From: Christopher Boyd RES
To: Jason Schaperow
Date: Fri, Oct 13, 2000 9:43 AM
Subject: Re:

Jason,
Here is a draft paragraph for your memo which breifly describes the benefits of our CFD effort.
Chris

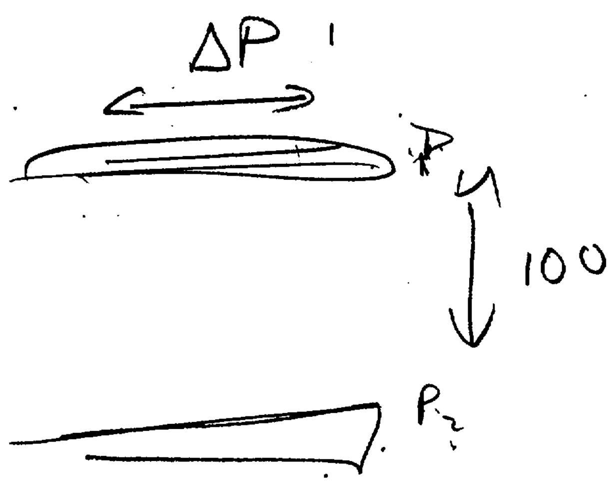
Christopher Boyd
USNRC Research
(301) 415 -0244
(301) 415 5160 [fax]
cxb5@nrc.gov

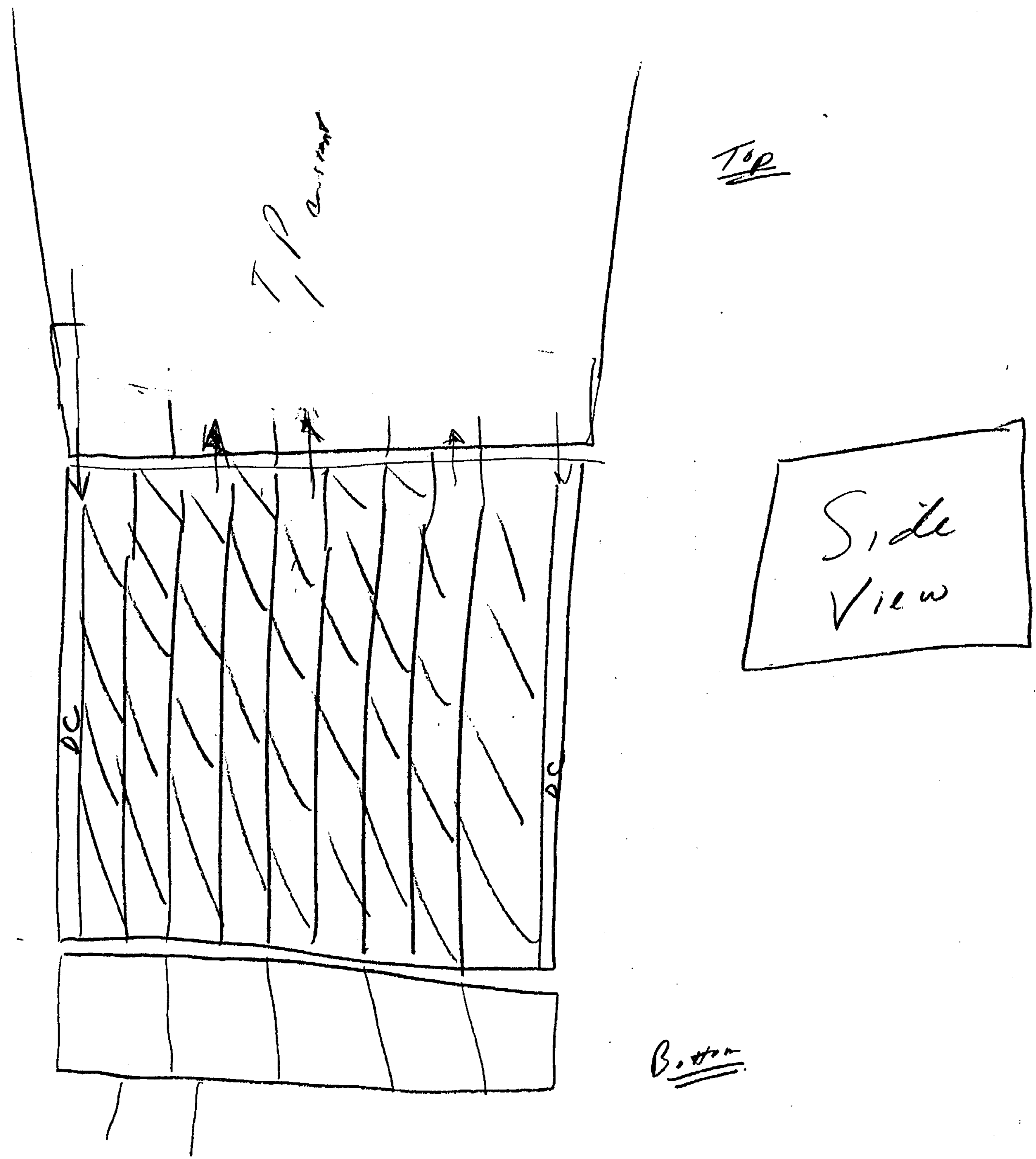
CC: Fxe

I-12

With regard to thermal hydraulics and accident progression, NRR previously estimated the critical decay time using the COBRA-SFS and SHARP codes. (Critical decay time refers to the time required to ensure that natural circulation of air in the fuel pool will keep the fuel temperatures below a specified value after a complete loss of pool coolant.) These existing thermal-hydraulic models rely on simplified thermal-hydraulic assumptions. These assumptions include a constant pressure and temperature control volume above and below the fuel racks. To assess the validity of these thermal-hydraulic modeling assumptions, NRR requested (Reference 5), and RES performed (References 6 and 7) integral three-dimensional calculations of the fuel heatup and natural circulation flows in the fuel pool and surrounding building after an instantaneous drain-down of the pool. RES utilized the FLUENT computational fluid dynamics (CFD) code for this purpose. The three-dimensional predictions indicate significant pressure and temperature variations above and below the fuel racks. The simplified control volume approach of the prior models is not representative of the RES predictions. In addition, the ~~complex~~ flow fields predicted by RES indicate that flow entrainment blocks a significant portion of the downcomer. This phenomena, among others, is neglected in the simplified control volume approach of prior modeling efforts. The CFD work includes the prediction of the critical decay time at 2 separate fuel burnups as well as sensitivity studies on major thermal-hydraulic parameters. Fuel burnup and ventilation rate are the most significant parameters found. The CFD predictions provide a data base which can be used to understand the natural circulation flow behavior and its sensitivities. In addition, these results can be used to assess the significance of the simplified thermal-hydraulic assumptions made in other spent fuel models.

provides the basis for refinements.
" " " " confirmation.




Top
T, P constant
DC
DC
Side View
Bottom