COMPUTATIONAL SIMULATION OF TENSILE TESTING USING SPECIMENS OF DIFFERENT CONFIGURATIONS

NOTCHED TENSILE SPECIMEN I

Project II

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OBJECTIVE

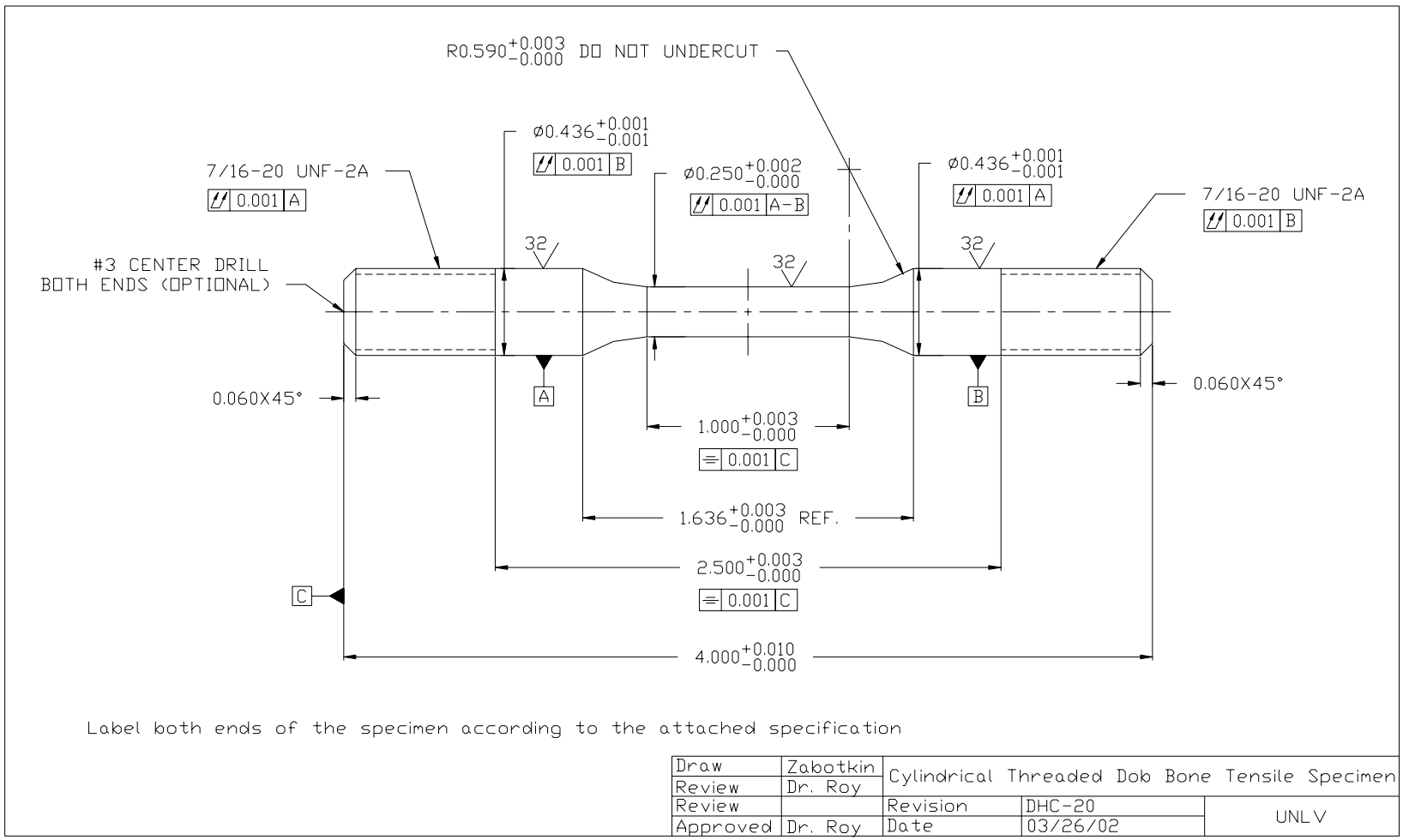
- To generate a computational model of a tensile specimen and evaluate its mechanical properties
- To study the effect of a notch in the gage section of the tensile specimen
- To study the effect of different mesh configurations
- To plot the Stress VS Time and Strain VS Time
- Compare the results obtained in both projects with experimental results.

The constraints and boundary conditions were different from the ones used in Project I

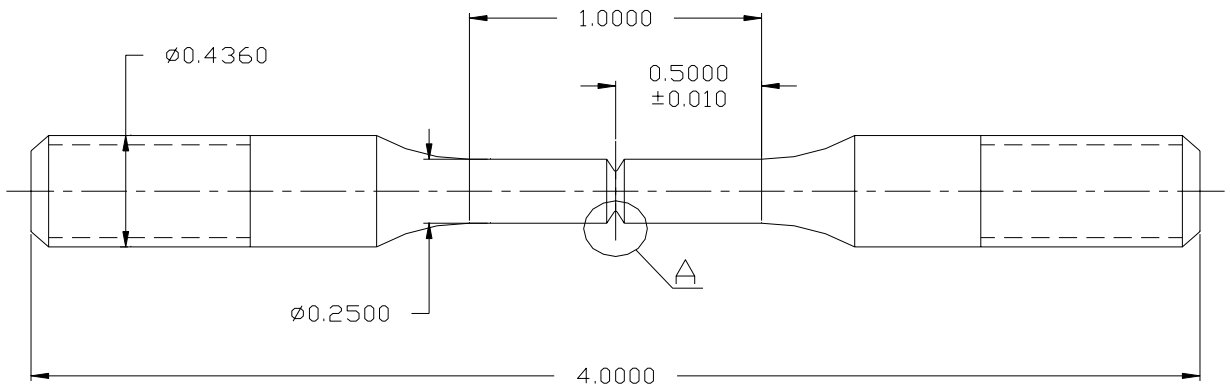
MODELING

- The specimen was modeled using Solid Works Educational Version
- Total length of the specimen is 4 inches
- The gage length of the specimen is 1 inch.

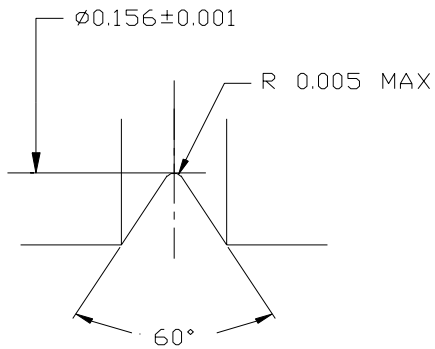
SPECIMEN CONFIGURATION (UN-NOTCHED)



SPECIMEN CONFIGURATION (NOTCHED)

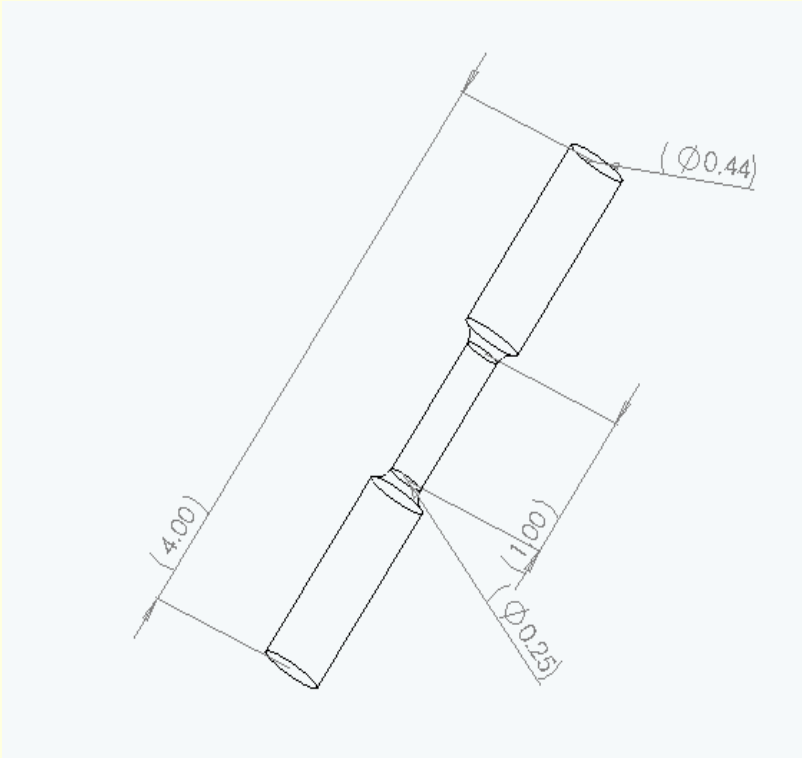


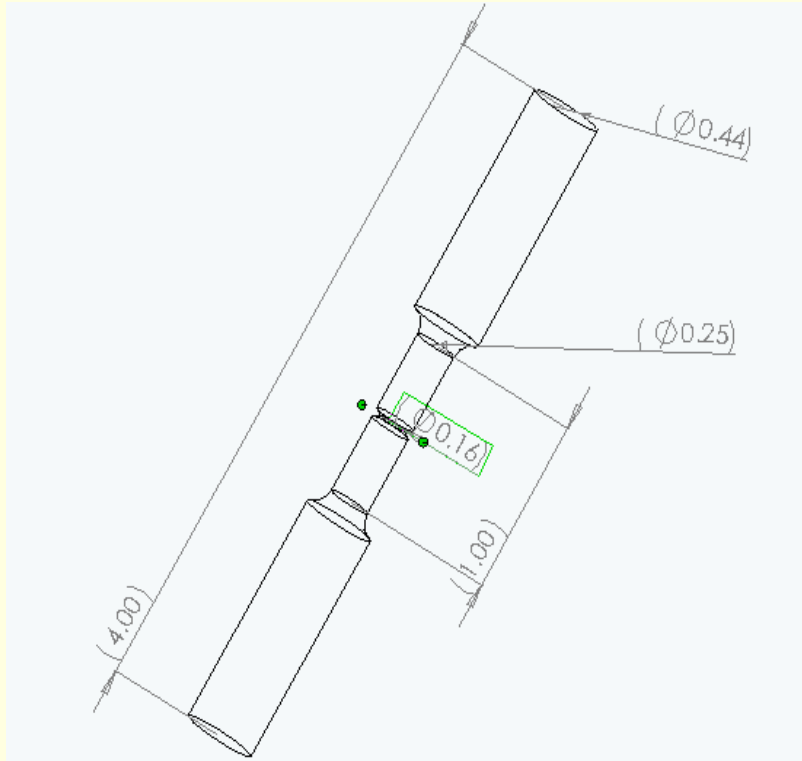
VIEW A
SCALE 6:1



University of Nevada, Las Vegas 4505 Maryland, Parkway, BOX 454009 Las Vegas, NV 89154-4009	Notched Tensile Specimen	
	DRAWN BY	ZABOTKIN
	CHECKED BY	DR. ROY
REVISION	DHC-30	SCALE 1.5:1
DATE	07/17/2002	

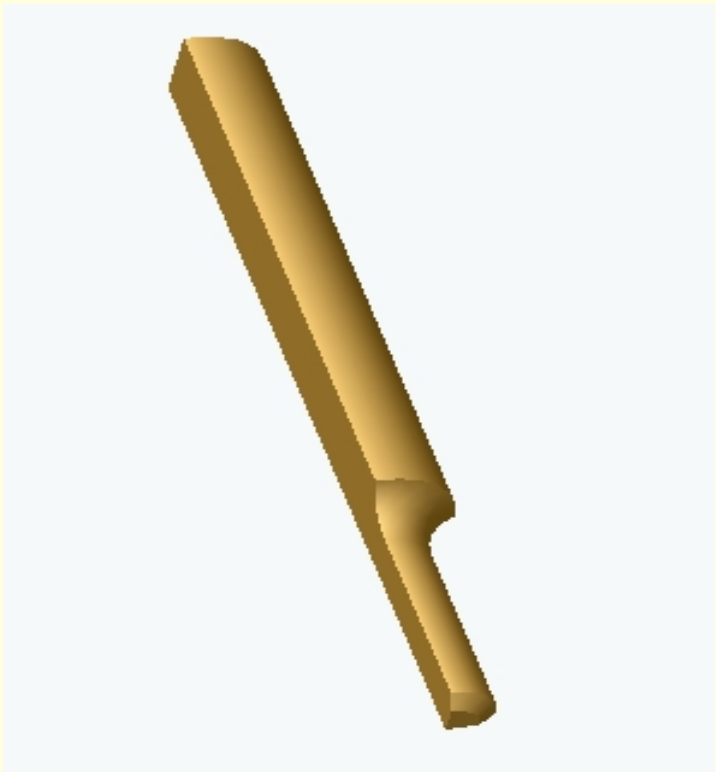
SPECIMEN CONFIGURATION (SOLID WORKS MODEL)





SPECIMEN SECTION FOR ANALYSIS

UN-NOTCHED



NOTCHED

MATERIAL PROPERTIES

MATERIAL	DENSITY (lb/in^3)	YIELD STRESS (psi)	YOUNG'S MODULUS (E) (psi)
HT-9	0.283599	$118 * 10^3$	$3 * 10^7$

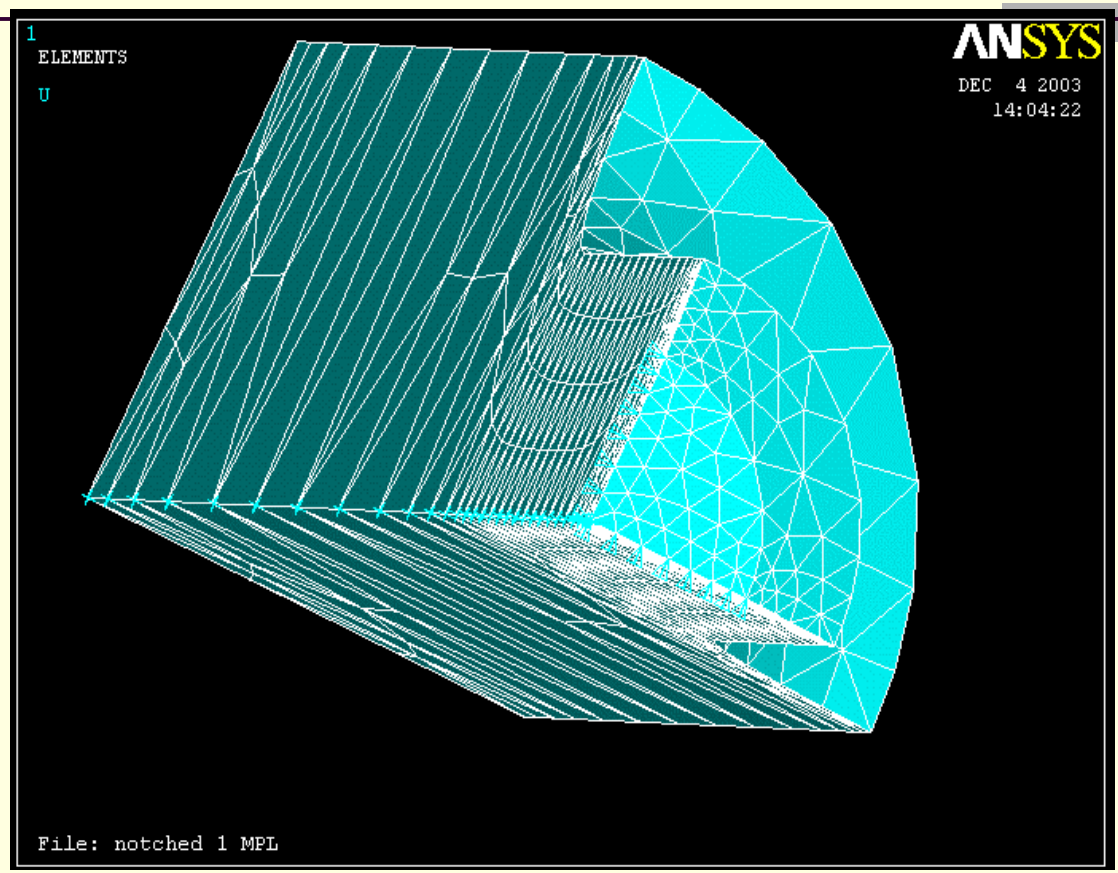
Element Type : 3D Solid 164

Material is Non Linear and Iso Tropic

MESHING

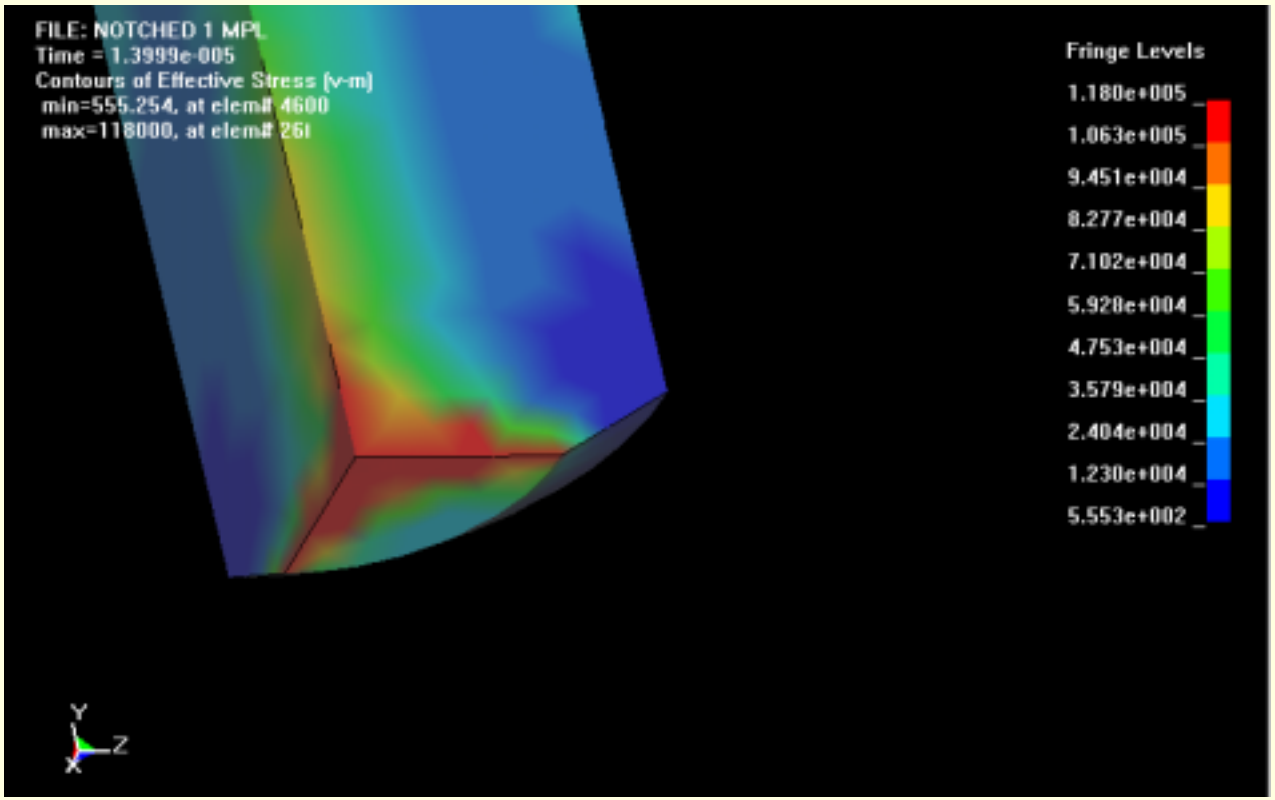
- Two different meshing configurations were used
- Mesh configuration 1 (coarse mesh)
- Mesh configuration 2 (fine mesh)

MESH CONFIGURATION I WITH CONSTRAINTS (NOTCHED)



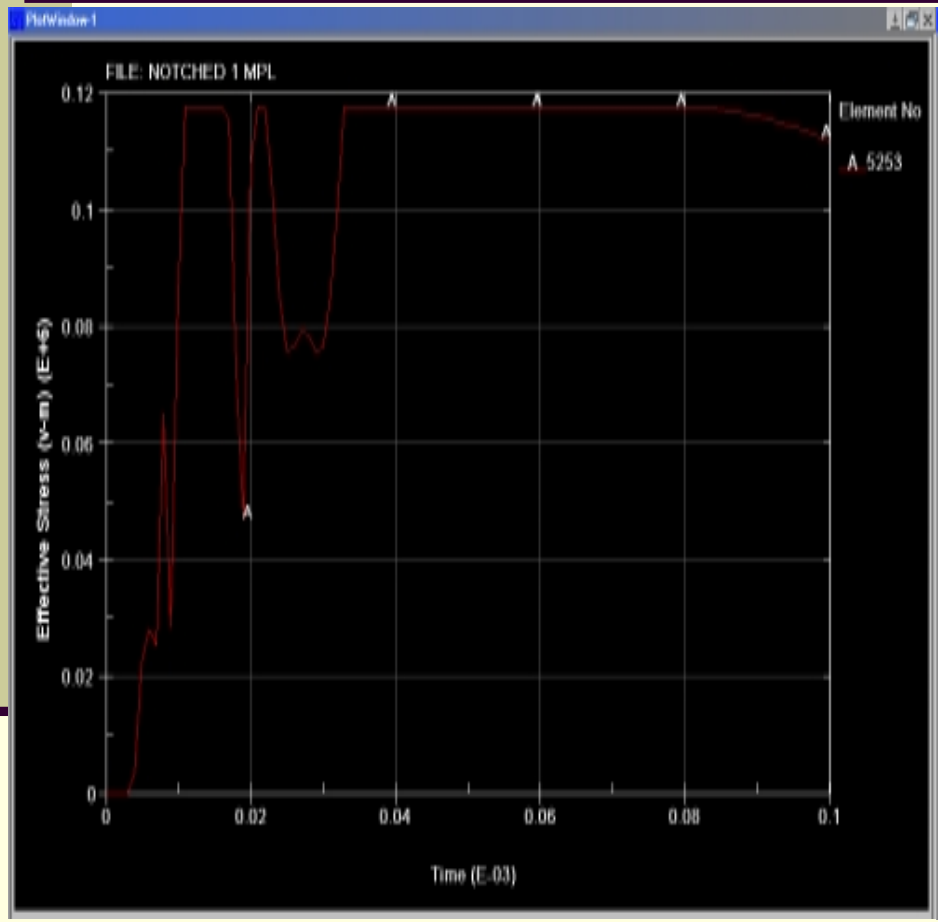
U_Z=0 in X-Direction, U_y=0 in Y-Direction, U_x =0 in Z-Direction

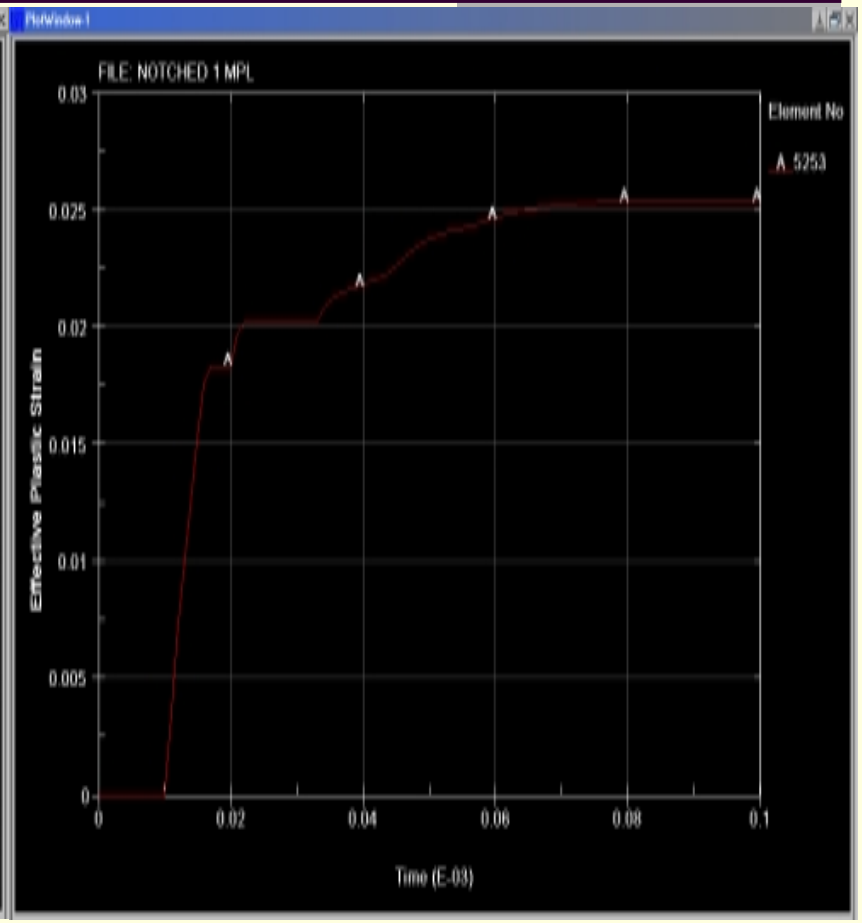
MAXIMUM STRESS CONTOUR (MESH I)



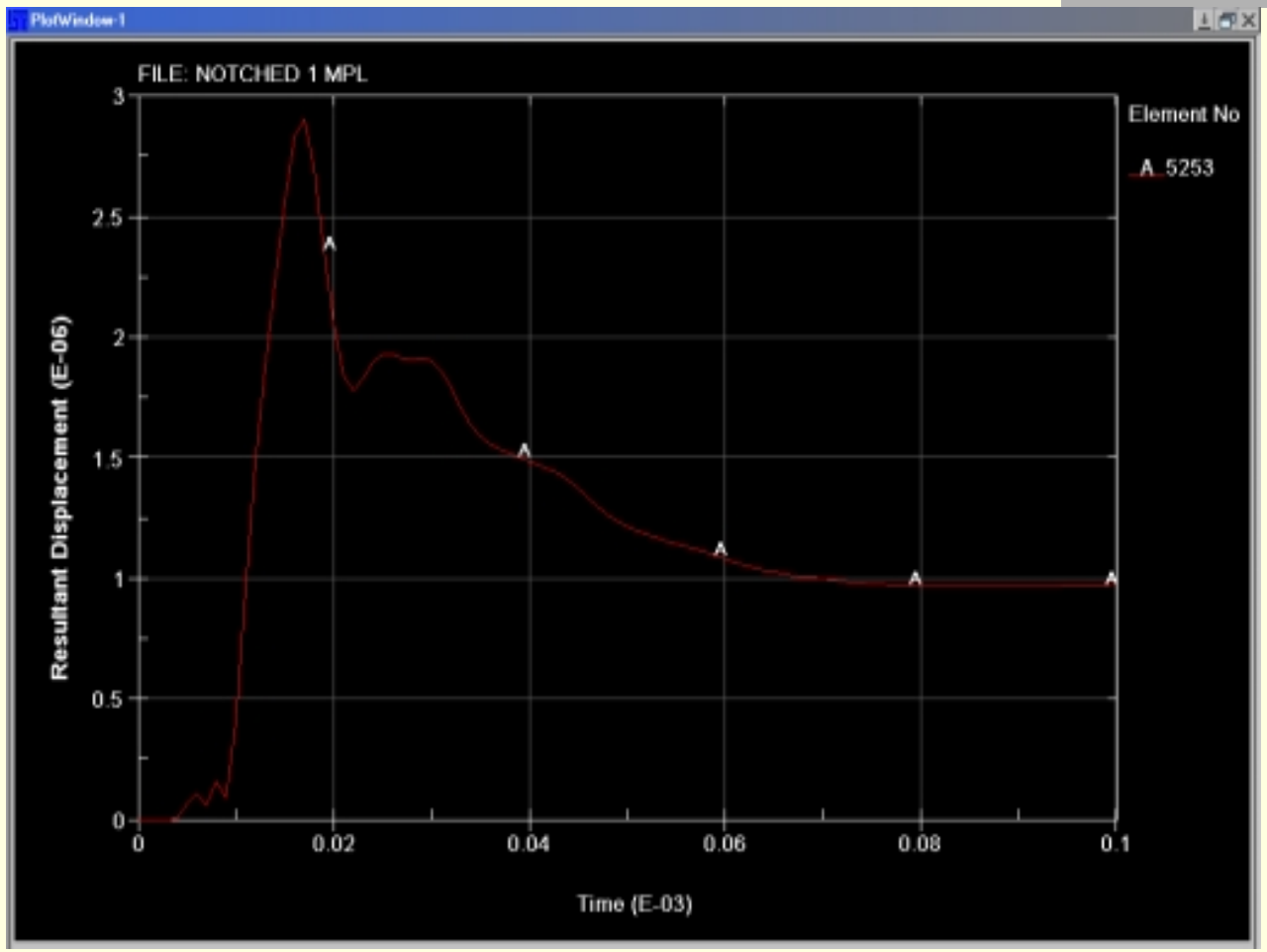
NOTCHED SPECIMEN

STRESS/PLASTIC STRAIN VS TIME PLOTS

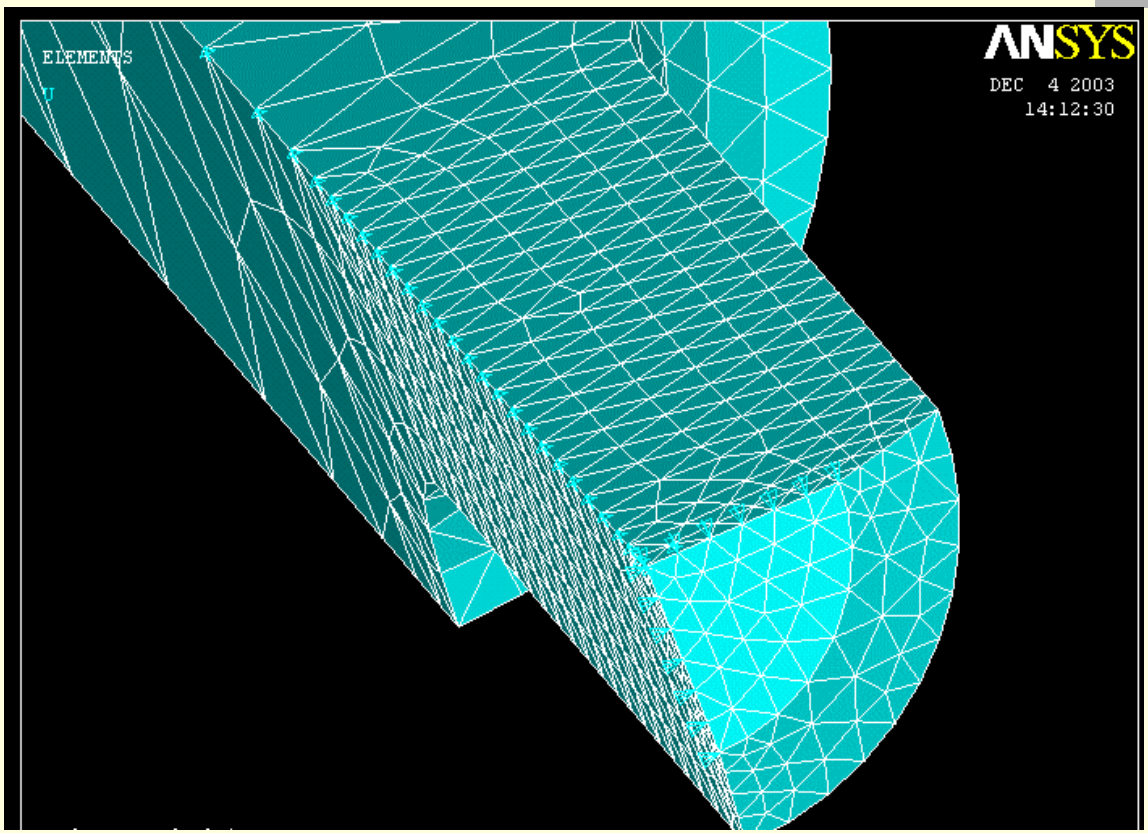




DISPLACEMENT VS TIME PLOT

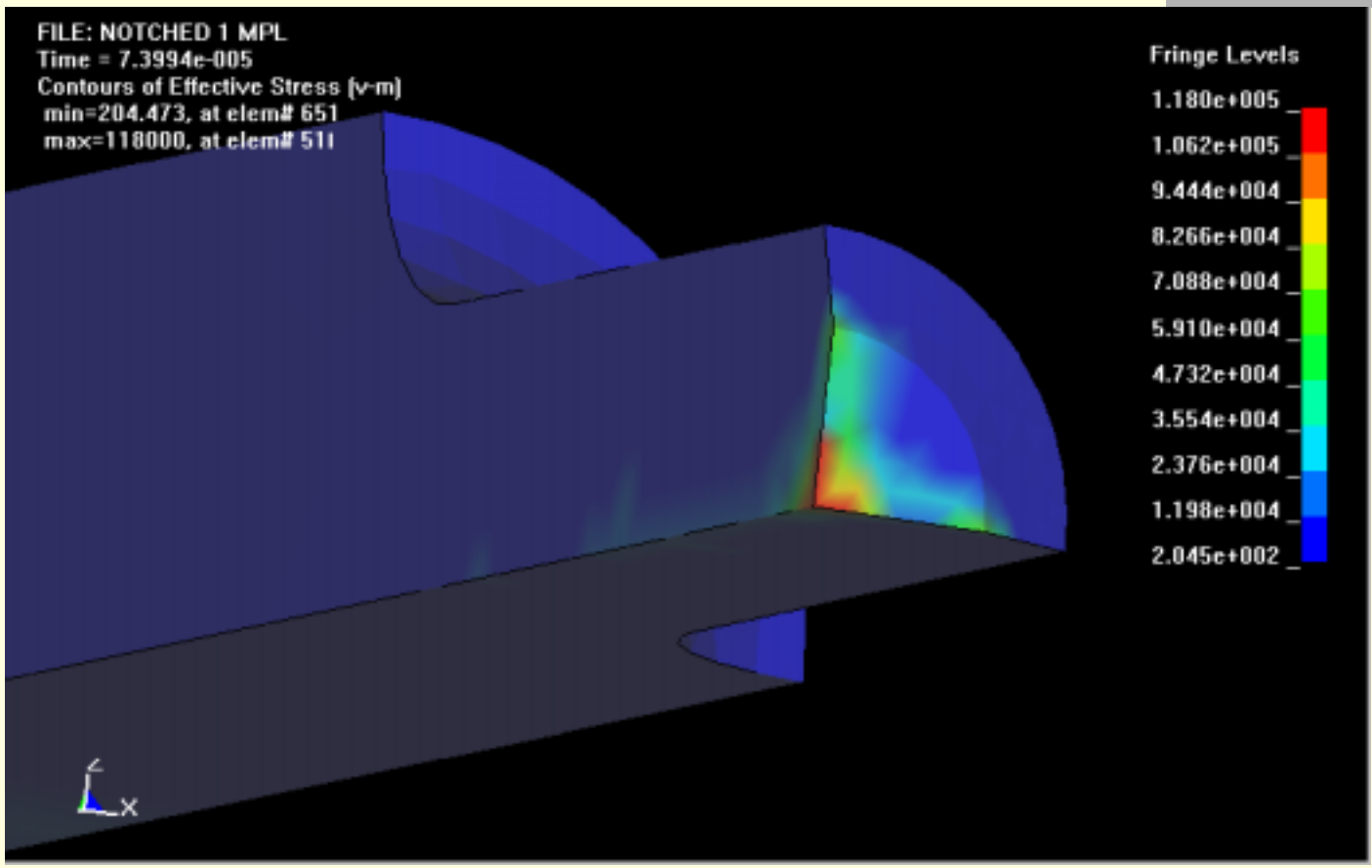


MESH CONFIGURATION II WITH CONSTRAINTS (NOTCHED)



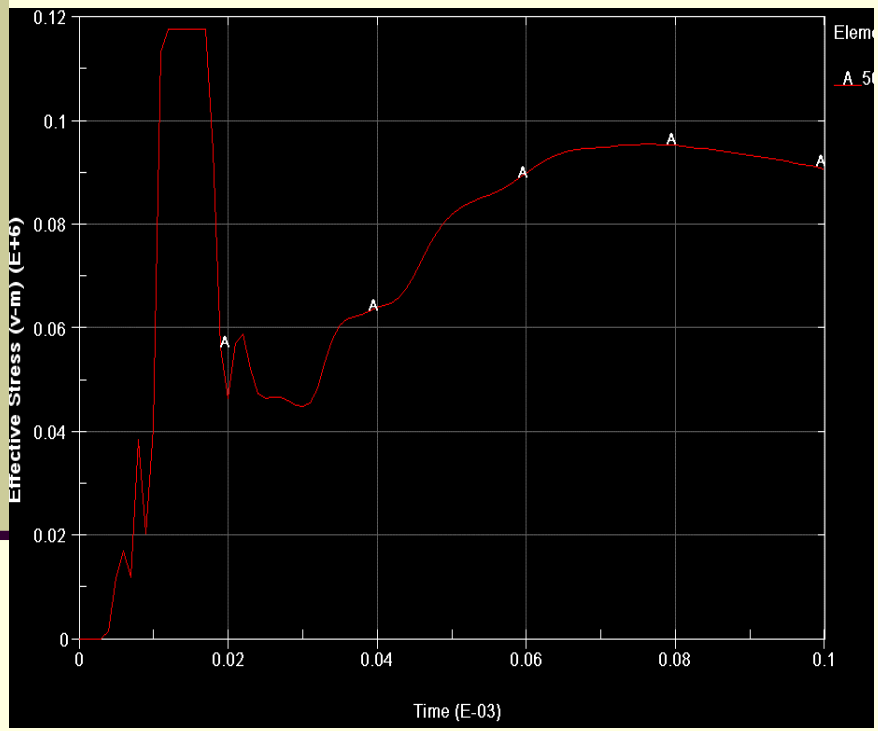
U_Z=0 in X-Direction, U_y=0 in Y-Direction, U_x =0 in Z-Direction

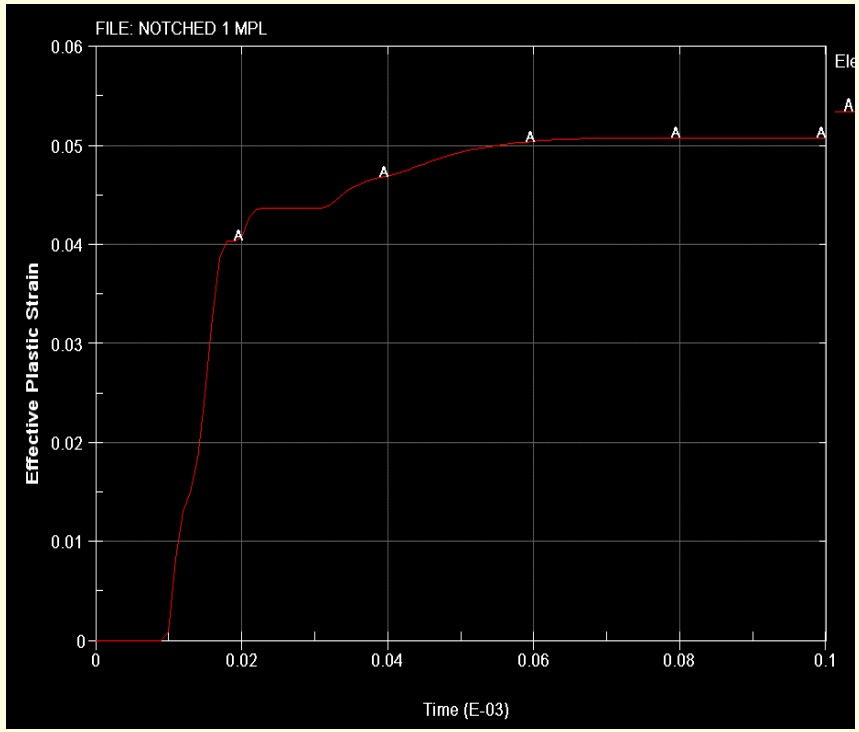
MAXIMUM STRESS CONTOUR (MESH II)



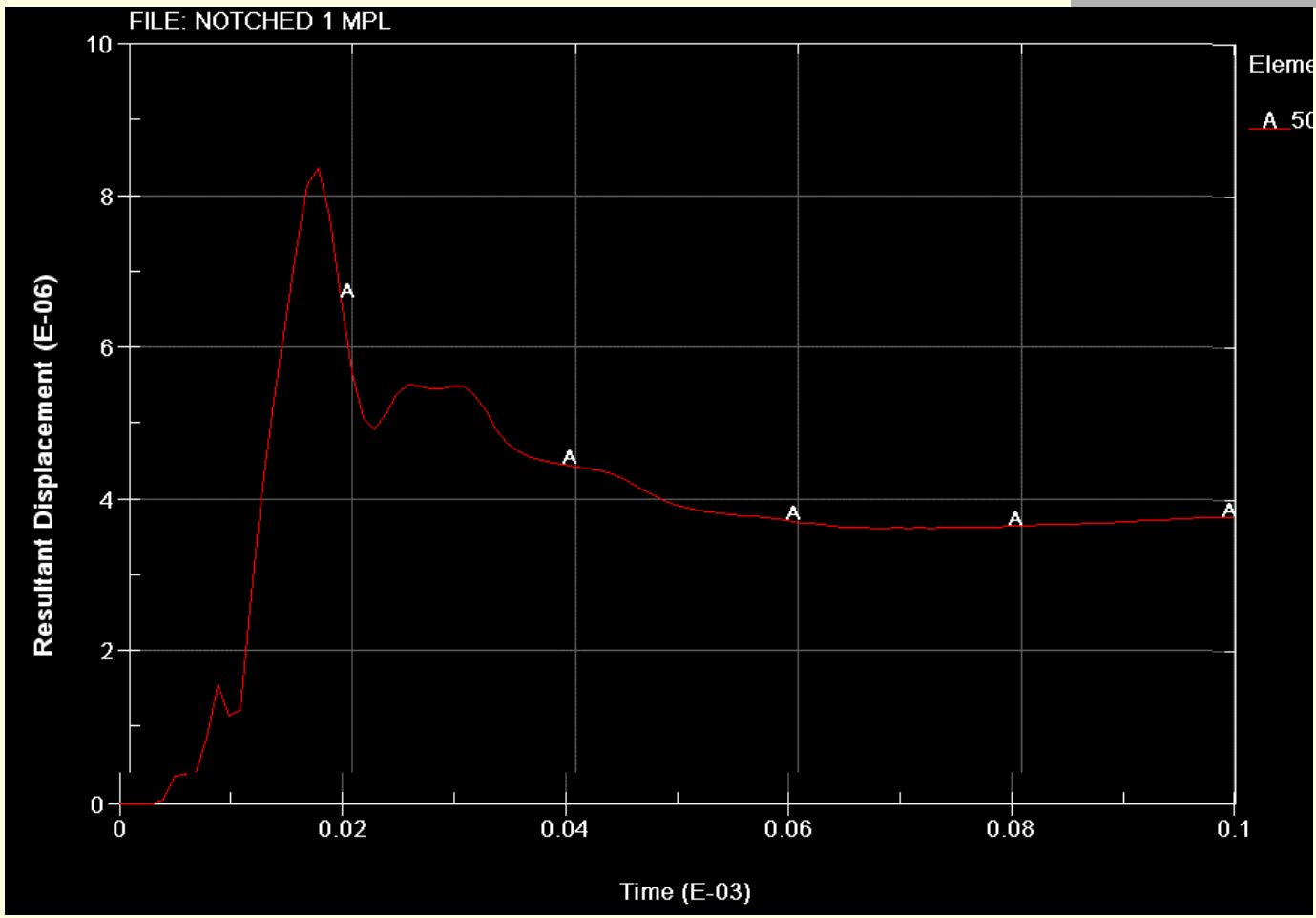
NOTCHED SPECIMEN

STRESS/PLASTIC STRAIN VS TIME PLOTS

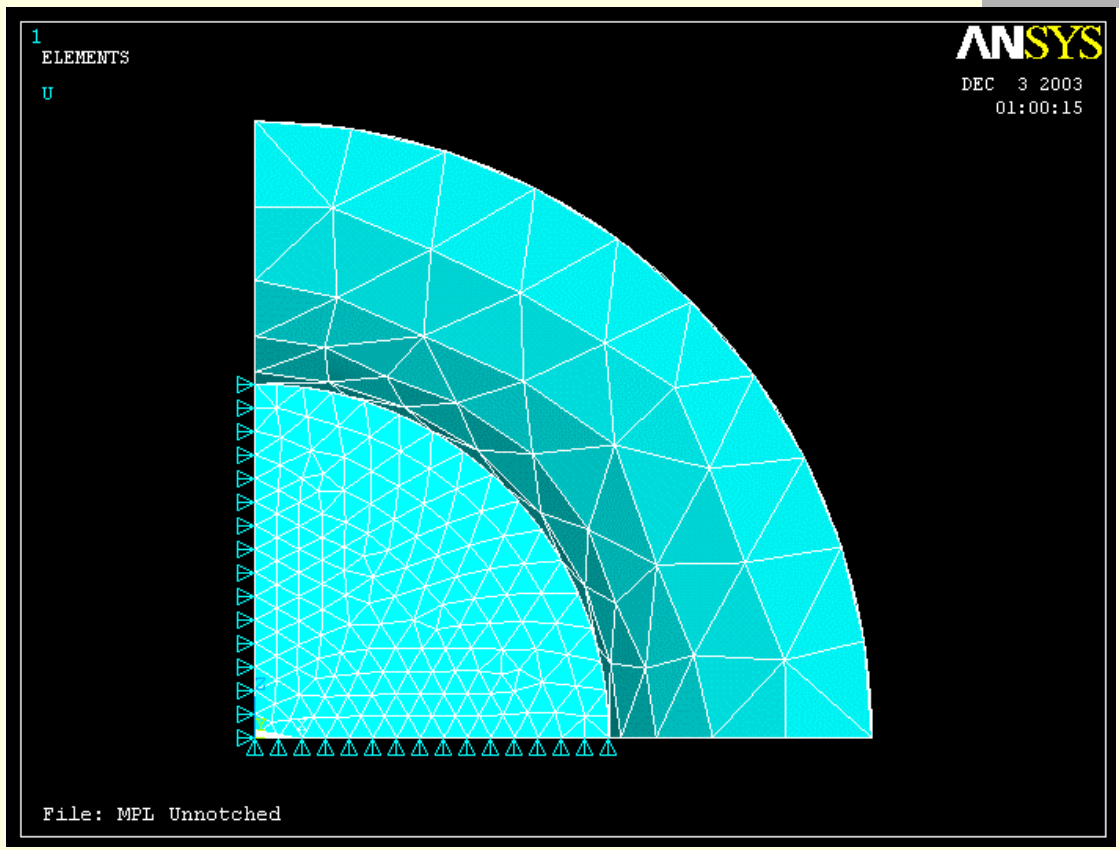




DISPLACEMENT VS TIME PLOT



MESH CONFIGURATION I WITH CONSTRAINTS (UN-NOTCHED)



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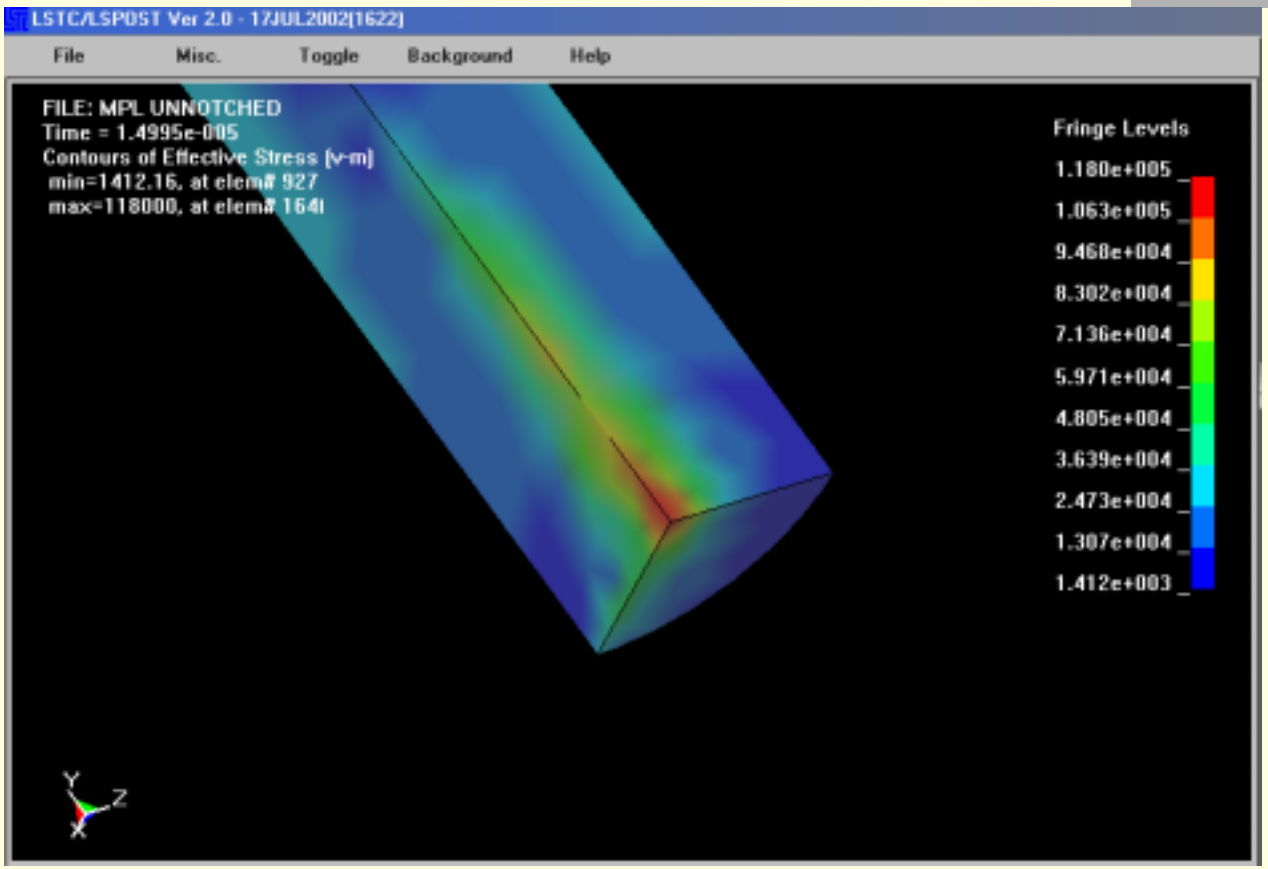
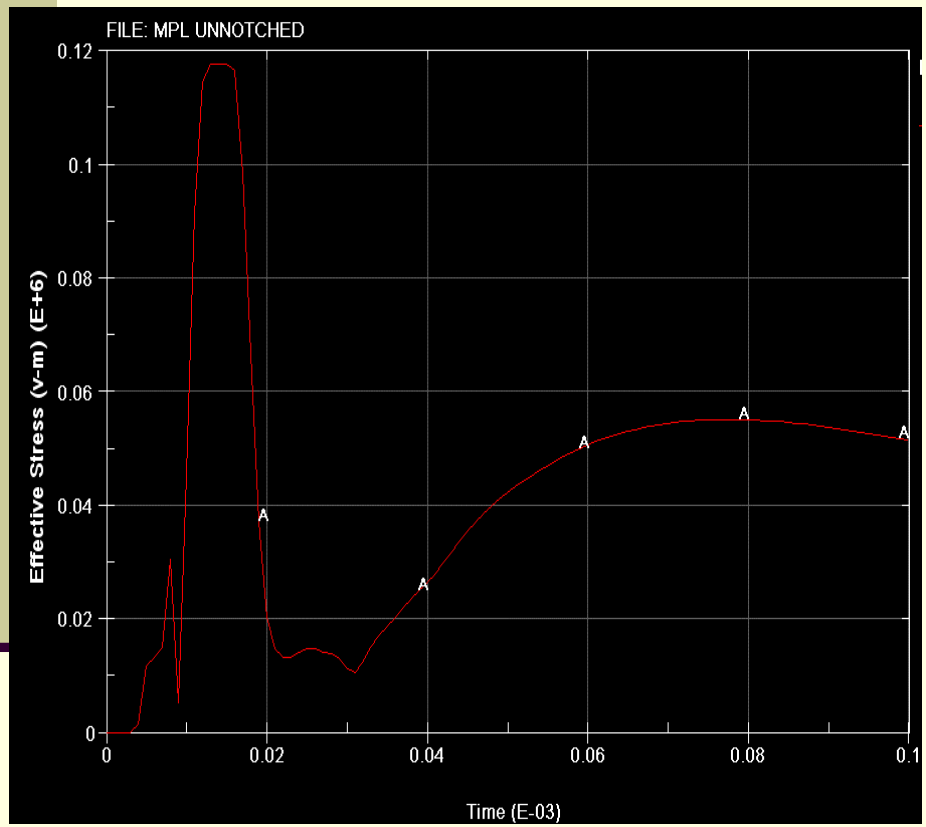
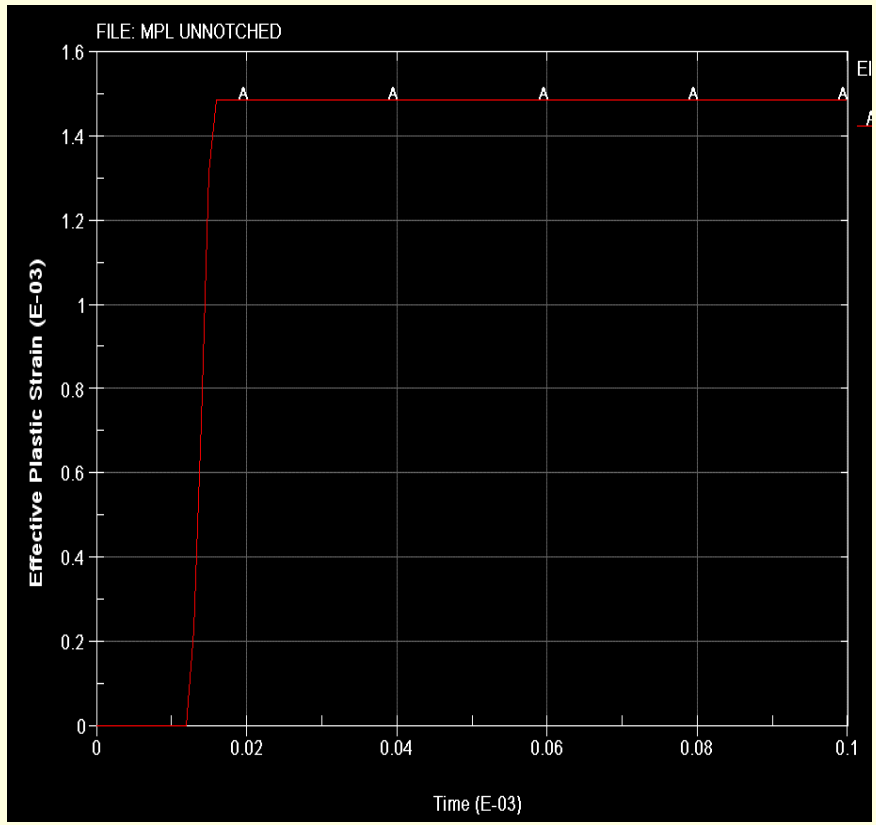
MAXIMUM STRESS CONTOUR (MESH I)



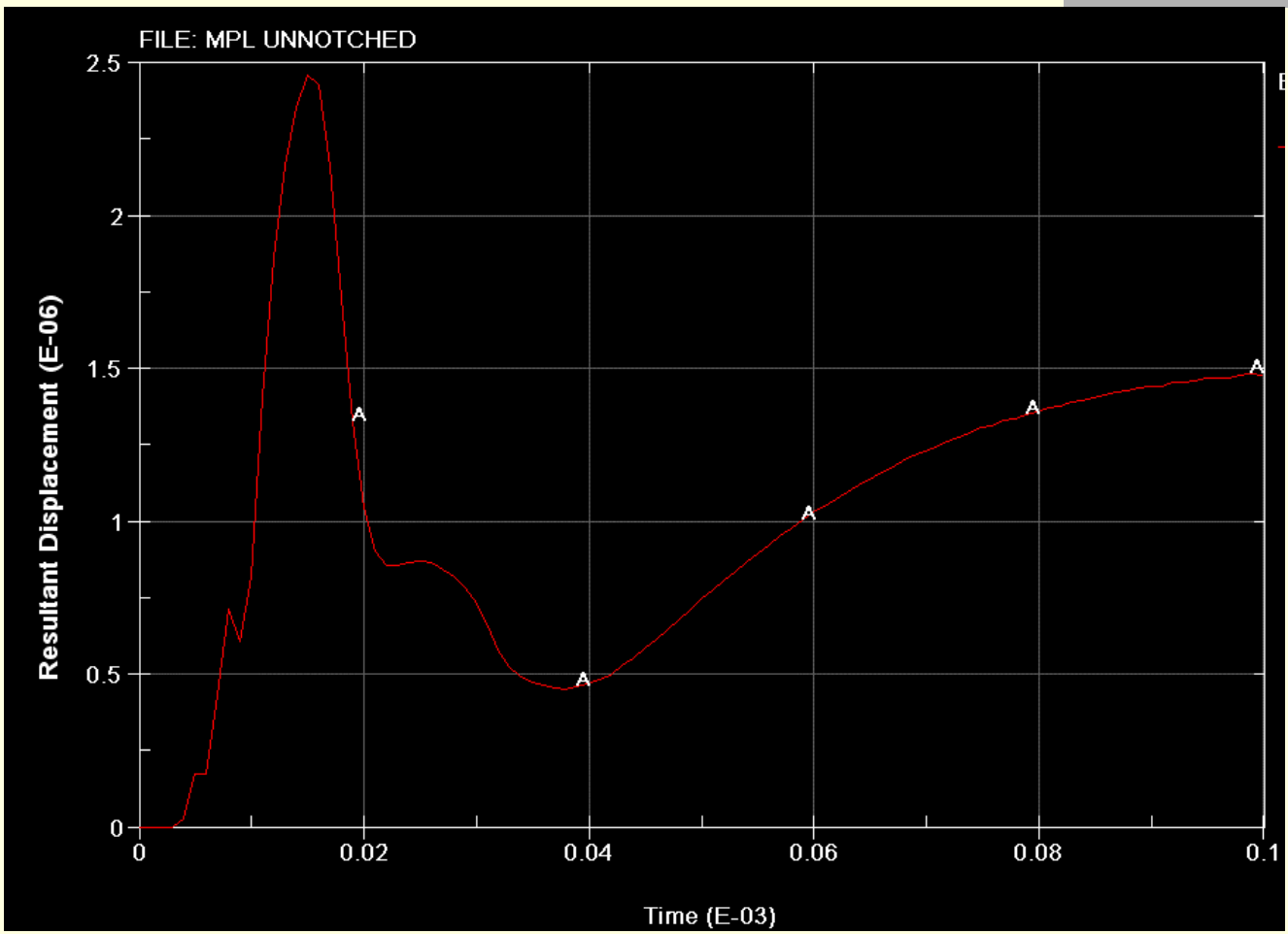
UN-NOTCHED SPECIMEN

STRESS/PLASTIC STRAIN VS TIME PLOTS

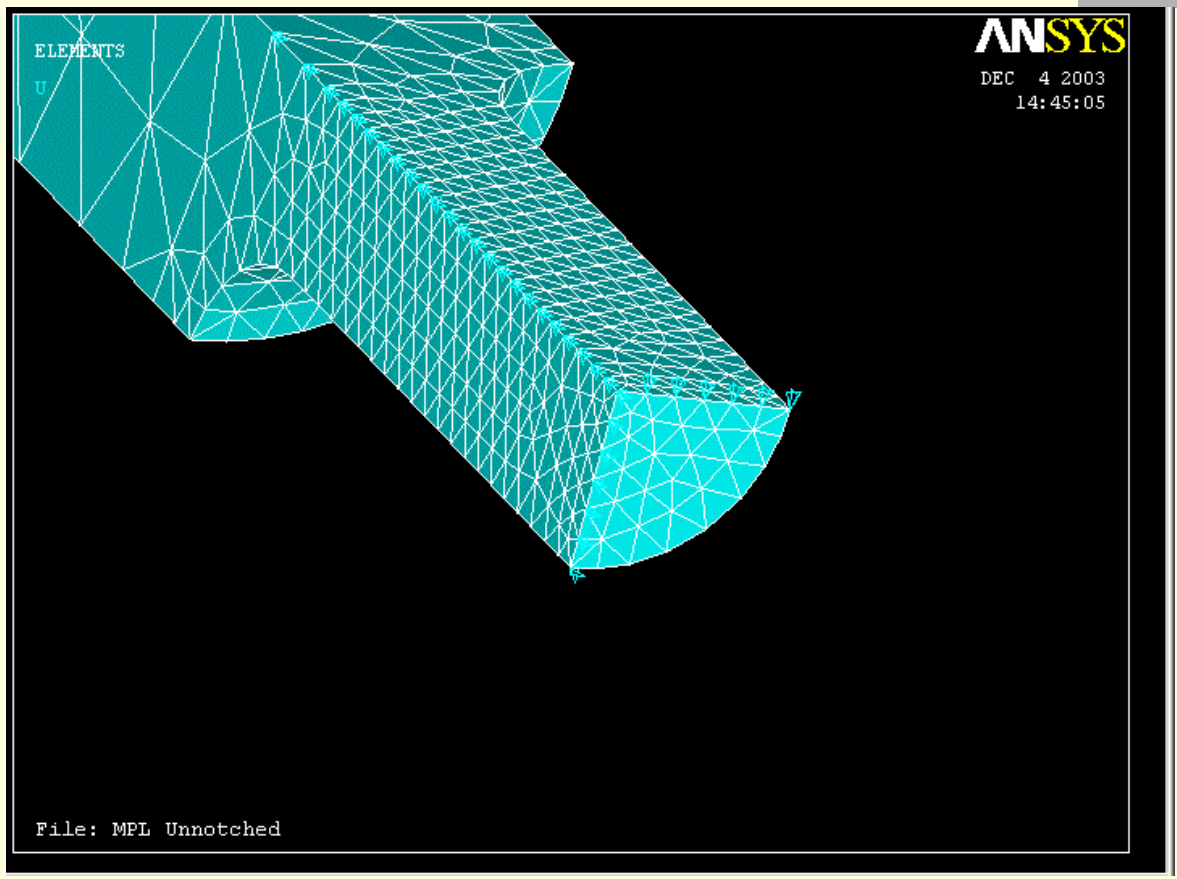




DISPLACEMENT VS TIME PLOT

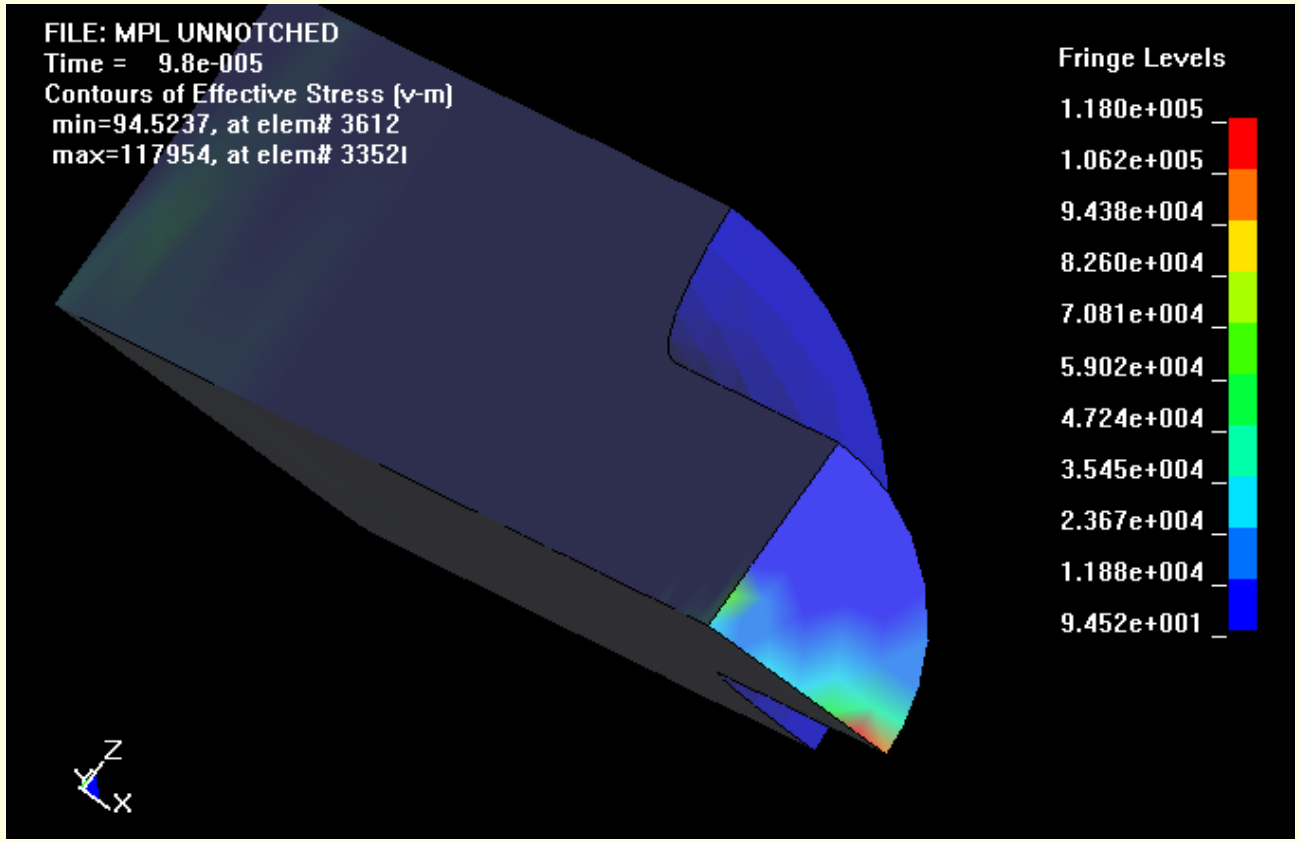


MESH CONFIGURATION Ii WITH CONSTRAINTS (UN-NOTCHED)



U_Z=0 in X-Direction, U_y=0 in Y-Direction, U_x =0 in Z-Direction

MAXIMUM STRESS CONTOUR (MESH II)



UN-NOTCHED SPECIMEN

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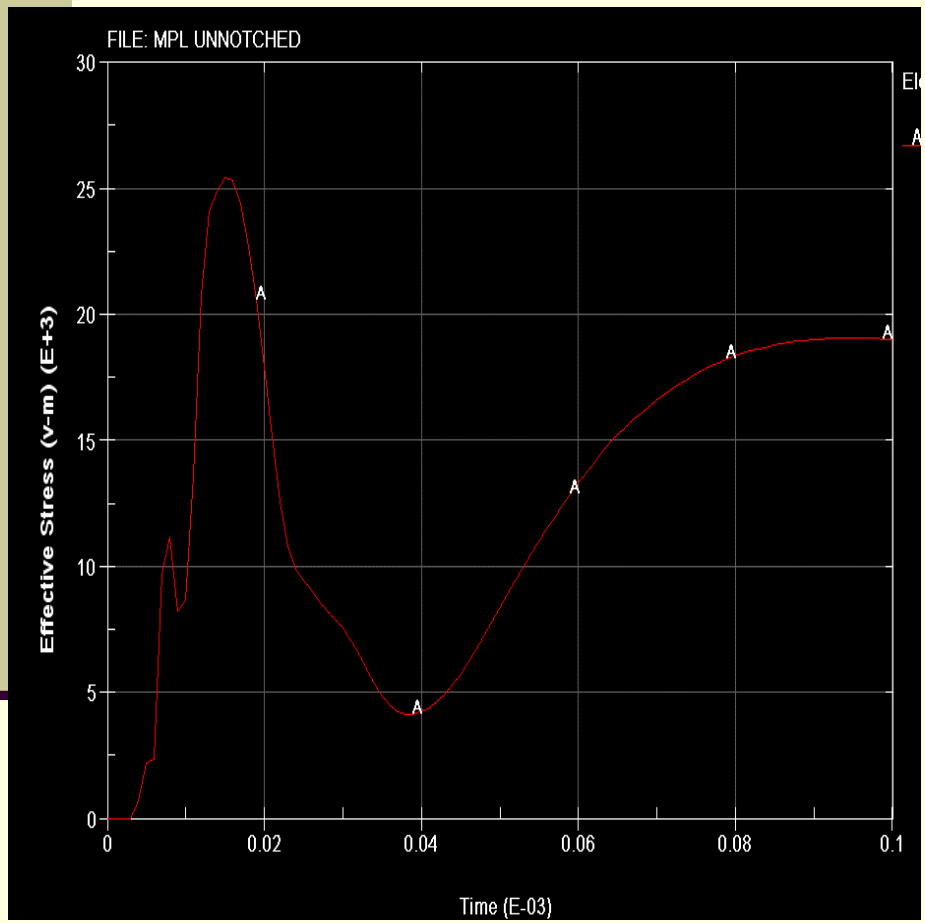
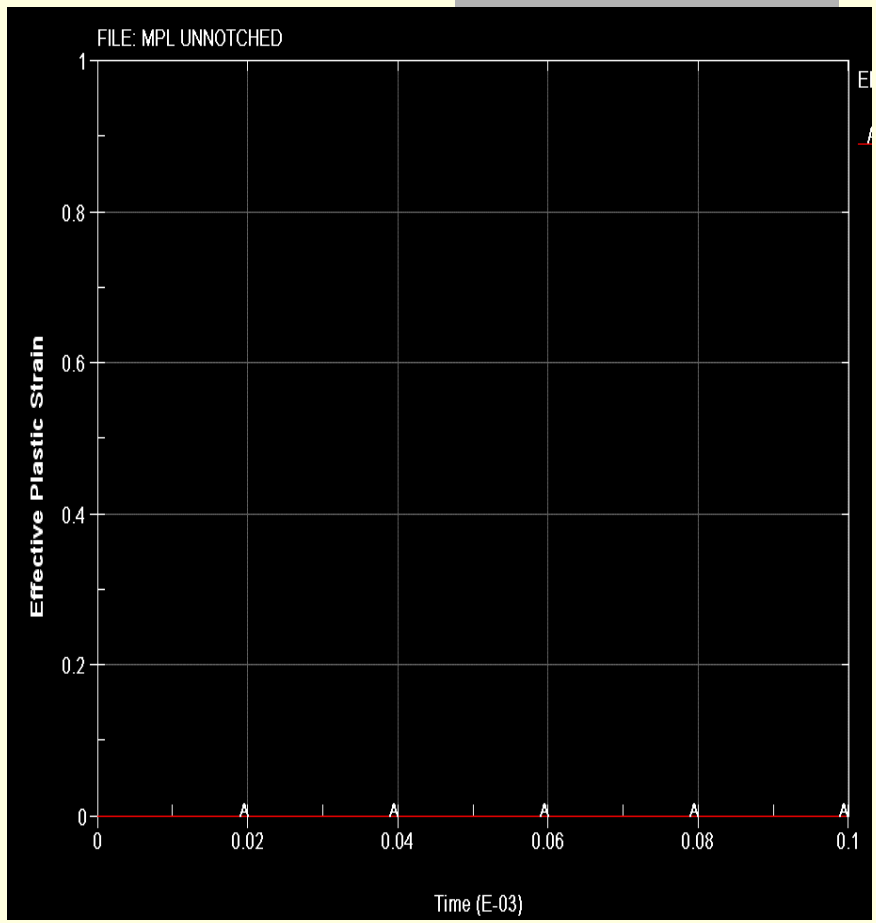
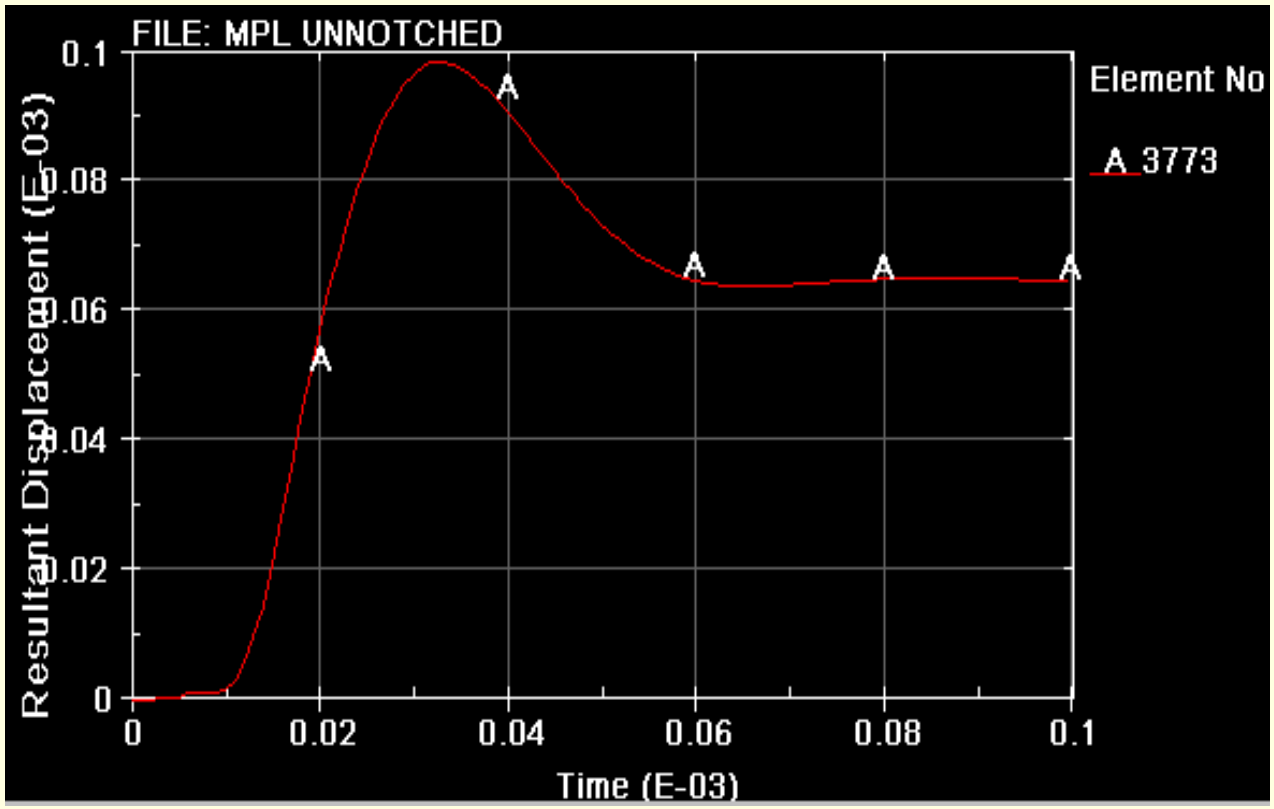




DISPLACEMENT VS TIME PLOT



COMPARISON OF EXPERIMENTAL AND COMPUTATIONAL RESULTS

MATERIAL	CONFIGURATION	MESH SCHEME	EXPERIMENTAL VALUES	COMPUTATIONAL VALUES PROJ I	RESULTS PROJ II
HT-9	UN-NOTCHED	SCHEME 1	Ult. Tensile Strength= 143 Ksi	Max. Stress Obtained = 184 Ksi	Max Stress= 118 Ksi
HT-9	UN-NOTCHED	REFINED MESH	Ult. Tensile Strength= 143 Ksi	Max. Stress Obtained = 188.5 Ksi	Max Stress= 118 Ksi

MATERIAL	CONFIGURATION	MESH SCHEME	EXPERIMENTAL VALUES	COMPUTATIONAL VALUES Proj I	Results Proj II
HT-9	NOTCHED	SCHEME 1	Ult. Tensile Strength= 243 Ksi	Max. Stress Obtained = 264.845 Ksi	Max Stress= 118 Ksi
HT-9	NOTCHED	REFINED MESH	Ult. Tensile Strength= 243 Ksi	Max. Stress Obtained = 307.670 Ksi	Max Stress= 118 Ksi

CONCLUSIONS

- The tensile specimen was studied under different mesh configurations
- Comparison of computational and experimental results shows discrepancies in the magnitude of the parameter under consideration.
- The results obtained were compared with those obtained in project I and also the experimental values.
- Stress VS Time, Strain VS time and Displacement Vs Time were plotted.