



CALCULATION STUDY
Reactions forces calculations

MIE Climbing Wall - Japan
Profil Entre-Prises Climbing Wall

16/09/02

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Use of finite element software : ROBOT Millenium V14
Linear calculation with beam elements.

Loads :

Dead loads :

- Dead loads of each elements
- Dead loads due to composite panels

Climbing Loads :

Loads defined by EUROPEAN STANDARD **EN 12572 March 1999**

- 1 case of load for each I.T.R.S. by using a combination of strenghs corresponding to the case loaded at 1000 daN at 12.5° from the direction of nominal loads and the others loaded at 380 daN at 12.5 ° from the direction of nominal loads
- Note : I.P.P. Individual Protection Points
- I.T.R.S. Individual Top Rope Systems

Combinations :

Combinations of loads according with EUROCODE

Summary:

- Support Nodes location
- Load cases definition
- Combinations definition (Eurocode)
- Reactions forces values for Dead load case
- Reactions forces values – Extremal values per node (For ELU Combinations)
- Reactions forces values – Extremal values per node (Global Extremum)

Conclusions :

Fixings in Concrete wall are done with mechanical anchors FISCHER FBN M12/15x113.

Support Nodes Location

Node	X (mm)	Y (mm)	Z (mm)	Support code	Support
101	-1500,00	500,00	-6000,00	xxxfff	Rotule
102	-1500,00	500,00	-5000,00	xxxfff	Rotule
103	-1500,00	500,00	-4000,00	xxxfff	Rotule
104	-1500,00	500,00	-3000,00	xxxfff	Rotule
105	-1500,00	500,00	-2000,00	xxxfff	Rotule
106	-1500,00	500,00	-1000,00	xxxfff	Rotule
107	-1500,00	500,00	0,0	xxxfff	Rotule
108	1500,00	500,00	-6000,00	xxxfff	Rotule
109	1500,00	500,00	-5000,00	xxxfff	Rotule
110	1500,00	500,00	-4000,00	xxxfff	Rotule
111	1500,00	500,00	-3000,00	xxxfff	Rotule
112	1500,00	500,00	-2000,00	xxxfff	Rotule
113	1500,00	500,00	-1000,00	xxxfff	Rotule
114	1500,00	500,00	0,0	xxxfff	Rotule
201	-750,00	500,00	-3000,00	xxxfff	Rotule
202	750,00	500,00	-3000,00	xxxfff	Rotule
203	-750,00	500,00	-1643,00	xxxfff	Rotule
204	750,00	500,00	-1643,00	xxxfff	Rotule
205	-750,00	500,00	-286,00	xxxfff	Rotule
206	750,00	500,00	-286,00	xxxfff	Rotule
207	-750,00	500,00	714,00	xxxfff	Rotule
208	750,00	500,00	714,00	xxxfff	Rotule

Loads definition according with EN12572

	Case	Load type	List	Load values	Case name
	1	self-weight		PZ Negative	Dead Load
	1	self-weight	14 26A28 43 45 52 56 57 60 69A71 77A79 81 83	PZ Negative	Dead Load
	1	uniform load	1A7 22A25 32 33 35 36 39A41 44 47 48 51 54 55 65A68 74A76 82 85 86	PZ=-0,0003(kN/mm)	Dead Load
	2	nodal force	26	FZ=-10,0000(kN) Gamma=-12,5(Deg)	Overhanging 1
	2	nodal force	2	FZ=-3,8000(kN) Gamma=-12,5(Deg)	Overhanging 1
	3	nodal force	26	FZ=-3,8000(kN) Gamma=-12,5(Deg)	Overhanging 2
	3	nodal force	2	FZ=-10,0000(kN) Gamma=-12,5(Deg)	Overhanging 2
	4	nodal force	27	FZ=-10,0000(kN) Gamma=-12,5(Deg)	Climber Fall 1
	5	nodal force	4	FZ=-10,0000(kN) Gamma=-12,5(Deg)	Climber Fall 2
	6	nodal force	18	FZ=-10,0000(kN) Gamma=-12,5(Deg)	Climber Fall 3
	7	nodal force	6	FZ=-10,0000(kN) Gamma=-12,5(Deg)	Climber Fall 4
	8	nodal force	201	FZ=-10,0000(kN) Gamma=-12,5(Deg)	Climber Fall 5
	9	nodal force	202	FZ=-10,0000(kN) Gamma=-12,5(Deg)	Climber Fall 6

Combinations according with EUROCODE

Combinations/Comp.	Definition
EFF/ 1	1*1.33
EFF/ 2	1*1.33 + 2*1.50
EFF/ 3	1*1.33 + 3*1.50
EFF/ 4	1*1.33 + 4*1.50
EFF/ 5	1*1.33 + 5*1.50
EFF/ 6	1*1.33 + 6*1.50
EFF/ 7	1*1.33 + 7*1.50
EFF/ 8	1*1.33 + 8*1.50
EFF/ 9	1*1.33 + 9*1.50
EFF/ 10	1*1.00
EFF/ 11	1*1.00 + 2*1.50
EFF/ 12	1*1.00 + 3*1.50
EFF/ 13	1*1.00 + 4*1.50
EFF/ 14	1*1.00 + 5*1.50
EFF/ 15	1*1.00 + 6*1.50
EFF/ 16	1*1.00 + 7*1.50
EFF/ 17	1*1.00 + 8*1.50
EFF/ 18	1*1.00 + 9*1.50

Reactions forces values : Results for DEAD LOAD

Node/Case	FX (kN)	FY (kN)	FZ (kN)
101/ 1	-0,3165	-0,0000	-0,5756
102/ 1	-0,0415	0,0006	-0,4610
103/ 1	0,1483	0,0005	-0,1347
104/ 1	-0,2338	0,2652	-1,1467
105/ 1	0,0048	0,0379	-0,2079
106/ 1	-0,0010	-0,1417	-0,1514
107/ 1	-0,0132	0,0053	-0,1145
108/ 1	0,3165	-0,0000	-0,5756
109/ 1	0,0415	0,0006	-0,4610
110/ 1	-0,1483	0,0005	-0,1347
111/ 1	0,2338	0,2652	-1,1467
112/ 1	-0,0048	0,0379	-0,2079
113/ 1	0,0010	-0,1417	-0,1514
114/ 1	0,0132	0,0053	-0,1145
201/ 1	0,2885	0,0074	-0,6616
202/ 1	-0,2885	0,0074	-0,6616
203/ 1	0,0000	-0,0704	-0,1015
204/ 1	-0,0000	-0,0704	-0,1015
205/ 1	0,0000	-0,0666	-0,0971
206/ 1	-0,0000	-0,0666	-0,0971
207/ 1	0,0000	-0,0383	-0,0566
208/ 1	-0,0000	-0,0383	-0,0566
Case 1	Dead Load		
Sum of val.	0,0000	0,0000	-7,4174
Sum of reac.	0,0000	0,0000	-7,4174
Sum of forc.	0,0	0,0	-7,4174
Check val.	-0,0000	-0,0000	0,0000

Reactions forces values : Extremal values per Node

Node/Case	FX (kN)	FY (kN)	FZ (kN)	Definition
101/ EFF/10	-0,3165>>	-0,0000	-0,5756	1*1.00
101/ EFF/6	-0,5048<<	0,0001	-0,8757	1*1.33 + 6*1.50
101/ EFF/16	-0,3984	0,0001>>	-0,6828	1*1.00 + 7*1.50
101/ EFF/3	-0,4726	-0,0005<<	-0,8336	1*1.33 + 3*1.50
101/ EFF/10	-0,3165	-0,0000	-0,5756>>	1*1.00
101/ EFF/6	-0,5048	0,0001	-0,8757<<	1*1.33 + 6*1.50
102/ EFF/10	-0,0415>>	0,0006	-0,4610	1*1.00
102/ EFF/7	-0,0969<<	0,0153	-0,7714	1*1.33 + 7*1.50
102/ EFF/7	-0,0969	0,0153>>	-0,7714	1*1.33 + 7*1.50
102/ EFF/10	-0,0415	0,0006<<	-0,4610	1*1.00
102/ EFF/10	-0,0415	0,0006	-0,4610>>	1*1.00
102/ EFF/7	-0,0969	0,0153	-0,7714<<	1*1.33 + 7*1.50
103/ EFF/6	0,3048>>	0,0346	-0,1785	1*1.33 + 6*1.50
103/ EFF/10	0,1483<<	0,0005	-0,1347	1*1.00
103/ EFF/6	0,3048	0,0346>>	-0,1785	1*1.33 + 6*1.50
103/ EFF/11	0,2103	-0,0009<<	-0,1338	1*1.00 + 2*1.50
103/ EFF/16	0,2434	0,0272	-0,1325>>	1*1.00 + 7*1.50
103/ EFF/1	0,1978	0,0007	-0,1797<<	1*1.33
104/ EFF/10	-0,2338>>	0,2652	-1,1467	1*1.00
104/ EFF/6	-4,3777<<	1,9920	-7,5808	1*1.33 + 6*1.50
104/ EFF/6	-4,3777	1,9920>>	-7,5808	1*1.33 + 6*1.50
104/ EFF/10	-0,2338	0,2652<<	-1,1467	1*1.00
104/ EFF/10	-0,2338	0,2652	-1,1467>>	1*1.00
104/ EFF/2	-0,8274	1,9371	-7,7678<<	1*1.33 + 2*1.50
105/ EFF/6	1,3197>>	-1,1198	-0,4680	1*1.33 + 6*1.50
105/ EFF/13	-0,0176<<	0,6293	-0,8275	1*1.00 + 4*1.50
105/ EFF/2	0,0192	0,7517>>	-1,4605	1*1.33 + 2*1.50
105/ EFF/15	1,3181	-1,1324<<	-0,3987	1*1.00 + 6*1.50
105/ EFF/10	0,0048	0,0379	-0,2079>>	1*1.00
105/ EFF/2	0,0192	0,7517	-1,4605<<	1*1.33 + 2*1.50
106/ EFF/13	0,7735>>	-2,0925	-0,8052	1*1.00 + 4*1.50
106/ EFF/2	-0,0065<<	-1,6641	-0,6201	1*1.33 + 2*1.50
106/ EFF/10	-0,0010	-0,1417>>	-0,1514	1*1.00
106/ EFF/4	0,7732	-2,1397<<	-0,8557	1*1.33 + 4*1.50
106/ EFF/10	-0,0010	-0,1417	-0,1514>>	1*1.00
106/ EFF/4	0,7732	-2,1397	-0,8557<<	1*1.33 + 4*1.50
107/ EFF/11	0,5613>>	-1,0432	-0,3567	1*1.00 + 2*1.50
107/ EFF/6	-0,0501<<	0,0361	-0,1746	1*1.33 + 6*1.50
107/ EFF/5	0,0180	0,0674>>	-0,1973	1*1.33 + 5*1.50
107/ EFF/11	0,5613	-1,0432<<	-0,3567	1*1.00 + 2*1.50
107/ EFF/10	-0,0132	0,0053	-0,1145>>	1*1.00
107/ EFF/2	0,5569	-1,0414	-0,3949<<	1*1.33 + 2*1.50
108/ EFF/7	0,5048>>	0,0001	-0,8757	1*1.33 + 7*1.50
108/ EFF/10	0,3165<<	-0,0000	-0,5756	1*1.00
108/ EFF/15	0,3984	0,0001>>	-0,6828	1*1.00 + 6*1.50
108/ EFF/2	0,4726	-0,0005<<	-0,8336	1*1.33 + 2*1.50
108/ EFF/10	0,3165	-0,0000	-0,5756>>	1*1.00
108/ EFF/7	0,5048	0,0001	-0,8757<<	1*1.33 + 7*1.50
109/ EFF/6	0,0969>>	0,0153	-0,7714	1*1.33 + 6*1.50
109/ EFF/10	0,0415<<	0,0006	-0,4610	1*1.00
109/ EFF/6	0,0969	0,0153>>	-0,7714	1*1.33 + 6*1.50
109/ EFF/10	0,0415	0,0006<<	-0,4610	1*1.00
109/ EFF/10	0,0415	0,0006	-0,4610>>	1*1.00

109/	EFF/6	0,0969	0,0153	-0,7714<<	1*1.33 + 6*1.50
110/	EFF/10	-0,1483>>	0,0005	-0,1347	1*1.00
110/	EFF/7	-0,3048<<	0,0346	-0,1785	1*1.33 + 7*1.50
110/	EFF/7	-0,3048	0,0346>>	-0,1785	1*1.33 + 7*1.50
110/	EFF/12	-0,2103	-0,0009<<	-0,1338	1*1.00 + 3*1.50
110/	EFF/15	-0,2434	0,0272	-0,1325>>	1*1.00 + 6*1.50
110/	EFF/1	-0,1978	0,0007	-0,1797<<	1*1.33
111/	EFF/7	4,3777>>	1,9920	-7,5808	1*1.33 + 7*1.50
111/	EFF/10	0,2338<<	0,2652	-1,1467	1*1.00
111/	EFF/7	4,3777	1,9920>>	-7,5808	1*1.33 + 7*1.50
111/	EFF/10	0,2338	0,2652<<	-1,1467	1*1.00
111/	EFF/10	0,2338	0,2652	-1,1467>>	1*1.00
111/	EFF/3	0,8274	1,9371	-7,7678<<	1*1.33 + 3*1.50
112/	EFF/14	0,0176>>	0,6293	-0,8275	1*1.00 + 5*1.50
112/	EFF/7	-1,3197<<	-1,1198	-0,4680	1*1.33 + 7*1.50
112/	EFF/3	-0,0192	0,7517>>	-1,4605	1*1.33 + 3*1.50
112/	EFF/16	-1,3181	-1,1324<<	-0,3987	1*1.00 + 7*1.50
112/	EFF/10	-0,0048	0,0379	-0,2079>>	1*1.00
112/	EFF/3	-0,0192	0,7517	-1,4605<<	1*1.33 + 3*1.50
113/	EFF/3	0,0065>>	-1,6641	-0,6201	1*1.33 + 3*1.50
113/	EFF/14	-0,7735<<	-2,0925	-0,8052	1*1.00 + 5*1.50
113/	EFF/10	0,0010	-0,1417>>	-0,1514	1*1.00
113/	EFF/5	-0,7732	-2,1397<<	-0,8557	1*1.33 + 5*1.50
113/	EFF/10	0,0010	-0,1417	-0,1514>>	1*1.00
113/	EFF/5	-0,7732	-2,1397	-0,8557<<	1*1.33 + 5*1.50
114/	EFF/7	0,0501>>	0,0361	-0,1746	1*1.33 + 7*1.50
114/	EFF/12	-0,5613<<	-1,0432	-0,3567	1*1.00 + 3*1.50
114/	EFF/4	-0,0180	0,0674>>	-0,1973	1*1.33 + 4*1.50
114/	EFF/12	-0,5613	-1,0432<<	-0,3567	1*1.00 + 3*1.50
114/	EFF/10	0,0132	0,0053	-0,1145>>	1*1.00
114/	EFF/3	-0,5569	-1,0414	-0,3949<<	1*1.33 + 3*1.50
201/	EFF/6	2,1469>>	-0,1551	-1,6673	1*1.33 + 6*1.50
201/	EFF/16	-0,5556<<	0,1267	-1,3549	1*1.00 + 7*1.50
201/	EFF/3	0,7026	0,2177>>	-1,3328	1*1.33 + 3*1.50
201/	EFF/17	0,2885	-3,2392<<	-15,3061	1*1.00 + 8*1.50
201/	EFF/10	0,2885	0,0074	-0,6616>>	1*1.00
201/	EFF/8	0,3846	-3,2367	-15,5266<<	1*1.33 + 8*1.50
202/	EFF/15	0,5556>>	0,1267	-1,3549	1*1.00 + 6*1.50
202/	EFF/7	-2,1469<<	-0,1551	-1,6673	1*1.33 + 7*1.50
202/	EFF/2	-0,7026	0,2177>>	-1,3328	1*1.33 + 2*1.50
202/	EFF/18	-0,2885	-3,2392<<	-15,3061	1*1.00 + 9*1.50
202/	EFF/10	-0,2885	0,0074	-0,6616>>	1*1.00
202/	EFF/9	-0,3846	-3,2367	-15,5266<<	1*1.33 + 9*1.50
203/	EFF/6	0,0001>>	-3,6069	-5,1509	1*1.33 + 6*1.50
203/	EFF/10	0,0000<<	-0,0704	-0,1015	1*1.00
203/	EFF/10	0,0000	-0,0704>>	-0,1015	1*1.00
203/	EFF/6	0,0001	-3,6069<<	-5,1509	1*1.33 + 6*1.50
203/	EFF/10	0,0000	-0,0704	-0,1015>>	1*1.00
203/	EFF/6	0,0001	-3,6069	-5,1509<<	1*1.33 + 6*1.50
204/	EFF/10	-0,0000>>	-0,0704	-0,1015	1*1.00
204/	EFF/7	-0,0001<<	-3,6069	-5,1509	1*1.33 + 7*1.50
204/	EFF/10	-0,0000	-0,0704>>	-0,1015	1*1.00
204/	EFF/7	-0,0001	-3,6069<<	-5,1509	1*1.33 + 7*1.50
204/	EFF/10	-0,0000	-0,0704	-0,1015>>	1*1.00
204/	EFF/7	-0,0001	-3,6069	-5,1509<<	1*1.33 + 7*1.50
205/	EFF/3	0,0000>>	-0,5878	-0,8420	1*1.33 + 3*1.50
205/	EFF/10	0,0000<<	-0,0666	-0,0971	1*1.00
205/	EFF/10	0,0000	-0,0666>>	-0,0971	1*1.00
205/	EFF/4	0,0000	-2,7865<<	-3,9815	1*1.33 + 4*1.50
205/	EFF/10	0,0000	-0,0666	-0,0971>>	1*1.00
205/	EFF/4	0,0000	-2,7865	-3,9815<<	1*1.33 + 4*1.50
206/	EFF/10	-0,0000>>	-0,0666	-0,0971	1*1.00
206/	EFF/2	-0,0000<<	-0,5878	-0,8420	1*1.33 + 2*1.50

206/	EFF/10	-0,0000	-0,0666>>	-0,0971	1*1.00
206/	EFF/5	-0,0000	-2,7865<<	-3,9815	1*1.33 + 5*1.50
206/	EFF/10	-0,0000	-0,0666	-0,0971>>	1*1.00
206/	EFF/5	-0,0000	-2,7865	-3,9815<<	1*1.33 + 5*1.50
207/	EFF/3	0,0001>>	-1,2513	-1,7894	1*1.33 + 3*1.50
207/	EFF/15	-0,0000<<	-0,0557	-0,0816	1*1.00 + 6*1.50
207/	EFF/16	0,0000	-0,0300>>	-0,0448	1*1.00 + 7*1.50
207/	EFF/2	0,0000	-2,2861<<	-3,2671	1*1.33 + 2*1.50
207/	EFF/16	0,0000	-0,0300	-0,0448>>	1*1.00 + 7*1.50
207/	EFF/2	0,0000	-2,2861	-3,2671<<	1*1.33 + 2*1.50
208/	EFF/16	0,0000>>	-0,0557	-0,0816	1*1.00 + 7*1.50
208/	EFF/2	-0,0001<<	-1,2513	-1,7894	1*1.33 + 2*1.50
208/	EFF/15	-0,0000	-0,0300>>	-0,0448	1*1.00 + 6*1.50
208/	EFF/3	-0,0000	-2,2861<<	-3,2671	1*1.33 + 3*1.50
208/	EFF/15	-0,0000	-0,0300	-0,0448>>	1*1.00 + 6*1.50
208/	EFF/3	-0,0000	-2,2861	-3,2671<<	1*1.33 + 3*1.50

Reactions forces values : Global Extremum

	FX (kN)	FY (kN)	FZ (kN)
MAX	4,3777	1,9920	0,0079
Node	111	104	207
Case	EFF/7	EFF/6	7
MIN	-4,3777	-3,6069	-15,5266
Node	104	204	201
Case	EFF/6	EFF/7	EFF/8

MIE CLIMBING WALL – SUPPORT NODES LOCATION

