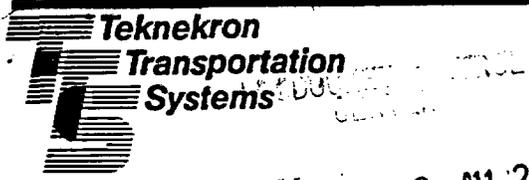


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January 26, 1987 WM-RES
WM Record File
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WM Project 10, 11, 16
Docket No. _____
PDR ✓
*LPDR ✓ (B, N, S)

Ms. Pauline Brooks
Division of Waste Management
MS 623 SS
U.S. Nuclear Regulatory Commission
Washington, D.C.

Distribution:
P Brooks | Joan-ticket
(Return to WM, 623-SS) | Sac

Subject: Contract No. NRC-02-81-026, FIN B-6985
Benchmarking of Computer Codes and Licensing Assistance
Monthly Letter Progress Report for July through December 1986

Dear Pauline:

This letter contains a management level summary of progress during the months of July through December 1986.

Task 3 - Benchmark Problems Report -- Waste Package Code

The final report was submitted to NRC July 7. Subsequent use of this document has revealed that corrections are required on pages 86 and 87. The corrected pages are attached.

Task 4 & 5 -- Siting Codes

We have received a letter from GeoTrans on the level of additional funding required for the completion of this task. The GeoTrans subcontract will be modified once we receive assurance that they have funded sufficient effort to respond to reasonable review comments.

Tasks 4 & 5 -- Repository Design Codes

We have reached agreement with Acres on the level of additional funding required for the completion of their portion of this task. The Acres subcontract has been modified.

We have also reached an agreement with GRAM, Inc. (Krishan K. Wahi) on the level of effort required for them to benchmark the Stealth code. A subcontract will be awarded.

Mr. Chapman's application to use the Oak Ridge National Laboratory computer facility, originally submitted to NRC on March 6, was resubmitted October 23. Acceptance of the application was received in late December and the

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acknowledgement form was returned to ORNL January 5, 1987. We are now working with the computer support people at ORNL to establish a modem link with the ORNL computer.

Mr. Douglas Dooley, a Ph.D. candidate in the nuclear engineering program at the University of California, will assist with benchmarking the HEATING CODE. An application for Mr. Dooley to use the ORNL computer facility was submitted to NRC January 13.

Input data have been prepared for the Repository Design problems that will be run with the HEATING code.

Tasks 4 & 5 -- Waste Package Codes

Mr. Chapman's application to use the INEL computer facility has been approved and the WAPPA-B code was moved from INEL to Berkeley where it will be loaded onto the in-house VAX computer for use in benchmarking selected waste package problems.

Mr. Ramtin T. Mahini, a Ph.D. candidate in the nuclear engineering program at the University of California, will assist with benchmarking the WAPPA-B, COVE, and ANISN codes. Mr. Dooley will assist in benchmarking the HEATING and ADINA codes. An application for Mr. Dooley to use the INEL computer facility was submitted to NRC January 13.

We are currently getting ready to move the ADINA code from the BNL computer to the INEL facility. Input data have been prepared for many of the Waste Package problems that will be run with the HEATING code.

Task 6 -- Technology Transfer

The repository design and waste package microcomputer programs have been documented and are scheduled for transmittal to the NRC at the end of January. Preliminary documentation for the radiological assessment microcomputer codes has been prepared.

General

We expect to hire an independent QA inspector at the appropriate time during the project. He may work in our offices in order to improve scheduling and efficiently utilize administrative staff. Therefore we will ensure that all reviews are certified to document independence. Estimated costs to date through January 3, 1987 is \$3,744,817.52.

Yours sincerely,



Charles J. Rosselle
Vice President

CJR:ko

and for $k = \text{constant}$, the integrals are

$$\sigma_r = \frac{E \alpha T(r_i) - T(r_o)}{2(1-\nu) \ln(r_o/r_i)} \left[-\ln(r_o/r_i) - \frac{r_i^2}{r_o^2 - r_i^2} (1 - r_o^2/r^2) \ln(r_o/r_i) \right] \quad (45)$$

and

$$\sigma_t = \frac{E \alpha T(r_i) - T(r_o)}{2(1-\nu) \ln(r_o/r_i)} \left[1 - \ln(r_o/r_i) - r_i^2/(r_o^2 - r_i^2) (1 + r_o^2/r^2) \ln(r_o/r_i) \right] \quad (46)$$

Thus, Equations 43 and 44 can be evaluated to give the radial and tangential stress components for any radial position r for the temperature distribution given by Equation 42.

Equations 43 and 44 can be written as

$$\sigma_r = A \left[-\ln(r_o/r) - B(1 - r_o^2/r^2) \right] \quad (47)$$

and

$$\sigma_t = A \left[1 - \ln r_0/r - B \left(1 + \frac{r_0^2}{r^2} \right) \right] \quad (48)$$

where

$$A = \frac{E \alpha [T(r_i) - T(r_o)]}{(1-\nu) \ln(r_o/r_i)} \quad (49)$$

and

$$B = \left(\frac{r_i^2}{r_o^2 - r_i^2} \right) \ln(r_o/r_i) \quad (50)$$