

Free-drop Analysis of the Transport Container for Hydrogen Isotopes

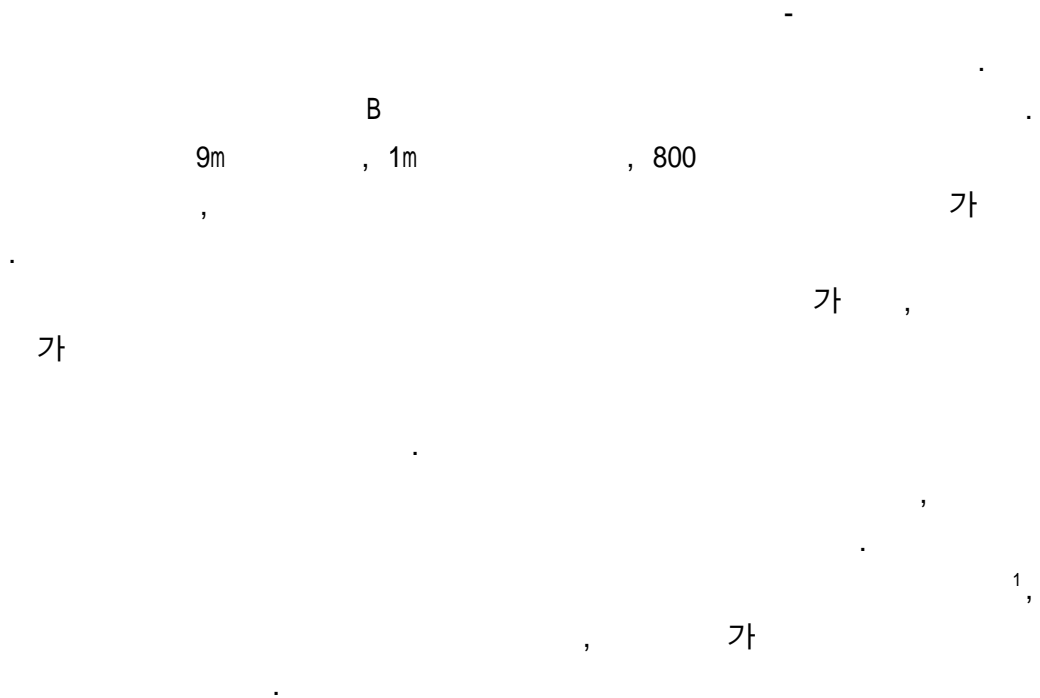
150

가 가 9m
30°

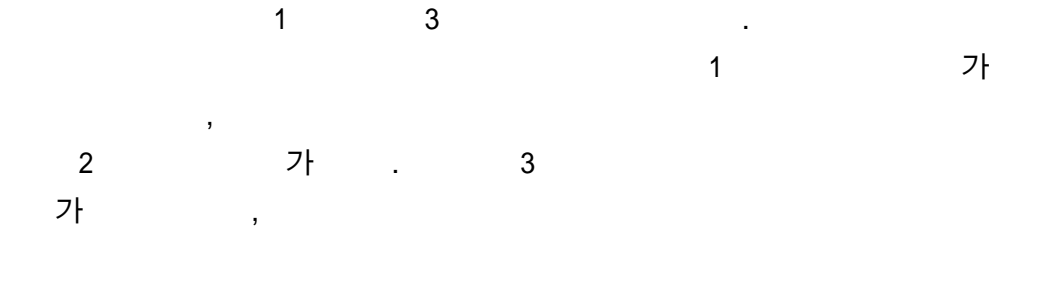
Abstract

The vessel used for the transport of radioactive materials, containing hydrogen isotopes is evaluated for hypothetical accident conditions according to national regulations. The computational analysis is a cost effective tool to minimize testing and streamline the regulatory procedures, and supports experimental programs to qualify the container for the safe transport of radioactive materials. The numerical analysis of 9m free-drop onto a flat unyielding, horizontal surface has been performed using the explicit finite element computer program ABAQUS. Especially free-drop simulations for 30° tilted condition is precisely estimated.

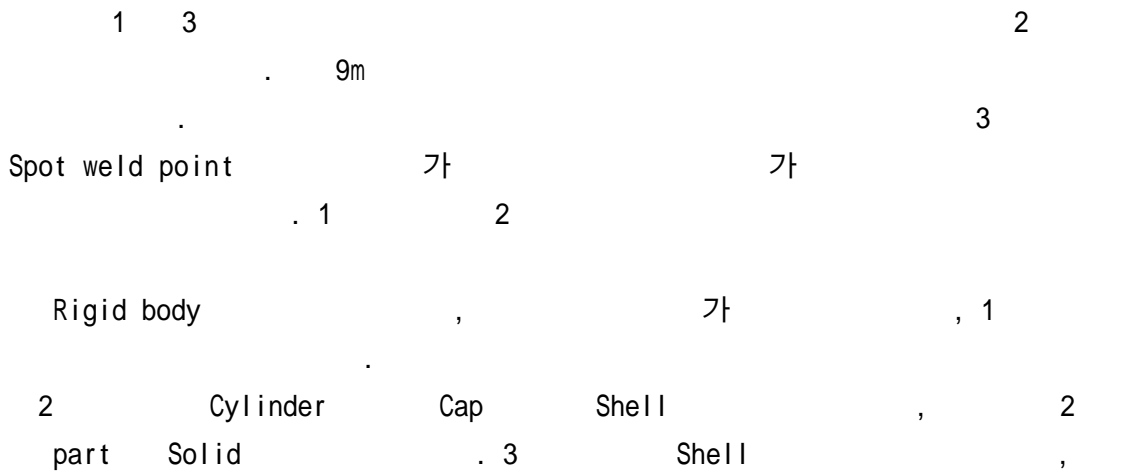
1.



2.



3.



(4)

$$E_{Kinetic} = \frac{1}{2} mv^2 \quad (4)$$

(5)

$$E_{Total} = E_{kinetic} + E_{Internal} + \dots = constant \quad (5)$$

(6)

$$E_{Total} \approx E_{kinetic} + E_{Internal} = constant \quad (6)$$

가

3 가

Stiffness matrix (Shape Reduced function)

Gauss 가

Hourglass(spurious zero energy) mode 가

Hourglass Hourglass 가

가 가 가

4 30 Drop

3 1 Delay 가

2 4 5 msec 1

5 Rigid Body 1 Reference Node 가

3 가 1msec 4.5msec 가

가 가 가 가 . 3
 10msec 가 가 20msec 가 가
 . 1 Spring
 1 가 ,
 2 Spring .
 6 3 . 7
 가 .
 3 , 3
 393 MPa .
 6
 7 . 3
 1

Spot weld
 8 9 2
 7msec 2 1
 가 가 , 2
 2 , 2
 0.1 0.5 mm . 8 3 6msec
 . 1 3
 , A
 10 2 Spring
 10 2 2
 1 2 2 A
 1 가 2 가
 가

5.

가

1m

30

1

3

3

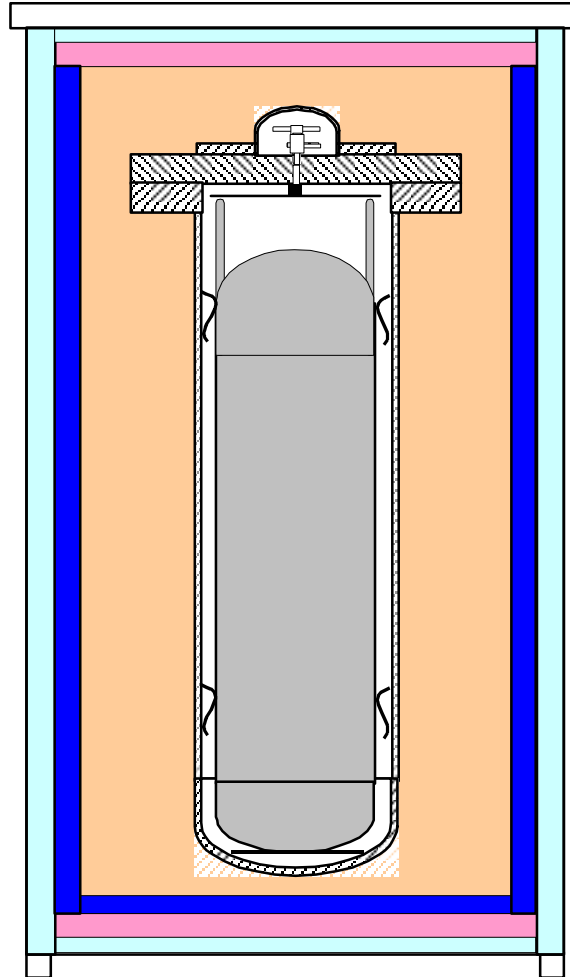
, 2

가

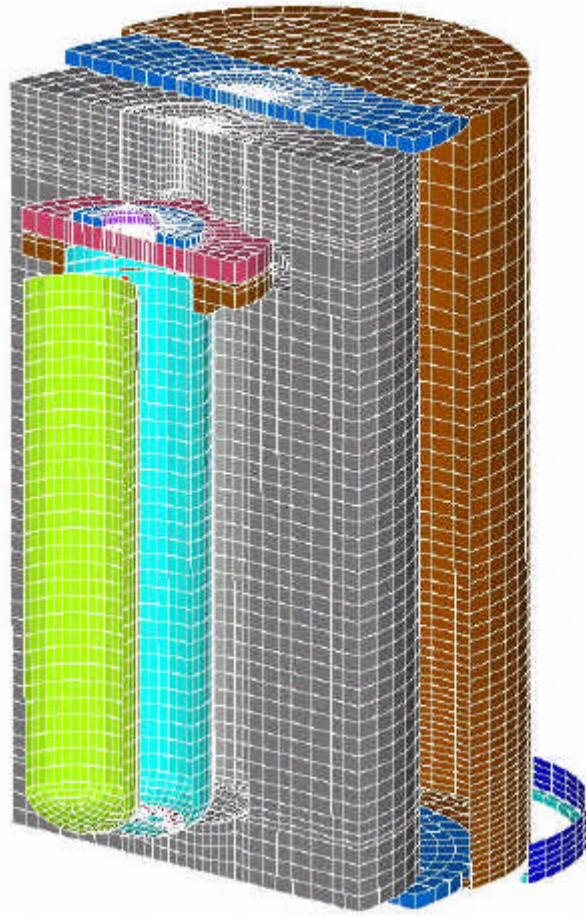
6.

1. , , , , “ Safety Analysis of the Transport Container for Hydrogen Isotopes ” , (2002).
2. , , , “ ” , , 17 4 , pp. 226 ~ 232, 2000
3. , “ 가 ” , (2001)
4. Zaouk, A., Bedewi, N. E., Kan, C. D., and Marzougui, D., "Development and Evaluation of a C-1500 Pick-up Truck Model for Roadside Hardware Impact", FHWA Simulation Conference, Langley, VA, FHWA and GWU July(1996)
5. 96-38 , ” , 1996
6. ABAQUS/Explicit User's Manual

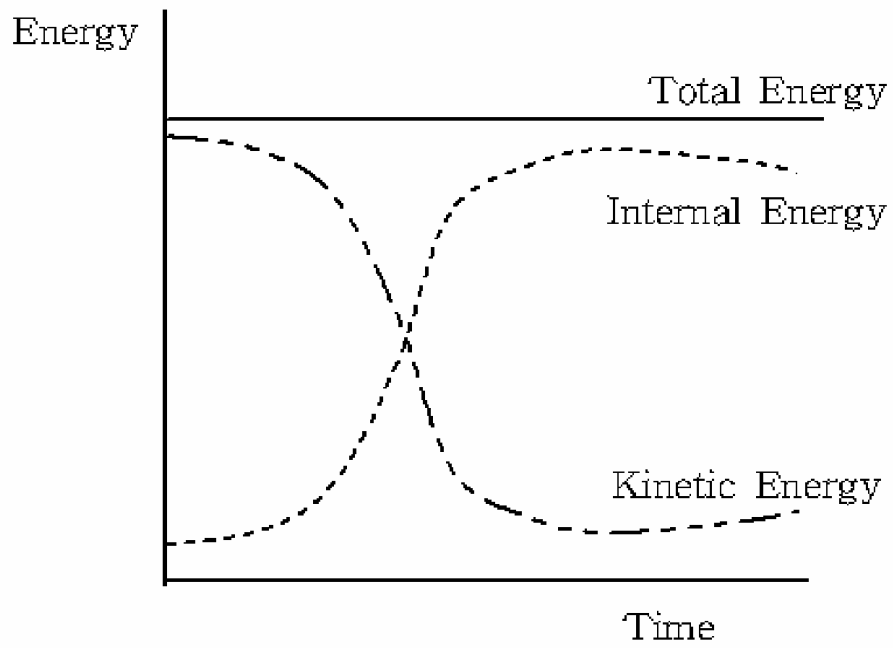
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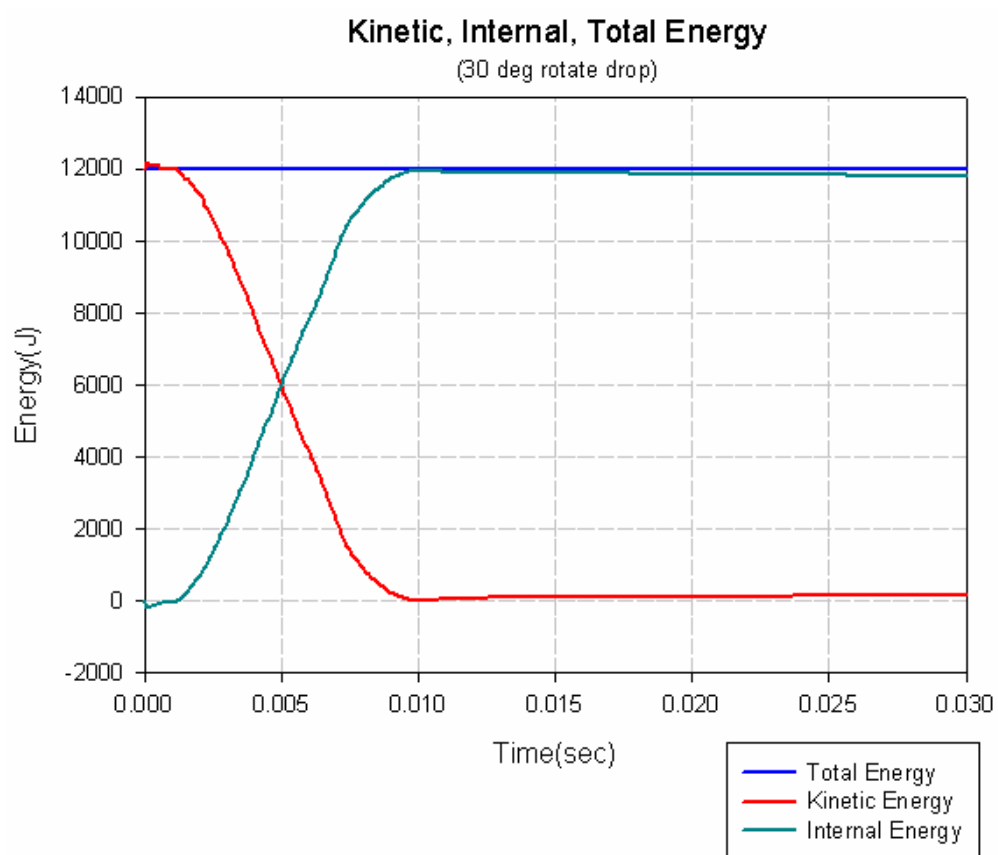
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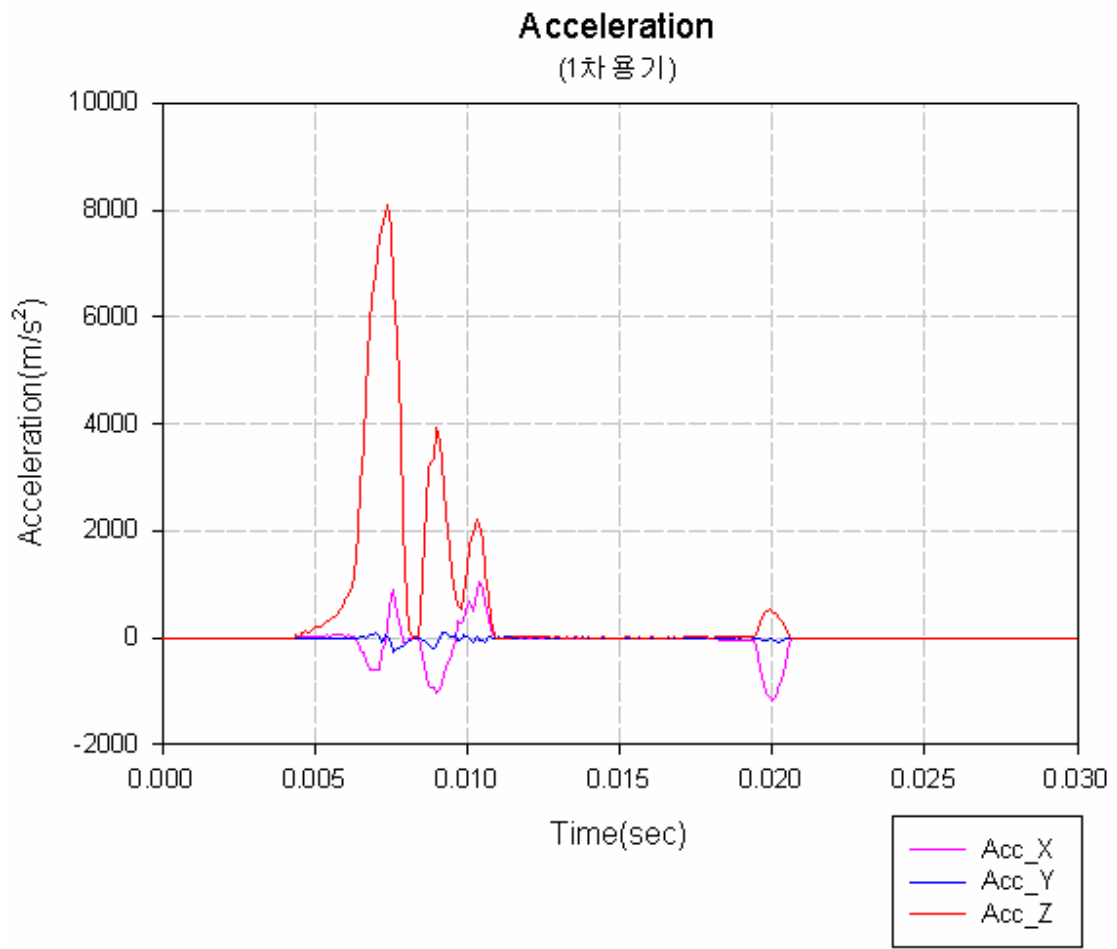
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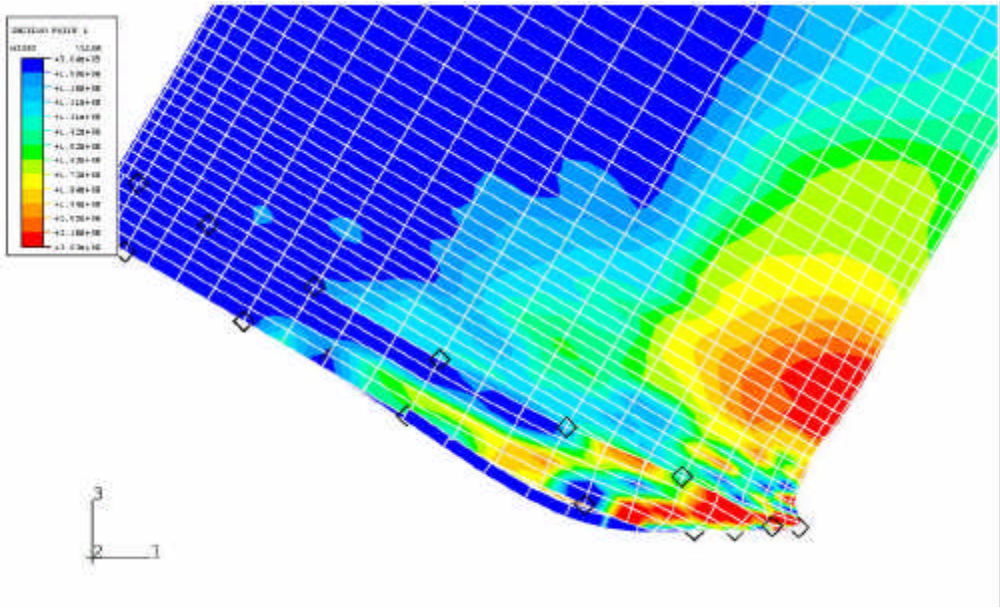
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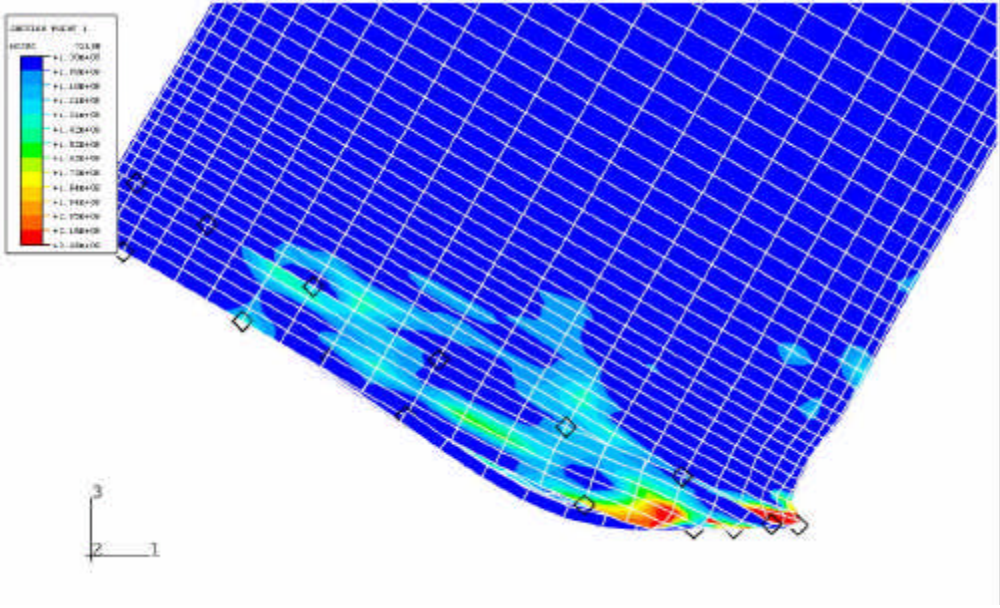
4. 30 ° 9m ,



5. 1 , 가

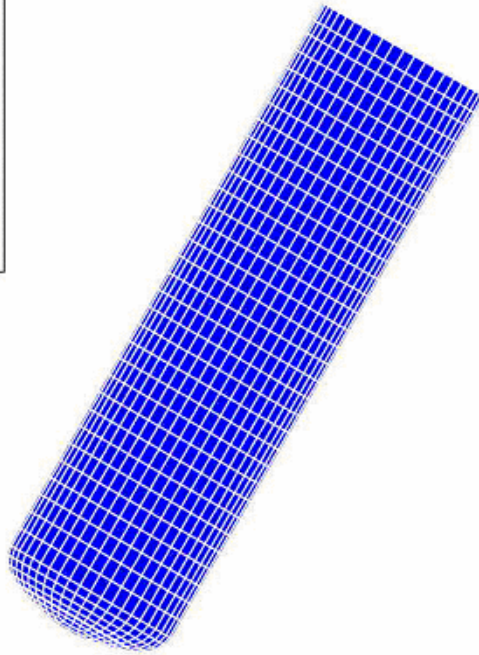
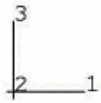
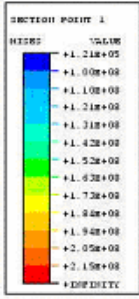


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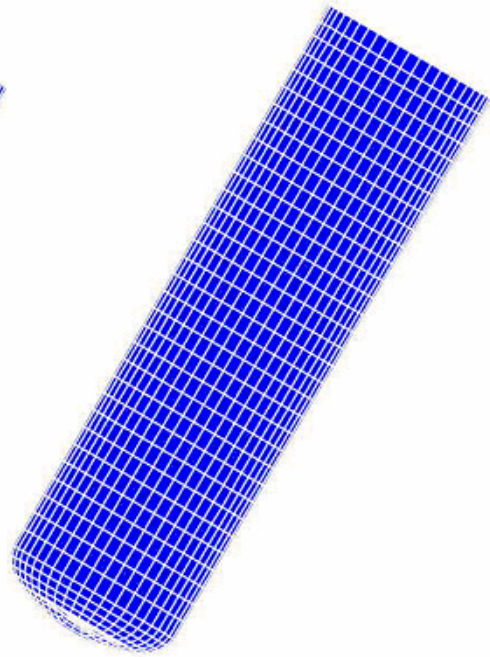


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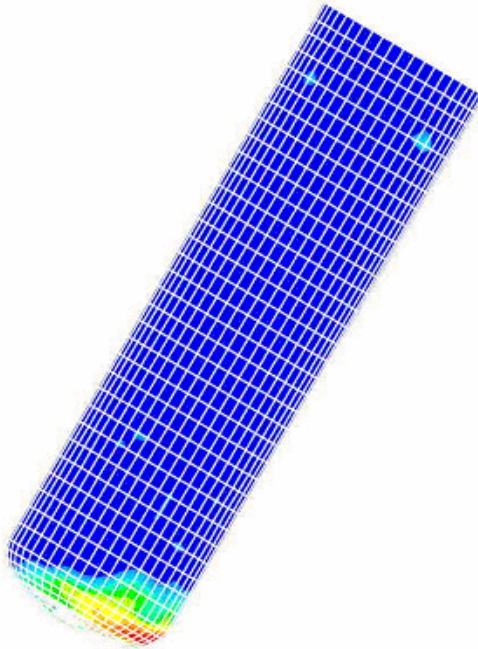
7. 6 3



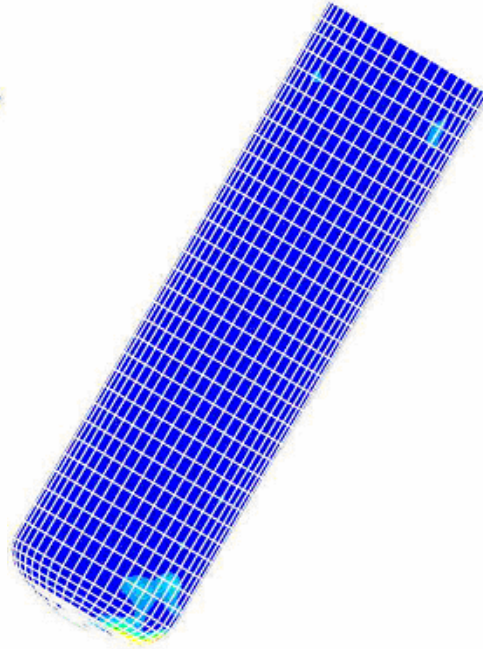
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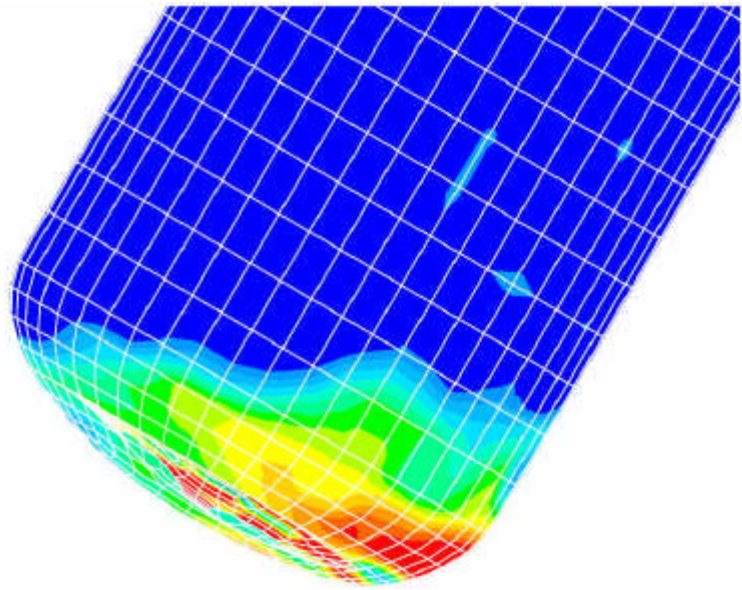
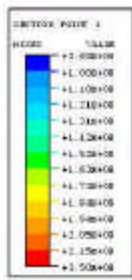


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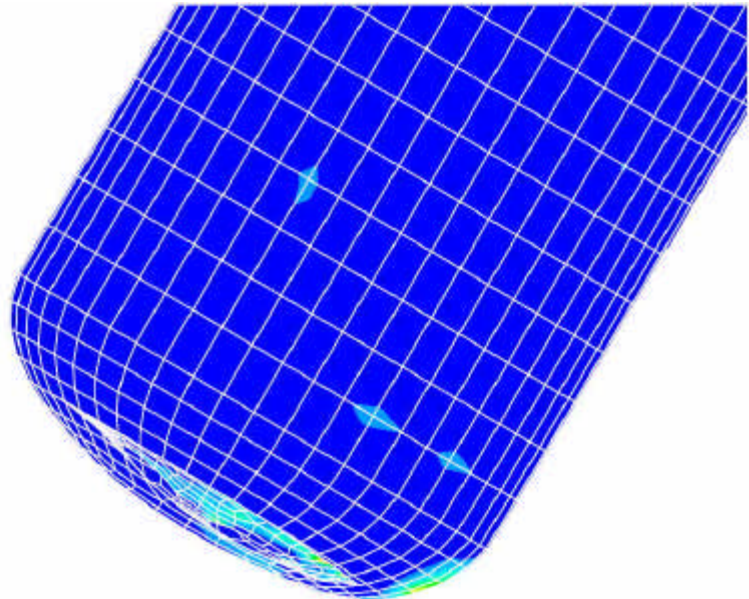
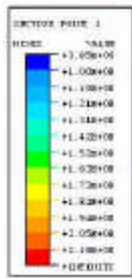
8. 30

9m

2

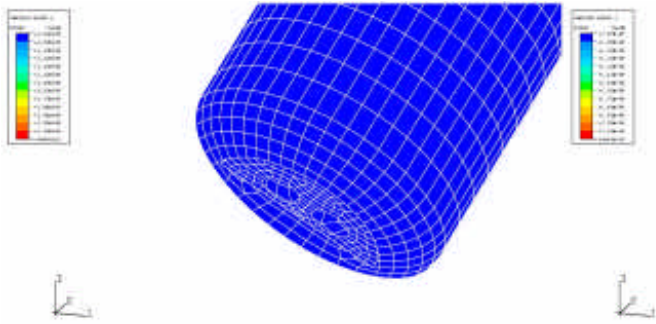


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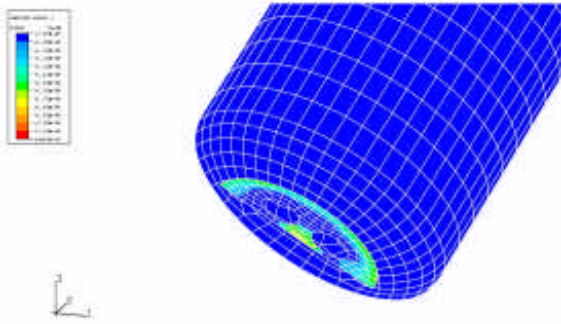


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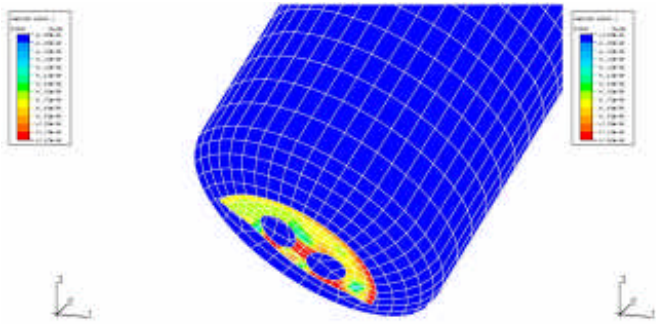
9. 8 2



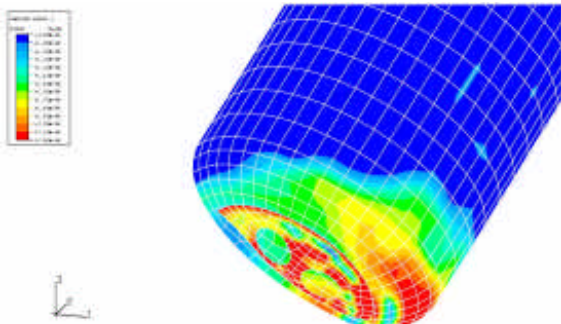
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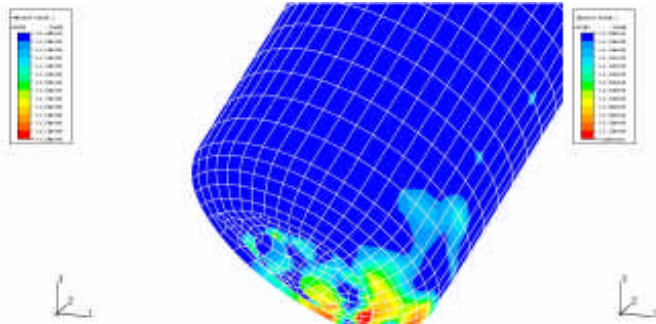
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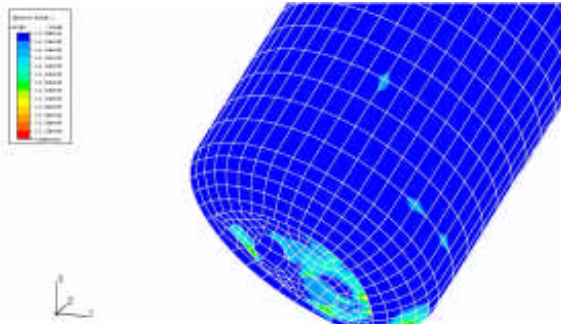
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< 7.5 msec >



< 9.0 msec >



< 10.5 msec >