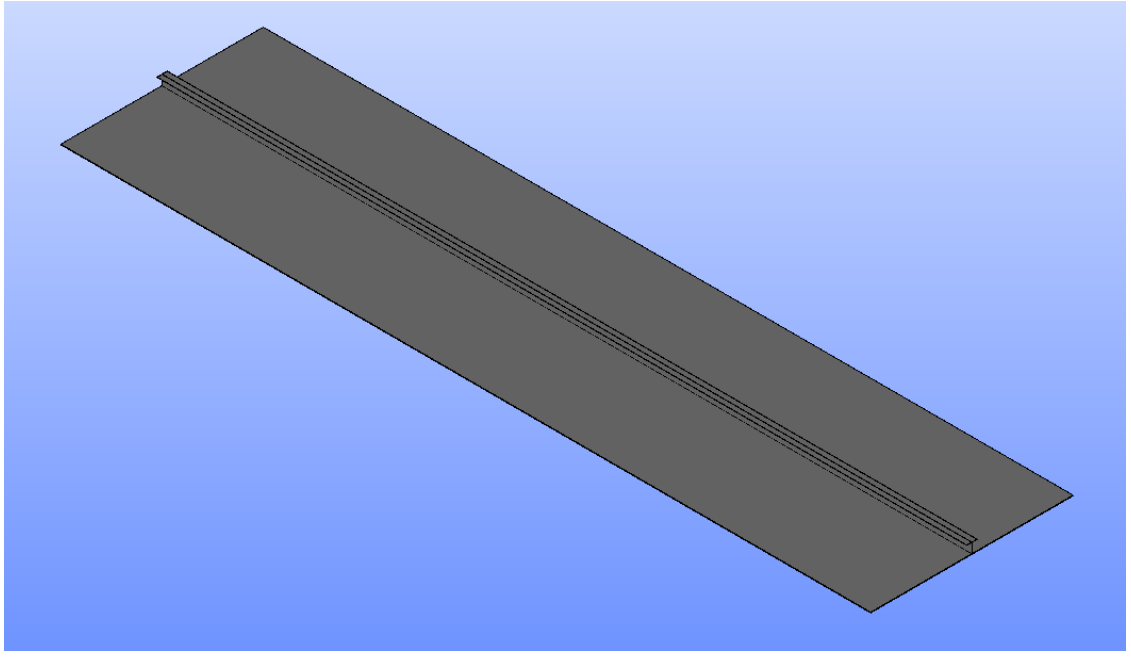
# Validate ShellSolver with Beams

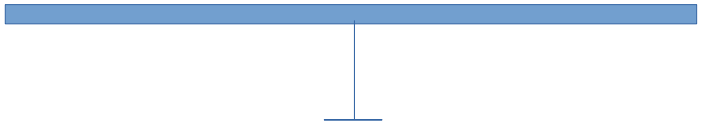
Model a plate with shell elements with a stiffener using beam elements



A 12 m long plate, 3 m wide plate
With a center beam stiffener,
.3 m deep subjected to a total
lateral load of 100 N/m along the
length.

Problem is modeled as a beam
only with BeamSolver and
Then with ShellSolver modeling
the plate as shells and the stiffener
as a beam.

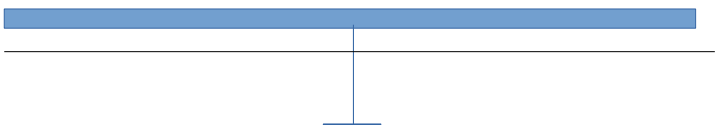
Modeling approach BeamSolver
In BeamSolver the plate and stiffener is modeled as a beam with a cross section



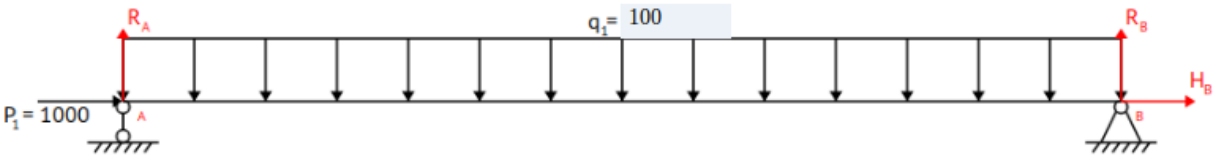
In ShellSolver the plate is model with a shell and the stiffener as a beam element.

Since there is not a neutral axis offset of a beam element the cross section of the beam element is effectively the same as the above

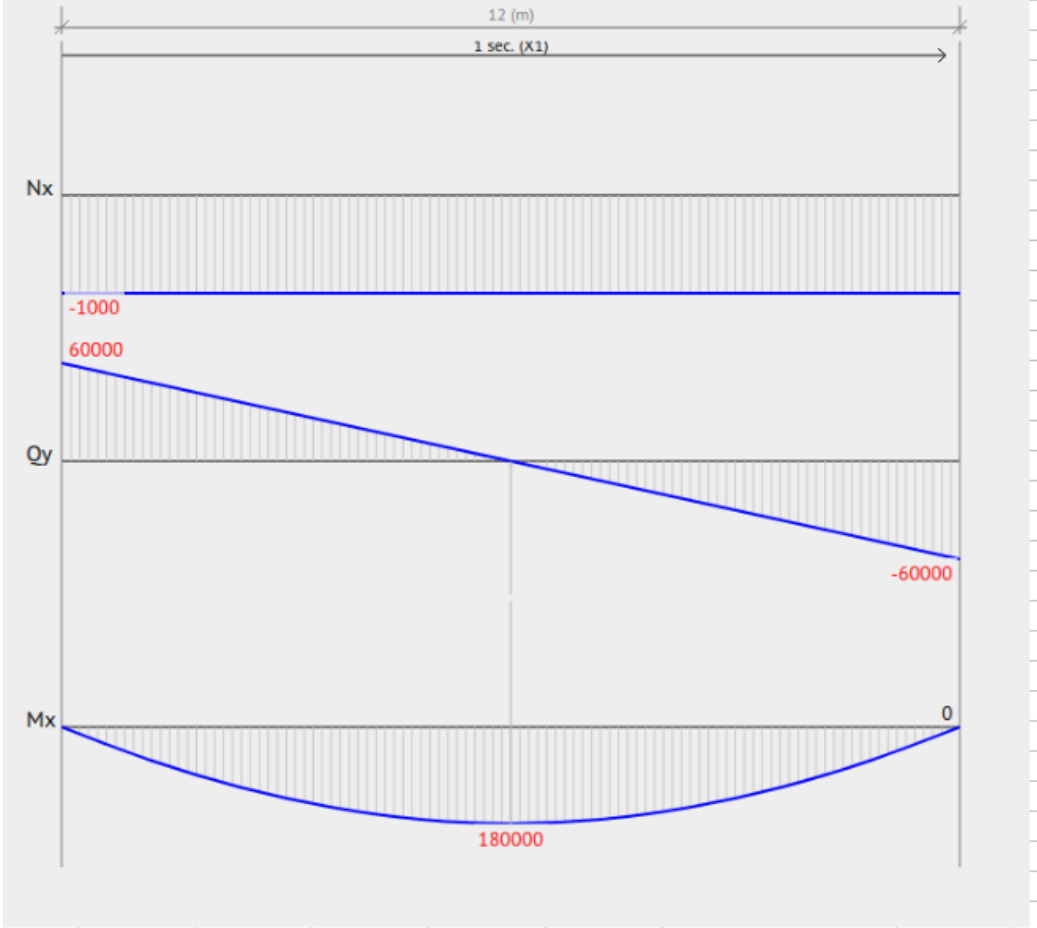
The plate adds little stiffness to the bending but will dominate axial loading

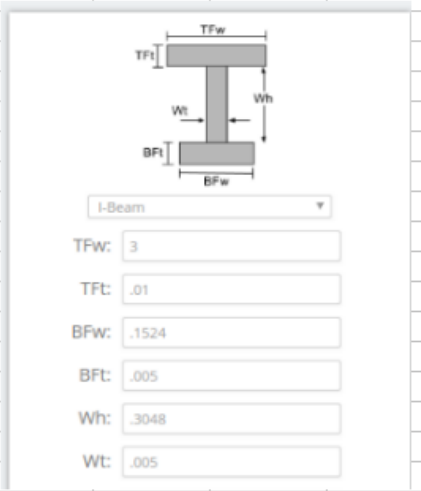


Shell is modeled at the neutral axis and will not be significant to lateral bending but will provide in plane stiffness and can be loaded with pressure loads. The area of the stiffener can be reduce by the area of the plate, to get the area correct.
This is known as the “Hybrid Method” and actually works better than an offset beam element.




| | |
|---|---|
| Tfw | 3.0000 |
| Tft | 0.0100 |
| Bfw | 0.1524 |
| Bft | 0.0050 |
| Wh | 0.3048 |
| Wt | 0.0050 |




# Deflection using bending only neglecting shear flexibilty

| | | |
|---|---|---|
| Bending Deflection | 0.011997 | Meter |

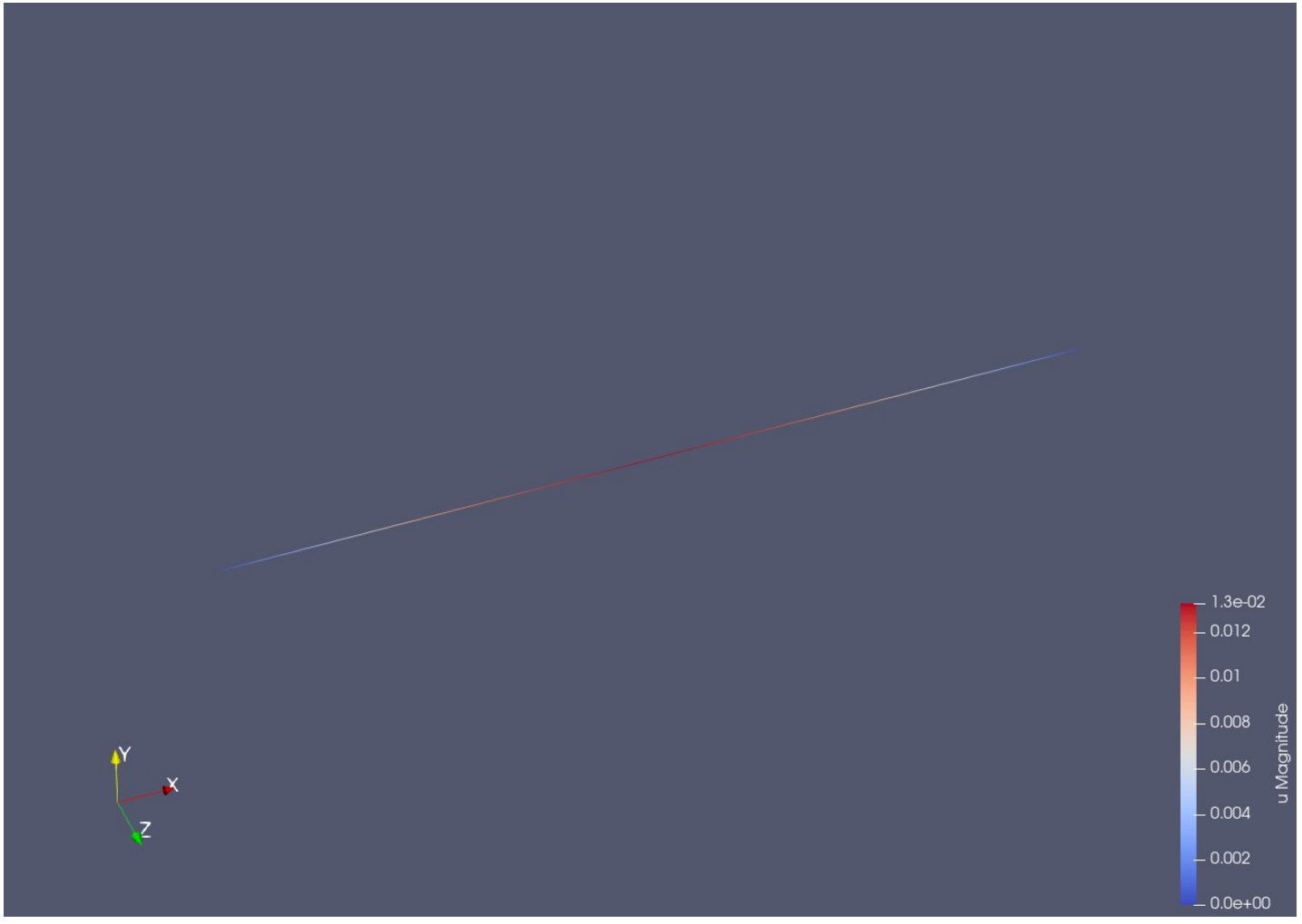
| | |
|---|---|
| Section properties | |
| Area | 0.018040 |
| I1 | 0.011253 |
| I2 | 0.000168 |
| J | 2.33E-07 |

600 -600 V

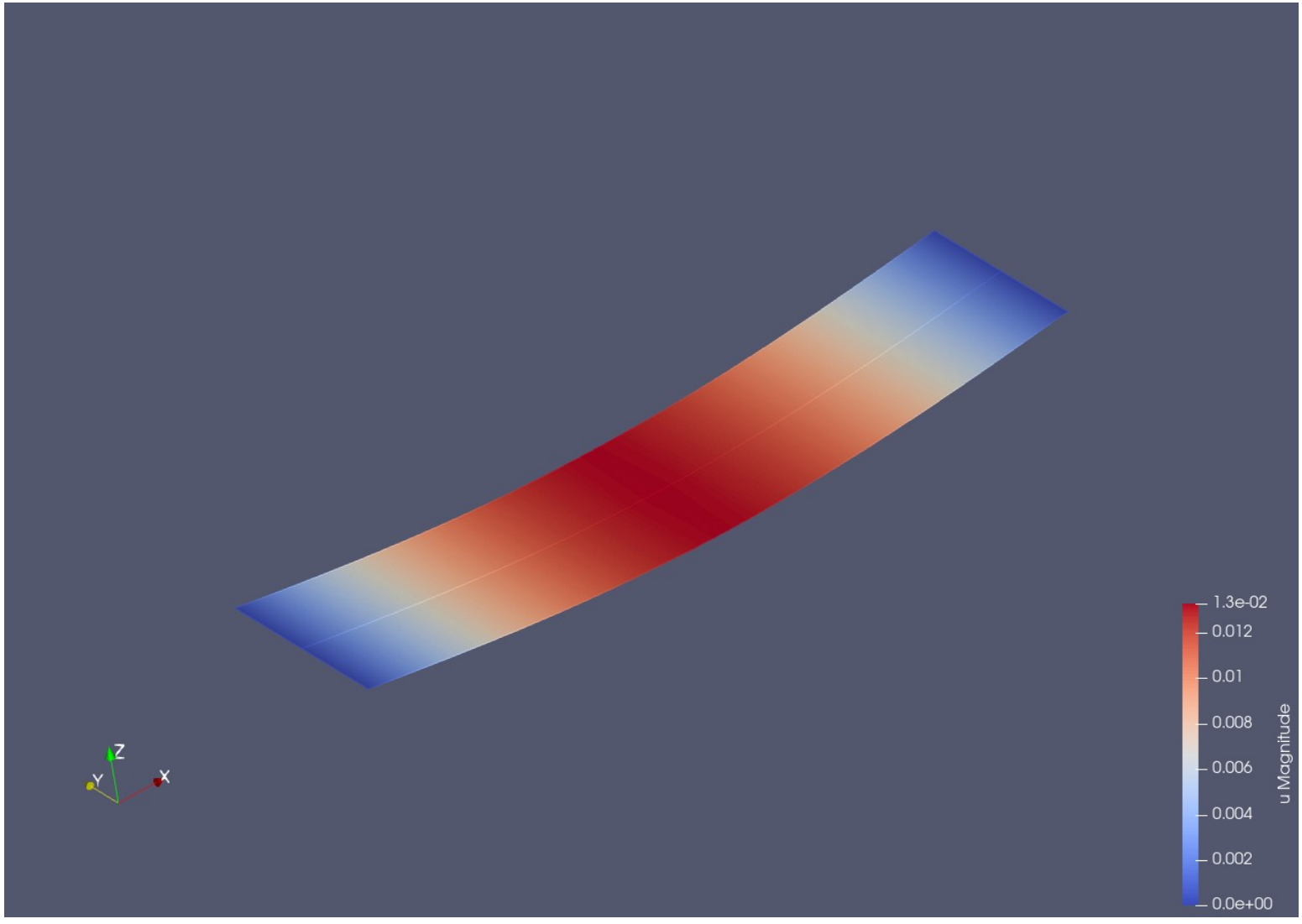
1800 M

| | |
|---|---|
| Theory bending only no shear deflection | 0.0120 |
| Nastran | 0.0138 |
| BeamSolver | 0.0132 |
| ShellSolver | 0.0132 |

# Comparison of Solutions




BeamSolver




ShellSolver