Simulation: Shell Elements vs. Solid Elements

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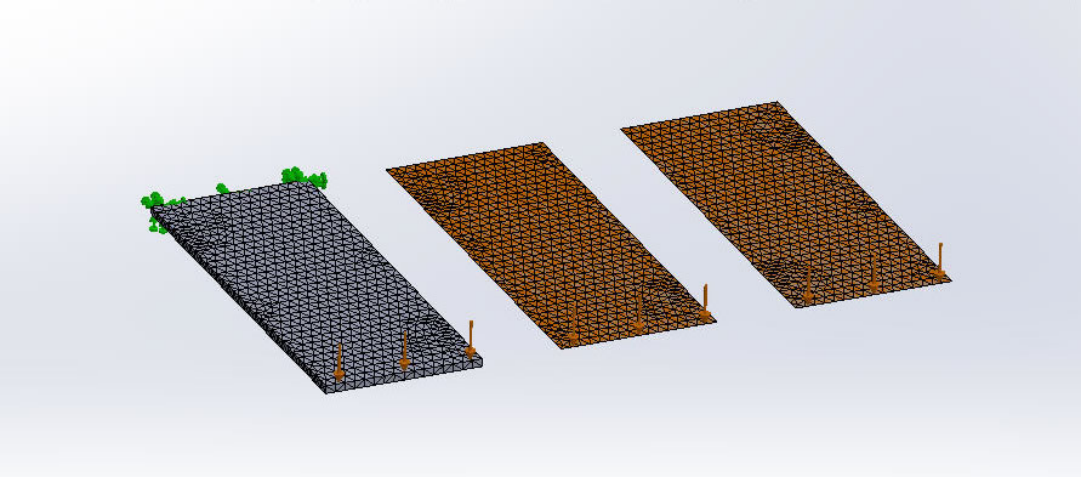
A number of people are quite reluctant to use shell elements vs. solid elements. Shell elements can be a huge time save since they allow the modelling of thin features with relatively much fewer elements than solid elements. They are also easier to mesh and less prone negative Jacobian errors which might occur when using extremely thin solid features. Here is a comparison of Solid and Shell elements for a fairly simple model. The figure below show the Solid (on the left), Thin Shell (in the centre) and Thick Shell (on the right) elements. All the three are subjected to same loadings and fixtures.



A simple static study reveals that we get the same results for all the three cases.

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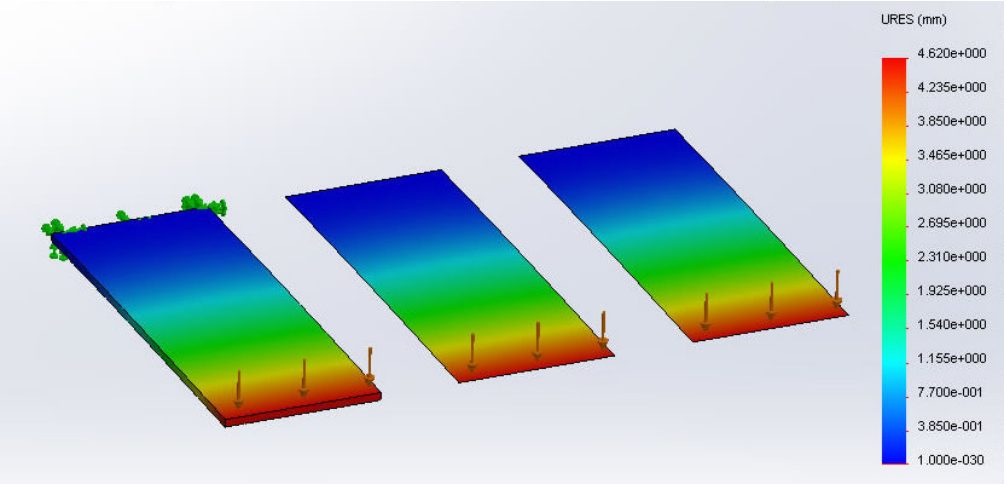

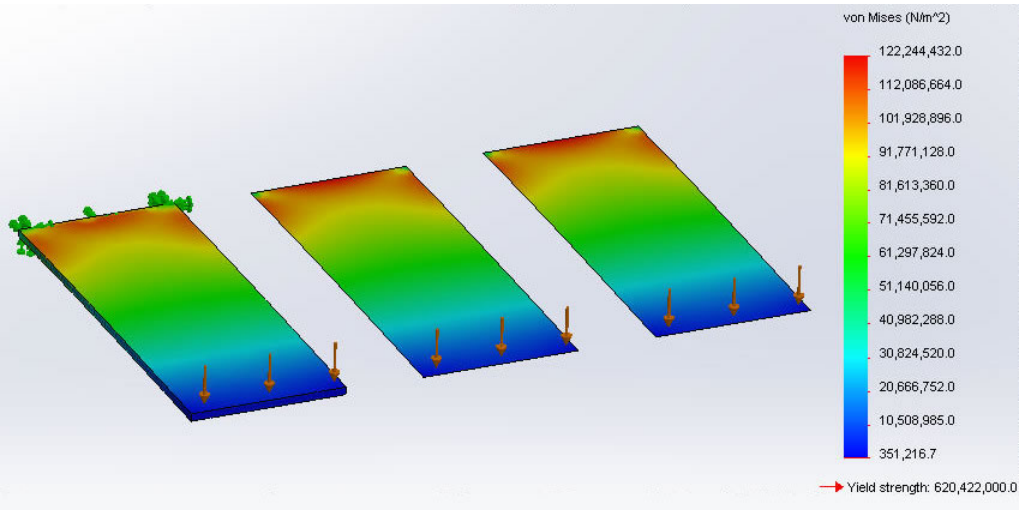

However, the shell elements are limited to features which are really thin. A good approximate is if the thickness of the body is at least 20 times less than the span. Another sample case shows bodies which are not good candidates for shell elements.