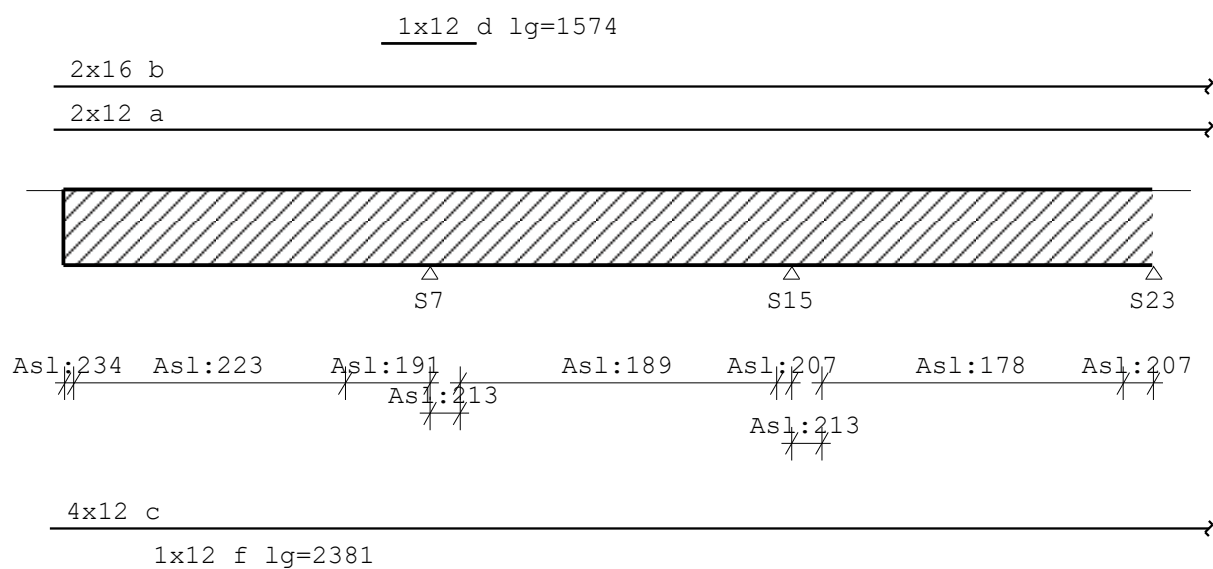
[59] 6.2.3: Z is berekend m.b.v. de gedrongen ligger berekening art 6.1 (10)

[109] Bij de berekening van de beugels is geen rekening gehouden met de detailleringsregels van art 9.7 voor de gedrongen liggers.

Hoofdwapening Fysisch lineair

Balk 5-A

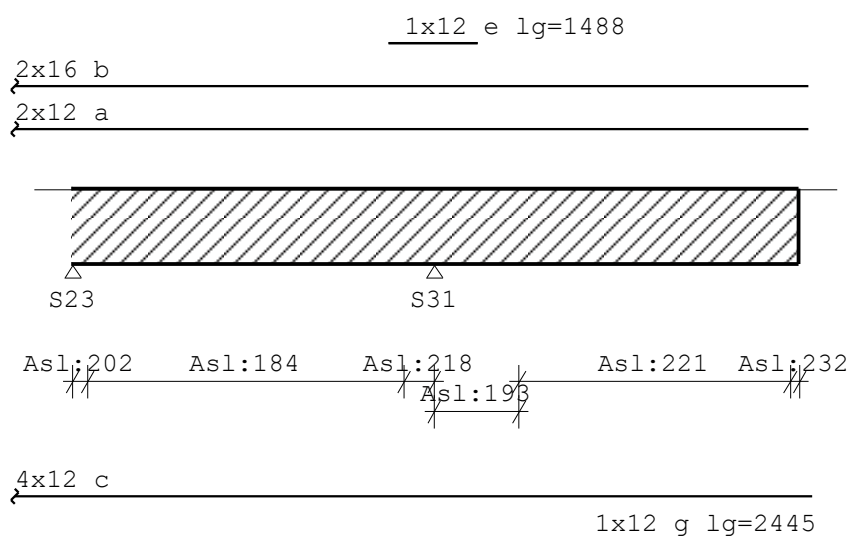
Velden: 1 t/m 3



Hoofdwapening Fysisch lineair

Balk 5-A

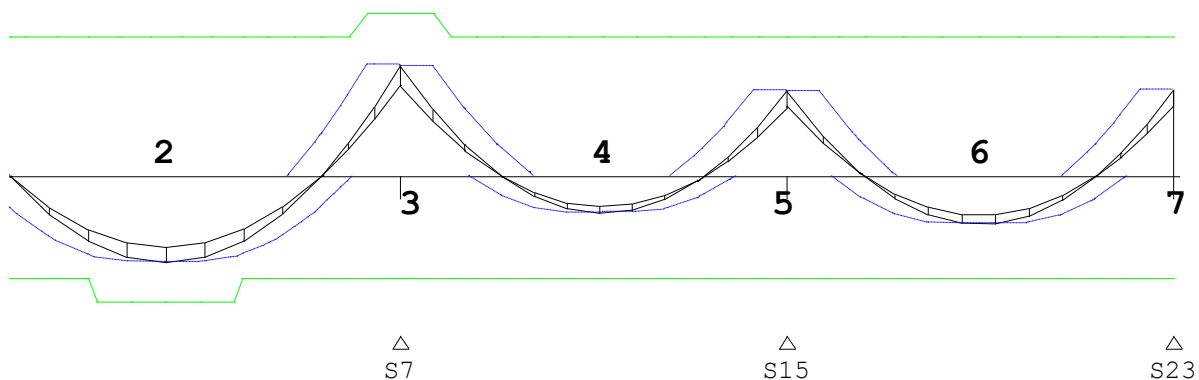
Velden: 4 t/m 5



Med dekkingslijn Fysisch lineair

Balk 5-A

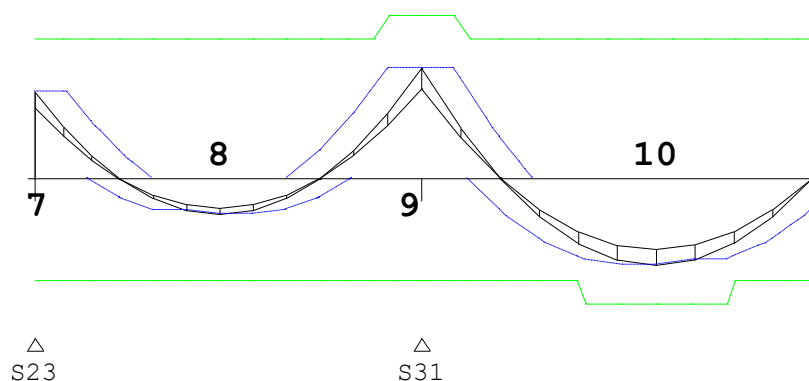
Velden: 1 t/m 3



MEd dekkingslijn Fysisch lineair

Balk 5-A

Velden: 4 t/m 5



Hoofdwapening

Balk 5-A

| Geb. | Pos. [mm] | M_{Ed} [kNm] | M_{Rd} [kNm] | z | B/O | A_b [mm ²] | A_a [mm ²] | Basiswapening +Bijlegwapening | Opm. |
|------|--------------|-------------------|-------------------|-----|-----|-----------------------------|-----------------------------|----------------------------------|------|
| 1 | S7-6060 | 0.27 | 120.40 | 422 | Bov | 165* | 629 | 2x16 + 2x12 | 54 |
| 2 | S7-3645 | -74.35 | -108.04 | 420 | Ond | 383 | 453 | 4x12 | |
| | | | | | Ond | | 114 | +1x12 | |
| 3 | S7+0 | 95.59 | 140.36 | 418 | Bov | 491 | 629 | 2x16 + 2x12 | |
| | | | | | Bov | | 114 | +1x12 | |
| 4 | S15-2860 | -31.39 | -87.50 | 419 | Ond | 199* | 453 | 4x12 | 1 |
| 5 | S15+0 | 73.41 | 120.40 | 422 | Bov | 373 | 629 | 2x16 + 2x12 | |
| 6 | S15+2990 | -41.31 | -87.50 | 419 | Ond | 210 | 453 | 4x12 | |
| 7 | S23-0 | 74.54 | 120.40 | 422 | Bov | 379 | 629 | 2x16 + 2x12 | |
| 8 | S23+2869 | -30.98 | -87.50 | 419 | Ond | 196* | 453 | 4x12 | 1 |
| 9 | S31+0 | 94.46 | 140.36 | 418 | Bov | 485 | 629 | 2x16 + 2x12 | |
| | | | | | Bov | | 114 | +1x12 | |
| 10 | S31+3637 | -74.79 | -108.04 | 420 | Ond | 385 | 453 | 4x12 | |
| | | | | | Ond | | 114 | +1x12 | |
| 11 | S31+6060 | 0.30 | 120.40 | 422 | Bov | 165* | 629 | 2x16 + 2x12 | 54 |

Opmerkingen

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

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

Scheurvorming volgens artikel 7.3.4

Balk 5-A

| Geb. | Pos. [mm] | Zijde | $M_E; freq$ [kNm] | S_r, max [mm] | $\epsilon_{sm} - \epsilon_{cm}$ [%] | w_k [mm] | k_x | w_{max} [mm] | U.C. | Opm. |
|------|-----------|-------|-------------------|-----------------|-------------------------------------|------------|-------|----------------|------|------|
| 1 | S7-6060 | Bov | 0.18 | 340 | 0.002 | 0.001 | 1.00 | 0.300 | 0.00 | |
| 1 | S7-5820 | Bov | 0.18 | 340 | 0.002 | 0.001 | 1.00 | 0.300 | 0.00 | |
| 1 | S7-507 | Bov | 72.52 | 305 | 0.845 | 0.258 | 1.00 | 0.300 | 0.86 | |
| 1 | S7-4837 | Ond | -51.63 | 406 | 0.815 | 0.332 | 1.14 | 0.343 | 0.97 | |
| 1 | S7-3645 | Ond | -56.27 | 358 | 0.740 | 0.265 | 1.14 | 0.343 | 0.77 | |
| 1 | S7-2455 | Ond | -51.63 | 406 | 0.815 | 0.332 | 1.14 | 0.343 | 0.97 | |
| 2 | S7+507 | Bov | 72.52 | 305 | 0.845 | 0.258 | 1.00 | 0.300 | 0.86 | |
| 2 | S15-432 | Bov | 55.77 | 340 | 0.677 | 0.231 | 1.00 | 0.300 | 0.77 | |
| 2 | S15-2860 | Ond | -23.92 | 406 | 0.378 | 0.154 | 1.14 | 0.343 | 0.45 | |
| 3 | S15+403 | Bov | 55.77 | 340 | 0.677 | 0.231 | 1.00 | 0.300 | 0.77 | |
| 3 | S23-405 | Bov | 56.38 | 340 | 0.689 | 0.235 | 1.00 | 0.300 | 0.78 | |
| 3 | S15+2990 | Ond | -31.11 | 406 | 0.491 | 0.200 | 1.14 | 0.343 | 0.58 | |
| 4 | S23+438 | Bov | 56.38 | 340 | 0.689 | 0.235 | 1.00 | 0.300 | 0.78 | |
| 4 | S31-507 | Bov | 71.59 | 305 | 0.830 | 0.254 | 1.00 | 0.300 | 0.85 | |
| 4 | S23+2869 | Ond | -23.49 | 406 | 0.371 | 0.151 | 1.14 | 0.343 | 0.44 | |
| 5 | S31+507 | Bov | 71.59 | 305 | 0.830 | 0.254 | 1.00 | 0.300 | 0.85 | |
| 5 | S31+5821 | Bov | 0.20 | 340 | 0.002 | 0.001 | 1.00 | 0.300 | 0.00 | |
| 5 | S31+6060 | Bov | 0.20 | 340 | 0.002 | 0.001 | 1.00 | 0.300 | 0.00 | |
| 5 | S31+2416 | Ond | -51.56 | 406 | 0.814 | 0.331 | 1.14 | 0.343 | 0.97 | |
| 5 | S31+3637 | Ond | -56.63 | 358 | 0.748 | 0.268 | 1.14 | 0.343 | 0.78 | |
| 5 | S31+4860 | Ond | -51.56 | 406 | 0.814 | 0.331 | 1.14 | 0.343 | 0.97 | |

Verloop hoofdwapening

Balk 5-A

| Merk | B/O | Wapening | Vanaf [mm] | Tot [mm] | Lengte [mm] | $L_{bd, begin}$ [mm] | $L_{bd, eind}$ [mm] |
|------|-------|----------|------------|----------|-------------|----------------------|---------------------|
| a | Boven | 2x12 | S7-6220 | S31+6220 | 30440 | 160 | 160 |
| b | Boven | 2x16 | S7-6220 | S31+6220 | 30440 | 160 | 160 |
| d | Boven | 1x12 | S7-787 | S7+787 | 1574 | 280 | 280 |
| e | Boven | 1x12 | S31-744 | S31+744 | 1488 | 236 | 236 |
| c | Onder | 4x12 | S7-6291 | S31+6292 | 30582 | 231 | 232 |
| f | Onder | 1x12 | S7-4837 | S7-2455 | 2381 | 120 | 120 |
| g | Onder | 1x12 | S31+2416 | S31+4860 | 2445 | 120 | 120 |

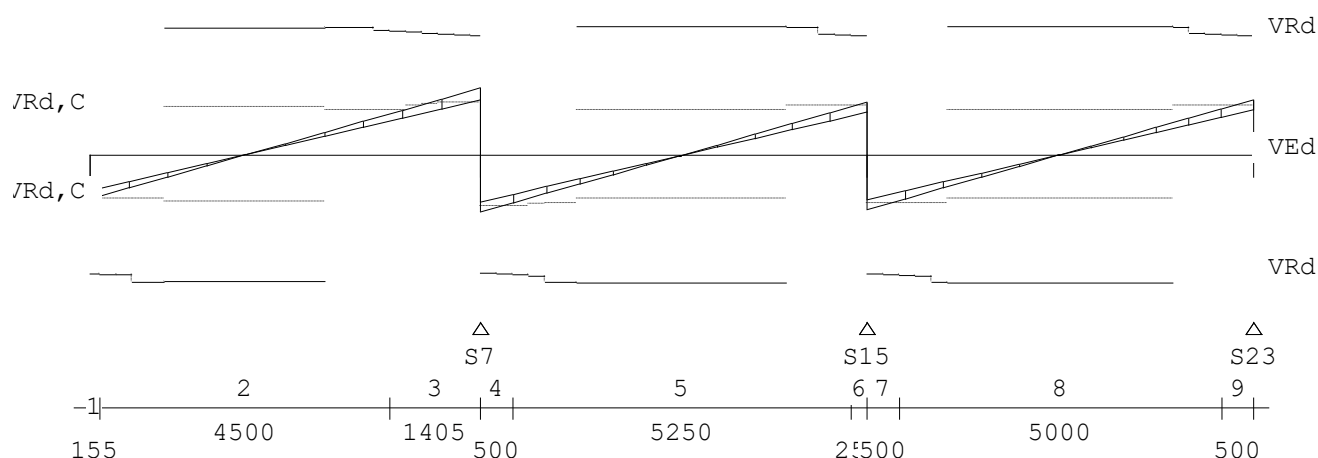
Opmerkingen

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

DWARSKRACHTEN Fysisch lineair

Balk 5-A Fundamentele combinatie

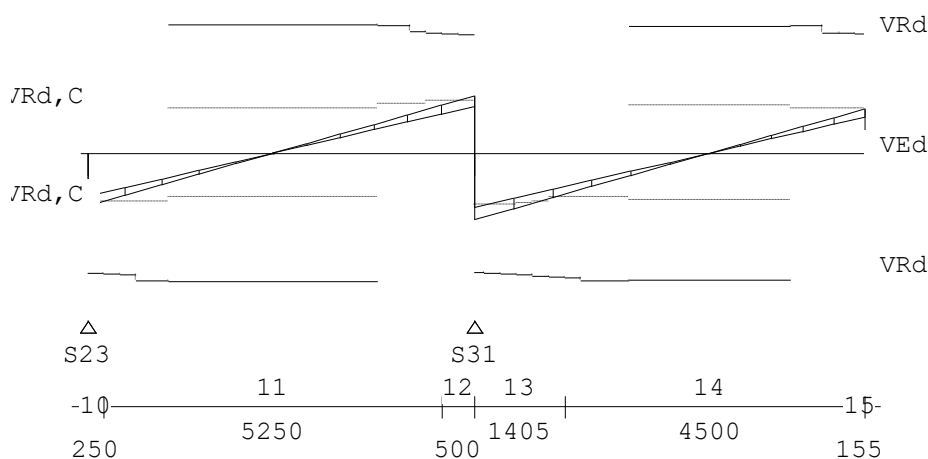
Velden: 1 t/m 3



DWARSKRACHTEN Fysisch lineair

Balk 5-A Fundamentele combinatie

Velden: 4 t/m 5


Wring- en dwarskrachtwapening

Balk 5-A

| Geb. Vanaf | Tot | Beugels | Lengte | <Wringing> | | <Dwarskr.> | | | | | |
|------------|----------|----------|--------|--------------------|----------------------|--------------------|--------------------|----------|----------|------|---|
| [mm] | [mm] | | [mm] | A_{lang} | A_{bg1} | A_{bg1} | A_{opg} | V_{Ed} | T_{Ed} | Opm. | |
| | | | | [mm ²] | [mm ² /m] | [mm ²] | [mm ²] | [kN] | [kNm] | | |
| 1 | S7-6060 | S7-5905 | Ø8-250 | 155 | 234 | 28 | 286 | 0 | 61.7 | 7 | 6 |
| 2 | S7-5905 | S7-1405 | Ø8-250 | 4500 | 223 | 26 | 286 | 0 | 57.7 | 6 | |
| 3 | S7-1405 | S7+0 | Ø8-250 | 1405 | 191 | 23 | 286 | 0 | 93.2 | 6 | 6 |
| 4 | S7+0 | S7+500 | Ø8-250 | 500 | 213 | 25 | 286 | 0 | 80.2 | 6 | 6 |
| 5 | S7+500 | S15-250 | Ø8-250 | 5250 | 189 | 22 | 286 | 0 | 67.5 | 5 | |
| 6 | S15-250 | S15+0 | Ø8-250 | 250 | 207 | 24 | 286 | 0 | 73.1 | 6 | 6 |
| 7 | S15+0 | S15+500 | Ø8-250 | 500 | 213 | 25 | 286 | 0 | 76.5 | 6 | 6 |
| 8 | S15+500 | S23-500 | Ø8-250 | 5000 | 178 | 21 | 286 | 0 | 64.1 | 5 | |
| 9 | S23-500 | S23-0 | Ø8-250 | 500 | 207 | 24 | 286 | 0 | 76.9 | 6 | 6 |
| 10 | S23-0 | S23+250 | Ø8-250 | 250 | 202 | 24 | 286 | 0 | 73.3 | 6 | 6 |
| 11 | S23+250 | S31-500 | Ø8-250 | 5250 | 184 | 22 | 286 | 0 | 67.2 | 5 | |
| 12 | S31-500 | S31+0 | Ø8-250 | 500 | 218 | 26 | 286 | 0 | 80.0 | 6 | 6 |
| 13 | S31+0 | S31+1405 | Ø8-250 | 1405 | 193 | 23 | 286 | 0 | 93.0 | 6 | 6 |
| 14 | S31+1405 | S31+5905 | Ø8-250 | 4500 | 221 | 26 | 286 | 0 | 57.9 | 6 | |
| 15 | S31+5905 | S31+6060 | Ø8-250 | 155 | 232 | 27 | 286 | 0 | 61.9 | 7 | 6 |

Opmerkingen

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

Wring- en dwarskrachten

Balk 5-A

| Geb. | Vanaf [mm] | Tot [mm] | θ [°] | V_{Rd} [kN] | V_{Ed} | $V_{Rd,C}$ | $V_{Rd,Max}$ | T_{Ed} | $T_{Rd,C}$ | $T_{Rd,Max}$ | V_{opg} | Opm. |
|------|---------------|-------------|-----------------|------------------|--------------|------------|--------------|---------------|------------|--------------|-----------|------|
| | | | | | -----kN----- | | | -----kNm----- | | | | |
| 1 | S7-6060 | S7-5905 | 21.8 | 155 | 62 | 61 | 416 | 7 | 26 | 63 | 0 | 6 |
| 2 | S7-5905 | S7-1405 | 21.8 | 156 | 58 | 61 | 416 | 6 | 26 | 63 | 0 | |
| 3 | S7-1405 | S7+0 | 21.8 | 157 | 93 | 73 | 410 | 6 | 26 | 63 | 0 | 6 |
| 4 | S7+0 | S7+500 | 21.8 | 154 | 80 | 73 | 410 | 6 | 26 | 63 | 0 | 6 |
| 5 | S7+500 | S15-250 | 21.8 | 159 | 67 | 73 | 411 | 5 | 26 | 63 | 0 | |
| 6 | S15-250 | S15+0 | 21.8 | 156 | 73 | 69 | 413 | 6 | 26 | 63 | 0 | 6 |
| 7 | S15+0 | S15+500 | 21.8 | 156 | 76 | 69 | 413 | 6 | 26 | 63 | 0 | 6 |
| 8 | S15+500 | S23-500 | 21.8 | 160 | 64 | 69 | 414 | 5 | 26 | 63 | 0 | |
| 9 | S23-500 | S23-0 | 21.8 | 156 | 77 | 69 | 413 | 6 | 26 | 63 | 0 | 6 |
| 10 | S23-0 | S23+250 | 21.8 | 157 | 73 | 69 | 413 | 6 | 26 | 63 | 0 | 6 |
| 11 | S23+250 | S31-500 | 21.8 | 158 | 67 | 73 | 411 | 5 | 26 | 63 | 0 | |
| 12 | S31-500 | S31+0 | 21.8 | 154 | 80 | 73 | 410 | 6 | 26 | 63 | 0 | 6 |
| 13 | S31+0 | S31+1405 | 21.8 | 157 | 93 | 73 | 410 | 6 | 26 | 63 | 0 | 6 |
| 14 | S31+1405 | S31+5905 | 21.8 | 156 | 58 | 61 | 416 | 6 | 26 | 63 | 0 | |
| 15 | S31+5905 | S31+6060 | 21.8 | 155 | 62 | 61 | 416 | 7 | 26 | 63 | 0 | 6 |

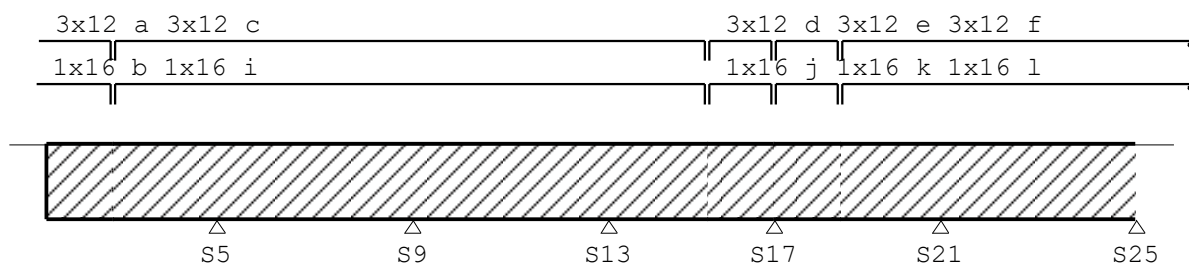
Opmerkingen

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

Hoofdwapening Fysisch lineair

Balk 5-B

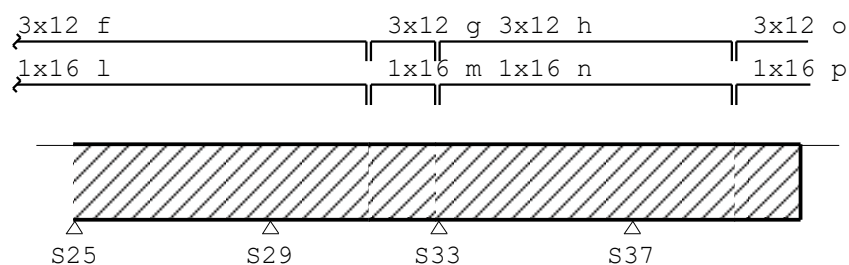
Velden: 1 t/m 6



Hoofdwapening Fysisch lineair

Balk 5-B

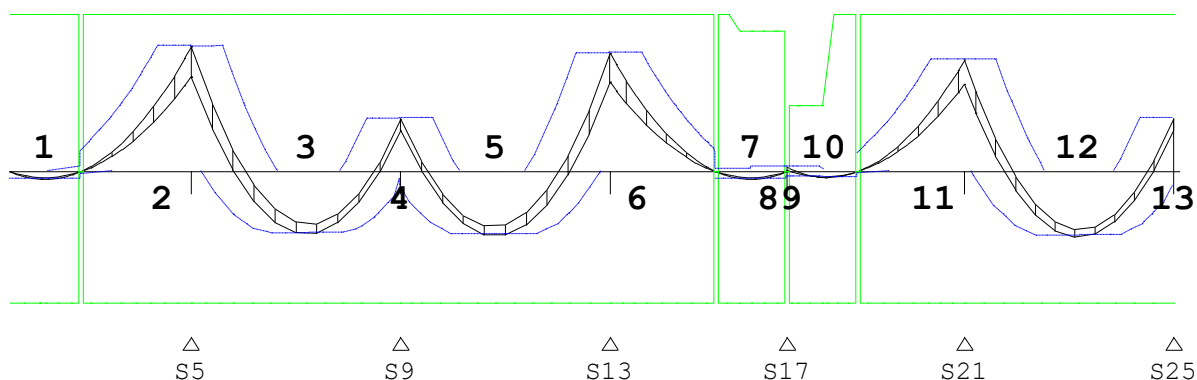
Velden: 7 t/m 10



MEd dekkingslijn Fysisch lineair

Balk 5-B

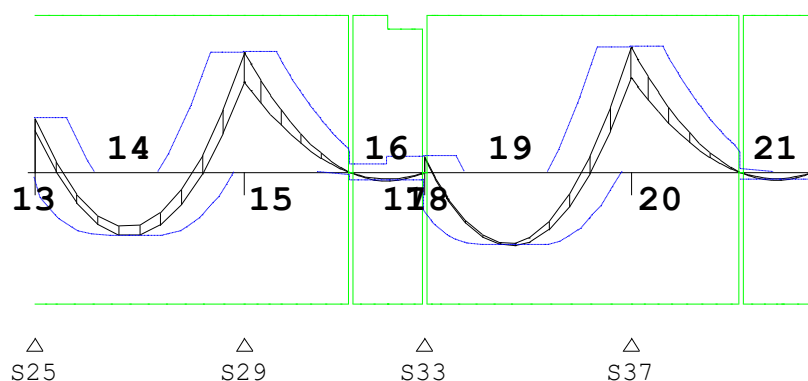
Velden: 1 t/m 6



MEd dekkingslijn Fysisch lineair

Balk 5-B

Velden: 7 t/m 10



Hoofdwapening

Balk 5-B

| Geb. | Pos. [mm] | M_{Ed} [kNm] | M_{Rd} [kNm] | z B/O [mm] | A_b [mm ²] | A_a [mm ²] | Basiswapening +Bijlegwapening | Opm. |
|------|--------------|-------------------|-------------------|---------------|-----------------------------|-----------------------------|----------------------------------|----------------|
| 1 | S5-2260 | -5.23 | -87.48 | 421 Ond | 165* | 453 | 4x12 | 2, 54, 68, 110 |
| 2 | S5+0 | 83.21 | 104.57 | 426 Bov | 425 | 541 | 1x16 + 3x12 | |
| 3 | S9-1456 | -41.58 | -87.48 | 421 Ond | 211 | 453 | 4x12 | |
| 4 | S9+0 | 35.55 | 104.57 | 426 Bov | 204* | 541 | 1x16 + 3x12 | 1 |
| 5 | S9+1475 | -42.77 | -87.48 | 421 Ond | 217 | 453 | 4x12 | |
| 6 | S13+0 | 78.59 | 104.57 | 426 Bov | 400 | 541 | 1x16 + 3x12 | |
| 7 | S17-550 | -5.23 | -87.48 | 421 Ond | 165* | 453 | 4x12 | 2, 54, 68, 110 |
| 8 | S17-0 | 2.97 | 93.39 | 397 Bov | 165* | 541 | 1x16 + 3x12 | 2, 54, 110 |
| 9 | S17+0 | 2.97 | 44.02 | 187 Bov | 165* | 541 | 1x16 + 3x12 | 2, 54, 110 |
| 10 | S17+623 | -3.94 | -87.48 | 421 Ond | 165* | 453 | 4x12 | 2, 54, 68, 110 |
| 11 | S21+0 | 74.45 | 104.57 | 426 Bov | 378 | 541 | 1x16 + 3x12 | |
| 12 | S25-1481 | -43.52 | -87.48 | 421 Ond | 221 | 453 | 4x12 | |
| 13 | S25-0 | 35.69 | 104.57 | 426 Bov | 204* | 541 | 1x16 + 3x12 | 1 |
| 14 | S25+1471 | -42.42 | -87.48 | 421 Ond | 215 | 453 | 4x12 | |
| 15 | S29+0 | 79.77 | 104.57 | 426 Bov | 407 | 541 | 1x16 + 3x12 | |
| 16 | S33-569 | -5.63 | -87.48 | 421 Ond | 165* | 453 | 4x12 | 2, 54, 68, 110 |
| 17 | S33-0 | 10.68 | 95.39 | 406 Bov | 165* | 541 | 1x16 + 3x12 | 2, 54, 110 |
| 18 | S33+0 | 10.68 | 104.57 | 426 Bov | 165* | 541 | 1x16 + 3x12 | 54 |
| 19 | S33+1354 | -48.86 | -87.48 | 421 Ond | 249 | 453 | 4x12 | |
| 20 | S37+0 | 83.21 | 104.57 | 426 Bov | 425 | 541 | 1x16 + 3x12 | |
| 21 | S37+2260 | -5.23 | -87.48 | 421 Ond | 165* | 453 | 4x12 | 2, 54, 68, 110 |

Opmerkingen

- [1] * = Eisen met betrekking tot minimum wapening zijn toegepast, zie nationale bijlage art. 9.2.1.1(1).
- [2] Benodigde wapening en inwendige hefboomsarm zijn bepaald volgens gedrongen ligger detaillering, zie nationale bijlage art. 6.1(10).
- [54] * = Eisen met betrekking tot minimum wapening ten behoeve van gecontroleerde scheurvorming zijn toegepast volgens art. 7.3.2.
- [68] **MRd als gevolg van de gedrongen ligger berekening (NB. 6.1(10)) is groter dan MRd volgens 6.1(P). De momentweerstand en inwendige hefboomsarm volgens 6.1(P) zijn maatgevend en daarom alsnog toegepast.**
- [110] Art. 9.7 (1), (2): Een orthogonaal wapeningsnet dient toegepast te worden aan iedere zijde van de gedrongen liggers:
Profiel 2 - B×H 400×500: 400 mm²/m aan elke zijde en in elke richting met een maximaal hoh 300 mm.

Scheurvorming volgens artikel 7.3.4

Balk 5-B

| Geb. | Pos. | Zijde | M_E, freq [kNm] | $S_{r, \max}$ [mm] | $\epsilon_{sm} - \epsilon_{cm}$ [%] | w_k [mm] | k_x | w_{\max} [mm] | U.C. | Opm. |
|------|----------|-------|-----------------------------|-----------------------|--|---------------|-------|--------------------|------|------|
| 1 | S5-463 | Bov | 58.29 | 353 | 0.844 | 0.298 | 1.00 | 0.300 | 0.99 | |
| 1 | S5-2584 | Ond | -3.66 | 406 | 0.058 | 0.024 | 1.14 | 0.343 | 0.07 | |
| 1 | S5-1865 | Ond | -3.66 | 406 | 0.058 | 0.024 | 1.14 | 0.343 | 0.07 | |
| 2 | S5+0 | Bov | 58.29 | 353 | 0.844 | 0.298 | 1.00 | 0.300 | 0.99 | |
| 2 | S5+279 | Bov | 58.29 | 353 | 0.844 | 0.298 | 1.00 | 0.300 | 0.99 | |
| 2 | S9-410 | Bov | 24.89 | 353 | 0.328 | 0.116 | 1.00 | 0.300 | 0.39 | |
| 2 | S9-1456 | Ond | -32.05 | 406 | 0.506 | 0.206 | 1.14 | 0.343 | 0.60 | |
| 3 | S9+413 | Bov | 24.89 | 353 | 0.328 | 0.116 | 1.00 | 0.300 | 0.39 | |
| 3 | S13-264 | Bov | 55.06 | 353 | 0.773 | 0.273 | 1.00 | 0.300 | 0.91 | |
| 3 | S9+1475 | Ond | -33.12 | 406 | 0.523 | 0.213 | 1.14 | 0.343 | 0.62 | |
| 4 | S13+274 | Bov | 55.06 | 353 | 0.773 | 0.273 | 1.00 | 0.300 | 0.91 | |
| 4 | S17-373 | Bov | 1.39 | 353 | 0.018 | 0.006 | 1.00 | 0.300 | 0.02 | |
| 4 | S17-945 | Ond | -3.66 | 406 | 0.058 | 0.024 | 1.14 | 0.343 | 0.07 | |
| 4 | S17-155 | Ond | -3.66 | 406 | 0.058 | 0.024 | 1.14 | 0.343 | 0.07 | |
| 5 | S17+372 | Bov | 1.39 | 353 | 0.018 | 0.006 | 1.00 | 0.300 | 0.02 | |
| 5 | S21-274 | Bov | 52.97 | 353 | 0.727 | 0.257 | 1.00 | 0.300 | 0.86 | |
| 5 | S17+155 | Ond | -2.99 | 406 | 0.047 | 0.019 | 1.14 | 0.343 | 0.06 | |
| 5 | S17+623 | Ond | -3.00 | 406 | 0.047 | 0.019 | 1.14 | 0.343 | 0.06 | |
| 5 | S17+1065 | Ond | -2.99 | 406 | 0.047 | 0.019 | 1.14 | 0.343 | 0.06 | |
| 6 | S21+0 | Bov | 52.97 | 353 | 0.727 | 0.257 | 1.00 | 0.300 | 0.86 | |
| 6 | S21+496 | Bov | 52.97 | 353 | 0.727 | 0.257 | 1.00 | 0.300 | 0.86 | |
| 6 | S25-405 | Bov | 24.87 | 353 | 0.328 | 0.116 | 1.00 | 0.300 | 0.39 | |
| 6 | S25-1481 | Ond | -34.14 | 406 | 0.539 | 0.219 | 1.14 | 0.343 | 0.64 | |
| 7 | S25+417 | Bov | 24.87 | 353 | 0.328 | 0.116 | 1.00 | 0.300 | 0.39 | |
| 7 | S29-268 | Bov | 55.89 | 353 | 0.791 | 0.279 | 1.00 | 0.300 | 0.93 | |
| 7 | S25+1471 | Ond | -32.77 | 406 | 0.517 | 0.210 | 1.14 | 0.343 | 0.61 | |
| 8 | S29+0 | Bov | 55.89 | 353 | 0.791 | 0.279 | 1.00 | 0.300 | 0.93 | |
| 8 | S29+274 | Bov | 55.89 | 353 | 0.791 | 0.279 | 1.00 | 0.300 | 0.93 | |
| 8 | S33-374 | Bov | 8.48 | 353 | 0.112 | 0.039 | 1.00 | 0.300 | 0.13 | |
| 8 | S33-985 | Ond | -3.94 | 406 | 0.062 | 0.025 | 1.14 | 0.343 | 0.07 | |
| 8 | S33-155 | Ond | -3.94 | 406 | 0.062 | 0.025 | 1.14 | 0.343 | 0.07 | |
| 9 | S33+374 | Bov | 8.48 | 353 | 0.112 | 0.039 | 1.00 | 0.300 | 0.13 | |
| 9 | S37-256 | Bov | 58.29 | 353 | 0.844 | 0.298 | 1.00 | 0.300 | 0.99 | |
| 9 | S33+807 | Ond | -39.36 | 406 | 0.621 | 0.253 | 1.14 | 0.343 | 0.74 | |
| 9 | S33+1354 | Ond | -39.34 | 406 | 0.621 | 0.253 | 1.14 | 0.343 | 0.74 | |
| 10 | S37+463 | Bov | 58.29 | 353 | 0.844 | 0.298 | 1.00 | 0.300 | 0.99 | |
| 10 | S37+1865 | Ond | -3.66 | 406 | 0.058 | 0.024 | 1.14 | 0.343 | 0.07 | |
| 10 | S37+2584 | Ond | -3.66 | 406 | 0.058 | 0.024 | 1.14 | 0.343 | 0.07 | |

Verloop hoofdwapening

Balk 5-B

| Merk | B/O | Wapening | Vanaf [mm] | Tot [mm] | Lengte [mm] | $L_{bd, begin}$ [mm] | $L_{bd, eind}$ [mm] |
|------|-------|----------|---------------|-------------|----------------|-------------------------|------------------------|
| a | Boven | 3x12 | S5-2930 | S5-1745 | 1185 | 120 | 120 |
| b | Boven | 1x16 | S5-2970 | S5-1745 | 1225 | 160 | 160 |
| c | Boven | 3x12 | S5-1675 | S17-1135 | 9790 | 137 | 137 |
| d | Boven | 3x12 | S17-1065 | S17-35 | 1030 | 120 | 120 |
| e | Boven | 3x12 | S17+35 | S17+1065 | 1030 | 120 | 120 |
| f | Boven | 3x12 | S17+1135 | S33-1175 | 9730 | 129 | 141 |
| g | Boven | 3x12 | S33-1105 | S33-35 | 1070 | 120 | 120 |
| h | Boven | 3x12 | S33+35 | S37+1675 | 4850 | 120 | 137 |
| i | Boven | 1x16 | S5-1675 | S17-1135 | 9790 | 194 | 194 |
| j | Boven | 1x16 | S17-1065 | S17-35 | 1030 | 160 | 160 |
| k | Boven | 1x16 | S17+35 | S17+1065 | 1030 | 160 | 160 |
| l | Boven | 1x16 | S17+1135 | S33-1175 | 9730 | 182 | 199 |
| m | Boven | 1x16 | S33-1105 | S33-35 | 1070 | 160 | 160 |
| n | Boven | 1x16 | S33+35 | S37+1675 | 4850 | 160 | 194 |
| o | Boven | 3x12 | S37+1745 | S37+2930 | 1185 | 120 | 120 |
| p | Boven | 1x16 | S37+1745 | S37+2970 | 1225 | 160 | 160 |
| q | Onder | 4x12 | S5-2930 | S5-1745 | 1185 | 120 | 120 |
| r | Onder | 4x12 | S5-1675 | S17-1135 | 9790 | 120 | 120 |
| s | Onder | 4x12 | S17-1065 | S17-35 | 1030 | 120 | 120 |
| t | Onder | 4x12 | S17+35 | S17+1065 | 1030 | 120 | 120 |
| u | Onder | 4x12 | S17+1135 | S33-1175 | 9730 | 120 | 120 |
| v | Onder | 4x12 | S33-1105 | S33-35 | 1070 | 120 | 120 |
| w | Onder | 4x12 | S33+35 | S37+1675 | 4850 | 220 | 120 |
| x | Onder | 4x12 | S37+1745 | S37+2930 | 1185 | 120 | 120 |

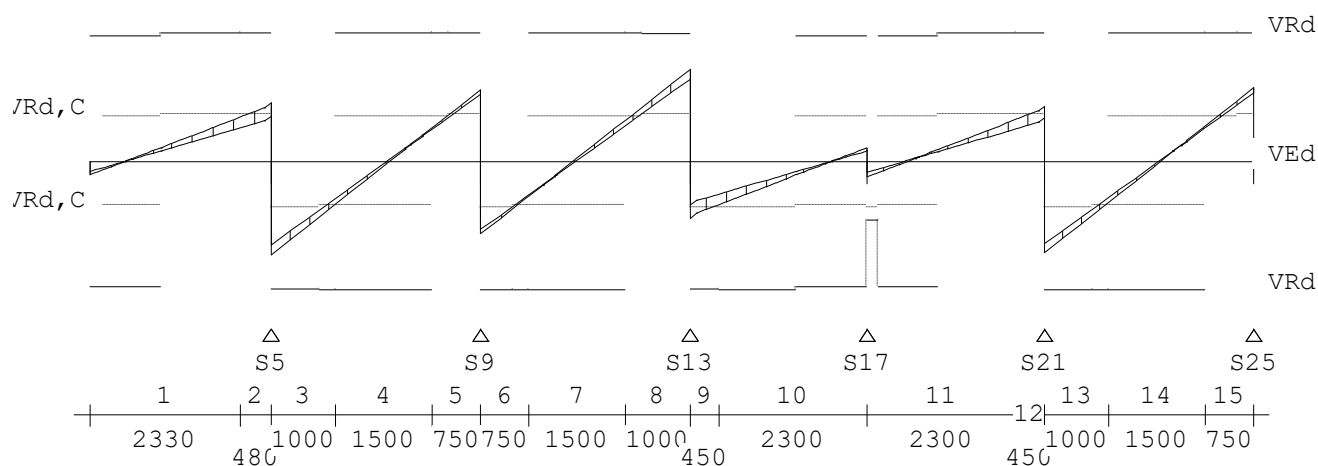
Opmerkingen

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

DWARSKRACHTEN Fysisch lineair

Balk 5-B Fundamentele combinatie

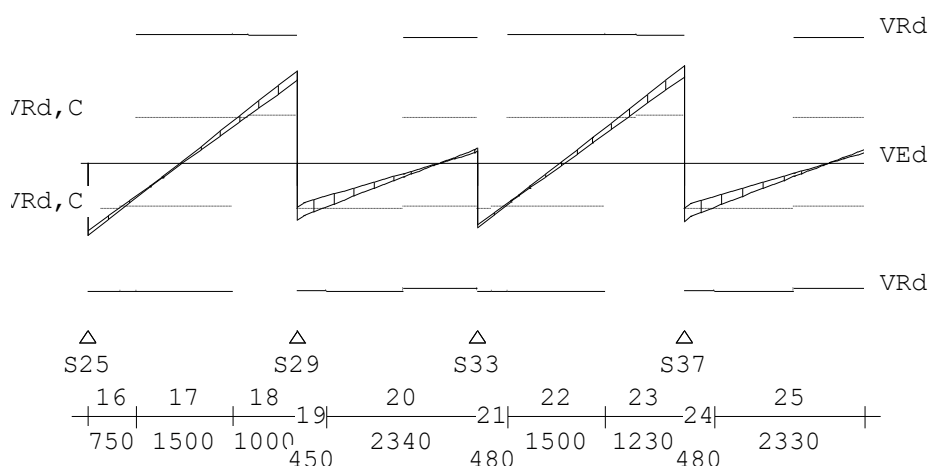
Velden: 1 t/m 6



DWARSKRACHTEN Fysisch lineair

Balk 5-B Fundamentele combinatie

Velden: 7 t/m 10


Wring- en dwarskrachtwapening

Balk 5-B

| Geb. | Vanaf | Tot | Beugels | Lengte | <Wringing> | | <Dwarskr.> | | V _{Ed} | T _{Ed} | Opm. |
|------|----------|----------|---------|--------|---------------------|----------------------|--------------------|--------------------|-----------------|-----------------|--------|
| | [mm] | [mm] | | [mm] | A _{l,angs} | A _{b,gl} | A _{b,gl} | A _{o,pg} | [kN] | [kNm] | |
| | | | | | [mm ²] | [mm ² /m] | [mm ²] | [mm ²] | | | |
| 1 | S5-2810 | S5-480 | Ø8-250 | 2330 | 0 | 0 | 286 | 0 | 61.4 | 0 | 58,109 |
| 2 | S5-480 | S5+0 | Ø8-250 | 480 | 0 | 0 | 286 | 0 | 81.5 | 0 | 6 |
| 3 | S5+0 | S5+1000 | Ø8-250 | 1000 | 0 | 0 | 293 | 0 | 130.3 | 0 | 6 |
| 4 | S5+1000 | S9-750 | Ø8-250 | 1500 | 0 | 0 | 286 | 0 | 59.4 | 0 | |
| 5 | S9-750 | S9+0 | Ø8-250 | 750 | 0 | 0 | 286 | 0 | 99.7 | 0 | 6 |
| 6 | S9+0 | S9+750 | Ø8-250 | 750 | 0 | 0 | 286 | 0 | 101.4 | 0 | 6 |
| 7 | S9+750 | S13-1000 | Ø8-250 | 1500 | 0 | 0 | 286 | 0 | 57.7 | 0 | |
| 8 | S13-1000 | S13+0 | Ø8-250 | 1000 | 0 | 0 | 289 | 0 | 128.6 | 0 | 6 |
| 9 | S13+0 | S13+450 | Ø8-250 | 450 | 0 | 0 | 286 | 0 | 79.5 | 0 | 6 |
| 10 | S13+450 | S17+0 | Ø8-250 | 2300 | 0 | 0 | 286 | 0 | 60.4 | 0 | |
| 11 | S17+0 | S21-450 | Ø8-250 | 2300 | 0 | 0 | 286 | 0 | 57.9 | 0 | 59,109 |
| 12 | S21-450 | S21+0 | Ø8-250 | 450 | 0 | 0 | 286 | 0 | 77.2 | 0 | 6 |
| 13 | S21+0 | S21+1000 | Ø8-250 | 1000 | 0 | 0 | 286 | 0 | 127.4 | 0 | 6 |
| 14 | S21+1000 | S25-750 | Ø8-250 | 1500 | 0 | 0 | 286 | 0 | 56.5 | 0 | |
| 15 | S25-750 | S25-0 | Ø8-250 | 750 | 0 | 0 | 286 | 0 | 102.6 | 0 | 6 |
| 16 | S25-0 | S25+750 | Ø8-250 | 750 | 0 | 0 | 286 | 0 | 101.0 | 0 | 6 |
| 17 | S25+750 | S29-1000 | Ø8-250 | 1500 | 0 | 0 | 286 | 0 | 58.1 | 0 | |
| 18 | S29-1000 | S29+0 | Ø8-250 | 1000 | 0 | 0 | 290 | 0 | 129.0 | 0 | 6 |
| 19 | S29+0 | S29+450 | Ø8-250 | 450 | 0 | 0 | 286 | 0 | 80.2 | 0 | 6 |
| 20 | S29+450 | S33+0 | Ø8-250 | 2340 | 0 | 0 | 286 | 0 | 61.1 | 0 | |
| 21 | S33+0 | S33+480 | Ø8-250 | 480 | 0 | 0 | 286 | 0 | 90.9 | 0 | 6 |
| 22 | S33+480 | S37-1230 | Ø8-250 | 1500 | 0 | 0 | 286 | 0 | 56.8 | 0 | |
| 23 | S37-1230 | S37+0 | Ø8-250 | 1230 | 0 | 0 | 307 | 0 | 136.3 | 0 | 6 |
| 24 | S37+0 | S37+480 | Ø8-250 | 480 | 0 | 0 | 286 | 0 | 81.5 | 0 | 6 |
| 25 | S37+480 | S37+2810 | Ø8-250 | 2330 | 0 | 0 | 286 | 0 | 61.4 | 0 | |

Opmerkingen

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

[58] 6.2.3: Z is berekend m.b.v. 0.9d

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

[109] Bij de berekening van de beugels is geen rekening gehouden met de detailleringregels van art 9.7 voor de gedrongen liggers.

Wring- en dwarskrachten

Balk 5-B

| Geb. | Vanaf [mm] | Tot [mm] | θ [°] | V_{Rd} [kN] | V_{Ed} | $V_{Rd,C}$ | $V_{Rd,Max}$ | T_{Ed} | $T_{Rd,C}$ | $T_{Rd,Max}$ | V_{opg} | Opm. |
|------|---------------|-------------|-----------------|------------------|--------------|------------|--------------|---------------|------------|--------------|-----------|--------|
| | | | | | -----kN----- | | | -----kNm----- | | | | |
| 1 | S5-2810 | S5-480 | 21.8 | 179 | 61 | 65 | 418 | 0 | 26 | 63 | 0 | 58,109 |
| 2 | S5-480 | S5+0 | 21.8 | 179 | 82 | 65 | 416 | 0 | 26 | 63 | 0 | 6 |
| 3 | S5+0 | S5+1000 | 21.8 | 179 | 130 | 65 | 415 | 0 | 26 | 63 | 0 | 6 |
| 4 | S5+1000 | S9-750 | 21.8 | 179 | 59 | 61 | 416 | 0 | 26 | 63 | 0 | |
| 5 | S9-750 | S9+0 | 21.8 | 179 | 100 | 65 | 417 | 0 | 26 | 63 | 0 | 6 |
| 6 | S9+0 | S9+750 | 21.8 | 179 | 101 | 65 | 417 | 0 | 26 | 63 | 0 | 6 |
| 7 | S9+750 | S13-1000 | 21.8 | 179 | 58 | 61 | 415 | 0 | 26 | 63 | 0 | |
| 8 | S13-1000 | S13+0 | 21.8 | 179 | 129 | 65 | 415 | 0 | 26 | 63 | 0 | 6 |
| 9 | S13+0 | S13+450 | 21.8 | 179 | 79 | 65 | 415 | 0 | 26 | 63 | 0 | 6 |
| 10 | S13+450 | S17+0 | 21.8 | 179 | 60 | 65 | 416 | 0 | 26 | 63 | 0 | |
| 11 | S17+0 | S21-450 | 21.8 | 179 | 58 | 65 | 418 | 0 | 26 | 63 | 0 | 59,109 |
| 12 | S21-450 | S21+0 | 21.8 | 179 | 77 | 65 | 416 | 0 | 26 | 63 | 0 | 6 |
| 13 | S21+0 | S21+1000 | 21.8 | 179 | 127 | 65 | 415 | 0 | 26 | 63 | 0 | 6 |
| 14 | S21+1000 | S25-750 | 21.8 | 179 | 56 | 61 | 415 | 0 | 26 | 63 | 0 | |
| 15 | S25-750 | S25+0 | 21.8 | 179 | 103 | 65 | 417 | 0 | 26 | 63 | 0 | 6 |
| 16 | S25+0 | S25+750 | 21.8 | 179 | 101 | 65 | 417 | 0 | 26 | 63 | 0 | 6 |
| 17 | S25+750 | S29-1000 | 21.8 | 179 | 58 | 61 | 415 | 0 | 26 | 63 | 0 | |
| 18 | S29-1000 | S29+0 | 21.8 | 179 | 129 | 65 | 415 | 0 | 26 | 63 | 0 | 6 |
| 19 | S29+0 | S29+450 | 21.8 | 179 | 80 | 65 | 415 | 0 | 26 | 63 | 0 | 6 |
| 20 | S29+450 | S33+0 | 21.8 | 179 | 61 | 65 | 416 | 0 | 26 | 63 | 0 | |
| 21 | S33+0 | S33+480 | 21.8 | 180 | 91 | 65 | 417 | 0 | 26 | 63 | 0 | 6 |
| 22 | S33+480 | S37-1230 | 21.8 | 179 | 57 | 61 | 415 | 0 | 26 | 63 | 0 | |
| 23 | S37-1230 | S37+0 | 21.8 | 179 | 136 | 65 | 415 | 0 | 26 | 63 | 0 | 6 |
| 24 | S37+0 | S37+480 | 21.8 | 179 | 82 | 65 | 415 | 0 | 26 | 63 | 0 | 6 |
| 25 | S37+480 | S37+2810 | 21.8 | 179 | 61 | 65 | 416 | 0 | 26 | 63 | 0 | |

Opmerkingen

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

[58] 6.2.3: Z is berekend m.b.v. 0.9d

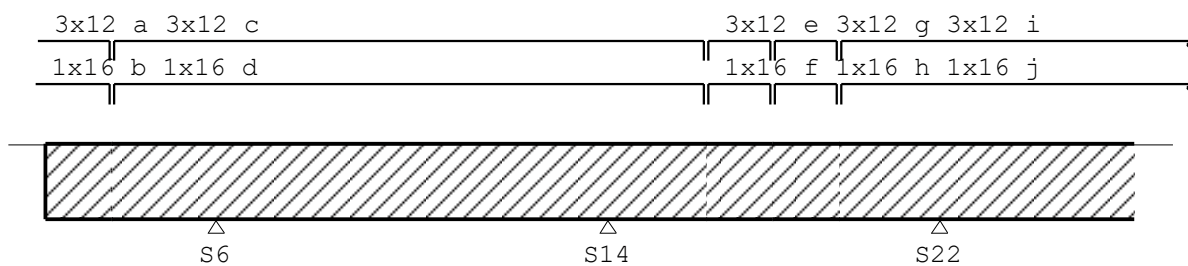
[59] 6.2.3: Z is berekend m.b.v. de gedrongen ligger berekening art 6.1 (10)

[109] Bij de berekening van de beugels is geen rekening gehouden met de detailleringsregels van art 9.7 voor de gedrongen liggers.

Hoofdwapening Fysisch lineair

Balk 5-C

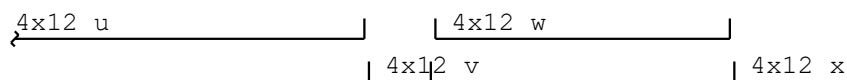
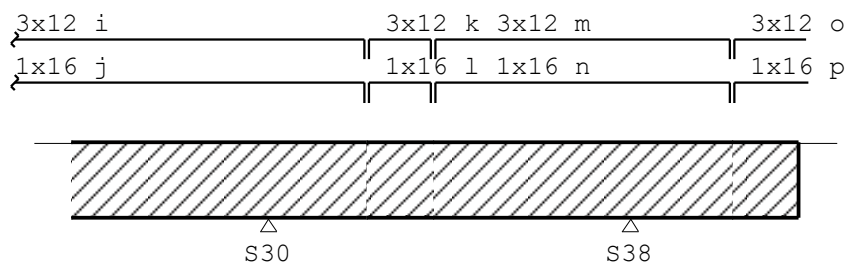
Velden: 1 t/m 6



Hoofdwapening Fysisch lineair

Balk 5-C

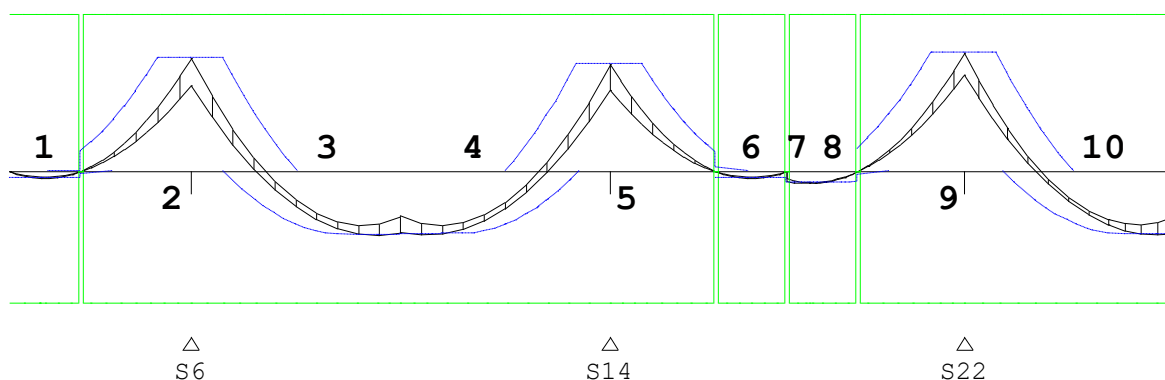
Velden: 7 t/m 10



MEd dekkingslijn Fysisch lineair

Balk 5-C

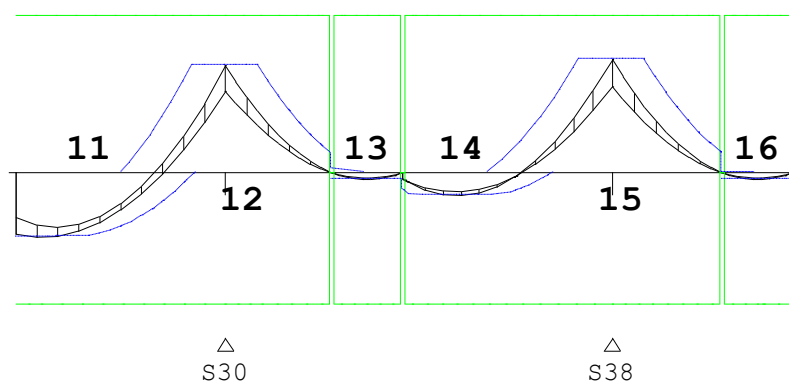
Velden: 1 t/m 6



MEd dekkingslijn Fysisch lineair

Balk 5-C

Velden: 7 t/m 10



Hoofdwapening

Balk 5-C

| Geb. | Pos. [mm] | M_{Ed} [kNm] | M_{Rd} [kNm] | z | B/O | A_b [mm ²] | A_a [mm ²] | Basiswapening +Bijlegwapening | Opm. |
|------|--------------|-------------------|-------------------|-----|-----|-----------------------------|-----------------------------|----------------------------------|----------------|
| 1 | S6-2260 | -4.74 | -87.48 | 421 | Ond | 165* | 453 | 4x12 | 2, 54, 68, 110 |
| 2 | S6+0 | 75.25 | 104.57 | 426 | Bov | 383 | 541 | 1x16 + 3x12 | |
| 3 | S6+2894 | -42.62 | -87.48 | 421 | Ond | 216 | 453 | 4x12 | |
| 4 | S14-2843 | -42.30 | -87.48 | 421 | Ond | 215 | 453 | 4x12 | |
| 5 | S14+0 | 71.06 | 104.57 | 426 | Bov | 361 | 541 | 1x16 + 3x12 | |
| 6 | S14+2750 | -6.75 | -87.48 | 421 | Ond | 165* | 453 | 4x12 | 2, 54, 68, 110 |
| 7 | S22-2457 | -7.77 | -87.48 | 421 | Ond | 165* | 453 | 4x12 | 2, 54, 68, 110 |
| 8 | S22-2354 | -7.76 | -87.48 | 421 | Ond | 165* | 453 | 4x12 | 2, 54, 68, 110 |
| 9 | S22+0 | 79.02 | 104.57 | 426 | Bov | 403 | 541 | 1x16 + 3x12 | |
| 10 | S22+2988 | -42.24 | -87.48 | 421 | Ond | 214 | 453 | 4x12 | |
| 11 | S30-2854 | -43.05 | -87.48 | 421 | Ond | 219 | 453 | 4x12 | |
| 12 | S30+0 | 71.06 | 104.57 | 426 | Bov | 361 | 541 | 1x16 + 3x12 | |
| 13 | S30+2200 | -4.74 | -87.48 | 421 | Ond | 165* | 453 | 4x12 | 2, 54, 68, 110 |
| 14 | S38-2406 | -15.41 | -87.48 | 421 | Ond | 165* | 453 | 4x12 | 54 |
| 15 | S38+0 | 75.25 | 104.57 | 426 | Bov | 383 | 541 | 1x16 + 3x12 | |
| 16 | S38+2260 | -4.74 | -87.48 | 421 | Ond | 165* | 453 | 4x12 | 2, 54, 68, 110 |

Opmerkingen

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

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

[68] **MRd als gevolg van de gedrongen ligger berekening (NB. 6.1(10)) is groter dan MRd volgens 6.1(P). De momentweerstand en inwendige hefboomsarm volgens 6.1(P) zijn maatgevend en daarom alsnog toegepast.**

[110] Art. 9.7 (1), (2): Een orthogonaal wapeningsnet dient toegepast te worden aan iedere zijde van de gedrongen liggers:
Profiel 2 - B*H 400*500: 400 mm²/m aan elke zijde en in elke richting met een maximaal hoh 300 mm.

Scheurvorming volgens artikel 7.3.4

Balk 5-C

| Geb. | Pos. [mm] | Zijde | $M_E; freq$ [kNm] | $S_{r, max}$ [mm] | $\epsilon_{sm} - \epsilon_{cm}$ [%] | w_k [mm] | k_x | w_{max} [mm] | U.C. | Opm. |
|------|--------------|-------|----------------------|----------------------|--|---------------|-------|-------------------|------|------|
| 1 | S6-463 | Bov | 53.10 | 353 | 0.730 | 0.258 | 1.00 | 0.300 | 0.86 | |
| 1 | S6-2584 | Ond | -3.34 | 406 | 0.053 | 0.021 | 1.14 | 0.343 | 0.06 | |
| 1 | S6-1865 | Ond | -3.34 | 406 | 0.053 | 0.021 | 1.14 | 0.343 | 0.06 | |
| 2 | S6+0 | Bov | 53.10 | 353 | 0.730 | 0.258 | 1.00 | 0.300 | 0.86 | |
| 2 | S6+288 | Bov | 53.10 | 353 | 0.730 | 0.258 | 1.00 | 0.300 | 0.86 | |
| 2 | S6+2264 | Ond | -32.96 | 406 | 0.520 | 0.212 | 1.14 | 0.343 | 0.62 | |
| 2 | S6+2894 | Ond | -32.85 | 406 | 0.519 | 0.211 | 1.14 | 0.343 | 0.62 | |
| 2 | S6+3250 | Ond | -32.84 | 406 | 0.519 | 0.211 | 1.14 | 0.343 | 0.62 | |
| 3 | S14-275 | Bov | 50.14 | 353 | 0.665 | 0.235 | 1.00 | 0.300 | 0.78 | |
| 3 | S14-2843 | Ond | -32.67 | 406 | 0.516 | 0.210 | 1.14 | 0.343 | 0.61 | |
| 3 | S14-2215 | Ond | -32.60 | 406 | 0.515 | 0.209 | 1.14 | 0.343 | 0.61 | |
| 4 | S14+274 | Bov | 50.14 | 353 | 0.665 | 0.235 | 1.00 | 0.300 | 0.78 | |
| 4 | S14+1805 | Ond | -3.34 | 406 | 0.053 | 0.021 | 1.14 | 0.343 | 0.06 | |
| 4 | S14+2398 | Ond | -4.95 | 406 | 0.078 | 0.032 | 1.14 | 0.343 | 0.09 | |
| 5 | S22-274 | Bov | 57.57 | 353 | 0.828 | 0.292 | 1.00 | 0.300 | 0.97 | |
| 5 | S22-2715 | Ond | -6.23 | 406 | 0.098 | 0.040 | 1.14 | 0.343 | 0.12 | |
| 5 | S22-2398 | Ond | -6.28 | 406 | 0.099 | 0.040 | 1.14 | 0.343 | 0.12 | |
| 5 | S22-2003 | Ond | -6.23 | 406 | 0.098 | 0.040 | 1.14 | 0.343 | 0.12 | |
| 6 | S22+0 | Bov | 57.57 | 353 | 0.828 | 0.292 | 1.00 | 0.300 | 0.97 | |
| 6 | S22+298 | Bov | 57.57 | 353 | 0.828 | 0.292 | 1.00 | 0.300 | 0.97 | |
| 6 | S22+2360 | Ond | -32.50 | 406 | 0.513 | 0.209 | 1.14 | 0.343 | 0.61 | |
| 6 | S22+2988 | Ond | -32.31 | 406 | 0.510 | 0.207 | 1.14 | 0.343 | 0.61 | |
| 7 | S30-274 | Bov | 50.14 | 353 | 0.665 | 0.235 | 1.00 | 0.300 | 0.78 | |
| 7 | S22+3250 | Ond | -33.33 | 406 | 0.526 | 0.214 | 1.14 | 0.343 | 0.62 | |
| 7 | S30-2854 | Ond | -33.21 | 406 | 0.524 | 0.213 | 1.14 | 0.343 | 0.62 | |
| 7 | S30-2221 | Ond | -33.14 | 406 | 0.523 | 0.213 | 1.14 | 0.343 | 0.62 | |
| 8 | S30+274 | Bov | 50.14 | 353 | 0.665 | 0.235 | 1.00 | 0.300 | 0.78 | |
| 8 | S30+1805 | Ond | -3.34 | 406 | 0.053 | 0.021 | 1.14 | 0.343 | 0.06 | |
| 8 | S30+2398 | Ond | -3.58 | 406 | 0.056 | 0.023 | 1.14 | 0.343 | 0.07 | |
| 9 | S38-283 | Bov | 53.10 | 353 | 0.730 | 0.258 | 1.00 | 0.300 | 0.86 | |
| 9 | S38-2865 | Ond | -11.30 | 406 | 0.178 | 0.073 | 1.14 | 0.343 | 0.21 | |
| 9 | S38-2406 | Ond | -11.30 | 406 | 0.178 | 0.073 | 1.14 | 0.343 | 0.21 | |
| 9 | S38-1909 | Ond | -11.30 | 406 | 0.178 | 0.073 | 1.14 | 0.343 | 0.21 | |
| 10 | S38+463 | Bov | 53.10 | 353 | 0.730 | 0.258 | 1.00 | 0.300 | 0.86 | |
| 10 | S38+1865 | Ond | -3.34 | 406 | 0.053 | 0.021 | 1.14 | 0.343 | 0.06 | |
| 10 | S38+2584 | Ond | -3.34 | 406 | 0.053 | 0.021 | 1.14 | 0.343 | 0.06 | |

Verloop hoofdwapening

Balk 5-C

| Merk | B/O | Wapening | Vanaf [mm] | Tot [mm] | Lengte [mm] | L _{bd; begin} [mm] | L _{bd; eind} [mm] |
|------|-------|----------|---------------|-------------|----------------|--------------------------------|-------------------------------|
| a | Boven | 3x12 | S6-2930 | S6-1745 | 1185 | 120 | 120 |
| b | Boven | 1x16 | S6-2970 | S6-1745 | 1225 | 160 | 160 |
| c | Boven | 3x12 | S6-1675 | S14+1615 | 9790 | 125 | 125 |
| d | Boven | 1x16 | S6-1675 | S14+1615 | 9790 | 178 | 178 |
| e | Boven | 3x12 | S14+1685 | S14+2715 | 1030 | 120 | 120 |
| f | Boven | 1x16 | S14+1685 | S14+2715 | 1030 | 160 | 160 |
| g | Boven | 3x12 | S22-2715 | S22-1685 | 1030 | 120 | 120 |
| h | Boven | 1x16 | S22-2715 | S22-1685 | 1030 | 160 | 160 |
| i | Boven | 3x12 | S22-1615 | S30+1615 | 9730 | 156 | 125 |
| j | Boven | 1x16 | S22-1615 | S30+1615 | 9730 | 221 | 178 |
| k | Boven | 3x12 | S30+1685 | S30+2715 | 1030 | 120 | 120 |
| l | Boven | 1x16 | S30+1685 | S30+2715 | 1030 | 160 | 160 |
| m | Boven | 3x12 | S30+2785 | S38+1675 | 4890 | 120 | 125 |
| n | Boven | 1x16 | S30+2785 | S38+1675 | 4890 | 160 | 178 |
| o | Boven | 3x12 | S38+1745 | S38+2930 | 1185 | 120 | 120 |
| p | Boven | 1x16 | S38+1745 | S38+2970 | 1225 | 160 | 160 |
| q | Onder | 4x12 | S6-2930 | S6-1745 | 1185 | 120 | 120 |
| r | Onder | 4x12 | S6-1675 | S14+1615 | 9790 | 120 | 120 |
| s | Onder | 4x12 | S14+1685 | S14+2715 | 1030 | 120 | 120 |
| t | Onder | 4x12 | S22-2715 | S22-1685 | 1030 | 120 | 120 |
| u | Onder | 4x12 | S22-1615 | S30+1615 | 9730 | 120 | 120 |
| v | Onder | 4x12 | S30+1685 | S30+2715 | 1030 | 120 | 120 |
| w | Onder | 4x12 | S30+2785 | S38+1675 | 4890 | 120 | 120 |
| x | Onder | 4x12 | S38+1745 | S38+2930 | 1185 | 120 | 120 |

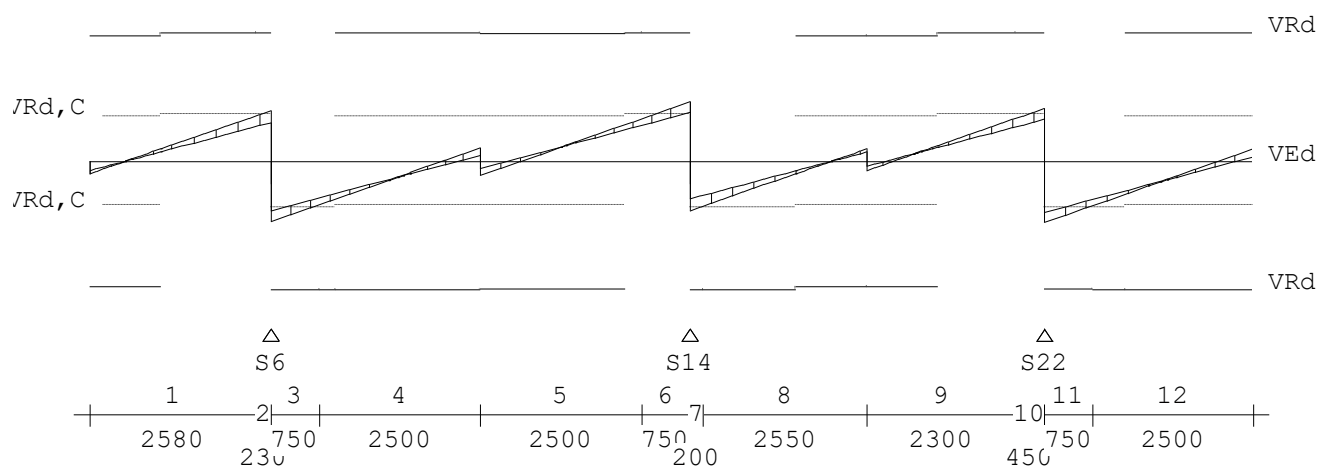
Opmerkingen

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

DWARSKRACHTEN Fysisch lineair

Balk 5-C Fundamentele combinatie

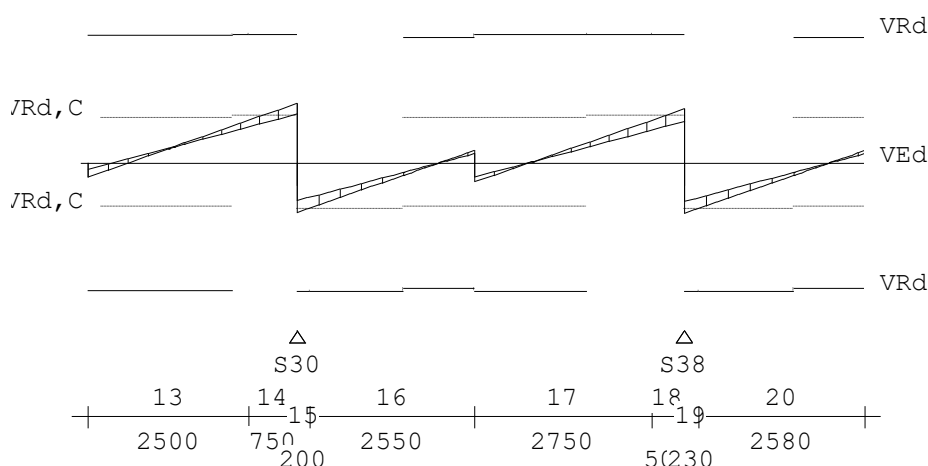
Velden: 1 t/m 6



DWARSKRACHTEN Fysisch lineair

Balk 5-C Fundamentele combinatie

Velden: 7 t/m 10


Wring- en dwarskrachtwapening

Balk 5-C

| Geb. | Vanaf | Tot | Beugels | Lengte | <Wringing> | | <Dwarskr.> | | V _{Ed} | T _{Ed} | Opm. |
|------|----------|----------|---------|--------|------------------------|----------------------|--------------------|--------------------|-----------------|-----------------|--------|
| | [mm] | [mm] | | [mm] | A _{l a n g s} | A _{b g l} | A _{b g l} | A _{o p g} | [kN] | [kNm] | |
| | | | | | [mm ²] | [mm ² /m] | [mm ²] | [mm ²] | | | |
| 1 | S6-2810 | S6-230 | Ø8-250 | 2580 | 0 | 0 | 286 | 0 | 63.5 | 0 | 58,109 |
| 2 | S6-230 | S6+0 | Ø8-250 | 230 | 0 | 0 | 286 | 0 | 70.7 | 0 | 6 |
| 3 | S6+0 | S6+750 | Ø8-250 | 750 | 0 | 0 | 286 | 0 | 84.3 | 0 | 6 |
| 4 | S6+750 | S6+3250 | Ø8-250 | 2500 | 0 | 0 | 286 | 0 | 60.8 | 0 | |
| 5 | S6+3250 | S14-750 | Ø8-250 | 2500 | 0 | 0 | 286 | 0 | 59.2 | 0 | |
| 6 | S14-750 | S14+0 | Ø8-250 | 750 | 0 | 0 | 286 | 0 | 82.7 | 0 | 6 |
| 7 | S14+0 | S14+200 | Ø8-250 | 200 | 0 | 0 | 286 | 0 | 68.8 | 0 | 6 |
| 8 | S14+200 | S14+2750 | Ø8-250 | 2550 | 0 | 0 | 286 | 0 | 62.5 | 0 | |
| 9 | S14+2750 | S22-450 | Ø8-250 | 2300 | 0 | 0 | 286 | 0 | 59.5 | 0 | 58,109 |
| 10 | S22-450 | S22+0 | Ø8-250 | 450 | 0 | 0 | 286 | 0 | 73.6 | 0 | 6 |
| 11 | S22+0 | S22+750 | Ø8-250 | 750 | 0 | 0 | 286 | 0 | 85.4 | 0 | 6 |
| 12 | S22+750 | S22+3250 | Ø8-250 | 2500 | 0 | 0 | 286 | 0 | 61.9 | 0 | |
| 13 | S22+3250 | S30-750 | Ø8-250 | 2500 | 0 | 0 | 286 | 0 | 59.4 | 0 | |
| 14 | S30-750 | S30+0 | Ø8-250 | 750 | 0 | 0 | 286 | 0 | 82.9 | 0 | 6 |
| 15 | S30+0 | S30+200 | Ø8-250 | 200 | 0 | 0 | 286 | 0 | 68.8 | 0 | 6 |
| 16 | S30+200 | S30+2750 | Ø8-250 | 2550 | 0 | 0 | 286 | 0 | 62.5 | 0 | |
| 17 | S30+2750 | S38-500 | Ø8-250 | 2750 | 0 | 0 | 286 | 0 | 59.6 | 0 | |
| 18 | S38-500 | S38+0 | Ø8-250 | 500 | 0 | 0 | 286 | 0 | 75.3 | 0 | 6 |
| 19 | S38+0 | S38+230 | Ø8-250 | 230 | 0 | 0 | 286 | 0 | 70.7 | 0 | 6 |
| 20 | S38+230 | S38+2810 | Ø8-250 | 2580 | 0 | 0 | 286 | 0 | 63.5 | 0 | |

Opmerkingen

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

[58] 6.2.3: Z is berekend m.b.v. 0.9d

[109] Bij de berekening van de beugels is geen rekening gehouden met de detailleringsregels van art 9.7 voor de gedrongen liggers.

Wring- en dwarskrachten

Balk 5-C

| Geb. | Vanaf [mm] | Tot [mm] | θ [°] | V_{Rd} [kN] | V_{Ed} | $V_{Rd,C}$ | $V_{Rd,Max}$ | T_{Ed} | $T_{Rd,C}$ | $T_{Rd,Max}$ | V_{opg} | Opm. |
|------|---------------|-------------|-----------------|------------------|--------------|------------|--------------|---------------|------------|--------------|-----------|--------|
| | | | | | -----kN----- | | | -----kNm----- | | | | |
| 1 | S6-2810 | S6-230 | 21.8 | 179 | 63 | 65 | 418 | 0 | 26 | 63 | 0 | 58,109 |
| 2 | S6-230 | S6+0 | 21.8 | 179 | 71 | 65 | 415 | 0 | 26 | 63 | 0 | 6 |
| 3 | S6+0 | S6+750 | 21.8 | 179 | 84 | 65 | 415 | 0 | 26 | 63 | 0 | 6 |
| 4 | S6+750 | S6+3250 | 21.8 | 180 | 61 | 65 | 417 | 0 | 26 | 63 | 0 | |
| 5 | S6+3250 | S14-750 | 21.8 | 180 | 59 | 65 | 417 | 0 | 26 | 63 | 0 | |
| 6 | S14-750 | S14+0 | 21.8 | 179 | 83 | 65 | 417 | 0 | 26 | 63 | 0 | 6 |
| 7 | S14+0 | S14+200 | 21.8 | 179 | 69 | 65 | 416 | 0 | 26 | 63 | 0 | 6 |
| 8 | S14+200 | S14+2750 | 21.8 | 179 | 63 | 65 | 416 | 0 | 26 | 63 | 0 | |
| 9 | S14+2750 | S22-450 | 21.8 | 179 | 60 | 65 | 418 | 0 | 26 | 63 | 0 | 58,109 |
| 10 | S22-450 | S22+0 | 21.8 | 179 | 74 | 65 | 416 | 0 | 26 | 63 | 0 | 6 |
| 11 | S22+0 | S22+750 | 21.8 | 179 | 85 | 65 | 415 | 0 | 26 | 63 | 0 | 6 |
| 12 | S22+750 | S22+3250 | 21.8 | 180 | 62 | 65 | 417 | 0 | 26 | 63 | 0 | |
| 13 | S22+3250 | S30-750 | 21.8 | 180 | 59 | 65 | 417 | 0 | 26 | 63 | 0 | |
| 14 | S30-750 | S30+0 | 21.8 | 179 | 83 | 65 | 417 | 0 | 26 | 63 | 0 | 6 |
| 15 | S30+0 | S30+200 | 21.8 | 179 | 69 | 65 | 416 | 0 | 26 | 63 | 0 | 6 |
| 16 | S30+200 | S30+2750 | 21.8 | 179 | 63 | 65 | 416 | 0 | 26 | 63 | 0 | |
| 17 | S30+2750 | S38-500 | 21.8 | 179 | 60 | 65 | 418 | 0 | 26 | 63 | 0 | |
| 18 | S38-500 | S38+0 | 21.8 | 179 | 75 | 65 | 416 | 0 | 26 | 63 | 0 | 6 |
| 19 | S38+0 | S38+230 | 21.8 | 179 | 71 | 65 | 415 | 0 | 26 | 63 | 0 | 6 |
| 20 | S38+230 | S38+2810 | 21.8 | 179 | 63 | 65 | 416 | 0 | 26 | 63 | 0 | |

Opmerkingen

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

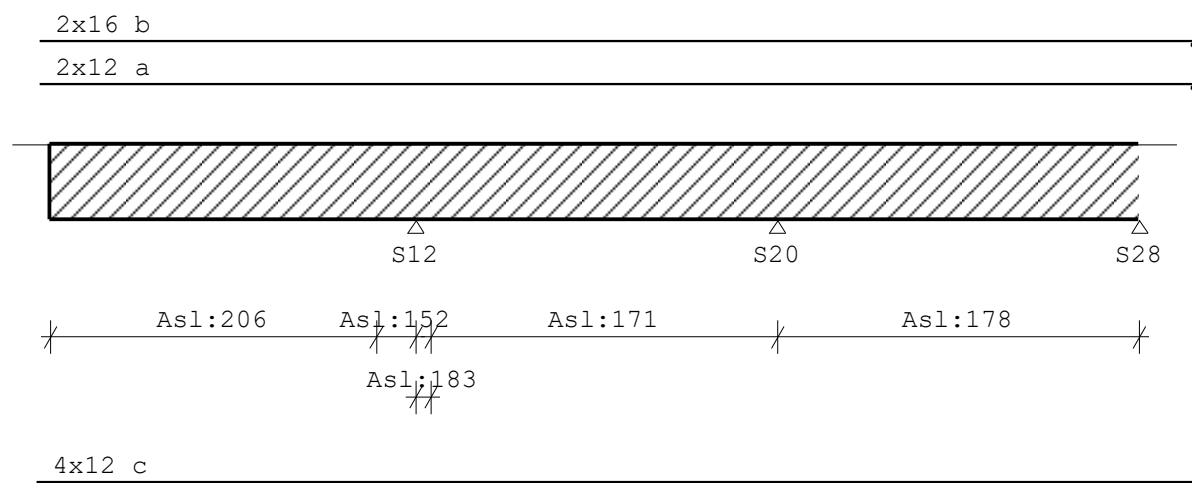
[58] 6.2.3: Z is berekend m.b.v. 0.9d

[109] Bij de berekening van de beugels is geen rekening gehouden met de detailleringsregels van art 9.7 voor de gedrongen liggers.

Hoofdwapening Fysisch lineair

Balk 5-D

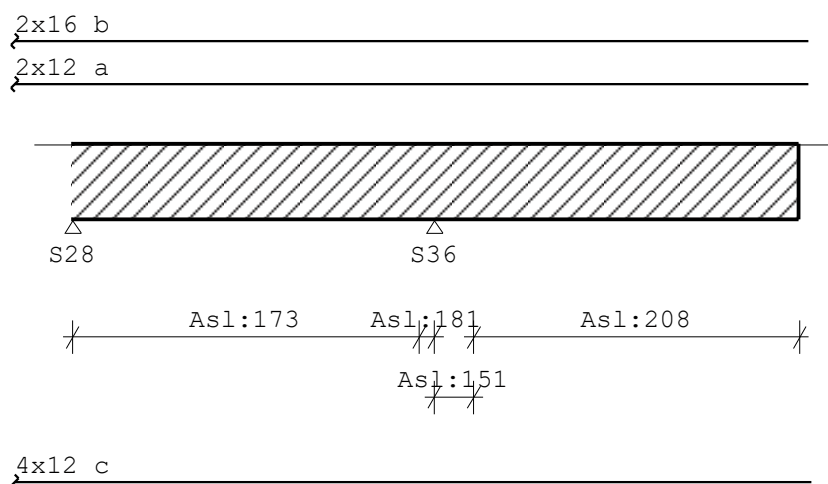
Velden: 1 t/m 3



Hoofdwapening Fysisch lineair

Balk 5-D

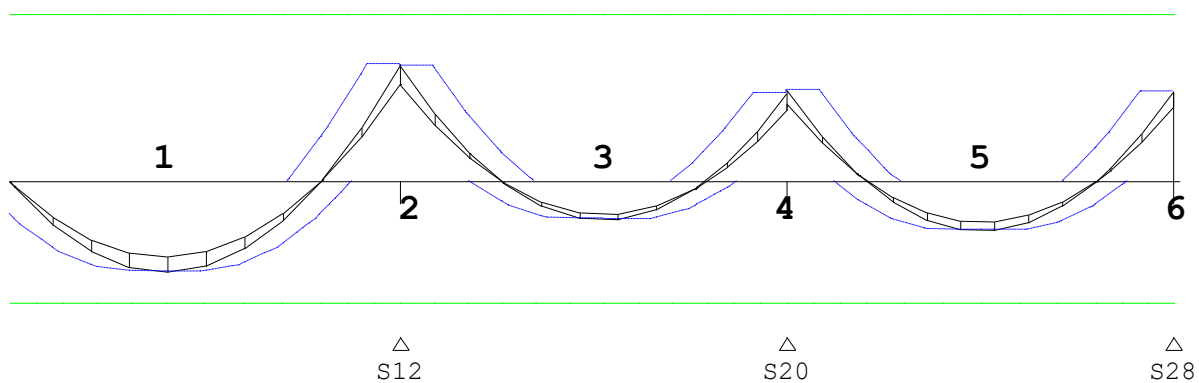
Velden: 4 t/m 5



MEd dekkingslijn Fysisch lineair

Balk 5-D

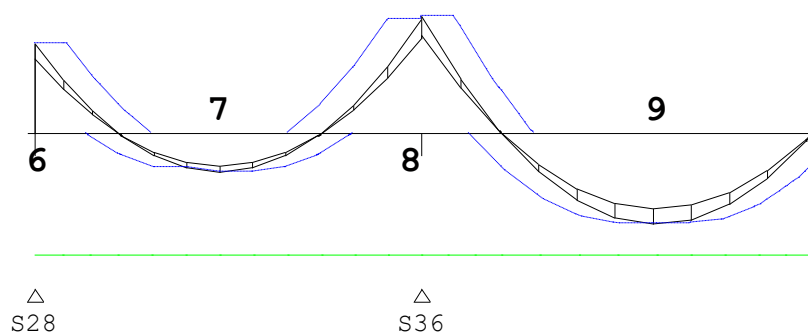
Velden: 1 t/m 3



MEd dekkingslijn Fysisch lineair

Balk 5-D

Velden: 4 t/m 5



Hoofdwapening

Balk 5-D

| Geb. | Pos. [mm] | M_{Ed} [kNm] | M_{Rd} [kNm] | z [mm] | B/O | A_b [mm ²] | A_a [mm ²] | Basiswapening +Bijlegwapening | Opm. |
|------|--------------|-------------------|-------------------|-----------|-----|-----------------------------|-----------------------------|----------------------------------|------|
| 1 | S12-3651 | -65.32 | -87.50 | 419 | Ond | 335 | 453 | 4x12 | |
| 2 | S12+0 | 84.05 | 120.40 | 422 | Bov | 429 | 629 | 2x16 + 2x12 | |
| 3 | S20-2853 | -27.91 | -87.50 | 419 | Ond | 179* | 453 | 4x12 | 1 |
| 4 | S20+0 | 65.85 | 120.40 | 422 | Bov | 333 | 629 | 2x16 + 2x12 | |
| 5 | S20+3006 | -35.63 | -87.50 | 419 | Ond | 206* | 453 | 4x12 | 1 |
| 6 | S28-0 | 64.82 | 120.40 | 422 | Bov | 328 | 629 | 2x16 + 2x12 | |
| 7 | S28+2869 | -27.68 | -87.50 | 419 | Ond | 177* | 453 | 4x12 | 1 |
| 8 | S36+0 | 84.23 | 120.40 | 422 | Bov | 430 | 629 | 2x16 + 2x12 | |
| 9 | S36+3652 | -65.27 | -87.50 | 419 | Ond | 334 | 453 | 4x12 | |

Opmerkingen

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

Scheurvorming volgens artikel 7.3.4

Balk 5-D

| Geb. | Pos. [mm] | Zijde | $M_{E, freq}$ [kNm] | $s_{r, max}$ [mm] | $\epsilon_{sm} - \epsilon_{cm}$ [%] | w_k [mm] | k_x | w_{max} [mm] | U.C. | Opm. |
|------|--------------|-------|------------------------|----------------------|--|---------------|-------|-------------------|------|------|
| 1 | S12-414 | Bov | 64.99 | 340 | 0.853 | 0.290 | 1.00 | 0.300 | 0.97 | |
| 1 | S12-3651 | Ond | -50.35 | 406 | 0.795 | 0.323 | 1.14 | 0.343 | 0.94 | |
| 2 | S12+0 | Bov | 64.99 | 340 | 0.853 | 0.290 | 1.00 | 0.300 | 0.97 | |
| 2 | S20-426 | Bov | 51.28 | 340 | 0.592 | 0.202 | 1.00 | 0.300 | 0.67 | |
| 2 | S20-2853 | Ond | -21.72 | 406 | 0.343 | 0.140 | 1.14 | 0.343 | 0.41 | |
| 3 | S20+417 | Bov | 51.28 | 340 | 0.592 | 0.202 | 1.00 | 0.300 | 0.67 | |
| 3 | S28-404 | Bov | 49.90 | 340 | 0.569 | 0.194 | 1.00 | 0.300 | 0.65 | |
| 3 | S20+3006 | Ond | -27.26 | 406 | 0.431 | 0.175 | 1.14 | 0.343 | 0.51 | |
| 4 | S28+433 | Bov | 49.90 | 340 | 0.569 | 0.194 | 1.00 | 0.300 | 0.65 | |
| 4 | S36+0 | Bov | 65.15 | 340 | 0.856 | 0.291 | 1.00 | 0.300 | 0.97 | |
| 4 | S28+2869 | Ond | -21.44 | 406 | 0.339 | 0.138 | 1.14 | 0.343 | 0.40 | |
| 5 | S36+415 | Bov | 65.15 | 340 | 0.856 | 0.291 | 1.00 | 0.300 | 0.97 | |
| 5 | S36+3652 | Ond | -50.30 | 406 | 0.794 | 0.323 | 1.14 | 0.343 | 0.94 | |

Verloop hoofdwapening

Balk 5-D

| Merk | B/O | Wapening | Vanaf [mm] | Tot [mm] | Lengte [mm] | $L_{bd, begin}$ [mm] | $L_{bd, eind}$ [mm] |
|------|-------|----------|---------------|-------------|----------------|-------------------------|------------------------|
| a | Boven | 2x12 | S12-6220 | S36+6220 | 30440 | 160 | 160 |
| b | Boven | 2x16 | S12-6220 | S36+6220 | 30440 | 160 | 160 |
| c | Onder | 4x12 | S12-6269 | S36+6269 | 30539 | 209 | 209 |

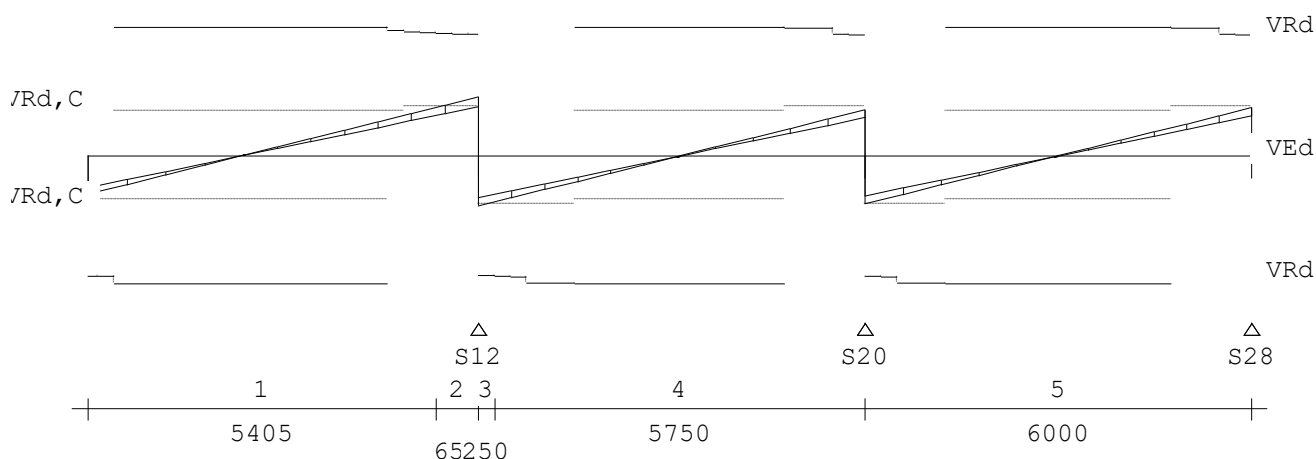
Opmerkingen

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

DWARSKRACHTEN Fysisch lineair

Balk 5-D Fundamentele combinatie

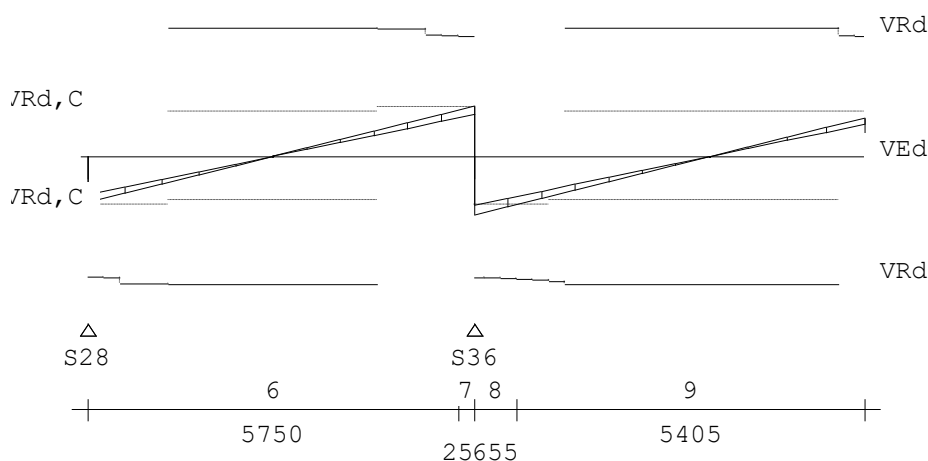
Velden: 1 t/m 3



DWARSKRACHTEN Fysisch lineair

Balk 5-D Fundamentele combinatie

Velden: 4 t/m 5



Wring- en dwarskrachtwapening

Balk 5-D

| Geb. Vanaf | Tot | Beugels | Lengte | <Wringing> | | <Dwarskr.> | | V_{Ed} [kN] | T_{Ed} [kNm] | Opm. |
|------------|----------|---------|--------|--|-----------------------------------|---------------------------------|---------------------------------|------------------|-------------------|------|
| [mm] | [mm] | | [mm] | $A_{l\text{angs}}$ [mm ²] | A_{bg1} [mm ² /m] | A_{bg1} [mm ²] | A_{opg} [mm ²] | | | |
| 1 S12-6060 | S12-655 | Ø8-250 | 5405 | 206 | 24 | 286 | 0 | 67.1 | 6 | |
| 2 S12-655 | S12+0 | Ø8-250 | 655 | 152 | 18 | 286 | 0 | 81.7 | 4 | 6 |
| 3 S12+0 | S12+250 | Ø8-250 | 250 | 183 | 22 | 286 | 0 | 70.5 | 5 | 6 |
| 4 S12+250 | S20+0 | Ø8-250 | 5750 | 171 | 20 | 286 | 0 | 64.9 | 5 | |
| 5 S20+0 | S28-0 | Ø8-250 | 6000 | 178 | 21 | 286 | 0 | 67.3 | 5 | |
| 6 S28-0 | S36-250 | Ø8-250 | 5750 | 173 | 20 | 286 | 0 | 64.5 | 5 | |
| 7 S36-250 | S36+0 | Ø8-250 | 250 | 181 | 21 | 286 | 0 | 70.1 | 5 | 6 |
| 8 S36+0 | S36+655 | Ø8-250 | 655 | 151 | 18 | 286 | 0 | 81.8 | 5 | 6 |
| 9 S36+655 | S36+6060 | Ø8-250 | 5405 | 208 | 25 | 286 | 0 | 67.1 | 6 | |

Opmerkingen

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

Wring- en dwarskrachten

Balk 5-D

| Geb. | Vanaf [mm] | Tot [mm] | θ [°] | V_{Rd} [kN] | V_{Ed} | $V_{Rd,C}$ | $V_{Rd,Max}$ | T_{Ed} | $T_{Rd,C}$ | $T_{Rd,Max}$ | V_{opg} | Opm. |
|------|---------------|-------------|-----------------|------------------|--------------|------------|--------------|---------------|------------|--------------|-----------|------|
| | | | | | -----kN----- | | | -----kNm----- | | | | |
| 1 | S12-6060 | S12-655 | 21.8 | 166 | 67 | 69 | 414 | 6 | 26 | 63 | 0 | |
| 2 | S12-655 | S12+0 | 21.8 | 162 | 82 | 69 | 412 | 4 | 26 | 63 | 0 | 6 |
| 3 | S12+0 | S12+250 | 21.8 | 159 | 70 | 69 | 413 | 5 | 26 | 63 | 0 | 6 |
| 4 | S12+250 | S20+0 | 21.8 | 160 | 65 | 69 | 413 | 5 | 26 | 63 | 0 | |
| 5 | S20+0 | S28-0 | 21.8 | 159 | 67 | 69 | 413 | 5 | 26 | 63 | 0 | |
| 6 | S28-0 | S36-250 | 21.8 | 160 | 65 | 69 | 413 | 5 | 26 | 63 | 0 | |
| 7 | S36-250 | S36+0 | 21.8 | 159 | 70 | 69 | 413 | 5 | 26 | 63 | 0 | 6 |
| 8 | S36+0 | S36+655 | 21.8 | 162 | 82 | 69 | 412 | 5 | 26 | 63 | 0 | 6 |
| 9 | S36+655 | S36+6060 | 21.8 | 167 | 67 | 69 | 414 | 6 | 26 | 63 | 0 | |

Opmerkingen

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