Certain template parameters are required to be provided by the user. Other template parameters are calculated and/or generated when the template class object is defined. Relevant template parameters and example parameters are outlined in table below.

A unit template is generated in Marc Mentat according to the template parameters. Units are 2D meshes constructed from square elements. A template is a solid grid with all boundary conditions and other properties defined. Figure below illustrates an example template.

A specified number of unique units are generated, run and analysed. A check is performed to determine that no more unique units are requested than theoretically possible. Units are defined by removing random internal elements. The number of elements removed and the element IDs of the removed elements are used to generate a unique ID for each unit. Displacement, reaction force and strain energy density data are extracted from each unit and used to evaluate them.

Displacement and reaction force nodal values are used to calculate constraint energy. Constraint energy is defined as

Where

is any node on the external boundary

is the total number of nodes

is the reaction force at the node

is the displacement at the node

Different results are desired for different cases. Specific cases are discussed in Section.

Generic properties applied to each template include a ramp table representative of a simple y=x equation used to apply displacements over time. Plane strain geometric properties are added. Solid state contact body properties are added. A static loadcase is added. A structural job is added requesting total strain energy density outputs.

An Ogden material model of Mold Star 15 is used. The parameters used are obtained from Ellis.

The first case is pure stress in the y-direction. Boundary conditions are applied as defined in table below.