

# An Analysis Of A Spent Fuel Transportation Cask Under Rail Tunnel Fire Conditions



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# INTRODUCTION

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- BALTIMORE TUNNEL FIRE
- SPENT FUEL TRANSPORTATION CASK
- PRELIMINARY RESULTS
- CONCLUSIONS AND FUTURE WORK

# BALTIMORE TUNNEL FIRE

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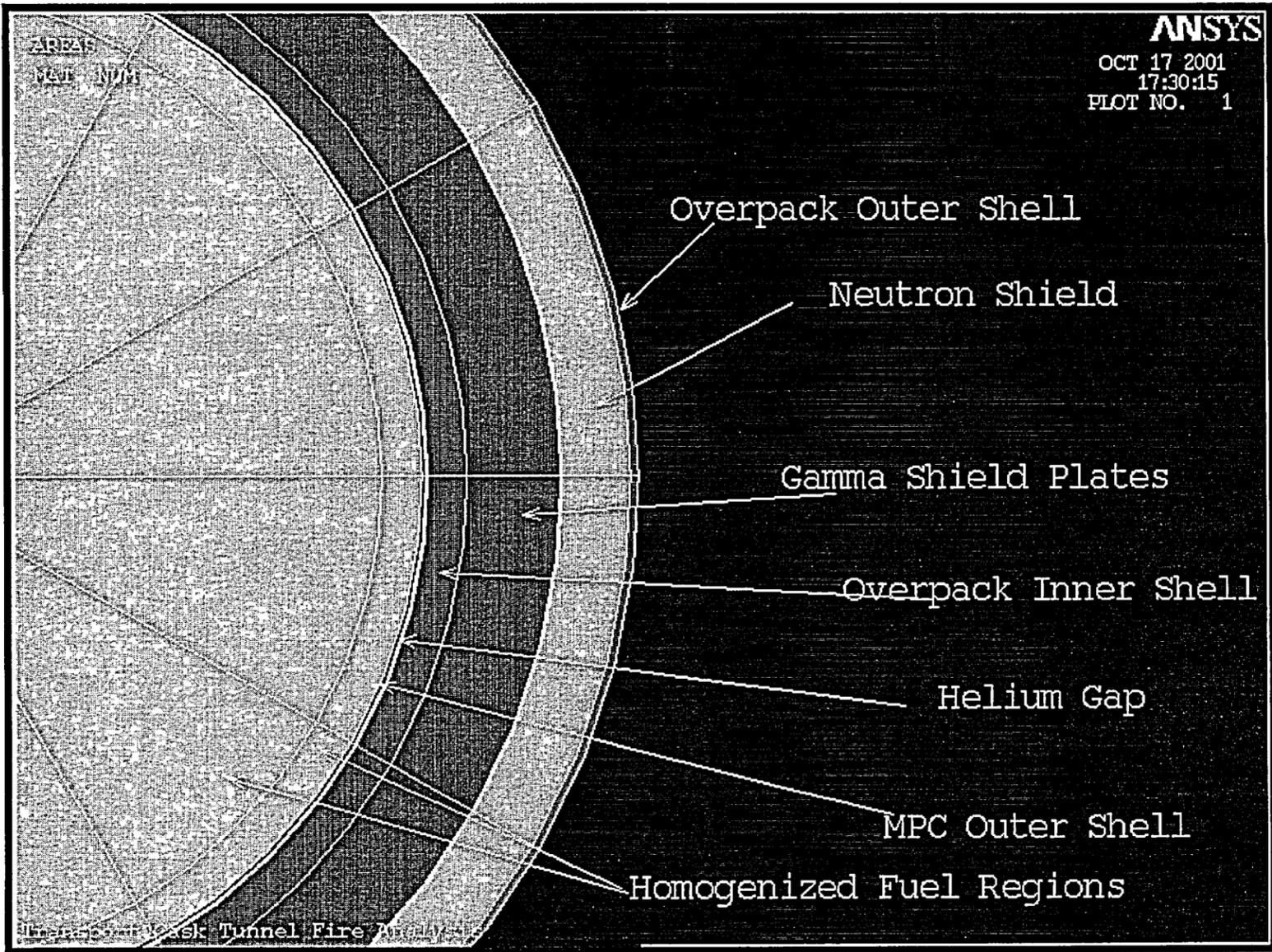
- JULY 18<sup>TH</sup>, 2001
- HOWARD STREET TUNNEL
- CSX FREIGHT TRAIN
- DERAILMENT AND FIRE
  - TRIPROPYLENE

# SPENT FUEL TRANSPORTATION CASK

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- 10 CFR 71.73 FIRE ACCIDENT
- CASK PERFORMANCE
- FINITE ELEMENT (ANSYS) MODEL

# ANSYS MODEL

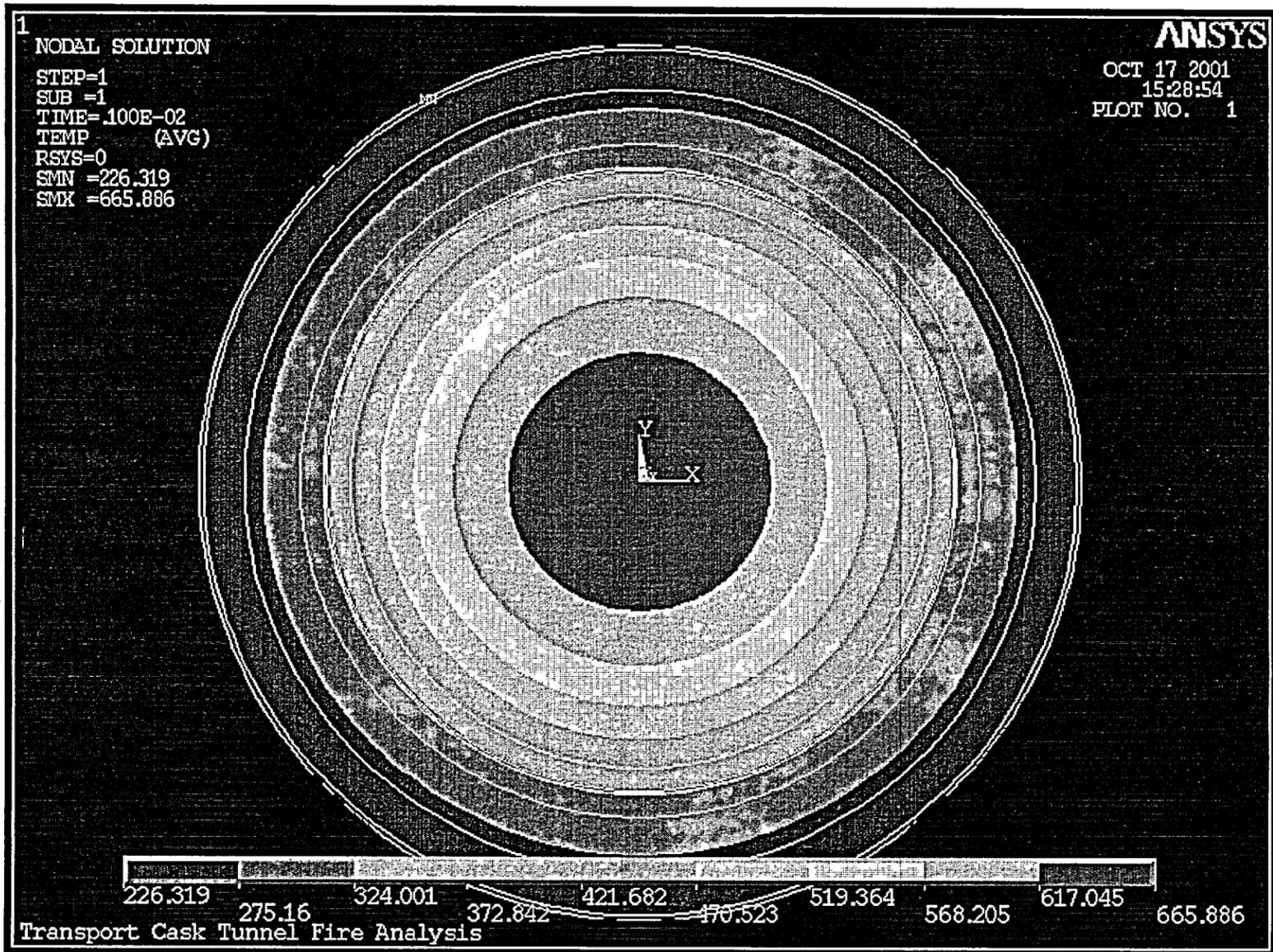


# BOUNDARY CONDITIONS

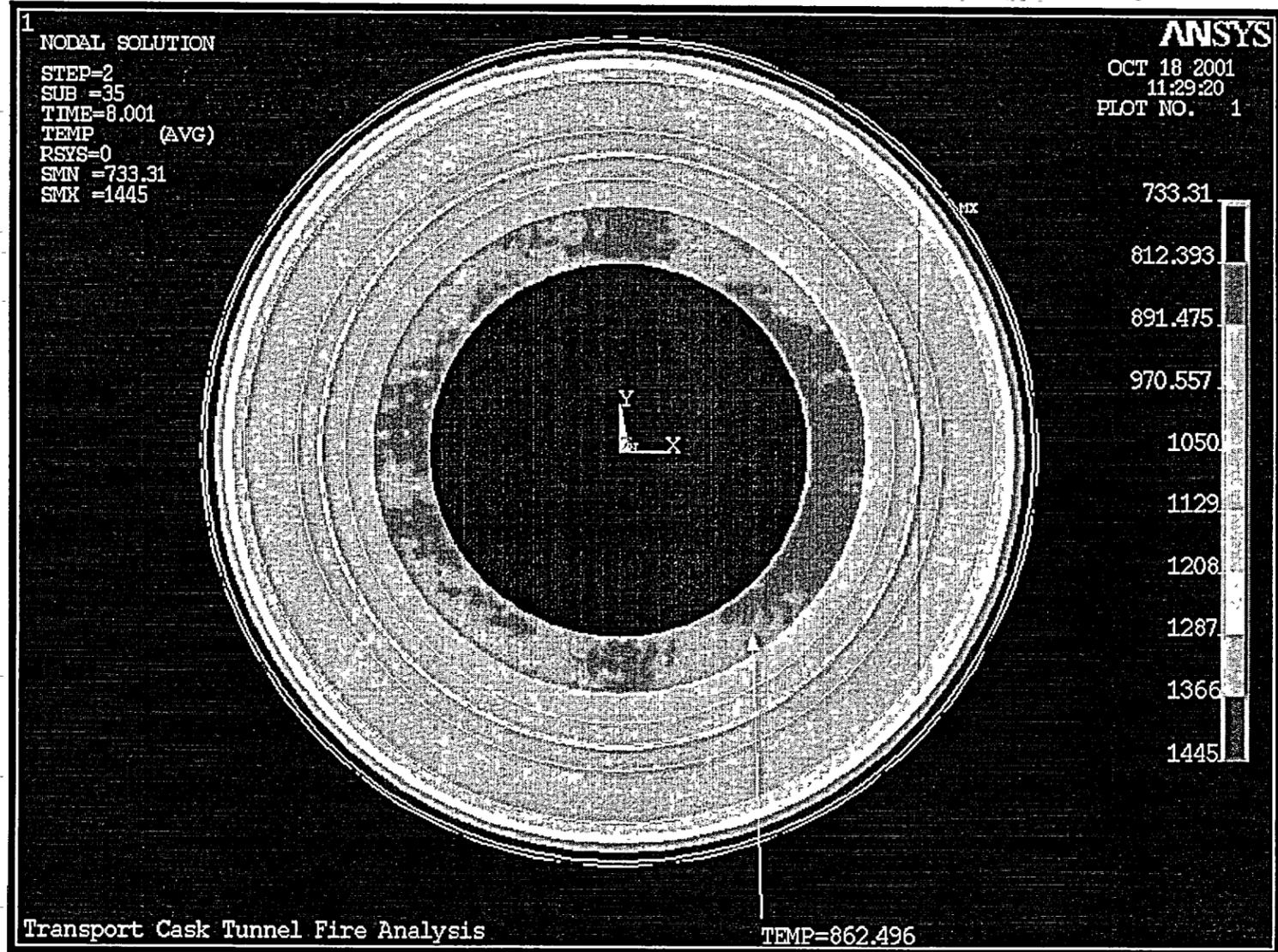
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- HEAT TRANSFER MECHANISMS
- INITIAL CONDITIONS
- FIRE CONDITIONS

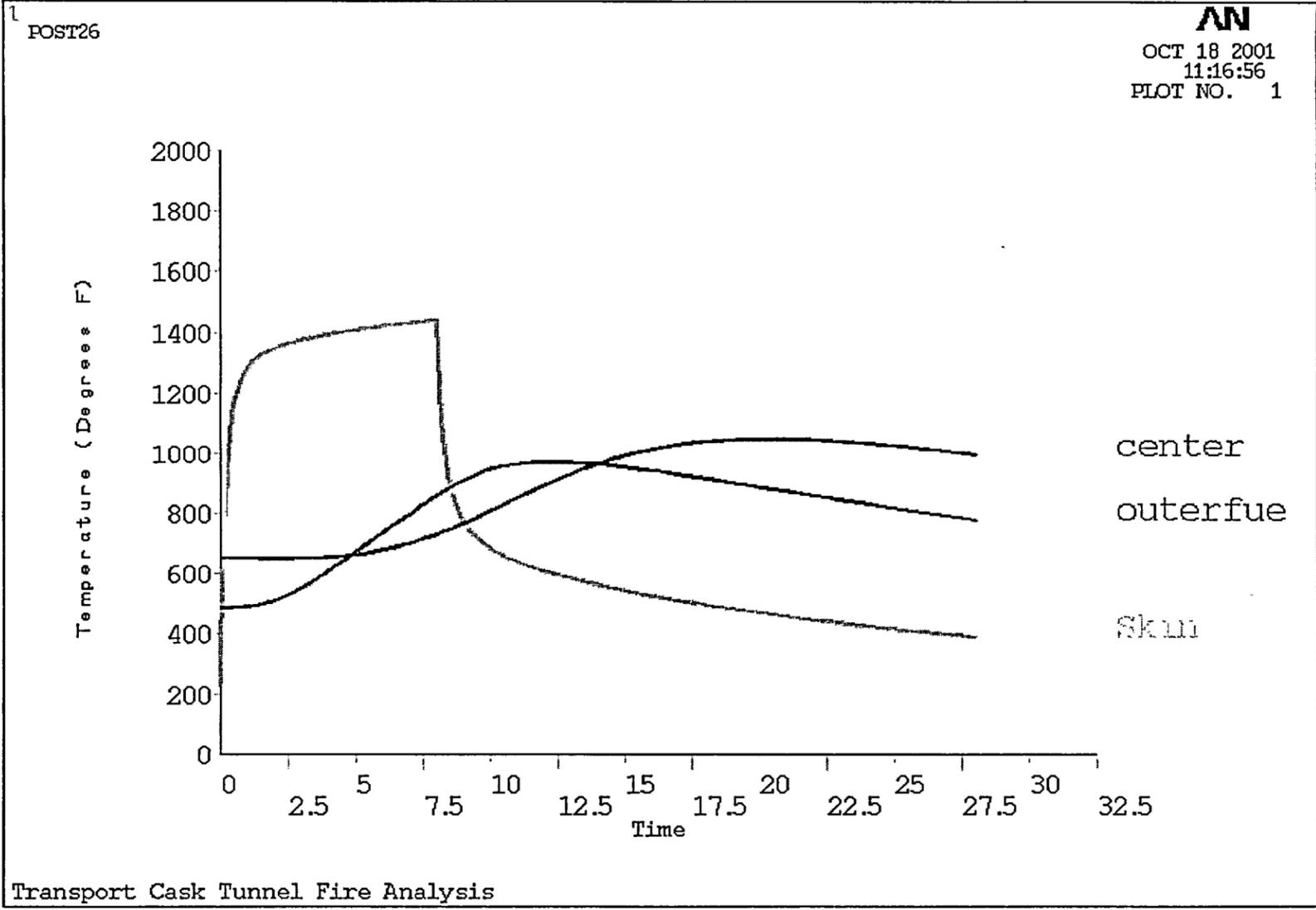
# NORMAL CONDITION TEMPERATURE PROFILE



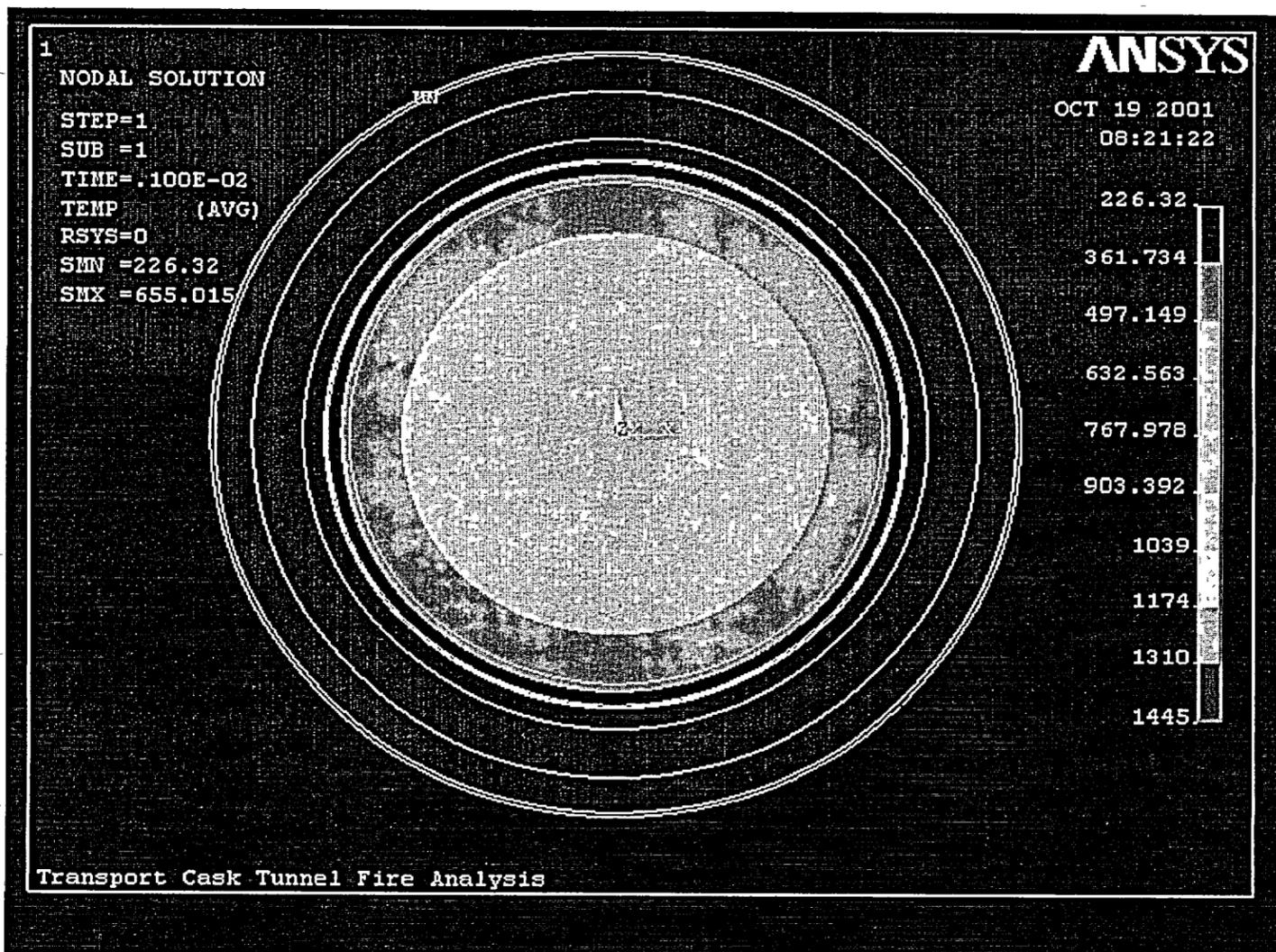
# 8 HOUR FIRE TEMPERATURE PROFILE



# CASK COMPONENT TIME VS. TEMPERATURE PLOT



# 8 HOUR FIRE WITH 20 HOUR COOLDOWN



# PRELIMINARY RESULTS

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- FUEL CLADDING TEMPERATURE LIMITS
- CONSERVATIVE ASSUMPTIONS

# CONCLUSIONS

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- CASK PERFORMANCE
- NTSB INVESTIGATION

# FUTURE WORK

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- FUEL MODEL
- MODEL RAILCAR
- MODEL TUNNEL
- 3-DIMENSIONAL COMPUTATIONAL FLUID DYNAMICS (CFD) ANALYSIS