Pre-design software: ACOBRI
Version : V 5.01

Company : DER-DF
Reference : DF-095 (EPCL)
Project : Ponte Metálica
User : SUTEC/GEPRO

File : PONTE DF 095 EPCL _R5

Beam characteristics at design cross-sections :

Ws : Section modulus of top flange

For beam no 1 (y = 0.40 m)

Concrete condition : Slab uncracked
Type of loading : Permanent
Steel / concrete modular ratio : 17.20

Cross-section	x (m)	Ws LHS (cm3)	Ws RHS (cm3)
1	0.00		63562.
2	0.40	63562.	63562.
3	1.52	63562.	63562.
4	2.64	63562.	63562.
5	3.76	63562.	63562.
6	4.88	63562.	63562.
7	6.00	63562.	63562.
8	7.12	63562.	63562.
9	8.24	63562.	63562.
10	9.36	63562.	63562.
11	10.48	63562.	63562.
12	11.60	63562.	63562.
13	12.72	63562.	63562.
14	13.84	63562.	63562.
15	14.96	63562.	63562.
16	16.08	63562.	63562.
17	17.20	63562.	63562.
18	18.13	63562.	63562.
19	19.07	63562.	63562.
20	20.00	63562.	63562.
21	20.93	63562.	63562.
22	21.87	63562.	63562.
23	22.80	63562.	63562.
24	23.92	63562.	63562.
25	25.04	63562.	63562.
26	26.16	63562.	63562.
27	27.28	63562.	63562.
28	28.40	63562.	63562.
29	29.52	63562.	63562.
30	30.64	63562.	63562.
31	31.76	63562.	63562.
32	32.88	63562.	63562.
33	34.00	63562.	63562.
34	35.12	63562.	63562.
35	36.24	63562.	63562.
36	37.36	63562.	63562.
37	38.48	63562.	63562.
38	39.60	63562.	63562.
39	40.00	63562.	

Pre-design software: ACOBRI
Version : V 5.01

Company : DER-DF
Reference : DF-095 (EPCL)
Project : Ponte Metálica
User : SUTEC/GEPRO

File : PONTE DF 095 EPCL _R5

Beam characteristics at design cross-sections :

Ws : Section modulus of top flange

For beam no 1 (y = 0.40 m)

Cross-section	x	Ws LHS	Ws RHS
	(m)	(cm3)	(cm3)
1	0.00		28240.
2	0.40	28240.	28240.
3	1.52	28240.	28240.
4	2.64	28240.	28240.
5	3.76	28240.	28240.
6	4.88	28240.	28240.
7	6.00	28240.	28240.
8	7.12	28240.	28240.
9	8.24	28240.	28240.
10	9.36	28240.	28240.
11	10.48	28240.	28240.
12	11.60	28240.	28240.
13	12.72	28240.	28240.
14	13.84	28240.	28240.
15	14.96	28240.	28240.
16	16.08	28240.	28240.
17	17.20	28240.	28240.
18	18.13	28240.	28240.
19	19.07	28240.	28240.
20	20.00	28240.	28240.
21	20.93	28240.	28240.
22	21.87	28240.	28240.
23	22.80	28240.	28240.
24	23.92	28240.	28240.
25	25.04	28240.	28240.
26	26.16	28240.	28240.
27	27.28	28240.	28240.
28	28.40	28240.	28240.
29	29.52	28240.	28240.
30	30.64	28240.	28240.
31	31.76	28240.	28240.
32	32.88	28240.	28240.
33	34.00	28240.	28240.
34	35.12	28240.	28240.
35	36.24	28240.	28240.
36	37.36	28240.	28240.
37	38.48	28240.	28240.
38	39.60	28240.	28240.
39	40.00	28240.	

Pre-design software: ACOBRI
Version : V 5.01

Company : DER-DF
Reference : DF-095 (EPCL)
Project : Ponte Metálica
User : SUTEC/GEPRO

File : PONTE DF 095 EPCL _R5

Beam characteristics at design cross-sections :

Ws : Section modulus of top flange

For beam no 1 (y = 0.40 m)

Concrete condition : Slab uncracked
Type of loading : Live
Steel / concrete modular ratio : 6.40

Cross-section	x (m)	Ws LHS (cm3)	Ws RHS (cm3)
1	0.00		138031.
2	0.40	138031.	138031.
3	1.52	138031.	138031.
4	2.64	138031.	138031.
5	3.76	138031.	138031.
6	4.88	138031.	138031.
7	6.00	138031.	138031.
8	7.12	138031.	138031.
9	8.24	138031.	138031.
10	9.36	138031.	138031.
11	10.48	138031.	138031.
12	11.60	138031.	138031.
13	12.72	138031.	138031.
14	13.84	138031.	138031.
15	14.96	138031.	138031.
16	16.08	138031.	138031.
17	17.20	138031.	138031.
18	18.13	138031.	138031.
19	19.07	138031.	138031.
20	20.00	138031.	138031.
21	20.93	138031.	138031.
22	21.87	138031.	138031.
23	22.80	138031.	138031.
24	23.92	138031.	138031.
25	25.04	138031.	138031.
26	26.16	138031.	138031.
27	27.28	138031.	138031.
28	28.40	138031.	138031.
29	29.52	138031.	138031.
30	30.64	138031.	138031.
31	31.76	138031.	138031.
32	32.88	138031.	138031.
33	34.00	138031.	138031.
34	35.12	138031.	138031.
35	36.24	138031.	138031.
36	37.36	138031.	138031.
37	38.48	138031.	138031.
38	39.60	138031.	138031.
39	40.00	138031.	

Pre-design software: ACOBRI
Version : V 5.01

Company : DER-DF
Reference : DF-095 (EPCL)
Project : Ponte Metálica
User : SUTEC/GEPRO

File : PONTE DF 095 EPCL _R5

Beam characteristics at design cross-sections :

Ws : Section modulus of top flange

For beam no 1 (y = 0.40 m)

Concrete condition : Slab uncracked
Type of loading : Steel / concrete modular ratio
Steel / concrete modular ratio : 6.40

Cross-section	x (m)	Ws LHS (cm3)	Ws RHS (cm3)
1	0.00		138031.
2	0.40	138031.	138031.
3	1.52	138031.	138031.
4	2.64	138031.	138031.
5	3.76	138031.	138031.
6	4.88	138031.	138031.
7	6.00	138031.	138031.
8	7.12	138031.	138031.
9	8.24	138031.	138031.
10	9.36	138031.	138031.
11	10.48	138031.	138031.
12	11.60	138031.	138031.
13	12.72	138031.	138031.
14	13.84	138031.	138031.
15	14.96	138031.	138031.
16	16.08	138031.	138031.
17	17.20	138031.	138031.
18	18.13	138031.	138031.
19	19.07	138031.	138031.
20	20.00	138031.	138031.
21	20.93	138031.	138031.
22	21.87	138031.	138031.
23	22.80	138031.	138031.
24	23.92	138031.	138031.
25	25.04	138031.	138031.
26	26.16	138031.	138031.
27	27.28	138031.	138031.
28	28.40	138031.	138031.
29	29.52	138031.	138031.
30	30.64	138031.	138031.
31	31.76	138031.	138031.
32	32.88	138031.	138031.
33	34.00	138031.	138031.
34	35.12	138031.	138031.
35	36.24	138031.	138031.
36	37.36	138031.	138031.
37	38.48	138031.	138031.
38	39.60	138031.	138031.
39	40.00	138031.	

Pre-design software: ACOBRI
Version : V 5.01

Company : DER-DF
Reference : DF-095 (EPCL)
Project : Ponte Metálica
User : SUTEC/GEPRO

File : PONTE DF 095 EPCL _R5

Number of spans : 1
Bridge length : 40.00 m
Bridge width : 13.40 m

Structural mass per span :

Span	Structural steel sections (t)	Concrete (t)	Subtotal (t)
1	146.96	387.06	538.65
Total	146.96	387.06	538.65

Mass of waterproofing, surfacing, ballast etc., per span :

Span	Waterproof. (t)	Surf./Ballast (t)	Footways (t)	Subtotal (t)	
1	80.64	64.51	96.00	241.15	
Total	80.64	64.51	0.00	96.00	241.15

Weight of deck furniture per span :

M1 = Parapet
M2 = Parapet
M3 = Cornices
M4 = Drains
M5 = Utilities
M6 = Other loads

Span	M1 (kN)	M2 (kN)	M3 (kN)	M4 (kN)	M5 (kN)	M6 (kN)	Subtotal (kN)
1	0.00	80.00	0.00	0.00	0.00	0.00	80.00
Total	0.00	80.00	0.00	0.00	0.00	0.00	80.00

Pre-design software: ACOBRI
Version : V 5.01

Company : DER-DF
Reference : DF-095 (EPCL)
Project : Ponte Metálica
User : SUTEC/GEPRO

File : PONTE DF 095 EPCL _R5

Materials characteristics :
---

1 - Structural steel :

Data :

Steel grade : S355
Reduction in yield strength with thickness

Design properties :

Yield strength :	fy =	-345. MPa
Young's modulus :	E =	-210000. MPa
Density :	rho =	7850. kg/m3

2 - Reinforcing steel :

Design properties :

Yield strength :	fy =	-500. MPa

3 - Steel for strengthening plates :

Design properties :

Steel grade : S355

Yield strength :	fy =	0. MPa

4 - Slab concrete :

Data :

Normal-weight concrete
Concrete class : C30/37

Design properties :

Compressive strength	fcj =	-30.00 MPa
Tensile strength	ftj =	-2.90 MPa
Density	rho =	2650. kg/m3

Pre-design software: ACOBRI
Version : V 5.01

Company : DER-DF
Reference : DF-095 (EPCL)
Project : Ponte Metálica
User : SUTEC/GEPRO

File : PONTE DF 095 EPCL _R5

Shear connectors :

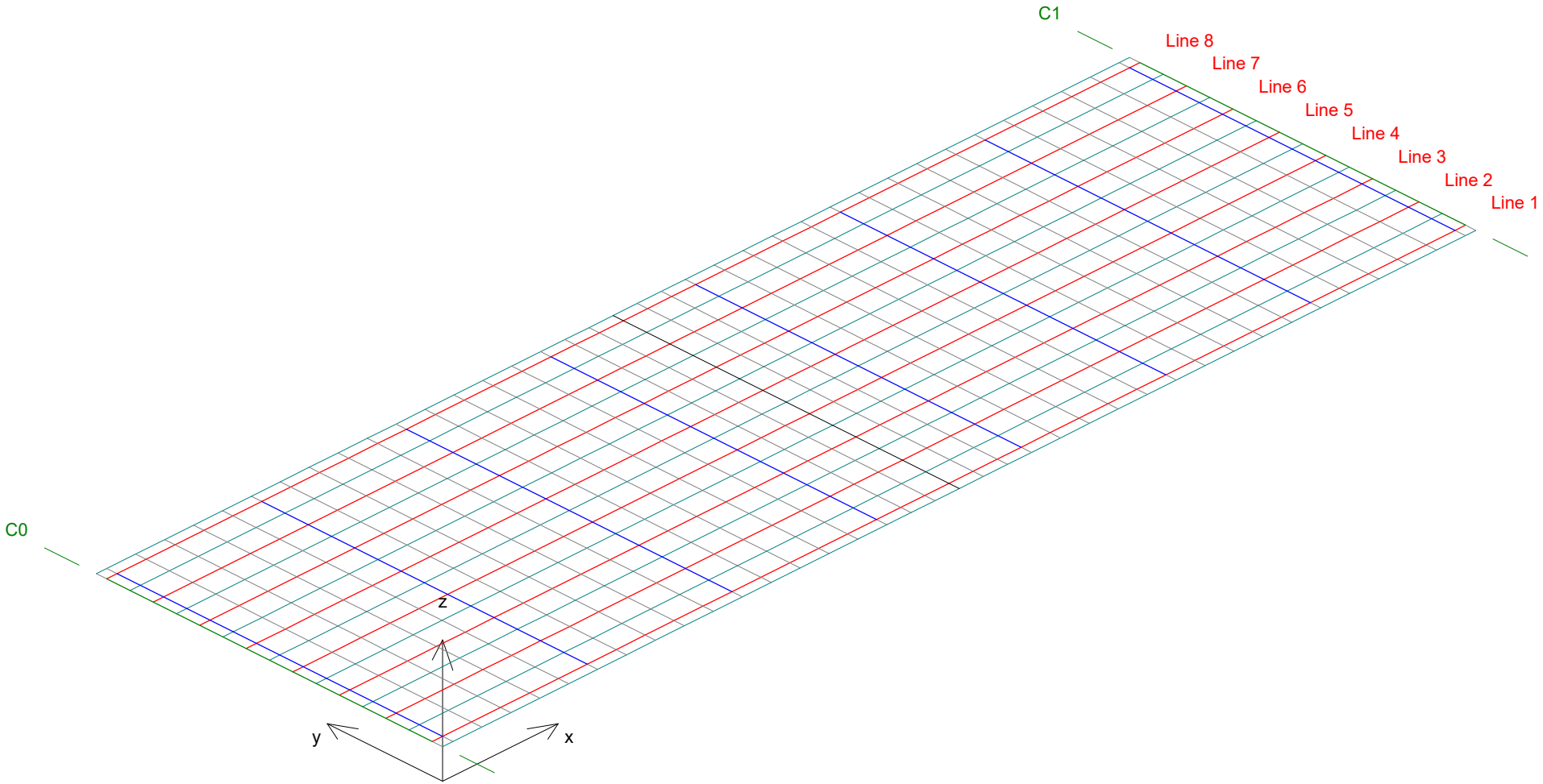
Type of connectors : Ø22x175
Diameter : 22.0 mm
Yield strength : 350. MPa
Shear resistance : 109.48 kN

Number of connectors per span

Beam	Span T01	Total
1	95	95
2	106	106
3	119	119
4	110	110
5	110	110
6	117	117
7	124	124
8	94	94
Total	875	875

STUDY : PONTE DF 095 EPCL _R5

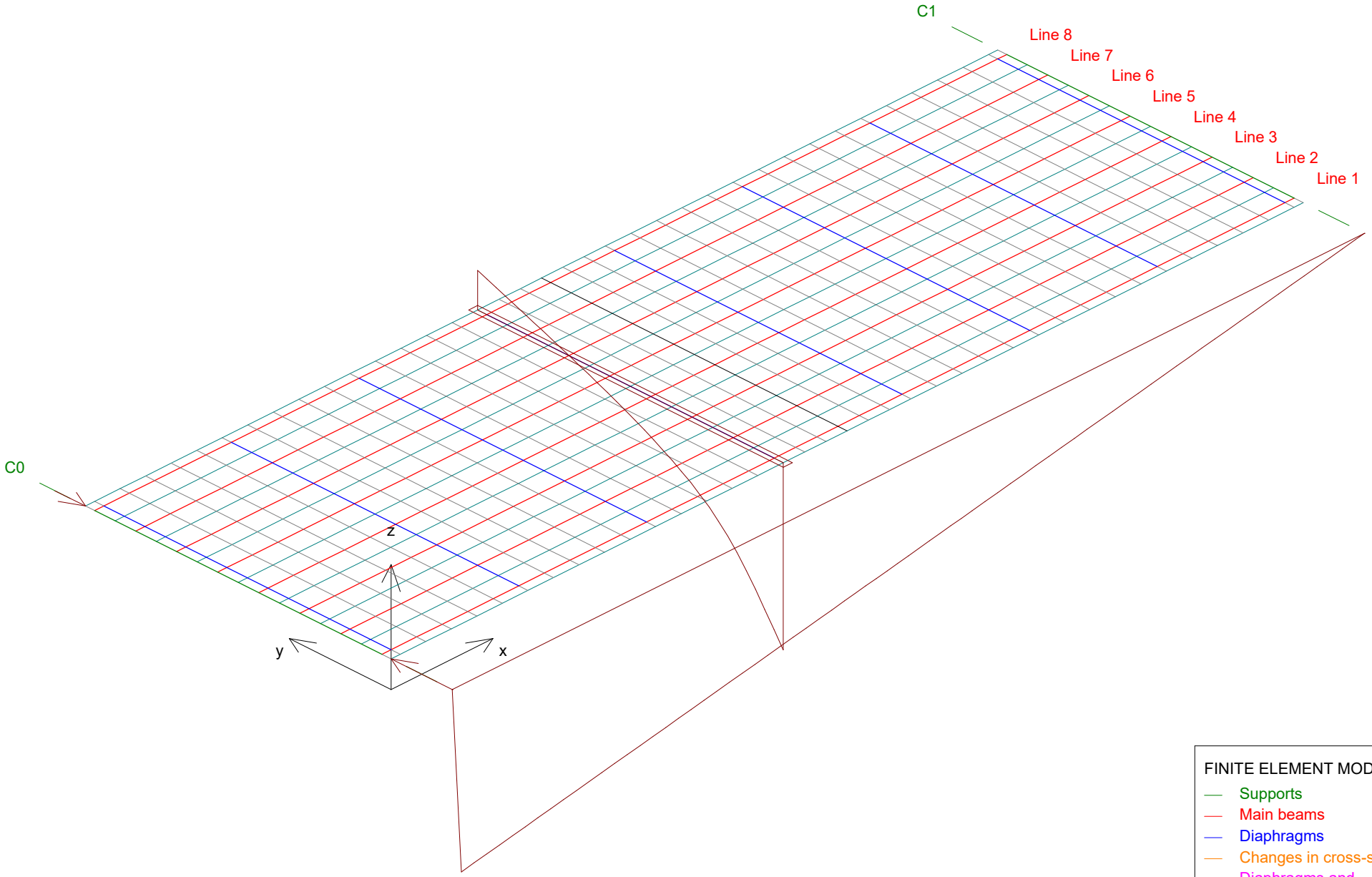
Finite Element Model



FINITE ELEMENT MODEL

- Supports
- Main beams
- Diaphragms
- Changes in cross-section
- Diaphragms and Changes in cross-section
- Concrete slab
- Special cross-sections

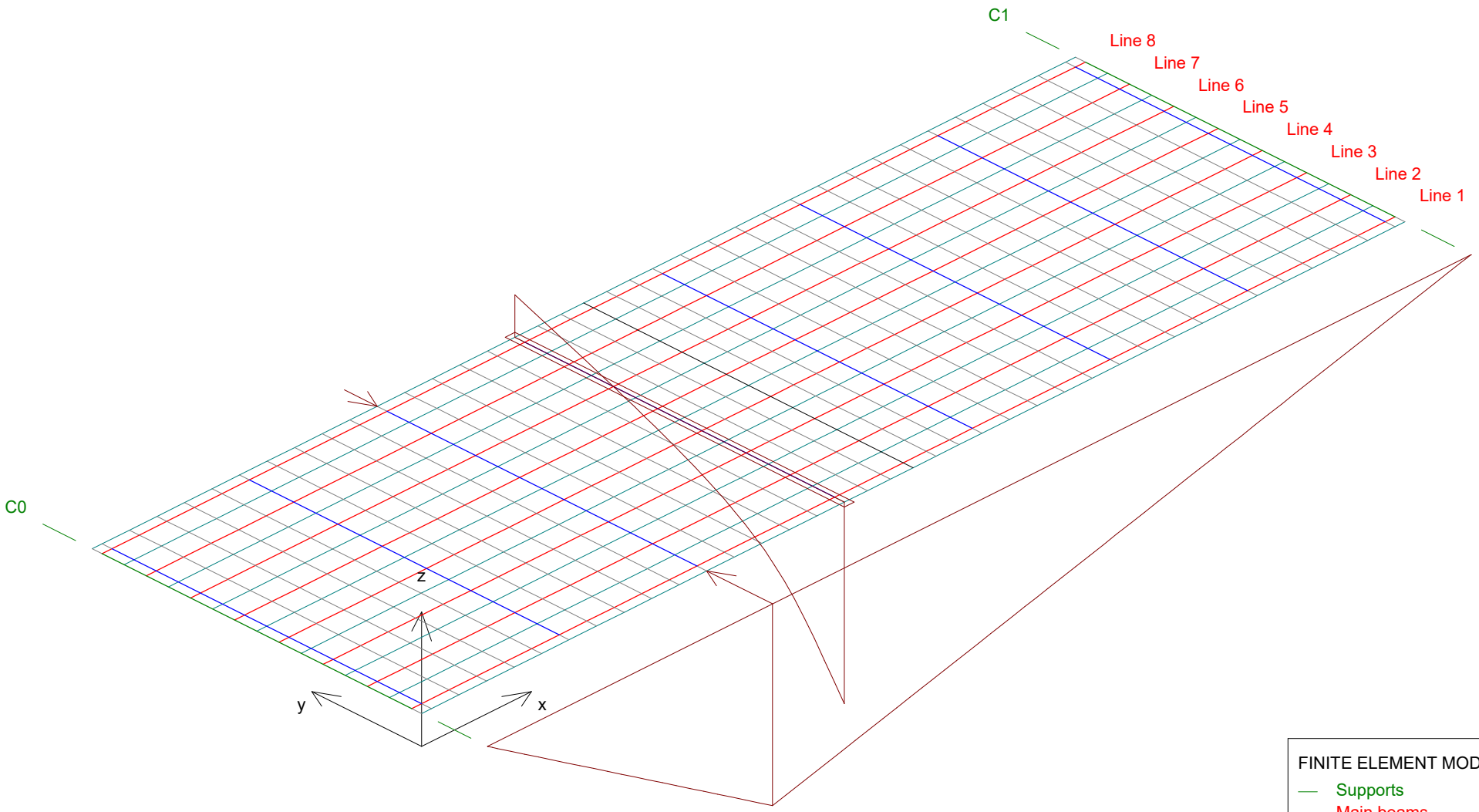
STUDY : PONTE DF 095 EPCL _R5
Finite Element Model



FINITE ELEMENT MODEL
- Supports
- Main beams
- Diaphragms
- Changes in cross-section
- Diaphragms and Changes in cross-section
- Concrete slab
- Special cross-sections
- Influence line

STUDY : PONTE DF 095 EPCL _R5

Finite Element Model



FINITE ELEMENT MODEL

- Supports
- Main beams
- Diaphragms
- Changes in cross-section
- Diaphragms and Changes in cross-section
- Concrete slab
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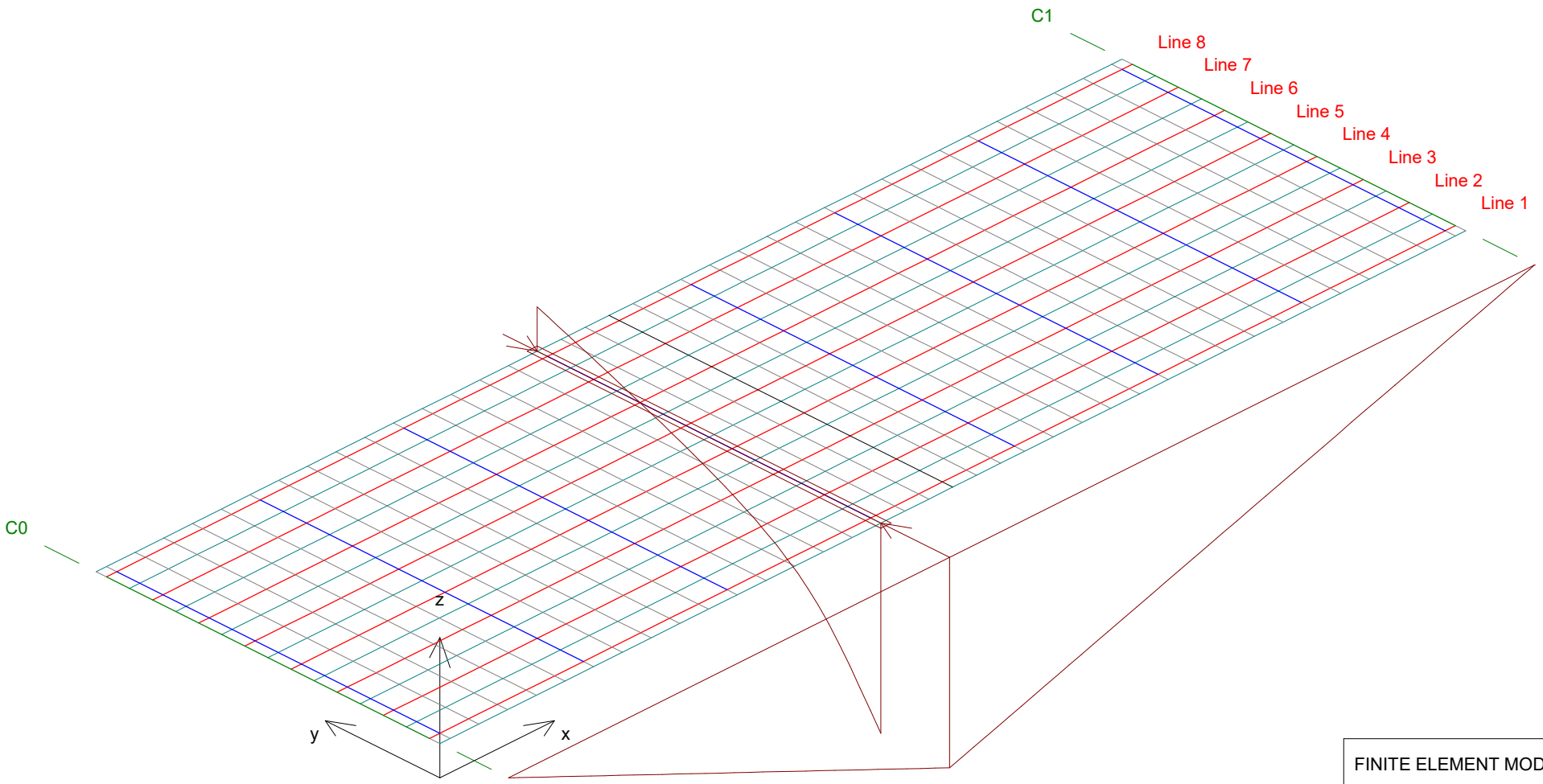
- Influence line

STUDY : PONTE DF 095 EPCL _R5

Finite Element Model



FINITE ELEMENT MODEL

- Supports
- Main beams
- Diaphragms
- Changes in cross-section
- Diaphragms and Changes in cross-section
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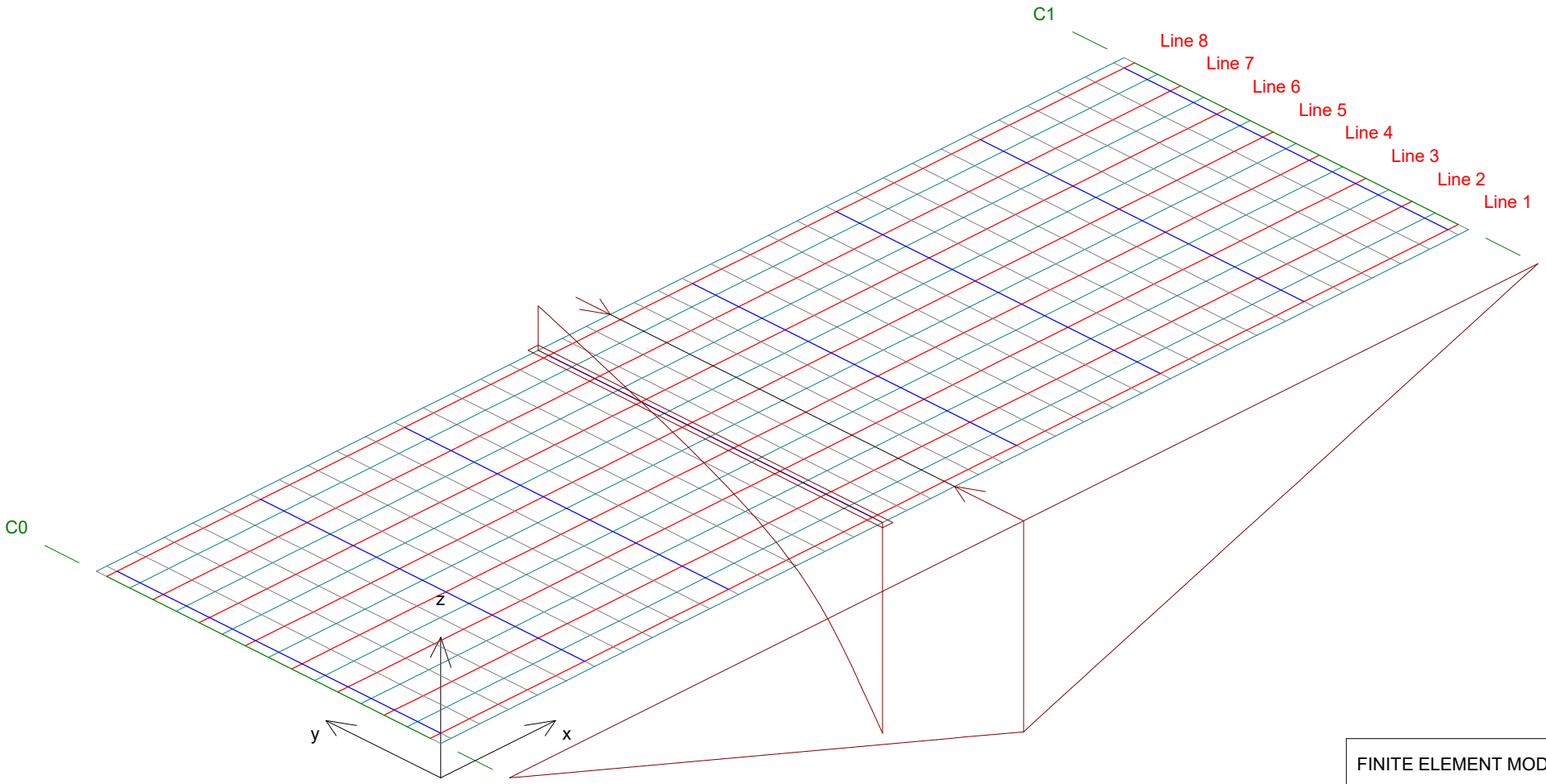
- Influence line

STUDY : PONTE DF 095 EPCL _R5

Finite Element Model

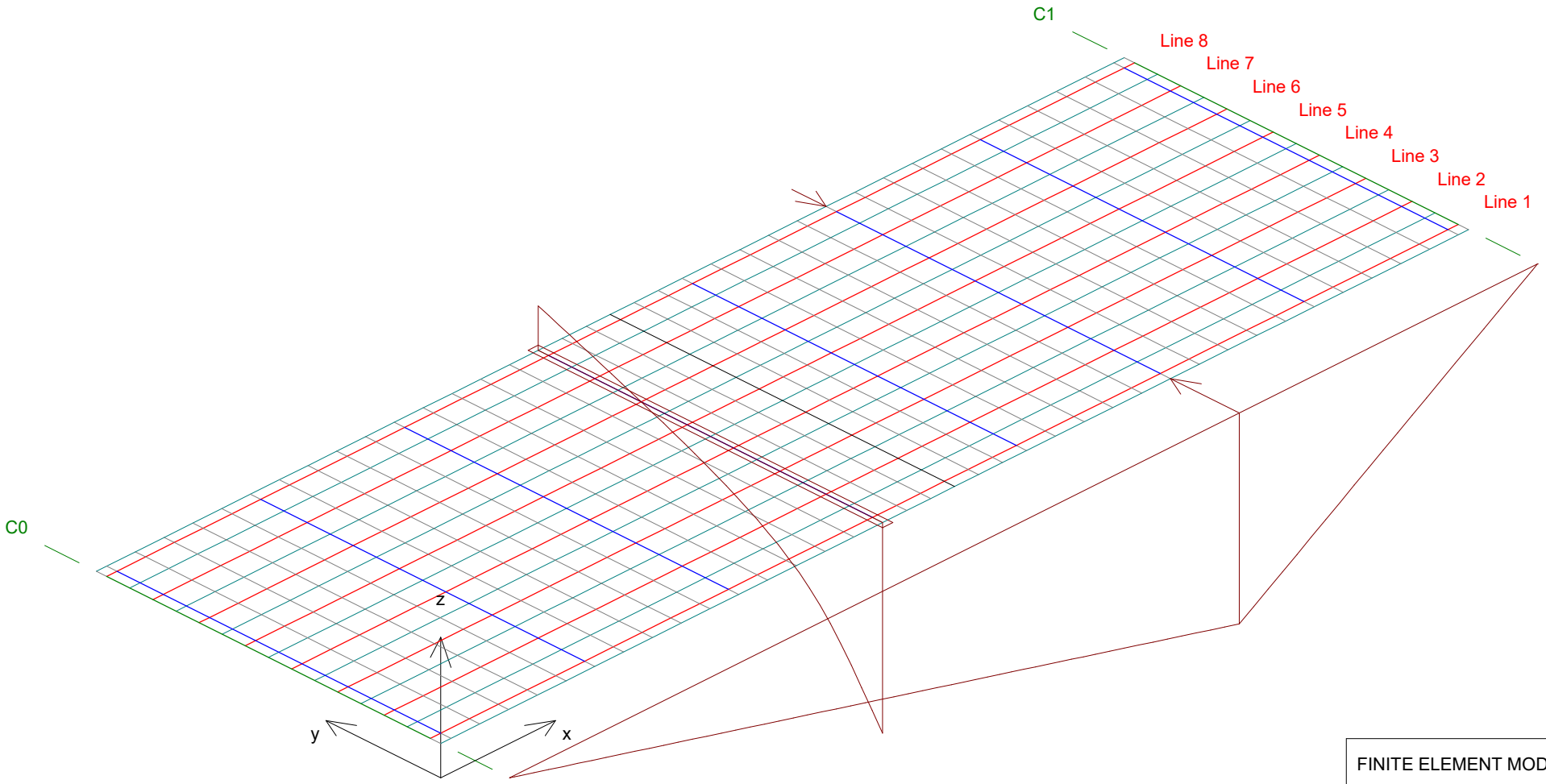


FINITE ELEMENT MODEL

- Supports
- Main beams
- Diaphragms
- Changes in cross-section
- Diaphragms and Changes in cross-section
- Concrete slab
- Special cross-sections
- Influence line

STUDY : PONTE DF 095 EPCL _R5

Finite Element Model



FINITE ELEMENT MODEL

- Supports
- Main beams
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- Changes in cross-section
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- Concrete slab
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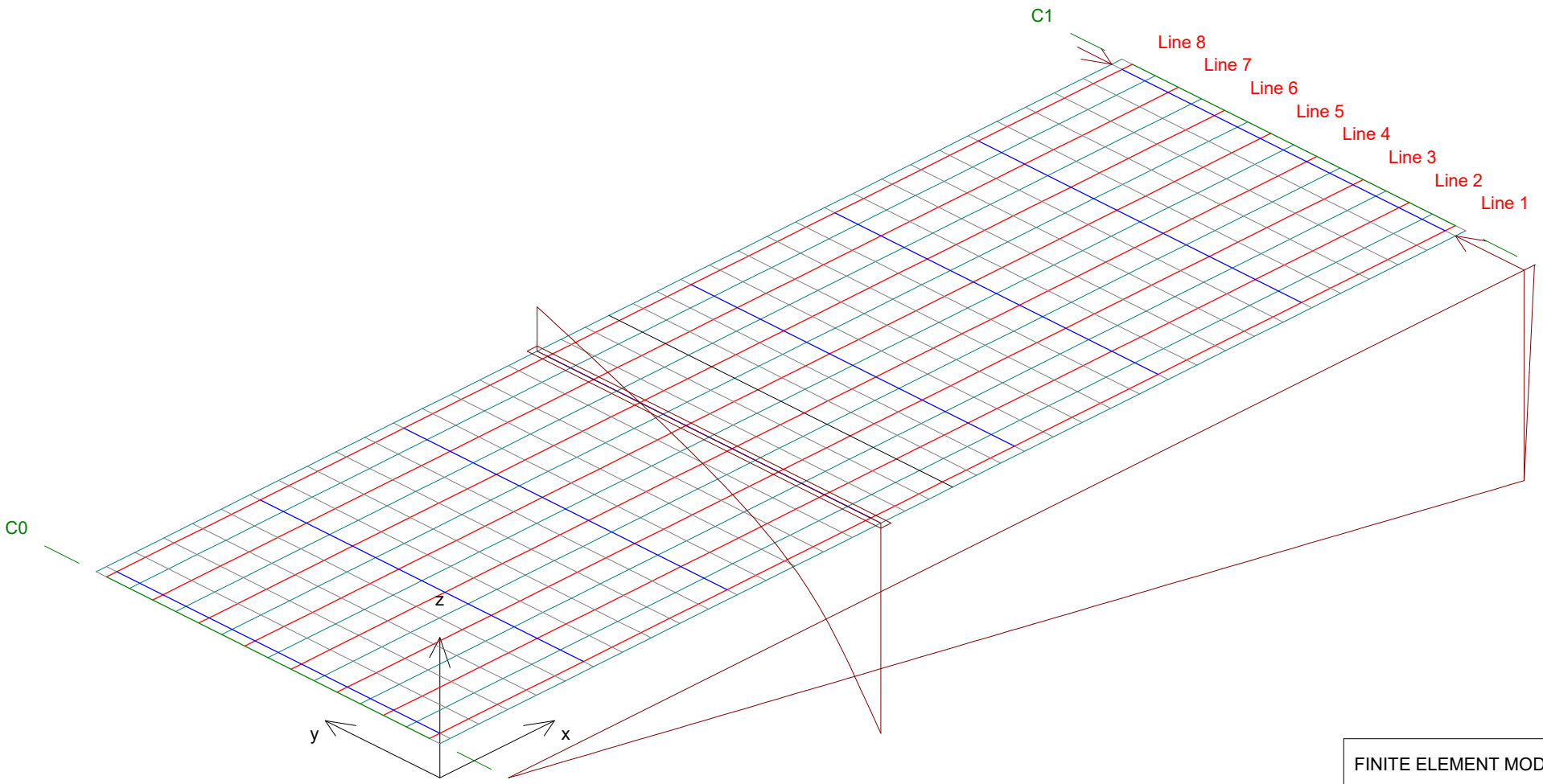
- Influence line

STUDY : PONTE DF 095 EPCL _R5

Finite Element Model

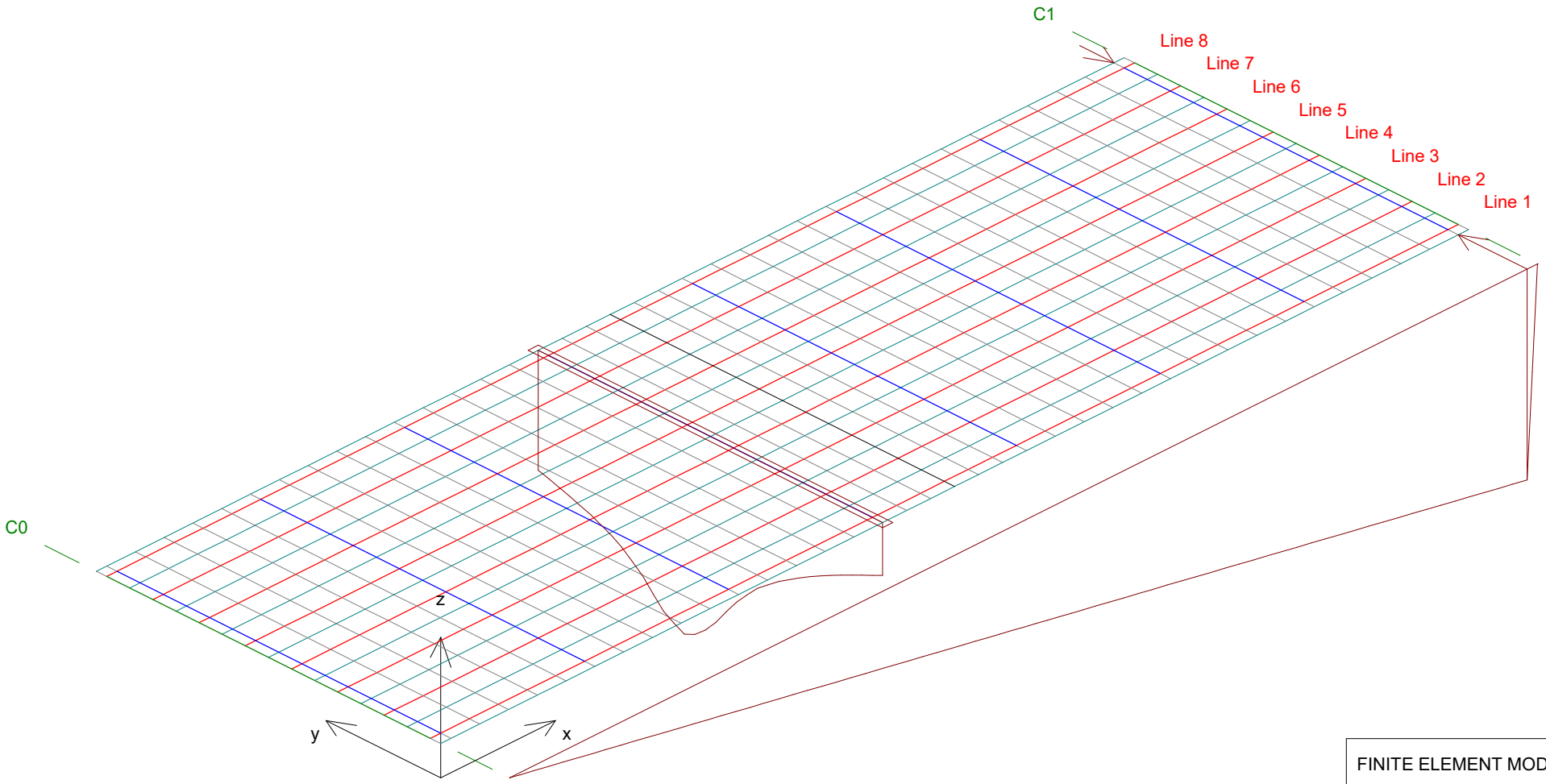


FINITE ELEMENT MODEL

- Supports
- Main beams
- Diaphragms
- Changes in cross-section
- Diaphragms and Changes in cross-section
- Concrete slab
- Special cross-sections
- Influence line

STUDY : PONTE DF 095 EPCL _R5

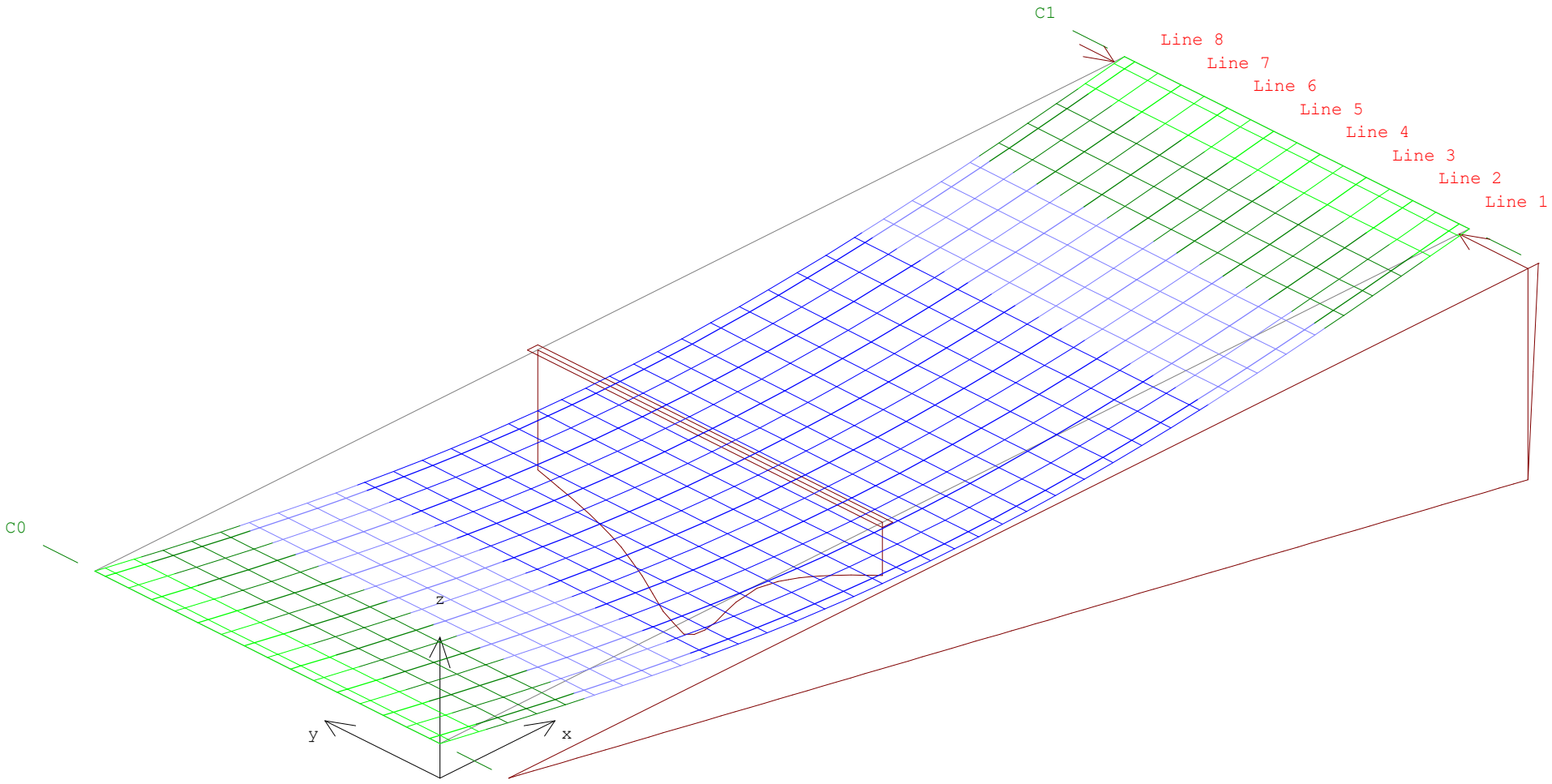
Finite Element Model



FINITE ELEMENT MODEL

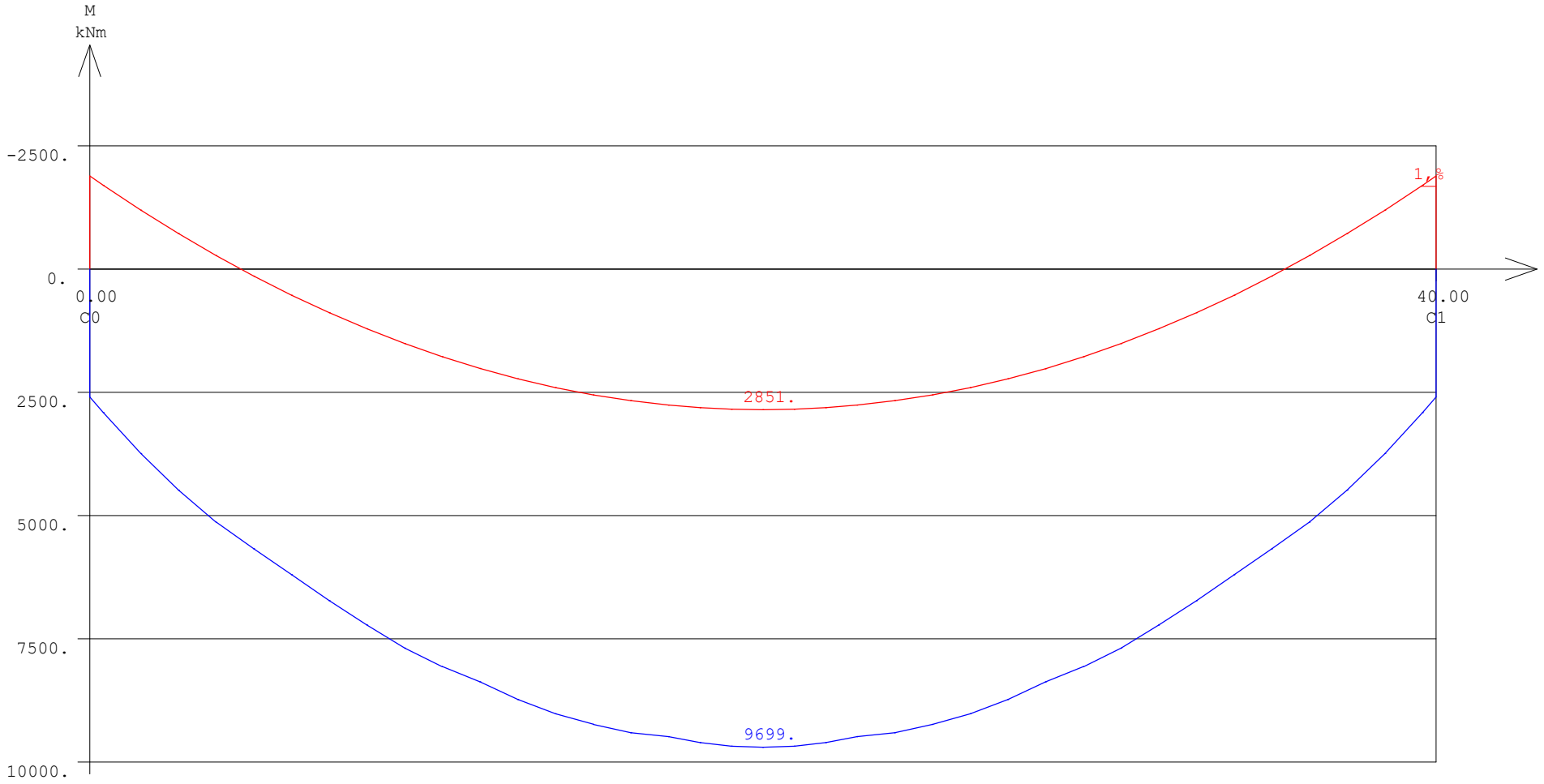
- Supports
- Main beams
- Diaphragms
- Changes in cross-section
- Diaphragms and Changes in cross-section
- Concrete slab
- Special cross-sections
- Influence line

STUDY : PONTE DF 095 EPCL _R5
Deflected shape, Eigenmode

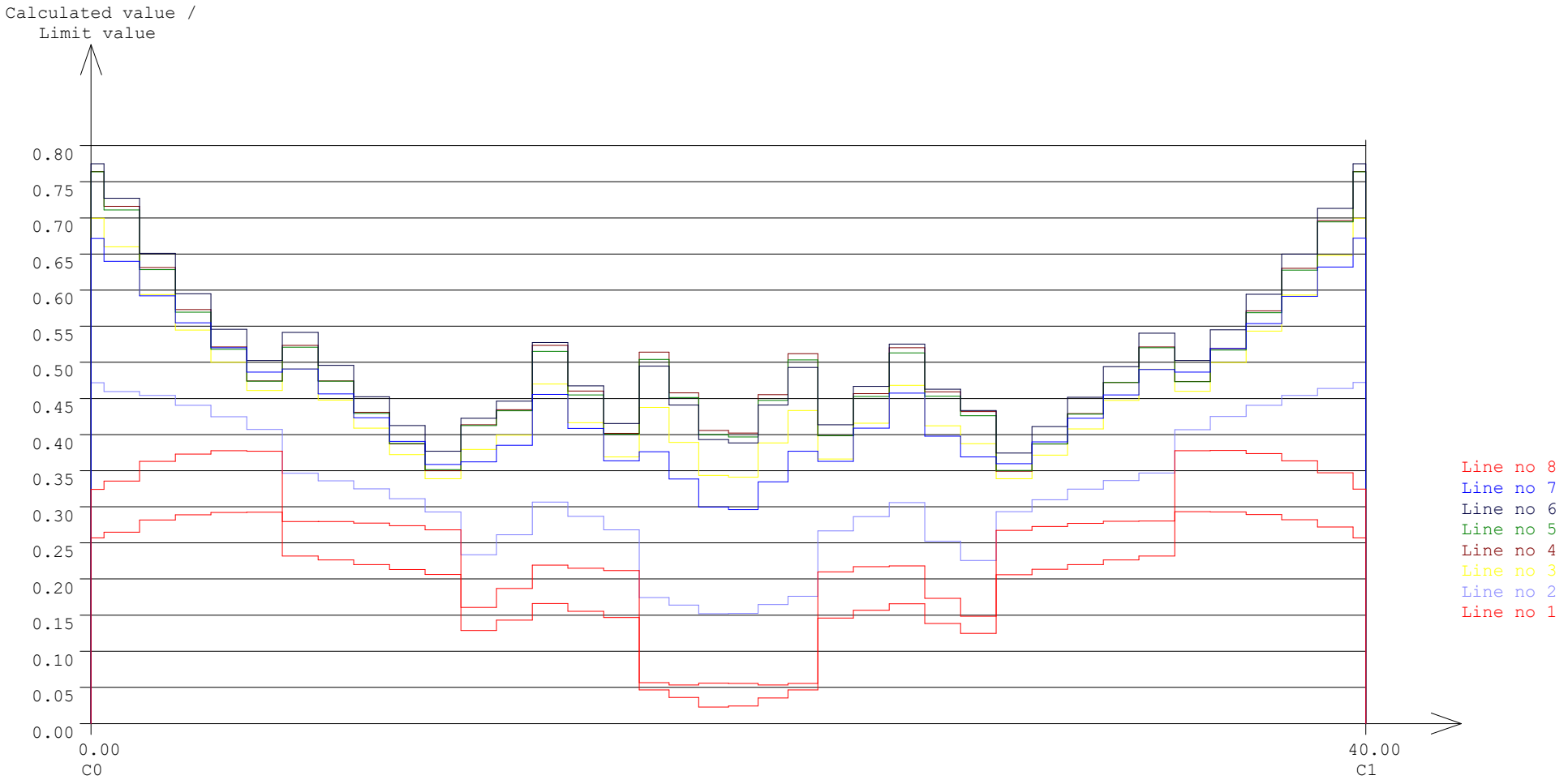


Frequency = 2.02 Hz
Rayleigh's approximate method

DIAGRAM OF ENVELOPE MOMENTS
Characteristic SLS combinations - Beam no 4

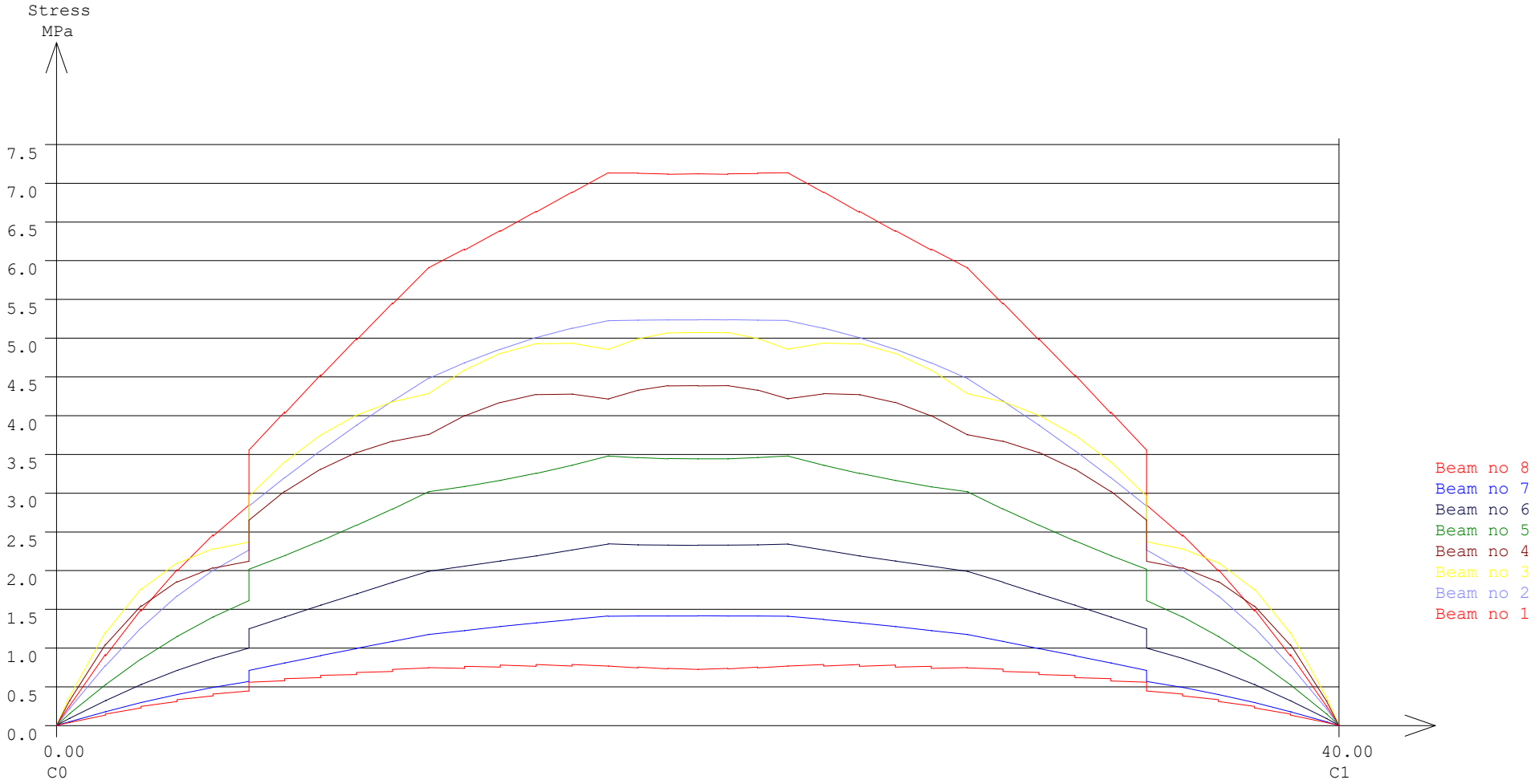


STUDY : PONTE DF 095 EPCL _R5
SLS criterion : Shear in connection



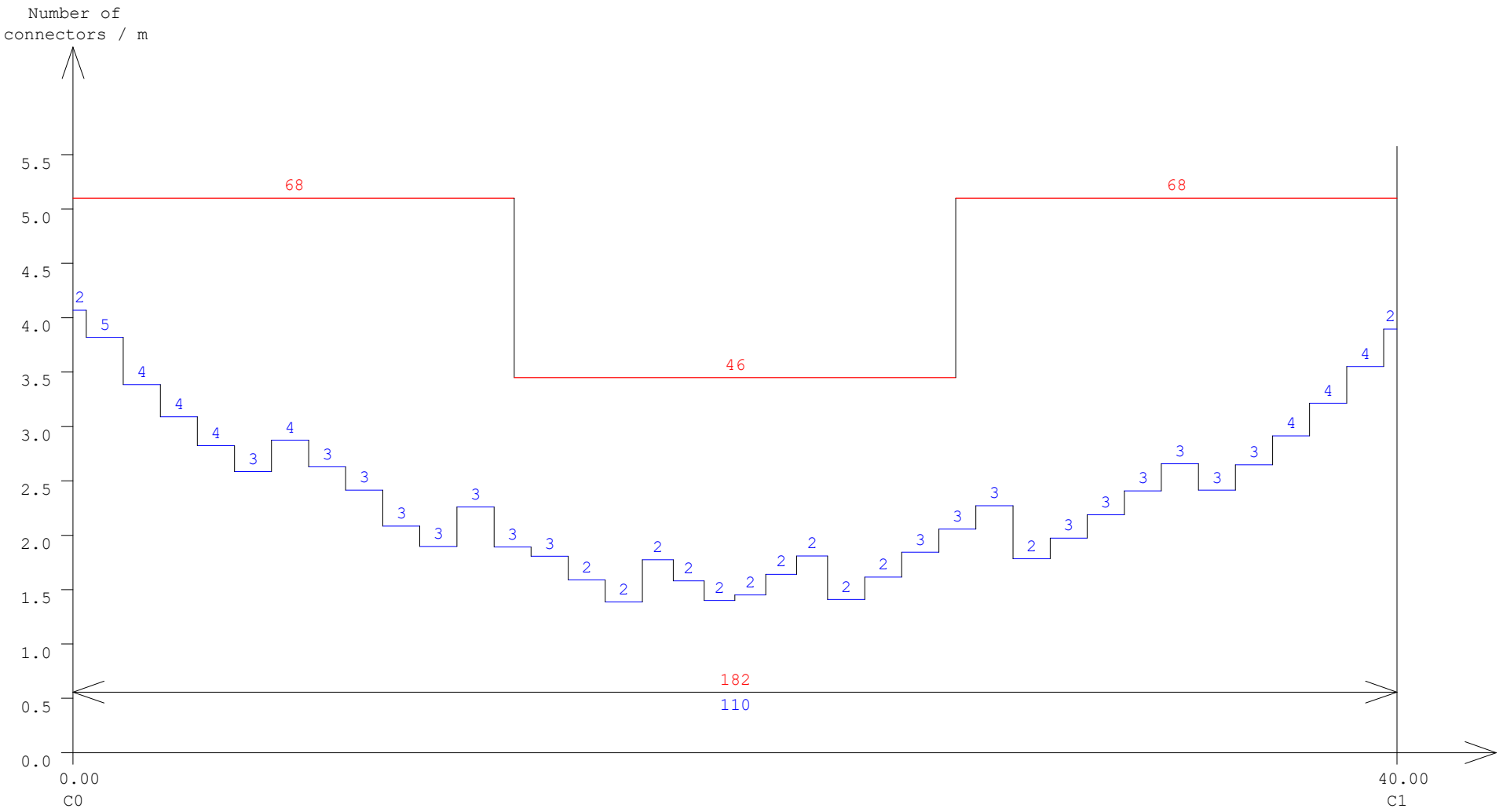
STUDY : PONTE DF 095 EPCL _R5

Stress range with Load model LM3 - LH slow lane



STUDY : PONTE DF 095 EPCL _R5

Distribution of connectors along beam line No. 4



N.B. : Axis of ordinates represents the shear connection density (number of connectors/ one linear meter).

Values displayed above the curve represent the number of connecteurs resulting from the density.

Connection defined by User

Connection as required by standards for SLS and ULS, calculated by ACOBRI

DIAGRAM OF ENVELOPE MOMENTS
ULS combinations - Beam no 7