Project data

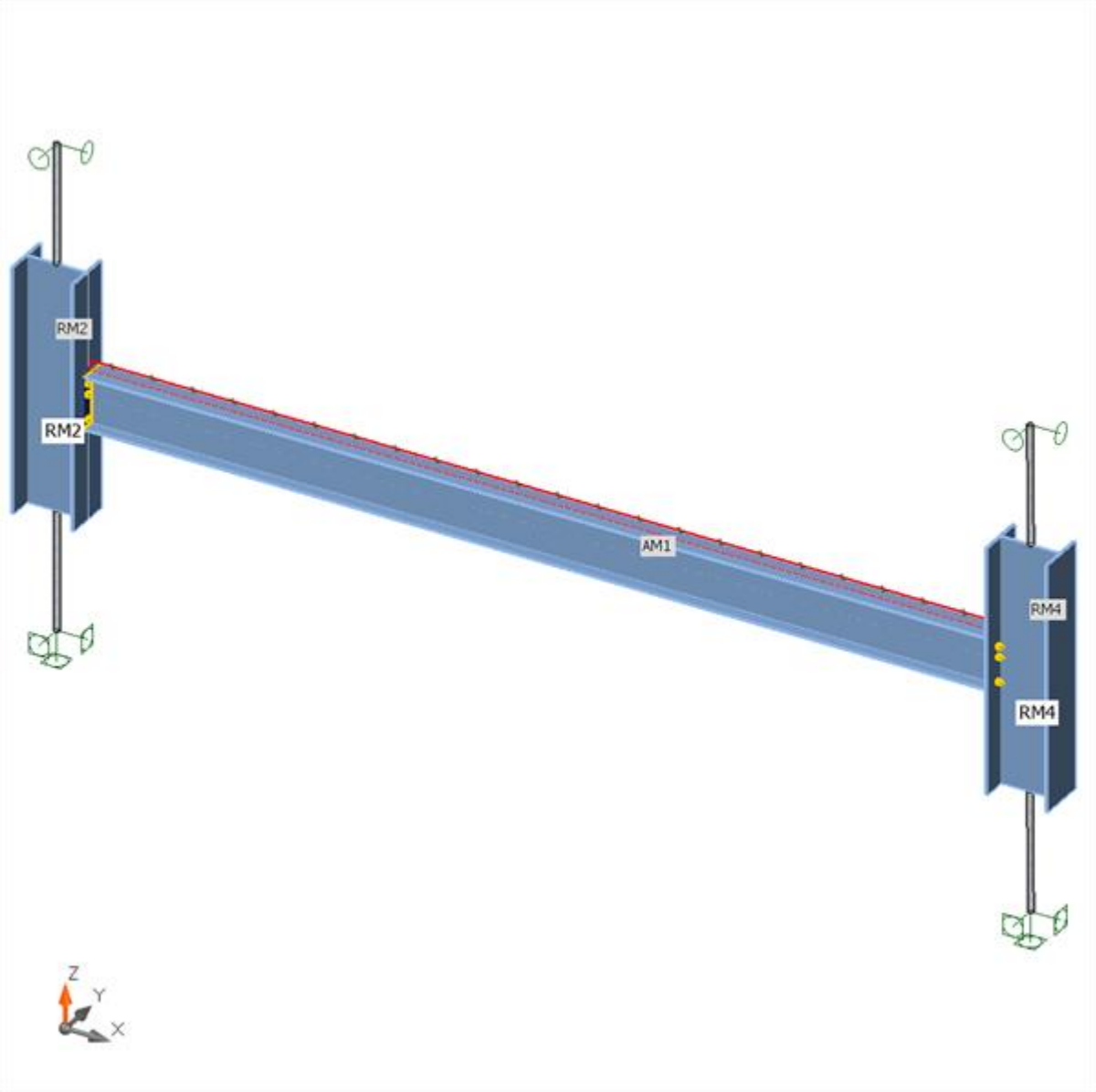
Project data	Amsterdam Industrial - Steel transverse beam
Date	10.03.2023
Design code	EN

Project: Amsterdam industrial

Project: 20231090

Author: Dave the Engineer

Geometry



Analyzed members

AM1

Property	Value
Name	AM1
Members	M2

Cross-section	IPE330
Length	6,00 m
ey	0 mm
ez	0 mm
Begin	(0,00; 0,00; 0,00) m
End	(6,00; 0,00; 0,00) m

Related members

RM2

Property	Value
Name	RM2
Members	M4
Cross-section	HEA400
Length	3,00 m
ey	0 mm
ez	0 mm
Begin	(0,00; 0,00; -1,50) m
End	(0,00; 0,00; 1,50) m
Support Begin	■ X | ■ Y | ■ Z | ■ Rx | ■ Ry | ■ Rz
Support End	□ X | ■ Y | ■ Z | □ Rx | □ Ry | □ Rz

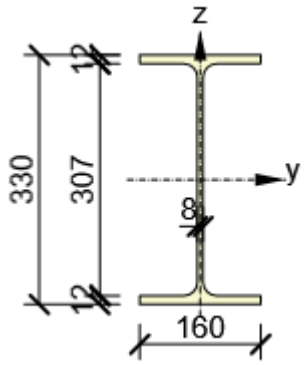
RM4

Property	Value
Name	RM4
Members	M6
Cross-section	HEA400
Length	3,00 m
ey	0 mm
ez	0 mm
Begin	(6,00; 0,00; -1,50) m
End	(6,00; 0,00; 1,50) m
Support Begin	■ X | ■ Y | ■ Z | ■ Rx | ■ Ry | ■ Rz
Support End	□ X | ■ Y | ■ Z | □ Rx | □ Ry | □ Rz

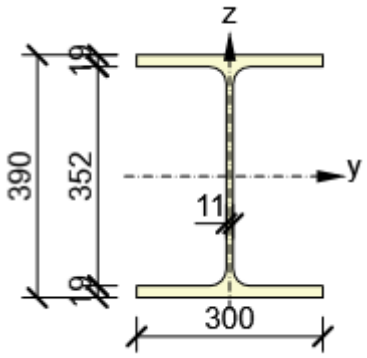
Lateral-Torsional Restraint

Plate	Torsional restraint C_θ [kNm/m]	Lateral restraint S_i [kN]
AM1-w 1	Free	Rigid

Cross-section



IPE330, Material: S 355



HEA400, Material: S 355

Loading

LC1

Line load

Member	Begin [m]	End [m]	X [kN/m]	Y [kN/m]	Z [kN/m]	Location	Width [mm]	Ey [mm]
AM1	1,40	1,60	0,0	0,0	-500,0	Top	0	0
AM1	2,90	3,10	0,0	0,0	-500,0	Top	0	0
AM1	4,40	4,60	0,0	0,0	-500,0	Top	0	0

Point load

Member	N [kN]	Vy [kN]	Vz [kN]	Mx [kN]	My [kN]	Mz [kN]
RM2 / Begin	0,0	0,0	0,0	0,0	0,0	0,0
RM2 / End	0,0	0,0	0,0	0,0	0,0	0,0

RM4 / Begin	0,0	0,0	0,0	0,0	0,0	0,0
RM4 / End	0,0	0,0	0,0	0,0	0,0	0,0

LC2

Line load

Member	Begin [m]	End [m]	X [kN/m]	Y [kN/m]	Z [kN/m]	Location	Width [mm]	Ey [mm]
AM1	0,00	6,00	0,0	5,0	-60,0	Member axis	0	0

Point load

Member	N [kN]	Vy [kN]	Vz [kN]	Mx [kN]	My [kN]	Mz [kN]
RM2 / Begin	0,0	0,0	0,0	0,0	0,0	0,0
RM2 / End	0,0	0,0	0,0	0,0	0,0	0,0
RM4 / Begin	0,0	0,0	0,0	0,0	0,0	0,0
RM4 / End	0,0	0,0	0,0	0,0	0,0	0,0

Results

Materially non-linear analysis (MNA)

Summary

Load	Applied loads [%]
LE1	100,0
LE2	100,0

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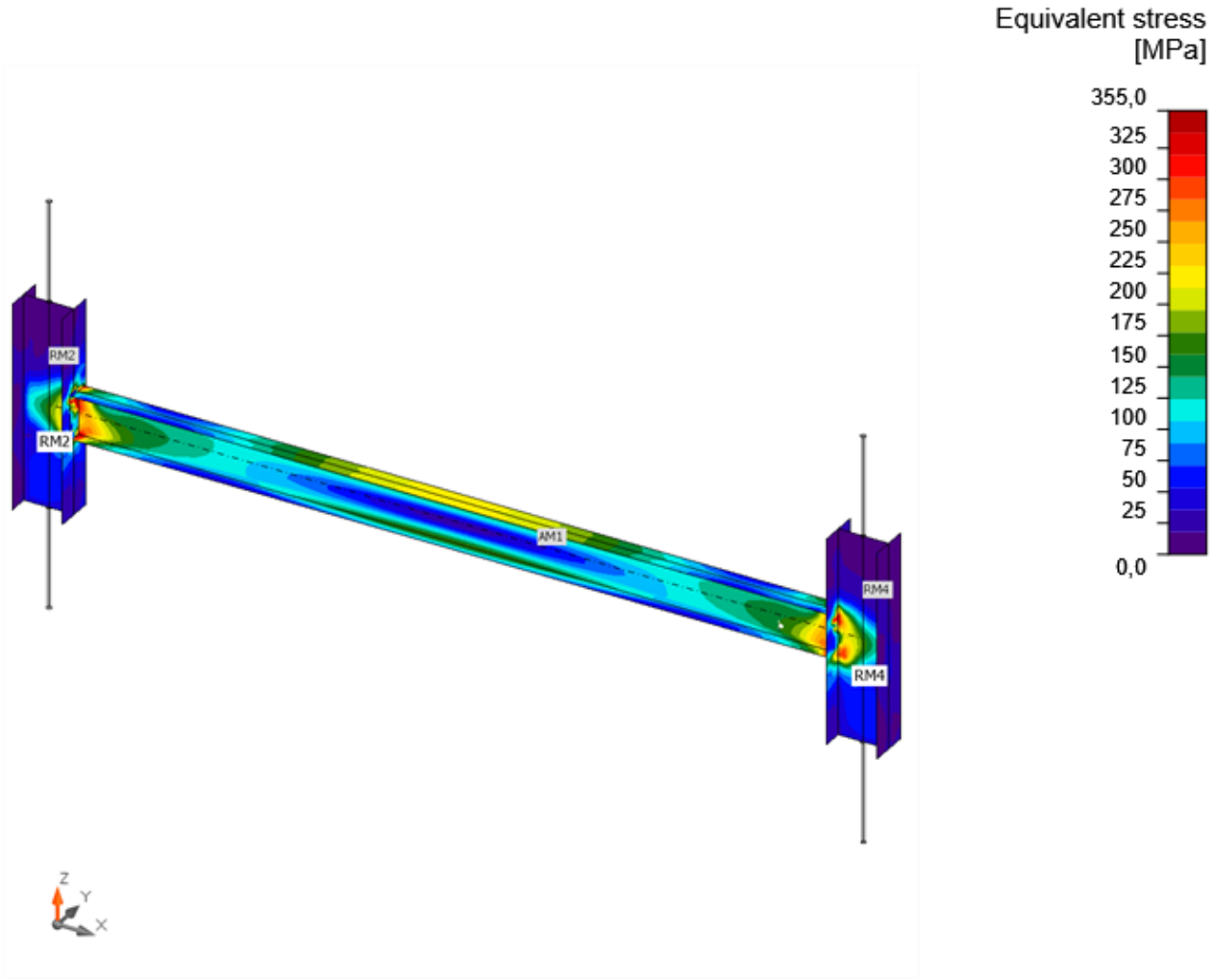
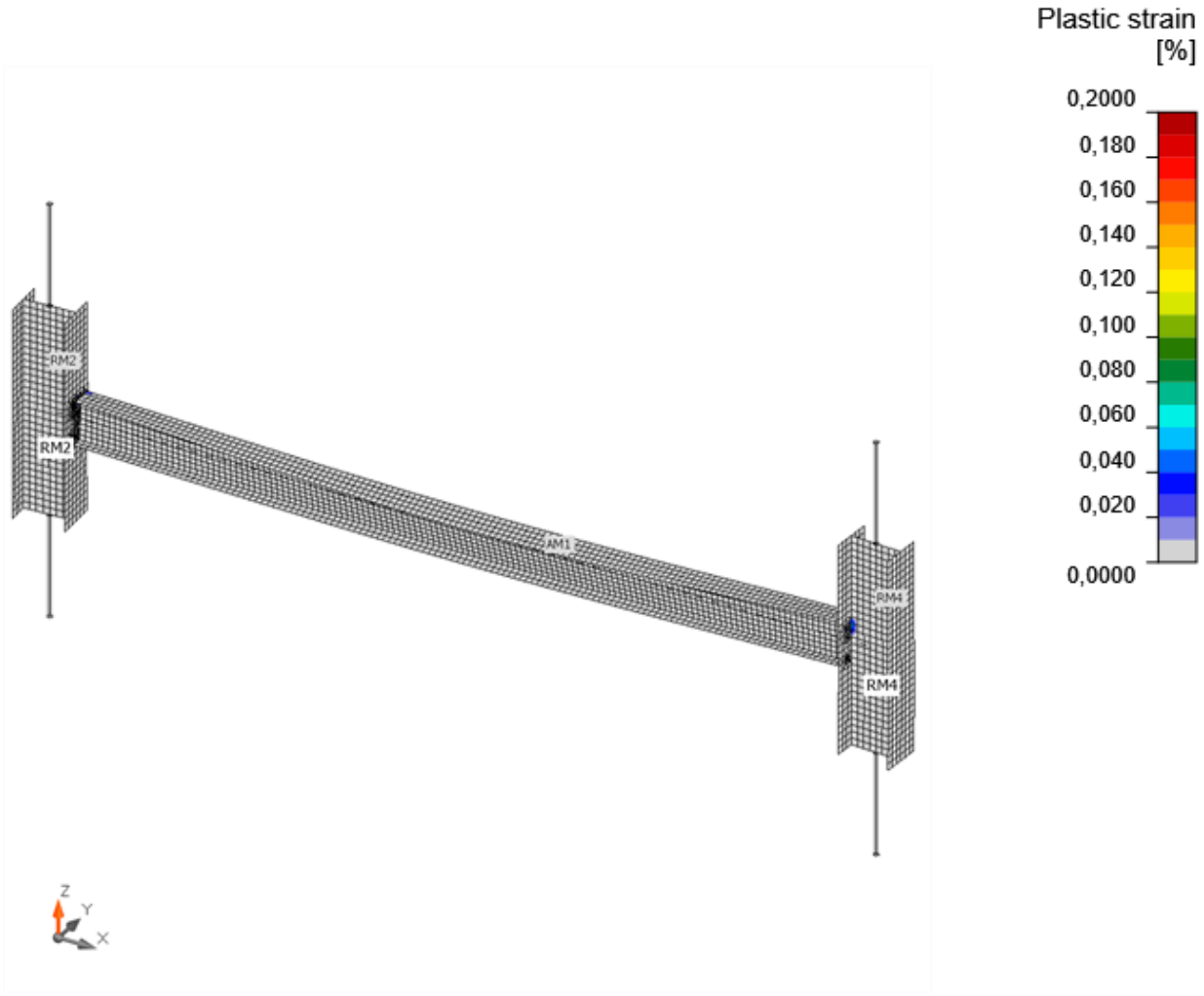


Eq. stress ,LC2



Plastic strain ,LC2

Plates

Part	Name	Material	Th [mm]	Load	σ_{Ed} [MPa]	ε_{Pl} [%]	Check
AM1	Bottom flange 1	S 355	12	LE2	353,6	0,0	OK
	Top flange 1	S 355	12	LE2	327,2	0,0	OK
	Web 1	S 355	8	LE2	284,2	0,0	OK
RM2	Bottom flange 1	S 355	19	LE2	355,3	0,2	OK
	Top flange 1	S 355	19	LE2	38,1	0,0	OK
	Web 1	S 355	11	LE2	355,1	0,0	OK
RM4	Bottom flange 1	S 355	19	LE2	38,3	0,0	OK
	Top flange 1	S 355	19	LE2	355,3	0,2	OK
	Web 1	S 355	11	LE1	355,1	0,0	OK
CON1	End plate (EP1)	S 355	20	LE2	355,5	0,3	OK

CON2	End plate (EP1)	S 355	20	LE2	355,6	0,3	OK

Design data

Material	f_y [MPa]	ε_{lim} [%]
S 355	355,0	5,0

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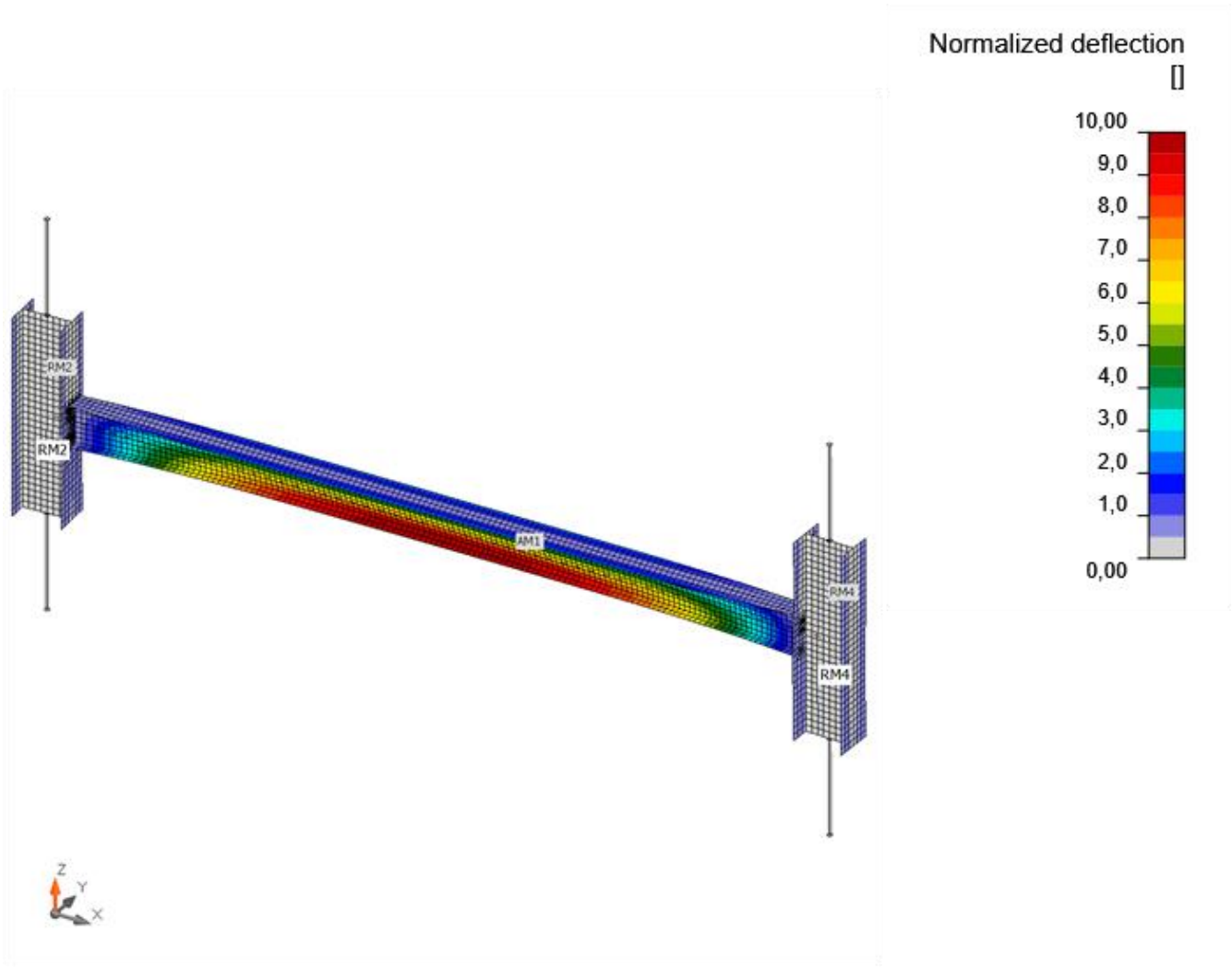
Linear buckling analysis (LBA)

Buckling



Normalized deflection, LE1, Buckling shape 1

Loads	1 [-]	2 [-]	3 [-]	4 [-]	5 [-]	6 [-]
LE1	4,07	7,51	8,31	8,32	8,82	9,05
LE2	8,50	9,44	9,57	10,46	10,46	10,87

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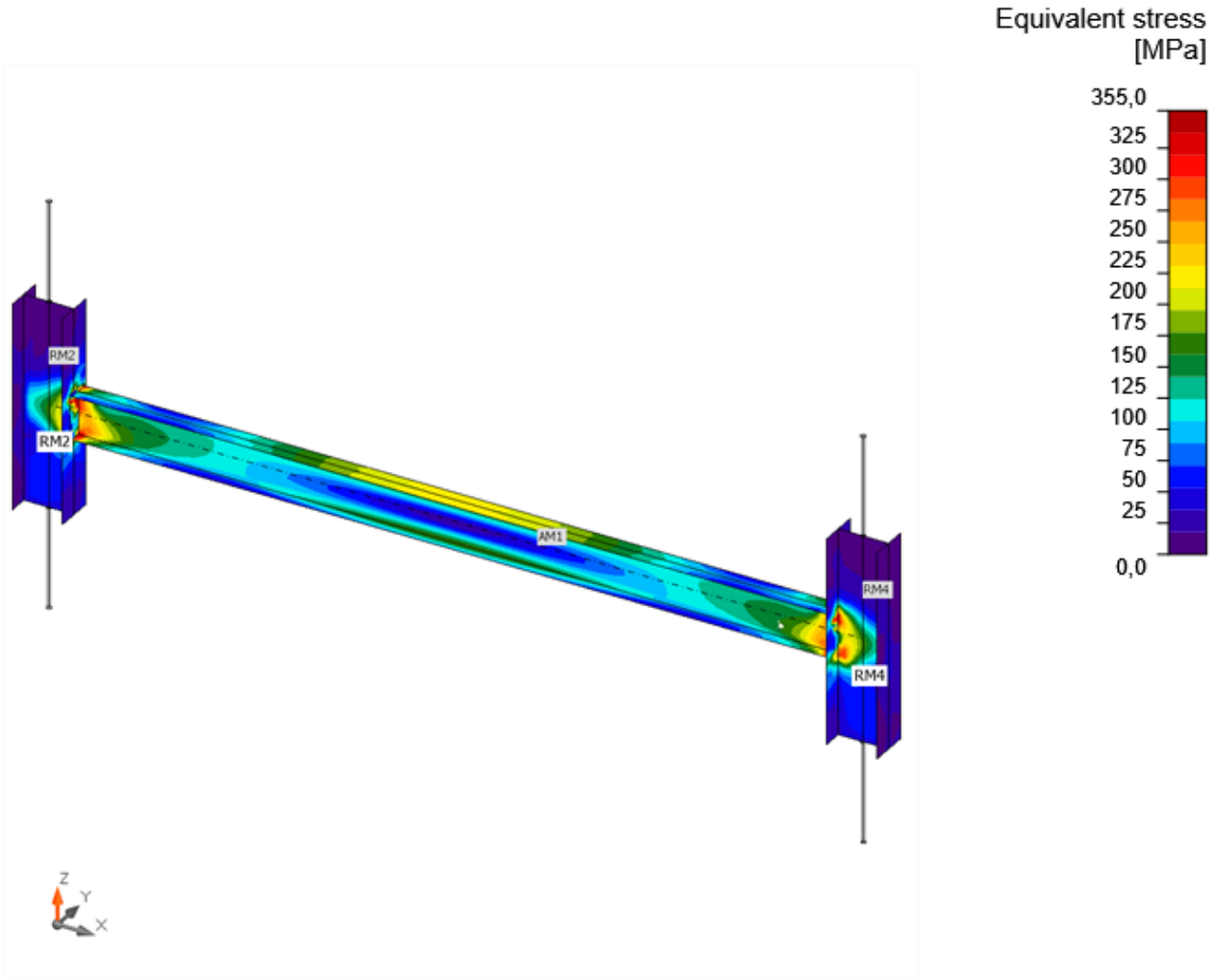
Geometrically and materially non-linear analysis with imperfections (GMNIA)

Summary

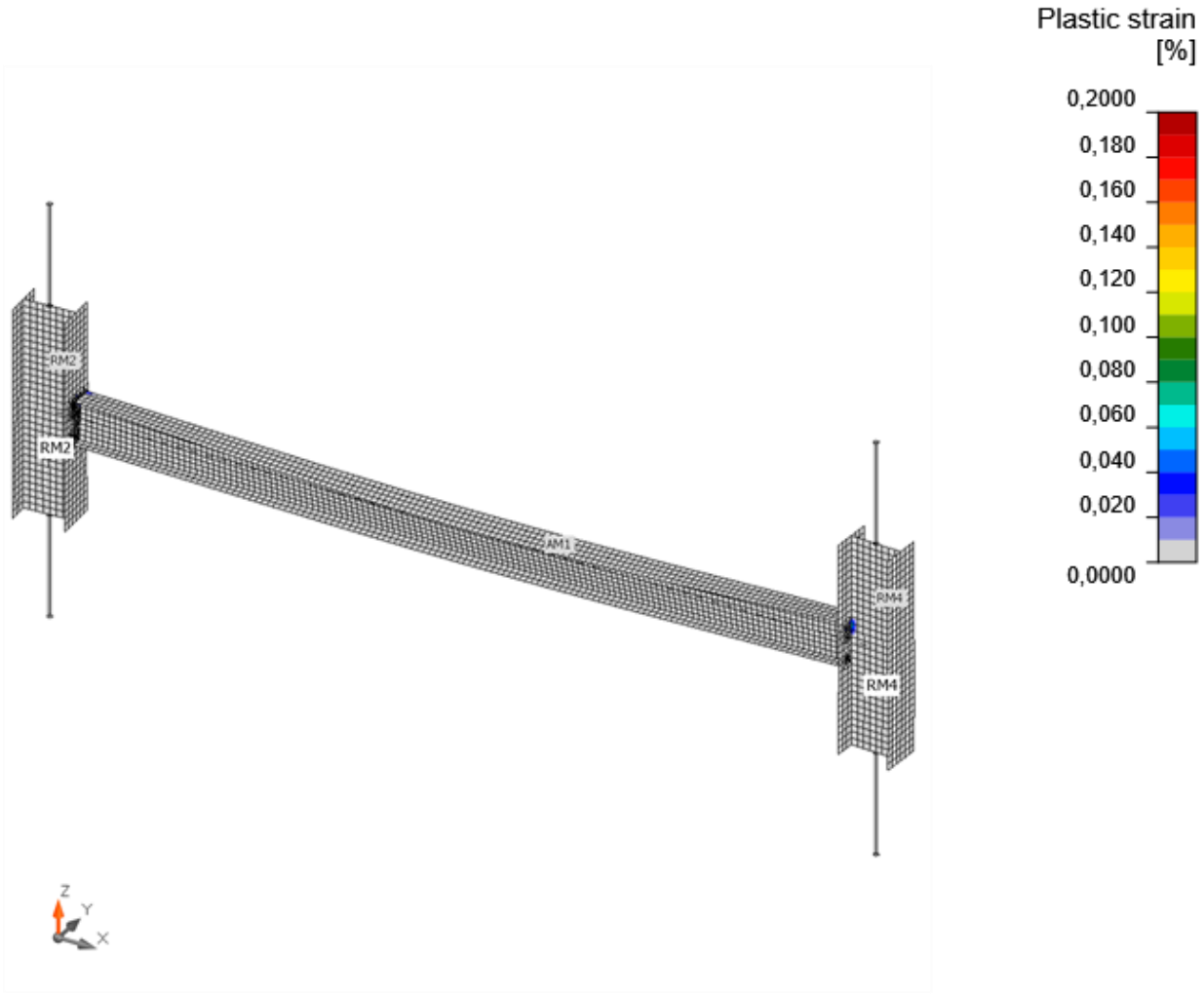
Load	Applied loads [%]
LE1	100,0
LE2	100,0

Imperfections

Loads		1	2	3	4	5	6
LE1	Buckling factor [-]	4,07	7,51	8,31	8,32	8,82	9,05
	Amplitude [mm]	25	0	0	0	0	0
LE2	Buckling factor [-]	8,50	9,44	9,57	10,46	10,46	10,87
	Amplitude [mm]	10	0	0	0	0	0



Eq. stress ,LC2



Plastic strain ,LC2

Plates

Part	Name	Material	Th [mm]	Load	σ_{Ed} [MPa]	ε_{Pl} [%]	Check
AM1	Bottom flange 1	S 355	12	LE2	352,8	0,0	OK
	Top flange 1	S 355	12	LE2	313,8	0,0	OK
	Web 1	S 355	8	LE2	277,7	0,0	OK
RM2	Bottom flange 1	S 355	19	LE2	355,4	0,2	OK
	Top flange 1	S 355	19	LE1	34,0	0,0	OK
	Web 1	S 355	11	LE2	355,2	0,1	OK
RM4	Bottom flange 1	S 355	19	LE2	34,1	0,0	OK
	Top flange 1	S 355	19	LE2	355,4	0,2	OK
	Web 1	S 355	11	LE2	355,1	0,1	OK
CON1	End plate (EP1)	S 355	20	LE2	355,5	0,2	OK

CON2	End plate (EP1)	S 355	20	LE2	355,5	0,2	OK

Design data

Material	f_y [MPa]	ε_{lim} [%]
S 355	355,0	5,0

Symbol explanation

Symbol	Explanation
σ_{Ed}	Eq. stress
ε_{Pl}	Strain
f_y	Yield strength
ε_{lim}	Limit of plastic strain used in 2D plate element check

Code settings

Stop at limit strain	No	
Pretension force factor k	0,70	-
Friction coefficient in slip-resistance	0,30	-
γ M2	1,25	-
γ M,fi	1,00	-
Anchor length for stiffness calculation [d]	8	
Limit plastic strain	500,0	1e-4
Division of surface of the biggest circular hollow member	64	
Division of arc of rectangular hollow member	3	
Number of elements on biggest member web or flange	8	
Number of elements on biggest web of RHS member	16	
Number of elements on individual plates	20	
Number of analysis iterations	25	
Divergent iterations count	6	
Minimal size of element	10	mm
Maximal size of element	50	mm
Number of buckling modes	6	

Software info

Application	IDEA StatiCa Member
Version	23.0.0.3259

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Developed by IDEA StatiCa