

12/22
11/21/01
no

SOFTWARE RELEASE NOTICE

| | | |
|---|----------|----------------------------|
| 01. SRN Number: EBS-SRN-148 | | |
| 02. Project Title: TSPAI KTI | | Project No. 20-5708-761 |
| 03. SRN Title: EBSPAC Version 1.1 | | |
| 04. Originator/Requestor: QA | | Date: 6/17/97 |
| 05. Summary of Actions | | |
| <ul style="list-style-type: none"><input type="checkbox"/> Release of new software<input type="checkbox"/> Release of modified software:<input type="checkbox"/> Enhancements made<input type="checkbox"/> Corrections made<input type="checkbox"/> Change of access software<input checked="" type="checkbox"/> Software Retirement | | |
| <i>AW 11/30/2001</i> | | |
| 06. Persons Authorized Access | | |
| Name | RO/RW | A/C/D |
| Sitakanta Mohanty Dennis Vinson | RW RW | |
| 07. Element Manager Approval: <i>EG Baea</i> | | Date: <i>6/17/97</i> |
| 08. Remarks: | | |
| Future versions of EBSPAC were expected to be managed in accordance with TOP-018 by NRC Staff, but the CNWRA performed the modifications because of its use in the TPA phase 3 code development. | | |

2/22

SOFTWARE SUMMARY FORM

| | | | |
|--|---|---|---|
| 01. Summary Date: 6/17/87 | 02. Summary prepared by (Name and phone) Sitakanta Mohanty (210)522-5185 | 03. Summary Action: None | |
| 04. Software Date: 6/17/97 | 05. Short Title: EBSPAC Version 1.1 | | |
| 6. Software Title: Engineering Barrier System Performance Assessment Code, Version 1.1 | | 07. Internal Software ID: None | |
| 08. Software Type: <input type="checkbox"/> Automated Data System <input checked="" type="checkbox"/> Computer Program <input type="checkbox"/> Subroutine/Module | 09. Processing Mode: <input type="checkbox"/> Interactive <input type="checkbox"/> Batch <input checked="" type="checkbox"/> Combination | 10. APPLICATION AREA a. General: <input checked="" type="checkbox"/> Scientific/Engineering <input type="checkbox"/> Auxiliary Analyses <input checked="" type="checkbox"/> Total System PA <input checked="" type="checkbox"/> Subsystem PA <input type="checkbox"/> Other b. Specific: | |
| 11. Submitting Organization and Address: Center for Nuclear Waste Regulatory Analyses 6220 Culebra Road San Antonio, TX 782238-5166 | | 12. Technical Contact(s) and Phone: Sitakanta Mohanty (210) 522-5185 | |
| 13. Narrative: EBSPAC Predicts Container Life and Radionuclide Releases from the EBS. | | | |
| 14. Computer Platform SUN IPX SUN SPARC 20 | 15. Computer Operating System: Solaris | 16. Programming Language(s): FORTRAN 77 | 17. Number of Source Program Statements: 6,500 approx. |
| 18. Computer Memory Requirements: Varies | 19. Tape Drives: None | 20. Disk/Drum Units: Disk | 21. Graphics: None |
| 22. Other Operational Requirements None | | | |
| 23. Software Availability: <input checked="" type="checkbox"/> Available <input type="checkbox"/> Limited <input type="checkbox"/> In-House ONLY | | 24. Documentation Availability: <input checked="" type="checkbox"/> Available <input type="checkbox"/> Inadequate <input type="checkbox"/> In-House ONLY | |
| Software Custodian: <u><i>Sitakanta Mohanty</i></u> | | Date: <u>6/17/97</u> | |



CENTER FOR NUCLEAR WASTE REGULATORY ANALYSES QUALITY ASSURANCE SURVEILLANCE REPORT

PROJECT NO.: 20.01402.159

REPORT NO.: 2000-13

PAGE 1 OF 2

SURVEILLANCE SCOPE: Review of CNWRA Developed Scientific and Engineering Software to determine whether the documentation present in the CNWRA Software Working Records Folders is adequate.

REFERENCE DOCUMENTS: Technical Operating Procedure-018, Development and Control of Scientific and Engineering (S&E) Software; QAP-004, Surveillance Control; Nonconformance Report 2000-03.

STARTING DATE: 3/7/2000

ENDING DATE: 6/9/2000

QA REPRESENTATIVE: B. Mabrito

PERSONS CONDUCTING TEST/EXAM/ACTIVITY: Various CNWRA staff working on Developed S&E software.

SATISFACTORY FINDINGS: During the course of this surveillance, CNWRA Developed S&E software and documentation was checked and contact made with CNWRA staff who worked with the software. In each case, the particular S&E software folder was reviewed for completeness and where no Design Verification Report (DVR) was located, the objective evidence in the folder was compared to the DVR form questions and discussions were held with cognizant CNWRA staff. The list of Developed S&E software reviewed is included in Attachment A.

In each case, key elements of the DVR were compared against that which was included in each software folder in the QA working records. Also, the previous version of the software code documentation was checked to ensure that the earlier DVR had been properly completed. The later version of the software documentation showed the specific changes made through the Software Change Reports. Based on this review, it is clear that although in a few cases no DVR was accomplished, product quality did not suffer. The minor enhancements and "bug" fixes made to TPA Version 3.2.3 and 3DStress Version 1.3.1 and 1.3.2 software were clearly identified and controlled so that the CNWRA product being delivered met the client's requirements.

UNSATISFACTORY FINDINGS: None.

NONCONFORMANCE REPORT NO.: None.

ATTACHMENTS: Attachment A.

RECOMMENDATIONS/ACTIONS: N/A.

APPROVED: 
CENTER DIRECTOR OF QUALITY ASSURANCE

DATE:

6/12/2000

DISTRIBUTION:

ORIGINAL - CENTER QA DIRECTOR QA Records
ORIGINATOR
PRINCIPAL INVESTIGATORS OF EACH CODE
ELEMENT MANAGERS
B. Sagar, H. Garcia

| <u>NAME OF S&E SOFTWARE</u> | <u>DESIGN VERIFICATION REPORT</u> | | <u>NOTES</u> |
|---------------------------------|-----------------------------------|-----------------|--|
| 3DStress Version 1.2 | Present | Dated 5/8/97 | |
| 3DStress Version 1.3 | Present | Dated 8/7/98 | |
| 3DStress Version 1.3.1 | Not Present | | Software Release Notice Dated 7/15/99 |
| 3DStress Version 1.3.2 | Not Present | | Software Release Notice Dated 9/16/99 |
| ASHPLUME Version 1.0 | Present | Dated 6/23/97 | |
| BREATH Version 1.1 | Not Present | | Software Release Notice Dated 9/21/95 |
| BREATH Version 1.2 | Present | Dated 9/17/97 | |
| EBSPAC Version 1.0 | Present | Dated 5/15/97 | |
| EBSPAC Version 1.1 | Present | Dated 6/17/97 | |
| FAULTING Version 1.0 | Not Present | | Software Release Notice Dated 1/21/98 Module put under TPA Code and controlled in that manner. |
| GEOINVRT Version 1.0 | Software Code Not Finished | | Software Requirements Description only. |
| HAZINFO Version 1.0 | Software Code Not Finished | | Software Requirements Description only. |
| MULTIFLO Version 1.2 | Present | Dated 3/2/2000 | |
| MULTIFLO Version 2.0 | Software Code Not Finished | | Software Requirements Description only. |
| PVHA Version 1.0 | Present | Dated 2/15/2000 | |
| SUFLAT Version 1.0 | Not Present | | Element Manager (EM) determined that this software has not been used for regulatory reviews and will not be used for such work. EM requested the folder be archived in QA Records to reflect previous efforts on code. |
| TECTRAN Version 1.0 | Software Code Not Finished | | Software Requirements Description only. |
| TPA Version 3.2 | Present | Dated 7/17/98 | |
| TPA Version 3.2 (PP) Beta | Present | Dated 11/25/98 | |
| TPA Version 3.2.3 | Not Present | | Software Release Notice Dated 7/14/99 |
| TPA Version 3.3 | Present | Dated 11/24/99 | |
| TPA Version 4.0 | Present | Dated 3/31/2000 | |

DESIGN VERIFICATION REPORT FOR CNWRA SOFTWARE: EBSPAC V. 1.1

June 17, 1997

EBSPAC VERSION 1.1

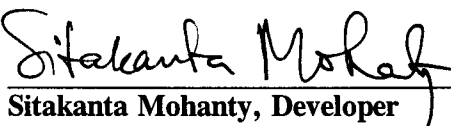
1. Scientific Notebook Documentation Development: The CNWRA Electronic Scientific Notebook No. 170 assigned to S. Mohanty was verified; a hard copy of the electronic scientific notebook is maintained in the QA Records Room; the Electronic Scientific Notebook referenced documents the EBSPAC Version 1.1 software development. Installation test documentation is also found in Scientific Notebook No. 135 which is being kept by N. Sridhar.
2. Programming Language: ANSI Standard FORTRAN 77 confirmed by the Software Custodian.
3. Internal Documentation: On 6/16/97, B. Mabrito reviewed portions of the EBSPAC Version 1.1 software on one of the CNWRA platforms. EBSPAC_fail and other files were reviewed. There were clear and numerous internal documentation comments meeting the requirements of TOP-018 Section 5.4.4. Some print outs of screens were made and are made part of the EBSPAC Version 1.1 folder documentation.
4. Software Labels and Data
 - a. Header Data and Format: EBSPAC Version 1.1 header data and the format were compared against TOP-018 (Revision 5 dated 4/3/97) Section 5.4.6 and found acceptable. Print out sheets of the header data and format are in the EBSPAC Version 1.1 scientific and engineering software folder in the QA Records Room.
 - b. NRC Data: EBSPAC Version 1.1 header NRC data and the format were compared against TOP-018, Section 5.4.6, third bullet and found acceptable.
 - c. Source Code Header: EBSPAC Version 1.1 header data was compared to TOP-018 Section 5.4.6, fourth bullet, and found acceptable. This area was found to be improved over earlier design verification activities.
5. Unique Run Identification: At the top of output files a unique identifier is created on the print out. For instance, a page of the "Calculation of Waste Package Failure Time" file printed and kept in the EBSPAC Version 1.1 QA Records Folder showed the following: "EBSPAC version 1.1" and "Mon Jun 16 19:39:23 1997". This file was created on that date/time and it fully meets the unique run identification requirements of TOP-018, Section 5.4.5.

6. Software Analysis and Results

a. Analysis: The FOR_STUDY software analysis tool was utilized on EBSPAC Version 1.1 throughout its development. During the development of EBSPAC Version 1.1 files of SPAG.fig were not used. The FOR_STUDY software analysis tool was determined to be adequate to help debug EBSPAC Version 1.1.

b. Analysis Report: Since the software analysis of EBSPAC Version 1.1 was conducted incrementally during development, error and warning messages were utilized to search out problem areas and eliminate them immediately. Therefore, there is a minimum of objective evidence available. Several selected pages have been printed out and are in the EBSPAC Version 1.1 scientific and engineering software QA Folder as objective evidence.

c. Resolution of Comments: The developer(s) reviewed all of the warning and error messages provided by FOR_STUDY and addressed the most critical problem statements. According to developer S. Mohanty, all error statements were eliminated through software fixes and all but two warning messages (one in ebspac_fail.f and one in ebspac_release.f) were eliminated. These two warnings were on "fdate," a Unix system intrinsic function.

 6/17/97

Sitakanta Mohanty, Developer Date

 6/17/97

Bruce Mabrito, Software Custodian Date

original to: Software Folder
cc: CNWRA Software Developer

Mr. Mabrito;

19 June 1997

6/22

Herewith notification that a S&E Software code has been placed under Version Control in accordance with TOP-018, para.5.7.

Details

Program Name: EBSPAC V 1.1
Category: CNWRA developed
Developer: S. Mohanty
Date Entered: 17 June 97
Control Method: SCCS
Location: mammoth:/lan/rcs/ebspac1.1

Chris Wilkinson
Pico Consulting
ext-5238

| | | | | | | |
|------------|---|------|--------|---------|--------------|--------------------|
| drwxr-xr-x | 2 | root | daemon | 512 | Jun 20 11:32 | SCCS |
| -r--r--r-- | 1 | root | daemon | 6392 | Jun 19 14:07 | ebsflo.dat |
| -r--r--r-- | 1 | root | daemon | 1842 | Jun 19 14:29 | ebspac.nuc |
| -r--r--r-- | 1 | root | daemon | 68095 | Jun 19 14:29 | ebspac_fail.f |
| -r--r--r-- | 1 | root | daemon | 4407 | Jun 19 14:30 | ebspac_fail.inp |
| -r--r--r-- | 1 | root | daemon | 127470 | Jun 19 14:31 | ebspac_release.f |
| -r--r--r-- | 1 | root | daemon | 3156 | Jun 19 14:31 | ebspac_release.inp |
| -r--r--r-- | 1 | root | daemon | 127 | Jun 19 14:31 | ebspacrun |
| -r--r--r-- | 1 | root | daemon | 1274984 | Jun 19 14:31 | multiflo.dat |
| -r--r--r-- | 1 | root | daemon | 754061 | Jun 19 14:32 | thermal.dat |

SCCS History Files

8/22

| | | | | |
|------------|--------|--------|----------------------|----------------------|
| -r--r--r-- | 1 root | daemon | 6690 Jun 19 14:07 | s.ebsflo.dat |
| -r--r--r-- | 1 root | daemon | 1990 Jun 19 14:29 | s.ebspac.nuc |
| -r--r--r-- | 1 root | daemon | 68243 Jun 19 14:29 | s.ebspac_fail.f |
| -r--r--r-- | 1 root | daemon | 4555 Jun 19 14:30 | s.ebspac_fail.inp |
| -r--r--r-- | 1 root | daemon | 127618 Jun 19 14:31 | s.ebspac_release.f |
| -r--r--r-- | 1 root | daemon | 3304 Jun 19 14:31 | s.ebspac_release.inp |
| -r--r--r-- | 1 root | daemon | 275 Jun 19 14:31 | s.ebspacrun |
| -r--r--r-- | 1 root | daemon | 1275132 Jun 19 14:31 | s.multiflo.dat |
| -r--r--r-- | 1 root | daemon | 754209 Jun 19 14:31 | s.thermal.dat |

9/22

c code: EBSPAC (engineering barrier system performance assessment code)

c
c part: ebspac_fail.f. this is one of the two parts of ebspac

c version: 1.1

c date: June 17, 1997
c January 6, 1997 (Version 1.0)

c purpose: the ebspac computer program has been developed jointly by the
c center for nuclear waste regulatory analyses (cnwra) and the
c u. s. nuclear regulatory commission (nrc) for use in the
c review of doe's licence application for the hlw geologic
c repository by the office of nmss, dwn.

c
c ebspac_fail.f part of ebspac calculates waste package failure
c time & ebspac_release.f part of ebspac calculates the rate of
c release of nuclides from the repository in the near field.

c
c the repository is assumed to be made up of cells and ebspac
c provides results for one cell. input to ebspac is read from
c files which may either be created manually by the user or
c generated by use of codes other than ebspac.

c
C Developers: ebspac_fail.f was developed by Sitakanta Mohanty & G. Cragolino,
c at the CNWRA with assistance from Tae Ahn (NRC, 301-415-5812),
c P. Lichtner, N. Sridhar, and R. Janetzke (CNWRA)

C User: Developed for use in NRC Iterative Performance Assessment
c III. This computer code is managed under CNWRA's CODE
c CONFIGURATION PROCEDURE. Any modifications to the source
c code must be reported to code custodian (see below).
c OTHER versions of this code will be released in the future.
c

c disclaimer: This computer software/material was prepared as an output
 c of work performed by the Center for Nuclear Waste
 c Regulatory Analyses (CNWRA) for the Division of Waste
 c Management of the Nuclear Regulatory Commission (NRC),
 c an independent agency of the United States Government.
 c The developer(s) of the code nor any of their sponsors
 c make any warranty, expressed or implied, or assume any
 c legal liability or responsibility for the accuracy,
 c completeness, or usefulness of any information, apparatus,
 c product or process disclosed, or represent that its use
 c would not infringe on privately-owned rights.

c In no event unless required by applicable law will the
 c sponsors or those who have written or modified this
 c code, be liable for damages, including any lost
 c profits, lost monies, or other special, incidental or
 c consequential damages arising out of the use or inability
 c to use (including but not limited to loss of data or
 c data being rendered inaccurate or losses sustained by
 c third parties or a failure of the program to operate
 c with other programs) the program, even if you have been
 c advised of the possibility of such damages or for any
 c claim by any other party.

c contact: sitakanta mohanty (210)522-5185
 c center for nuclear waste regulatory analyses
 c southwest research institute, san antonio, tx 78250

c-----

calculation of waste package failure time

11/22

```
=====
                    end of simulation time [yr]:      10000.
                    no. of rows of data to pass to release.f:      196
                    -----
```

| ilayer | tstop [yr] | tcan [c] | ecrit [vshe] | ecorr [vshe] | chloride flag | rthick [m] | mode |
|--------|---------------|-------------|-----------------|-----------------|------------------|---------------|---------|
| 1 | 50.42 | 161.90 | 0.0000 | 0.0000 | 0 | 1.1999722E-01 | dry oxd |
| 1 | 100.50 | 155.60 | 0.0000 | 0.0000 | 0 | 1.1999451E-01 | dry oxd |
| 1 | 152.40 | 150.70 | 0.0000 | 0.0000 | 0 | 1.1999183E-01 | dry oxd |
| 1 | 206.00 | 147.40 | 0.0000 | 0.0000 | 0 | 1.1998915E-01 | dry oxd |
| 1 | 259.40 | 145.80 | 0.0000 | 0.0000 | 0 | 1.1998648E-01 | dry oxd |
| 1 | 312.80 | 144.70 | 0.0000 | 0.0000 | 0 | 1.1998382E-01 | dry oxd |
| 1 | 366.20 | 143.90 | 0.0000 | 0.0000 | 0 | 1.1998115E-01 | dry oxd |
| 1 | 419.70 | 143.00 | 0.0000 | 0.0000 | 0 | 1.1997849E-01 | dry oxd |
| 1 | 473.10 | 142.30 | 0.0000 | 0.0000 | 0 | 1.1997583E-01 | dry oxd |
| 1 | 533.80 | 141.00 | 0.0000 | 0.0000 | 0 | 1.1997317E-01 | dry oxd |
| 1 | 585.70 | 139.90 | 0.0000 | 0.0000 | 0 | 1.1997051E-01 | dry oxd |
| 1 | 637.50 | 138.80 | 0.0000 | 0.0000 | 0 | 1.1996786E-01 | dry oxd |
| 1 | 689.30 | 137.70 | 0.0000 | 0.0000 | 0 | 1.1996520E-01 | dry oxd |
| 1 | 741.10 | 136.60 | 0.0000 | 0.0000 | 0 | 1.1996255E-01 | dry oxd |
| 1 | 793.00 | 135.60 | 0.0000 | 0.0000 | 0 | 1.1995990E-01 | dry oxd |
| 1 | 844.80 | 134.60 | 0.0000 | 0.0000 | 0 | 1.1995725E-01 | dry oxd |
| 1 | 896.60 | 133.70 | 0.0000 | 0.0000 | 0 | 1.1995459E-01 | dry oxd |
| 1 | 948.40 | 132.70 | 0.0000 | 0.0000 | 0 | 1.1995194E-01 | dry oxd |
| 1 | 1000.00 | 131.80 | 0.0000 | 0.0000 | 0 | 1.1994929E-01 | dry oxd |
| 1 | 1065.00 | 130.50 | 0.0000 | 0.0000 | 0 | 1.1994664E-01 | dry oxd |
| 1 | 1129.00 | 129.30 | 0.0000 | 0.0000 | 0 | 1.1994399E-01 | dry oxd |
| 1 | 1194.00 | 128.00 | 0.0000 | 0.0000 | 0 | 1.1994134E-01 | dry oxd |
| 1 | 1258.00 | 126.80 | 0.0000 | 0.0000 | 0 | 1.1993870E-01 | dry oxd |
| 1 | 1323.00 | 125.60 | 0.0000 | 0.0000 | 0 | 1.1993605E-01 | dry oxd |
| 1 | 1388.00 | 124.40 | 0.0000 | 0.0000 | 0 | 1.1993340E-01 | dry oxd |
| 1 | 1452.00 | 123.30 | 0.0000 | 0.0000 | 0 | 1.1993075E-01 | dry oxd |
| 1 | 1517.00 | 122.10 | 0.0000 | 0.0000 | 0 | 1.1992811E-01 | dry oxd |
| 1 | 1581.00 | 121.00 | 0.0000 | 0.0000 | 0 | 1.1992546E-01 | dry oxd |
| 1 | 1646.00 | 119.90 | 0.0000 | 0.0000 | 0 | 1.1992281E-01 | dry oxd |
| 1 | 1710.00 | 118.80 | 0.0000 | 0.0000 | 0 | 1.1992016E-01 | dry oxd |
| 1 | 1775.00 | 117.70 | 0.0000 | 0.0000 | 0 | 1.1991752E-01 | dry oxd |
| 1 | 1839.00 | 116.70 | 0.0000 | 0.0000 | 0 | 1.1991487E-01 | dry oxd |
| 1 | 1904.00 | 115.60 | 0.0000 | 0.0000 | 0 | 1.1991223E-01 | dry oxd |
| 1 | 1986.00 | 114.40 | 0.0000 | 0.0000 | 0 | 1.1990958E-01 | dry oxd |
| 1 | 2036.00 | 113.60 | 0.0000 | 0.0000 | 0 | 1.1990693E-01 | dry oxd |
| 1 | 2086.00 | 112.90 | 0.0000 | 0.0000 | 0 | 1.1990429E-01 | dry oxd |
| 1 | 2136.00 | 112.30 | 0.0000 | 0.0000 | 0 | 1.1990164E-01 | dry oxd |
| 1 | 2186.00 | 111.60 | 0.0000 | 0.0000 | 0 | 1.1989899E-01 | dry oxd |
| 1 | 2236.00 | 111.00 | 0.0000 | 0.0000 | 0 | 1.1989635E-01 | dry oxd |
| 1 | 2286.00 | 110.30 | 0.0000 | 0.0000 | 0 | 1.1989370E-01 | dry oxd |
| 1 | 2336.00 | 109.70 | 0.0000 | 0.0000 | 0 | 1.1989106E-01 | dry oxd |

from mech. module: sfactor, yieldstr= 1.400000000000 205.0000000000

from mech. module: dkic= 250.0000000000

| | | | | | | | |
|---|---------|--------|---------|--------|---|---------------|-------|
| 1 | 2386.00 | 109.10 | -0.5694 | 0.1950 | 1 | 6.8730647E-02 | local |
|---|---------|--------|---------|--------|---|---------------|-------|

from mech. module: sfactor, yieldstr= 1.400000000000 205.0000000000

from mech. module: dkic= 250.0000000000

| | | | | | | | |
|---|---------|--------|---------|--------|---|---------------|-------|
| 1 | 2436.00 | 108.50 | -0.5695 | 0.1945 | 1 | 5.0298189E-02 | local |
|---|---------|--------|---------|--------|---|---------------|-------|

12/22

```
from mech. module: sfactor, yieldstr= 000000000000 205.0000000000
from mech. module: dkic= 250.0000000000
1 2486.00 107.90 -0.5695 0.1940 1 3.6529053E-02 local
from mech. module: sfactor, yieldstr= 1.400000000000 205.0000000000
from mech. module: dkic= 250.0000000000
1 2536.00 107.30 -0.5695 0.1935 1 2.5118710E-02 local
from mech. module: sfactor, yieldstr= 1.400000000000 205.0000000000
from mech. module: dkic= 250.0000000000
2 2586.00 106.80 0.0631 0.1235 1 1.4881173E-02 local
from mech. module: sfactor, yieldstr= 1.400000000000 205.0000000000
from mech. module: dkic= 250.0000000000
2 2636.00 106.20 0.0653 0.1230 1 4.6311727E-03 local
2 2686.00 105.70 0.0671 0.1227 1 -5.6188273E-03 local
```

```
=====  
wp wetting time [yr]: 2336.  
wp failure time [yr]: 2636.  
penetration by dry oxidation [m]: 1.089E-04  
echoed input data in: echo_fail.dat  
output data are in files: temphumd.dat and corrode.out  
=====
```

13/22

pcl5

JOB 600

echo1

For: bigbend!mohanty
Date: Mon Jun 16 19:40:24 CDT 1997
Submit queue: IF 1 / Ethernet / UHSW
Submitted: Wed Apr 23 11:38:58 1992
Started: Wed Apr 23 11:38:58 1992



QMS 3825 Print System

QMS 3825 Print System

```

subroutine tempstry( iflag, iflagtpa, nset, timr, tcan, tavg,
&      humid, tend, nhist, nhist3, timintv)
  implicit none
c*** start of declarations inserted by spag
  real*8 ambient, col, dcan, dt, eps1, humid, tavg, tcan, tend,
&      timintv, timr
  integer i, iflag, ii, iset, nhist, nhist3, nintv, nset
  integer iflagtpa
c*** end of declarations inserted by spag
c-----
c      purpose: read temperature, relative humidity from a table to be
c      provided by the tpa code. also, doe data can be read if
c      proper data file is provided
c-----
c      parameter (nintv=2000)
c      dimension timr(nintv), tcan(nintv), tavg(nintv), humid(nintv)
c      local arrays:
c      dimension col(4, 12)
c-----
c      nomenclature:
c
c      maxrow: maximum number of rows provided in the temperature data file
c      timr:   time at which temperature and relative humidity
c             data are provided [y]
c      tcan:   surface temperature of the wp outer overpack [c]
c      tavg:   temperature of the drift wall surrounding the wp [c]
c      humid:  relative humidity near the wp surface [dimensionless]
c      nset:   corresponds only to iflag = 2; it is the data set
c             that corresponds to a particular set of
c             temperature, humidity data
c
c      iflag   :1      use functional temp, humidity representation
c              of doe data
c              :2      read from a file temp, humidity
c-----
c      note:   the reason we have this doe model is that the temperature

```

15/22

ebspac (engineering barrier system performance assessment code)

EBSPAC version 1.1

this part of EBSPAC computes wp failure time

Wed Jun 18 20:25:09 1997

calculation of waste package failure time

```

=====
                end of simulation time [yr]:      10000.
                no. of rows of data to pass to release.f:      196
-----
ilayer  tstop      tcan      ecrit      ecorr  chloride  rthick      mode
      [yr]      [c]      [vshe]      [vshe]  flag      [m]
=====
1      50.42      161.90      0.0000      0.0000      0  1.1999722E-01  dry oxd
1      100.50      155.60      0.0000      0.0000      0  1.1999451E-01  dry oxd
1      152.40      150.70      0.0000      0.0000      0  1.1999183E-01  dry oxd
1      206.00      147.40      0.0000      0.0000      0  1.1998915E-01  dry oxd
1      259.40      145.80      0.0000      0.0000      0  1.1998648E-01  dry oxd
1      312.80      144.70      0.0000      0.0000      0  1.1998382E-01  dry oxd
1      366.20      143.90      0.0000      0.0000      0  1.1998115E-01  dry oxd
1      419.70      143.00      0.0000      0.0000      0  1.1997849E-01  dry oxd
1      473.10      142.30      0.0000      0.0000      0  1.1997583E-01  dry oxd
1      533.80      141.00      0.0000      0.0000      0  1.1997317E-01  dry oxd
1      585.70      139.90      0.0000      0.0000      0  1.1997051E-01  dry oxd
1      637.50      138.80      0.0000      0.0000      0  1.1996786E-01  dry oxd
1      689.30      137.70      0.0000      0.0000      0  1.1996520E-01  dry oxd
1      741.10      136.60      0.0000      0.0000      0  1.1996255E-01  dry oxd
1      793.00      135.60      0.0000      0.0000      0  1.1995990E-01  dry oxd
1      844.80      134.60      0.0000      0.0000      0  1.1995725E-01  dry oxd
1      896.60      133.70      0.0000      0.0000      0  1.1995459E-01  dry oxd
1      948.40      132.70      0.0000      0.0000      0  1.1995194E-01  dry oxd
1     1000.00      131.80      0.0000      0.0000      0  1.1994929E-01  dry oxd
1     1065.00      130.50      0.0000      0.0000      0  1.1994664E-01  dry oxd
1     1129.00      129.30      0.0000      0.0000      0  1.1994399E-01  dry oxd
1     1194.00      128.00      0.0000      0.0000      0  1.1994134E-01  dry oxd
1     1258.00      126.80      0.0000      0.0000      0  1.1993870E-01  dry oxd
1     1323.00      125.60      0.0000      0.0000      0  1.1993605E-01  dry oxd
1     1388.00      124.40      0.0000      0.0000      0  1.1993340E-01  dry oxd
1     1452.00      123.30      0.0000      0.0000      0  1.1993075E-01  dry oxd
1     1517.00      122.10      0.0000      0.0000      0  1.1992811E-01  dry oxd
1     1581.00      121.00      0.0000      0.0000      0  1.1992546E-01  dry oxd
1     1646.00      119.90      0.0000      0.0000      0  1.1992281E-01  dry oxd
1     1710.00      118.80      0.0000      0.0000      0  1.1992016E-01  dry oxd
1     1775.00      117.70      0.0000      0.0000      0  1.1991752E-01  dry oxd
1     1839.00      116.70      0.0000      0.0000      0  1.1991487E-01  dry oxd
1     1904.00      115.60      0.0000      0.0000      0  1.1991223E-01  dry oxd
1     1986.00      114.40      0.0000      0.0000      0  1.1990958E-01  dry oxd
1     2036.00      113.60      0.0000      0.0000      0  1.1990693E-01  dry oxd
1     2086.00      112.90      0.0000      0.0000      0  1.1990429E-01  dry oxd
1     2136.00      112.30      0.0000      0.0000      0  1.1990164E-01  dry oxd
1     2186.00      111.60      0.0000      0.0000      0  1.1989899E-01  dry oxd
1     2236.00      111.00      0.0000      0.0000      0  1.1989635E-01  dry oxd
1     2286.00      110.30      0.0000      0.0000      0  1.1989370E-01  dry oxd
1     2336.00      109.70      0.0000      0.0000      0  1.1989106E-01  dry oxd
1     2386.00      109.10     -0.5694      0.1950      1  6.8730647E-02  local
1     2436.00      108.50     -0.5695      0.1945      1  5.0298189E-02  local
1     2486.00      107.90     -0.5695      0.1940      1  3.6529053E-02  local
1     2536.00      107.30     -0.5695      0.1935      1  2.5118710E-02  local
2     2586.00      106.80      0.0631      0.1235      1  1.4881173E-02  local
2     2636.00      106.20      0.0653      0.1230      1  4.6311727E-03  local
2     2686.00      105.70      0.0671      0.1227      1 -5.6188273E-03  local

```


16/22

```
=====  
wp wetting time [yr]:      2336.  
wp failure time [yr]:     2636.  
penetration by dry oxidation [m]: 1.089E-04  
echoed input data in:    echo_fail.dat  
output data are in files: temphumd.dat and corrode.out  
=====
```

17/22

ebspac1.1 17 June 97

UNIX IDS

6392 Jun 17 17:29 ebsflo.dat
 1842 Jun 17 17:29 ebspac.nuc
 68095 Jun 17 16:51 ebspac_fail.f
 4407 Jun 16 13:49 ebspac_fail.inp
 127470 Jun 17 17:09 ebspac_release.f
 3156 Jun 16 13:49 ebspac_release.inp
 127 Jun 17 17:30 ebspacrun
 1274984 Jun 17 17:30 multiflo.dat
 754061 Jun 17 17:30 thermal.dat

Name of files as copied to 2 3 1/2 disks

DISKETTE IDS

| | | | | |
|----------|-----|---------|---------|-------|
| THERMAL | DAT | 754061 | 6-18-97 | 4:22p |
| EBSPAC | NUC | 1842 | 6-18-97 | 4:23p |
| EBSPAC_F | F | 68095 | 6-18-97 | 4:23p |
| EBSPAC_F | INP | 4407 | 6-18-97 | 4:23p |
| EBSPAC_R | F | 127470 | 6-18-97 | 4:24p |
| EBSPAC_R | INP | 3156 | 6-18-97 | 4:24p |
| EBSPACRU | | 127 | 6-18-97 | 4:25p |
| EBSFLO | DAT | 6392 | 6-18-97 | 4:19p |
| MULTIFLO | DAT | 1274984 | 6-18-97 | 4:19p |

*provided by
C. Wilkerson 6/18/97*

18/22

Tape sent to the NRC

GARANTEE A VIE SONY

Si ce produit devait présenter un défaut de fabrication ou de matériau, il sera, au choix de Sony, remplacé ou remboursé par le revendeur ou par Sony.

DAN CE CAS, SONY PROCÉDERA UNIQUEMENT A UN ECHANGE OU UN REMBOURSEMENT MAIS SA RESPONSABILITE NE POURRA ETRE ENGAGEE A QUEL TITRE QUE CE SOIT POUR D'EVENUELS DOMMAGES OU AUTRES PERTES LIES ACCIDENTELLEMENT OU PART OF THE MANUFACTURER, DISTRIBUTOR OR SELLER FOR ANY LOSS OR DAMAGE, DIRECT OR CONSEQUENTIAL, ARISING OUT OF THE USE OF OR INABILITY TO USE, THIS PRODUCT THIS WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

This warranty does not cover any damage or defect due to accident, misuse, abuse or neglect.

In the United States, contact: Customer Relations Dept., Sony Electronics Inc., Sony Building, 680 Kinderkamack Road, Oradell, New Jersey 07649.

In Canada, contact: Sony of Canada, Ltd., 411 Gordon Baker Rd., Willowdale, Ontario M2H 2S6.

Baker Rd., Willowdale, Ontario M2H 2S6.

Au Canada, veuillez contacter: Sony du Canada, Ltée, 411 Gordon

Cette garantie ne couvre pas les dommages et défauts dus à un accident, un mauvais usage, un emploi abusif ou une négligence.

PARTEICULIERS.

OU L'UTILE LOYALE ET MARCHANDE ET D'APPLIQUER A DES USAGES INCLUANT MAIS NE SE LIMITANT PAS AUX GARRANTIES DE TOUTE AUTRE, OU ELLE SONT EXPLICITES OU IMPLIQUES, CE CI DE CE PRODUIT, CETTE GARRANTIE S'EXERCE A LA PLACE DE DIRECTEMENT A UN USAGE OU UNE MAUVAISE MANTENATION OU DOMMAGES OU AUTRES PERTES LIES ACCIDENTELLEMENT OU PART OF THE MANUFACTURER, DISTRIBUTOR OR SELLER FOR ANY LOSS OR DAMAGE, DIRECT OR CONSEQUENTIAL, ARISING OUT OF THE USE OF OR INABILITY TO USE, THIS PRODUCT THIS WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

This warranty does not cover any damage or defect due to accident, misuse, abuse or neglect.

In the United States, contact: Customer Relations Dept., Sony Electronics Inc., Sony Building, 680 Kinderkamack Road, Oradell, New Jersey 07649.

In Canada, contact: Sony of Canada, Ltd., 411 Gordon Baker Rd., Willowdale, Ontario M2H 2S6.



DATE June 17, 1997

SONY

| | |
|------------------------------------|---------------------------|
| EBSPAC VERSION 1.1 | EBSPAC FAIL. INP |
| Module Names: EBSPAC_FAIL.F | EBSPAC_FAIL.INP |
| EBSPAC_RELEASE.F | EBSPAC_RELEASE.INP |
| Module Revision: 1.1 | EBSPAC.NUC |
| File Type: FORTRAN 77 | ERSFLO.DAT |
| Recording Date: 6-17-97 | THERMAL.DAT |
| Operating System: UNIX | MULTIFLO.DAT |
| | EBSPACRUN |

The files were copied to this tape using the command

Line: tar -xvf /dev/rmt/0 ebspac1.1

1st diskette = MULTIFLO.DAT (input files)
ERSFLO.DAT (input files)

2nd diskette = THERMAL.DAT EBSPAC.Release.
EBSPAC.NUC SUP
EBSPAC.F F EBSPACRU
EBSPAC.F INP
EBSPAC.Release.F

19/22

pcl5

JOB 79

ebspac_fail.rpt

For: cscherer
Date: Tue Jun 17 16:21:57 CDT 1997
Submit queue: IF 1 / Ethernet / UHSW
Submitted: Thu Apr 24 08:18:33 1992
Started: Thu Apr 24 08:18:33 1992



QMS 3825 Print System

QMS 3825 Print System

This is

objection evidence
That the use of the
for-study analysis pool
was effective.
It shows elimination
of the majority
of error and
warning messages.

[Signature]
6/17/97

pcl5

JOB 114

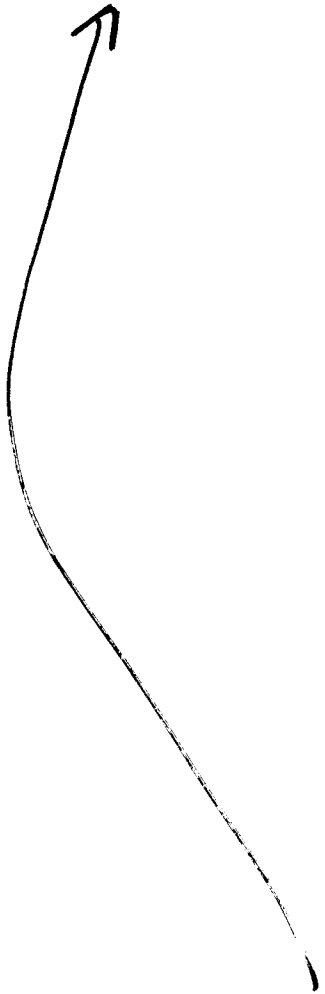
ebspac_release.rpt

For: cscherer
Date: Wed Jun 18 09:08:27 CDT 1997
Submit queue: IF 1 / Ethernet / UHSW
Submitted: Fri Apr 25 01:05:09 1992
Started: Fri Apr 25 01:05:09 1992



QMS 3825 Print System

QMS 3825 Print System



This is objective evidence
 that the use of the Fed. Study
 software analysis tool was
 effective. It shows elimination
 of the majority
 of error and
 warning messages.
 Anne Malachuk
 6/18/97