

rijkswaterstaat directie bruggen

KANAAL NESSEM-NEDERNEERT

werk: PUNTDEUREN

datum: AUG. '05

blz. 1

PANNEEL HOGE DEUR.

Spaalkracht

$$l = \frac{\sqrt{10} \times (6300 + 800)}{3} - 200 - \frac{300}{3}$$

$$= 7184,06 \text{ m}$$

$$Q_{\text{tot}} = 652,05 \times 7184,06$$

$$= 4684.364 \text{ N} = \underline{4684 \text{ kN}}$$

$$F = \frac{1}{2} \times Q = 2.342.182 \text{ N}$$

$$= \underline{2342 \text{ kN}}$$

$$R = 2 \cdot \cos \alpha \cdot F$$

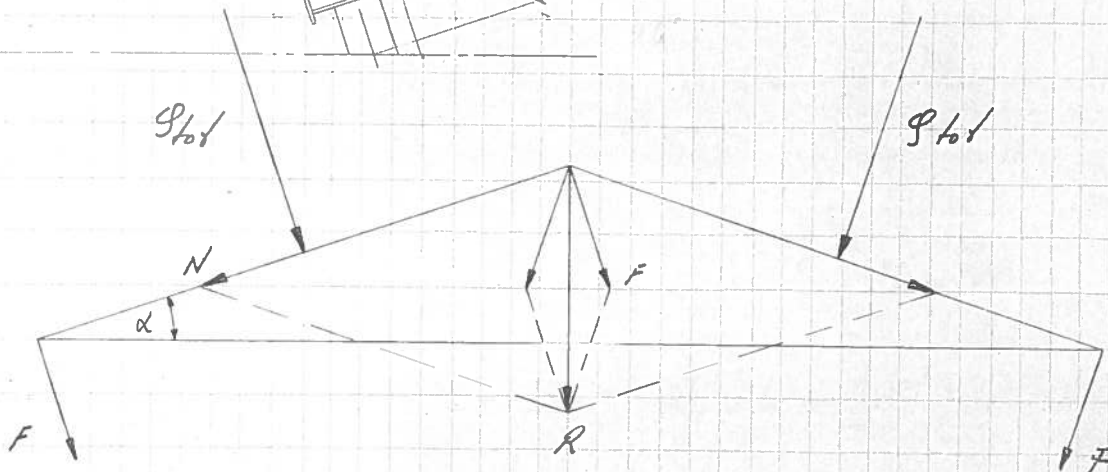
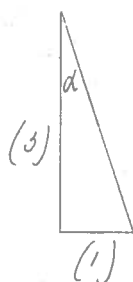
$$= 4.443.978 \text{ N}$$

$$\frac{N}{2} = \frac{R}{2 \sin \alpha} = \underline{7.026.546 \text{ N}}$$

$$= \underline{7027 \text{ kN}}$$

$$\sin \alpha = 0,31623$$

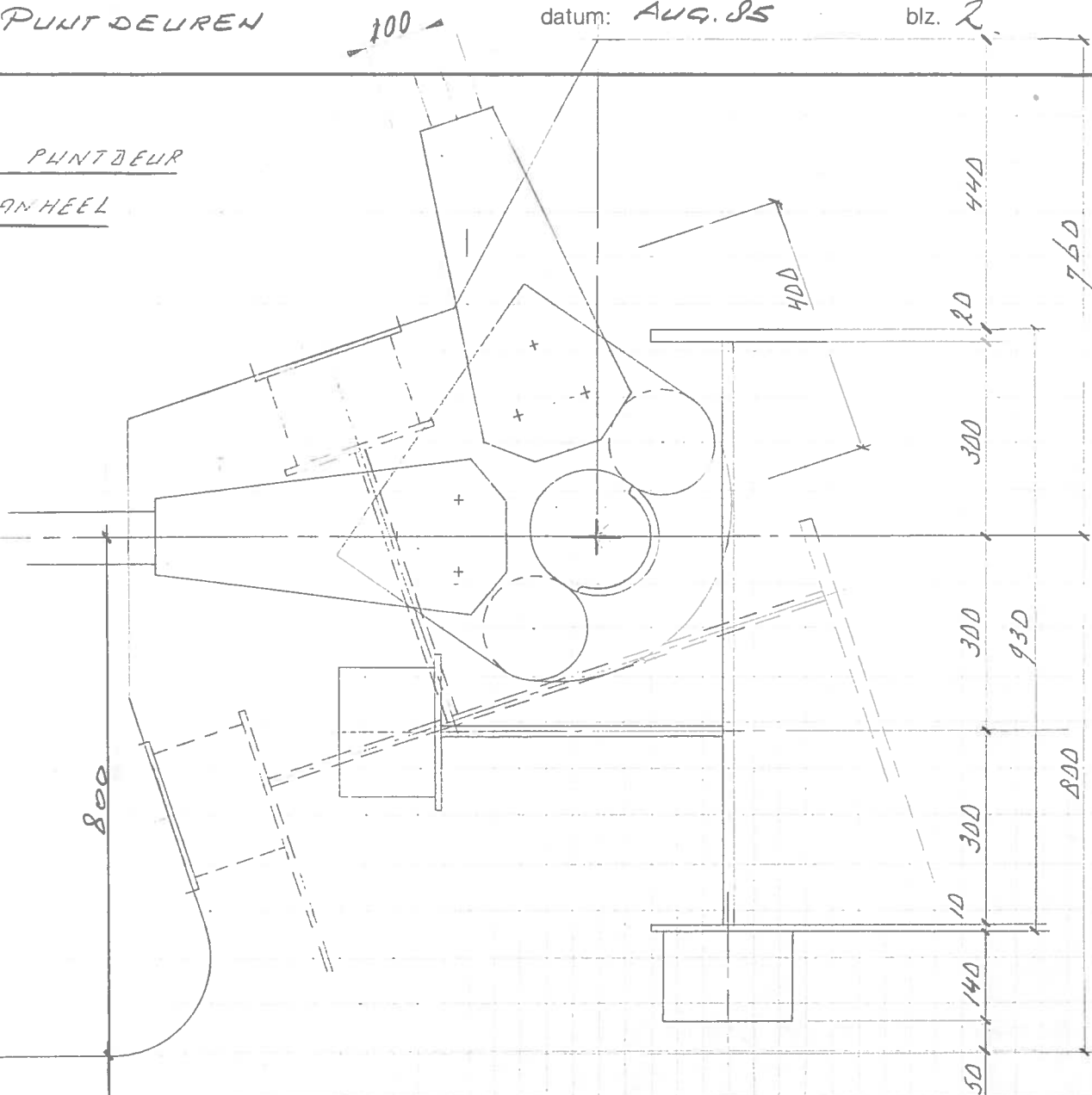
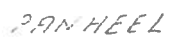
$$\cos \alpha = 0,94868$$



KANAAL WESSEM-NEDERNEERT

datum: Aug. 85

blz. 2



- SLUIS BREEDTE = 12.600

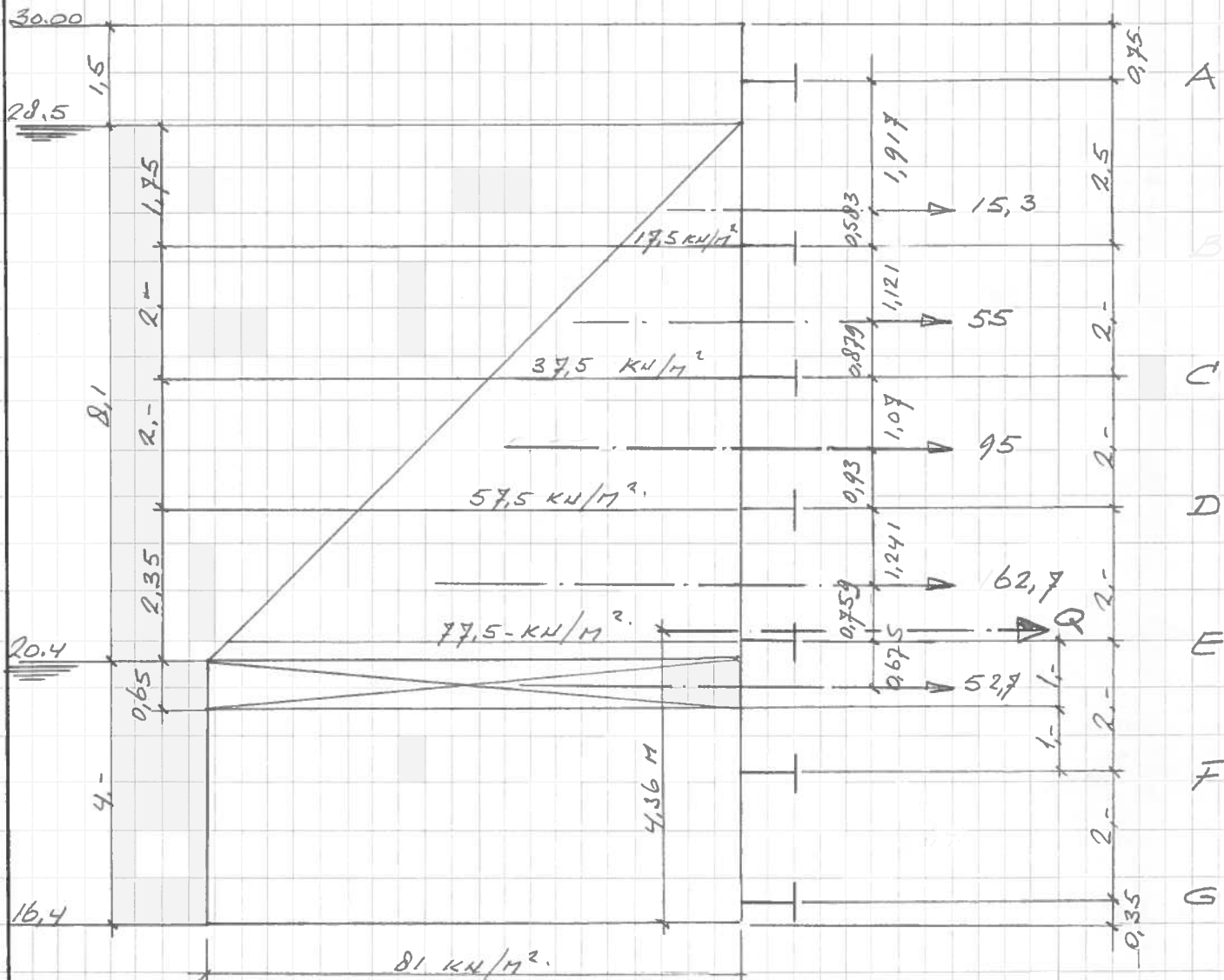
rijkswaterstaat directie bruggen

werk: KANAAL WESSEM-NEDERWEERT datum: AUG '85

blz. 3

PUNTDEUREN

PANHEEL HO E DEUR. WATERBELASTING.



$$Q = 4 \times 81 + 81 \times 0,1 \times 0,5 = 652 \text{ KN/M}$$

$$\text{ZWAARTELYN: } e = \frac{4 \times 81 \times 2 + 81 \times 0,1 \times 0,5 \times 6,7}{652} = 4,36 \text{ M.}$$

DRUK OP REGENS:

$$M_B = 7,9 \text{ KNM/M}$$

$$M_C = 22,32 \text{ KNM/M}$$

$$M_D = 30,1 \text{ KNM/M}$$

$$M_E = 52,7 \times 0,675 \text{ KNM/M}$$

CLAPEYRON VERGELYKING

rijkswaterstaat directie bruggen

werk: KANAAL NESSEM-NEDERWEERT

datum: AUG '85

blz. 4.

PUNTDEUREN

HOGHE DEUR.

$$\text{REGEL A} = \frac{15,3 \times 0,583}{2,5} - \frac{7,9}{2,5} = \underline{0,41 \text{ KN/M'}}$$

$$\text{REGEL B} = \frac{15,3 \times 0,917}{2,5} + \frac{55 \times 0,879}{2} + \frac{7,9}{2} + \frac{7,9}{2,5} - \frac{22,32}{2} = \underline{32 \text{ KN/M'}}$$

$$\text{REGEL C} = \frac{95 \times 0,93}{2} + \frac{55 \times 1,121}{2} + \frac{2 \times 22,32}{2} - \frac{30,1}{2} - \frac{7,9}{2} = \underline{78 \text{ KN/M'}}$$

$$\text{REGEL D} = \frac{162,7 \times 0,759}{2} + \frac{95 \times 1,07}{2} + \frac{0,1 \times 2}{2} - \frac{35,57}{2} - \frac{22,32}{2} = \underline{114 \text{ KN/M}}$$

$$\text{REGEL E} = \frac{162,7 \times 1,241}{2} + \frac{35,57}{2} + 52,7 - \frac{30,1}{2} = \underline{156 \text{ KN/M}}$$

$$\text{REGEL F} = 2 \times 81 = \underline{162 \text{ KN/M}}$$

$$\text{REGEL G} = (1 + 0,35) 81 = \underline{109 \text{ KN/M'}}$$

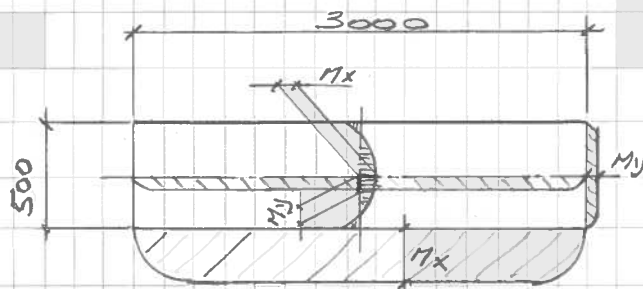
PANHEEL HOGE DEUR.

CONTROLE DOORLOPENDE PLAAT $\delta = 10 \text{ mm}$.

PLAATVELD $3000 \times 2000 \text{ mm}$,

MET 3 HOR. VERSIJVINGEN, PLAATVELD WORDT $3000 \times 500 \text{ mm}$.

WATERDRUK = $0,081 \text{ N/mm}^2$.



RANDSPANNING:

$$\frac{l_y}{l_x} = \frac{3000}{500} = 6$$

$$\psi_x = 12$$

$$\psi_y = 17,5$$

$$W = \frac{1}{6} \cdot 1 \cdot 10^2 = 16,7 \text{ mm}^3 \text{ PER mm.}$$

$$M_x = \frac{0,081 \times 500^2}{12} = 1688 \text{ Nmm}$$

$$M_y = \frac{0,081 \times 500^2}{17,5} = 1157 \text{ Nmm.}$$

$$\sigma_x = \frac{1688 \times 1,5}{16,7} = \frac{152 \text{ N/mm}^2}{360}$$

$$\sigma_y = \frac{1157 \times 1,5}{16,7} = \frac{104 \text{ N/mm}^2}{360}$$

SPANNING MIDDEN PLAAT:

$$\psi_x = 25 \quad \psi_y = 105$$

$$M_x = \frac{0,081 \times 500^2}{25} = 810 \text{ Nmm}$$

$$M_y = \frac{0,081 \times 500^2}{105} = 193 \text{ Nmm.}$$

$$\sigma_x = \frac{810 \times 1,5}{16,7} = \frac{73 \text{ N/mm}^2}{360}$$

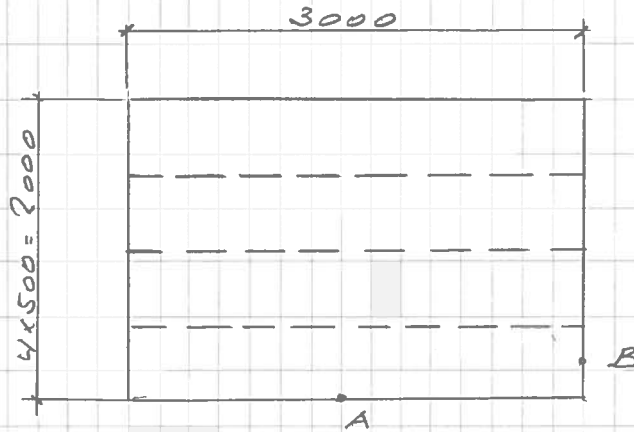
$$\sigma_y = \frac{193 \times 1,5}{16,7} = \frac{17 \text{ N/mm}^2}{360}$$

DOORBUIGING MIDDEN PLAAT:

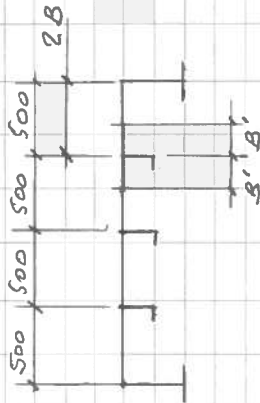
$$\delta_m = \frac{0,034 \times 0,081 \times 500^4}{2,1 \times 10^5 \times 10^3} = 0,82 \text{ mm} = \frac{e}{610}$$

PUNT DEUREN

PLAATVERSTYVING:



WATERDRUK
9,081 N/mm²



$$QB = 500 \text{ mm} \quad B = 250 \text{ mm} \quad L = 3000 \text{ mm}$$

$$\frac{B}{L} = \frac{250}{3000} = 0,083 \rightarrow \lambda = 0,93$$

$$B' = 0,93 \times 250 = 233$$

$$2B' = 466 \text{ mm}$$

VERSTYVING: L 150.75.10

$$A = 466 \times 10 + 1660 = 6320 \text{ mm}^2$$

$$a_1 = \frac{466 \times 10 \times 5 + 1660 \times 128,1}{6320} = 37 \text{ mm}$$

$$a_2 = 123 \text{ mm}$$

$$J = \frac{1}{12} \cdot 466 \cdot 10^3 + 466 \times 10 \times 32,1^2 + 1620000 + 1660 \times 9,1^2 = 2020 \times 10^4 \text{ mm}^4$$

$$W_{\text{MIN.}} = \frac{2020 \times 10^4}{123} = 164227 \text{ mm}^3$$

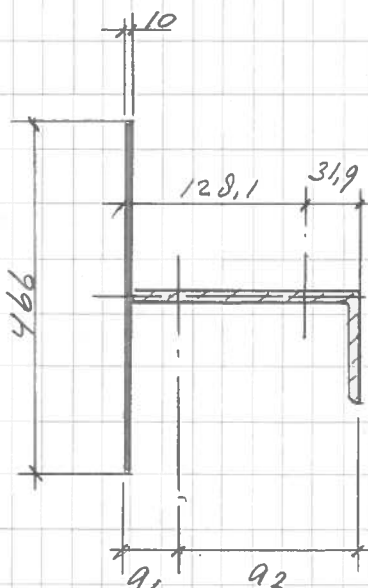
$$W_{\text{MAX.}} = \frac{2020 \times 10^4}{37} = 545945 \text{ mm}^3$$

$$q = 0,5 \times 81 = 40,5 \text{ kN/m}^2$$

$$M_{\text{INKL.}} = \frac{1}{12} \cdot 40,5 \times 3^2 = 30,4 \text{ kNm}$$

$$\sigma_{\text{MAX.}} = \frac{30,4 \times 10^6 \times 1,5}{164227} = 278 \text{ N/mm}^2 < 360$$

$$\sigma_{\text{MIN.}} = \frac{30,4 \times 10^6 \times 1,5}{545945} = 84 \text{ N/mm}^2 < 360$$

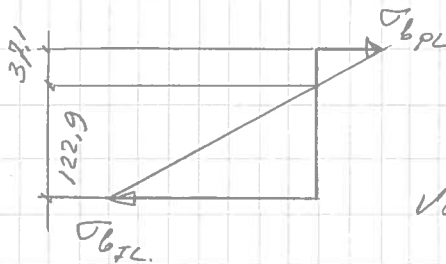


PUNT DEUREN

BEREKENING LASSEN VERSTIJVING L 150.75.10

$$\left. \begin{array}{l} \sigma_{bpl.} = 84 \text{ N/mm}^2 \\ \sigma_{bfl.} = 278 \text{ N/mm}^2 \end{array} \right\} \text{BIJ DE INKLEMMING}$$

$$D = 12 \cdot 40,5 \cdot 3 = 61 \text{ kN.}$$



$$\tau_{MAX} = \frac{61 \times 10^3 \times \frac{1}{2} \times 122,9 \times 10}{10 \times 501 \times 10^2} = 92 \text{ N/mm}^2.$$

VOOR GROOTSTE DRUKSPANNING GELDT:

$$a = 0,6 \times 10 \times \frac{278}{360} = 4,63 \text{ mm} \rightarrow \underline{\underline{5 \text{ mm.}}}$$

VOOR GROOTSTE SCHUIFSPANNING GELDT:

$$a = \frac{0,85 \times 10}{2 \times 360} \sqrt{3 \times 92^2} = 2 \text{ mm} \rightarrow \underline{\underline{5 \text{ mm.}}}$$

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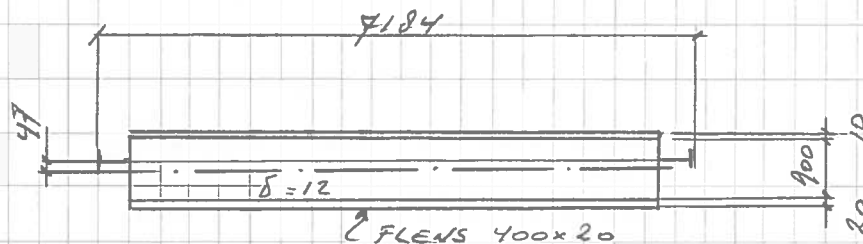
werk: KANAAL WESSEM-NEDER WEERT datum: AUG. '85

blz. 7

PUNTDEUREN.

BEREKENING REGELS PANHEEL HOGE DEUR.

REGEL F IS MAAR GEVEND.



$$q = 162 \text{ KN/M} \quad N = 1/2 \cdot 162 \cdot 7.184 \times 3 = 1746 \text{ KN}$$

$$\text{DOOR WATERDRUK: } M = 1/8 \cdot 162 \cdot 7.184^2 = 1045 \text{ KNM.}$$

$$\text{" SPATKRACHT } M = -1746 \times 0.047 = -82 \text{ "}$$

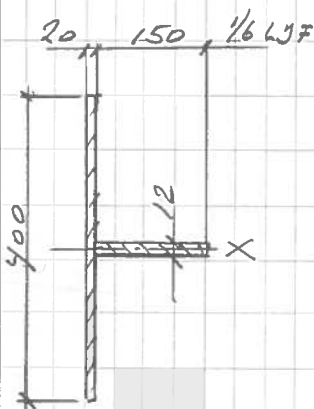
$$M_{\text{TOT.}} = \underline{963 \text{ KNM}}$$

$$\sigma_{\text{PL}} = \frac{963 \times 10^6 \times 1.5}{15019 \times 10^3} - \frac{1746 \times 10^3 \times 1.5}{34800} = \underline{21 \text{ N/MM}^2} \quad \text{TREK}$$

$$\sigma_{\text{FL}} = \frac{963 \times 10^6 \times 1.5}{9357 \times 10^3} + \frac{1746 \times 10^3 \times 1.5}{34800} = \underline{230 \text{ N/MM}^2} \quad \text{DRUK.}$$

$$\text{DRUKFLENS } \frac{h}{t_w} = \frac{930}{12} = 77.5 > 75 \rightarrow \text{NIET VORMVAST}$$

KNIKKEN DRUKRAND: VLGS 2.7.3



$$I_x = 1/12 \cdot 20 \cdot 400^3 + 1/12 \cdot 150 \cdot 12^3 = 106 \times 10^6 \text{ MM}^4$$

$$A = 400 \times 20 + 150 \times 12 = 9800 \text{ MM}^2$$

$$i = \sqrt{\frac{106 \times 10^6}{9800}} = 104 \text{ MM}$$

$$\lambda = \frac{3000}{104} = 29 \rightarrow W = 1.08 \cdot F_{ES10}$$

$$\sigma_{\text{KN.}} = 230 \times 1.08 = \underline{248 \text{ N/MM}^2} < 360$$

DOORBUIGING REGEL F:

$$\delta_M = \frac{0.62 \times 162 \times 7.184^4 - 596 \times 82 \times 7.184^2}{5362 \times 10^2} \times 10 = 4.52 \text{ MM} = \frac{e}{1589}$$

rijkswaterstaat directie bruggen

werk: KANAAL NESSEN NEDERWEERT datum: AUG. '85

blz. 8

PUNTDEUREN

CONTROLE PLOOIEN LYF REGEL F

PLAAT LENGTE = 3000 mm
 PLAAT BREEDTE = 900 mm.
 LYF DIKTE = 12 mm. OPLEGREACTIE LIGGER = 582 kN.

$$M_B \text{ MIDDEN PLAAT DOOR WATERDRUK} = 582 \times 1,5 - \frac{1}{2} \cdot 162 \cdot 1,5^2 = 691 \text{ kNm}$$

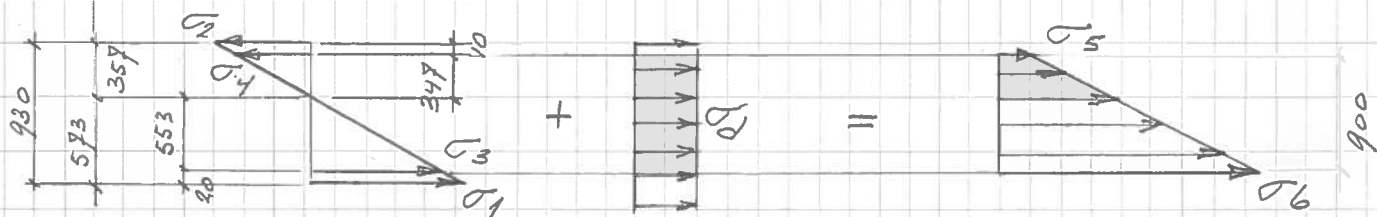
$$M_B \text{ " " " SPATKRACHT} = -82 \text{ kNm}$$

$$M_B = 609 \text{ kNm}$$

$$\text{SPATKRACHT} = 1746 \text{ kN}$$

$$\text{DWARSKRACHT MIDDEN PLAAT} = \frac{1}{2} \times 582 = 291 \text{ kN}$$

SPANNINGEN PLAATRAND:



$$\sigma_{6 \text{ FL}} = \sigma_1 = \frac{609 \cdot 10^6 \times 1,5}{9357 \times 10^3} = 98 \text{ N/mm}^2 \text{ DRUK}$$

$$\sigma_{6 \text{ PL}} = \sigma_2 = \frac{609 \cdot 10^6 \times 1,5}{15019 \times 10^3} = 61 \text{ N/mm}^2 \text{ TREK}$$

$$\sigma_{6 \text{ FL}} = \sigma_3 = \frac{553 \times 98}{573} = 95 \text{ N/mm}^2 \text{ DRUK}$$

$$\sigma_{6 \text{ PL}} = \sigma_4 = \frac{347 \times 61}{357} = 59 \text{ N/mm}^2 \text{ TREK}$$

$$\sigma_d = \frac{1746 \times 10^3 \times 1,5}{34800} = 75 \text{ N/mm}^2 \quad \tau_{\text{GER.}} = \frac{291 \times 10^3 \times 1,5}{900 \times 12} = 40 \text{ N/mm}^2 < 0,580$$

$$\sigma_5 = 59 - 75 = -16 \text{ N/mm}^2 \text{ DRUK. } \sigma_6 = 95 - 75 = 20 \text{ N/mm}^2 \text{ DRUK}$$

$$\psi = \frac{-16}{-170} = 0,09 \quad \alpha = \frac{3000}{900} = 3,33$$

$$K_d = 7,3 \quad \text{voor } \alpha > 1 \rightarrow K_s = 5,35 + \frac{4}{3,33^2} = 5,71$$

$$\sigma_E = 19 \left(\frac{100 \times 12}{900} \right)^2 = 33,77 \text{ N/mm}^2$$

$$\sigma_{KR} = 7,3 \times 33,77 = 246 \text{ N/mm}^2$$

$$\tau_{KR} = 5,71 \times 33,77 = 192 \text{ N/mm}^2$$

$$\sqrt{\left(\frac{170}{246} \right)^2 + \left(\frac{40}{192} \right)^2} = 0,73 < 1$$

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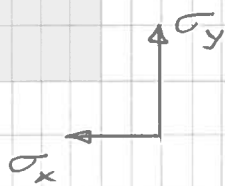
werk: KANAAL WESSEM-NEDERNEERT datum: AUG. '84
PUNTDEUREN

blz. 9

GECombineerde SPANNINGEN REGEL F

RANDSPANNING PLAAT + BUIGSPANNING LIGGER F

PUNT A ZIE BLZ.

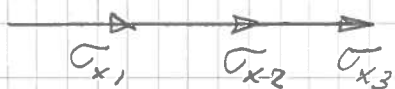


$$\sigma_x = 21 \text{ N/MM}^2 \text{ TREK BLZ.}$$

$$\sigma_y = 152 \text{ N/MM}^2 \text{ DRUK BLZ}$$

$$\sigma_{TOT.} = \sqrt{21^2 + 152^2 + 21 \times 152} = 162 \text{ N/MM}^2 < 360$$

PUNT B



$$\sigma_{x1} = 21 \text{ N/MM}^2 \text{ TREK BLZ.}$$

$$\sigma_{x2} = 104 \text{ N/MM}^2 \text{ TREK BLZ.}$$

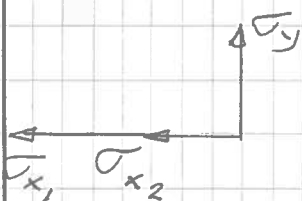
$$\sigma_{x3} = 84 \text{ N/MM}^2 \text{ TREK BLZ.}$$

$$\sigma_{TOT.} = 84 + 21 + 104 = 209 \text{ N/MM}^2 < 360$$

SPANNING MIDDEN PLAAT + BUIGSPANNING LIGGER F
+ TREKSPANNING VERSTYFUNG.: $\sigma_{x1} = 84 \text{ N/MM}^2 \text{ BLZ.}$

$$\sigma_{x2} = 21 \text{ N/MM}^2 \text{ TREK BLZ.}$$

$$\sigma_y = 73 \text{ N/MM}^2 \text{ TREK BLZ}$$



$$\sigma_{TOT.} = \sqrt{(84+21)^2 + 73^2 - (84+21)73} = 94 \text{ N/MM}^2$$

REGEL D, E EN G UITVOEREN ALS REGEL F

REGEL C UITVOEREN ALS REGEL D ERP

REGEL A EN B UITVOEREN ALS REGEL B ERP

rijkswaterstaat directie bruggen

werk: KANAAL NESSEM-NEDERNEERT datum: AUG, '85

blz. 10

PUNT DEUREN

BEREKENING LASSEN REGEL F (HOOG DEUR PANHEEL)

$$q = 162 \text{ KN/M} \quad N = 1746 \text{ KN} \quad A = 34800 \text{ MM}^2$$

$$\text{KRACHT OP LUFPLAAT } Q = 162 \times 7,184 = 1164 \text{ KN}$$

$$\sigma_{\perp} = \frac{1164 \times 10^3 \times 1,5}{7,184 \times 12} = 20 \text{ N/MM}^2$$

$$\text{SPATKRACHT} = 1746 \text{ KN} \quad \sigma_{\parallel} = \frac{1746 \times 10^3 \times 1,5}{34800} = 75 \text{ N/MM}^2$$

$$D_{\text{MAX}} = \frac{1}{2} \cdot 162 \cdot 7,184 = 582 \text{ KN} \quad \tau_{\text{MAX}} = \frac{582 \times 10^3 \times 1,5}{900 \times 12} = 8 \text{ N/MM}^2$$

LIGGER BIJ OPLEGGING: $M = 0$

$$\sigma_c = \sqrt{75^2 + 20^2 - 75 \times 20 + 3 \times 8^2} = 156 \text{ N/MM}^2 < 1,2 \sigma_e$$

LIGGER OP 1/4 V.D. LENGTE:

$$M = 582 \times 1,796 - \frac{1}{2} \cdot 162 \cdot 1,796^2 - 82 = 702 \text{ KNM}$$

$$D = 582 \times \frac{1}{2} = 291 \text{ KN}$$

$$\sigma_b = \frac{702 \times 10^6 \times 1,5}{9357 \times 10^3} = 113 \text{ N/MM}^2$$

$$\sigma_{\perp} = 20 \text{ N/MM}^2$$

$$\sigma_{\parallel} = 75 \text{ N/MM}^2$$

$$\tau = \frac{291 \times 10^3 \times 1,5}{900 \times 12} = 41 \text{ N/MM}^2$$

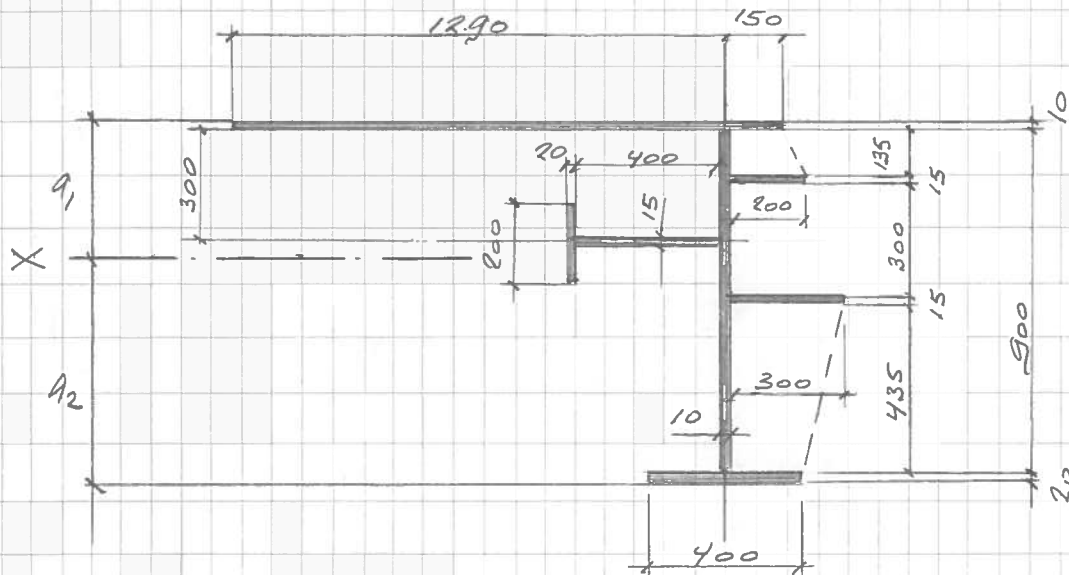
$$\sigma_c = \sqrt{(113 + 75)^2 + 20^2 - (113 + 75) \cdot 20 + 3 \times 41^2} = 192 \text{ N/MM}^2 < 1,2 \sigma_e$$

LASSEN $a = 5 \text{ MM}$. TAB. T1 ART. 3.3

$$\sigma_{cl} = \frac{0,85 \times 12}{2 \times 5} \sqrt{2 \times 20^2 + 3 \times 41^2} = 146 \text{ N/MM}^2 < \sigma_e$$

PUNTDEUREN

DOORSNEDE VOORHAR HOGE DEUR PANHEEL



$$L = 13600 \text{ mm} \quad 2B = 300 \text{ mm} \quad B = 1500 \text{ mm} \quad L = \frac{1500}{13600} = 0,11$$

$$\lambda = 0,86 \quad B' = 0,86 \times 1500 = 1290 \text{ mm}$$

$$A = 1440 \times 10 + 900 \times 10 + 400 \times 20 + 400 \times 15 + 200 \times 20 + 200 \times 15 + 300 \times 15 = 48900 \text{ mm}^2$$

$$a_1 = \frac{1440 \times 10 \times 5 + 900 \times 10 \times 460 + 400 \times 20 \times 920 + 400 \times 15 \times 310}{48900} +$$

$$\frac{200 \times 20 \times 310 + 200 \times 15 \times 147,5 + 300 \times 15 \times 467,5}{48900} = 352 \text{ mm}$$

$$a_2 = 930 - 352 = 578 \text{ mm}$$

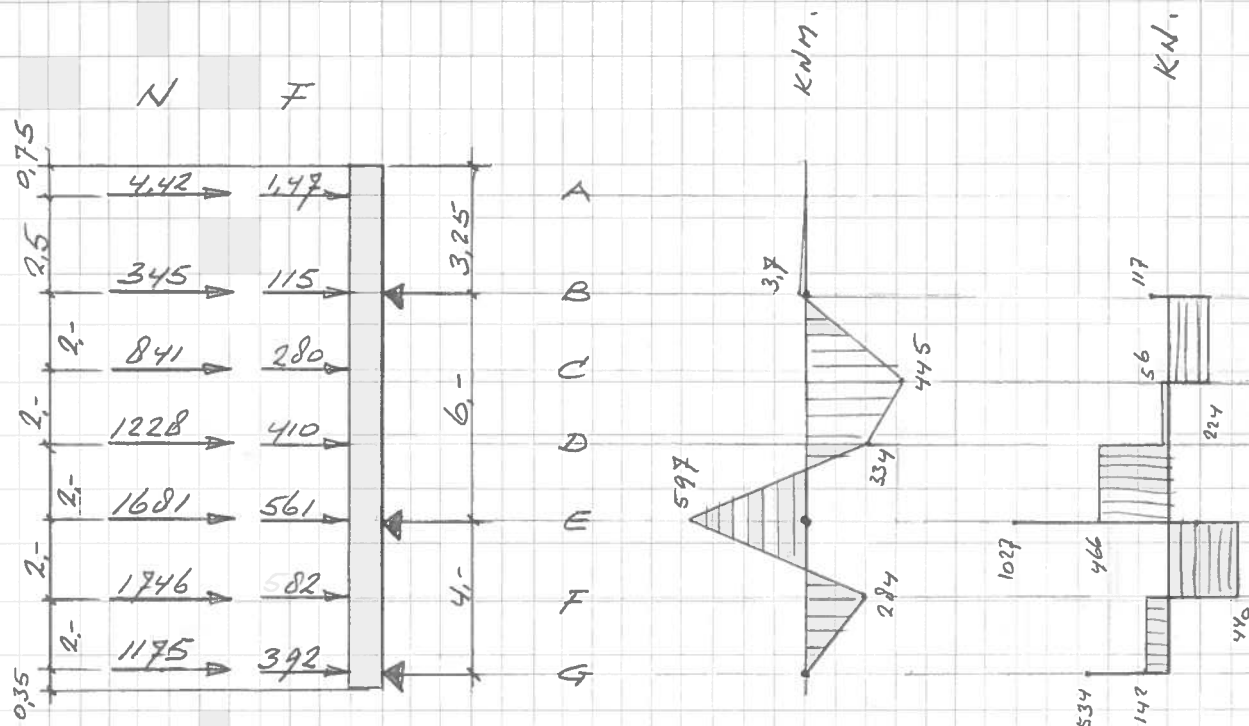
$$I_x = \frac{1}{12} \cdot 1440 \cdot 10^3 + 1440 \times 10 \cdot 347^2 + \frac{1}{12} \cdot 10 \cdot 900^3 + 900 \times 10 \times 10^2 + \frac{1}{12} \cdot 400 \cdot 20^3 + 400 \times 20 \times 568^2 + \frac{1}{12} \cdot 400 \cdot 15^3 + 400 \times 15 \times 42^2 + \frac{1}{12} \cdot 20 \cdot 200^3 + 200 \times 20 \times 42^2 + \frac{1}{12} \cdot 200 \cdot 15^3 + 200 \times 15 \times 199,5^2 + \frac{1}{12} \cdot 300 \cdot 15^3 + 300 \times 15 \times 115,5^2 = 5238 \times 10^6 \text{ mm}^4$$

$$W_1 = \frac{5238 \times 10^6}{352} = 14880 \times 10^3 \text{ mm}^3$$

$$W_2 = \frac{5238 \times 10^6}{578} = 9062 \times 10^3 \text{ mm}^3$$

VERVOLG VOOR HAR HOGE DEUR PANHEEL

DE HARREN DRUKKEN ALLEEN T.P.V. DE STEUNPUNTEN
B, E EN G TEGEN ELKAAR.



OPLEG DRUKKEN UIT REGELS T.G.V. WATERDRUK

REGEL A:	$F = \frac{1}{2} \cdot 0,41 \cdot 7,184 = 1,47 \text{ KN}$	$N = 4,42 \text{ KN.}$
" B:	$F = \frac{1}{2} \cdot 32 \cdot 7,184 = 115 \text{ KN}$	$N = 345 \text{ KN.}$
" C:	$F = \frac{1}{2} \cdot 78 \cdot 7,184 = 280 \text{ KN}$	$N = 841 \text{ KN}$
" D:	$F = \frac{1}{2} \cdot 114 \cdot 7,184 = 410 \text{ KN}$	$N = 1228 \text{ KN}$
" E:	$F = \frac{1}{2} \cdot 156 \cdot 7,184 = 561 \text{ KN}$	$N = 1681 \text{ KN}$
" F:	$F = \frac{1}{2} \cdot 162 \cdot 7,184 = 582 \text{ KN}$	$N = 1746 \text{ KN.}$
" G:	$F = \frac{1}{2} \cdot 109 \cdot 7,184 = 392 \text{ KN}$	$N = 1175 \text{ KN}$

rijkswaterstaat directie bruggen

werk: KANAAL WESSEN-NEDERNEERT

datum: AUG. 85

blz. 12

PUNTDEUREN

$$M_B = 1,47 \times 2,5 = 3,7 \text{ KNM.}$$

$$M_C = 1,47 \times 4,5 + 11 \times 2 - 341 \times 2 = 445 \text{ KNM.}$$

$$M_D = 1,47 \times 6,5 + 115 \times 4 + 280 \times 2 - 341 \times 4 = 334 \text{ KNM.}$$

$$M_E = \underline{597} \text{ KNM} \quad (\text{UIT CLAPEYRON VERG.}).$$

$$M_F = 534 \times 2 - 392 \times 2 = 284 \text{ KNM.}$$

$$R_B = 117 + \frac{410 \times 2}{6} + \frac{280 \times 4}{6} - \frac{597}{6} = 341 \text{ KN.}$$

$$R_E = 561 + \frac{582}{2} + \frac{410 \times 4}{6} + \frac{280 \times 2}{6} + \frac{597}{4} + \frac{597}{6} = \underline{1467} \text{ KN.}$$

$$R_G = 392 + \frac{582}{2} - \frac{597}{4} = 534 \text{ KN.}$$

$$\sigma_{b \text{ MAX.}} = \frac{597 \times 10^6 \times 1,5}{9062 \times 10^3} = 99 \text{ N/MM}^2 < 360$$

$$\tau = \frac{466 \times 10^3 \times 1,5}{900 \times 10} = 78 \text{ N/MM}^2 < 0,58 \times 360$$

$$\tau_c = \sqrt{99^2 + 3 \times 78^2} = \underline{167} \text{ N/MM}^2 < 1,2 \times 360$$

rijkswaterstaat directie bruggen

werk: KANAAL WESSEM NEDERWEERT datum: AUG '85

blz. 13

PUNTDEUREN

CONTROLE REGEL E DOOR BELASTING UIT VOORHAR.

HOGGE DEUR PANHEEL

3 PUNTS OPLEGGING VOORHAR

VOOR SCHETS ZIE REGEL F BLZ.

$$q = 156 \text{ KN/M'}$$

$$N = 4401 \text{ KN.}$$

$$\text{DOOR WATERDRUK: } M = \frac{1}{8} \cdot 156 \cdot 7,184^2 = 1006 \text{ KN.M.}$$

$$\text{" SPATKRACHT: } M = 4401 \times 0,047 = -207 \text{ KN.M.}$$
$$M_{\text{TOT.}} = \underline{\underline{799}} \text{ KN.M.}$$

$$\sigma_{\text{PL.}} = \frac{799 \times 10^6 \times 1,5}{15019 \times 10^3} - \frac{4401 \times 10^3 \times 1,5}{34800} = -110 \text{ N/MM}^2 \text{ DRUK.}$$

$$\sigma_{\text{FL.}} = -\frac{799 \times 10^6 \times 1,5}{9357 \times 10^3} - \frac{4401 \times 10^3 \times 1,5}{34800} = -318 \text{ N/MM}^2 \text{ DRUK}$$

KNIKKEN DRUK RAND: ZIE OOK REGEL F BLZ.

$$\sigma = 318 \times 1,08 = \underline{\underline{343}} \text{ N/MM}^2 < 360$$

rijkswaterstaat directie bruggen

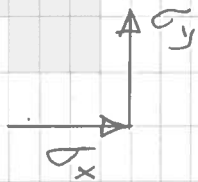
werk: KANAAL WESSEM-NEDERWEERT datum: AUG. 85

blz. 19

PUNT DEUREN.

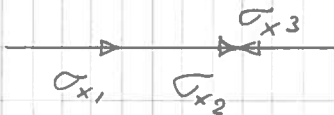
GECOMBINEERDE SPANNINGEN REGEL E HOGE DEUR PANHEEL BIJ 3-PUNTS OPLEGGING VOORHAR

UIT REGEL E: $\sigma_x = -110 \text{ N/MM}^2$ DRUK BLZ.
UIT RANDSPANNING PLAAT $\sigma_y = 152 \text{ N/MM}^2$ TREK BLZ.



$$\sigma_{\text{TOT.}} = \sqrt{110^2 + 152^2 + 110 \times 152} = 228 \text{ N/MM}^2 < 360$$

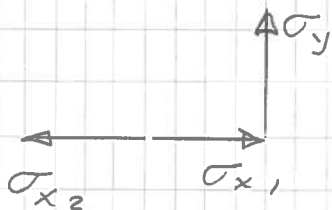
UIT REGEL E $\sigma_{x1} = -110 \text{ N/MM}^2$ DRUK BLZ.
UIT RANDSP. PLAAT $\sigma_{x2} = -104 \text{ N/MM}^2$ DRUK BLZ.
UIT VERSTIJVING $\sigma_{x3} = 84 \text{ N/MM}^2$ TREK BLZ.



$$\sigma_{\text{TOT.}} = -110 - 104 + 84 = 130 \text{ N/MM}^2 < 360$$

SPANNING IN HET MIDDEN V.D. PLAAT

UIT REGEL E: $\sigma_{x1} = -110 \text{ N/MM}^2$ DRUK BLZ.
UIT VERSTIJVING: $\sigma_{x2} = 84 \text{ N/MM}^2$ TREK BLZ.
UIT MIDDEN PLAAT $\sigma_y = 73 \text{ N/MM}^2$ TREK BLZ.

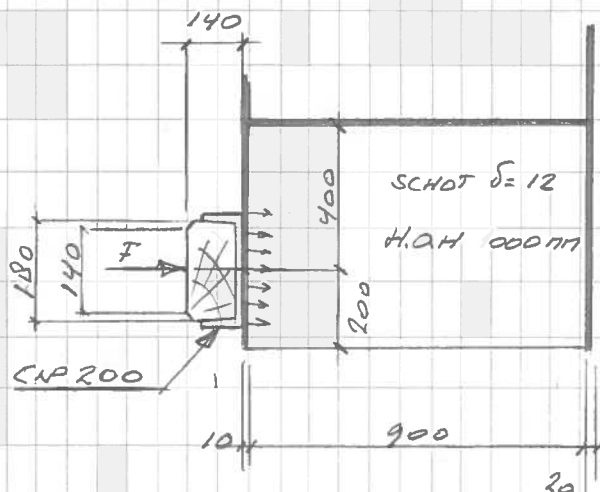


$$\sigma_{\text{TOT.}} = \sqrt{(110 - 84)^2 + 73^2 + (110 - 84) \times 73} = 89 \text{ N/MM}^2 < 360$$

REGEL D UITVOEREN ALS REGEL E
REGEL C UITVOEREN ALS REGEL D ERP (MET LUF 900x10 MM)
REGEL A EN B UITVOEREN ALS REGEL B ERP
(MET LUF 900x10 MM)

ONDERREGEL G (HOGE DE R PANHEEL)

DEZE REGEL WORDT OVER DE GEHELE LENGTE GESTEUND DOOR DE ONDERAFDICHTING TEGEN DE DREMPEL.



OP ONDERREGEL:

$$q = 109 \text{ kN/m'}$$

TOTALE DRUK OP DEUR $Q = 109 \times 7,184 = 783 \text{ kN}$

BALK LENGTE = 2000 MM.

DRUK OP HOUT: $\sigma_d = \frac{783 \times 10^3}{2000 \times 140} = 2,8 \text{ N/mm}^2 < 15$

KRACHT OP SCHOT: $F = \frac{783}{2} = 392 \text{ kN}$

DRUK OP PLAAT: $\sigma_d = \frac{392 \times 10^3 \times 1,5}{200 \times 12} = 245 \text{ N/mm}^2 < 360$

DEZE DRUK WORDT GEACHT OVER DE GEHELE HOOGTE VAN HET SCHOT OP TE TREDEN.

PLOOI VEILIGHEID SCHOT:

$a' = 900 \quad b' = 600 \quad \alpha = \frac{900}{600} = 1,5 \quad \psi = \frac{-245}{-245} = 1$

$\sigma_E = 19 \left(\frac{100 \times 12}{600} \right)^2 = 76 \text{ N/mm}^2$

$\bar{\sigma} = \frac{392 \times 10^3 \times 1,5}{900 \times 12} = 54 \text{ N/mm}^2$

$K_d = 4 \quad K_s = 4 + \frac{5,35}{1,5^2} = 6,37$

$\sigma_{KR} = 4 \times 76 = 304 \text{ N/mm}^2$

$\bar{\sigma}_{KR} = 6,37 \times 76 = 484 \text{ N/mm}^2 \rightarrow 208 \text{ N/mm}^2$

$\sqrt{\left(\frac{245}{304} \right)^2 + \left(\frac{54}{208} \right)^2} = 0,85 < 1$

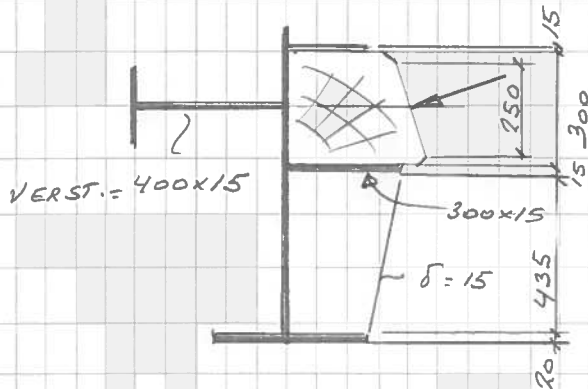
PUNTDEUREN

DRUKSPANNING OP HOUTEN BALK EN VERSTUJVING

HOGE DEUR PANHEEL

TP.V. REGELE

UIT VOORHAR BELASTING:



WATERDRUK
SPATKRACHT

$$F_1 = 467 \text{ kN.}$$

$$F_2 = 4401 \text{ KN.}$$

$$F = \sqrt{1467^2 + 4401^2} = \underline{4639 \text{ kN}}$$

LENGTE HOUT WAAROVER DE DRUK WORDT UITGEOEFEND.

$$L = 2000 \text{ mm}$$

HOUTSPANNING $\sigma_d = \frac{4639 \times 10^3}{2000 \times 250} = \underline{9.3 \text{ N/mm}^2} < 15$ $L = 2$

DRUK SPANNING OP VERSTIJVING 700x15:

$$\sigma_d = \frac{4401 \times 10^3 \times 15}{2000 \times 15} = \underline{\underline{220 \text{ N/mm}^2}} < 360$$

PLOOIEN SCHOT 300x435x15 : H.O.H = $\frac{2000}{3} = 667 \text{ mm}$.

HOULTSPANNING OVER 2 M = $\frac{1467 \times 10^3}{2000 \times 300} \approx 2,5 \text{ N/mm}^2$

UIT HOUTSPANNING: $F = 2,5 \times 300 \times \frac{667}{1000} = 500 \text{ kN}$.

$$\sigma_d = \frac{500 \times 10^3 \times 1,5}{300 \times 15} = 167 \text{ N/mm}^2 < 360$$

$$\psi = \frac{-167}{-167} = 1 \quad \alpha = \frac{435}{300} = 1,45 \rightarrow K_d = 4.$$

$$K_S = 4 + \frac{5,35}{1,45^2} = 6,54 \quad \bar{\sigma}_{\text{GEM.}} = \frac{500 \times 10^3 \times 1,5}{435 \times 15} = 115 \text{ N/mm}^2 < 958 \times 360$$

$$\sigma_c = 19 \left(\frac{100 \times 15}{300} \right)^2 = 475 \text{ N/mm}^2$$

$$\sigma_{KR.} = 4 \times 475 = 1900 \rightarrow 360 \text{ N/mm}^2$$

$$\bar{\epsilon}_{KR} = 6,54 \times 475 = 3106 \rightarrow 208 \text{ N/mm}^2$$

$$\sqrt{\left(\frac{232}{360}\right)^2 + \left(\frac{115}{208}\right)^2} = \underline{\underline{0,85}} < 1$$

PUNTDEUREN

BEREKENING LASSEN VOORHAR (HOGE DEUR PANHEEL)

GROOTSTE SPANNINGEN TREDEN OP BIJ VERSTYKINGS -
PLAAT 400×15 MM:

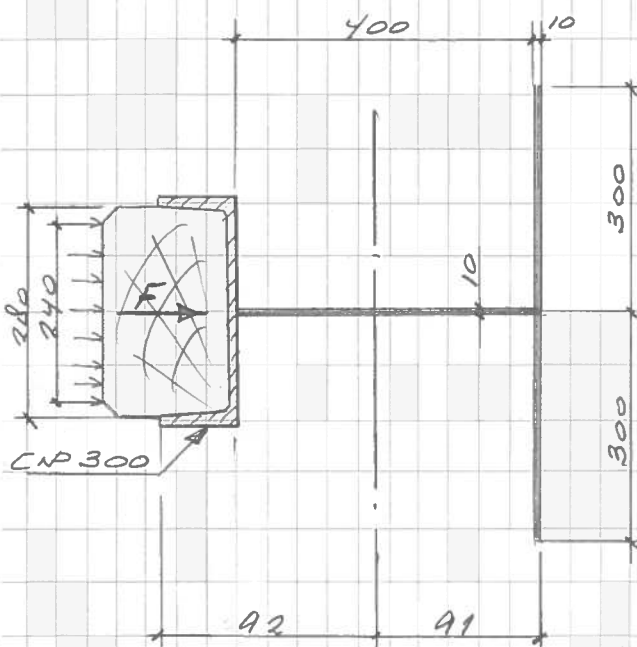
SPATKRACHT REGEL $F = 1746$ KN

$$\sigma_{d1} = \frac{1746 \times 10^3 \times 1,5}{2000 \times 15} = \underline{87 \text{ N/MM}^2} < \sigma_e$$

LASSEN $a = 5$ MM

$$\sigma_{dl} = \frac{0,85 \times 15}{2 \times 5} \sqrt{2 \times 87^2} = \underline{157 \text{ N/MM}^2} < \sigma_e$$

ACHTERHAR (HOGE DEUR PANHEEL)



DOORSNEDE BEREKENING ZONDER SCHOTTEN.

$$A = 600 \times 10 + 400 \times 10 + 5880 = 15880 \text{ mm}^2$$

$$a_1 = \frac{600 \times 10 \times 5 + 400 \times 10 \times 210}{15880} + \frac{5880 \times 437}{15880} = 217 \text{ mm.}$$

$$a_2 = 293 \text{ mm}$$

$$M = \frac{1}{12} \cdot 60 \cdot 10^3 + 600 \times 10 \cdot 217^2 + \frac{1}{12} \cdot 10 \cdot 400^3 + 400 \times 10 \cdot 7^2 + 495 \times 10^4 + 5880 \times 220^2 = 612 \times 10^6 \text{ mm}^4$$

$$W_1 = \frac{612 \times 10^6}{217} = 2820 \times 10^3 \text{ mm}^3$$

$$W_2 = \frac{612 \times 10^6}{293} = 2088 \times 10^3 \text{ mm}^3$$

REGEL F BALK LENGTE = 2000 mm.

SPATK ACHT OP ACHTERHAR: $F = \frac{1}{2} \cdot 162.7.184 \times 3 = 1746 \text{ kN}$

DRUK OP HOUT: $\sigma_d = \frac{1746 \times 10^3}{2000 \times 240} = 3.64 \text{ N/mm}^2 < 15$

DRUK OP PLAAT 400 x 10: $\sigma_d = \frac{1746 \times 10^3 \times 1.5}{2000 \times 10} = 131 \text{ N/mm}^2 < 360$

$$M = \frac{1}{8} \cdot 1746 \cdot 2 = 437 \text{ kNm.}$$

$$\sigma_{pl.} = \frac{437 \times 10^6 \times 1.5}{2820 \times 10^3} = 232 \text{ N/mm}^2 < 360$$

$$\sigma_{prof.} = \frac{437 \times 10^6 \times 1.5}{2088 \times 10^3} = 314 \text{ N/mm}^2 < 360$$

DN. KRACHT = $\frac{1746}{2} = 873 \text{ kN}$

$$\bar{\sigma} = \frac{873 \times 10^3 \times 1.5}{400 \times 10 + 2 \times 100 \times 16} = 182 \text{ N/mm}^2 < 0.58 \times 360$$

PUNTDEUREN

VERVOLG ACHTERHAR

PLOOI VEILIGHEID PLAAT 400x10

PLAAT LENGTE 2000 MM $\alpha = \frac{2000}{400} = 5$
 $\psi = \frac{232}{-314} = -0,74 \rightarrow K_D = 17,8$

$K_S = 5,35 + \frac{4}{5^2} = 5,51$ $\sigma_E = 19 \left(\frac{100 \times 10}{400} \right)^2 = 118 \text{ N/mm}^2$

$\sigma_{KR} = 17,8 \times 118 = 2100 \rightarrow 360 \text{ N/mm}^2$

$\bar{\sigma}_{KR} = 5,51 \times 118 = 650 \rightarrow 208 \text{ N/mm}^2$

$$\sqrt{\left(\frac{314}{360} \right)^2 + \left(\frac{182}{208} \right)^2} = 1,24 > 1$$

VOLDOET NIET

PLOOTSCHOTTEN TOEPASSEN $\delta = 12 \text{ MM}$ H.O.H. $\approx 680 \text{ MM}$

ZIJDELINGSE ONDERSTEUNING:

ZIE SCHETS BLZ.

$$F = 12,162 \cdot 4,060 = 572 \text{ KN.}$$

DRUK OP HOUT: $\sigma_d = \frac{572 \times 10^3}{2000 \times 140} = 2 \text{ N/mm}^2 < 15$

DRUK OP PLAAT = $\frac{572 \times 10^3 \times 1,5}{2000 \times 10} = 43 \text{ N/mm}^2 < 360$

BEREKENING LASSEN ACHTERHAR

(HOOG DEUR PANHEEL)

$$\sigma_{b, \text{max}} = 314 \text{ N/mm}^2.$$

$$N = 1746 \text{ kN.}$$

DRUK OP PLAAT 400×10 + SCHOTTEN:

$$\sigma_d = \frac{1746 \times 10^3 \times 1.5}{2000 \times 10 + 2 \times 250 \times 12} = 101 \text{ N/mm}^2.$$

$$\tau = 182 \text{ N/mm}^2. \text{ BIJ OPLEGGING.}$$

$$\tau = \frac{1}{2} \times 182 = 91 \text{ N/mm}^2 \text{ OP } \frac{1}{4} \text{ VAN PLAAT LENGTE}$$

$$\sigma_c = \sqrt{314^2 + 101^2 - 314 \times 101 + 3 \times 91^2} = \underline{\underline{319 \text{ N/mm}^2}} < 1,2 \sigma_e$$

LASSEN a = 5

$$\sigma_{cl.} = \frac{0.85 \times 10}{2 \times 5} \sqrt{2 \times 101^2 + 3 \times 182^2} = \underline{\underline{294 \text{ N/mm}^2}} < \sigma_e$$

rijkswaterstaat directie bruggen

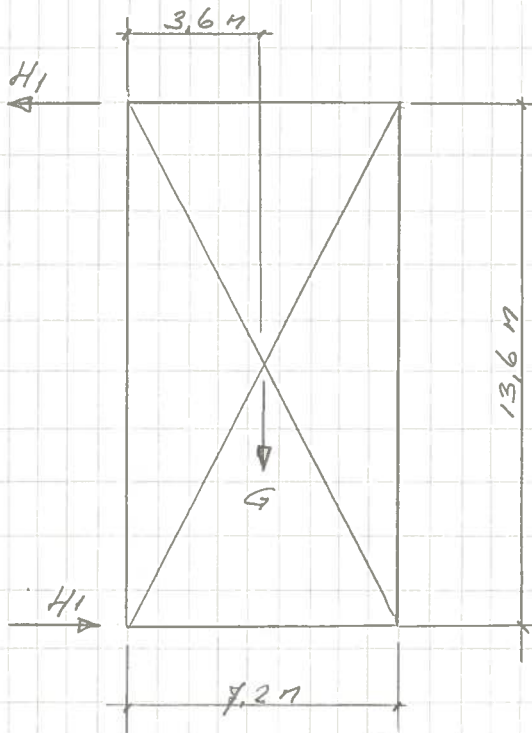
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blz. 21

PUNTDEUREN.

KRACHTEN OP BOVENDRAAI PUNT EN TAATS

HOGHE DEUR PANHEEL

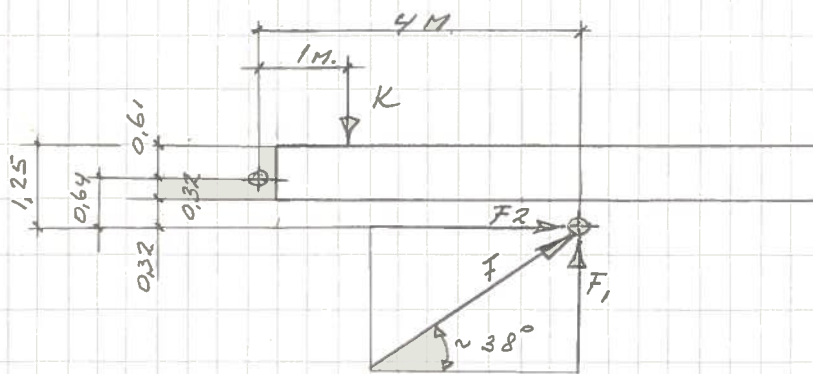


DOOR EIGEN GENICHT DEUR:

$$G = \sim 400 \text{ KN.}$$

$$H_1 = \frac{400 \times 3,6}{13,6} = \underline{106 \text{ KN}}$$

DOOR DUW PERSKRACHT: $F = 310 \text{ KN.}$



$$\sin 38^\circ = 0,61566$$

$$\cos 38^\circ = 0,78801$$

$$F_1 = 310 \times 0,61566 = \underline{191 \text{ KN}}$$

$$F_2 = 310 \times 0,78801 = \underline{244 \text{ KN.}}$$

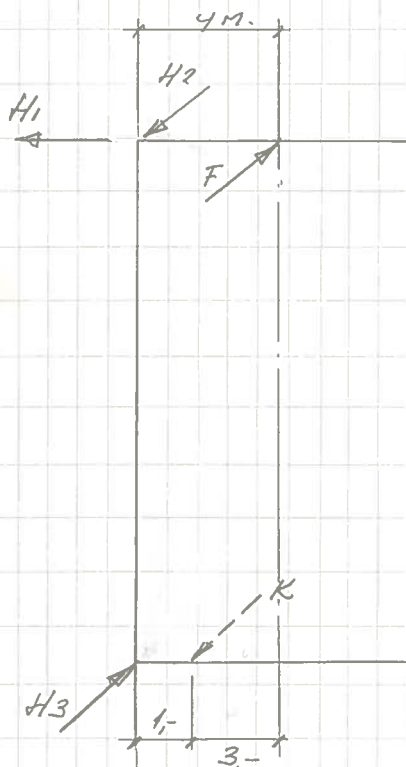
rijkswaterstaat directie bruggen

werk: KANAAL WESSEN-NEDERWEERT datum: SEPT '85
PUNTDEUREN

blz. 22.

DEUR OP OBSTAKEL:

1^e DUNPERSKRACHT $F = 310 \text{ KN} \perp$ OP DEUR.



OBSTAKEL KRACHT = K.

$$H_1 = 0$$

$$H_2 = 310 \text{ KN.}$$

$$K = \frac{310 \times 4}{1} = 1240 \text{ KN.}$$

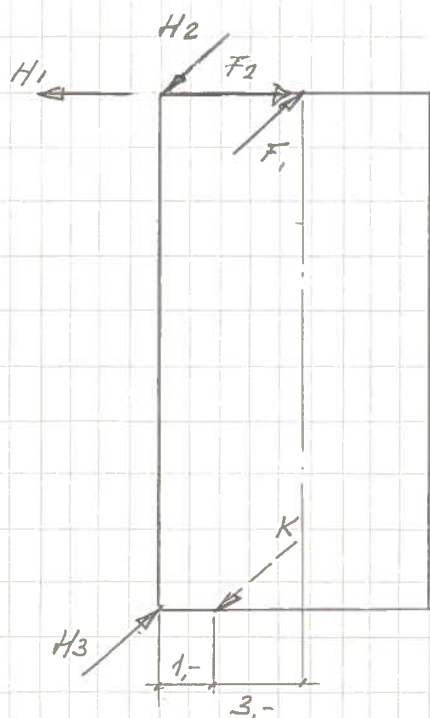
$$H_3 = 1240 \text{ KN}$$

MET DEZE STAND WORDT NIET GEREKEND.

2^e DUNPERSKRACHT $F_1 = 191 \text{ KN} \perp$ OP DEUR

$F_2 = 244 \text{ KN} \parallel$ DEUR.

(DEUR BYNA GESLOTEN)



DOOR F_1 : = 191 KN

$$H_1 = 0$$

$$H_2 = 191 \text{ KN}$$

$$K = \frac{191 \times 4}{1} = 764 \text{ KN}$$

$$H_3 = 764 \text{ KN.}$$

DOOR F_2 : = 244 KN.

$$H_1 = 244 \text{ KN.}$$

$$H_2 = 0$$

$$K = \frac{244 \times 0.64}{1} = 156 \text{ KN.}$$

$$H_3 = 156 \text{ KN.}$$

PUNTDEUREN

KRACHT OP BOVENDRAALPUNT WORDT:

$$H = \sqrt{(106+244)^2 + 191^2} = \underline{\underline{399 \text{ KN.}}}$$

$$V = 0$$

KRACHT OP ONDERDRAALPUNT WORDT:

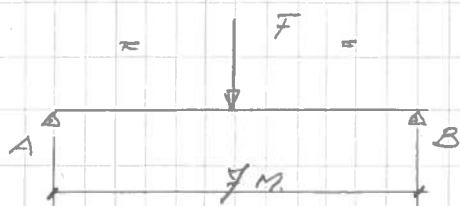
$$H = \sqrt{(106)^2 + (764+156)^2} = \underline{\underline{926 \text{ KN.}}}$$

$$V = \underline{\underline{400 \text{ KN.}}}$$

PUNTDEUREN

STERKTE BOVENREGEN T.G.V. DUWERS KRACHT

ALS LÏFPLAATBREEDTE WORDT GENOMEN $690 \times 10 \text{ mm}$
 FLENS $200 \times 10 \text{ mm}$
 (ZIE BLZ. 20)



DEUR IN GESLOTEN STAND
 DUWERS KRACHT $F = 191 \text{ kN}$
 BLYFT AANWEZIG.

BELASTING DOOR WATERDRUK IS NIHIŁ

$$R_A = R_B = 191 \times \frac{1}{2} = 96 \text{ kN.}$$

$$M_{\text{MAX.}} = \frac{1}{4} \cdot 191 \cdot 7 = 334 \text{ kNm.}$$

$$A = 25100 \text{ mm}^2$$

$$W_1 = 9675 \times 10^3 \text{ mm}^3$$

$$W_2 = 2746 \times 10^3 \text{ mm}^3$$

$$I = 1519 \times 10^6 \text{ mm}^4$$

$$\text{SPATKRACHT} = 3 \times 96 = 288 \text{ kN} \rightarrow M = 288 \times 0,083 = 24 \text{ kNm}$$

$$M_{\text{TOT.}} = 334 + 24 = 358 \text{ kNm}$$

$$\sigma_{\text{PL.}} = \frac{358 \times 10^6 \times 1,5}{9675 \times 10^3} - \frac{288 \times 10^3 \times 1,5}{25100} = 38 \text{ N/mm}^2.$$

$$\sigma_{\text{FL.}} = \frac{358 \times 10^6 \times 1,5}{2746 \times 10^3} - \frac{288 \times 10^3 \times 1,5}{25100} = 213 \text{ N/mm}^2.$$

DOORBUIGING:

$$\delta M = \frac{0,99 \times 191 \times 7^3 + 5,96 \times 24 \times 7^2}{1519 \times 10^2} \times 10 = 4,7 \text{ mm} = \frac{l}{1490}$$

DWARSKRACHT = 96 kN.

VOOR AFSCHUIVING: $A = 690 \times 10 = 6900 \text{ mm}^2$

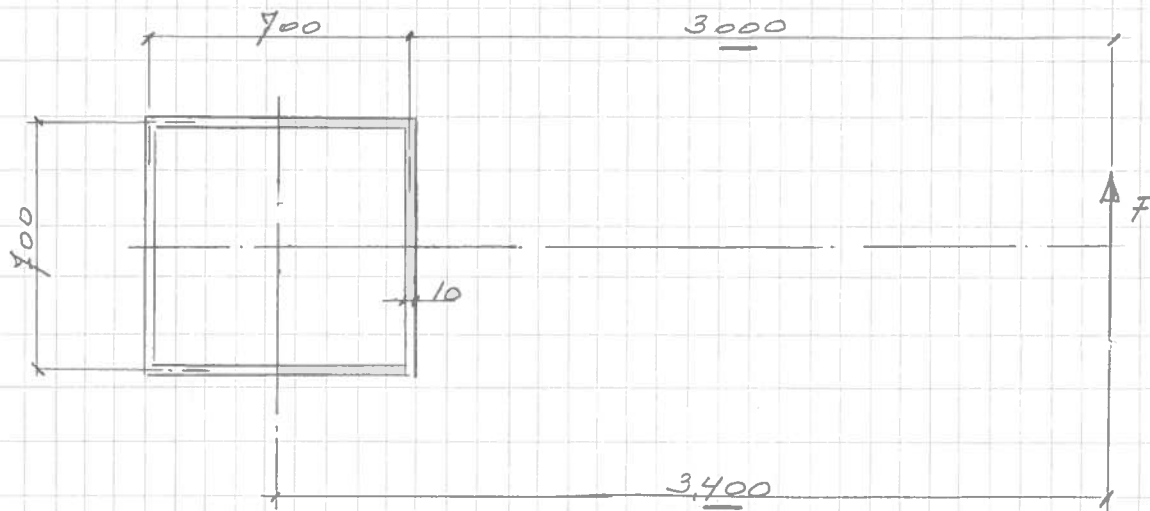
$$\tau = \frac{96 \times 10^3 \times 1,5}{6900} = 21 \text{ N/mm}^2 < 0,58 \times 360$$

$$\sigma_c = \sqrt{213^2 + 3 \times 21^2} = 216 \text{ N/mm}^2 < 1,2 \times 360$$

TORSIE BELASTING T.G.V. DUNPERSKRACHT

DEUR OP OBSTAKEL DUNPERSKRACHT $F = 191 \text{ kN}$.

DOORSNEDE KOKER WORDT GENOMEN $700 \times 700 \times 10 \text{ mm}$



$$M_{\text{KOKER}} = 191 \times 3,4 = 649 \text{ kNm.}$$

$$W_w = 2 \times 700^2 \times 10 = 9800 \times 10^3 \text{ mm}^3.$$

$$\tau_w = \frac{649 \times 10^6 \times 1,5}{9800 \times 10^3} = \underline{\underline{99 \text{ N/mm}^2}} < 0,58 \sigma_e$$

BOVENREGL:

$$M_b = 191 \times 3 = 573 \text{ kNm.}$$

$$W_{\text{MIN}} = 2746 \times 10^3 \text{ mm}^3$$

VOOR AFSCHUIVING: $A = 690 \times 10 = 6900 \text{ mm}^2.$

$$\sigma_b = \frac{573 \times 10^6 \times 1,5}{2746 \times 10^3} = 313 \text{ N/mm}^2 < 360$$

$$\tau = \frac{191 \times 10^3 \times 1,5}{6900} = 42 \text{ N/mm}^2 < 0,58 \times 360$$

$$\sigma_d = \sqrt{313^2 + 3 \times 42^2} = \underline{\underline{321 \text{ N/mm}^2}} < 1,2 \times 360$$

$$\sigma = \sqrt{170^2 + 3 \times 34^2} = \underline{187 \text{ N/mm}^2} \approx 1,2 \times 300$$

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werk: KANAAL WESSEM-NEDERWEERT datum: SEPT. '85

blz.

27

DOORSNEDE II

$$M = 399 \times 0,2 = 80 \text{ KNM}$$

$$W = 0,1 \times 200^3 = 20 \times 10^4 \text{ MM}^3$$

$$\sigma_b = \frac{80 \times 10^6 \times 1,5}{20 \times 10^4} = 150 \text{ N/MM}^2 < 300$$

$$\tau = \frac{399 \times 10^3 \times 1,5}{51 \times 100^2} = 19 \text{ N/MM}^2 < 0,58 \times 300$$

$$\sigma_d = \sqrt{150^2 + 3 \times 19^2} = \underline{154} \text{ N/MM}^2 < 1,2 \times 300$$

DOORSNEDE III

$$M = 133 \times 0,015 = 2 \text{ KNM}$$

$$W = 0,1 \times 80^3 = 51 \times 10^3 \text{ MM}^3$$

$$\sigma_b = \frac{2 \times 10^6 \times 1,5}{51 \times 10^3} = 59 \text{ N/MM}^2 < 300$$

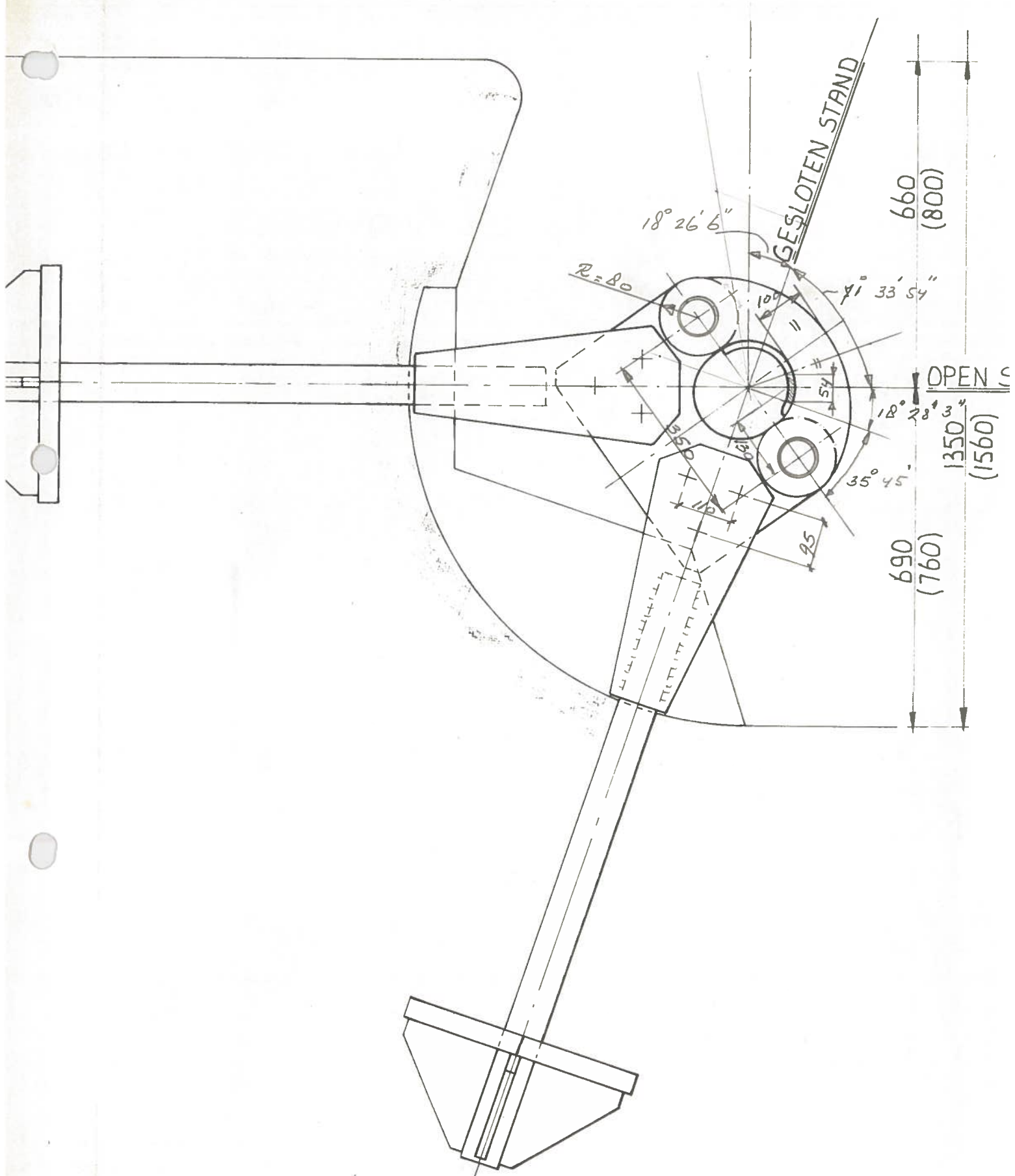
$$\tau = \frac{133 \times 10^3 \times 1,5}{51 \times 40^2} = 40 \text{ N/MM}^2 < 0,58 \times 300$$

$$\sigma_d = \sqrt{59^2 + 3 \times 40^2} = 91 \text{ N/MM}^2 < 1,2 \times 300$$

STUIK: $\bar{\sigma}_{st} = 300 \text{ N/MM}^2$

DOORSNEDE II $\sigma_{st} = \frac{532 \times 10^3 \times 1,5}{50 \times 200} = 80 \text{ N/MM}^2 < 300$

DOORSNEDE III $\sigma_{st} = \frac{133 \times 10^3 \times 1,5}{80 \times 80} = 83 \text{ N/MM}^2 < 300$



HALSBUIGEL VOERING.

MAT. ALL. BRONS

$$\bar{\sigma}_0 = 50 \text{ N/mm}^2.$$

$$b = 54 \text{ mm}$$

ZIE SCHETS

$$l = 160 \text{ mm}$$

$$A = 54 \times 160 = 8640 \text{ mm}^2.$$

DOOR E.G. DEUR

$$F = 106 \text{ kN}$$

" DUW STANG

$$F = 244 \text{ kN}$$

$$F_{\text{TOT.}} = 350 \text{ kN}$$

$$\sigma_0 = \frac{350 \times 10^3}{8640} = \underline{\underline{41 \text{ N/mm}^2}} < 50$$

HALSBEUGEL

MAT. QMC 50 $\sigma_c = 240 \text{ N/mm}^2$

$$l = 350 \text{ mm}.$$

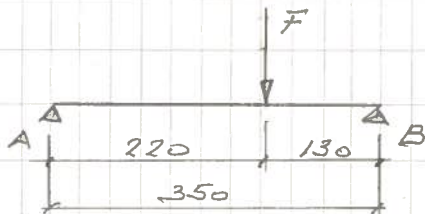
$$M_b = \frac{1}{4} \cdot 350 \cdot 0,35 = 31 \text{ kNm}.$$

$$W_b = \frac{1}{6} \cdot 160 \times 100^2 = 266 \times 10^3 \text{ mm}^3$$

$$\sigma_b = \frac{31 \times 10^6 \times 1,5}{266 \times 10^3} = \underline{\underline{175 \text{ N/mm}^2}} < 240$$

HALSBEUGEL DOG.

$$F = 350 \text{ kN}.$$

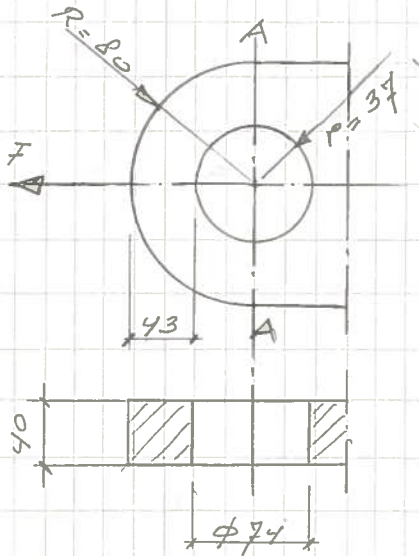


$$R_B = \frac{350 \times 220}{350} = \underline{\underline{220 \text{ kN}}}.$$

$$\text{PEN DIAM} = \phi 74 \text{ mm}.$$

ZIE VOLGENDE BLZ.:

VERVOLG HALSBEUGEL 009.



VLGS BLEICH:

KRITIEKE DOORSNEDE IS A-A

$$F = 220 \text{ KN.}$$

BIJ CONCENTRISCHE DIAMETERS
IS $e = 0$

$$K = 1 + \frac{e}{R-r} = 1$$

$$\sqrt{b} = \frac{80-34}{80+34} = 0,34 \rightarrow K_0 = 4,7$$

$$A = 4 \times 40 (80-34) = 6880 \text{ mm}^2.$$

$$\sigma = \frac{4,7 \times 220 \times 10^3 \times 1,5}{6880} = \underline{\underline{225 \text{ N/mm}^2}} < 240$$

VOOR HALSBEUGEL PLAAT MET DIKTE 80 MM
GELDT DEZELFDE SPANNING.

HALSBEUGEL PEN: MAT. FE 510 $\sigma_e = 335 \text{ N/mm}^2.$

$$F = 220 \text{ KN.}$$

$$M_B = 4 \times 220 \times 0,12 = 6,6 \text{ kNm.}$$

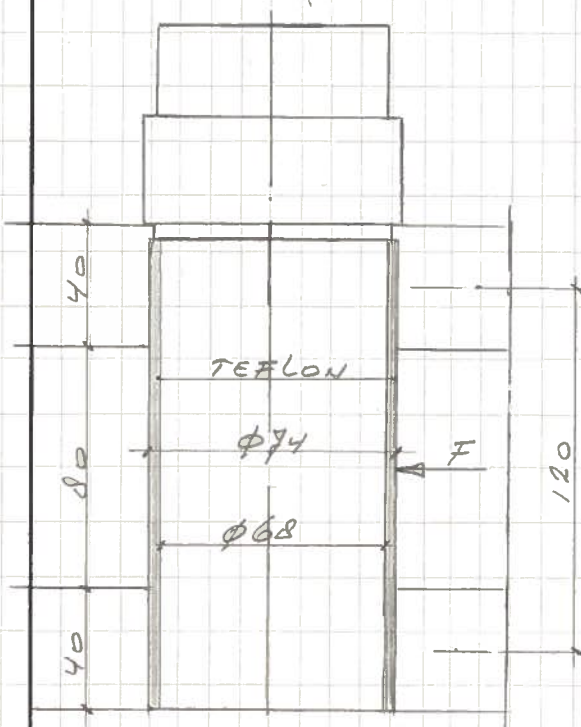
$$W_B = 0,1 \cdot 68^3 = 31400 \text{ mm}^3.$$

$$\sigma_B = \frac{6,6 \times 10^6 \times 1,5}{31400} = \underline{\underline{315 \text{ N/mm}^2}} < 335$$

$$\tau = \frac{220 \times 10^3 \times 1,5}{2 \times \pi \times 34^2} = \underline{\underline{45 \text{ N/mm}^2}}$$

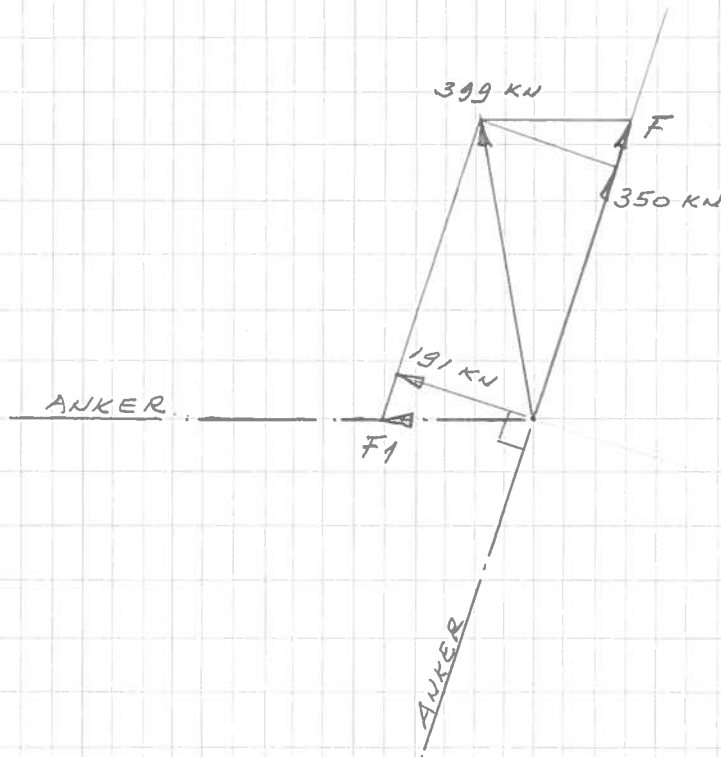
STUK DRUK OP TEFLON:

$$\sigma_{st.} = \frac{220 \times 10^3}{80 \times 74} = \underline{\underline{37 \text{ N/mm}^2}}.$$



BEVESTIGING ANKERPLAAT AAN HALS BEUGELPLAAT

ZIE SCHETS: BLZ



DOOR E.G. DEUR + DUNSTANGKRACHT:

KRACHT OP ANKERS = 399 KN.

$$F = 415 \text{ KN}$$

$$F_1 = 202 \text{ KN.}$$

BOUTEN $3 \times M36$ KNAAL: Fe510

$$\sigma_e = 360 \text{ N/mm}^2$$

PLAAT MAT Fe510 $\delta = 25 \text{ mm}$

$$\sigma_{st.} = 360 \text{ N/mm}^2$$

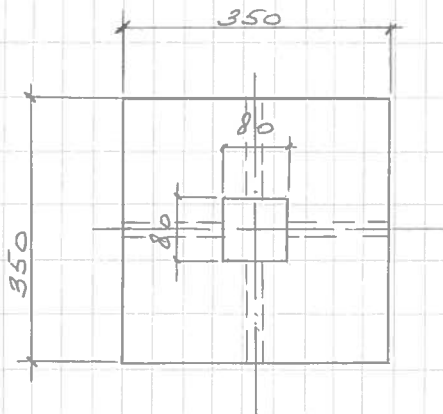
$$\text{DOORSNEDE } A = 3 \times \frac{1}{4} \pi \times 36^2 = 3053 \text{ mm}^2$$

$$\tau = \frac{415 \times 10^3 \times 1,5}{2 \times 3053} = \underline{\underline{102 \text{ N/mm}^2}} < 0,58 \times 360$$

$$\sigma_{strijk.} = \frac{415 \times 10^3 \times 1,5}{6 \times 25 \times 36} = \underline{\underline{115 \text{ N/mm}^2}} < 360$$

$$\text{TREKSPANNING IN PLAAT } \sigma_L = \frac{415 \times 10^3 \times 1,5}{2 \times 120 \times 25} = \underline{\underline{69 \text{ N/mm}^2}} < 360$$

BETONDRUK OP ANKERPLAAT DIK 40 MM.



BETON KWAL. 22,5

$$\bar{\sigma} = 13,5 \text{ N/MM}^2$$

$$A = 350 \times 350 - 80 \times 80 = 116100 \text{ MM}^2$$

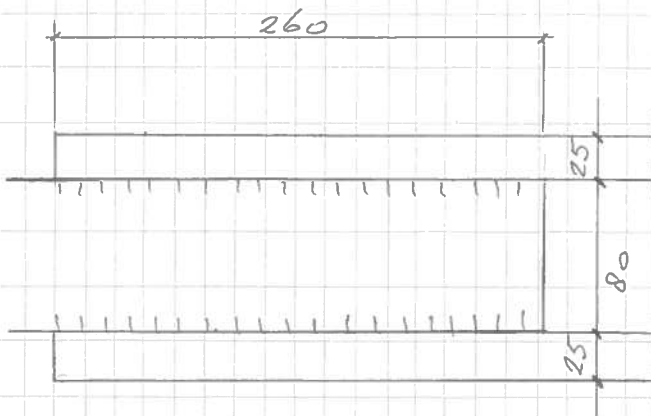
$$\sigma = \frac{415 \times 10^3}{116100} = \underline{\underline{3,6 \text{ N/MM}^2}} < 13,5$$

SCHOTTEN $\delta = 20 \text{ MM}$ TOEPASSEN
TEGEN AFBUIGING PLAAT.

LASSEN $\Delta 5$ PRACTISCH.

TREKSPANNING IN ANKERSTANG: MAT. Fe 510 $\sigma_e = 315 \text{ N/MM}^2$

$$\sigma_t = \frac{415 \times 10^3 \times 1,5}{80 \times 80} = \underline{\underline{97 \text{ N/MM}^2}} < 315$$



LASSEN ANKERPLAAT:

$\Delta 8$

PLAAT:

$$\sigma = \frac{415 \times 10^3 \times 1,5}{4 \times 260 \times 25} = 24 \text{ N/MM}^2$$

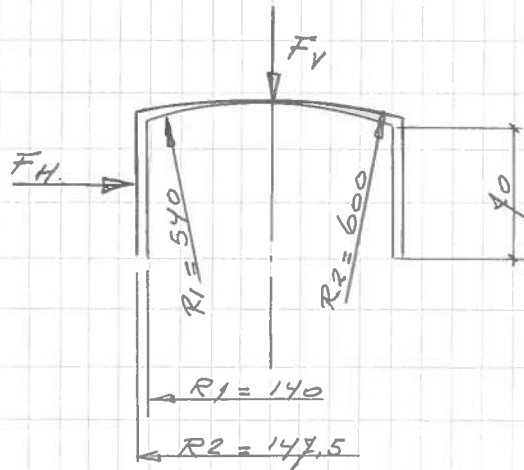
$$< 0,58 \times 360$$

$$\sigma_{del} = \frac{0,85 \times 25}{2 \times 8} \times 24 \sqrt{3} = \underline{\underline{55 \text{ N/MM}^2}} < 315$$

TAATSKOM EN KAP

HOGHE DEUR PANHEEL

MAT: MANGAANSTAAL $\bar{\sigma} = 1800 \text{ N/MM}^2$.



1^e ELKAAR RAKENDE BOLOPPERVLAKKEN:

EIGEN GEWICHT DEUR $F_V = 400 \text{ kN}$

$$\sigma_{Hz} = \sqrt[3]{1,09 \times 10^{10} \times F_V \times \rho^2} \quad \text{N/MM}^2$$

$$\rho = \frac{1}{2} \left(\frac{600 - 540}{600 \times 540} \right) = 926 \times 10^{-7}$$

$$\rho^2 = 8573 \times 10^{-12}$$

$$\sigma_{Hz} = \sqrt[3]{1,09 \times 400 \times 10 \times 8573} = \underline{\underline{334 \text{ N/MM}^2}} < 1800$$

2^e ELKAAR RAKENDE CILINDEROPPERVLAKKEN

$F_H = 926 \text{ kN}$ [UIT OBSTAKEL KRACHT + EG DEUR]
 $l = 40 \text{ mm}$.

$$\sigma_{Hz} = \sqrt[3]{0,75 \times 10^5 \times \frac{F_H \times \rho}{l}} \quad \text{N/MM}^2$$

rijkswaterstaat directie bruggen

werk: KANAAL WESSEM-NEDERWEERT

datum: SEPT, 85

blz. 3.4

PUNTDEUREN

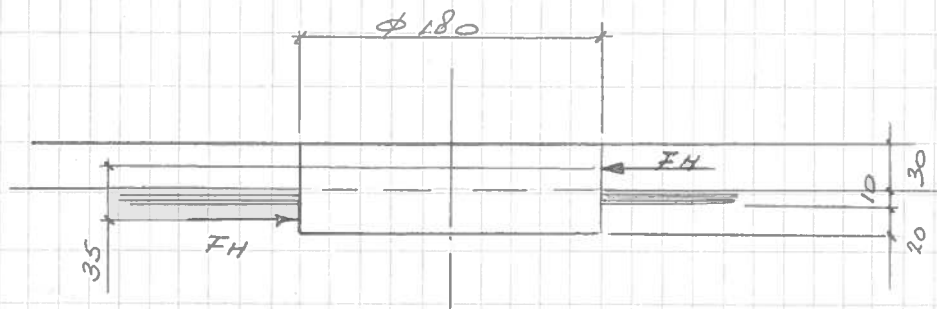
$$\rho = \frac{1}{2} \left(\frac{147,5 - 140}{147,5 \times 140} \right) = 1816 \times 10^{-7}$$

$$\sigma_{H2} = \sqrt{\frac{0,75 \times 926 \times 10 \times 1816}{70}} = \underline{\underline{424 \text{ N/mm}^2}} < 1800$$

CENTREERNOK

MAT. Fe 510

$$\sigma_e = 325 \text{ N/mm}^2$$



$$FH = 926 \text{ kN}$$

$$M = 926 \times 0,035 = 32,4 \text{ kNm}$$

$$W = 0,1 \times 180^3 = 583 \times 10^3 \text{ mm}^3$$

$$\sigma = \frac{32,4 \times 10^6 \times 1,5}{583 \times 10^3} = 83 \text{ N/mm}^2$$

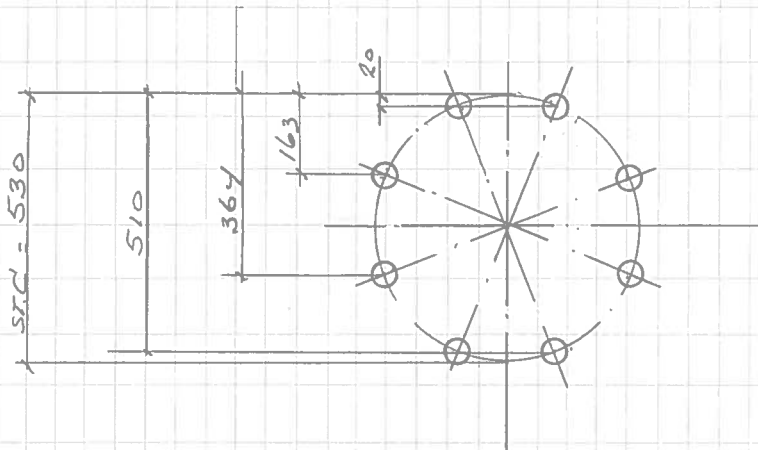
$$\bar{\sigma} = \frac{926 \times 10^3 \times 1,5}{\pi \times 90^2} = 55 \text{ N/mm}^2$$

$$\sigma_{ST} = \frac{926 \times 10^3 \times 1,5}{180 \times 20} = 386 \text{ N/mm}^2 < 1,2 \sigma_e$$

PAS BOUTEN ONDERDRAAI PUNT

MAT. FE 510 $\sigma_e = 360 \text{ N/mm}^2$

8 x M27 DRAADEIND
M30 BOUT



$$M_{\text{BOUTEN}} = 926 \times 150 = 139000 \text{ KNMM}$$

$$F_{\text{MAX. BOUT}} = \frac{139000 \times 510}{2(20^2 + 163^2 + 364^2 + 510^2)} = 84 \text{ KN}$$

$$A_s = 459 \text{ mm}^2 \rightarrow \text{M27}$$

$$\sigma_e = \frac{84 \times 10^3 \times 1.5}{459} = \underline{\underline{275 \text{ N/mm}^2}} < 360$$

TAATS

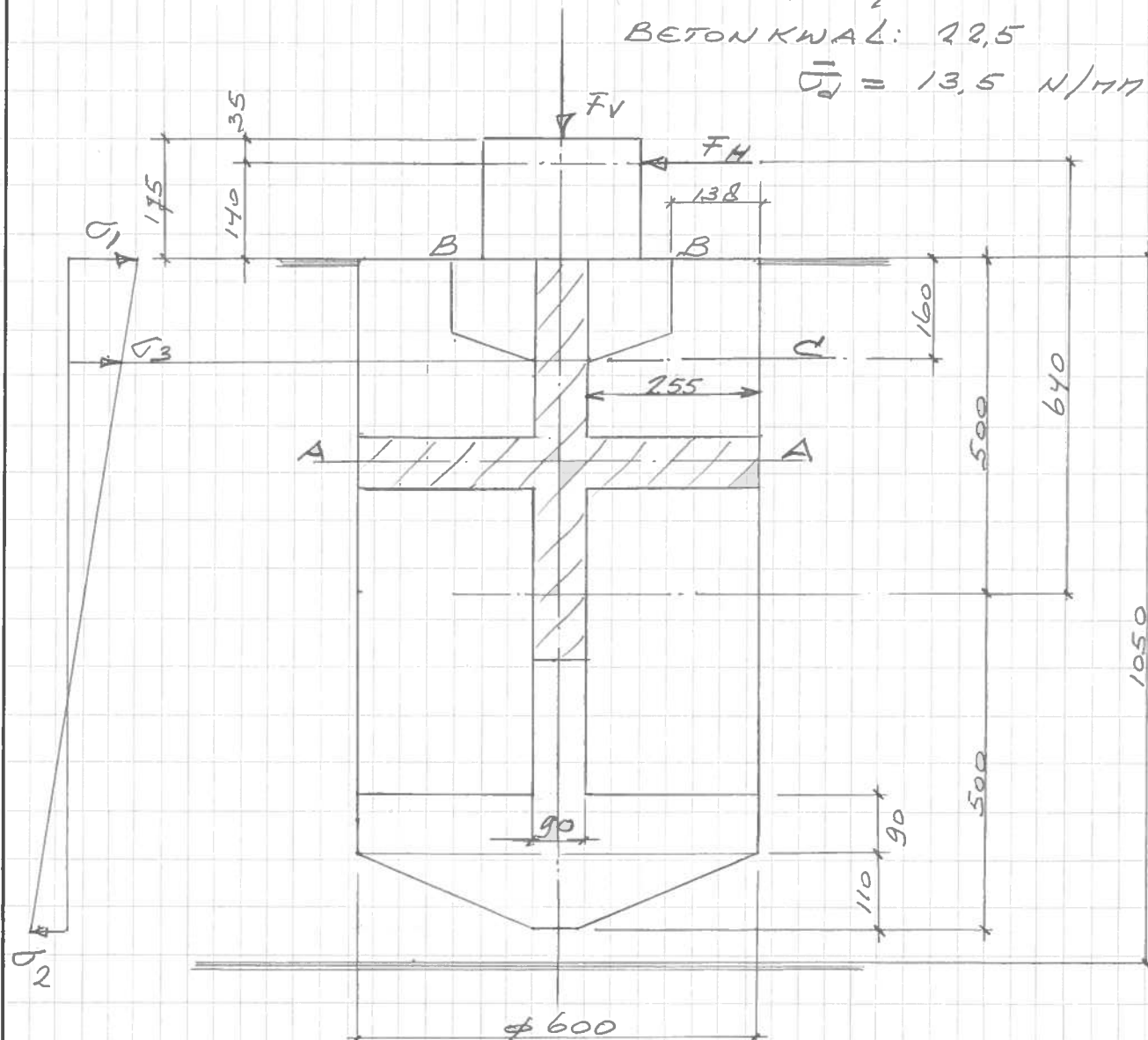
HOGHE DEUR PANHEEL

MAT. GIETSTAAL 52.

$$\sigma_R = 240 \text{ N/mm}^2$$

BETONKVAL: 22,5

$$\bar{\sigma}_d = 13,5 \text{ N/mm}^2$$



TAATSNOK: $FV = 400 \text{ kN}$.

$$\text{ONDERVLAK: } A = \pi \cdot 300^2 = 282 \times 10^3 \text{ mm}^2$$

$$\sigma_{\text{bet.}} = \frac{400 \times 10^3}{282 \times 10^3} = 1,42 \text{ N/mm}^2 < 13,5$$

DOORSN. A-A

$$FH = 926 \text{ kN. } FV = 3400 \text{ kN.}$$

$$A = 600 \times 90 = 54 \times 10^3 \text{ mm}^2$$

$$J = \frac{1}{12} \cdot 90 \cdot 600^3 = 1620 \times 10^6 \text{ mm}^4$$

rijkswaterstaat directie bruggen

werk: KANAAL NESSEM-NEDERWEERT datum: SEPT. '85

blz. 37

PUNTDELIREN.

$$W = \frac{1620 \times 10^6}{300} = 54 \times 10^5 \text{ mm}^3$$

$$M = 926 \times 0,64 = 593 \text{ kNm}$$

$$\sigma_d = \frac{593 \times 10^6 \times 1,5}{54 \times 10^5} + \frac{400 \times 10^3 \times 1,5}{54 \times 10^3} = 176 \text{ N/mm}^2 < 240$$

$$\tau = \frac{926 \times 10^3 \times 1,5}{54 \times 10^3} = 26 \text{ N/mm}^2 < 0,58 \times 240$$

$$\sigma_L = \sqrt{176^2 + 3 \times 26^2} = 182 \text{ N/mm}^2 < 1,2 \times 240$$

DOORSNEDE B-B

$$A = \pi \cdot 120^2 = 45238 \text{ mm}^2$$

$$M = 926 \times 0,14 = 130 \text{ kNm}$$

$$W = 0,1 \times 240^3 = 1382 \times 10^3 \text{ mm}^3$$

$$\sigma_d = \frac{130 \times 10^6 \times 1,5}{1382 \times 10^3} + \frac{400 \times 10^3 \times 1,5}{45238} = 154 \text{ N/mm}^2 < 240$$

$$\tau = \frac{926 \times 10^3 \times 1,5}{45238} = 31 \text{ N/mm}^2 < 0,58 \times 240$$

$$\sigma_L = \sqrt{154^2 + 3 \times 31^2} = 163 \text{ N/mm}^2 < 1,2 \times 240$$

DRUK OP BETON:

$$\sigma_d = \frac{926 \times 10^3}{600 \times 1000} = 1,54 \text{ N/mm}^2$$

$$W = \frac{1}{6} \cdot 600 \cdot 1000^2 = 100 \times 10^6 \text{ mm}^3$$

$$\sigma_d = \frac{593 \times 10^6}{100 \times 10^6} = 5,93 \text{ N/mm}^2$$

$$\sigma_1 = 7,47 \text{ N/mm}^2 < 13,5$$

$$\sigma_2 = 5,93 - 1,54 = 4,4 \text{ N/mm}^2$$

$$\sigma_3 = 5,6 \text{ N/mm}^2$$

AFBUIGING VLEUGELS T.G.V. DE DRUK

T.P.V. B. $\sigma_1 = 7,5 \text{ N/mm}^2$

PER MM. $W = \frac{1}{6} \cdot 1 \cdot 90^3 = 1350 \text{ mm}^3$
 $M = \frac{1}{2} \cdot 7,5 \cdot 130^2 = 71415 \text{ Nmm}$

$$\sigma_b = \frac{71415 \times 1,5}{1350} = 79 \text{ N/mm}^2 < 240$$

T.P.V. C

$\sigma_3 = 5,6 \text{ N/mm}^2$
 $M = \frac{1}{2} \cdot 5,6 \cdot 255^2 = 182070 \text{ Nmm}$

$$\sigma_b = \frac{182070 \times 1,5}{1350} = 202 \text{ N/mm}^2 < 240$$

DN. KRACHT = $5,6 \times 255 = 1428 \text{ N}$

$A = 1 \times 90 = 90 \text{ mm}^2$

$$\tau = \frac{1428 \times 1,5}{90} = 24 \text{ N/mm}^2 < 0,58 \times 240$$

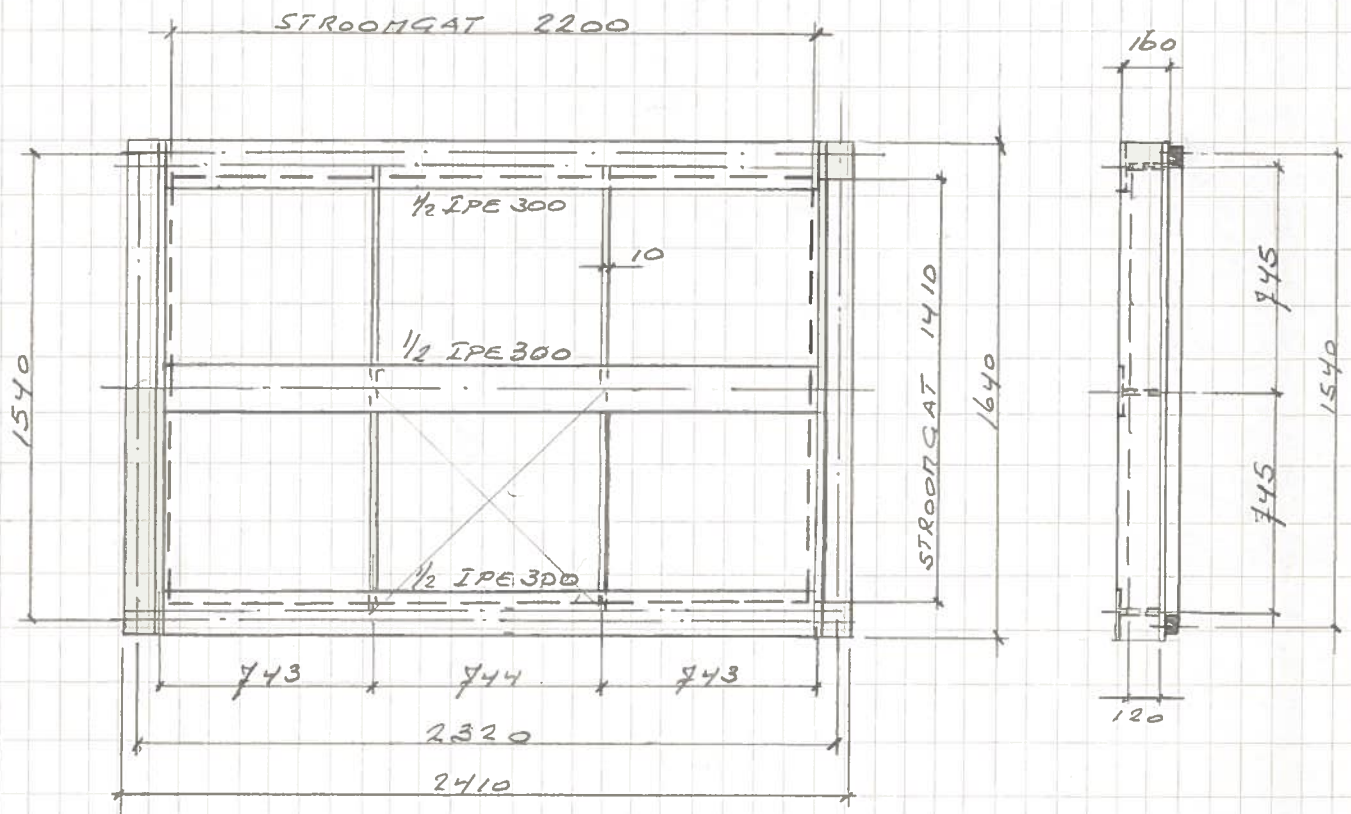
$$\sigma_i = \sqrt{202^2 + 3 \times 24^2} = \underline{\underline{206 \text{ N/mm}^2}} < 1,2 \times 240$$

rijkswaterstaat directie bruggen

werk: KANAAL WESSEM-NEDERWEERT datum: OKT. '85
HOGE PUNTDEUR PANHEEL

blz. 1

SCHUIF 2320 x 1540 mm.



WATERDRUK : $0,081 \text{ N/mm}^2$ PLAATDIKTE 10 mm . $F_e 510$

$$\frac{r_y}{r_x} = \frac{745}{744} = 1 \rightarrow \varphi = 19,4.$$

$$M_B = \frac{0,081 \times 744^2}{19,4} = 2311 \text{ Nmm}. \quad W = \frac{1}{6} \cdot 1 \cdot 10^3 = 16,7 \text{ mm}^3$$

$$\sigma_{\text{max}} = \frac{2311 \times 1,5}{16,7} = 208 \text{ N/mm}^2 < 360.$$

$$\delta_M = \frac{0,0152 \times 0,081 \times 744^4}{2,1 \times 10^5 \times 10^3} = 1,8 \text{ mm} = \frac{r}{413}$$

LASSEN PLAAT : BELASTING = $0,081 \times 745 \times 744 = 44897 \text{ N}$
= $\sim 45 \text{ kN}$.

SPANNING IN STRIP 120×10 : $\sigma_t = \frac{45 \times 10^3 \times 1,5}{745 \times 10} = 9 \text{ N/mm}^2$.

$$a_{\text{LAS}} = \frac{0,85 \times 10}{2 \times 360} \sqrt{2 \times 9^2} = 0,1 \text{ mm} \rightarrow \underline{a = 4 \text{ mm}}.$$

rijkswaterstaat directie bruggen

werk: KANAAL WESSEM NEDERWEERT

datum: OKT. '85

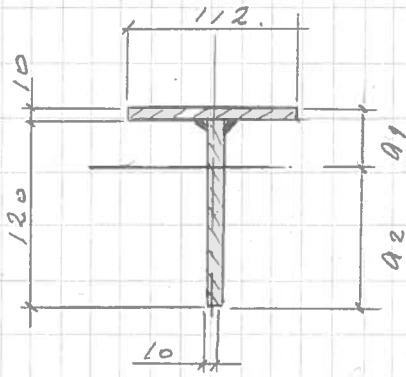
blz. 2

HOOG PUNTDEUR PANHEEL

STRIP 120x10

$$2B = 743 \quad B = 371 \text{ mm.}$$

$$L = 745 \text{ mm.}$$



$$\frac{B}{L} = \frac{371}{745} = 0,5 > 0,3$$

$$B' = 0,15 \times 371 = 56 \text{ mm.}$$

$$2 \times 56 = 112 \text{ mm}$$

$$A = 120 \times 10 + 112 \times 10 = 2320 \text{ mm}^2$$

$$a_1 = \frac{112 \times 10 \times 5 + 120 \times 10 \times 70}{2320} = 39 \text{ mm}$$

$$a^2 = 91 \text{ mm.}$$

$$J = \frac{1}{12} \cdot 112 \cdot 10^3 + 112 \times 10 \times 34^2 + \frac{1}{12} \cdot 10 \cdot 120^3 + 120 \times 10 \times 31^2 = 389 \times 10^4 \text{ mm}^4$$

$$W_1 = \frac{389 \times 10^4}{39} = 997 \times 10^2 \text{ mm}^3$$

$$W_2 = \frac{389 \times 10^4}{91} = 427 \times 10^2 \text{ mm}^3$$

$$q = 0,744 \times 81 = 60,3 \text{ kN/m'}$$

$$M_{\text{INKL.}} = \frac{1}{12} \cdot 60,3 \cdot 0,745^2 = 2,8 \text{ kNm.}$$

$$M_{\text{VELD}} = 2,8 \times \frac{1}{2} = 1,4 \text{ kNm.}$$

$$\sigma_{1 \text{ INKL.}} = \frac{2,8 \times 10^6 \times 1,5}{997 \times 10^2} = 42 \text{ N/mm}^2$$

$$\sigma_{2 \text{ INKL.}} = \frac{2,8 \times 10^6 \times 4,5}{427 \times 10^2} = \underline{\underline{98 \text{ N/mm}^2}}$$

$$\sigma_{1 \text{ VELD}} = \frac{1}{2} \times 42 = 21 \text{ N/mm}^2$$

$$\sigma_{2 \text{ VELD}} = \frac{1}{2} \times 98 = \underline{\underline{49 \text{ N/mm}^2}}$$

$$\delta_m = \frac{0,62 \times 60,3 \times 0,745^4}{389} \times 10 = \underline{\underline{0,3 \text{ mm}}}$$

rijkswaterstaat directie bruggen

werk: KANAAL WESSEM-NEDERWEERT datum: OKT, '85

blz. 3

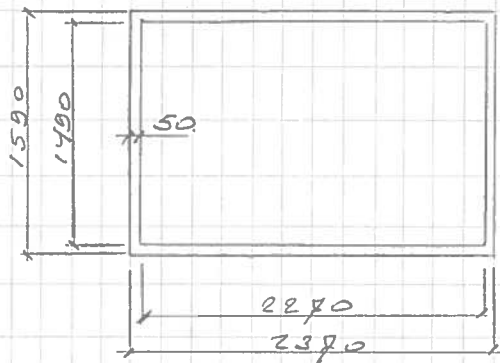
HOOG PUNTDEUR PANHEEL

AFBUIGING ZIJ PLAAT SCHUIF:

$$\text{TOTALE KRACHT OP SCHUIF} = 2,41 \times 1,64 \times 81 = 320 \text{ kN.}$$

$$\begin{aligned} \text{OPP. AFDICHTING} &= 1,59 \times 2,37 - 1,49 \times 2,27 = 0,39 \text{ m}^2 \\ &= 390000 \text{ mm}^2. \end{aligned}$$

AFDICHTING.



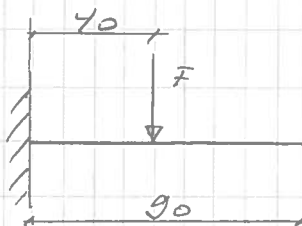
DRUK OP AFDICHTING:

$$\frac{320 \times 10^3}{390 \times 10^3} = 0,82 \text{ N/mm}^2.$$

FLENSBREEDTE 90 mm. $\delta = 10 \text{ mm.}$

STROOKJE VAN 1 mm:

$$F = 90 \times 0,82 = 74 \text{ N.}$$



$$M = 1/2 \cdot 1 \cdot 10^3 = 83 \text{ mm}^4$$

$$W = 83/5 = 16,7 \text{ mm}^3.$$

$$M = 74 \times 40 = 2960 \text{ Nmm.}$$

$$\sigma = \frac{2960 \times 1,5}{16,7} = \underline{\underline{265 \text{ N/mm}^2}} < 360$$

1 x SCHOTJE $\delta = 10$ IN LENGTE EN HOOGTE VAN DE SCHUIF TOEPASSEN.

MIDDEN LIGGER.:

$l = 2,32 \text{ m.}$ WATERDRUK 81 kN/m^2

$$q = 0,745 \times 81 = 60,3 \text{ kN/m'}$$

DOORSNEDE:

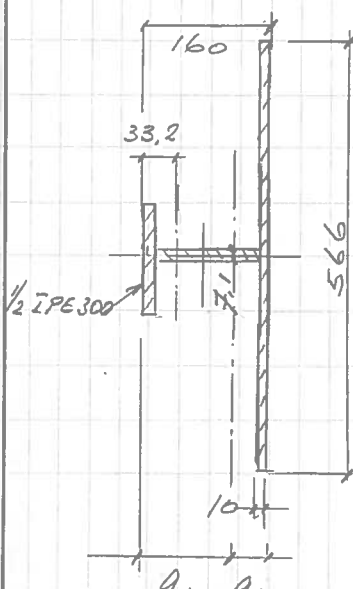
$$2B = 745 \quad B = 372$$

$$\frac{B}{L} = \frac{372}{2320} = 0,16 \rightarrow \lambda = 0,76$$

$$B' = 0,76 \times 372 = 283 \text{ mm.}$$

$$2B' = 2 \times 283 = 566 \text{ mm.}$$

$$A = 2690 + 566 \times 10 = 8350 \text{ mm}^2.$$



rijkswaterstaat directie bruggen

werk: KANAAL NESSEM - NEDERWEERT

datum: OKT. 85

blz. 4

HOGHE PUNTDEUR PANHEEL

$$a_1 = \frac{2690 \times 33,2 + 566 \times 10 \times 155}{0350} = 116 \text{ mm}$$

$$a_2 = 44 \text{ mm.}$$

$$M = 509 \times 10^4 + 2690 \times 82,8^2 + 12 \cdot 566 \cdot 10^3 + 566 \times 10 \times 39^2 = 32 \times 10^6 \text{ mm}^4$$

$$W_1 = \frac{32 \times 10^6}{116} = 275 \times 10^3 \text{ mm}^3$$

$$W_2 = \frac{32 \times 10^6}{44} = 727 \times 10^3 \text{ mm}^3$$

$$M = 18,60,3 \cdot 2,32^2 = 41 \text{ kNm.}$$

$$\sigma_1 = \frac{41 \times 10^6 \times 1,5}{275 \times 10^3} = 224 \text{ N/mm}^2 < 360 \text{ DRUK.}$$

$$\sigma_2 = \frac{41 \times 10^6 \times 1,5}{727 \times 10^3} = 85 \text{ N/mm}^2 \text{ TREK.}$$

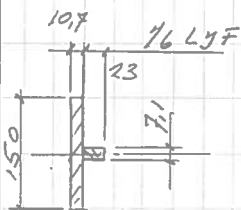
$$\text{DRUKFLENS: } \frac{h}{t_w} = \frac{160}{7,1} = 22,5 < 75 \text{ VORMVAST}$$

$$\frac{L}{h} = \frac{2320}{160} = 14,5$$

$$1,25 \times \frac{b}{t_f} = 1,25 \times \frac{150}{10,7} = 17,5$$

$$14,5 < 17,5 \rightarrow \text{NIET VORMVAST}$$

KNIKKEN DRUKRAND:



$$M_x = 1/2 \cdot 10,7 \cdot 150^3 + 1/2 \cdot 23 \cdot 7,1^3 = 3 \times 10^6 \text{ mm}^4$$

$$A = 150 \times 10,7 + 23 \times 7,1 = 1768 \text{ mm}^2$$

$$L = \sqrt{\frac{3 \times 10^6}{1768}} = 41 \quad \lambda = \frac{2320}{41} = 57$$

$$\text{VOOR } F_c 510 \rightarrow W = 1,44$$

$$\sigma = 1,44 \times 224 = 323 \text{ N/mm}^2 < 360$$

GEEN SCHOTJES

rijkswaterstaat directie bruggen

werk: KANAAL WESSEM-NEDERWEERT datum: OKT. 85

blz. 5

HOGHE PUNTDEUR PANHEEL

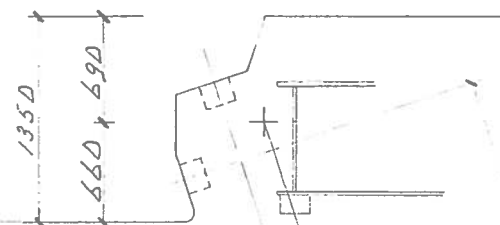
DOORBUIGING LIGGER:

$$\delta_1 = \frac{0,62 \times 60,3 \times 2,32^4}{32 \times 10^6} \times 10 = 3,4 \text{ mm} = \frac{e.}{682}$$

PUNTDEUREN

Spaarnaach LAGE DEUR PANHEEL

(UITVOERING GELIJK AAN
PUNTDEUREN ZUID-WILLEMSVAART)



$$L = \frac{\sqrt{10} \times (6300 + 660)}{3} - 100 - \frac{230}{3}$$

$$= 7059,8$$

$$q_{hd} = 20 \times 7059,8$$

$$= 565 \text{ KN}$$

$$F = \frac{1}{2} \times q = 283 \text{ KN}$$

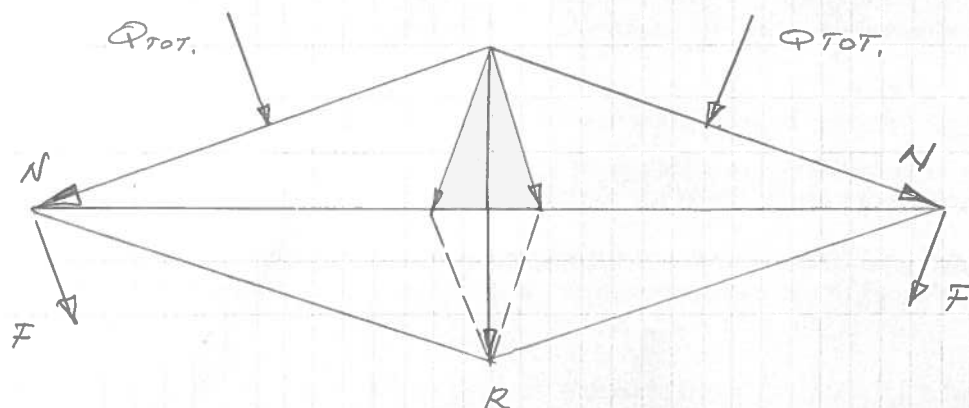
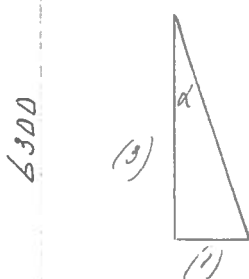
$$R = 2 \cdot \cos \alpha \cdot F$$

$$= 536 \text{ N}$$

$$\sin \alpha = 0,31623$$

$$\cos \alpha = 0,94868$$

$$N = \frac{R}{2 \sin \alpha} = 848 \text{ KN}$$



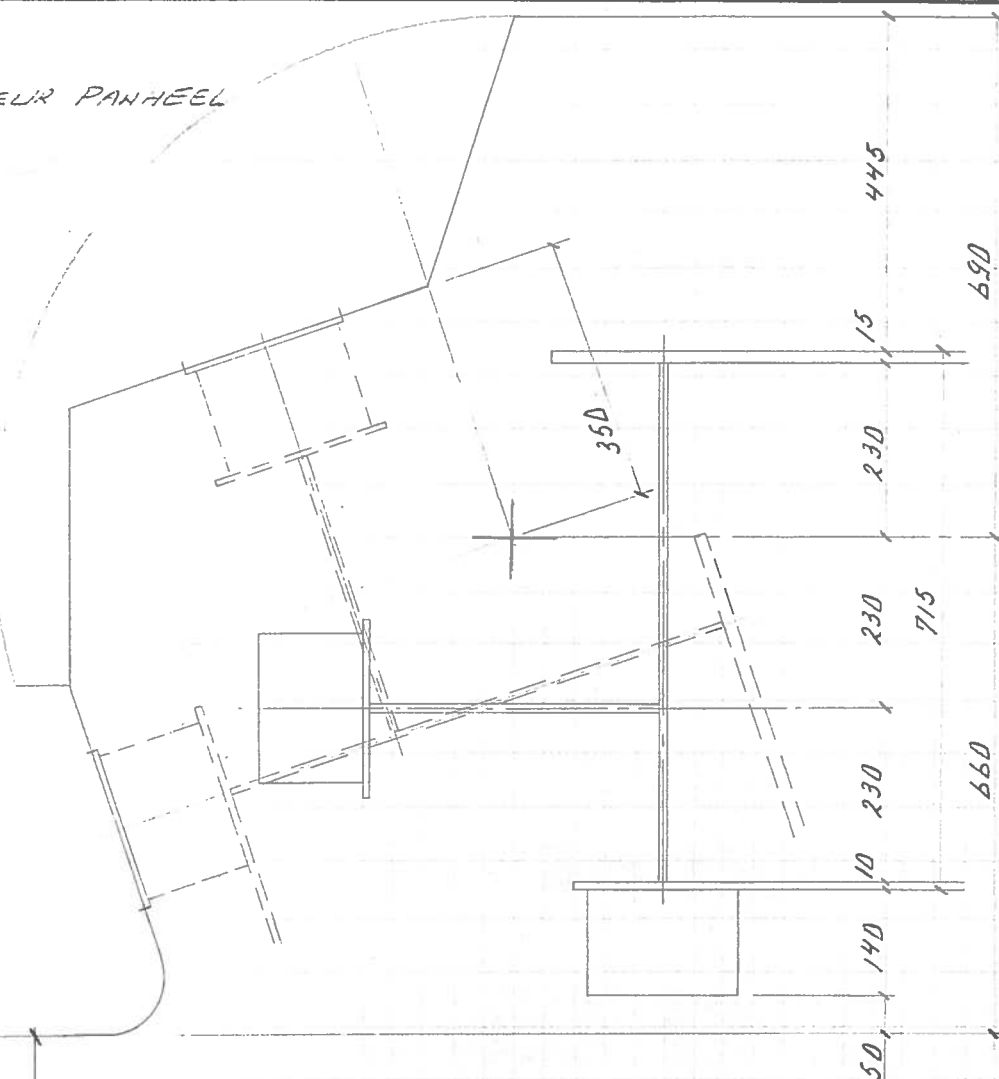
rijkswaterstaat directie bruggen

werk: KANAAL WESSEM-NEDERWEERT datum: AUG. '85

blz.

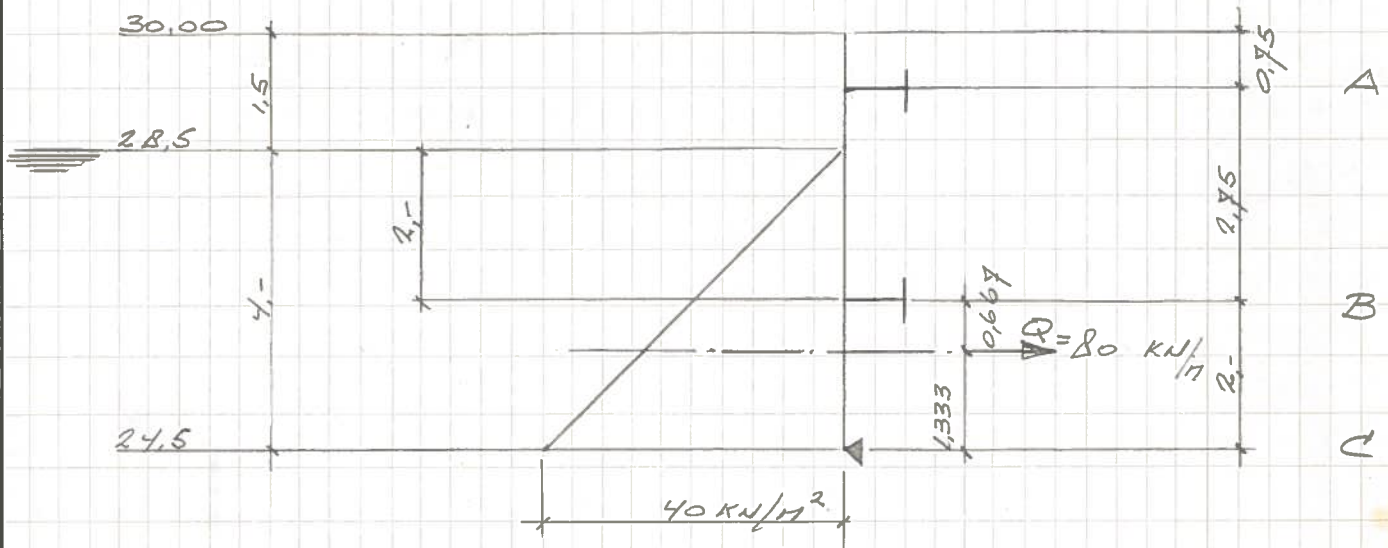
LAGE DEUR PANHEEL WESSEM-NEDERWEERT

LAGE PUNTDEUR PANHEEL



PUNT DEUREN

PANHEEL LAGE DEUR.



$$Q = 80 \text{ kN/m} \quad e = \frac{4}{3} = 1,333 \text{ m}$$

$$\text{VLGS CLAPEYRON: } \frac{80 \times 1,333 (2^2 - 1,333^2)}{6 \times 2} = \frac{M_B}{3} (2,75 + 2)$$

$$M_B = 12,48 \text{ kN/m}$$

DRUK OP REGELS:

$$\text{REGEL A} = - \frac{12,48}{2,75} = -4,54 \text{ kN/m'}$$

$$\text{REGEL B} = \frac{80 \times 1,333}{2} + \frac{12,48}{2} + \frac{12,48}{2,75} = 64,1 \text{ kN/m'}$$

$$R_C = \frac{80 \times 0,667}{2} - \frac{12,48}{2} = 20,44 \text{ kN/m'}$$

LIGGER A EN C UITVOEREN ALS LIGGER B ERP

LIGGER B UITVOEREN ALS LIGGER C ERP

rijkswaterstaat directie bruggen

werk: KANAAL WESSEM-NEDERWEERT datum: OKT. 85

blz. 1.

HOGHE PUNTDEUR PAUHEEL

GENICHTS BEGROTING

WONDERPL.	1 x	PL. 815 x 30	Lg. 915	240 KG/M ²	=	179 KG
" "	1 x	PL. 550 x 12	Lg. 900	96 "	=	48 "
SCHOT	2 x	PL. 410 x 15	" 500	120 "	=	26 "
"	10 x	PL. 514 x 12	" 900	96 "	=	467 "
RICHE PL.	1 x	PL. 7150 x 10	" 13742	80 KG/M ²	=	7860 "
BOORHAR	21 x	PL. 300 x 15	" 435	120 "	=	329 "
" "	21 x	PL. 135 x 15	" 200	120 "	=	68 "
" "	1 x	PL. 300 x 15	" 13040	35,4 KG/M ²	=	462 "
" "	1 x	PL. 200 x 15	" 13040	23,6 "	=	308 "
" "	1 x	PL. 400 x 20	" 13150	64 "	=	842 "
" "	1 x	PL. 900 x 10	" 13742	72 "	=	989 "
" "	1 x	+ 200 x 20 v	" 2488	31,4 "	=	78 "
" "	5 x	+ 200 x 20 v	" 1988	31,4 "	=	312 "
" "	1 x	+ 200 x 20 v	" 544	31,4 "	=	17 "
" "	1 x	+ 400 x 15 v	" 2488	48 "	=	119 "
" "	5 x	+ 400 x 15	" 1988	48 "	=	477 "
" "	1 x	+ 400 x 15	" 544	48 "	=	26 "
CHTERHAR	1 x	CNP 300	" 12890	46,2 "	=	596 "
CHTERHAR	1 x	CNP 200	" 12400	25,3 "	=	314 "
CHTERHAR	1 x	PL. 814 x 50	" 900	400 KG/M ²	=	293 "
CHTERHAR	18 x	PL. 295 x 15	" 470	120 "	=	316 "
"	18 x	PL. 595 x 15	" 595	120 "	=	765 "
"	1 x	PL. 595 x 30	" 595	240 "	=	85 "
"	1 x	PL. 470 x 10	" 12879	80 "	=	484 "
"	1 x	PL. 920 x 10	" 12879	80 "	=	948 "
STJL	2 x	PL. 900 x 10	" 2488	80 "	=	358 "
"	10 x	PL. 900 x 10	" 1988	80 "	=	1432 "
"	1 x	PL. 1250 x 20	" 13150	160 "	=	2630 "
						20828 KG

rijkswaterstaat directie bruggen

werk: KANAAL WESSEM - NEDERNEERT

datum:

blz.

2

HOGHE PUNTDEUR PANHEEL

20828

STIJL FLENS	1 x ∇ 200x10	Lg 2300	15,7 kg/m'	=	36 kg
	4 x ∇ 200x10	Lg 1800	"	=	113 "
	1 x ∇ 200x10	Lg 7250	"	=	114 "
ILENS REGL	2 x ∇ 200x10	Lg 5600	"	=	198 "
	1 x ∇ 300x15	Lg 5600	35,4 "	=	198 "
	2 x ∇ 400x20	Lg 5600	64 "	=	717 "
	1 x pl. 2750x20	Lg 5600	160 kg/m ²	=	154 "
REGL	1 x pl. 900x12	Lg 6444	85 kg/m'	=	548 "
"	6 x pl. 900x12	Lg 6840	"	=	3488 "
VERST.	24 x L 150.75.10	Lg 2900	17 kg/m'	=	1219 "
AFRICHT	1 x CNB 200	Lg 7100	25,3 kg/m'	=	180 "
					27,657 kg

HALSPEN

154

ZONDER KOLFERDEKING 27,811

rijkswaterstaat directie bruggen

werk: LUID-WILLEMSVAART

datum: OKT. 85

blz. 1,

PUNTDEUR ERP

GEWICHTS BEGROTING.

ONDERPL.	1 x PL. 795 x 30	LG. 815	240 kg/m ²	= 152 kg
"	1 x PL. 450 x 10	LG. 690	80 kg/m ²	= 25 "
SCHOT	2 x PL. 410 x 12.	" 500	96 "	= 39 "
"	10 x PL. 545 x 10	" 690	80 "	= 301 "
RICHTPL.	1 x PL. 7050 x 10	" 9842.	80 "	= 5551 "
BOORHAR.	15 x PL. 280 x 12.	" 330	96 "	= 133 "
"	15 x f. 100 x 12	" 200	9.42 kg/m ²	= 28 "
"	1 x PL. 280 x 10	" 9150	96 kg/m ²	= 246 "
"	1 x f. 200 x 10	" 9150	15.7 kg/m ²	= 144 "
"	1 x PL. 400 x 15	" 9250	120 kg/m ²	= 444 "
"	1 x PL. 690 x 10	" 9842	80 "	= 543 "
"	1 x f. 150 x 15	" 2590	17.7 kg/m ²	= 46 "
"	3 x f. 150 x 15	" 1990	"	= 106 "
"	1 x f. 150 x 15	" 545	"	= 10 "
"	1 x f. 300 x 10	" 2590	23.6 kg/m ²	= 61 "
"	3 x f. 300 x 10	" 1990	"	= 141 "
"	1 x f. 300 x 10	" 545	"	= 13 "
INTERHAR.	1 x CNP 240	" 2990	33.2 kg/m ²	= 298 "
AFB.	1 x CNP 200	" 8580	25.3 "	= 217 "
OVENPL.	1 x PL. 690 x 80	" 800.	400 kg/m ²	= 221 "
PL.	13 x PL. 225 x 12	" 458	96 "	= 129 "
"	12 x PL. 455 x 12	" 580	96 "	= 304 "
"	1 x PL. 455 x 30	" 580	240 "	= 63 "
"	1 x PL. 458 x 10	" 8980	80 "	= 329 "
"	1 x PL. 716 x 10	" 8980	80 "	= 514 "
STYL.	2 x PL. 690 x 10	" 2590	80 "	= 286 "
"	6 x PL. 690 x 10	" 1990	80 "	= 659 "
"	1 x PL. 1050 x 15	" 9250	120 "	= 1165 "

12168 kg

rijkswaterstaat directie bruggen

werk: LUID - WILLEMSVAART

datum: OKT. '85

blz. 2

PUNTDEUR ERP

12168

STIJL FLENS	1 x + 200 x 10	L 92400	15,7 kg/m'	=	38 kg
	2 x + 200 x 10	" 1800	"	=	57 "
FLENS REGL	2 x + 200 x 10	" 5650	"	=	89 "
"	1 x + 300 x 15	" 5650	35,4 "	=	200 "
	1 x PL. 2700 x 15	" 5650	120 kg/m ²	=	1831 "
REGL.	1 x PL. 690 x 10	" 6345	80 "	=	350 "
"	4 x PL. 690 x 10	" 6740	80 "	=	2157 "
VERST.	12 x L 150. 75. 10	" 2990	17 kg/m'	=	610 "
AFD.	1 x CNP 200	" 7000	25,3 kg/m'	=	177
					<u>17677</u>

HALSPEN

154

rijkswaterstaat directie bruggen

werk: KANAAL NESSEM-NEDERWEERT datum: OKT. '85

blz. 1.

HOGHE DEUR PANHEEL

GEWICHT SCHUIF

T.O.V. VOORKANT
AFDICHTING

KG

1 x PL. 2410 x 1640 x 10	$78,5 \text{ kg/m}^2 = 310 \times 30 = 9300$
3 x IPE 300. $l = 2220$	$2,1 \text{ kg/m}^2 = 141 \times 15,8 = 21404$
2 x $\uparrow$ 150 x 10 $l = 1640$	$11,8 \text{ kg/m}^2 = 39 \times 110 = 4290$
4 x $\uparrow$ 120 x 10 $l = 731$	$9,42 \text{ " } = 28 \times 95 = 2660$
2 x $\uparrow$ 50 x 10 $l = 139$	$3,93 \text{ " } = 1,1 \times 105 = 116$
2 x $\uparrow$ 60 x 10 $l = 60$	$4,71 \text{ " } = 0,6 \times 65 = 39$
2 x PL. 85 x 10 $l = 150$	$6,7 \text{ " } = 2, - \times 85 = 170$
4 x L 80 x 80 x 10 $l = 110$	$11,9 \text{ " } = 5,2 \times 92 = 478$
2 x PL. 139 x 16 $l = 190$	$125,6 \text{ kg/m}^2 = 6,6 \times 90 = 594$
	STAAL = <u>534</u> KG. 39051

7 STAND
LOKJE:

4 x $\uparrow$ 50 x 20 $l = 100$ $0,1 \text{ kg} = 0,4 \times 125 = 50$

4 x " " " " " " " " $0,4 \times 75 = 30$

AFDICHTING

2 x $\uparrow$ 50 x 25 $l = 2270$ $1,25 \text{ kg/m}^2 = 5,6 \times 12,5 = 70$

"

2 x $\uparrow$ 50 x 25 $l = 1640$ " $4,1 \times 12,5 = 51$

NYLON = 10,5 KG 201

TOTAAL = 545 39252.

$$n = \frac{39252}{545} = 72 \text{ MM TOT VOORKANT AFDICHT.}$$

$$= 72 - 25 = 47 \text{ MM TOT VOORK. PLAAT}$$

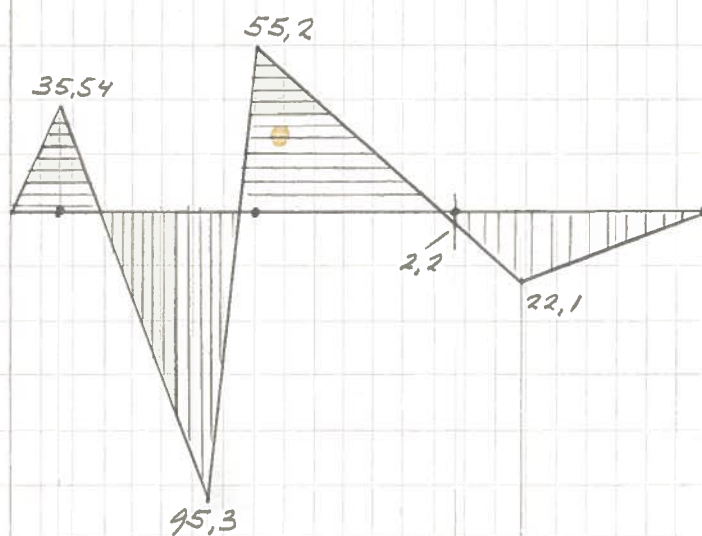
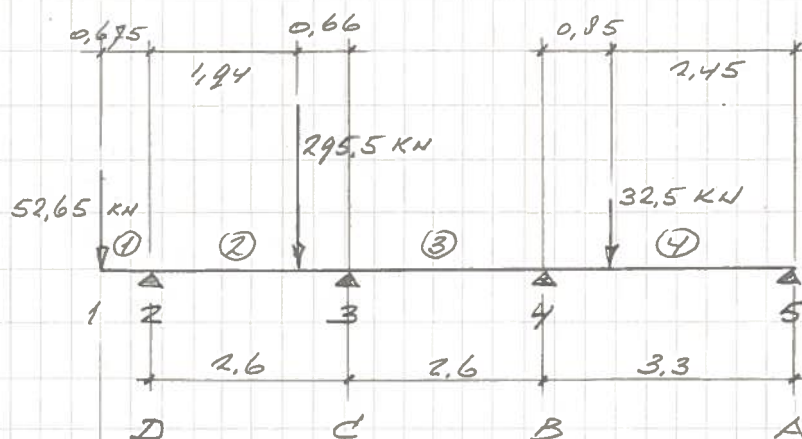
rijkswaterstaat directie bruggen

werk: KANAAL WESSEM-NEDERWEERT datum: AUG. 85

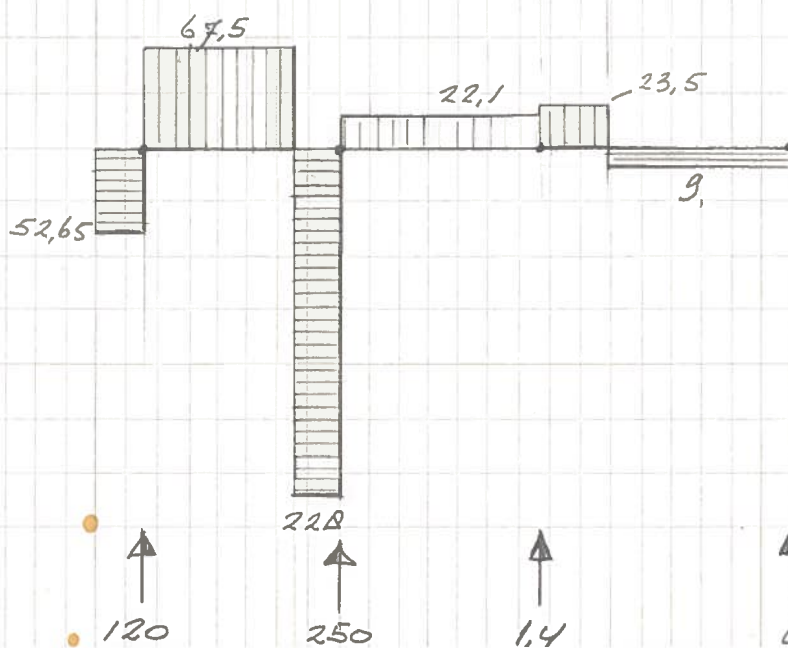
blz. 14

PUNT DEUREN.

PANHEEL HOGE DEUR
CHECK D.M.V. COMPUTER.



M-LYN.
KNM.



D-LYN
KN.

rijkswaterstaat directie bruggen

KANAAL WESSEM-NEDERWEERT

werk:

PANHEEL HOGHE DEUR.

datum: AUG. 85

blz. 15

1129 08/08/85 PAGE0005

PANHEEL HOGHE DEUR

BELASTINGGEVAL 1

STAAF	RASTERPUNT	NORMAALKRACHT KN	MOMENT KN*M	DWARSKRACHT KN
1	1	0.000	0.000	-52.650
=	1	0.000	0.000	-155.300 N.V.T.
=	2	0.000	-17.769	-52.650
=	3	0.000	-35.539	-52.650
2	4	0.000	-35.539	67.456
=	5	0.000	8.308	67.456
=	6	0.000	52.154	67.456
=	7	0.000	95.326	67.456
=	7	0.000	95.326	-228.044
=	8	0.000	-55.183	-228.044
3	9	0.000	-55.183	22.057
=	10	0.000	-40.846	22.057
=	11	0.000	-26.509	22.057
=	12	0.000	-12.172	22.057
=	13	0.000	2.165	22.057
4	14	0.000	2.165	23.473
=	15	0.000	22.117	23.473
=	15	0.000	22.117	-9.027
=	16	0.000	14.895	-9.027
=	17	0.000	7.447	-9.027
=	18	0.000	-0.000	-9.027

OPLEGREACTIES VOOR BELASTINGGEVAL 1

KNOOP	X KN	Y KN	RZ KN*M
2	0.000	-120.106	0.000
3	0.000	-250.101	0.000
4	0.000	-1.416	0.000
5	0.000	-9.027	0.000