Westinghouse Electric Corporation Energy Systems

Nuclear and Advanced Technology Division

Box 355
Pittsburgh Pennsylvania 15230-0355

NTD-NRC-94-4143
NTD-NSA-SAI-94-232
May 23, 1994

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, D.C. 20555

Attention: Mr. William T. Russell

Subject: Change in Methodology for Execution of BASH Evaluation Model

Ref: WCAP-10266, Rev 2, "The 1981 Version of the Westinghouse ECCS Evaluation Model Using the BASH Code," March 1987

Dear Mr. Russell:

This letter is to inform you of the implementation of a change in the methodology for performing a LOCA analysis with the Westinghouse 1981 Large Break LOCA Evaluation Model with BASH, previously approved in the reference. The change involves revisions to the procedures used to couple the various codes in the entire execution stream for the purpose of improving the process, quality and consistency of performing LOCA calculations. No changes have been made to any of the approved physical models, nor basic techniques which form the basis of the methodology. This revision produces small changes to the results calculated by the model as will be discussed below.

Dry Containment Plants

The entire Westinghouse large break LOCA evaluation model consists of a series of computer codes which are individually specialized to calculate the thermal hydraulic phenomena for a portion of the transient. Figures 1A and 1B compare the execution stream for the previous version of the model with the revised execution stream. The pertinent change which has been made is with regard to which RCS code supplies the boundary conditions for the containment code (COCO) during the reflood phase of the transient. Previously in the BASH model, the 1981 Model methodology for calculating containment backpressure had been retained, in which the WREFLOOD code was still used to perform the calculations of RCS response during core reflood and was coupled with the COCO code to obtain a containment pressure history. The BASH code had replaced the WREFLOOD code from the 1981 model as an improved method for calculating the RCS response during the reflood phase for fuel rod analysis, but had not been coupled with the COCO code. Instead, the containment transient pressure history from the

1010
1/1

WREFLOOD/COCO calculation was hand transferred as a boundary condition. The improved methodology provides for an interactive calculation between the BASH and COCO codes. Note that the containment pressure methodology during the blowdown phase of the transient has not been changed. The refill transient portion of the WREFLOOD code, which calculates RCS behavior during vessel lower plenum refill following the end of blowdown, has been reprogrammed as a separate, but identical code (REFILL), which also runs interactively with the COCO code.

Ice Condenser Containment Plants

The large break LOCA evaluation model used for ice condenser type plants is identical to that for dry containment plants with the exception of the containment code, where the LOTIC code is used in place of COCO. Figures 2A and 2B compare the execution stream for the previously approved version of the model with the revised execution stream. At this time Westinghouse has not merged the LOTIC code with BASH to provide interactive capabilities. The pertinent change which has been made is again with regard to which RCS code supplies the boundary conditions for the containment code during the reflood phase of the transient. Similar to the BASH with COCO model, the BASH code has replaced the WREFLOOD code as the source of break mass and energy release boundary conditions, while all other features of this model have not changed. The containment backpressure versus break flow calculations are performed in an iterative fashion as before, but the new methodology provides better coupling between the RCS and containment codes.

Implementation

It is noted that no changes have been made to the any of the approved physical models, nor basic techniques governing the solutions provided by the individual computer codes in the methodology. This revision to the execution stream is being made to provide a more consistent methodology by coupling the same RCS code used for calculating fuel rod response with the containment pressure code. It also allows for a significant improvement to the process and quality of performing LOCA calculations by reducing computer time and data transfer requirements, with the attendant need for verification and potential for error.

Westinghouse is making this revision for the above purposes, and seeks neither gain nor loss of margin from the change. The results of code testing and verification have found that the new execution stream produces small changes to the calculated results, specifically the peak clad temperature. The magnitude of the changes have been determined to be minor and are bounded by a value no more than approximately $\pm$25 F. Investigations have determined that these effects are a result of perturbing boundary conditions to a relatively large and complex model such as used for the RCS. Furthermore, there has been no observed bias toward either penalties or benefits.

Relative to the present methodology which decouples the RCS and containment responses, we consider the new code configuration to represent a superior methodology for accurately modeling a large break LOCA transient as a whole. In view of the small effect on predicted results, it is our intent to implement the new execution stream on a forward-fit basis, whereby we will perform any new plant licensing analyses with this methodology, and the code coupling effects will become implicit to the new reported results. For purposes of conducting sensitivity studies relative to existing licensed results, as the new methodology is phased in, calculations will be made with the most appropriate code execution stream, which for a period of time may involve the old methodology, or possibly a hybrid, if from an engineering perspective it is deemed to be appropriate for correctly obtaining sensitivity effects.

By copy of this letter, licensees utilizing the Westinghouse 1981 Large Break LOCA Evaluation Model with BASH are informed of the status of changes to the methodology. Since no reanalysis or Technical Specification modifications are required, this submittal satisfies 10CFR50.46(a)(3)(ii) for evaluation model changes without further reporting on the part of individual utilities. Further questions or comments may be addressed to Mr. M. E. Nissley.

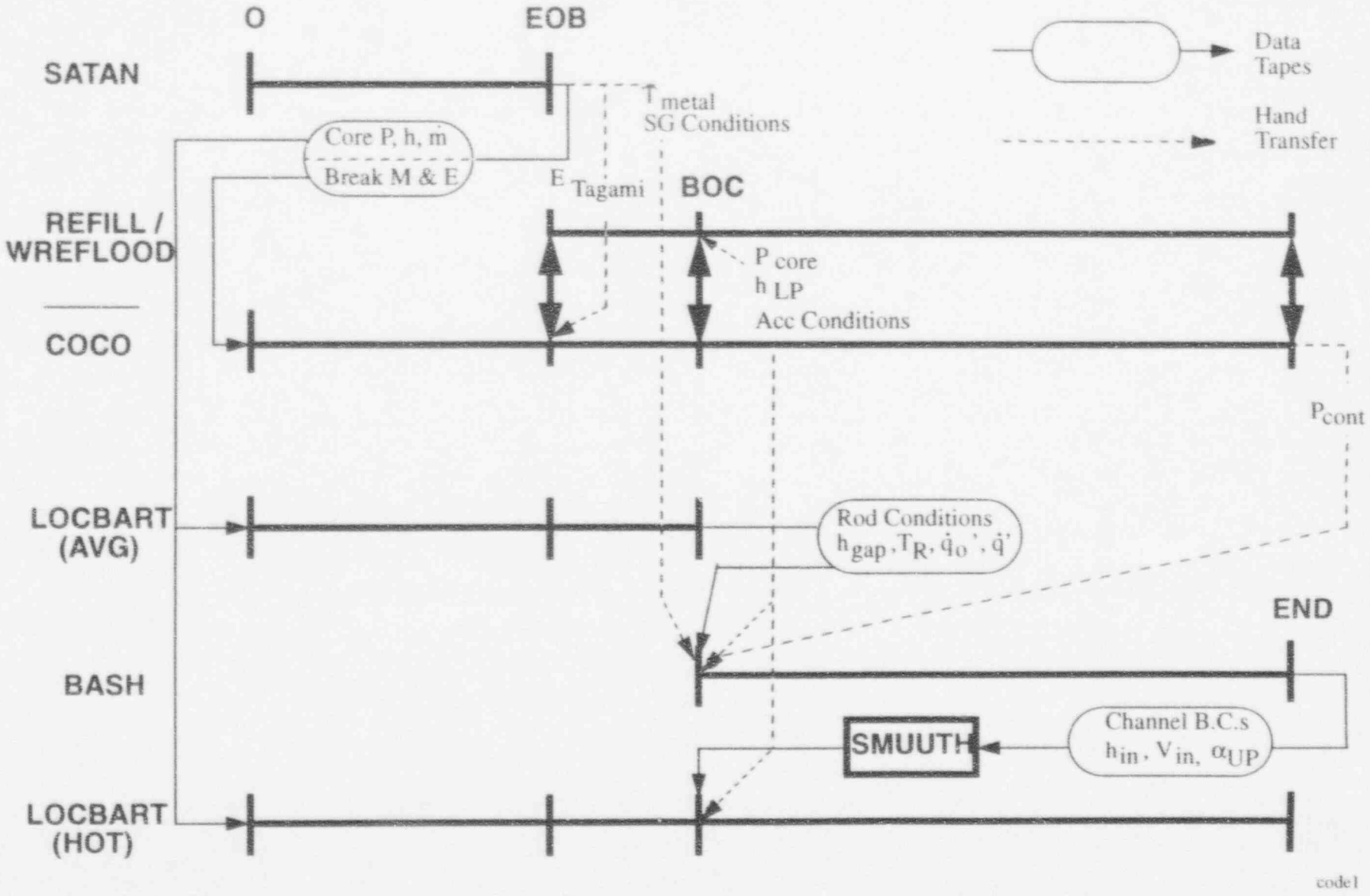
Very truly yours,

N. J. Liparulo, Manager
Nuclear Safety Regulatory and Licensing Activities

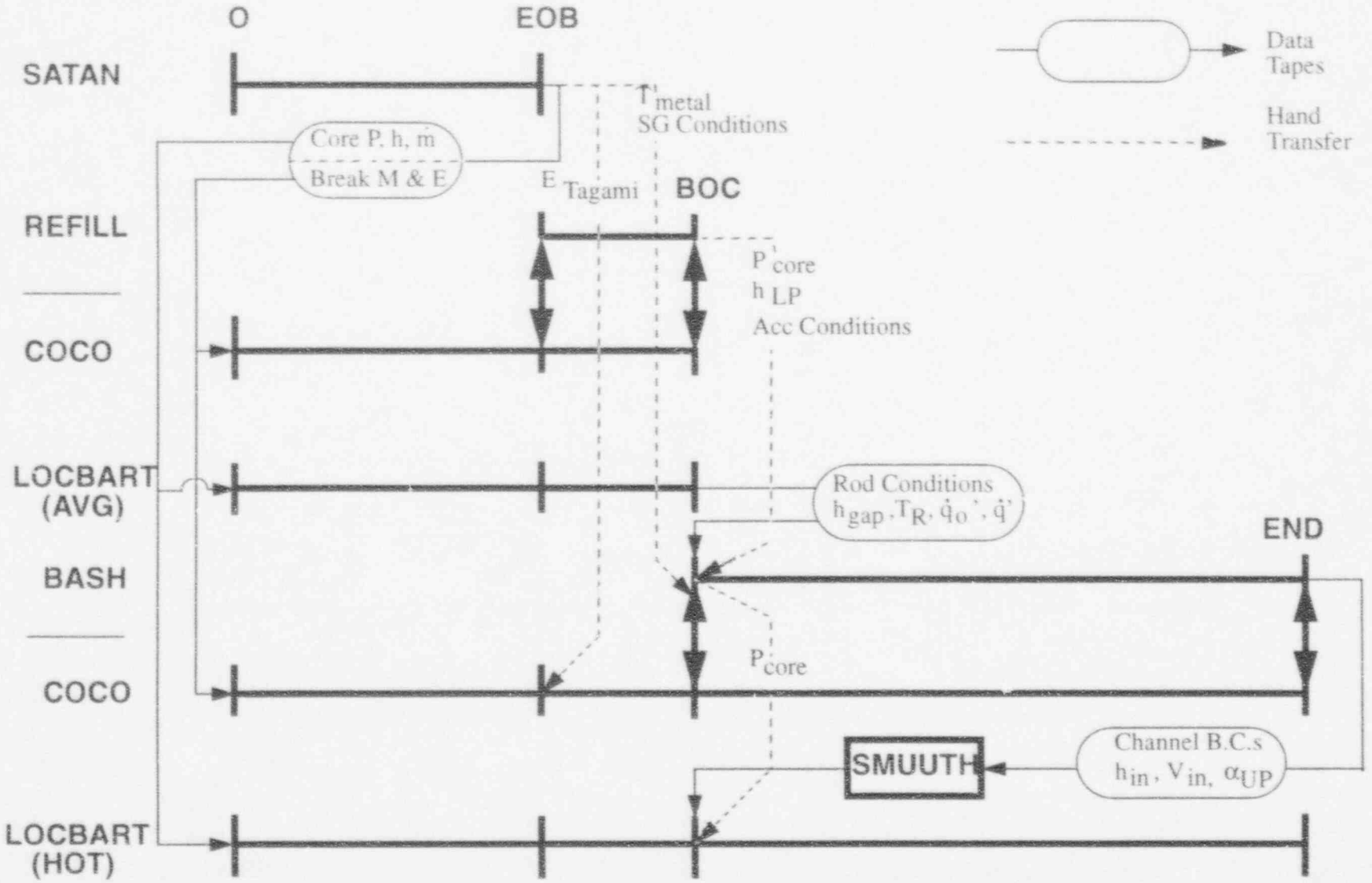
DJS/sm

cc: R. Jones, RSB
F. Orr, RSB

Dry Containment LOCA Code Interfaces

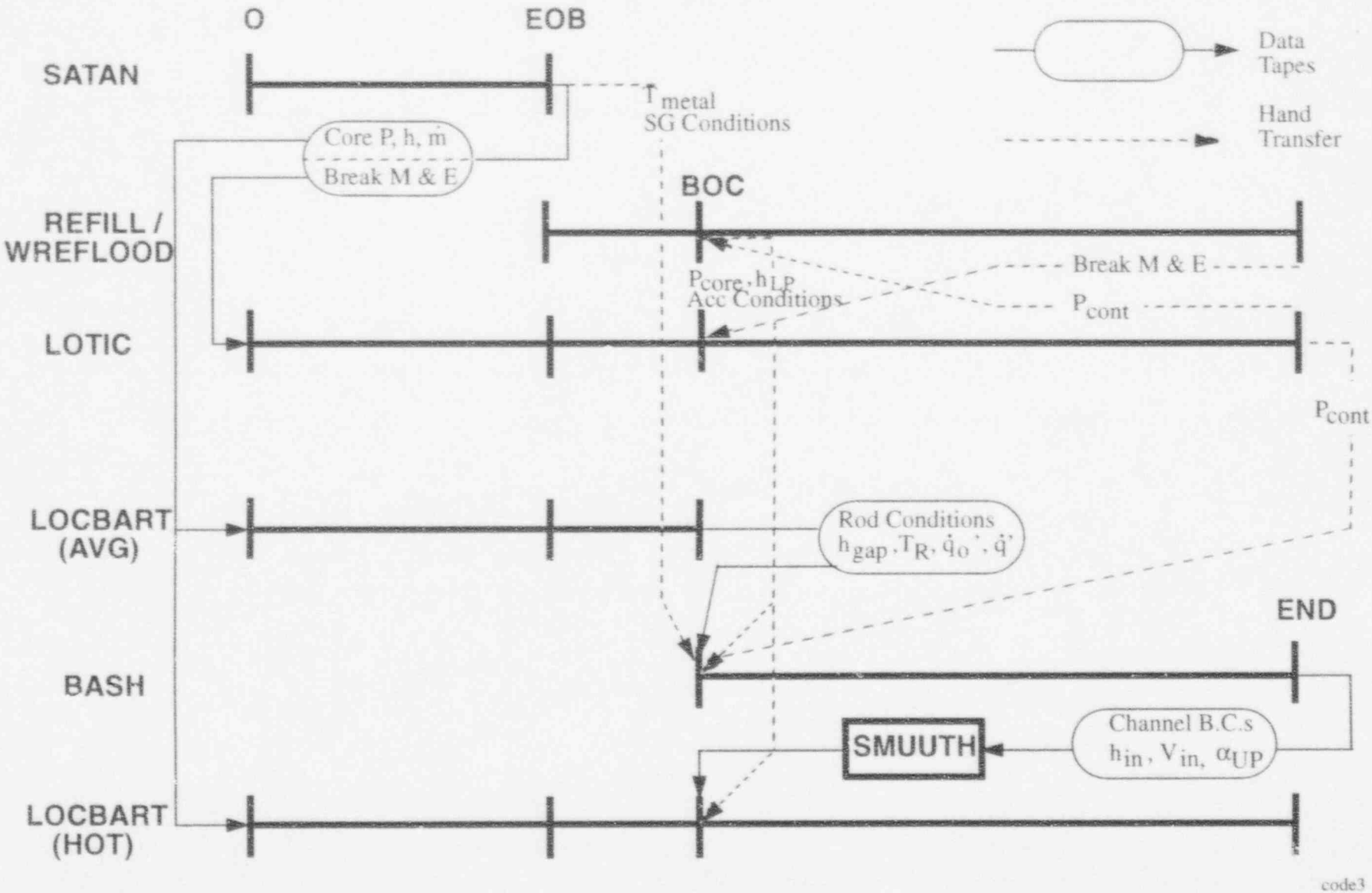


Dry Containment LOCA Code Interfaces (Revised)

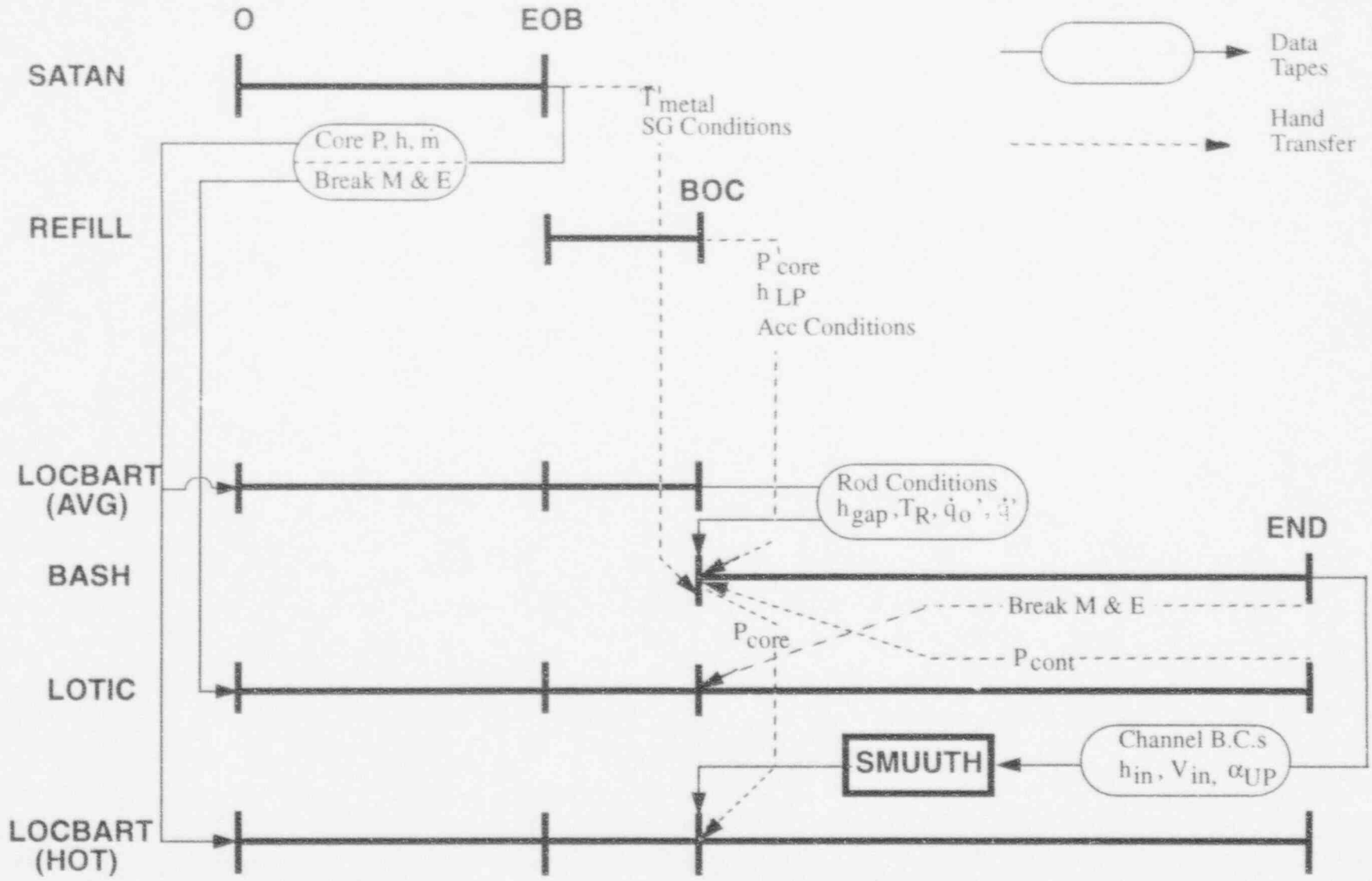


code2

Ice Condenser Plant LOCA Code Interfaces



Ice Condenser Plant LOCA Code Interfaces (Revised)



code4