



1 Demo01.f2e

2 Output data

2.1 Joints

no.	Coordinates		Support						
	Y [m]	Z [m]	Displacement Y	K[MN/m]	Displacement Z	K[MN/m]	Rotation X	K[MNm]	Rotation [°]
1	0,000	0,000	fixed		fixed				
2	1,625	0,758							
3	3,250	1,516							
4	4,875	2,273							
5	6,500	3,031							
6	8,125	2,273							
7	9,750	1,516							
8	11,375	0,758							
9	13,000	0,000			fixed				
10	11,700	0,000							
11	10,400	0,000							
12	9,100	0,000							
13	7,800	0,000							
14	6,500	0,000							
15	5,200	0,000							
16	3,900	0,000							
17	2,600	0,000							
18	1,300	0,000							

2.2 Members

Member type, topology and profiles:

no.	Type	Start joint	Conditions	End joint	Section	Length	Rotation	Material
						[m]	[°]	
1	Beam	1	o----o	5	Pi-cross-section	7,172	0,00	S10 (C24) - coniferous
2	Beam	5	o----o	9	Pi-cross-section	7,172	0,00	S10 (C24) - coniferous
3	Beam	1	o----o	9	built-up cross-section	13,000	0,00	S10 (C24) - coniferous
4	Beam	3	o----o	17	rectangle	1,649	0,00	S10 (C24) - coniferous
5	Beam	3	o----o	15	rectangle	2,470	0,00	S10 (C24) - coniferous
6	Beam	5	o----o	15	rectangle	3,298	0,00	S10 (C24) - coniferous
7	Beam	5	o----o	13	rectangle	3,298	0,00	S10 (C24) - coniferous
8	Beam	7	o----o	13	rectangle	2,470	0,00	S10 (C24) - coniferous
9	Beam	7	o----o	11	rectangle	1,649	0,00	S10 (C24) - coniferous

no.	Type	Start joint	Conditions	End joint	Section	Length	Rotation	Material
						[m]	[°]	
1	Beam	1	o----o	5	Pi-cross-section	7,172	0,00	S10 (C24) - coniferous
2	Beam	5	o----o	9	Pi-cross-section	7,172	0,00	S10 (C24) - coniferous
3	Beam	1	o----o	9	built-up cross-section	13,000	0,00	S10 (C24) - coniferous
4	Beam	3	o----o	17	rectangle	1,649	0,00	S10 (C24) - coniferous
5	Beam	3	o----o	15	rectangle	2,470	0,00	S10 (C24) - coniferous
6	Beam	5	o----o	15	rectangle	3,298	0,00	S10 (C24) - coniferous
7	Beam	5	o----o	13	rectangle	3,298	0,00	S10 (C24) - coniferous



no.	Type	Start joint	Conditions	End joint	Section	Length	Rotation	Material
						[m]	[°]	
8	Beam	7	o----o	13	rectangle	2,470	0,00	S10 (C24) - coniferous
9	Beam	7	o----o	11	rectangle	1,649	0,00	S10 (C24) - coniferous

2.3 Member profile parameters

Section characteristics of member profiles:

Section	Section area	Shear area	Sec. mom. of area	Main axis incl.
	A [mm ²]	A _z [mm ²]	I _{yh} [mm ⁴]	φ [°]
Pi-cross-section	18400	14002	67,0099E+06	0,00
built-up cross-section	16000	13333	53,3333E+06	0,00
rectangle	3200	2667	1,70667E+06	0,00

Material characteristics of member profiles:

Material	Elastic modulus	Shear modulus	Therm. exp. coef.	Spec. weight
	E [MPa]	G [MPa]	α _t [1/K]	γ [kN/m ³]
S10 (C24) - coniferous	11,00E+03	690,0E+00	5,000E-06	4,20

2.4 Load cases

no.	Name	Code	Type	γ _f (γ _{f,inf})*	Factors for combinations				
					ξ	Categ.**	ψ ₀	ψ ₁	ψ ₂
1	G1 Seelf weight	Self-weight	Permanent	1,35(0,90)	0,85	-	-	-	-
2	G2 Roofing	Force	Permanent	1,35(0,90)	0,85	-	-	-	-
3	S3 Snow	Force	Short-term variable snow load	1,50	-	H<1000	0,50	0,20	0,00
4	G4 Ceiling	Force	Permanent	1,35(0,90)	0,85	-	-	-	-

* γ_{f,inf} for favourable dead loads

** Category of live loads according to table A1.1 in EN 1990

2.5 Load members

Member	Member load
Load case no.2 - G2 Roofing	
Member no.1 1 o----o 5, length 7,172 m	Continuous force - Orientation along global Z-axis f = -0,20 kN/m
Member no.2 5 o----o 9, length 7,172 m	Continuous force - Orientation along global Z-axis f = -0,20 kN/m
Load case no.3 - S3 Snow	
Member no.1 1 o----o 5, length 7,172 m	Continuous force - On projection in direct. of gl. Z-axis f = -0,70 kN/m
Member no.2 5 o----o 9, length 7,172 m	Continuous force - On projection in direct. of gl. Z-axis f = -0,70 kN/m
Load case no.4 - G4 Ceiling	
Member no.3 1 o----o 9, length 13,000 m	Continuous force - Orientation along global Z-axis f = -0,20 kN/m

2.6 Combinations for 1st order calculation

Combination for check of ultimate limit state (ULS), 1st order

Number	Comb. name and type
	Composition
1	G1+G2+G4; basic combination γ _{f,sup,1} *G1 + γ _{f,sup,2} *G2 + γ _{f,sup,4} *G4



Number	Comb. name and type
	Composition
2	S3:G1+G2+G4; basic combination $\gamma_{f,sup,1} * G1 + \gamma_{f,sup,2} * G2 + \gamma_{f,sup,3} * S3 + \gamma_{f,sup,4} * G4$
3	S3:G1+G2+G4; accidental combination $G1 + G2 + \psi_{1,3} * S3 + G4$

Combination for check of serviceability limit state (SLS), 1st order

Number	Comb. name and type
	Composition
1	G1+G2+G4; characteristic combination $G1 + G2 + G4$
2	S3:G1+G2+G4; characteristic combination $G1 + G2 + S3 + G4$

2.7 Member's weight and surface

Structure weight

	in total [kg]	selected [kg]
Timber elements	218,15	60,96
Total weight	218,15	60,96

Painting area

	in total [m ²]	selected [m ²]
Timber elements	30,384	8,160
Total area	30,384	8,160

3 Results

3.1 Deformation for 1st order comb.

3.1.1 Deformation extremes

Combination for check of ultimate limit state (ULS), 1st order

Positive extremes:

Deformation	Combination	Joint	Value
Displacement Y	Combination 2	4	1,7 mm
Displacement Z	-	-	0,0 mm
Rotation X	Combination 2	10	1,3 mrad

Negative extremes:

Deformation	Combination	Joint	Value
Displacement Y	Combination 2	6	-0,3 mm
Displacement Z	Combination 2	4	-5,0 mm
Rotation X	Combination 2	18	-1,3 mrad

Combination for check of serviceability limit state (SLS), 1st order

Positive extremes:

Deformation	Combination	Joint	Value
Displacement Y	Combination 2	4	1,2 mm
Displacement Z	-	-	0,0 mm
Rotation X	Combination 2	10	0,9 mrad

Negative extremes:

Deformation	Combination	Joint	Value
Displacement Y	Combination 2	6	-0,2 mm



Deformation	Combination	Joint	Value
Displacement Z	Combination 2	4	-3,5 mm
Rotation X	Combination 2	18	-0,9 mrad

3.2 Int. forces in member's coor. sys. for 1st order comb.

3.2.1 Internal forces per members

Combination for check of ultimate limit state (ULS), 1st order

1st order combination, MSÚ		Position [m]	Internal forces		
no.	Name		N [kN]	V ₃ [kN]	M ₂ [kNm]
Member no.1 - 1 o----o 5, length 7,172 m					
1	G1+G2+G4	0,000	-10,12	-0,50	0,00
		1,569	-9,87	0,03	0,37
		3,586	-9,55	0,71	-0,38
		3,586	-7,67	-0,71	-0,38
		7,172	-7,10	0,50	0,00
2	S3:G1+G2+G4	0,000	-23,46	-1,72	0,00
		1,345	-22,71	-0,11	1,23
		3,586	-21,45	2,59	-1,55
		3,586	-17,84	-2,59	-1,55
		7,172	-15,83	1,72	0,00
3	S3:G1+G2+G4	0,000	-9,27	-0,53	0,00
		1,569	-9,01	0,04	0,39
		3,586	-8,66	0,78	-0,44
		3,586	-7,04	-0,78	-0,44
		7,172	-6,42	0,53	0,00
Member no.2 - 5 o----o 9, length 7,172 m					
1	G1+G2+G4	0,000	-7,10	0,50	0,00
		1,569	-7,35	-0,03	0,37
		3,586	-7,67	-0,71	-0,38
		3,586	-9,55	0,71	-0,38
		7,172	-10,12	-0,50	0,00
2	S3:G1+G2+G4	0,000	-15,83	1,72	0,00
		1,345	-16,59	0,11	1,23
		3,586	-17,84	-2,59	-1,55
		3,586	-21,45	2,59	-1,55
		7,172	-23,46	-1,72	0,00
3	S3:G1+G2+G4	0,000	-6,42	0,53	0,00
		1,569	-6,69	-0,04	0,39
		3,586	-7,04	-0,78	-0,44
		3,586	-8,66	0,78	-0,44
		7,172	-9,27	-0,53	0,00
Member no.3 - 1 o----o 9, length 13,000 m					
1	G1+G2+G4	0,000	8,96	-0,43	0,00
		1,300	8,96	0,04	0,26
		5,200	8,55	0,51	-0,21
		5,200	5,57	-0,47	-0,21
		7,800	5,57	0,47	-0,21
		7,800	8,55	-0,51	-0,21
		13,000	8,96	0,43	0,00



1st order combination, MSÚ		Position [m]	Internal forces		
no.	Name		N [kN]	V ₃ [kN]	M ₂ [kNm]
2	S3:G1+G2+G4	0,000	20,53	-0,51	0,00
		1,517	20,53	0,03	0,36
		5,200	20,20	0,60	-0,22
		5,200	12,89	-0,47	-0,22
		7,800	12,89	0,47	-0,22
		7,800	20,20	-0,60	-0,22
		13,000	20,53	0,51	0,00
3	S3:G1+G2+G4	0,000	8,18	-0,33	0,00
		1,300	8,18	0,02	0,21
		5,200	7,89	0,39	-0,15
		5,200	5,10	-0,35	-0,15
		7,800	5,10	0,35	-0,15
		7,800	7,89	-0,39	-0,15
		13,000	8,18	0,33	0,00
Member no.4 - 3 o----o 17, length 1,649 m					
1	G1+G2+G4	0,000	1,04	0,01	0,00
		0,471	1,03	0,00	0,00
		1,649	1,01	-0,01	0,00
2	S3:G1+G2+G4	0,000	0,86	0,01	0,00
		0,471	0,85	0,00	0,00
		1,649	0,83	-0,01	0,00
3	S3:G1+G2+G4	0,000	0,75	0,00	0,00
		0,471	0,74	0,00	0,00
		1,649	0,73	0,00	0,00
Member no.5 - 3 o----o 15, length 2,470 m					
1	G1+G2+G4	0,000	-2,40	0,02	0,00
		1,235	-2,41	0,00	0,01
		2,470	-2,43	-0,02	0,00
2	S3:G1+G2+G4	0,000	-6,47	0,02	0,00
		1,235	-6,49	0,00	0,01
		2,470	-6,50	-0,02	0,00
3	S3:G1+G2+G4	0,000	-2,32	0,01	0,00
		1,235	-2,33	0,00	0,01
		2,470	-2,34	-0,01	0,00
Member no.6 - 5 o----o 15, length 3,298 m					
1	G1+G2+G4	0,000	2,76	0,01	0,00
		1,649	2,74	0,00	0,01
		3,298	2,71	-0,01	0,00
2	S3:G1+G2+G4	0,000	5,58	0,01	0,00
		1,649	5,55	0,00	0,01
		3,298	5,52	-0,01	0,00
3	S3:G1+G2+G4	0,000	2,42	0,01	0,00
		1,649	2,40	0,00	0,01
		3,298	2,38	-0,01	0,00
Member no.7 - 5 o----o 13, length 3,298 m					
1	G1+G2+G4	0,000	2,76	0,01	0,00
		1,649	2,74	0,00	0,01
		3,298	2,71	-0,01	0,00



1st order combination, MSÚ		Position [m]	Internal forces		
no.	Name		N [kN]	V ₃ [kN]	M ₂ [kNm]
2	S3:G1+G2+G4	0,000	5,58	0,01	0,00
		1,649	5,55	0,00	0,01
		3,298	5,52	-0,01	0,00
3	S3:G1+G2+G4	0,000	2,42	0,01	0,00
		1,649	2,40	0,00	0,01
		3,298	2,38	-0,01	0,00
Member no.8 - 7 o----o 13, length 2,470 m					
1	G1+G2+G4	0,000	-2,40	0,02	0,00
		1,235	-2,41	0,00	0,01
		2,470	-2,43	-0,02	0,00
2	S3:G1+G2+G4	0,000	-6,47	0,02	0,00
		1,235	-6,49	0,00	0,01
		2,470	-6,50	-0,02	0,00
3	S3:G1+G2+G4	0,000	-2,32	0,01	0,00
		1,235	-2,33	0,00	0,01
		2,470	-2,34	-0,01	0,00
Member no.9 - 7 o----o 11, length 1,649 m					
1	G1+G2+G4	0,000	1,04	0,01	0,00
		0,471	1,03	0,00	0,00
		1,649	1,01	-0,01	0,00
2	S3:G1+G2+G4	0,000	0,86	0,01	0,00
		0,471	0,85	0,00	0,00
		1,649	0,83	-0,01	0,00
3	S3:G1+G2+G4	0,000	0,75	0,00	0,00
		0,471	0,74	0,00	0,00
		1,649	0,73	0,00	0,00

Combination for check of serviceability limit state (SLS), 1st order

1st order combination, MSP		Position [m]	Internal forces		
no.	Name		N [kN]	V ₃ [kN]	M ₂ [kNm]
Member no.1 - 1 o----o 5, length 7,172 m					
1	G1+G2+G4	0,000	-7,49	-0,37	0,00
		1,569	-7,31	0,02	0,27
		3,586	-7,07	0,53	-0,28
		3,586	-5,68	-0,53	-0,28
		7,172	-5,26	0,37	0,00
2	S3:G1+G2+G4	0,000	-16,39	-1,19	0,00
		1,345	-15,87	-0,07	0,85
		3,586	-15,01	1,78	-1,06
		3,586	-12,46	-1,78	-1,06
		7,172	-11,08	1,19	0,00
Member no.2 - 5 o----o 9, length 7,172 m					
1	G1+G2+G4	0,000	-5,26	0,37	0,00
		1,569	-5,44	-0,02	0,27
		3,586	-5,68	-0,53	-0,28
		3,586	-7,07	0,53	-0,28
		7,172	-7,49	-0,37	0,00



1st order combination, MSP		Position [m]	Internal forces		
no.	Name		N [kN]	V ₃ [kN]	M ₂ [kNm]
2	S3:G1+G2+G4	0,000	-11,08	1,19	0,00
		1,345	-11,60	0,07	0,85
		3,586	-12,46	-1,78	-1,06
		3,586	-15,01	1,78	-1,06
		7,172	-16,39	-1,19	0,00
Member no.3 - 1 o----o 9, length 13,000 m					
1	G1+G2+G4	0,000	6,64	-0,32	0,00
		1,300	6,64	0,03	0,19
		5,200	6,33	0,38	-0,15
		5,200	4,12	-0,35	-0,15
		7,800	4,12	0,35	-0,15
		7,800	6,33	-0,38	-0,15
		13,000	6,64	0,32	0,00
2	S3:G1+G2+G4	0,000	14,35	-0,37	0,00
		1,300	14,35	-0,03	0,26
		5,200	14,10	0,44	-0,16
		5,200	9,01	-0,35	-0,16
		7,800	9,01	0,35	-0,16
		7,800	14,10	-0,44	-0,16
		13,000	14,35	0,37	0,00
Member no.4 - 3 o----o 17, length 1,649 m					
1	G1+G2+G4	0,000	0,77	0,00	0,00
		0,471	0,77	0,00	0,00
		1,649	0,75	0,00	0,00
2	S3:G1+G2+G4	0,000	0,65	0,00	0,00
		0,471	0,65	0,00	0,00
		1,649	0,63	0,00	0,00
Member no.5 - 3 o----o 15, length 2,470 m					
1	G1+G2+G4	0,000	-1,78	0,01	0,00
		1,235	-1,79	0,00	0,01
		2,470	-1,80	-0,01	0,00
2	S3:G1+G2+G4	0,000	-4,49	0,01	0,00
		1,235	-4,50	0,00	0,01
		2,470	-4,51	-0,01	0,00
Member no.6 - 5 o----o 15, length 3,298 m					
1	G1+G2+G4	0,000	2,05	0,01	0,00
		1,649	2,03	0,00	0,01
		3,298	2,01	-0,01	0,00
2	S3:G1+G2+G4	0,000	3,92	0,01	0,00
		1,649	3,90	0,00	0,01
		3,298	3,88	-0,01	0,00
Member no.7 - 5 o----o 13, length 3,298 m					
1	G1+G2+G4	0,000	2,05	0,01	0,00
		1,649	2,03	0,00	0,01
		3,298	2,01	-0,01	0,00
2	S3:G1+G2+G4	0,000	3,92	0,01	0,00
		1,649	3,90	0,00	0,01
		3,298	3,88	-0,01	0,00



1st order combination, MSP		Position [m]	Internal forces		
no.	Name		N [kN]	V ₃ [kN]	M ₂ [kNm]
Member no.8 - 7 o----o 13, length 2,470 m					
1	G1+G2+G4	0,000	-1,78	0,01	0,00
		1,235	-1,79	0,00	0,01
		2,470	-1,80	-0,01	0,00
2	S3:G1+G2+G4	0,000	-4,49	0,01	0,00
		1,235	-4,50	0,00	0,01
		2,470	-4,51	-0,01	0,00
Member no.9 - 7 o----o 11, length 1,649 m					
1	G1+G2+G4	0,000	0,77	0,00	0,00
		0,471	0,77	0,00	0,00
		1,649	0,75	0,00	0,00
2	S3:G1+G2+G4	0,000	0,65	0,00	0,00
		0,471	0,65	0,00	0,00
		1,649	0,63	0,00	0,00

3.3 Reaction for load cases

3.3.1 Reaction per joints

Load case		Reaction		
no.	Name	R _y [kN]	R _z [kN]	RO _x [kNm]
Joint no.1 - abs. Y: 0,000 m Z: 0,000 m				
1	G1 Seelf weight	0,00	1,09	-
2	G2 Roofing	0,00	1,43	-
3	S3 Snow	0,00	4,55	-
4	G4 Ceiling	0,00	1,30	-
Joint no.9 - abs. Y: 13,000 m Z: 0,000 m				
1	G1 Seelf weight	-	1,09	-
2	G2 Roofing	-	1,43	-
3	S3 Snow	-	4,55	-
4	G4 Ceiling	-	1,30	-

3.3.2 Sums of reactions in global axis directions

Load case	In Y-axis direction [kN]	In Z-axis direction [kN]
Load case 1	0,00	2,18
Load case 2	0,00	2,87
Load case 3	0,00	9,10
Load case 4	0,00	2,60

3.4 Reaction for 1st order comb.

3.4.1 Reaction per joints

Combination for check of ultimate limit state (ULS), 1st order

1st order combination, MSÚ		Reaction		
no.	Name	R _y [kN]	R _z [kN]	RO _x [kNm]
Joint no.1 - abs. Y: 0,000 m Z: 0,000 m				
1	G1+G2+G4	0,00	5,16	-
2	S3:G1+G2+G4	0,00	11,99	-



1st order combination, MSÚ		Reaction		
no.	Name	R _y [kN]	R _z [kN]	RO _x [kNm]
3	S3:G1+G2+G4	0,00	4,74	-
Joint no.9 - abs. Y: 13,000 m Z: 0,000 m				
1	G1+G2+G4	-	5,16	-
2	S3:G1+G2+G4	-	11,99	-
3	S3:G1+G2+G4	-	4,74	-

Combination for check of serviceability limit state (SLS), 1st order

1st order combination, MSP		Reaction		
no.	Name	R _y [kN]	R _z [kN]	RO _x [kNm]
Joint no.1 - abs. Y: 0,000 m Z: 0,000 m				
1	G1+G2+G4	0,00	3,83	-
2	S3:G1+G2+G4	0,00	8,38	-
Joint no.9 - abs. Y: 13,000 m Z: 0,000 m				
1	G1+G2+G4	-	3,83	-
2	S3:G1+G2+G4	-	8,38	-

3.4.2 Sums of reactions in global axis directions

Combination for check of ultimate limit state (ULS), 1st order

Combination	In Y-axis direction [kN]	In Z-axis direction [kN]
Combination no.1	0,00	10,33
Combination no.2	0,00	23,98
Combination no.3	0,00	9,47

Combination for check of serviceability limit state (SLS), 1st order

Combination	In Y-axis direction [kN]	In Z-axis direction [kN]
Combination no.1	0,00	7,65
Combination no.2	0,00	16,75