

Stabiliteitscontrole (vlgs NEN 6771):
C1 = 1.13 C2 = 0.45 ongesteunde lengte = 5.00 m
S = 846.2 C = 1.38 Kred = 1.00
Mke = 38.45 Wke = 0.44
Mym = 13.13
TEA120 INP120 LEA120

BOUWTECHNISCH ADVIESBUREAU

beton-staal-hout-steen

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Opdrachtnr. : 8147

Omschrijving : BEDRIJFSHAL AZC TE BUDEL

Onderdeel : Constructie

Datum : 15 september 2015

Constructie berekening hal /parkeerruimte voor medische busis gekoppeld aan gebouw FN12

upload voor People Power dec 2023

BEREKENING

INHOUDSOPGAVE STATISCHE BEREKENING

Betreft Opdracht : 8147
Omschrijving : BEDRIJFSHAL AZC TE BUDEL

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10	Dakliggers
11 t/m 14	Gevelregels
15 t/m 20	Kolommen
21 t/m 22	Fundering
23	Ankerbouten

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Belastingen			
Gevolgklasse	CC1	$\gamma_f: g =$	1.2 / 1.35 / 0.9
	Bijlage B 1990NB	$\gamma_f: q =$	1.5
		$K_{FI} =$	0.9

PD1	Platdak dakhelling < 10°	
G: eg=	staaldak, isolatie, dakbedekking e.d. afwerking	0.40 kN/m ² 0.00 kN/m ²
Q:		$g_k =$ 0.40 kN/m ²
wind :	zuiging niet maatgevend	
sneeuw : vlg 1991-1-3NB		
dakhelling aansluitend dakvlak =	0 °	
$\mu_s =$	0.00	
$l_s =$	n.v.t. m	$h =$ n.v.t. m
$B_1 =$ hoge dak	n.v.t. m	$B_2 =$ lage dak n.v.t. m
$\mu_w =$	0.80	$\mu_1 =$ 0.80
$\mu_2 =$	0.80	$S_k =$ 0.7 kN/m ² art 4.1 1991-1-3-NB
indien $l_s > B_2$, moet gerekend zijn met μ'_2		
$\mu'_2 =$	n.v.t.	$\mu_{gem} =$ 0.80
C_e en $C_t = 1$ art 5.2 1991-1-3		$q_{sk} = \mu_{gem} \times C_e \times C_t \times S_k =$
		0.56 kN/m ²
Regenwater :		
Dakopstand =	50 mm	$q_k =$ 0.50 kN/m ²
personen i.v.m. werkzaamheden	$Q_k =$ (in de bouwfase)	2.00 kN
art 6.3.4.2 1991-1-1 NB	$Q_k =$	1.50 kN
	$q_k =$	0.00 kN/m ²
ψ factor=	$\psi_0 =$ 0.00	q_k maatgevend= 0.56 kN/m ²
art A1.2.2 1990NB	$\psi_2 =$ 0.00	
Belastingcombinaties : vlg tabel A1 2(B) 1990NB verg 6.10a en 6.10b		
$q_{Ed} = 1.2 \times K_{FI} \times G + 1.5 \times K_{FI} \times Q =$		1.19 kN/m ²
$q_{Ed} = 1.35 \times K_{FI} \times G + 1.5 \times K_{FI} \times Q \times \psi_0 =$		0.49 kN/m ²
$q_k = G + Q =$		0.96 kN/m ²

GV	Gevelbeplating	
$q_{Ed} = 1.2 \times K_{FI} \times G =$		0.32 kN/m ²
$q_{Ed} = 1.35 \times K_{FI} \times G =$		0.36 kN/m ²
$q_k = G =$		0.30 kN/m ²

M100	1/2-steensmuur	
$q_{Ed} = 1.2 \times K_{FI} \times G =$		2.16 kN/m ²
$q_{Ed} = 1.35 \times K_{FI} \times G =$		2.43 kN/m ²
$q_k = G =$		2.00 kN/m ²

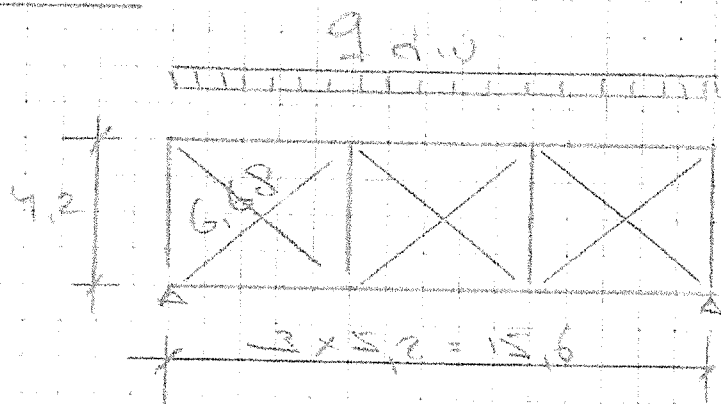
FS	Funderingsstrook	
$q_{Ed} = 1.2 \times K_{FI} \times G =$		10.80 kN/m ²
$q_{Ed} = 1.35 \times K_{FI} \times G =$		12.15 kN/m ²
$q_k = G =$		10.00 kN/m ²

Stabiliteit	
De horizontale krachten worden via verbanden in het dak en de gevels naar de fundering afgevoerd	

W1	Wind	
Q:		
wind :		
hoogte(z) =	5.50	$c_o =$ 1.00 art 4.3.3 1991-1-4
Terreincat.	onbebouwd	$c_s c_d =$ 1.00 art 6.3.1 1991-1-4
Windgebied	3	$c_r =$ 0.69 art 4.3.2 1991-1-4NB
$z_o =$	0.200	$v_m(z) =$ 17.00 art 4.2 1991-1-1NB
$z_{min} =$	4	$I_v(z) =$ 0.302
		$q_p(z) =$ 0.56
Belastingcombinaties : vlg tabel A1 2(B) 1990NB verg 6.10a en 6.10b		
$q_{Ed} = 1.5 \times K_{FI} \times Q =$		0.76 kN/m ²
$q_k = Q =$		0.56 kN/m ²

Stabilität

Dale



$$\begin{aligned} q_{dw} &= 1,5 \times 0,76 \times 2,6 = 2,57 \\ &+ 0,04 \times 0,76 \times 8,4 = 0,26 \\ &+ 1/250 Q = 0,17 \end{aligned}$$

$$3,00 \text{ kg/m}$$

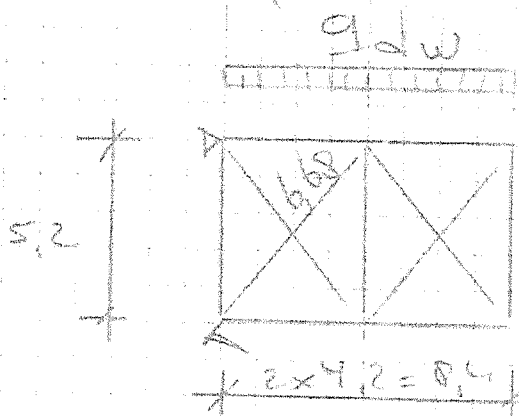
$$R_d = \frac{15,6}{2} \times 2 + 23,4 \text{ kN}$$

$$V_{d \max} = 23,4 - \frac{5,2}{2} \times 3 = 12,6 \text{ kN}$$

$$\text{diag. } T+d = 15,6 \times \frac{6,68}{4,2} = 24,8 \text{ kN}$$

$$4 \times 50 \times 50 \times 5 + 2 \text{ m } 12 \text{ (41)}$$

$$\text{o/b. vergal } T+d = \pm 21,7 \text{ kN}$$



$$q_{dw} = 3,2 \text{ kg/m}$$

$$R_d = 27,7 \text{ kN}$$

$$V_d = 27,7 - \frac{4,2}{2} \times 3,3 = 20,8 \text{ l/s}$$

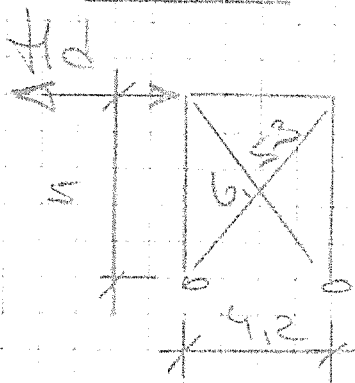
$$\text{diag. } F+d = 20,8 \times \frac{6,68}{5,2} = 26,7 \text{ l/s}$$

$$\neq 50 \times 5 + 2 \text{ m } 12 \text{ (41)}$$

$$\text{o/b-vegel } F+d = +/- 22,4 \text{ l/s}$$

Gevels

AS A



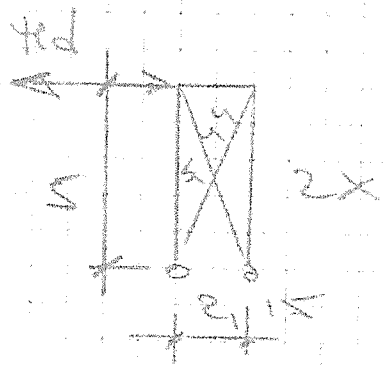
$$H_d = 23,5 \text{ l/s}$$

$$\text{diag. } F+d = 23,5 \times \frac{6,53}{4,2} = 36,5 \text{ l/s}$$

$$\neq 50 \times 5 + 2 \text{ m } 12 \text{ (41)}$$

$$V_d = +/- 27,9 \text{ l/s}$$

AS D



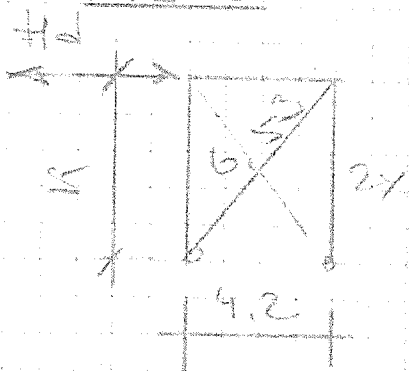
$$H_d = 23,9 \text{ l/s}$$

$$\text{diag. } F+d = \frac{23,9}{2} \times \frac{5,44}{2,15} = 29,6 \text{ l/s}$$

$$\neq 50 \times 5 + 2 \text{ m } 12 \text{ (41)}$$

$$V_d = +/- 27,2 \text{ l/s}$$

AS 1



$$H_d = 27,7 \text{ l/s}$$

$$\text{diag. } F+d = \frac{27,7}{2} \times \frac{6,53}{4,2} = 21,5 \text{ l/s}$$

$$\neq 50 \times 5 + 2 \text{ m } 12 \text{ (41)}$$

$$V_d = +/- 16,5 \text{ l/s}$$

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Kipsteun		Dak			
Profiel				K60x60x4	
$W_{pl,y} = 18.4 \text{ cm}^3$		$I_y = 45.9 \text{ cm}^4$			
$W_{pl,z} = 18.4 \text{ cm}^3$		$I_z = 45.9 \text{ cm}^4$			
$A = 8.8 \text{ cm}^2$		$t_f = 4.0 \text{ mm}$			
$h = 60.0 \text{ mm}$		$t_w = 4.0 \text{ mm}$			
$b = 60.0 \text{ mm}$					
$i_y = 2.28 \text{ cm}$		$I_t = 71.7 \text{ cm}^4$			
$i_z = 2.28 \text{ cm}$		$i_{y,d} = 235 \text{ N/mm}^2$			
$N_{Ed} =$ Uit dakverband				22.00 kN	
$L_{y,cr} =$				5.20 m	
$L_{z,cr} =$				5.20 m	
$L_{kip} =$				5.20 m	
$e_{oy} = 2.00 \text{ cm}$		$e_{oz} = 2.00 \text{ cm}$			
extra moment t.g.v. wind:					
$M_{y,Ed} = 0.00 \text{ kNm}$		$M_{z,Ed} = 0.00 \text{ kNm}$			
totaal moment:					
$M_{y,Ed} =$				0.44 kNm	
$M_{z,Ed} =$				0.44 kNm	
$M_{y,pl,d} =$				4.34 kNm	
$M_{z,pl,d} =$				4.34 kNm	
$N_{pl,d} =$				207 kN	
$C_1 = 1.750$		$C_2 = 0.000$		$\lambda_{vrel} = 2.429$	
$S = 38.7$		$C = 5.50$		$\lambda_{zrel} = 2.429$	
$K_{red} = 1.00$		$M_{ke} = 79.11 \text{ kNm}$		$\lambda_{LTrel} = 0.234$	
$\alpha_y = 0.49$		$\Phi_y = 3.996$		$\chi_y = 0.139$	
$\alpha_z = 0.49$		$\Phi_z = 3.996$		$\chi_z = 0.139$	
$\alpha_{LT} = 0.21$		$\Phi_{LT} = 0.531$		$\chi_{LT} = 0.992$	
$Y_{M0} = 1.00$		$Y_{M1} = 1.00$			
Uiterste grenstoestanden volgens NEN-EN 1993-1-1:					
(Formule)					
(Formule)					
$\frac{N_{Ed}}{\chi_y N_{Rk}/\gamma_{M1}} =$		0.761		< 1 (6.46 en 6.47)	
$\frac{M_{y,Ed}}{\chi_{LT} M_{y,pl,d}/\gamma_{M1}} =$		0.10		< 1 (6.54 en 6.55)	
$\frac{N_{Ed}}{\chi_z N_{Rk}/\gamma_{M1}} =$		0.761		< 1 (6.46 en 6.47)	
$\frac{M_{z,Ed}}{M_{z,pl,d}/\gamma_{M1}} =$		0.10		< 1 (6.54 en 6.55)	
$C_{my} = 0.6$		$k_{yy} = 0.965$		$k_{zy} = 0.579$	
$C_{mz} = 0.6$		$k_{yz} = 0.743$		$k_{zz} = 1.239$	
$\frac{N_{Ed}}{\chi_y N_{Rk}/\gamma_{M1}} + k_{yy} \frac{M_{y,Ed}}{\chi_{LT} M_{y,pl,d}/\gamma_{M1}} + k_{yz} \frac{M_{z,Ed}}{M_{z,pl,d}/\gamma_{M1}} =$		0.94		< 1 (6.61)	
$\frac{N_{Ed}}{\chi_z N_{Rk}/\gamma_{M1}} + k_{zy} \frac{M_{y,Ed}}{\chi_{LT} M_{y,pl,d}/\gamma_{M1}} + k_{zz} \frac{M_{z,Ed}}{M_{z,pl,d}/\gamma_{M1}} =$		0.95		< 1 (6.62)	
Doorbuiging					
$\delta_{max,y} = \frac{M_{y,rep} l^2}{16 E I} =$		6.43 mm		$\delta_{max,y} = \frac{M_{z,rep} l^2}{16 E I} =$	
				6.43 mm	

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Randliggers As 1+3							
L(t)=						5.20 m	
Profiel						HEA140	
A = 31.4 cm ² W _y = 155 cm ³ I _y = 1033 cm ⁴							
Wind	PD			GV	Totaal inclusief eigen gewicht		
0.98	1.19			0.32	q _{Ed} = 1,2*K _{ft} *G + 1,5*K _{ft} *Q =	4.24 kN/m'	
0.00	0.49			0.36	q _{Ed} = 1,35*K _{ft} *G + 1,5*K _{ft} *Q*ψ ₀ =	2.12 kN/m'	
0.73	0.96			0.30	q _{k (eind)} =	3.49 kN/m'	
0.73	0.56			0.00	q _{k (bijk)} =	1.75 kN/m'	
2.40				5.00	 "draagvlak"		
Sterkte:							
M _{Ed} = 0.125 x 4.24 x 5.20 ² =						14.33 kNm	
M _{el} = 0.235 x 155.0 = 36.43 kNm							
factor I.v.m. A-symmetrisch profiel = 1.00							
Doorsnede controle : 1.00 x 14.33 / 36.43 u.c. =						0.39 < 1	
Doorbuiging:							
w _{eind} = 1.00 x 6.20 x 3.49 x 5.20 ⁴ / 1033 =						15.33 mm	
w _{eind} toelaatbaar = 0.004 x 5200 =						20.80 mm	
w _{bij} = 1.00 x 6.20 x 1.75 x 5.20 ⁴ / 1033 =						7.67 mm	
w _{bij} toelaatbaar = 0.004 x 5200 =						20.80 mm	
Oplegging :							
oplegreactie = eg = 4.54 kN						N _{Ed} = 11.0 kN	
vb = 4.54 kN							

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Randligger		As 1+3			
Profiel W_{pl,y} = 119.0 cm³ W_{pl,z} = 58.9 cm³ A = 25.30 cm² h = 114.0 mm b = 120.0 mm i_y = 4.89 cm i_z = 3.02 cm I_y = 606 cm⁴ I_z = 231 cm⁴ t_f = 8.0 mm t_w = 5.0 mm I_t = 5.96 cm⁴ I_{y,d} = 235 N/mm² HEA120					
N _{Ed} = Uit dakverband				27.70 kN	
L _{y,cr} =				5.20 m	
L _{z,cr} =				5.20 m	
L _{kip} =				5.20 m	
e _{oy} = 0.00 cm				e _{oz} = 0.00 cm	
extra moment t.g.v. dak en gevel (zie balk berek.):					
M _{y,Ed} = 14.33 kNm				M _{z,Ed} = 0.00 kNm	
totaal moment:					
M _{y,Ed} =				14.33 kNm	
M _{z,Ed} =				0.00 kNm	
M _{y,pl,d} =				27.97 kNm	
M _{z,pl,d} =				13.84 kNm	
N _{pl,d} =				595 kN	
C ₁ = 1.750		C ₂ = 0.000		λ _{vrel} = 1.132	
S = 571.4		C = 5.82		λ _{zrel} = 1.834	
K _{red} = 1.00		M _{ke} = 54.13 kNm		λ _{LTrel} = 0.719	
α _y = 0.34		Φ _y = 1.300		χ _y = 0.516	
α _z = 0.49		Φ _z = 2.582		χ _z = 0.227	
α _{LT} = 0.21		Φ _{LT} = 0.813		χ _{LT} = 0.839	
Y _{M0} = 1.00		Y _{M1} = 1.00			
Uiterste grenstoestanden volgens NEN-EN 1993-1-1:					
(Formule)					
N _{Ed}				M _{y,Ed}	
=		0.090 < 1 (6.46 en 6.47)		=	
χ _y N _{Rk} /γ _{M1}				χ _{LT} M _{y,pl,d} /γ _{M1}	
=		0.205 < 1 (6.46 en 6.47)		=	
χ _z N _{Rk} /γ _{M1}				M _{z,Ed}	
				=	
				M _{z,pl,d} /γ _{M1}	
C _{mv} = 0.6		k _{yy} = 0.643		k _{zy} = 0.941	
C _{mz} = 0.6		k _{yz} = 0.463		k _{zz} = 0.772	
N _{Ed}		M _{y,Ed}		M _{z,Ed}	
+ k _{yy}		+ k _{yz}		=	
χ _y N _{Rk} /γ _{M1}		χ _{LT} M _{y,pl,d} /γ _{M1}		M _{z,pl,d} /γ _{M1}	
				0.48 < 1	
				(6.61)	
N _{Ed}		M _{y,Ed}		M _{z,Ed}	
+ k _{zy}		+ k _{zz}		=	
χ _z N _{Rk} /γ _{M1}		χ _{LT} M _{y,pl,d} /γ _{M1}		M _{z,pl,d} /γ _{M1}	
				0.78 < 1	
				(6.62)	
Doorbuiging					
δ _{max,y} =		M _{y,ren} l ²		M _{z,ren} l ²	
=		15.86 mm		=	
16 E I				16 E I	
				0.00 mm	

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1	Dakligger					
L(t) =					8.40 m	
Profiel					IPE300	
h =					300 mm	
b =					150 mm	
t _w =					7.1 mm	
t _f =					10.7 mm	
r _c =					15.0 mm	
A =					53.8 cm ²	
I _y =					8356 cm ⁴	
i _y =					12.50 mm	
I _z =					604 cm ⁴	
i _z =					3.35 mm	
W _{y,pl} =					628.0 cm ³	
I _t =					19.76 cm ⁴	
	PD			GV	Totaal inclusief eigen gewicht	
	1.19			0.32	q _{Ed} = 1.2*K _{fl} *G + 1.5*K _{fl} *Q =	7.56 kN/m ¹
	0.49			0.36	q _{Ed} = 1.35*K _{fl} *G + 1.5*K _{fl} *Q*ψ ₀ =	3.42 kN/m ¹
	0.96			0.30	q _{k (eind)} =	6.16 kN/m ¹
	0.56			0.00	q _{k (bijk)} =	3.35 kN/m ¹
5.98					➤ "draagvlak"	
Sterkte:						
V _{zpl,Rd} = 2566.97 x 235 / √3 =						348.28 kN
M _{pl,Rd} = 628.0 x 235 =						147.58 kNm
M _{Ed} = 0.125 x 7.56 x 8.40 ² =						66.68 kNm
Doorsnede controle : M _{Ed} / M _{pl,Rd} = 66.68 / 147.58 =						0.45 < 1
Stabiliteitscontrole : (vlgs NEN 6771: art. 12.2.1)						
C1 = 1.13 ongesteunde lengte (L _{kip}) =						4.20 m
C2 = -0.45 (NEN 6771: art. 12.2.5.3)						
S = 1335.31 mm C = 7.34 K _{red} = 1.00						
M _{ke} = 124.49 kNm λ _{LT} = 1.09						
NEN-EN 1993-1-1 art. 6.3.2.1						
α _{LT} = 0.21 Φ _{LT} = 1.186 χ _{LT} = 0.604						
M _{b,Rd} = χ _{LT} W _{y,pl} f _y = 89.09 kNm M _{Ed} / M _{b,Rd} = 66.68 / 89.09 =						0.75 < 1
Doorbuiging:						
w _{eind} = 1.00 x 6.20 x 6.16 x 8.40 ⁴ / 8356 =						22.77 mm
w _{bij} = 1.00 x 6.20 x 3.35 x 8.40 ⁴ / 8356 =						12.37 mm
< w _{bij} toelaatbaar = 0.004 x 8400 =						33.60 mm
w _{on} = 22.77 - 12.37 = 10.40 Zeeg =						0.00 mm
w _{eind,tot} = 22.77 - 0.00 =						22.77 mm
< w _{eind} toelaatbaar = 0.004 x 8400 =						33.60 mm
Oplegging :						
oplegreactie = eg = 11.82 kN						
vb = 14.06 kN oplegreactie= F _{Ed} = V _{Ed} =						31.8 kN

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Tussenregels gevel							
L(t)=						5.20 m	
Profiel						UNP160	
A = 24.0 cm ² W _y = 116 cm ³ I _y = 925 cm ⁴							
Wind	PD			GV	Totaal inclusief eigen gewicht		
0.98	1.19			0.32	q _{Ed} = 1.2*K _{Ft} *G + 1.5*K _{Ft} *Q =	3.03 kN/m'	
0.00	0.49			0.36	q _{Ed} = 1.35*K _{Ft} *G + 1.5*K _{Ft} *Q*ψ ₀ =	0.23 kN/m'	
0.73	0.96			0.30	q _{k (eind)} =	2.29 kN/m'	
0.73	0.56			0.00	q _{k (bijk)} =	2.10 kN/m'	
2.88					→ "draagvlak"		
Sterkte:							
M _{Ed} = 0.125 x 3.03 x 5.20 ² =							10.23 kNm
M _{el} = 0.235 x 116.0 = 27.26 kNm							
factor l.v.m. A-symmetrisch profiel = 1.25							
Doorsnede controle : 1.25 x 10.23 / 27.26 u.c. =							0.47 < 1
Doorbuiging:							
w _{eind} = 1.25 x 6.20 x 2.29 x 5.20 ⁴) / 925 =							14.00 mm
w _{eind} toelaatbaar = 0.004 x 5200 =							20.80 mm
w _{bij} = 1.25 x 6.20 x 2.10 x 5.20 ⁴) / 925 =							12.84 mm
w _{bij} toelaatbaar = 0.004 x 5200 =							20.80 mm
Oplegging :							
oplegreactie = eg = 0.49 kN							N _{Ed} = 7.9 kN
vb = 5.45 kN							

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Tussenregels gevel											
L(t)=										2.60 m	
Profiel										UNP160Z	
A = 24.0 cm ² W _z = 18.3 cm ³ I _z = 85.3 cm ⁴											
Wind		PD				GV		Totaal inclusief eigen gewicht			
0.98		1.19				0.32		q _{Ed} = 1.2*K _{rf} *G + 1.5*K _{rf} *Q =		1.82 kN/m'	
0.00		0.49				0.36		q _{Ed} = 1.35*K _{rf} *G + 1.5*K _{rf} *Q*ψ ₀ =		2.05 kN/m'	
0.73		0.96				0.30		q _{k (end)} =		1.69 kN/m'	
0.73		0.56				0.00		q _{k (bijk)} =		0.00 kN/m'	
						5.00		→ "draagvlak"			
Sterkte:											
M _{Ed} = 0.125 x 2.05 x 2.60 ² =										1.73 kNm	
M _{el} = 0.235 x 18.3 = 4.30 kNm											
factor i.v.m. A-symmetrisch profiel = 1.25											
Doorsnede controle : 1.25 x 1.73 / 4.30 u.c. =										0.50 < 1	
Doorbuiging:											
w _{eind} = 1.25 x 6.20 x 1.69 x 2.60 ⁴ / 85 =										7.01 mm	
w _{eind} toelaatbaar = 0.004 x 2600 =										10.40 mm	
w _{bij} = 1.25 x 6.20 x 0.00 x 2.60 ⁴ / 85 =										0.00 mm	
w _{bij} toelaatbaar = 0.004 x 2600 =										10.40 mm	
Oplegging :											
oplegreactie = eg = 2.19 kN										N _{Ed} =	
vb = 0.00 kN										2.7 kN	

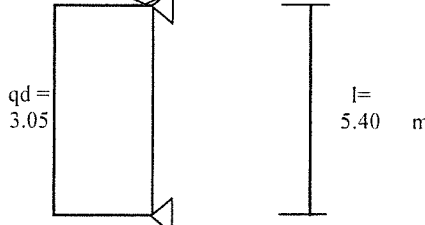
Bouwtechnisch adviesbureau v.d. Meerendonk BV te Bostel						tel : 0411 631558	
Tussenregels gevel							
Controle dubbele buiging:							
Sterkte:							
$M_{Eyd} =$							10.23 kNm
$M_{Ezd} =$							1.73 kNm
factor i.v.m. A-symmetrisch profiel =		1.25					
Doorsnede controle :		1.25 x	10.23	/	27.26	u.c. =	0.47
		1.25 x	1.73	/	4.30	u.c. =	0.50
						u.c.tot. =	0.97
							< 1

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Onderregels gevel							
L(t)=						5.20 m	
Profiel						UNP140	
A = 20.4 cm ² W _y = 86.4 cm ³ I _y = 605 cm ⁴							
Wind	PD			GV	Totaal inclusief eigen gewicht		
0.98	1.19			0.32	q _{Ed} = 1.2*K _{Fi} *G + 1.5*K _{Fi} *Q =	1.54 kN/m'	
0.00	0.49			0.36	q _{Ed} = 1.35*K _{Fi} *G + 1.5*K _{Fi} *Q*ψ ₀ =	0.19 kN/m'	
0.73	0.96			0.30	q _k (eind) =	1.18 kN/m'	
0.73	0.56			0.00	q _k (bijk) =	1.02 kN/m'	
1.40							
Sterkte:							
M _{Ed} = 0.125 x 1.54 x 5.20 ² =						5.22 kNm	
M _{gl} = 0.235 x 86.4 = 20.30 kNm							
factor i.v.m. A-symmetrisch profiel = 1.25							
Doorsnede controle : 1.25 x 5.22 / 20.30 u.c. =						0.32 < 1	
Doorbuiging:							
w _{eind} = 1.25 x 6.20 x 1.18 x 5.20 ⁴ / 605 =						11.05 mm	
w _{eind} toelaatbaar = 0.004 x 5200 =						20.80 mm	
w _{bij} = 1.25 x 6.20 x 1.02 x 5.20 ⁴ / 605 =						9.55 mm	
w _{bij} toelaatbaar = 0.004 x 5200 =						20.80 mm	
Oplegging :							
oplegreactie = eg = 0.42 kN						N _{Ed} = 4.0 kN	
vb = 2.65 kN							

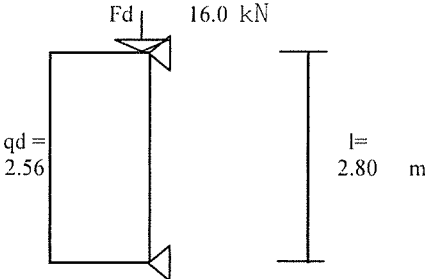
Bouwtechnisch adviesbureau v.d. Meerendonk BV te Bostel						tel : 0411 631558	
Onderregels gevel							
L(t)=						2.60 m	
Profiel						UNP140Z	
A = 20.4 cm ²							
W _z = 14.8 cm ³							
I _z = 62.7 cm ⁴							
Wind	PD			GV	Totaal inclusief eigen gewicht		
0.98	1.19			0.32	q _{Ed} = 1.2*K _{F1} *G + 1.5*K _{F1} *Q =	0.63 kN/m'	
0.00	0.49			0.36	q _{Ed} = 1.35*K _{F1} *G + 1.5*K _{F1} *Q*ψ ₀ =	0.70 kN/m'	
0.73	0.96			0.30	q _{k (eind)} =	0.58 kN/m'	
0.73	0.56			0.00	q _{k (bijk)} =	0.00 kN/m'	
				1.40	→ "draagvlak"		
Sterkte:							
M _{Ed} = 0.125 x 0.70 x 2.60 ² = 0.60 kNm							
M _{el} = 0.235 x 14.8 = 3.48 kNm							
factor I.v.m. A-symmetrisch profiel = 1.25							
Doorsnede controle : 1.25 x 0.60 / 3.48 u.c. = 0.21 < 1							
Doorbuiging:							
w _{eind} = 1.25 x 6.20 x 0.58 x 2.60 ⁴ / 63 = 3.28 mm							
w _{eind} toelaatbaar = 0.004 x 2600 = 10.40 mm							
w _{bij} = 1.25 x 6.20 x 0.00 x 2.60 ⁴ / 63 = 0.00 mm							
w _{bij} toelaatbaar = 0.004 x 2600 = 10.40 mm							
Oplegging :							
oplegreactie = eg = 0.75 kN							
vb = 0.00 kN							
						N _{Ed} =	0.9 kN

Bouwtechnisch adviesbureau v.d. Meerendonk BV te Bostel					tel : 0411 631558	
Onderregels gevel						
Controle dubbele buiging:						
Sterkte:						
$M_{Eyd} =$					5.22 kNm	
$M_{Ezd} =$					0.60 kNm	
factor I.v.m. A-symmetrisch profiel = 1.25						
Doorsnede controle :		1.25 x	5.22	/	20.30	u.c. = 0.32
		1.25 x	0.60	/	3.48	u.c. = 0.21
					u.c.tot. =	0.54
						< 1

Bouwtechnisch adviesbureau v.d. Meerendonk BV te Bostel										tel : 0411 631558	
Stalen kolom		Gevels algemeen									
Windbelasting : qd =											
C		*		Pw		*		breedte		*	
1.30		*		0.56		*		5.20		*	
										factor	
										1.35	
										=	
										5.11 kN/m	
Uit dak+gevel+wind+eg =											
Fd 61.0 kN											
Profiel											
HEA140											
WypI=											
173 cm ³											
Wzpl=											
85 cm ³											
Iy=											
1033 cm ⁴											
Iz=											
389 cm ⁴											
A =											
31 cm ²											
h =											
133 mm											
b =											
140 mm											
tf=											
5.5 mm											
tw=											
8.5 mm											
r=											
12.0 mm											
iy=											
57.3 mm											
iz=											
35.2 mm											
It=											
8.03 cm ⁴											
fy;d =											
235 N/mm ²											
Lky=											
5.40 m											
Lkz=											
5.40 m											
lmax=											
5.40 m											
Extra moment t.g.v. wind:											
Mdy=											
18.6 kNm											
Mdz=											
0.0 kNm											
Vz.s.d.=											
13.8 kN											
Vz.pl.d =											
0.58		*		235		*		1958		=	
										265.4 kN	
Npl.d=											
3140		*		235						=	
										737.9 kN	
Mv.pl.d=											
173.00		*		235						=	
										40.7 kNm	
Mz.pl.d=											
84.90		*		235						=	
										20.0 kNm	
Sterkte : vlgs art. 11.3 NEN6770											
Vz.s.d <= 0.5*Vz.pl.d											
a1		=		0.500		Ns,d<=0.5a1*Npl.d		ja			
										0.46	
										u.c. akkoord	

Bouwtechnisch adviesbureau v.d. Meerendonk BV te Boxtel										tel : 0411 631558																			
Stalen kolom					Tpv overheaddeuren																								
Windbelasting : qd =										C		*		Pw		*		breedte		*		factor				=		3.05 kN/m	
										1.30		*		0.56		*		3.10		*		1.35							
Uit dak+gevel+wind+eg =																													
Fd										47.0 kN																			
										Profiel																			
qd =										3.05																			
l =										5.40		m																	

Bouwtechnisch adviesbureau v.d. Meerendonk BV te Bostel										tel : 0411 631558	
Stabiliteitskontrolle : vlg art. 12.3.1.2.1 NEN6771											
C ₁ =	1.13	C ₂ =	-0.45								
S =	500	C =	3.26								
K _{red} =	1.00	M _{ke} =	25.91 kNm								
l _{rel} =	1.27	W _{kip} =	0.49								
F _{v,E} =	962.39 kN	n _v =	20.48								
F _{z,E} =	80.67 kN	n _z =	1.72								
l _{vrel} =	0.83	e _v =	8.42 mm								
l _{zrel} =	2.85	e _z =	13.84 mm								
a _{kv} =	0.21										
a _{kz} =	0.34										
l _o =	0.20										
$N_{c,s,d}/N_{c,u,d} + (n_v/(n_v-1)) * (M_{v,eq,u,s,d} + F_{vtot,s,d} * e_y)/(M_{v,u,d} * w_{kip}) + (n_z/(n_z-1)) * (c_v * M_{zequ,s,d})/M_{z,u,d} < 1$											
0.07	+	1.05	*	0.56	+	2.40	*	0.00	=	0.66	
										u.c. akkoord	
$N_{c,s,d}/N_{c,u,d} + (n_v/(n_v-1)) * (C_z * M_{v,eq,u,s,d})/(M_{v,u,d} * w_{kip}) + (n_z/(n_z-1)) * (M_{zequ,s,d} + F_{z,tot,s,d} * e_z)/M_{z,u,d} < 1$											
0.07	+	1.05	*	0.54	+	2.40	*	0.06	=	0.80	
										u.c. akkoord	
Doorsnede kontrolle t.b.v. torsieknikstabiliteit : vlg art. 12.3.3 NEN6770											
(M _{y;s;d} /W _{kip} /M _{y;pl;d})<=1											
										0.54	
										u.c. akkoord	
Doorbuiging :											
U _{bij} =	6.20	*	2.26	*	5.40 ^4	/	1354	=	8.79	mm	
U _{bij} toelaatbaar =										0.004	*
										5400	=
										21.60	mm

Bouwtechnisch adviesbureau v.d. Meerendonk BV te Boxtel										tel : 0411 631558							
Stalen kolom		Tpv loopdeuren															
Windbelasting : qd =																	
C		*		Pw		*		breedte		*		factor					
1.30		*		0.56		*		2.60		*		1.35		=		2.56 kN/m	
Uit dak+gevel+eg =																	
Fd 16.0 kN												Profiel		UNP160			
												WypI=		138 cm ³			
												Wzpl=		35 cm ³			
												Iy=		925 cm ⁴			
												Iz=		85 cm ⁴			
												A =		24 cm ²			
												h =		160 mm			
												b =		65 mm			
												tf=		7.5 mm			
												tw=		10.5 mm			
												r=		10.5 mm			
												iy=		62.1 mm			
												iz=		18.8 mm			
												It=		7.44 cm ⁴			
												fy;d =		235 N/mm ²			
Lky=												2.80 m					
Lkz=												2.80 m					
lmax=												2.80 m					
Extra moment t.g.v. wind:																	
Mdy=												2.5 kNm					
Mdz=												0.0 kNm					
Vz,s,d=												3.6 kN					
Vz,pl,d = 0.58 *												235 *		1899 = 257.4 kN			
Npl,d = 2401 *												235 = 564.2 kN					
Mv,pl,d = 138.00 *												235 = 32.4 kNm					
Mz,pl,d = 35.20 *												235 = 8.3 kNm					
Sterkte : vlgs art. 11.3 NEN6770																	
Vz,s,d <= 0.5*Vz,pl,d																	
a1		=		0.500		Ns,d<=0.5a1*Npl,d		ja				0.08		u.c. akkoord			

Bouwtechnisch adviesbureau v.d. Meerendonk BV te Boxtel										tel : 0411 631558	
Stabiliteitskontrolle : vlgs art. 12.3.1.2.1 NEN6771											
C ₁ =		1.13		C ₂ =		-0.45					
S =		435		C =		3.25					
K _{red} =		1.00		M _{ke} =		38.04 kNm					
l _{rel} =		0.92		W _{kip} =		0.72					
F _{v,E} =		2444.58 kN		n _v =		152.79					
F _{z,E} =		224.82 kN		n _z =		14.05					
l _{vrel} =		0.48		e _v =		3.38 mm					
l _{zrel} =		1.58		e _z =		6.90 mm					
a _{kv} =		0.21									
a _{kz} =		0.34									
l _o =		0.20									
$N_{c,s,d}/N_{c,u,d} + (n_v/(n_v-1)) * (M_{v,eq,u,s,d} + F_{v,tot,s,d} * e_y)/(M_{v,u,d} * w_{kip}) + (n_z/(n_z-1)) * (c_v * M_{zequ,s,d})/M_{z,u,d} < 1$											
0.03 + 1.01 * 0.11 + 1.08 * 0.00 =										0.14	
										u.c. akkoord	
$N_{c,s,d}/N_{c,u,d} + (n_v/(n_v-1)) * (C_z * M_{v,eq,u,s,d})/(M_{v,u,d} * w_{kip}) + (n_z/(n_z-1)) * (M_{zequ,s,d} + F_{z,tot,s,d} * e_z)/M_{z,u,d} < 1$											
0.03 + 1.01 * 0.11 + 1.08 * 0.01 =										0.15	
										u.c. akkoord	
Doorsnede kontrolle t.b.v. torsieknikstabiliteit : vlgs art. 12.3.3 NEN6770											
(M _{y;s;d} /W _{kip} /M _{y;pl;d})<=1											
0.11											
u.c. akkoord											
Doorbuiging :											
U _{bij} = 6.20 * 1.89 * 2.80 ^4 / 925 = 0.78 mm											
U _{bij} toelaatbaar = 0.004 * 2800 = 11.20 mm											

Bouwtechnisch adviesbureau v.d. Meerendonk BV te Boxtel										tel : 0411 631558				
Funderingsbelastingen														
F-last	Wind	PD				GV	M100	S300		FS	q _{rep}	q _{rep}	q _{dmax}	B 'smax:d
eg	1.00	0.40				0.30	2.00	4.00		10.00	g _k	q _k	q _{Ed}	
vb		0.56									in kN	in kN		in mm in kN/m²
1		28.7				26.0	2.0			2.00	43.27	16.05	68.40	1200 57.00
2	22.9	5.5				22.5	2.0			2.00	55.80	3.06	69.45	1200 57.88
3	-22.9	5.0				20.3	1.8			1.80	6.76	0.00	8.21	1200 6.84
4											0.00	0.00	0.00	300 0.00
5											0.00	0.00	0.00	300 0.00
6											0.00	0.00	0.00	300 0.00
7											0.00	0.00	0.00	300 0.00
8											0.00	0.00	0.00	300 0.00
9											0.00	0.00	0.00	300 0.00
10											0.00	0.00	0.00	300 0.00
11											0.00	0.00	0.00	300 0.00
12											0.00	0.00	0.00	300 0.00
13											0.00	0.00	0.00	300 0.00
14											0.00	0.00	0.00	300 0.00
15											0.00	0.00	0.00	300 0.00
16											0.00	0.00	0.00	300 0.00

De kolommen staan op gewapende funderingstroken, afm. bxbh=600x400mm²

De belastingen uit de kolommen worden over de funderingstroken gespreid over een lengte van >2m

Fd1 is Fdmax uit kolommen

Fd2 is Fdmax tpv gevelverbanden

Fd3 is Fdmin tpv gevelverbanden

Bouwtechnisch adviesbureau v.d. Meerendonk BV te Boxtel		tel : 0411 631558	
Wapening		Stroken	
$q_{Ed} =$	$(69.45/5.2) =$		13.5 kN/m
$L(t) =$			5.20 m
$B =$			600 mm
$H =$			400 mm
dekking $c_{nom} =$			35 mm
$d =$			353 mm
betonkwaliteit =		C	20 /25
betonstaalkwaliteit =		B	500 B
$f_{yd} =$			435 N/mm ²
$f_{cd} =$			13.33 N/mm ²
$M_{Ed} =$	$0.100 \times 14 \times 5.20^2$	=	36.50 kNm
$M_{Ed}/bd^2 =$			488
$\rho_l =$			0.115
$A_s =$			243 mm ²
$V_{Ed} =$	$0.50 \times 14 \times 5.20$	=	35 kN
$v_{Ed} =$	$35100 / (600 \times 353)$	=	0.17 N/mm ²
	$k = 1.75$	$v_{Rd,c} =$	0.36 N/mm ²
			geen beugels nodig
		# o 8 -150 o/b + 3 o 12 o/b (= 490mm ²)	

Ankerbouten

Voor krachten zie stabiliteits berekening

$Hd;max = 27.7kN$, $Hrep = 20.5kN$

$Vd;max = 27.9kN$

4M16 (4.6): $Vu;rep=4 \times 7.88=31.5kN > 27.7$

$Ftu;d= 4 \times 44.6 = 178.4kN >> 27.9$

$Hd;max = 23.4kN$, $Hrep = 17.4kN$

$Vd;max = 27.2kN$

2M20 (4.6): $Vu;rep=2 \times 12=24kN > 17.4$

$Ftu;d= 2 \times 70.3 = 140.6kN >> 27.2$