Problem 5:
Metal Impact

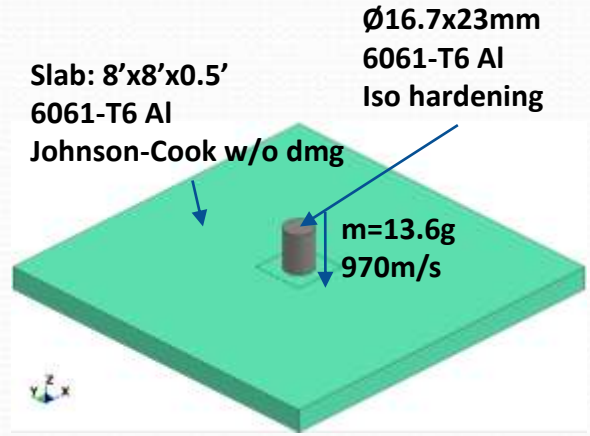
Objectives:

1. Apply the pseudo Lagrangian kernel in material failure and fragmentation analysis
2. Observe the formation of debris chips
3. Study the sensitivity to failure criterion (FS)

To do list:

You are expected to do the following studies by ***Beta***:

1. Create a new directory under Example 5 & copy ***input_alimp.k***.
2. Obtain results by setting KERNEL=2, ITB=2, FS=0.4.
3. Create another directory & copy ***input_alimp.k***.
4. Obtain results by setting KERNEL=2, ITB=2, FS=0.2.
5. Compare the deformation and residual velocity (344.4m/s in test) of the two cases, and understand the difference.



Input file: ***input_alimp.k***

Projectile residual velocity in test: 344.4m/s

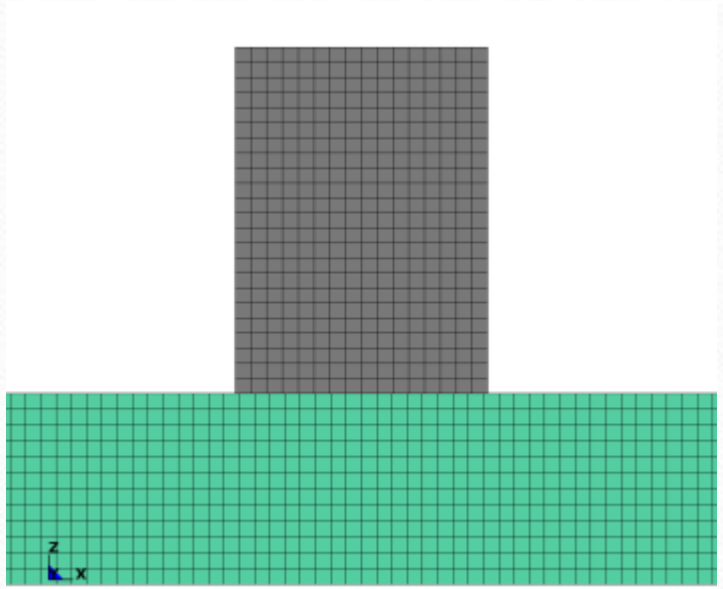
Schwer L.E. "Aluminum plater perforation: a comparative case study using Lagrange with erosion, multi-material ALE, and smooth particle hydrodynamics," 7th European LS-DYNA Conference, Salzburg, Austria, May 14th-15th, 2009

Major Keyword for Analyses

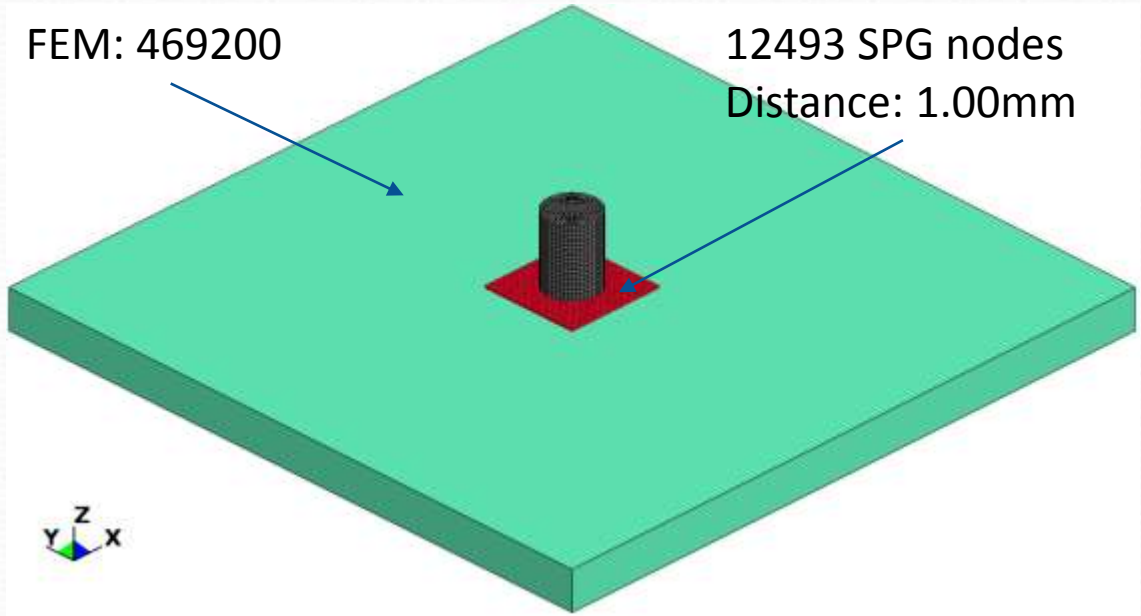
Keyword	Remark
*SECTION_SOLID_SPG $# secid elform aet 2 47 0 $# DX DY DZ ISPLINE KERNEL LSCALE SMSTEM SWTIME 1.5 1.5 1.5 0 2 0.0 30 0.0 $# IDAM FS STRETCH ITB 1 0.40 1.15 2	Pseudo Lagrangian kernel Simplified fluid particle stabilization TSSFAC=0.5 FS=0.4, STRETCH=1.15 Clock time: 10min
*SECTION_SOLID_SPG $# secid elform aet 2 47 0 $# DX DY DZ ISPLINE KERNEL LSCALE SMSTEM SWTIME 1.5 1.5 1.5 0 2 0.0 30 0.0 $# IDAM FS STRETCH ITB 1 0.20 1.08 2	Pseudo Lagrangian kernel Simplified fluid particle stabilization TSSFAC=0.5 FS=0.2, STRETCH=1.08 Clock time: 10min

Note:
For high velocity impact, TSSFAC should be adjusted according to impact velocity, so that the node to surface contact algorithm works properly. For this particular case, TSSFAC=0.5!

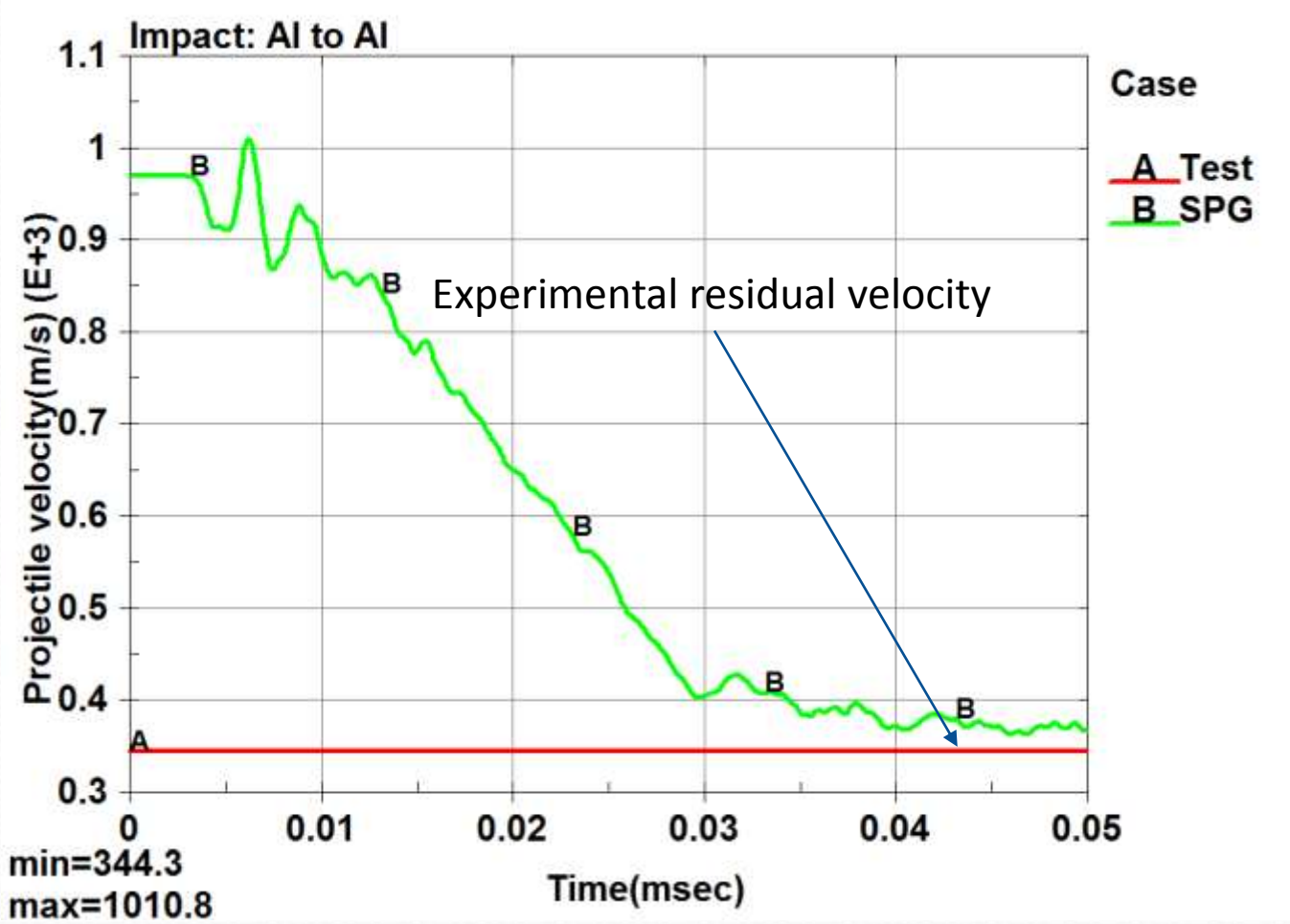
Target Discretization



Nodal distance: 1.0 mm

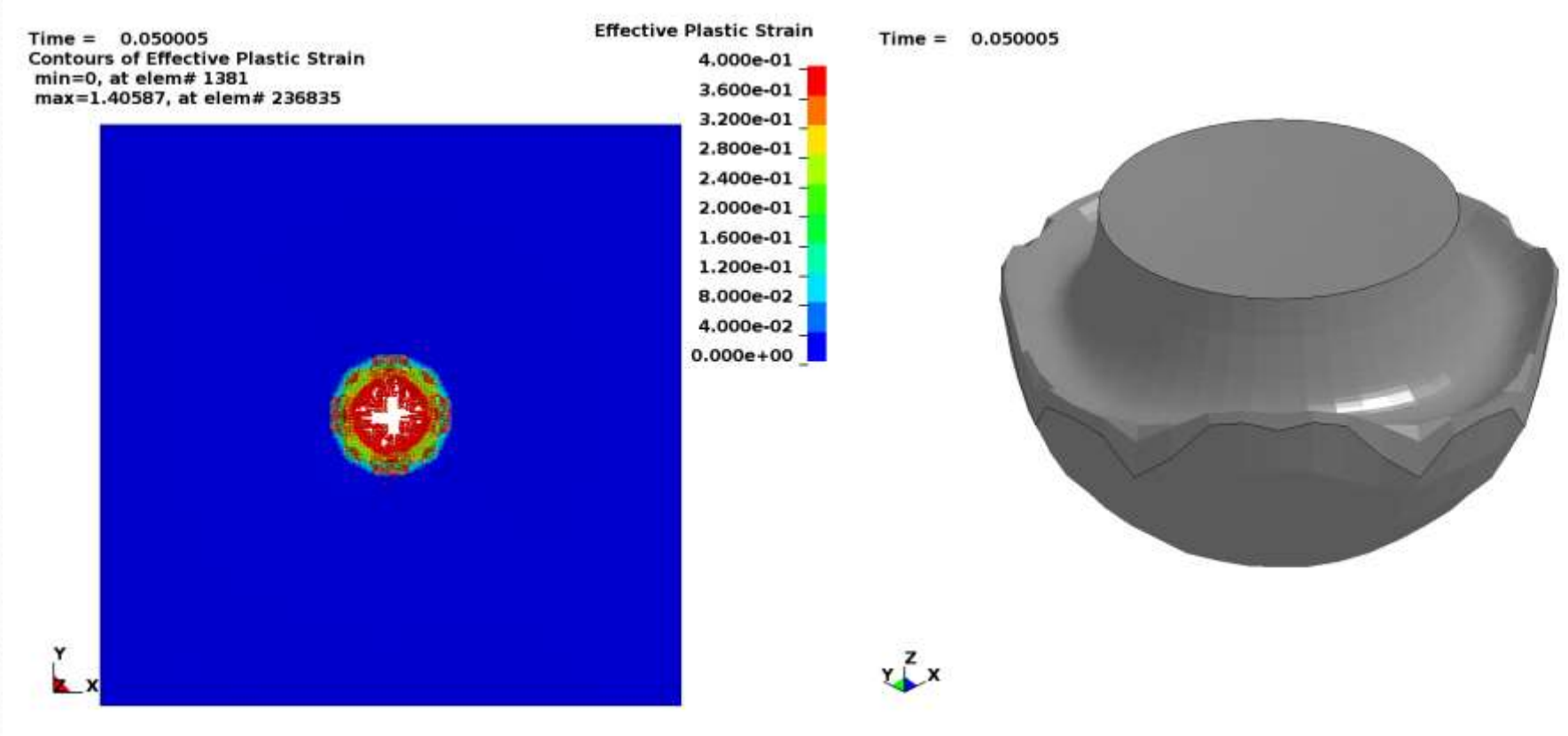


Velocity History of Projectile

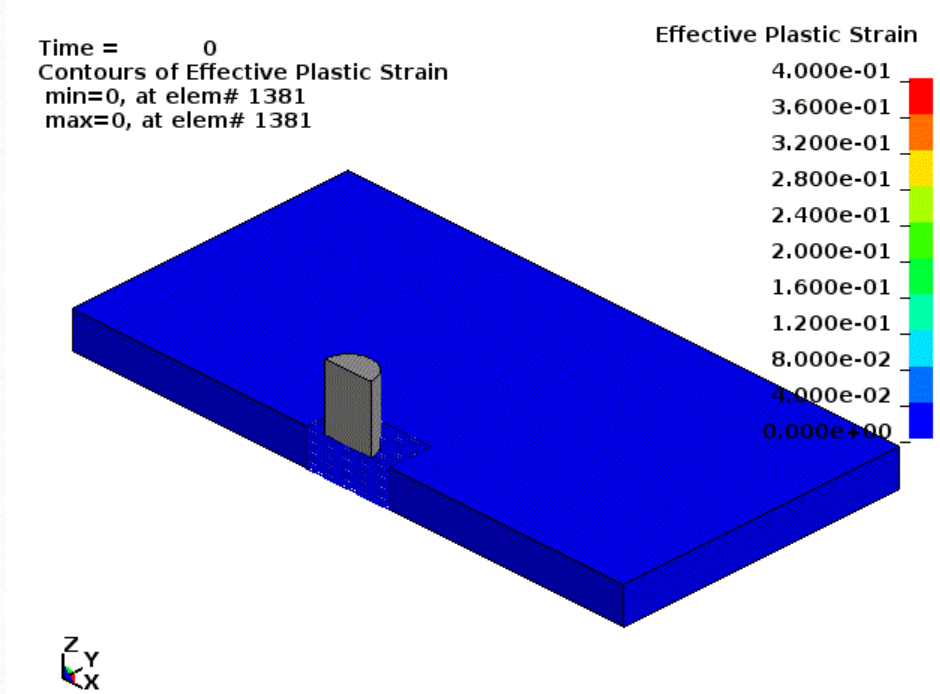


LSTC
Livermore Software Technology Corp.

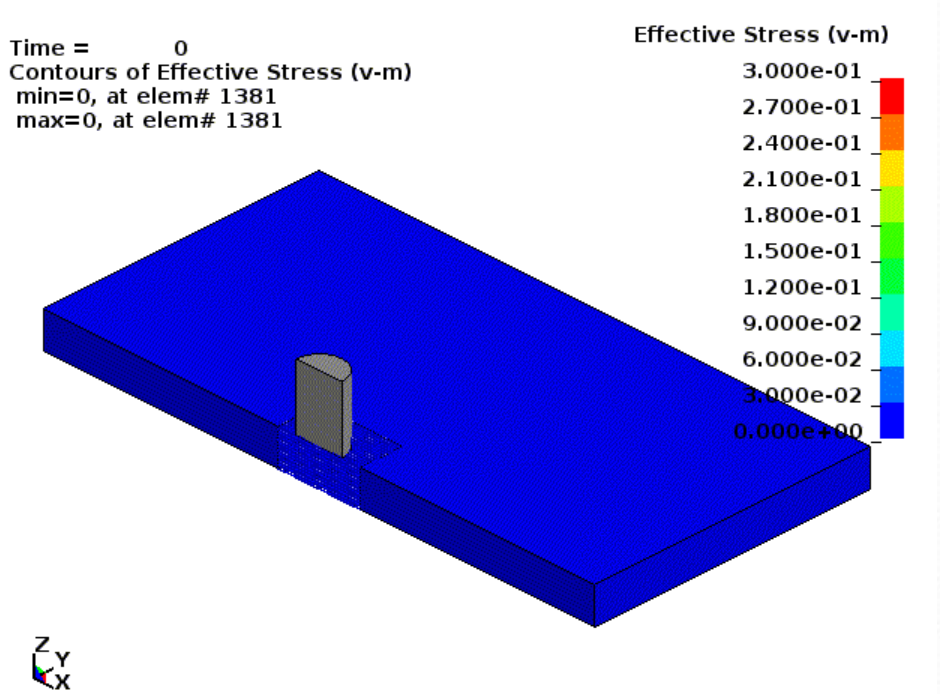
Perforated Plate and Deformed Projectile



Evolution of Plastic Strain and Effective Stress



Effective plastic strain



von-Mises stress