

System

Basic data**Type of structure : General XYZ**

Number of nodes: 12
 Number of members: 7
 Number of 1D macros: 7
 Number of bound. lines: 4
 Number of 2D macros: 1
 Number of profiles : 3
 Number of cases: 11
 Number of materials: 2

Material

Name:

B 25

E modulus 30000.00 MPa
 Poisson coeff. 0.20
 Density 2500.000 kg/m³
 Extensibility 0.01 mm/m.K

B 25 gewichtslos

E modulus 30000.00 MPa
 Poisson coeff. 0.20
 Density 0.000 kg/m³
 Extensibility 0.01 mm/m.K

List of material**Group of members :**

1/7

no.	Name:	quality	unit weight kg/m	length m	weight kg
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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	19.20	48000.00

The total weight of the structure: 48000.00 kg

Nodes

node	X m	Y m	Z m
1	-0.300	0.000	0.600
2	0.350	0.000	0.600

node	X m	Y m	Z m
3	-0.625	0.563	0.600
4	-0.625	-0.563	0.600
5	-0.300	0.000	6.400
6	-0.625	-0.563	-0.500
7	0.350	0.000	-0.500
8	-0.625	0.563	-0.500
9	-2.000	-2.000	-0.500
10	2.000	-2.000	-0.500
11	2.000	2.000	-0.500
12	-2.000	2.000	-0.500

Members

macro	memb	node 1	node 2	length m	Rx deg	profile	quality
1	1	1	2	0.650	0.00	3 - Lasteinleitung (Numerica...	B 25 gewichtslos
2	2	1	3	0.650	0.00	3 - Lasteinleitung (Numerica...	B 25 gewichtslos
3	3	1	4	0.650	0.00	3 - Lasteinleitung (Numerica...	B 25 gewichtslos
4	4	1	5	5.800	0.00	1 - KREIS (190.0)	B 25 gewichtslos
5	5	6	4	1.100	0.00	3 - Lasteinleitung (Numerica...	B 25 gewichtslos
6	6	7	2	1.100	0.00	3 - Lasteinleitung (Numerica...	B 25 gewichtslos
7	7	8	3	1.100	0.00	3 - Lasteinleitung (Numerica...	B 25 gewichtslos

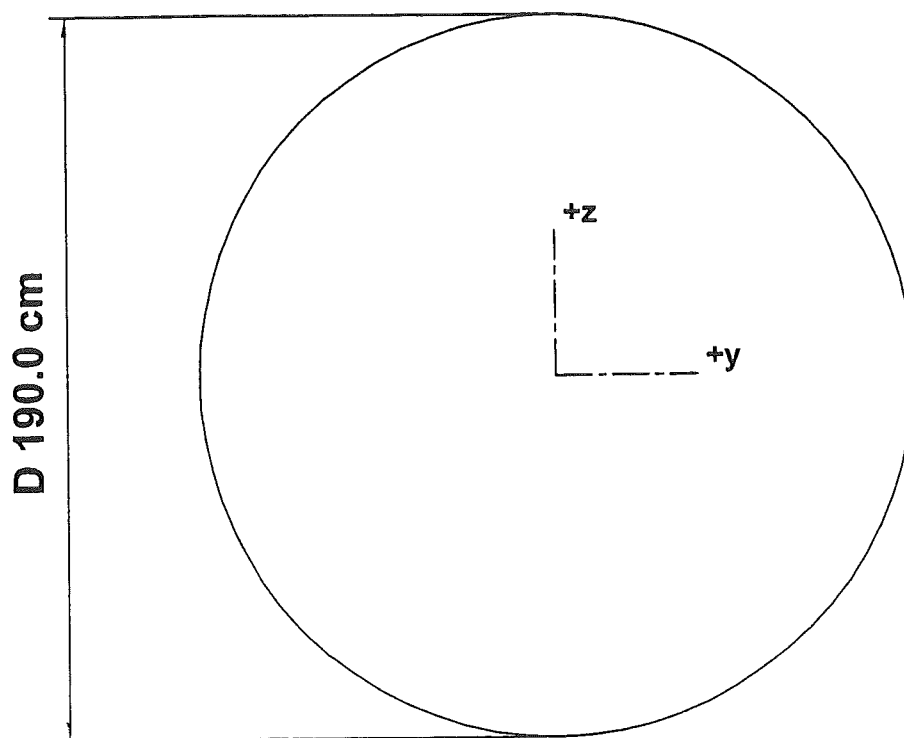
Boundaries

bound. line	type	node
1	Line	9,10
2	Line	10,11
3	Line	11,12
4	Line	12,9

2D Macros

num	type	
1	B 25	Thickness 1.20 m
	Boundary:	1,2,3,4
	Nodes :	6,7,8

Profiles



KREIS (190.0)

Profile no. 1 - KREIS (190.0)

Material : 8 - B 25 gewichtslos

A:	2.835287e+004 cm ²		
Ay/A:	0.850	Az/A:	0.850
Iy:	6.397117e+007 cm ⁴	Iz:	6.397117e+007 cm ⁴
Iyz:	1.477768e-007 cm ⁴	It:	1.279423e+008 cm ⁴
Iw:	0.000000e+000 cm ⁶		
Wely:	6.716733e+005 cm ³	Welz:	6.716733e+005 cm ³
Wply:	1.140975e+006 cm ³	Wplz:	1.140992e+006 cm ³
cy:	0.00 cm	cz:	0.00 cm
iy:	47.50 cm	iz:	47.50 cm
dy:	0.00 cm	dz:	0.00 cm
Outline :	596.15 cm		

Type for check: Untypical section

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

A: 1.000000e+003 cm²
 dy: 0.00 cm dz: 0.00 cm
 Outline : 0.00 cm

Type for check: Untypical section

Hinges

The stiffness values of line hinges are stated in 1 m' of length

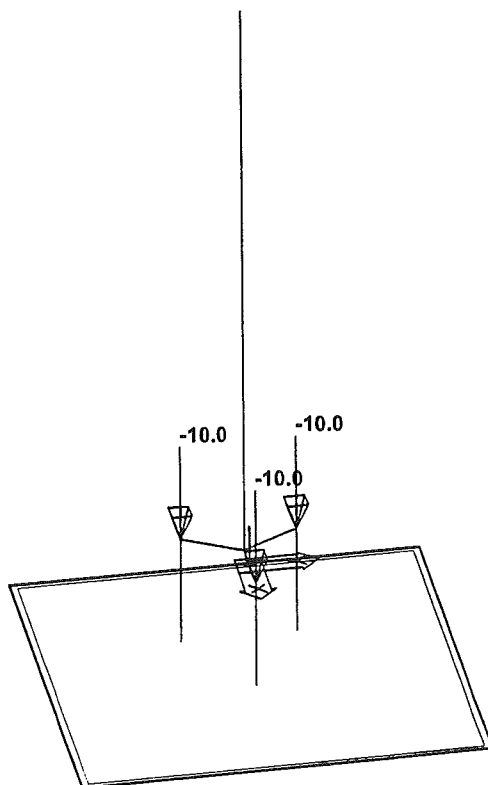
macro	type	pos
5	fiyfiz	beg
6	fiyfiz	beg
7	fiyfiz	beg

Soil - 2D macro

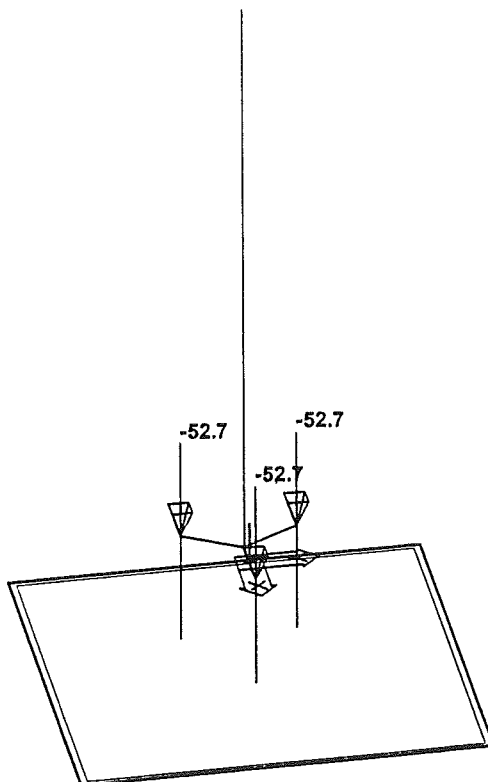
Index	2D macro	Name of subsoil
1	1	Sand/Clean/Moderate

Loadcases

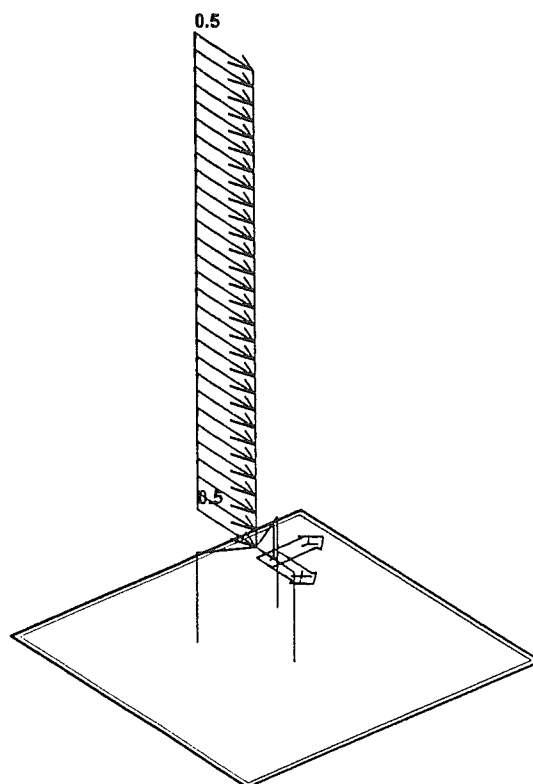
Case	Name:	Description
1	Weight concret	Self weight. Direction -Z
2	Weight	Permanent - Loads
3	Water	Variable - P
4	Wind +X	Variable - Wind Excl.
5	Wind -X	Variable - Wind Excl.
6	Wind +Y	Variable - Wind Excl.
7	Wind -Y	Variable - Wind Excl.
8	Wind -X/+Y	Variable - Wind Excl. Summational load case 5. Wind -X, 0.71 6. Wind +Y, 0.71
9	Wind -X/-Y	Variable - Wind Excl. Summational load case 5. Wind -X, 0.71 7. Wind -Y, 0.71
10	Wind +X/-Y	Variable - Wind Excl. Summational load case 4. Wind +X, 0.71 7. Wind -Y, 0.71
11	Wind +X/+Y	Variable - Wind Excl. Summational load case 4. Wind +X, 0.71 6. Wind +Y, 0.71



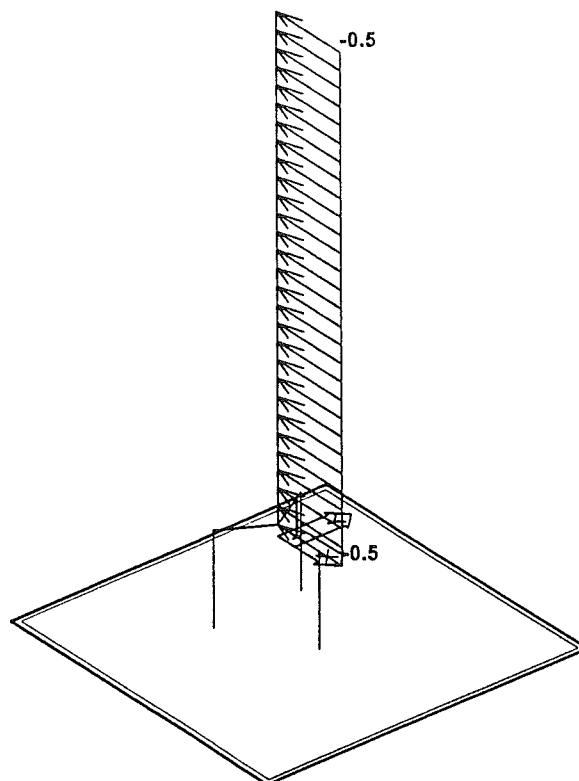
2. Weight



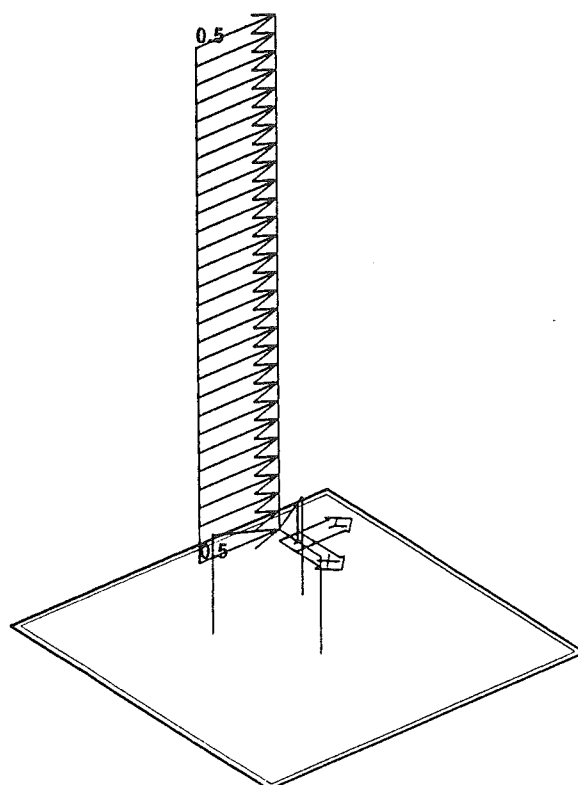
3. Water



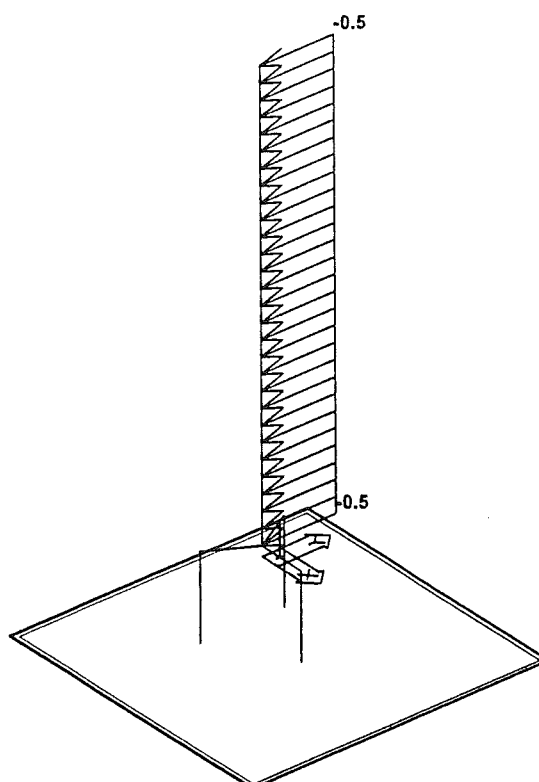
4. Wind +X



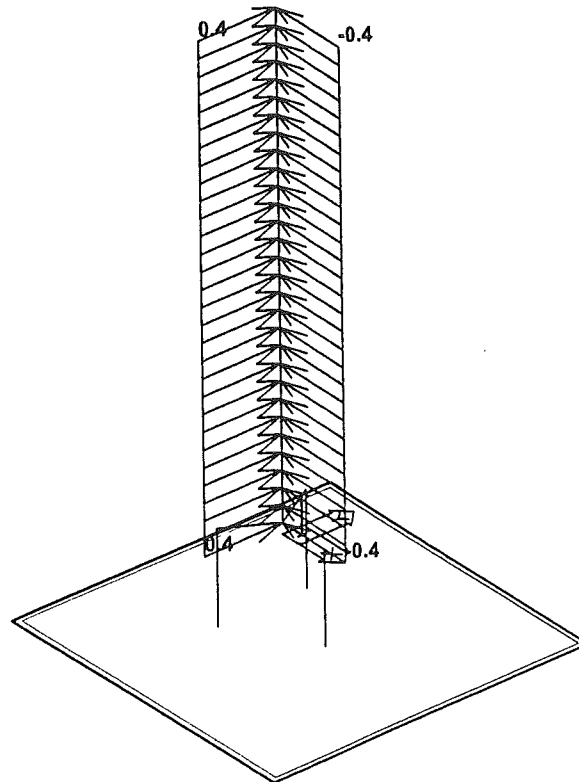
5. Wind -X



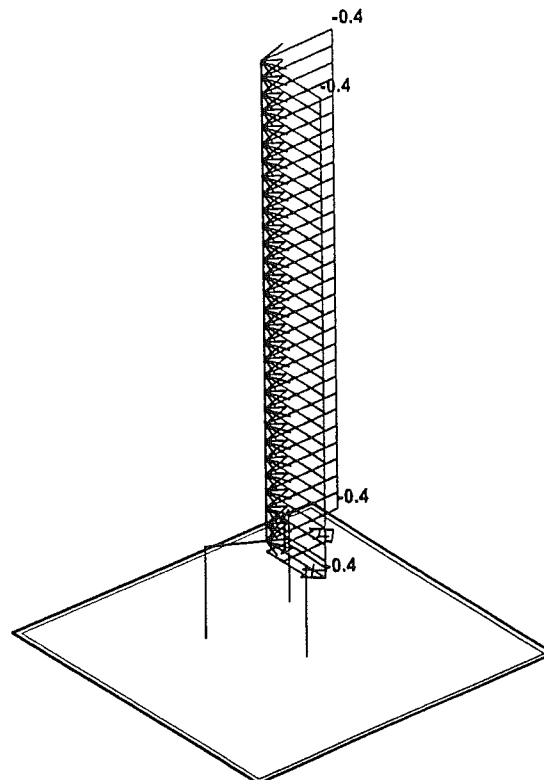
6. Wind +Y



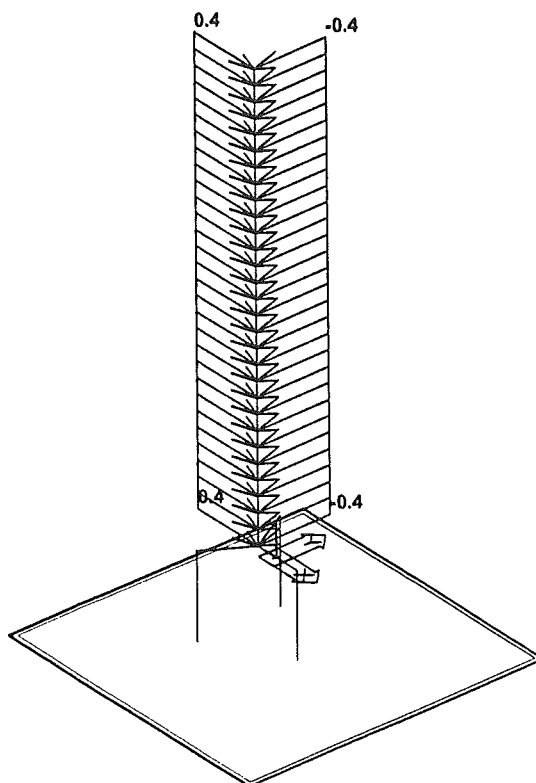
7. Wind -Y



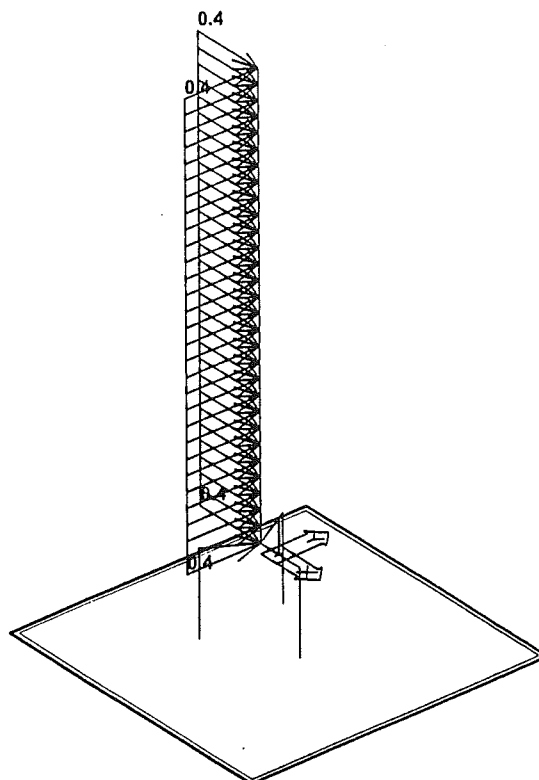
8. Wind -X/+Y



9. Wind -X/-Y



10. Wind +X/-Y



11. Wind +X/+Y

Variable loads group

Name: **P**

P

Wind Excl.

Loadcase no. 2 - nodal loads

node	Fx kN	Fy kN	Fz kN	Mx kNm	My kNm	Mz kNm
2	0.00	0.00	-10.00	0.00	0.00	0.00
3	0.00	0.00	-10.00	0.00	0.00	0.00
4	0.00	0.00	-10.00	0.00	0.00	0.00

Loadcase no. 3 - nodal loads

node	Fx kN	Fy kN	Fz kN	Mx kNm	My kNm	Mz kNm
2	0.00	0.00	-52.67	0.00	0.00	0.00
3	0.00	0.00	-52.67	0.00	0.00	0.00
4	0.00	0.00	-52.67	0.00	0.00	0.00

Loadcase no. 4 - distributed loads

macro	type	dx m	exY m	exZ m		X beg end	Y beg end	Z beg end
4	force kN/m	0.00 rel 1.00	0.00	0.00	glo len	0.50 0.50	0.00 0.00	0.00 0.00

Loadcase no. 5 - distributed loads

macro	type	dx m	exY m	exZ m		X beg end	Y beg end	Z beg end
4	force kN/m	0.00 rel 1.00	0.00	0.00	glo len	-0.50 -0.50	0.00 0.00	0.00 0.00

Loadcase no. 6 - distributed loads

macro	type	dx m	exY m	exZ m		X beg end	Y beg end	Z beg end
4	force kN/m	0.00 rel 1.00	0.00	0.00	glo len	0.00 0.00	0.50 0.50	0.00 0.00

Loadcase no. 7 - distributed loads

macro	type	dx m	exY m	exZ m		X beg end	Y beg end	Z beg end
4	force kN/m	0.00 rel 1.00	0.00	0.00	glo len	0.00 0.00	-0.50 -0.50	0.00 0.00

Loadcase no. 8 - distributed loads

macro	type	dx m	exY m	exZ m		X beg end	Y beg end	Z beg end
4	force	0.00 rel	0.00	0.00	glo	-0.35	0.00	0.00
	kN/m	1.00			len	-0.35	0.00	0.00
	force	0.00 rel	0.00	0.00	glo	0.00	0.35	0.00
	kN/m	1.00			len	0.00	0.35	0.00

Loadcase no. 9 - distributed loads

macro	type	dx m	exY m	exZ m		X beg end	Y beg end	Z beg end
4	force	0.00 rel	0.00	0.00	glo	-0.35	0.00	0.00
	kN/m	1.00			len	-0.35	0.00	0.00
	force	0.00 rel	0.00	0.00	glo	0.00	-0.35	0.00
	kN/m	1.00			len	0.00	-0.35	0.00

Loadcase no. 10 - distributed loads

macro	type	dx m	exY m	exZ m		X beg end	Y beg end	Z beg end
4	force	0.00 rel	0.00	0.00	glo	0.35	0.00	0.00
	kN/m	1.00			len	0.35	0.00	0.00
	force	0.00 rel	0.00	0.00	glo	0.00	-0.35	0.00
	kN/m	1.00			len	0.00	-0.35	0.00

Loadcase no. 11 - distributed loads

macro	type	dx m	exY m	exZ m		X beg end	Y beg end	Z beg end
4	force	0.00 rel	0.00	0.00	glo	0.35	0.00	0.00
	kN/m	1.00			len	0.35	0.00	0.00
	force	0.00 rel	0.00	0.00	glo	0.00	0.35	0.00
	kN/m	1.00			len	0.00	0.35	0.00

Combinations

Combi	Norm	Case	coeff
1.	User-ultimate	1 Weight concret	1.00
		2 Weight	1.00
		3 Water	1.00
		4 Wind +X	1.00
		5 Wind -X	1.00
		6 Wind +Y	1.00
		7 Wind -Y	1.00
		8 Wind -X/+Y	1.00
		9 Wind -X/-Y	1.00
		10 Wind +X/-Y	1.00
		11 Wind +X/+Y	1.00

Combi	Norm	Case	coeff
2.	User-serviceability	1 Weight concret	1.00
		2 Weight	1.00
		3 Water	1.00
		4 Wind +X	1.00
		5 Wind -X	1.00
		6 Wind +Y	1.00
		7 Wind -Y	1.00
		8 Wind -X/+Y	1.00
		9 Wind -X/-Y	1.00
		10 Wind +X/-Y	1.00
		11 Wind +X/+Y	1.00

Basic rules for generation of ultimate load combinations:

1 : 1.00*LC1 / 1.00*LC2 / 1.00*LC3 / 1.00*LC4 / 1.00*LC5 / 1.00*LC6 / 1.00*LC7
/ 1.00*LC8 / 1.00*LC9 / 1.00*LC10 / 1.00*LC11

Basic rules for generation of serviceability load combinations:

1 : 1.00*LC1 / 1.00*LC2 / 1.00*LC3 / 1.00*LC4 / 1.00*LC5 / 1.00*LC6 / 1.00*LC7
/ 1.00*LC8 / 1.00*LC9 / 1.00*LC10 / 1.00*LC11

List of extreme ultimate load combinations

1/ 1 : +1.00*LC1+1.00*LC2+1.00*LC4
2/ 1 : +1.00*LC1+1.00*LC2+1.00*LC5
3/ 1 : +1.00*LC1+1.00*LC2+1.00*LC6
4/ 1 : +1.00*LC1+1.00*LC2+1.00*LC7
5/ 1 : +1.00*LC1+1.00*LC2+1.00*LC8
6/ 1 : +1.00*LC1+1.00*LC2+1.00*LC9
7/ 1 : +1.00*LC1+1.00*LC2+1.00*LC10
8/ 1 : +1.00*LC1+1.00*LC2+1.00*LC11
9/ 1 : +1.00*LC1+1.00*LC2+1.00*LC3+1.00*LC4
10/ 1 : +1.00*LC1+1.00*LC2+1.00*LC3+1.00*LC8
11/ 1 : +1.00*LC1+1.00*LC2+1.00*LC3+1.00*LC9

List of extreme serviceability load combinations

1/ 1 : +1.00*LC1+1.00*LC2+1.00*LC4
2/ 1 : +1.00*LC1+1.00*LC2+1.00*LC5
3/ 1 : +1.00*LC1+1.00*LC2+1.00*LC6
4/ 1 : +1.00*LC1+1.00*LC2+1.00*LC7
5/ 1 : +1.00*LC1+1.00*LC2+1.00*LC8
6/ 1 : +1.00*LC1+1.00*LC2+1.00*LC9
7/ 1 : +1.00*LC1+1.00*LC2+1.00*LC10
8/ 1 : +1.00*LC1+1.00*LC2+1.00*LC11
9/ 1 : +1.00*LC1+1.00*LC2+1.00*LC3+1.00*LC4
10/ 1 : +1.00*LC1+1.00*LC2+1.00*LC3+1.00*LC5
11/ 1 : +1.00*LC1+1.00*LC2+1.00*LC3+1.00*LC8
12/ 1 : +1.00*LC1+1.00*LC2+1.00*LC3+1.00*LC9

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 400
 Number of 1D elements 7
 Number of mesh nodes 446
 Number of equations 2676

Loadcases
 LC 1 Weight concret
 LC 2 Weight
 LC 3 Water
 LC 4 Wind +X
 LC 5 Wind -X
 LC 6 Wind +Y
 LC 7 Wind -Y
 LC 8 Wind -X/+Y
 LC 9 Wind -X/-Y
 LC 10 Wind +X/-Y
 LC 11 Wind +X/+Y

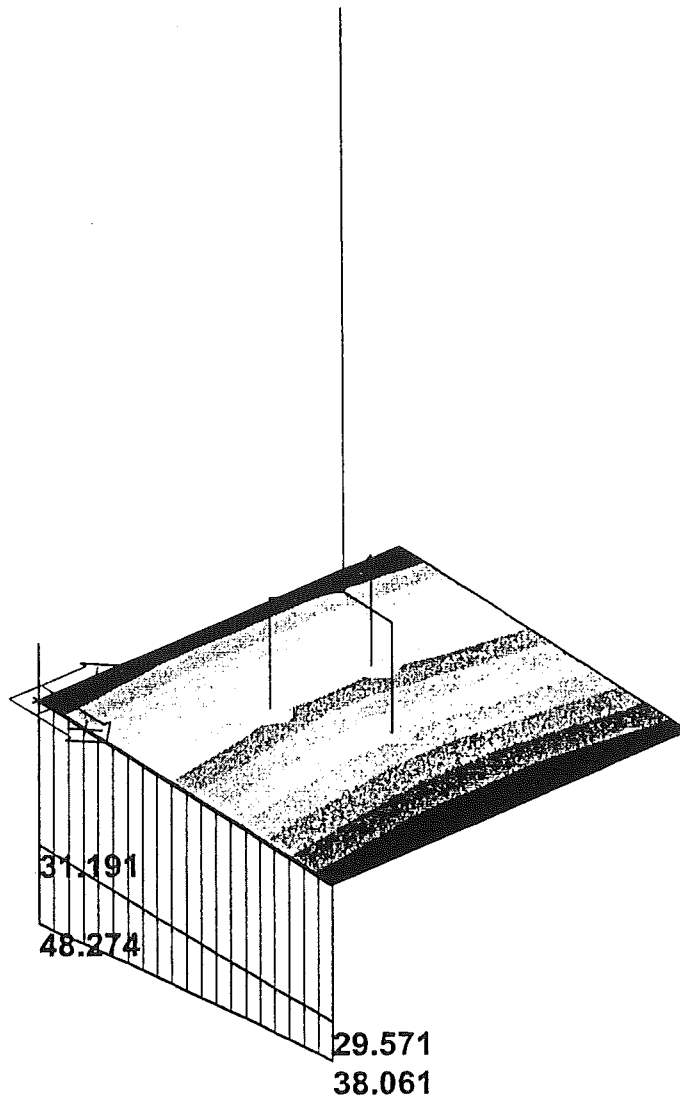
Bending theory Mindlin
 Start of calculation 27.08.2004 13:55
 End of calculation 27.08.2004 13:55

Sum of loads and reactions.

		X	Y	Z
loadcase 1	loads	0.0	0.0	-480.0 ✓
	reactions	0.0	0.0	0.0
	contact	0.0	0.0	480.0
loadcase 2	loads	0.0	0.0	-30.0 ✓
	reactions	0.0	0.0	0.0
	contact	-0.0	-0.0	30.0
loadcase 3	loads	0.0	0.0	-158.0 ✓
	reactions	0.0	0.0	0.0
	contact	-0.0	-0.0	158.0
loadcase 4	loads	2.9	0.0	0.0
	reactions	0.0	0.0	0.0
	contact	-2.9	0.0	0.0
loadcase 5	loads	-2.9	0.0	0.0
	reactions	0.0	0.0	0.0
	contact	2.9	-0.0	-0.0
loadcase 6	loads	0.0	2.9	0.0
	reactions	0.0	0.0	0.0
	contact	-0.0	-2.9	-0.0
loadcase 7	loads	0.0	-2.9	0.0
	reactions	0.0	0.0	0.0
	contact	0.0	2.9	0.0
loadcase 8	loads	-2.1	2.1	0.0
	reactions	0.0	0.0	0.0
	contact	2.1	-2.1	0.0
loadcase 9	loads	-2.1	-2.1	0.0
	reactions	0.0	0.0	0.0
	contact	2.1	2.1	-0.0
loadcase 10	loads	2.1	-2.1	0.0
	reactions	0.0	0.0	0.0
	contact	-2.1	2.1	-0.0
loadcase 11	loads	2.1	2.1	0.0

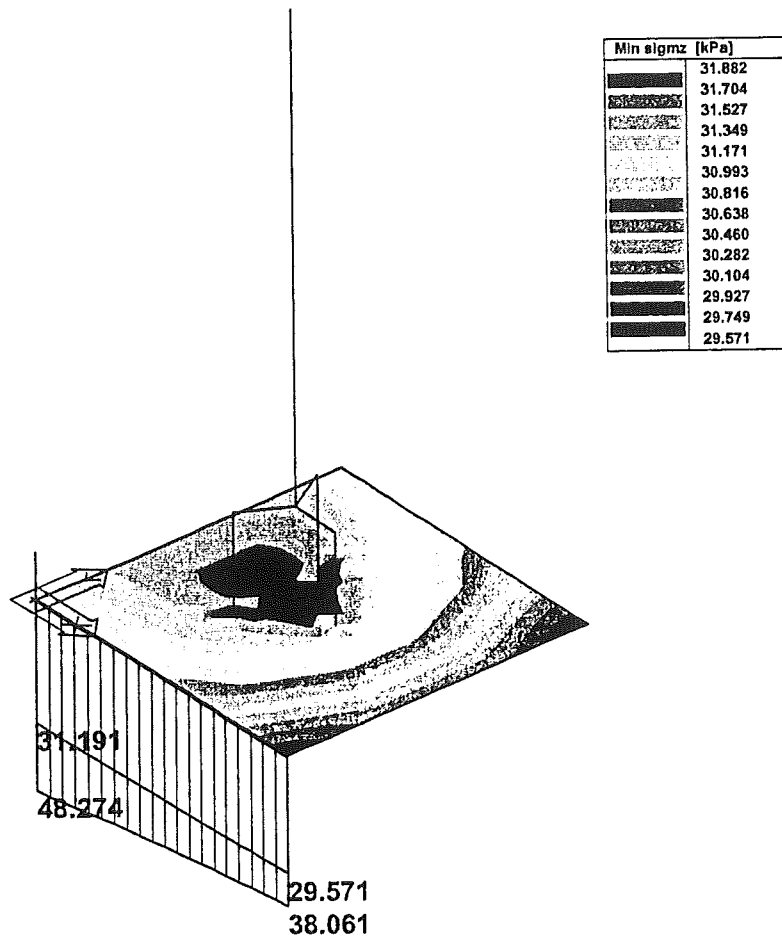
$$G_s = 40 \cdot 40 \cdot 12 \cdot 25,0 = \underline{\underline{480 \text{ kN}}}$$

	X	Y	Z
reactions	0.0	0.0	0.0
contact	-2.1	-2.1	0.0



Max sigmz [kPa]	
48.274	
47.458	
46.642	
45.826	
45.010	
44.194	
43.378	
42.562	
41.745	
40.929	
40.113	
39.297	
38.481	
37.665	

Contact stress - max sigmz - FEM Combi : 1



Contact stress - min sigmz - FEM Combi : 1

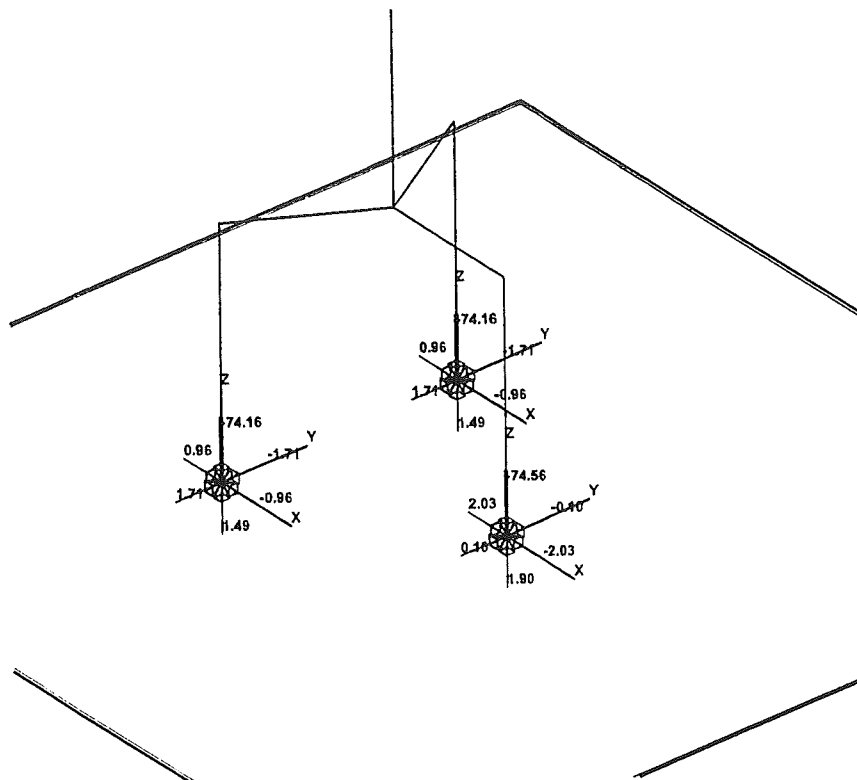
RESULTS : CONTACT STRESSES

FEM Combi:
C1 User-ultimate

Global extremes

node	sigmz [kPa]
9	48.274
10	29.571

Selection was done for macros: 1



in node(s). Ult. combi : 1/11

Force in connection coordinate system. Global extreme

Group of ultimate combi : 1/11

1 - a

Node - 6. Position of connection coordinate system related to node : : x : 0.00 m, y : 0.00 m, z : 0.00 m

memb	combi	Fx [kN]	Fy [kN]	Fz [kN]	Mx [kNm]	My [kNm]	Mz [kNm]
1	8	0.96	-1.71	1.49	0.00	0.00	0.00
	6	-0.96	-1.71	-21.49	0.00	0.00	-0.00
	11	-0.96	-1.71	74.16	0.00	0.00	-0.00

2 - b

Node - 8. Position of connection coordinate system related to node : : x : 0.00 m, y : 0.00 m, z : 0.00 m

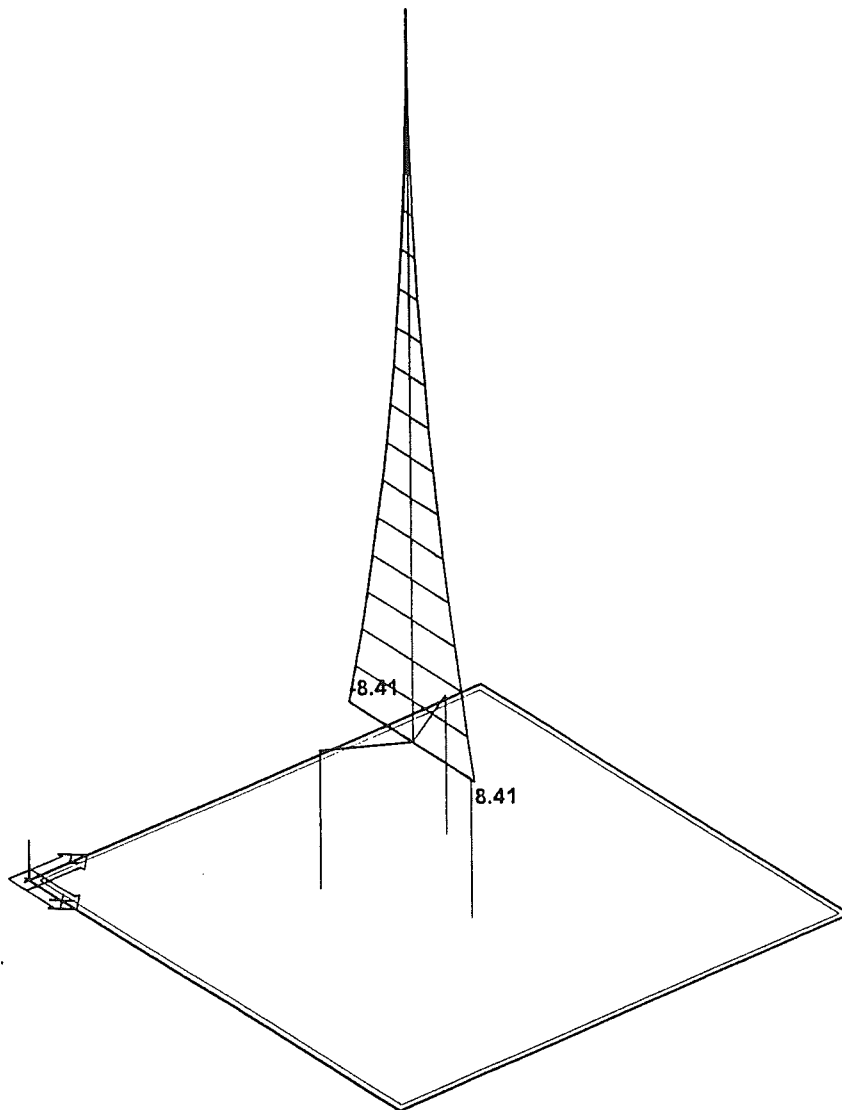
memb	combi	Fx [kN]	Fy [kN]	Fz [kN]	Mx [kNm]	My [kNm]	Mz [kNm]
1	7	0.96	-1.71	1.49	0.00	-0.00	-0.00
	5	-0.96	-1.71	-21.49	0.00	-0.00	0.00
	10	-0.96	1.71	74.16	0.00	-0.00	0.00

3 - c

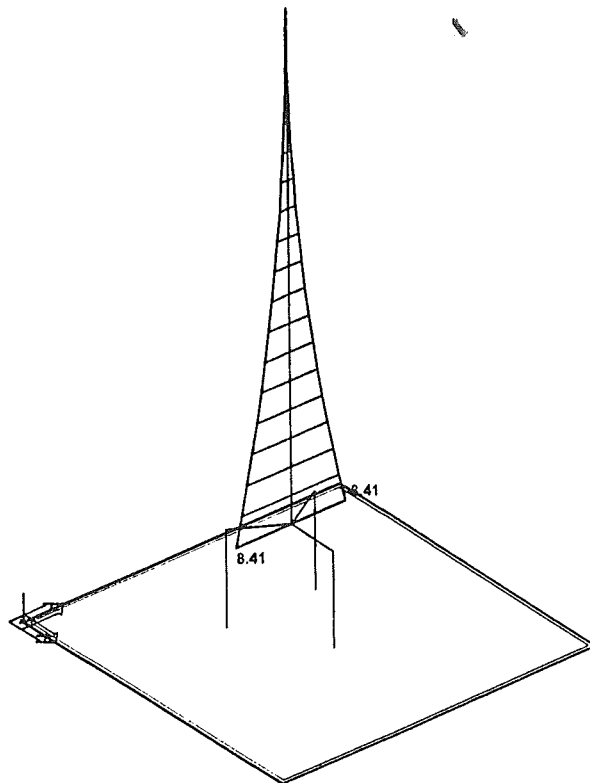
Node - 7. Position of connection coordinate system related to node : : x : 0.00 m, y : 0.00 m, z : 0.00 m

memb	combi	Fx [kN]	Fy [kN]	Fz [kN]	Mx [kNm]	My [kNm]	Mz [kNm]
1	9	2.03	0.00	74.56	-0.00	0.00	0.00
	2	-2.03	-0.00	1.90	-0.00	-0.00	0.00
	4	-0.00	0.10	-10.00	-0.00	0.00	-0.01

memb	combi	Fx [kN]	Fy [kN]	Fz [kN]	Mx [kNm]	My [kNm]	Mz [kNm]
	3	-0.00	-0.10	-10.00	-0.00	0.00	0.01

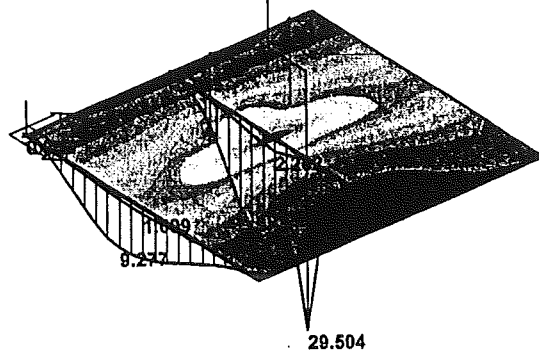


Internal forces - My on member(s). Ult. combi : 1/11

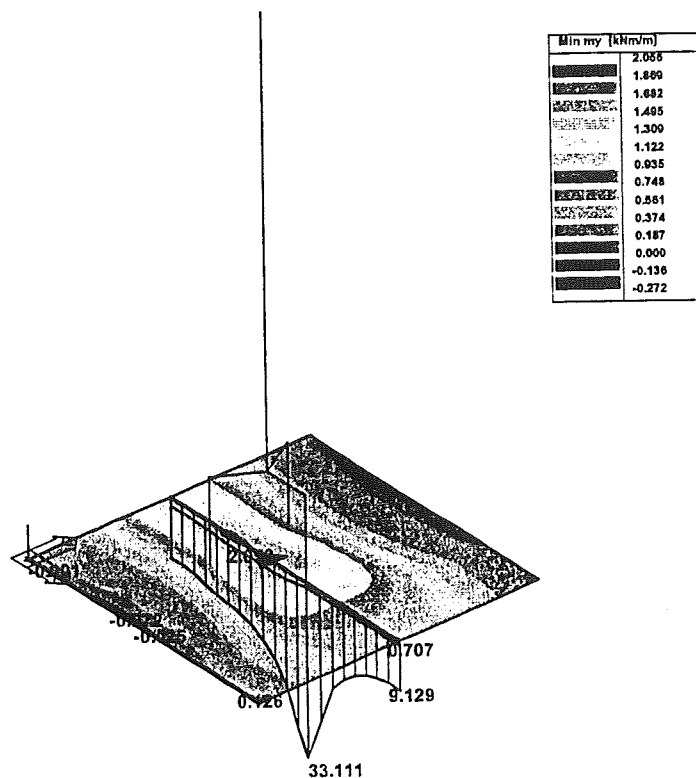


Internal forces - Mz on member(s). Ult. combi : 1/11

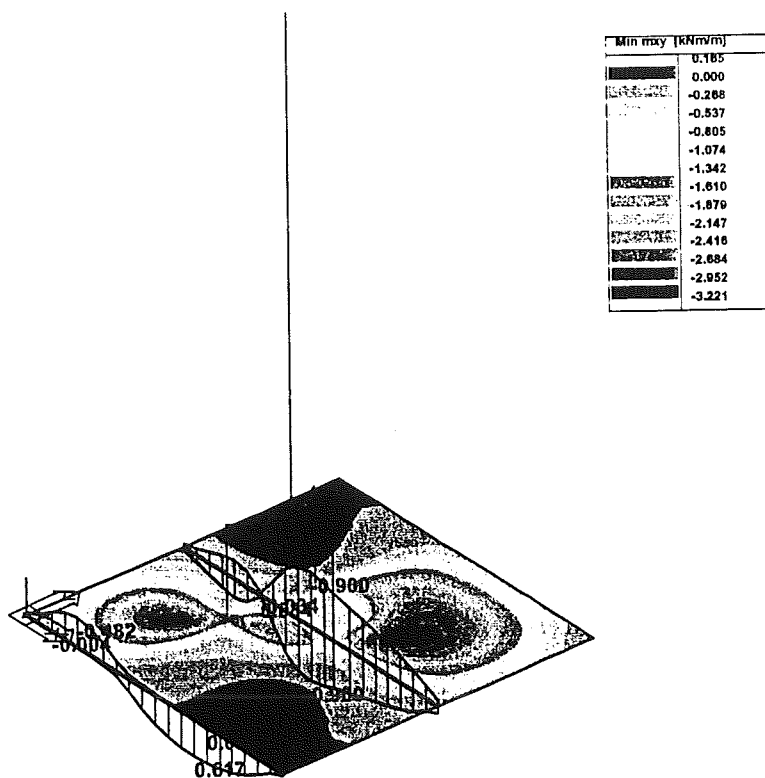
Min mx [kNm/m]
2.282
2.073
1.885
1.698
1.508
1.319
1.131
0.942
0.754
0.565
0.377
0.188
0.000
-0.254



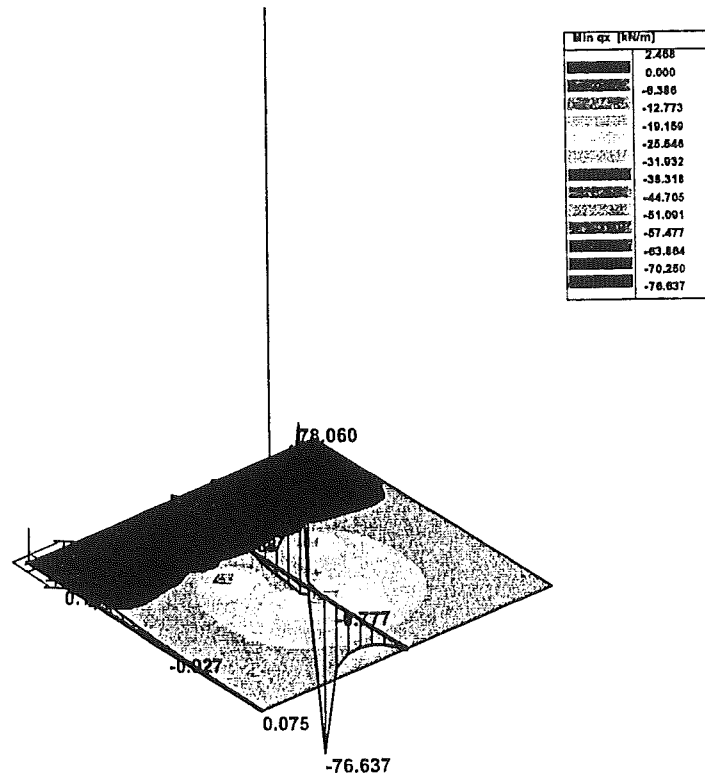
Internal force - min mx - FEM Combi : 1



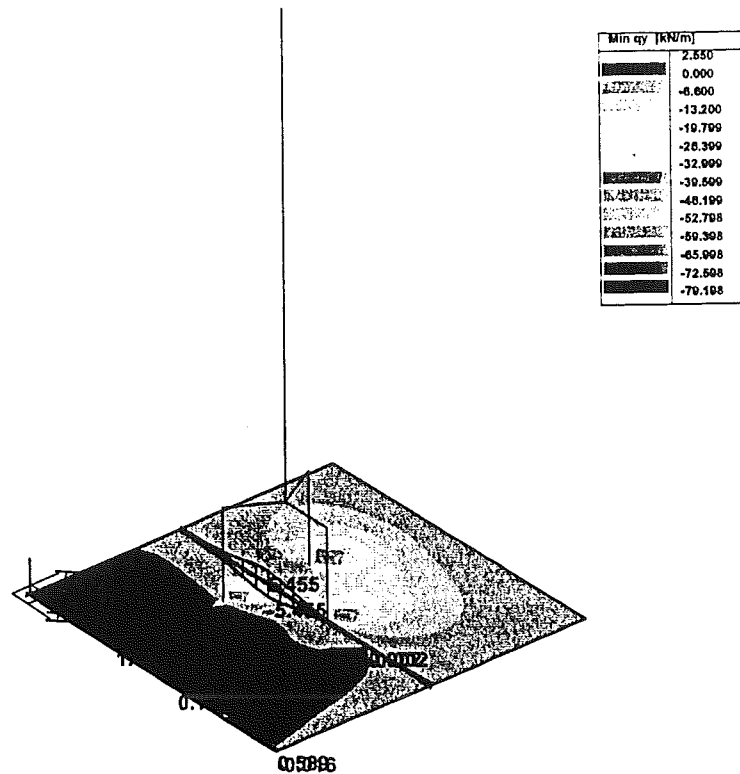
Internal force - min my - FEM Combi : 1



Internal force - min mxy - FEM Combi : 1



Internal force - min qx - FEM Combi : 1



Internal force - min qy - FEM Combi : 1

RESULTS : INTERNAL FORCES**FEM Combi:**

C1 Eigen-Tragfähigk.

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]
6	30.673	30.108	0.263	11.811	6.101
425	-0.254	1.159	0.008	0.176	-2.511
7	29.504	33.111	0.784	2.635	0.783
364	0.792	-0.272	-0.167	-0.286	0.084
127	7.033	9.469	3.221	-1.020	13.071
235	0.124	0.937	3.221	-12.802	-13.071
120	16.661	23.228	0.061	88.018	15.009
181	0.221	1.008	-0.710	-76.637	-0.380
161	21.653	18.411	1.702	-2.076	79.198
215	0.264	1.373	-1.702	-18.088	79.198

Selection was done for macros: 1

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	25000.000 kPa
betaR	17500.000 kPa
Tau011_1 plates	350.000 kPa
Tau011_2 plates	500.000 kPa
Tau02 plates	1800.000 kPa
Tau012 beams	750.000 kPa
Tau02 beams	1800.000 kPa
Tau03 beams	3000.000 kPa

Explanation of reinforcement steel symbols

Abbreviation	Explanation
betaS	Characteristic yield strength of reinforcement

Steel characteristics

BSI 420
 betaS 420000.000 kPa
 E modulus 200000000.000 kPa

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.

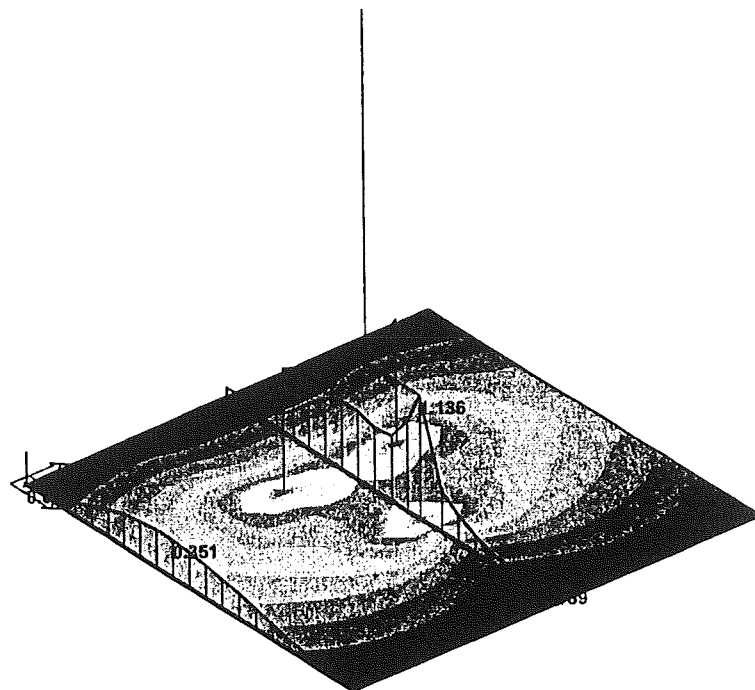
Description	Value
height < 7 cm represents increase of internal forces (§ 17.2.1 (6))	ON
Structural reinforcement of deep beam	OFF

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 internally 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

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]
7	0.085	0.018	~	~	1.276	1.136	0.000	0.00	0.00
121	0.000	0.000	~	~	0.617	0.525	0.000	0.00	0.00
8	0.038	0.056	~	~	1.136	1.159	0.000	0.00	0.00
9	0.000	0.000	~	~	0.001	0.001	0.000	0.00	0.00
7	0.085	0.018	~	~	1.276	1.136	0.000	0.00	0.00
10	0.000	0.000	~	~	0.001	0.002	0.000	0.00	0.00
8	0.038	0.056	~	~	1.136	1.159	0.000	0.00	0.00
12	0.000	0.000	~	~	0.001	0.001	0.000	0.00	0.00
6	0.038	0.056	~	~	1.136	1.159	0.000	0.00	0.00
	0.038	0.056	~	~	1.136	1.159	0.000	0.00	0.00
	0.038	0.056	~	~	1.136	1.159	0.000	0.00	0.00
439	0.001	0.000	~	~	1.028	0.824	0.000	0.00	0.00
185	0.016	0.003	~	~	0.362	0.072	0.000	0.00	0.00

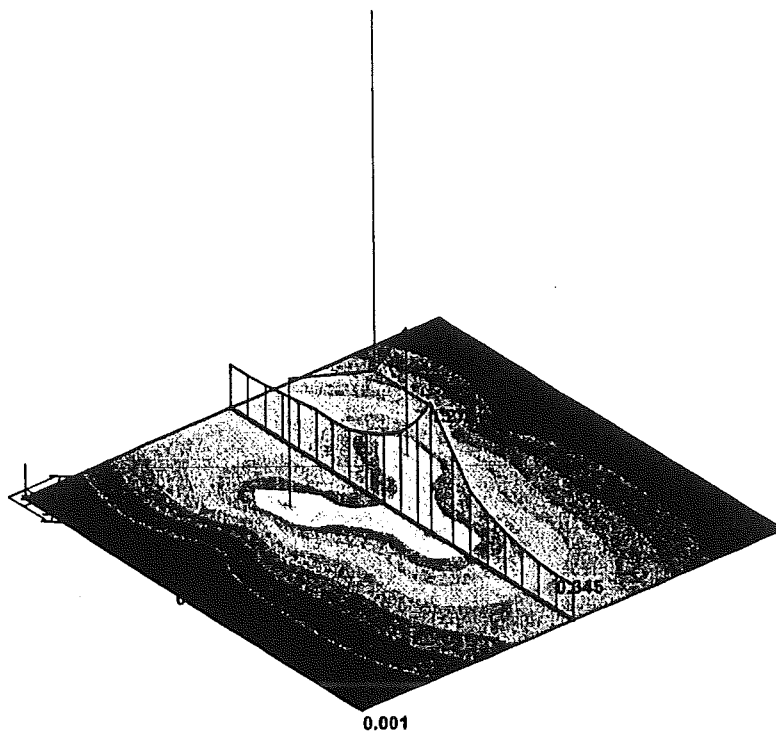
Selection was done for macros: 1



As1- [cm ² /m]
1.159
1.070
0.981
0.892
0.803
0.714
0.625
0.535
0.446
0.357
0.268
0.179
0.090
0.001

Ø10/20cm

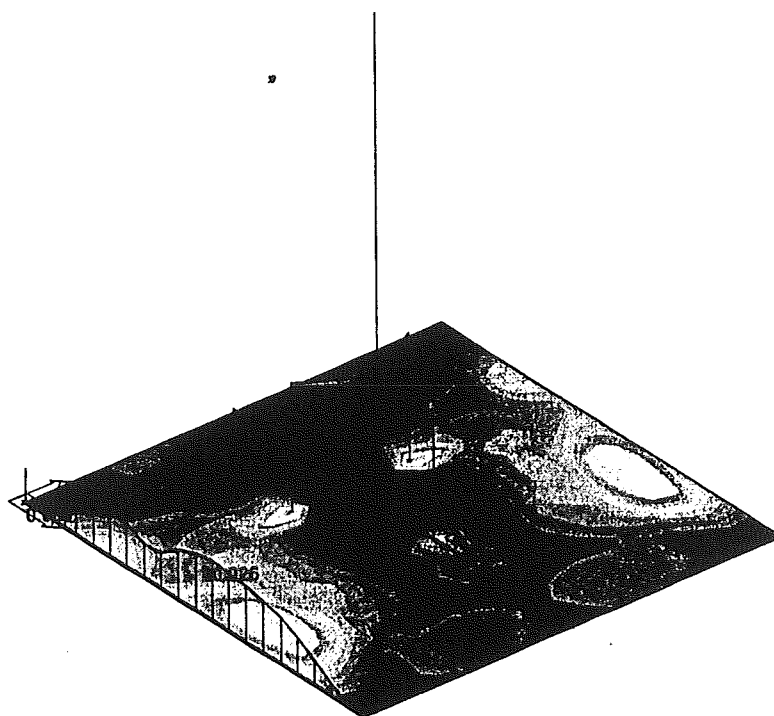
2D reinforcement - As1-



As2- [cm ² /m]
1.276
1.178
1.080
0.982
0.884
0.786
0.687
0.589
0.491
0.393
0.295
0.197
0.099
0.001

Ø10/20cm

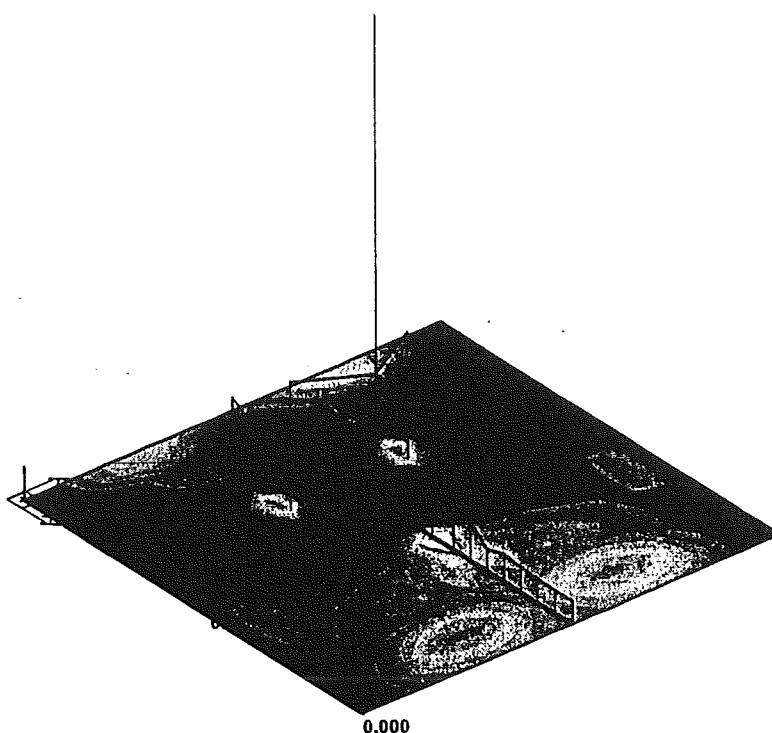
2D reinforcement - As2-



As2+ [cm²/m]	
	0.056
	0.051
	0.047
	0.043
	0.039
	0.034
	0.030
	0.026
	0.021
	0.017
	0.013
	0.009
	0.004
	0.000

φ10/20cm

2D reinforcement - As2+



As1+ [cm²/m]	
	0.085
	0.079
	0.072
	0.065
	0.059
	0.052
	0.046
	0.039
	0.033
	0.026
	0.020
	0.013
	0.007
	0.000

φ10/20cm

2D reinforcement - As1+



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HAP v3.3

Customer No.:

Phone:
Resp.:

Anchor fastening design

Location:

Page: 1 of 4 E31

Quotation:

Project:

List No.:

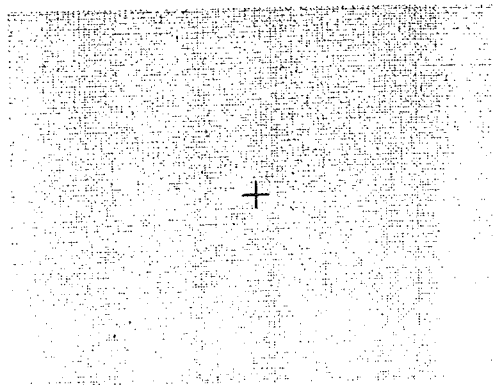
Date:

Project name:

Anchor fastening design for HST-M10

As per ETAG Annex C method

Positioning

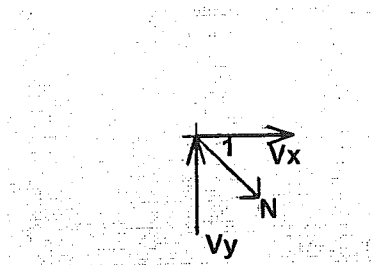


Anchoring plate:

Single anchor

+ Anchor

Loads (design values)



Tensile Load:

$N_d = 2.9 \text{ kN}$ ($1.50 \cdot 1.9 \text{ kN}$)

Shear Load:

$V_{x,d} = 3.2 \text{ kN}$ ($1.50 \cdot 2.1 \text{ kN}$)

$V_{y,d} = 3.2 \text{ kN}$ ($1.50 \cdot 2.1 \text{ kN}$)

Concrete

Compressive class: C20/25
tensile zone / cracked concrete
Thickness of base material: 120.0 cm
no edge reinforcement
close reinforcement (close reinforcement ($s \leq 15 \text{ cm}$))



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Anchor fastening design

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List No.:

Date:

Project name:

Tension Load N

HST-M10

Anchor
Design value of tension load $N_{Sd,i}$ 1
2.9 kN

Design value of anchor group $N_{Sd,T}^g = N_{Sd,i}$ = 2.9 kN

Steel failure

Characteristic value for one anchor $N_{Rk,s} = 32.0$ kN
Partial safety factor $M_s = 1.50$

Design value of resistance $N_{Rd,s} = \frac{N_{Rk,s}}{M_s} = 21.3$ kN Check $\frac{N_{Sd}^h}{N_{Rd,s}} = 0.13$

Pullout failure

Characteristic value for one anchor $N_{Rk,p} = 9.0$ kN
Partial safety factor $M_p = 1.80$

Design value of resistance $N_{Rd,p} = \frac{N_{Rk,p}}{M_p} = 5.0$ kN Check $\frac{N_{Sd}^h}{N_{Rd,p}} = 0.57$

Concrete cone failure

Initial value of the anchor resistance	$N_{Rk,c}^0 = 16.7$ kN	
Actual area of concrete cone	$A_{c,N} = 32400$ mm ²	
Reference area of concrete cone	$A_{c,N}^0 = 32400$ mm ²	
Factor for disturbance of stressed distribution	$s_{,N} = 1.00$	
Shell spalling factor	$re,N = 0.80$	
Eccentricity of the resulting tensile load	$e_{N,x} = 0$ mm	$e_{N,y} = 0$ mm
Factors for eccentric loading	$ec_{,N,x} = 1.00$	$ec_{,N,y} = 1.00$
Factors for the position of the anchorage	$ucr,N = 1.00$	

Characteristic value for the anchor group

$$N_{Rk,c} = N_{Rk,c}^0 \cdot \frac{A_{c,N}}{A_{c,N}^0} \cdot s_{,N} \cdot re,N \cdot ec_{,N,x} \cdot ec_{,N,y} \cdot ucr,N = 13.4 \text{ kN}$$

Partial safety factor $M_c = 1.80$

Design value of resistance $N_{Rd,c} = \frac{N_{Rk,c}}{M_c} = 7.4$ kN Check $\frac{N_{Sd}^g}{N_{Rd,c}} = 0.38$



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HAP v3.3

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Anchor fastening design

Location:

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Project name:

Shear Load V

HST-M10

Anchor
Design value of shear in x $V_{Sd,x,i}$ **1**
Design value of shear in y $V_{Sd,y,i}$ **3.2 kN**

Design value of anchor group $V_{Sd,x}^g = V_{Sd,x,i} = 3.2 \text{ kN}$ $V_{Sd,y}^g = V_{Sd,y,i} = 3.2 \text{ kN}$

Resulting design value of shear $V_{Sd,i}$ **4.5 kN**

Steel failure without lever arm

Characteristic value for one anchor $V_{Rk,s} = 20.0 \text{ kN}$
Partial safety factor $M_s = 1.25$

Design value of resistance $V_{Rd,s} = \frac{V_{Rk,s}}{M_s} = 16.0 \text{ kN}$ Check $\frac{V_{Sd}^h}{V_{Rd,s}} = 0.28$

Concrete edge failure

Initial value of the anchor resistance	$V_{Rk,c}^0$	=	---
Actual area of concrete cone	$A_{c,V}$	=	0 mm ²
Reference area of concrete cone	$A_{c,V}^0$	=	0 mm ²
Factor for disturbance of stressed distribution	$s_{s,V}$	=	1.00
Factor for member thickness	$h_{h,V}$	=	1.00
Factor for load direction	$\alpha_{\alpha,V}$	=	1.00
Eccentricity of the resulting shear load	$e_{e,V,x}$	=	0 mm
	$e_{e,V,y}$	=	0 mm
Factors for eccentric loading	$ec_{ec,V,x}$	=	1.00
	$ec_{ec,V,y}$	=	1.00
Factors for the position of the anchorage	$ucr_{ucr,V}$	=	1.0

Characteristic value for the anchor group

$V_{Rk,c} = V_{Rk,c}^0 \cdot \frac{A_{c,V}}{A_{c,V}^0} \cdot s_{s,V} \cdot h_{h,V} \cdot \alpha_{\alpha,V} \cdot ec_{ec,V} \cdot ucr_{ucr,V}$ $V_{Rk,c,x} = \text{---}$ $M_c = 1.00$

Design value of resistance $V_{Rd,c} = \frac{V_{Rk,c}}{M_c} = \text{---}$ Check $\frac{V_{Sd}^g}{V_{Rd,c}} = 0.00$



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Resp.:

Anchor fastening design

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Project:

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Date:

Project name:

Concrete pryout failure

HST-M10

Factor for short stiff anchors
Characteristic value for the anchor group

$$k = 2.0$$
$$N_{Rk,c} = 13.4 \text{ kN}$$

Characteristic value for the anchor group
Partial safety factor

$$V_{Rk,c} = 26.8 \text{ kN}$$
$$M_c = 1.80$$

Design value of resistance

$$V_{Rd,c} = \frac{V_{Rk,c}}{M_c} = 14.9 \text{ kN}$$

Check $\frac{V_{Sd}^g}{V_{Rd,c}} = 0.30$

Splitting failure due to loading

$$\frac{N_{Sd}^g}{N_{Rd,sp}} = 0.20$$

Combined tension and shear load

$$N = 0.57 < 1.0$$

$$V = 0.30 < 1.0$$

$$(N + V)/1.2 = 0.72 < 1.0$$

$$N + V = 0.59 < 1.0$$

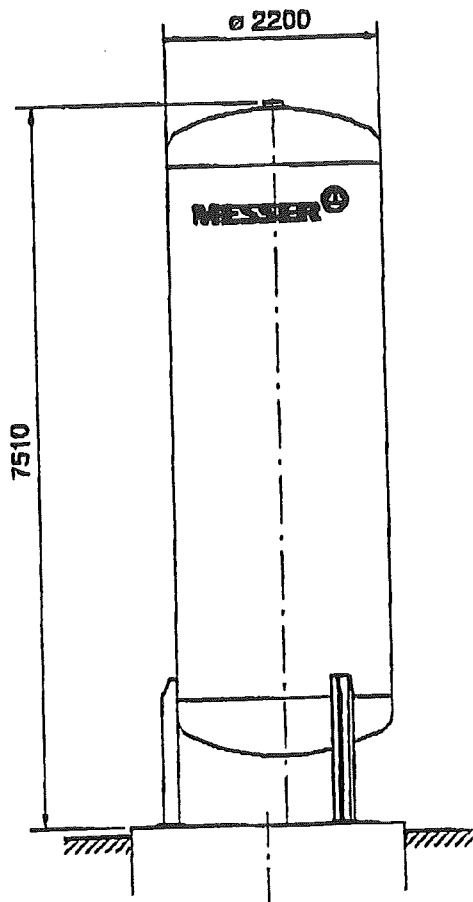
Chapter F

Foundation MP-LIN Storage Tank
B73001



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

Loadcase



$$G_{min} = 105 \text{ kN}$$

$$P_{max} = 201 \text{ kN}$$

$$Q_{max} = \underline{\underline{306 \text{ kN}}}$$

Wind (DIN 1055 T4)

$$H_{max} = 7,51 \text{ m} < 8,0 \text{ m}$$

$$\rightarrow q_{40} = \underline{\underline{0,50 \text{ kN/m}^2}}$$

$$\phi 2,20 \text{ m}$$

$$Re = \frac{35,0 \cdot 2,20}{1,5 \cdot 10^{-5}} = 5,25 \cdot 10^6$$

$$C_{fo} = 1,2 + \frac{0,18 \cdot \log\left(10 \cdot \frac{9000}{2,2}\right)}{1104 \cdot \log 5,25} = 0,873$$

$$\lambda = 0,7 \cdot \frac{7,51}{2,2} = 2,39 \Rightarrow \psi = 0,65$$

$$q_w = 0,65 \cdot 0,873 \cdot 0,50 \cdot 2,20$$

$$= \underline{\underline{0,62 \text{ kN/m}}}$$

KIMAI

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

1.2 Behälterangaben

Baureihe	Behältertyp	D_a [m]	H [m]	n [-]	D_F [m]	G_B [kN]	G_F [kN]
60	KV 65 II	2.5	3.5	3	2.4	59.0	82.0
	KV 160 II	2.7	6.1	4	2.2	105.0	201.0

Erläuterungen:

D_a = Außendurchmesser
H = Höhe
n = Anzahl der Stützfüße

D_F = Fußkreisdurchmesser
 G_B = Leergewicht
 G_F = Gewicht der Füllung

1.3 Armaturenkastenangaben

a_K [m]	b_K [m]	h_K [m]
0.7	1.4	1.4

Erläuterungen:

a_K = Tiefe
 b_K = Breite
 h_K = Höhe

Messer Griesheim GmbH
Industriestraße Krefeld

Krefeld, den 12.11.1999

Th. Redemann
Dipl.-Ing. Th. Redemann



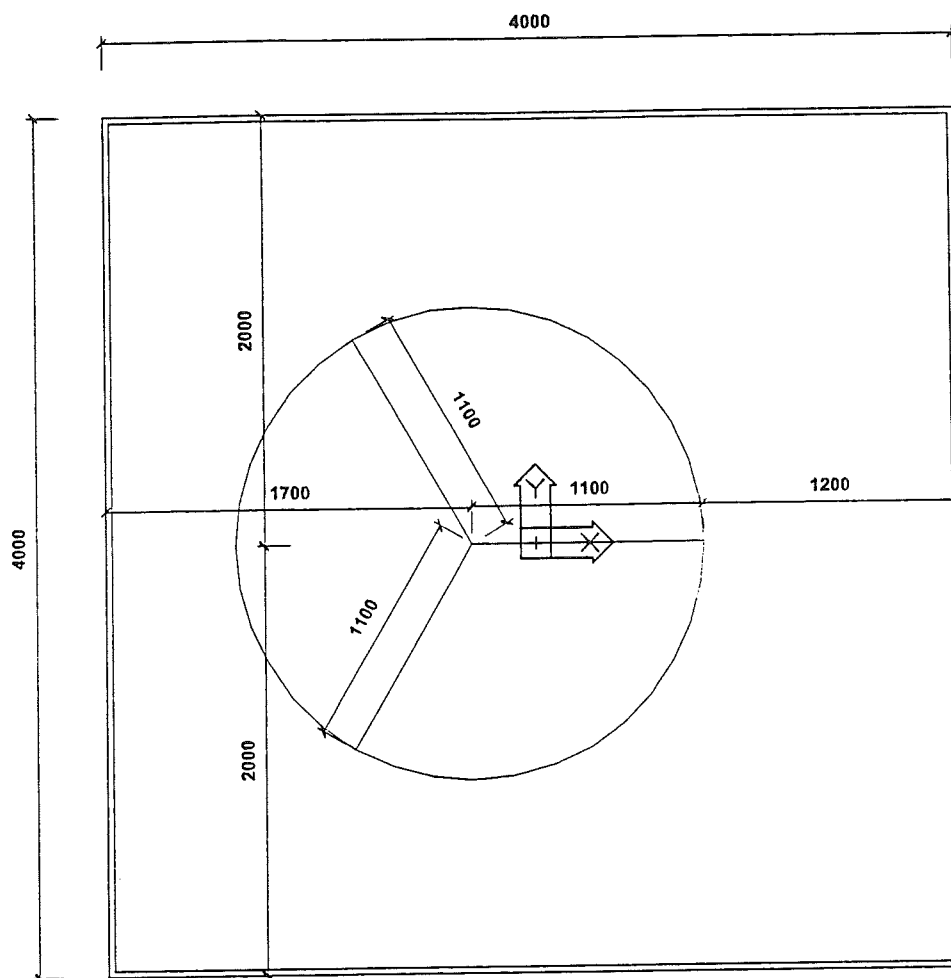
Anlage 2.4.2 zum Prüfbescheid
172-542-142

Gesehen:
Ministerium
für Bauwesen und Wohnen
des Landes Nordrhein-Westfalen
40180 Düsseldorf

- PRÜFAMT FÜR BAUSTATIK -
Düsseldorf, den 22.11.1999

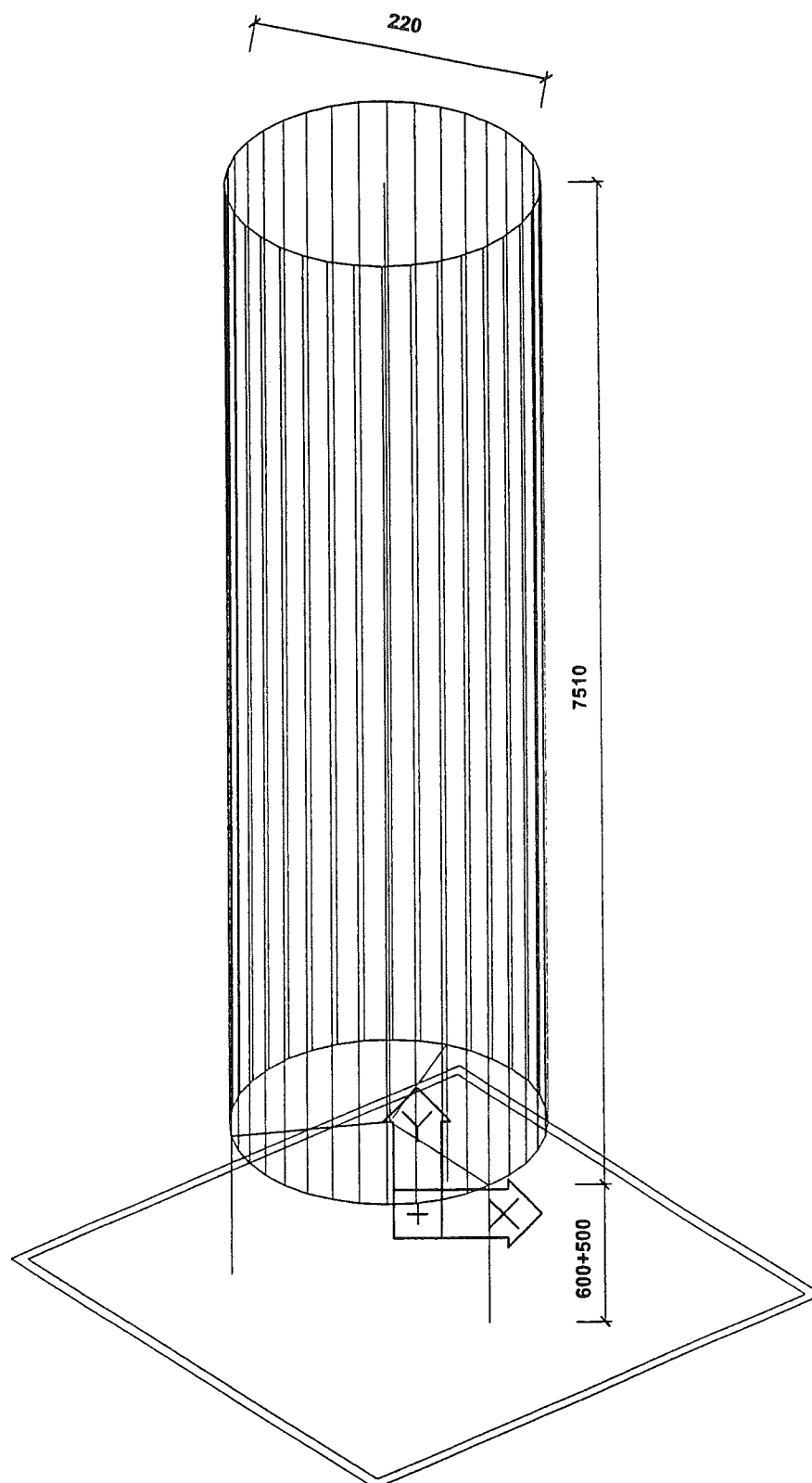
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2D reinforcement - As1+	30



B25, d = 120 cm

plan view



System

Basic data**Type of structure : General XYZ**

Number of nodes: 12
 Number of members: 7
 Number of 1D macros: 7
 Number of bound. lines: 4
 Number of 2D macros: 1
 Number of profiles : 3
 Number of cases: 11
 Number of materials: 2

Material

Name:

B 25

E modulus 30000.00 MPa
 Poisson coeff. 0.20
 Density 2500.000 kg/m³
 Extensibility 0.01 mm/m.K

B 25 gewichtslos

E modulus 30000.00 MPa
 Poisson coeff. 0.20
 Density 0.000 kg/m³
 Extensibility 0.01 mm/m.K

List of material**Group of members :**

1/7

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	19.20	48000.00

The total weight of the structure: 48000.00 kg

Nodes

node	X m	Y m	Z m
1	-0.300	0.000	0.600
2	0.800	0.000	0.600

node	X m	Y m	Z m
3	-0.850	0.953	0.600
4	-0.850	-0.953	0.600
5	-0.300	0.000	8.110
6	-0.850	-0.953	-0.500
7	0.800	0.000	-0.500
8	-0.850	0.953	-0.500
9	-2.000	-2.000	-0.500
10	2.000	-2.000	-0.500
11	2.000	2.000	-0.500
12	-2.000	2.000	-0.500

Members

macro	memb	node 1	node 2	length m	Rx deg	profile	quality
1	1	1	2	1.100	0.00	3 - Lasteinleitung (Numerica...	B 25 gewichtslos
2	2	1	3	1.100	0.00	3 - Lasteinleitung (Numerica...	B 25 gewichtslos
3	3	1	4	1.100	0.00	3 - Lasteinleitung (Numerica...	B 25 gewichtslos
4	4	1	5	7.510	0.00	1 - KREIS (220.0)	B 25 gewichtslos
5	5	6	4	1.100	0.00	3 - Lasteinleitung (Numerica...	B 25 gewichtslos
6	6	7	2	1.100	0.00	3 - Lasteinleitung (Numerica...	B 25 gewichtslos
7	7	8	3	1.100	0.00	3 - Lasteinleitung (Numerica...	B 25 gewichtslos

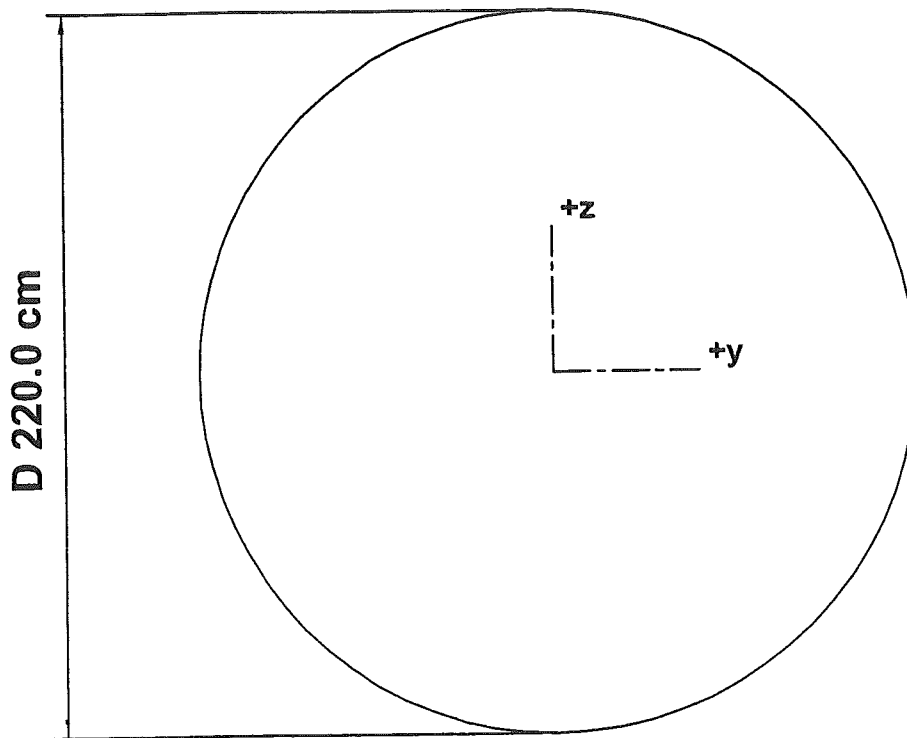
Boundaries

bound. line	type	node
1	Line	9,10
2	Line	10,11
3	Line	11,12
4	Line	12,9

2D Macros

num	type
1	
	B 25 Thickness 1.20 m
	Boundary: 1,2,3,4
	Nodes : 6,7,8

Profiles



KREIS (220.0)

Profile no. 1 - KREIS (220.0)
Material : 8 - B 25 gewichtslos

A:	3.801327e+004 cm ²	Az/A:	0.850
Ay/A:	0.850	Iz:	1.149901e+008 cm ⁴
Iy:	1.149901e+008 cm ⁴	It:	2.299803e+008 cm ⁴
Iyz:	6.086711e-007 cm ⁴		
Iw:	0.000000e+000 cm ⁶		
Wely:	1.042714e+006 cm ³	Welz:	1.042714e+006 cm ³
Wply:	1.771265e+006 cm ³	Wplz:	1.771290e+006 cm ³
cy:	0.00 cm	cz:	0.00 cm
iy:	55.00 cm	iz:	55.00 cm
dy:	0.00 cm	dz:	0.00 cm
Outline :	690.27 cm		

Type for check: Untypical section
Profile no. 3 - Lasteinleitung (Numerical)
Material : 8 - B 25 gewichtslos

A:	1.000000e+003 cm ²	Az/A:	1.000
Ay/A:	1.000	Iz:	4.000000e+004 cm ⁴
Iy:	4.000000e+004 cm ⁴	It:	4.000000e+004 cm ⁴
Iyz:	0.000000e+000 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

A: $-1.000000e+003 \text{ cm}^2$
 dy: 0.00 cm dz: 0.00 cm
 Outline : 0.00 cm

Type for check: Untypical section

Hinges

The stiffness values of line hinges are stated in 1 m' of length

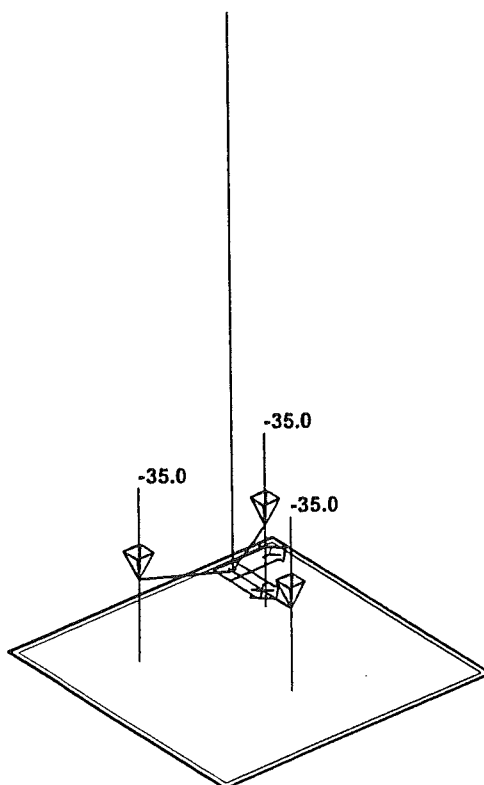
macro	type	pos
5	fiyfiz	beg
6	fiyfiz	beg
7	fiyfiz	beg

Soil - 2D macro

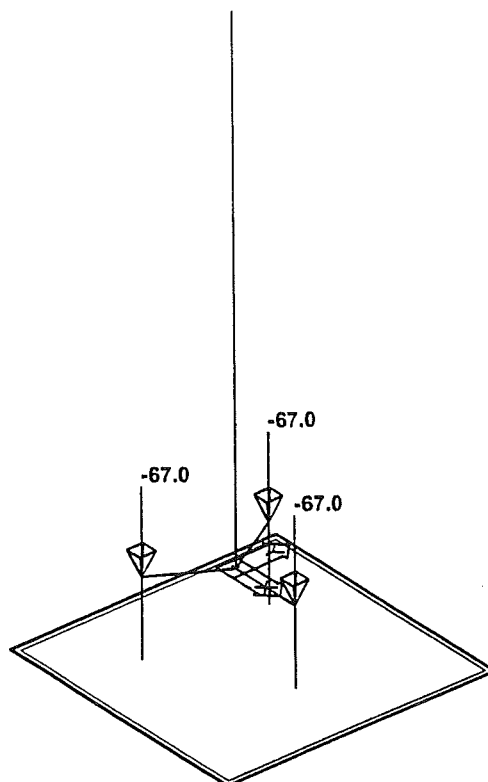
Index	2D macro	Name of subsoil
1	1	Sand/Clean/Moderate

Loadcases

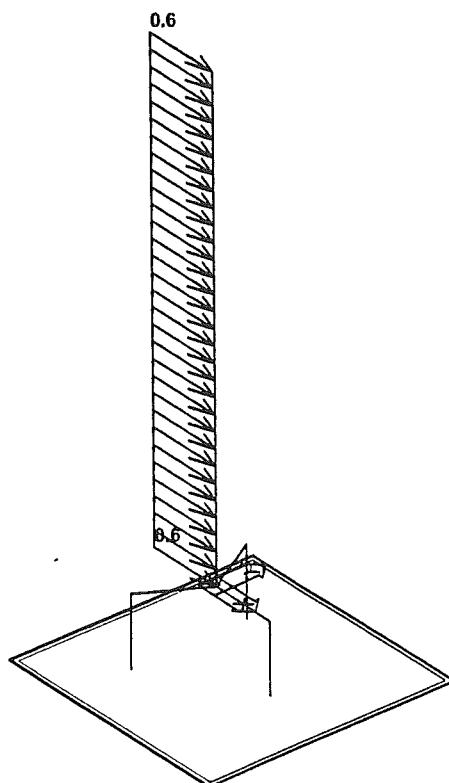
Case	Name:	Description
1	Weight concret	Self weight. Direction -Z
2	Weight	Permanent - Loads
3	P	Variable - P
4	Wind +X	Variable - Wind Excl.
5	Wind -X	Variable - Wind Excl.
6	Wind +Y	Variable - Wind Excl.
7	Wind -Y	Variable - Wind Excl.
8	Wind -X/+Y	Variable - Wind Excl. Summational load case 5. Wind -X, 0.71 6. Wind +Y, 0.71
9	Wind -X/-Y	Variable - Wind Excl. Summational load case 5. Wind -X, 0.71 7. Wind -Y, 0.71
10	Wind +X/-Y	Variable - Wind Excl. Summational load case 4. Wind +X, 0.71 7. Wind -Y, 0.71
11	Wind +X/+Y	Variable - Wind Excl. Summational load case 4. Wind +X, 0.71 6. Wind +Y, 0.71



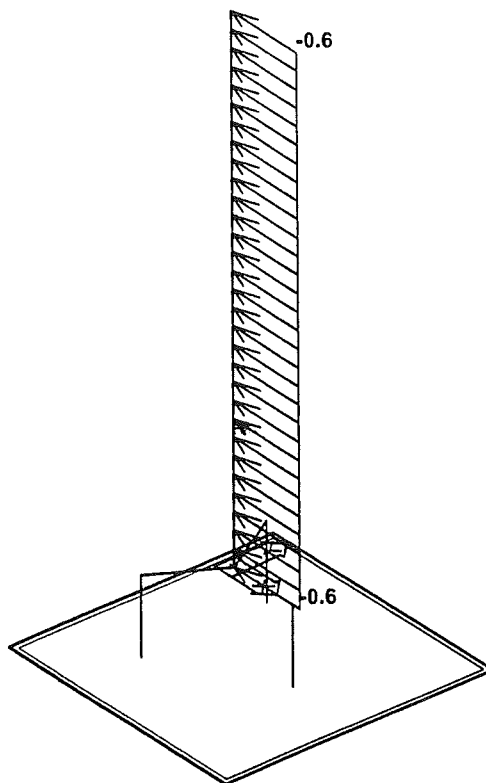
2. Weight



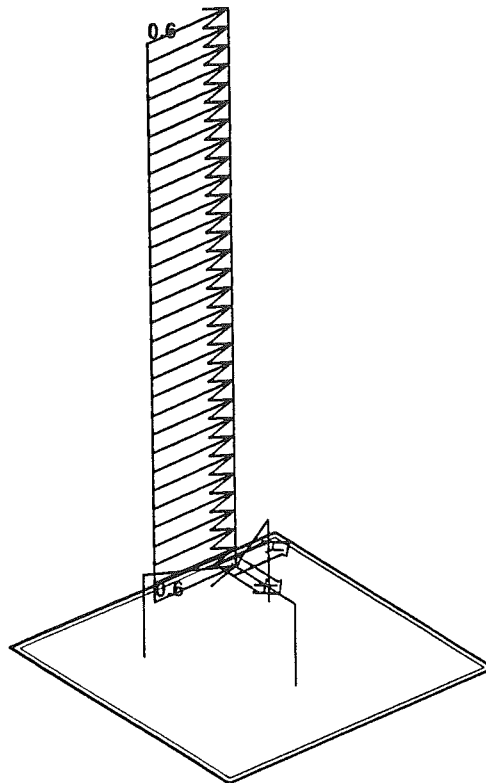
3. P



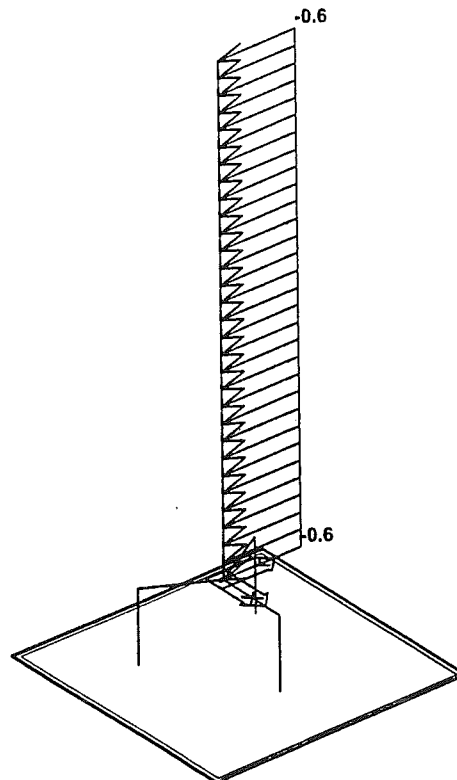
4. Wind +X



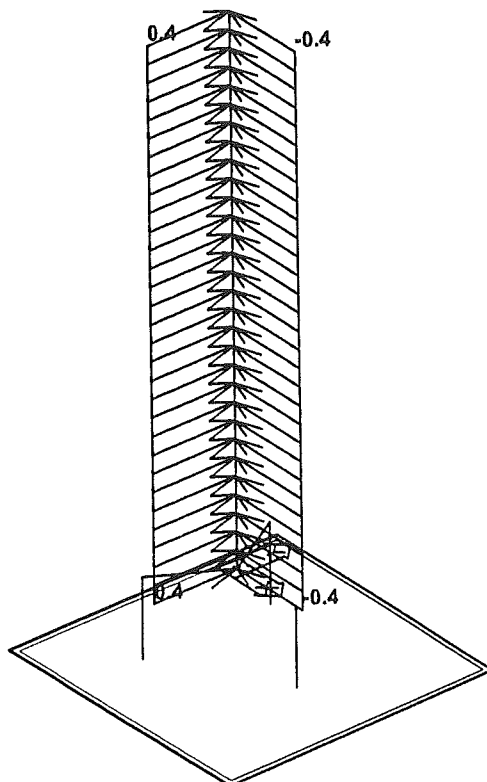
5. Wind -X



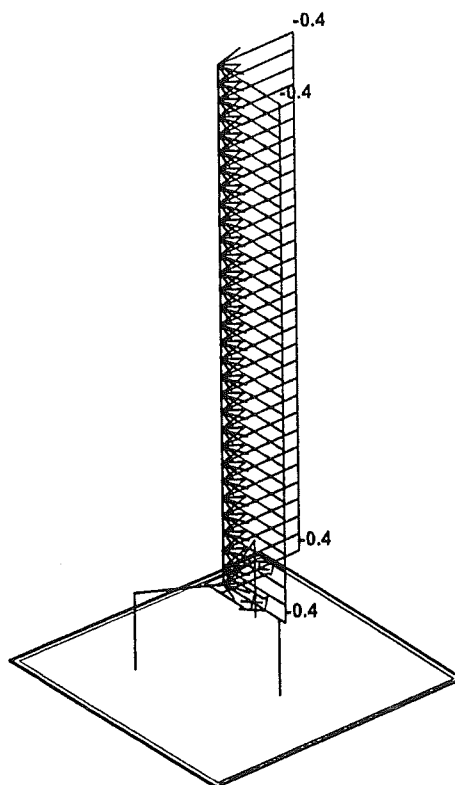
6. Wind +Y



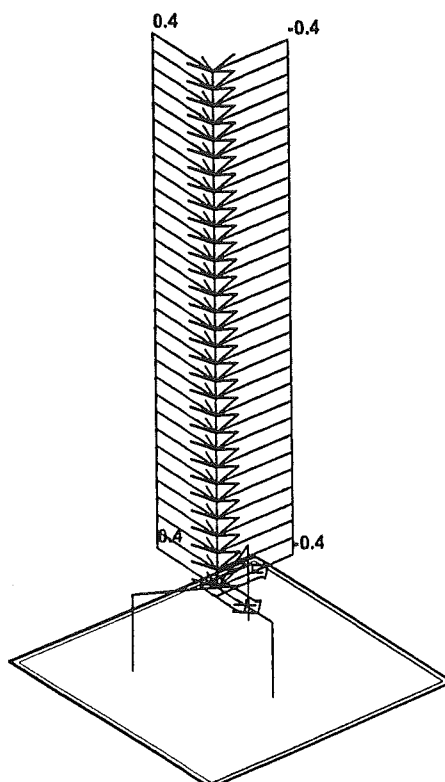
7. Wind -Y



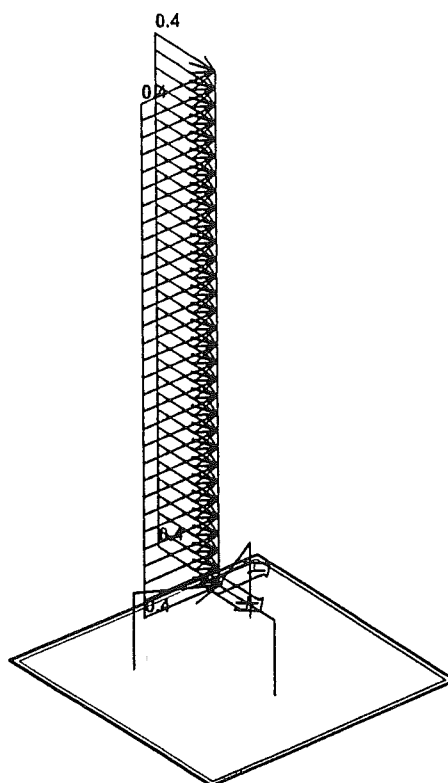
8. Wind -X/+Y



9. Wind -X/-Y



10. Wind +X/-Y



11. Wind +X/+Y

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
2	0.00	0.00	-35.00	0.00	0.00	0.00
3	0.00	0.00	-35.00	0.00	0.00	0.00
4	0.00	0.00	-35.00	0.00	0.00	0.00

Loadcase no. 3 - nodal loads

node	Fx kN	Fy kN	Fz kN	Mx kNm	My kNm	Mz kNm
2	0.00	0.00	-67.00	0.00	0.00	0.00
3	0.00	0.00	-67.00	0.00	0.00	0.00
4	0.00	0.00	-67.00	0.00	0.00	0.00

Loadcase no. 4 - distributed loads

macro	type	dx m	exY m	exZ m		X beg end	Y beg end	Z beg end
4	force kN/m	0.00 rel 1.00	0.00	0.00	glo len	0.62 0.62	0.00 0.00	0.00 0.00

Loadcase no. 5 - distributed loads

macro	type	dx m	exY m	exZ m		X beg end	Y beg end	Z beg end
4	force kN/m	0.00 rel 1.00	0.00	0.00	glo len	-0.62 -0.62	0.00 0.00	0.00 0.00

Loadcase no. 6 - distributed loads

macro	type	dx m	exY m	exZ m		X beg end	Y beg end	Z beg end
4	force kN/m	0.00 rel 1.00	0.00	0.00	glo len	0.00 0.00	0.62 0.62	0.00 0.00

Loadcase no. 7 - distributed loads

macro	type	dx m	exY m	exZ m		X beg end	Y beg end	Z beg end
4	force kN/m	0.00 rel 1.00	0.00	0.00	glo len	0.00 0.00	-0.62 -0.62	0.00 0.00

Loadcase no. 8 - distributed loads

macro	type	dx m	exY m	exZ m		X beg end	Y beg end	Z beg end
4	force	0.00 rel	0.00	0.00	glo	-0.44	0.00	0.00
	kN/m	1.00			len	-0.44	0.00	0.00
	force	0.00 rel	0.00	0.00	glo	0.00	0.44	0.00
	kN/m	1.00			len	0.00	0.44	0.00

Loadcase no. 9 - distributed loads

macro	type	dx m	exY m	exZ m		X beg end	Y beg end	Z beg end
4	force	0.00 rel	0.00	0.00	glo	-0.44	0.00	0.00
	kN/m	1.00			len	-0.44	0.00	0.00
	force	0.00 rel	0.00	0.00	glo	0.00	-0.44	0.00
	kN/m	1.00			len	0.00	-0.44	0.00

Loadcase no. 10 - distributed loads

macro	type	dx m	exY m	exZ m		X beg end	Y beg end	Z beg end
4	force	0.00 rel	0.00	0.00	glo	0.44	0.00	0.00
	kN/m	1.00			len	0.44	0.00	0.00
	force	0.00 rel	0.00	0.00	glo	0.00	-0.44	0.00
	kN/m	1.00			len	0.00	-0.44	0.00

Loadcase no. 11 - distributed loads

macro	type	dx m	exY m	exZ m		X beg end	Y beg end	Z beg end
4	force	0.00 rel	0.00	0.00	glo	0.44	0.00	0.00
	kN/m	1.00			len	0.44	0.00	0.00
	force	0.00 rel	0.00	0.00	glo	0.00	0.44	0.00
	kN/m	1.00			len	0.00	0.44	0.00

Combinations

Combi	Norm	Case	coeff
1.	User-ultimate	1 Weight concret	1.00
		2 Weight	1.00
		3 P	1.00
		4 Wind +X	1.00
		5 Wind -X	1.00
		6 Wind +Y	1.00
		7 Wind -Y	1.00
		8 Wind -X/+Y	1.00
		9 Wind -X/-Y	1.00
		10 Wind +X/-Y	1.00
		11 Wind +X/+Y	1.00

Combi	Norm	Case	coeff
2.	User-serviceability	1 Weight concret	1.00
		2 Weight	1.00
		3 P	1.00
		4 Wind +X	1.00
		5 Wind -X	1.00
		6 Wind +Y	1.00
		7 Wind -Y	1.00
		8 Wind -X/+Y	1.00
		9 Wind -X/-Y	1.00
		10 Wind +X/-Y	1.00
		11 Wind +X/+Y	1.00

Basic rules for generation of ultimate load combinations:

1 : 1.00*LC1 / 1.00*LC2 / 1.00*LC3 / 1.00*LC4 / 1.00*LC5 / 1.00*LC6 / 1.00*LC7 / 1.00*LC8 / 1.00*LC9 / 1.00*LC10 / 1.00*LC11

Basic rules for generation of serviceability load combinations:

1 : 1.00*LC1 / 1.00*LC2 / 1.00*LC3 / 1.00*LC4 / 1.00*LC5 / 1.00*LC6 / 1.00*LC7 / 1.00*LC8 / 1.00*LC9 / 1.00*LC10 / 1.00*LC11

List of extreme ultimate load combinations

1/ 1 : +1.00*LC1+1.00*LC2+1.00*LC4
 2/ 1 : +1.00*LC1+1.00*LC2+1.00*LC5
 3/ 1 : +1.00*LC1+1.00*LC2+1.00*LC6
 4/ 1 : +1.00*LC1+1.00*LC2+1.00*LC7
 5/ 1 : +1.00*LC1+1.00*LC2+1.00*LC8
 6/ 1 : +1.00*LC1+1.00*LC2+1.00*LC9
 7/ 1 : +1.00*LC1+1.00*LC2+1.00*LC10
 8/ 1 : +1.00*LC1+1.00*LC2+1.00*LC11
 9/ 1 : +1.00*LC1+1.00*LC2+1.00*LC3+1.00*LC4
 10/ 1 : +1.00*LC1+1.00*LC2+1.00*LC3+1.00*LC8
 11/ 1 : +1.00*LC1+1.00*LC2+1.00*LC3+1.00*LC9

List of extreme serviceability load combinations

1/ 1 : +1.00*LC1+1.00*LC2+1.00*LC4
 2/ 1 : +1.00*LC1+1.00*LC2+1.00*LC5
 3/ 1 : +1.00*LC1+1.00*LC2+1.00*LC6
 4/ 1 : +1.00*LC1+1.00*LC2+1.00*LC7
 5/ 1 : +1.00*LC1+1.00*LC2+1.00*LC8
 6/ 1 : +1.00*LC1+1.00*LC2+1.00*LC9
 7/ 1 : +1.00*LC1+1.00*LC2+1.00*LC10
 8/ 1 : +1.00*LC1+1.00*LC2+1.00*LC11
 9/ 1 : +1.00*LC1+1.00*LC2+1.00*LC3+1.00*LC4
 10/ 1 : +1.00*LC1+1.00*LC2+1.00*LC3+1.00*LC5
 11/ 1 : +1.00*LC1+1.00*LC2+1.00*LC3+1.00*LC8
 12/ 1 : +1.00*LC1+1.00*LC2+1.00*LC3+1.00*LC9

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.

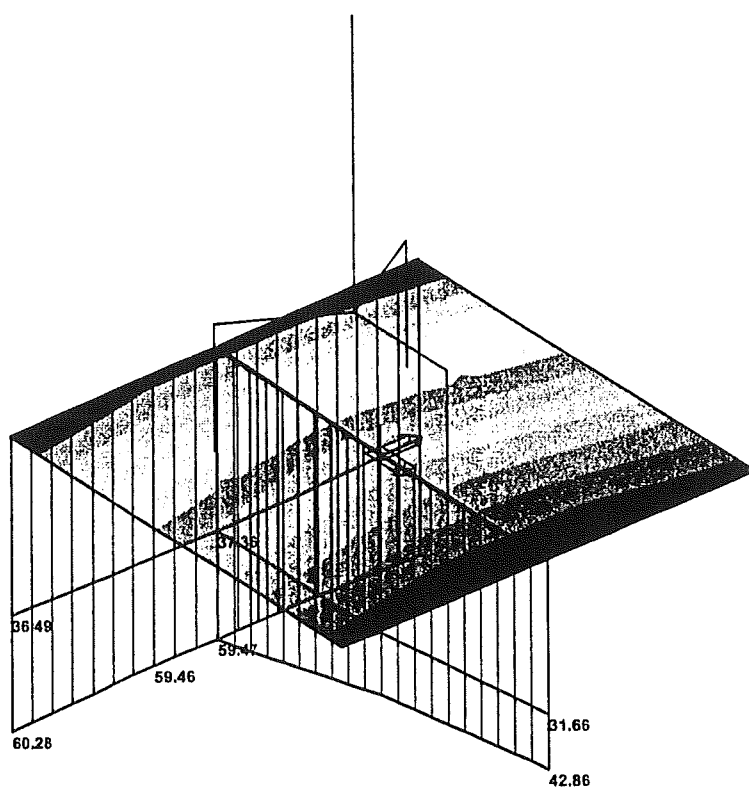
Linear calculation

Number of 2D elements	400
Number of 1D elements	7
Number of mesh nodes	446
Number of equations	2676
Loadcases	LC 1 Weight concret
	LC 2 Weight
	LC 3 P
	LC 4 Wind +X
	LC 5 Wind -X
	LC 6 Wind +Y
	LC 7 Wind -Y
	LC 8 Wind -X/+Y
	LC 9 Wind -X/-Y
	LC 10 Wind +X/-Y
	LC 11 Wind +X/+Y
Bending theory	Mindlin
Start of calculation	06.09.2004 15:01
End of calculation	06.09.2004 15:01

Sum of loads and reactions.

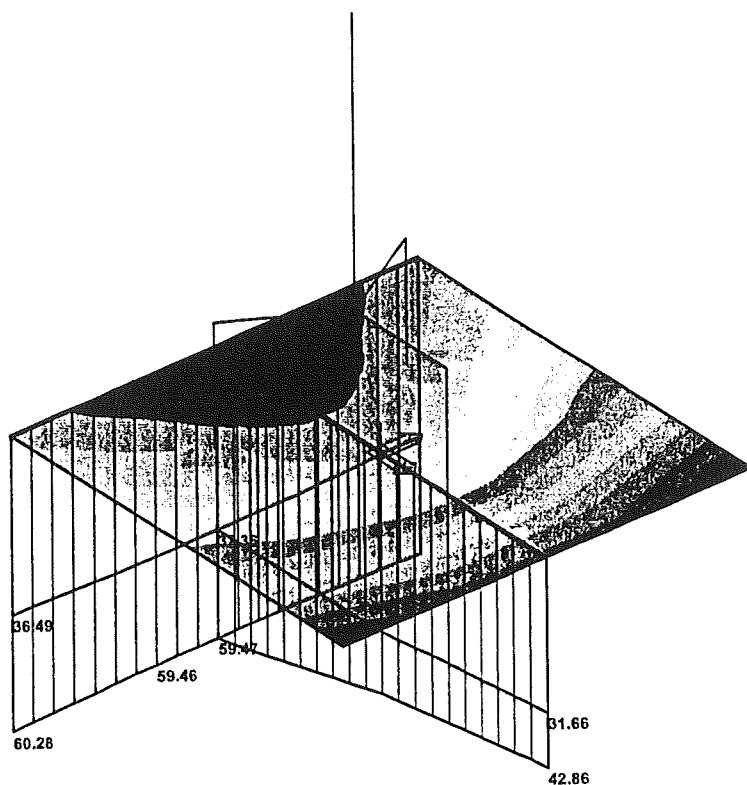
		X	Y	Z
loadcase 1	loads	0.0	0.0	-480.0
	reactions	0.0	0.0	0.0
	contact	-0.0	0.0	480.0
loadcase 2	loads	0.0	0.0	-105.0
	reactions	0.0	0.0	0.0
	contact	-0.0	-0.0	105.0
loadcase 3	loads	0.0	0.0	-201.0
	reactions	0.0	0.0	0.0
	contact	-0.0	-0.0	201.0
loadcase 4	loads	4.7	0.0	0.0
	reactions	0.0	0.0	0.0
	contact	-4.7	-0.0	0.0
loadcase 5	loads	-4.7	0.0	0.0
	reactions	0.0	0.0	0.0
	contact	4.7	0.0	-0.0
loadcase 6	loads	0.0	4.7	0.0
	reactions	0.0	0.0	0.0
	contact	-0.0	-4.7	-0.0
loadcase 7	loads	0.0	-4.7	0.0
	reactions	0.0	0.0	0.0
	contact	0.0	4.7	0.0
loadcase 8	loads	-3.3	3.3	0.0
	reactions	0.0	0.0	0.0
	contact	3.3	-3.3	0.0
loadcase 9	loads	-3.3	-3.3	0.0
	reactions	0.0	0.0	0.0
	contact	3.3	3.3	-0.0
loadcase 10	loads	3.3	-3.3	0.0
	reactions	0.0	0.0	0.0
	contact	-3.3	3.3	-0.0
loadcase 11	loads	3.3	3.3	0.0

	X	Y	Z
reactions	0.0	0.0	0.0
contact	-3.3	-3.3	0.0



Max sigmz [kPa]
60.282
58.940
57.598
56.256
54.914
53.573
52.231
50.889
49.547
48.205
46.863
45.522
44.180
42.838

Contact stress - max sigmz - FEM Combi : 1



Min sigmz [kPa]	
37.382	
36.858	
36.353	
35.849	
35.344	
34.839	
34.335	
33.830	
33.326	
32.821	
32.317	
31.812	
31.307	
30.803	

Contact stress - min sigmz - FEM Combi : 1

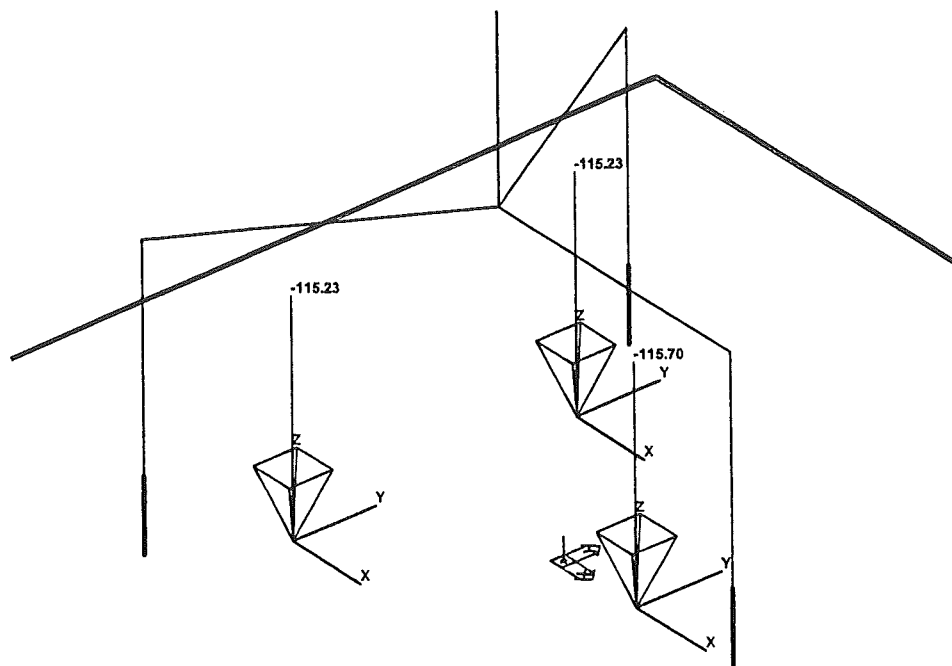
RESULTS : CONTACT STRESSES

FEM Combi:
C1 User-ultimate

Global extremes

node	sigmz [kPa]
9	60.282
10	30.803

Selection was done for macros: 1



in node(s). Ult. combi : 1/11

Force in connection coordinate system. Member extreme

Group of ultimate combi : 1/11

1 - a

Node - 6. Position of connection coordinate system related to node : : x : 0.23 m, y : 0.39 m, z : 0.00 m

memb	combi	Fx [kN]	Fy [kN]	Fz [kN]	Mx [kNm]	My [kNm]	Mz [kNm]
5	3	-1.88	2.64	-23.13	0.00	0.00	-0.05
	4	-1.88	-2.63	-46.86	0.00	0.00	0.05
	8	1.66	3.19	-21.77	0.00	0.00	0.03
	6	-1.66	3.19	-48.23	0.00	0.00	-0.03
	11	-1.66	-3.19	-115.23	0.00	0.00	-0.03
1	3	-1.88	2.64	-23.13	0.73	-0.42	-8.47
	4	-1.88	-2.63	-46.86	-0.73	0.42	-18.81
	8	1.66	3.19	-21.77	0.65	-0.37	-7.74
	6	-1.66	3.19	-48.23	-0.65	0.37	-19.54
	11	-1.66	-3.19	-115.23	-0.65	0.37	-45.65

2 - b

Node - 8. Position of connection coordinate system related to node : : x : 0.22 m, y : -0.39 m, z : 0.00 m

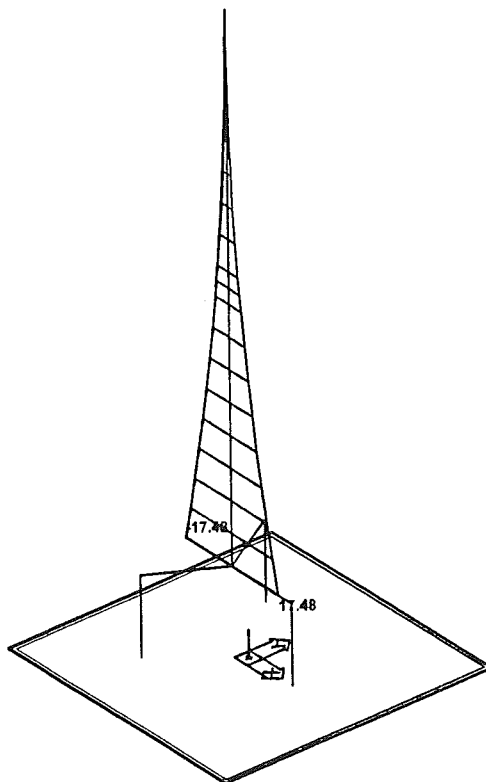
memb	combi	Fx [kN]	Fy [kN]	Fz [kN]	Mx [kNm]	My [kNm]	Mz [kNm]
7	4	-1.88	-2.64	-23.13	0.00	-0.00	0.05
	3	-1.88	2.63	-46.86	0.00	-0.00	-0.05
	5	-1.66	3.19	-48.23	0.00	-0.00	0.03
	7	1.66	-3.19	-21.77	0.00	-0.00	-0.03

memb	combi	Fx [kN]	Fy [kN]	Fz [kN]	Mx [kNm]	My [kNm]	Mz [kNm]
1	10	-1.66	3.19	-175.23	0.00	-0.00	0.03
	3	-1.66	2.63	-46.86	0.73	0.42	18.81
	7	1.66	-3.19	-21.77	-0.65	-0.37	7.74
	10	-1.66	3.19	-175.23	0.65	0.37	45.65

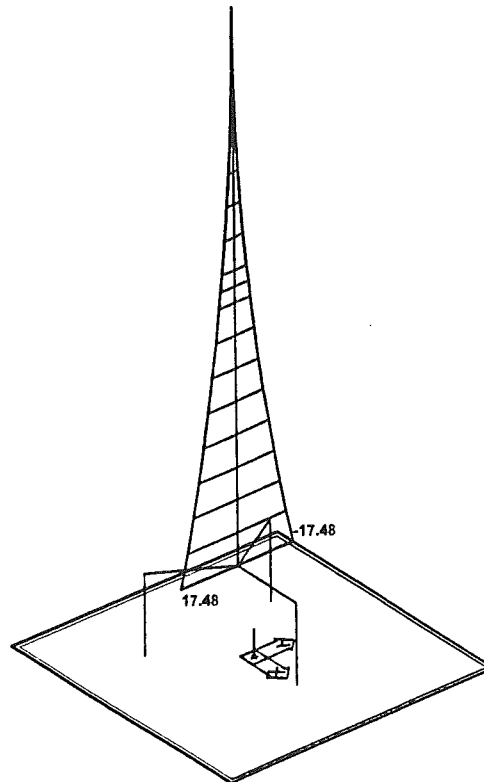
3 - c

Node - 7. Position of connection coordinate system related to node : : x : -0.45 m,y : 0.00 m,z : 0.00 m

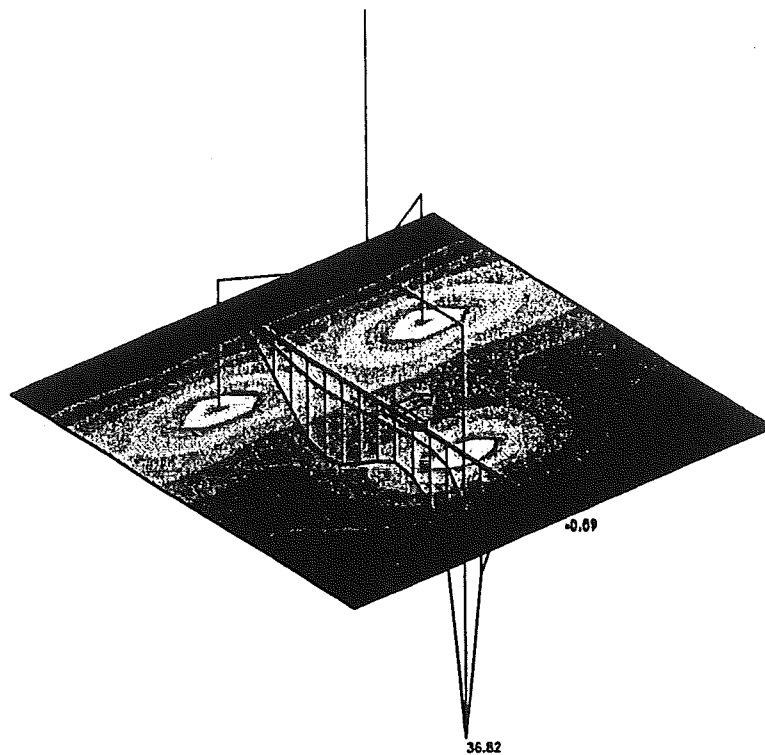
memb	combi	Fx [kN]	Fy [kN]	Fz [kN]	Mx [kNm]	My [kNm]	Mz [kNm]
6	1	-3.72	-0.00	-48.70	-0.00	0.00	0.00
	2	-3.72	0.00	-21.30	-0.00	-0.00	0.00
	4	-0.00	-0.61	-35.00	-0.00	0.00	-0.10
	3	-0.00	-0.61	-35.00	-0.00	0.00	0.10
	9	3.72	-0.00	-115.70	-0.00	0.00	0.00
1	1	-3.72	-0.00	-48.70	-0.00	1.67	0.00
	2	-3.72	0.00	-21.30	-0.00	-1.67	0.00
	3	-0.00	-0.61	-35.00	-0.00	-0.00	0.38
	9	3.72	-0.00	-115.70	-0.00	1.67	0.00



Internal forces - My on member(s). Ult. combi : 1/11

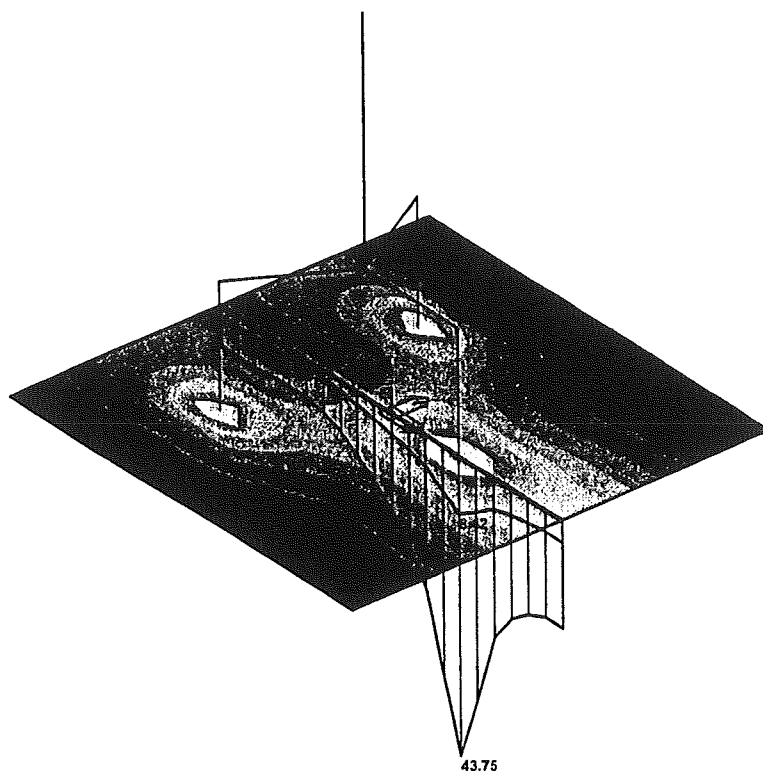


Internal forces - Mz on member(s). Ult. combi : 1/11



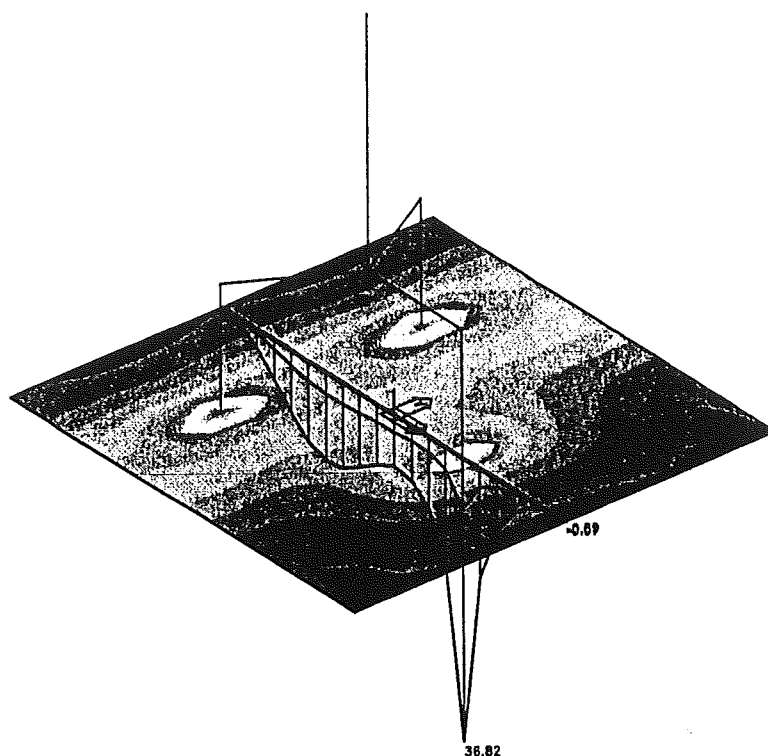
Max mx [kNm/m]	
36.953	
35.950	
32.947	
29.943	
26.940	
23.936	
20.933	
17.930	
14.926	
11.923	
8.920	
5.916	
2.913	
-0.091	

Internal force - max mx - FEM Combi : 1



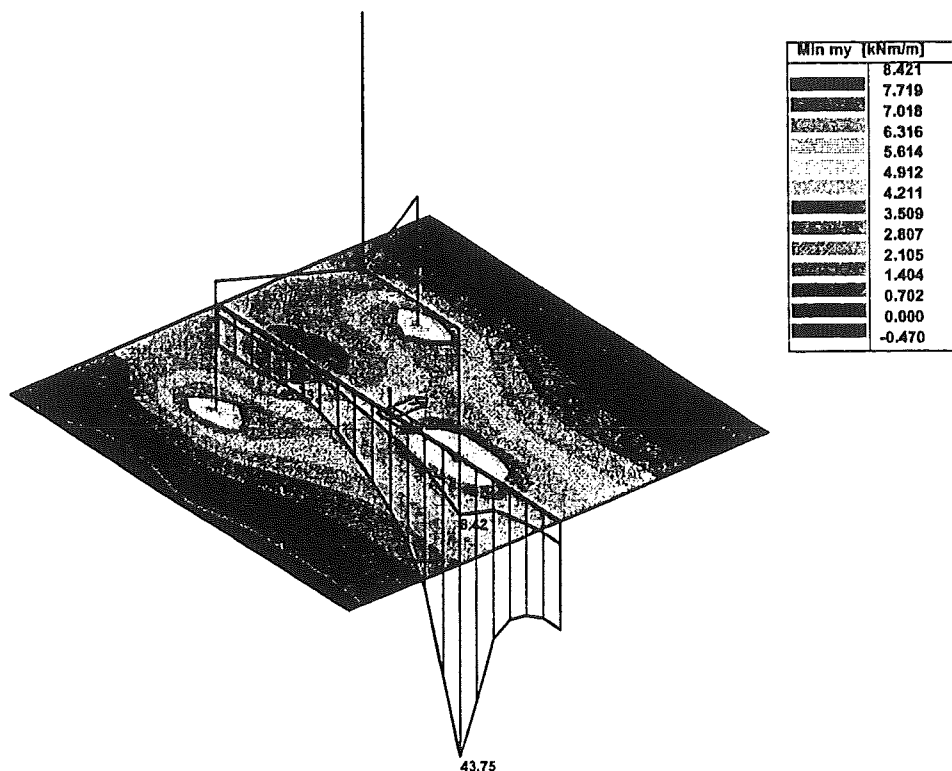
Max my [kNm/m]	
43.752	
40.379	
37.006	
33.634	
30.261	
26.888	
23.515	
20.143	
16.770	
13.397	
10.024	
6.652	
3.279	
-0.084	

Internal force - max my - FEM Combi : 1



Min mx [kNm/m]	
7.626	
6.891	
6.355	
5.720	
5.084	
4.449	
3.813	
3.178	
2.542	
1.907	
1.271	
0.636	
0.000	
-0.409	

Internal force - min mx - FEM Combi : 1



Internal force - min my - FEM Combi : 1

RESULTS : INTERNAL FORCES

FEM Combi:

C1 Eigen-Tragfähigk.

Global extremes

Rotation of the local system: No

Basic magnitudes - bending, membrane

node	mx [kNm/m]	my [kNm/m]	mxy [kNm/m]	qx [kN/m]	qy [kN/m]	nx [kN/m]	ny [kN/m]	qxy [kN/m]
6	38.953	36.966	0.195	16.373	-0.903	1.000	0.707	0.365
431	-0.409	1.444	-0.406	0.797	-0.284	-0.038	-0.773	-0.009
7	36.822	43.752	1.183	-0.570	0.232	0.328	0.101	0.661
410	2.538	-0.470	-0.074	-2.069	-4.389	-1.387	-0.071	-0.021
232	10.456	12.149	5.317	-1.317	9.474	0.840	0.880	1.366
117	2.609	2.861	5.318	-15.766	-9.476	-0.840	-0.880	-1.366
436	20.964	27.106	-0.004	135.437	15.141	3.160	1.101	4.551
183	2.511	6.634	-1.093	121.998	-0.403	-5.869	-0.635	-1.470
441	29.263	20.239	3.054	-0.842	127.867	1.362	6.584	4.624
437	5.860	4.088	-3.060	-9.942	127.761	-1.377	-6.568	-4.633
181	15.545	33.755	1.265	118.185	0.034	6.536	0.832	2.726
	2.940	6.606	-1.266	20.949	-0.034	6.536	-0.832	-2.726
441	29.263	20.239	3.054	-0.842	127.867	1.362	6.584	4.624
	5.866	4.098	-0.087	-9.749	23.010	-1.362	6.584	-4.624
437	29.228	20.188	0.086	-0.877	-22.988	1.377	6.568	4.633

node	mx	my	mxy	qx	qy	nx	ny	qxy
[kNm/m]	[kNm/m]	[kNm/m]	[kNm/m]	[kN/m]	[kN/m]	[kN/m]	[kN/m]	[kN/m]
	5.860	4.088	-3.060	-9.942	-127.761	-1.377	-6.568	-1.623

Selection was done for macros: 1

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	25000.000 kPa
betaR	17500.000 kPa
Tau011_1 plates	350.000 kPa
Tau011_2 plates	500.000 kPa
Tau02 plates	1800.000 kPa
Tau012 beams	750.000 kPa
Tau02 beams	1800.000 kPa
Tau03 beams	3000.000 kPa

Explanation of reinforcement steel symbols

Abbreviation	Explanation
betaS	Characteristic yield strength of reinforcement

Steel characteristics

	BSt 420
betaS	420000.000 kPa
E modulus	200000000.000 kPa

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

Description	Value
Structural reinforcement of deep beam	OFF

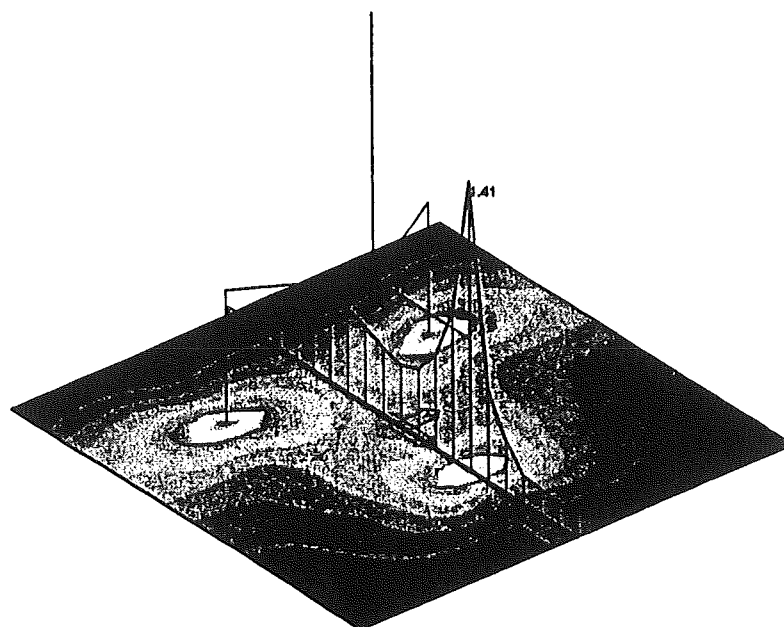
Description	Value
Maximum allowable crack width on face Zp+	0.25
Maximum allowable crack width on face Zp-	0.25
Characteristic bar distances on face Zp+	200.00
Characteristic bar distances on face Zp-	200.00
Load case attribute	crack proof LC due to internally caused imposed deformations
Effect upon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

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]
224	0.039	0.008	~	~	0.540	0.108	0.000	0.00	0.00
47	0.000	0.000	~	~	0.203	0.320	0.000	0.00	0.00
412	0.008	0.042	~	~	0.071	0.357	0.000	0.00	0.00
9	0.000	0.000	~	~	0.004	0.004	0.000	0.00	0.00
7	0.004	0.001	~	~	1.646	1.408	0.000	0.00	0.04
10	0.000	0.001	~	~	0.000	0.002	0.000	0.00	0.00
6	0.002	0.004	~	~	1.420	1.509	1.510	0.04	0.11
11	0.000	0.001	~	~	0.000	0.002	0.000	0.00	0.00
8	0.002	0.004	~	~	1.420	1.508	1.510	0.04	0.11
7	0.004	0.001	~	~	1.646	1.408	0.000	0.00	0.04
8	0.002	0.004	~	~	1.420	1.508	1.510	0.04	0.11
7	0.004	0.001	~	~	1.646	1.408	0.000	0.00	0.04
8	0.002	0.004	~	~	1.420	1.508	1.510	0.04	0.11
397	0.001	0.001	~	~	0.004	0.007	0.000	0.00	0.00

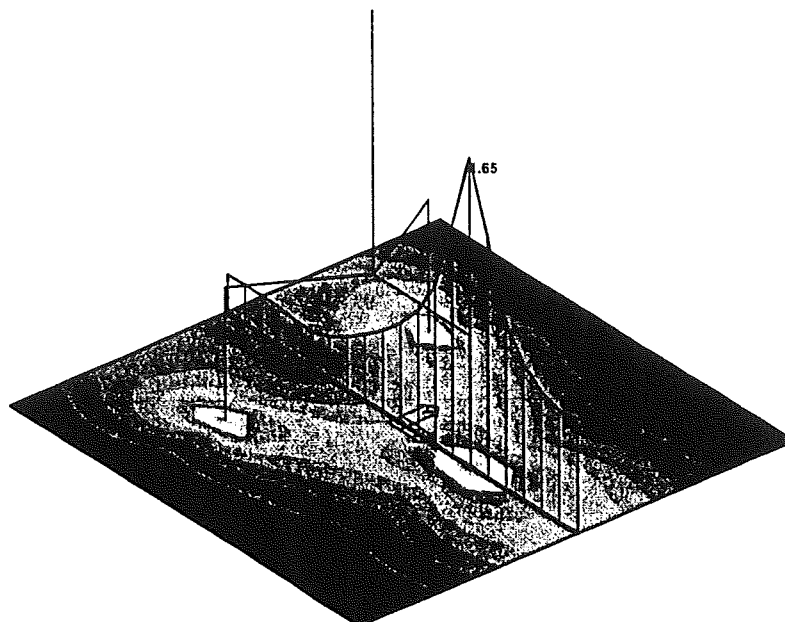
Selection was done for macros: 1



As1- [cm²/m]	
	1.509
	1.393
	1.277
	1.161
	1.045
	0.929
	0.813
	0.697
	0.581
	0.465
	0.350
	0.234
	0.118
	0.002

φ10/20cm

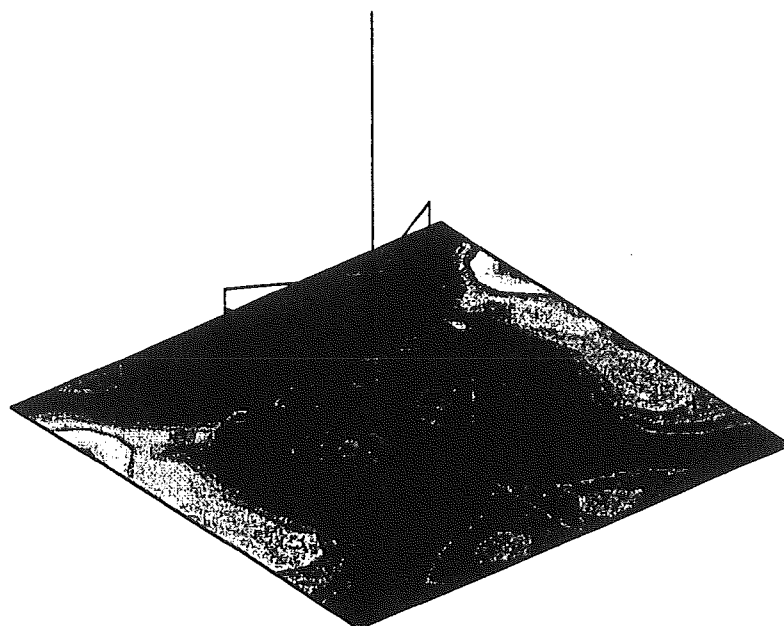
2D reinforcement - As1-



As2- [cm²/m]	
	1.646
	1.519
	1.392
	1.266
	1.139
	1.013
	0.886
	0.760
	0.633
	0.506
	0.380
	0.253
	0.127
	0.000

φ10/20cm

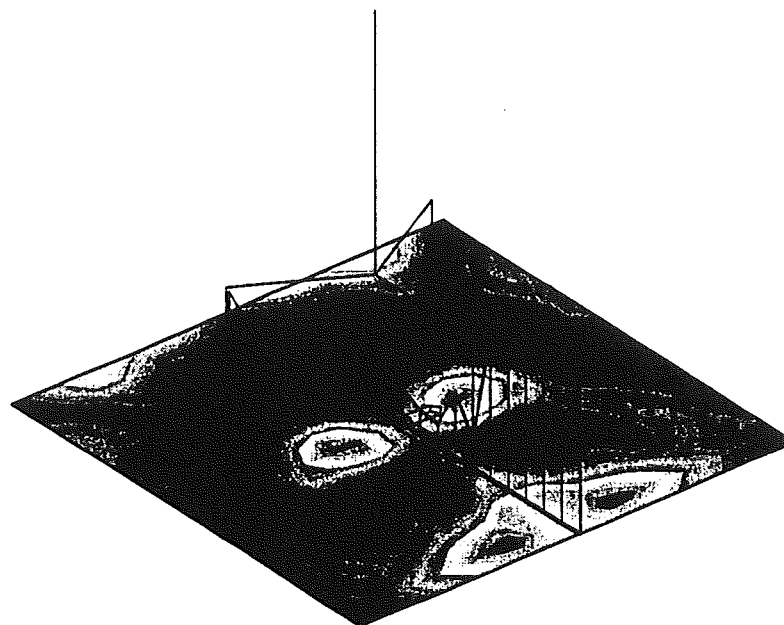
2D reinforcement - As2-



As2+ [cm²/m]	
0.042	
0.039	
0.036	
0.033	
0.029	
0.026	
0.023	
0.020	
0.016	
0.013	
0.010	
0.007	
0.003	
0.000	

9/10/20cm

2D reinforcement - As2+



As1+ [cm²/m]	
0.039	
0.036	
0.033	
0.030	
0.027	
0.024	
0.021	
0.018	
0.015	
0.012	
0.009	
0.006	
0.003	
0.000	

9/10/20cm

2D reinforcement - As1+

Chapter G

Foundation LIN Truck filling Pump P72001,
HP-LIN Backup Pump P74101
HP-LIN Backup Pump P74201



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E-Mail info@kmw-ing.de

- 62 -

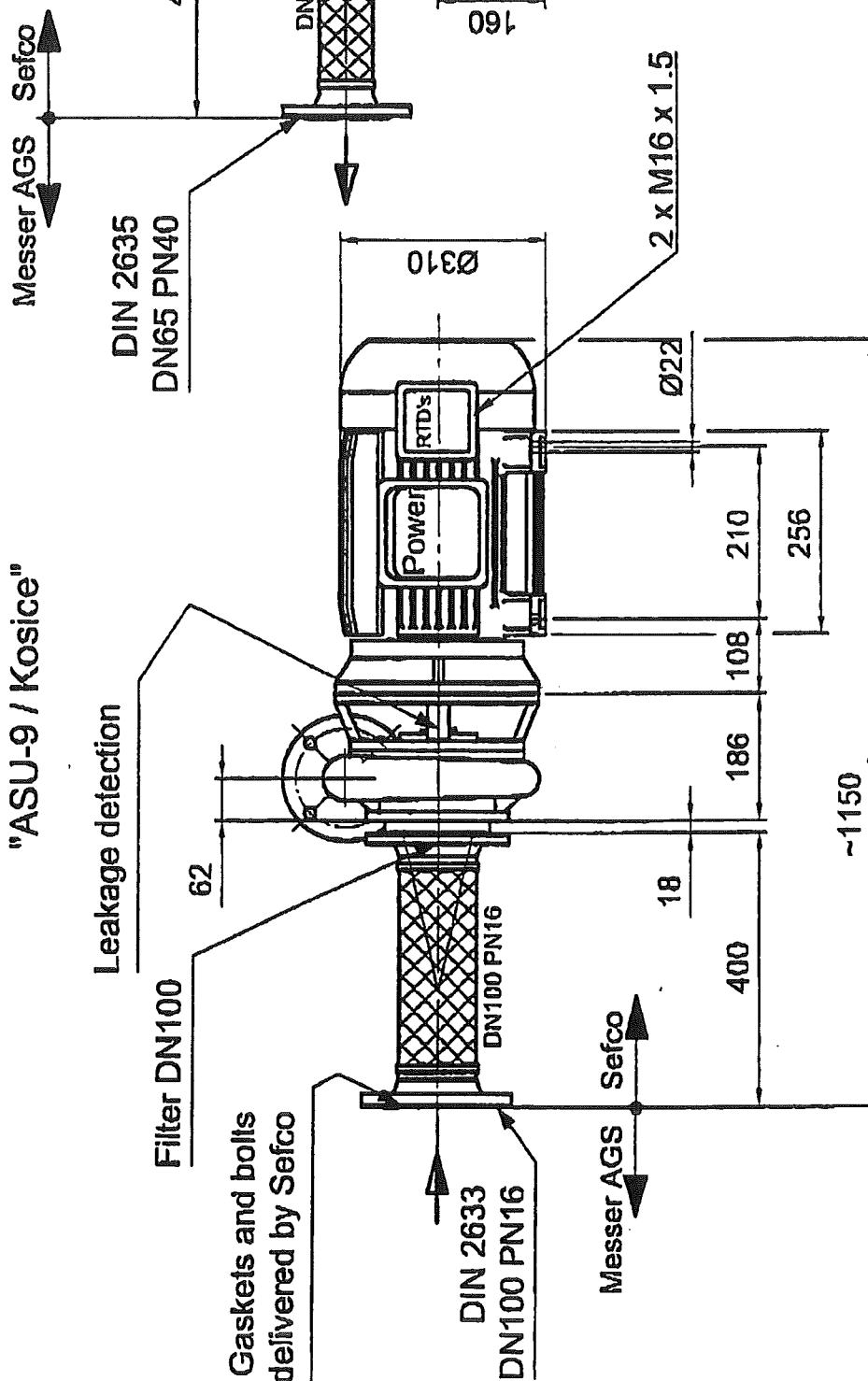
sefco

04.271/2

Pump Type : C-20 / EM - 15
 Motor Type : 160M - 15 kW
 Weight approx. 160 Kg

Arrangement Drawing : LIN Truck Filling Pump P72100

Messer AGS
 "ASU-9 / Kosice"



Max. Flanschenbelastung nach Zeichnung 4 13942

$$36 + 37$$

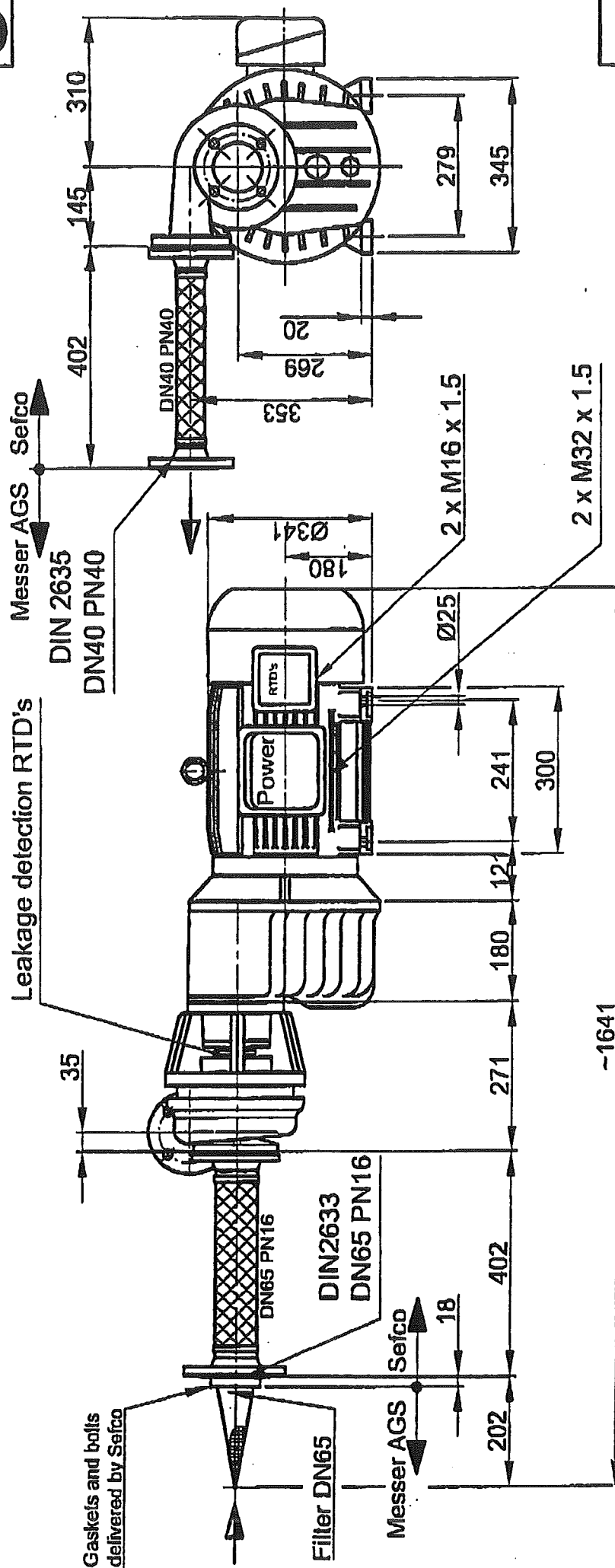
Arrangement drawing : LIN Backup Pump
P74101 & P74201

Messer AGS
"ASU-9 / Kosice"

Pump type : C - 19 / G2 / EM - 22
Motor type : 180M - 22 kW
Weight : approx. 245 Kg

setco

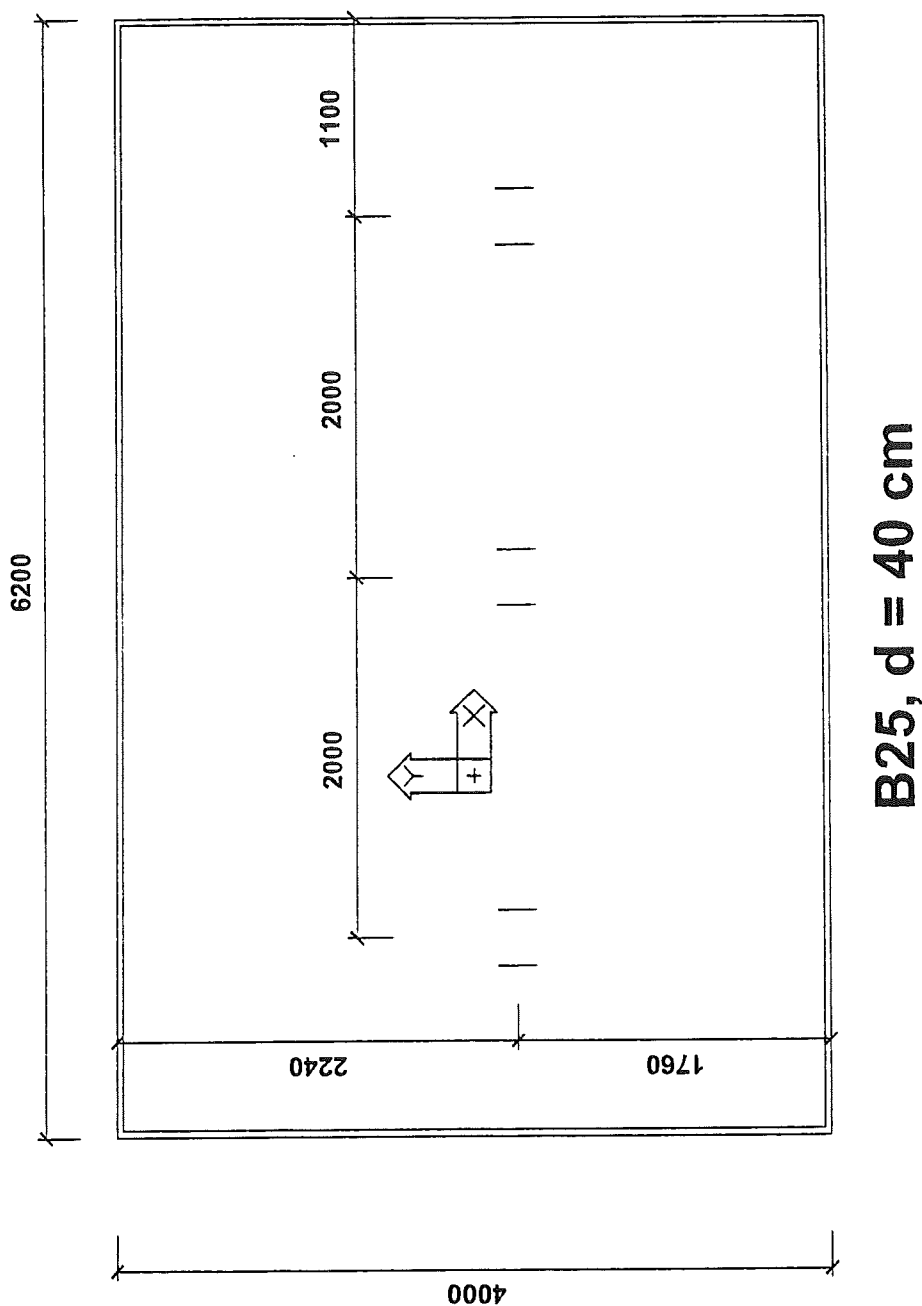
04.269



Max nozzle loadings according to drawing 4 13576

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plan view

Basic data
Type of structure : General XYZ

Number of nodes: 19
 Number of members: 0
 Number of 1D macros: 0
 Number of bound. lines: 10
 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/m³
 Extensibility 0.01 mm/m.K

B 25 gewichtslos

E modulus 30000.00 MPa
 Poisson coeff. 0.20
 Density 0.000 kg/m³
 Extensibility 0.01 mm/m.K

List of material
Group of members :

1/0

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

List of material - Macro2D
Group of members :

1/7

no.	Name:	quality	unit volume weight kgm ³	volume m ³	weight kg
4	B 25	B 25	2500.00	9.92	24800.00

The total weight of the structure: 24800.00 kg

Nodes

node	X m	Y m	Z m
1	-2.000	-2.000	-0.500
2	4.200	-2.000	-0.500

node	X m	Y m	Z m
3	4.200	2.000	-0.500
4	-2.000	2.000	-0.500
5	-0.900	-0.240	-0.500
6	1.100	-0.240	-0.500
7	3.100	-0.240	-0.500
8	-0.745	-0.345	-0.500
9	-0.745	-0.135	-0.500
10	-1.055	-0.345	-0.500
11	-1.055	-0.135	-0.500
12	1.255	-0.345	-0.500
13	1.255	-0.135	-0.500
14	0.945	-0.345	-0.500
15	0.945	-0.135	-0.500
16	3.255	-0.345	-0.500
17	3.255	-0.135	-0.500
18	2.945	-0.345	-0.500
19	2.945	-0.135	-0.500

Boundaries

bound. line	type	node
1	Line	1,2
2	Line	2,3
3	Line	3,4
4	Line	4,1
5	Line	8,9
6	Line	10,11
7	Line	12,13
8	Line	14,15
9	Line	16,17
10	Line	18,19

2D Macros

num	type
1	
	B 25 Thickness 0.40 m
	Boundary: 1,2,3,4
	Nodes : 5,6,7
	1 Inner line: 5
	2 Inner line: 6
	3 Inner line: 7
	4 Inner line: 8
	5 Inner line: 9
	6 Inner line: 10

Profiles

Hinges

The stiffness values of line hinges are stated in 1 m' of length

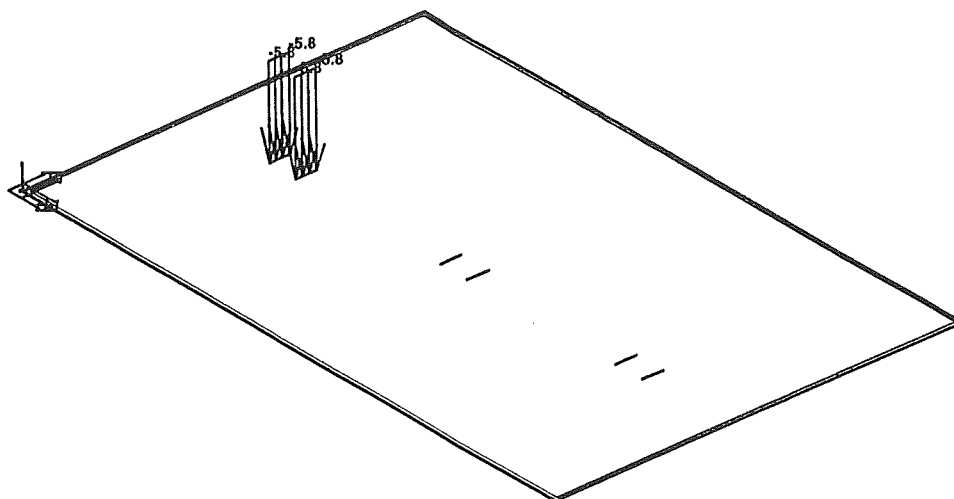
memb	macro	2D macro/ bound	type	pos	flexibility kN/m-kNm/rad	funct
------	-------	--------------------	------	-----	-----------------------------	-------

Soil - 2D macro

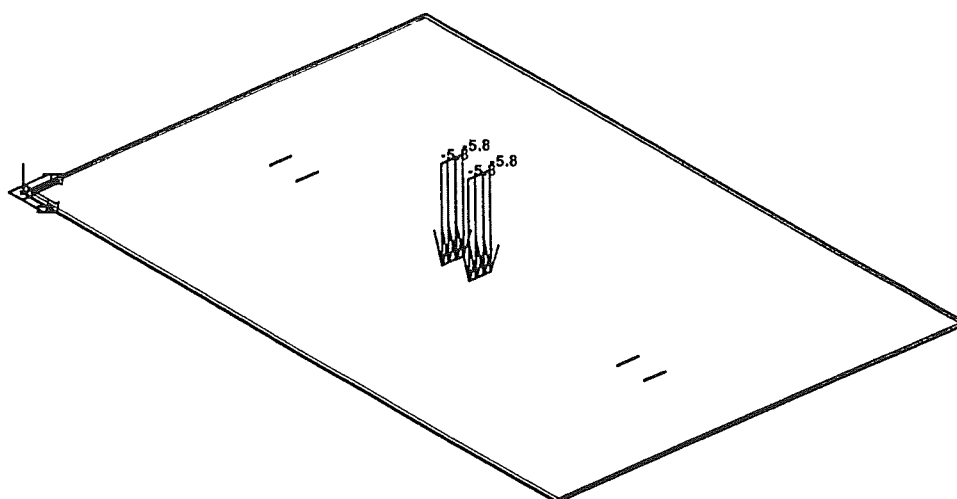
Index	2D macro	Name of subsoil
1	1	Sand/Clean/Moderate

Loadcases

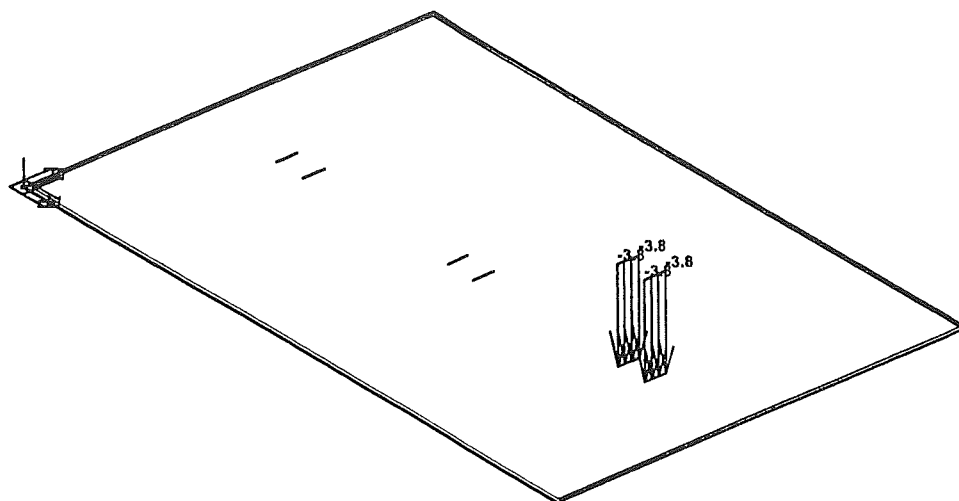
Case	Name:	Description
1	Weight concrete	Self weight. Direction -Z
2	Weight 36	Variable - P
3	Weight 37	Variable - P
4	Weight 35	Variable - P



2. Weight 36



3. Weight 37



4. Weight 35

Variable loads group

Name:

P

Loadcase no. 2 - distributed loads

bound	type	dx m	exY m	exZ m		X beg end	Y beg end	Z beg end
5	force kN/m	0.00 rel 1.00	0.00	0.00	glo len	0.00 0.00	0.00 0.00	-5.83 -5.83
6	force kN/m	0.00 rel 1.00	0.00	0.00	glo len	0.00 0.00	0.00 0.00	-5.83 -5.83

Loadcase no. 3 - distributed loads

bound	type	dx m	exY m	exZ m		X beg end	Y beg end	Z beg end
7	force kN/m	0.00 rel 1.00	0.00	0.00	glo len	0.00 0.00	0.00 0.00	-5.83 -5.83
8	force kN/m	0.00 rel 1.00	0.00	0.00	glo len	0.00 0.00	0.00 0.00	-5.83 -5.83

Loadcase no. 4 - distributed loads

bound	type	dx m	exY m	exZ m	X' beg end	Y beg end	Z beg end
9	force kN/m	0.00 rel 1.00	0.00	0.00	glo len	0.00 0.00	0.00 -3.81
10	force kN/m	0.00 rel 1.00	0.00	0.00	glo len	0.00 0.00	0.00 -3.81

Combinations

Combi	Norm	Case	coeff
1.	User-ultimate	1 Weight concrete	1.00
		2 Weight 36	1.00
		3 Weight 37	1.00
		4 Weight 35	1.00
2.	User-serviceability	1 Weight concrete	1.00
		2 Weight 36	1.00
		3 Weight 37	1.00
		4 Weight 35	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

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.

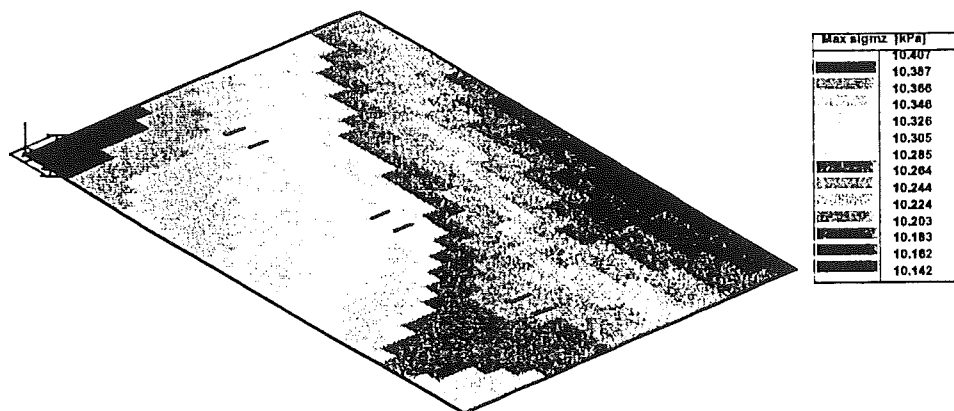
Linear calculation

Number of 2D elements	650
Number of 1D elements	0
Number of mesh nodes	681
Number of equations	4086
Loadcases	LC 1 Weight concrete
	LC 2 Weight 36
	LC 3 Weight 37
	LC 4 Weight 35
Bending theory	Mindlin
Start of calculation	06.09.2004 14:16
End of calculation	06.09.2004 14:16

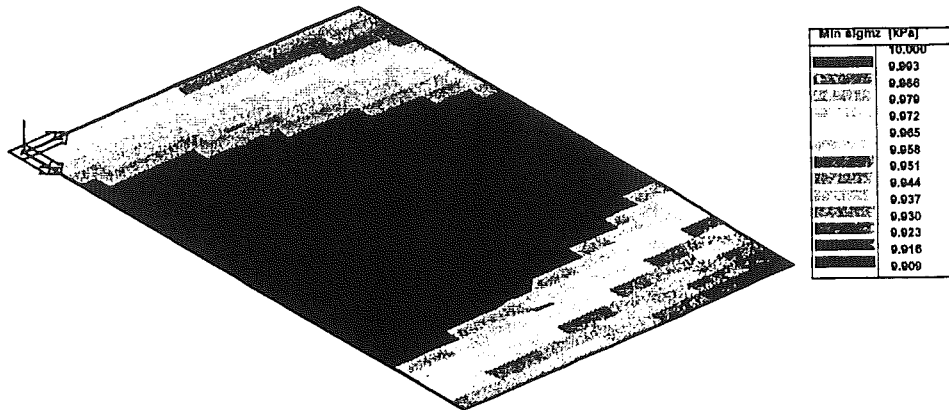
Sum of loads and reactions.

		X	Y	Z	
loadcase 1	loads	0.0	0.0	-248.0	✓
	reactions	0.0	0.0	0.0	
	contact	0.0	0.0	248.0	✓
loadcase 2	loads	0.0	0.0	-2.4	✓
	reactions	0.0	0.0	0.0	
	contact	0.0	0.0	2.4	✓
loadcase 3	loads	0.0	0.0	-2.4	✓
	reactions	0.0	0.0	0.0	
	contact	0.0	0.0	2.4	✓
loadcase 4	loads	0.0	0.0	-1.6	✓
	reactions	0.0	0.0	0.0	
	contact	0.0	0.0	1.6	

$$G = 6,20 \cdot 4,0 \cdot 9,40 \cdot 25,0 = 248 \text{ kN}$$



Contact stress - max sigmz - FEM Combi : 1



Contact stress - min sigmz - FEM Combi : 1

RESULTS : CONTACT STRESSES

FEM Combi:
C1 Eigen-Tragfähig.

Global extremes

elem	sigmz [kPa]
469	10.000
518	0.809

Selection was done for macros: 1

RESULTS : INTERNAL FORCES**FEM Combi:**

C1 Eigen-Tragfähigk.

Global extremes

Rotation of the local system: No

Basic magnitudes - bending, membrane

elem	mx [kNm/m]	my [kNm/m]	mxy [kNm/m]	qx [kN/m]	qy [kN/m]	nx [kN/m]	ny [kN/m]	qxy [kN/m]
595	0.643	0.752	0.012	1.693	0.143	0.000	0.000	0.000
588	-0.212	-0.000	-0.008	-0.055	-0.045	0.000	0.000	0.000
572	0.433	0.758	0.016	0.073	0.145	0.000	0.000	0.000
550	-0.001	-0.010	-0.009	-0.002	-0.105	0.000	0.000	0.000
226	0.366	0.346	0.094	0.437	0.004	0.000	0.000	0.000
254	-0.167	0.000	-0.106	-0.285	-0.318	0.000	0.000	0.000
595	0.557	0.596	0.012	1.753	0.197	0.000	0.000	0.000
572	-0.034	-0.000	0.000	-1.783	-0.023	0.000	0.000	0.000
571	0.354	0.464	0.036	0.128	1.358	0.000	0.000	0.000
592	-0.202	0.000	-0.077	-0.679	-1.515	0.000	0.000	0.000
1	0.014	0.011	0.000	0.046	0.100	0.000	0.000	0.000
	0.014	0.011	0.000	0.046	0.100	0.000	0.000	0.000
	0.014	0.011	0.000	0.046	0.100	0.000	0.000	0.000
	0.014	0.011	0.000	0.046	0.100	0.000	0.000	0.000
	0.014	0.011	0.000	0.046	0.100	0.000	0.000	0.000
	0.014	0.011	0.000	0.046	0.100	0.000	0.000	0.000

Selection was done for macros: 1

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	25000.000 kPa
betaR	17500.000 kPa
Tau011_1 plates	350.000 kPa
Tau011_2 plates	500.000 kPa
Tau02 plates	1800.000 kPa
Tau012 beams	750.000 kPa
Tau02 beams	1800.000 kPa

B 25
Tau03 beams 3000.000 kPa

Explanation of reinforcement steel symbols

Abbreviation Explanation
betaS Characteristic yield strength of reinforcement

Steel characteristics

BSt 420
betaS 420000.000 kPa
E modulus 200000000.000 kPa

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 externally 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

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]
279	0.026	0.005	~	~	0.043	0.055	0.000	0.00	0.00
2	0.000	0.000	~	~	0.000	0.000	0.000	0.00	0.00
459	0.014	0.008	~	~	0.010	0.019	0.000	0.00	0.00
541	0.000	0.000	~	~	0.002	0.001	0.000	0.00	0.00
14	0.026	0.005	~	~	0.084	0.077	0.000	0.00	0.00
2	0.000	0.000	~	~	0.000	0.000	0.000	0.00	0.00
667	0.026	0.005	~	~	0.081	0.077	0.000	0.00	0.00
2	0.000	0.000	~	~	0.000	0.000	0.000	0.00	0.00

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]
1	0.000	0.000	~	~	0.000	0.000	0.000	0.00	0.00
	0.000	0.000	~	~	0.000	0.000	0.000	0.00	0.00
	0.000	0.000	~	~	0.000	0.000	0.000	0.00	0.00
	0.000	0.000	~	~	0.000	0.000	0.000	0.00	0.00
	0.000	0.000	~	~	0.000	0.000	0.000	0.00	0.00
234	0.014	0.003	~	~	0.049	0.017	0.000	0.00	0.00
1	0.000	0.000	~	~	0.000	0.000	0.000	0.00	0.00

Selection was done for macros: 1

|| ϕ 10/20 cm #