Vervolgblad: 1.1

statische berekening

vlg. TGB 1990 bel. en vervormingen NEN 6702
TGB 1990 staal constr. NEN 6770

veiligheids klasse 3
windgebied II

staal S235 bouten 8.8 kwal.

q.e.g. vloeren +2.400 en +4.800 = 1 kN/m²
q.N.b. vloeren +2400 en +4800 = 2,5 kN/m²

q.Nb. apparaat +2400 vloer = 12 kN/m²
(app. 004-005 006-007-024)

referentie documenten

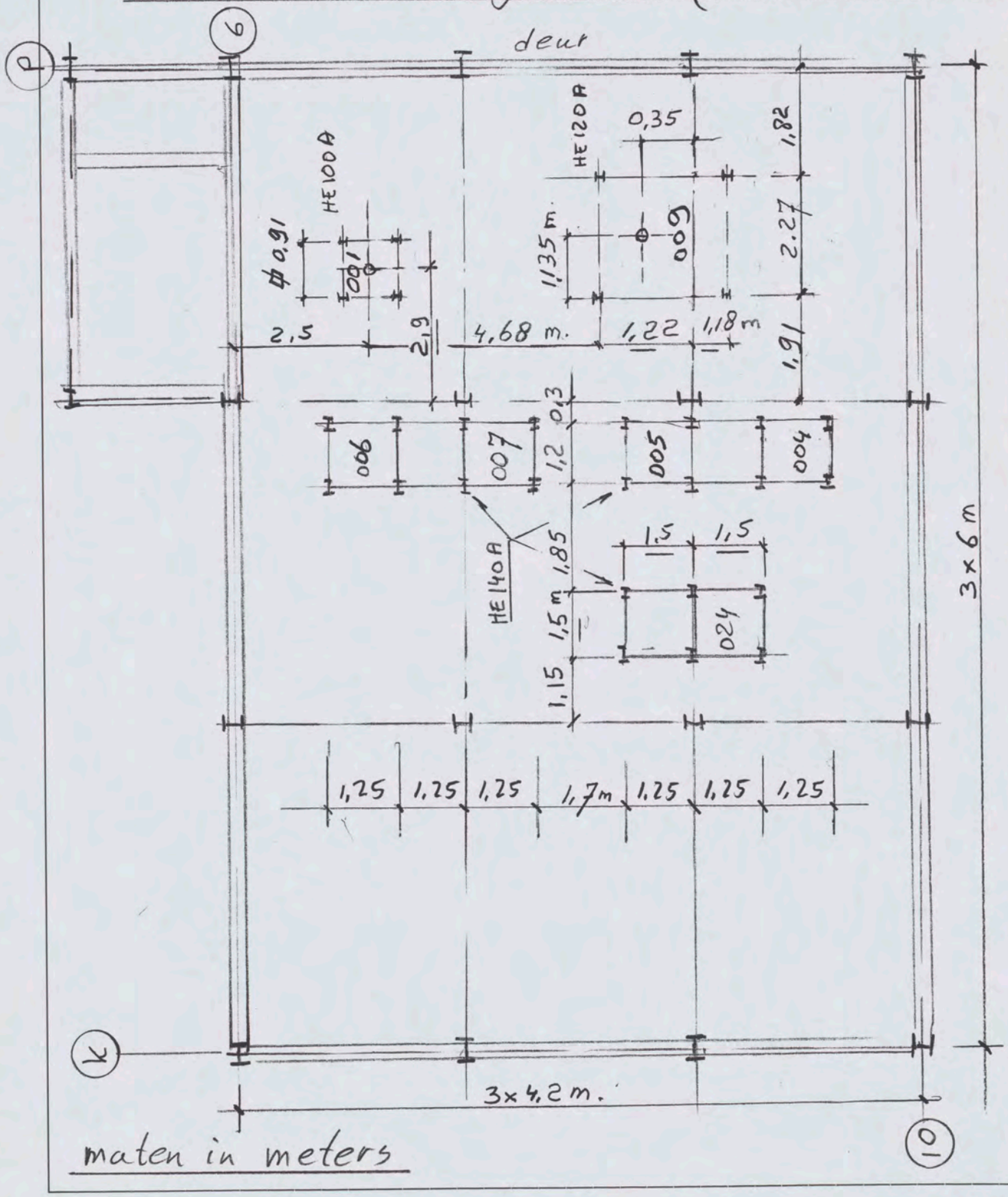
* originele DHV. berekening NR. 1-2691-00-10 dec 1977
shell Amsterdam proj. NR. 298328
* Jacobs doc. NR 303xx/02/1000
7 mei 2002
* ber. standaardrekken tek. V303kg/89/1001
1989
* staaltekeningen/bouwk. tekeningen D.H.V.
dec. 2002

gewyzigd 19-12-2002

Vervolgblad: 1.2

opstelling Hal 11C

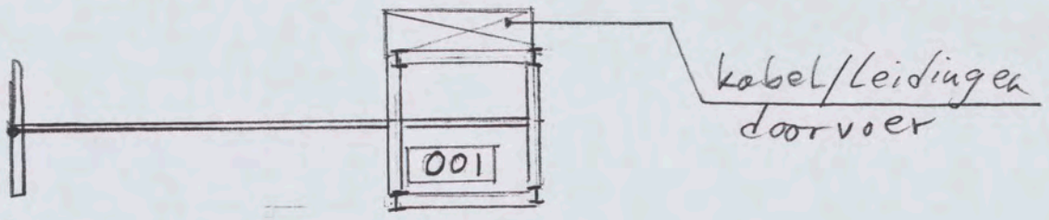
nieuw te maken frame's (standaard frames)

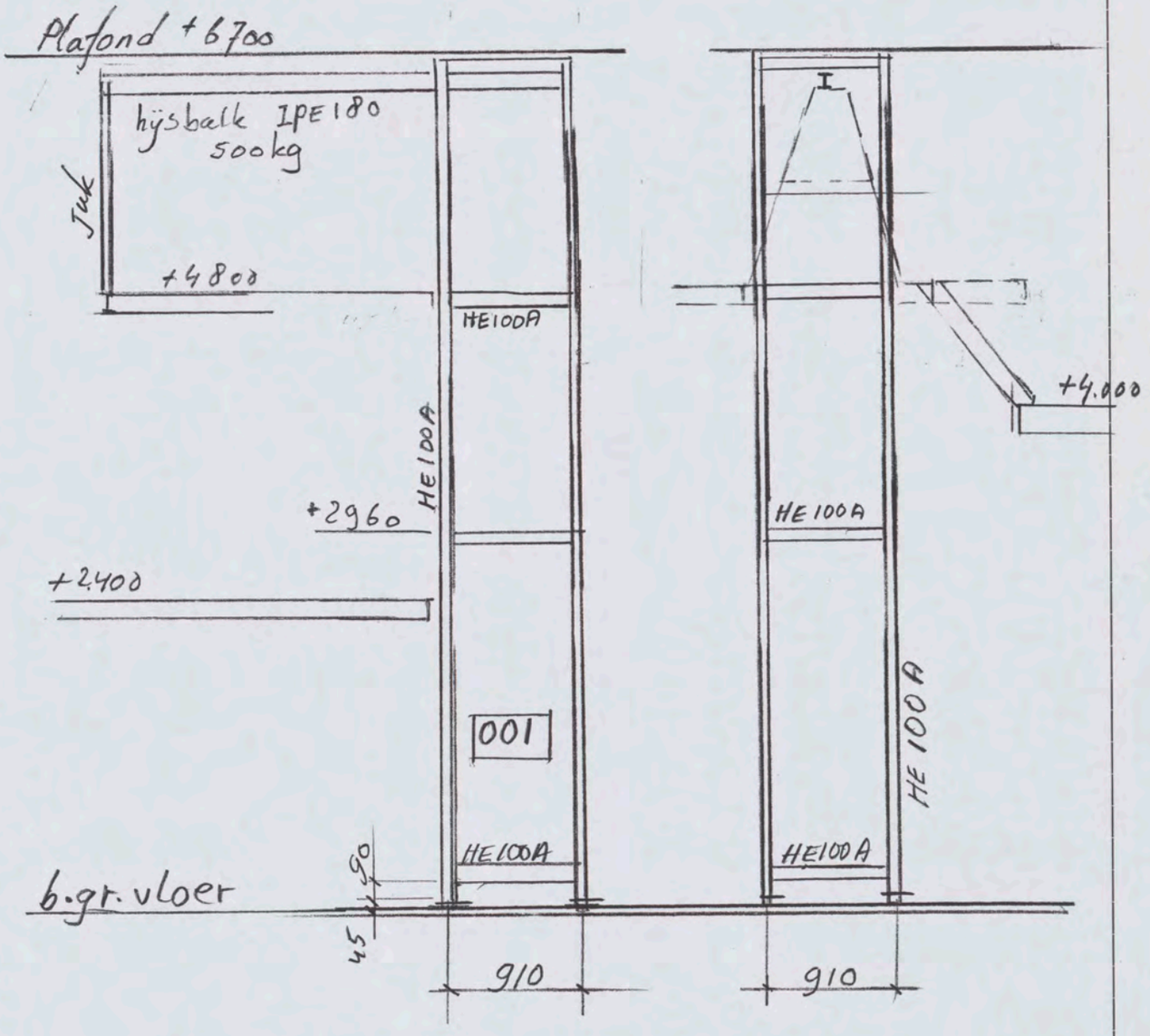


91.156

Vervolgblad: 1.3

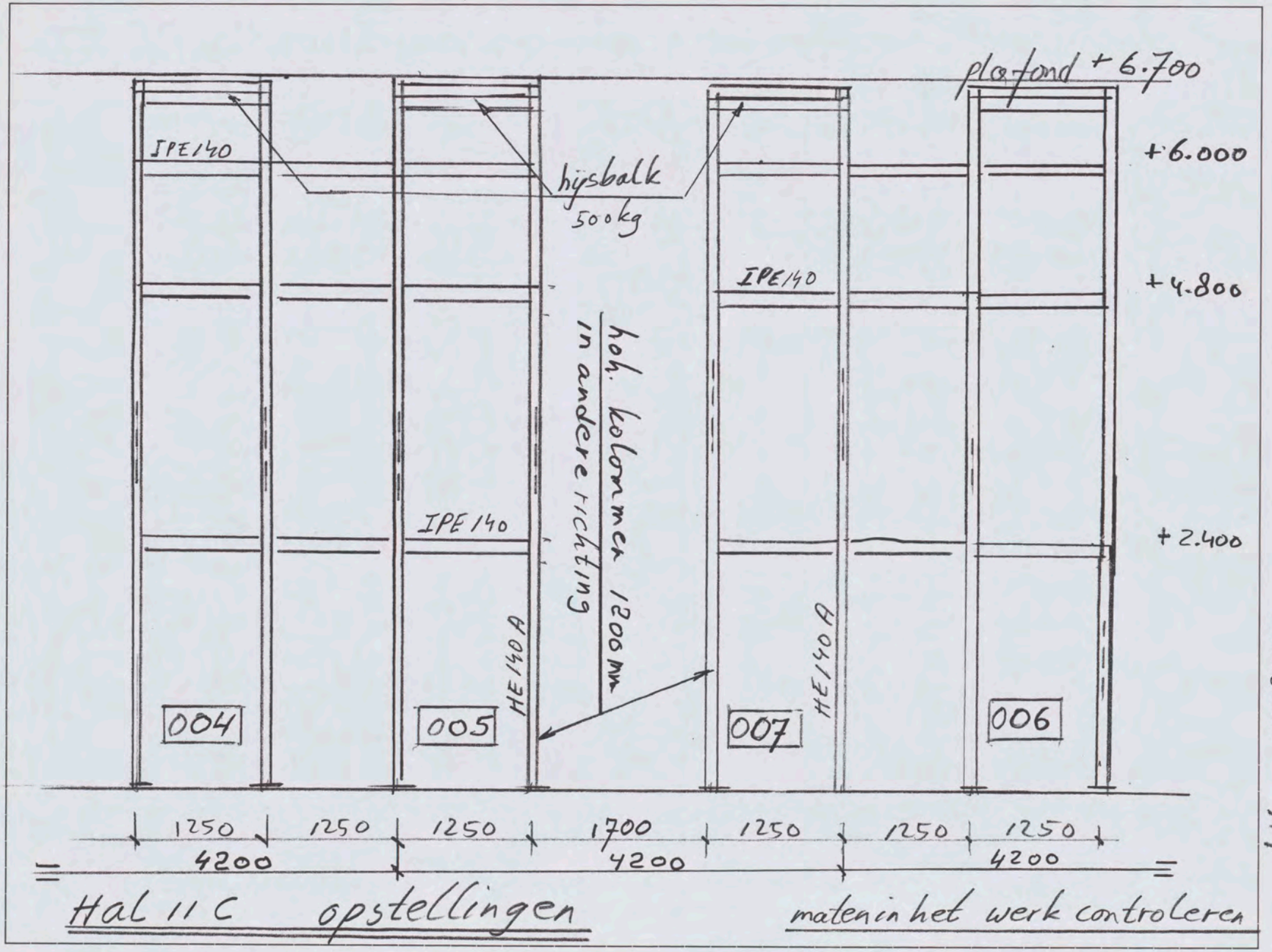
Hal IIC 001 opstelling hor. koppelen aan vloeren





maten in het werk controleren

91.156



Hal 11 C opstellingen

maten in het werk controleren

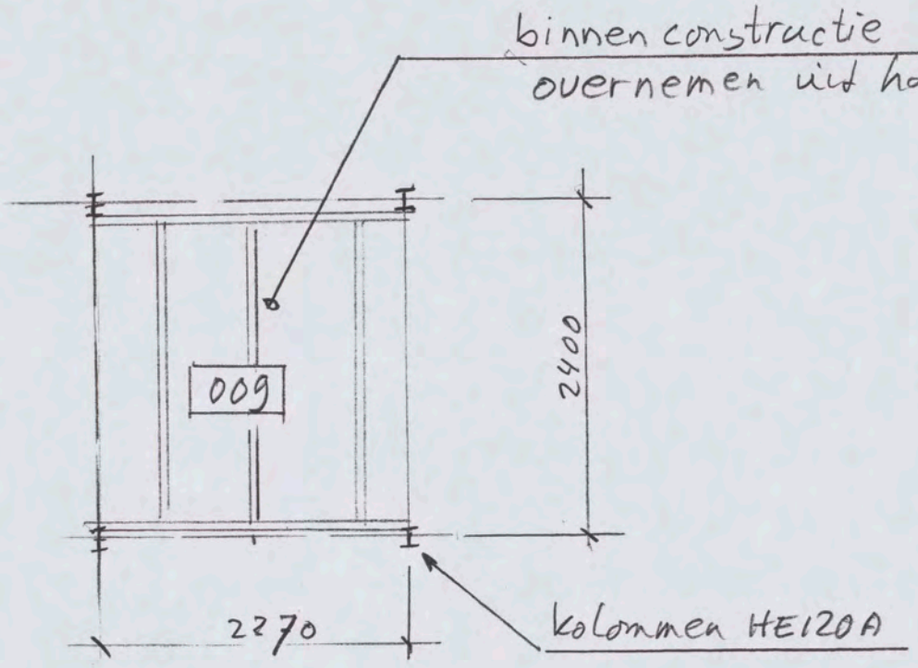
Vervolgblad: 4 / 4

91.156

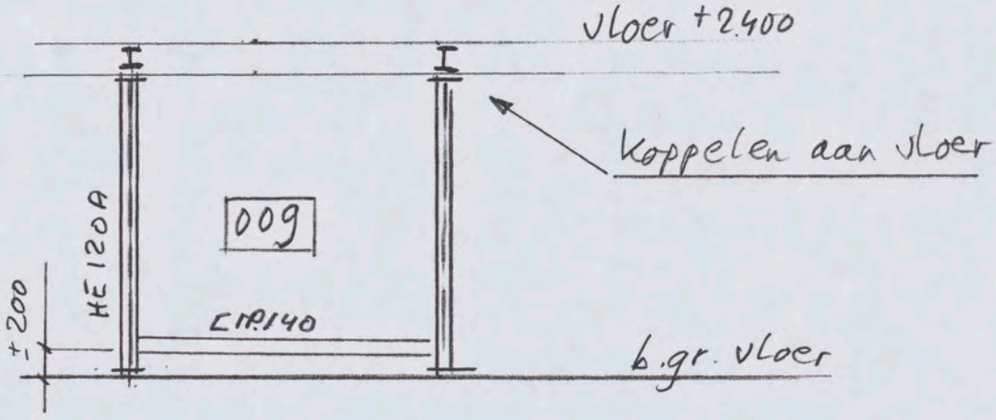
Vervolgblad: 1.5

Hal 11C 009

frame uitvoeren als frame ingeb. PMC-B



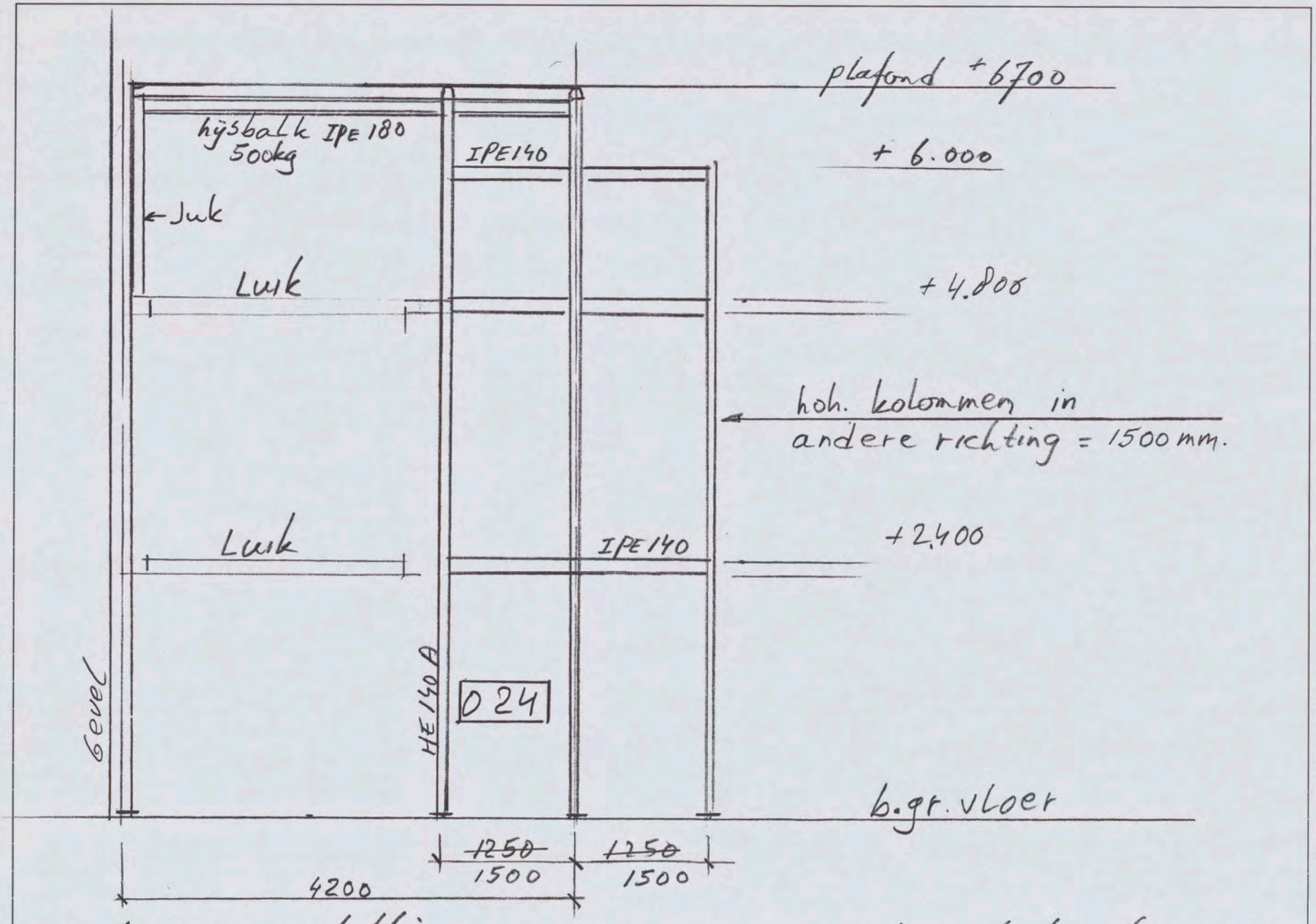
Vloerplan



alleen op begane grond

maten in het werk controleren

91.156



Hal 11 C opstelling

maten in het werk controleren

Vervolgblad: 1.6

91.156

V.2421.01.005

Vervolgblad: 2.0

shell intern. chem. bv Amsterdam

stabiliteits berekening geb. 11 C
nieuwe situatie

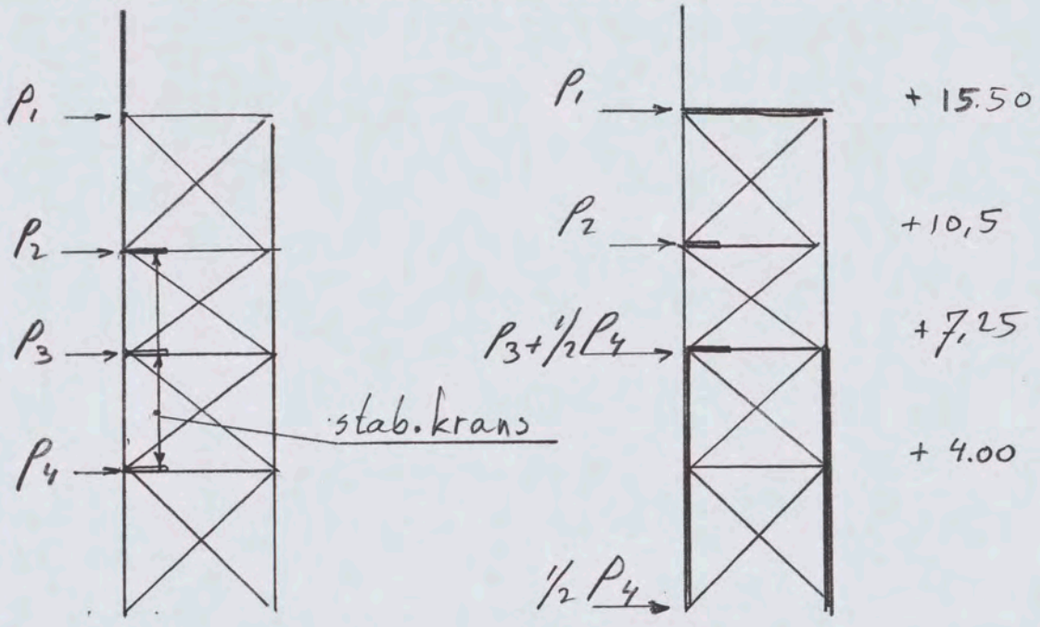
zie ook contr ber. [redacted] proj NR. 298320
Doc. NR 303X04/02/1000 7-5-2002

zie ber. proeffabriek DHV. geb. 611
Doss. NR 1-2691-00-10
12-1977

zie tekeningen DHV.

stabiliteit geb. II.C

stab. krans op +4.000 vervalt.



bestaande situatie

nieuwe situatie

nieuwe situatie

1e stab. krans +7.25 controleren op extra belasting.

2e Windverbanden onder +7.25 vloer controleren

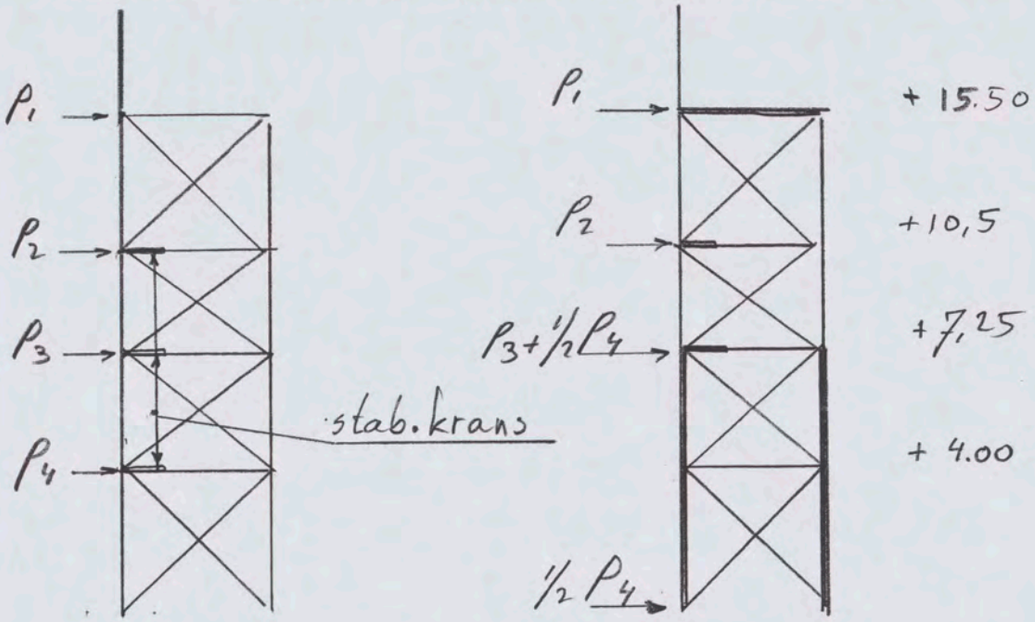
3e hor. regels in gevels op +4.000 controleren IVM. het verdwijnen van stab. krans

4e berekening kolomversterking.

Vervolgblad: 2.1

stabiliteit geb. II.C

stab. krans op +4.000 vervalt.



bestaande situatie

nieuwe situatie

nieuwe situatie

1e stab. krans +7.25 controleren op extra belasting.

2e Windverbanden onder +7.25 vloer controleren

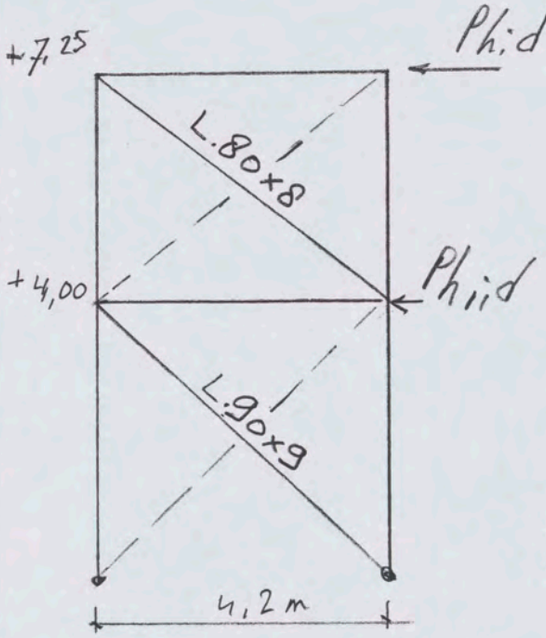
3e hor. regels in gevels op +4.000 controleren IVM. het verdwijnen van stab. krans

4e berekening kolomversterking.

91.156

Windverband str. m p.

zie blad V1-V2-V3 DHV



$Ph;d = 73,95 + 31,46 + 37,38 + \frac{41,7}{2} + 15,4$

$P.h;d = 199,2$ kN

$Ph;d = \frac{41,7}{2} + 19,94 = 40,8$ kN.

$Ph;d.tot. = (199,2 - 15,4) + 40,8 = 224,6$ kN

diagonaal L. 80×8 A.netto = 1052 mm²

$Pt;d = 251 - 30,67$ (uit drukdiagonaal) $= 221$ kN

$\sigma;d = \frac{221 \times 10^3}{1052} = 210$ N/mm² 3× 3/4" WW. 8.8 accoord

diagonaal. L. 90×9 A.netto = 1340 mm²

$Pt;d = 305,2 - 44,4$ (uit drukdiagonaal) $= 261$ kN

$\sigma;d = \frac{261 \times 10^3}{1340} = 195$ N/mm²

Bouten controleren 3× 7/8" WW. 8.8

accoord

max. druk in wand bordes regel +4000

str. m. P l_k = 4,2 m. IPE200

tpv. windverband blad V1 - V2 DHV

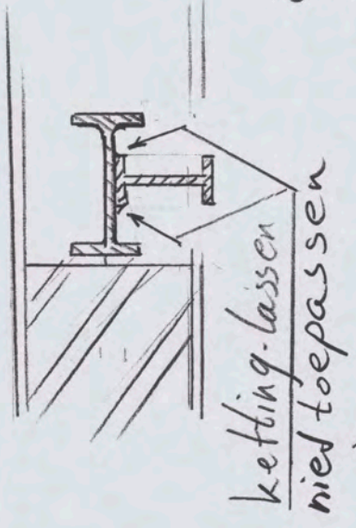
P.d hor = (73.95 + 51,46 + 37,38 + 41,70) + 15,4 = 220 kN.

$\lambda_z = \frac{4200}{22,4} = 187,5$ $\lambda_{rel} = 1,995$ W.buc = 0,2

$\lambda_y = \frac{4200}{82,6}$ 50,85 $\lambda_{rel} = 0,541$ W.buc = 0,905

Npl. d = 2850 × 0,235 = 669,75 kN

$\mu_c = \frac{220}{0,905 \times 669,75} = 0,363 < 1$



Z-as versterken

neem IPE 140 in z-as

$\lambda_y = \frac{4200}{57,4} = 71.17$: $\lambda_{rel} = 0,778$

W buc = 0,81 (a)

$\mu_c = \frac{220}{0,81 \times 669,75} = 0,406 < 1$

accoord

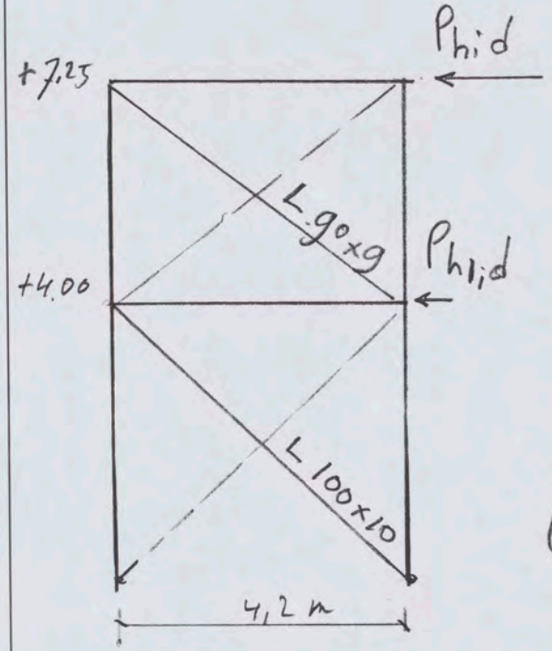
overige str. m. P (IPE200) P;d = 41,7 kN

blad V1

$\mu_c = \frac{41.7}{0,2 \times 669,75} = 0.31$

Windverband str m. k.

zie blad V-3-V4
DHV



$P_{hid} = 73{,}93 + 63{,}84 + 60{,}23 + \frac{67{,}17}{2} + 29{,}4$

$P_{hid} = 261$ kN

$P_{hld} = \frac{67{,}17}{2} + 50{,}91 = 84{,}5$ kN

$\therefore$

P_{hld} tot. =
$(261 - 29{,}4) + 84{,}5 = 316{,}1$ kN

diagonaal. L.90×9 A netto = 1340 mm²

P_{tid} = 330 − 84.7 (uit drukdiagonaal) = 245,3 kN

$\sigma_{id} = \frac{245{,}3 \times 10^3}{1340} = 183$ N/mm²

3× 3/4" W. 8.8 accoord

diagonaal L.100×10 A. netto = 1700 mm²

P_{tid} = 436,5 kN − 111,34 (uit drukdiagonaal) = 325,2 kN

$\sigma_{id} = \frac{325{,}2 \times 10^3}{1700} = 191{,}3$ N/mm²

boulen controleren 4× 3/4" WW. 8.8 accoord

max. druk wandbordesregel + 4.000

str.m.k $\ell_k = 4{,}2\,m$ HE 200A

tpv. windverband blad V3 - V4 (DHV)

$P_{id\,hor.} = 277{,}2 + 29{,}4 = 306{,}6$ kN

$\lambda_z = \frac{4200}{49{,}8} = 84{,}3$ $\lambda_{rel.} = 0{,}897$ $\therefore \omega_{buc} = 0{,}6$ (c)

$N_{pl;id} = 5300 \times 0{,}235 = 1264{,}3$ kN

$u_c = \frac{306{,}6}{0{,}6 \times 1264} = 0{,}4 < 1{,}0$

Overige str.m.k. HE 200A

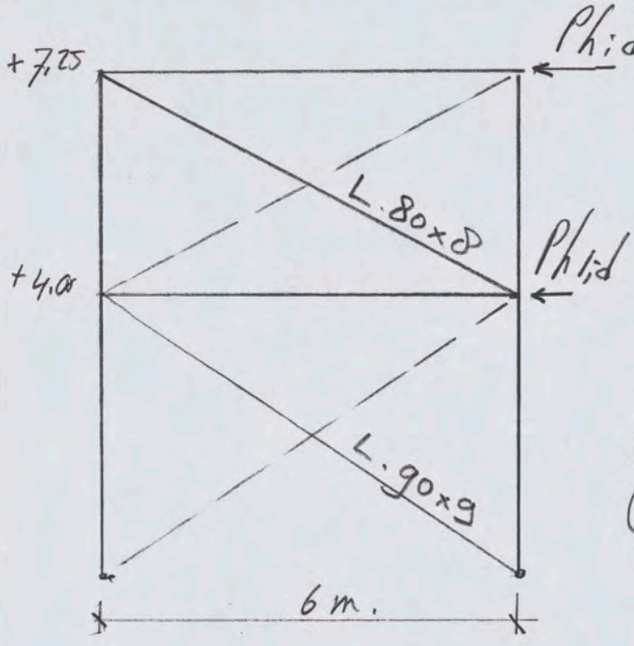
$P_{id} = 67{,}13$ kN

V3

accoord

Windverband str. m. 6 en 10

zie blad V5-V6-V7 DHV.



$Ph;d = 59,6 + 61,17 + 44,44 + \frac{49,57}{2} + 29 =$

$Ph;d = 219$ kN

$Ph;d = \frac{49,57}{2} + 42,56 = 67,35$ kN

$\therefore$

Ph;d tot =

$(219 - 29) + 67,35 = 257,35$ kN

diagonaal L.80×8 A.netto = 1052 mm²

$Pt;d = 250 - 31,94$ (uitdrukdiagonaal) $= 217,8$ kN

$\sigma;d = \frac{217,8 \times 10^3}{1052} = 207$ N/mm²

3× 3/4" ww 8.8

diagonaal L.90×9 A. netto = 1340 mm²

$Pt;d = 309,3 - 45,72$ (uitdrukdiagonaal) $= 263,5$ kN

$\sigma;d = \frac{263,5 \times 10^3}{1340} = 197$ N/mm²

Boutencontroleren 3× 7/8" w.w 8.8

Vervolgblad: 2.7

max. druk wandbordesregel + 4.000

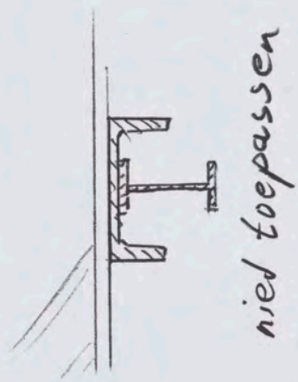
str.m 6 en 10 $\ell_k = 6m$

tpv. windverband blad V5-V6 DHV.

$P_{;d\,hor.} = 257{,}35$ kN.

[NP. 200 $\lambda_z = \frac{6000}{22{,}4} = 268 \therefore \lambda_{rel} = 2{,}85 \therefore \omega_{buc} = 0{,}105$

z-as versterken met IPE 140 in z-as



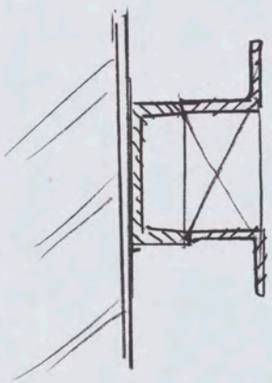
$\lambda = \frac{6000}{57{,}4} = 104{,}5$ $\lambda_{rel.} = 1{,}112$

$\omega_{buc} = 0{,}6$ (a)

$N_{pl.:d} = 2850 \times 0{,}235 = 669{,}75$ kN

A = IPE 200

$U_c = \frac{257{,}35}{0{,}6 \times 669{,}25} = 0{,}64 < 1$



voorkeur

Overige in str.m. 6 en 10 [NP. 200

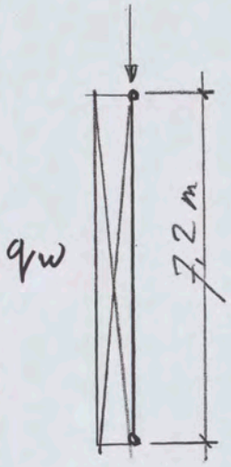
$P_{;d} = 49{,}57$ kN
blad V5

$U_c = \frac{49{,}57}{0{,}105 \; 669{,}75} = 0{,}7$

kolom controle

buiging door wind.

kolom versterken tot HE 280 A



$q_w = 6 \times 1{,}1 \times 0{,}85 = 5{,}61$ kN. m.

$M_{.} = 1/8 \times 5{,}61 \times 7{,}2^2 = 36{,}35$ kN. m.

$M_{;d} = 54{,}53$ kN. m.

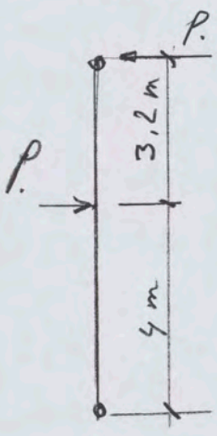
$\sigma_{;d} = \frac{54{,}53 \times 10^6}{913{,}3 \times 10^3} = 59{,}7$ N/mm^2

door buiging u

$u = \frac{7{,}2^3}{13673}\left[6{,}2 \times 5{,}61 \times 7{,}2\right] = 6{,}84$ mm

$= 1/1053$ h.

buiging door ventilatie schacht.



$P_{;d} = 15.23$ kN $P = 10{,}15$ kN

$M_{;d} = 1/4 \times 15{,}23 \times 7{,}2 = 27{,}414$ kN. m

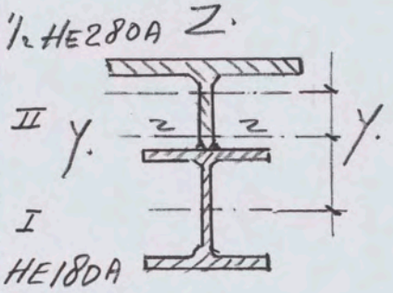
$\sigma_{;d} = \frac{27{,}414 \times 10^6}{913{,}3 \times 10^3} = 30$ N/mm^2

door buiging.

$u = \frac{7{,}2^3}{13673}\left[9{,}8 \times 10{,}15\right] = 2{,}715$ mm.

kolomversterking.

HE 180 A naar HE 280 A



	opp.	a	Aa	az	Aa^2	I.z
I	45,3	8,5	385	10,3	4833,7	2510
II	48,5	28,5	1384,3	9,7	9397	477
	93,8		1767,3		14230	2978

$$a_z = \frac{1767,3}{93,8} = 18,84\ cm$$

$$I_y = 14230 + 2798 = 17208\ cm^4$$

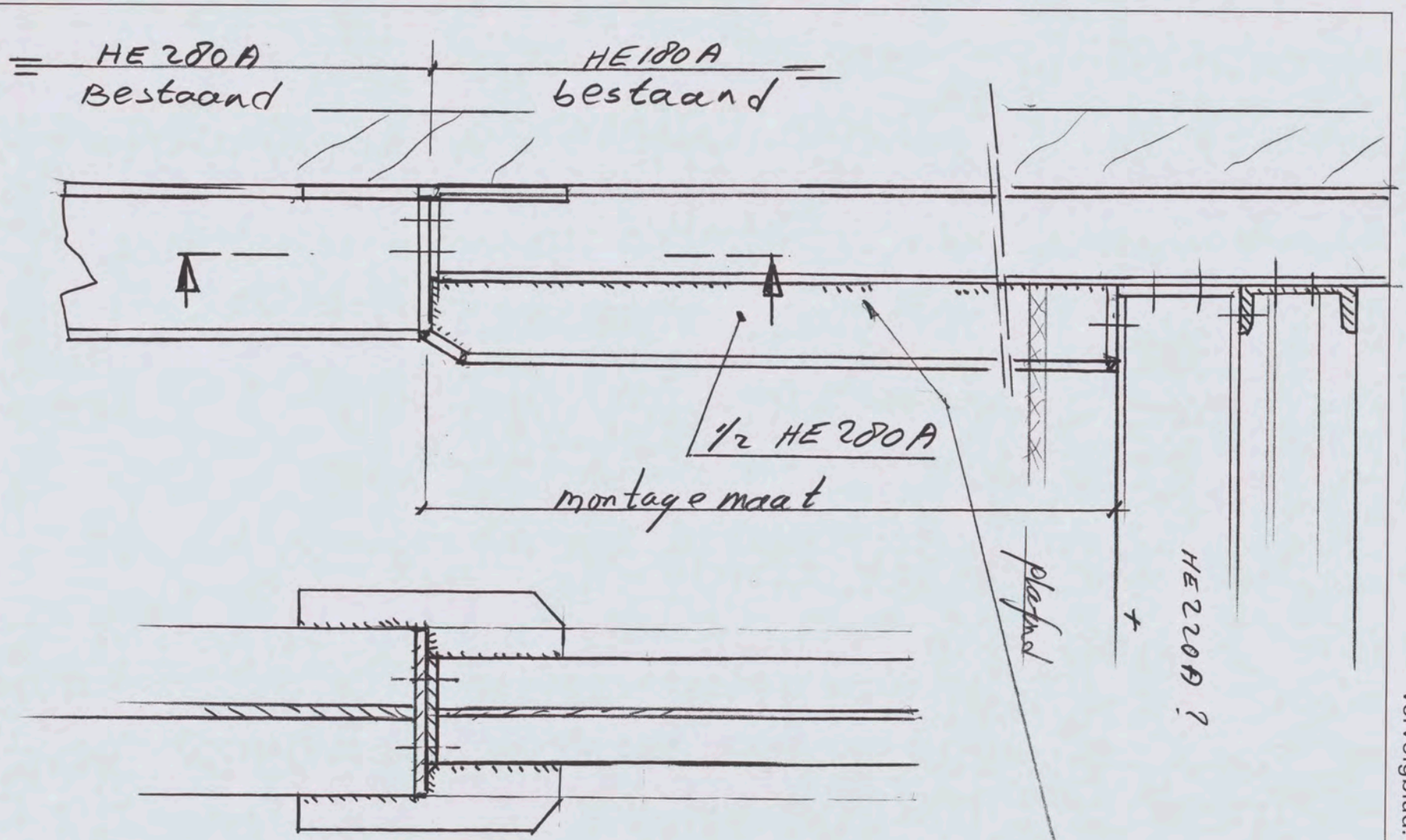
$$W_y = \frac{17208}{18,84} = 913,3\ cm^3$$

$$i_y = \sqrt{\frac{17208}{93,8}} = 13,55\ cm = 135,5\ mm.$$

$$I.z = 925 + 1/2 \times 4763 = 3306,5\ cm^4$$

$$W.z = \frac{3306,5}{14} = 236,2\ cm^3$$

$$i.z = \sqrt{\frac{3306,5}{93,8}} = 5,9372\ cm = 59,372\ mm.$$



kettinglassen dL.5

eerste en laatste 0,5 m volledig lassen

overige 50-150 (50=laslengte)

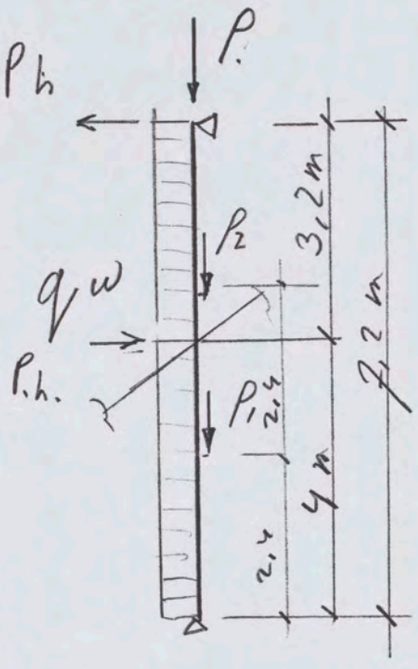
Vervolgblad: 2.10

91.156

Vervolgblad: 2.11

Gevelkolom 0-6 max. belasting

zie berekening Jocobs pt NR. 298328



$P;d = 740,6$ kN

$P_2;d = 1003,2 - 740,6 = 262,6$ kN

$P_1;d = 1140 - 1003,2 = 136,8$ kN

$qw = 6 \times 1,1 \times 0,85 = 5,61$ kN.m.

$M. = 1/8 \times 5,61 \times 7,2^2 = 36,35$ kN.m.

$M;d = 1,5 \times 36,35 = 54,53$ kN.m.

$P.h;d$ ventilatie schacht $= 15,23$ kN

$M;d = 1/4 \times 15,23 \times 7,2 = 27,414$ kN.m.

$\therefore M;d\ max. = 54,53 + 27,414 = 81,95$ kN.m.

kolom controle nieuwe situatie

$L_y = 7,20$ m

$\lambda = \frac{7200}{128} = 56,25$

$\lambda_{rel} = 0,5984$

$\therefore$

$\omega_{buc} = 0,89$

$L_{z1} = 3,20$ m boven

$\lambda_{z1} = \frac{3200}{59,372} = 53,9$

$L_{z2} = 4,00$ m onder.

$\lambda_{z2} = \frac{4000}{70} = 57,14$

$\lambda_{rel.} = 0,6079$

$\therefore$

$\omega_{buc} = 0,79.$

$N.p.l.;d = 9730 \times 0,235 = 2286,5$ kN

$M.y.u;d = 2 \times 556 \times 0,235 = 261,3$ kN.m

$N_{c;s;d} = 740 + 262 + 137 = 1139$ kN

$M_{y.equ\,s;d} = 54,53$ kN

$\mu_c = 1,1 \frac{1139}{0,89 \times 2286,5} + 1,1 \frac{54,53}{261,3} =$

$\mu_c = 0,6157 + 0,2296 = 0,845 < 1$

accoord.