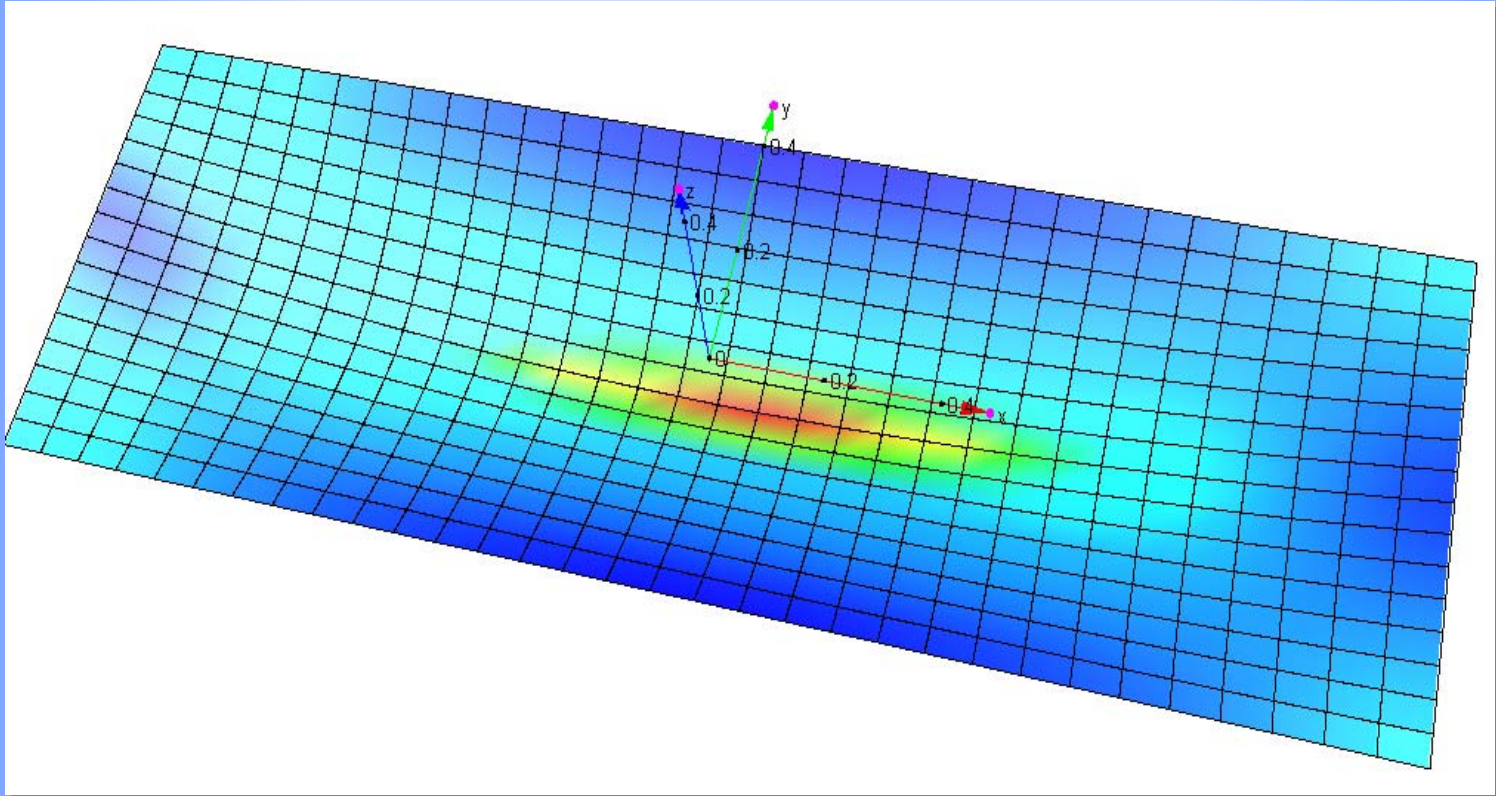


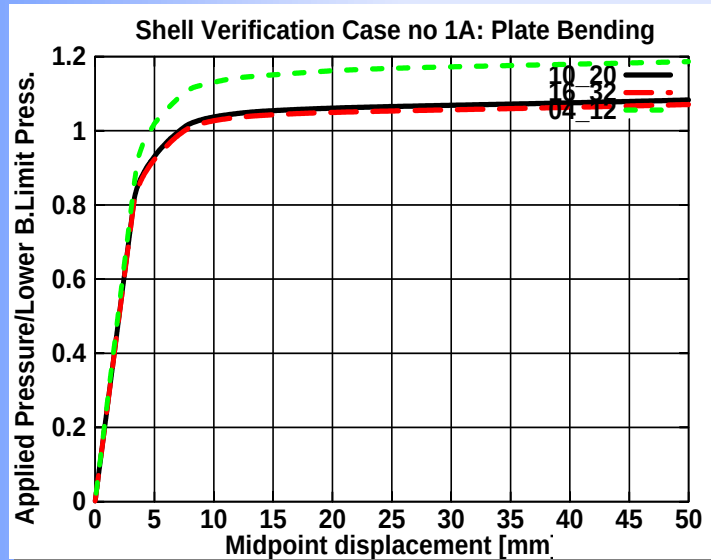
Non linear Shell Element Verification

Shell Verification 1A

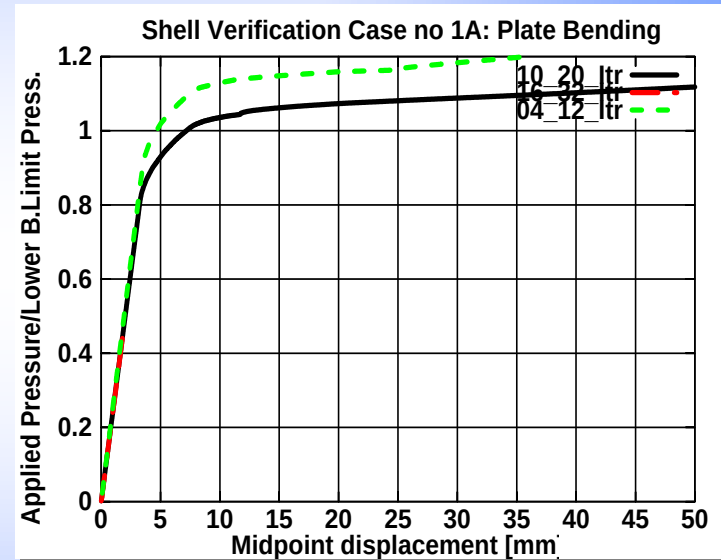


Distribution of Plastic strain. (red is 0.5%). Displacements are scaled

Shell Verification 1A

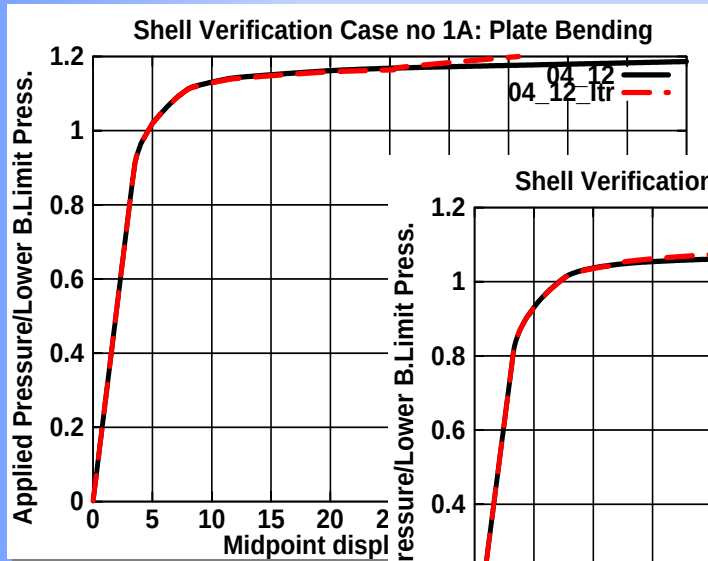


Equilibrium Corrections only

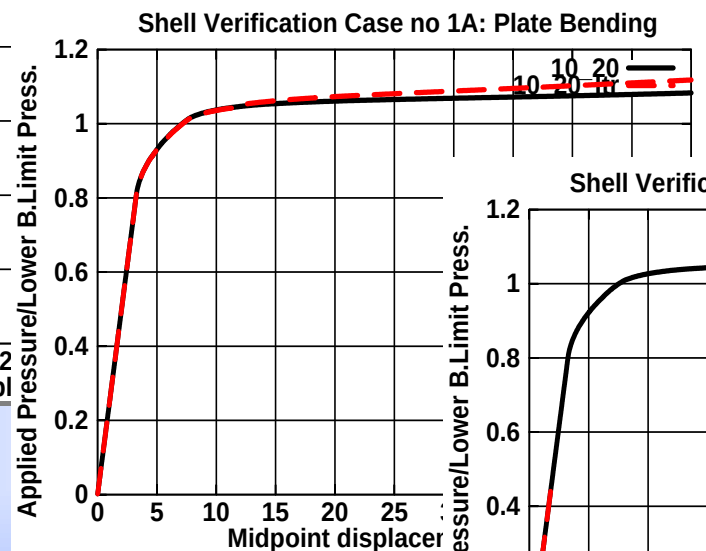


Iterations included

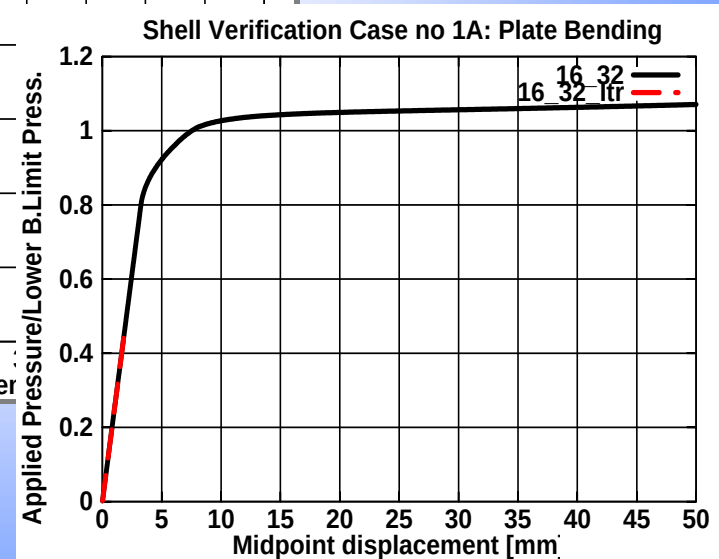
Shell Verification 1A



4 x 12 mesh



10 x 20 mesh



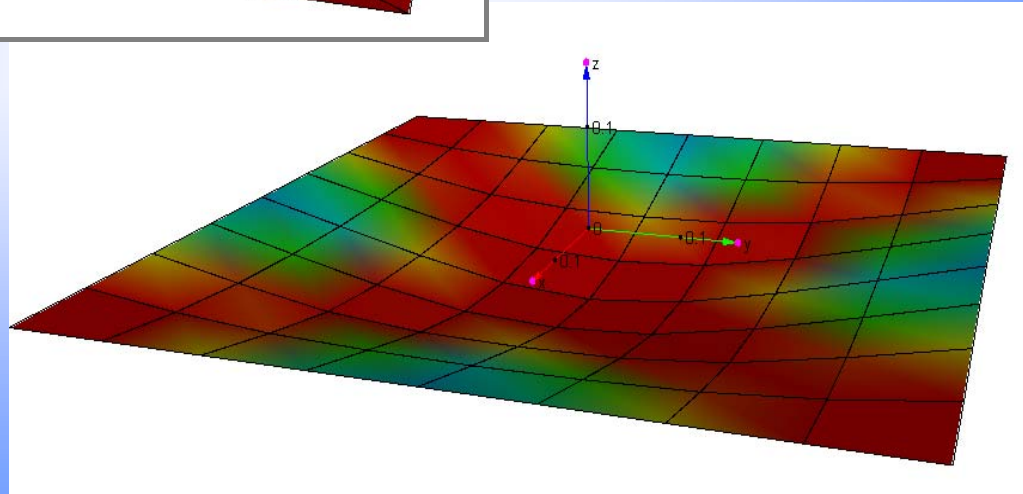
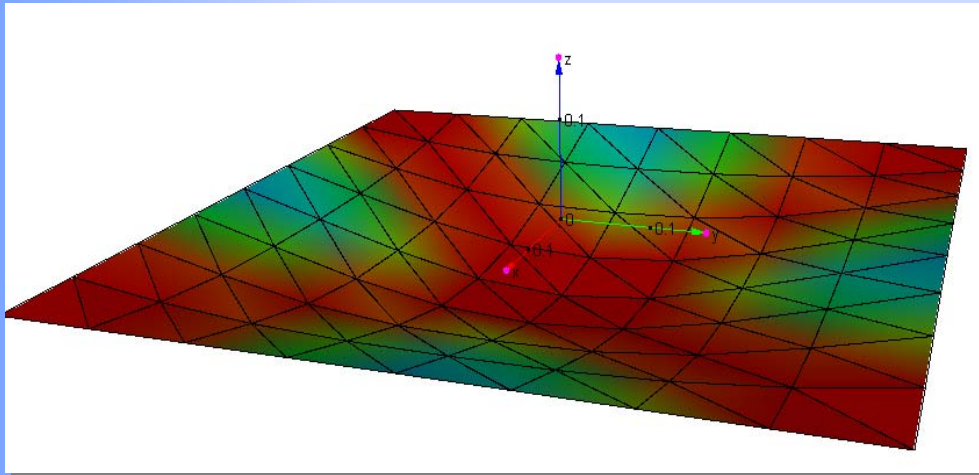
16 x 32 mesh

Shell Verification 1B

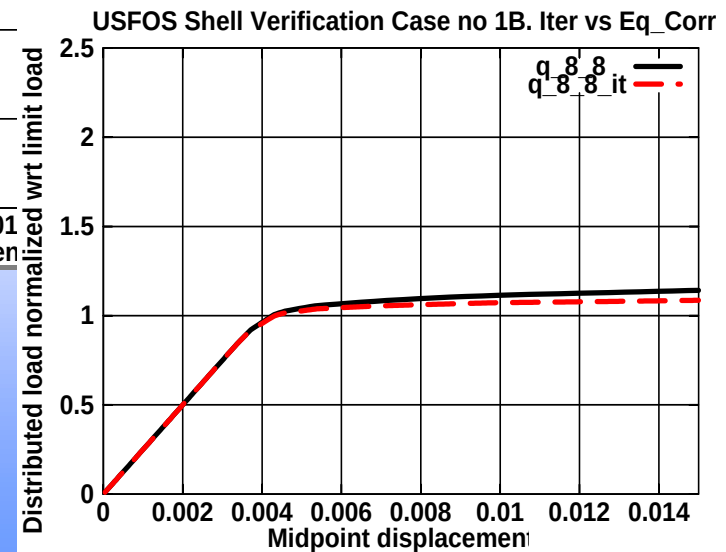
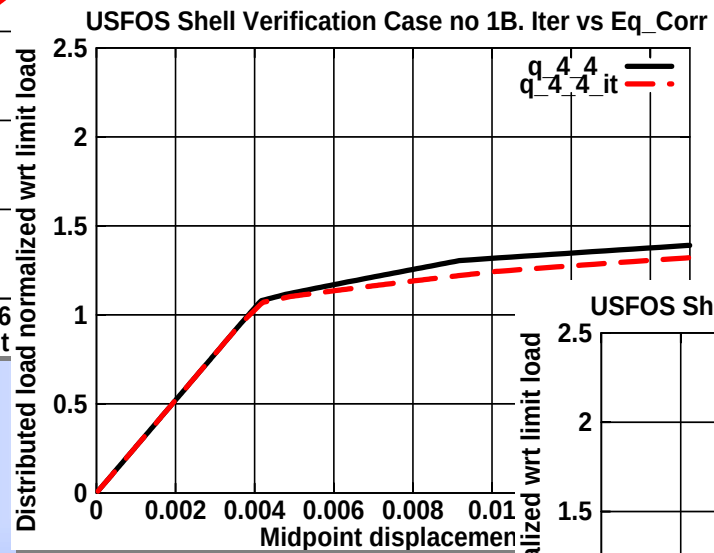
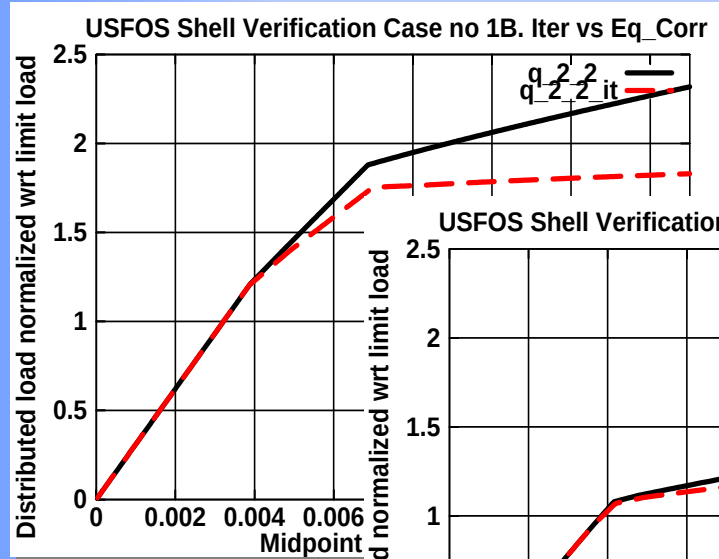
Quadratic Plate with uniformly distributed load

- Plate length/width/thickness : 800 / 800 / 80 [mm]
- Yield stress : 400 [MPa]
- E-module : 210.000 [MPa]
- M_p : $\sigma t^2 / 4 = 0.64E6$ [Nm]
- “Limit pressure” : $24 M_p / \text{width}^2 = 24E6$ [N/m²]

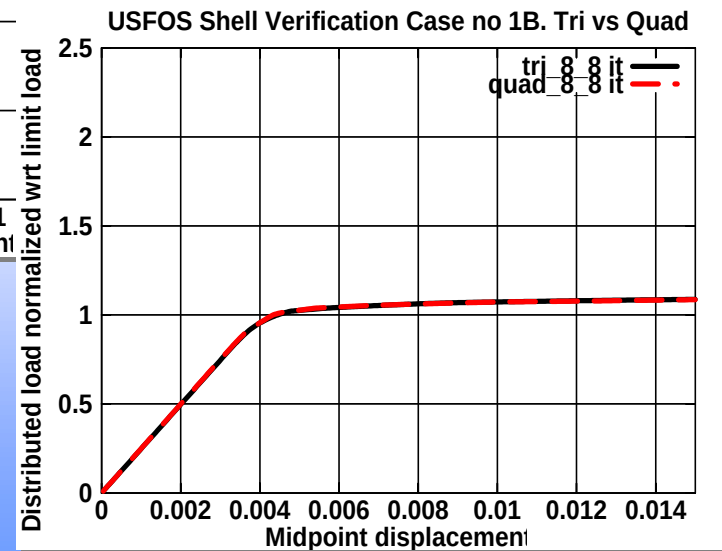
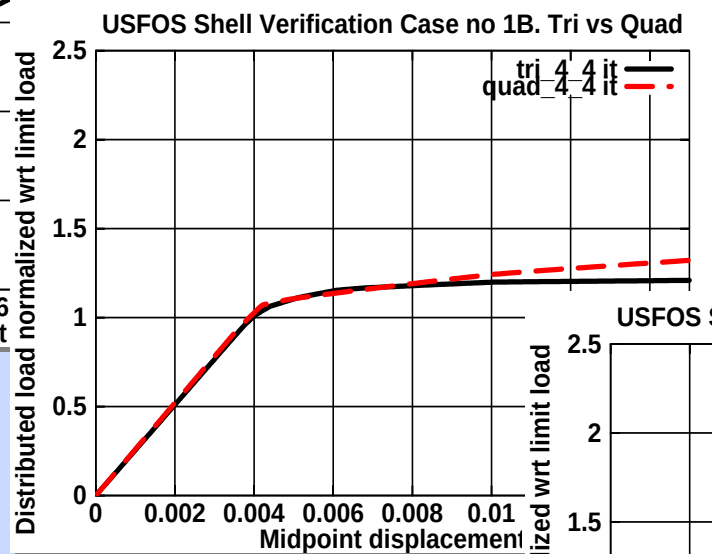
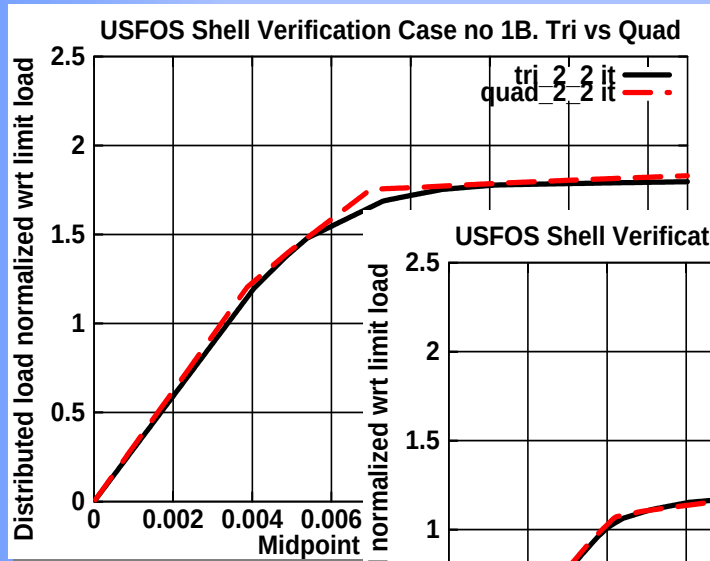
Shell Verification 1B



Shell Verification 1B



Shell Verification 1B



Shell Verification 2

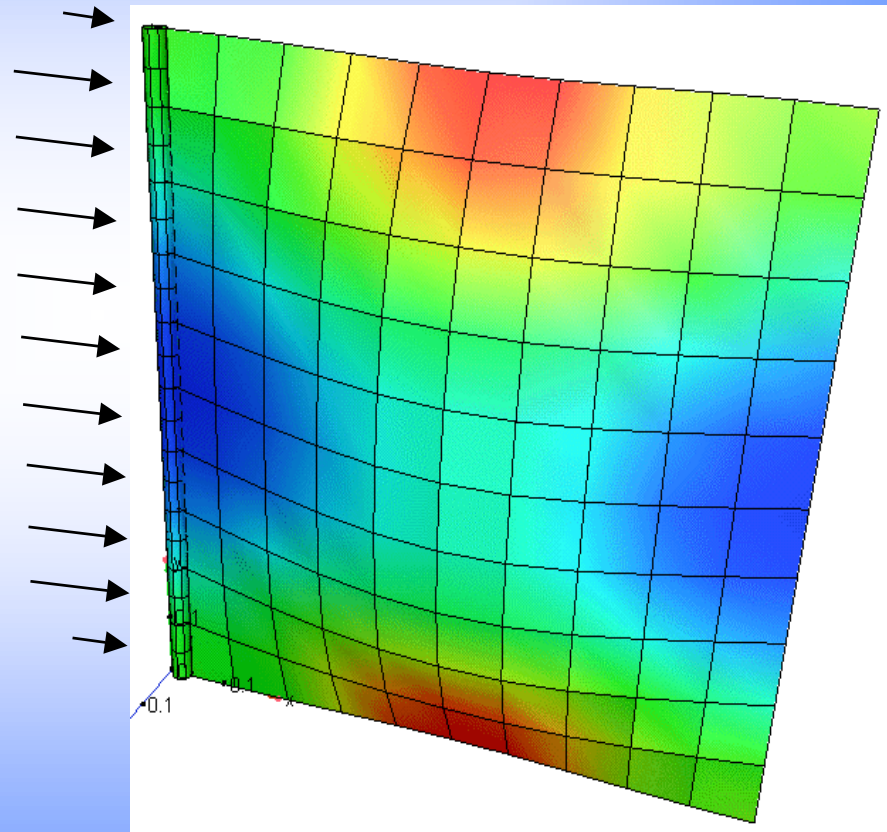
Plate Buckling

- Plate length/width/thickness : 1000/1000 / 20 [mm]
- Yield stress : 400 [MPa]
- E-module : 210.000 [MPa]
- Boundary Conditions :
 - Edge 1 : 001000
 - Edge 2 : 001000
 - Edge 3 : 111000
 - Edge 4 : 001000
- Imperfection : 2 mm (first mode)

Shell Verification 2

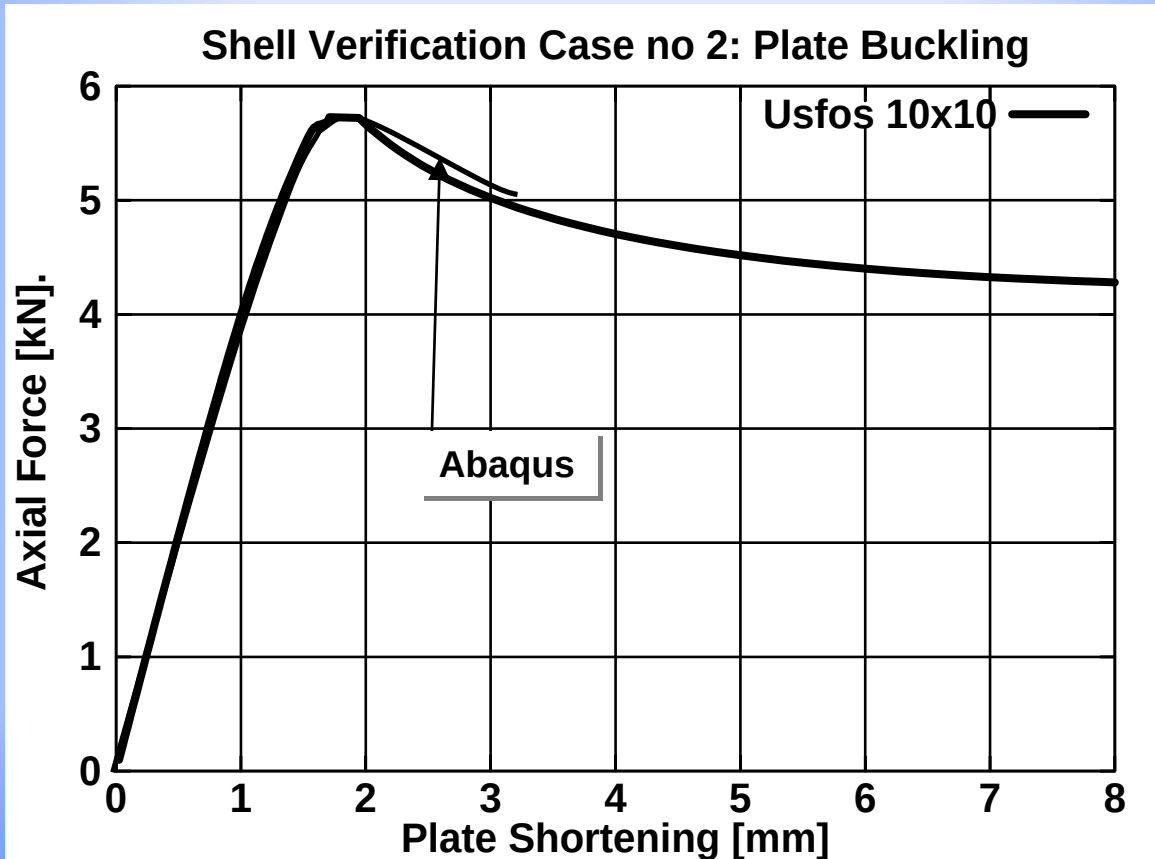
Plate Buckling

Axial
Force



Shell Verification 2

Plate Buckling



Shell Verification 7

Buckling of Aluminium Plate Girder

Load

	matno	E-mod	poiss	yield	density	term.exp			
MISOIEP	1	70000E6	0.3	210E+06	2700	2.4E-5	-3	257E+06	0.1130
#MISOIEP	1	70000E6	0.3	192E+06	2700	2.4E-5	-3	350E+06	0.1130! Old value
MISOIEP	2	70000E6	0.3	262E+06	2700	2.4E-5	-3	440E+06	0.1350
# temperature 200 degree C									
#MISOIEP	1	60000E6	0.3	167E+06	2700	2.4E-5	-3	181E+06	0.15
#MISOIEP	2	60000E6	0.3	153E+06	2700	2.4E-5	-3	190E+06	0.15
# temperature 225 degree C									
#MISOIEP	1	57000E6	0.3	138E+06	2700	2.4E-5	-3	157E+06	0.15
#MISOIEP	2	57000E6	0.3	147E+06	2700	2.4E-5	-3	164E+06	0.15

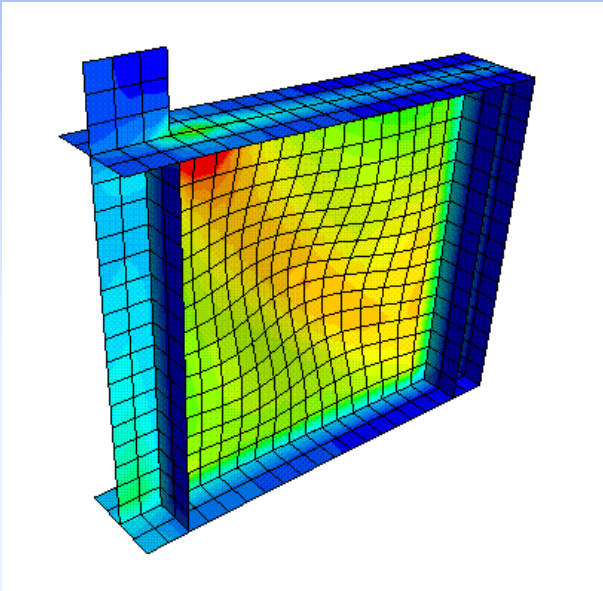
Thick : 4 mm
 σ_y : 192 MPa

Thick : 30 mm
 σ_y : 262 MPa

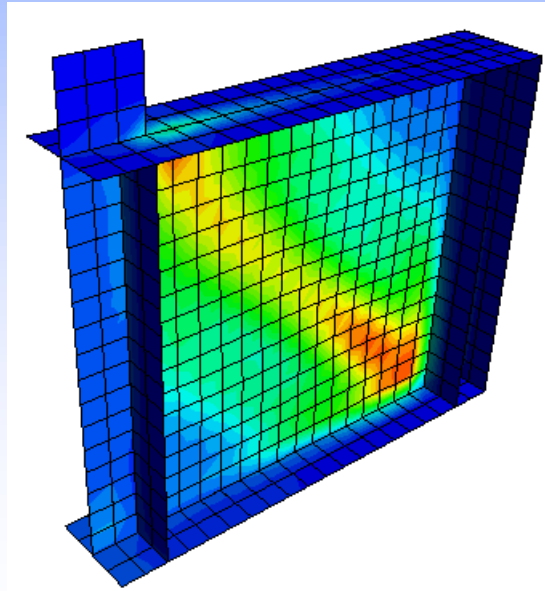
Thick : 15 mm
 σ_y : 262 MPa



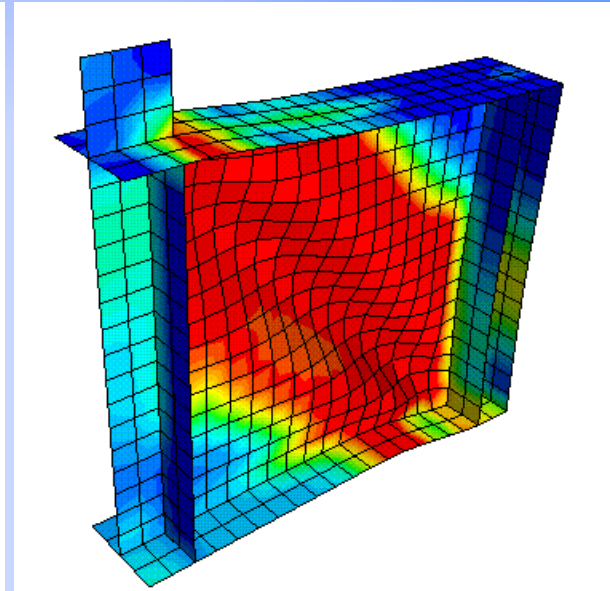
Shell Verification 7



*The out of plane deformations at the bifurcation load of 75KN.
(displ.x 20, utilis. x 10))*



The out of plane deformations at the load of 180 KN (displ. x 2)



The out of plane deformations at collapse (displ. x 1)

Shell Verification 7

*Load vs. displacement for plate girder:
 Comparison between tests and ABAQUS & USFOS*

Note: Material model in USFOS and ABAQUS not exactly identical

