

NOV 1 1983

109.9/PO/83/10/25/0

- 1 -

MEMORANDUM FOR: Malcolm Knapp, Section Leader
Hydrology Section
Geotechnical Branch
Division of Waste Management

FROM: Peter Ornstein
Geotechnical Branch
Division of Waste Management

SUBJECT: TOUGH CODE IMPLEMENTATION AT BNL

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The TOUGH code was received from LBL and successfully implemented at the BNL computing facility thereby satisfying Operating Plan Commitment 31311. Successful implementation included code compilation and execution of four sample problems.

The TOUGH code is a multi-dimensional integrated finite difference computer code capable of simulating non-isothermal fluid and gas flow in a variably-saturated media. It's gridding geometry may be highly irregular and can be used to simulate flow through discrete fractures. However, the number of grid blocks are limited to approximately 500 due to Large Core Memory limitations of the BNL computer. The code also has extensive internal documentation (i.e., important variables and algorithms are defined, and there is also a running commentary).

The TOUGH code has widespread applicability to canister scale, repository scale, and larger scale hydrogeologic assessment. Some of these applications include:

- Simulation of repository resaturation.
- Simulation of advective and/or thermally induced fluid flow.
- Simulation of advective and/or thermally induced gas flow.
- Simulation of the thermal environment.

JCL instructions for accessing TOUGH and the sample problems are attached. Any staff interested in learning how to use TOUGH should contact me for additional instructions and documentation.

WM Record File
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Peter Ornstein
Geotechnical Branch
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The TOUGH code, along with a sample problem input file, may be accessed from BNL's MFZ in the following manner:

<u>JCL Language</u>	<u>Comments</u>
ORNST,STMFZ,TP0,T177.	Job Control Card
ACCOUNT,ORNSTEIN,1349,1349.	Account Card
ATTACH,BT,ORNSTEINTOUGHBINAR, ID=ZZRNRC,CY=001,MR=1.	Access TOUGH
FILE,DATA,RT=Z,BT=C,FL=90.	See Below
ATTACH,DATA,fname, ID=TOUGH,ST=MFA,MR=1.	Access Input File
BT,DATA.	Execute TOUGH
EXIT,U.	
REWIND,DATA.	
COPYSP,DATA,OUTPUT.	Print Input File
*EOR	
*EOF	

Where fname = RURF	Canister Sample Problem
= GATUF	Geothermal Sample Problem
= RBM41	1-D Infiltration Problem
= RBM42	2-D Infiltration Problem

FILE Card is necessary to access Sample Problems from MFZ.