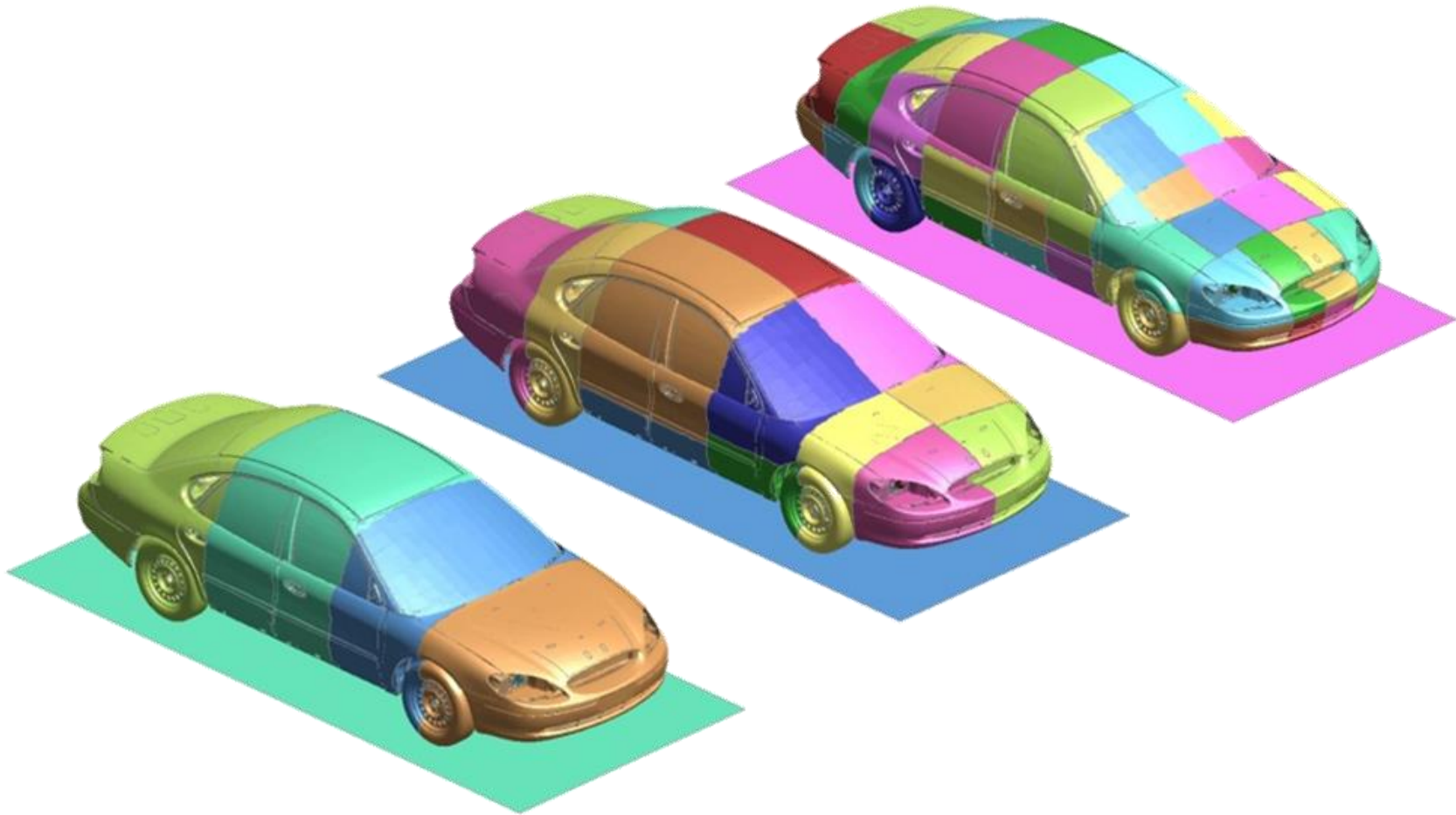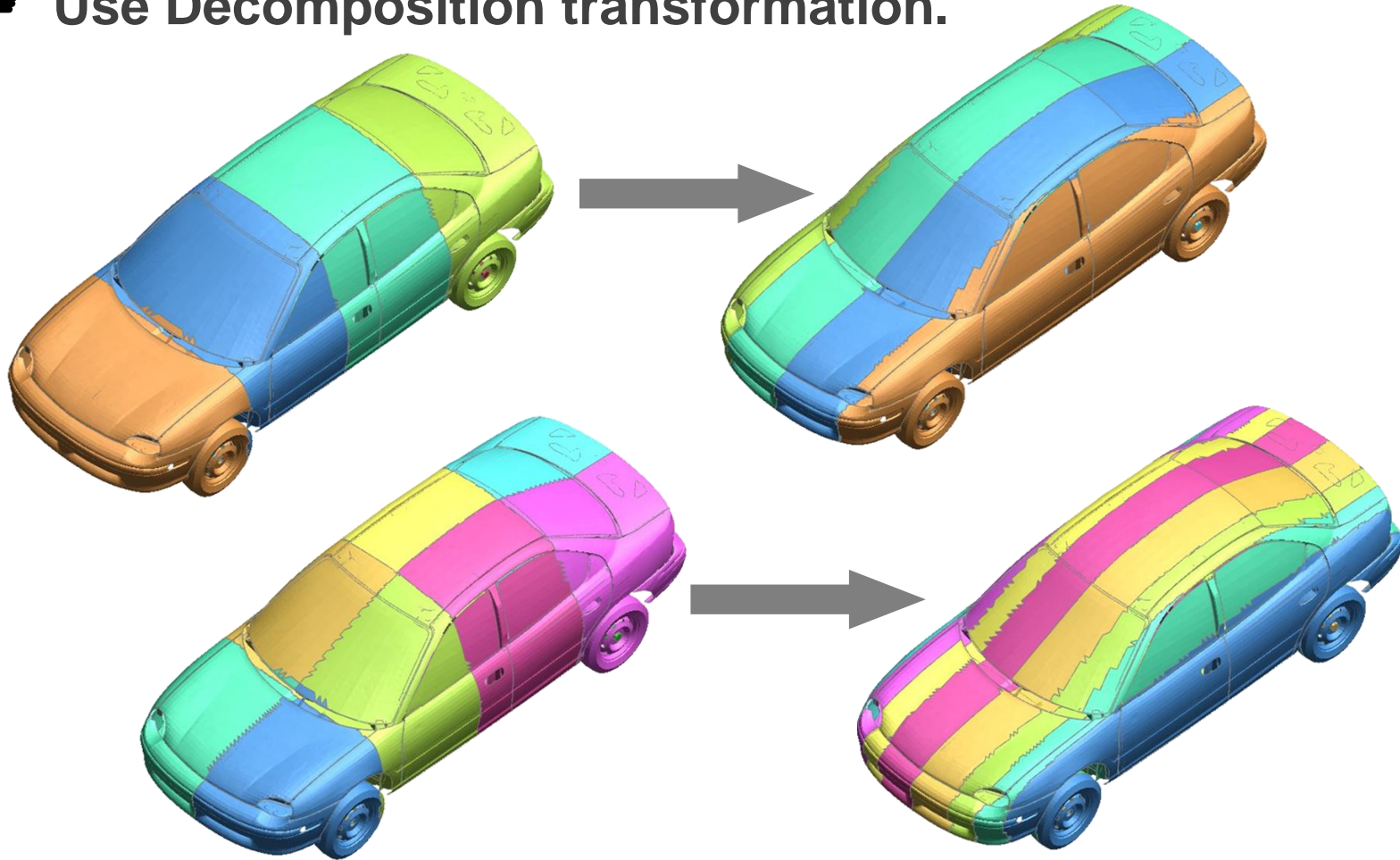# BEST PRACTICES - LS-DYNA

MPP - DECOMPOSITION

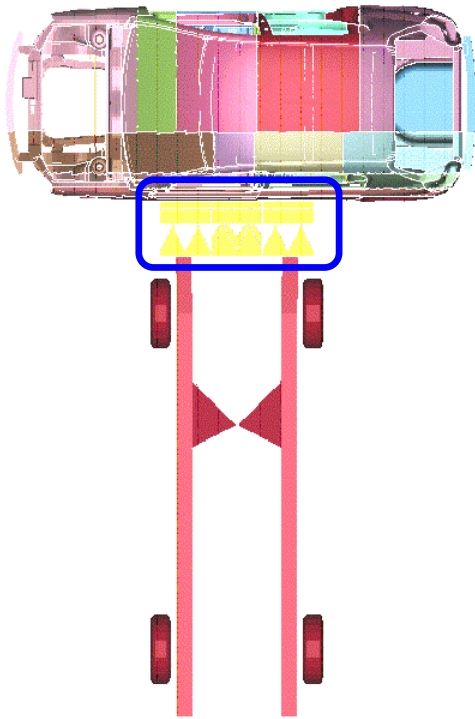☞ **Recursive Coordinate Bisection (RCB).**
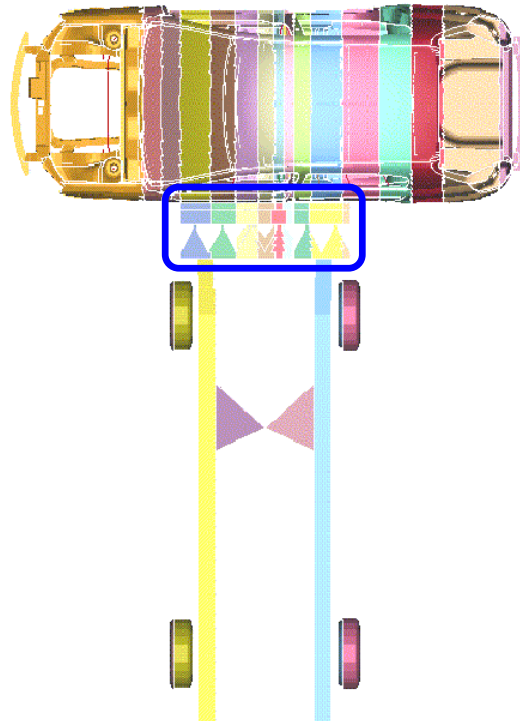
_DECOMPOSITION_TRANSFORMATION

👉 **Use Decomposition transformation.**

_DECOMPOSITION_CONTACT_DISTRIBUTE
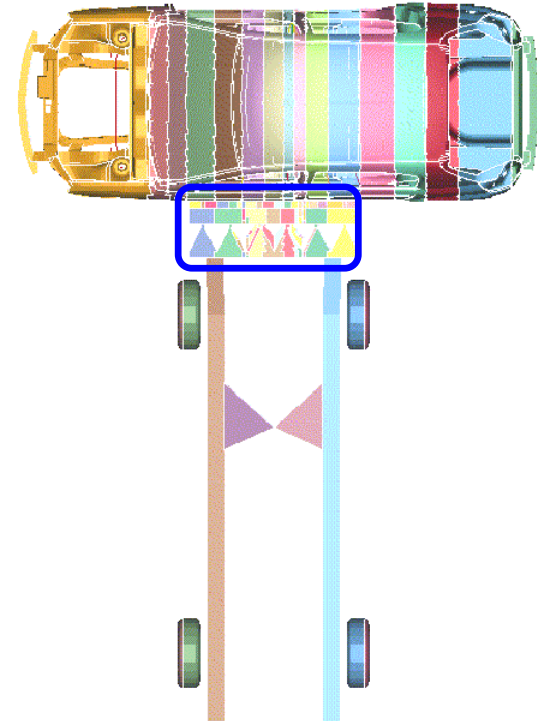

Default Decomposition

With Decomposition Transformation

+ Decomposition Contact Distribute

_MPP_CONTACT_GROUPABLE

☞ **CONTROL_MPP_CONTACT_GROUPABLE – The GROUPABLE algorithm is an alternate MPP communication algorithm for various single surface, nodes_to_surface, surface_to_surface, ERODING, and option SOFT = 2 contacts.**

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_MPP_DECOMPOSITION_BAGREF

☞ **CONTROL_MPP_DECOMPOSITION_BAGREF – will perform decomposition according to the airbag's reference geometry, rather than the folded geometry.**

CPU Binding or CPU affinity

☞ **CPU binding will improve the performance of many applications by binding a process to a particular CPU.**

Spotting the non-default values used

☞ **To make things easy for debugging, preferably leave the variable for those which are using LS-DYNA defaults as zero or as blank.**

```
$
*CONTROL_SHELL
$:  wrpang      esort      irnxx     istupd     theory        bwc      miter       proj
       20.0          1         -1          4          2          2          1          0
$: rotascl     intgrd     lamsht     cstyp6     thshel
        1.0          0          0          1          0
$: psstupd    sidt4tu      cntco     itsflg     irquad     w-mode    stretch       icrq
          0          0          0          0          2        0.0        0.0          0
$:  nfail1     nfail4     psnfail     keepcs      delfr    drcpsid    drcprm    intperr
          1          1          0          0          0          0        1.0          0
$

$
*CONTROL_SHELL
$:  wrpang      esort      irnxx     istupd     theory        bwc      miter       proj
        0.0          1          0          4          0          0          0          0
$: rotascl     intgrd     lamsht     cstyp6     thshel
        0.0          0          0          0          0
$: psstupd    sidt4tu      cntco     itsflg     irquad     w-mode    stretch       icrq
          0          0          0          0          0        0.0        0.0          0
$:  nfail1     nfail4     psnfail     keepcs      delfr    drcpsid    drcprm    intperr
          1          1          0          0          0          0        0.0          0
$
```
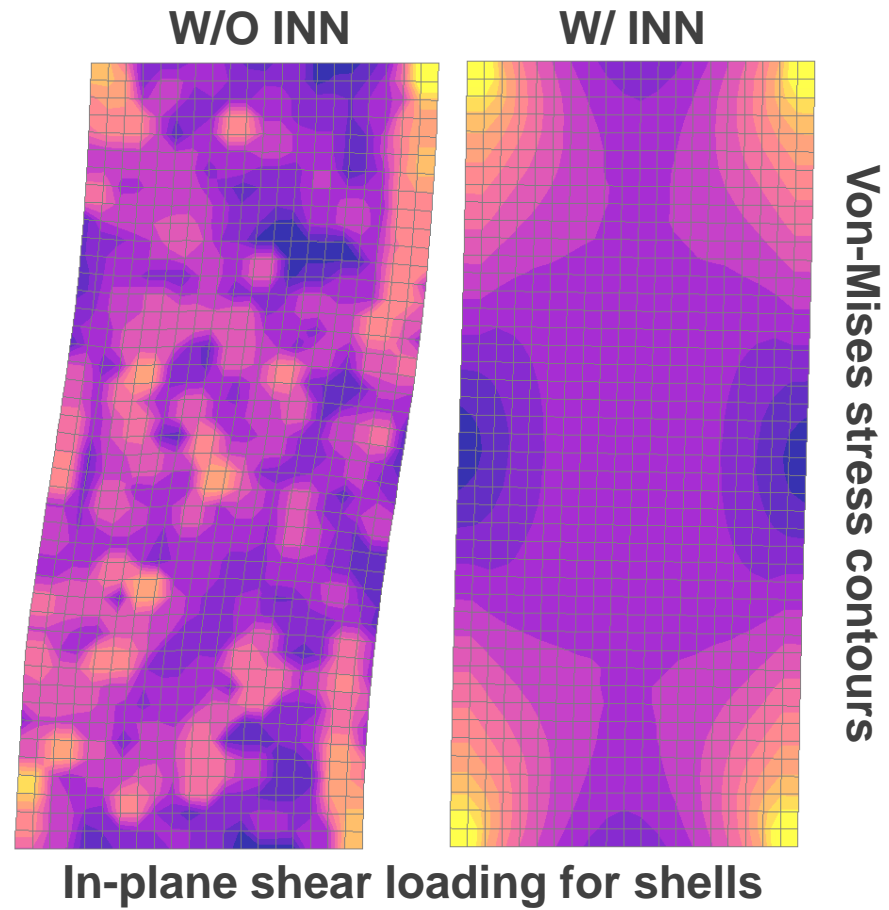
CONTROL_ACCURACY

☞ **OSU = 1 – Invokes 2nd order objective stress.**

☞ **PIDOSU > 0 – Part set ID for objective stress updates.**

CONTROL_ACCURACY…

☞ **INN = 4 – Invariant node numbering.**

W/O INN　　**W/ INN**

In-plane shear loading for shells

Von-Mises stress contours

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CONTROL_BULK_VISCOSITY

☛ **TYPE = –2 – Internal energy dissipated by the viscosity in the shell elements is computed and included in the over all energy balance.**

CONTROL_CONTACT

☛ **RWPNAL < 0.0** *(= −1.0)* **– Nodes of the rigid bodies as well the deformable bodies that are interacting with rigid walls are treated by the penalty method.**
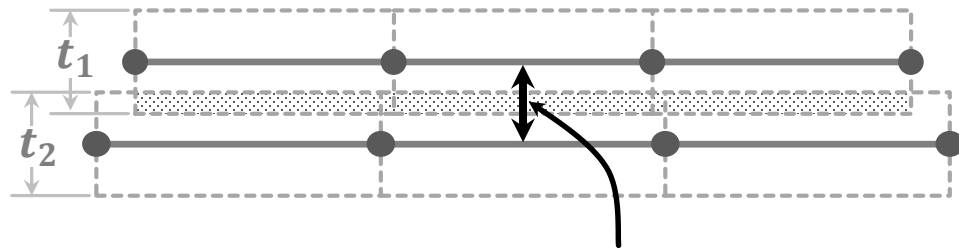
CONTROL_CONTACT…

☞ **SSTHK = 1 – Uses the contact thickness equal to the shell thickness. Not applicable for SOFT = 2.**
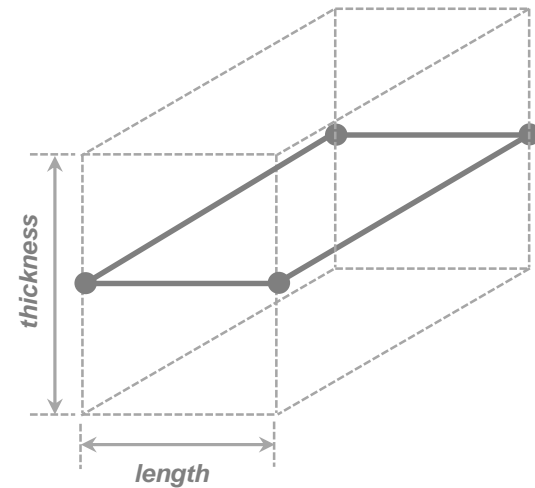
CONTROL_CONTACT…

☞ **IGNORE = 2 – allows 'initial' penetrations to exist by tracking the initial penetrations. Penetration warning messages are printed with the original coordinates and the recommended coordinates of each slave node.**

Minimum gap between two mid-plane shell meshes should be at least 90% of the average of the parent panels
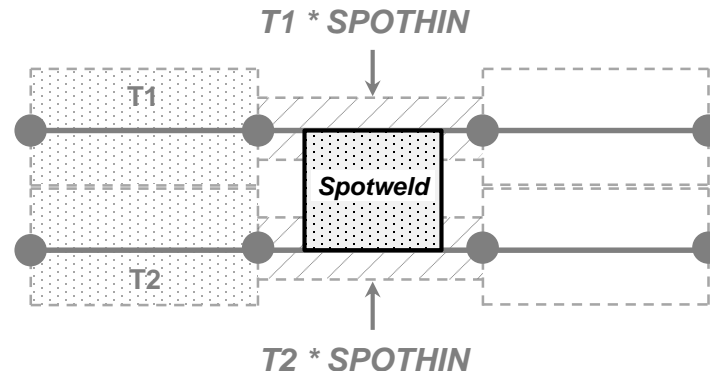
CONTROL_CONTACT…

☞ **SPOTSTP = 2 – when spotweld beam nodes or solid element faces cannot find master surfaces, print a message, delete such welds and continue with calculation.**

CONTROL_CONTACT…

☞ **SPOTDEL = 1 – the beam or solid spotweld is deleted and the tied constraint is removed when the parent shells attached on one side of the spotweld element erodes.**

CONTROL_CONTACT…

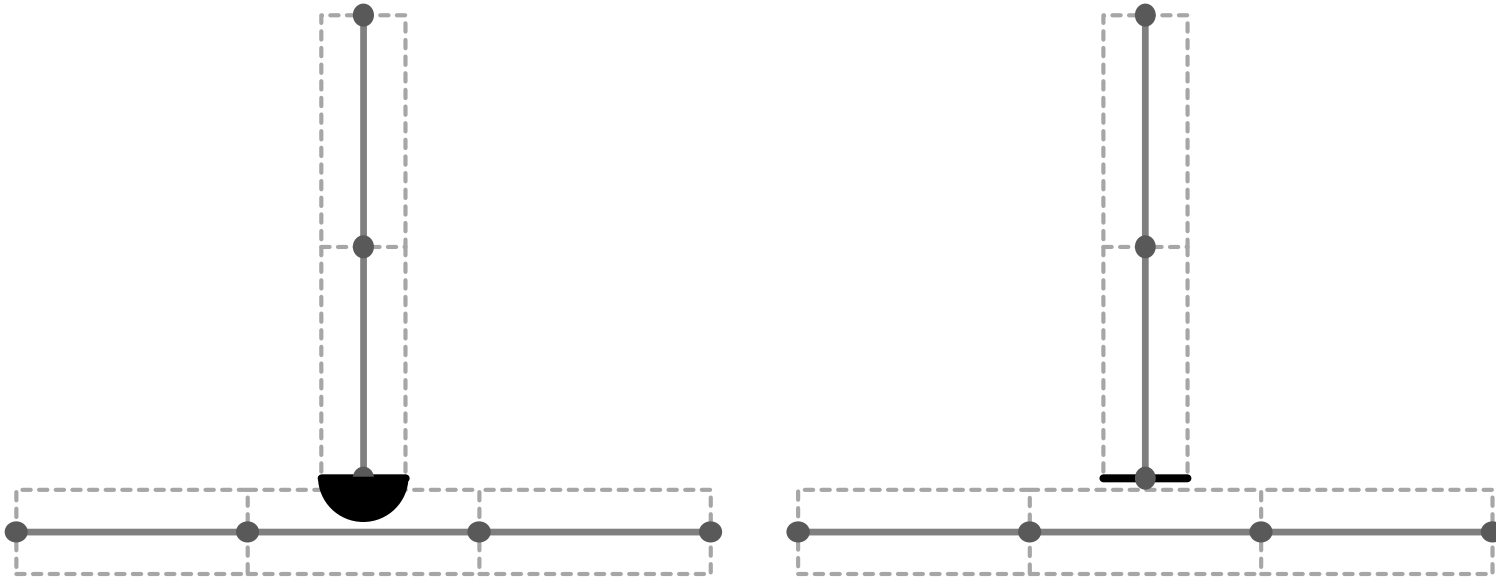☞ **SPOTHIN = 0.5 – the thickness of the spotwelded parts are scaled in the vicinity of the spotweld so that the contact forces do not develop between these parts, which would otherwise lead to tensile forces in the spotwelds and their premature failure.**

*T1 * SPOTHIN*

T1

Spotweld

T2

*T2 * SPOTHIN*

CONTACT_CONTACT…

☞ **SHLEDG = 1 – Shell edges are assumed square and flush with the nodes.**

CONTROL_CONTACT…

☛ **FTALL = 1 – Output the contact force data to RCFORC for all the forces transducers that match.**

CONTROL_CPM

☛ **CPMOUT = 21 – full CPM database written in more efficient version 4 format.**

CONTROL_CPM…

☞ **NP2P = 1 – No. of cycles for repartition particle among processors.**

CONTROL_CPM…

☛ **CPMERR = 1 – Enables error checking for airbag integrity, chamber integrity & inconsistent orientation between the shell reference geometry and FEM shell connectivity. If any problems are detected LS-DYNA will either error terminate the job or try to fix the problem.**

CONTROL_ENERGY

☞ **HGEN = 2 – Hourglass energy is computed and included in the energy balance.**

☞ **SLNTEN = 2 – Sliding interface energy or contact energy is computed and included in the energy balance.**

CONTROL_HOURGLASS

☞ **High velocity deformations – Viscous hourglass control.**

☞ **Low velocity deformations – Stiffness hourglass control.**

☞ **IHQ = 8 – for type 16 shells.**

CONTROL_OUTPUT

☞ **NPOPT =1 & NEECHO = 3 – would suppress the output of the nodal coordinates and element topology info to the d3hsp.**

CONTROL_SHELL

☞ **ESORT > 0** *(=1)* **– Sorts triangular shells and switches the degenerated quadrilateral shells to more suitable triangular shell formulations.**

CONTROL_SHELL…

☞ **ISTUPD = 4 & PSTUPD > 0 – Instead of using the total strain, the shell thickness update is carried out using plastic strains.**

CONTROL_SHELL…

☞ **NFAIL1 = 1 & NFAIL4 = 1 – Checks for highly distorted under-integrated and fully-integrated shells respectively, prints message and deletes such elements.**

CONTROL_SOLID

☞ **ESORT > 0 *(=2)* – Sorts tetrahedral and pentahedral solids and switches the degenerated hexahedrons to more suitable tetrahedral and pentahedral formulations respectively.**

CONTROL_TIMESTEP

☞ **DT2MS < 0 – Add mass to an element if and only if an element's timestep is less than |DT2MS|.**

☞ **IMSCL < 0 - |IMSCL| is the part set ID of the parts for which the selective mass scaling. All other parts in the model are mass scaled the usual way.**

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