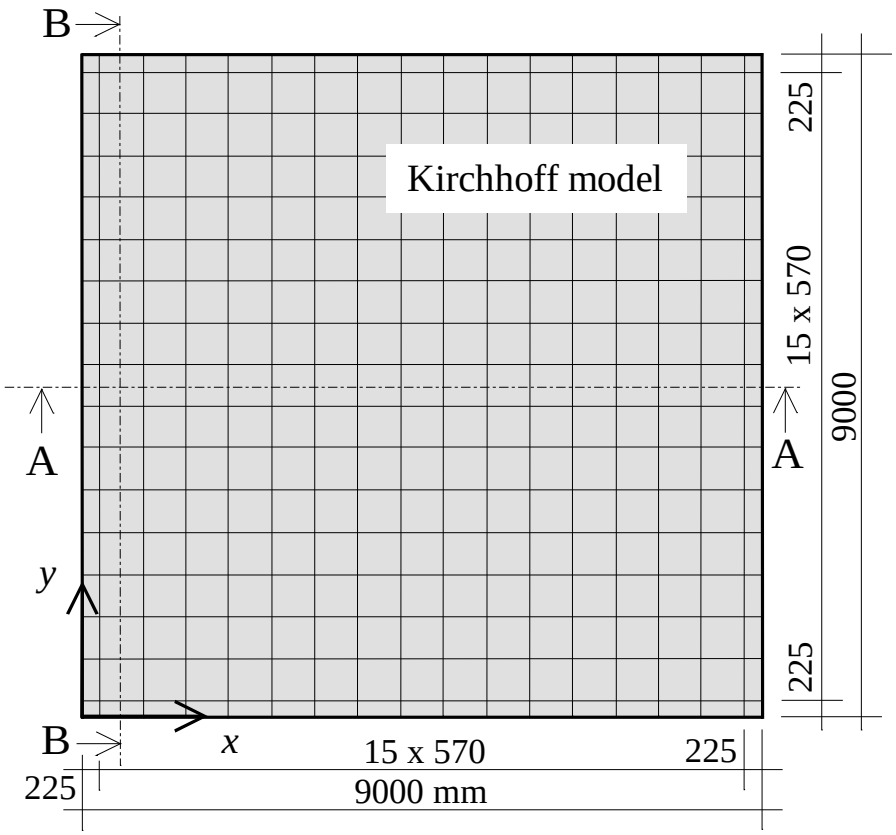
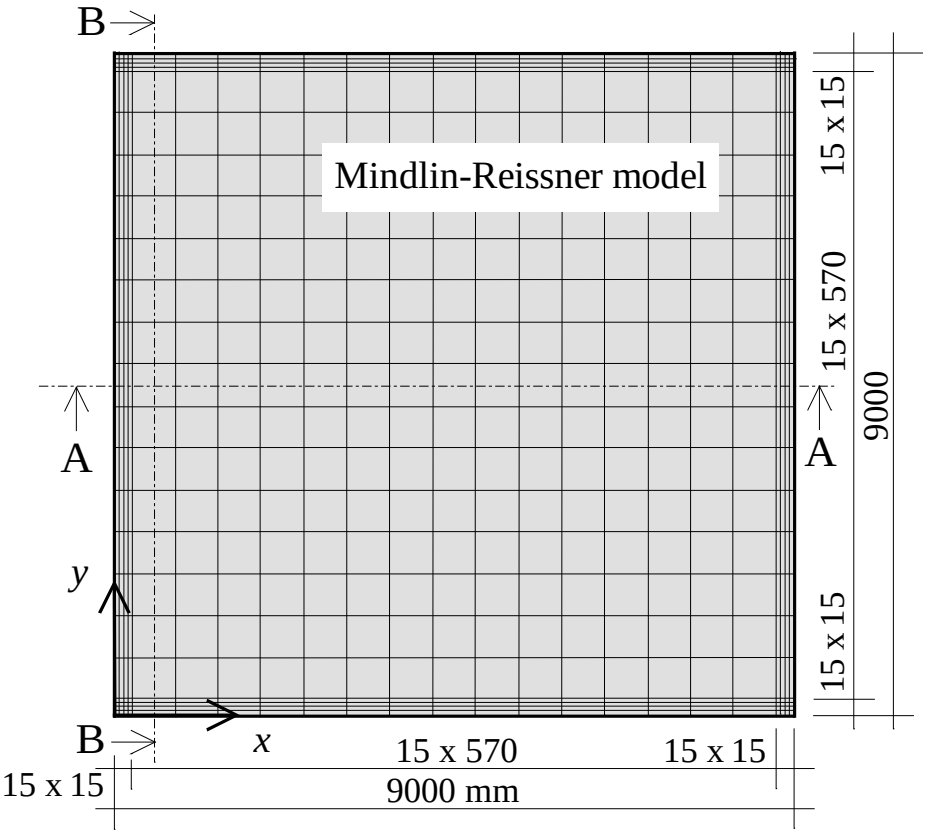
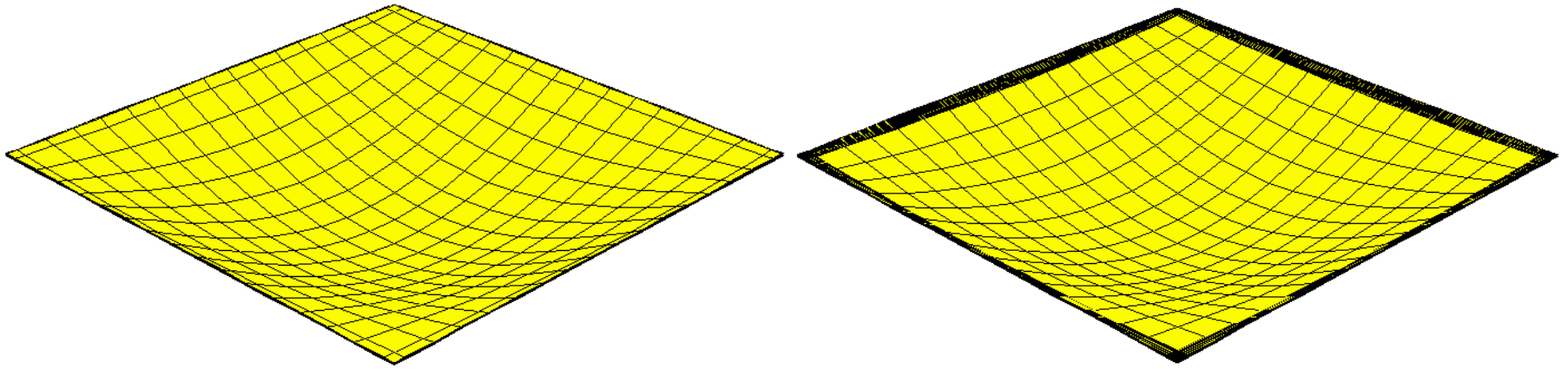
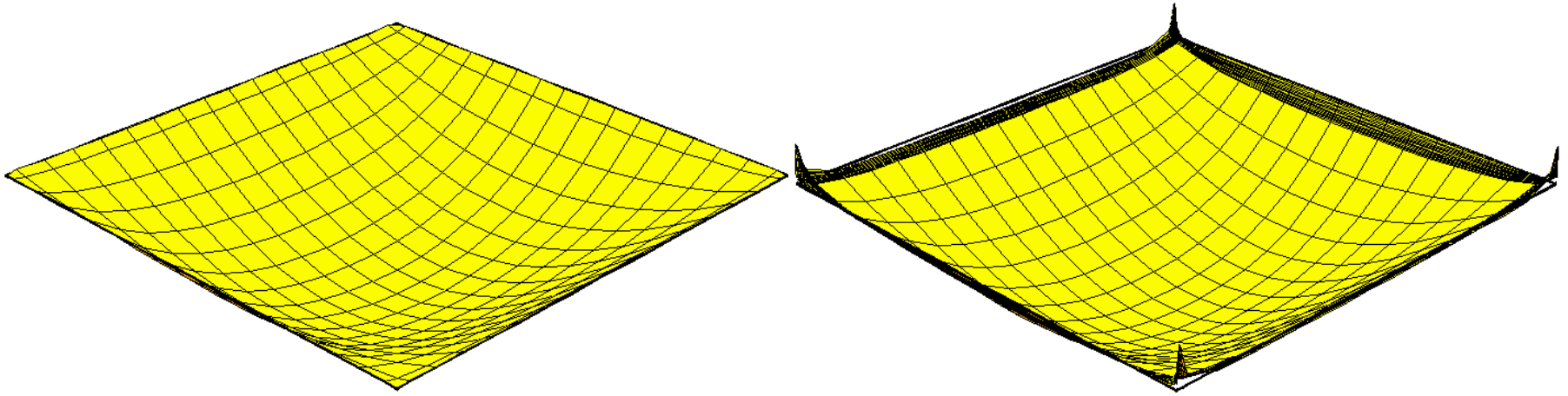
Book Blaauwendraad, blz 283.



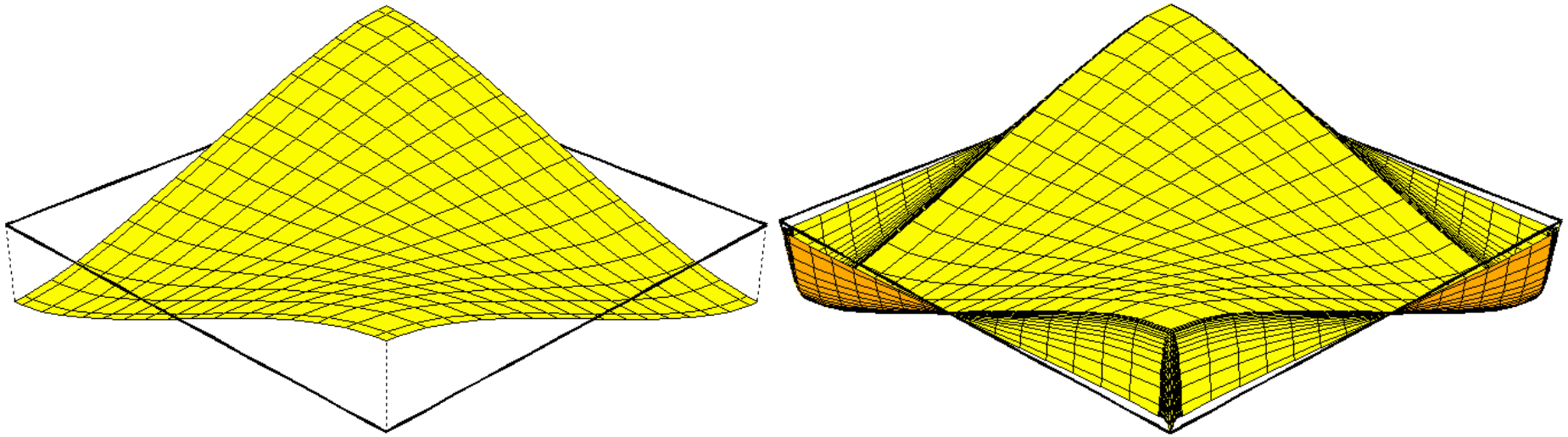




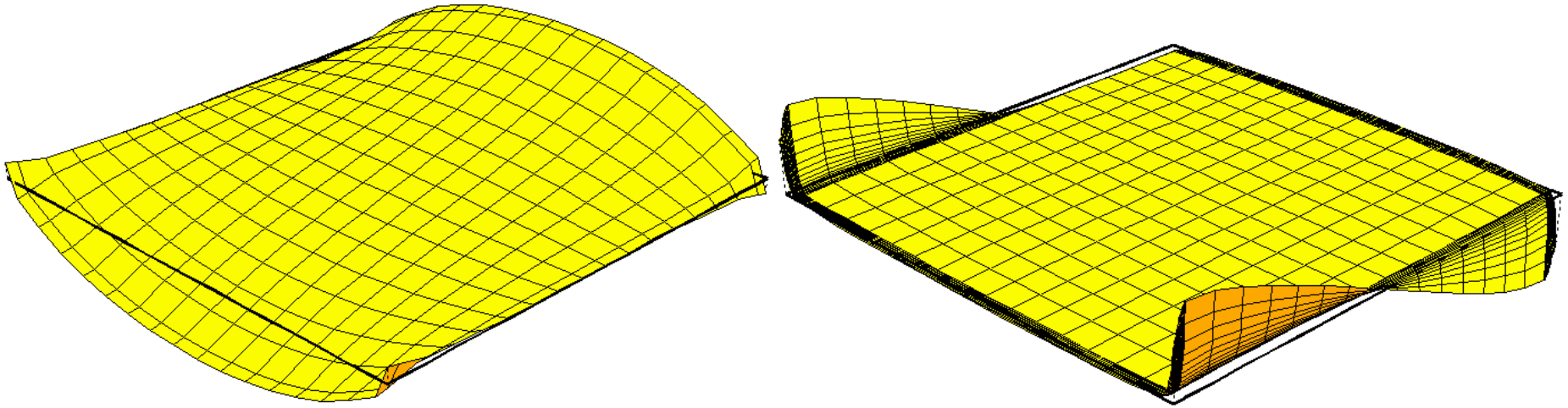
Deflection (3.93 versus 4.02 mm) Thickness is 200 mm



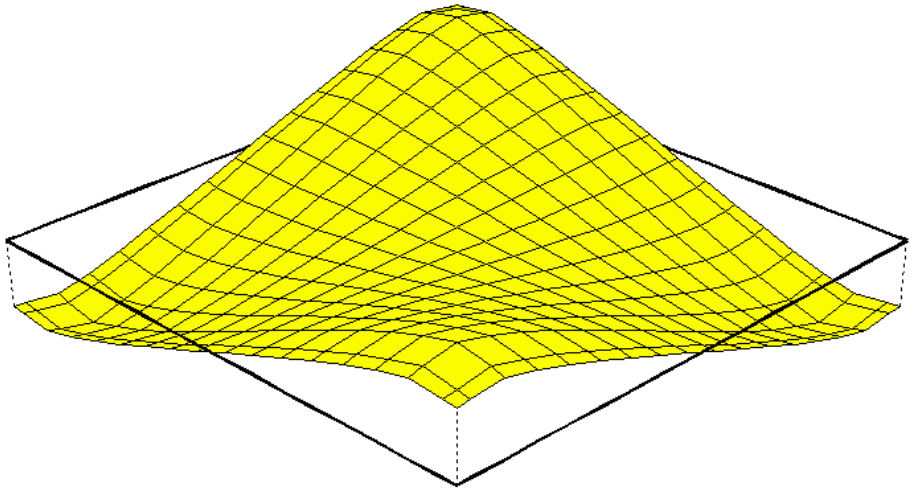
Bending moment m_{xx} (-10.1 versus -10.3 kNm/m) Thickness is 200 mm



Torsion moments m_{xy} (9.69 versus 9.39 kNm/m) Thickness is 200 mm

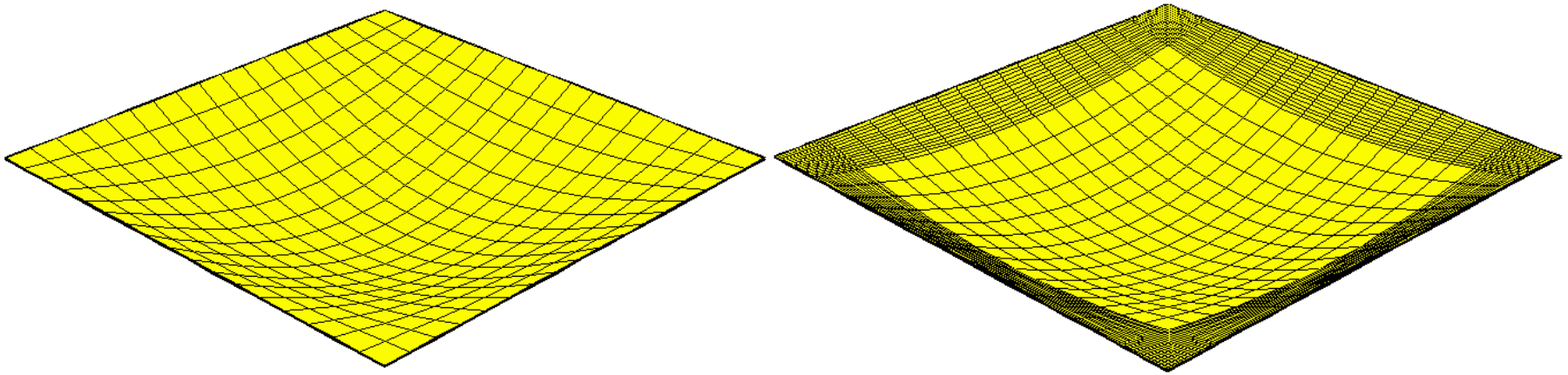


Shear force v_x (8.77 versus 11.53 kN/m) Thickness is 200 mm

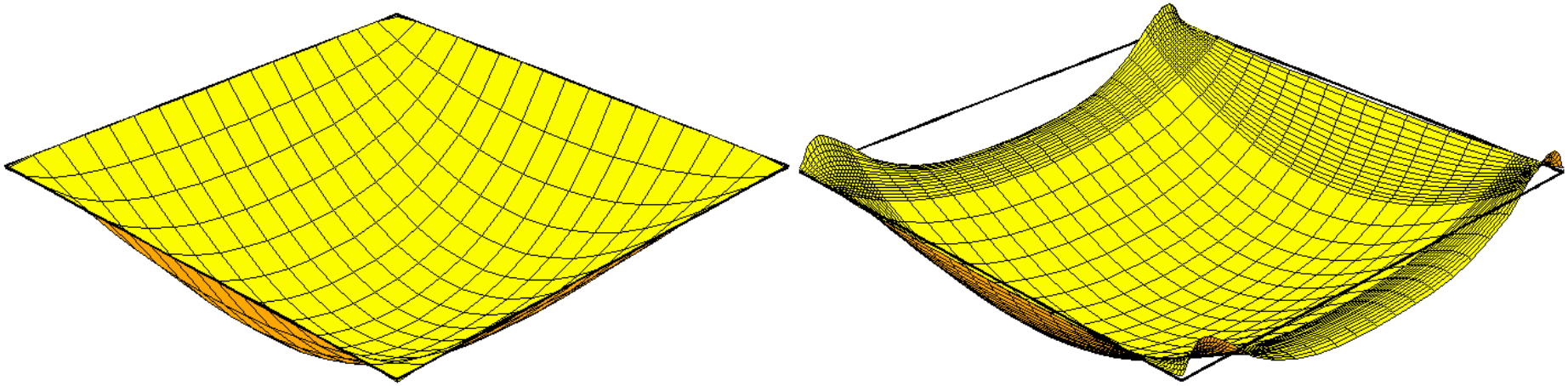


Mindlin-Reissner torsion moment m_{xy} using a course mesh. Thickness is 200 mm.

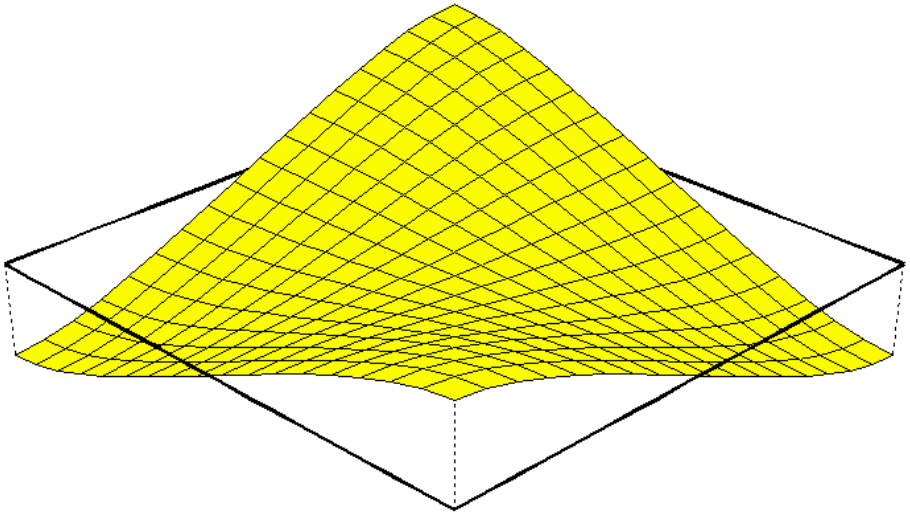
This results is not converged. Converging means going to the right solution when we use smaller and smaller elements. So, not converged means that the elements are not small enough to compute the right result. (The right result is shown above.)

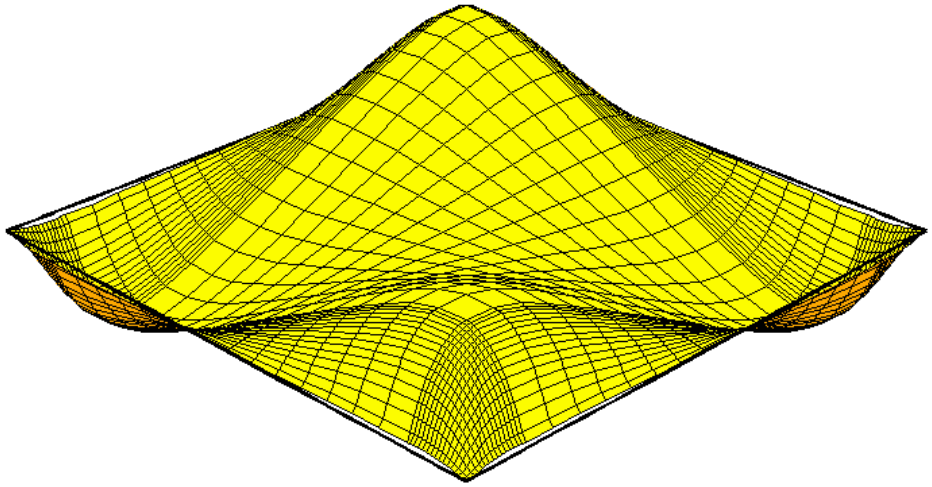


Deflection (0.00276 versus 0.00401 mm) Thickness is 2250 mm

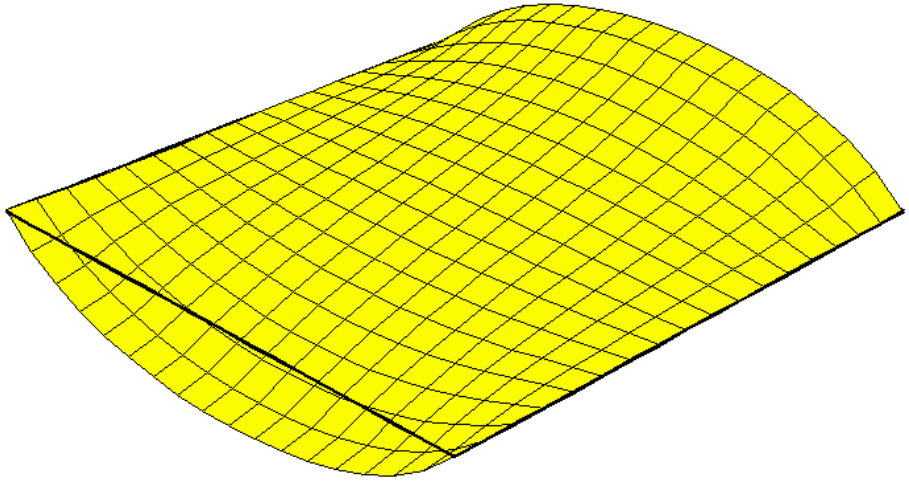


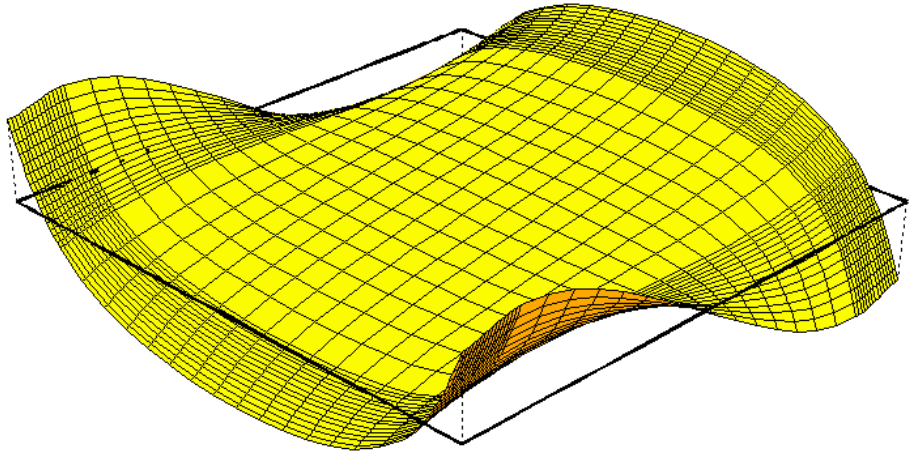
Bending moment m_{xx} (-10.2 versus -11.9 kNm/m) Thickness is 2250 mm





Torsion moments m_{xy} (9.28 versus 6.87 kNm/m) Thickness is 2250 mm





Shear force v_x (7.73 versus 12.1 kN/m) Thickness is 2250 mm

Conclusions

- Use the Kirchhoff plate theory for thin plates.
  Use element widths and lengths of approximately two times the plate thickness.
  Smaller elements do not change the results.

- Use the Mindlin-Reissner plate theory for thick plates.
  Use element widths of approximately 1/10 of the plate thickness at the edges.

- Some software only support the Mindlin-Reissner plate theory.
  You may need to use this software for a thin plate and face the following trilemma.
  - You can use very small elements throughout the plate and wait during the long computation time.
  - You can use very small elements but only at the edges and spend a lot of time on creating an acceptable mesh.
  - You can use an element size of two times the plate thickness and accept that the results depend on the element size. You will have discussions with other engineers who compute different results for the same plate.