

Materials

Concrete

Name	f _{ck} [MPa]	f _{ctk,0.05} [MPa]	f _{ctm} [MPa]	E _{cm} [MPa]	ν [-]	φ _{perm}	φpres				
	30.0	2.0	2.9	32836.6	0.20	2.5	2.5				
C30/37	$\epsilon_{c2} = 20$	ϵ_{c2} = 20.0 1e-4, ϵ_{cu2} = 500.0 1e-4,Diagram type: Parabolic									
	φ _{perm} : 2	.50									
	φ _{pres} : 2.	50									

Reinforcement

Name	f _{yk} [MPa]	k [-]	E₅ [MPa]	Unit mass [kg/m ³]	ε _{uk} [1e-4]	Surface		
	500.0	1.08	200000.0	7850	500.0	Ribbed		
D 300D	$\epsilon_{st} = 500.0 \ 1e-4, \epsilon_{sc} = 500.0 \ 1e-4,$							



DRM1

Geometry



Overview table

Name	Туре	Properties	Position		
10/1	Wall	Rectangular; W: 5.67 m; H: 3.00 m; T: 0.30 m;			
VVI	vvali	Material: C30/37			
Wo	Wall	Rectangular; W: 5.67 m; H: 0.30 m; T: 0.90 m;	M: W1: ID: A: MD: 1		
VVZ V	vvali	Material: C30/37			
01	Opening	Rectangular; W: 1.20 m; H: 2.25 m	M: W1; IP: 1; MP: 1		
1.01	Line	X: 100 MN/m2; Z: 600 MN/m2 (Pressure only);	M: W2, Edge 1; Part of edge; From		
LOI	support	Local; L: 1.00 m	beginning; X: 0.00 m		
162	Line	X: 100 MN/m2; Z: 600 MN/m2 (Pressure only);	M: W2, Edge 1; Part of edge; From end; X:		
L32	support	Local; L: 1.00 m	0.55 m		

ULS, SLS_char



SLS_qp



Combination

Name	Туре	Content	
ULS	ULS	ULS	
SLS_char	SLS - Characteristic	SLS_char	
SLS_qp	SLS - Quasi-permanent	SLS_qp	



Reinforcement

Scheme of reinforcement





Concrete: C30/37; Steel: B 500B

Results

Summary

Overview table

	Check item	Comb	nati	ion	Increme	nt	Item				
I	JLS	ULS		G100.0%		Strength of reinforcement			nent	\bigcirc	
	Check item Item			l	Utilization						
	Strength of concrete W1			σc/σc,lim: 93.8%				\bigcirc			
	Strength of reinforcement WF1		εs/εs,lim: 6.0%, σs/σs,lim: 45.8%			5.8%	\bigcirc				
	Anchorage ler	ngth	· ·	WF1	тb/fbd: 99.7	тb/fbd: 99.7%			\bigcirc		
;	SLS	SLS_qp (ST))	G100.0% Stres		Stress limit	Stress limitation			
Check item Combination		tion	Increment	Crit	ical check	ltem	Uti	lization			

Project no: 20239010



Author: Dave the Engineer

Stress limitation	SLS_qp (ST)	G100.0%	7.2(3)	W1	100.0%	
Crack width	SLS_qp (LT)	G100.0%	w/wlim	GB2	37.9%	\bigcirc

ULS - Summary

Stress flow



Summary of reactions and applied loads: ULS, Load increment: G100.0%

Туре	F _x [kN]	F _z [kN]	M _y [kNm]
Summary of reactions	332.0	1399.5	6360.4
Summary of applied load	-332.0	-1399.5	-6360.4
Check of equilibrium	0.0	0.0	0.0

ULS - Strength

Detailed concrete strength results: ULS, Load increment: G100.0%

Member	X [m]	Z [m]	σ _c [MPa]	ε _c [1e-4]	ε _{pl} [1e-4]	k _{c2} [-]	σ _c /σ _{c,lim} [%]	
W1	2.25	2.25	-18.8	-15.3	-6.4	1.00	93.8	OK
W1	0.00	2.78	-3.8	-3.1	0.0	0.62	30.5	OK
W2	3.38	0.00	-3.0	-1.5	0.0	1.00	14.8	OK
W2	0.00	-0.08	-1.4	-0.7	0.0	0.98	7.2	OK
W2	0.00	0.00	-0.1	0.0	0.0	1.00	0.3	OK

Project no: 20239010



Author: Dave the Engineer

Detailed reinforcement strength results: ULS, Load increment: G100.0%

Member	X [m]	Z [m]	σ _s [MPa]	ε _s [1e-4]	σ _s /σ _{s,lim} [%]	ε _s /ε _{s,lim} [%]	
WF1	0.14	0.84	215.2	6.7	45.8	6.0	OK
GB2	0.03	0.00	168.4	5.8	35.9	3.6	OK
GB4	0.02	2.78	154.3	6.2	32.9	2.4	OK
GB2	0.03	0.07	153.8	6.7	32.8	2.0	OK
GB1	2.10	-0.07	103.6	1.6	22.1	1.3	OK
GB1	3.44	-0.27	95.3	2.2	20.3	1.3	OK
GB6	3.28	2.97	-84.7	-4.2	18.0	0.9	OK
GB6	0.10	2.97	82.5	1.4	17.6	0.9	OK
GB6	2.17	2.97	77.4	2.2	16.5	0.9	OK
GB3	4.74	0.07	-43.5	-2.2	9.3	0.5	OK
GB3	3.69	-0.21	43.0	0.2	9.2	0.3	OK
GB5	4.88	0.08	39.8	0.4	8.5	0.1	OK

Concrete stress/strength ratio



Concrete principal stress σ_c





Concrete principal strain ϵ_{c}



Concrete plastic strain ϵ_{pl}





Directions of principal stresses



Project no: 20239010

Author: Dave the Engineer

Compressive strength reduction factor kc2



Reinforcement strain/limit strain ratio - $\epsilon_s/\epsilon_{s,lim}$ [%]



Reinforcement stress/strength ratio - $\sigma_s/\sigma_{s,lim}$ [%]







Reinforcement stress - σ_s [MPa]



Reinforcement strain - ϵ_s [1e-4]



ULS - Anchorage

Detailed anchorage results - Reinforcement: ULS, Load increment: G100.0%

Member	X [m]	Z [m]	т _ь [MPa]	Fa [kN]	F _{tot} [kN]	F _{tot} /F _{lim} [%]	т _ь /f _{bd} [%]	
WF1	0.02	2.70	3.0	0.1	7.1	50.5	99.8	OK
WF1	0.14	0.03	-3.0	0.1	7.1	50.5	99.8	OK
WF1	0.14	0.84	0.5	0.1	33.8	45.8	15.2	OK
WF1	2.24	2.42	-0.7	0.1	-9.5	12.8	21.4	OK
WF1	0.14	2.90	3.0	0.1	20.9	74.2	99.8	OK
GB2	0.03	0.70	3.0	32.2	10.9	50.8	99.8	OK
GB2	0.03	-0.07	-3.0	32.2	67.7	35.9	99.8	OK
GB2	0.03	0.00	2.9	32.2	67.7	35.9	94.9	OK
GB2	1.83	0.70	-0.1	32.2	-0.2	0.1	3.4	OK
GB2	0.18	0.63	3.0	32.2	29.0	68.0	99.8	OK
GB4	1.00	1.13	-3.0	64.5	10.8	50.7	99.8	OK
GB4	0.02	2.63	2.2	64.5	41.4	21.9	71.1	OK
GB4	0.09	2.78	-2.1	64.5	62.0	32.9	99.5	OK
GB4	0.02	2.78	2.1	64.5	62.0	32.9	99.5	OK
GB4	0.86	2.93	0.0	64.5	-2.9	1.6	0.7	OK
GB4	0.86	1.13	-0.2	64.5	23.2	54.7	7.0	OK
GB5	4.67	0.53	3.0	6.6	8.1	38.3	99.8	OK
GB5	4.67	2.93	-0.9	6.6	-2.2	1.2	42.0	OK
GB5	4.88	0.08	0.0	6.6	16.0	18.8	0.1	OK
GB5	4.74	2.93	-0.1	6.6	-3.6	1.9	3.9	OK
GB6	0.10	2.97	2.1	20.2	7.9	7.5	99.5	OK
GB6	5.57	2.97	-1.5	20.2	8.0	7.5	68.6	OK
GB6	0.10	2.97	2.1	20.2	18.7	17.6	99.5	OK
GB6	3.28	2.97	0.0	20.2	-19.2	18.0	1.5	OK
GB3	4.59	0.70	3.0	15.1	-7.5	4.0	97.7	OK

//=/==> StatiCa*

Project no: 20239010



Author: Dave the Engineer

GB3	4.89	-0.28	-1.4	15.1	-3.5	1.9	44.9	OK
GB3	3.69	-0.21	0.1	15.1	17.3	9.2	3.3	OK
GB3	4.74	0.07	-0.2	15.1	-17.5	9.3	6.5	OK
GB1	4.11	-0.27	-1.8	42.6	131.4	15.5	57.9	OK
GB1	0.03	-0.07	1.7	42.6	61.3	17.2	56.7	OK
GB1	2.10	-0.07	0.0	42.6	187.4	22.1	0.5	OK
GB1	4.78	-0.27	0.0	42.6	-23.3	2.7	0.2	OK

Bond stress check value - Tb/fbd [%]



Force check value - Ftot/Flim [%]





Total force in the bar - Ftot [kN]



Bond stress - Tb [MPa]





SLS - Stress

Detailed concrete stress results: SLS_qp, Load increment: G100.0%

Member	X [m]	Z [m]	Critical check	σ _c [MPa]	σ _{lim} [MPa]	σ _c /σ _{lim} [%]	
W1	2.25	2.25	7.2(3)	13.5	13.5	100.0	Warning
W2	4.92	-0.30	7.2(3)	-1.8	13.5	13.6	OK

Detailed reinforcement stress results: SLS_char, Load increment: G100.0%

Reinforcement	X [m]	Z [m]	Critical check	σ₅ [MPa]	σ _{lim} [MPa]	σ _s /σ _{lim} [%]	
WF1	3.35	2.40	7.2(5)	160.0	400.0	40.0	OK
GB1	3.44	-0.27	7.2(5)	93.5	400.0	23.4	OK
GB2	0.03	0.00	7.2(5)	153.7	400.0	38.4	OK
GB3	3.99	-0.28	7.2(5)	59.1	400.0	14.8	OK
GB4	0.02	0.83	7.2(5)	66.9	400.0	16.7	OK
GB5	4.67	0.08	7.2(5)	44.3	400.0	11.1	OK
GB6	2.17	2.97	7.2(5)	76.8	400.0	19.2	OK



Concrete stress



Concrete stress check

σc/σlim [%]
°
100.0
90.0
20.0
0.0
0.0

Project no: 20239010

Author: Dave the Engineer

Neglected regions



Reinforcement stress - σ_s [MPa]





Project no: 20239010



Author: Dave the Engineer

Reinforcement stress check



SLS - Crack

Detailed crack results: SLS_qp, Load increment: G100.0%, wlim=0.300 mm

Member	X [m]	Z [m]	w [mm]	w/w _{lim} [%]	
GB2	0.03	0.00	0.114	37.9	OK
WF1	0.29	0.84	0.057	19.0	OK
GB1	2.92	-0.27	0.054	17.9	OK
GB4	0.02	0.83	0.026	8.7	OK
GB3	3.99	-0.28	0.022	7.4	OK
GB6	2.02	2.97	0.012	4.0	OK
GB5	4.67	0.08	0.006	2.0	OK

Intermediate crack results

Member	ε _{cm} [1e-4]	ε _m [1e-4]	S _r [mm]	Φ [mm]	ρ _{eff} [%]	w _b [mm]	θ _r [-]	θ _b [-]
GB2	0.0	2.2	406	16	0.98	0.089	0.67	1.57
WF1	0.0	1.8	243	10	1.02	0.044	0.69	1.57
GB1	0.0	1.1	235	16	1.67	0.026	0.50	0.00
GB4	0.0	1.3	137	16	2.84	0.018	0.75	0.00
GB3	0.0	0.3	561	16	0.71	0.014	2.26	1.57
GB6	0.0	1.0	120	12	2.44	0.012	1.35	0.00
GB5	0.0	0.4	148	16	2.62	0.006	1.56	0.00

Note: There are TCM intermediate values displayed in the table above. Adequate POM values are not available in current version of the program.

Project: Amsterdam industrial Project no: 20239010 Author: Dave the Engineer **Crack width - w [mm]**



0.114 mm

Crack width check



Project no: 20239010

Author: Dave the Engineer

SLS - Deflection

Detailed deflection results: SLS_char, Load increment: G100.0%

Member	X [m]	Z [m]	u _{z,st} [mm]	u _{z,lt} [mm]	∆u _z [mm]	u _z [mm]	
W1	5.15	3.00	-2.6	-3.0	0.0	-3.0	OK
W1	5.67	3.00	-2.8	-2.9	0.0	-2.9	OK
W2	5.67	-0.30	-2.7	-2.5	0.0	-2.5	OK
W1	0.00	0.00	0.2	0.2	0.0	0.2	OK
W2	0.00	-0.08	0.2	0.2	0.0	0.2	OK

Deflection



Nonconformities

The functionality of Limited stress check for Stress limitation checks according to EN 1992-1-1 chap. 7.2 is activated. The stress in concrete exceeding the limit stress can be neglected in small regions that don't influence the overall durability of the structure.



Items numbering



Fabric reinforcement tables

Parameter	Value
Index	K1
Φ X/Y [mm]	10 / 10
Material	B 500B
Number of items	2
Total area [m2]	17.01
Bar spacing X/Y [mm]	150 / 150
Weight of one item [kg]	140
Assigned to wall	W1

Brief reinforcement bar table

Index	Φ [mm]	Material	Items	Length [mm]	Weight [kg]	Total length [m]
1	16	B 500B	18	6043	10	108.77
2	16	B 500B	140	975	2	136.50
3	12	B 500B	2	5620	5	11.24



Project no: 20239010



Author: Dave the Engineer

Detailed reinforcement bar tables

Parameter	Value	Shape
Index	1	
Φ [mm]	16	
Material	B 500B	
Number of items	18	320 5597
Length [mm]	6043	
Weight [kg]	10	
Total length [m]	108.77	
Parameter	Value	Shape
Index	2	
Φ [mm]	16	
Material	B 500B	
Number of items	140	975
Length [mm]	975	
Weight [kg]	2	
Total length [m]	136.50	
Parameter	Value	Shape
Index	3	
Φ [mm]	12	
Material	B 500B	
Number of items	2	5620
Length [mm]	5620	
Weight [kg]	5	
Total length [m]	11.24	

Overview table

Φ [mm]	12	16
Total length of Φ [m]	11.24	245.27
Weight per meter of Φ [kg/m]	1	2
Total weight of Φ [kg]	10	387
Total weight of bars [kg]	397	
Total weight of fabric reinforcement [kg]		
Total weight [kg]		
Volume of concrete [m3]	5.82	
Reinforcement weight per volume unit of concrete [kg/m3]	116	

Explanation

Symbol	Explanation
f _{ck}	Characteristic compressive cylinder strength of concrete at 28 days
f _{ctk,0.05}	Characteristic axial tensile strength of concrete 5% quantile
f _{ctm}	Mean value of axial tensile strength of concrete
Ecm	Secant modulus of elasticity of concrete
ν	Poisson ratio
ε _c	Compressive strain in the concrete at the peak stress fc
ε _{cu}	Ultimate compressive strain in the concrete
<i>(</i>)	Final value of creep coefficient at time interval (t0 = 28 days, tinf = design working life) for permanent
Ψperm	load

Project no: 20239010

//=/=== StatiCa°

Author: Dave the Engineer

φpres	Final value of creep coefficient at time interval (t0 = 28 days, tinf = design working life) for prestressing load
f _{yk}	Characteristic yield strength of reinforcement
Es	Modulus of elasticity of reinforcement steel
ε _{uk}	Characteristic strain of reinforcement or prestressing steel at maximum load
Properties	W - Width; H - Height; T - Thickness; L - Length; r - Radius; α - Inclination
Position	M - Master; MP - Master point; IP - Insert point
σ	The extreme value of compressive stress σc of concrete of selected subregion.
ε _c	Minimum compressive strain of concrete εc
ε _{pl}	Minimum compressive plastic strain of concrete εpl
k _{c2}	Compressive strength reduction factor kc2
alar	The ratio of concrete stress and concrete strength. It presents the level of material utilization with
Oc/Oc,lim	respect to concrete strength.
σs	Maximum stress along the length of reinforcement bar.
٤s	Maximum strain along the length of reinforcement bar.
	The ratio of stress and strength of the reinforcement. It presents the level of material utilization with
05/05,1111	respect to reinforcement strength.
Es/Es lim	The ratio of strain and limit strain of the reinforcement. It presents the level of material utilization with
	respect to limit strain
Tb	Bond stress on the surface of reinforcement bar.
Fa	The anchorage force. It is developed at the ends of the bars due to hooked anchorage.
Ftot	Total force developed along the length of the bar. It consists of the anchorage force due to hooked
	anchorage and bond force, which integrates bond stresses acting on the surface of the bar.
	The ratio of total force in the bar and limit value of the force. It presents the level of utilization of the
Ftot/Flim	as the sum of ultimate anchorage force and the force developed from the end of the bar to the point of
	interest assuming ultimate bond strength (b) the ultimate strength of the bar
	The ratio of bond stress and ultimate bond strength for selected (group of) bars and applied portion of
Tb/fbd	the load. It shows the level of utilization with respect to ultimate bond strength between the rebar and
	adjacent concrete.
w	Total crack width including effect of creep.
ε _{cm}	the mean strain in the concrete between cracks
	the mean strain in the reinforcement under relevant combination of loads, including the effect of
ε _m	imposed deformations and taking into account the effects of tension stiffening. Only the additional
	tensile strain beyond the state of zero strain of the concrete at the same level is considered
Sr	mean value of axial tensile strength of concrete
Φ	diameter of reinforcing bar
ρ _{eff}	effective reinforcement ratio
Wb	calculated crack width
θr	inclination of the cracks (the angle between the global coordinate system and the crack direction)
θ _b	bar inclination (the angle between the global coordinate system and the axis of reinforcement bar)
Uz,st	Immediate deflection caused by total load, calculated with short-term stiffnesses.
Uz,lt	Long-term effects of long-term load.
Δuz	Deflection increment caused by variable load.
Uz	Total deflection including effect of creep.

Calculation presumptions

- Minimum amount of reinforcement resisting at least the tensile stresses prior cracking has to be provided in cracked zones.
- It is assumed that a transverse rebar or adequate overlap is provided to enable full anchorage of the stirrups.
- The analysis and code checks are performed for support conditions as specified in the project. No change of supports in construction/service stages is considered.

Project no: 20239010

Author: Dave the Engineer

- Calculate yesterday's estimates
- The crack width is checked in the vicinity of the reinforcement only. No control of cracking is performed in non-reinforced zones.
- The presentation of crack spacing is schematic only. It does not represent the crack spacing computed for the calculations.