COMPUTATIONAL SIMULATION OF TENSILE TESTING USING SPECIMENS OF DIFFERENT CONFIGURATIONS
NOTCHED TENSILE SPECIMEN - II

PRESENTED BY

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MEG 795 SPECIAL TOPICS: ENGERGY METHODS II

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OBJECTIVE

➢ To generate mechanical properties of tensile specimen and to compare the results with standard experimental data

➢ To study the effect of different mesh configuration

➢ The specimen configuration includes notched, unnotched specimen

➢ To plot the Stress Vs Time and Strain Vs Time

MODELING

- Modeling software used is solidworks

- The length of the specimen is 1.15 inches and the gauge length is 0.35 inches

- The tensile testing specimen experiment is simulated computationally using LS-DYNA

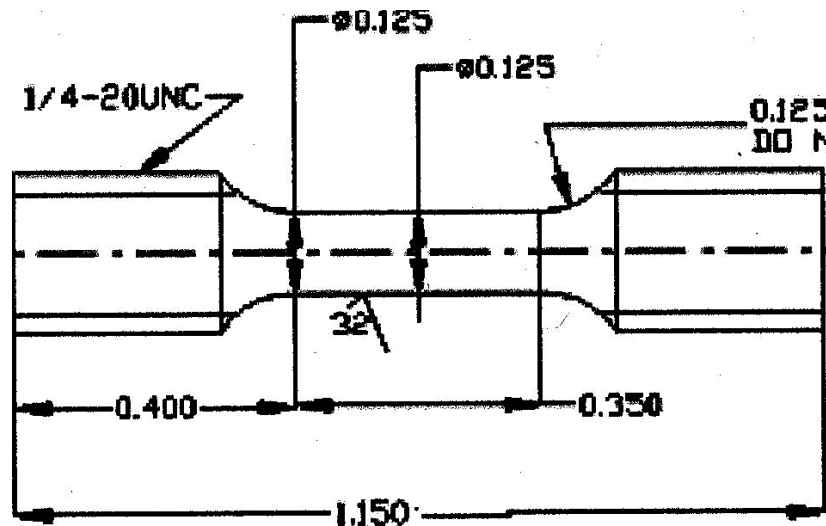# MATERIAL CONFIGURATION

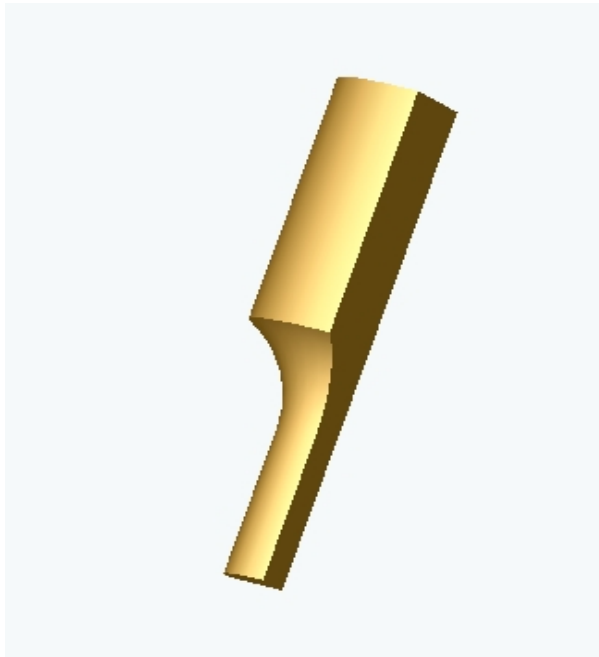422 SS UNNOTCED SPECIMEN

422 SS NOTCHED SPECIMEN

MATERIAL CONFIGURATION cont'd

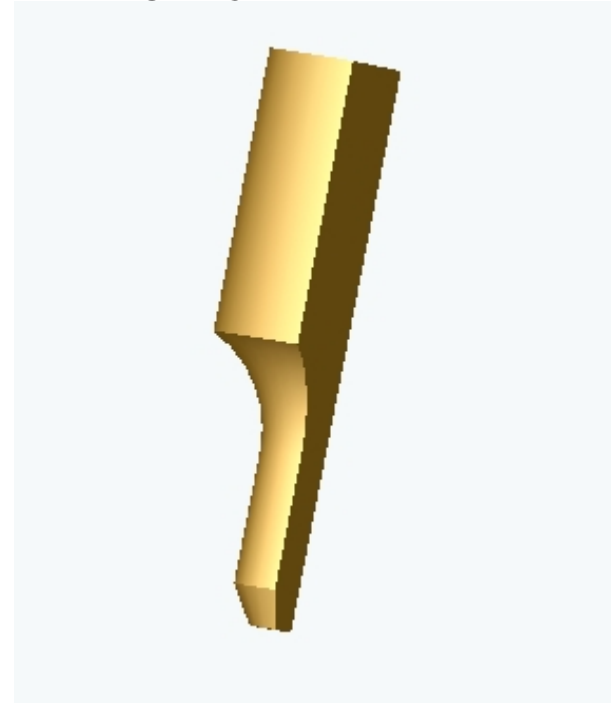- The following figure shows the dimension of the material 422SS used

MATERIAL CONFIGURATION cont'd

1/8th part of 422 SS UN-NOTCHED SPECIMEN

1/8th part of 422 SS UN-NOTCHED SPECIMEN
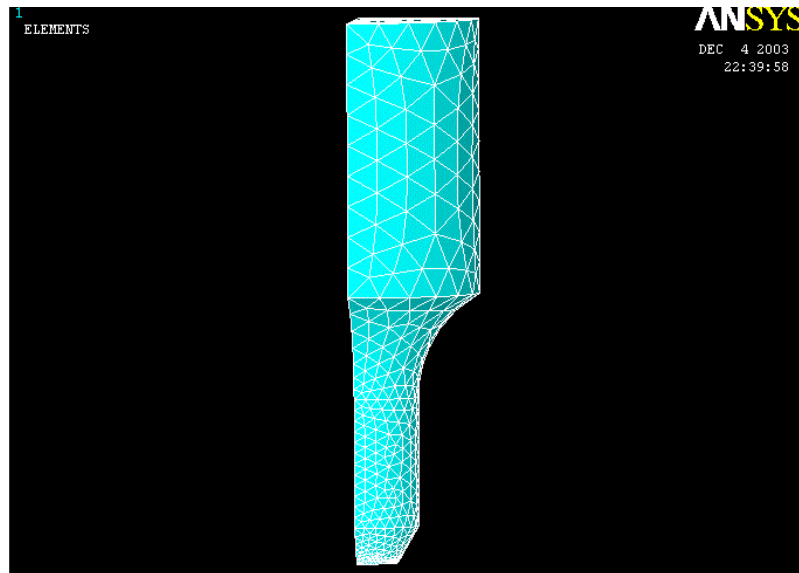
MATERIAL PROPERTIES

- ## MATERIAL PROPERTIES

MATERIAL	DENSITY (Lb/in^3)	YIELD STRESS (psi)	YOUNGS MODULUS (psi)
422 SS	0.283599	110 $*10^3$	3 $*10^7$

- Material Models used in testing includes a nonlinear, inelastic , kinematic model

422 SS NOTCHED SPECIMEN (MESH I-ANSYS)

- Two different mesh configurations are used
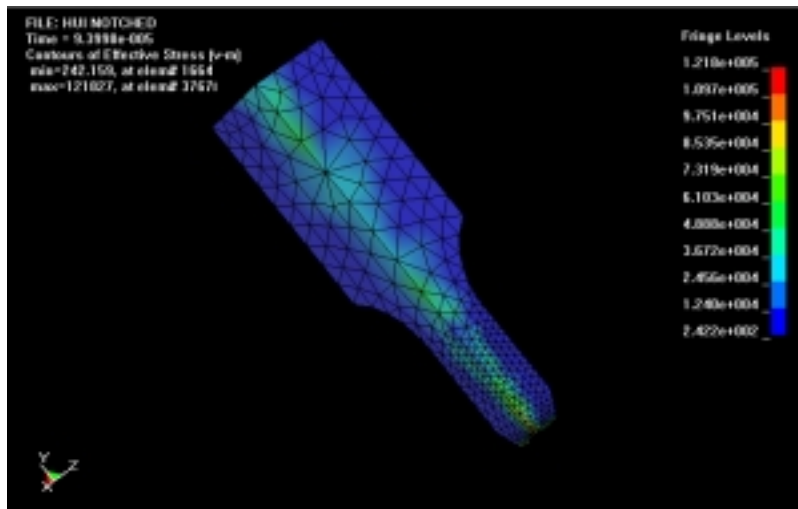
  Mesh I (coarse mesh)

  Mesh II (fine mesh)
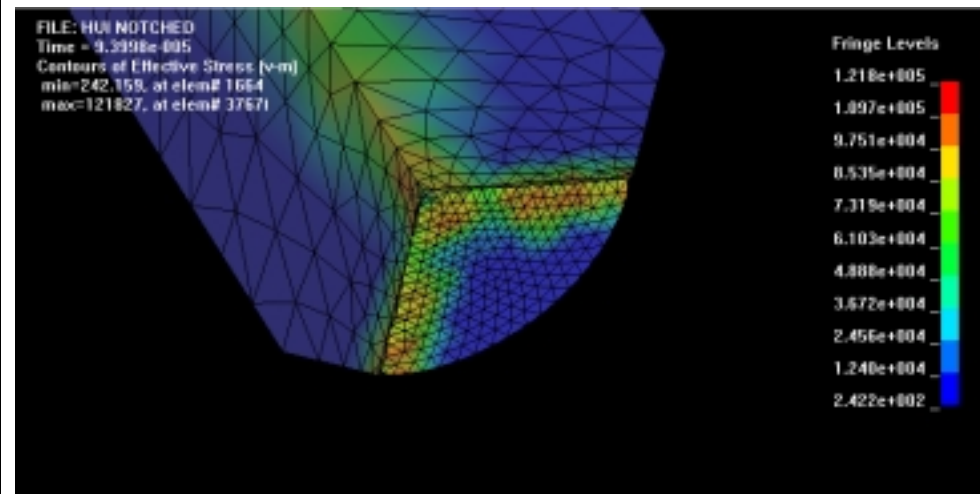
NOTCHED SPECIMEN WITH CONSTRAINTS

- Uz=0 in x-dir;
- Uy=0 in y-dir;
- Ux=0 in z-dir;
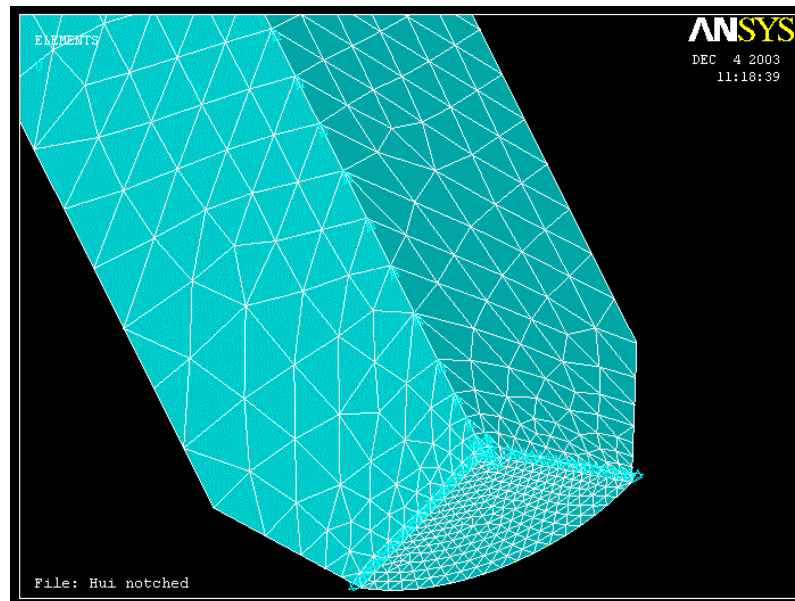
STRESS CONTOUR OF 422 SS UNNOTCHED SPECIMEN (MESH I- LSDYNA)
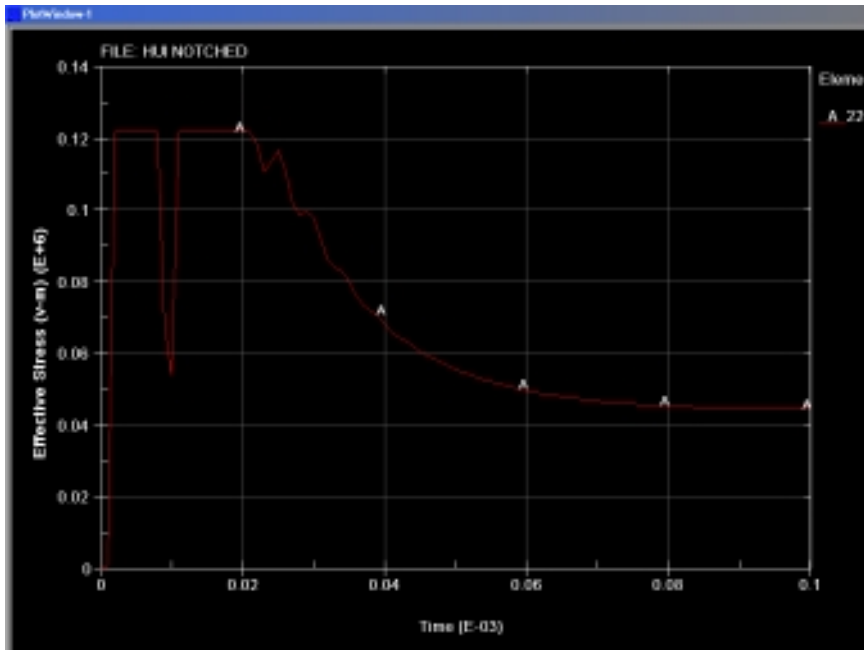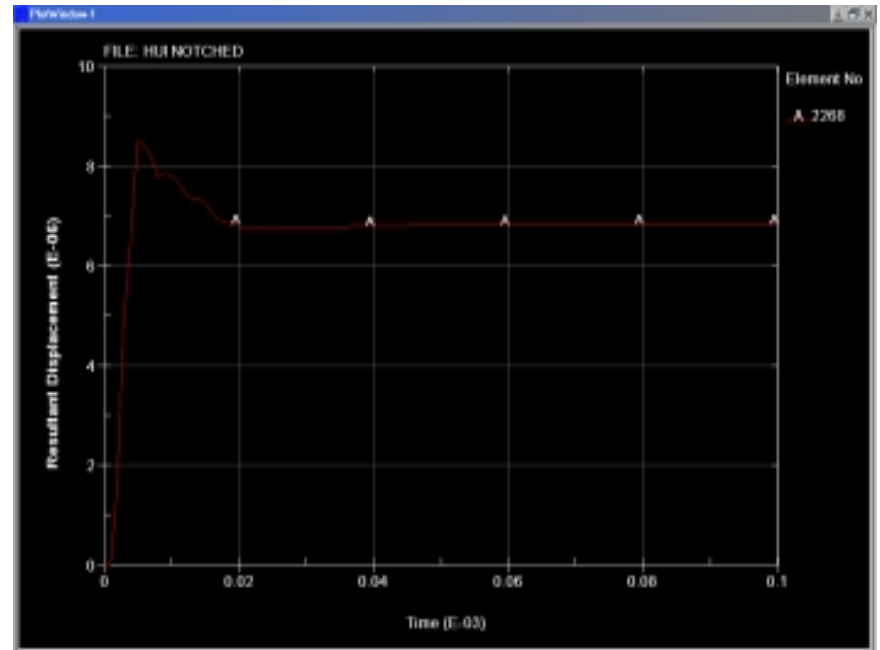

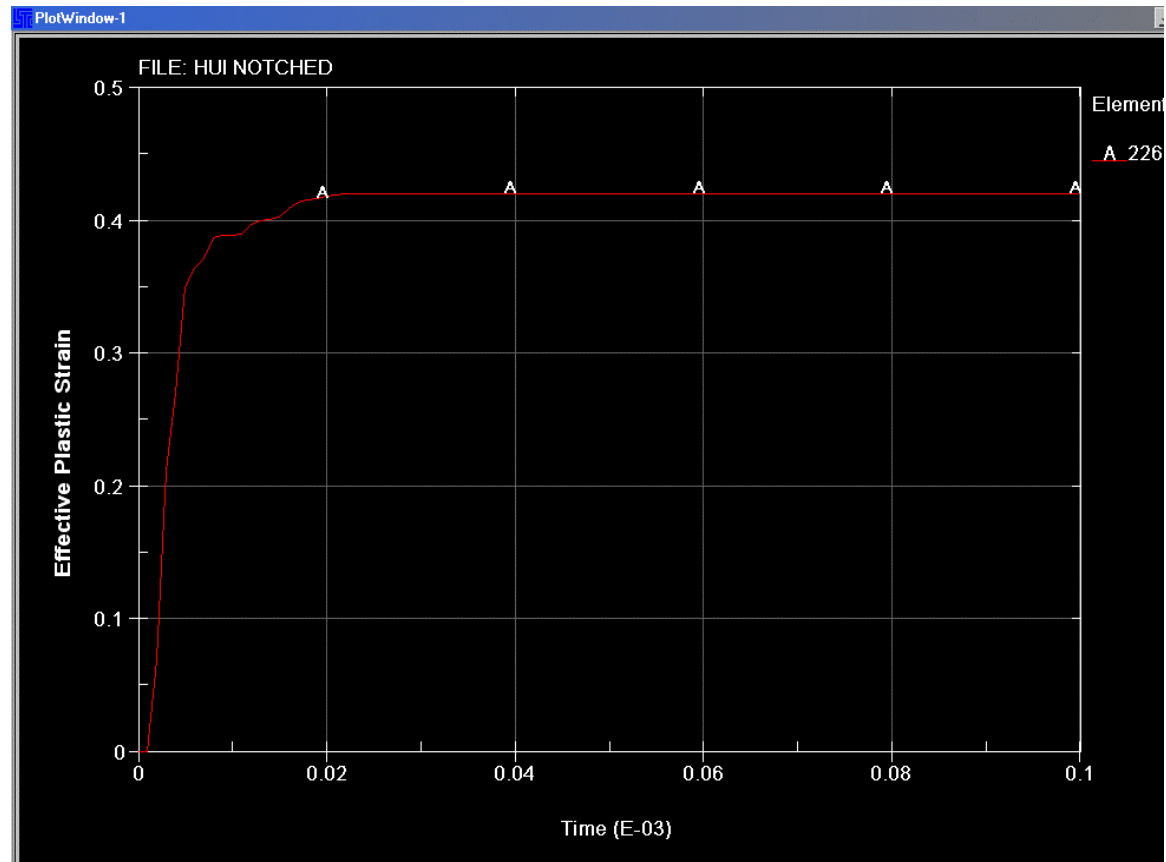MAX STRESS CONTOUR   MAX STRESS IN NOTCH REGION
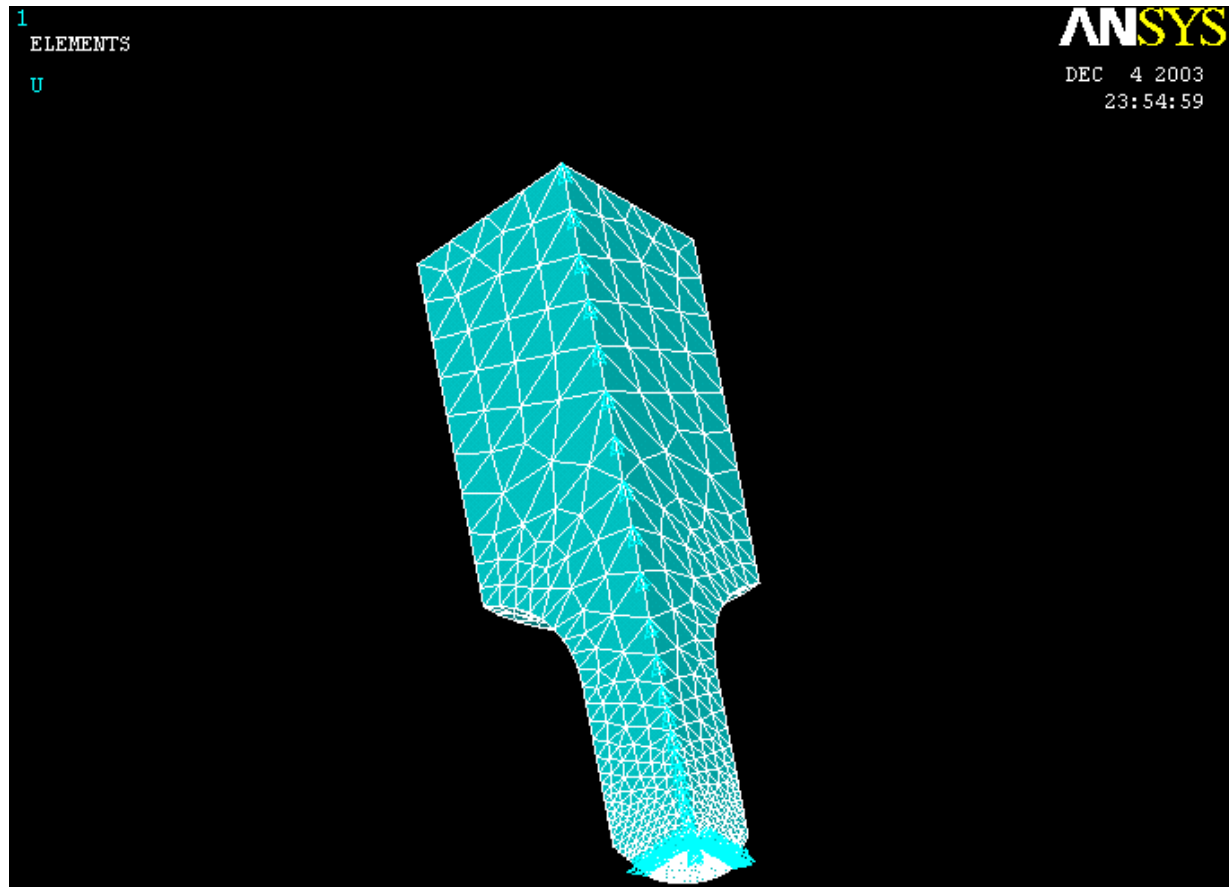
LSDYNA PLOTS

STRESS VS TIME

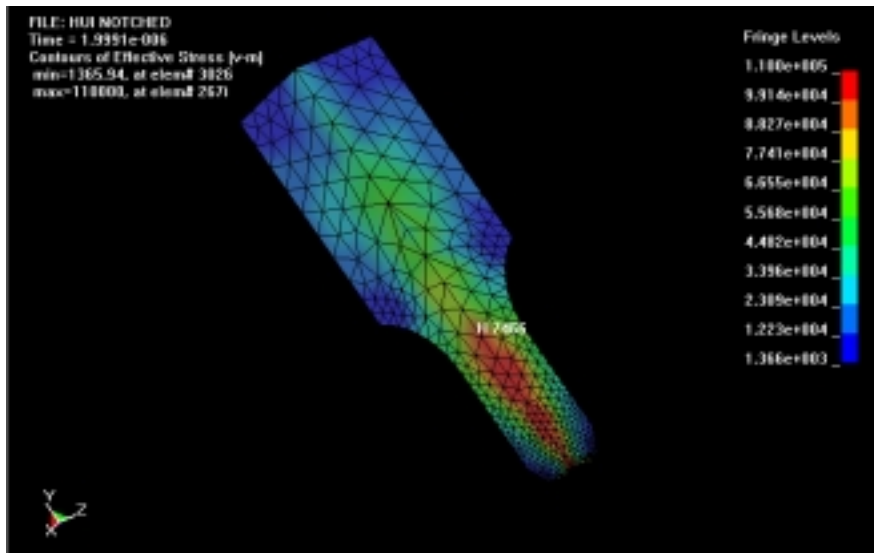DISPLACEMENT VS TIME

LSDYNA PLOTS CONT'D
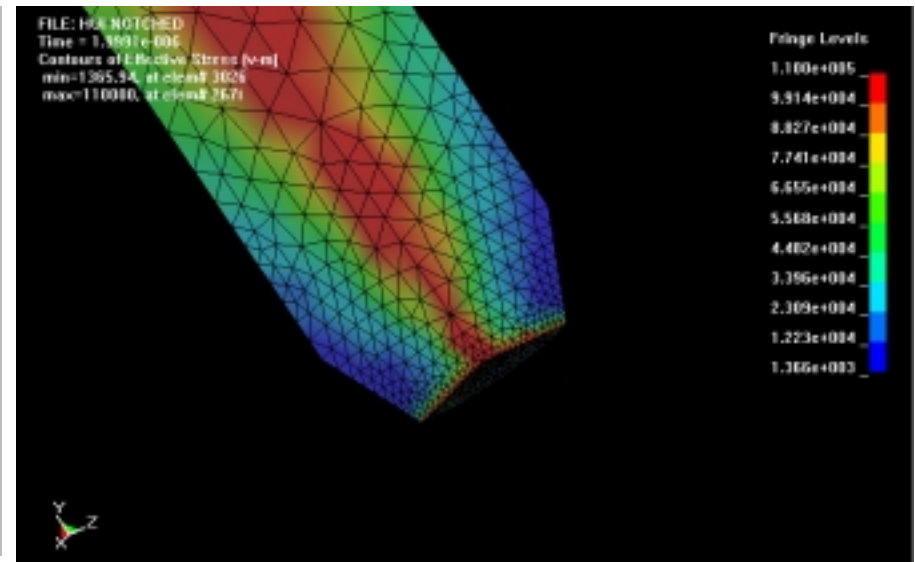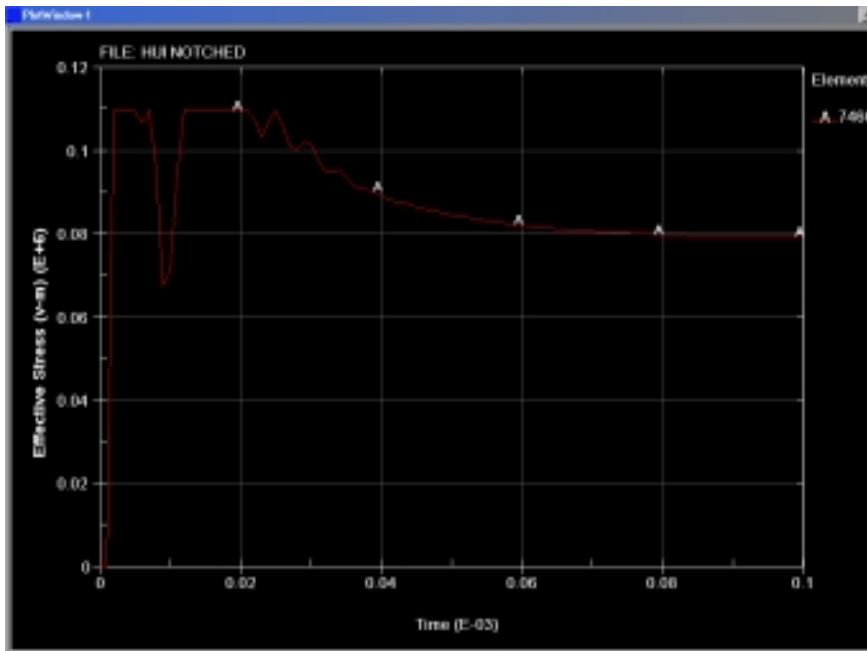

EFFECTIVE PLASTIC STRAIN VS TIME

422 SS NOTCHED SPECIMEN (MESH II – ANSYS)

STRESS CONTOUR NOTCHED SPECIMEN (MESH II- LSDYNA)

MAX STRESS CONTOUR
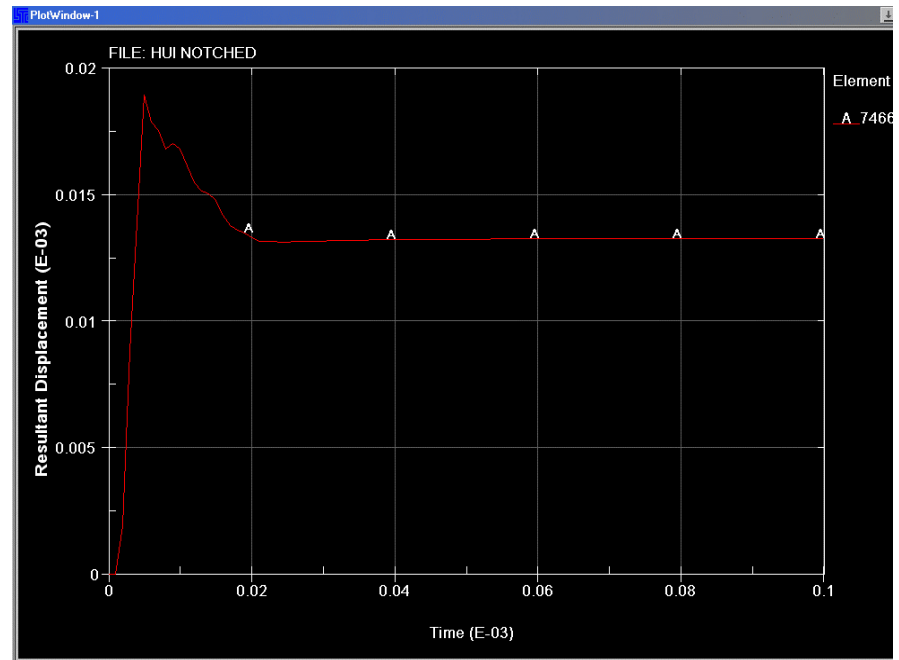

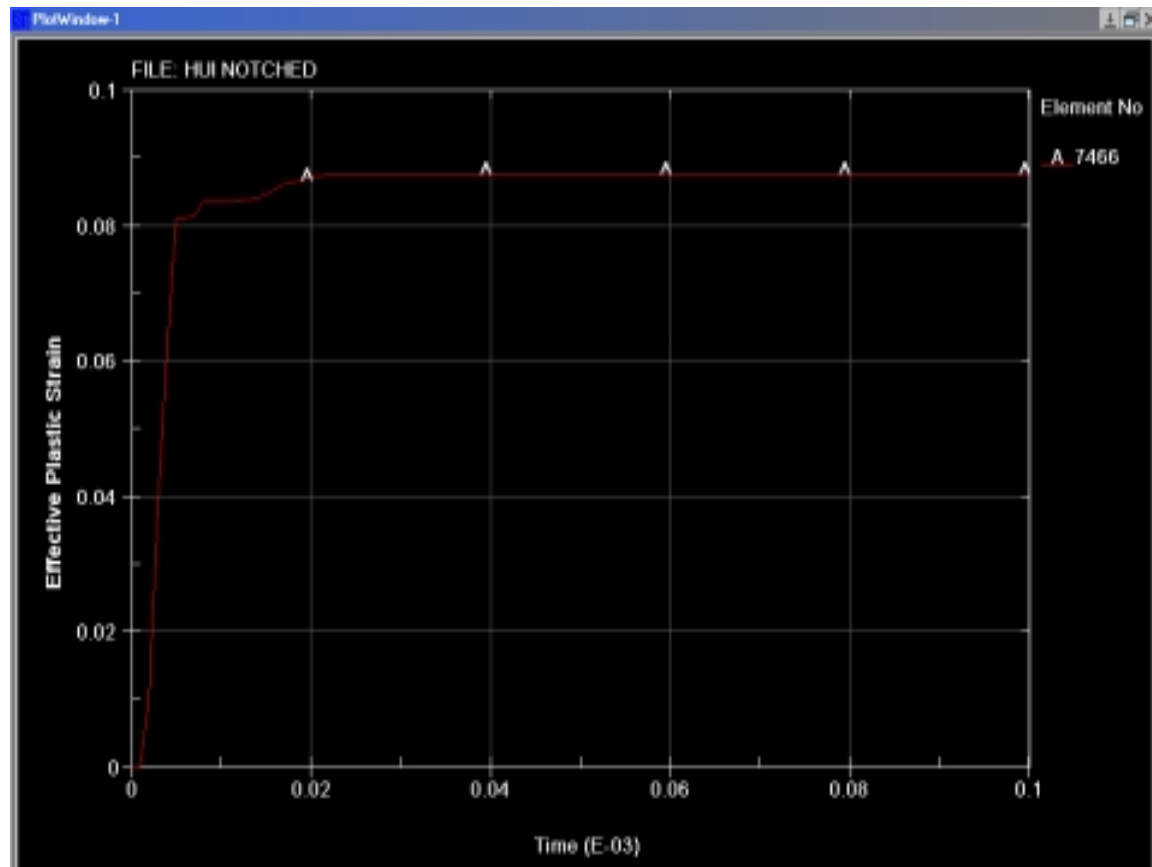MAX STRESS IN NOTCH REGION
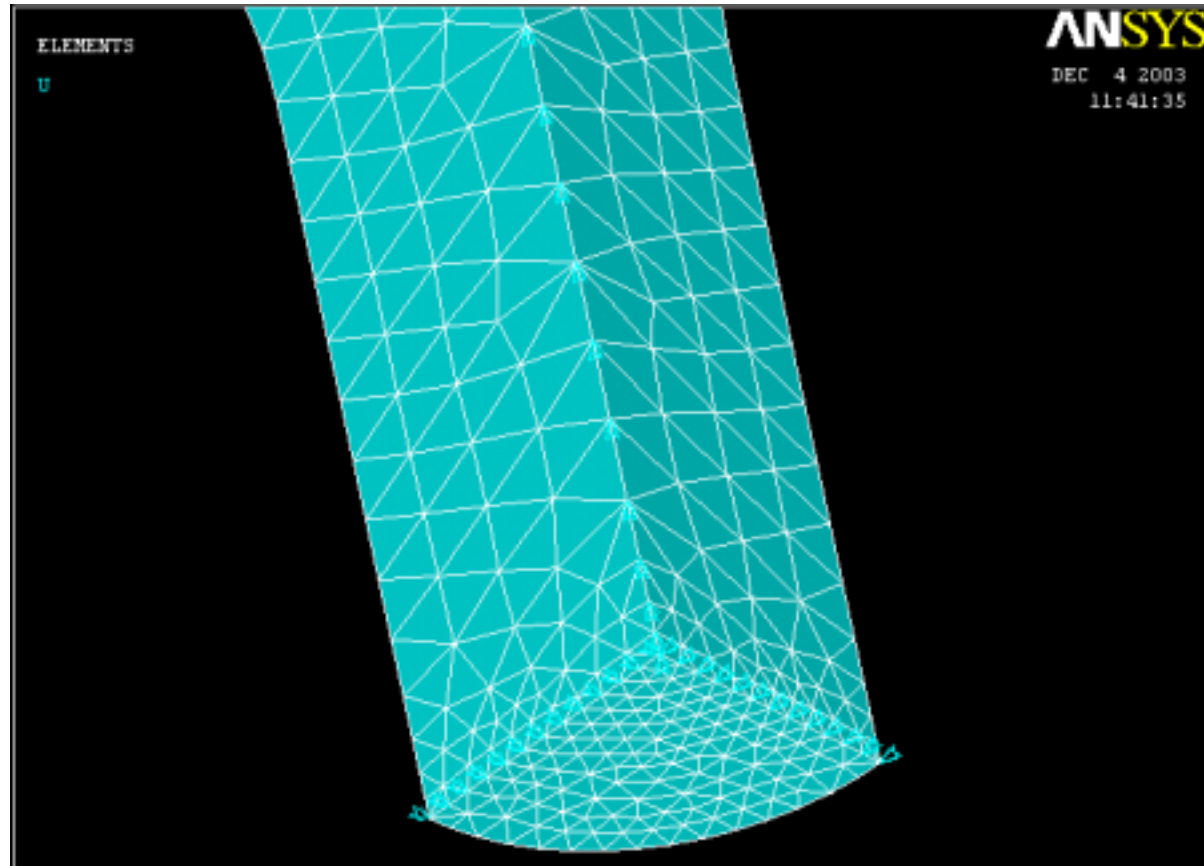
LS DYNA PLOTS

STRESS VS TIME

DISPLACEMENT VS TIME
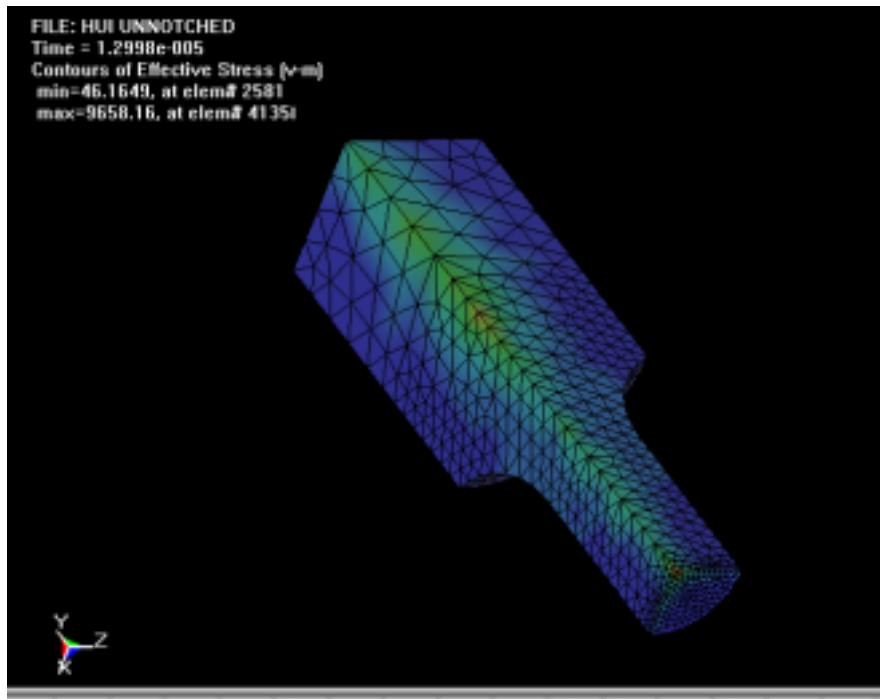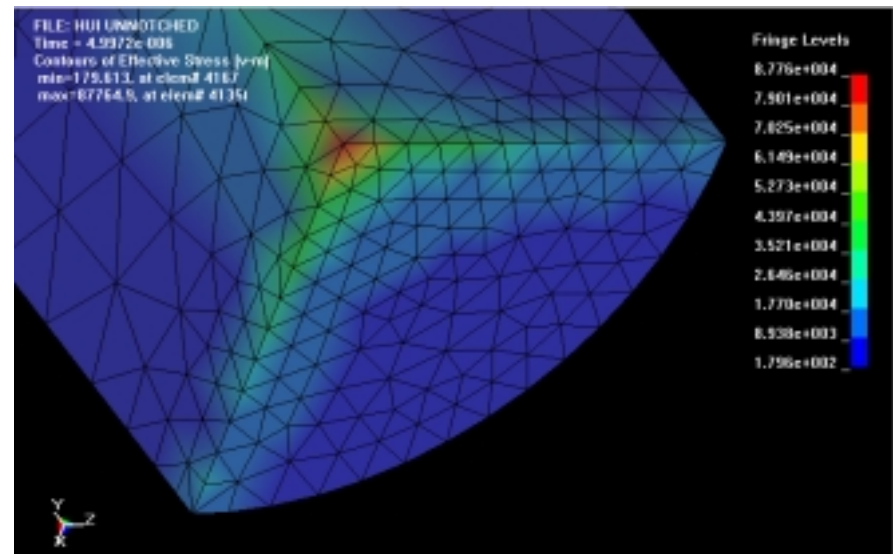
LS DYNA PLOTS CONT'D

EFFECTIVE PLASTIC STRAIN VS TIME

UNNOTCHED SPECIMEN (MESHI) WITH CONSTRAINTS

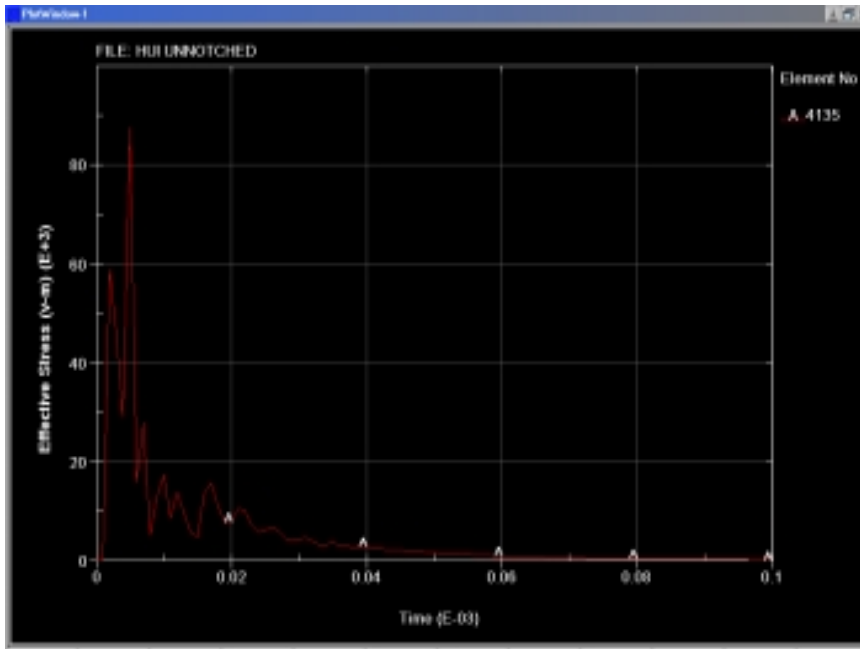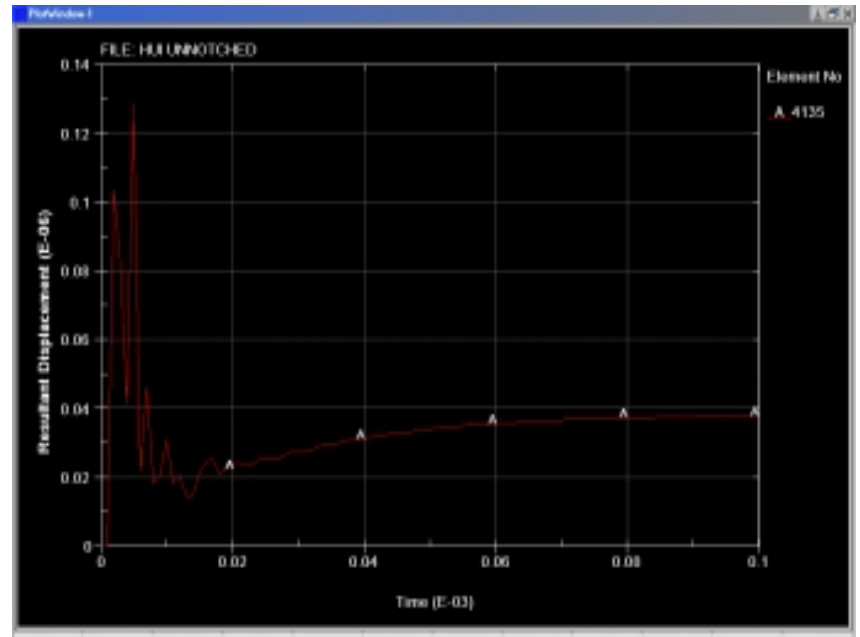# STRESS CONTOUR OF 422 SS UNNOTCHED SPECIMEN (MESH I- LSDYNA)

MAX STRESS CONTOUR

MAX STRESS AT THE BOTTOM REGION
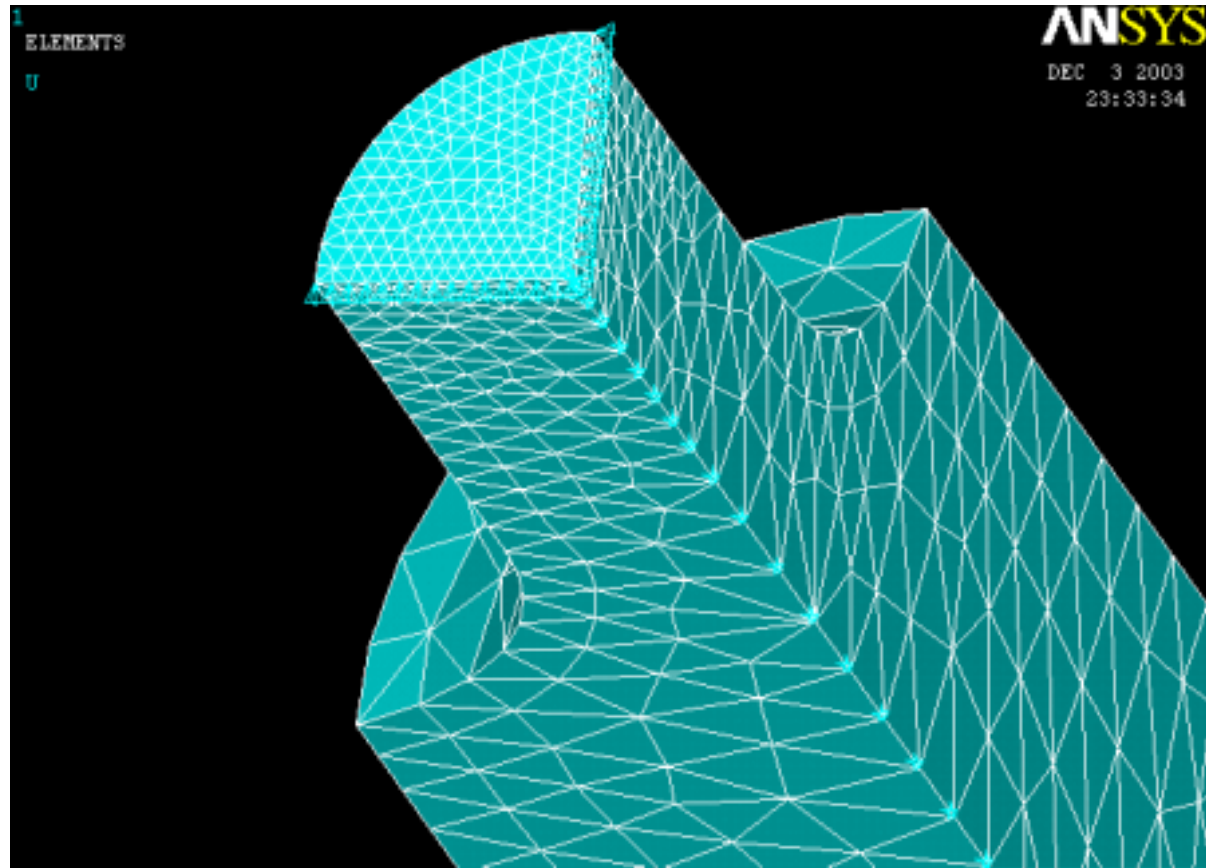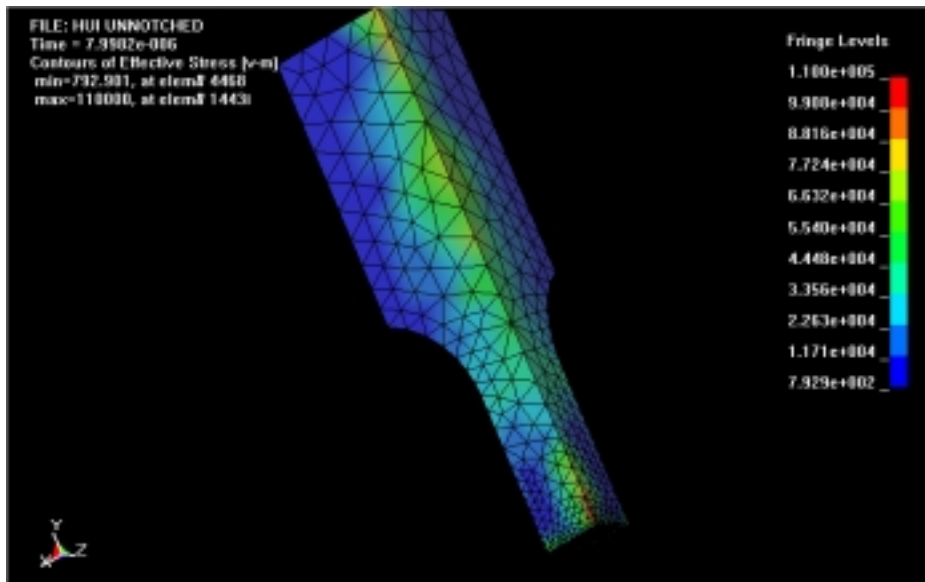
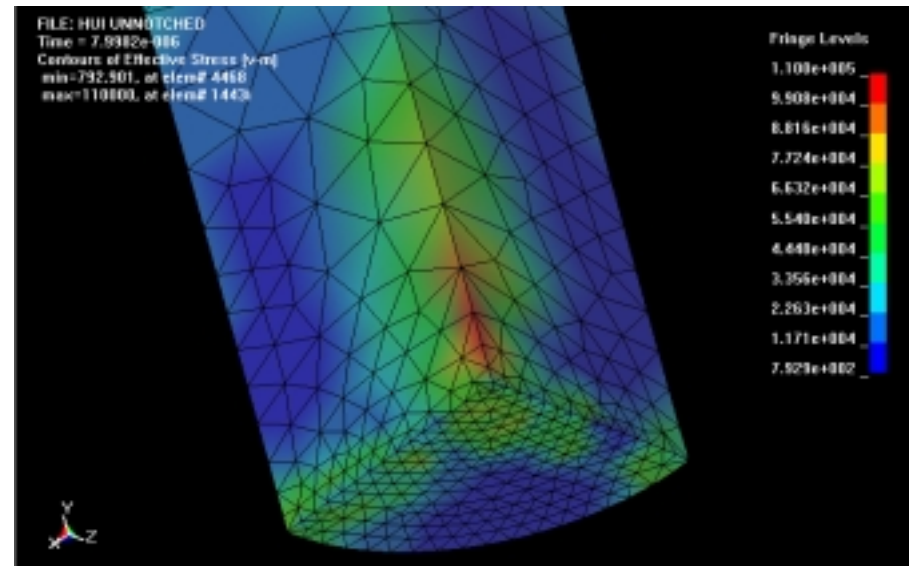# LS DYNA PLOTS

STRESS VS TIME

DISPLACEMENT VS TIME

UNNOTCHED SPECIMEN MESHII

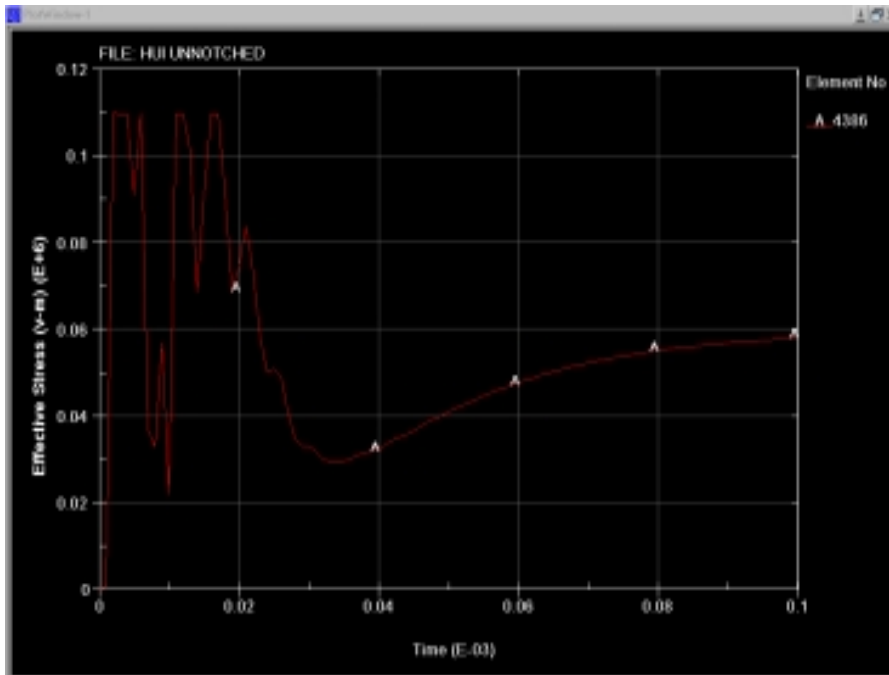# STRESS CONTOUR OF 422 SS UNNOTCHED SPECIMEN (MESH II- LSDYNA)
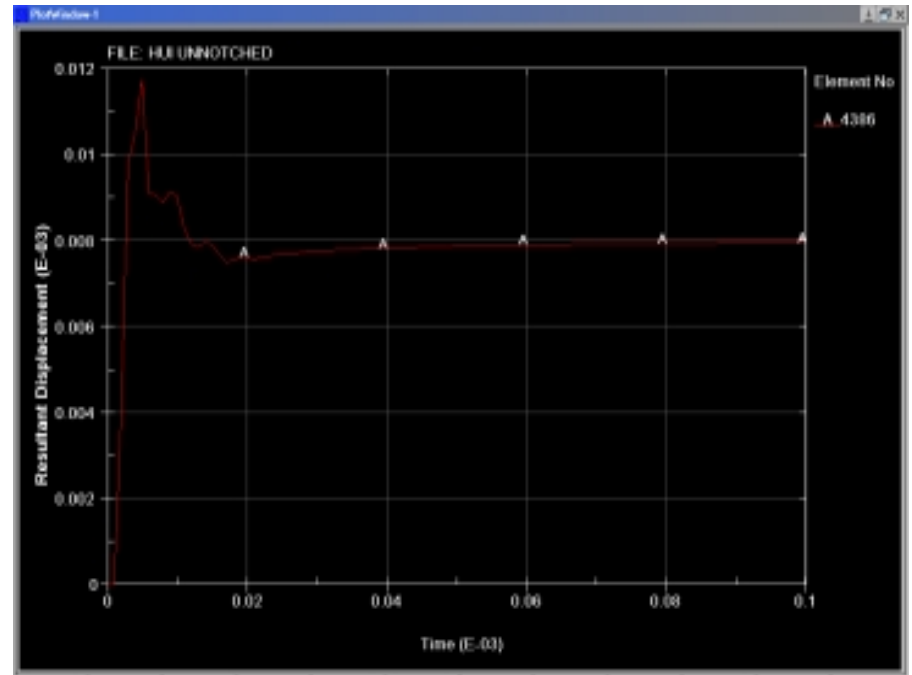

MAX STRESS CONTOUR

MAX STRESS AT THE BOTTOM REGION

LS DYNA PLOTS
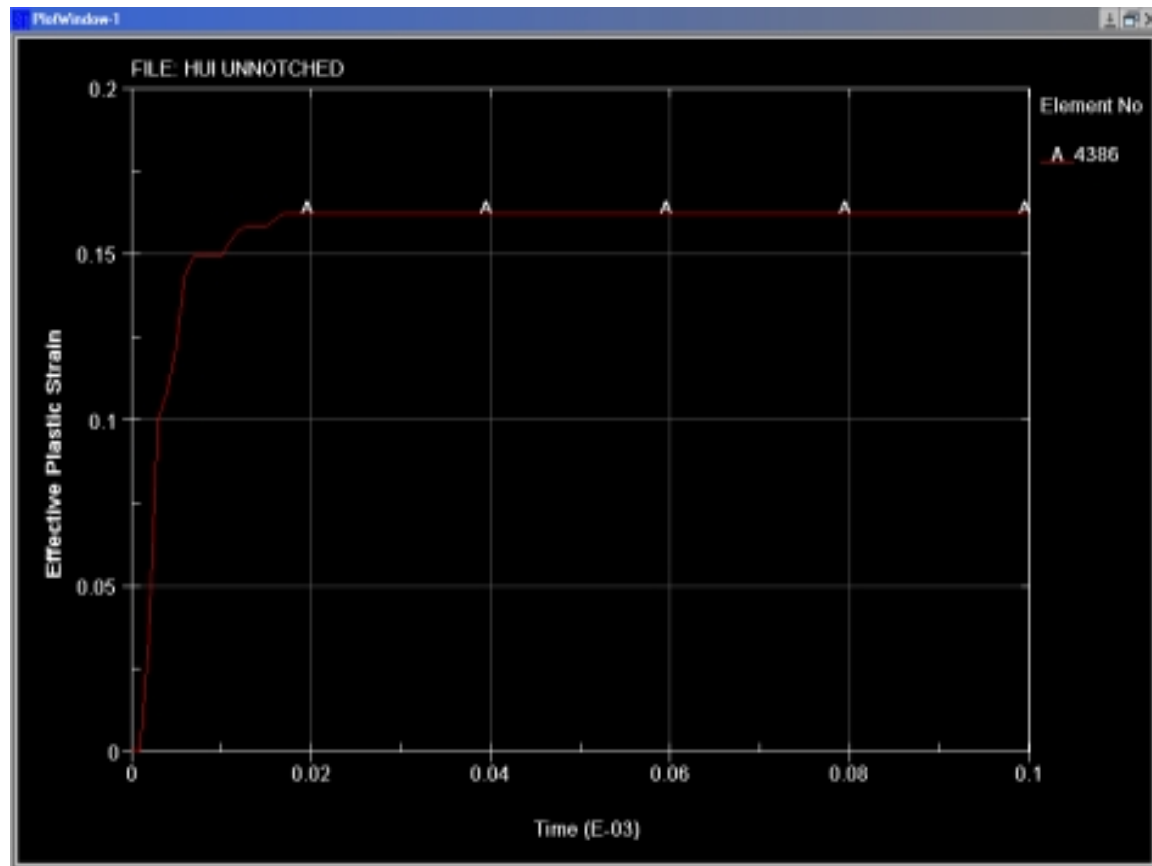

STRESS VS TIME

DISPLACEMENT VS TIME

LS DYNA PLOTS CONT'

EFFECTIVE PLASTIC STRAIN VS TIME

RESULTS
MAXIMUM STRESS VALUES

		EXP VALUES	PROJECT 1	PROJECT 2
		Ksi	Ksi	Ksi
MESH I	UNNOTCHED	145	185.6	87.6
	NOTCHED	145	221.5	121.8
MESH II	UNNOTCHED	239	187.2	110.0
	NOTCHED	239	199.3	110.0

CONCLUSION

➢ Thus the experimental and computational values are compared for different mesh configuration

➢ Thus the comparison of project 1 and project 2 is also shown

➢ Thus the variation in results are due to tensile load applied and the time for which specimen is pulled

➢ Contours for Effective Stress, Resultant Displacement and Time is also plotted