

Biaxial Bending

Project Information

Project title:	Παράδειγμα Chen
Author:	Αριστοτέλης Χαραλαμπάκης
Comments:	Το παράδειγμα αυτό μελετήθηκε από τους Chen et al.
File:	Z:\Programming\TLW2010\Docs\Whitepapers\25-4\Greek\G-B25-W04.m125
Date:	1/12/2010
Time:	13:54

Data

Units

Length units	mm
Force units	KN
Bending moment units	KNm

General data

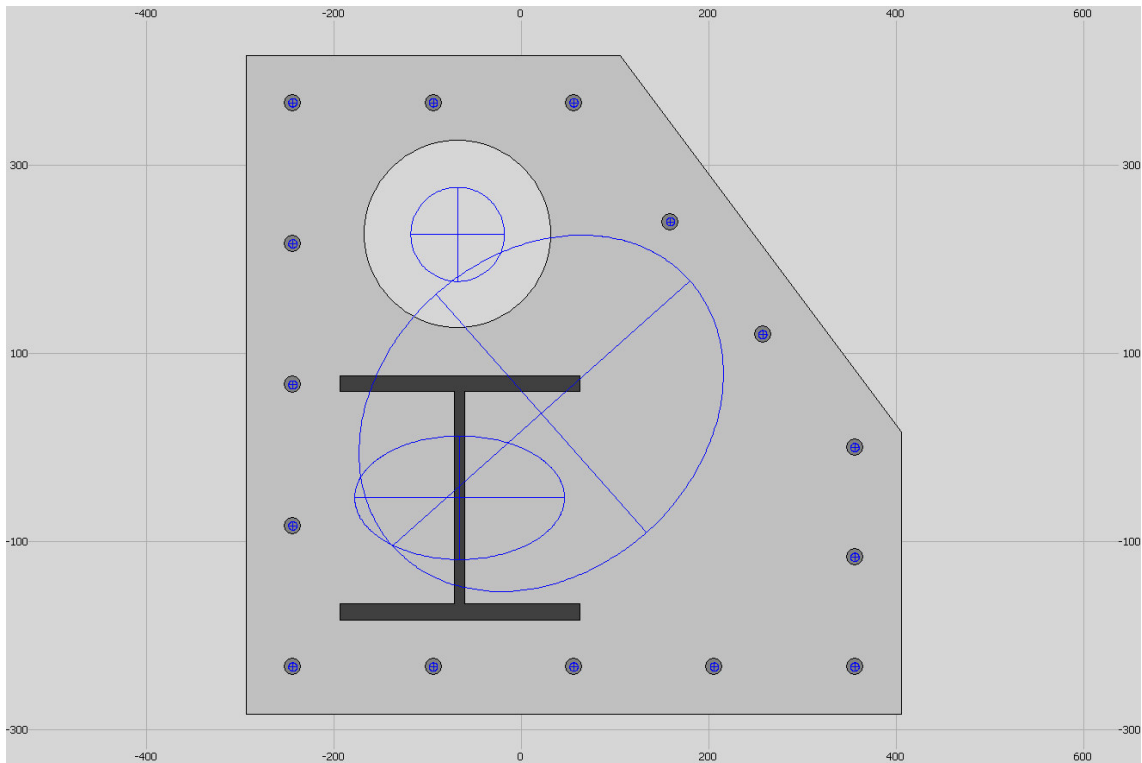
Axial load	-4120
Angle step (degrees)	5
Moment My	0
Moment Mz	0
Initial curvature step	Rough
Maximum axial load error (KN)	0.001
Max bending moment error (KNm)	0.001
Usage of point C	No

Section

General

Curvilinear polygons	18
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Image



Polygon 1

Name	CLPolygon 1
Foreground material	S355, 1.1 (MPa)
Background material	C30, 0.85, 1.5 (MPa)
Corner point	12
Corner points 1 X-coordinate	-71.481
Corner points 1 Y-coordinata	59.4536
Corner points 2 X-coordinate	-71.481
Corner points 2 Y-coordinata	-165.9464
Corner points 3 X-coordinate	-194.231
Corner points 3 Y-coordinata	-165.9464
Corner points 4 X-coordinate	-194.231
Corner points 4 Y-coordinata	-183.2464
Corner points 5 X-coordinate	61.769
Corner points 5 Y-coordinata	-183.2464
Corner points 6 X-coordinate	61.769
Corner points 6 Y-coordinata	-165.9464
Corner points 7 X-coordinate	-60.981
Corner points 7 Y-coordinata	-165.9464
Corner points 8 X-coordinate	-60.981
Corner points 8 Y-coordinata	59.4536

Corner points 9 X-coordinate	61.769
Corner points 9 Y-coordinata	59.4536
Corner points 10 X-coordinate	61.769
Corner points 10 Y-coordinata	76.7536
Corner points 11 X-coordinate	-194.231
Corner points 11 Y-coordinata	76.7536
Corner points 12 X-coordinate	-194.231
Corner points 12 Y-coordinata	59.4536

Polygon 2

Name	CLPolygon 2
Foreground material	C30, 0.85, 1.5 (MPa)
Background material	None
Corner point	5
Corner points 1 X-coordinate	-294.231
Corner points 1 Y-coordinata	416.7536
Corner points 2 X-coordinate	-294.231
Corner points 2 Y-coordinata	-283.2464
Corner points 3 X-coordinate	405.769
Corner points 3 Y-coordinata	-283.2464
Corner points 4 X-coordinate	405.769
Corner points 4 Y-coordinata	16.7536
Corner points 5 X-coordinate	105.769
Corner points 5 Y-coordinata	416.7536

Polygon 3

Name	D200
Foreground material	None
Background material	C30, 0.85, 1.5 (MPa)
Circle	Yes
X-coordinate of center	-68.2644
Y-coordinate of center	226.7536
Radius	100

Polygon 4

Name	D18
Foreground material	S460, 1.15 (MPa)
Background material	C30, 0.85, 1.5 (MPa)
Circle	Yes
X-coordinate of center	-244.231
Y-coordinate of center	366.7536
Radius	9

Polygon 5

Name	D18
Foreground material	S460, 1.15 (MPa)
Background material	C30, 0.85, 1.5 (MPa)

Circle	Yes
X-coordinate of center	-94.231
Y-coordinate of center	366.7536
Radius	9
Polygon 6	
Name	D18
Foreground material	S460, 1.15 (MPa)
Background material	C30, 0.85, 1.5 (MPa)
Circle	Yes
X-coordinate of center	55.769
Y-coordinate of center	366.7536
Radius	9
Polygon 7	
Name	D18
Foreground material	S460, 1.15 (MPa)
Background material	C30, 0.85, 1.5 (MPa)
Circle	Yes
X-coordinate of center	159.0164
Y-coordinate of center	240.1923
Radius	9
Polygon 8	
Name	D18
Foreground material	S460, 1.15 (MPa)
Background material	C30, 0.85, 1.5 (MPa)
Circle	Yes
X-coordinate of center	-244.231
Y-coordinate of center	216.7536
Radius	9
Polygon 9	
Name	D18
Foreground material	S460, 1.15 (MPa)
Background material	C30, 0.85, 1.5 (MPa)
Circle	Yes
X-coordinate of center	-244.231
Y-coordinate of center	66.7536
Radius	9
Polygon 10	
Name	D18
Foreground material	S460, 1.15 (MPa)
Background material	C30, 0.85, 1.5 (MPa)
Circle	Yes
X-coordinate of center	257.3927
Y-coordinate of center	120.1396

Radius	9
Polygon 11	
Name	D18
Foreground material	S460, 1.15 (MPa)
Background material	C30, 0.85, 1.5 (MPa)
Circle	Yes
X-coordinate of center	355.769
Y-coordinate of center	0.0869
Radius	9
Polygon 12	
Name	D18
Foreground material	S460, 1.15 (MPa)
Background material	C30, 0.85, 1.5 (MPa)
Circle	Yes
X-coordinate of center	355.769
Y-coordinate of center	-116.5798
Radius	9
Polygon 13	
Name	D18
Foreground material	S460, 1.15 (MPa)
Background material	C30, 0.85, 1.5 (MPa)
Circle	Yes
X-coordinate of center	355.769
Y-coordinate of center	-233.2464
Radius	9
Polygon 14	
Name	D18
Foreground material	S460, 1.15 (MPa)
Background material	C30, 0.85, 1.5 (MPa)
Circle	Yes
X-coordinate of center	205.769
Y-coordinate of center	-233.2464
Radius	9
Polygon 15	
Name	D18
Foreground material	S460, 1.15 (MPa)
Background material	C30, 0.85, 1.5 (MPa)
Circle	Yes
X-coordinate of center	55.769
Y-coordinate of center	-233.2464
Radius	9
Polygon 16	
Name	D18

Foreground material	S460, 1.15 (MPa)
Background material	C30, 0.85, 1.5 (MPa)
Circle	Yes
X-coordinate of center	-94.231
Y-coordinate of center	-233.2464
Radius	9

Polygon 17

Name	D18
Foreground material	S460, 1.15 (MPa)
Background material	C30, 0.85, 1.5 (MPa)
Circle	Yes
X-coordinate of center	-244.231
Y-coordinate of center	-233.2464
Radius	9

Polygon 18

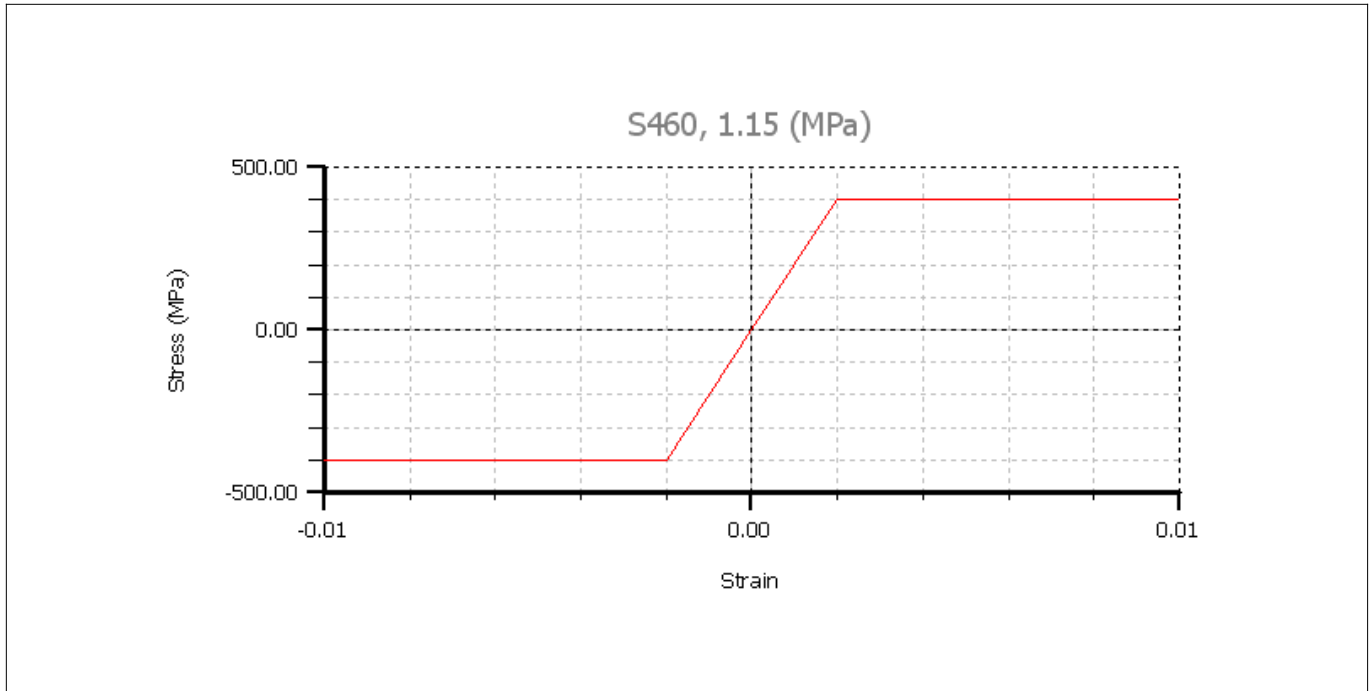
Name	D18
Foreground material	S460, 1.15 (MPa)
Background material	C30, 0.85, 1.5 (MPa)
Circle	Yes
X-coordinate of center	-244.231
Y-coordinate of center	-83.2464
Radius	9

Materials

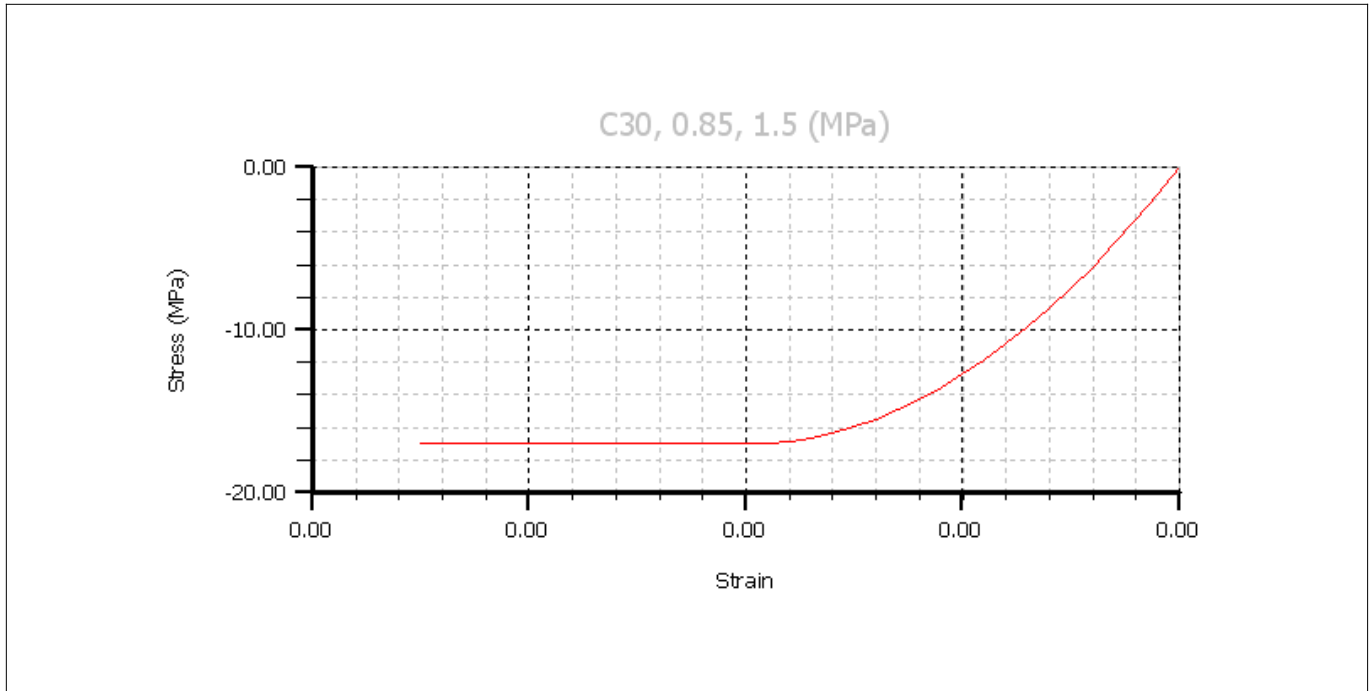
S460, 1.15 (MPa)

Stress units	MPa
Safety factor	1
Young	200000
Yield stress	400
Max negative strain	-.01
Max neg. strain failure	Yes
Max positive strain	.01
Max pos. strain failure	Yes

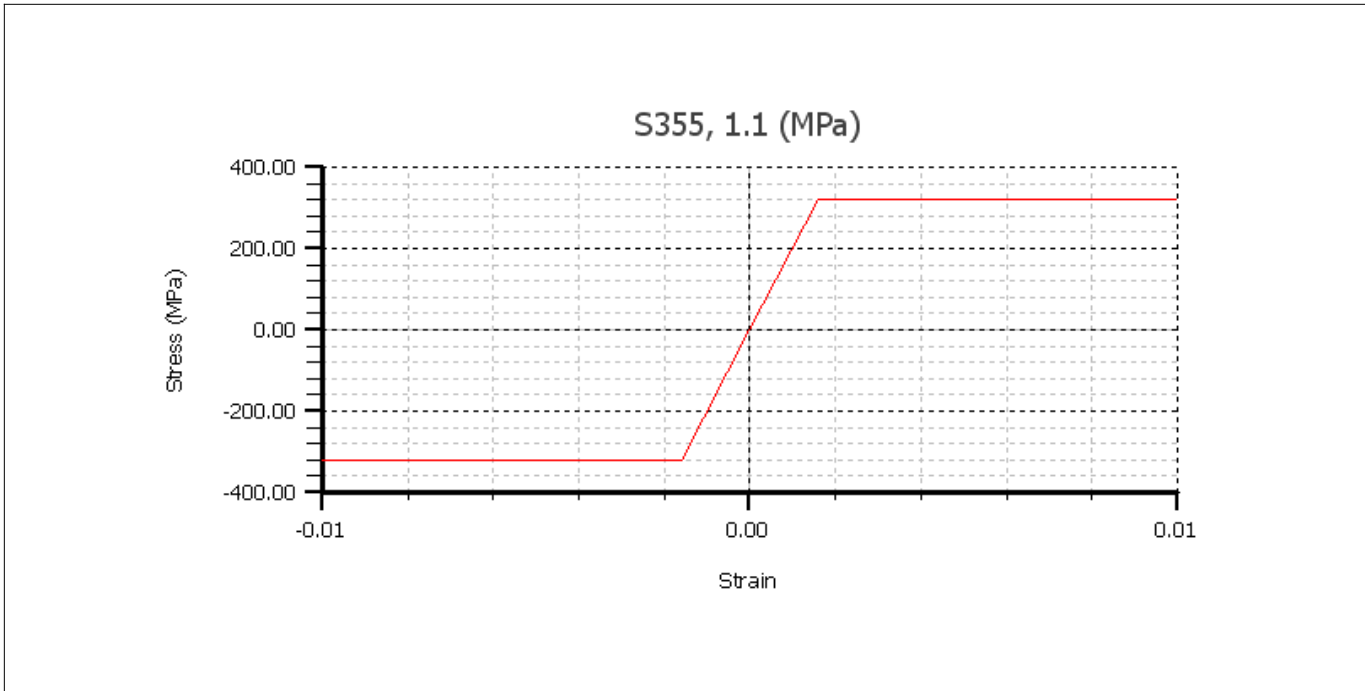
#	Strain (X)	Stress (Y)	Code
1	-.01	-400	1
2	-.002	-400	1
3	0	0	1
4	.002	400	1
5	.01	400	



C30, 0.85, 1.5 (MPa)			
Stress units			MPa
Safety factor			1
Young			32000
Yield stress			17
Max negative strain			-.0035
Max neg. strain failure			Yes
Max positive strain			0
Max pos. strain failure			No
#	Strain (X)	Stress (Y)	Code
1	-.0035	-17	1
2	-.002	-17	21
3	-.0013	-14.9175	22
4	0	0	



S355, 1.1 (MPa)			
Stress units			MPa
Safety factor			1
Young			200000
Yield stress			322.7273
Max negative strain			-.01
Max neg. strain failure			Yes
Max positive strain			.01
Max pos. strain failure			Yes
#	Strain (X)	Stress (Y)	Code
1	-.01	-322.7273	1
2	-.001613636	-322.7273	1
3	0	0	1
4	.001613636	322.7273	1
5	.01	322.7273	1



Results

Image

#	Angle	My	Mz
1	0.0000	1063.1542	156.1485
2	5.0000	1051.8285	222.6905
3	10.0000	1031.2344	288.0958
4	15.0000	989.0890	360.9503
5	20.0000	940.3281	426.3244
6	25.0000	889.8127	484.5624
7	30.0000	834.6310	538.6529
8	35.0000	779.0933	588.2679
9	40.0000	720.9190	634.1555
10	45.0000	662.9347	676.8037
11	50.0000	604.5556	715.1877
12	55.0000	545.0289	751.2762
13	60.0000	482.4732	784.1940
14	65.0000	417.3154	815.1560
15	70.0000	349.0420	844.6909
16	75.0000	277.7936	872.6460
17	80.0000	203.8459	897.7149
18	85.0000	127.1316	919.5193
19	90.0000	46.7631	939.0521
20	95.0000	-33.0246	939.5102

21	100.0000	-112.9665	935.3468
22	105.0000	-192.8135	925.8288
23	110.0000	-276.2515	911.4201
24	115.0000	-362.1659	889.5543
25	120.0000	-455.0188	859.2449
26	125.0000	-553.2097	819.3759
27	130.0000	-637.9643	755.6656
28	135.0000	-705.2010	678.2534
29	140.0000	-765.4197	592.9158
30	145.0000	-818.6311	505.6312
31	150.0000	-864.8401	414.8374
32	155.0000	-900.6075	326.5585
33	160.0000	-928.1557	242.5414
34	165.0000	-949.2106	161.2176
35	170.0000	-965.6993	82.7952
36	175.0000	-978.5100	6.2662
37	180.0000	-986.7983	-68.2215
38	185.0000	-965.3639	-139.8411
39	190.0000	-940.9061	-206.9603
40	195.0000	-914.1382	-269.9621
41	200.0000	-886.0397	-329.1368
42	205.0000	-856.3492	-385.3968
43	210.0000	-824.6647	-439.7892
44	215.0000	-790.3360	-493.3488
45	220.0000	-751.4828	-546.6932
46	225.0000	-707.1702	-598.3221
47	230.0000	-659.1599	-649.1714
48	235.0000	-607.2100	-699.9579
49	240.0000	-550.1110	-748.4724
50	245.0000	-487.1028	-795.0787
51	250.0000	-416.9831	-837.2616
52	255.0000	-339.4333	-878.0377
53	260.0000	-256.8342	-916.0742
54	265.0000	-177.0768	-941.6648
55	270.0000	-95.1273	-961.7850
56	275.0000	-20.0362	-952.0447
57	280.0000	57.3154	-932.9083
58	285.0000	140.5633	-903.9655
59	290.0000	223.7364	-869.1635
60	295.0000	309.3179	-823.0052
61	300.0000	394.1618	-768.8411
62	305.0000	475.5589	-710.6825
63	310.0000	551.5784	-647.8339

64	315.0000	621.9829	-583.3772
65	320.0000	688.4628	-515.3168
66	325.0000	754.8011	-440.6036
67	330.0000	820.3467	-359.2812
68	335.0000	880.5997	-274.0342
69	340.0000	935.4804	-186.0906
70	345.0000	978.3452	-99.5413
71	350.0000	1015.5123	-11.1325
72	355.0000	1043.2255	73.2108
73	360.0000	1063.1542	156.1485

Image

