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3D skew-shape bridge

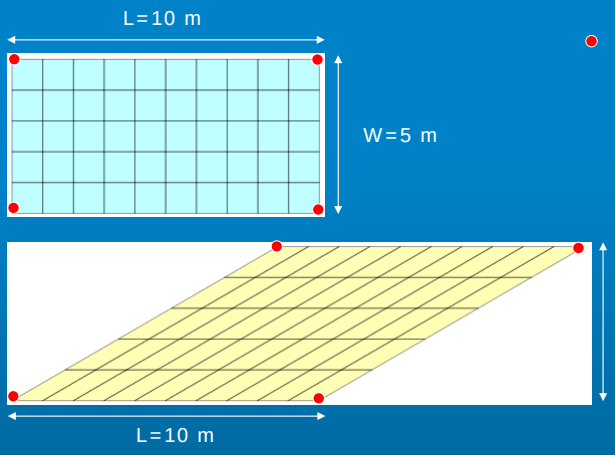
Shen Ma

Highlights

- Rectangular-shape vs Skew-shape
- Shell model? Solid model? Or Shell-Solid model?
- Mobile Load
- Composed element: Line & Surface
- Enveloped results from iDIANA Femview (SCAN function)
- VBA-Macro for MxD+/-, and MyD+/-

- Diana version: v9.4.4 (date: 30 May, 2013)

Rectangular-shape vs Skew-shape

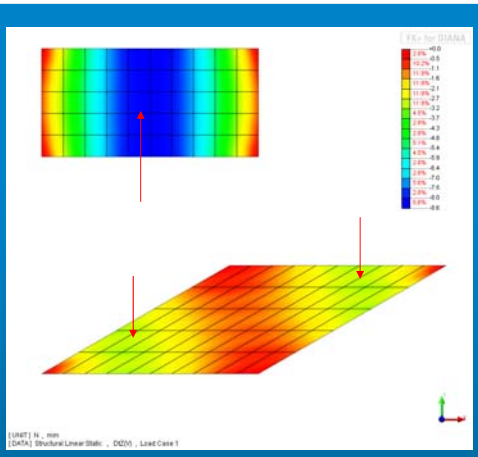


- simply supported

Load: q=10 kN/m2

Thickness: t=400 mm
Angle of skew: 30 degree

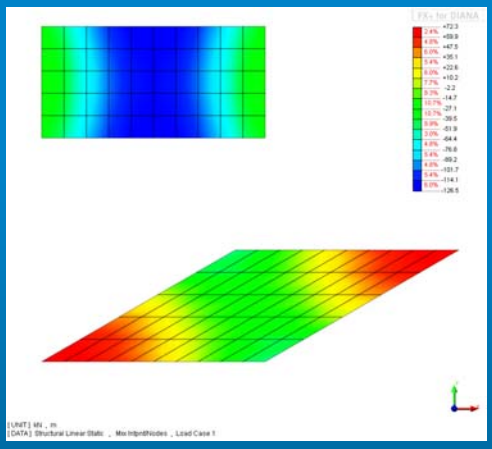
Deflection [mm]



Deflection: 8.6 mm

Deflection: 2.7 mm

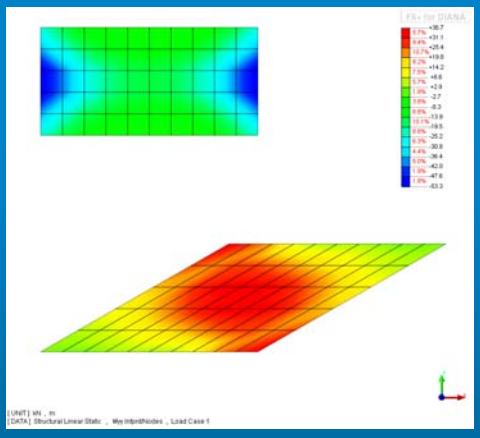
Distributed moment [kNm/m]: Mxx



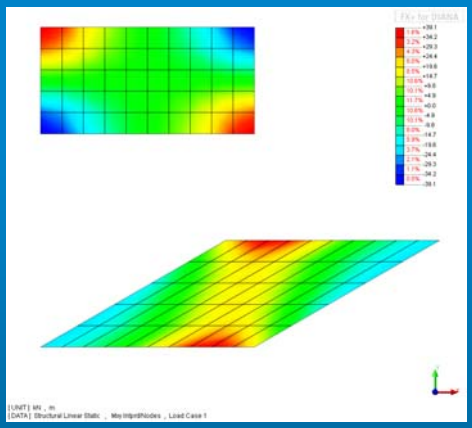
M=1/8*q*L^2
=125 kNm//m

M=F{q,L}=?

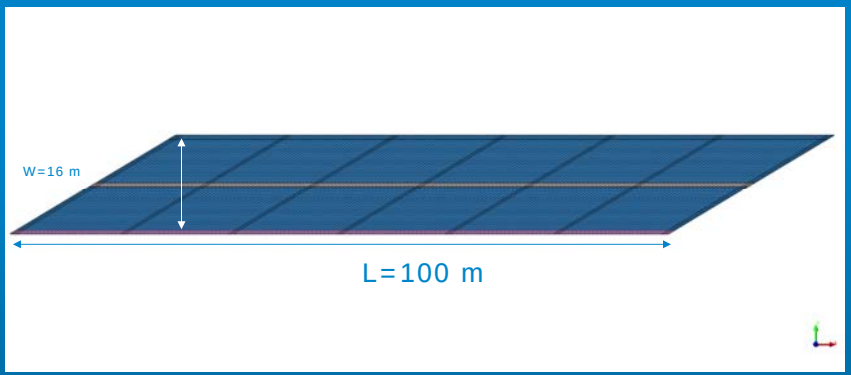
Distributed moment [kNm/m]: Myy



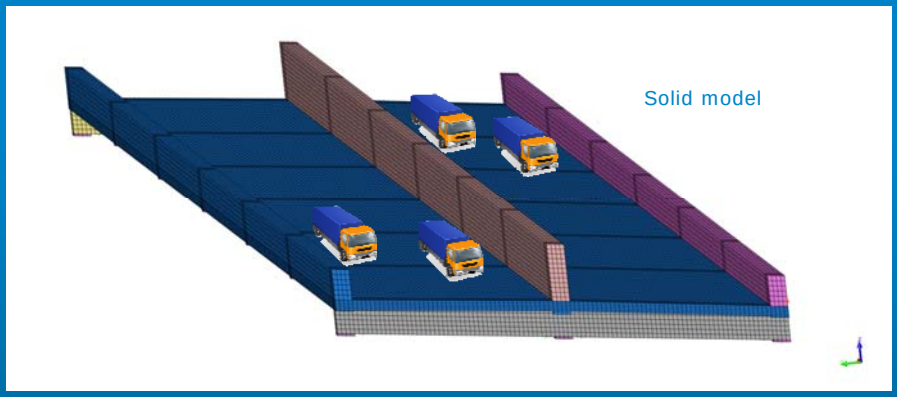
Distributed moment [kNm/m]: Mxy



If a bridge is skew-shape, then?



If a bridge is skew-shape, then?



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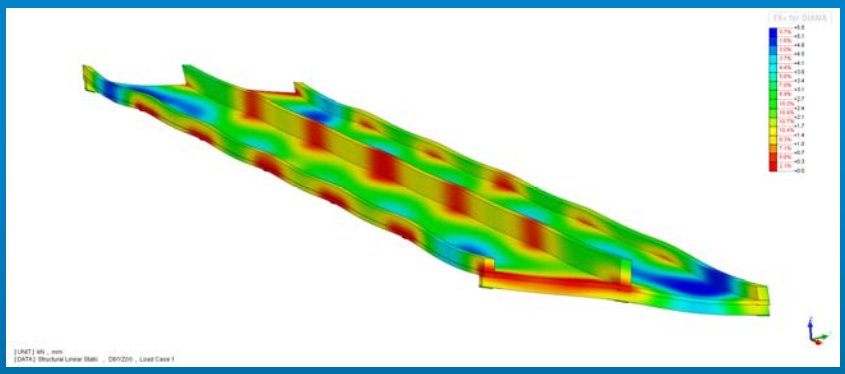
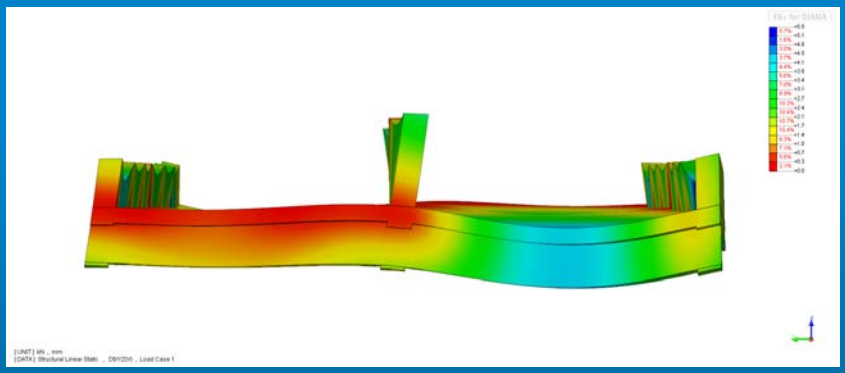
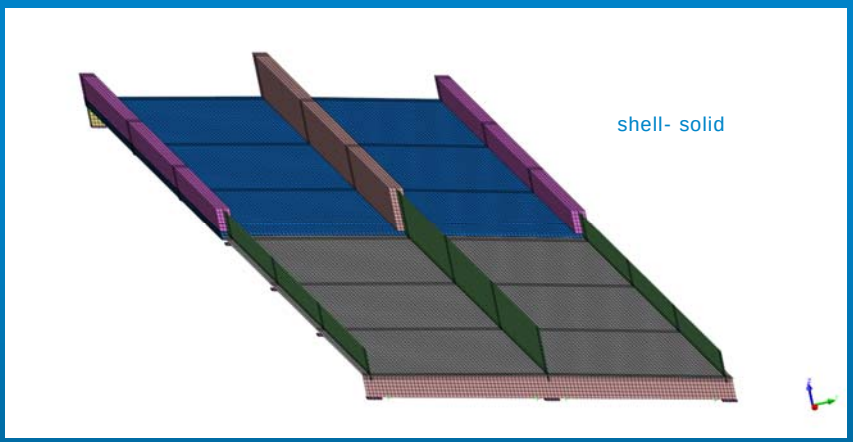


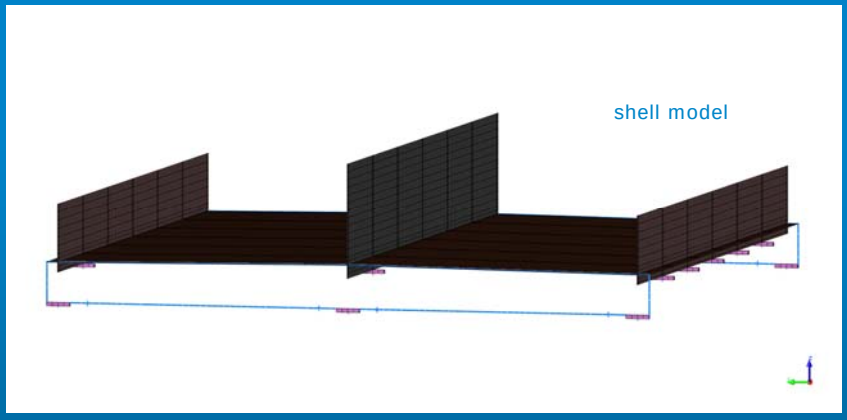
If a bridge is skew-shape, then?



Shell model? Solid model? Or Shell-Solid model?



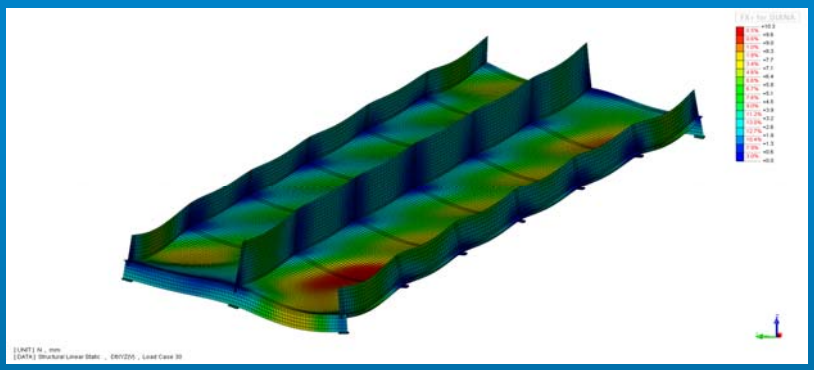
Shell model? Solid model? Or Shell-Solid model?



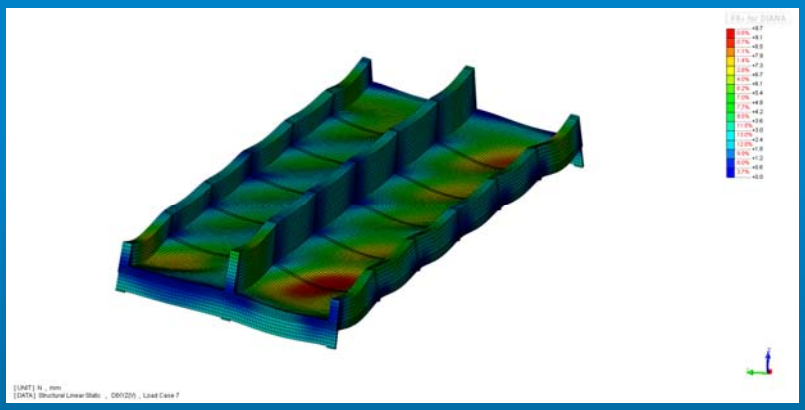
Shell model? Solid model? Or Shell-Solid model?

	ELEMENT	NODE	Difference
SHELL MODEL	28,577	84,615	1 time
SHELL-SOLID MODEL	77,961	319,987	4 times
SOLID MODEL	130,981	568,411	7 times

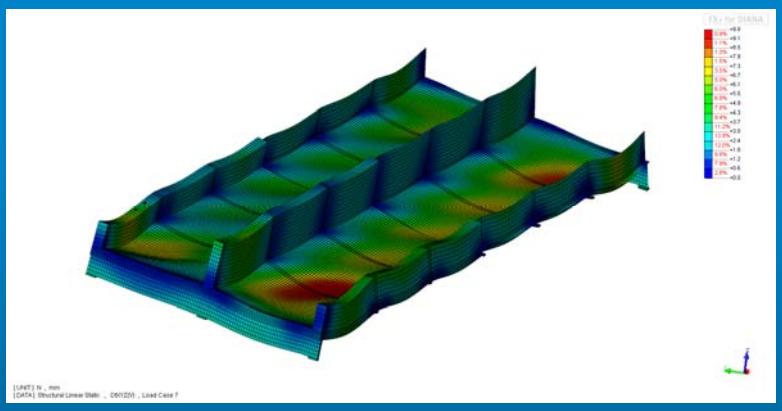
Shell model? Solid model? Or Shell-Solid model?



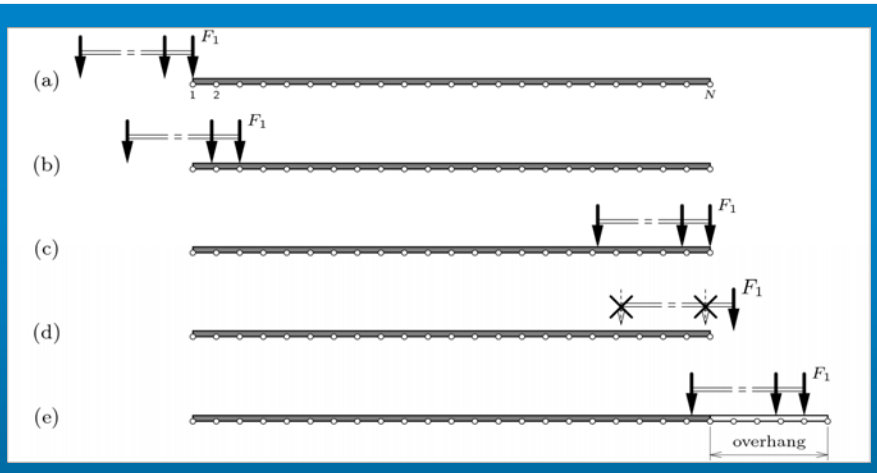
Shell model? Solid model? Or Shell-Solid model?



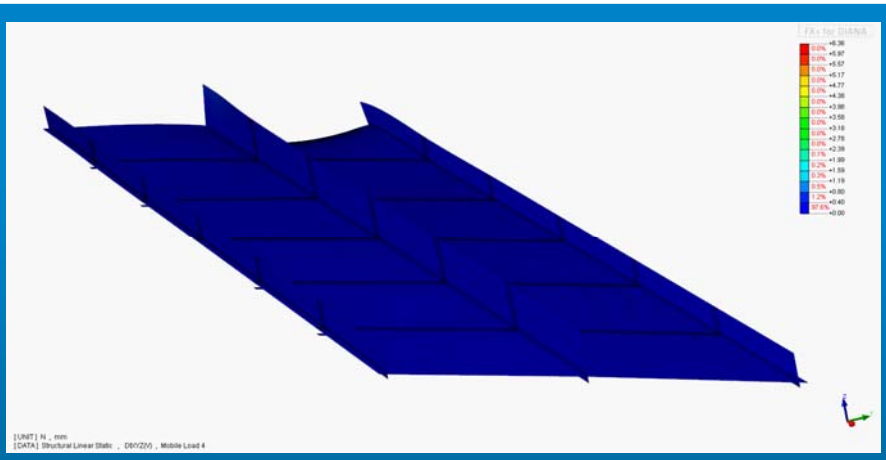
Shell model? Solid model? Or Shell-Solid model?



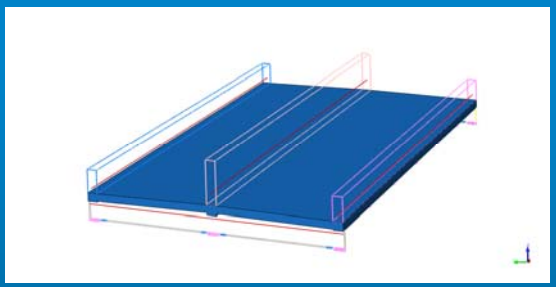
Mobile load



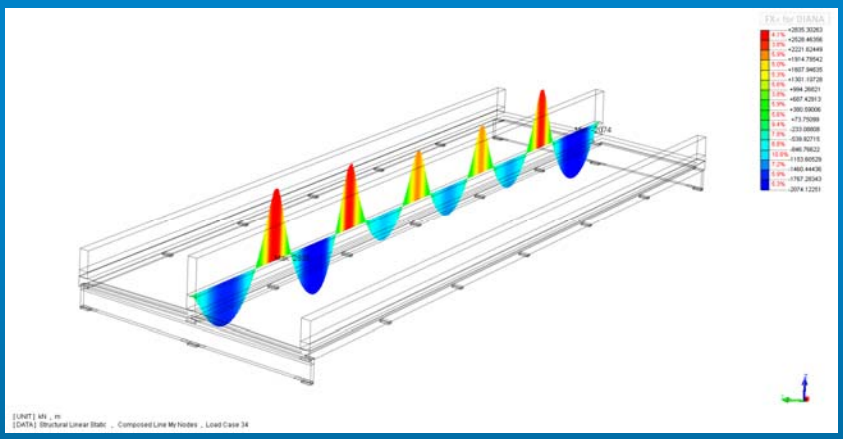
Mobile load



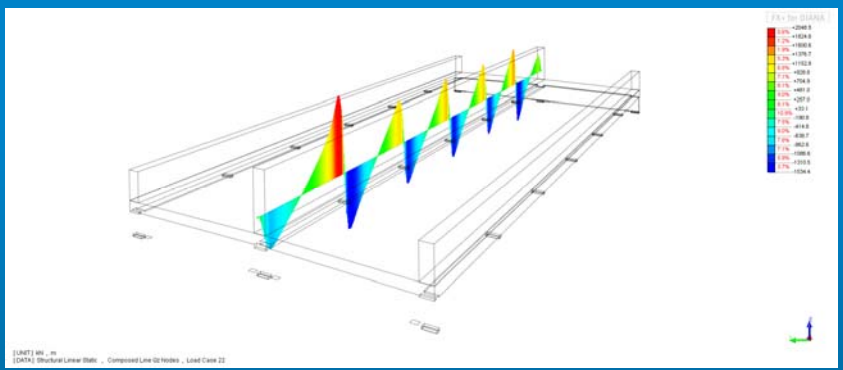
Composed element: Line, CL3CM



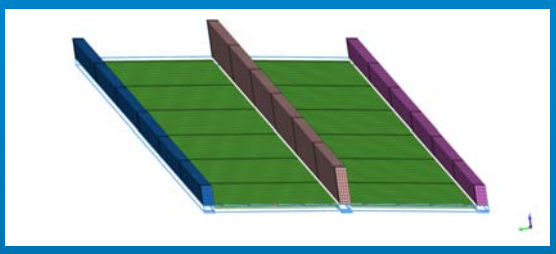
Composed element: Line, CL3CM

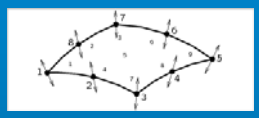


Composed element: Line, CL3CM

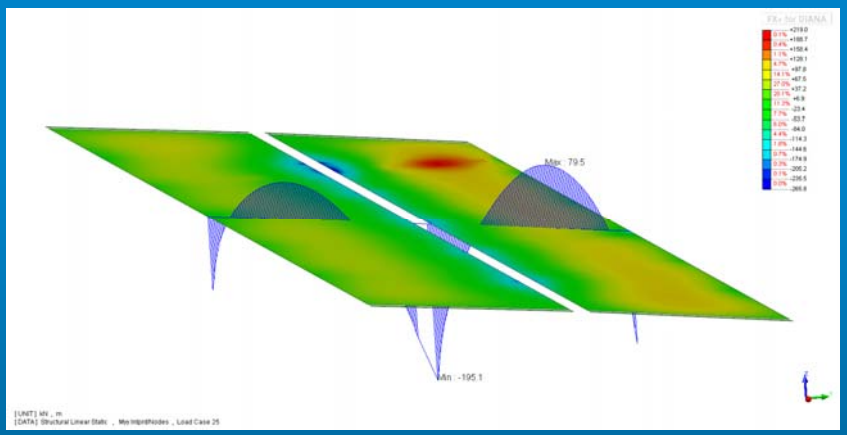


Composed element: Surface, CQ8CM

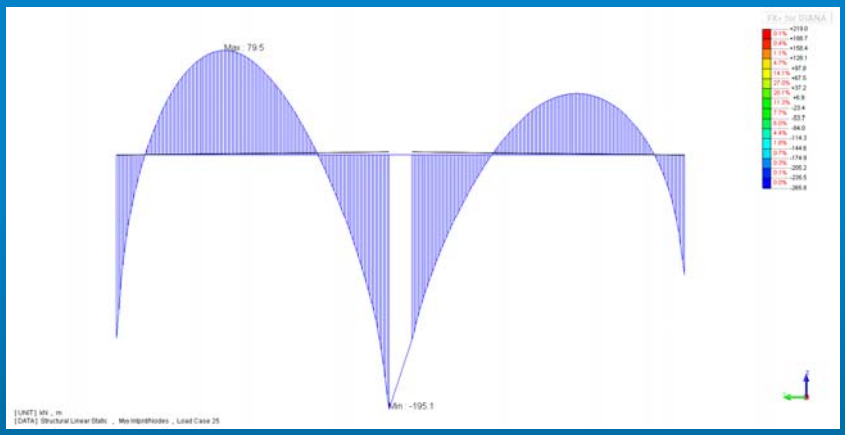




Composed element: Surface, CQ8CM

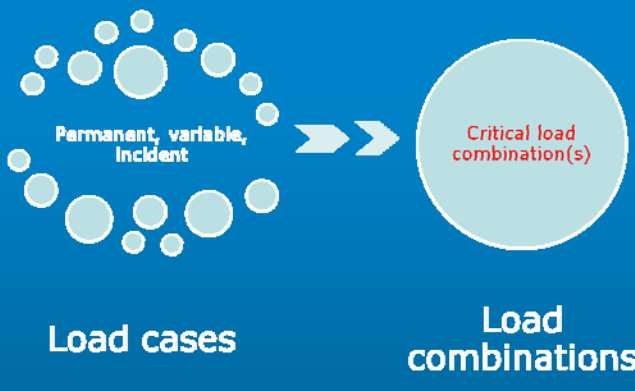


Composed element: Surface, CQ8CM



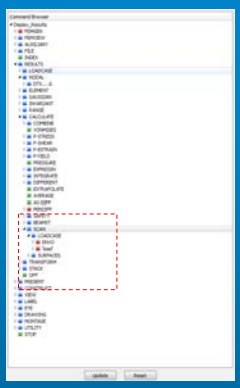
Enveloped results from iDIANA Femview

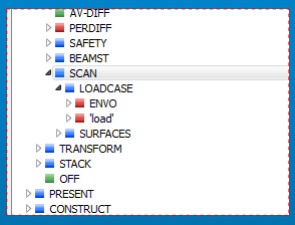
"SCAN" function



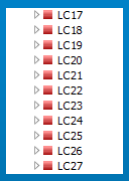
Enveloped results from iDIANA Femview

"SCAN" function



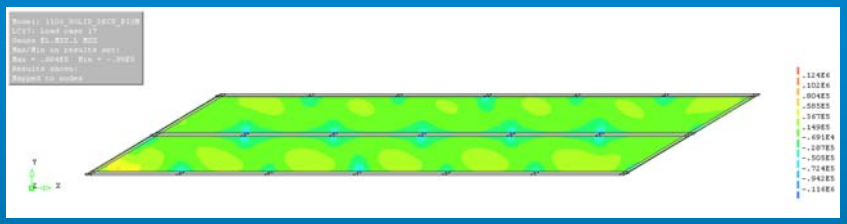


Example:



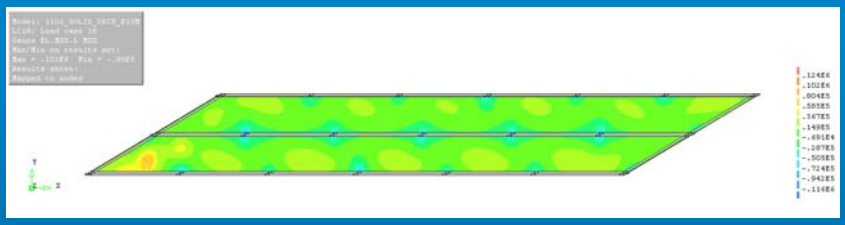
Enveloped results from iDIANA Femview

"SCAN" function



Enveloped results from iDIANA Femview

"SCAN" function



Enveloped results from iDIANA Femview

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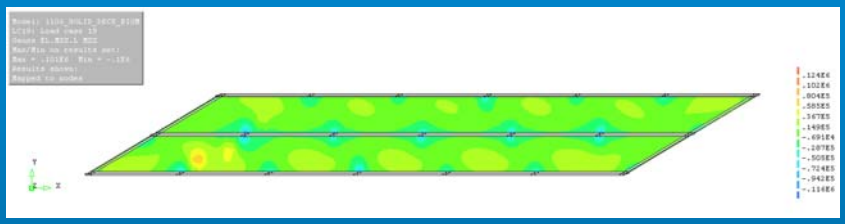
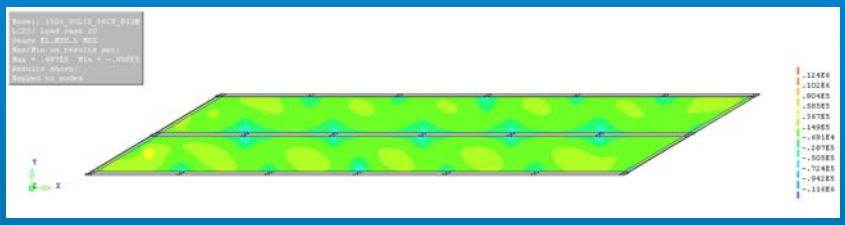


Enveloped results from iDIANA Femview

"SCAN" function



Enveloped results from iDIANA Femview

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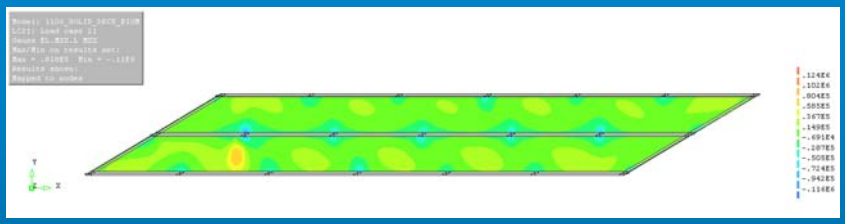
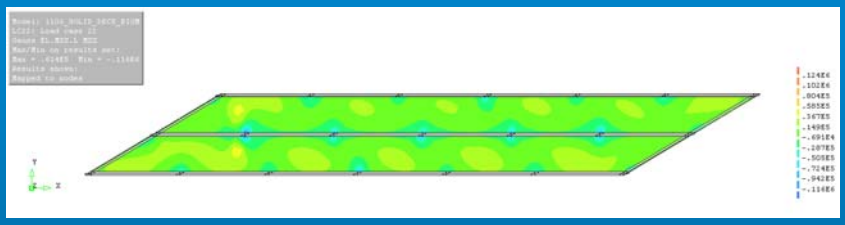


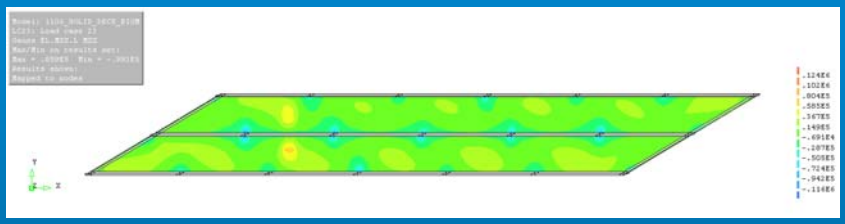
Enveloped results from iDIANA Femview

"SCAN" function



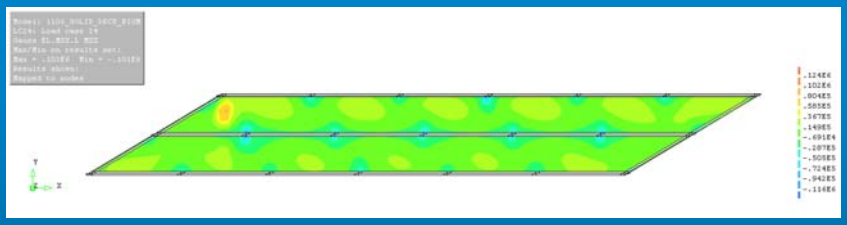
Enveloped results from iDIANA Femview

"SCAN" function



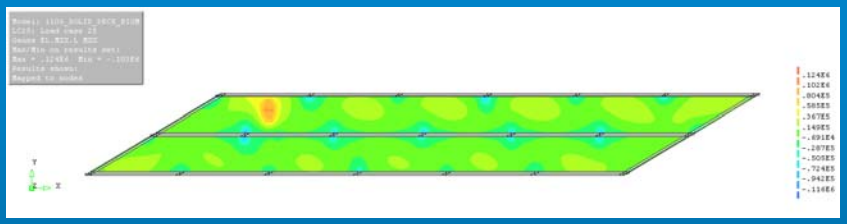
Enveloped results from iDIANA Femview

"SCAN" function



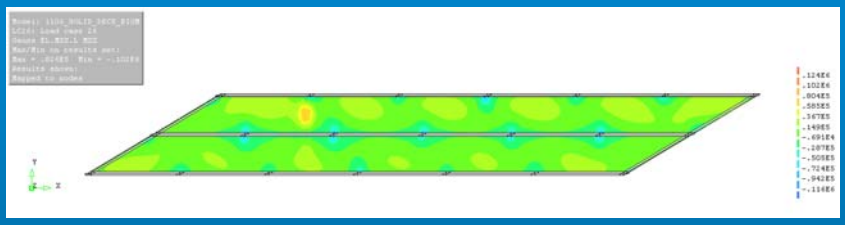
Enveloped results from iDIANA Femview

"SCAN" function



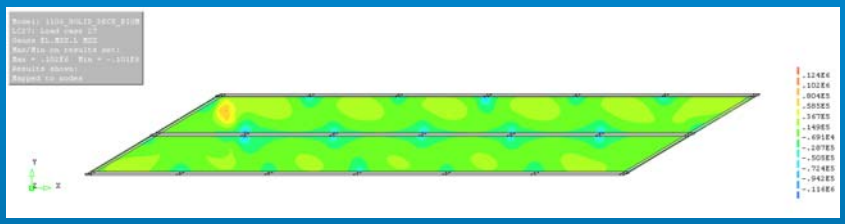
Enveloped results from iDIANA Femview

"SCAN" function



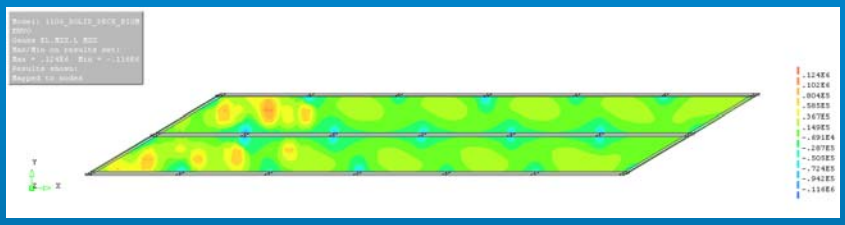
Enveloped results from iDIANA Femview

"SCAN" function



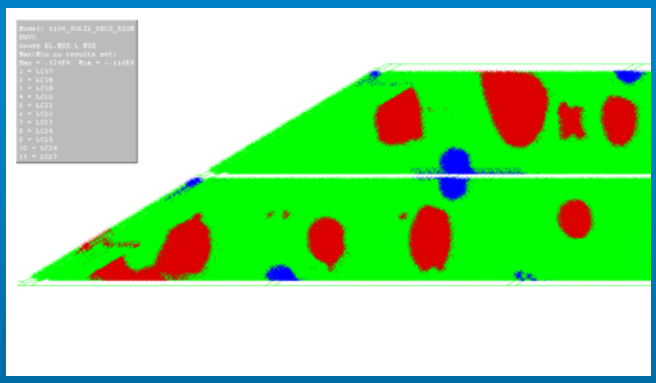
Enveloped results from iDIANA Femview

"SCAN" function: Enveloped result from LC17 to LC27



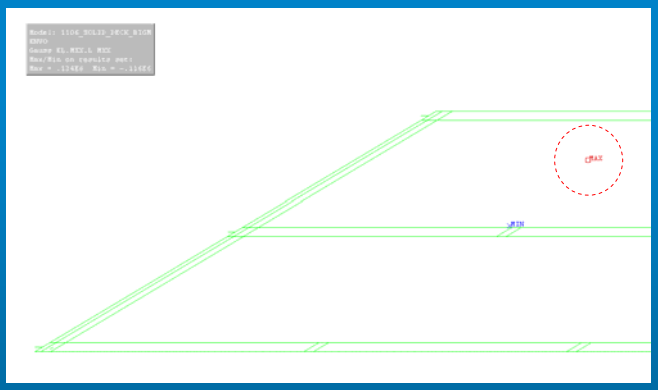
Enveloped results from iDIANA Femview

"SCAN" function



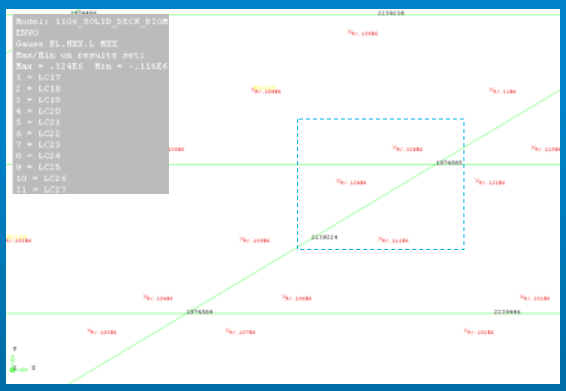
Enveloped results from iDIANA Femview

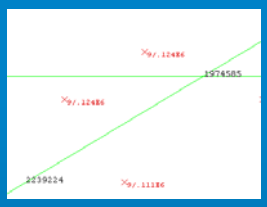
"SCAN" function



Enveloped results from iDIANA Femview

"SCAN" function





"X 9/.124^{E}6 " means:

Mxx,max = 1.24^{e}5 kNm/m

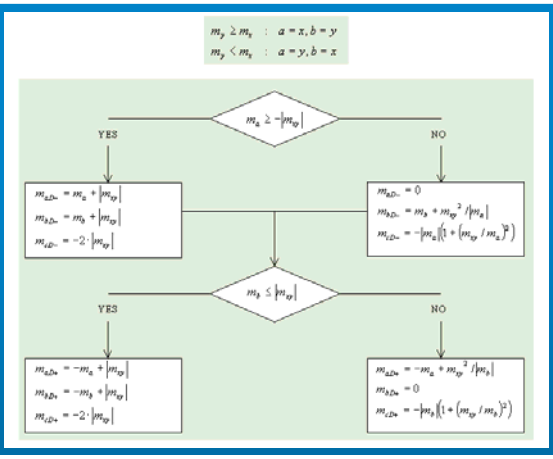
9: LC25, load combination 25

VBA-Macro for MxD+/- & MyD+/-

Orthogonal reinforcement in Non-orthogonal skew-shape bridge:

- The transformation of Mxx, Myy and Mxy to orthogonal coordinate is needed.
- DIANA has no output of design moment (MxD+/- & MyD+/-)

VBA-Macro for MxD+/- & MyD+/-



The calculation of design moments for plates and shells according to the EC2 algorithm (option EC2 is selected) follows the flow chart from CSN P ENV 1992–1–1 (731201), Annex 2, paragraph A2.8.

VBA-Macro for MxD+/- & MyD+/-

DIANA output command:

```
RESULTS LOADCASE ENVO
VIEW MESH SIDE_T_N

RESULTS GAUSSIAN EL.MXX.L MXX
UTILITY TABULATE PRINTFILE OPEN MXX_SIDE_T_N
PRESENT NUMERIC
UTILITY TABULATE RESULTS
UTILITY TABULATE PRINTFILE CLOSE

RESULTS GAUSSIAN EL.MXX.L MYY
UTILITY TABULATE PRINTFILE OPEN MYY_SIDE_T_N
PRESENT NUMERIC
UTILITY TABULATE RESULTS
UTILITY TABULATE PRINTFILE CLOSE

RESULTS GAUSSIAN EL.MXX.L MXY
UTILITY TABULATE PRINTFILE OPEN MXY_SIDE_T_N
PRESENT NUMERIC
UTILITY TABULATE RESULTS
UTILITY TABULATE PRINTFILE CLOSE
```

Inputs files to combine Moments

Moments	File names
MXX	X:\skewbridge\MXX_SIDE_T_N.LST
MYY	X:\skewbridge\MYY_SIDE_T_N.LST
MXY	X:\skewbridge\MXY_SIDE_T_N.LST

Guideline:
1. Input the name in the proper order: MXX, MXY and MYY
2. Select the cells containing the addresses
3. Press the COMBINE MOMENTS button

Remarks:
Trailings for the Text to Columns may need manual input if there is failure

folder	X:\skewbridge\
mesh set	SIDE_T_N
file name	MXX_SIDE_T_N
	MYY_SIDE_T_N
	MXY_SIDE_T_N
file format	.LST

Questions?