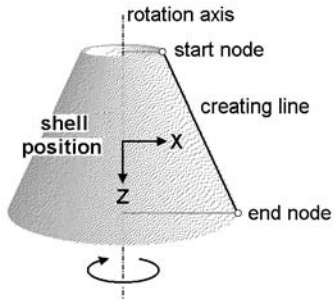
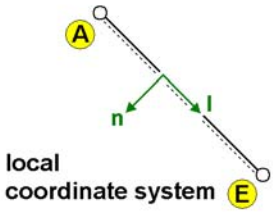
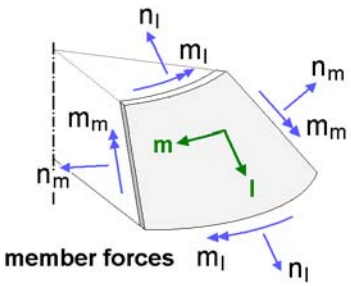
Structural Calcualtions of rotationally symmetrical shell structures by using the Finite Element Method



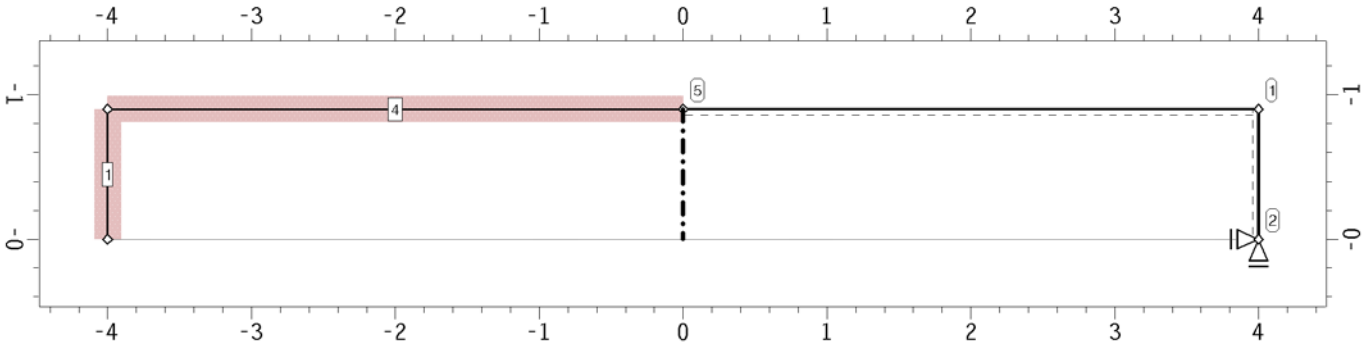




SYSTEM DESCRIPTION

System graphic

on r.h. side: node numbers, bearing information, orientation of the pos.; on l.h. side: number, thickness of the pos.



Coordinates and bearing information

node -	X m	Z m	Cf-X MN/m²	Cf-Z MN/m²	Cm-Y MNm/m	designation -
1	4.000	-0.900	-	-	-	
2	4.000	0.000	fest	fest	-	
5	0.000	-0.900	-	-	-	

Calculation values of position 1:

Material designation: generallyes, user definedes Material

Geom. characteristic values		Phys. characteristic values		elastic bedding
Start node:	1	E-modulus:	29961.95 MN/m2	no
End node:	2	Poisson's ratio:	0.00 -	
Length:	0.90 m	Temp. coeff.:	1.00 10-5/K	
Thickn.:	18.00 cm			

Calculation values of position 4:

Material designation: generallyes, user definedes Material

Geom. characteristic values		Phys. characteristic values		elastic bedding
Start node:	5	E-modulus:	29961.95 MN/m2	no
End node:	1	Poisson's ratio:	0.00 -	
Length:	4.00 m	Temp. coeff.:	1.00 10-5/K	
Thickn.:	18.00 cm			

Description of loading structure

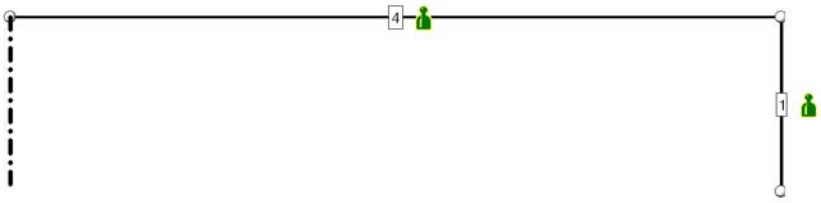
On the left-hand side, the relationship between the actions effects, load case file and load cases are shown in a tree structure. The right-hand side shows the characteristics of the superposition to the associated objects on the left-hand. In terms of the superposition, a load case file is equivalent to an extreme rule of the defined objects therein and can be additive or alternatively superpositioned.

Used symbols: Action effect Load case file Load case

1: new action effect	**permanent loads**
1: new load case	additive

LOAD PICTURES IN LOAD CASE 1: NEW LOAD CASE

Loaded objects in load case 1



dead loads in load case 1

pos.	max.density
-	kN/m³
1	25.000
4	25.000

VERIFICATIONS

meanings in case of application of superposition rule acc. to Eurocode:

Ψ_{dom}	Combination coefficient of a	leading	traffic load action	(leading load action)
Ψ_{sub}	Combination coefficient of a	non-leading	traffic load action	(accompanying load action)
γ_{sup}	Partial safety factor for	unfavourable	load positions	
γ_{inf}	Partial safety factor for	favourable	load positions	

meanings in case of application of superposition rule acc. to DIN 18800:

Ψ_{dom}	Combination coefficient of a main combination
Ψ_{sub}	Combination coefficient of a minor combination

Superposition rules of bridge construction and DIN 1055-100 behave like Eurocode.
In non-linear analysis, rules of extremization will not be considered

If verifications according to Eurocode are listet below, the following applies:
The national annex "Germany" is taken into account.

Verification 1: Analysis

Analysis: Analysis no Verifications

1: Standard combination

Rules of extremization of verification 1, type: standard, rule of superposition: charakteristisch

action	γ_{sup}	γ_{inf}
1	1.00	1.00

List of beams of verification 1:

Line numbers ...	
1	4

REGULATIONS

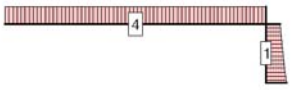
VERIFICATION 1: SUMMARY

Extremal Reactions of supported nodes (γ_F-fach)

node	type	ap_x kN/m	ap_z kN/m	am_y kNm/m
2	Min	-7.43	-13.05	0.00
	Max	-7.43	-13.05	0.00
Minimum		**-7.43**	**-13.05**	**0.00**
Maximum		**-7.43**	**-13.05**	**0.00**

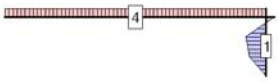
Normal force n_l

Min/Max: -13.05/0.00 kN/m



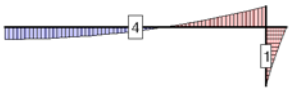
Normal force n_m

Min/Max: -10.93/28.15 kN/m



Internal moment m_l

Min/Max: -8.36/5.16 kNm/m



Internal moment m_m

Min/Max: 0.00/5.16 kNm/m

Shear force q_l

Min/Max: -9.00/10.93 kN/m

Extremal member forces

node	s m	type	n_l kN/m	n_m kN/m	m_l kNm/m	m_m kNm/m	q_l kN/m
Shell 1							
1	0.00	Min	-9.00	-10.93	-8.36	0.00	10.93
		Max	-9.00	-10.93	-8.36	0.00	10.93
	0.30	Min	-10.35	28.15	-5.10	0.00	10.29
		Max	-10.35	28.15	-5.10	0.00	10.29
	0.60	Min	-11.70	24.06	-2.32	0.00	8.33
		Max	-11.70	24.06	-2.32	0.00	8.33
2	0.90	Min	-13.05	0.00	0.00	0.00	7.43
		Max	-13.05	0.00	0.00	0.00	7.43
Shell 4							
5	0.00	Min	0.00	0.00	0.00	0.00	0.00
		Max	0.00	0.00	0.00	0.00	0.00
	0.00	Min	-10.93	-10.93	5.16	5.16	-0.00
		Max	-10.93	-10.93	5.16	5.16	-0.00
	2.05	Min	-10.93	-10.93	1.60	3.96	-4.61
		Max	-10.93	-10.93	1.60	3.96	-4.61

Extremal member forces

node	s	type	n_l	n_m	m_l	m_m	q_l
-	m		kN/m	kN/m	kNm/m	kNm/m	kN/m
1	4.00	Min	-10.93	-10.93	-8.36	0.62	-9.00
		Max	-10.93	-10.93	-8.36	0.62	-9.00
Minimum			**-13.05**	**-10.93**	**-8.36**	**0.00**	**-9.00**
Maximum			**0.00**	**28.15**	**5.16**	**5.16**	**10.93**