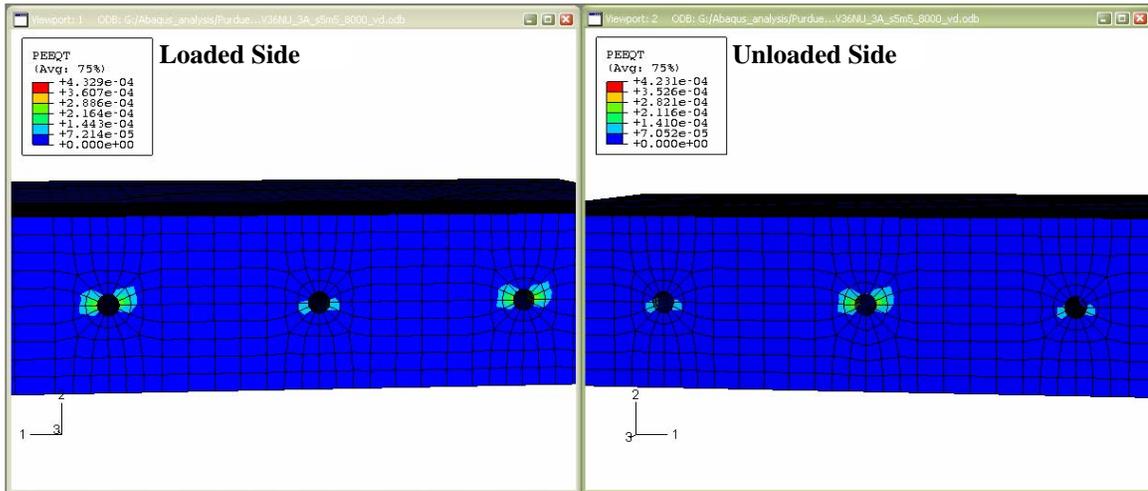


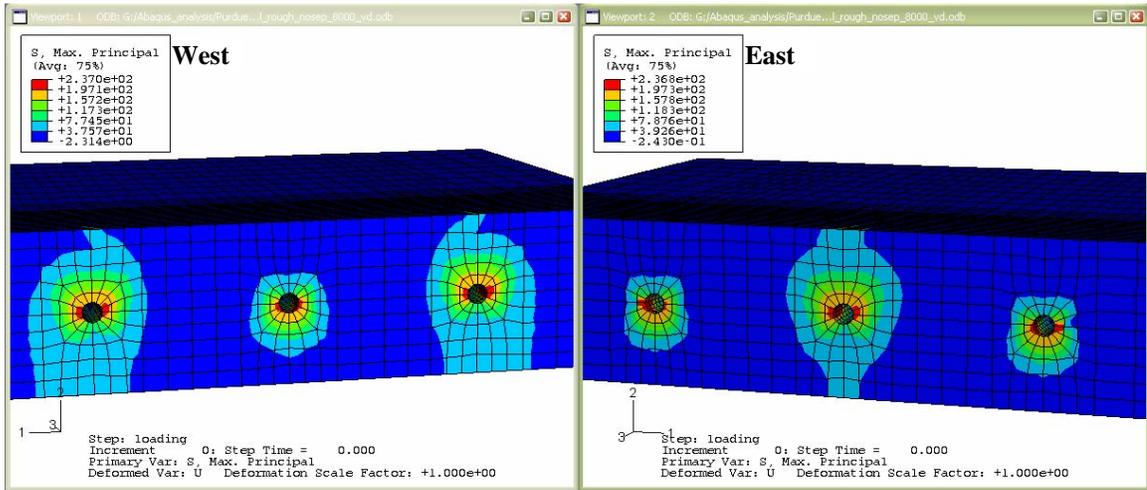
(c) Inelastic Compressive Strains at end of load application



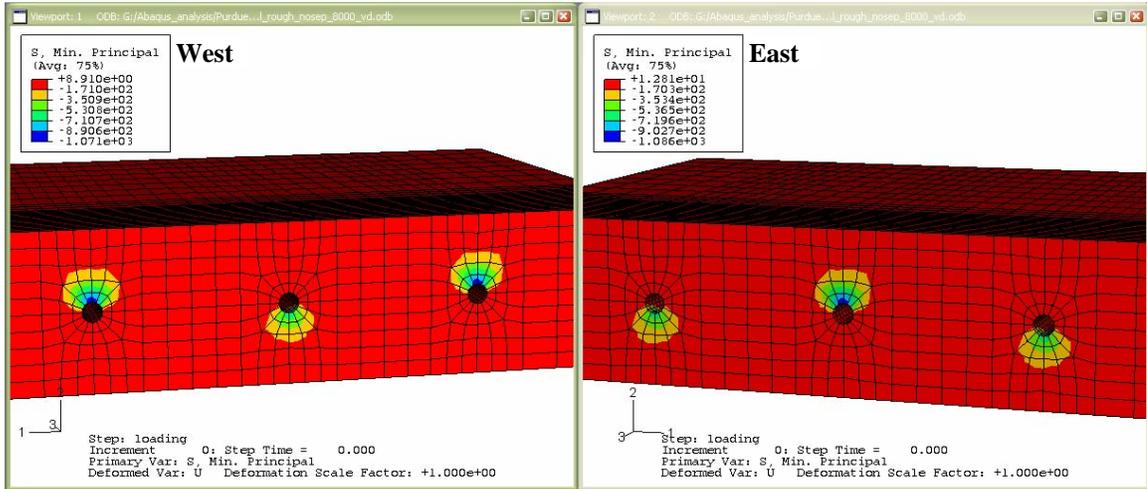
(d) Inelastic Tensile Strains at end of load application

Figure D-4: Stresses and Strains for 3V36NU model after load application

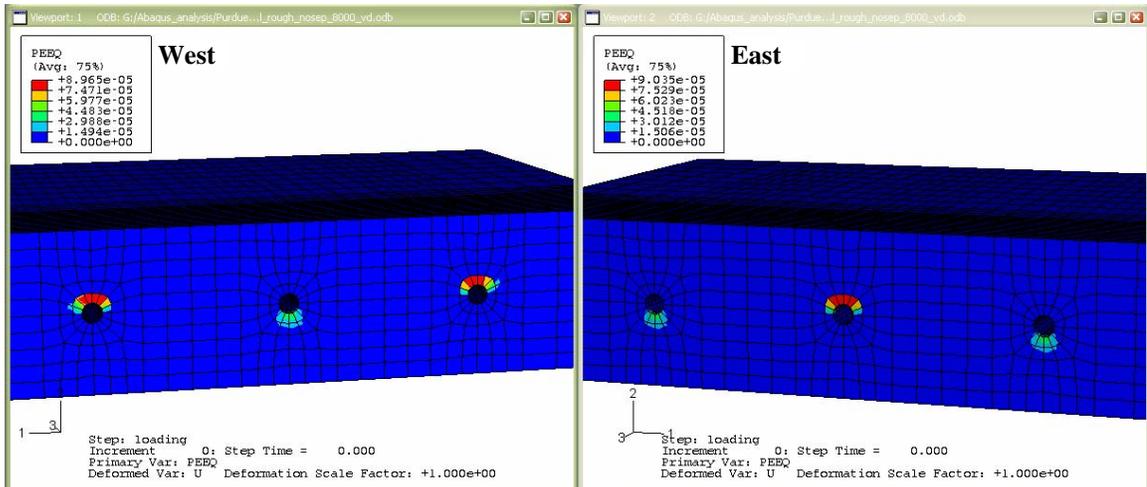
BEHAVIOR OF 3V72NU FINITE ELEMENT MODEL



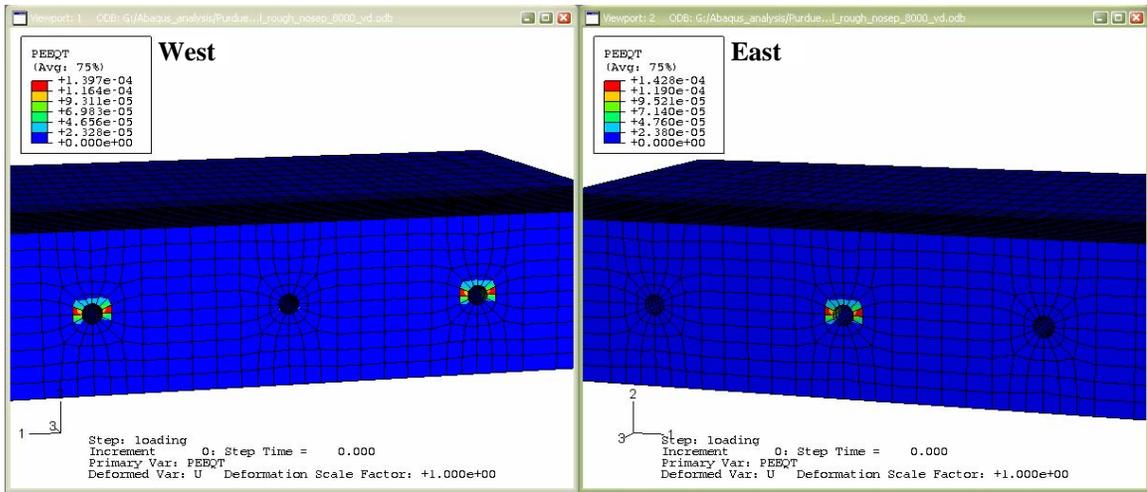
(a) Maximum Tensile Stresses at joint opening of 1/8 in.



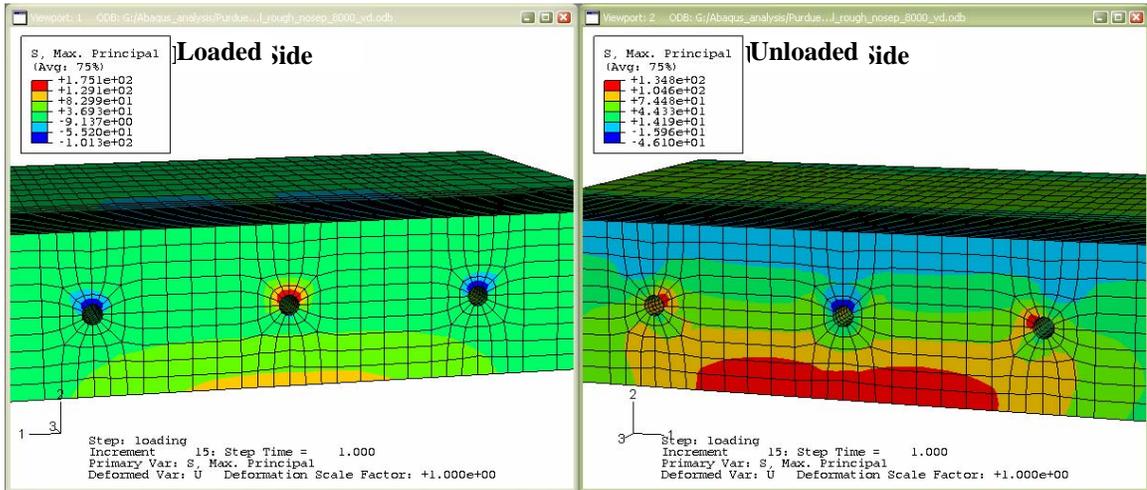
(b) Maximum Compressive Stresses at joint opening of 1/8 in.



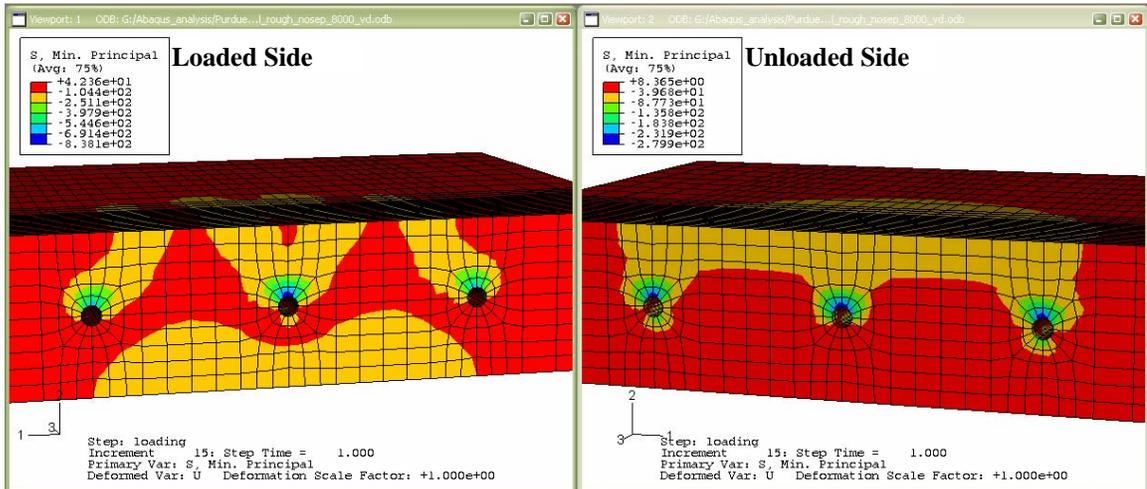
(c) Maximum Compressive Strains at joint opening of 1/8 in.



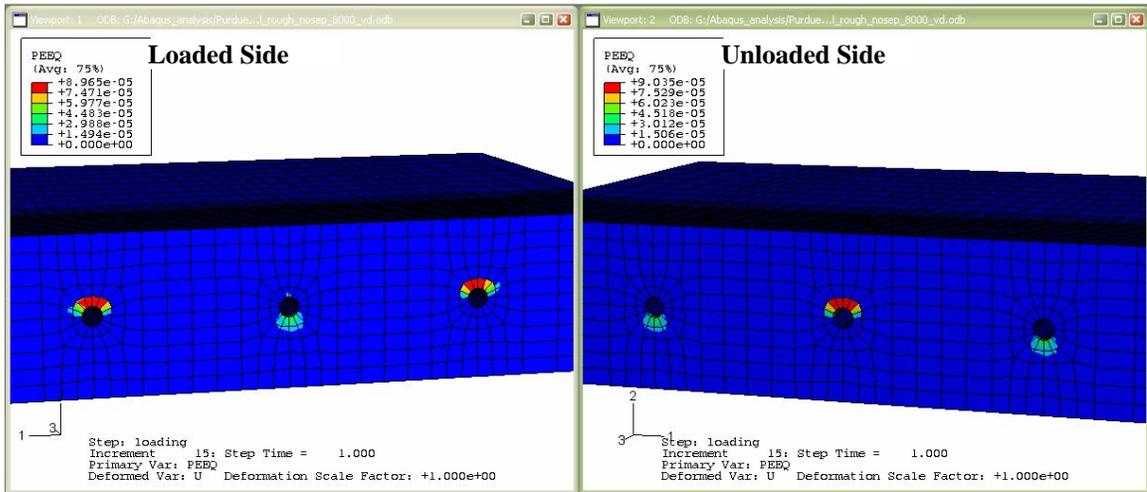
(d) Maximum Tensile Strains at joint opening of 1/8 in.
Figure D-5: Stress and Strains for 3V36AM slab model at joint opening of 1/8 in.



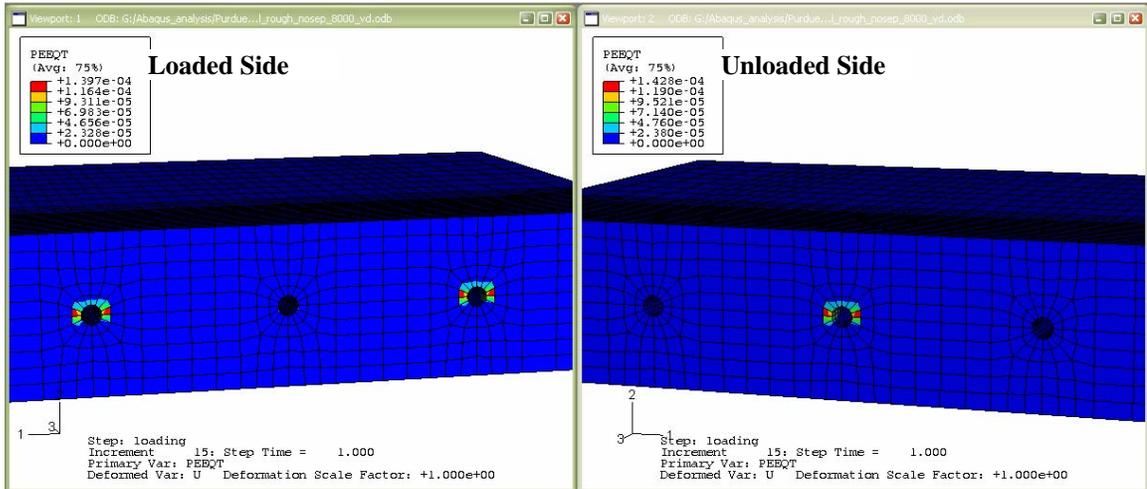
(a) Maximum Tensile Stresses at end of load application



(b) Maximum Compressive Stresses at end of load application



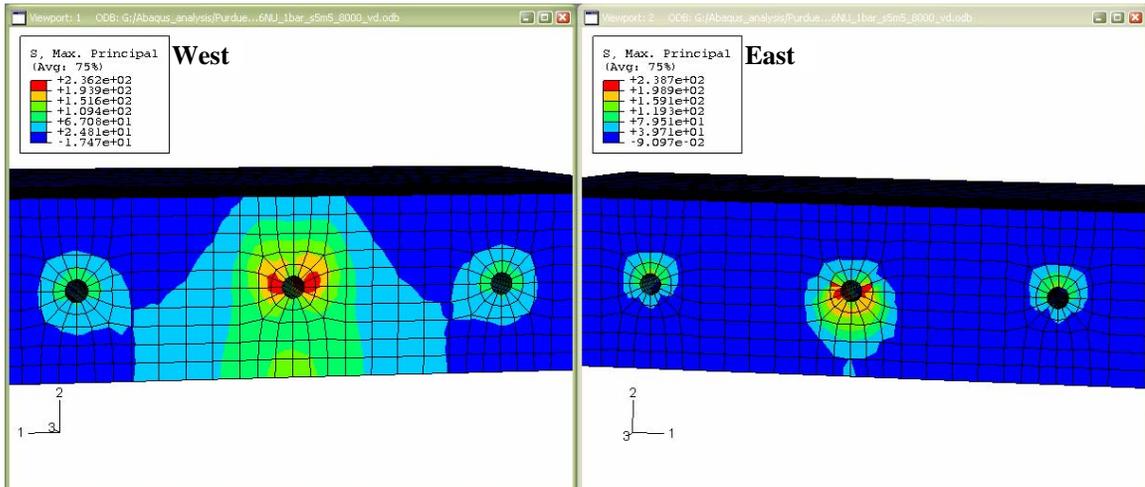
(c) Inelastic Compressive Strains at end of load application



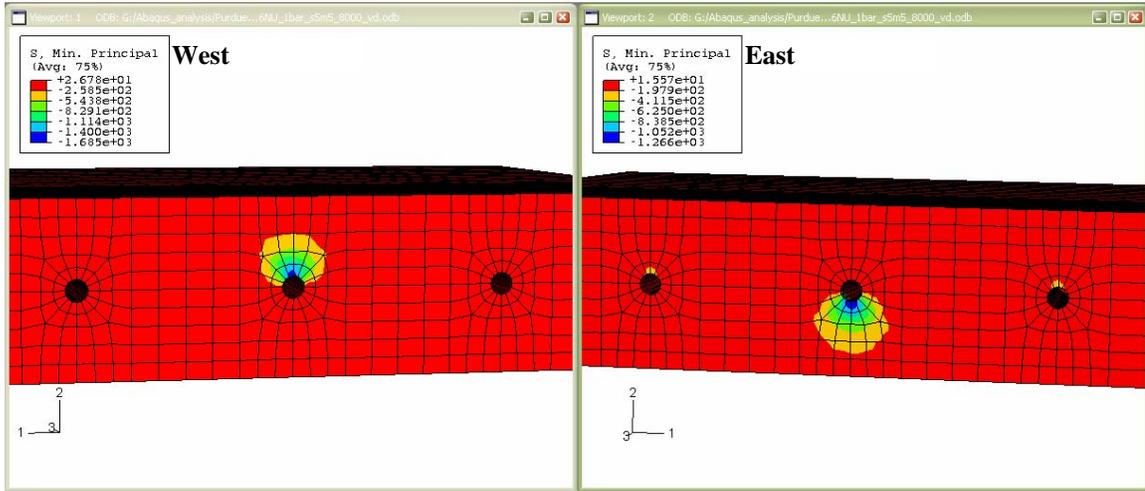
(d) Inelastic Tensile Strains at end of load application

Figure D-6: Stresses and Strains for 3V72NU model after load application

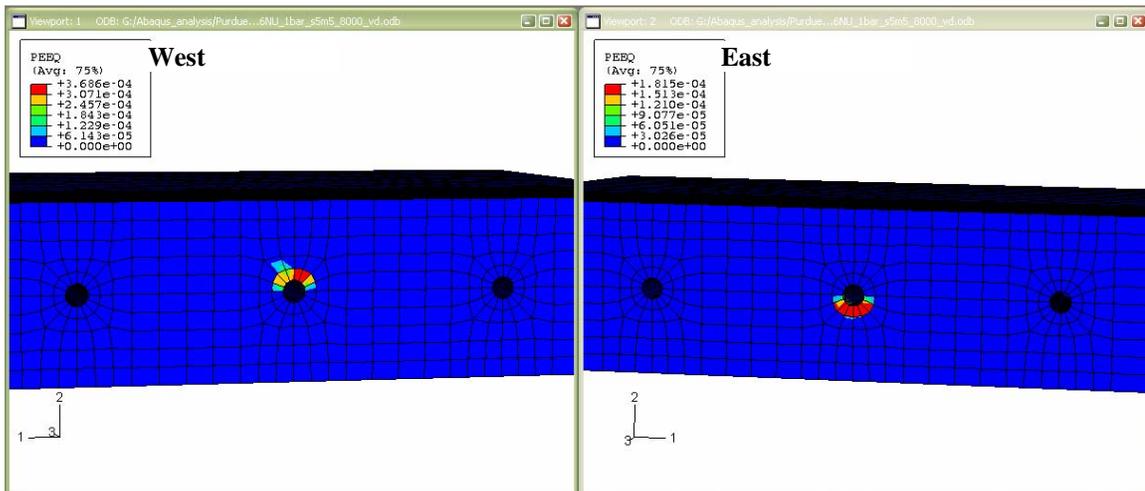
BEHAVIOR OF 3V36AM FINITE ELEMENT MODEL



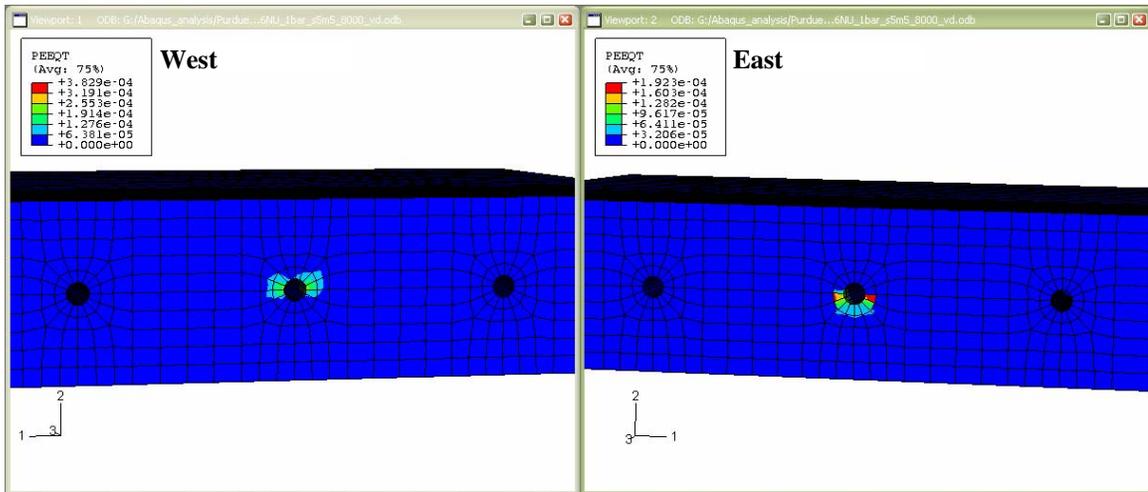
(a) Maximum Tensile Stresses at joint opening of 1/8 in.



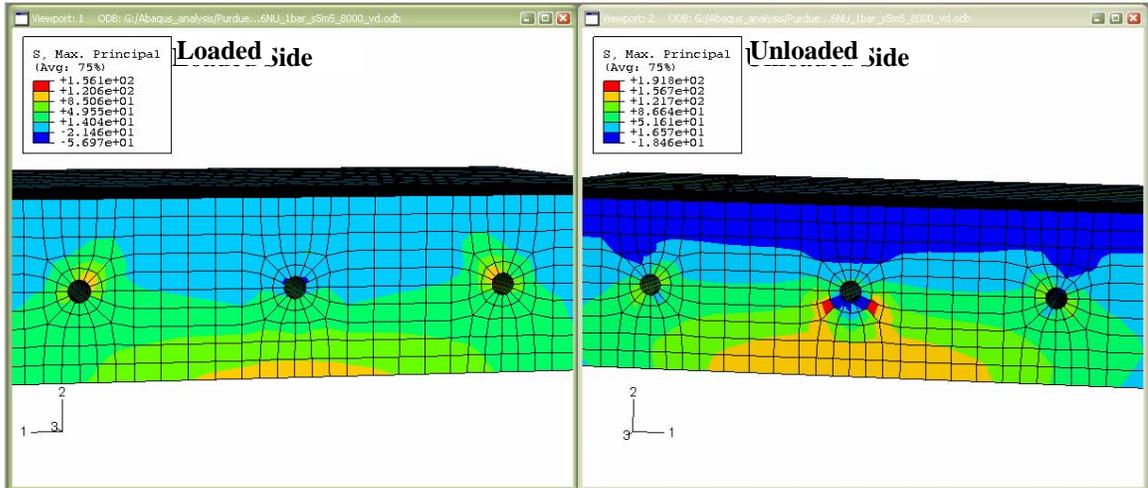
(b) Maximum Compressive Stresses at joint opening of 1/8 in.



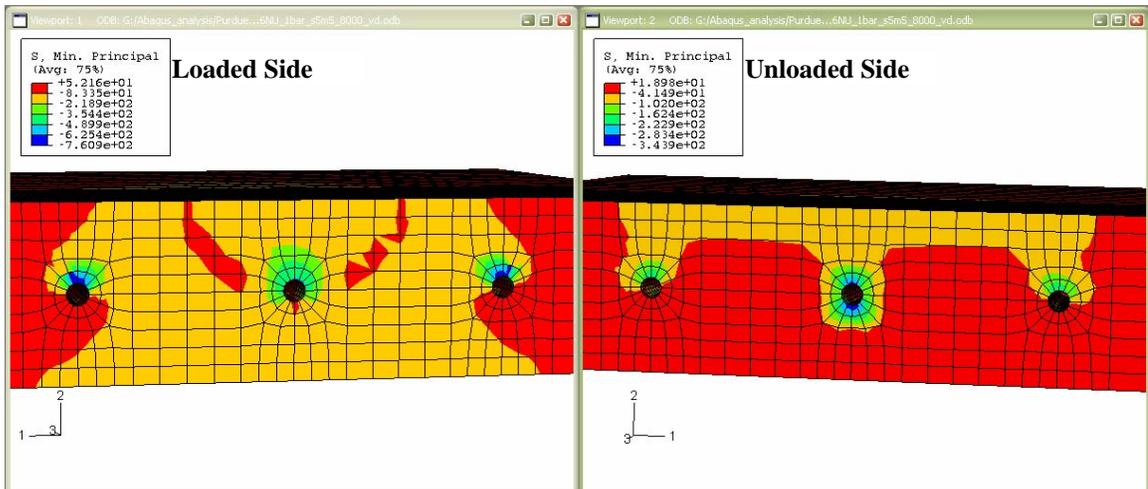
(c) Maximum Compressive Strains at joint opening of 1/8 in.



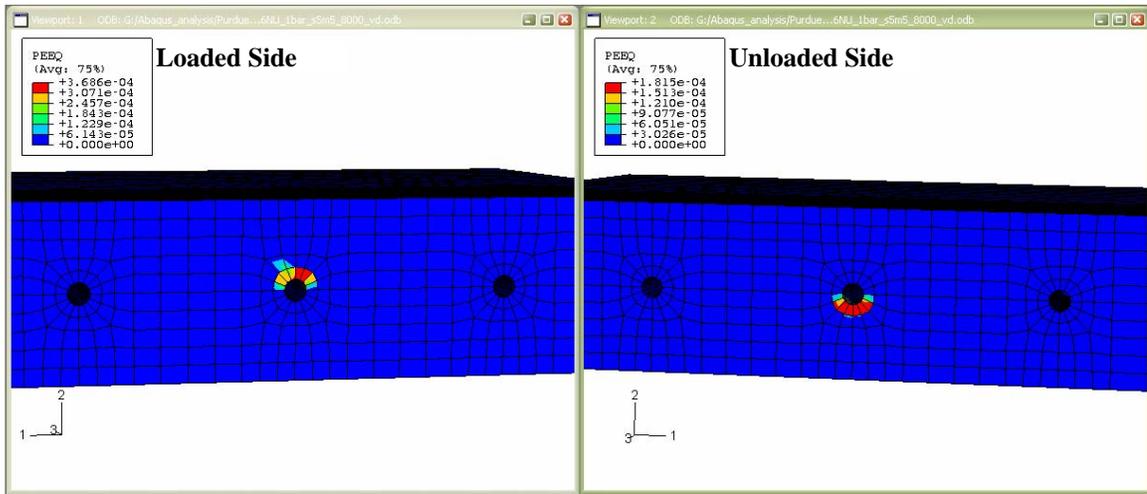
(d) Maximum Tensile Strains at joint opening of 1/8 in.
Figure D-7: Stress and Strains for 3V36AM slab model at joint opening of 1/8 in.



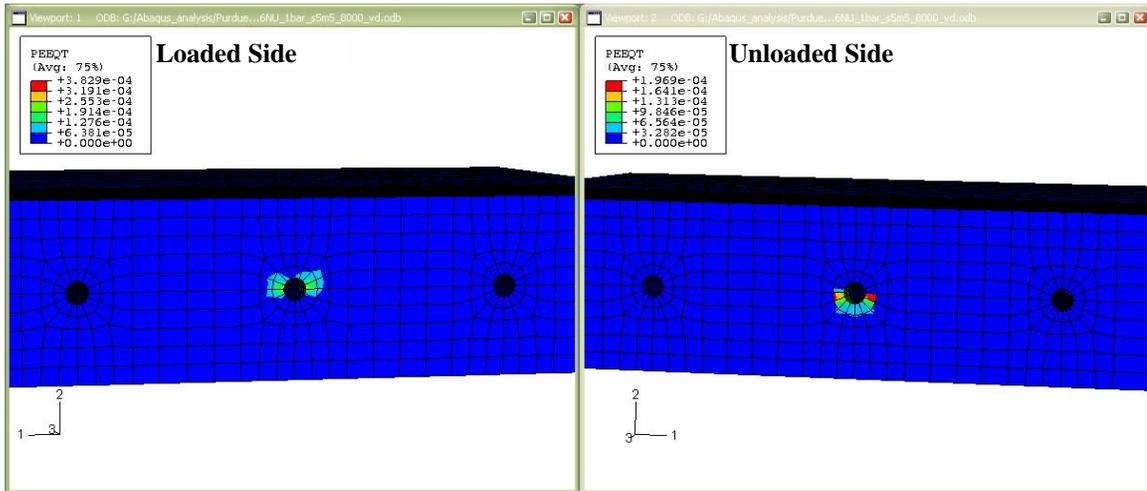
(a) Maximum Tensile Stresses at end of load application



(b) Maximum Compressive Stresses at end of load application



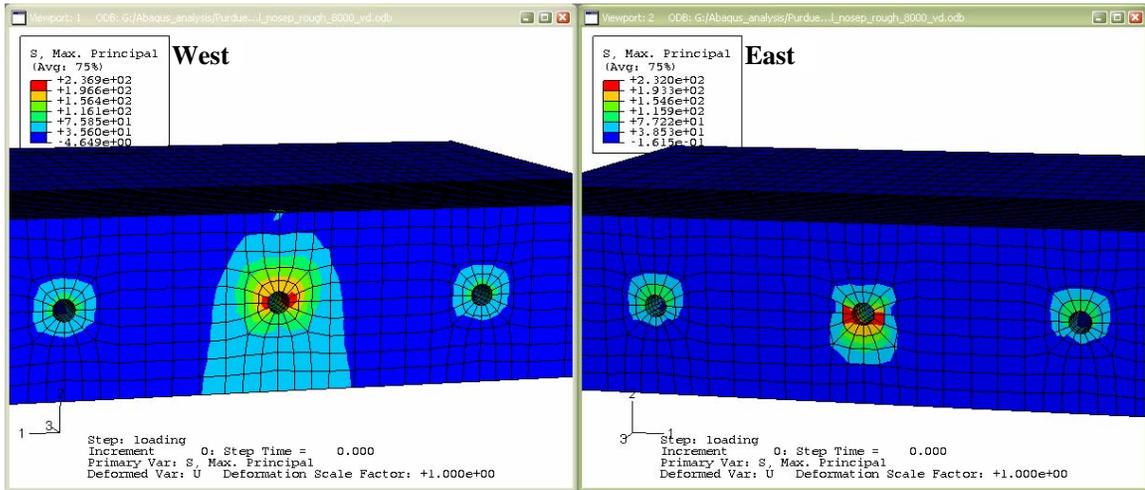
(c) Inelastic Compressive Strains at end of load application



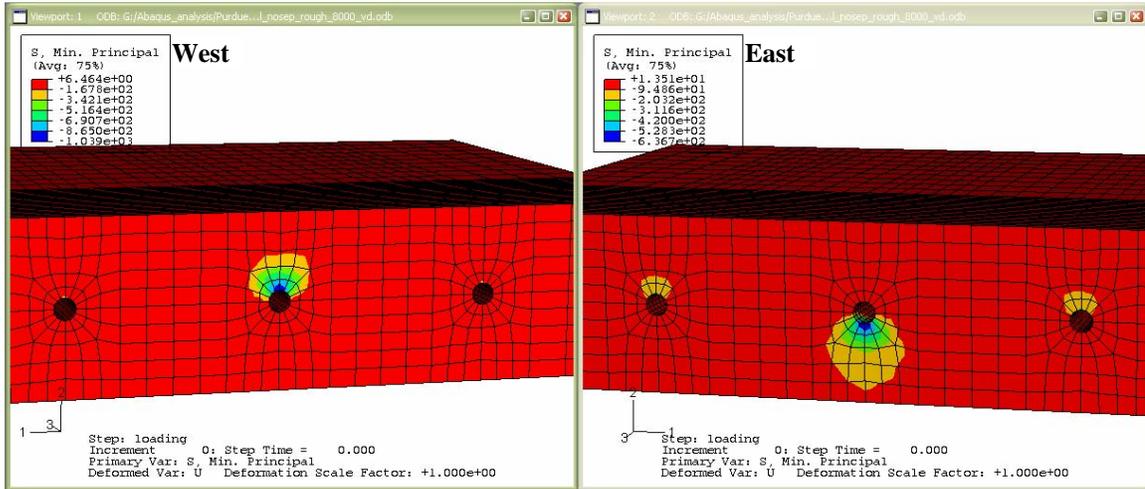
(d) Inelastic Tensile Strains at end of load application

Figure D-8: Stresses and Strains for 3V36AM model after load application

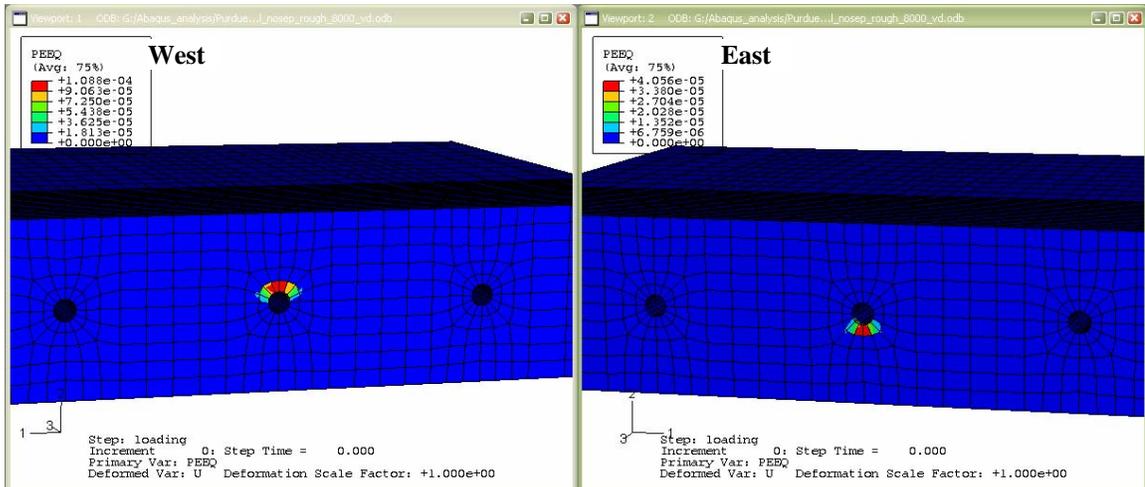
BEHAVIOR OF 3V72AM FINITE ELEMENT MODEL



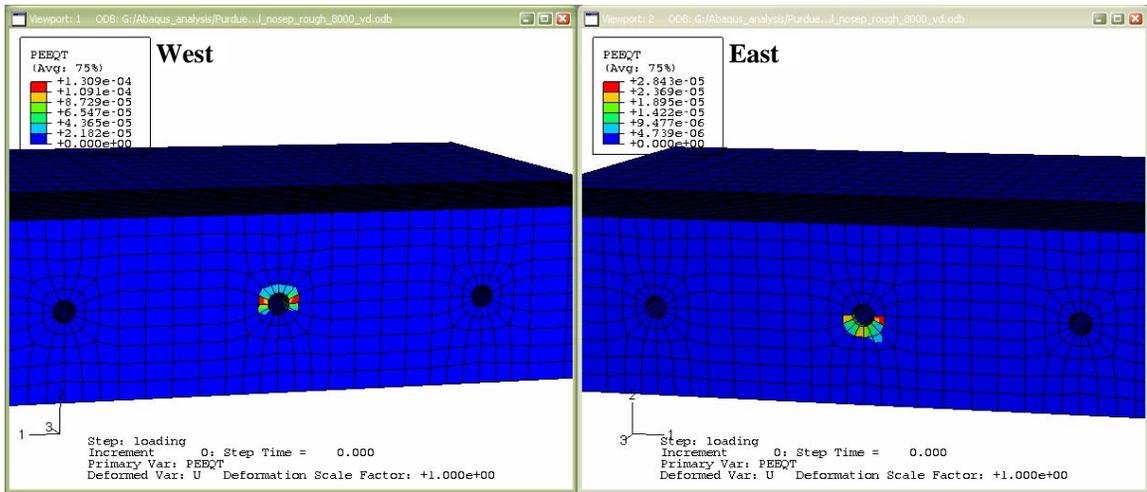
(a) Maximum Tensile Stresses at joint opening of 1/8 in.



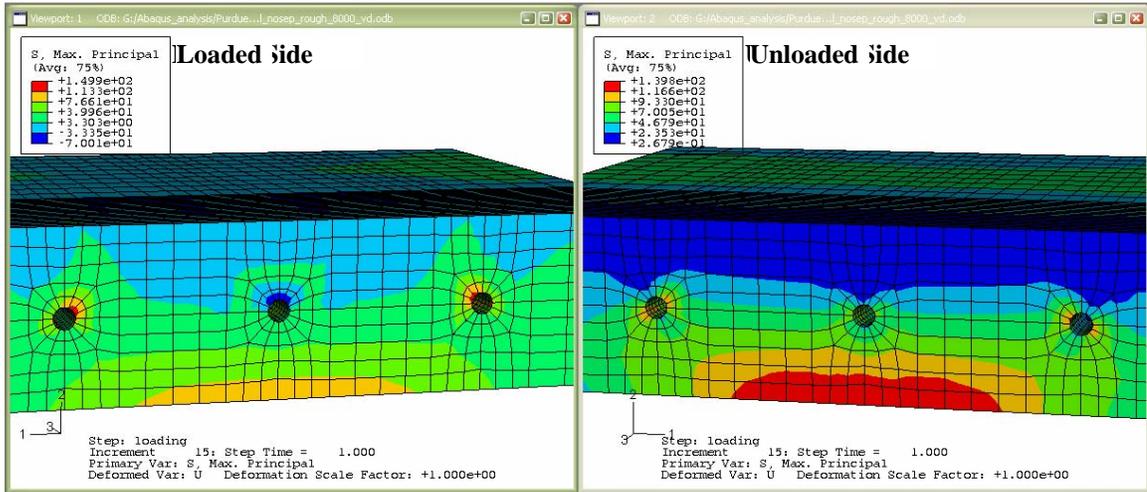
(b) Maximum Compressive Stresses at joint opening of 1/8 in.



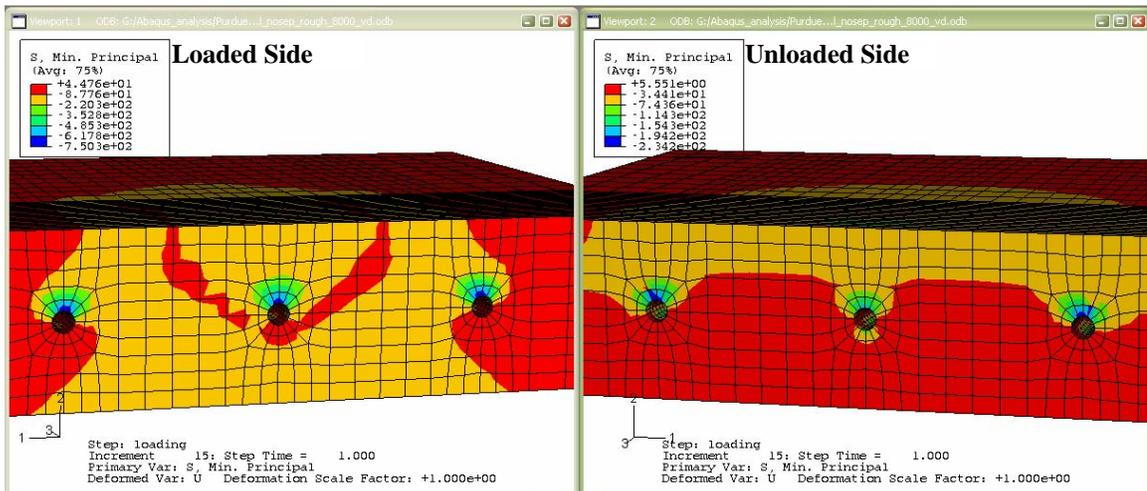
(c) Maximum Compressive Strains at joint opening of 1/8 in.



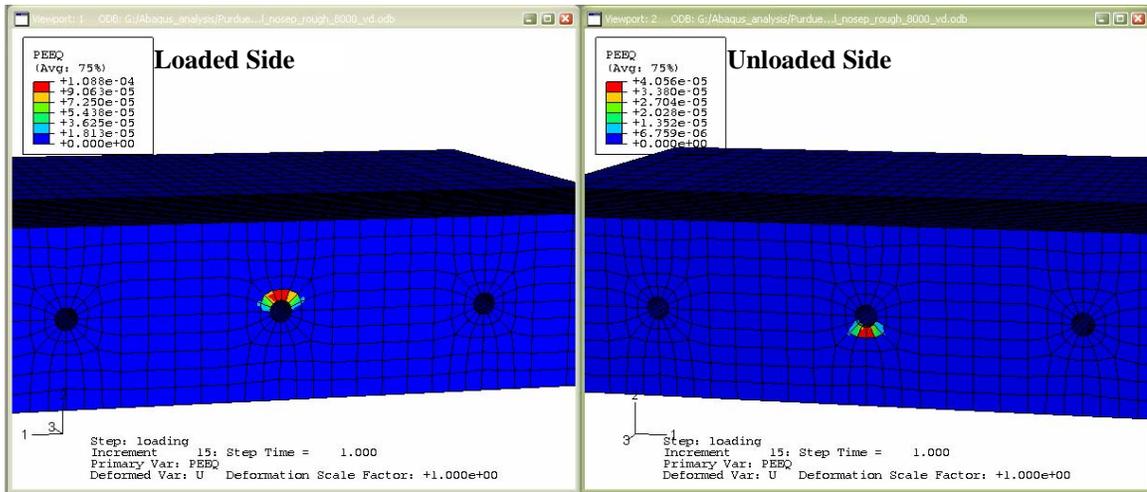
(d) Maximum Tensile Strains at joint opening of 1/8 in.
Figure D-9: Stress and Strains for 3V72AM slab model at joint opening of 1/8 in.



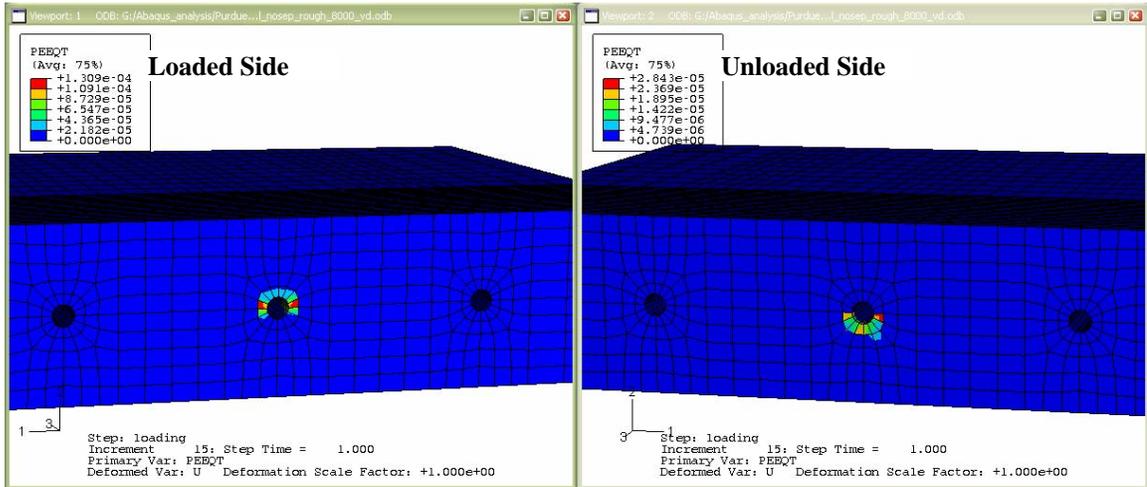
(a) Maximum Tensile Stresses at end of load application



(b) Maximum Compressive Stresses at end of load application



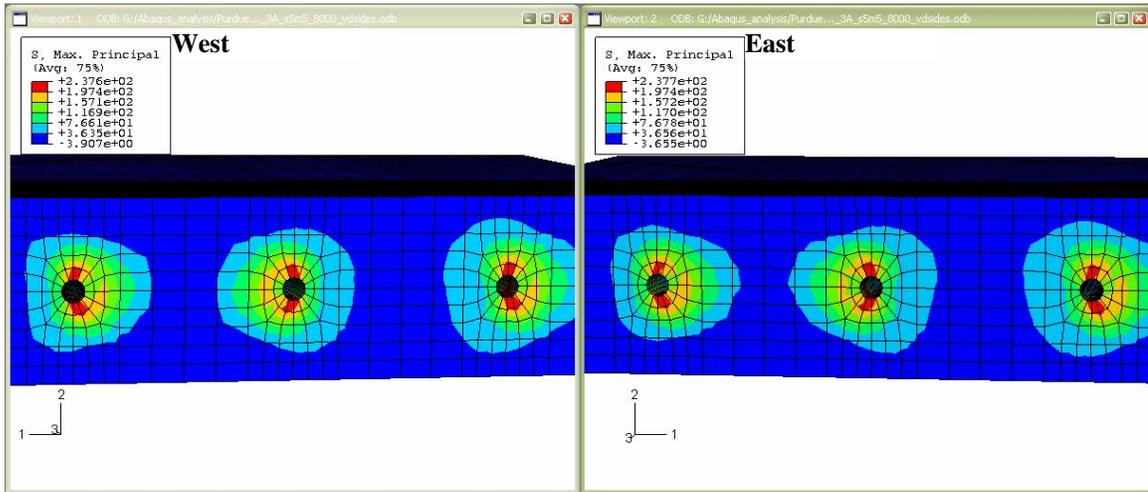
(c) Inelastic Compressive Strains at end of load application



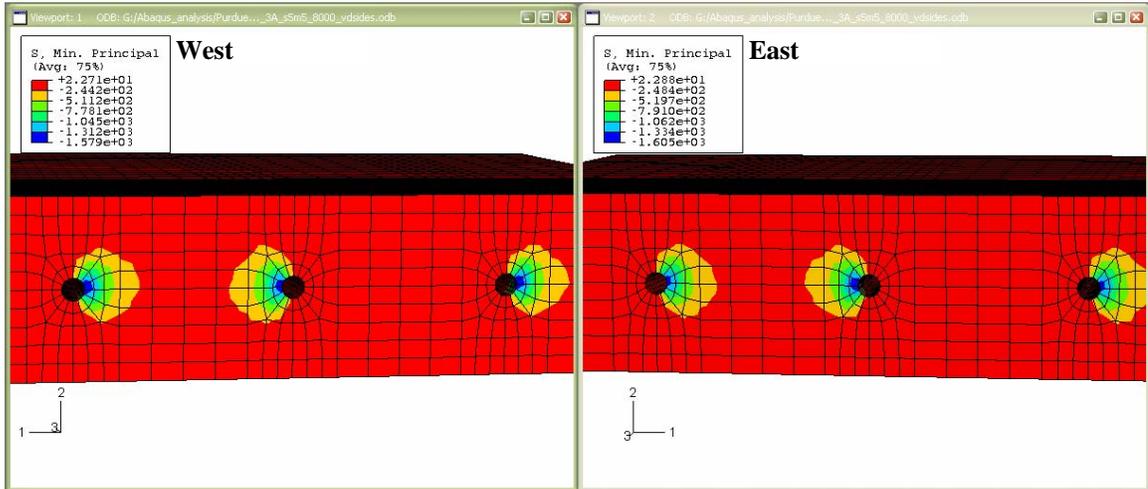
(d) Inelastic Tensile Strains at end of load application

Figure D-10: Stresses and Strains for 3V72AM model after load application

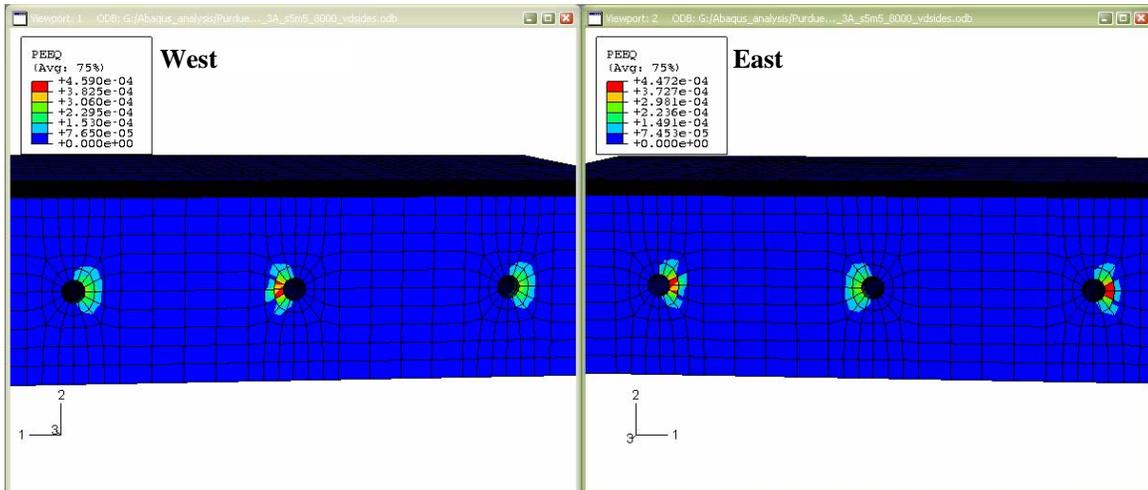
BEHAVIOR OF 3H36NU FINITE ELEMENT MODEL



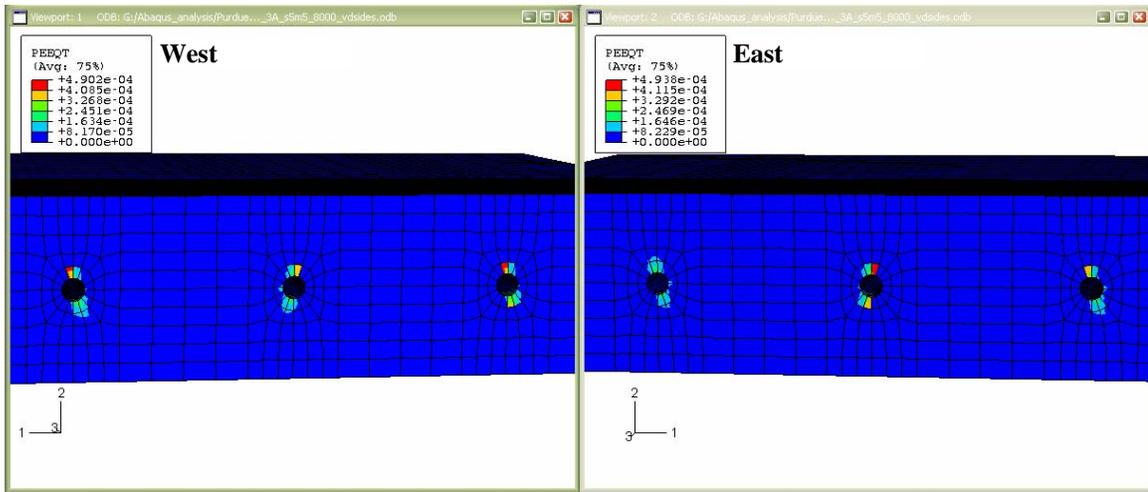
(a) Maximum Tensile Stresses at joint opening of 1/8 in.



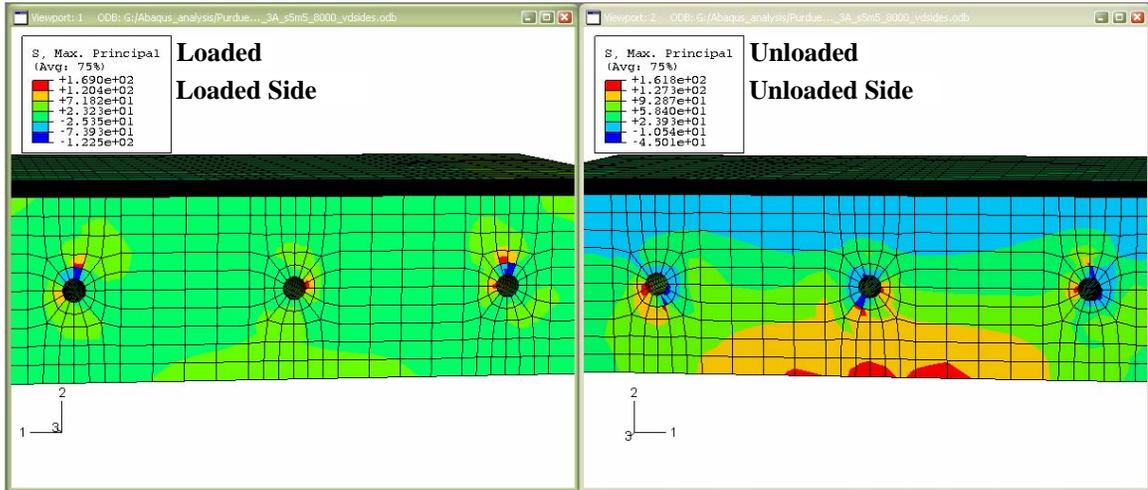
(b) Maximum Compressive Stresses at joint opening of 1/8 in.



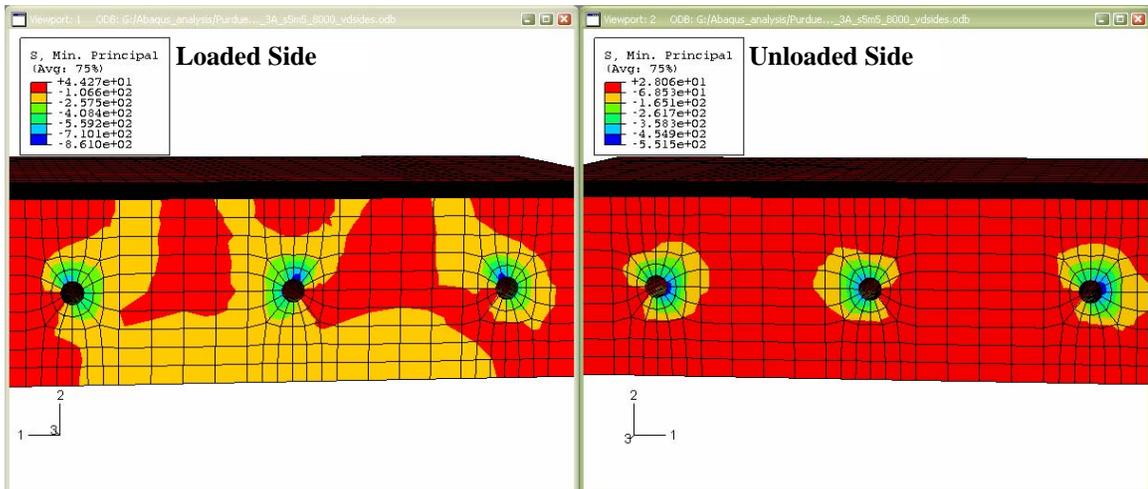
(c) Maximum Compressive Strains at joint opening of 1/8 in.



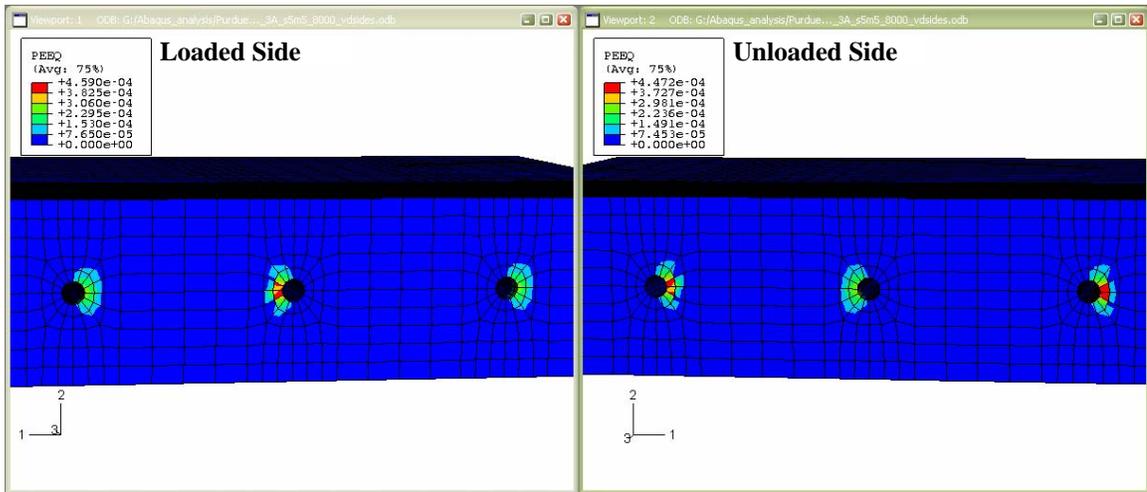
(d) Maximum Tensile Strains at joint opening of 1/8 in.
Figure D-11: Stress and Strains for 3H36NU slab model at joint opening of 1/8 in.



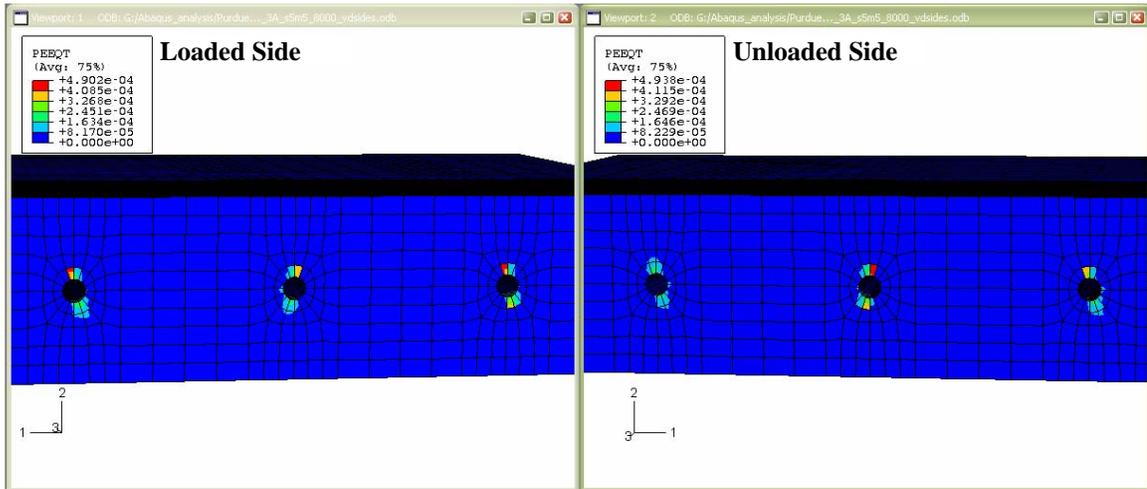
(a) Maximum Tensile Stresses at end of load application



(b) Maximum Compressive Stresses at end of load application



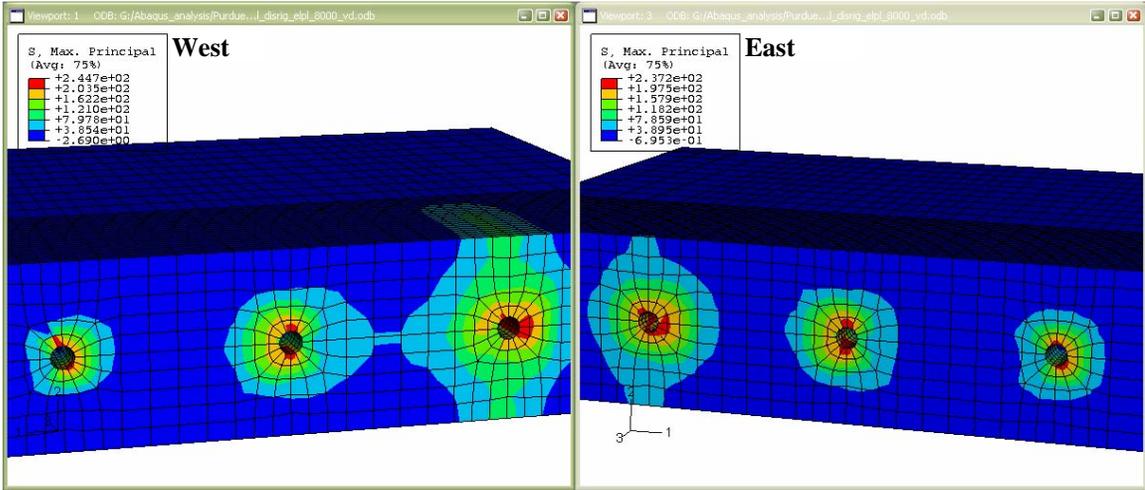
(c) Inelastic Compressive Strains at end of load application



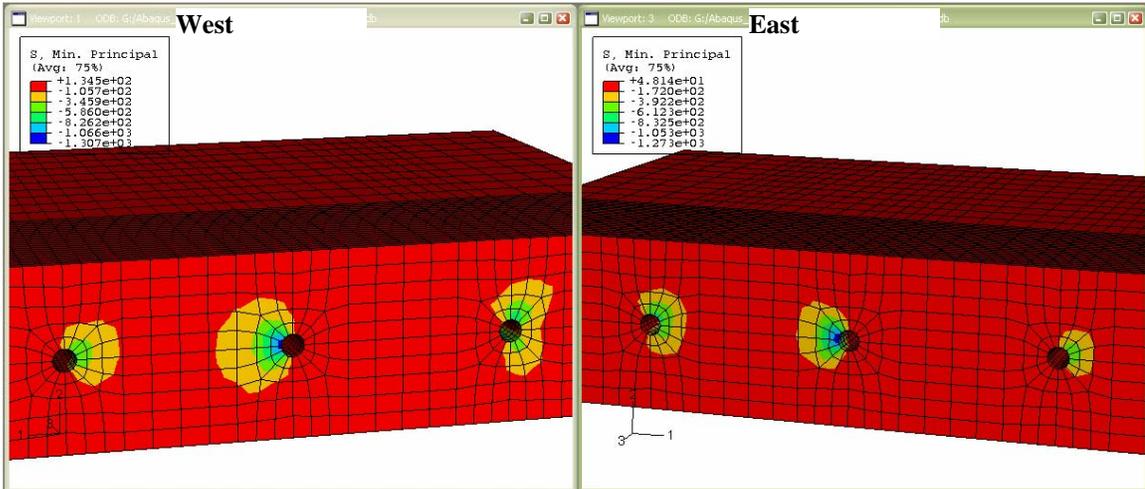
(d) Inelastic Tensile Strains at end of load application

Figure D-12: Stresses and Strains for 3H36NU model after load application

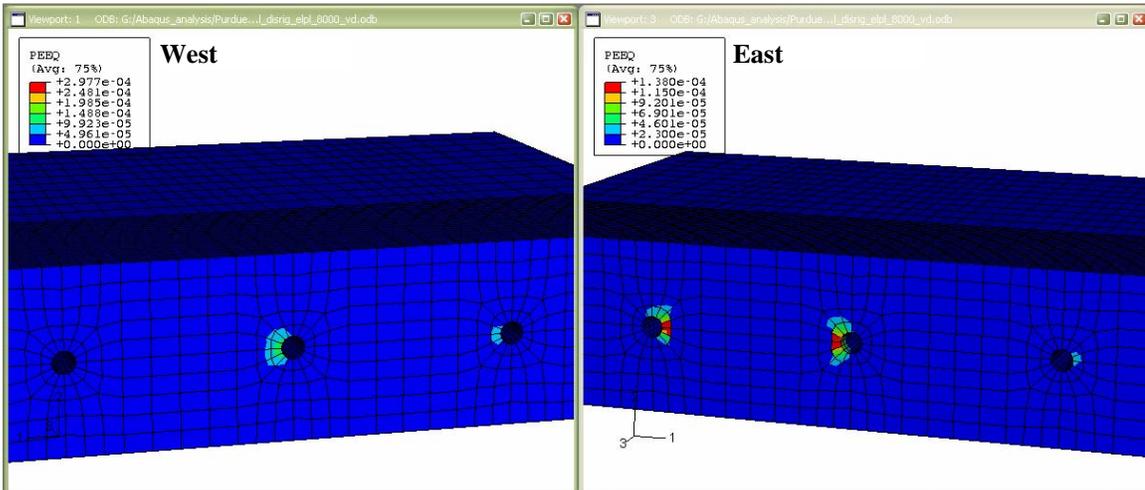
BEHAVIOR OF 3H72NU FINITE ELEMENT MODEL



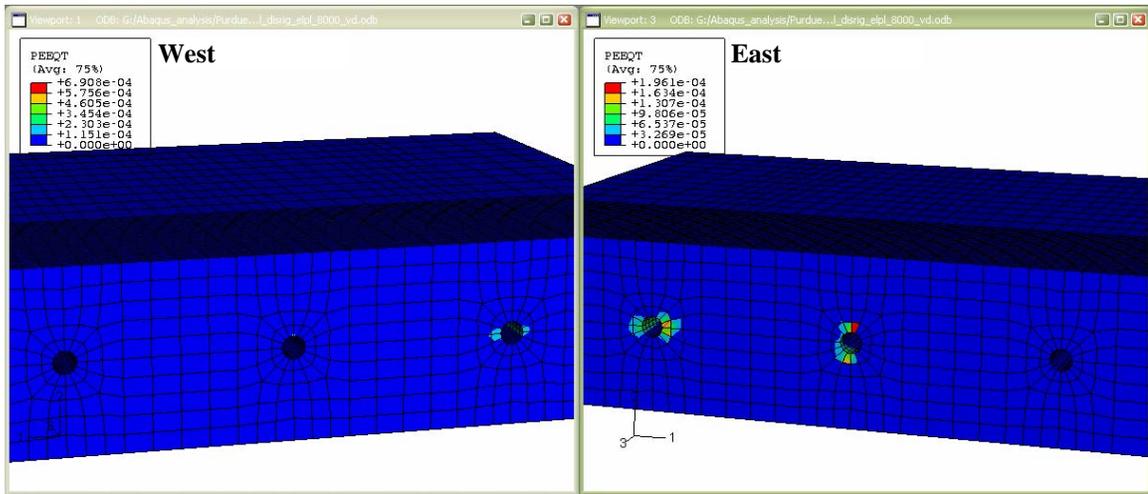
(a) Maximum Tensile Stresses at joint opening of 1/8 in.



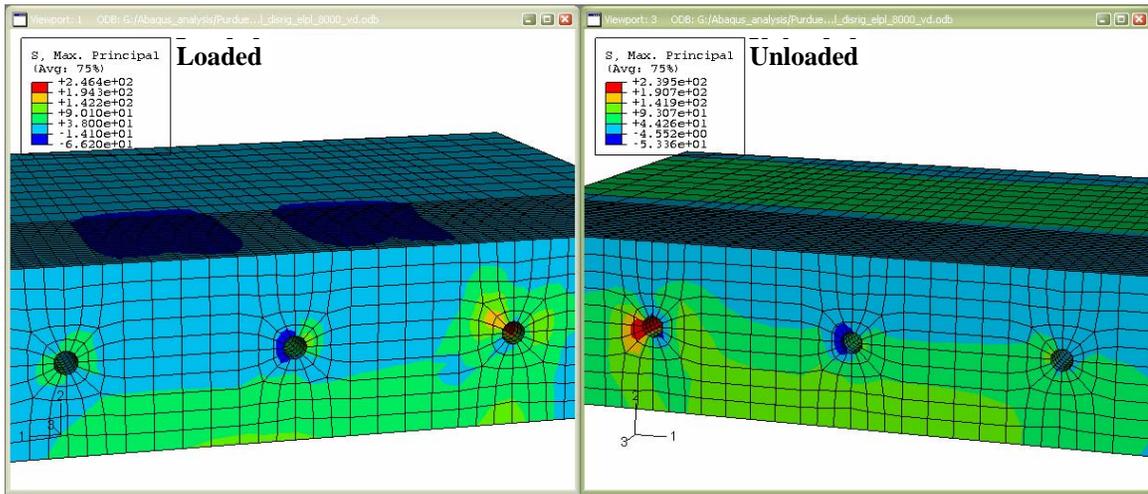
(b) Maximum Compressive Stresses at joint opening of 1/8 in.



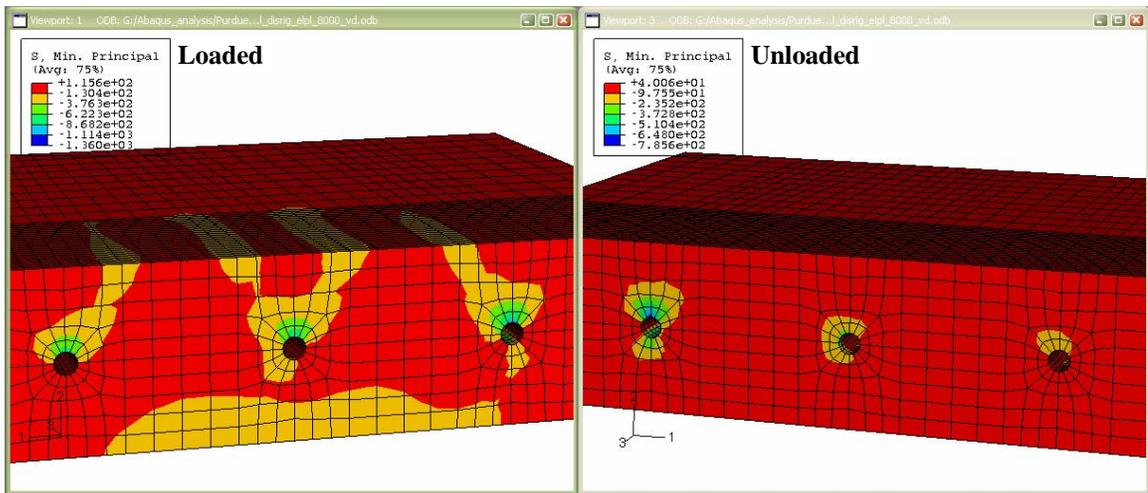
(c) Maximum Compressive Strains at joint opening of 1/8 in.



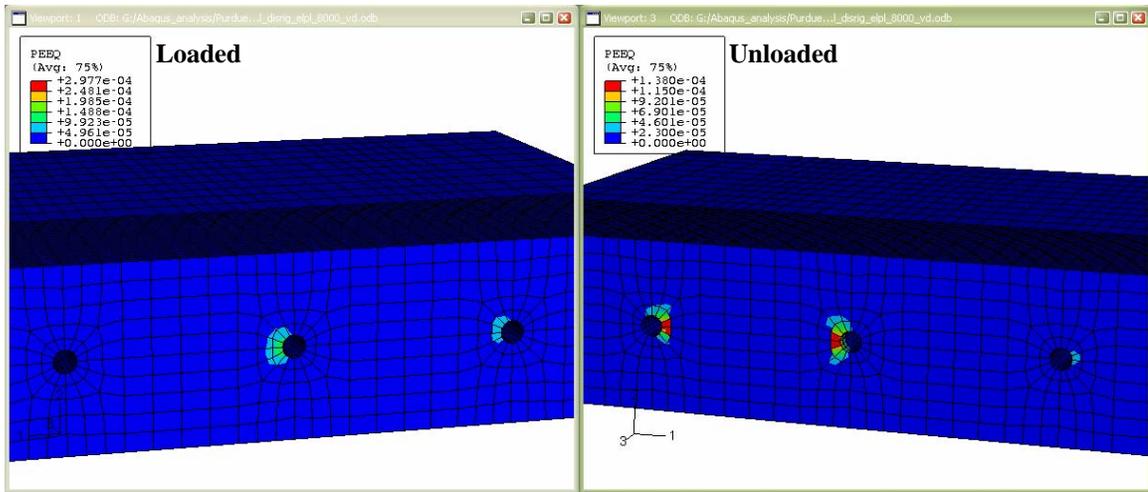
(d) Maximum Tensile Strains at joint opening of 1/8 in.
Figure D-13: Stress and Strains for 3H72NU slab model at joint opening of 1/8 in.



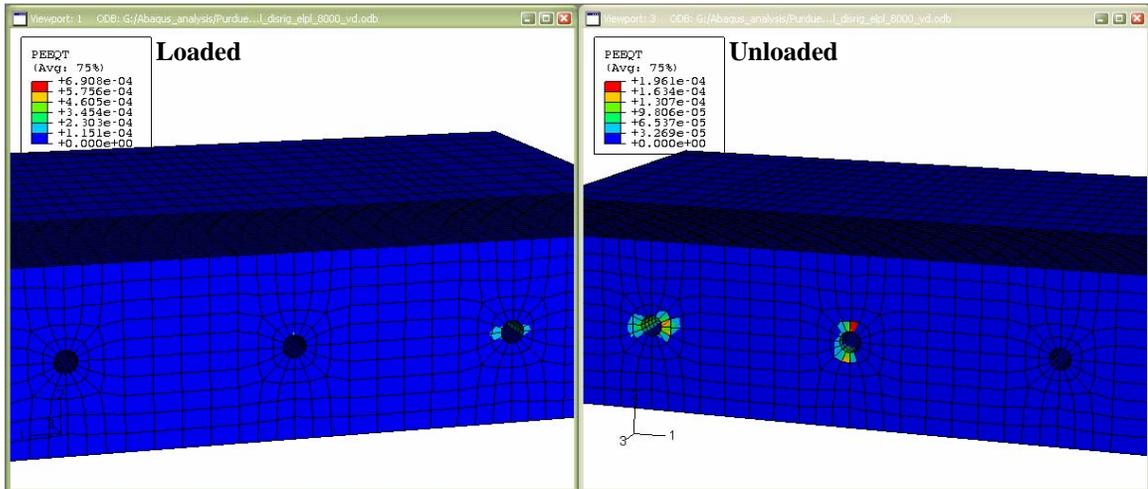
(a) Maximum Tensile Stresses at end of load application



(b) Maximum Compressive Stresses at end of load application



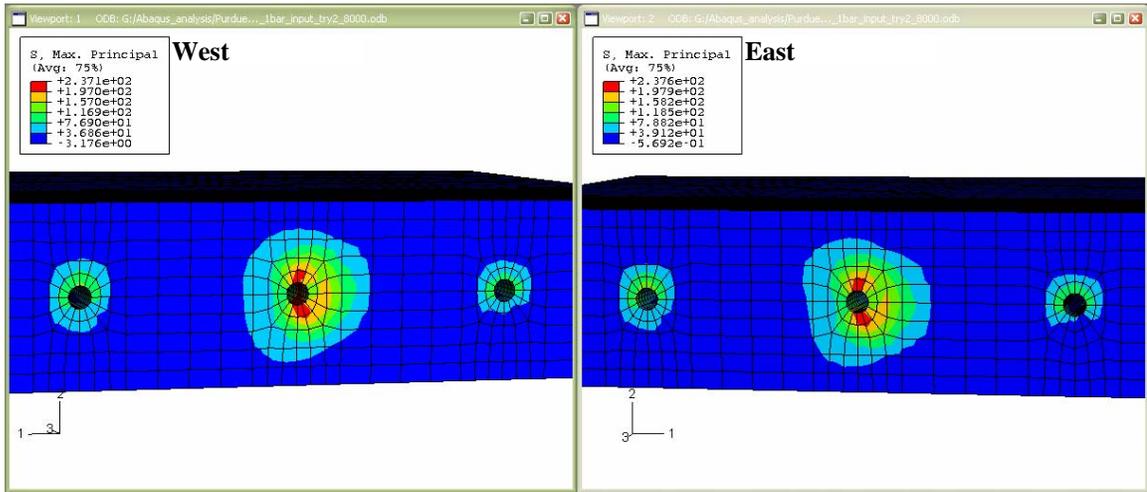
(c) Inelastic Compressive Strains at end of load application



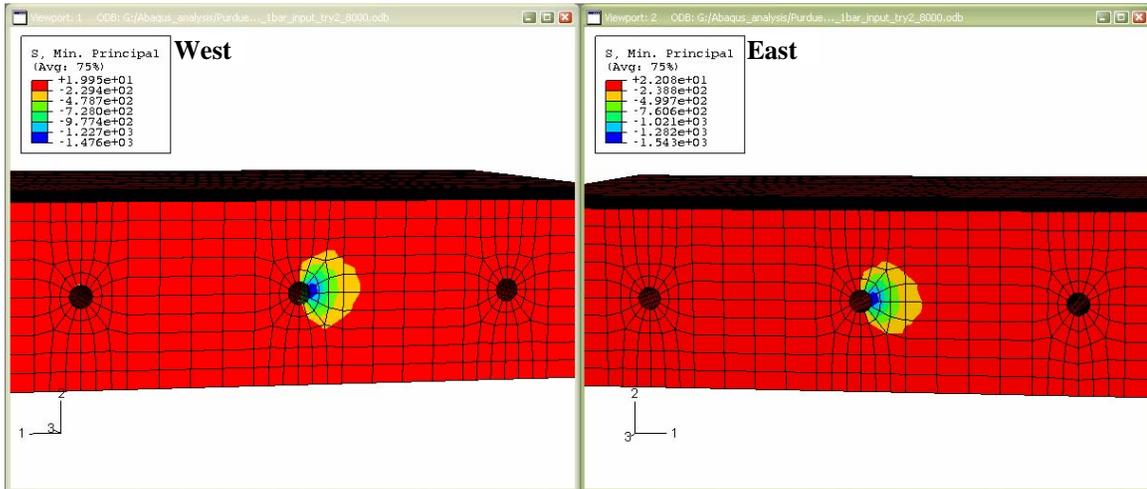
(d) Inelastic Tensile Strains at end of load application

Figure D-14: Stresses and Strains for 3H72NU model after load application

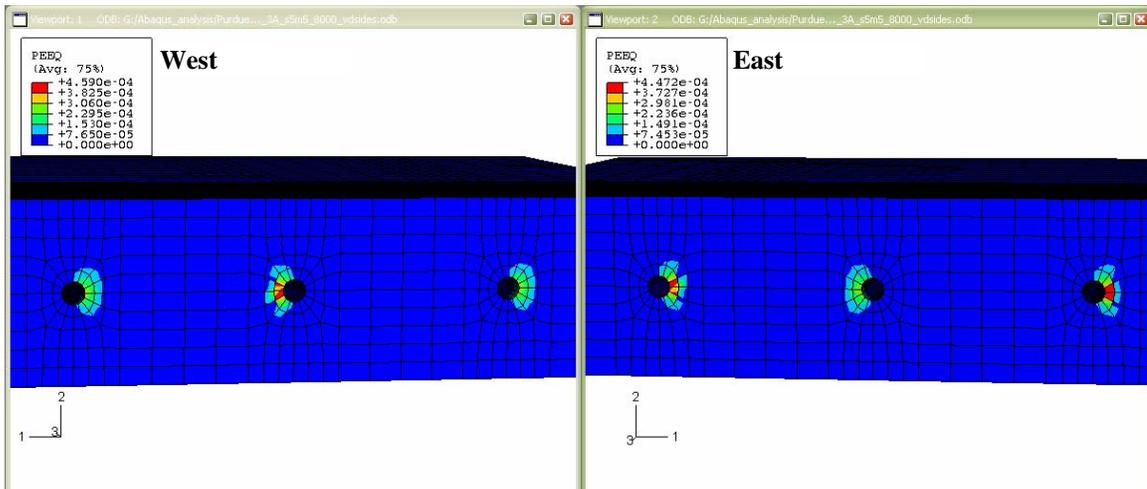
BEHAVIOR OF 3H36AM FINITE ELEMENT MODEL



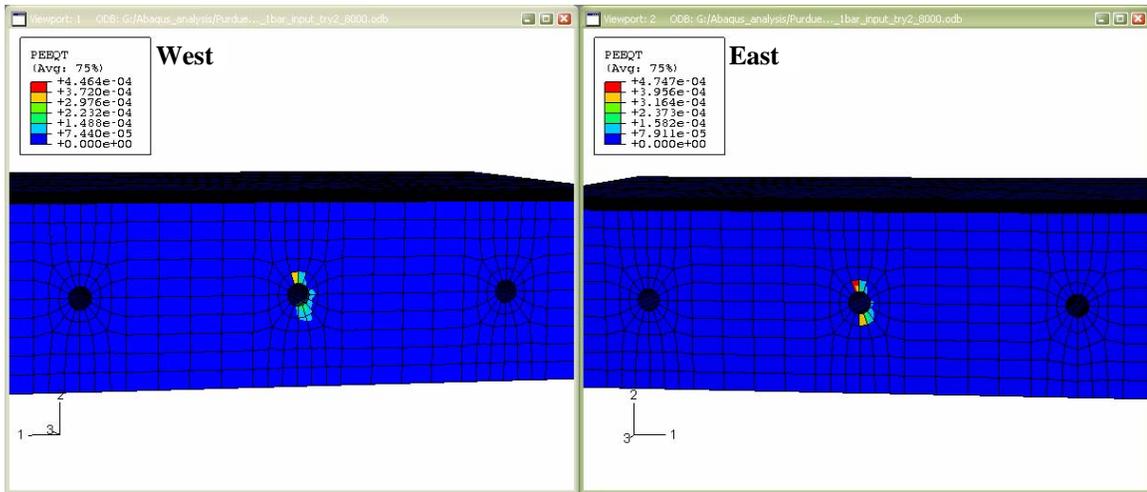
(a) Maximum Tensile Stresses at joint opening of 1/8 in.



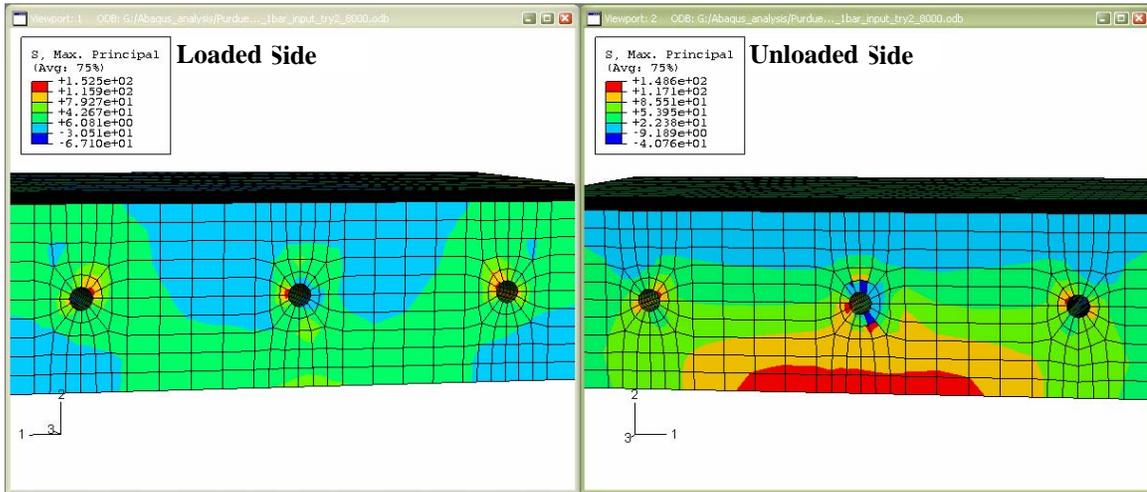
(b) Maximum Compressive Stresses at joint opening of 1/8 in.



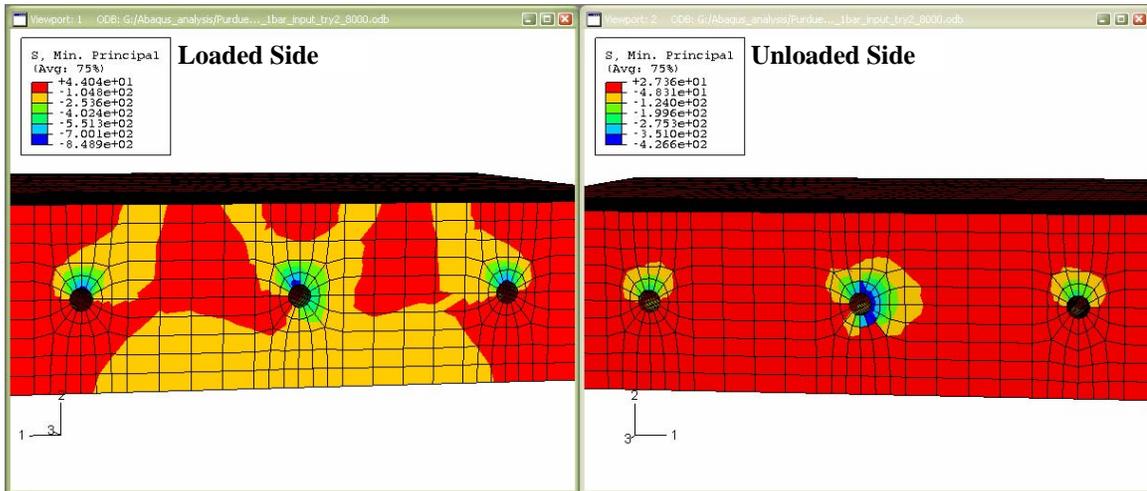
(c) Maximum Compressive Strains at joint opening of 1/8 in.



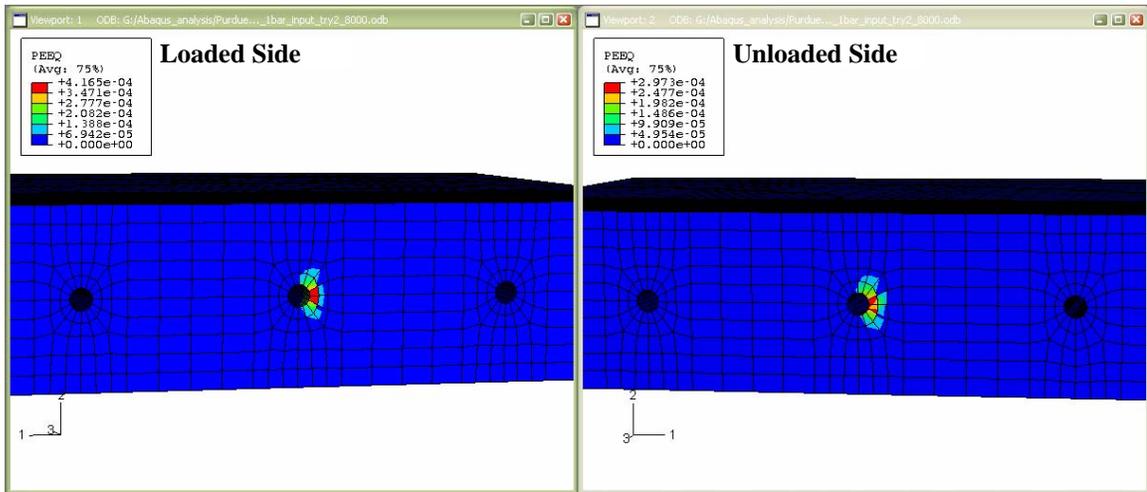
(d) Maximum Tensile Strains at joint opening of 1/8 in.
Figure D-15: Stress and Strains for 3H36AM slab model at joint opening of 1/8 in.



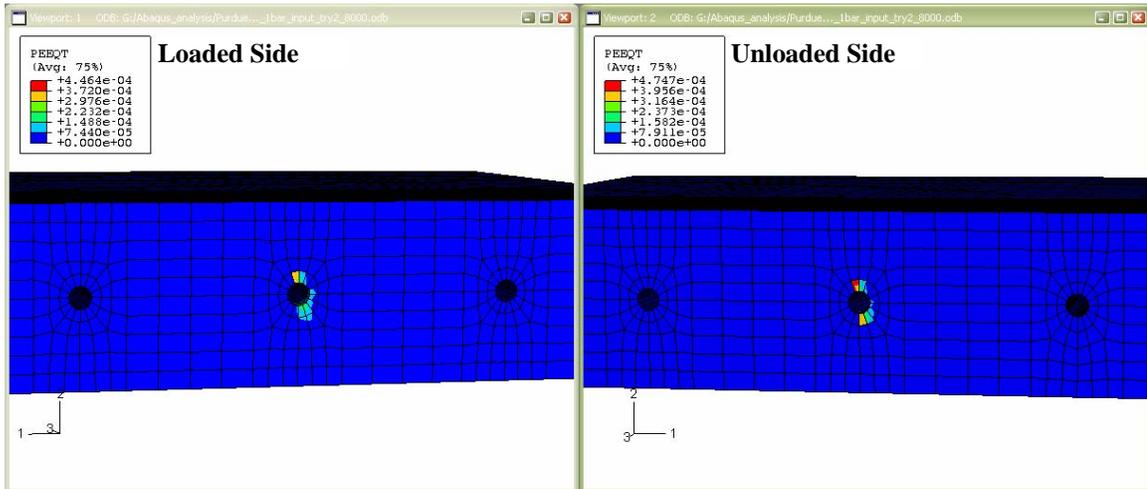
(a) Maximum Tensile Stresses at end of load application



(b) Maximum Compressive Stresses at end of load application



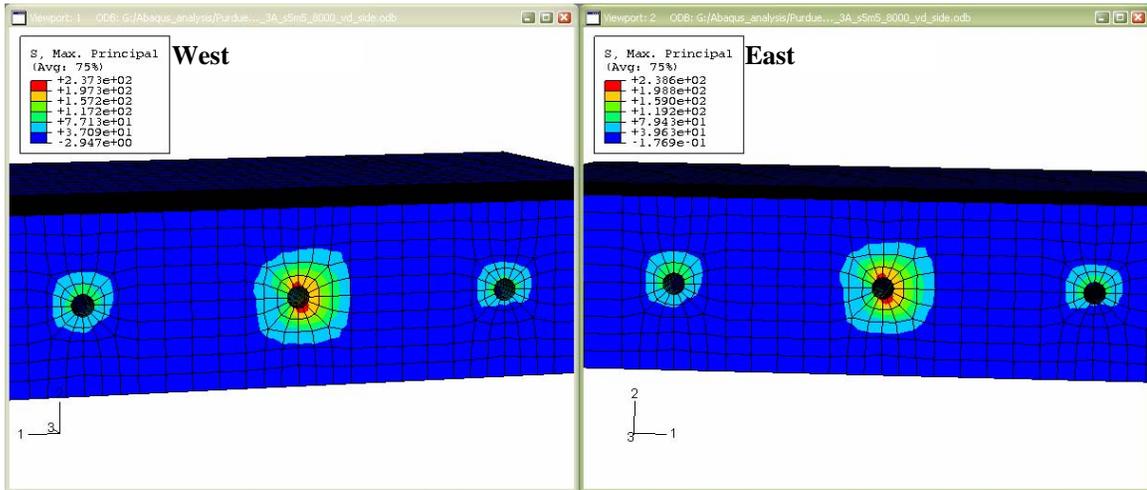
(c) Inelastic Compressive Strains at end of load application



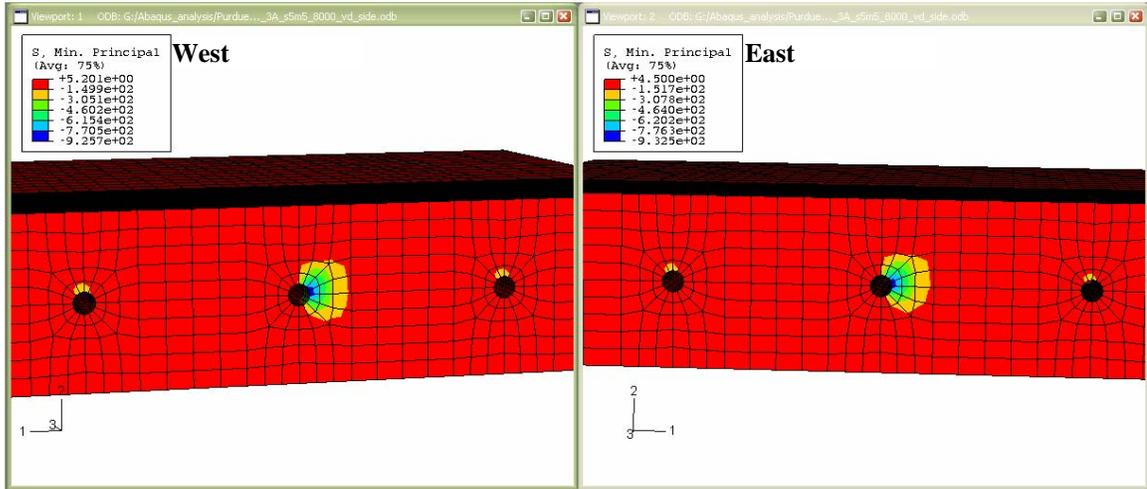
(d) Inelastic Tensile Strains at end of load application

Figure D-16: Stresses and Strains for 3H36AM model after load application

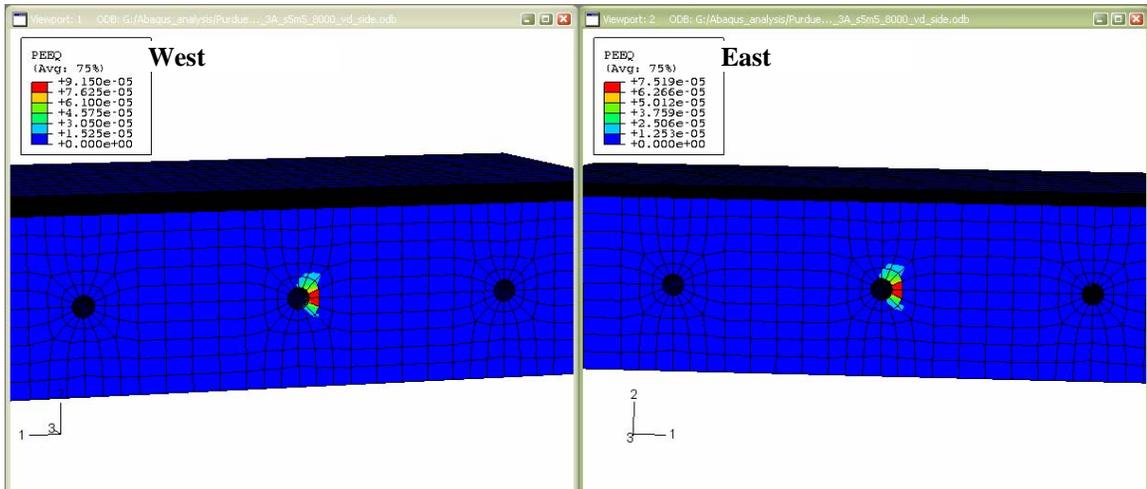
BEHAVIOR OF 3H72AM FINITE ELEMENT MODEL



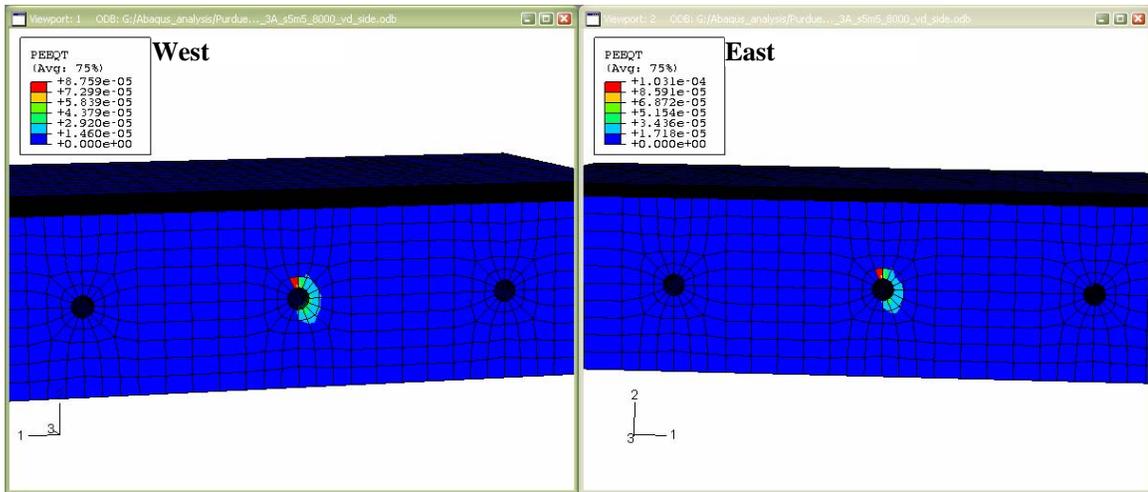
(a) Maximum Tensile Stresses at joint opening of 1/8 in.



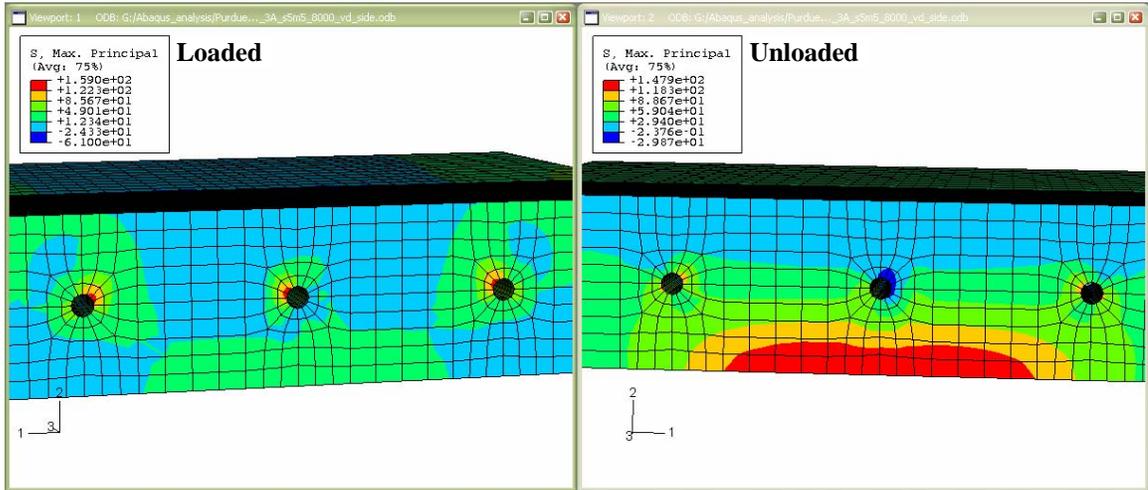
(b) Maximum Compressive Stresses at joint opening of 1/8 in.



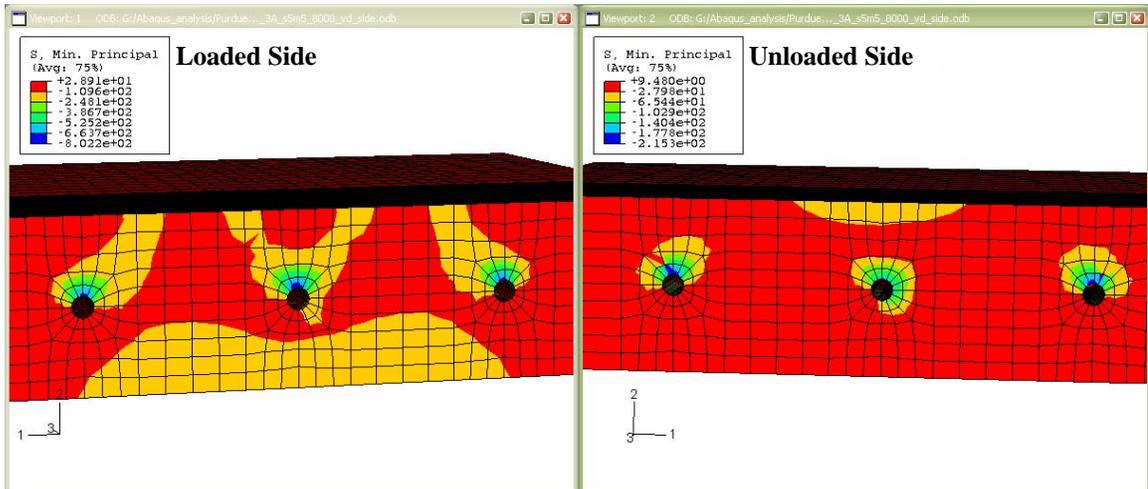
(c) Maximum Compressive Strains at joint opening of 1/8 in.



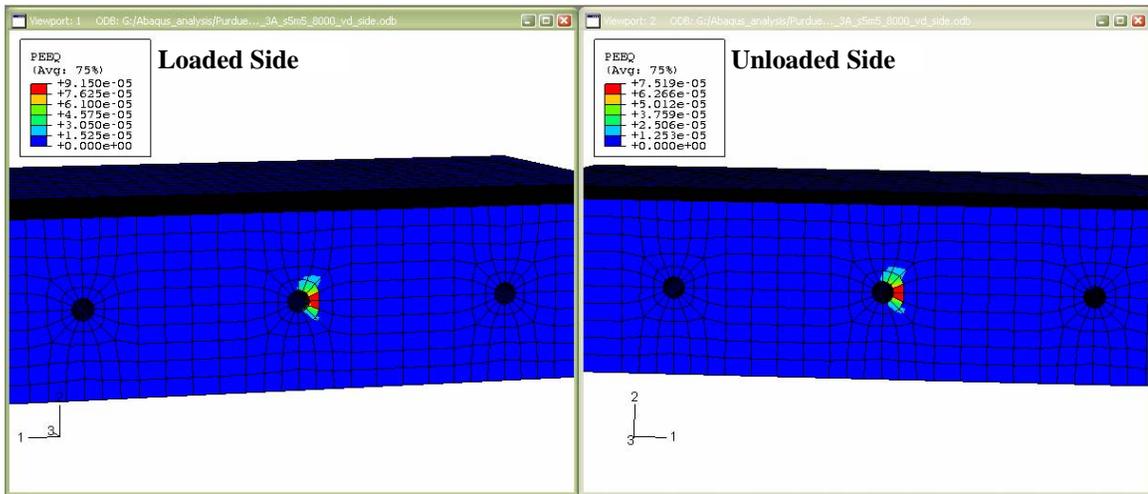
(d) Maximum Tensile Strains at joint opening of 1/8 in.
Figure D-17: Stress and Strains for 3H72AM slab model at joint opening of 1/8 in.



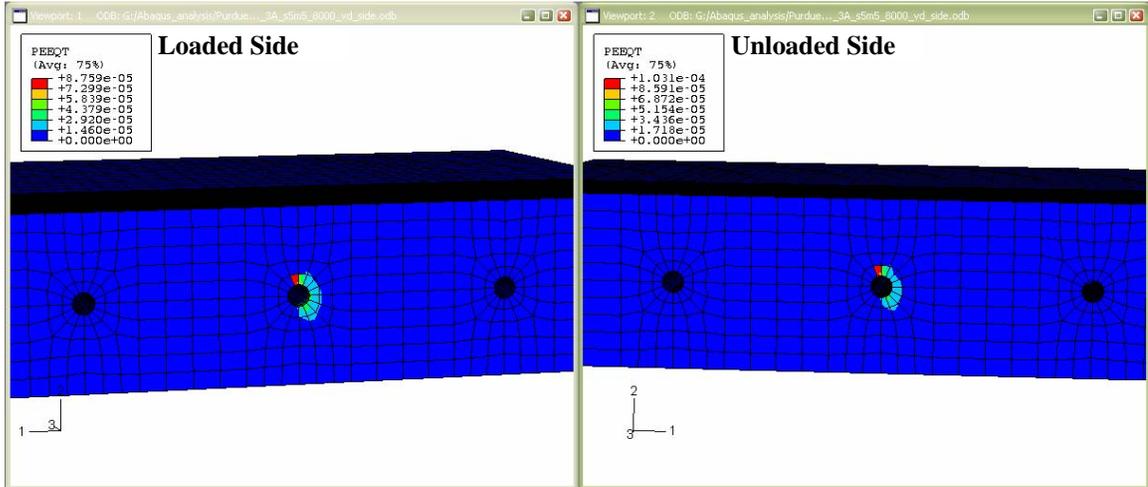
(a) Maximum Tensile Stresses at end of load application



(b) Maximum Compressive Stresses at end of load application



(c) Inelastic Compressive Strains at end of load application



(d) Inelastic Tensile Strains at end of load application

Figure D-18: Stresses and Strains for 3H72AM model after load application

APPENDIX E
CONVERGENCE STUDY OF THE 3D FINITE ELEMENT MODEL

A convergence study / mesh sensitivity study was carried out to compare the formation of the various events / material damage limit states on the dowel pullout force-joint opening behavior between a coarse and fine mesh. The 2V18NU test finite element model was used for this study. This model was primarily used as all the events / material damage limit states occurred on the dowel pullout force-joint opening behavior in the finite element model. The element size of the concrete surrounding the dowel bar in the fine mesh model was 0.25 in. (approx.) compared to an element size of 0.5 in. (approx.) in the coarse mesh.

Figure E-1 presents a comparison of the dowel pullout force per bar – joint opening behavior for the 2V18NU test specimen. As the events (A-F) form in the FE model, the joint opening and dowel pullout force per bar is presented in Table E-1. From the results of the convergence study, the magnitude of joint opening and pullout forces compare favorably with the coarse and fine mesh finite element models.

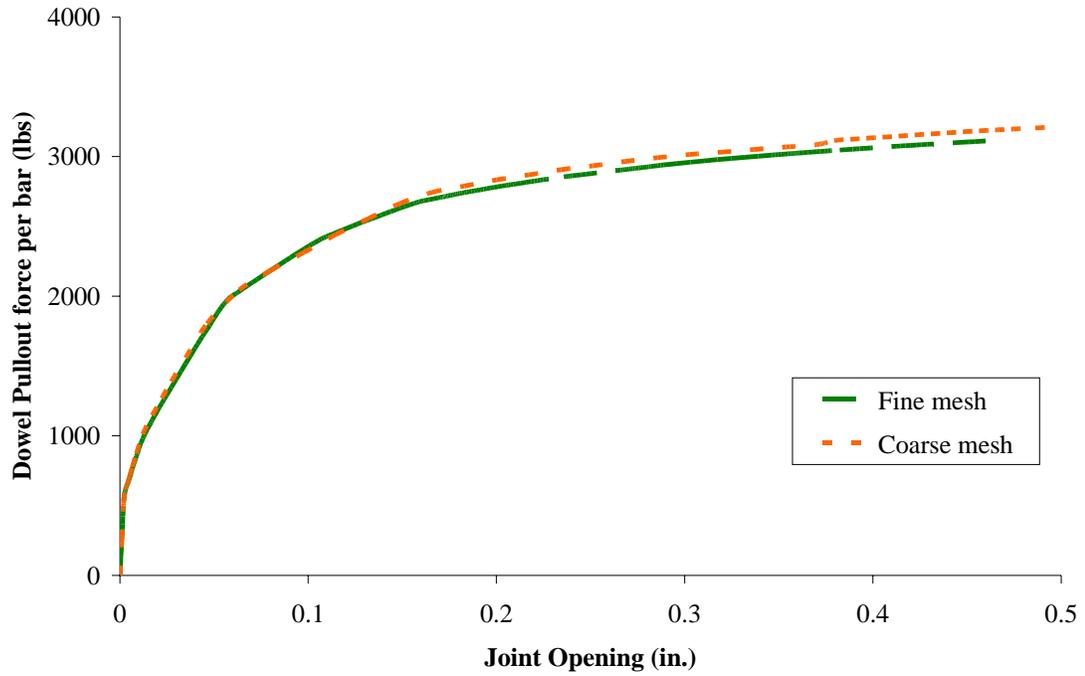


Figure E-1: Comparison of dowel pullout force-joint opening behavior for the 2V18NU coarse and fine mesh finite element model

Table E-1: Comparison of the fine and coarse mesh joint opening and dowel pullout forces

	Fine Mesh		Coarse Mesh	
	Joint Opening	Force / bar	Joint Opening	Force / bar
	(in.)	(lbs)	(in.)	(lbs)
B	0.012	979.41	0.012	1010.22
C	0.021	1271.76	0.022	1269.27
D	0.453	3137.10	0.486	3204.54
E	0.309	2987.50	0.336	3050.00
F	0.230	2865.07	0.251	2965.08

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