Static Calculation 7574

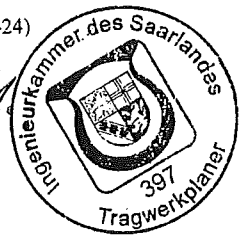
Part 7

Air Liquide AGS GmbH
Fütingsweg 34
47805 Krefeld

K70101, ASU No. 9 Kosice
Foundation Vaporizer W62001

Saarbrücken, im August 2005

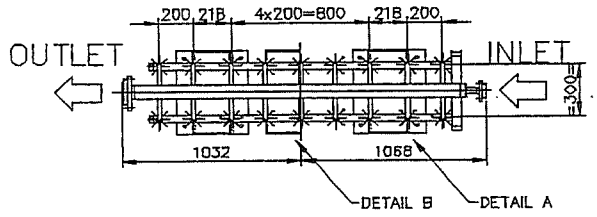
(statische Berechnung Seiten 1-24)

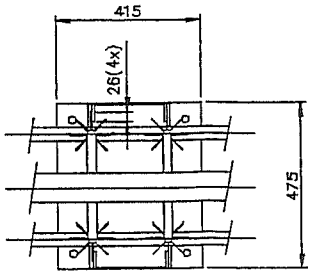


KMW
Ingenieurgesellschaft mbH
Saarbrücker Straße 9
66130 Saarbrücken-Brebach
Telefon (0681) 8 83 13-0
Telefax (0681) 8 83 13-88
E-Mail info@kmw-ing.de

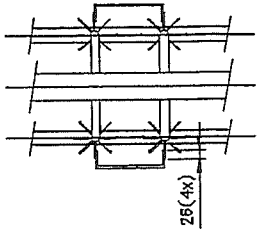
GENERAL NOTES

PRESSURE VOLUME	: 30,0 LTR
MEDIUM	: $O_2 - N_2 - AR - CO_2$
DESIGN PRESSURE	: 40 BARG
TEST PRESSURE	: 44 BARG
DESIGN TEMPERATURE	: −196/+50°C
TOTAL EMPTY WEIGHT	: ± 150 KGS.



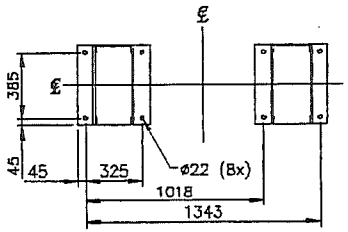


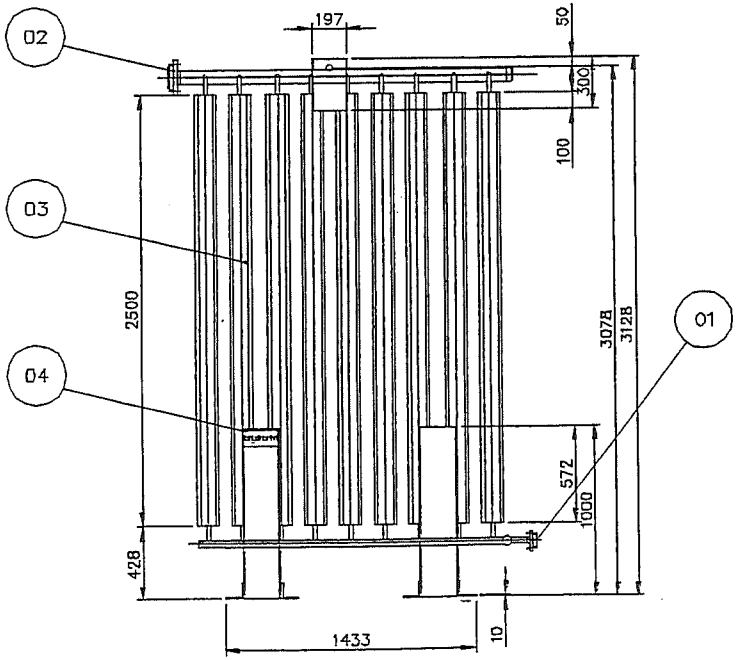
DETAIL A

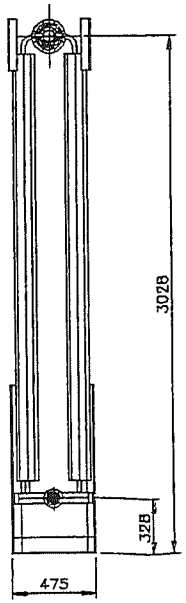


DETAIL B

FOUNDATION







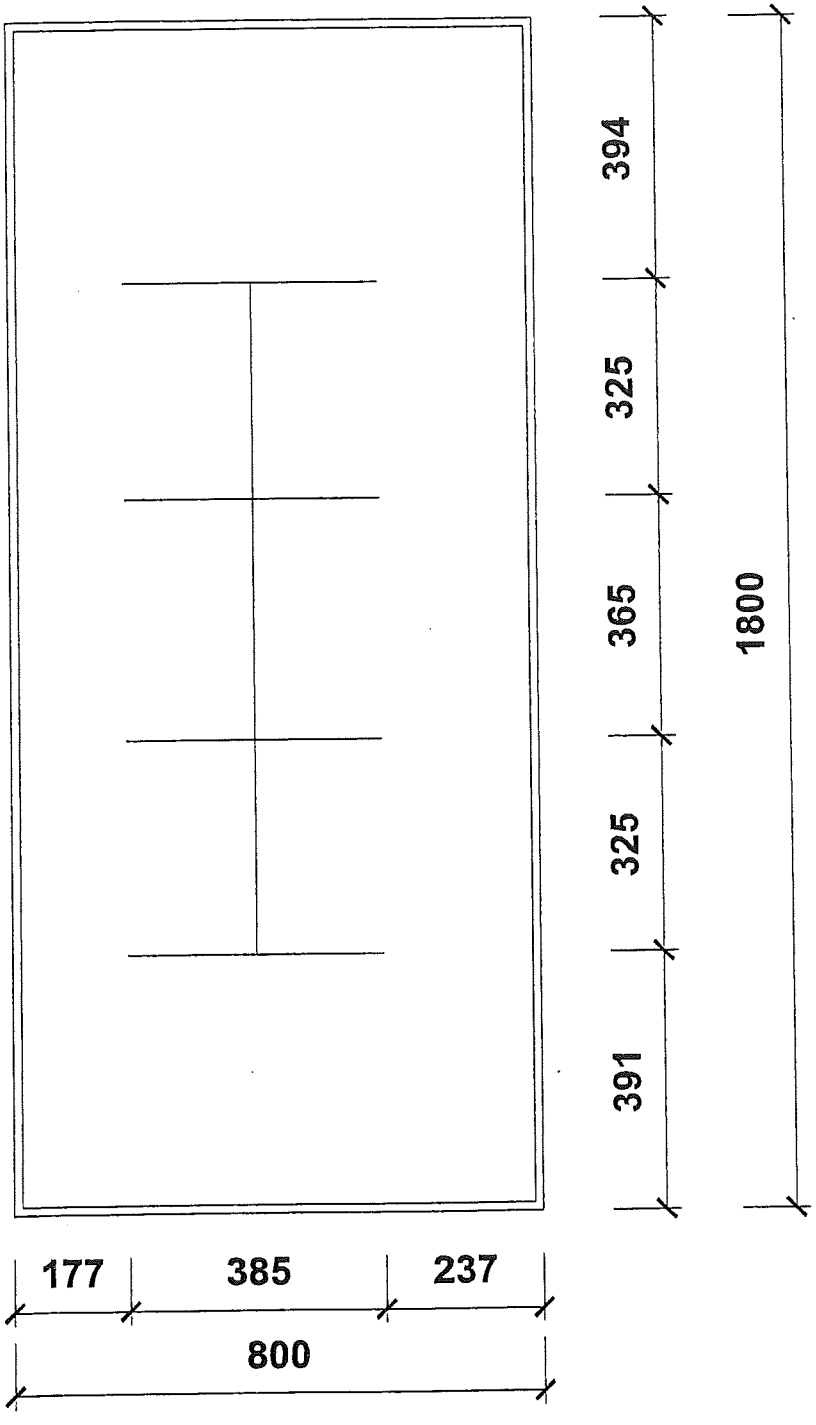
NR.	QUANT.	NAME/DESCRIPTION	DRWG.	MATERIAL	REMARKS
04	1	NAME PLATE	CN4193−4	ALUMINIUM	−
03	1	VAPORISER BLOCK	CN4615−2	ALUMINIUM	−
02	1	OUTLET FLANGE WITH MATING FLANGE DN50	1583−A3 ITEM F	ALU./AISI BRASS	−
01	1	INLET FLANGE WITH MATING FLANGE DN25	1583−A3 ITEM C	ALU./AISI BRASS	−

REV.	DESCRIPTION	DRWN.	CHK.	DATE

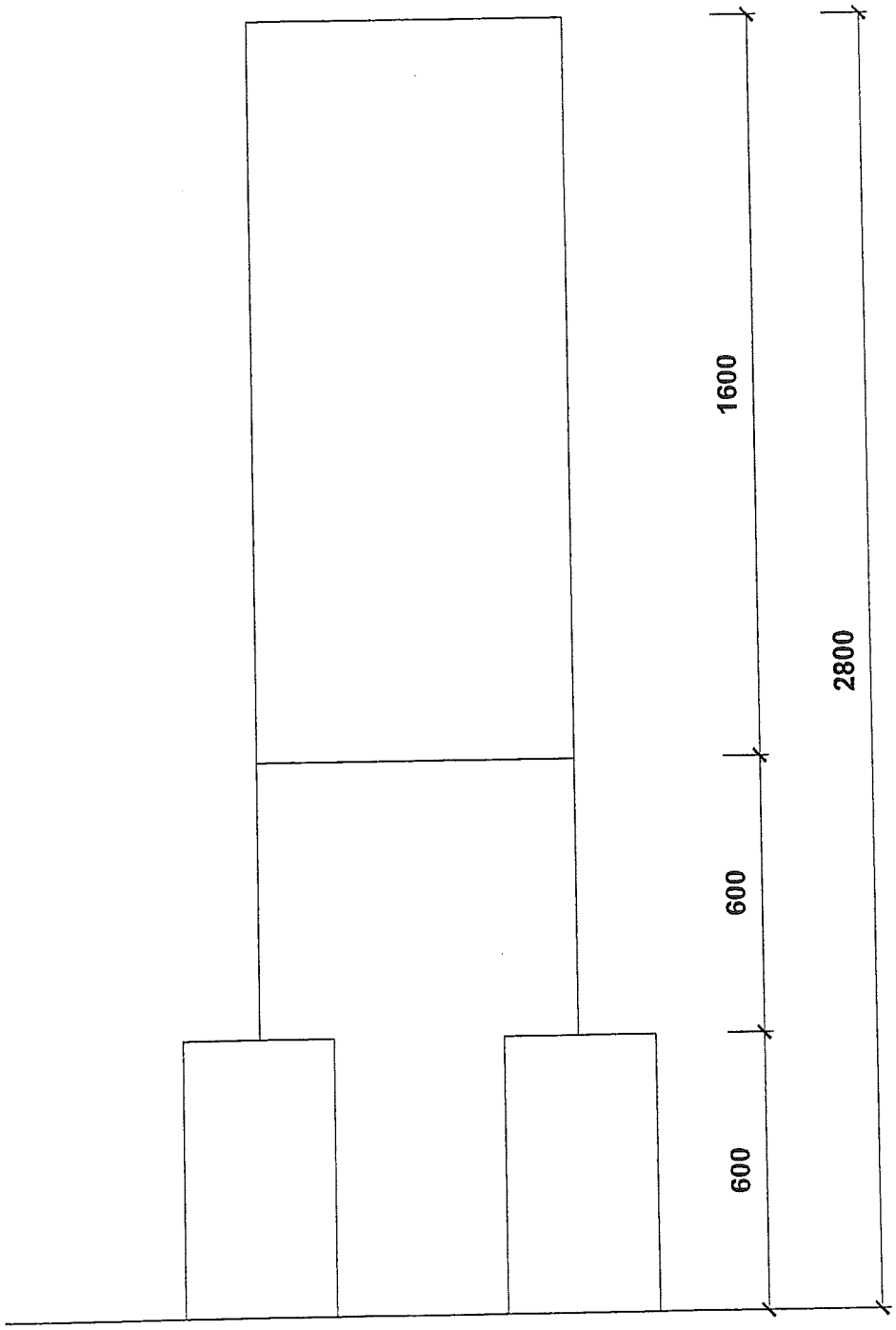
PB 2x9x2500
PRESSURE BUILD UP VAPORISER

DRWN.: R.G.	SCALE: 1:20
CHECKED:	DATE: 12−07−05
CAD NR: I:\...\R2−050223\4HC	
CN4614−2	
REPLACES:	

cryonorm BV
KOPERWEG 3
2401 LH ALPHEN A/D RIJN
THE NETHERLANDS
TEL. 0172−416060
FAX 0172−436816



h = 120 cm, B25


1600
2800
600
600

Basic data
Type of structure : General XYZ

Number of nodes:	30
Number of members:	26
Number of 1D macros:	18
Number of bound. lines:	4
Number of 2D macros:	1
Number of profiles :	3
Number of cases:	4
Number of materials:	2

Material

Name:		
B 25		
	E modulus	30000.00 MPa
	Poisson coeff.	0.20
	Density	2500.000 kg/m^3
	Extensibility	0.01 mm/m.K
B 25 gewichtslos		
	E modulus	30000.00 MPa
	Poisson coeff.	0.20
	Density	0.000 kg/m^3
	Extensibility	0.01 mm/m.K

List of material
Group of members :
1/26

no.	Name:	quality	unit weight kg/m	length m	weight kg

List of material - Macro2D
Group of members :
1/1

no.	Name:	quality	unit volume weight kgm^3	volume m^3	weight kg
4	B 25	B 25	2500.00	1.73	4320.00

The total weight of the structure: 4320.00 kg

Nodes

node	X m	Y m	Z m
1	-2.000	-2.000	-0.500
2	-1.200	-2.000	-0.500
3	-1.200	-0.200	-0.500
4	-2.000	-0.200	-0.500
5	-1.822	-1.609	-0.500
6	-1.437	-1.609	-0.500
7	-1.822	-1.284	-0.500
8	-1.437	-1.284	-0.500
9	-1.822	-0.594	-0.500
10	-1.437	-0.594	-0.500
11	-1.822	-0.919	-0.500
12	-1.437	-0.919	-0.500
13	-1.822	-1.609	0.100
14	-1.437	-1.609	0.100
15	-1.822	-1.284	0.100
16	-1.437	-1.284	0.100
17	-1.822	-0.594	0.100
18	-1.437	-0.594	0.100
19	-1.822	-0.919	0.100
20	-1.437	-0.919	0.100
21	-1.630	-0.919	0.100
22	-1.630	-0.594	0.100
23	-1.630	-1.284	0.100
24	-1.630	-1.609	0.100
25	-1.630	-0.757	0.100
26	-1.630	-1.446	0.100
27	-1.630	-1.446	0.700
28	-1.630	-1.446	2.300
29	-1.630	-0.757	0.700
30	-1.630	-0.757	2.300

Members

macro	memb	node 1	node 2	length m	Rx deg	profile	quality
1	1	13	24	0.192	0.00	3 - Lasteinleitung (Numerica...	B 25 gewichtslos
	2	24	14	0.193	0.00	3 - Lasteinleitung (Numerica...	B 25 gewichtslos
2	3	15	23	0.192	0.00	3 - Lasteinleitung (Numerica...	B 25 gewichtslos
	4	23	16	0.193	0.00	3 - Lasteinleitung (Numerica...	B 25 gewichtslos
3	5	17	22	0.192	0.00	3 - Lasteinleitung (Numerica...	B 25 gewichtslos
	6	22	18	0.193	0.00	3 - Lasteinleitung (Numerica...	B 25 gewichtslos
4	7	19	21	0.192	0.00	3 - Lasteinleitung (Numerica...	B 25 gewichtslos
	8	21	20	0.193	0.00	3 - Lasteinleitung (Numerica...	B 25 gewichtslos
5	9	5	13	0.600	0.00	3 - Lasteinleitung (Numerica...	B 25 gewichtslos
6	10	6	14	0.600	0.00	3 - Lasteinleitung (Numerica...	B 25 gewichtslos
7	11	7	15	0.600	0.00	3 - Lasteinleitung (Numerica...	B 25 gewichtslos
8	12	8	16	0.600	0.00	3 - Lasteinleitung (Numerica...	B 25 gewichtslos
9	13	9	17	0.600	0.00	3 - Lasteinleitung (Numerica...	B 25 gewichtslos
10	14	10	18	0.600	0.00	3 - Lasteinleitung (Numerica...	B 25 gewichtslos
11	15	11	19	0.600	0.00	3 - Lasteinleitung (Numerica...	B 25 gewichtslos
12	16	12	20	0.600	0.00	3 - Lasteinleitung (Numerica...	B 25 gewichtslos
13	17	24	26	0.163	0.00	3 - Lasteinleitung (Numerica...	B 25 gewichtslos
	18	26	23	0.162	0.00	3 - Lasteinleitung (Numerica...	B 25 gewichtslos
14	19	21	25	0.162	0.00	3 - Lasteinleitung (Numerica...	B 25 gewichtslos
	20	25	22	0.162	0.00	3 - Lasteinleitung (Numerica...	B 25 gewichtslos
15	21	26	27	0.600	0.00	3 - Lasteinleitung (Numerica...	B 25 gewichtslos
	22	27	28	1.600	0.00	3 - Lasteinleitung (Numerica...	B 25 gewichtslos
16	23	25	29	0.600	0.00	3 - Lasteinleitung (Numerica...	B 25 gewichtslos
	24	29	30	1.600	0.00	3 - Lasteinleitung (Numerica...	B 25 gewichtslos
17	25	27	29	0.690	0.00	3 - Lasteinleitung (Numerica...	B 25 gewichtslos

macro	memb	node 1	node 2	length m	Rx deg	profile	quality
18	26	28	30	0.690	0.00	3 - Lasteinleitung (Numerica...	B 25 gewichtslos

Boundaries

bound. line	type	node
1	Line	1,2
2	Line	2,3
3	Line	3,4
4	Line	4,1

2D Macros

num	type		
1			
	B 25	Thickness	1.20 m
	Boundary:	1,2,3,4	
	Nodes :	5,6,7,8,9,10,11,12	

Profiles

Profile no. 3 - Lasteinleitung (Numerical)
Material : 8 - B 25 gewichtslos

A:	1.000000e+003 cm^2		
Ay/A:	1.000	Az/A:	1.000
Iy:	4.000000e+004 cm^4	Iz:	4.000000e+004 cm^4
Iyz:	0.000000e+000 cm^4	It:	4.000000e+004 cm^4
Iw:	4.000000e+005 cm^6		
Wely:	4.000000e+003 cm^3	Welz:	4.000000e+003 cm^3
Wply:	4.000000e+003 cm^3	Wplz:	4.000000e+003 cm^3
cy:	0.00 cm	cz:	0.00 cm
iy:	6.32 cm	iz:	6.32 cm
dy:	0.00 cm	dz:	0.00 cm
Outline :		0.00 cm	

Type for check: Untypical section

Hinges
The stiffeness values of line hinges are stated in 1 m´ of length

memb	macro	2D macro/ bound	type	pos	flexibility kN/m-kNm/rad	funct

Design Loads

-weight Vaporier: (Loadcase No.1)

max V = 200 kg => V = 2,0/2 = 1.0 kN

-Wind: (Loadcase No.2 + No.3)

Hw = 1.2*0.5*2.1/2*3.2 = 2.02 kN

Soil - 2D macro

Index	2D macro	Name of subsoil
1	1	Sand/Clean/Moderate

Loadcases

Case	Name:	Description
1	Weight concret	Self weight. Direction -Z
2	Weight	Variable - P
3	Wind +X	Variable - Wind Excl.
4	Wind -X	Variable - Wind Excl.

Variable loads group

Name:	
P	
Wind	Excl.

Loadcase no. 2 - nodal loads

node	Fx kN	Fy kN	Fz kN	Mx kNm	My kNm	Mz kNm
27	0.00	0.00	-1.00	0.00	0.00	0.00
29	0.00	0.00	-1.00	0.00	0.00	0.00

Loadcase no. 3 - nodal loads

node	Fx kN	Fy kN	Fz kN	Mx kNm	My kNm	Mz kNm
28	2.02	0.00	0.00	0.00	0.00	0.00
30	2.02	0.00	0.00	0.00	0.00	0.00

Loadcase no. 4 - nodal loads

node	Fx kN	Fy kN	Fz kN	Mx kNm	My kNm	Mz kNm
28	-2.02	0.00	0.00	0.00	0.00	0.00
30	-2.02	0.00	0.00	0.00	0.00	0.00

Loadcase no. 3 - distributed loads

memb	macro	bound	type	dx m	exY m	exZ m	X beg end	Y beg end	Z beg end

Loadcase no. 4 - distributed loads

memb	macro	bound	type	dx m	exY m	exZ m	X beg end	Y beg end	Z beg end

Combinations

Combi	Norm	Case	coeff
1.	User-ultimate	1 Weight concret	1.00
		2 Weight	1.00
		3 Wind +X	1.00
		4 Wind -X	1.00
2.	User-serviceability	1 Weight concret	1.00
		2 Weight	1.00
		3 Wind +X	1.00
		4 Wind -X	1.00

Basic rules for generation of ultimate load combinations:
1 : 1.00*LC1 / 1.00*LC2 / 1.00*LC3 / 1.00*LC4

Basic rules for generation of serviceability load combinations:
1 : 1.00*LC1 / 1.00*LC2 / 1.00*LC3 / 1.00*LC4

List of extreme ultimate load combinations
1/ 1 : +1.00*LC1+1.00*LC2
2/ 1 : +1.00*LC1+1.00*LC3
3/ 1 : +1.00*LC1+1.00*LC4
4/ 1 : +1.00*LC1+1.00*LC2+1.00*LC3
5/ 1 : +1.00*LC1+1.00*LC2+1.00*LC4

List of extreme serviceability load combinations
1/ 1 : +1.00*LC1+1.00*LC2
2/ 1 : +1.00*LC1+1.00*LC3
3/ 1 : +1.00*LC1+1.00*LC4
4/ 1 : +1.00*LC1+1.00*LC2+1.00*LC3
5/ 1 : +1.00*LC1+1.00*LC2+1.00*LC4

Nonlinear combination

Combi	Group of init. deformations	dx mm/m	dy mm/m	Group of init. curvatures	Case	coeff
C 1	0	0.00	0.00	0	1 Weight concret	1.00
	0	0.00	0.00	0	2 Weight	1.00
C 2	0	0.00	0.00	0	1 Weight concret	1.00
	0	0.00	0.00	0	3 Wind +X	1.00
C 3	0	0.00	0.00	0	1 Weight concret	1.00
	0	0.00	0.00	0	4 Wind -X	1.00
C 4	0	0.00	0.00	0	1 Weight concret	1.00
	0	0.00	0.00	0	2 Weight	1.00
	0	0.00	0.00	0	3 Wind +X	1.00
C 5	0	0.00	0.00	0	1 Weight concret	1.00
	0	0.00	0.00	0	2 Weight	1.00
	0	0.00	0.00	0	4 Wind -X	1.00

Subsoils

Name:	Type of position	C1x kN/m^3	C1y kN/m^3	C1z kN/m^3	C2x kN/m	C2y kN/m	SigZpl kN/m^2
Sand/Clean/Moderate	Under plate, block	1000.000	1000.000	15000.000	0.000	0.000	0.000

Calculation protocol.

Linear calculation

Number of 2D elements	150
Number of 1D elements	26
Number of mesh nodes	192
Number of equations	1152
Loadcases	LC 1 Weight concret
	LC 2 Weight
	LC 3 Wind +X
	LC 4 Wind -X
Bending theory	Mindlin
Start of calculation	03.08.2005 08:11
End of calculation	03.08.2005 08:11

Sum of loads and reactions.

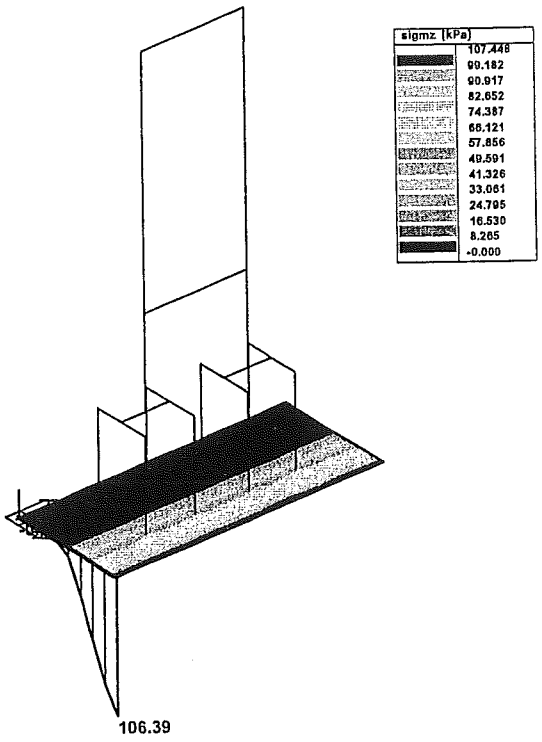
			X	Y	Z
loadcase	1	loads	0.0	0.0	-43.2
		reactions	0.0	0.0	0.0
		contact	0.0	0.0	43.2
loadcase	2	loads	0.0	0.0	-2.0
		reactions	0.0	0.0	0.0
		contact	-0.0	0.0	2.0

			X	Y	Z
loadcase	3	loads	4.0	0.0	0.0
		reactions	0.0	0.0	0.0
		contact	-4.0	-0.0	0.0
loadcase	4	loads	-4.0	0.0	0.0
		reactions	0.0	0.0	0.0
		contact	4.0	0.0	-0.0

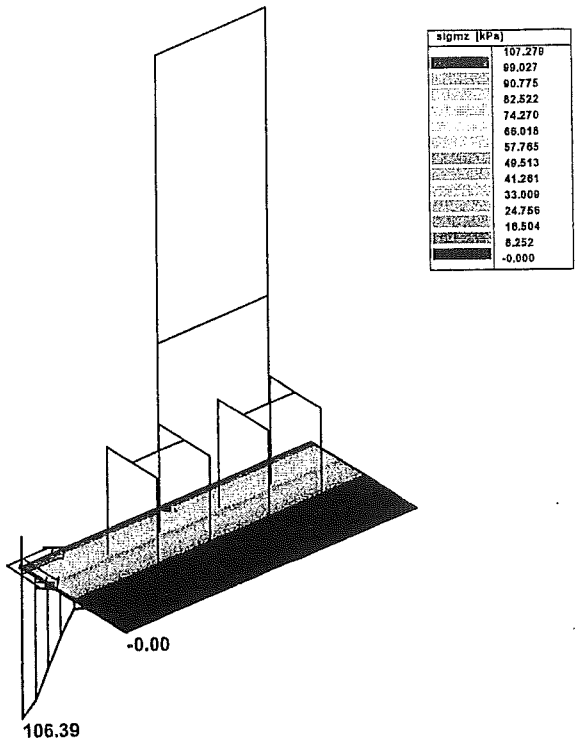
Nonlinear calculation

Number of 2D elements	150
Number of 1D elements	26
Number of mesh nodes	192
Number of equations	1152
Maximum iterations	50
Bending theory	Mindlin

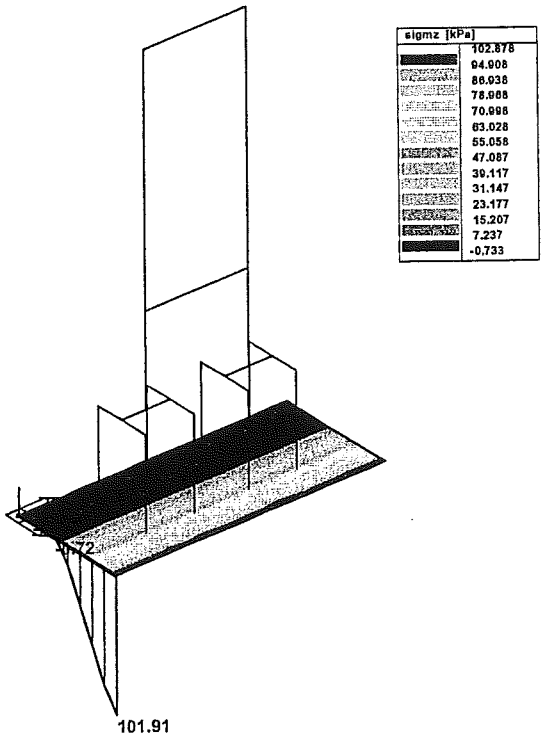
Number Combi	Start	End	NoOfIteration
NC 1	03.08.2005 08:11	03.08.2005 08:11	1
NC 2	03.08.2005 08:11	03.08.2005 08:12	4
NC 3	03.08.2005 08:12	03.08.2005 08:12	4
NC 4	03.08.2005 08:12	03.08.2005 08:12	3
NC 5	03.08.2005 08:12	03.08.2005 08:12	3



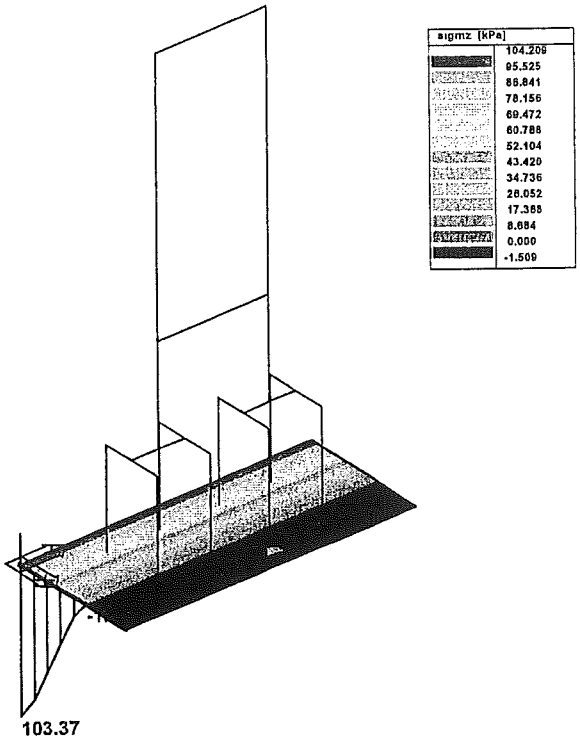
Contact stress - sigmz - Nonl. Combi : 2



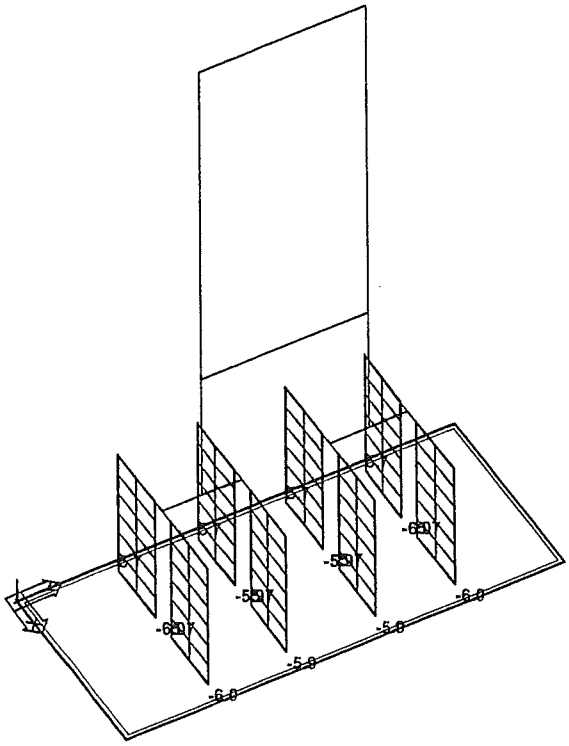
Contact stress - sigmz - Nonl. Combi : 3



Contact stress - sigmz - Nonl. Combi : 4



Contact stress - sigmz - Nonl. Combi : 5

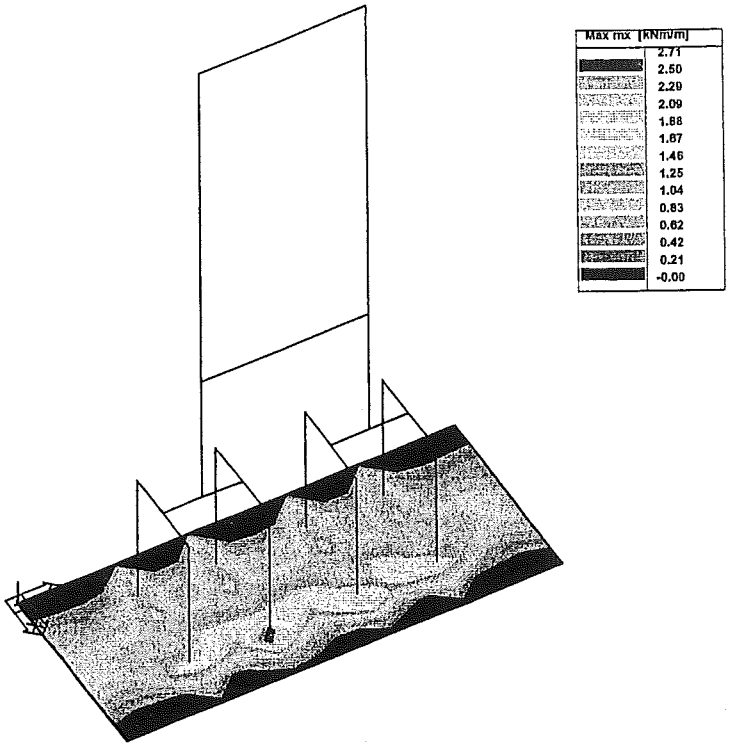


Internal forces - N on member(s). Non. combi : 1/5

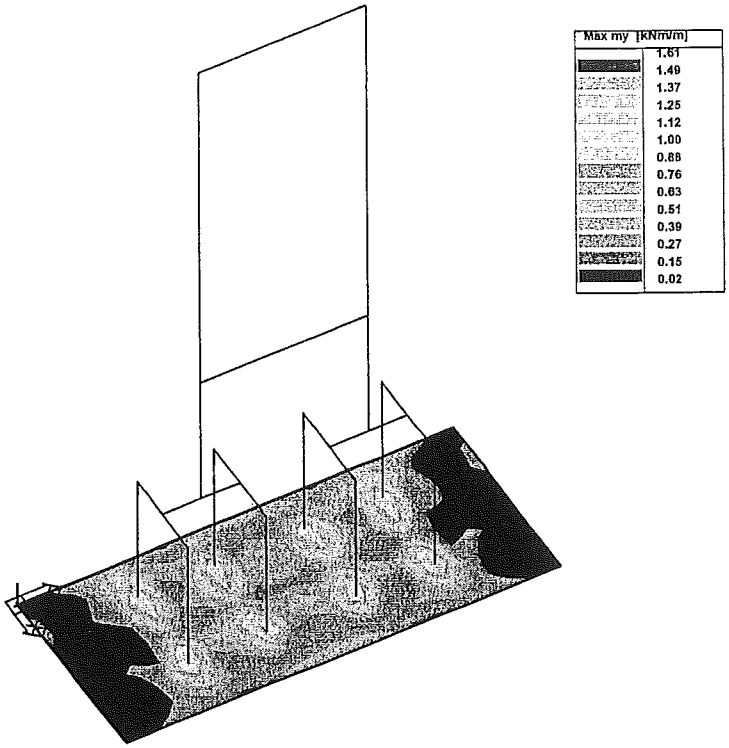
Internal forces on member(s). Global extreme

Nonlinear calculation
Group of member(s) :9/16
Group of nonlinear combination(s) :1/5

memb	cr.nr	non. c.	dx [m]	N [kN]	Vy [kN]	Vz [kN]	Mx [kNm]	My [kNm]	Mz [kNm]
14	3	3	0.000	5.7	0.0	-0.5	0.0	0.3	-0.0
13		5		-6.0	-0.1	-0.5	0.0	0.3	0.0



Internal force - max mx - Nonl. Combi : 1/5



Internal force - max my - Nonl. Combi : 1/5

RESULTS : INTERNAL FORCES

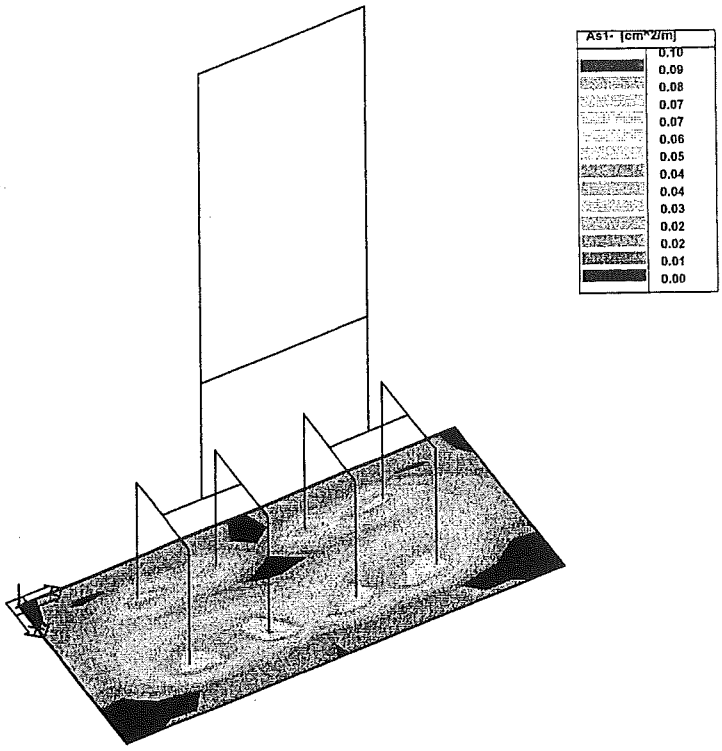
Nonl. Combi:
NC1
NC2
NC3
NC4
NC5

Global extremes

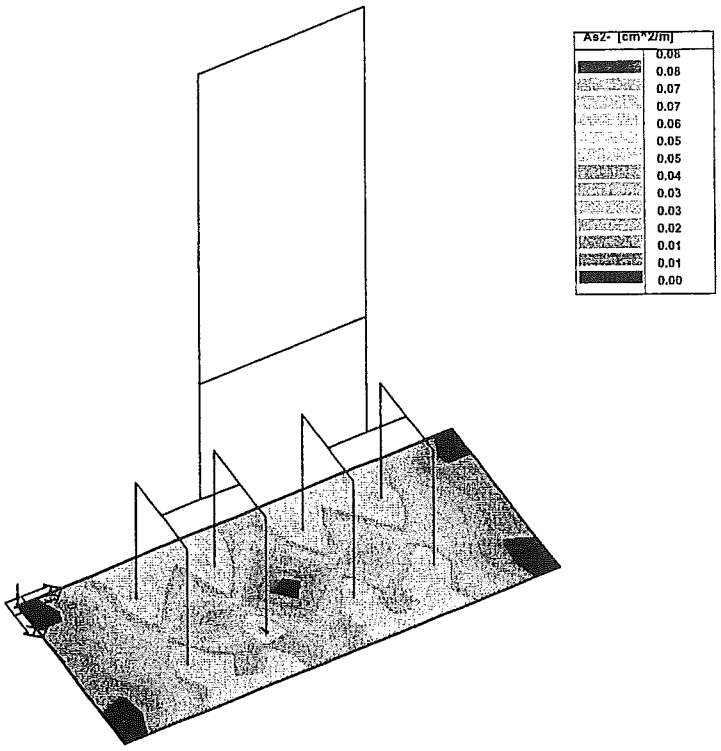
Rotation of the local system: No
Basic magnitudes - bending

node	mx [kNm/m]	my [kNm/m]	mxy [kNm/m]	qx [kN/m]	qy [kN/m]
8	**2.71**	1.61	0.31	0.07	0.88
164	**-2.03**	-0.38	-0.52	-14.90	-10.46
8	2.71	**1.61**	0.31	0.07	0.88
	-1.67	**-1.40**	-0.31	-2.56	-0.73
74	1.13	0.12	**1.30**	0.78	0.79
75	-0.01	-0.04	**-1.30**	-0.05	-2.93
155	1.21	0.61	0.45	**14.28**	3.55
172	-1.29	-0.39	-0.47	**-16.31**	-7.50
173	1.60	0.65	0.99	0.05	**15.70**
	-0.71	-0.48	-0.96	-4.69	**-16.56**

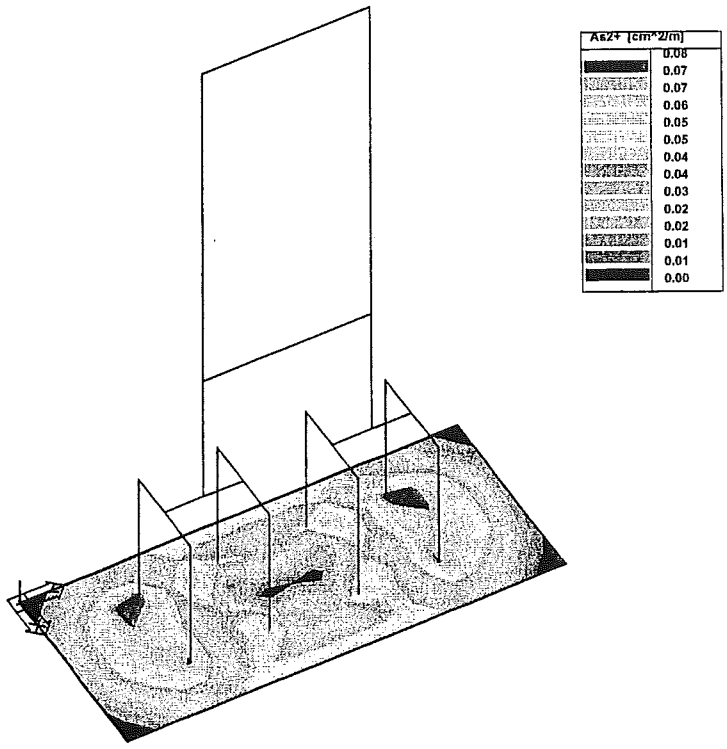
Selection was done for macros: 1



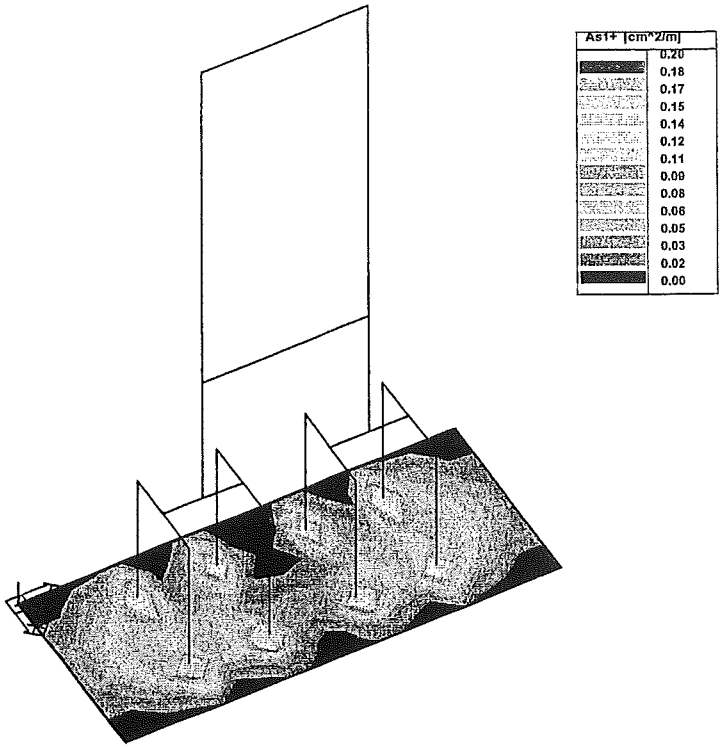
2D reinforcement - As1-



2D reinforcement - As2-



2D reinforcement - As2+



2D reinforcement - As1+

Code for calculation: DIN 1045 7/88
Serviceability crack proof

Explanation of concrete symbols

Abbreviation	Explanation
betaWN	Concrete cube compression strength.
betaR	Design concrete compression strength.
Tau01	1st shear stress limit according Table 13.
Tau02	2nd shear stress limit according Table 13.
Tau03	3rd shear stress limit according Table 13.

Concrete characteristics

	B 25
betaWN	25.00 MPa
betaR	17.50 MPa
Tau011_1 plates	0.35 MPa
Tau011_2 plates	0.50 MPa
Tau02 plates	1.80 MPa
Tau012 beams	0.75 MPa
Tau02 beams	1.80 MPa
Tau03 beams	3.00 MPa

Explanation of reinforcement steel symbols

Abbreviation	Explanation
betaS	Characteristic yield strength of reinforcement

Steel characteristics

	BSt 420
betaS	420.00 MPa
E modulus	200000.00 MPa

Input parameters

Description	Percentage
Maximum % of reinforcement	9.00
Minimum % of net reinforcement	0.00
Minimum % of pressure reinforcement	0.50
Minimum % of tension reinforcement	0.00
Minimum % of transverse reinforcement	20.00

Shear mode
Tension reinforcement is partially anchored in the field.

Description	Value
height < 7 cm represents increase of internal forces (§ 17.2.1 (6))	ON
Structural reinforcement of deep beam	OFF

Description	Value
Maximum allowable crack width on face Zp+	0.25
Maximum allowable crack width on face Zp-	0.25
Characteristic bar distances on face Zp+	200.00
Characteristic bar distances on face Zp-	200.00
Load case attribute	crack proof LC due to internaly caused imposed deformations
Effect upon the mean strain	1.00
Effect upon the mean crack distance	0.80
Environment class	3. moist - buildings with access outdoor air

Explanation of symbols - longitudinal reinforcement

Symbol	Explanation
s	Minimum constructive reinforcement superposing statically required tension reinforcement
c	Minimum constructive reinforcement superposing statically required pressure reinforcement

Global extremes

Necessary areas

node	As1+ [cm^2/m]	As2+ [cm^2/m]	As3+ [cm^2/m]	As3- [cm^2/m]	As2- [cm^2/m]	As1- [cm^2/m]	Ass [cm^2/m^2]	tau [MPa]	tau0 [MPa]
8	**0.20**	0.07	~	~	0.08	0.10	0.00	0.00	0.03
104	**0.00**	0.01	~	~	0.01	0.01	0.00	0.00	0.00
180	0.06	**0.08**	~	~	0.03	0.03	0.00	0.00	0.01

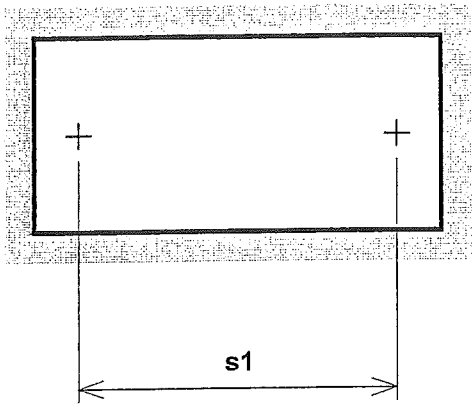
node	As1+ [cm^2/m]	As2+ [cm^2/m]	As3+ [cm^2/m]	As3- [cm^2/m]	As2- [cm^2/m]	As1- [cm^2/m]	Ass [cm^2/m^2]	tau [MPa]	tau0 [MPa]
2	0.00	0.00	~	~	0.00	0.00	0.00	0.00	0.00
8	0.20	0.07	~	~	0.08	0.10	0.00	0.00	0.03
2	0.00	0.00	~	~	0.00	0.00	0.00	0.00	0.00
8	0.20	0.07	~	~	0.08	0.10	0.00	0.00	0.03
42	0.01	0.03	~	~	0.01	0.00	0.00	0.00	0.00
1	0.00	0.00	~	~	0.00	0.00	0.00	0.00	0.00
	0.00	0.00	~	~	0.00	0.00	0.00	0.00	0.00
	0.00	0.00	~	~	0.00	0.00	0.00	0.00	0.00
	0.00	0.00	~	~	0.00	0.00	0.00	0.00	0.00
8	0.20	0.07	~	~	0.08	0.10	0.00	0.00	0.03
74	0.08	0.06	~	~	0.02	0.04	0.00	0.00	0.00

Selection was done for macros: 1

Dübelbemessung für HST-M16

Nach der ETAG Anhang C Methode

Positionierung

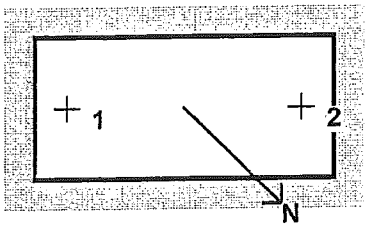


Ankerplatte:

lx=415 mm ly=200 mm
s1=325 mm

+ Dübel
◯ Dübel im Langloch

Lasten (Bemessungswerte)



Zuglast:

N_d=15.4 kN (1.35*11.4 kN)

Beton

Druckfestigkeitsklasse: C20/25
Zugzone / gerissener Beton
Dicke des Betonteils: 120.0 cm
keine Randbewehrung
dichte Bewehrung (dichte Bewehrung (s <= 15 cm))

Zuglast N

HST-M16

Dübel		1	2
Bem.wert der Zuglast	$N_{Sd,i}$	7.7 kN	7.7 kN

Bem.wert der Dübelgruppe $N^g_{Sd} = \sum_{i=1} N_{Sd,i}$ = 15.4 kN

Stahlversagen

Charakt. Wert für einen Dübel $N_{Rk,s}$ = 75.0 kN
Teilsicherheitsbeiwert $_{Ms}$ = 1.50

Bemessungswert des Widerstandes $N_{Rd,s} = \frac{N_{Rk,s}}{Ms}$ = 50.0 kN Check $\frac{N^h_{Sd}}{N_{Rd,s}}$ = 0.15

Herausziehen

Charakt. Wert für einen Dübel $N_{Rk,p}$ = 20.0 kN
Teilsicherheitsbeiwert $_{Mp}$ = 1.80

Bemessungswert des Widerstandes $N_{Rd,p} = \frac{N_{Rk,p}}{Mp}$ = 11.1 kN Check $\frac{N^h_{Sd}}{N_{Rd,p}}$ = 0.69

Betonausbruch

Initialwert des Dübelwiderstandes	$N^0_{Rk,c}$	= 26.7 kN		
Aktuelle Fläche des Betonkegels	$A_{c,N}$	= 121032 mm²		
Referenzfläche des Betonkegels	$A^0_{c,N}$	= 60516 mm²		
Faktor für Störung der Spannungsverteilung	$_{s,N}$	= 1.00		
Schalenabplatzfaktor	$_{re,N}$	= 0.91		
Exzentrizität der resultierenden Zugkraft	$e_{N,x}$	= 0 mm	$e_{N,y}$	= 0 mm
Faktoren für exzentrische Last	$_{ec,N,x}$	= 1.00	$_{ec,N,y}$	= 1.00
Faktor für die Lage der Verankerung	$_{ucr,N}$	= 1.00		

Charakteristischer Wert für die Dübelgruppe

$$N_{Rk,c} = N^0_{Rk,c} \cdot \frac{A_{c,N}}{A^0_{c,N}} \cdot {}_{s,N} \cdot {}_{re,N} \cdot {}_{ec,N,x} \cdot {}_{ec,N,y} \cdot {}_{ucr,N} = 48.7 \text{ kN}$$

Teilsicherheitsbeiwert $_{Mc}$ = 1.80

Bemessungswert des Widerstandes $N_{Rd,c} = \frac{N_{Rk,c}}{Mc}$ = 27.0 kN Check $\frac{N^g_{Sd}}{N_{Rd,c}}$ = 0.57

Querkraft V

HST-M16

Dübel		1	2
Bem.wert Querlast in x	$V_{Sd,x,i}$	0.0 kN	0.0 kN
Bem.wert Querlast in y	$V_{Sd,y,i}$	0.0 kN	0.0 kN
Bem.wert der Dübelgruppe		$V^g_{Sd,x} = \sum^n_{i=} V_{Sd,x,i}$ = 0.0 kN	$V^g_{Sd,y} = \sum^n_{i=} V_{Sd,y,i}$ = 0.0 kN
Result. Bemessungswert Querzug	$V_{Sd,i}$	0.0 kN	0.0 kN

Stahlversagen ohne Hebelarm

Charakt. Wert für einen Dübel $V_{Rk,s}$ = ---

Teilsicherheitsbeiwert $_{Ms}$ = 1.00

Bemessungswert des Widerstandes $V_{Rd,s} = \frac{V_{Rk,s}}{Ms}$ = --- Check $\frac{V^h_{Sd}}{V_{Rd,s}}$ = 0.00

Betonkantenbruch

Initialwert des Dübelwiderstandes	$V^0_{Rk,c}$	= ---		
Aktuelle Fläche des Betonkegels	$A_{c,V}$	= 0 mm²		
Referenzfläche des Betonkegels	$A^0_{c,V}$	= 0 mm²		
Faktor für Störung der Spannungsverteilung	$_{s,V}$	= 1.00		
Faktor für Bauteildicke	$_{h,V}$	= 1.00		
Faktor für Lastrichtung	$_{,V}$	= 1.00		
Exzentrizität der resultierenden Querkraft	$e_{V,x}$	= 0 mm	$e_{V,y}$	= 0 mm
Faktoren für exzentrische Last	$_{ec,V,x}$	= 1.00	$_{ec,V,y}$	= 1.00
Faktor für die Lage der Verankerung	$_{ucr,V}$	= 1.0		

Charakteristischer Wert für die Dübelgruppe

$V_{Rk,c} = V^0_{Rk,c} \cdot \frac{A_{c,V}}{A^0_{c,V}} \cdot {}_{s,V} \cdot {}_{h,V} \cdot {}_{,V} \cdot {}_{ec,V} \cdot {}_{ucr,V}$ $V_{Rk,c,x}$ = --- $_{Mc}$ = 1.00

Bemessungswert des Widerstandes $V_{Rd,c} = \frac{V_{Rk,c}}{Mc}$ = --- Check $\frac{V^g_{Sd}}{V_{Rd,c}}$ = 0.00

Rückwärtiger Betonausbruch

HST-M16

Faktor für kurze, steife Dübel: $k = 0.0$

Charakteristischer Wert für die Dübelgruppe: $N_{Rk,c} = ---$

Charakteristischer Wert für die Dübelgruppe: $V_{Rk,c} = ---$

Teilsicherheitsbeiwert: $_{Mc} = 0.00$

Bemessungswert des Widerstandes $V_{Rd,c} = \frac{V_{Rk,c}}{Mc} = ---$ Check $\frac{V_{Sd}^{g}}{V_{Rd,c}} = 0.00$

Spaltbruch infolge Belastung

$$\frac{N_{Sd}^{g}}{N_{Rd,sp}} = 0.35$$