Four horns support system – static analysis, new results

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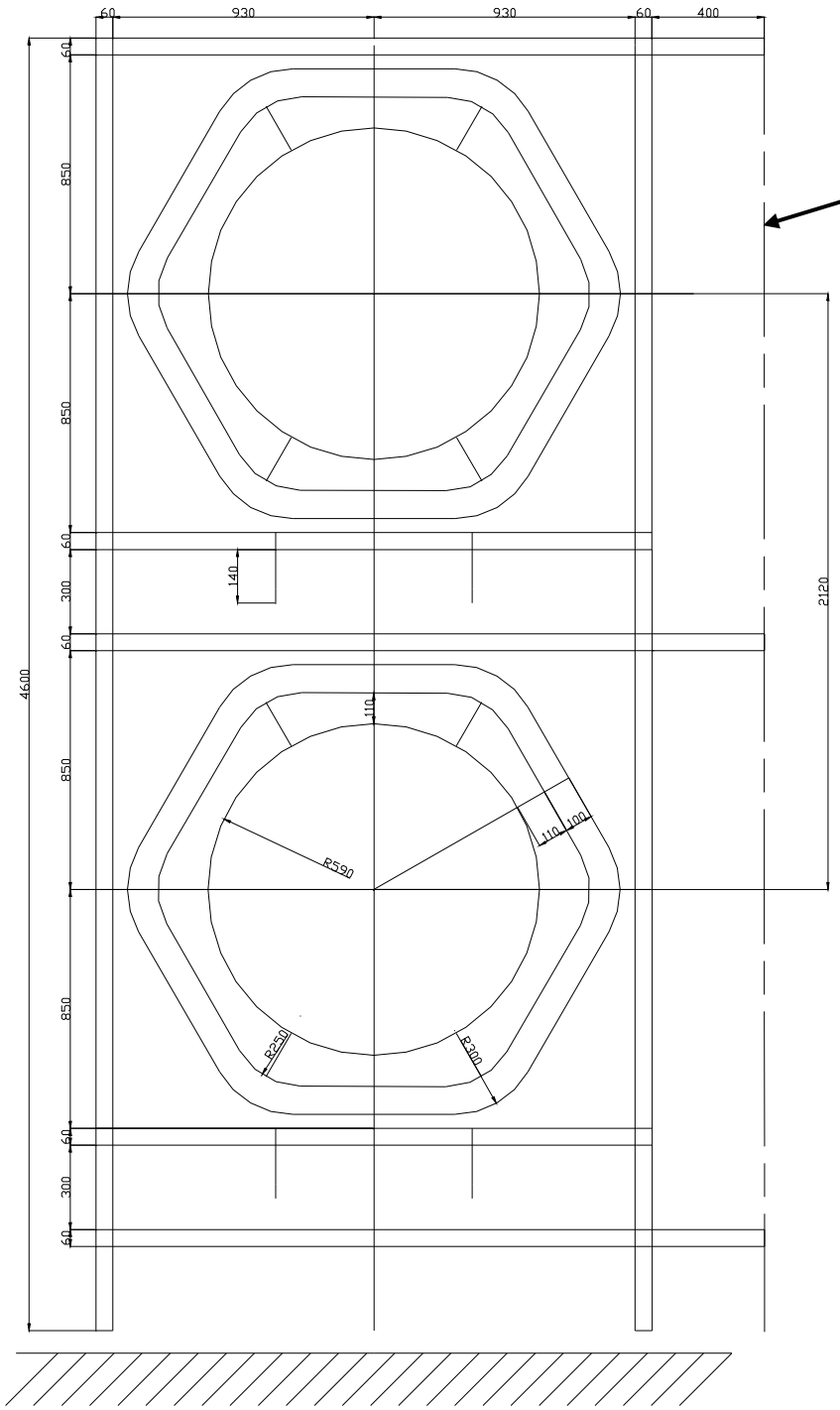
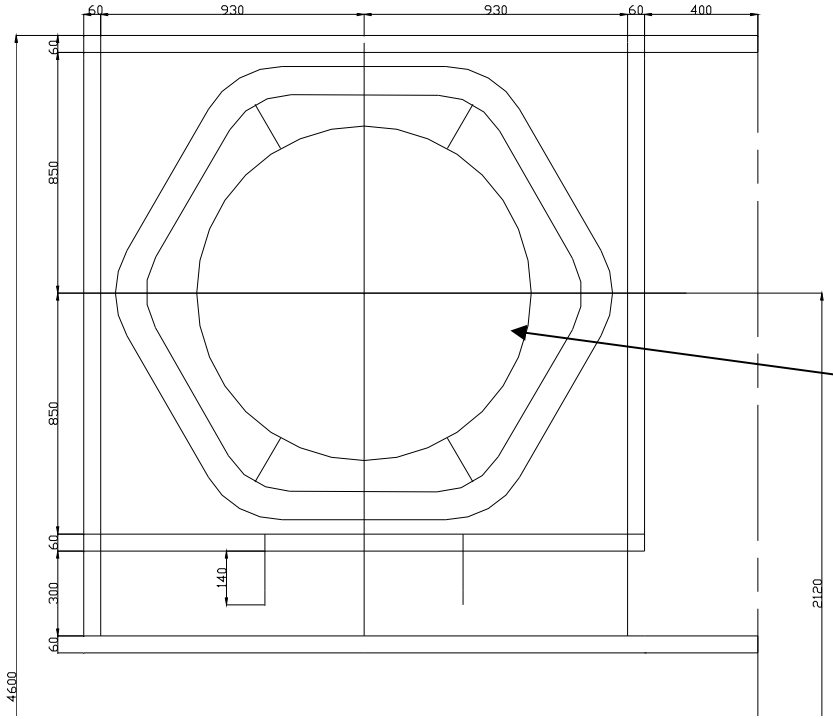


Axe of symmetry

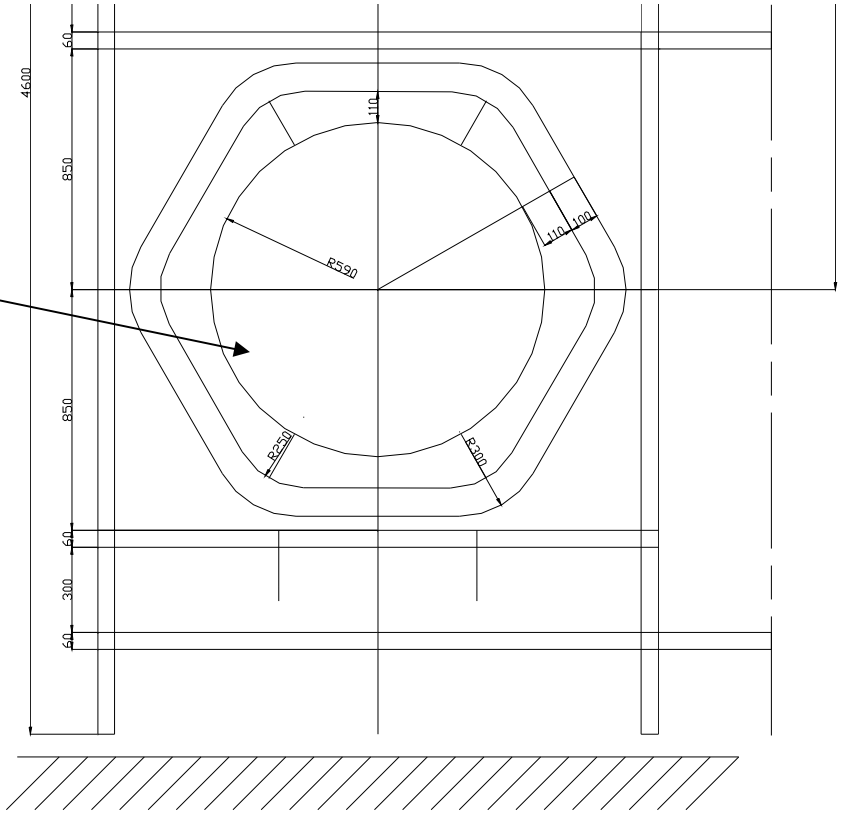
1. Total height: H = 4600 [*mm*]
2. Distance between horn centres: L = 2120
3. Distance between frames: B = 2 x 400 [*mm*]
4. Width of the cell for single horn: C = 2 x 930 [*mm*]
5. Height of the cell for single horn: J = 2 x 850 [*mm*]

Symmetric ½ of four horns supporting system –front view

Symmetric ½ of four horns supporting system –front view



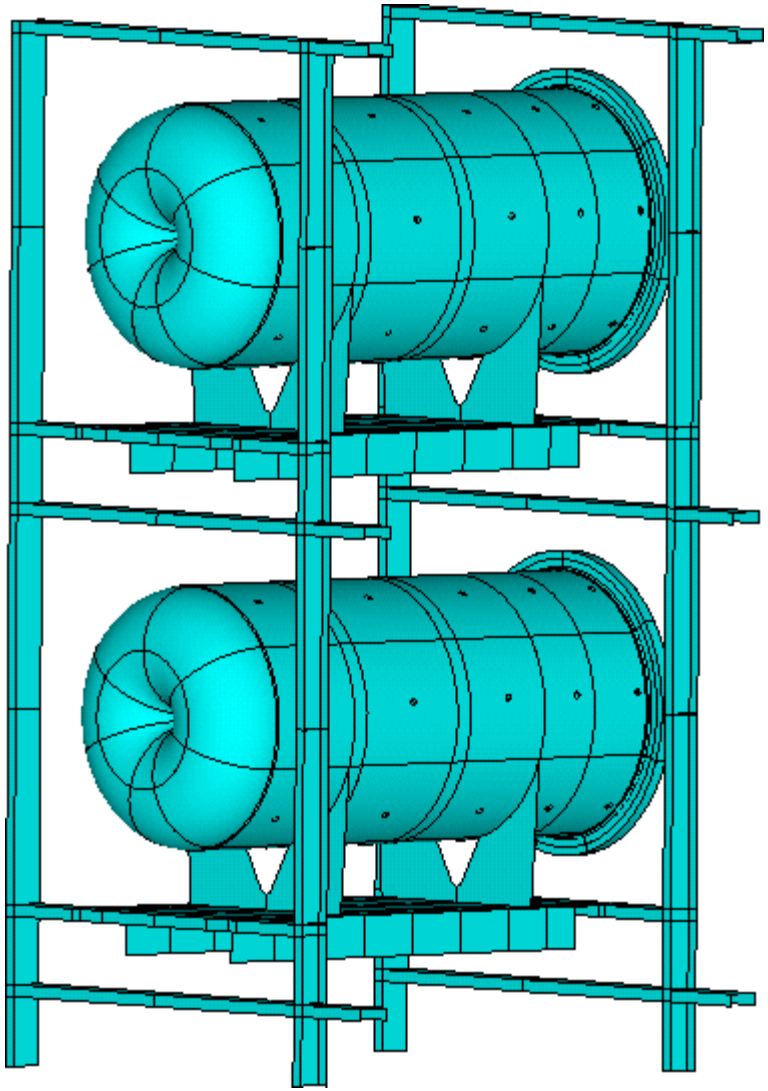
Upper left horn



Bottom left horn

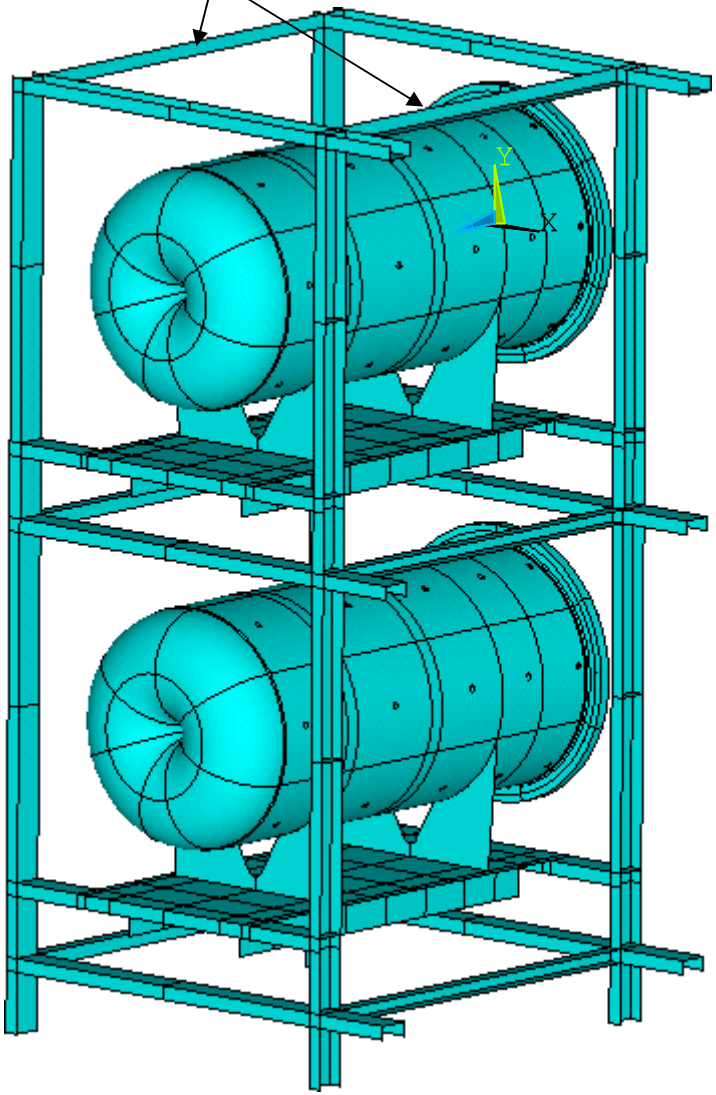
1. Distance between the bottom line of channel section for upper horn and top surface of channel section for lower horn : *D* = 300 [*mm*]
2. Width of the channel section *H1* = 65 [*mm*]

Symmetric half with ribs under horizontal horn supporting plates

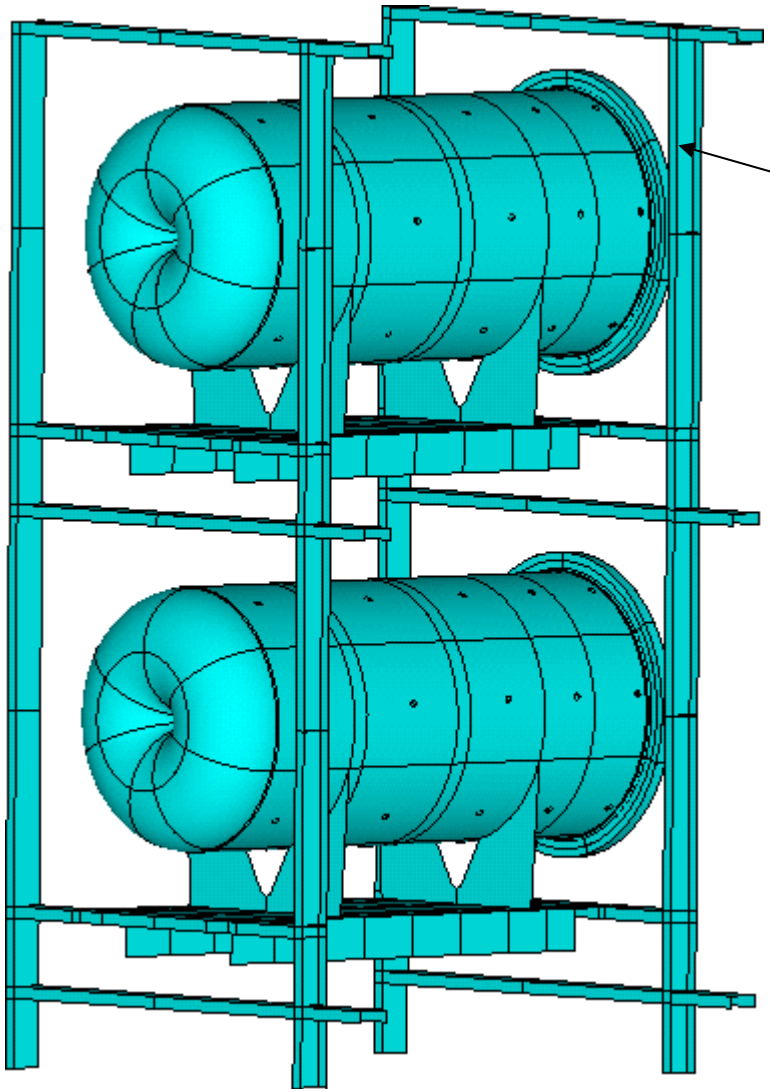


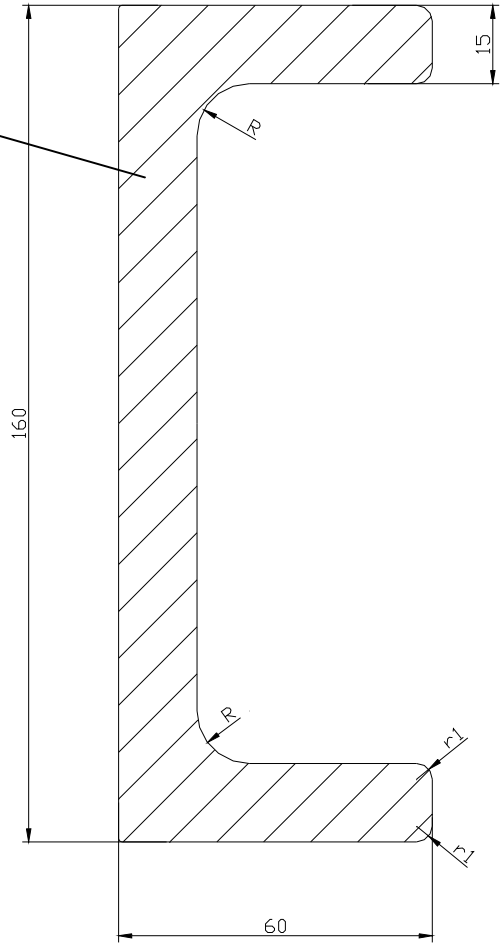
Structure without longitudinal spans connecting frames

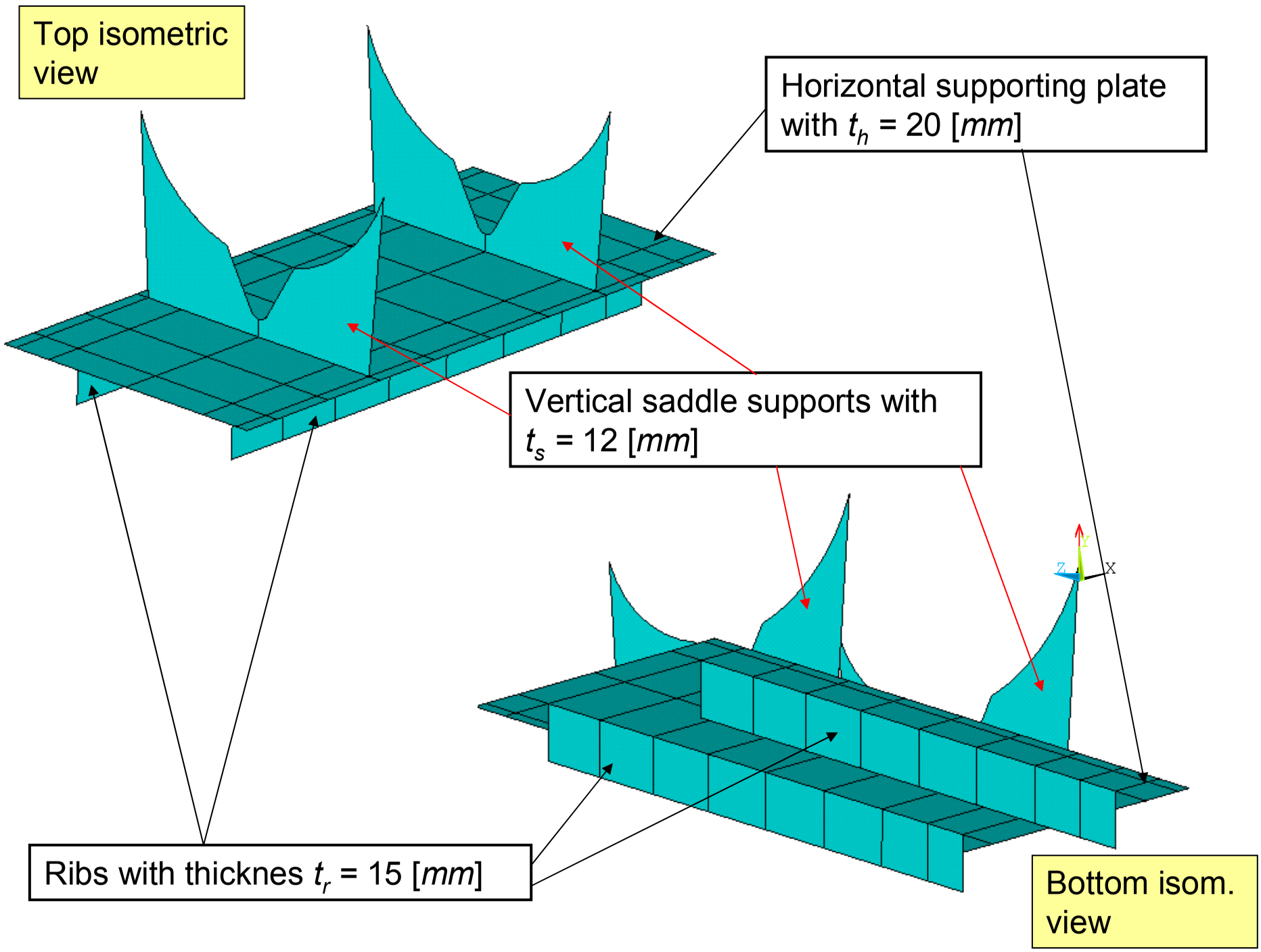
Structure with longitudinal spans (6) connecting frames



Standard aluminium channel section for frame structure





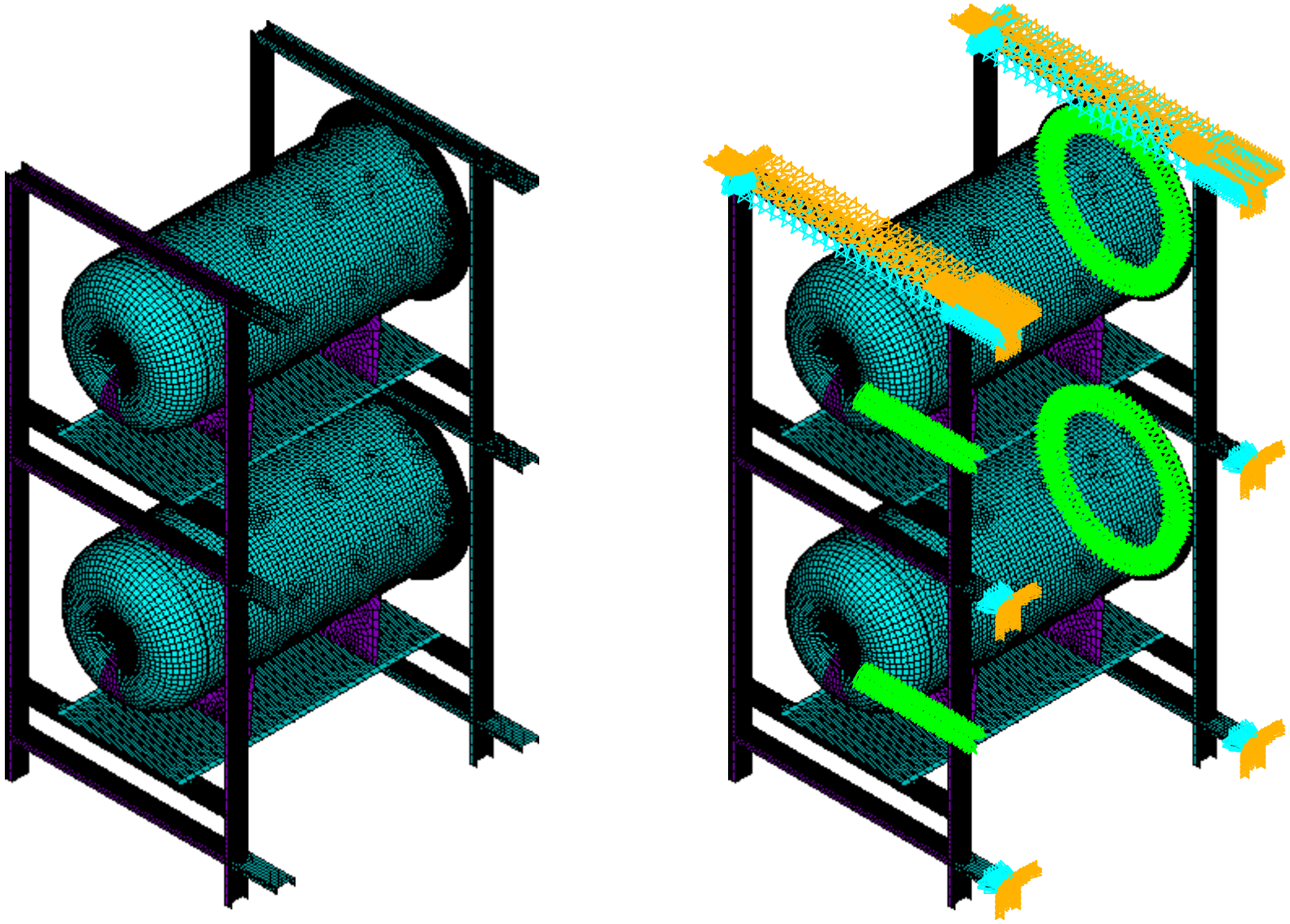

Top isometric view
Horizontal supporting plate with t_h = 20 [mm]
Vertical saddle supports with t_s = 12 [mm]
Ribs with thicknes t_r = 15 [mm]
Bottom isom. view
Y
Z
X

Symmetric ½ of structure with ribs, without longitudinal spans, supported on the top,

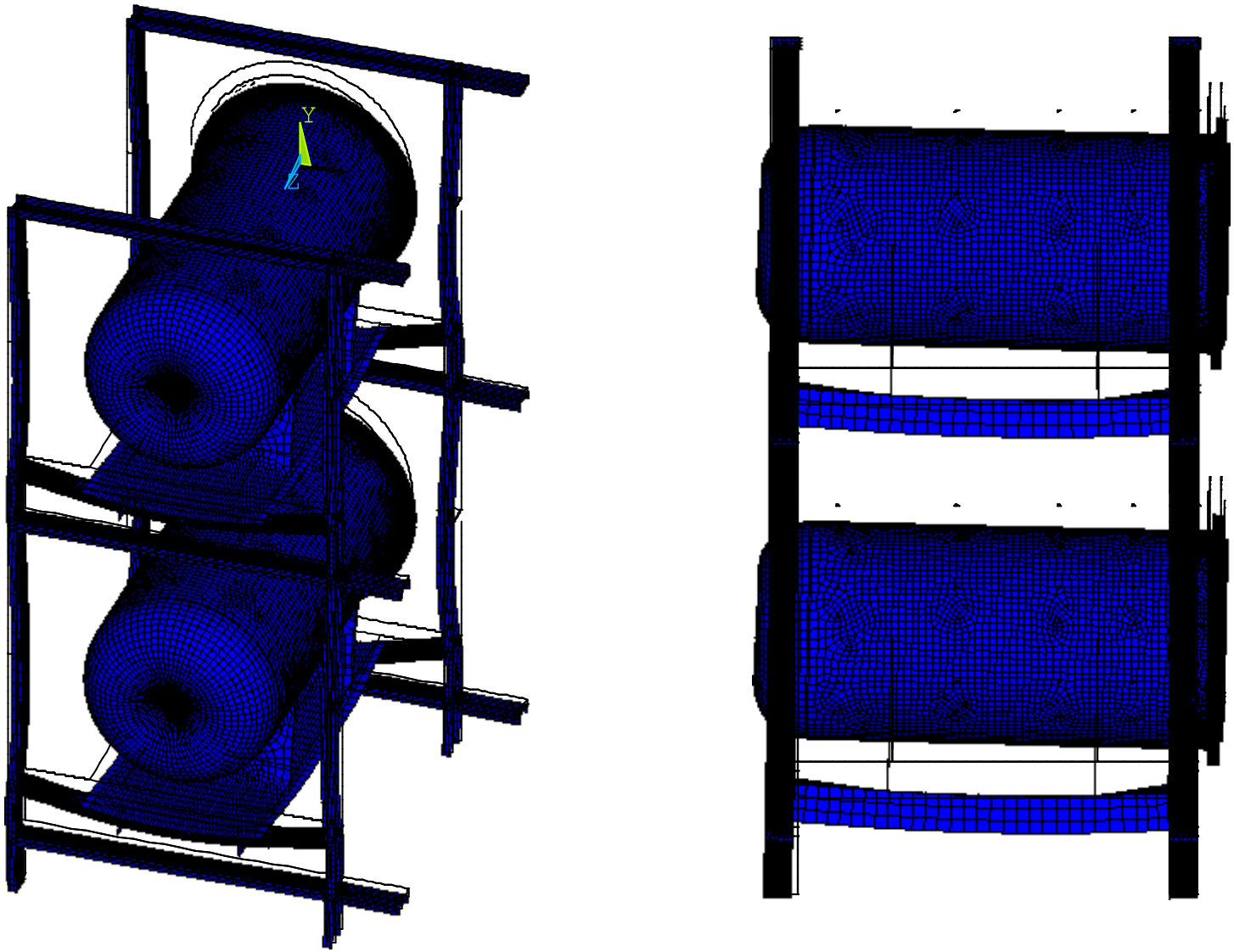
Slides: 8 – 18 (load: deadweight)

Slides: 8 – 26 (load: deadweight + hydrostatic pressure)

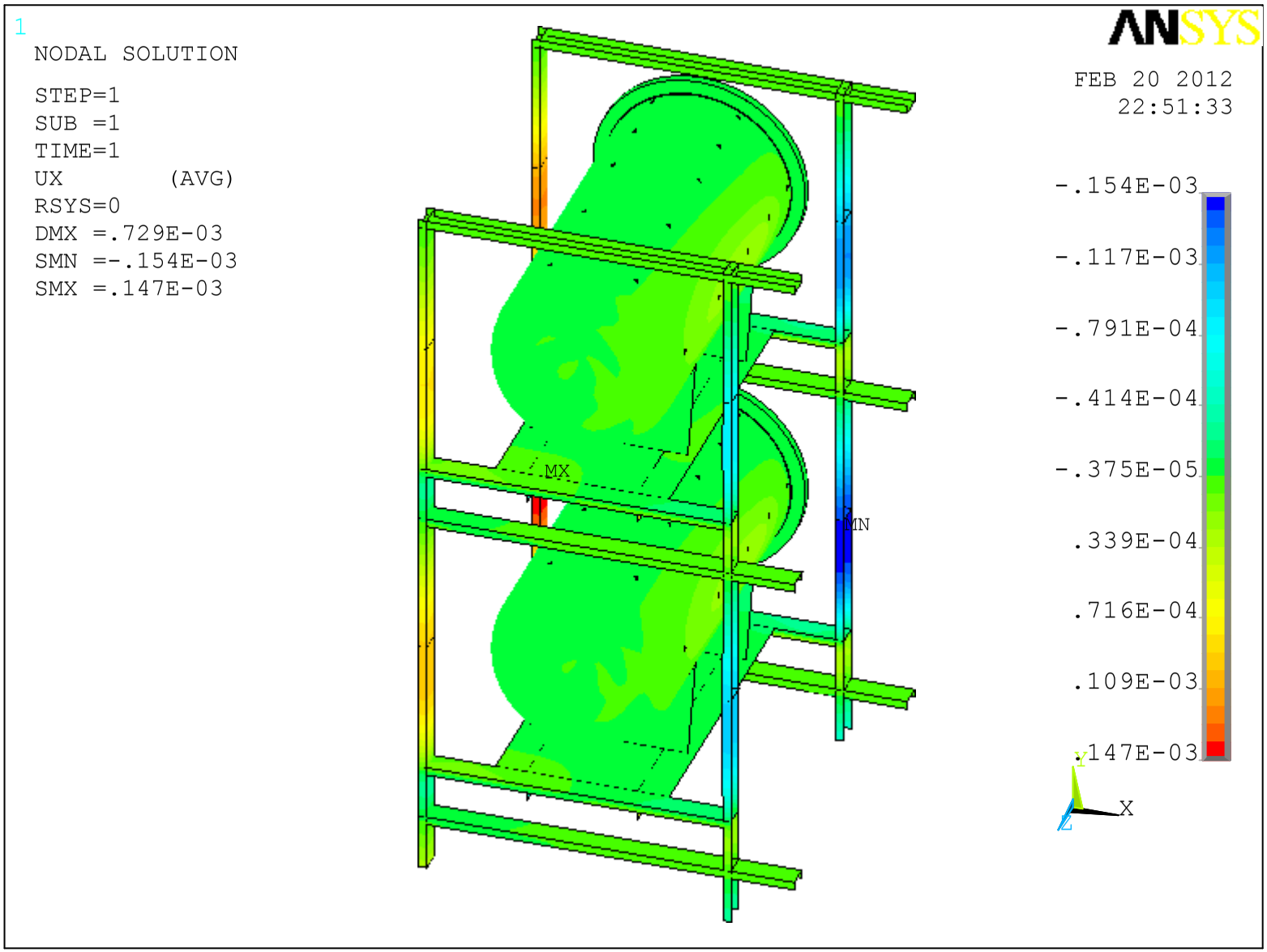
Slides: 27 – 30 results for str.without ribs under supporting plate, only deadweight introduced



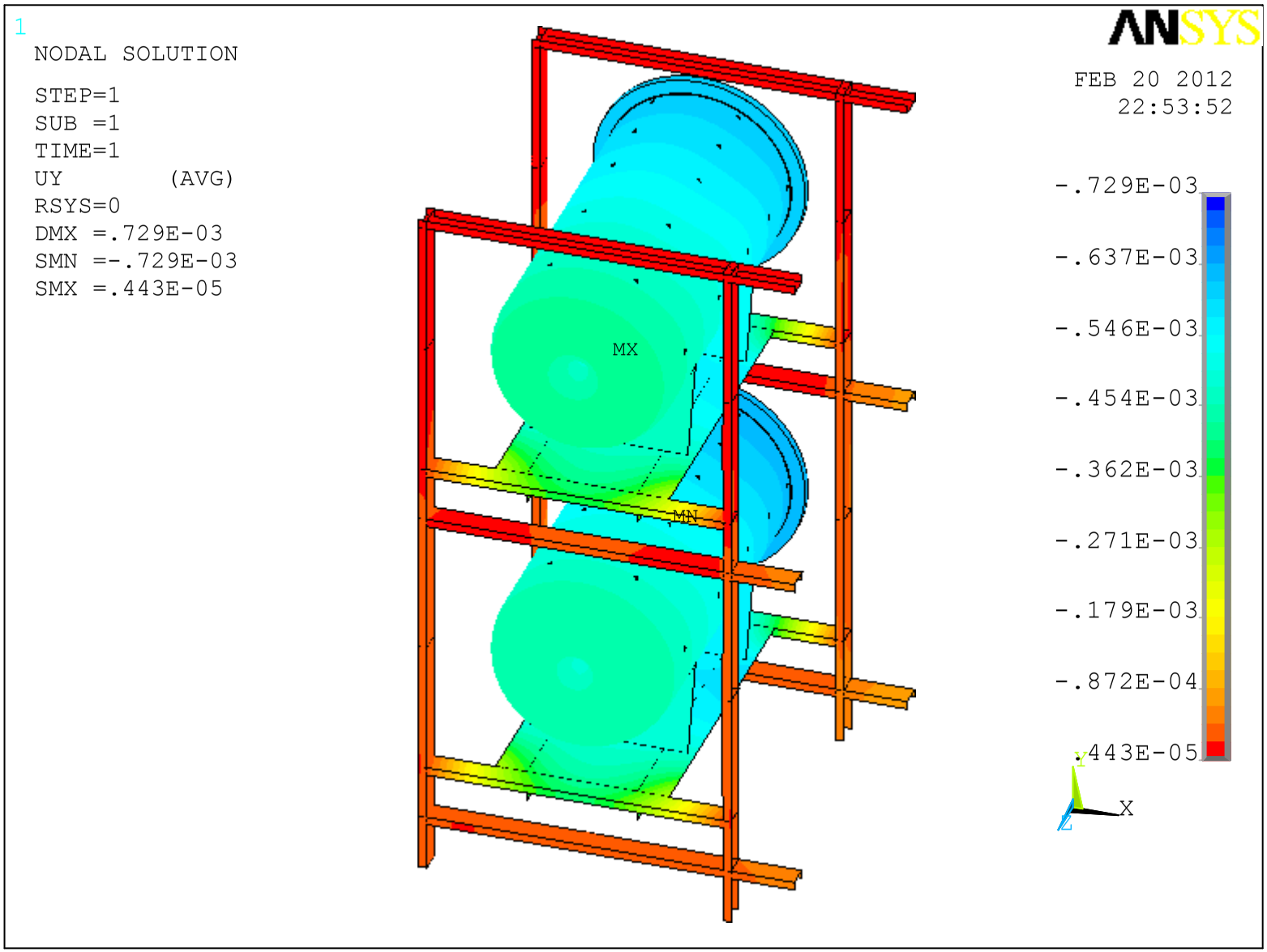
Isometric view of mesh and mesh with boundary conditions introduced



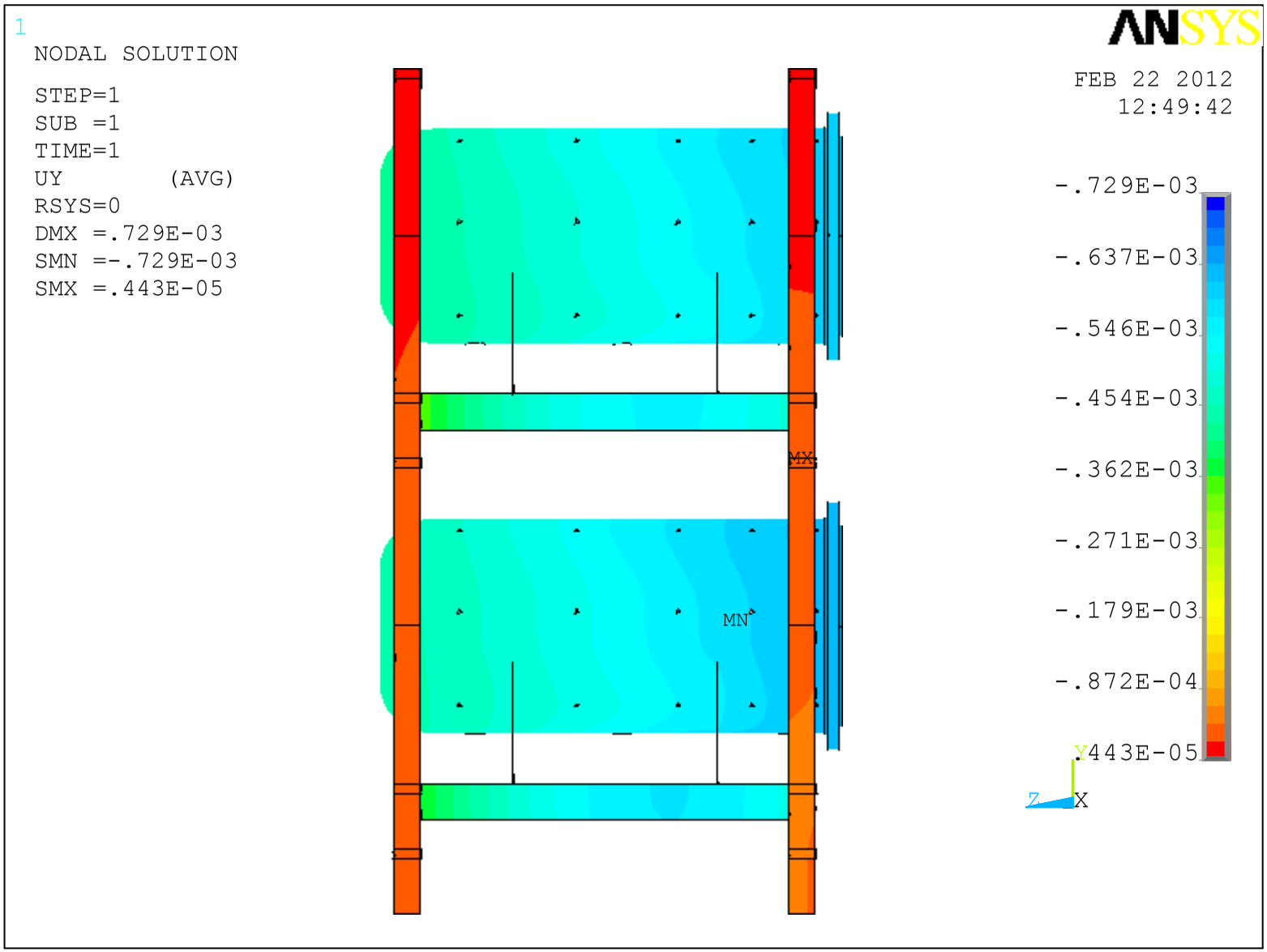
Deformation of structure under deadweight – not to scale drawing



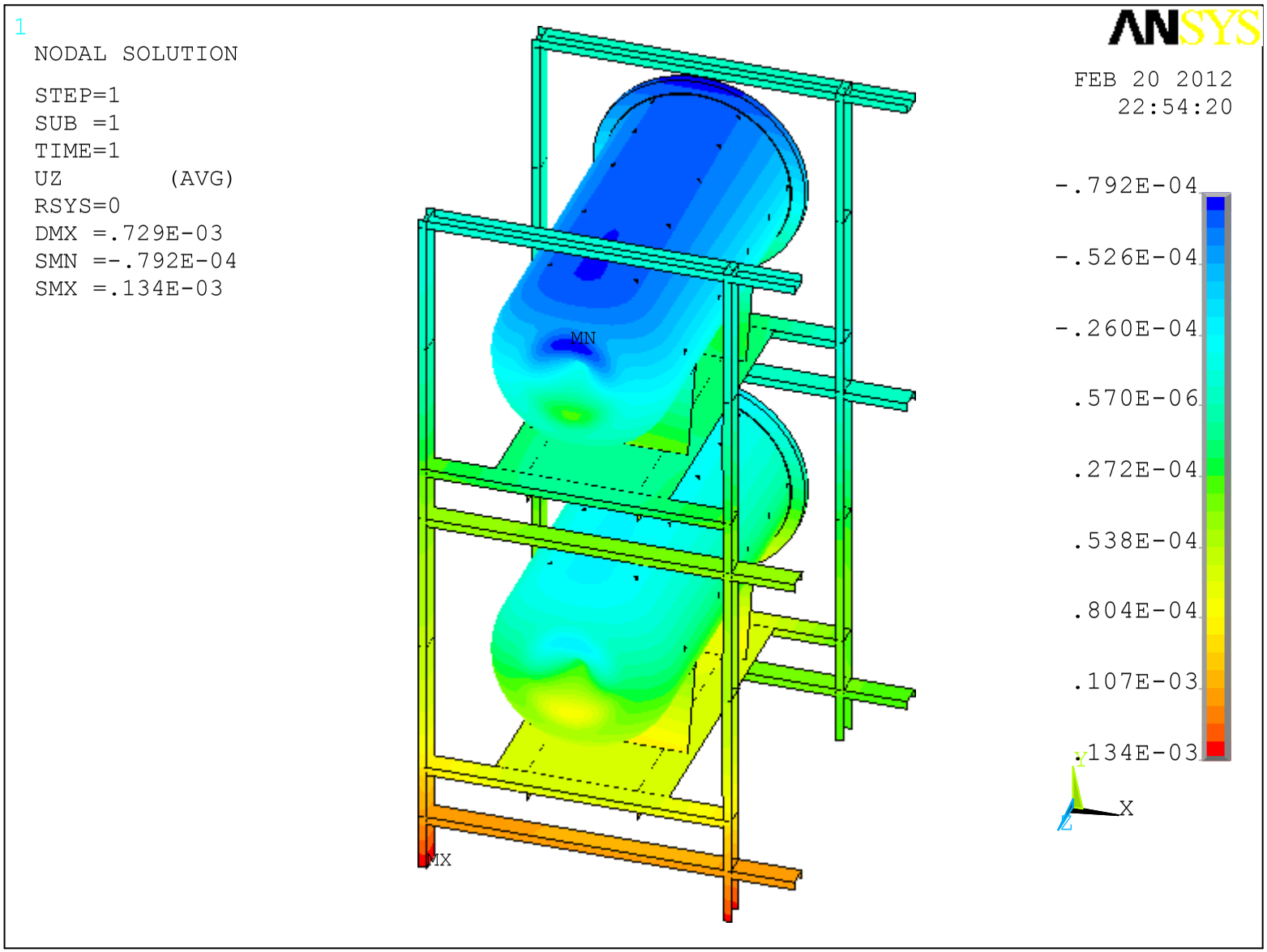
Ux displacement in [*m*]



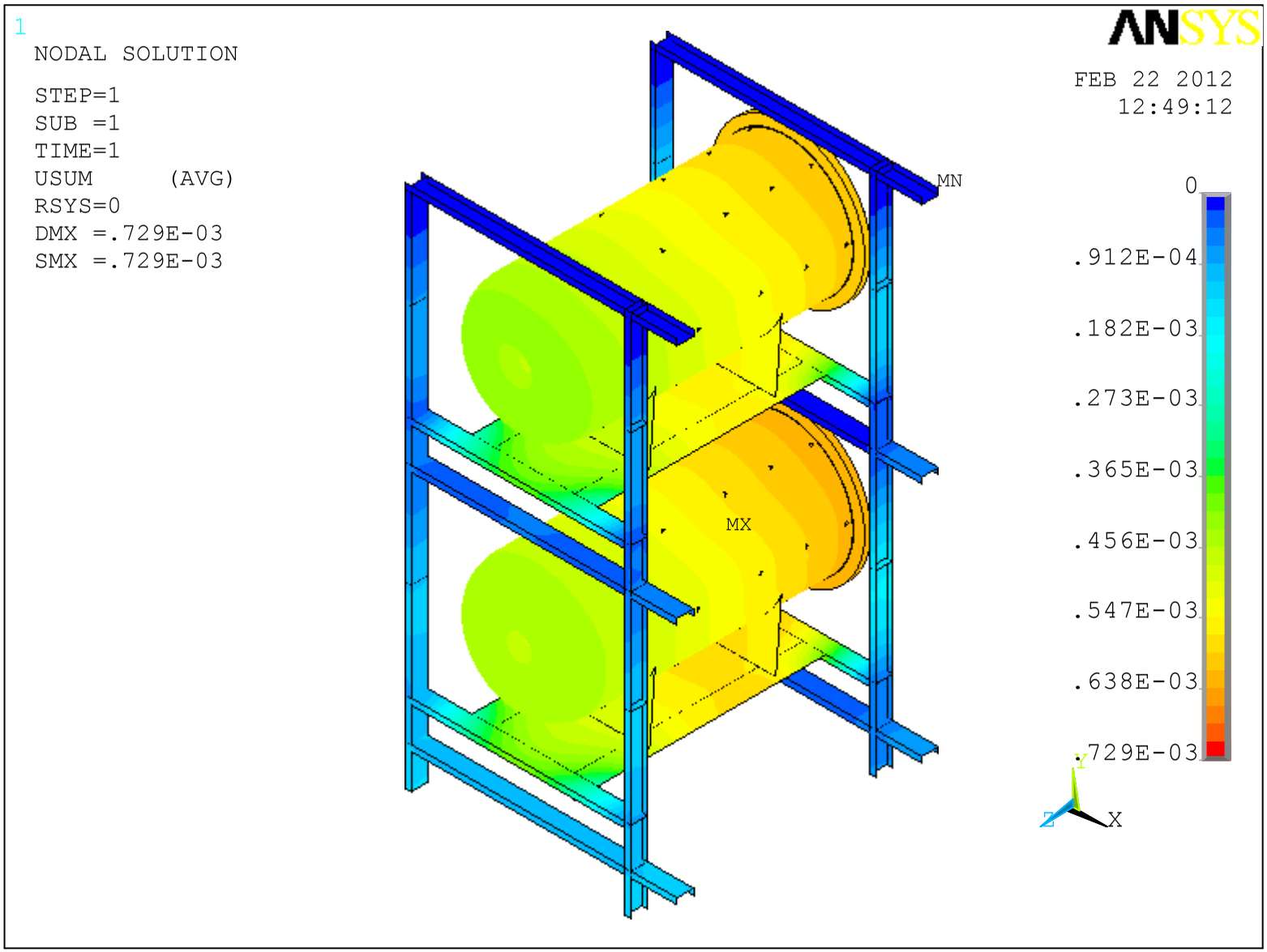
Uy displacement in [*m*]



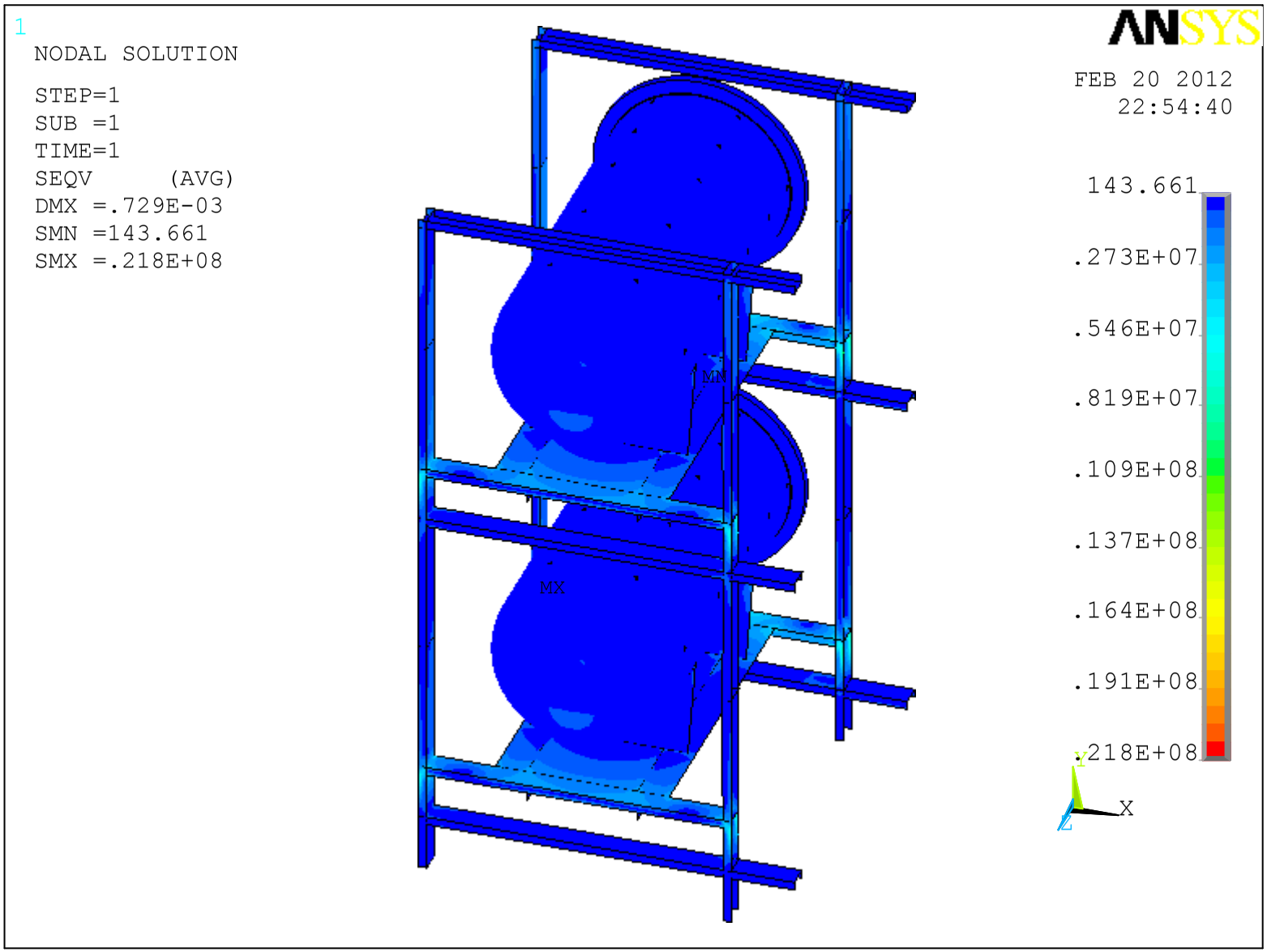
Uy displacement in [*m*]



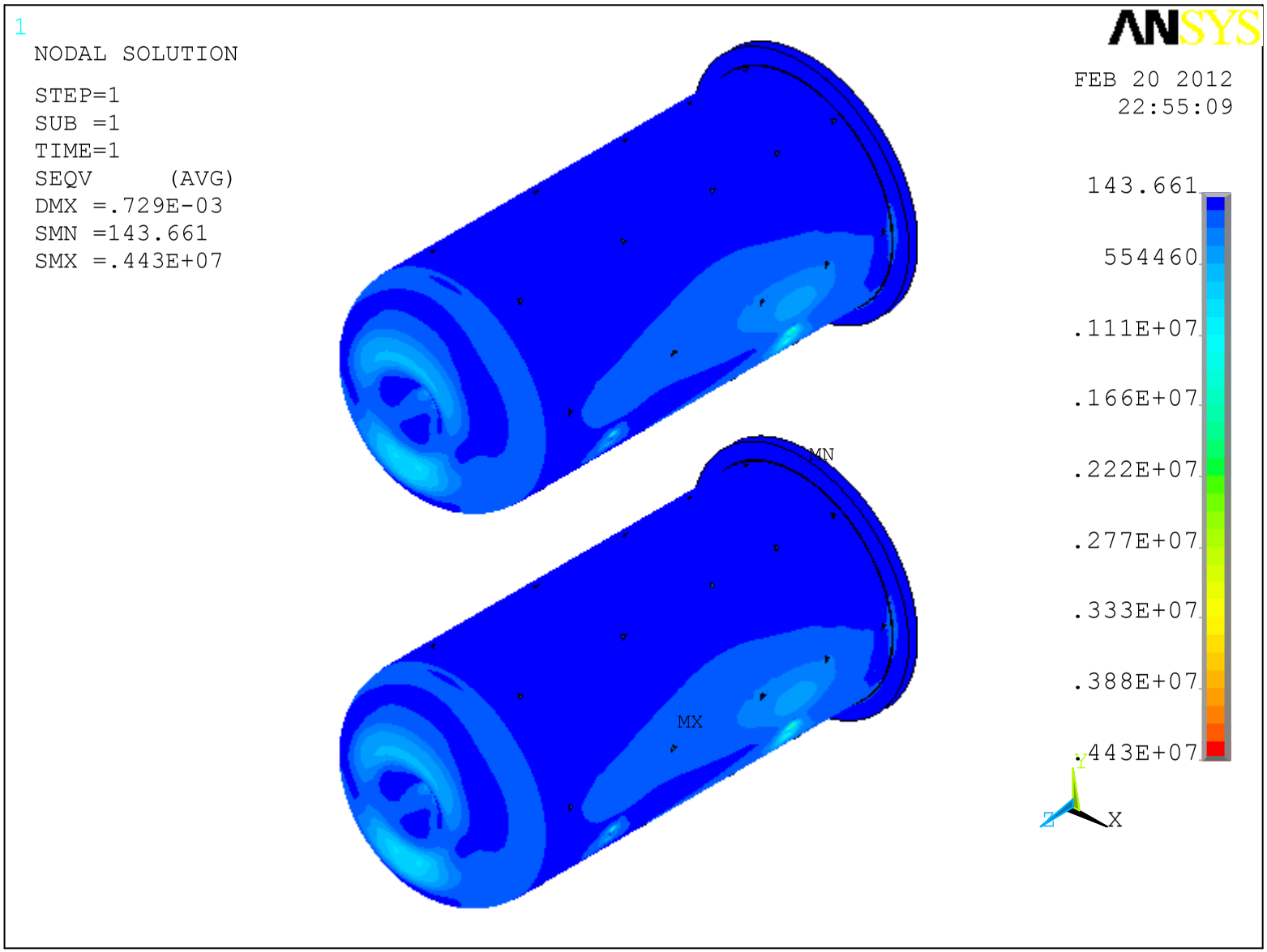
Uz displacement in [*m*]



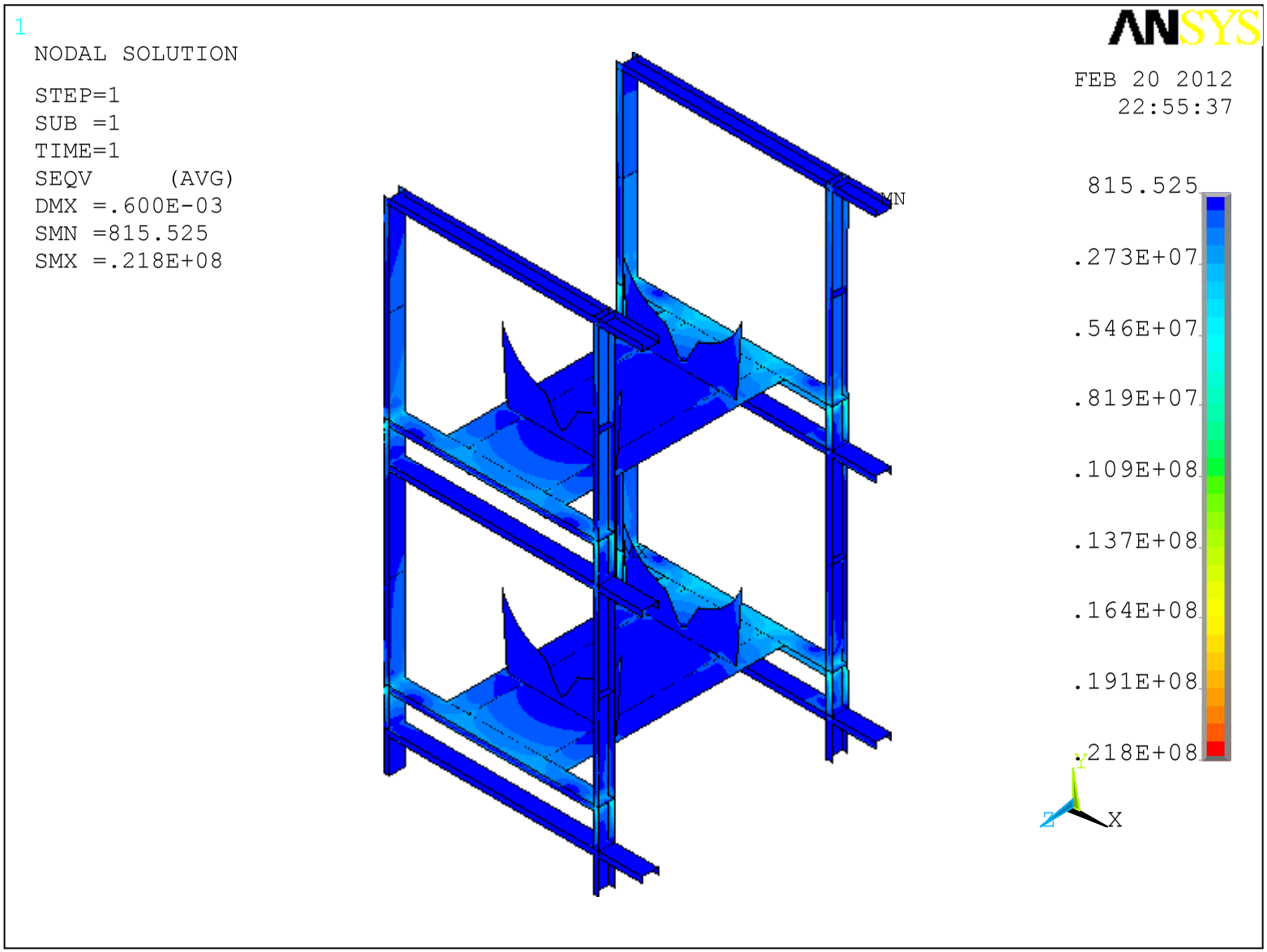
Distribution of displacement vector displacement in [*m*]



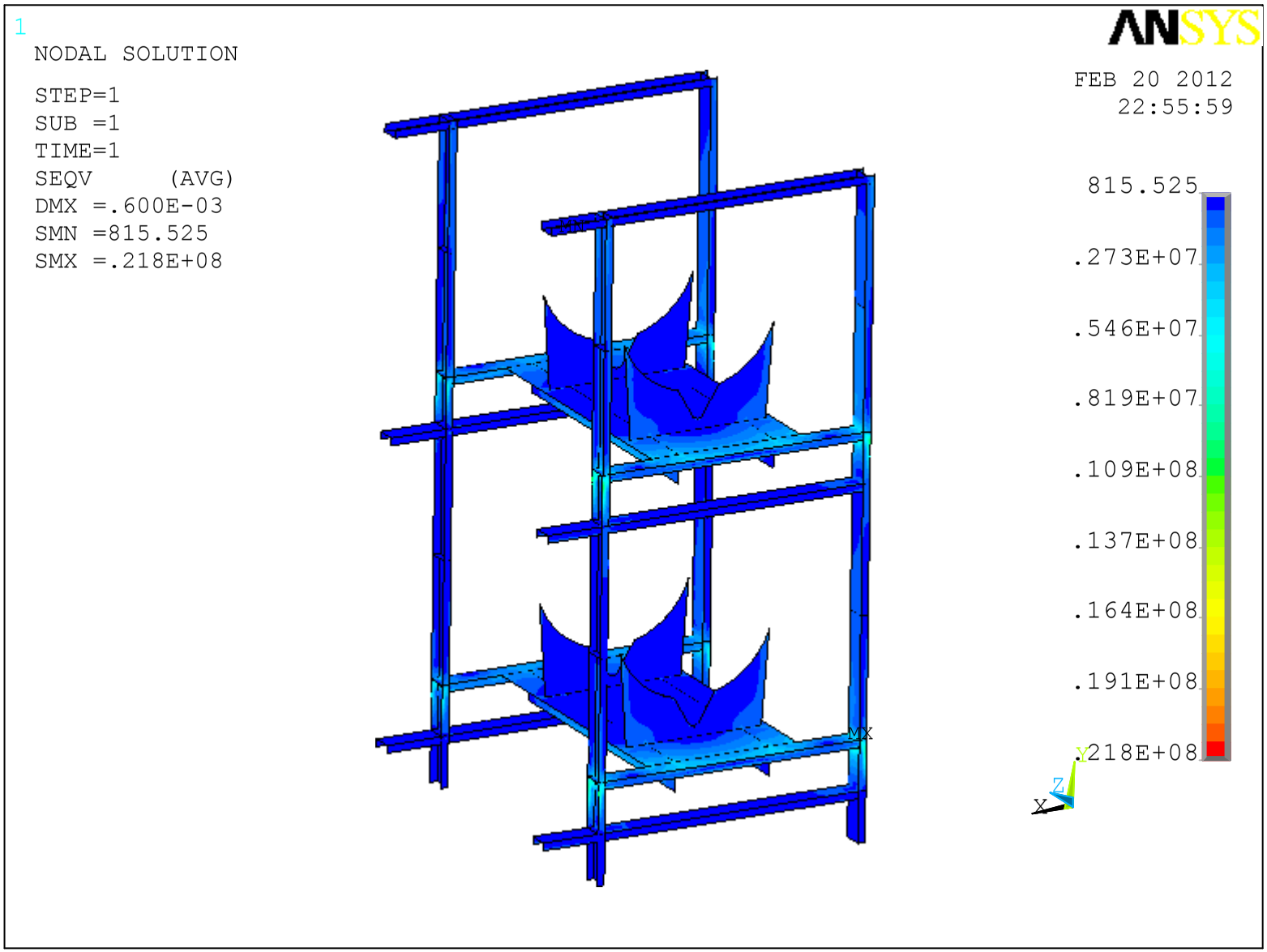
Distribution of equivalent stress in [*Pa*]



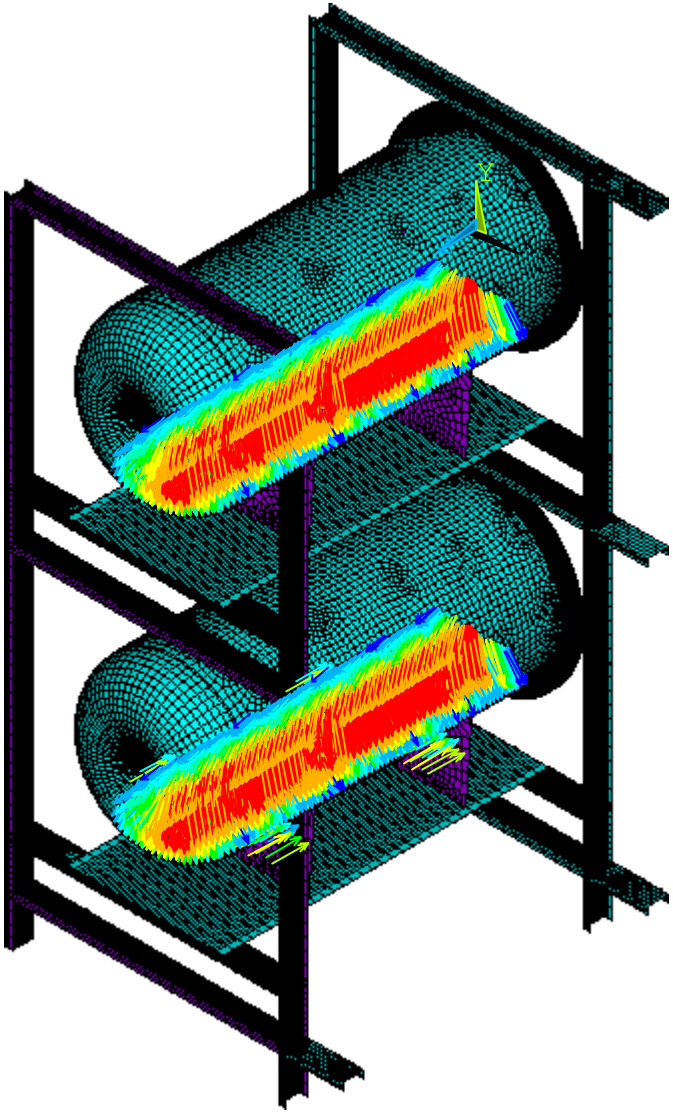
Distribution of equivalent stress in [*Pa*] – only horns are shown



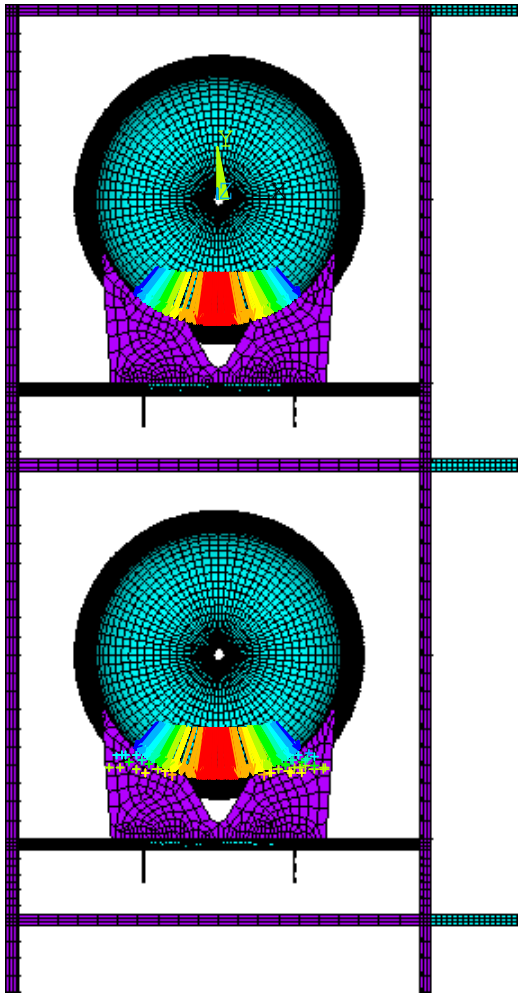
Distribution of equivalent stress in [*Pa*] – only frames are shown

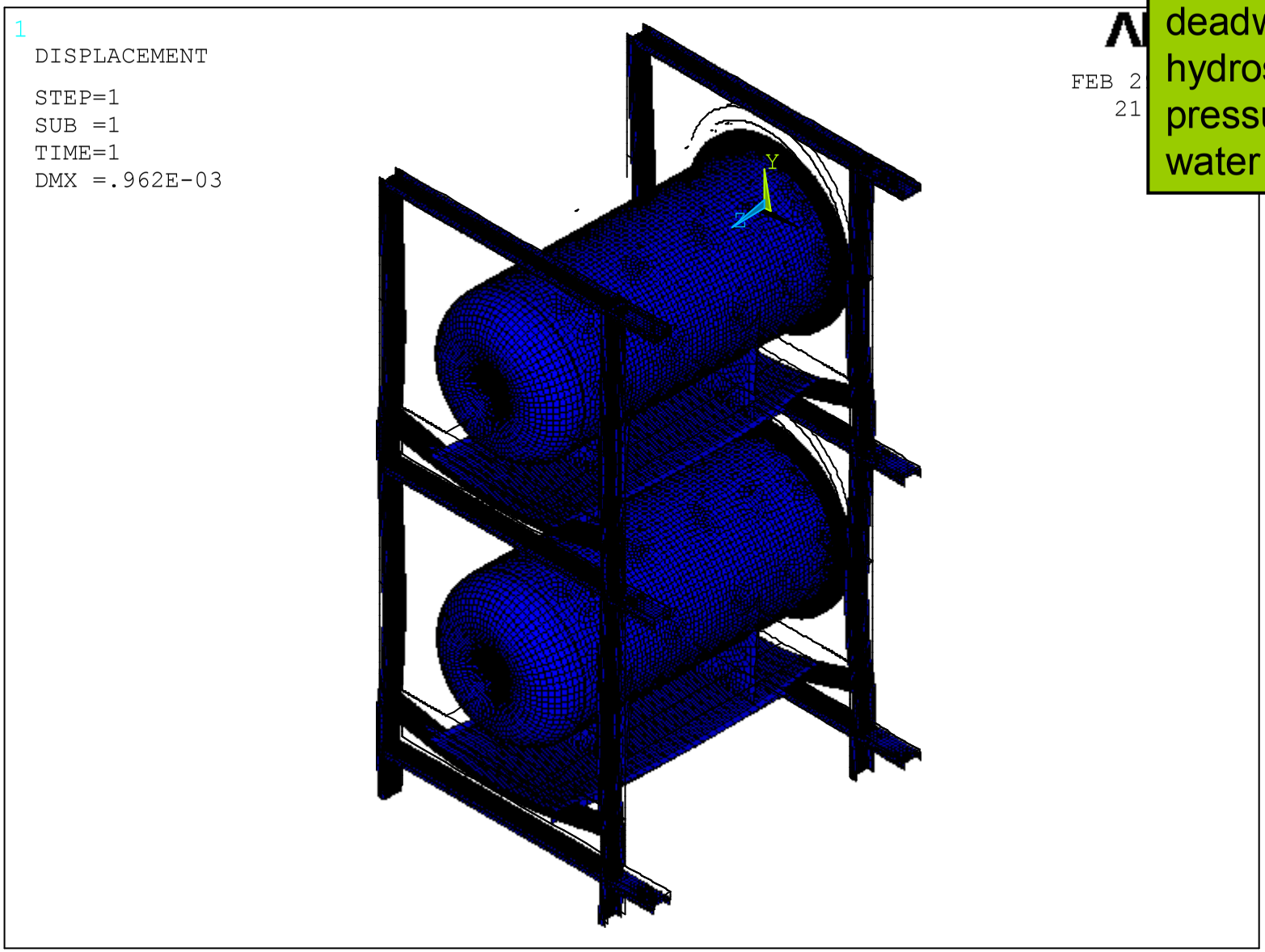


Distribution of equivalent stress in [*Pa*] – only frames are shown (opposite view)



Pressure of water inside horns added





Loads: deadweight + hydrostatic pressure of water

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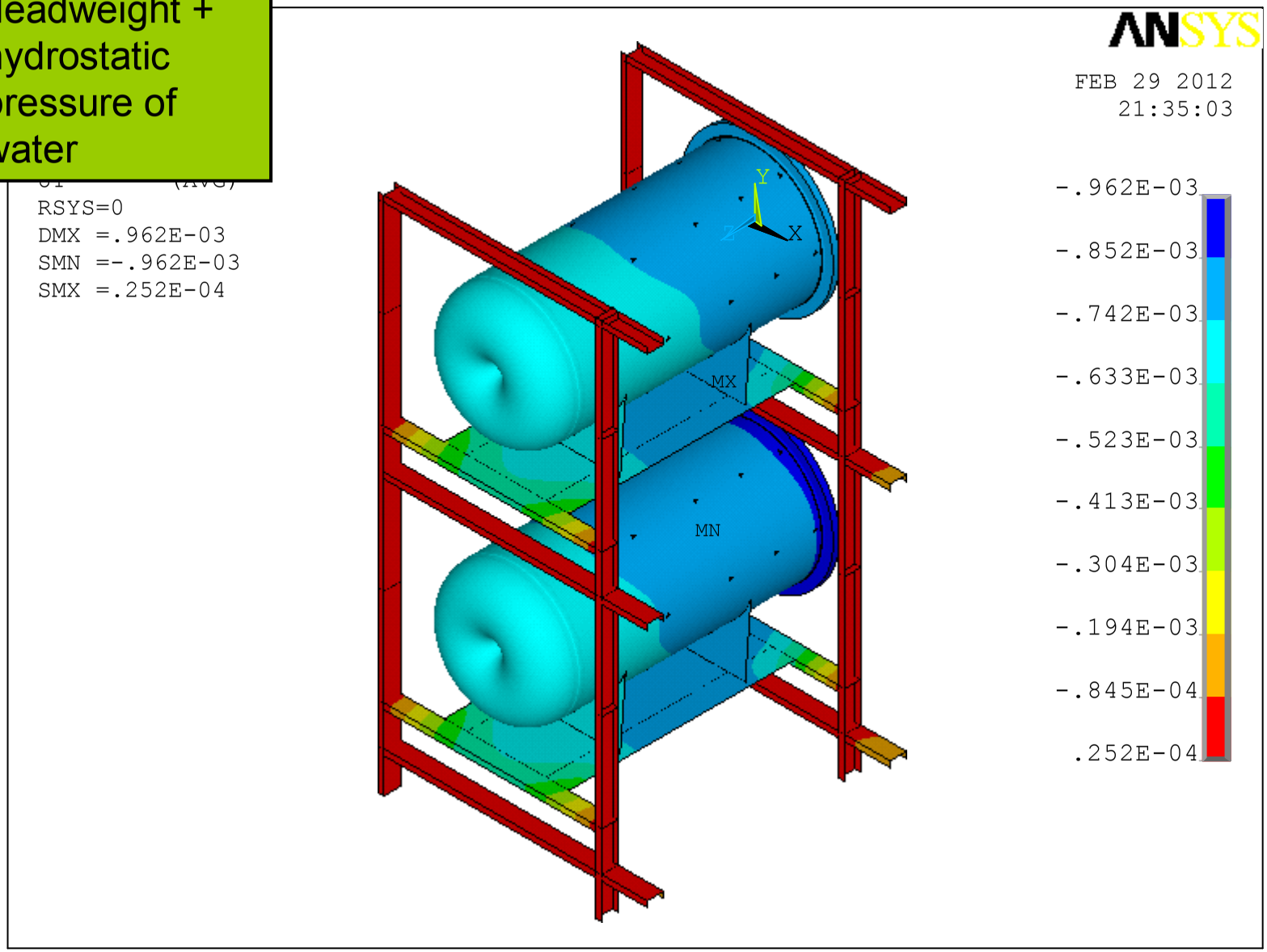
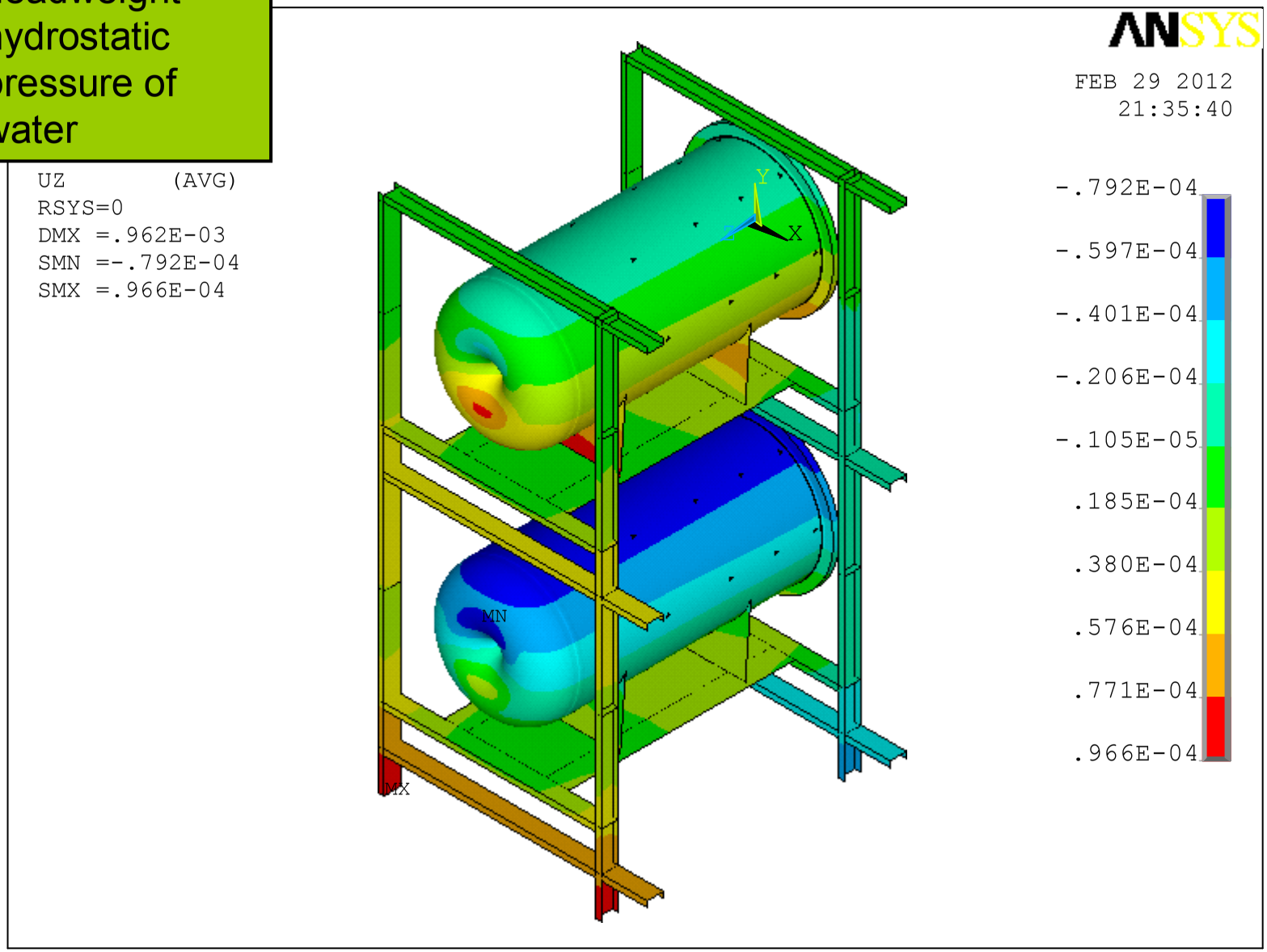


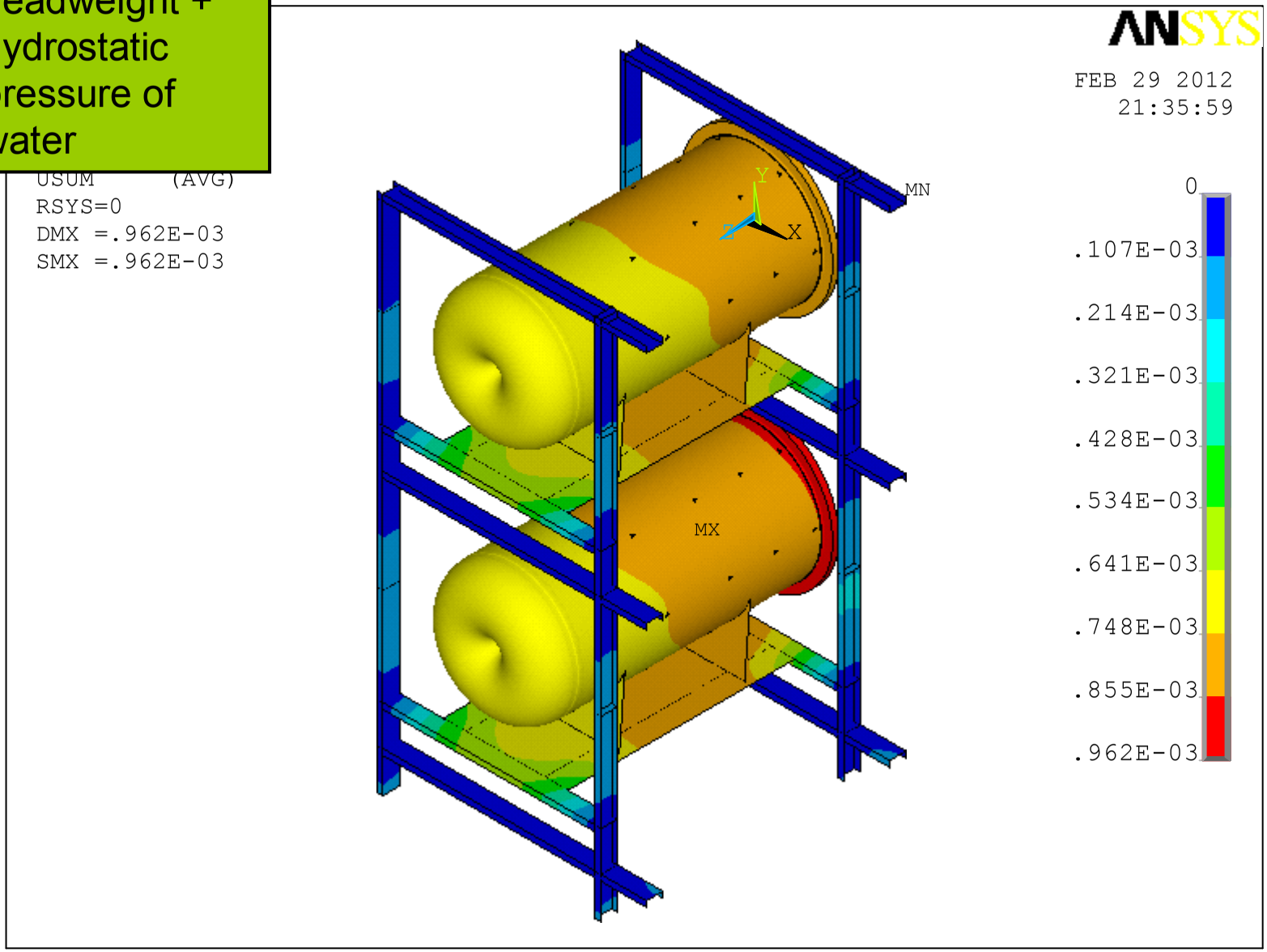
Uy displacement in [*m*]

Loads: deadweight + hydrostatic pressure of water



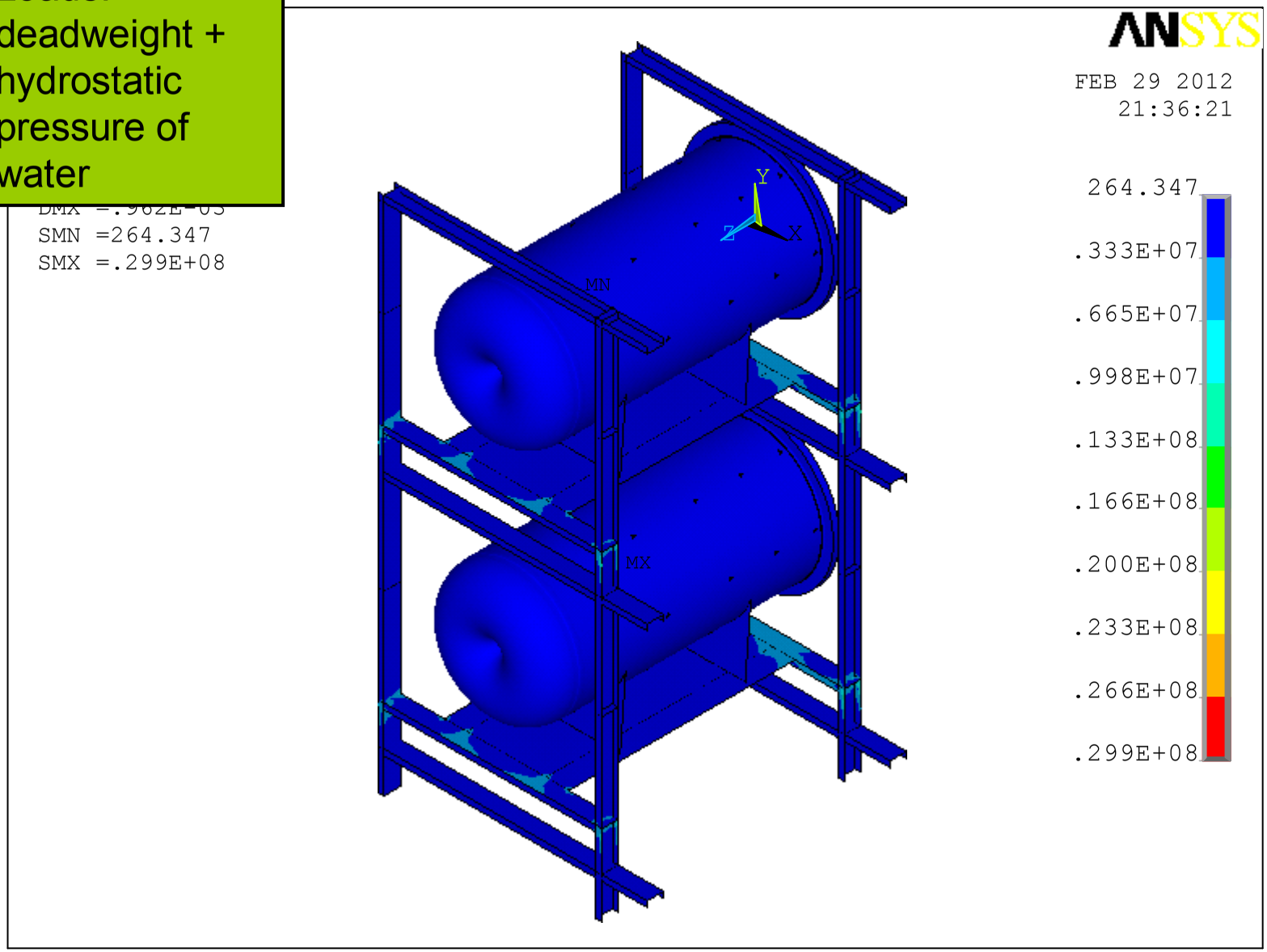
Uz displacement in [*m*]

Loads: deadweight + hydrostatic pressure of water

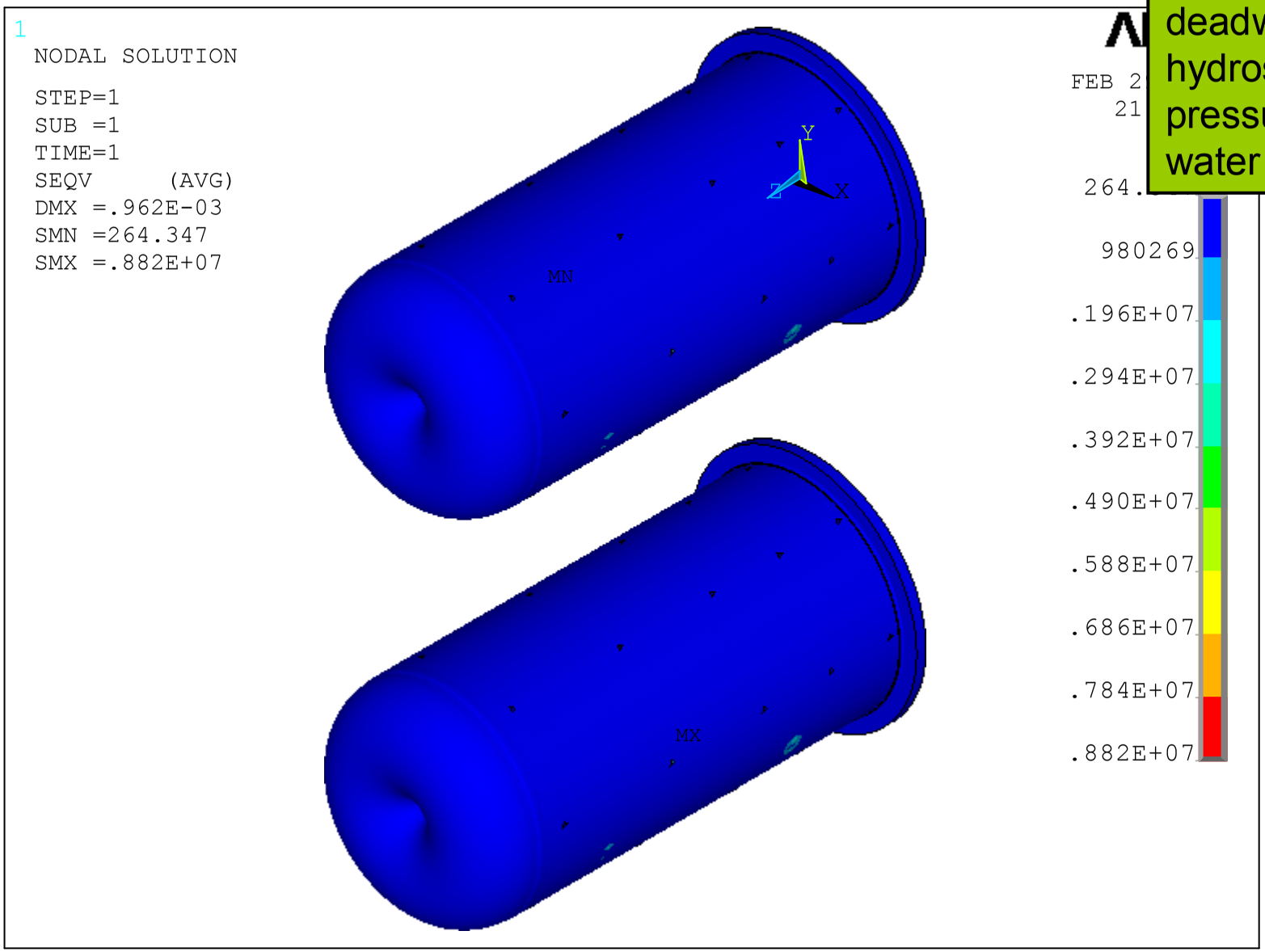


Distribution of displacement vector displacement in [*m*]

Loads: deadweight + hydrostatic pressure of water

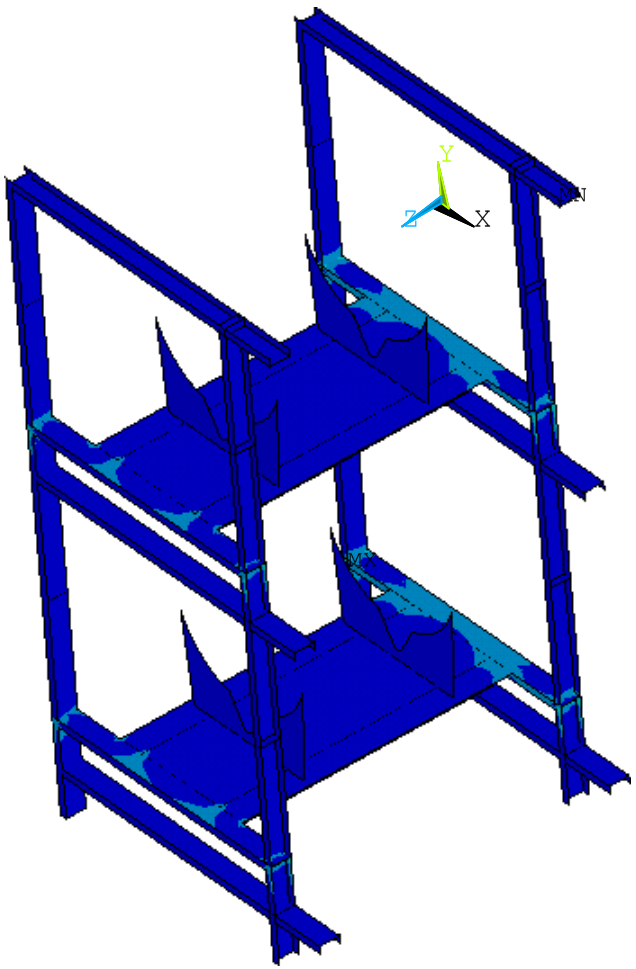


Distribution of equivalent stress in [*Pa*]

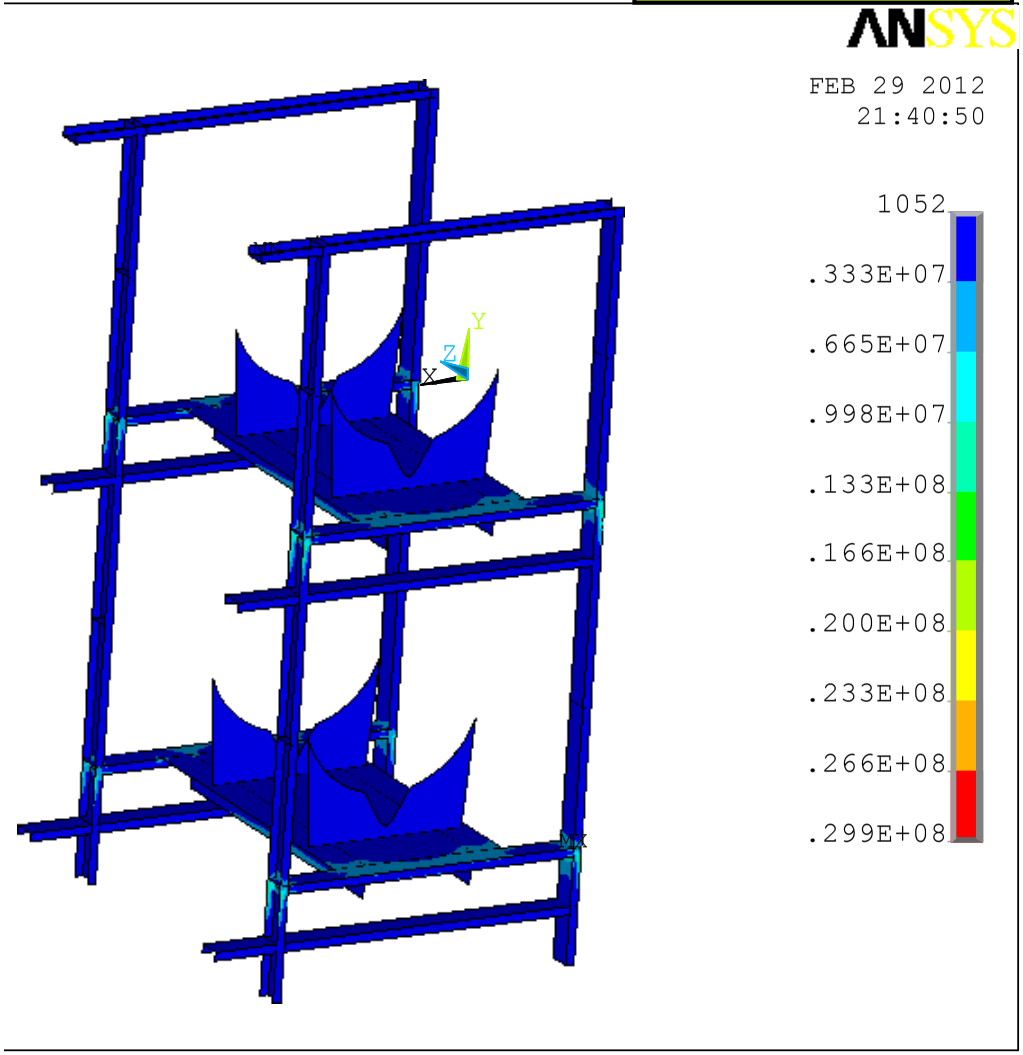


Loads: deadweight + hydrostatic pressure of water

Distribution of equivalent stress in [*Pa*] – only horns are shown

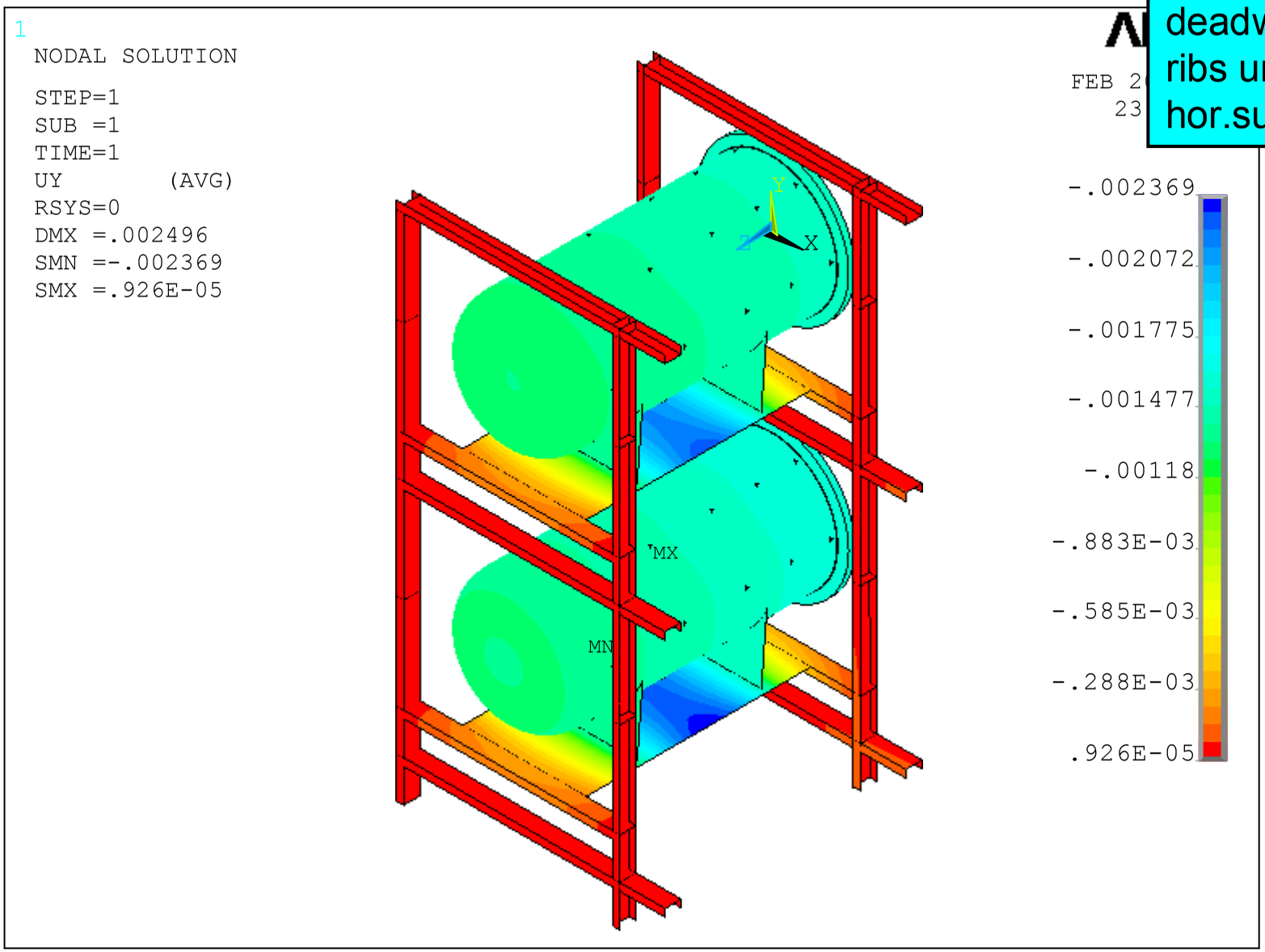


Loads:
deadweight +
hydrostatic
pressure of
water

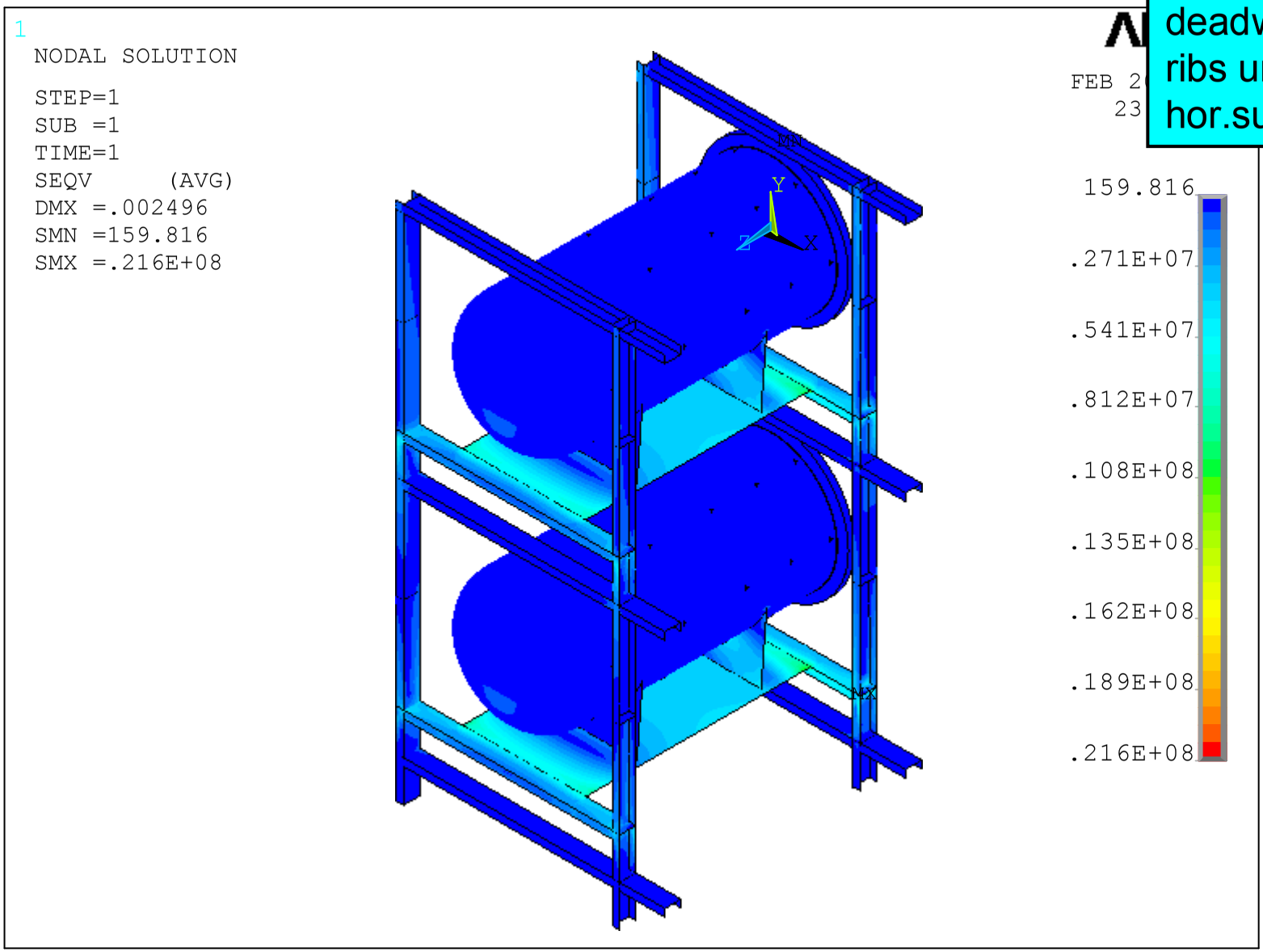


Distribution of equivalent stress in [*Pa*]
– only frames are shown

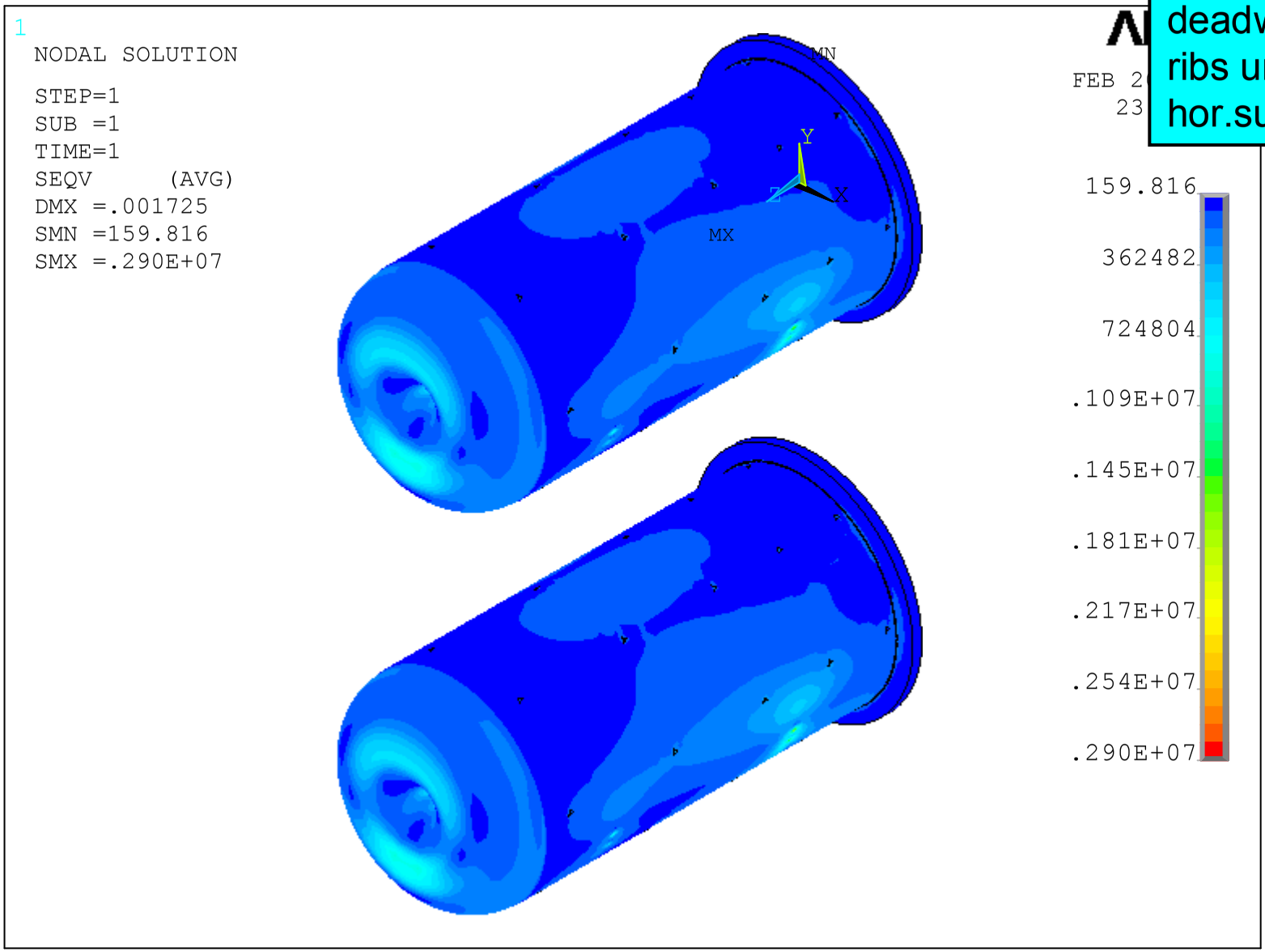
Loads: deadweight no ribs under hor.supp. plate



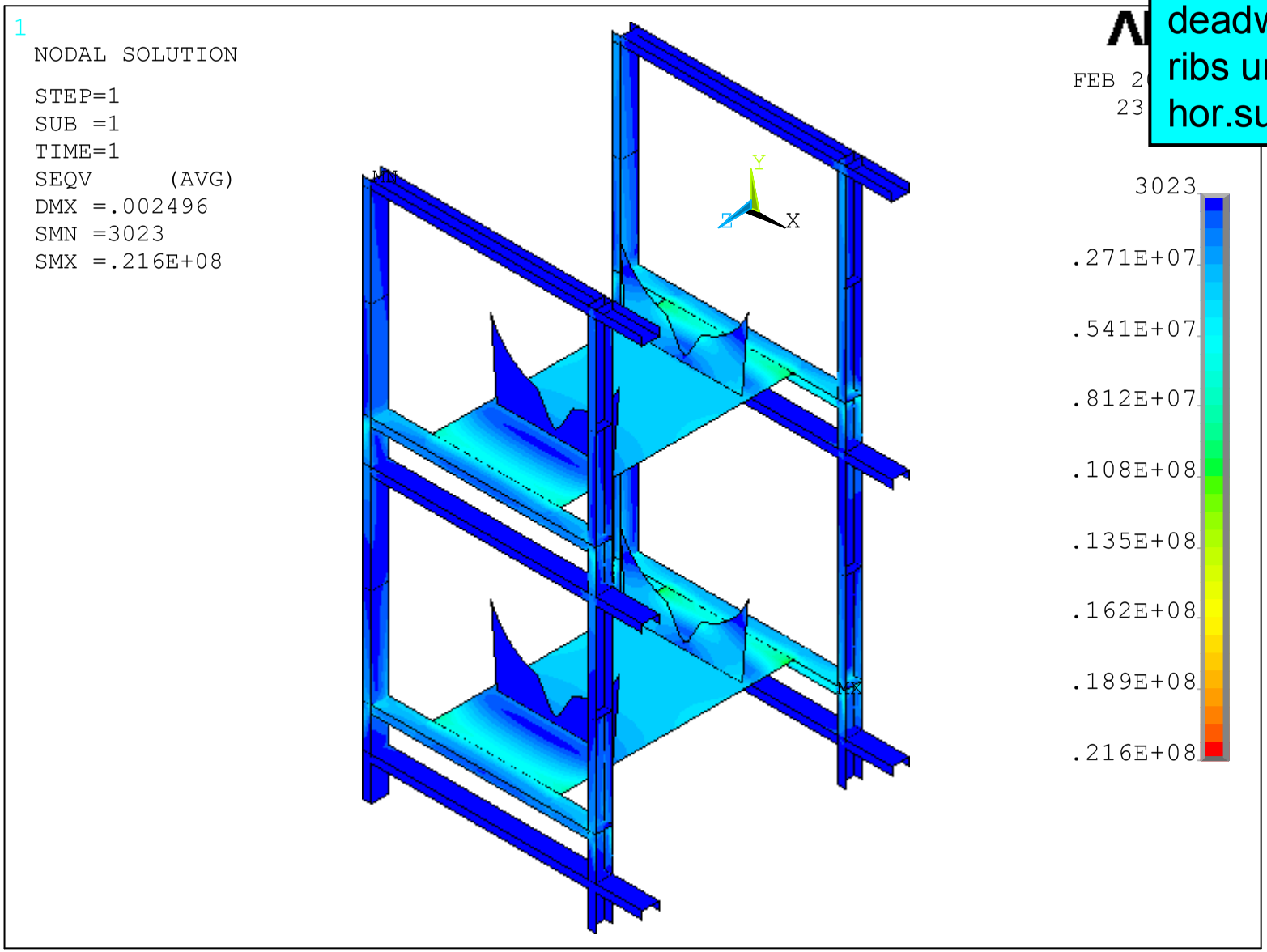
Loads: deadweight no ribs under hor.supp. plate



Loads: deadweight no ribs under hor.supp. plate



Loads: deadweight no ribs under hor.supp. plate

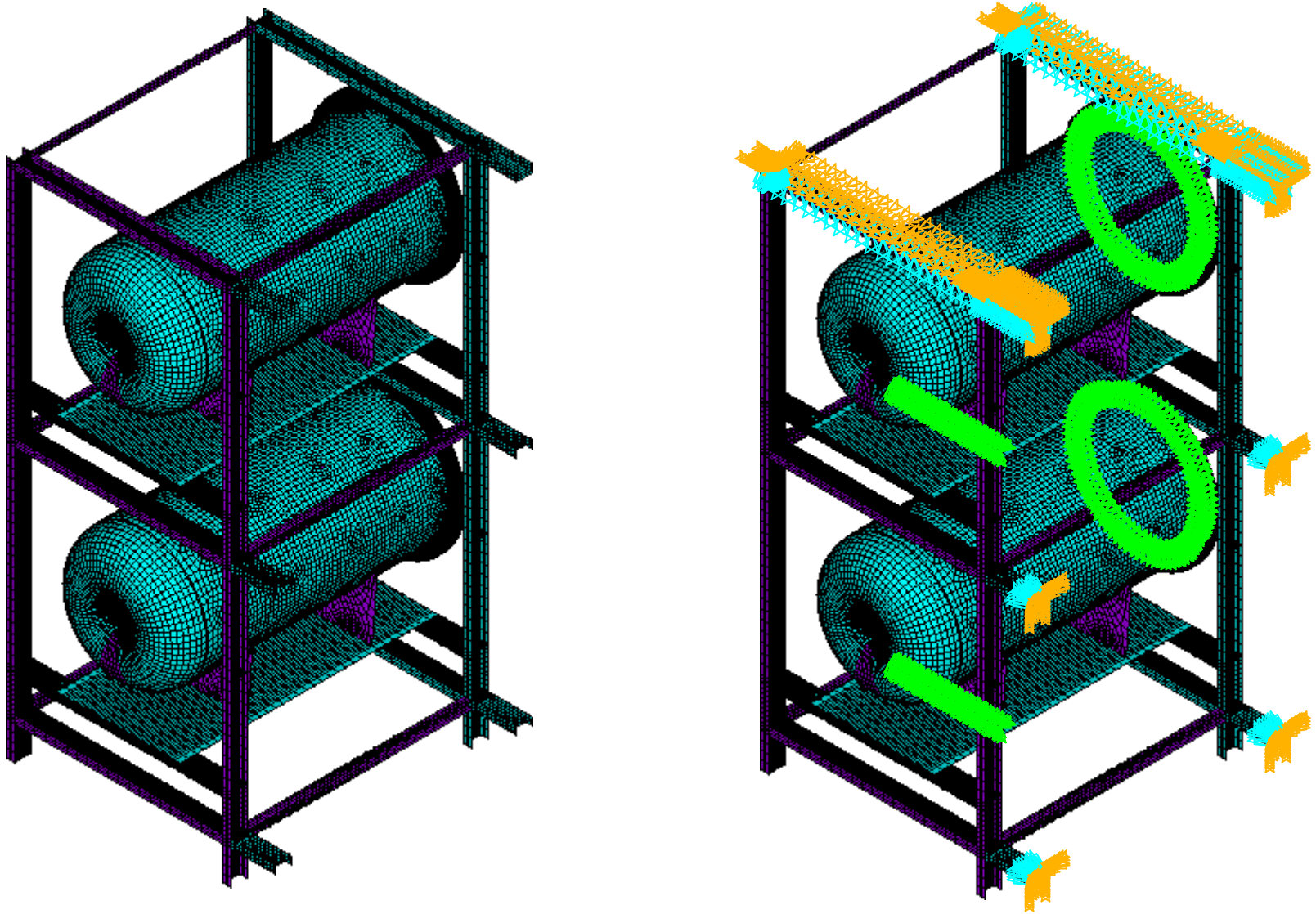


Summary of results for structure without longitudinal spans

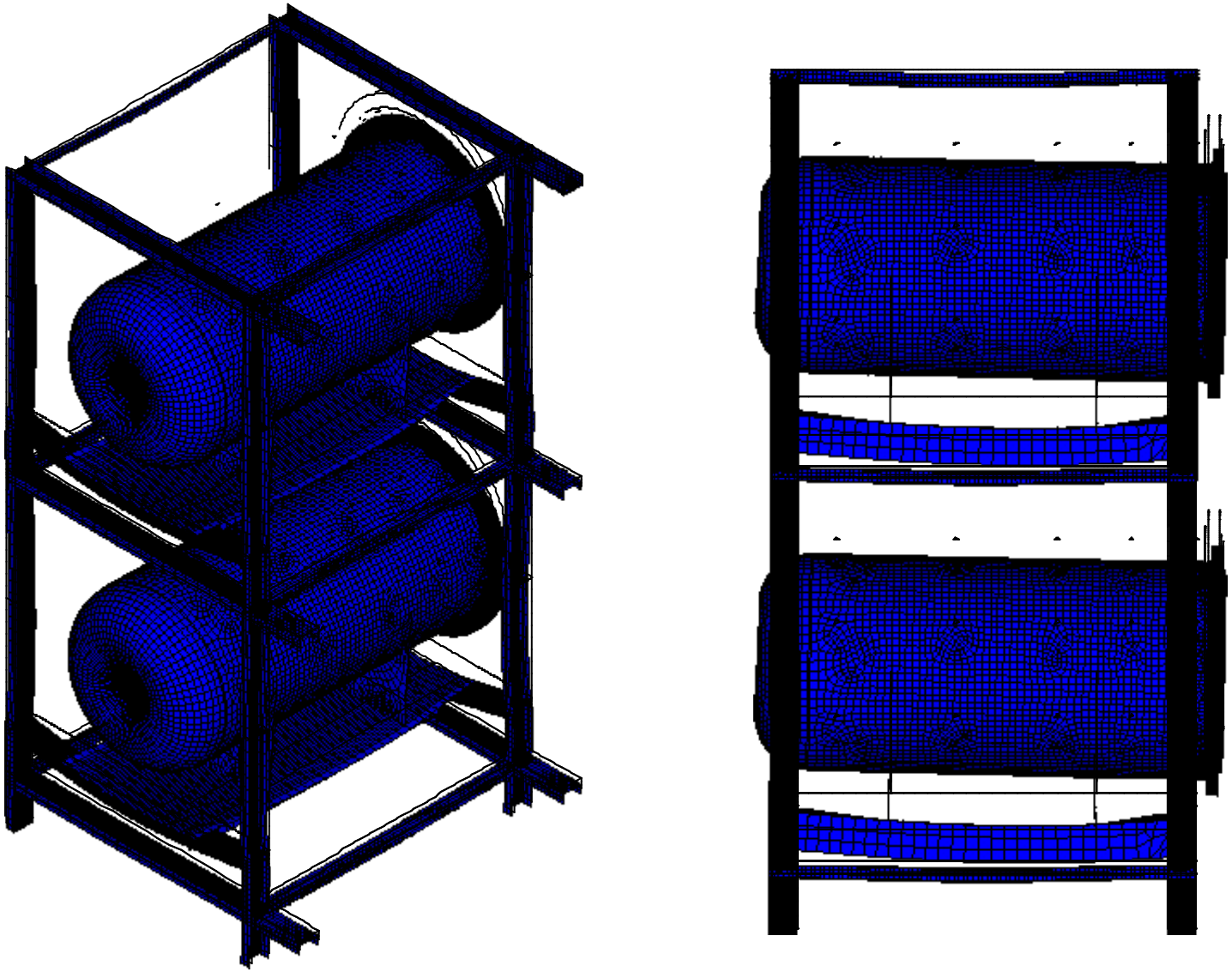
Strucutre, loads	$\|u_y\|_{max}$ *mm*	$\sigma_{eqv,\ max}$ *MPa* (horn)	$\sigma_{eqv,\ max}$ *MPa* (frame)
(plate with ribs), deadweight	0.73	4.4	21.8
(plate with ribs), deadweight + hydrostatic pressure	0.96	8.8	29.9
(plate without ribs), deadweight	2.37	2.9	21.6

Symmetric ½ of structure with ribs, with longitudinal spans, supported on the top,

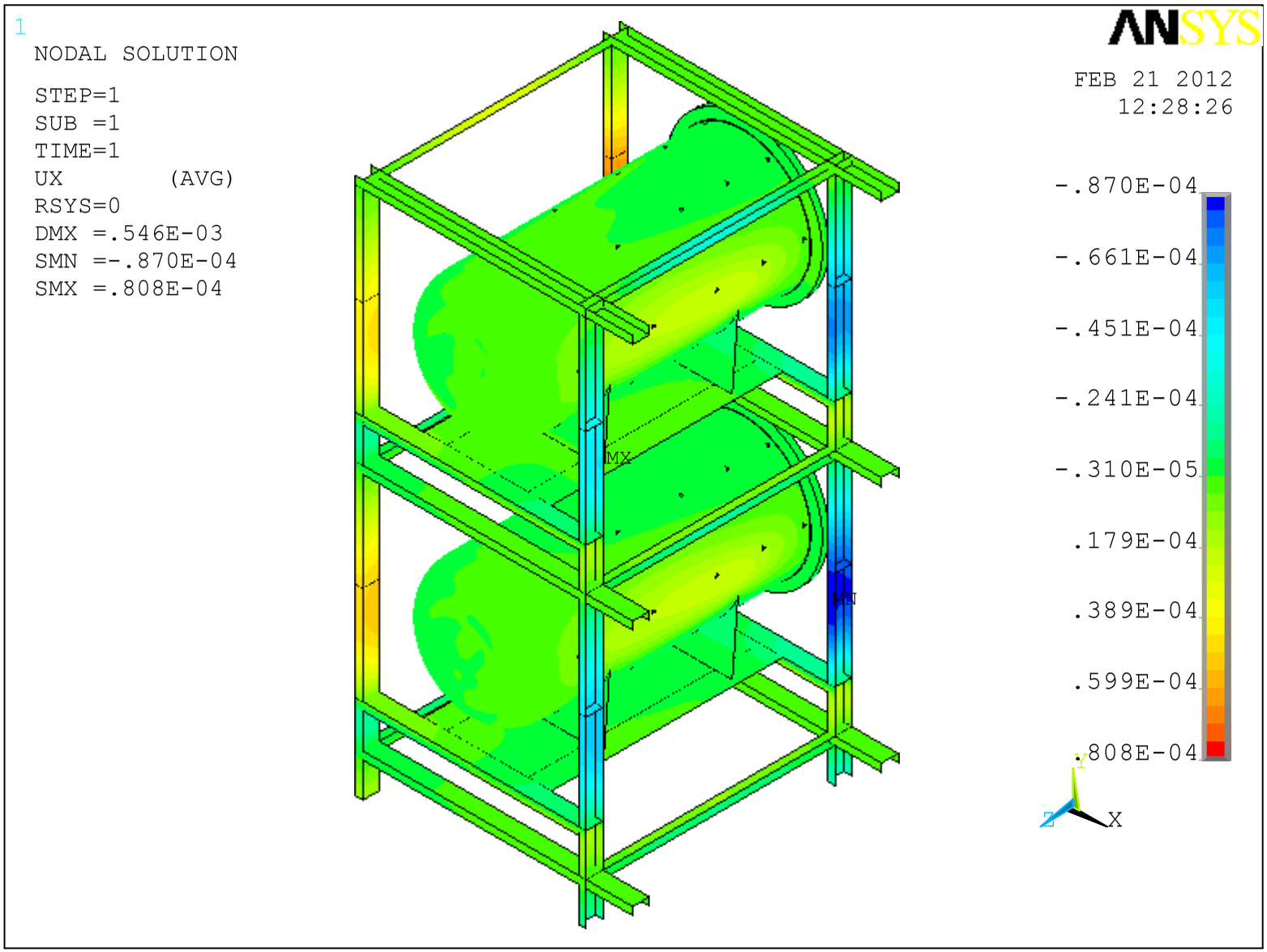
Slides: 33 – 43 (load: deadweight)



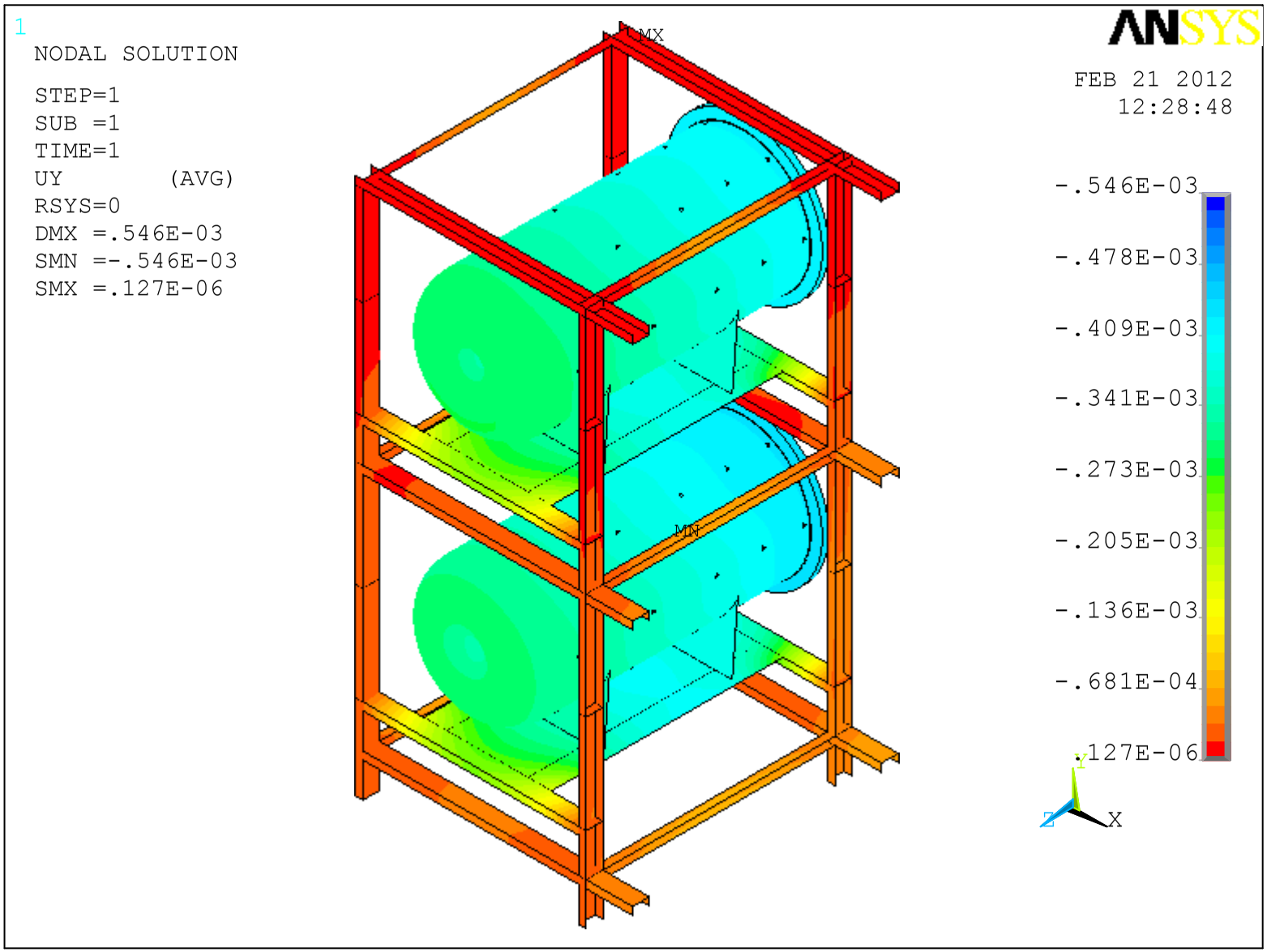
Isometric view of mesh and mesh with boundary conditions introduced



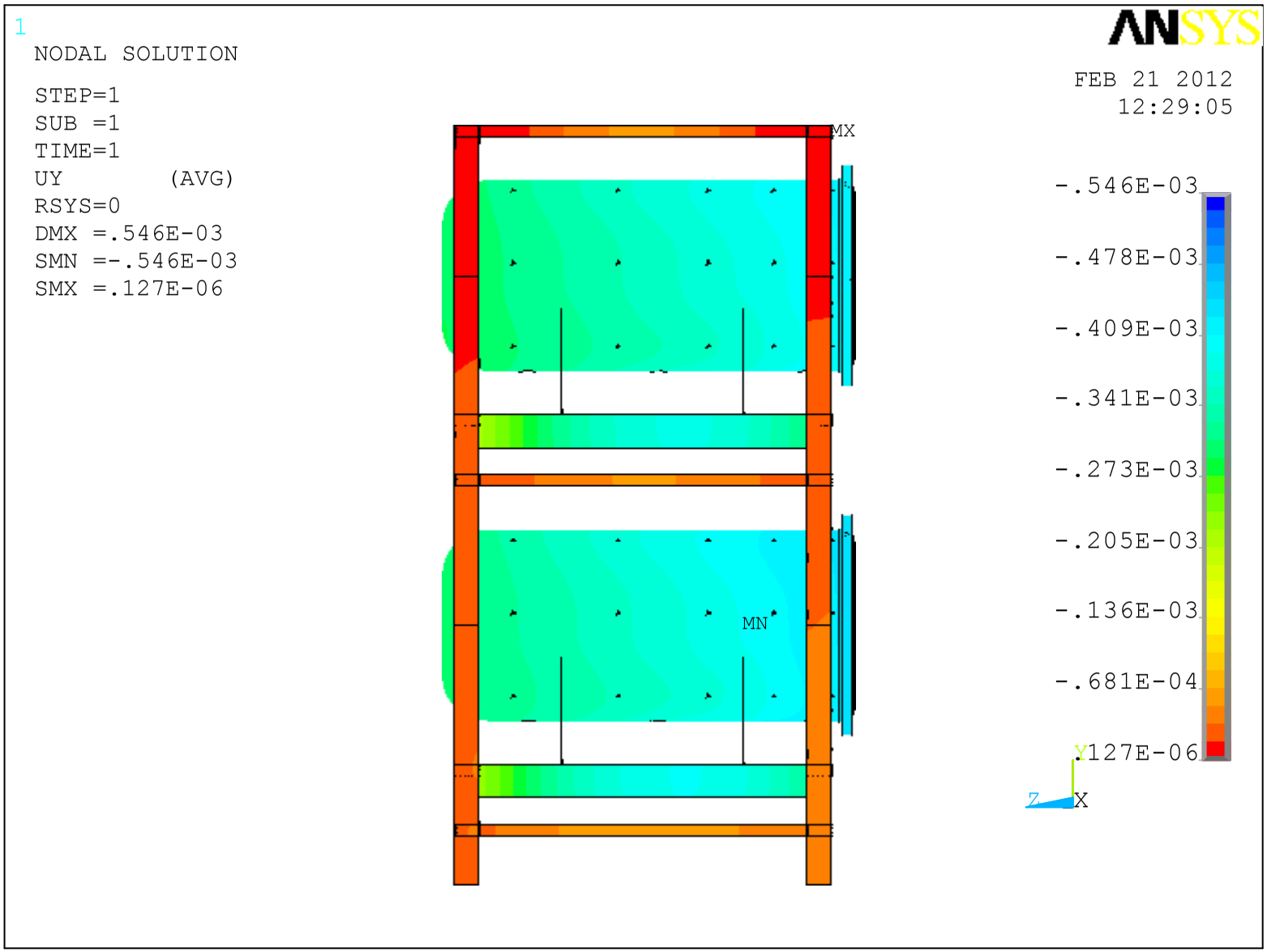
Deformation of structure under deadweight – not to scale drawing



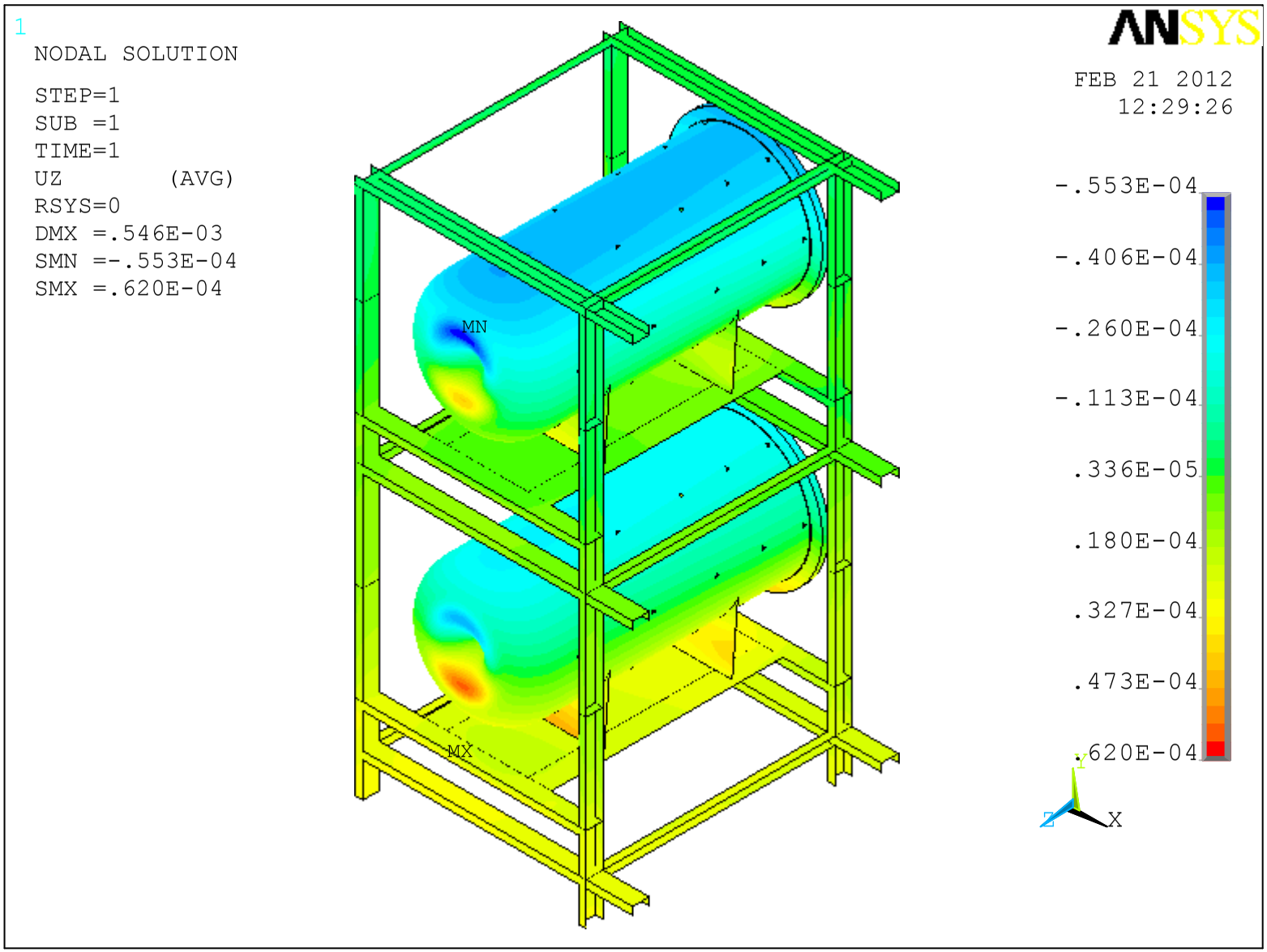
Ux displacement in [*m*]



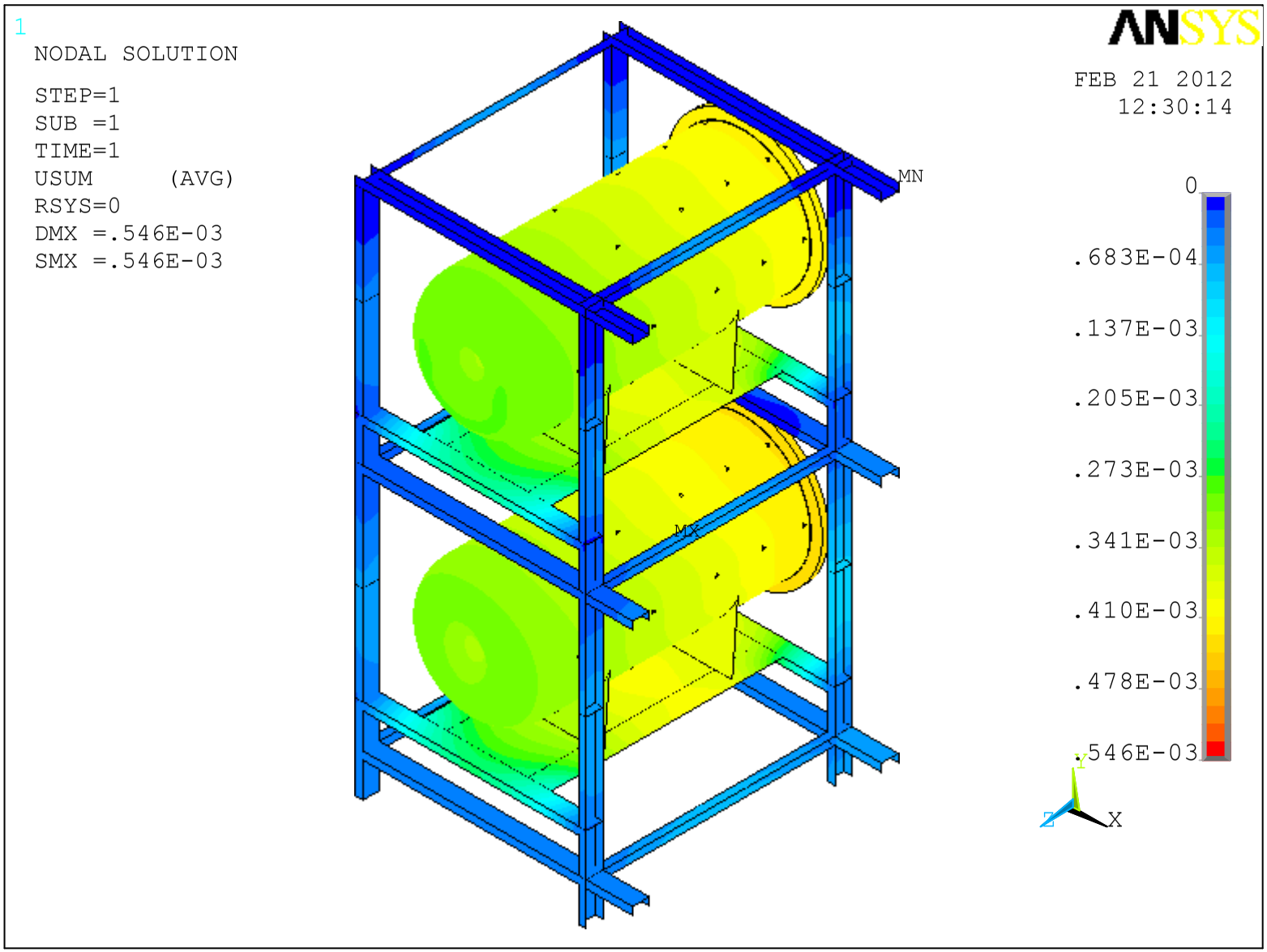
Uy displacement in [*m*]



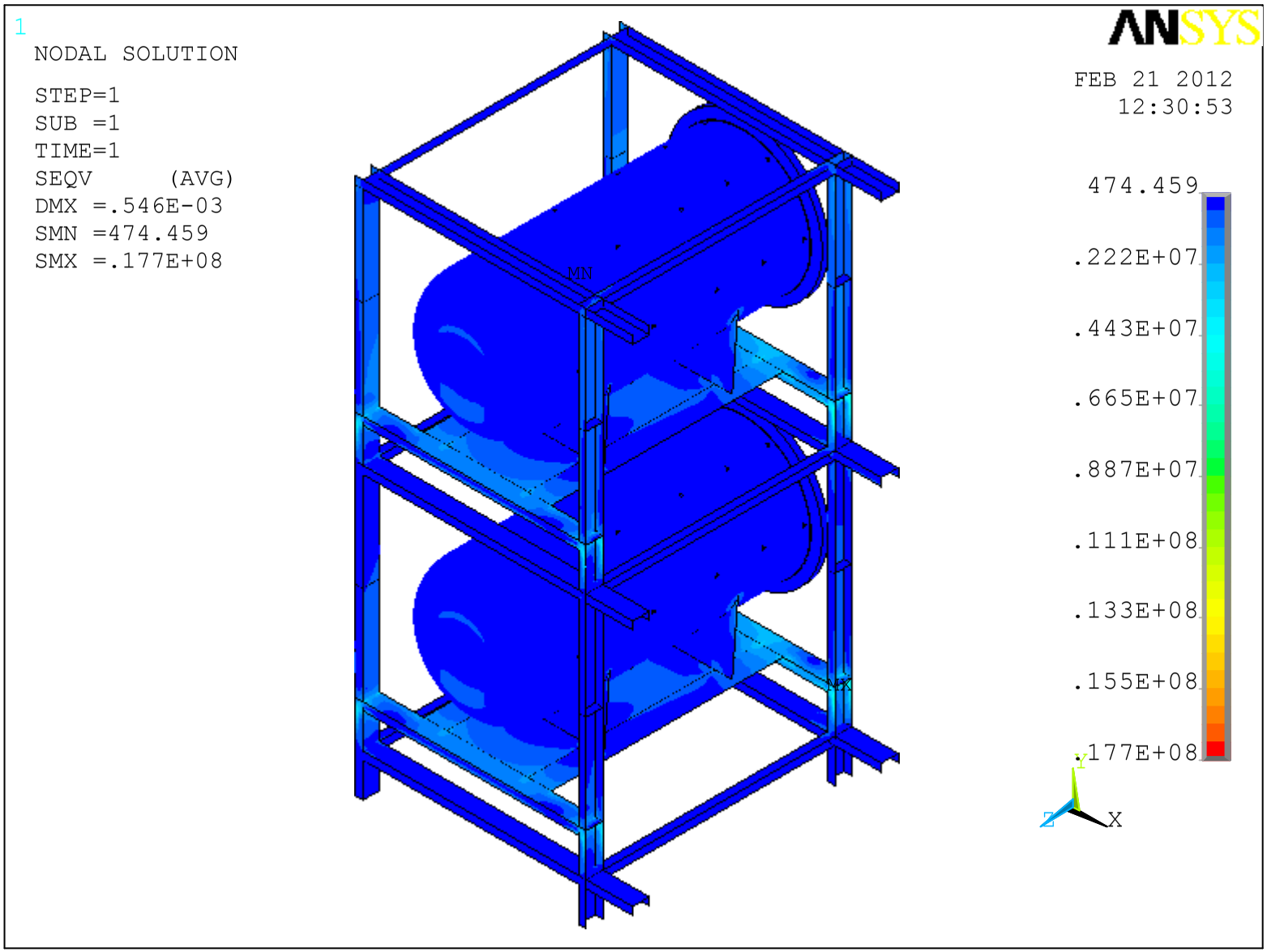
Uy displacement in [*m*]



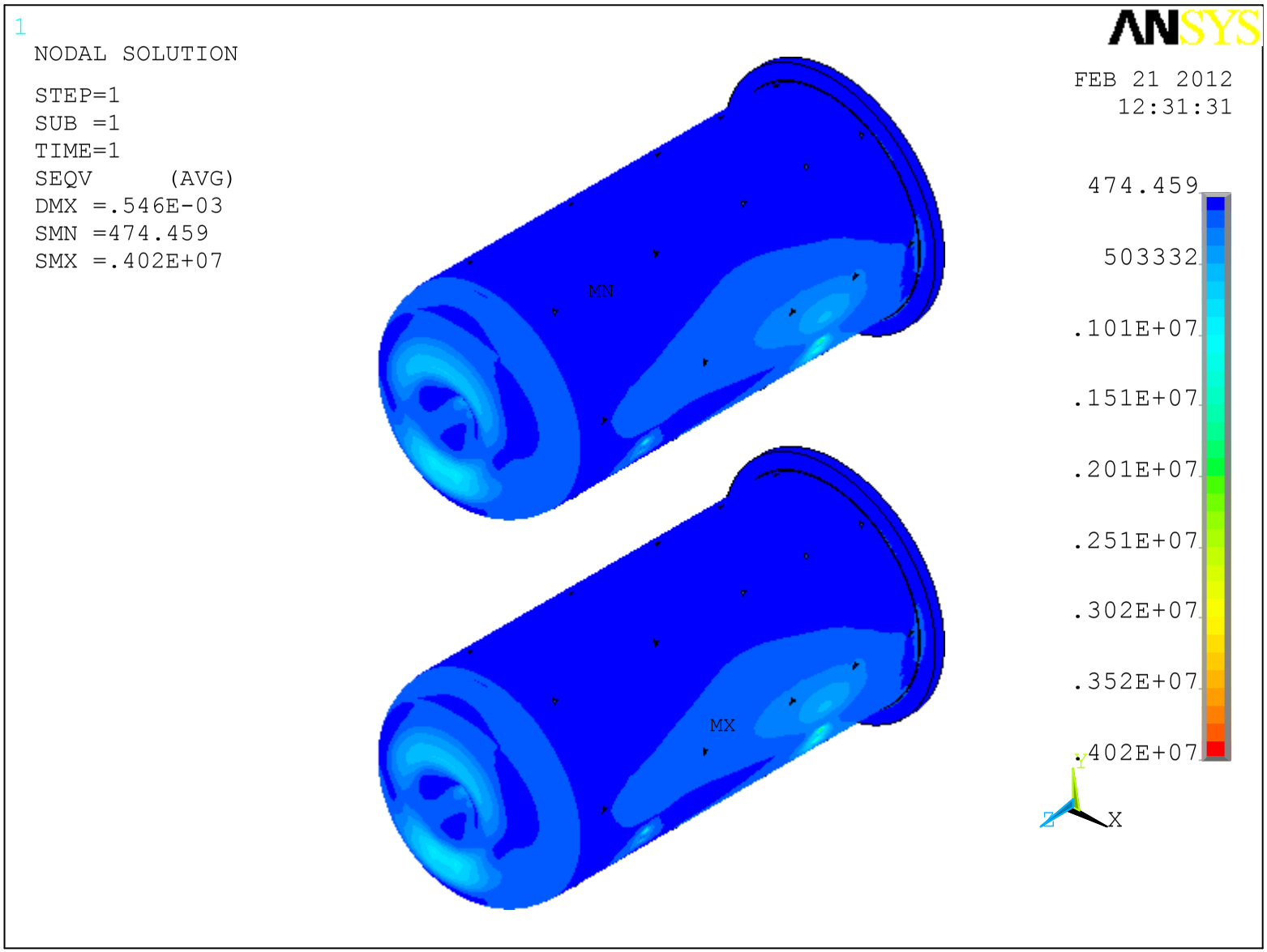
Uz displacement in [*m*]



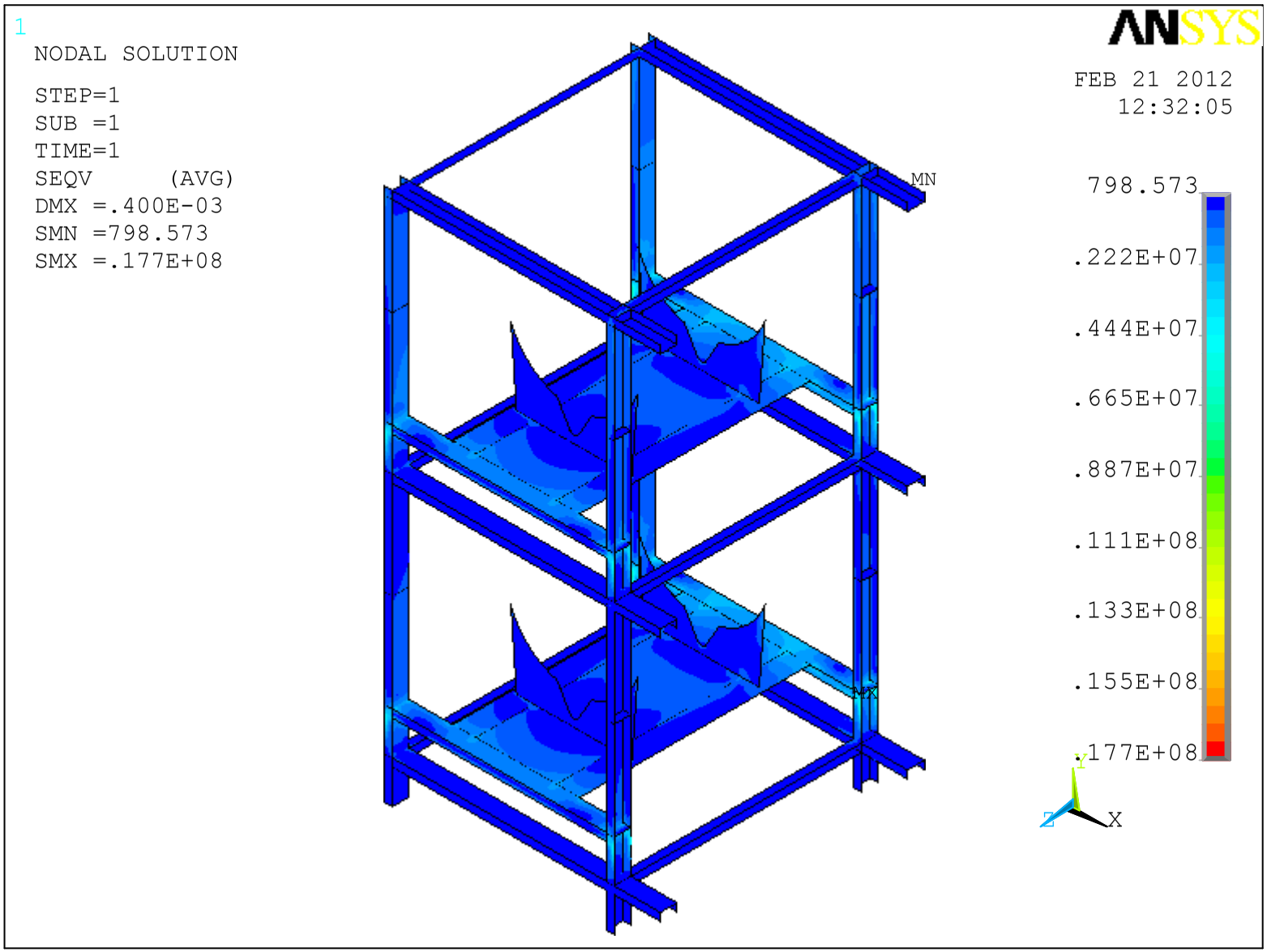
Distribution of displacement vector displacement in [*m*]



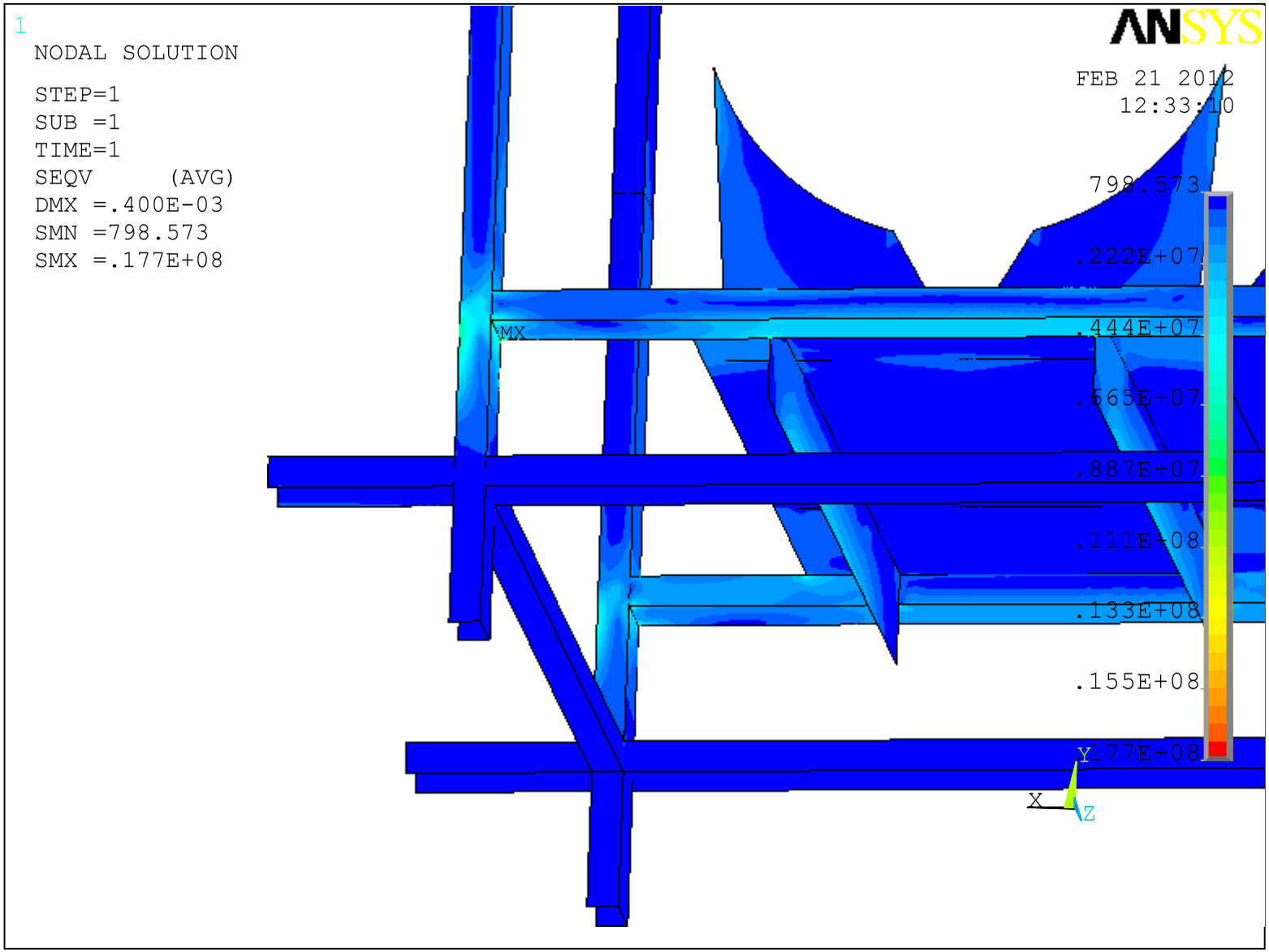
Distribution of equivalent stress in [*Pa*]



Distribution of equivalent stress in [*Pa*] – only horns are shown



Distribution of equivalent stress in [*Pa*] – only frames are shown



Distribution of equivalent stress in [*Pa*] – only frames are shown (opposite view, magnifiction)

Further steps to make:

1.Optimization of thickness for supporting plates and shape optimization for ribs (?)

2. Calculations of natural frequencies for the whole structure (not only symmetric half)

3. Introduction of water frame

4. Introduction of strip line plates

Thank you for your attention