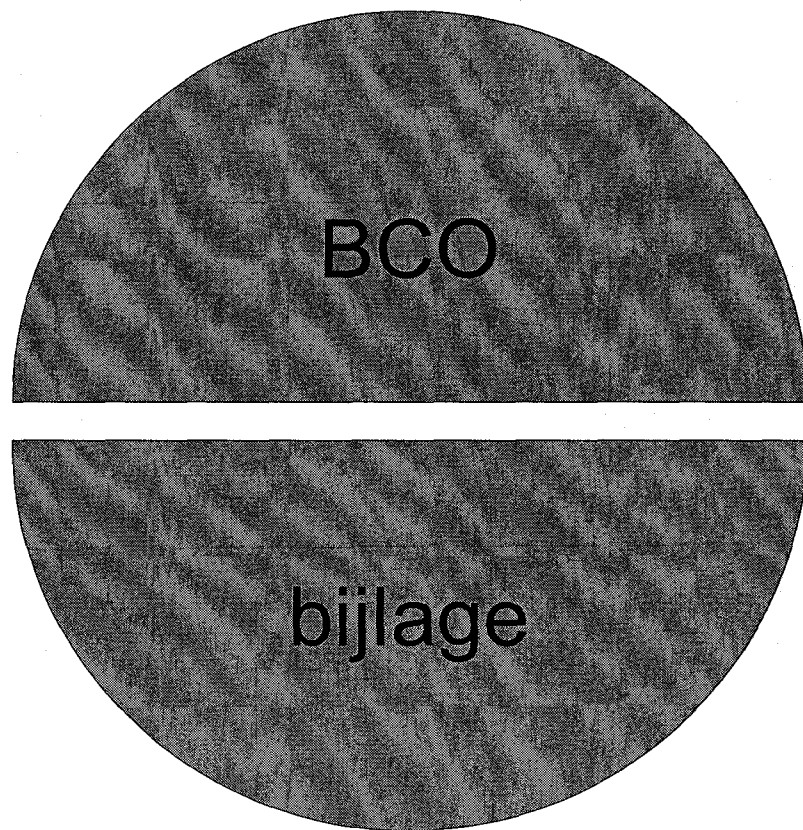


b. 795296

scriptie BK 2004 DEKK



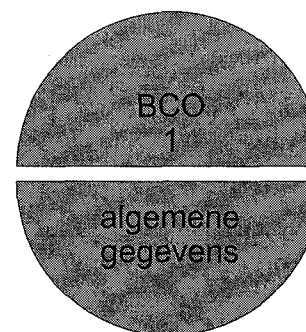
Mediatheek HvU



0300 529 3719



Bijlage BCO Teun Dekker 1109222



algemeen

schoolgebouw te Utrecht

stuwdrukgebied

Utrecht; stuwdrukgebied III, bebouwd

veiligheid

schoolgebouw; veiligheidsklasse 3, $\gamma_g = 1,2$ en $\gamma_q = 1,5$

referentieperiode

50 jaar

bestaande constructie

- hoofddraagconstructie: portalen; kolommen(beton), liggers(staal)
- fundering: paalfundering prefab beton
- begane grondvloer: geïsoleerde kanaalplaatvloeren
- verdiepingsvloer: -
- dak: geprofileerde staalplaten op stalen dakliggers met zeeg
- stabiliteit: metselwerk gevels en windverbanden in het dakvlak

nieuwe constructie (voor overzicht zie bijlage 1)

- hoofddraagconstructie: stalen spanten en liggers
- fundering: schroefboorpalen
- begane grondvloer: als bestaand
- verdiepingsvloer: houten balklaag in stalen liggers
- dak: geprofileerde staalplaten
- stabiliteit: stalen spanten en windverbanden

voor aansluiting bestaand/nieuw; zie bijlage 6

gehanteerde normen

NEN 6700 - TGB 1990 Algemene basiseisen
NEN 6702 - TGB 1990 Belastingen en vervormingen
NEN 6770 - TGB 1990 Staalconstructies
NEN 6760 - TGB 1990 Houtconstructies

overzicht belastingen

	permanent	veranderlijk
- dak geprofileerde staalplaten	0,20 kN/m ²	0,56 kN/m ²
- verdiepingsvloer houten balklaag	0,50 kN/m ²	2,50 kN/m ²
- begane grondvloer kanaalplaatvloer	4,80 kN/m ²	5,00 kN/m ²

uitgangspunten

toegepaste materialen

- beton	B25
- staalconstructie	S235
- boutkwaliteit	8.8
- houtconstructie	K17
- dakplaattype	101R/800 dikte 1,00 mm





dakligger tussen str V1/V2 en VC/VD
hoh 3100mm, l = 9600mm, HE200B

permanente belasting

$$q_{g1} = 0,61 \text{ kN/m'}$$

$$q_{g2} = 3,1 \cdot 0,2 = 0,62 \text{ kN/m'}$$

$$q_g = 1,23 \text{ kN/m'}$$

veranderlijke belasting

$$q_{sn} = 3,1 \cdot 0,56 = 1,74 \text{ kN/m'}$$

momenten

$$M_g = \frac{1}{8} \cdot 1,23 \cdot 9,6^2 = 14,17 \text{ kNm}$$

$$M_{sn} = \frac{1}{8} \cdot 1,74 \cdot 9,6^2 = 20,04 \text{ kNm}$$

$$M_d = 1,2 \cdot 14,17 + 1,5 \cdot 20,04 = 47,06 \text{ kNm}$$

controle sterkte

$$\sigma = M/W < 235 \text{ N/mm}^2$$

$$W_{ben} = 200 \cdot 10^3 \text{ mm}^3$$

controle doorbuiging

$$\delta = 5qL^4/384EI_{ben} < 0,004L = 38,4 \text{ mm}$$

$$I_{ben} = 4073 \cdot 10^4 \text{ mm}^4$$

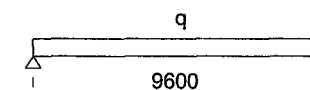
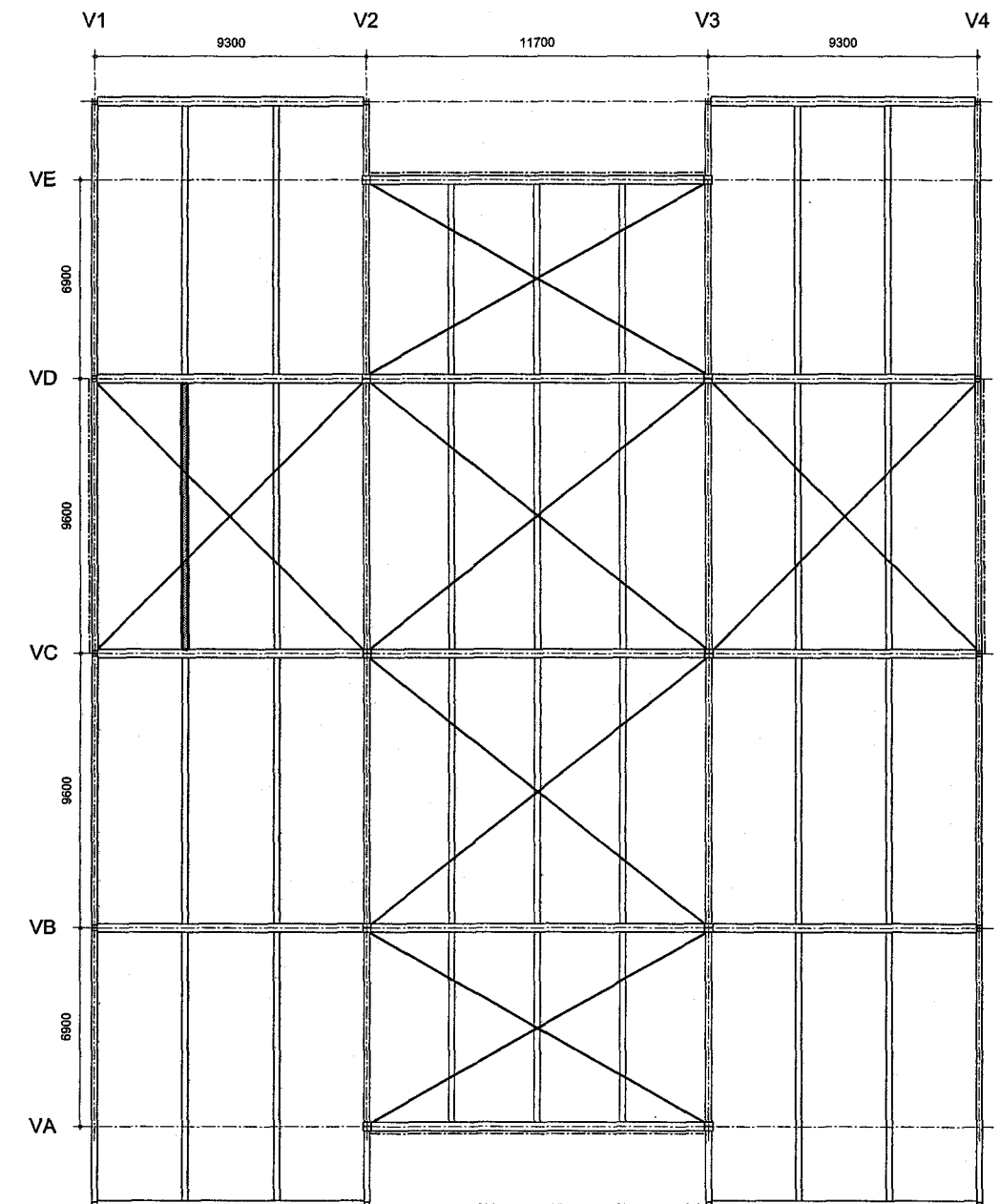
controle profiel

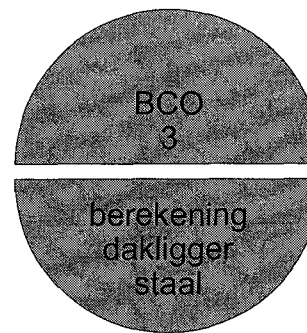
HE200B

$$W_y = 570 \cdot 10^3 \text{ mm}^3$$

$$I_y = 5696 \cdot 10^4 \text{ mm}^4$$

voor overzicht dakvlak zie verder bijlage 2





dakligger tussen str V2/V3 en op VC
hoh 9600mm, l = 11700mm, HE300B

permanente belasting

$$q_{g1} = 1,17 \text{ kN/m'}$$

$$q_{g2} = 9,6 \cdot 0,2 = 1,92 \text{ kN/m'}$$

$$q_g = 3,09 \text{ kN/m'}$$

veranderlijke belasting

$$q_{sn} = 9,6 \cdot 0,56 = 5,38 \text{ kN/m'}$$

momenten

$$M_g = \frac{1}{8} \cdot 3,09 \cdot 11,7^2 = 52,87 \text{ kNm}$$

$$M_{sn} = \frac{1}{8} \cdot 5,38 \cdot 11,7^2 = 92,06 \text{ kNm}$$

$$M_d = 1,2 \cdot 52,87 + 1,5 \cdot 92,06 = 201,53 \text{ kNm}$$

controle sterkte

$$\sigma = M/W < 235 \text{ N/mm}^2$$

$$W_{ben} = 858 \cdot 10^3 \text{ mm}^3$$

controle doorbuiging

$$\delta = 5qL^4/384EI_{ben} < 0,004L = 46,8 \text{ mm}$$

$$I_{ben} = 18123 \cdot 10^4 \text{ mm}^4$$

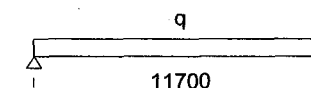
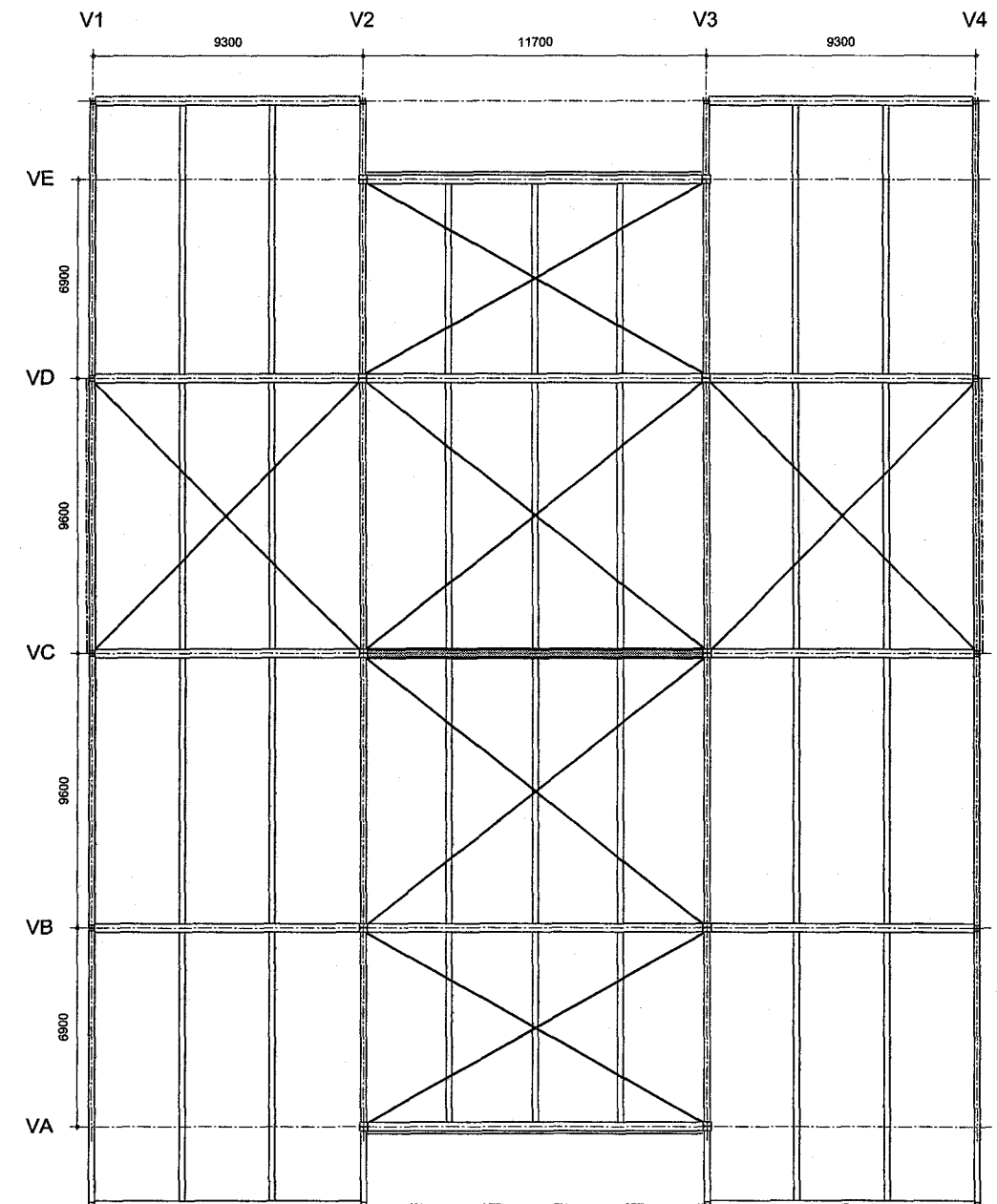
controle profiel

HE300B

$$W_y = 1680 \cdot 10^3 \text{ mm}^3$$

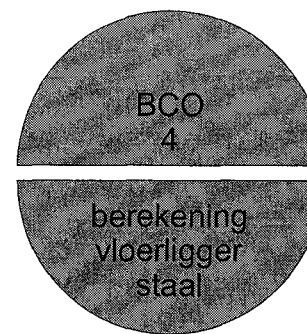
$$I_y = 25166 \cdot 10^4 \text{ mm}^4$$

voor overzicht dakvlak zie verder bijlage 2



LOGO

Bijlage BCO Teun Dekker 1109222



vloerligger tussen str V1/V2 en VC/VD
hoh 4650mm, l = 9600mm, HE300B

permanente belasting

$$q_{g1} = 1,17 \text{ kN/m'}$$

$$q_{g2} = 4,65 \cdot 0,5 = 2,33 \text{ kN/m'}$$

$$q_g = 3,50 \text{ kN/m'}$$

veranderlijke belasting

$$q_{pers} = 4,85 \cdot 2,50 = 12,13 \text{ kN/m'}$$

momenten

$$M_g = \frac{1}{8} \cdot 3,50 \cdot 9,6^2 = 40,32 \text{ kNm}$$

$$M_{pers} = \frac{1}{8} \cdot 12,13 \cdot 9,6^2 = 139,74 \text{ kNm}$$

$$M_d = 1,2 \cdot 40,32 + 1,5 \cdot 139,74 = 257,99 \text{ kNm}$$

controle sterkte

$$\sigma = M/W < 235 \text{ N/mm}^2$$

$$W_{ben} = 1098 \cdot 10^3 \text{ mm}^3$$

controle doorbuiging

$$\delta = 5qL^4/384EI_{ben} < 0,004L = 38,4 \text{ mm}$$

$$I_{ben} = 21573 \cdot 10^4 \text{ mm}^4$$

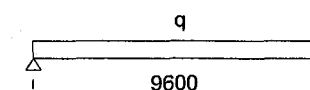
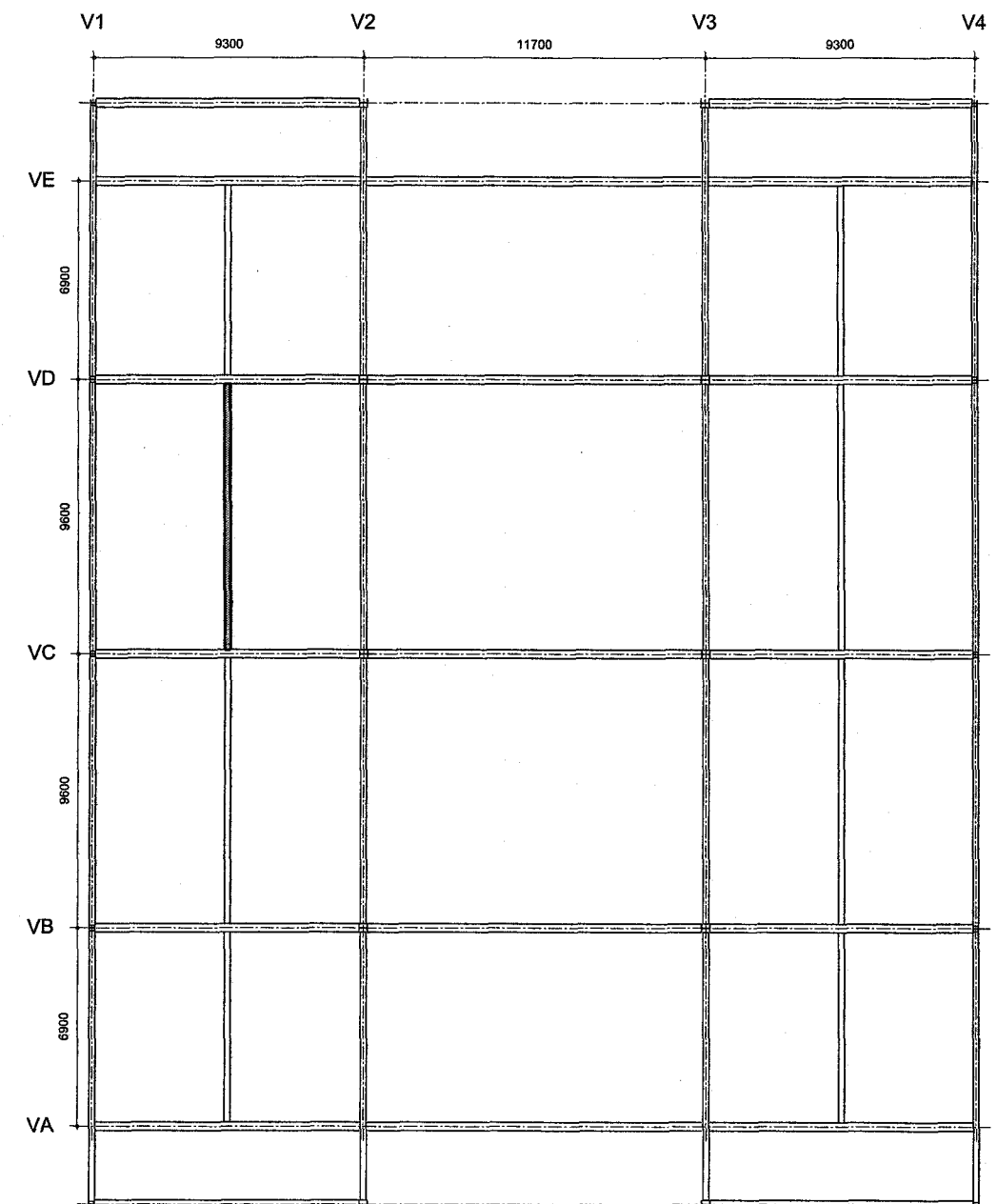
controle profiel

HE300B

$$W_y = 1680 \cdot 10^3 \text{ mm}^3$$

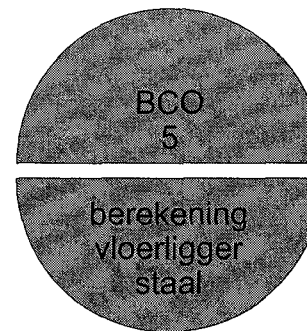
$$I_y = 25166 \cdot 10^4 \text{ mm}^4$$

voor overzicht verdieping zie verder bijlage 3



LOGO

Bijlage BCO Teun Dekker 1109222



vloerligger op str VC
hoh 9600mm, l = 9300mm, HE300M

permanente belasting
 $q_{g1} = 2,38 \text{ kN/m'}$
oplegreacties: $F_g = 34,56 \text{ kN}$

veranderlijke belasting
oplegreacties: $F_{pers} = 116,45 \text{ kN}$

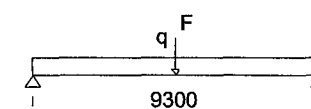
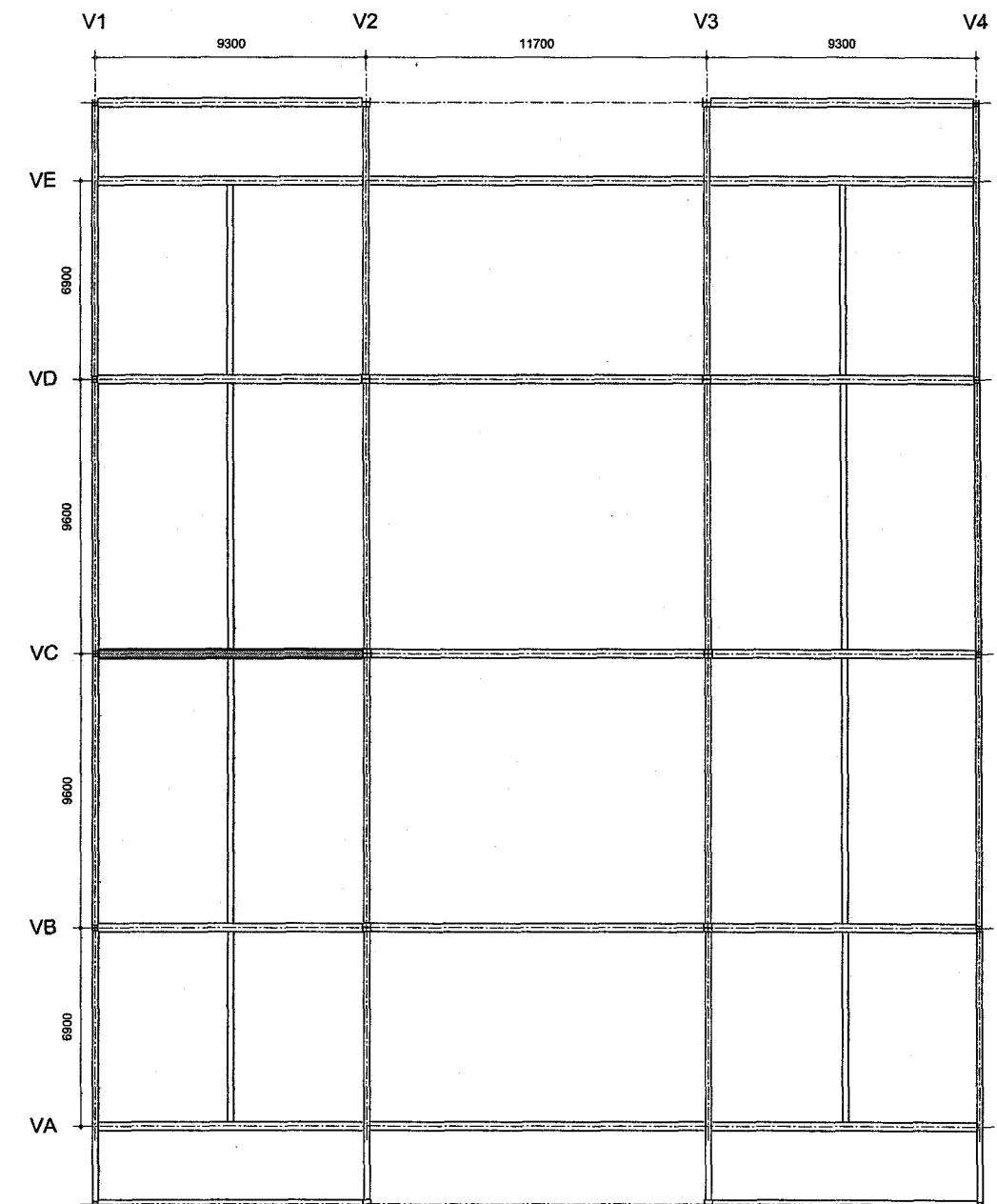
momenten
 $M_{g1} = \frac{1}{8} \cdot 2,38 \cdot 9,3^2 = 25,73 \text{ kNm}$
 $M_g = \frac{1}{4} \cdot 34,56 \cdot 9,3 = 80,35 \text{ kNm}$
 $M_{pers} = \frac{1}{4} \cdot 116,45 \cdot 9,3 = 270,75 \text{ kNm}$
 $M_d = 1,2 \cdot 106,80 + 1,5 \cdot 270,75 = 534,29 \text{ kNm}$

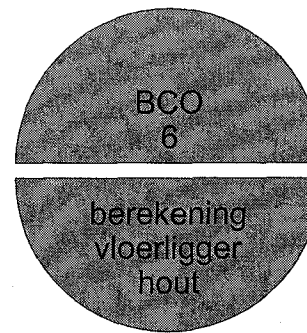
controle sterkte
 $\sigma = M/W < 235 \text{ N/mm}^2$
 $W_{ben} = 2274 \cdot 10^3 \text{ mm}^3$

controle doorbuiging
 $\delta = 5qL^4/384EI_{ben} + Fl^3/48EI < 0,004L = 37,2 \text{ mm}$
 $I_{ben} = 35360 \cdot 10^4 \text{ mm}^4$

controle profiel
HE300M
 $W_y = 3480 \cdot 10^3 \text{ mm}^3$
 $I_y = 59201 \cdot 10^4 \text{ mm}^4$

voor overzicht verdieping zie verder bijlage 3





verdiepingsvloer, houten balklaag
hoh 600mm, I = 4400mm, K17, E = 10000 N/mm²

permanente belasting
 $q_g = 0,6 \cdot 0,5 = 0,3 \text{ kN/m'}$

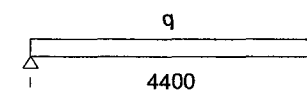
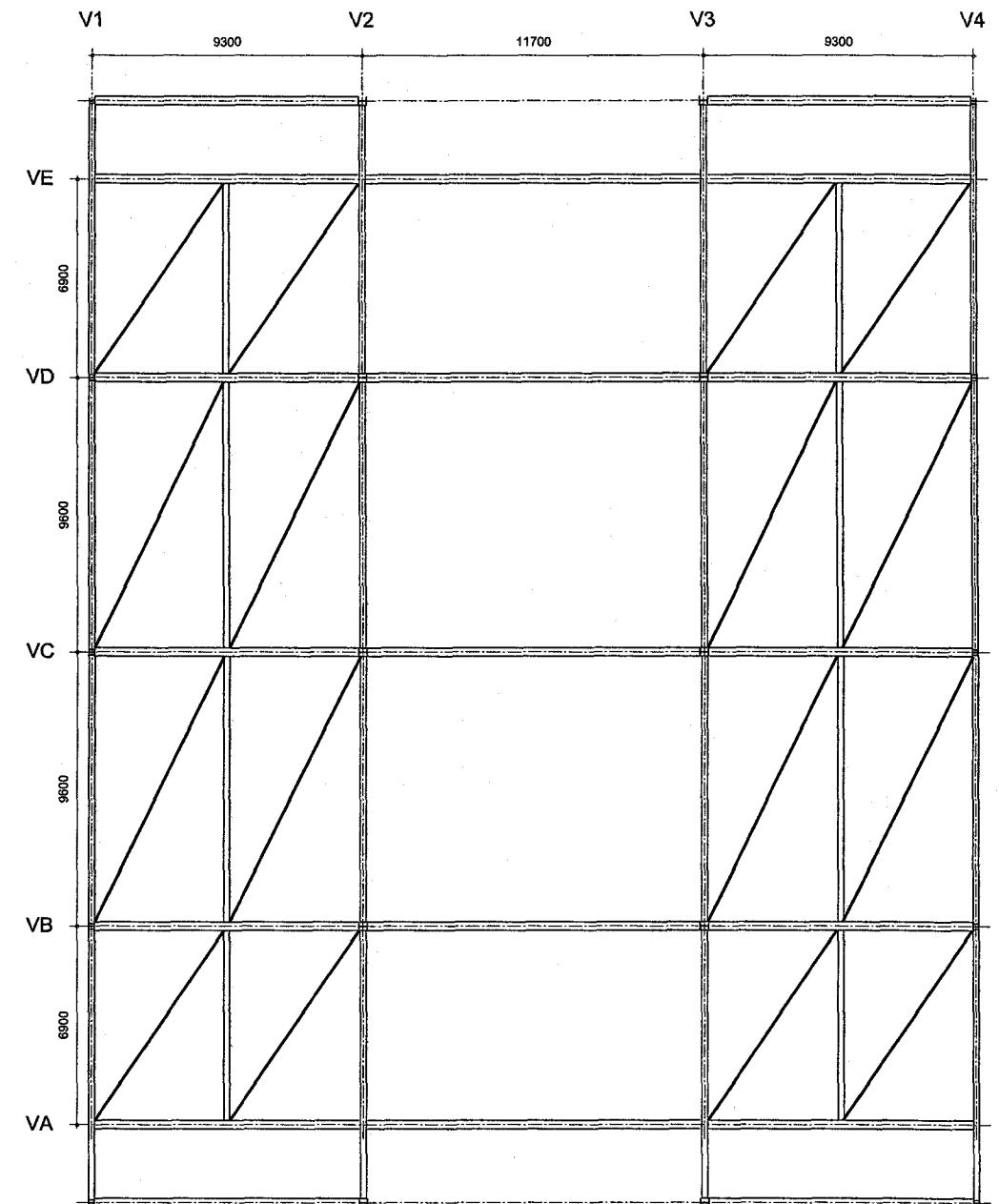
veranderlijke belasting
 $q_{pers} = 0,6 \cdot 2,5 = 1,6 \text{ kN/m'}$

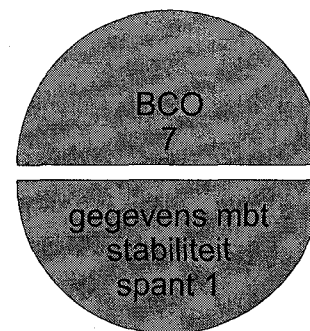
momenten
 $M_g = \frac{1}{8} \cdot 0,3 \cdot 4,4^2 = 0,73 \text{ kNm}$
 $M_{pers} = \frac{1}{8} \cdot 1,6 \cdot 4,4^2 = 3,87 \text{ kNm}$
 $M_d = 1,2 \cdot 0,73 + 1,5 \cdot 3,87 = 6,68 \text{ kNm}$

controle sterkte
 $\sigma = M/W < 12,04 \text{ N/mm}^2 (17/1,2 \cdot 0,85)$
 $W_{ben} = 555 \cdot 10^3 \text{ mm}^3$

controle doorbuiging
 $\delta = 5qL^4/384EI_{ben} < 0,004L = 17,6 \text{ mm}$
 $I_{ben} = 53 \cdot 10^6 \text{ mm}^4$

gekozen profiel
71*221 mm
 $W_y = 577 \cdot 10^3 \text{ mm}^3$
 $I_y = 63,9 \cdot 10^6 \text{ mm}^4$





algemene gegevens

stuwdrukgebied III, onbebouwd, $h = 10,0$ m

stuwdruk

$$p_w = 0,70 \text{ kN/m}^2$$

factor c_{dim}

$$c_{dim} = 0,90$$

winddruk

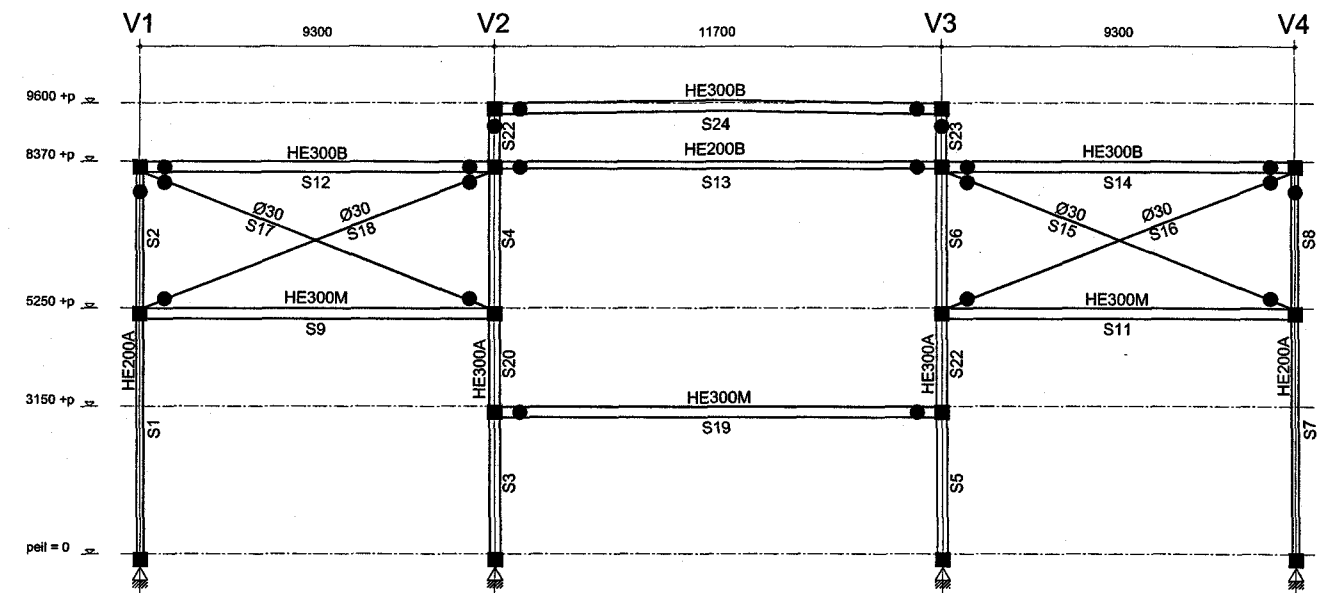
$$c_{index} = 0,8$$

windzuiging

$$c_{index} = -0,4$$

windbelasting

$$p_{rep} = 0,90 \cdot 1,2 \cdot 0,70 = 0,76 \text{ kN/m}^2$$



Projectnaam	berekening	Projectnummer	
Omschrijving	spant	Constructeur	T. Dekker
Opdrachtgever	1109222	Eenheden	m, kN, kNm
Bestand	J:\alstuden\constructie\spant_1.mxe		

Constructiegegevens

Projecttype	Knope	Staven	Opleggingen	Profielen	Belastingsgevallen	Belastingscombinaties
2D-Raamwerk	16	23	4	6	4	3

Staven

Staaf	Knoop	Scharnier	Knoop	Profiel	X-B	Z-B	X-E	Z-E	Lengte
S1	K1	NVM	NVM	K5	P1	0,000	0,000	-5,250	5,250
S2	K5	NVM	NV-	K9	P1	0,000	-5,250	0,000	3,120
S3	K2	NVM	NVM	K13	P21	9,300	0,000	9,300	2,800
S4	K6	NVM	NVM	K10	P21	9,300	-5,250	9,300	3,120
S5	K3	NVM	NVM	K14	P21	21,000	0,000	21,000	2,800
S6	K7	NVM	NVM	K11	P21	21,000	-5,250	21,000	3,120
S7	K4	NVM	NVM	K8	P1	30,300	0,000	30,300	5,250
S8	K8	NVM	NV-	K12	P1	30,300	-5,250	30,300	3,120
S9	K5	NVM	NVM	K6	P28	0,000	-5,250	9,300	9,300
S11	K7	NVM	NVM	K8	P28	21,000	-5,250	30,300	9,300
S12	K9	NV-	NV-	K10	P22	0,000	-8,370	9,300	9,300
S13	K10	NV-	NV-	K11	P29	9,300	-8,370	21,000	11,700
S14	K11	NV-	NV-	K12	P22	21,000	-8,370	30,300	9,300
S15	K7	NV-	NV-	K12	P4	21,000	-5,250	30,300	9,809
S16	K8	NV-	NV-	K11	P4	30,300	-5,250	21,000	9,809
S17	K5	NV-	NV-	K10	P4	0,000	-5,250	9,300	9,809
S18	K6	NV-	NV-	K9	P4	9,300	-5,250	0,000	9,809
S19	K13	NV-	NV-	K14	P28	9,300	-2,800	21,000	11,700
S20	K13	NVM	NVM	K6	P21	9,300	-2,800	9,300	2,450
S21	K14	NVM	NVM	K7	P21	21,000	-2,800	21,000	2,450
S22	K10	NVM	NV-	K15	P21	9,300	-8,370	9,300	1,230
S23	K11	NVM	NV-	K16	P21	21,000	-8,370	21,000	1,230
S24	K15	NV-	NV-	K16	P22	9,300	-9,600	21,000	11,700
-	-	-	-	-	-	m	m	m	m

Profielen

Profiel	Profielnaam	Oppervlakte	Iy	Materiaal	Hoek
P1	HE200A	5.3831e-03	3.6922e-05	S235	0°
P4	C30	7.0685e-04	3.9761e-08	S235	0°
P21	HE300A	1.1253e-02	1.8263e-04	S235	0°
P22	HE300B	1.4908e-02	2.5166e-04	S235	0°
P28	HE300M	3.0308e-02	5.9201e-04	S235	0°
P29	HE200B	7.8061e-03	5.6962e-05	S235	0°
-	-	m2	m4	-	°

Profielvormen

Profiel	Verlopende hoogte	hB	hE	tf	tw	tf2	B	bL	bR	Raaltiggen	Hoogte
P4	Nee	0.030	0.030	0.000	0.000	0.000	0.030	0.000	0.000	Nee	0.000
-	-	m	m	m	m	m	m	m	m	-	m

Materialen

Materiaalnaam	Dichtheid	E-Modulus	Lineaire uitzettingcoëff.
S235	78.50	2.1000e+08	12.0000e-06
-	kN/m3	kN/m2	C/m

Opleggingen

Opleggingen	Knoop	X	Z	Yr	HoekYr
O4	K4	vast	vast	vrij	0°
O3	K3	vast	vast	vrij	0°
O2	K2	vast	vast	vrij	0°
O1	K1	vast	vast	vrij	0°
-	-	kNm	kNm	kNmrad	°

Belastingsgevallen

Type	Beginwaarde	Eindwaarde	Beginafstand	Eindafstand	Richting	Staaf of knoop
BG1: windbelasting						

Type	Beginwaarde	Eindwaarde	Beginafstand	Eindafstand	Richting	Staaf of knoop
BG1: windbelasting						
N	-11,38				X	K12
N	-30,53				X	K8
BG2: permanent						
F	22,32		4,650		Z	S9,S11
F	11,16		0,000		Z	S9,S11
F	11,16		9,300		Z	S9,S11
F	10,80		5,850		Z	S19
F	5,40		2,100		Z	S19
F	5,40		9,600		Z	S19
F	5,95		3,100		Z	S12,S14
F	5,95		6,200		Z	S12,S14
F	2,98		0,000		Z	S12,S14
F	2,98		9,300		Z	S12,S14
F	2,81		0,000		Z	S24
F	2,81		11,700		Z	S24
F	5,62		2,925		Z	S24
F	5,62		5,850		Z	S24
F	5,62		8,775		Z	S24
q		1,17	0,000		L	S12,S14,S24
q	0,61	0,61	0,000		L	S13
q	2,38	2,38	0,000		L	S9,S11,S19
F	3,88		4,185		Z	S1,S7
F	8,48		1,050		Z	S20,S21
BG3: personen						
F	111,60		4,650		Z	S9,S11
F	55,80		0,000		Z	S9,S11
F	55,80		9,300		Z	S9,S11
F	90,00		5,850		Z	S19
F	45,00		2,100		Z	S19
F	45,00		9,600		Z	S19
BG4: sneeuw						
F	16,66		3,100		Z	S12,S14
F	16,66		6,200		Z	S12,S14
F	8,33		0,000		Z	S12,S14
F	8,33		9,300		Z	S12,S14
F	15,72		2,925		Z	S24
F	15,72		5,850		Z	S24
F	15,72		8,775		Z	S24
F	7,86		0,000		Z	S24
F	7,86		11,700		Z	S24
-	-	-	m	m	-	-

Fundamenteel Belastingscombinaties

B.G.	Omschrijving	F.C.1							
BG1	windbelasting	1.50							
BG2	permanent	1.20							
BG3	personen	1.50							
BG4	sneeuw	1.50							

Incidenteel Belastingscombinaties

B.G.	Omschrijving	I.C. Uon	I.C.1						
BG1	windbelasting	1.00	1.00						
BG2	permanent	1.00	-						
BG3	personen	1.00	-						
BG4	sneeuw	1.00	-						

F.C. Staafkrachten

Staaf	B.C.	Mb	Mmax	xMmax	Me	x-M0	x-M0	T/D	Nmax	Vb	Vmax	Ve
S1	F.C.1	0,00			-55,44	0,000	0,000		-267,40	-10,56	-10,56	-10,56
S2		38,46			0,00	0,000	0,000		-58,04	-12,33	-12,33	-12,33
S3		0,00			-96,97	0,000	0,000		-509,63	-34,63	-34,63	-34,63
S4		-159,49			34,32	2,567	0,000		-123,86	62,12	62,12	62,12
S5		0,00			-42,71	0,000	0,000		-550,85	-15,25	-15,25	-15,25
S6		62,55			-34,32	2,014	0,000		-131,51	-31,05	-31,05	-31,05
S7		0,00			-12,70	0,000	0,000		-226,18	-2,42	-2,42	-2,42
S8		-32,88			0,00	3,118	0,000		-50,14	10,54	10,54	10,54
S9		-93,90	356,96	4,650	-156,89	0,918	7,938	T	13,74	103,60	-117,15	-117,15
S11		-321,84	311,34	4,650	-20,18	2,306	9,040		-43,67	142,81	142,81	-77,94
S12		0,00	113,10	3,100	0,00	9,213	0,000		-22,20	38,66	-54,73	-54,73
S13		0,00	12,53	5,850	0,00	0,000	0,000	T	56,86	4,28	4,28	-4,28



Staaf	B.C.	Mb	Mmax	xMmax	Me	x-M0	x-M0	T/D	Nmax	Vb	Vmax	Ve
S14	F.C.1	0,00	113,10	3.100	0,00	9.213	0.000		-13,92	38,66	-54,73	-54,73
S15		0,00			0,00	0.000	0.000		-14,44	0,00	0,00	0,00
S16		0,00			0,00	0.000	0.000	T	11,43	0,00	0,00	0,00
S17		0,00			0,00	0.000	0.000		-12,62	0,00	0,00	0,00
S18		0,00			0,00	0.000	0.000	T	10,41	0,00	0,00	0,00
S19		0,00	637,01	5.850	0,00	0.000	0.000		-73,15	164,67	164,67	-164,67
S20		-98,97			-2,61	0.000	0.000		-344,97	38,52	38,52	38,52
S21		-42,71			-259,30	0.000	0.000		-386,18	-88,40	-88,40	-88,40
S22		34,32			0,00	0.000	0.000		-68,87	-27,90	-27,90	-27,90
S23		-34,32			0,00	0.000	0.000		-68,86	27,90	27,90	27,90
S24		0,00	201,43	5.850	0,00	11.634	0.000		-27,90	53,70	-68,86	-68,86
-	-	kNm	kNm	m	kNm	m	m	-	kN	kN	kN	kN

F.C. Oplegreacties

B.C.	Opleggingen	Knoop	X	Z	My
F.C.1	O4	K4	2.42	-226.18	0.00
	O3	K3	15.25	-550.85	0.00
	O2	K2	34.63	-609.63	0.00
	O1	K1	10.56	-267.40	0.00
	Som Reacties		62,87	-1.554,06	
	Som Lasten		-62,87	1.554,06	
-	-	-	kN	kN	kNm

I.C. Knoopverplaatsingen

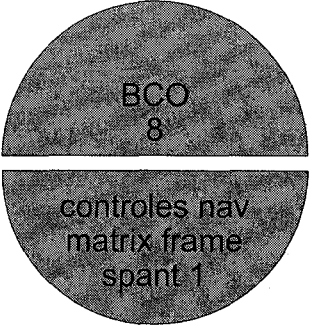
Knoop	B.C.	X	Z	Ry
K1	I.C. Uon	0.0000	0.0000	9.347e-03
	I.C.1	0.0000	0.0000	7.513e-03
K2	I.C. Uon	0.0000	0.0000	7.262e-03
	I.C.1	0.0000	0.0000	7.105e-03
K3	I.C. Uon	0.0000	0.0000	6.836e-03
	I.C.1	0.0000	0.0000	6.995e-03
K4	I.C. Uon	0.0000	0.0000	5.906e-03
	I.C.1	0.0000	0.0000	7.740e-03
K5	I.C. Uon	-0.0267	0.0009	-3.426e-03
	I.C.1	-0.0262	0.0001	-0.042e-03
K6	I.C. Uon	-0.0267	0.0007	2.865e-03
	I.C.1	-0.0262	0.0000	1.042e-03
K7	I.C. Uon	-0.0264	0.0007	-0.715e-03
	I.C.1	-0.0269	0.0000	1.107e-03
K8	I.C. Uon	-0.0264	0.0007	3.301e-03
	I.C.1	-0.0269	-0.0001	-0.083e-03
K9	I.C. Uon	-0.0273	0.0010	0.000e-03
	I.C.1	-0.0271	0.0001	0.090e-03
K10	I.C. Uon	-0.0273	0.0008	-0.645e-03
	I.C.1	-0.0271	0.0000	-0.150e-03
K11	I.C. Uon	-0.0270	0.0009	0.166e-03
	I.C.1	-0.0272	0.0000	-0.329e-03
K12	I.C. Uon	-0.0271	0.0008	0.000e-03
	I.C.1	-0.0273	-0.0001	0.000e-03
K13	I.C. Uon	-0.0181	0.0004	4.877e-03
	I.C.1	-0.0181	0.0000	5.234e-03
K14	I.C. Uon	-0.0182	0.0005	5.824e-03
	I.C.1	-0.0182	0.0000	5.467e-03
K15	I.C. Uon	-0.0268	0.0008	0.000e-03
	I.C.1	-0.0269	0.0000	0.000e-03
K16	I.C. Uon	-0.0269	0.0009	0.000e-03
	I.C.1	-0.0269	0.0000	0.000e-03
-	-	m	m	rad

I.C. Doorbuigingen

Staaf	B.C.	Knoop Begin		Staaf		Knoop Eind	
		X	Z	Z'afst	Z'	X	Z
S1	I.C. Uon	0.0000	0.0000	3.088	-0.0086	-0.0267	0.0009
	I.C.1	0.0000	0.0000	3.088	-0.0051	-0.0262	0.0001
S2	I.C. Uon	-0.0267	0.0009	1.248	0.0022	-0.0273	0.0010

Staaf	B.C.	Knoop Begin		Staaf		Knoop Eind	
		X	Z	Z'afst	Z'	X	Z
S2	I.C.1	-0.0262	0.0001	1.248	0.0002	-0.0271	0.0001
S3	I.C. Uon	0.0000	0.0000	1.556	-0.0009	-0.0181	0.0004
	I.C.1	0.0000	0.0000	1.556	-0.0007	-0.0181	0.0000
S4	I.C. Uon	-0.0267	0.0007	1.248	-0.0015	-0.0273	0.0008
	I.C.1	-0.0262	0.0000	1.248	-0.0005	-0.0271	0.0000
S5	I.C. Uon	0.0000	0.0000	1.556	-0.0004	-0.0182	0.0005
	I.C.1	0.0000	0.0000	1.556	-0.0005	-0.0182	0.0000
S6	I.C. Uon	-0.0264	0.0007	0.936	0.0004	-0.0270	0.0009
	I.C.1	-0.0269	0.0000	1.248	-0.0006	-0.0272	0.0000
S7	I.C. Uon	0.0000	0.0000	3.088	-0.0018	-0.0264	0.0007
	I.C.1	0.0000	0.0000	3.088	-0.0053	-0.0269	-0.0001
S8	I.C. Uon	-0.0264	0.0007	1.248	-0.0019	-0.0271	0.0008
	I.C.1	-0.0269	-0.0001	1.248	0.0001	-0.0273	-0.0001
S9	I.C. Uon	-0.0267	0.0009	4.500	0.0122	-0.0267	0.0007
	I.C.1	-0.0262	0.0001	6.000	0.0015	-0.0262	0.0000
S11	I.C. Uon	-0.0264	0.0007	5.100	0.0097	-0.0264	0.0007
	I.C.1	-0.0269	0.0000	3.300	-0.0018	-0.0269	-0.0001
S12	I.C. Uon	-0.0273	0.0010	4.650	0.0144	-0.0273	0.0008
	I.C.1	-0.0271	0.0001	0.000	0.0000	-0.0271	0.0000
S13	I.C. Uon	-0.0273	0.0008	5.850	0.0124	-0.0270	0.0009
	I.C.1	-0.0271	0.0000	0.000	0.0000	-0.0272	0.0000
S14	I.C. Uon	-0.0270	0.0009	4.650	0.0144	-0.0271	0.0008
	I.C.1	-0.0272	0.0000	0.000	0.0000	-0.0273	-0.0001
S15	I.C. Uon	-0.0264	0.0007	0.000	0.0000	-0.0271	0.0008
	I.C.1	-0.0269	0.0000	0.000	0.0000	-0.0273	-0.0001
S16	I.C. Uon	-0.0264	0.0007	0.000	0.0000	-0.0270	0.0009
	I.C.1	-0.0269	-0.0001	0.000	0.0000	-0.0272	0.0000
S17	I.C. Uon	-0.0267	0.0009	0.000	0.0000	-0.0273	0.0008
	I.C.1	-0.0262	0.0001	0.000	0.0000	-0.0271	0.0000
S18	I.C. Uon	-0.0267	0.0007	0.000	0.0000	-0.0273	0.0010
	I.C.1	-0.0262	0.0000	0.000	0.0000	-0.0271	0.0001
S19	I.C. Uon	-0.0181	0.0004	5.850	0.0457	-0.0182	0.0005
	I.C.1	-0.0181	0.0000	0.000	0.0000	-0.0182	0.0000
S20	I.C. Uon	-0.0181	0.0004	1.050	-0.0006	-0.0267	0.0007
	I.C.1	-0.0181	0.0000	1.225	-0.0013	-0.0262	0.0000
S21	I.C. Uon	-0.0182	0.0005	1.225	-0.0020	-0.0264	0.0007
	I.C.1	-0.0182	0.0000	1.225	-0.0013	-0.0269	0.0000
S22	I.C. Uon	-0.0273	0.0008	0.615	0.0001	-0.0268	0.0008
	I.C.1	-0.0271	0.0000	0.615	0.0000	-0.0269	0.0000
S23	I.C. Uon	-0.0270	0.0009	0.615	-0.0001	-0.0269	0.0009
	I.C.1	-0.0272	0.0000	0.615	0.0000	-0.0269	0.0000
S24	I.C. Uon	-0.0268	0.0008	5.850	0.0374	-0.0269	0.0009
	I.C.1	-0.0269	0.0000	0.000	0.0000	-0.0269	0.0000
-	-	m	m	m	m	m	m





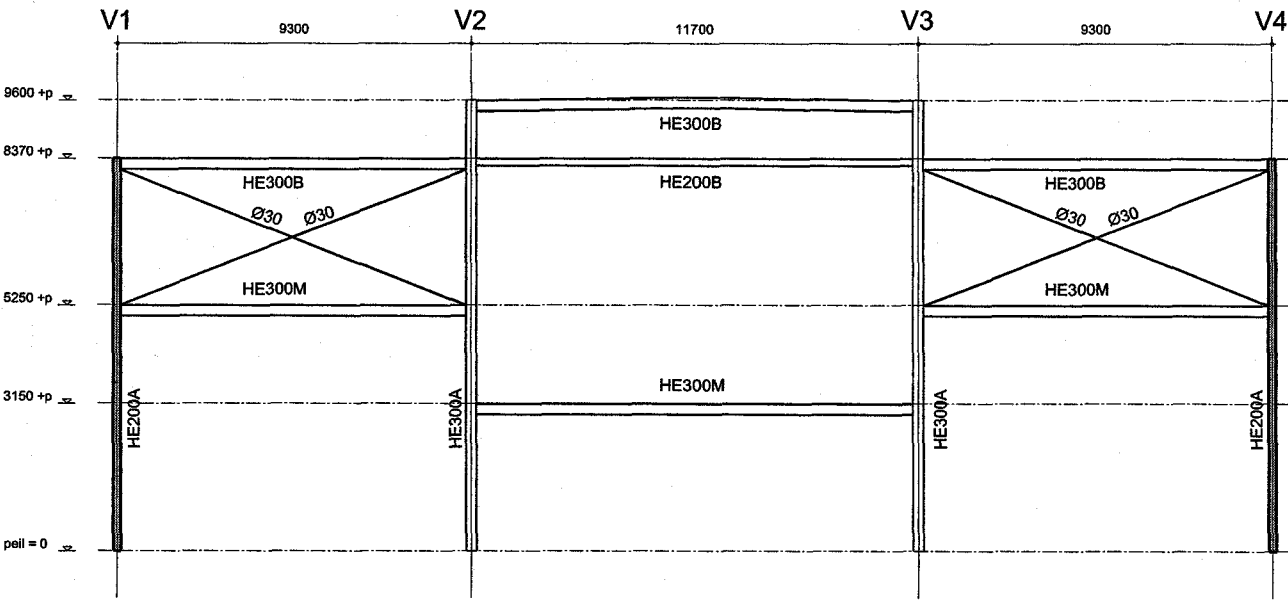
controles spant
kolom HE200A

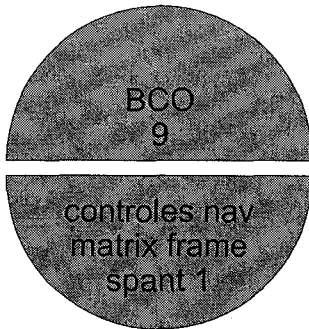
knik om z-as
 $R_d :$ 267,40 kN (FC1)
Kniklengte $L_{buc} :$ 5250 mm
Traagheidsstraal om z-as: 49 mm
 $\lambda :$ 107,14
 $\lambda_{rel} :$ 1,14
 $\omega_{buc} :$ 0,46
 $F_d :$ 581 kN
UC = 0,46

knik om y-as
 $R_d :$ 267,40 kN (FC1)
Kniklengte $L_{buc} :$ 3150 mm
Traagheidsstraal om z-as: 74 mm
 $\lambda :$ 42,57
 $\lambda_{rel} :$ 0,45
 $\omega_{buc} :$ 0,91
 $F_d :$ 1151 kN
UC = 0,23

moment om y-as
 $M_d = 55,40$ kNm (FC1)
 $\sigma_d = M_d / W_y < 235$ N/mm²
UC = 0,61

voor oplegreacties spant, zie bijlage Matrix Frame-spant_1





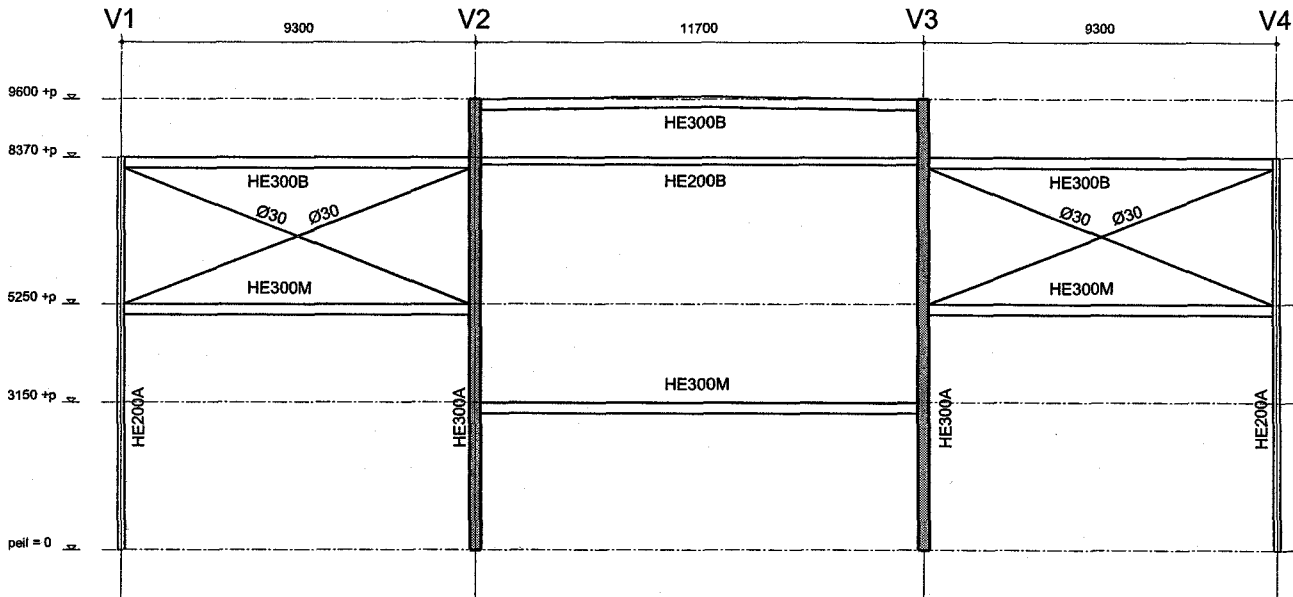
controles spant
kolom HE300A

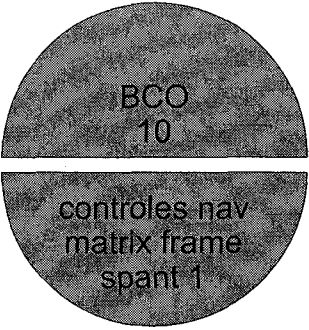
knik om z-as
 $R_d :$ 550,85 kN (FC1)
Kniklengte $L_{buc} :$ 5250 mm
Traagheidsstraal om z-as: 74 mm
 $\lambda :$ 70,95
 $\lambda_{rel} :$ 0,76
 $\omega_{buc} :$ 0,69
 $F_d :$ 1824 kN
UC = 0,30

knik om y-as
 $R_d :$ 550,85 kN (FC1)
Kniklengte $L_{buc} :$ 3150 mm
Traagheidsstraal om z-as: 127 mm
 $\lambda :$ 24,80
 $\lambda_{rel} :$ 0,26
 $\omega_{buc} :$ 0,98
 $F_d :$ 2591 kN
UC = 0,21

moment om y-as
 $M_d = 259,30$ kN (FC1)
 $\sigma_d = M_d / W_y < 235$ N/mm²
UC = 0,88

voor oplegreacties spant, zie bijlage Matrix Frame-spant_1





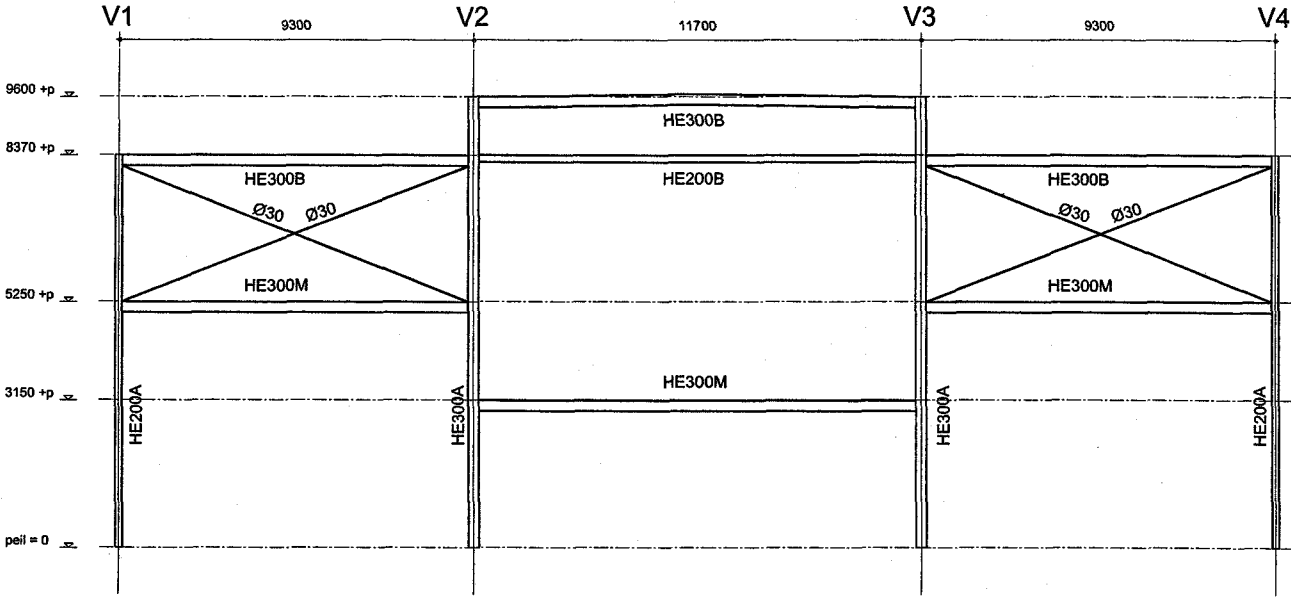
controles spant
verplaatsing spant en momentvaste verbinding

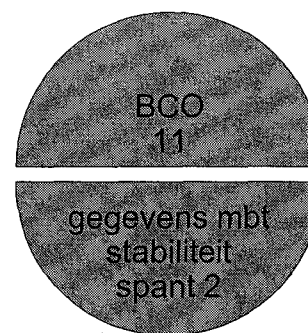
verplaatsing spant
 $u = 27,1 \text{ mm (IC Uon)}$
 $u = 0,0028 \cdot l < 0,003 \cdot l$

boutverbinding
kolom-ligger verbinding

Optredend moment	321,84 kNm (FC1)
Toegepaste bouten	M16
Boutkwaliteit	8.8
$f_{t;b;d}$	800 N/mm ²
$f_{y;b;d}$	640 N/mm ²
$A_{b;s}$	155 mm ²
$F_{t;u;d}$	178,56 kN (per 2 bouten)
Moment	339,26 kNm
UC	0,94

voor gegevens spant, zie bijlage Matrix Frame-spant_1





algemene gegevens

stuwdrukgebied III, onbebouwd, $h = 10,0$ m

stuwdruk

$$p_w = 0,70 \text{ kN/m}^2$$

factor c_{dim}

$$c_{dim} = 0,90$$

winddruk

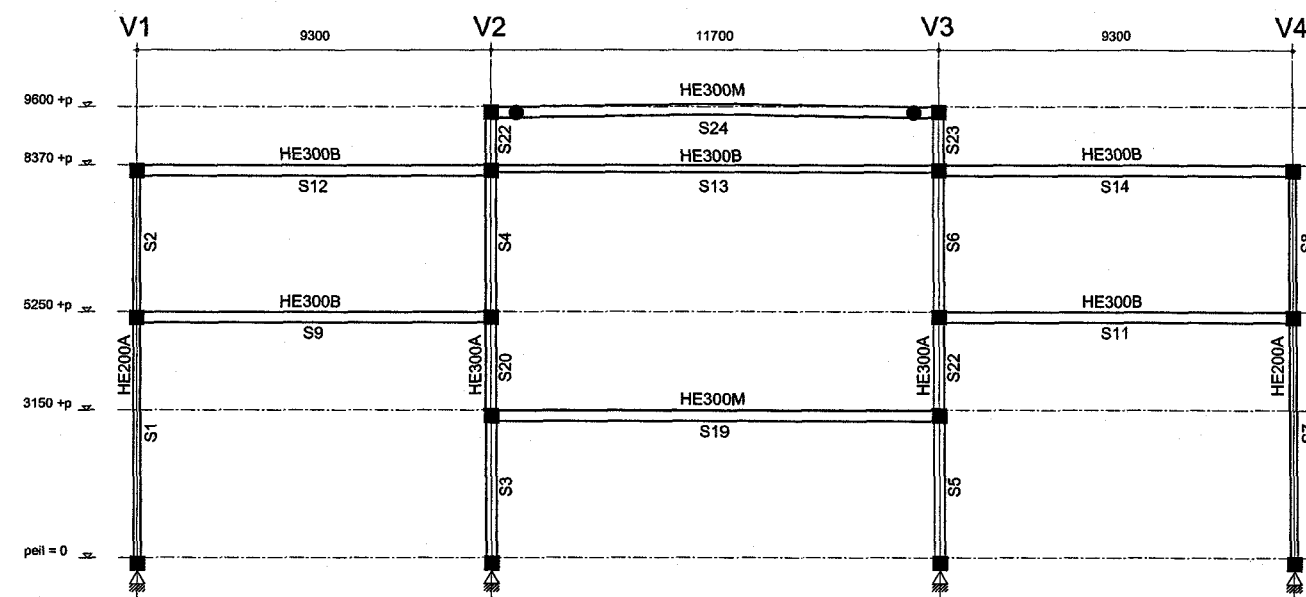
$$c_{index} = 0,8$$

windzuiging

$$c_{index} = -0,4$$

windbelasting

$$p_{rep} = 0,90 \cdot 1,2 \cdot 0,70 = 0,76 \text{ kN/m}^2$$



Projectnaam	berekening	Projectnummer	
Omschrijving	spant	Construcleur	T. Dekker
Opdrachtgever	1109222	Eenheden	m, kN, kNm
Bestand	J:\afstuderen\constructiespant_2.mxe		

Constructiegegevens

Projecttype	Knopen	Staven	Opleggingen	Profielen	Belastingsgevalen	Belastingscombinaties
2D-Raamwerk	16	19	4	4	4	9

Staven

Staf	Knoop	Scharnier	Knoop	Profiel	X-B	Z-B	X-E	Z-E	Lengte
S1	K1	NVM	K5	P44	0,000	0,000	0,000	-5,250	5,250
S2	K5	NVM	K9	P44	0,000	-5,250	0,000	-8,370	3,120
S3	K2	NVM	K13	P43	9,300	0,000	9,300	-2,800	2,800
S4	K6	NVM	K10	P43	9,300	-5,250	9,300	-8,370	3,120
S5	K3	NVM	K14	P43	21,000	0,000	21,000	-2,800	2,800
S6	K7	NVM	K11	P43	21,000	-5,250	21,000	-8,370	3,120
S7	K4	NVM	K8	P44	30,300	0,000	30,300	-5,250	5,250
S8	K8	NVM	K12	P44	30,300	-5,250	30,300	-8,370	3,120
S9	K5	NVM	K6	P41	0,000	-5,250	9,300	-5,250	9,300
S11	K7	NVM	K8	P41	21,000	-5,250	30,300	-5,250	9,300
S12	K9	NVM	K10	P41	0,000	-8,370	9,300	-8,370	9,300
S13	K10	NVM	K11	P41	9,300	-8,370	21,000	-8,370	11,700
S14	K11	NVM	K12	P41	21,000	-8,370	30,300	-8,370	9,300
S19	K13	NVM	K14	P42	9,300	-2,800	21,000	-2,800	11,700
S20	K13	NVM	K6	P43	9,300	-2,800	9,300	-5,250	2,450
S21	K14	NVM	K7	P43	21,000	-2,800	21,000	-5,250	2,450
S22	K10	NVM	K15	P43	9,300	-8,370	9,300	-9,600	1,230
S23	K11	NVM	K16	P43	21,000	-8,370	21,000	-9,600	1,230
S24	K15	NV-	K16	P42	9,300	-9,600	21,000	-9,600	11,700
-	-	-	-	-	m	m	m	m	m

Profielen

Profiel	Profielnaam	Oppervlakte	Iy	Materiaal	Hoek
P41	HE300B	1.4908e-02	2.5166e-04	S235	0°
P42	HE300M	3.0308e-02	5.9201e-04	S235	0°
P43	HE300A	1.1253e-02	1.8263e-04	S235	0°
P44	HE200A	5.3831e-03	3.6922e-05	S235	0°
-	-	m2	m4	-	°

Materialen

Materiaalnaam	Dichtheid	E-Modulus	Lineaire uitzettingcoëff.
S235	78.50	2.1000e+08	12.0000e-08
-	kN/m3	kN/m2	C°/m

Opleggingen

Opleggingen	Knoop	X	Z	Yr	HoekYr
O4	K4	vast	vast	vrij	0°
O3	K3	vast	vast	vrij	0°
O2	K2	vast	vast	vrij	0°
O1	K1	vast	vast	vrij	0°
-	-	kNm	kNm	kNm/rad	°

Belastingsgevalen

Type	Beginwaarde	Eindwaarde	Beginafstand	Eindafstand	Richting	Staf of knoop
BG1: windbelasting						
N	-11,38				X	K12
N	-30,63				X	K8
BG2: permanent						
F	22,32	4,650			Z	S9,S11
F	11,16	0,000			Z	S9,S11
F	11,16	9,300			Z	S9,S11
F	10,80	5,850			Z	S19
F	5,40	2,100			Z	S19
F	5,40	9,600			Z	S19
F	5,95	3,100			Z	S12,S14
F	5,95	6,200			Z	S12,S14
F	2,98	0,000			Z	S12,S14
F	2,98	9,300			Z	S12,S14
F	2,81	0,000			Z	S24

Type	Beginwaarde	Eindwaarde	Beginafstand	Eindafstand	Richting	Staf of knoop
BG2: permanent						
F	2,81		11,700		Z	S24
F	5,62		2,925		Z	S24
F	5,62		5,850		Z	S24
F	5,62		8,775		Z	S24
q	1,17	1,17	0,000	L	Z	S9,S11-S14
q	2,38	2,38	0,000	L	Z	S19,S24
F	3,88		4,185		Z	S1,S7
F	8,48		1,050		Z	S20-S21
BG3: personen						
F	111,60		4,650		Z	S9,S11
F	55,80		0,000		Z	S9,S11
F	55,80		9,300		Z	S9,S11
F	90,00		5,850		Z	S19
F	45,00		2,100		Z	S19
F	45,00		9,600		Z	S19
BG4: sneeuw						
F	16,66		3,100		Z	S12,S14
F	16,66		6,200		Z	S12,S14
F	8,33		0,000		Z	S12,S14
F	8,33		9,300		Z	S12,S14
F	15,72		2,925		Z	S24
F	15,72		5,850		Z	S24
F	15,72		8,775		Z	S24
F	7,86		0,000		Z	S24
F	7,86		11,700		Z	S24
-	-	-	m	m	-	-

Fundamenteel Belastingscombinaties

B.G.	Omschrijving	F.C.1							
BG1	windbelasting	1.50							
BG2	permanent	1.20							
BG3	personen	1.50							
BG4	sneeuw	1.50							

F.C. Staafkrachten 1st Iter

Staf	B.C.	Mb	Mmax	xMmax	Me	x-M0	x-M0	T/D	Nmax	Vb	Vmax	Ve
S1	F.C.1	0,00			-40,01	0,000	0,000		-251,27	-5,89	-9,12	-9,12
S2		94,47			-65,50	1,843	0,000		-54,41	-51,58	-51,58	-51,28
S3		0,00			-269,57	0,000	0,000		-545,75	-92,47	-97,57	-97,57
S4		-105,13			13,75	2,758	0,000		-142,18	38,70	38,70	38,20
S5		0,00			106,12	0,000	0,000		-519,87	39,19	41,10	41,10
S6		87,77			-48,31	2,013	0,000		-143,49	-43,84	-43,84	-43,62
S7		0,00			16,44	0,000	0,000		-235,62	3,50	4,73	4,73
S8		-76,40			47,62	1,923	0,000		-50,32	40,04	40,04	39,78
S9		-134,48	283,49	4,650	-211,85	1,426	7,384	T	43,60	95,61	-112,17	-112,17
S11		-278,51	280,98	4,650	-92,84	2,283	8,160		-10,13	123,56	123,56	-83,58
S12		-65,50	46,81	4,429	-70,62	1,777	7,437		-51,34	38,05	-38,18	-38,18
S13		-27,41	5,11	7,020	-11,66	4,102	9,513		-37,13	9,58	9,58	-6,87
S14		-89,43	51,60	6,200	-47,52	2,147	7,866		-56,86	43,14	43,14	-34,07
S19		-389,89	358,35	5,850	-167,44	2,201	10,538		-91,82	183,35	183,35	-145,05
S20		120,32			106,72	0,000	0,000		-361,41	-6,52	-6,52	-4,06
S21		-61,32			-190,74	0,000	0,000		-374,84	-50,48	-53,34	-53,34
S22		-29,46			0,00	0,000	0,000		-77,36	24,00	24,00	23,97
S23		29,46			0,00	0,000	0,000		-77,37	-23,98	-23,98	-23,92
S24		0,00	226,28	5,850	0,00	0,000	0,000	T	23,95	62,36	62,36	-62,36
-	-	kNm	kNm	m	kNm	m	m	-	kN	kN	kN	kN

F.C. Oplegreacties 1st Iter

B.C.	Opleggingen	Knoop	X	Z	My
F.C.1					
	O4	K4	-3,13	-235,62	0,00
	O3	K3	-37,90	-519,97	0,00
	O2	K2	96,28	-545,09	0,00
	O1	K1	7,62	-251,22	0,00
	Som Reacties		62,86	-1.551,90	
	Som Lasten		-62,86	1.551,90	
-	-	-	kN	kN	kNm



I.C. Knoopverplaatsingen 1st Iter

Knoop	B.C.	X	Z	Ry
K1	I.C. Uon	0.0000	0.0000	4.693e-03
K2		0.0000	0.0000	4.717e-03
K3		0.0000	0.0000	1.590e-03
K4		0.0000	0.0000	0.957e-03
K5		-0.0083	0.0008	-4.620e-03
K6		-0.0082	0.0007	3.021e-03
K7		-0.0120	0.0007	-1.224e-03
K8		-0.0120	0.0008	4.949e-03
K9		-0.0118	0.0009	-0.634e-03
K10		-0.0119	0.0009	0.463e-03
K11		-0.0120	0.0008	-0.074e-03
K12		-0.0121	0.0009	0.974e-03
K13		-0.0069	0.0005	-2.023e-03
K14		-0.0070	0.0004	4.352e-03
K15		-0.0122	0.0009	0.138e-03
K16		-0.0122	0.0009	0.253e-03
-	-	m	m	rad

I.C. Doorbuigingen 1st Iter

Staaf	B.C.	Knoop Begin		Staaf		Knoop Eind	
		X	Z	Z'afst	Z'	X	Z
S1	I.C. Uon	0.0000	0.0000	3.662	-0.0117	-0.0083	0.0008
	I.C. Uon	0.0000	0.0000	3.662	-0.0117	-0.0088	0.0008
S2	I.C. Uon	-0.0083	0.0008	2.984	-0.0118	-0.0118	0.0009
	I.C. Uon	-0.0088	0.0008	2.984	-0.0118	-0.0124	0.0010
S3	I.C. Uon	0.0000	0.0000	2.380	-0.0074	-0.0069	0.0005
	I.C. Uon	0.0000	0.0000	2.380	-0.0074	-0.0073	0.0005
S4	I.C. Uon	-0.0082	0.0007	3.120	-0.0119	-0.0119	0.0009
	I.C. Uon	-0.0088	0.0007	3.120	-0.0119	-0.0125	0.0009
S5	I.C. Uon	0.0000	0.0000	2.800	-0.0070	-0.0070	0.0004
	I.C. Uon	0.0000	0.0000	2.800	-0.0070	-0.0075	0.0004
S6	I.C. Uon	-0.0120	0.0007	2.984	-0.0120	-0.0120	0.0008
	I.C. Uon	-0.0126	0.0007	2.984	-0.0120	-0.0126	0.0009
S7	I.C. Uon	0.0000	0.0000	5.250	-0.0120	-0.0120	0.0008
	I.C. Uon	0.0000	0.0000	5.250	-0.0120	-0.0127	0.0008
S8	I.C. Uon	-0.0120	0.0008	0.936	-0.0141	-0.0121	0.0009
	I.C. Uon	-0.0127	0.0008	0.936	-0.0141	-0.0128	0.0009
S9	I.C. Uon	-0.0083	0.0008	4.650	0.0207	-0.0082	0.0007
	I.C. Uon	-0.0088	0.0008	4.650	0.0207	-0.0088	0.0007
S11	I.C. Uon	-0.0120	0.0007	5.115	0.0190	-0.0120	0.0008
	I.C. Uon	-0.0126	0.0007	5.115	0.0190	-0.0127	0.0008
S12	I.C. Uon	-0.0118	0.0009	4.429	0.0052	-0.0119	0.0009
	I.C. Uon	-0.0124	0.0010	4.429	0.0052	-0.0125	0.0009
S13	I.C. Uon	-0.0119	0.0009	7.020	0.0012	-0.0120	0.0008
	I.C. Uon	-0.0125	0.0009	7.020	0.0012	-0.0126	0.0008
S14	I.C. Uon	-0.0120	0.0008	4.871	0.0052	-0.0121	0.0009
	I.C. Uon	-0.0126	0.0009	4.871	0.0052	-0.0128	0.0009
S19	I.C. Uon	-0.0069	0.0005	6.386	0.0195	-0.0070	0.0004
	I.C. Uon	-0.0073	0.0005	6.386	0.0195	-0.0075	0.0004
S20	I.C. Uon	-0.0069	0.0005	2.450	-0.0082	-0.0082	0.0007
	I.C. Uon	-0.0073	0.0005	2.450	-0.0082	-0.0088	0.0007
S21	I.C. Uon	-0.0070	0.0004	2.100	-0.0122	-0.0120	0.0007
	I.C. Uon	-0.0075	0.0004	2.100	-0.0122	-0.0126	0.0007
S22	I.C. Uon	-0.0119	0.0009	1.230	-0.0122	-0.0122	0.0009
	I.C. Uon	-0.0125	0.0009	1.230	-0.0122	-0.0128	0.0009
S23	I.C. Uon	-0.0120	0.0008	1.230	-0.0122	-0.0122	0.0009
	I.C. Uon	-0.0126	0.0009	1.230	-0.0122	-0.0129	0.0009
S24	I.C. Uon	-0.0122	0.0009	5.850	0.0192	-0.0122	0.0009
	I.C. Uon	-0.0128	0.0009	5.850	0.0192	-0.0129	0.0009
-	-	m	m	m	m	m	m

F.C. Staafkrachten berekening

Staaf	B.C.	Mb	Mmax	xMmax	Me	x-M0	x-M0	T/D	Nmax	Vb	Vmax	Ve
S1	F.C.1	0,00			-38,51	0,000	0,000		-251,88	-4,82	-8,20	-8,20
S2		95,86			-66,69	1,841	0,000		-54,56	-52,32	-52,32	-52,01
S3		0,00			-276,68	0,000	0,000		-546,91	-92,58	-97,87	-97,87
S4		-105,66			11,68	2,811	0,000		-142,09	38,47	38,47	37,95
S5		0,00			97,21	0,000	0,000		-518,54	38,37	40,14	40,14
S6		86,74			-47,37	2,020	0,000		-143,47	-43,19	-43,19	-42,97
S7		0,00			14,52	0,000	0,000		-235,30	4,07	5,23	5,23
S8		-77,03			47,94	1,925	0,000		-50,29	40,38	40,38	40,10
S9		-134,37	293,63	4,650	-209,11	1,426	7,397	T	45,26	95,91	-111,90	-111,90
S11		-279,93	281,16	4,650	-91,55	2,268	8,192		-10,29	123,85	123,85	-83,29
S12		-66,69	46,50	4,429	-70,60	1,799	7,435		-52,08	38,19	-39,03	-39,03
S13		-27,43	5,40	7,020	-11,18	4,069	9,616		-39,78	9,62	9,62	-6,83
S14		-90,11	51,40	6,200	-47,94	2,159	7,859		-57,20	43,17	43,17	-34,04
S19		-399,23	380,14	5,850	-159,36	2,250	10,591		-80,29	184,85	184,85	-143,55
S20		122,55			103,45	0,000	0,000		-361,04	-8,39	-8,39	-5,94
S21		-62,15			-193,19	0,000	0,000		-374,92	-49,93	-52,84	-52,84
S22		-31,50			0,00	0,000	0,000		-77,36	25,68	25,68	25,64
S23		31,55			0,00	0,000	0,000		-77,37	-25,63	-25,63	-25,60
S24		0,00	225,65	5,850	0,00	0,000	0,000	T	25,62	62,37	62,37	-62,37
-	-	kNm	kNm	m	kNm	m	m	-	kN	kN	kN	kN

I.C. Knoopverplaatsingen berekening

Knoop	B.C.	X	Z	Ry
K1	I.C. Uon	0.0000	0.0000	4.933e-03
K2		0.0000	0.0000	4.926e-03
K3		0.0000	0.0000	1.807e-03
K4		0.0000	0.0000	1.108e-03
K5		-0.0088	0.0008	-4.628e-03
K6		-0.0088	0.0007	3.069e-03
K7		-0.0126	0.0007	-1.209e-03
K8		-0.0127	0.0008	4.971e-03
K9		-0.0124	0.0010	-0.606e-03
K10		-0.0125	0.0009	0.454e-03
K11		-0.0126	0.0009	-0.055e-03
K12		-0.0128	0.0009	0.961e-03
K13		-0.0073	0.0005	-1.977e-03
K14		-0.0075	0.0004	4.435e-03
K15		-0.0128	0.0009	0.110e-03
K16		-0.0129	0.0009	0.269e-03
-	-	m	m	rad

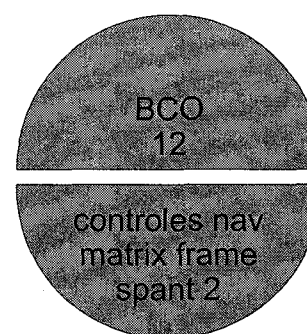
I.C. Doorbuigingen berekening

Staaf	B.C.	Knoop Begin		Staaf		Knoop Eind	
		X	Z	Z'afst	Z'	X	Z
S1	I.C. Uon	0.0000	0.0000	3.662	-0.0122	-0.0083	0.0008
	I.C. Uon	0.0000	0.0000	3.662	-0.0122	-0.0088	0.0008
S2	I.C. Uon	-0.0083	0.0008	2.984	-0.0125	-0.0118	0.0009
	I.C. Uon	-0.0088	0.0008	2.984	-0.0125	-0.0124	0.0010
S3	I.C. Uon	0.0000	0.0000	2.380	-0.0078	-0.0069	0.0005
	I.C. Uon	0.0000	0.0000	2.380	-0.0078	-0.0073	0.0005
S4	I.C. Uon	-0.0082	0.0007	3.120	-0.0125	-0.0119	0.0009
	I.C. Uon	-0.0088	0.0007	3.120	-0.0125	-0.0125	0.0009
S5	I.C. Uon	0.0000	0.0000	2.800	-0.0075	-0.0070	0.0004
	I.C. Uon	0.0000	0.0000	2.800	-0.0075	-0.0075	0.0004
S6	I.C. Uon	-0.0120	0.0007	3.120	-0.0126	-0.0120	0.0008
	I.C. Uon	-0.0126	0.0007	3.120	-0.0126	-0.0126	0.0009
S7	I.C. Uon	0.0000	0.0000	5.250	-0.0127	-0.0120	0.0008
	I.C. Uon	0.0000	0.0000	5.250	-0.0127	-0.0127	0.0008
S8	I.C. Uon	-0.0120	0.0008	0.936	-0.0148	-0.0121	0.0009
	I.C. Uon	-0.0127	0.0008	0.936	-0.0148	-0.0128	0.0009



Staat	B.C.	Knoop Begin		Staat		Knoop Eind	
		X	Z	Z'afst	Z'	X	Z
S9	I.C. Uon	-0.0083	0.0008	4.650	0.0208	-0.0082	0.0007
	I.C. Uon	-0.0088	0.0008	4.650	0.0208	-0.0088	0.0007
S11	I.C. Uon	-0.0120	0.0007	5.115	0.0191	-0.0120	0.0008
	I.C. Uon	-0.0126	0.0007	5.115	0.0191	-0.0127	0.0008
S12	I.C. Uon	-0.0118	0.0009	4.429	0.0052	-0.0119	0.0009
	I.C. Uon	-0.0124	0.0010	4.429	0.0052	-0.0125	0.0009
S13	I.C. Uon	-0.0119	0.0009	7.020	0.0013	-0.0120	0.0008
	I.C. Uon	-0.0125	0.0009	7.020	0.0013	-0.0126	0.0009
S14	I.C. Uon	-0.0120	0.0008	4.871	0.0052	-0.0121	0.0009
	I.C. Uon	-0.0126	0.0009	4.871	0.0052	-0.0128	0.0009
S19	I.C. Uon	-0.0069	0.0005	6.386	0.0196	-0.0070	0.0004
	I.C. Uon	-0.0073	0.0005	6.386	0.0196	-0.0075	0.0004
S20	I.C. Uon	-0.0069	0.0005	2.450	-0.0088	-0.0082	0.0007
	I.C. Uon	-0.0073	0.0005	2.450	-0.0088	-0.0088	0.0007
S21	I.C. Uon	-0.0070	0.0004	2.100	-0.0128	-0.0120	0.0007
	I.C. Uon	-0.0075	0.0004	2.100	-0.0128	-0.0126	0.0007
S22	I.C. Uon	-0.0119	0.0009	1.230	-0.0128	-0.0122	0.0009
	I.C. Uon	-0.0125	0.0009	1.230	-0.0128	-0.0128	0.0009
S23	I.C. Uon	-0.0120	0.0008	1.230	-0.0129	-0.0122	0.0009
	I.C. Uon	-0.0126	0.0009	1.230	-0.0129	-0.0129	0.0009
S24	I.C. Uon	-0.0122	0.0009	5.850	0.0191	-0.0122	0.0009
	I.C. Uon	-0.0128	0.0009	5.850	0.0191	-0.0129	0.0009
-	-	m	m	m	m	m	m





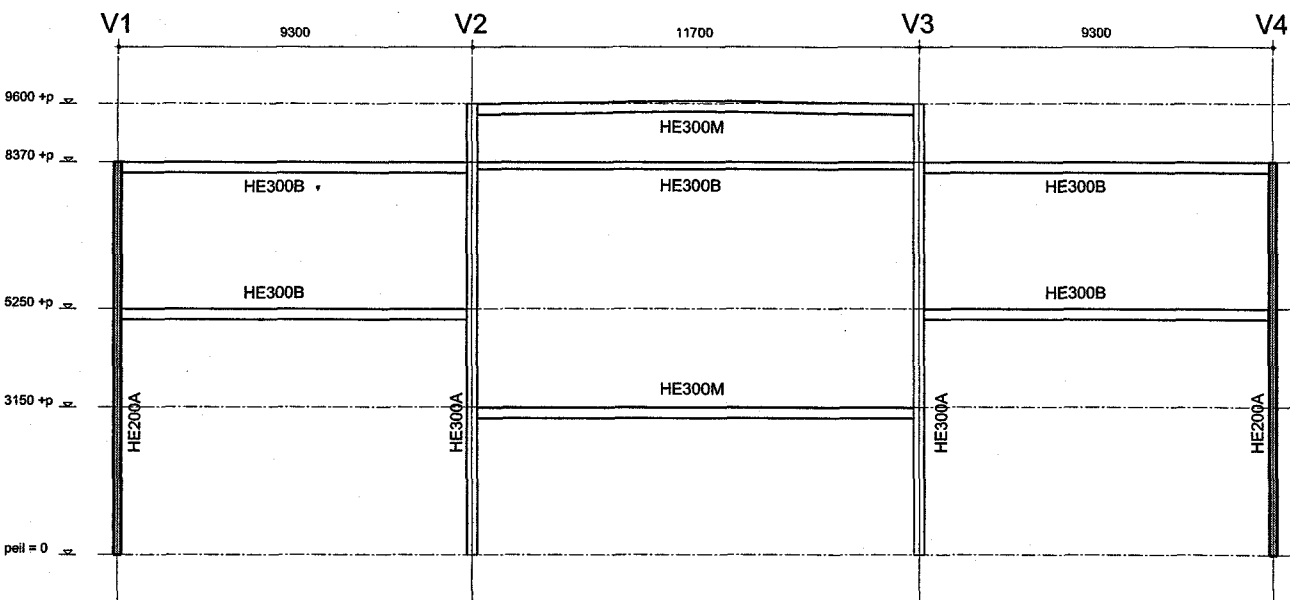
controles spant
kolom HE200A

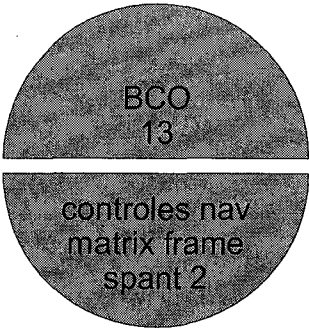
knik om z-as
 $R_d :$ 251,22 kN (FC1)
Kniklengte $L_{buc} :$ 5250 mm
Traagheidsstraal om z-as: 49 mm
 $\lambda :$ 107,14
 $\lambda_{rel} :$ 1,14
 $\omega_{buc} :$ 0,46
 $F_d :$ 581 kN
UC = 0,43

knik om y-as
 $R_d :$ 251,22 kN (FC1)
Kniklengte $L_{buc} :$ 3150 mm
Traagheidsstraal om z-as: 74 mm
 $\lambda :$ 42,57
 $\lambda_{rel} :$ 0,45
 $\omega_{buc} :$ 0,91
 $F_d :$ 1151 kN
UC = 0,22

moment om y-as
 $M_d = 95,86$ kNm (FC1)
 $\sigma_d = M_d / W_y < 235$ N/mm²
UC = 0,95

voor oplegreacties spant, zie bijlage Matrix Frame-spant_2





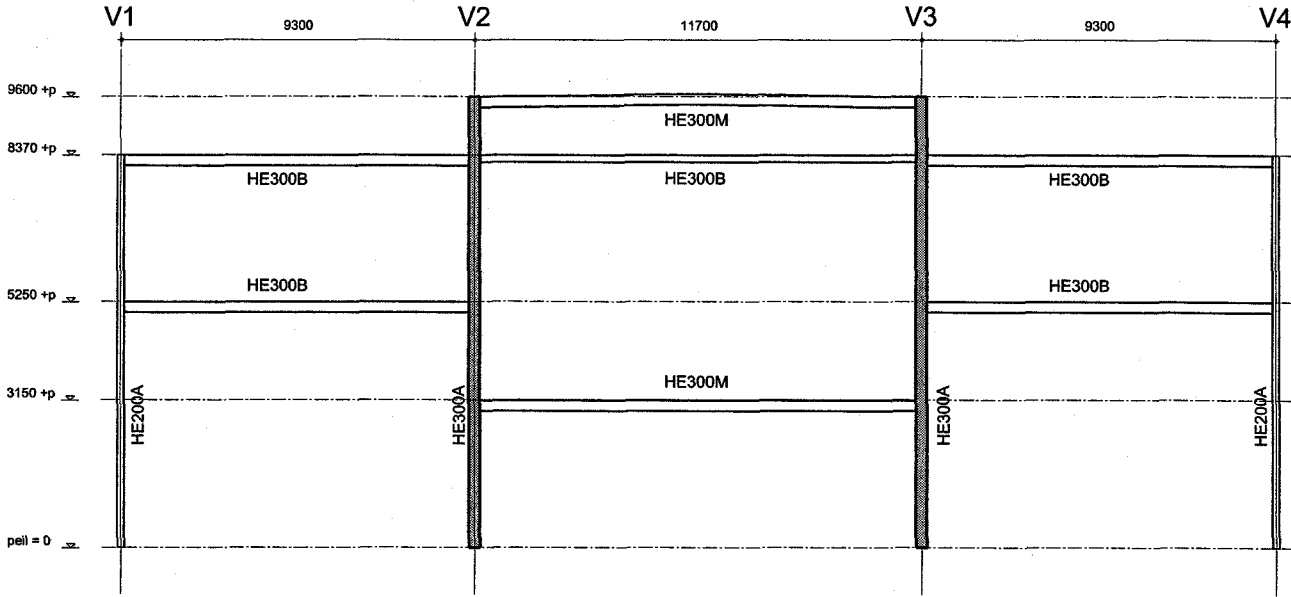
controles spant
kolom HE300A

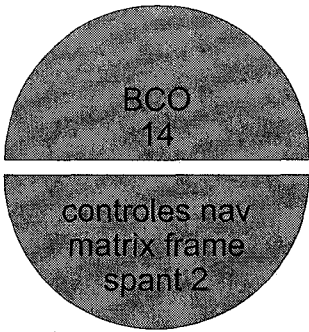
knik om z-as
 $R_d :$ 545,09 kN (FC1)
Kniklengte $L_{buc} :$ 5250 mm
Traagheidsstraal om z-as: 74 mm
 $\lambda :$ 70,95
 $\lambda_{rel} :$ 0,76
 $\omega_{buc} :$ 0,69
 $F_d :$ 1824 kN
UC = 0,30

knik om y-as
 $R_d :$ 545,09 kN (FC1)
Kniklengte $L_{buc} :$ 3150 mm
Traagheidsstraal om z-as: 127 mm
 $\lambda :$ 24,80
 $\lambda_{rel} :$ 0,26
 $\omega_{buc} :$ 0,98
 $F_d :$ 2591 kN
UC = 0,21

moment om y-as
 $M_d = 190,74$ kN (FC1)
 $\sigma_d = M_d / W_y < 235$ N/mm²
UC = 0,64

voor oplegreacties spant, zie bijlage Matrix Frame-spant_2





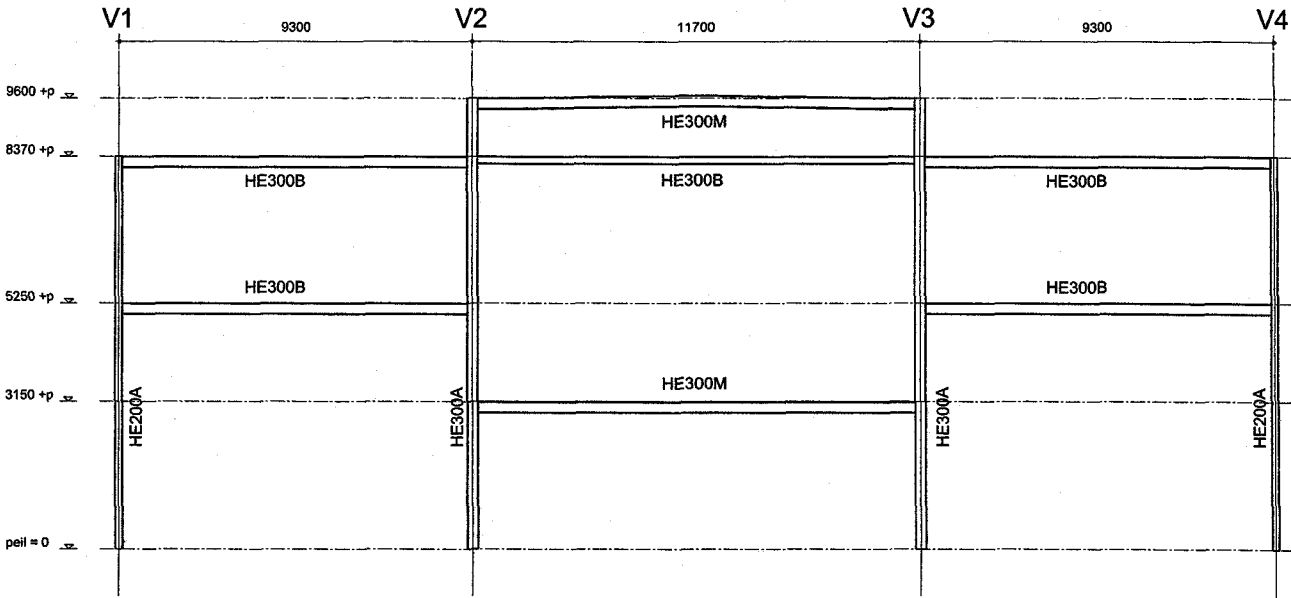
controles spant
verplaatsing spant en momentvaste verbinding

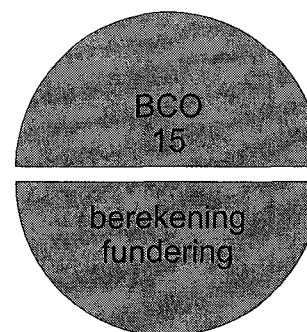
verplaatsing spant
 $u = 12,9 \text{ mm (IC Uon)}$
 $u = 0,0013 \cdot l < 0,003 \cdot l$

boutverbinding
kolom-ligger verbinding

Optredend moment	399,23 kNm (FC1)
Toegepaste bouten	M16
Boutkwaliteit	8.8
$f_{t;b;d}$	800 N/mm ²
$f_{y;b;d}$	640 N/mm ²
$A_{b;s}$	155 mm ²
$F_{t,u;d}$	178,56 kN (per 2 bouten)
Moment	428,11 kNm
UC	0,93

voor gegevens spant, zie bijlage Matrix Frame-spant_2





toelichting fundering
berekening nieuwe paalfundering / paalbelasting

belastingen per m²	permanent	veranderlijk
- dakvlak	0,20 kN/m²	0,56 kN/m²
- verdiepingsvloer	0,50 kN/m²	2,50 kN/m²
oppervlakte		
100,8 m²		
belastingen kN	permanent	veranderlijk
- dakvlak	20,2 kN	56,5 kN
- verdiepingsvloer	50,4 kN	252,0 kN
	70,6 kN	308,5 kN
	1,2 x 70,6 = 84,7 kN	1,5 x 308,5 = 462,7 kN

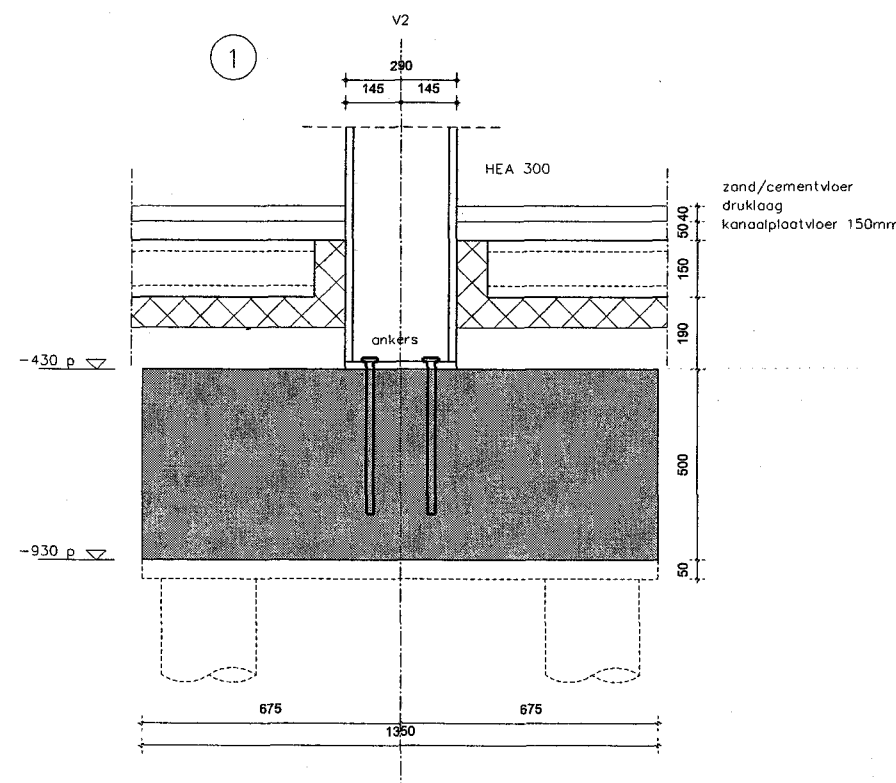
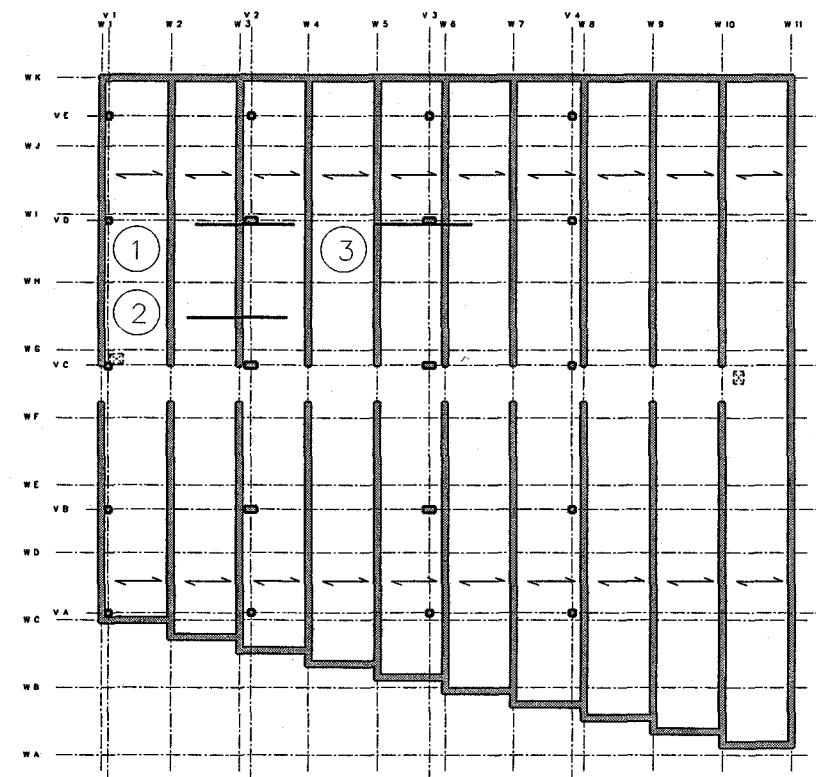
totale last kN
547,4 kN

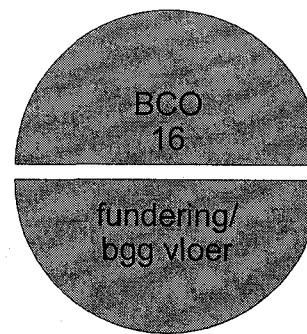
bestaande gronddruk
4,32 N/mm²

benodigd paaloppervlak
126,7.10³ mm²

nieuwe paalfundering

- onder tweepaalspoer:
2 schroefboorpalen Ø350 (192,4.10³ mm²)
- onder éénpaalspoer:
1 schroefboorpaal Ø350 (96,2.10³ mm²)





bestaande b.g. constructie
geïsoleerde kanaalplaatvloeren

materiaal
beton B25

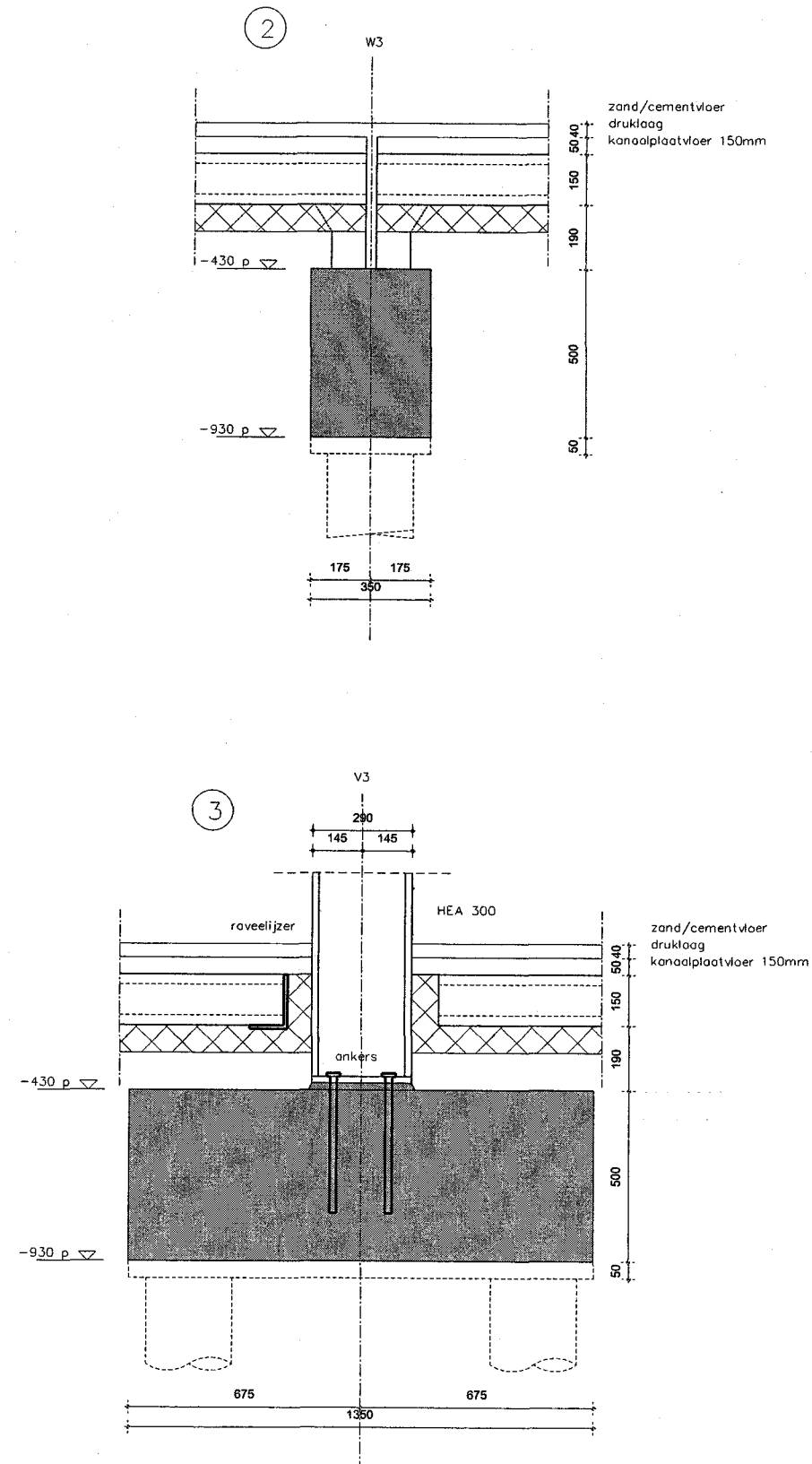
overspanning
4500 mm

dikte
150 mm

maximaal optredende vloerbelasting
5,0 kN/m²

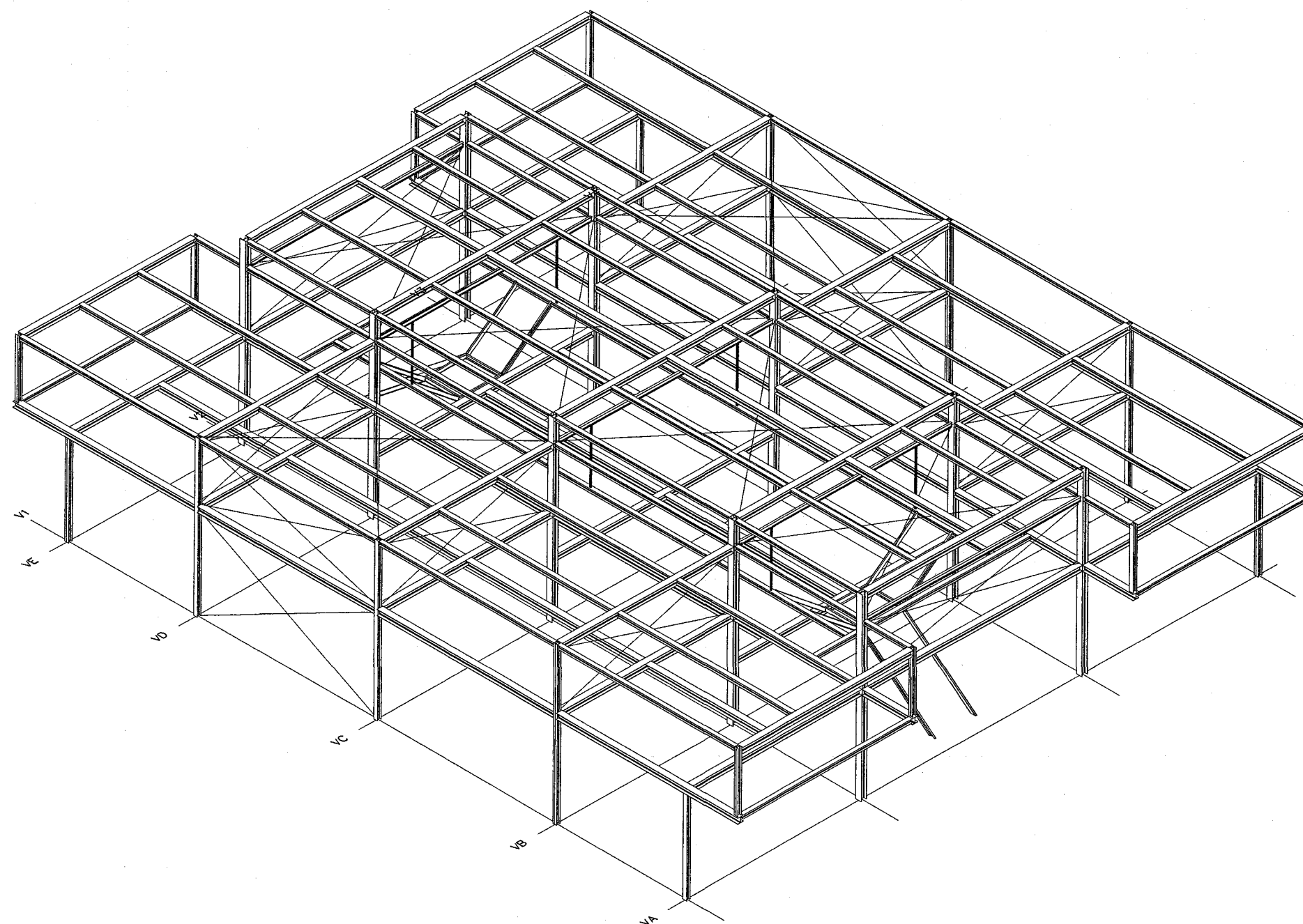
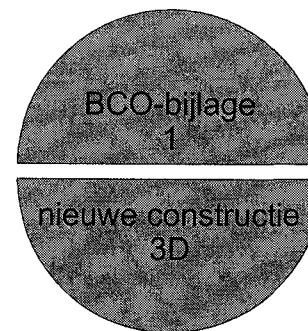
voorgeschreven capaciteit van de b.g. constructie
permanente belasting: 4,8 kN/m²
veranderlijke belasting: 10,0 kN/m²

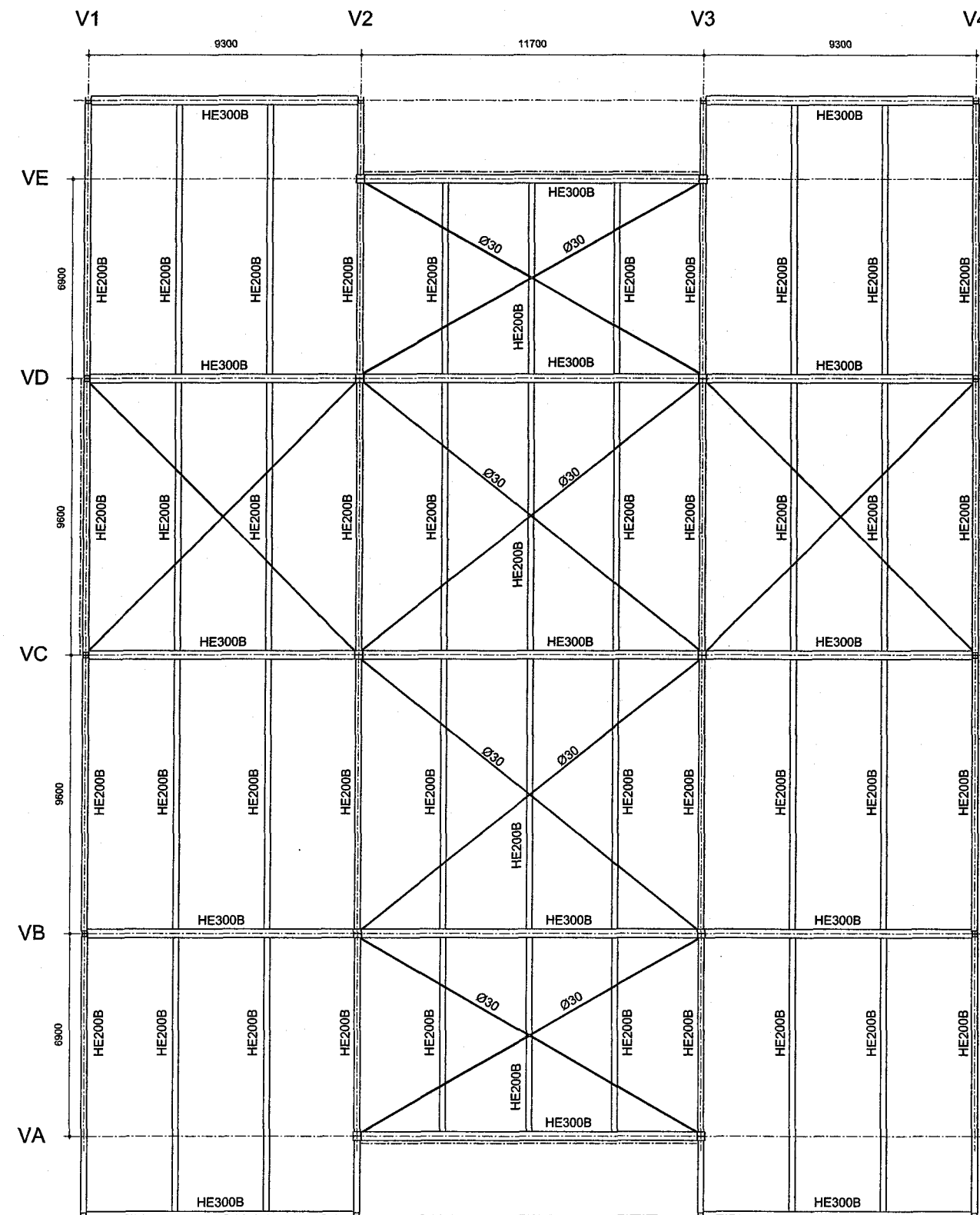
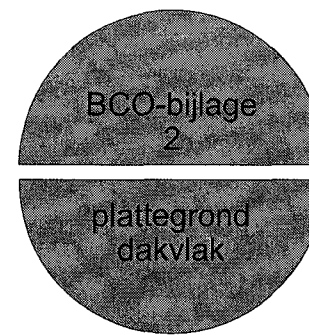
hulpconstructie
raveelijzer; wanneer vloerdoorbreking midden in een kanaalplaat valt,
anders een stuk uithakken



LOGO

Bijlage BCO Teun Dekker 1109222





plattegrond
verdieping



