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Rev.0

VERIFICATION AND VALIDATION OF RADMODL VERSION 1.0 (U)

K. D. Kimball

Westinghouse Savannah River Company
Savannah River Technology Center
Aiken, SC 29603

SAVANNAH RIVER SITE

PREPARED FOR THE U.S. DEPARTMENT OF ENERGY UNDER CONTRACT NO. DE-AC09-89SR18035

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VERIFICATION AND VALIDATION OF
RADMODL VERSION 1.0 (U)

K. D. Kimball
MARCH 1993

Authorized Derivative Classifier
and Reviewing Official

W. J. Murphy
S. L. Murphy

4/7/93
Date

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4/7/93
Date

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APPROVALS

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MARCH 16, 1993
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EXECUTIVE SUMMARY

RADMODL is a system of linked computer codes designed to calculate the radiation environment following an accident in which nuclear materials are released. The RADMODL code and the corresponding Verification and Validation (V&V) calculations (Appendix A), were developed for Westinghouse Savannah River Company (WSRC) by EGS Corporation (EGS).

Each module of RADMODL is an independent code and was verified separately. The full system was validated by comparing the output of the various modules with the corresponding output of a previously verified version of the modules. The results of the verification and validation tests show that RADMODL correctly calculates the transport of radionuclides and radiation doses.

As a result of this verification and validation effort, RADMODL Version 1.0 is certified for use in calculating the radiation environment following an accident.

1.0 INTRODUCTION

The Long Term Environmental Qualification Program (LTEQP) was initiated to develop an Environmental Qualification (EQ) program that:

- demonstrates that applicable equipment is qualified to perform its required safety function during and/or after exposure to postulated harsh environment conditions; and
- ensures that new and replacement components are qualified to the appropriate requirements such that qualification is maintained.

Accurate prediction of the radiation environment is one of the essential tasks in determining the harsh environments and, subsequently, the resulting environmental qualification of equipment. A PC-based computer code, RADMODL, will be used to perform the analyses that determine the radiation environment in the Savannah River K-Reactor. The analyses to be performed with RADMODL are critical applications. Thus, RADMODL is required to be tested to quality assurance standards applicable to critical applications.

RADMODL is based on standard analysis codes used in the nuclear industry. It has been modified and adapted for WSRC by EGS Corporation. EGS provided RADMODL documentation manuals (User's Manual, Programmer's Manual and Training Manual) along with the V&V calculations. The original Verification and Validation calculations prepared by EGS Corporation are included as Appendix A.

2.0 METHOD OF ANALYSIS

The objective of the verification and validation process is to ensure that the basis of the software is correct and all features operate as designed. This report documents the verification and validation effort for RADMODL. Specifically, the following topics are presented:

- Code Description - A general description of the function and structure of RADMODL is presented to provide the basis for the features of the program tested.
- Test Objectives - The test objectives for RADMODL are detailed. These objectives support the verification and validation process by identifying the critical features of the program.
- General Methodology - The general verification and validation methodology is described in this subsection.

2.1 Code Description

RADMODL is a system of linked computer codes designed to calculate the radiation environment following an accident in which nuclear materials are released. The program consists of five modules: STPISOTP, STP, QADSR, PARABINT, and DOSE. Four of these modules require user input. A brief description of each module follows.

- **STPISOTP** - This module provides information required by the module STP on the radioisotopes to be considered in the analysis.
- **STP** - This module calculates the radioactivity in a given area, and the photon spectrum resulting from that activity.
- **QADSR** - This module calculates the dose rates in the affected areas as a function of time and location, using the photon spectra developed by the module STP.
- **PARABINT** - This module integrates the dose rates obtained with QADSR over time, resulting in the total gamma dose at the location in question. This module does not require any user input.
- **DOSE** - This module allows the user to examine the results of variations in each input parameters such as reactor power level, failed fuel fraction, or isotopic release splits.

2.2 Test Objectives

The overall objective of the verification and validation process is to ensure that the basis of the software is correct, and all features operate as designed. Some aspects of the program are informational only, and are there for the convenience of the user. However, the outputs used in critical applications are the transport data of materials, the radioactive dose rates, and the integrated doses over time. Therefore, the specific objectives of this verification and validation effort are to ensure that RADMODL reasonably calculates the radiation environment in each compartment as a function of time.

2.3 General Methodology

The verification and validation process was performed by verifying the individual modules separately. This is an acceptable approach since each module is an independent program. The verification approach allows the user to run the modules independently if so desired. RADMODL was verified by comparing the output of the various modules to the output of previously verified versions using the same test case.

2.4 Tests Performed

The EGS Verification and Validation calculations (Appendix A) contain the tests performed for the verification of RADMODL.

3.0 RESULTS AND CONCLUSIONS

The results of the analyses demonstrate that RADMODL is verified for use in calculating the radiation environment as a result of a release of radioactive materials. The specific results are documented in the EGS Verification and Validation calculations contained in Appendix A.

4.0 REFERENCES

1. "Verification and Validation of RADMODL Code Version 1.0," EGS Report #910600-08, Revision 0, November 1992, (Calculations contained in Appendix A).

Appendix A - EGS Verification and Validation Calculations of RADMODL Code, Revision 1.0

This appendix contains the original EGS calculations for the verification and validation of RADMODL Version 1.0. The following sections are included:

- Annex A - Verification of STPISOTP
- Annex B - Verification of STP
- Annex C - Verification of QADSR
- Annex D - Verification of PARABINT
- Annex E - Verification of DOSE
- Annex F - Verification of Post Processor

EGS Corporation

Title Verification and Validation of Page ~ of ~

RADMODL Code Ver. 1.0 EGS-TR-910600-08 Project WSRC

Calculated by H.P.

Date 12 Nov 92

Checked by

H.P.
Durr

Date 11/13/92

11/13/92

Annex A

Verification of STPISOTP

Verification of Computer Program STPISOTP (PC)
Version 1.1

by

Dave Gore
EGS Corporation
Knoxville, Tennessee

Submitted to
Westinghouse Savannah River Company

October 1992

Contract #AA30194P
EGS Report #910600-17

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PREPARATION	
PROJECT ENGINEER:	<u>Janet Davidson</u> Janet Davidson
TECHNICAL REVIEWS	
PROGRAM MANAGER:	<u>Douglas W. Wilson</u> Douglas W. Wilson
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EGS Form 611-10/89

*Justification for Project Manager performing engineering verification: Due to his technical competence in the subject and theory, Program Manager D. W. Wilson performed the engineering verification for this report. Mr. Wilson did not participate in the program development, technical input, nor selection of sample problems.

Disclaimer

Program Name

STPISOTP Version 1.1

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October 1992

Title Verification of Computer Program

Page IV of V

STPISOTP (PC) Version 1.1 EGS-TR-910600-17

Project WSRC

Calculated by OGJ

Date 10/23/92 Checked by QWJ

Date 10/26/92

ABSTRACT

This report documents the verification of the computer program STPISOTP (PC) Version 1.1. Version 1.0 was initially prepared for generic use. STPISOTP (PC) Version 1.1 was modified specifically for use with the computer system RADMODL and for Westinghouse Savannah River Corporation. STPISOTP (PC) is a computer code that produces part of the input to be used in an STP run.

Title Verification of Computer Program

Page V of V

STPISOTP (PC) Version 1.1 EGS-TR-910600-17

Project WSRC

Calculated by DGJ

Date 10/23/92 Checked by QWJ

Date 10/24/92

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Contents of Appendix A intentionally deleted.

1.0) INTRODUCTION

This report documents the verification of the computer program STPISOTP (PC) Version 1.1. STPISOTP (PC) Version 1.1 is a revised version of STPISOTP (PC) (reference 1), which has been updated for use in the RADMODL system. STPISOTP is the first module of the RADMODL system. This system is designed to calculate the dose at certain areas of the Savannah River K reactor. Version 1.0 uses the unedited DRALIST package (reference 2) from RSIC for its calculations, while version 1.1 uses the updated DRALIST package for its calculations. An explanation of the updated DRALIST package can be found in reference 3. A listing of STPISOTP (PC) Version 1.1 is included in Appendix A.

The Westinghouse Savannah River Company (WSRC) sent EGS a list of isotopes with potential for significant contribution to the radiation dose, which affects the radiation model developed by EGS. In order to develop a model which includes the list of isotopes furnished by WSRC, EGS modified DRALIST by adding data for those isotopes which were in the WSRC list but not in DRALIST. This modification is discussed in reference 3. After adding in the isotopic data, FILE.06 and DRALIST.DAT were renamed FILE06.SRL and DRALIST.SRL, respectively.

STPISOTP (PC) Version 1.1 now reads the two new files, FILE06.SRL and DRALIST.SRL. The arrays for the beta and gamma energies had to be increased, because the added isotopes had a larger number of energies than version 1.0 could handle. STPISOTP (PC) Version 1.1 has also been changed so as to give the user the option of sending the output to a printer or to a file. Furthermore, STPISOTP (PC) Version 1.1 gives a message to check the input when it encounters an isotope which is not in the DRALIST package, and the program will then terminate. Version 1.0 continues running and gives zeros for the output of the unlisted isotope(s), along with a message in the output that the isotope is not in the library.

Title Verification of Computer Program

Page 2 of 5

STPISOTP (PC) Version 1.1 EGS-TR-910600-17

Project WSRC

Calculated by DAG

Date 10/23/92 Checked by DWW

Date 10/26/92

2.0) Verification

To verify STPISOTP (PC) Version 1.1, the test cases which were used to verify version 1.0 were run using version 1.1. The output files for the runs using version 1.1 can be found in Appendix B. The output from these test cases were then compared with the results using version 1.0. All test cases gave the same output, except for test case 2. In this test case, everything remained the same except for the last page of output. In the last page of output, version 1.0 gives zeroes for the output of the unlisted isotope, while version 1.1 terminates before it calculates this page of output, which include the gamma energies and the total electron energy. A further explanation of this page of output can be found in reference 1. Version 1.1 also gives a message on the screen to check the input. A printout of this message is given with the run in Appendix B.

Input Files

The input files for the three test cases are listed below.

Test Case 1

TEST FOR ISOTOPE

KR-85M KR-85 KR-90 XE-131M END BR-85 I-131 END
RB-90M RB-90 SR-90 'Y-90' TE-131M TE-131 END

T

0.03 0.4 0.9 1.35 1.8 2.2 2.6 7.5

T

Test Case 2

TEST FOR ISOTOPE NOT IN FILE

SR-92 SR-93 SR-94

T

0.03 0.4 0.9 1.35 1.8 2.2 2.6 7.5

T

Title Verification of Computer Program

Page 3 of 5

STPISOTP (PC) Version 1.1 EGS-TR-910600-17

Project WSRC

Calculated by DAB

Date 10/23/92 Checked by DAB

Date 10/26/92

Test Case 3

BORDERLINE GAMMA ENERGY TEST

'C-11 '

T

0.03 .511 0.9

T

Title Verification of Computer Program

Page 4 of 5

STPISOTP (PC) Version 1.1 EGS-TR-910600-17

Project WSRC

Calculated by DAG

Date 10/23/92 Checked by

DW

Date 10/26/92

3.0) Conclusion

To qualify STPISOTP (PC) version 1.1, the results from the run using STPISOTP (PC) version 1.1 were compared with the results from the run using version 1.0 (reference 1). This comparison showed that the same results were obtained for test case 1 and 3. Test case 2 was the only one that differed. In this test case, the program terminated, as it should have, before calculating the last page of output, and it also gave the error message to check the input. All of the differences were expected, since the program was altered to perform these changes. Based on this analysis, STPISOTP (PC) version 1.1 may be considered qualified and valid for use in safety related calculations.

Title Verification of Computer Program

Page 5 of 5

STPISOTP (PC) Version 1.1 EGS-TR-910600-17

Project WSRC

Calculated by DAG

Date 10/23/92

Checked by

DAG

Date

10/26/92

4.0) References

1) "Verification of Computer Program STPISOTP Version 1.0". EGS-TR-910600-05 Revision A. Dave Gore. October 22.

2) Kocher, D. "DRALIST. Radioactive Decay Data for Application to Radiation Dosimetry and Radiological Assessments." DLC-80. RSIC. Oak Ridge, TN. June 1988.

3) "DRALIST Modification for Savannah River Radiation Model". EGS-TR-910600-13. Janet Davidson. September 1992.

Title Verification of Computer Program

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STPISOTP (PC) Version 1.1 EGS-TR-910600-17

Project WSRC

Calculated by DGJ

Date 10/23/92

Checked by

DWJ

Date

10/26/92

APPENDIX A

PROGRAM STPISOTP (PC) VERSION 1.1

October 1992

Contents of Appendix A intentionally deleted.

Title Verification of Computer Program

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STPISOTP (PC) Version 1.1 EGS-TR-910600-17

Project WSRC

Calculated by DG

Date 10/23/92 Checked by QW

Date 10/26/92

APPENDIX B

Output Files

October 1992

*** PROGRAM STPISOTP IS AT YOUR SERVICE ***

** VERSION NUMBER=1.1 REVISION DATE WAS 8/31/92

* TODAY'S DATE = 10/23/1992 START TIME = 9:1:14

REPRODUCTION OF INPUT DATA DECK

```

+      +      +      +      +      +      +
TEST FOR ISOTOPE
KR-85M KR-85 KR-90 XE-131M END KR-85 I-131 END
RB-90M RB-90 SR-90 'Y-90 ' TE-131M TE-131 END
T
0.03 0.4 0.9 1.35 1.8 2.2 2.6 7.5
T
+      +      +      +      +      +      +

```

***** PROGRAM STPISOTF (VERSION 1.1) RAN ON 10/23/1992 *****

TEST FOR ISOTOPE

END OF FILE ENCOUNTERED ON PRECURSOR FILE

```

***** PROGRAM STPISOTP (VERSION 1.1 )      RAN ON 10/23/1992 *****
1KR-85M 1 4.2978E-05 54.0234E-03 10.0000E+00 10.0000E+00
2KR-85 1 2.0490E-09 19.0683E-06 56.5688E-06 10.0000E+00
3KR-90 1 2.1446E-02 10.0000E+00 10.0000E+00 10.0000E+00
4XE-131M 1 6.7758E-07 61.0836E-08 10.0000E+00 10.0000E+00
5BR-85 2 4.0299E-03 10.0000E+00 10.0000E+00 10.0000E+00
6I-131 2 9.9783E-07 114.9932E-06 124.6210E-04 10.0000E+00
7EB-90M 3 2.6866E-03 32.5521E-03 10.0000E+00 10.0000E+00
8RB-90 3 4.4149E-03 31.8894E-02 76.1792E-05 10.0000E+00
9SR-90 3 7.6801E-10 72.6248E-03 84.4149E-03 10.0000E+00
10Y-90 3 1.0038E-06 97.6801E-10 10.0000E+00 10.0000E+00
11TE-131M 3 6.4180E-06 10.0000E+00 10.0000E+00 10.0000E+00
12TE-131 3 4.6210E-04 111.4248E-06 10.0000E+00 10.0000E+00

```

*** PROGRAM STPISOTF (VERSION 1.1) RAN ON 10/23/1992 ***

ENERGY NO. PHOTONS
 .40 .90 1.35 1.80 2.20 2.60 7.50
 KR-85M 1.568D-01 1.225D-04 0.000D+00 0.000D+00 0.000D+00 0.000D+00 0.000D+00
 5.813D-01
 KR-85 0.000D+00 2.231D-03 0.000D+00 0.000D+00 0.000D+00 0.000D+00 0.000D+00
 5.140D-01
 KR-90 7.661D-02 2.335D-01 4.617D-01 3.860D-01 4.912D-02 1.901D-02 4.483D-02
 3.855D+00
 KE-131M 6.644D-03 0.000D+00 0.000D+00 0.000D+00 0.000D+00 0.000D+00 0.000D+00
 1.639D-01
 KR-85 0.000D+00 3.338D-02 2.334D-02 6.587D-03 2.748D-03 0.000D+00 0.000D+00
 1.833D+00
 I-131 3.175D-01 6.250D-02 0.000D+00 0.000D+00 0.000D+00 0.000D+00 0.000D+00
 7.229D-01
 RB-90M 3.438D-03 8.551D-01 1.949D-01 4.719D-01 1.855D-01 1.184D-01 1.444D+00
 4.726D+00
 RB-90 0.000D+00 2.773D-01 9.625D-02 1.923D-02 3.660D-02 1.108D-01 1.624D+00
 5.333D+00
 SR-90 0.000D+00 0.000D+00 0.000D+00 0.000D+00 0.000D+00 0.000D+00 0.000D+00
 0.000D+00
 Y-90 0.000D+00 0.000D+00 0.000D+00 0.000D+00 0.000D+00 0.000D+00 0.000D+00
 0.000D+00
 TE-131M 1.119D-01 8.278D-01 3.772D-01 2.192D-02 7.347D-02 8.710D-03 0.000D+00
 2.271D+00
 TE-131 1.100D-01 1.621D-01 1.419D-01 3.231D-03 0.000D+00 0.000D+00 0.000D+00
 1.501D+00

TOTAL ELECTRON ENERGY =
 2.553D-01 2.505D-01 1.315D+00 1.422D-01 1.003D+00 1.904D-01 1.388D+00
 1.960D+00 1.958D-01 9.347D-01 1.899D-01 7.186D-01

***END PROGRAM STPISOTF (VERSION 1.1)

TIME OFF = 9: 1:18 DATE = 10/23/1992

*** PROGRAM STPISOTP IS AT YOUR SERVICE ***

** VERSION NUMBER=1.1 REVISION DATE WAS 8/31/92

* TODAY'S DATE = 10/23/1992 START TIME = 9: 2:52

REPRODUCTION OF INPUT DATA DECK

```
+ + + + + + + +
TEST FOR ISOTOPE NOT IN FILE
SR-92 SR-93 SR-94
T
0.03 0.4 0.9 1.35 1.8 2.2 2.6 7.5
T
+ + + + + + + +
```

***** PROGRAM STPISOTP (VERSION 1.1) RAN ON 10/23/1992 *****

TEST FOR ISOTOPE NOT IN FILE

ISOTOPE SR-94 NOT IN THE LIBRARY

END OF FILE ENCOUNTERED ON PRECURSOR FILE

```

**** PROGRAM STPISOTP (VERSION 1.1 )      RAN ON 10/23/1992  ****
1SR-92 1 7.1048E-05 10.0000E+00 10.0000E+00 10.0000E+00
2SR-93 1 1.5825E-03 10.0000E+00 10.0000E+00 10.0000E+00
3SR-94 1 0.0000E+00 10.0000E+00 10.0000E+00 10.0000E+00

```

C:\SRISO>stpisotp
File name missing or blank - please enter file name
UNIT 6? prn
ENTERING HANDLR
ISOTOPE NOT IN LIBRARY - CHECK INPUT

C:\SRISO>

*** PROGRAM STPISOTP IS AT YOUR SERVICE ***

** VERSION NUMBER=1.1 REVISION DATE WAS 8/31/92

* TODAY'S DATE = 10/23/1992 START TIME = 9: 7:24

REPRODUCTION OF INPUT DATA DECK

+ + + + +

BORDERLINE GAMMA ENERGY TEST

'C-11 '

T

0.03 .511 0.9

T

+ + + + +

***** PROGRAM STPISOTP (VERSION 1.1) RAN ON 10/23/1992 *****

BORDERLINE GAMMA ENERGY TEST

END OF FILE ENCOUNTERED ON PRECURSOR FILE

**** PROGRAM STPLSOTP (VERSION 1.1) RAN ON 10/23/1992 ****
1C-11 1 5.6408E-04 10.0000E+00 10.0000E+00 10.0000E+00

*** PROGRAM STPISOTP (VERSION 1.1) RAN ON 10/23/1992 ***

ENERGY NO. PHOTONS

.51 .90

C-11 0.000D+00 1.020D+00 5.110D-01

TOTAL ELECTRON ENERGY =

3.770D-07

***END PROGRAM STPISOTP (VERSION 1.1)

TIME OFF = 9: 7:26 DATE = 10/23/1992

EGS Corporation

Title Verification and Validation of Page ~ of ~

RADMODL Code Ver. 1.0 EGS-TR-910600-08 Project WSRC

Calculated by #2.

Date 12 Nov 92 Checked by A.S.

Date 11/13/92

Annex B

Verification of STP

*Verification of Computer Program STP (PC)
Version 1.1*

by

*Evelyn Downey
EGS Corporation
Knoxville, Tennessee*

*Submitted to
Westinghouse Savannah River Company*

October 1992

*Contract #AA30194P
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PROJECT ENGINEER:	<u>Evelyn G. Downey</u> Evelyn G. Downey
TECHNICAL REVIEWS	
PROGRAM MANAGER:	<u>Douglas W. Wilson</u> Douglas W. Wilson
ENGINEERING VERIFIER:	<u>Douglas W. Wilson</u> Douglas W. Wilson
QUALITY ASSURANCE:	<u>Carter Pope</u> Carter Pope
APPROVAL	
GROUP/DIVISION DIRECTOR:	<u>Ronald D. Guthrie</u> Ronald D. Guthrie

EGS Form 611-10/89

*Justification for Project Manager performing engineering verification: Due to his technical competence in the subject and theory, Program Manager D. W. Wilson performed the engineering verification for this report. Mr. Wilson did not participate in the program development, technical input, nor selection of sample problems.

Disclaimer

Program Name

STP (PC) Version 1.1

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October 1992

Title Verification of Computer Program Page LV of V

STP (PC) Version 1.1 FGS-TR-910600-18 Project All

Calculated by SLD Date 10/28/92 Checked by QWW Date 10/26/92

ABSTRACT

This report verifies computer code STP (PC) Version 1.1, prepared for Westinghouse Savannah River Company. STP (PC) is a computer code which is used to model complex flow systems while taking into account radioactive decay with the production of daughter isotopes. The code is able to generate the activities and the gamma spectra in the various compartments of the system over time. The changes in the code from the previous report are presented. The results of the sample cases generated using this version, as well as the computer code are included in the appendices.

Title Verification of Computer Program Page V of V
STP (PC) Version 1.1 EGS-TR-910600-18 Project All
 Calculated by ELL Date 10/23/92 Checked by QAD Date 10/26/92

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Appendix H	(Example 8)	H1 of H17
Appendix I	(Example 9)	I1 of I22
Appendix J	(Examples 10A and 10B)	J1 of J49
Appendix K	(Example 11)	K1 of K18
Appendix L	(Computer Code STP (PC) Version 1.1	L1 of L41

Contents of Appendix L intentionally deleted.

Title Verification of Computer Program Page 1 of 3

STP (PC) Version 1.1 EGS-TR-910600-18 Project All

Calculated by ELH Date 10/23/92 Checked by QW Date 10/26/92

1.0 Introduction

This report is presented to verify the computer code STP (PC) Version 1.1. Version 1.0 of this code was originally verified in Report No. EGS-TR-910600-06 (reference 1). This code was revised for use with the program RADMODL for the Savannah River Nuclear Plant. The modifications made to create this version resulted from work on a radiation model being developed for Westinghouse Savannah River Corporation (WSRC). A listing of this version of the computer code is found in Appendix L.

This version of the STP code was made to enable a much larger system to be modelled than in the previous version. In addition, this version of the code is compiled to run under WINDOWS 3.1 to make use of the virtual memory available in WINDOWS.

The changes made in the actual code are for the purpose of handling much larger arrays, to accommodate the needs of the Savannah River Nuclear Plant. The primary change in the code is the change in the size of the array COMMON which requests the number of core locations available for use. The size of this array is increased from 40001 to 225001. Another change to increase the flexibility of the model is an increase in the size of the array VEND in the code from 4 to 25 to allow for up to 25 variable volumes in one time step. The variable NREV is changed to reflect the new revision number in the subroutine HEADER. The date in this subroutine is also changed to correspond to the new revision date.

To verify STP (PC) Version 1.1 for use, the sample cases from reference 1, which were used to verify version 1.0, are rerun under Version 1.1, and the outputs from both versions are compared. A match between the two results indicates that version 1.1 of the code STP (PC) is verified.

Title Verification of Computer Program Page 2 of 3

STP (PC) Version 1.1 EGS-TR-910600-18 Project All

Calculated by ELO Date 10/23/92 Checked by WOW Date 10/26/92

2.0 Verification

The same sample cases were run in this revision as were run in version 1.0, and the results were compared. Appendices A-K contain the output of the sample cases generated for this verification. These appendices correspond to appendices I-XI in the original report which verified version 1.0 of this code.

3.0 Conclusion

To qualify STP (PC) Version 1.1, the same sample problems were run and the results were compared to the results in reference 1 obtained using version 1.0 of STP (PC) Version 1.0. The corresponding results were then compared. This comparison shows no differences. Therefore, based on this comparison, this version of the code may be considered qualified and valid for use in safety related calculations.

Title Verification of Computer Program Page 3 of 3

STP (PC) Version 1.1 EGS-TR-910600-18 Project All

Calculated by ELD Date 10/23/92 Checked by QW Date 10/26/92

4.0 References

Downey, Evelyn. "Verification of Computer Program STP (PC)
Version 1.0." EGS-TR-910600-06. Knoxville, TN,
August 3, 1992.

Title Verification of Computer Program Page A1 of A27

STP (PC) Version 1.1 EGS-TR-910600-18 Project All

Calculated by ELD

Date 10/25/92 Checked by Qua

Date 10/26/92

Appendix A
Example 1

*** PROGRAM STP-PC (THE SHIELDER-S EDGE) IS AT YOUR SERVICE ***

** VERSION NUMBER=1: REVISION DATE WAS 9/29/92

* TODAY'S DATE = 10/ 9/1992 START TIME = 9:32:51

REPRODUCTION OF INPUT DATA DECK

+ + + + +

NV= 2 NS= 1

N1= 12 N2= 3 N3= 7 N4= 2

1KR-85M	1	4.2978E-05	54.0234E-03	10.0000E+00	10.0000E+00
2KR-85	1	2.0490E-09	19.0683E-06	56.5688E-06	10.0000E+00
3KR-90	1	2.1446E-02	10.0000E+00	10.0000E+00	10.0000E+00
4XE-131M	1	6.7758E-07	61.0836E-08	10.0000E+00	10.0000E+00
5BR-85	2	4.0299E-03	10.0000E+00	10.0000E+00	10.0000E+00
6I-131	2	9.9783E-07	114.9932E-06	124.6210E-04	10.0000E+00
7RB-90M	3	2.6866E-03	32.5521E-03	10.0000E+00	10.0000E+00
8RB-90	3	4.4149E-03	31.8894E-02	76.1792E-05	10.0000E+00
9SR-90	3	7.6801E-10	72.6248E-03	84.4149E-03	10.0000E+00
10Y-90	3	3.0038E-06	97.6801E-10	10.0000E+00	10.0000E+00
11TE-131M	3	6.4180E-06	10.0000E+00	10.0000E+00	10.0000E+00
12TE-131	3	4.6210E-04	111.4248E-06	10.0000E+00	10.0000E+00
		.40	.90	1.35	1.80
					2.20
					2.60
					7.50
1KR-85M		.255157+0123-3000+0000+0000+0000+0000+0581+0	+		
2KR-85		.251000+0223-2000+0000+0000+0000+0000+0514+0	+		
3KR-90		1.315766-1233+0462+0386+0491-1190-1448-1386+1	+		
4XE-131M		.142664-2000+0000+0000+0000+0000+0000+0164+0	+		
5BR-85		1.003000+0334-1233-1659-2275-2000+0000+0183+1	+		
6I-131		.190317+0625-1000+0000+0000+0000+0000+0723+0	+		
7RB-90M		1.388344-2855+0195+0472+0186+0118+0144+1473+1	+		
8RB-90		1.960000+0277+0963-1192-1366-1111+0162+1533+1	+		
9SR-90		.196000+0000+0000+0000+0000+0000+0000+0000+0	+		
10Y-90		.935000+0000+0000+0000+0000+0000+0000+0000+0	+		
11TE-131M		.190112+0828+0377+0219-1735-1871-2000+0227+1	+		
12TE-131		.719110+0162+0142+0323-2000+0000+0000+0150+1	+		

*** PROGRAM STP-PC (THE SHIELDER-S EDGE) IS AT YOUR SERVICE ***

*** VERSION NUMBER=1.1 REVISION DATE WAS 9/29/92

* TODAY'S DATE = 10/ 9/1992 START TIME = 9:32:51

1 'SOURCE'
1 1.0 2 1.0 3 1.0 4 1.0 5 1.0 6 1.0
7 1.0 8 1.0 9 1.0 10 1.0 11 1.0 12 1.0

0

T

STP QUALIFICATION EXAMPLE 1 KEY LETTERS S,F,V

NJ= 2

1 'VOLUME 1'

2 'VOLUME 2'

-1

SOURCE AND VOLUME INITIALIZATION

V 1 1.00 CC

V 2 1.00 CC

S 1 1 0 1.0

1 SECOND

ACTIVITIES AFTER 1 SECOND

F 1 2 0 1.0

1 MIN

ACTIVITIES AFTER 1 MIN

1 HOUR

ACTIVITIES AFTER 1 HOUR

24 HOUR 90

ACTIVITIES AFTER 1 DAY

30 D 90

ACTIVITIES AFTER 1 MONTH

T

T

+ + + + + + + +

* * *

PROGRAM S T P (VERSION 1.1)

RAN ON 10/ 9/1992

* * *

DATA FOR THIS RUN OR SERIES OF RUNS

NUMBER OF ISOTOPES (DATA CARDS) = 12

NUMBER OF COMPONENTS (ALL RUNS) = 2

NUMBER OF CLASSES OF ISOTOPES = 3

NUMBER OF SOURCES (MAXIMUM) = 1

NUMBER OF GAMMA GROUPS = 7

NUMBER OF PRECURSORS (MAXIMUM) = 2

STORAGE LOCATIONS REQUESTED =225000

STORAGE LOCATIONS USED = 761

* * * PROGRAM S T P (VERSION 1.1) RAN ON 10/ 9/1992 * * *
 * * * STP QUALIFICATION EXAMPLE 1 KEY LETTERS S,P,V * * *

NUCLIDE DATA INPUT (LIBRARY)

NUMBER	NAME	CLASS	LAMDA(1/HR)	PRECURSOR (NO.,RATE)-
1	KR-85M	1	1.5472E-01	5 1.5447E-01 1 0.0000E+00
2	KR-85	1	7.3764E-06	1 1.5564E-06 5 1.2024E-08
3	KR-90	1	7.7206E+01	1 0.0000E+00 1 0.0000E+00
4	XE-131M	1	2.4393E-03	6 2.6490E-05 1 0.0000E+00
5	BR-85	2	1.4508E+01	1 0.0000E+00 1 0.0000E+00
6	I-131	2	3.5922E-03	11 2.7947E-03 12 3.5922E-03
7	RB-90M	3	9.6718E+00	3 1.1510E+00 1 0.0000E+00
8	RB-90	3	1.5894E+01	3 1.4002E+01 7 3.6555E-01
9	SR-90	3	2.7648E-06	7 2.7012E-06 8 2.7648E-06
10	Y-90	3	1.0814E-02	9 1.0814E-02 1 0.0000E+00
11	TE-131M	3	2.3105E-02	1 0.0000E+00 1 0.0000E+00
12	TE-131	3	1.6636E+00	11 3.6931E-01 1 0.0000E+00

* * * PROGRAM S T P (VERSION 1.1) RAN ON 10/ 9/1992 * * *
 * * * STP QUALIFICATION EXAMPLE 1 KEY LETTERS S,P,V * * *

I	ISOTOPE	BETA MEV/DISC	GAMMA (MEV/DISC) BY GROUP AND MAX.ENERGY (MEV)						
			1	2	3	4	5	6	7
	EFFECTIVE ENERGY		.400	.900	1.350	1.800	2.200	2.600	7.500
1	KR-85M	.255	.157	.000	.000	.000	.000	.000	.581
2	KR-85	.251	.000	.002	.000	.000	.000	.000	.514
3	KR-90	1.315	.077	.233	.462	.386	.049	.019	3.860
4	KR-131M	.142	.007	.000	.000	.000	.000	.000	.164
5	BR-85	1.003	.000	.033	.023	.007	.003	.000	1.830
6	I-131	.190	.317	.063	.000	.000	.000	.000	.723
7	BR-90M	1.388	.003	.855	.195	.472	.186	.118	4.730
8	BR-90	1.960	.000	.277	.096	.019	.037	.111	5.330
9	SE-90	.196	.000	.000	.000	.000	.000	.000	.000
10	Y-90	.935	.000	.000	.000	.000	.000	.000	.000
11	TR-131M	.190	.112	.828	.377	.022	.074	.009	2.270
12	TR-131	.719	.110	.162	.142	.003	.000	.000	1.500

*** PROGRAM S T P (VERSION 1.1) RAN ON 10/ 9/1992 ***
*** STP QUALIFICATION EXAMPLE 1 KEY LETTERS S,P,V ***

RUN LOOP INFORMATION FOR THIS RUN FOLLOWS.

NJ, NUMBER OF COMPONENTS USED IN THIS RUN LOOP = 2
KCONC, CALC. TYPE (0/INVENTORY, 1/CONCENTRATION) = 0
IR., -- ACT/COMP. --- ACT/GM.
NDECAY, CALCULATE DAUGHTER PRODUCTION (0/YES,1/NO) = 0
(DEFAULT =0)
ITMAX, MAXIMUM NUMBER OF ITERATIONS PER TIME STEP = 0
(DEFAULT = 10)
KDEBUG, DEBUG OPTION (0/NORMAL OUTPUT, 1/MUCHO) = 0

* * * PROGRAM S T P (VERSION 1.1)

RAN ON 10/ 9/1992 * * *

* * * STP QUALIFICATION EXAMPLE 1 KEY LETTERS S,P,V

* * *

SOURCE LIBRARY

NUCLIDE	SOURCE	
	1	
1 KR-85M	1.000E+00	
2 KR-85	1.000E+00	
3 KR-90	1.000E+00	
4 XR-131M	1.000E+00	
5 BR-85	1.000E+00	
6 I-131	1.000E+00	
7 RB-90M	1.000E+00	
8 RB-90	1.000E+00	
9 SR-90	1.000E+00	
10 Y-90	1.000E+00	
11 TR-131M	1.000E+00	
12 TR-131	1.000E+00	
TOTAL CLASS 1	4.000E+00	
TOTAL CLASS 2	2.000E+00	
TOTAL CLASS 3	6.000E+00	
GRAND TOTAL	1.200E+01	

```

* * * * PROGRAM S T P (VERSION 1.1 )          RAN ON 10/ 9/1992 * * * *
* * * STEP QUALIFICATION EXAMPLE 1 KEY LETTERS S,P,V * * *
* * STEP SOURCE AND VOLUME INITIALIZATION

```

```

TIME      RMC TIME = -1.000E+00      INTERVALS/STEP      = 30
STEP      START TIME = 0.000E+00      ERROR LIMIT          = 1.0000E-05
          DELTA T   = 0.000E+00

```

```

***** COMPONENT ***** DATA READ (BY CLASS NUMBER)
NO.  NAME          VOLUME OR MASS      1      2      3
1  VOLUME 1        1.000E+00 CC
      REMOVAL RATES (FROM 1) = 0.000E+00 0.000E+00 0.000E+00
      STEP SOURCE FACTOR (FROM SOURCE 1) = 1.000E+00 1.000E+00 1.000E+00
2  VOLUME 2        1.000E+00 CC
      REMOVAL RATES (FROM 2) = 0.000E+00 0.000E+00 0.000E+00

```

* * * PROGRAM S T P (VERSION 1.1) RAN ON 10/ 9/1992 * * *

* * * STEP QUALIFICATION EXAMPLE 1 KEY LETTERS S,F,V * * *

* * STEP SOURCE AND VOLUME INITIALIZATION

STEP SOURCE DATA FROM SOURCE INPUT

	1
	VOLUME 1
NUCLIDE	
1 KR-85K	1.000E+00
2 KR-85	1.000E+00
3 KR-90	1.000E+00
4 KR-131M	1.000E+00
5 KR-85	1.000E+00
6 I-131	1.000E+00
7 RB-90M	1.000E+00
8 RB-90	1.000E+00
9 FA-90	1.000E+00
10 Y-90	1.000E+00
11 YR-131M	1.000E+00
12 YR-131	1.000E+00
VOLUME	1.000E+00 CC
TOTAL CLASS 1	4.000E+00
TOTAL CLASS 2	2.000E+00
TOTAL CLASS 3	6.000E+00
GRAND TOTAL	1.200E+01

* * * PROGRAM S T P (VERSION 1.1)

RAN ON 10/ 9/1992 * * *

* * * STP QUALIFICATION EXAMPLE 1 KEY LETTERS S,P,V

* * *

* * STEP SOURCE AND VOLUME INITIALIZATION

ACTIVITIES AT END OF THE TIME STEP

		1
		VOLUME 1
NUCLIDE		
1	KR-85M	1.000E+00
2	KR-85	1.000E+00
3	KR-90	1.000E+00
4	KR-131M	1.000E+00
5	BR-85	1.000E+00
6	I-131	1.000E+00
7	RB-90M	1.000E+00
8	RB-90	1.000E+00
9	SR-90	1.000E+00
10	Y-90	1.000E+00
11	YR-131M	1.000E+00
12	YR-131	1.000E+00
VOLUME		1.000E+00 CC
TOTAL CLASS 1 4.000E+00		
TOTAL CLASS 2 2.000E+00		
TOTAL CLASS 3 6.000E+00		
GRAND TOTAL 1.200E+01		

```

* * *      PROGRAM S T P   (VERSION 1.1 )      RAN ON 10/ 9/1992      * * *
* * * STP QUALIFICATION EXAMPLE 1 KEY LETTERS S,P,V      * * *
* * STEP SOURCE AND VOLUME INITIALIZATION
      STP GAMMA SHIELDING INFORMATION CALCULATED

```

COMPONENT 1 VOLUME 1

```

CONVERSION FACTOR = 1.000E+00
VOLUME             = 1.000E+00 CC
BETA SOURCE        = 3.161E+05 (MEV/SEC/ )
      PARTICLE SOURCE ENERGY SOURCE GROUP ENERGY
      (PHOTON/SEC/ ) (MEV/SEC/ ) (MEV-EFFECTIVE)

```

1	7.240E+04	2.896E+04	.40
2	1.009E+05	9.077E+04	.90
3	3.551E+04	4.794E+04	1.35
4	1.868E+04	3.363E+04	1.80
5	5.852E+03	1.287E+04	2.20
6	3.653E+03	9.498E+03	2.60
7	2.155E+04	1.149E+05	5.33 (VARIABLE)
TOTALS	2.585E+05	3.385E+05	1.31

***** PROGRAM S T P (VERSION 1.1) RAN ON 10/ 9/1992 *****

*** STP QUALIFICATION EXAMPLE 1 KEY LETTERS S,F,V ***

*** STEP ACTIVITIES AFTER 1 SECOND

	END TIME = 1.000E+00 SECO	INTERVALS/STEP = 30
TIME	START TIME = 0.000E+00	ERROR LIMIT = 1.0000E-05
STEP	DELTA T = 1.000E+00 SECO	

***** COMPONENT *****			DATA READ (BY CLASS NUMBER)		
NO.	NAME	VOLUME OR MASS	1	2	3
1	VOLUME 1	1.000E+00 CC			
		REMOVAL RATES (FROM 1) =	0.000E+00	0.000E+00	0.000E+00
		FLOW RATES (CC /HR) F (1 TO 2) =	1.000E+00	1.000E+00	1.000E+00
		TRANSM. FRACTION (1 TO 2) =	1.000E+00	1.000E+00	1.000E+00

2 VOLUME 2 1.000E+00 CC

REMOVAL RATES (FROM 2) = 0.000E+00 0.000E+00 0.000E+00

*** 30 STEPS WERE USED REQUIRING AN AVERAGE OF .00 ITERATIONS PER STEP

```

* * *   PROGRAM S T P   (VERSION 1.1 )   RAN ON 10/ 9/1992   * * *
* * *   STP QUALIFICATION EXAMPLE 1 KEY LETTERS S,P,V   * * *
* * *   STEP ACTIVITIES AFTER 1 SECOND

```

ACTIVITIES AT END OF THE TIME STEP

	1 VOLUME 1	2 VOLUME 2
NUCLIDE		
1 KR-85M	9.997E-01	2.777E-04
2 KR-85	9.997E-01	2.777E-04
3 KR-90	9.785E-01	2.718E-04
4 KR-131M	9.997E-01	2.777E-04
5 KR-85	9.957E-01	2.766E-04
6 I-131	9.997E-01	2.777E-04
7 RB-90M	9.974E-01	2.771E-04
8 RB-90	9.993E-01	2.776E-04
9 SR-90	9.997E-01	2.777E-04
10 Y-90	9.997E-01	2.777E-04
11 TR-131M	9.997E-01	2.777E-04
12 TR-131	9.994E-01	2.776E-04
VOLUME	1.000E+00 CC	1.000E+00 CC
TOTAL CLASS 1	3.978E+00	1.105E-03
TOTAL CLASS 2	1.995E+00	5.544E-04
TOTAL CLASS 3	5.995E+00	1.666E-03
GRAND TOTAL	1.197E+01	3.325E-03

*** PROGRAM S T P (VERSION 1.1) ***
 *** STP QUALIFICATION EXAMPLE 1 KEY LETTERS S,P,V ***
 *** STEP ACTIVITIES AFTER 1 SECOND ***

STP GAMMA SHIELDING INFORMATION CALCULATED

COMPONENT 1 VOLUME 1

CONVERSION FACTOR = 1.000E+00
 VOLUME = 1.000E+00 CC
 BETA SOURCE = 3.147E+05 (MEV/SEC/)
 PARTICLE SOURCE ENERGY SOURCE GROUP ENERGY
 (PHOTON/SEC/) (MEV/SEC/) (MEV-EFFECTIVE)

1	7.222E+04	2.889E+04	.40
2	1.005E+05	9.048E+04	.90
3	3.521E+04	4.754E+04	1.35
4	1.849E+04	3.328E+04	1.80
5	5.825E+03	1.281E+04	2.20
6	3.642E+03	9.468E+03	2.60
7	2.151E+04	1.147E+05	5.33 (VARIABLE)
TOTALS	2.574E+05	3.371E+05	1.31

COMPONENT 2 VOLUME 2

CONVERSION FACTOR = 1.000E+00
 VOLUME = 1.000E+00 CC
 BETA SOURCE = 8.743E+01 (MEV/SEC/)
 PARTICLE SOURCE ENERGY SOURCE GROUP ENERGY
 (PHOTON/SEC/) (MEV/SEC/) (MEV-EFFECTIVE)

1	2.006E+01	8.026E+00	.40
2	2.793E+01	2.514E+01	.90
3	9.783E+00	1.321E+01	1.35
4	5.136E+00	9.244E+00	1.80
5	1.618E+00	3.560E+00	2.20
6	1.012E+00	2.630E+00	2.60
7	5.976E+00	3.185E+01	5.33 (VARIABLE)
TOTALS	7.152E+01	9.366E+01	1.31


```

* * * PROGRAM S T P (VERSION 1.1 )          RAN ON 10/ 9/1992  * * *
* * * STP QUALIFICATION EXAMPLE 1 KEY LETTERS S,P,V          * * *
* * * STEP ACTIVITIES AFTER 1 MIN

```

```

TIME      END TIME = 1.000E+00 MIN          INTERVALS/STEP          = 30
          START TIME = 1.667E-02 MIN          ERROR LIMIT          = 1.0000E-05
STEP      DELTA T   = 9.833E-01 MIN

```

```

***** COMPONENT *****
NO.      NAME      VOLUME OR MASS          DATA READ (BY CLASS NUMBER)
          1          2          3
1 VOLUME 1      1.000E+00 CC
          REMOVAL RATES (FROM 1) = 0.000E+00 0.000E+00 0.000E+00
          FLOW RATES (CC /HR) F ( 1 TO 2) = 1.000E+00 1.000E+00 1.000E+00
          TRANSM. FRACTION ( 1 TO 2) = 1.000E+00 1.000E+00 1.000E+00

```

```

2 VOLUME 2      1.000E+00 CC
          REMOVAL RATES (FROM 2) = 0.000E+00 0.000E+00 0.000E+00

```

```

*** 30 STEPS WERE USED REQUIRING AN AVERAGE OF .00 ITERATIONS PER STEP

```

***** PROGRAM S T P (VERSION 1.1)

RAN ON 10/ 9/1992 *****

*** STP QUALIFICATION EXAMPLE 1 KEY LETTERS S,P,V

*** STEP ACTIVITIES AFTER 1 MIN

ACTIVITIES AT END OF THE TIME STEP

	1	2
	VOLUME 1	VOLUME 2
NUCLIDE		
1 KR-85M	9.832E-01	1.652E-02
2 KR-85	9.835E-01	1.653E-02
3 KR-90	2.716E-01	4.565E-03
4 KR-131M	9.834E-01	1.653E-02
5 BR-85	7.722E-01	1.298E-02
6 I-131	9.835E-01	1.653E-02
7 RB-90M	8.467E-01	1.423E-02
8 RB-90	8.698E-01	1.462E-02
9 SR-90	9.835E-01	1.653E-02
10 Y-90	9.835E-01	1.653E-02
11 TR-131M	9.831E-01	1.652E-02
12 TR-131	9.625E-01	1.618E-02
VOLUME	1.000E+00 CC	1.000E+00 CC
TOTAL CLASS 1	3.222E+00	5.414E-02
TOTAL CLASS 2	1.756E+00	2.951E-02
TOTAL CLASS 3	5.629E+00	9.460E-02
GRAND TOTAL	1.061E+01	1.783E-01

* * * PROGRAM S T P (VERSION 1.1) RAN ON 10/ 9/1992 * * *
 * * * STP QUALIFICATION EXAMPLE 1 KEY LETTERS S,P,V * * *
 * * STEP ACTIVITIES AFTER 1 MIN

STP GAMMA SHIELDING INFORMATION CALCULATED

COMPONENT 1 VOLUME 1

CONVERSION FACTOR = 1.000E+00
 VOLUME = 1.000E+00 CC
 BETA SOURCE = 2.526E+05 (MEV/SEC/)

	PARTICLE SOURCE (PHOTON/SEC/)	ENERGY SOURCE (MEV/SEC/)	GROUP ENERGY (MEV-EFFECTIVE)
1	6.589E+04	2.636E+04	.40
2	8.583E+04	7.724E+04	.90
3	2.466E+04	3.329E+04	1.35
4	1.132E+04	2.038E+04	1.80
5	4.659E+03	1.025E+04	2.20
6	2.991E+03	7.777E+03	2.60
7	1.833E+04	9.770E+04	5.33 (VARIABLE)
TOTALS	2.137E+05	2.730E+05	1.28

COMPONENT 2 VOLUME 2

CONVERSION FACTOR = 1.000E+00
 VOLUME = 1.000E+00 CC
 BETA SOURCE = 4.245E+03 (MEV/SEC/)

	PARTICLE SOURCE (PHOTON/SEC/)	ENERGY SOURCE (MEV/SEC/)	GROUP ENERGY (MEV-EFFECTIVE)
1	1.107E+03	4.430E+02	.40
2	1.442E+03	1.298E+03	.90
3	4.144E+02	5.594E+02	1.35
4	1.903E+02	3.426E+02	1.80
5	7.830E+01	1.723E+02	2.20
6	5.027E+01	1.307E+02	2.60
7	3.081E+02	1.642E+03	5.33 (VARIABLE)
TOTALS	3.591E+03	4.588E+03	1.28

*** PROGRAM S T P (VERSION 1.1) RAN ON 10/ 9/1992 ***

*** STP QUALIFICATION EXAMPLE 1 KEY LETTERS S,P,V ***

** STEP ACTIVITIES AFTER 1 HOUR

TIME END TIME = 1.000E+00 HOUR INTERVALS/STEP = 30
 START TIME = 1.667E-02 HOUR ERROR LIMIT = 1.0000E-05
 STEP DELTA T = 9.833E-01 HOUR

***** COMPONENT ***** DATA READ (BY CLASS NUMBER)
 NO. NAME VOLUME OR MASS 1 2 3

 1 VOLUME 1 1.000E+00 CC

 REMOVAL RATES (FROM 1) = 0.000E+00 0.000E+00 0.000E+00
 FLOW RATES (CC /HR) F (1 TO 2) = 1.000E+00 1.000E+00 1.000E+00
 TRANSM. FRACTION (1 TO 2) = 1.000E+00 1.000E+00 1.000E+00

2 VOLUME 2 1.000E+00 CC

 REMOVAL RATES (FROM 2) = 0.000E+00 0.000E+00 0.000E+00

 *** 30 STEPS WERE USED REQUIRING AN AVERAGE OF .00 ITERATIONS PER STEP

*** PROGRAM S T P (VERSION 1.1)

RAN ON 10/ 9/1992 ***

*** STP QUALIFICATION EXAMPLE 1 KEY LETTERS S,F,V

*** STEP ACTIVITIES AFTER 1 HOUR

ACTIVITIES AT END OF THE TIME STEP

	1	2
	VOLUME 1	VOLUME 2
NUCLIDE		
1 KR-85M	3.185E-01	5.473E-01
2 KR-85	3.679E-01	6.321E-01
3 KR-90	1.086E-34	1.866E-34
4 XE-131M	3.670E-01	6.306E-01
5 BR-85	1.841E-07	3.164E-07
6 I-131	3.684E-01	6.330E-01
7 RB-90M	2.359E-05	4.053E-05
8 RB-90	1.440E-06	2.474E-06
9 SR-90	3.679E-01	6.321E-01
10 Y-90	3.679E-01	6.321E-01
11 YR-131M	3.595E-01	6.177E-01
12 YR-131	1.349E-01	2.319E-01
VOLUME	1.000E+00 CC	1.000E+00 CC
TOTAL CLASS 1	1.053E+00	1.810E+00
TOTAL CLASS 2	3.684E-01	6.330E-01
TOTAL CLASS 3	1.230E+00	2.114E+00
GRAND TOTAL	2.652E+00	4.557E+00

*** PROGRAM S T P (VERSION 1.1)

RAN ON 10/ 9/1992

Page A21 of A27

*** STP QUALIFICATION EXAMPLE 1 KEY LETTERS S,P,V

** STEP ACTIVITIES AFTER 1 HOUR

STP GAMMA SHIELDING INFORMATION CALCULATED

COMPONENT 1 VOLUME 1

CONVERSION FACTOR = 1.000E+00

VOLUME = 1.000E+00 CC

BETA SOURCE = 3.245E+04 (MEV/SEC/)

	PARTICLE SOURCE (PHOTON/SEC/)	ENERGY SOURCE (MEV/SEC/)	GROUP ENERGY (MEV-EFFECTIVE)
--	-----------------------------------	------------------------------	---------------------------------

1	2.075E+04	8.300E+03	.40
2	1.412E+04	1.271E+04	.90
3	4.240E+03	5.723E+03	1.35
4	1.710E+02	3.078E+02	1.80
5	4.444E+02	9.778E+02	2.20
6	4.460E+01	1.160E+02	2.60
7	2.839E-01	1.343E+00	4.73 (VARIABLE)

TOTALS	3.977E+04	2.813E+04	.71
--------	-----------	-----------	-----

COMPONENT 2 VOLUME 2

CONVERSION FACTOR = 1.000E+00

VOLUME = 1.000E+00 CC

BETA SOURCE = 5.576E+04 (MEV/SEC/)

	PARTICLE SOURCE (PHOTON/SEC/)	ENERGY SOURCE (MEV/SEC/)	GROUP ENERGY (MEV-EFFECTIVE)
--	-----------------------------------	------------------------------	---------------------------------

1	3.565E+04	1.426E+04	.40
2	2.426E+04	2.183E+04	.90
3	7.285E+03	9.835E+03	1.35
4	2.938E+02	5.289E+02	1.80
5	7.637E+02	1.680E+03	2.20
6	7.663E+01	1.992E+02	2.60
7	4.878E-01	2.308E+00	4.73 (VARIABLE)

TOTALS	6.833E+04	4.834E+04	.71
--------	-----------	-----------	-----

***** PROGRAM S T P (VERSION 1.1)

RAN ON 10/ 9/1992

***** Page A22 of A 27

***** STEP QUALIFICATION EXAMPLE 1 KEY LETTERS S,P,V

***** STEP ACTIVITIES AFTER 1 DAY

TIME	END TIME =	2.400E+01 HOUR	INTERVALS/STEP	=	90
STEP	START TIME =	1.000E+00 HOUR	ERROR LIMIT	=	3.3333E-06
	DELTA T =	2.300E+01 HOUR			

***** COMPONENT *****		DATA READ (BY CLASS NUMBER)			
NO.	NAME	VOLUME OR MASS	1	2	3
1	VOLUME 1	1.000E+00 CC			
		REMOVAL RATES (FROM 1) =	0.000E+00	0.000E+00	0.000E+00
		FLOW RATES (CC /HR) F (1 TO 2) =	1.000E+00	1.000E+00	1.000E+00
		TRANSM. FRACTION (1 TO 2) =	1.000E+00	1.000E+00	1.000E+00

2 VOLUME 2 1.000E+00 CC

REMOVAL RATES (FROM 2) = 0.000E+00 0.000E+00 0.000E+00

*** 90 STEPS WERE USED REQUIRING AN AVERAGE OF .00 ITERATIONS PER STEP

*** PROGRAM S T P (VERSION 1.1)

RAN ON 10/ 9/1992

Page A23 of A27

*** STEP QUALIFICATION EXAMPLE 1 KEY LETTERS S,P,V

*** STEP ACTIVITIES AFTER 1 DAY

ACTIVITIES AT END OF THE TIME STEP

	1	2
	VOLUME 1	VOLUME 2
NUCLIDE		
1 KR-85M	9.309E-13	2.466E-02
2 KR-85	3.775E-11	9.998E-01
3 KR-90	0.000E+00	0.000E+00
4 KR-131M	3.563E-11	9.438E-01
5 KR-85	2.306-162	6.108-152
6 I-131	3.708E-11	9.824E-01
7 RB-90M	5.955-112	1.577-101
8 RB-90	3.499-113	9.267-103
9 SR-90	3.775E-11	9.999E-01
10 Y-90	3.775E-11	1.000E+00
11 TR-131M	2.168E-11	5.744E-01
12 TR-131	4.881E-12	1.293E-01
VOLUME	1.000E+00 CC	1.000E+00 CC
TOTAL CLASS 1	7.430E-11	1.968E+00
TOTAL CLASS 2	3.708E-11	9.824E-01
TOTAL CLASS 3	1.021E-10	2.704E+00
GRAND TOTAL	2.135E-10	5.654E+00

PROGRAM S T P VERSION 1.1
 *** S T P QUALIFICATION EXAMPLE 1 KEY LETTERS S,P,V ***
 *** STEP ACTIVITIES AFTER 1 DAY

S T P GAMMA SHIELDING INFORMATION CALCULATED

COMPONENT 1 VOLUME 1

CONVERSION FACTOR = 1.000E+00
 VOLUME = 1.000E+00 CC
 BETA SOURCE = 2.669E-06 (MEV/SEC/)

	PARTICLE SOURCE (PHOTON/SEC/)	ENERGY SOURCE (MEV/SEC/)	GROUP ENERGY (MEV-EFFECTIVE)
1	1.397E-06	5.588E-07	.40
2	8.693E-07	7.824E-07	.90
3	2.430E-07	3.281E-07	1.35
4	1.008E-08	1.815E-08	1.80
5	2.680E-08	5.897E-08	2.20
6	2.688E-09	6.988E-09	2.60
7	7.151E-10	3.382E-10	4.73 (VARIABLE)
TOTALS	2.549E-06	1.753E-06	.69

COMPONENT 2 VOLUME 2

CONVERSION FACTOR = 1.000E+00
 VOLUME = 1.000E+00 CC
 BETA SOURCE = 7.071E+04 (MEV/SEC/)

	PARTICLE SOURCE (PHOTON/SEC/)	ENERGY SOURCE (MEV/SEC/)	GROUP ENERGY (MEV-EFFECTIVE)
1	3.701E+04	1.480E+04	.40
2	2.303E+04	2.073E+04	.90
3	6.438E+03	8.691E+03	1.35
4	2.671E+02	4.808E+02	1.80
5	7.100E+02	1.562E+03	2.20
6	7.119E+01	1.851E+02	2.60
7	1.894E-97	8.959E-97	4.73 (VARIABLE)
TOTALS	6.752E+04	4.645E+04	.69

```

* * * PROGRAM S T P (VERSION 1.1 ) RAN ON 10 9 1992 * * *
* * * STP QUALIFICATION EXAMPLE 1 KEY LETTERS S.P.V * * *
* * * STEP ACTIVITIES AFTER 1 MONTH

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```

TIME      END TIME = 3.000E+01 D      INTERVALS/STEP      = 90
STEP      START TIME = 1.000E+00 D      ERROR LIMIT      = 3.3333E-06
          DELTA T = 2.900E+01 D

```

```

***** COMPONENT ***** DATA READ (BY CLASS NUMBER)
NO.  NAME      VOLUME OR MASS      1      2      3
1  VOLUME 1      1.000E+00 CC
      REMOVAL RATES (FROM 1) = 0.000E+00 0.000E+00 0.000E+00
      FLOW RATES (CC /HR) F ( 1 TO 2) = 1.000E+00 1.000E+00 1.000E+00
      TRANSM. FRACTION ( 1 TO 2) = 1.000E+00 1.000E+00 1.000E+00

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```

2  VOLUME 2      1.000E+00 CC
      REMOVAL RATES (FROM 2) = 0.000E+00 0.000E+00 0.000E+00

```

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*** 90 STEPS WERE USED REQUIRING AN AVERAGE OF .00 ITERATIONS PER STEP

```

* * * PROGRAM S P P (VERSION 1.1)

RAN ON 10. 9. 1992 * * *

* * * STEP QUALIFICATION EXAMPLE 1 KEY LETTERS S,P,V

* * *

* * * STEP ACTIVITIES AFTER 1 MONTH

ACTIVITIES AT END OF THE TIME STEP

NUCLIDE	VOLUME 2
1 KR-85M	4.214E-49
2 KR-85	9.947E-01
3 KR-90	0.000E+00
4 XE-131M	1.753E-01
5 BR-85	0.000E+00
6 I-131	8.933E-02
7 RB-90M	0.000E+00
8 RB-90	0.000E+00
9 SR-90	9.980E-01
10 Y-90	9.983E-01
11 TE-131M	5.961E-08
12 TE-131	1.342E-08
VOLUME	1.000E+00 CC
TOTAL CLASS 1	1.170E+00
TOTAL CLASS 2	8.933E-02
TOTAL CLASS 3	1.996E+00
GRAND TOTAL	3.256E+00

***** PROGRAM S T P (VERSION 1.1) RAN ON 10 9 1992 *****

*** STP QUALIFICATION EXAMPLE 1 KEY LETTERS S.P.V ***

*** STP ACTIVITIES AFTER 1 MONTH

STP GAMMA SHIELDING INFORMATION CALCULATED

COMPONENT 1 VOLUME 1

CONVERSION FACTOR = 1.000E+00

VOLUME = 1.000E+00 CC

BETA SOURCE = 1.068-308 (MEV/SEC/)

	PARTICLE SOURCE (PHOTON/SEC/)	ENERGY SOURCE (MEV/SEC/)	GROUP ENERGY (MEV-EFFECTIVE)
--	-----------------------------------	------------------------------	---------------------------------

1	5.542-310	2.217-310	.40
2	6.517-311	5.866-311	.90
3	1.358-316	1.833-316	1.35
4	5.635-318	1.014-317	1.80
5	1.498-317	3.295-317	2.20
6	1.502-318	3.904-318	2.60
7	0.000E+00	0.000E+00	7.50 (VARIABLE)

TOTALS	6.193-310	2.803-310	.45
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COMPONENT 2 VOLUME 2

CONVERSION FACTOR = 1.000E+00

VOLUME = 1.000E+00 CC

BETA SOURCE = 5.256E+04 (MEV/SEC/)

	PARTICLE SOURCE (PHOTON/SEC/)	ENERGY SOURCE (MEV/SEC/)	GROUP ENERGY (MEV-EFFECTIVE)
--	-----------------------------------	------------------------------	---------------------------------

1	2.727E+03	1.091E+03	.40
2	3.207E+02	2.886E+02	.90
3	6.681E-04	9.020E-04	1.35
4	2.773E-05	4.991E-05	1.80
5	7.369E-05	1.621E-04	2.20
6	7.389E-06	1.921E-05	2.60
7	0.000E+00	0.000E+00	7.50 (VARIABLE)

TOTALS	3.048E+03	1.379E+03	.45
--------	-----------	-----------	-----

*** END PROGRAM S T P (VERSION 1.1) ***

TIME OFF = 9:40:49 DATE = 10/ 9/1992

Title Verification of Computer Program Page B1 of B58

STP (PC) Version 1.1 EGS-TR-910600-18 Project All

Calculated by ELH Date 10/23/92 Checked by RWD Date 10/20/92

Appendix B
Examples 2A and 2B

*** PROGRAM SUP - PC THE SHELLER-S EDGE IS AT YOUR SERVICE ***

*** VERSION NUMBER=11 REVISION DATE WAS 9/29/92

*** TODAY'S DATE = 10/9/1992 START TIME = 9:45:52

REPRODUCTION OF INPUT DATA DECK

+ + + + +

NV= 2 NS= 1

NI= 12 NJ= 3 NG= 7 NL= 2

1KE-85M	1	4.2978E-05	54.0234E-03	10.0000E+00	10.0000E+00
2KE-85	1	2.0490E-09	19.0683E-06	56.5688E-06	10.0000E+00
3KE-90	1	2.1446E-02	10.0000E+00	10.0000E+00	10.0000E+00
4KE-131M	1	6.7758E-07	61.0836E-08	10.0000E+00	10.0000E+00
5NR-85	2	4.0299E-03	10.0000E+00	10.0000E+00	10.0000E+00
6I-131	2	9.9783E-07	114.9932E-06	124.210E-04	10.0000E+00
7NR-90M	3	2.6866E-03	32.5521E-03	10.0000E+00	10.0000E+00
8NR-90	3	4.4149E-03	31.8894E-02	76.1792E-05	10.0000E+00
9SR-90	3	7.6801E-10	72.6248E-03	84.4149E-03	10.0000E+00
10Y-90	3	3.0038E-06	97.6801E-10	10.0000E+00	10.0000E+00
11YE-131M	3	6.4180E-06	10.0000E+00	10.0000E+00	10.0000E+00
12YE-131	3	4.6210E-04	111.4248E-06	10.0000E+00	10.0000E+00

	.40	.90	1.35	1.80	2.20	2.60	7.50
1KE-85M	.255157+0123-3000+0000+0000+0000+0000+0581+0	+					
2KE-85	.251000+0223-2000+0000+0000+0000+0000+0514+0	+					
3KE-90	1.315766-1233+0462+0386+0491-1190-1448-1386+1	+					
4KE-131M	.142664-2000+0000+0000+0000+0000+0000+0164+0	+					
5NR-85	1.003000+0334-1233-1659-2275-2000+0000+0183+1	+					
6I-131	.190317+0625-1000+0000+0000+0000+0000+0723+0	+					
7NR-90M	1.388344-2855+0195+0472+0186+0118+0144+1473+1	+					
8NR-90	1.966000+0277+0963-1192-1366-1111+0162+1533+1	+					
9SR-90	.196000+0000+0000+0000+0000+0000+0000+0000+0	+					
10Y-90	.935000+0000+0000+0000+0000+0000+0000+0000+0	+					
11YE-131M	.190112+0828+0377+0219-1735-1871-2000+0227+1	+					
12YE-131	.719110+0162+0142+0323-2000+0000+0000+0150+1	+					

*** PROGRAM STP-PC (THE SHELDER-SHCE. IS AT YOUR SERVICE ***

** VERSION NUMBER=1.1 REVISION DATE WAS 9/29/92

* TODAY'S DATE = 10/9/1992 START TIME = 9:45:52

1 'SOURCE'
1 1.0 2 1.0 3 1.0 4 1.0 5 1.0 6 1.0
7 1.0 8 1.0 9 1.0 10 1.0 11 1.0 12 1.0

0

T

STP QUALIFICATION EXAMPLE 2A KEY LETTER X

NJ= 2

1 'VOLUME 1'

2 'VOLUME 2'

-1

SOURCE AND VOLUME INITIALIZATION

V 1 1.00 CC

V 2 1.00 CC

S 1 1 0 1.0

X 1 2 2 0.1

X 1 2 3 0.01

1 SECOND

ACTIVITIES AFTER 1 SECOND

P 1 2 0 1.0

1 MIN

ACTIVITIES AFTER 1 MIN

1 HOUR

ACTIVITIES AFTER 1 HOUR

24 HOUR

ACTIVITIES AFTER 1 DAY

30 D

ACTIVITIES AFTER 1 MONTH

T

T

+ + + + + + + +

....

PROGRAM S T P (VERSION 1.1)

RAN ON 10 9 1992

....

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DATA FOR THIS RUN OR SERIES OF RUNS

NUMBER OF ISOTOPES (DATA CARDS) = 12

NUMBER OF COMPONENTS (ALL RUNS) = 2

NUMBER OF CLASSES OF ISOTOPES = 3

NUMBER OF SOURCES (MAXIMUM) = 1

NUMBER OF GAMMA GROUPS = 7

NUMBER OF PRECURSORS (MAXIMUM) = 2

STORAGE LOCATIONS REQUESTED =225000

STORAGE LOCATIONS USED = 761

PROGRAM S T P (VERSION 1.1) RAN ON 10/ 9 1992

*** STEP QUALIFICATION EXAMPLE 2A KEY LETTER X ***

NUCLIDE DATA INPUT (LIBRARY)

NUMBER	NAME	CLASS	LAMDA(1/HR)	PRECORSCR (NO.,RATE)-
1	KR-85M	1	1.5472E-01	5 1.5447E-01 1 0.0000E+00
2	KR-85	1	7.3764E-06	1 1.5564E-06 5 1.2024E-08
3	KR-90	1	7.7206E+01	1 0.0000E+00 1 0.0000E+00
4	XR-131M	1	2.4393E-03	6 2.6490E-05 1 0.0000E+00
5	BR-85	2	1.4508E+01	1 0.0000E+00 1 0.0000E+00
6	I-131	2	3.5922E-03	11 2.7947E-03 12 3.5922E-03
7	RB-90M	3	9.6718E+00	3 1.1510E+00 1 0.0000E+00
8	RB-90	3	1.5894E+01	3 1.4002E+01 7 3.6555E-01
9	SR-90	3	2.7648E-06	7 2.7012E-06 8 2.7648E-06
10	Y-90	3	1.0814E-02	9 1.0814E-02 1 0.0000E+00
11	TR-131M	3	2.3105E-02	1 0.0000E+00 1 0.0000E+00
12	TR-131	3	1.6636E+00	11 3.6931E-01 1 0.0000E+00

STP QUALIFICATION EXAMPLE 2A KEY LETTER X

I	ISOTOPE	BETA MEV/DISC	GAMMA (MEV/DISC) BY GROUP AND MAX ENERGY (MEV)						
			1	2	3	4	5	6	7
	EFFECTIVE ENERGY		.400	.900	1.350	1.800	2.200	2.600	7.500
1	KR-85M	.255	.157	.000	.000	.000	.000	.000	.581
2	KR-85	.251	.000	.002	.000	.000	.000	.000	.514
3	KR-90	1.315	.077	.233	.462	.386	.049	.019	3.860
4	KR-131M	.142	.007	.000	.000	.000	.000	.000	.164
5	BR-85	1.003	.000	.033	.023	.007	.003	.000	1.830
6	I-131	.190	.317	.063	.000	.000	.000	.000	.723
7	RB-90M	1.388	.003	.855	.195	.472	.186	.118	4.730
8	RB-90	1.960	.000	.277	.096	.019	.037	.111	5.339
9	SR-90	.196	.000	.000	.000	.000	.000	.000	.000
10	Y-90	.935	.000	.000	.000	.000	.000	.000	.000
11	TR-131M	.190	.112	.828	.377	.022	.074	.009	2.270
12	TR-131	.719	.110	.162	.142	.003	.000	.000	1.500

PROGRAM S T P (VERSION 1.1)

RAN ON 10 9:1992

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S T P QUALIFICATION EXAMPLE 2A KEY LETTER X

RUN LOOP INFORMATION FOR THIS RUN FOLLOWS.

NJ, NUMBER OF COMPONENTS USED IN THIS RUN LOOP = 2

KCONC, CALC. TYPE (0/INVENTORY, 1/CONCENTRATION) = 0
IN., -- ACT/COMP. --- ACT/GM.

NDECAY, CALCULATE DAUGHTER PRODUCTION (0/YES, 1/NO) = 0
(DEFAULT = 0)

ITMAX, MAXIMUM NUMBER OF ITERATIONS PER TIME STEP = 0
(DEFAULT = 10)

KDEBUG, DEBUG OPTION (0/NORMAL OUTPUT, 1/MUCHO) = 0

S T P QUALIFICATION EXAMPLE 2A KEY LETTER X

SOURCE LIBRARY

1

SOURCE

NUCLIDE

1	KR-85M	1.000E+00
2	KR-85	1.000E+00
3	KR-90	1.000E+00
4	KR-131M	1.000E+00
5	BR-85	1.000E+00
6	I-131	1.000E+00
7	RB-90M	1.000E+00
8	RB-90	1.000E+00
9	SR-90	1.000E+00
10	Y-90	1.000E+00
11	TR-131M	1.000E+00
12	TR-131	1.000E+00
TOTAL CLASS 1		4.000E+00
TOTAL CLASS 2		2.000E+00
TOTAL CLASS 3		6.000E+00
GRAND TOTAL		1.200E+01

PROGRAM S T P (VERSION 1.1)

RAN ON 10/ 9/1992

STEP QUALIFICATION EXAMPLE 2A KEY LETTER X

STEP SOURCE AND VOLUME INITIALIZATION

TIME	END TIME = -1.000E+00	INTERVALS/STEP	= 30
STEP	START TIME = 0.000E+00	ERROR LIMIT	= 1.0000E-05
	DELTA T = 0.000E+00		

***** COMPONENT *****			DATA READ (BY CLASS NUMBER)		
NO.	NAME	VOLUME OR MASS	1	2	3
1	VOLUME 1	1.000E+00 CC			
		REMOVAL RATES (FROM 1) =	0.000E+00	0.000E+00	0.000E+00
		STEP SOURCE FACTOR (FROM SOURCE 1) =	1.000E+00	1.000E+00	1.000E+00
2	VOLUME 2	1.000E+00 CC			
		REMOVAL RATES (FROM 2) =	0.000E+00	0.000E+00	0.000E+00

* * * PROGRAM S T P (VERSION 1.1)

RAN ON 10 9 1992

* * * STP QUALIFICATION EXAMPLE 2A KEY LETTER X

* * * STEP SOURCE AND VOLUME INITIALIZATION

STEP SOURCE DATA FROM SOURCE INPUT

		1
		VOLUME 1
NUCLIDE		
1	KR-85M	1.000E+00
2	KR-85	1.000E+00
3	KR-90	1.000E+00
4	KR-131M	1.000E+00
5	RB-85	1.000E+00
6	I-131	1.000E+00
7	RB-90M	1.000E+00
8	RB-90	1.000E+00
9	SR-90	1.000E+00
10	Y-90	1.000E+00
11	TR-131M	1.000E+00
12	TR-131	1.000E+00
VOLUME		1.000E+00 CC
TOTAL CLASS 1		4.000E+00
TOTAL CLASS 2		2.000E+00
TOTAL CLASS 3		6.000E+00
GRAND TOTAL		1.200E+01

*** STP QUALIFICATION EXAMPLE 2A KEY LETTER X

*** STEP SOURCE AND VOLUME INITIALIZATION

ACTIVITIES AT END OF THE TIME STEP

1
VOLUME 1

NUCLIDE

1	KR-85M	1.000E+00
2	KR-85	1.000E+00
3	KR-90	1.000E+00
4	KR-131M	1.000E+00
5	R-131	1.000E+00
6	I-131	1.000E+00
7	RB-90M	1.000E+00
8	RB-90	1.000E+00
9	SR-90	1.000E+00
10	Y-90	1.000E+00
11	YR-131M	1.000E+00
12	YR-131	1.000E+00

VOLUME 1.000E+00 CC

TOTAL CLASS 1	4.000E+00
TOTAL CLASS 2	2.000E+00
TOTAL CLASS 3	6.000E+00
GRAND TOTAL	1.200E+01

*** STP QUALIFICATION EXAMPLE 2A KEY LETTER X

*** STEP SOURCE AND VOLUME INITIALIZATION

STP GAMMA SHIELDING INFORMATION CALCULATED

COMPONENT 1 VOLUME 1

CONVERSION FACTOR = 1.000E+00

VOLUME = 1.000E+00 CC

BETA SOURCE = 3.161E+05 (MEV/SEC/)

	PARTICLE SOURCE (PHOTON/SEC/)	ENERGY SOURCE (MEV/SEC/)	GROUP ENERGY (MEV-EFFECTIVE)
--	-----------------------------------	------------------------------	---------------------------------

1	7.240E+04	2.896E+04	.40
2	1.009E+05	9.077E+04	.90
3	3.551E+04	4.794E+04	1.35
4	1.868E+04	3.363E+04	1.80
5	5.852E+03	1.287E+04	2.20
6	3.653E+03	9.498E+03	2.60
7	2.155E+04	1.149E+05	5.33 (VARIABLE)

TOTALS	2.585E+05	3.385E+05	1.31
--------	-----------	-----------	------


```

* * * PROGRAM S T P (VERSION 1.1 ) RAN ON 10. 9.1992 * * *
* * * STP QUALIFICATION EXAMPLE 2A KEY LETTER X * * *
* * * STEP ACTIVITIES AFTER 1 SECOND

```

```

TIME      END TIME = 1.000E+00 SECO      INTERVALS/STEP      = 30
STEP      START TIME = 0.000E+00          ERROR LIMIT      = 1.0000E-05
          DELTA T   = 1.000E+00 SECO

```

```

***** COMPONENT *****
NO.  NAME      VOLUME OR MASS      DATA READ (BY CLASS NUMBER)
                                     1      2      3

1  VOLUME 1      1.000E+00 CC

      REMOVAL RATES (FROM 1) = 0.000E+00 0.000E+00 0.000E+00
      FLOW RATES (CC /HR) F ( 1 TO 2) = 1.000E+00 1.000E+00 1.000E+00
      TRANSM. FRACTION ( 1 TO 2) = 1.000E+00 1.000E-01 1.000E-02

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```

2  VOLUME 2      1.000E+00 CC

      REMOVAL RATES (FROM 2) = 0.000E+00 0.000E+00 0.000E+00

```

```

*** 30 STEPS WERE USED REQUIRING AN AVERAGE OF .00 ITERATIONS PER STEP

```

* * * STP QUALIFICATION EXAMPLE 2A KEY LETTER I

* * STEP ACTIVITIES AFTER 1 SECOND

ACTIVITIES AT END OF THE TIME STEP

	1	2
	VOLUME 1	VOLUME 2
NUCLIDE		
1 KR-85M	9.997E-01	2.777E-04
2 KR-85	9.997E-01	2.777E-04
3 KR-90	9.785E-01	2.718E-04
4 KR-131M	9.997E-01	2.777E-04
5 BR-85	9.957E-01	2.766E-05
6 I-131	9.997E-01	2.777E-05
7 RB-90M	9.974E-01	2.814E-06
8 RB-90	9.993E-01	3.303E-06
9 SR-90	9.997E-01	2.777E-06
10 Y-90	9.997E-01	2.777E-06
11 YR-131M	9.997E-01	2.777E-06
12 YR-131	9.994E-01	2.776E-06
VOLUME	1.000E+00 CC	1.000E+00 CC
TOTAL CLASS 1	3.978E+00	1.105E-03
TOTAL CLASS 2	1.995E+00	5.544E-05
TOTAL CLASS 3	5.995E+00	1.723E-05
GRAND TOTAL	1.197E+01	1.178E-03

PROGRAM S T P (VERSION 1.1) RAN ON 10 9 1952
 * * * STP QUALIFICATION EXAMPLE 2A KEY LETTER X
 * * STEP ACTIVITIES AFTER 1 SECOND

STP GAMMA SHIELDING INFORMATION CALCULATED

COMPONENT 1 VOLUME 1

CONVERSION FACTOR = 1.000E+00
 VOLUME = 1.000E+00 CC
 BETA SOURCE = 3.147E+05 (MEV/SEC/)
 PARTICLE SOURCE ENERGY SOURCE GROUP ENERGY
 (PHOTON/SEC/) (MEV/SEC/) (MEV-EFFECTIVE)

1	7.222E+04	2.889E+04	.40
2	1.005E+05	9.048E+04	.90
3	3.521E+04	4.754E+04	1.35
4	1.849E+04	3.328E+04	1.80
5	5.825E+03	1.281E+04	2.20
6	3.642E+03	9.468E+03	2.60
7	2.151E+04	1.147E+05	5.33 (VARIABLE)
TOTALS	2.574E+05	3.371E+05	1.31

COMPONENT 2 VOLUME 2

CONVERSION FACTOR = 1.000E+00
 VOLUME = 1.000E+00 CC
 BETA SOURCE = 2.170E+01 (MEV/SEC/)
 PARTICLE SOURCE ENERGY SOURCE GROUP ENERGY
 (PHOTON/SEC/) (MEV/SEC/) (MEV-EFFECTIVE)

1	7.002E+00	2.801E+00	.40
2	2.990E+00	2.691E+00	.90
3	3.523E+00	4.756E+00	1.35
4	2.191E+00	3.943E+00	1.80
5	2.400E-01	5.281E-01	2.20
6	8.379E-02	2.179E-01	2.60
7	1.498E-01	7.985E-01	5.33 (VARIABLE)
TOTALS	1.618E+01	1.574E+01	.97

PROGRAM S T P (VERSION 1.1)

RAN ON 10 9/1992

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S T P QUALIFICATION EXAMPLE 2A KEY LETTER X

STEP ACTIVITIES AFTER 1 MIN

TIME END TIME = 1.000E+00 MIN INTERVALS/STEP = 30
 START TIME = 1.667E-02 MIN ERROR LIMIT = 1.0000E-05
 STEP DELTA T = 9.833E-01 MIN

***** COMPONENT *****			DATA READ (BY CLASS NUMBER)		
NO.	NAME	VOLUME OR MASS	1	2	3
1	VOLUME 1	1.000E+00 CC			
		REMOVAL RATES (FROM 1) =	0.000E+00	0.000E+00	0.000E+00
		FLOW RATES (CC /HR) P (1 TO 2) =	1.000E+00	1.000E+00	1.000E+00
		TRANSM. FRACTION (1 TO 2) =	1.000E+00	1.000E-01	1.000E-02

2 VOLUME 2 1.000E+00 CC

REMOVAL RATES (FROM 2) = 0.000E+00 0.000E+00 0.000E+00

*** 30 STEPS WERE USED REQUIRING AN AVERAGE OF .00 ITERATIONS PER STEP

STEP QUALIFICATION EXAMPLE 2A KEY LETTER X

STEP ACTIVITIES AFTER 1 MIN

ACTIVITIES AT END OF THE TIME STEP

NUCLIDE	1	2
	VOLUME 1	VOLUME 2
1 KR-85M	9.832E-01	1.651E-02
2 KR-85	9.835E-01	1.653E-02
3 KR-90	2.716E-01	4.565E-03
4 XK-131M	9.834E-01	1.653E-02
5 BR-85	7.722E-01	1.298E-03
6 I-131	9.835E-01	1.653E-03
7 RB-90M	8.467E-01	2.080E-04
8 RB-90	8.698E-01	9.129E-04
9 SR-90	9.835E-01	1.653E-04
10 Y-90	9.835E-01	1.653E-04
11 TK-131M	9.831E-01	1.652E-04
12 TK-131	9.625E-01	1.618E-04
VOLUME	1.000E+00 CC	1.000E+00 CC
TOTAL CLASS 1	3.222E+00	5.413E-02
TOTAL CLASS 2	1.756E+00	2.951E-03
TOTAL CLASS 3	5.629E+00	1.778E-03
GRAND TOTAL	1.061E+01	5.886E-02

* * * STP QUALIFICATION EXAMPLE 2A KEY LETTER X

* * STEP ACTIVITIES AFTER 1 MIN

STP GAMMA SHIELDING INFORMATION CALCULATED

COMPONENT 1 VOLUME 1

CONVERSION FACTOR = 1.000E+00

VOLUME = 1.000E+00 CC

BETA SOURCE = 2.526E+05 (MEV/SEC/)

	PARTICLE SOURCE (PHOTON/SEC/)	ENERGY SOURCE (MEV/SEC/)	GROUP ENERGY (MEV-EFFECTIVE)
--	-----------------------------------	------------------------------	---------------------------------

1	6.589E+04	2.636E+04	.40
2	8.583E+04	7.724E+04	.90
3	2.466E+04	3.329E+04	1.35
4	1.132E+04	2.038E+04	1.80
5	4.659E+03	1.025E+04	2.20
6	2.991E+03	7.777E+03	2.60
7	1.833E+04	9.770E+04	5.33 (VARIABLE)

TOTALS	2.137E+05	2.730E+05	1.28
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COMPONENT 2 VOLUME 2

CONVERSION FACTOR = 1.000E+00

VOLUME = 1.000E+00 CC

BETA SOURCE = 7.672E+02 (MEV/SEC/)

	PARTICLE SOURCE (PHOTON/SEC/)	ENERGY SOURCE (MEV/SEC/)	GROUP ENERGY (MEV-EFFECTIVE)
--	-----------------------------------	------------------------------	---------------------------------

1	3.341E+02	1.336E+02	.40
2	7.576E+01	6.818E+01	.90
3	6.448E+01	8.705E+01	1.35
4	3.886E+01	6.994E+01	1.80
5	5.246E+00	1.154E+01	2.20
6	3.046E+00	7.919E+00	2.60
7	1.376E+01	7.336E+01	5.33 (VARIABLE)

TOTALS	5.353E+02	4.516E+02	.84
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* * * PROGRAM S T P (VERSION 1.1 ) RAN ON 10. 9.1992 * * *
* * * STEP QUALIFICATION EXAMPLE 2A KEY LETTER X * * *
* * * STEP ACTIVITIES AFTER 1 HOUR

```

```

TIME      END TIME = 1.000E+00 HOUR      INTERVALS/STEP      = 30
          START TIME = 1.667E-02 HOUR      ERROR LIMIT      = 1.000E-05
STEP      DELTA T   = 9.833E-01 HOUR

```

```

***** COMPONENT ***** DATA READ (BY CLASS NUMBER)
NO.   NAME          VOLUME OR MASS      1          2          3
1 VOLUME 1          1.000E+00 CC
      REMOVAL RATES (FROM 1) = 0.000E+00 0.000E+00 0.000E+00
      FLOW RATES (CC /HR) F ( 1 TO 2) = 1.000E+00 1.000E+00 1.000E+00
      TRANSM. FRACTION ( 1 TO 2) = 1.000E+00 1.000E-01 1.000E-02

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```

2 VOLUME 2          1.000E+00 CC
      REMOVAL RATES (FROM 2) = 0.000E+00 0.000E+00 0.000E+00

```

```

*** 30 STEPS WERE USED REQUIRING AN AVERAGE OF .00 ITERATIONS PER STEP

```

PROGRAM S T P (VERSION 1.1)

RAN ON 10-9-1992

S T P QUALIFICATION EXAMPLE 2A KEY LETTER X

S T P ACTIVITIES AFTER 1 HOUR

ACTIVITIES AT END OF THE TIME STEP

	1 VOLUME 1	2 VOLUME 2
NUCLIDE		
1 KR-85M	3.185E-01	5.468E-01
2 KR-85	3.679E-01	6.321E-01
3 KR-90	1.086E-34	1.866E-34
4 KR-131M	3.670E-01	6.306E-01
5 KR-85	1.841E-07	3.164E-08
6 I-131	3.684E-01	6.314E-02
7 RB-90M	2.359E-05	4.210E-07
8 RB-90	1.440E-06	2.611E-08
9 SR-90	3.679E-01	6.321E-03
10 Y-90	3.679E-01	6.321E-03
11 TE-131M	3.595E-01	6.177E-03
12 TE-131	1.349E-01	2.319E-03
VOLUME	1.000E+00 CC	1.000E+00 CC
TOTAL CLASS 1	1.053E+00	1.809E+00
TOTAL CLASS 2	3.684E-01	6.314E-02
TOTAL CLASS 3	1.230E+00	2.114E-02
GRAND TOTAL	2.652E+00	1.894E+00

PROGRAM S T P (VERSION 1.1) RUN ON 10, 9/1992

STP QUALIFICATION EXAMPLE 2A KEY LETTER X

STEP ACTIVITIES AFTER 1 HOUR

STP GAMMA SHIELDING INFORMATION CALCULATED

COMPONENT 1 VOLUME 1

CONVERSION FACTOR = 1.000E+00

VOLUME = 1.000E+00 CC

BETA SOURCE = 3.245E+04 (MEV/SEC/)

	PARTICLE SOURCE (PHOTON/SEC/)	ENERGY SOURCE (MEV/SEC/)	GROUP ENERGY (MEV-EFFECTIVE)
--	-----------------------------------	------------------------------	---------------------------------

1	2.075E+04	8.300E+03	.40
2	1.412E+04	1.271E+04	.90
3	4.240E+03	5.723E+03	1.35
4	1.710E+02	3.078E+02	1.80
5	4.444E+02	9.778E+02	2.20
6	4.460E+01	1.160E+02	2.60
7	2.839E-01	1.343E+00	4.73 (VARIABLE)

TOTALS	3.977E+04	2.813E+04	.71
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COMPONENT 2 VOLUME 2

CONVERSION FACTOR = 1.000E+00

VOLUME = 1.000E+00 CC

BETA SOURCE = 1.516E+04 (MEV/SEC/)

	PARTICLE SOURCE (PHOTON/SEC/)	ENERGY SOURCE (MEV/SEC/)	GROUP ENERGY (MEV-EFFECTIVE)
--	-----------------------------------	------------------------------	---------------------------------

1	1.027E+04	4.107E+03	.40
2	4.487E+02	4.038E+02	.90
3	7.285E+01	9.835E+01	1.35
4	2.939E+00	5.290E+00	1.80
5	7.637E+00	1.680E+01	2.20
6	7.664E-01	1.993E+00	2.60
7	5.073E-03	2.400E-02	4.73 (VARIABLE)

TOTALS	1.080E+04	4.633E+03	.43
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* * * * * PROGRAM S T P (VERSION 1.1 )          RAN ON 10/ 9/1992 * * * * *
* * * STP QUALIFICATION EXAMPLE 2A KEY LETTER I * * *
* * STEP ACTIVITIES AFTER 1 DAY

```

```

TIME      END TIME   =  2.400E+01 HOUR      INTERVALS/STEP      =   30
          START TIME =  1.000E+00 HOUR      ERROR LIMIT       = 1.0000E-05
STEP      DELTA T    =  2.300E+01 HOUR

```

```

***** COMPONENT ***** DATA READ (BY CLASS NUMBER)
NO.   NAME          VOLUME OR MASS      1          2          3
-----
1 VOLUME 1          1.000E+00 CC

      REMOVAL RATES (FROM 1) =   0.000E+00   0.000E+00   0.000E+00
      FLOW RATES (CC /HR) F ( 1 TO 2) =   1.000E+00   1.000E+00   1.000E+00
      TRANSM. FRACTION ( 1 TO 2) =   1.000E+00   1.000E-01   1.000E-02

```

```

2 VOLUME 2          1.000E+00 CC

      REMOVAL RATES (FROM 2) =   0.000E+00   0.000E+00   0.000E+00

```

```

*** 30 STEPS WERE USED REQUIRING AN AVERAGE OF .00 ITERATIONS PER STEP

```

*** STEP QUALIFICATION EXAMPLE 2A KEY LETTER X

*** STEP ACTIVITIES AFTER 1 DAY

ACTIVITIES AT END OF THE TIME STEP

	1	2
	VOLUME 1	VOLUME 2
NUCLIDE		
1 KR-85M	9.309E-13	2.464E-02
2 KR-85	3.775E-11	9.998E-01
3 KR-90	0.000E+00	0.000E+00
4 KR-131M	3.563E-11	9.432E-01
5 BR-85	2.306-162	6.108-153
6 I-131	3.708E-11	9.278E-02
7 RB-90M	5.955-112	1.616-103
8 RB-90	3.499-113	9.495-105
9 SR-90	3.775E-11	9.999E-03
10 Y-90	3.775E-11	1.001E-02
11 YR-131M	2.168E-11	5.744E-03
12 YR-131	4.881E-12	1.293E-03
VOLUME	1.000E+00 CC	1.000E+00 CC
TOTAL CLASS 1	7.430E-11	1.968E+00
TOTAL CLASS 2	3.708E-11	9.278E-02
TOTAL CLASS 3	1.021E-10	2.705E-02
GRAND TOTAL	2.135E-10	2.088E+00

S T P QUALIFICATION EXAMPLE 2A KEY LETTER X

S T P ACTIVITIES AFTER 1 DAY

S T P GAMMA SHIELDING INFORMATION CALCULATED

COMPONENT 1 VOLUME 1

CONVERSION FACTOR = 1.000E+00

VOLUME = 1.000E+00 CC

BETA SOURCE = 2.669E-06 (MEV/SEC/)

	PARTICLE SOURCE (PHOTON/SEC/)	ENERGY SOURCE (MEV/SEC/)	GROUP ENERGY (MEV-EFFECTIVE)
--	-----------------------------------	------------------------------	---------------------------------

1	1.397E-06	5.588E-07	.40
2	8.693E-07	7.824E-07	.90
3	2.430E-07	3.281E-07	1.35
4	1.008E-08	1.815E-08	1.80
5	2.680E-08	5.897E-08	2.20
6	2.688E-09	6.988E-09	2.60
7	7.151E-106	3.382E-107	4.73 (VARIABLE)

TOTALS	2.549E-06	1.753E-06	.69
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COMPONENT 2 VOLUME 2

CONVERSION FACTOR = 1.000E+00

VOLUME = 1.000E+00 CC

BETA SOURCE = 1.562E+04 (MEV/SEC/)

	PARTICLE SOURCE (PHOTON/SEC/)	ENERGY SOURCE (MEV/SEC/)	GROUP ENERGY (MEV-EFFECTIVE)
--	-----------------------------------	------------------------------	---------------------------------

1	3.730E+03	1.492E+03	.40
2	5.343E+02	4.809E+02	.90
3	6.438E+01	8.691E+01	1.35
4	2.671E+00	4.808E+00	1.80
5	7.100E+00	1.562E+01	2.20
6	7.119E-01	1.851E+00	2.60
7	1.941E-99	9.179E-99	4.73 (VARIABLE)

TOTALS	4.339E+03	2.082E+03	.48
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***** PROGRAM S T P (VERSION 1.1)

RAN ON 10 9 1992

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*** STEP QUALIFICATION EXAMPLE 2A KEY LETTER X

*** STEP ACTIVITIES AFTER 1 MONTH

TIME	END TIME = 3.000E+01 D	INTERVALS/STEP	= 30
STEP	START TIME = 1.000E+00 D	ERROR LIMIT	= 1.0000E-05
	DELTA T = 2.900E+01 D		

***** COMPONENT *****			DATA READ (BY CLASS NUMBER)		
NO.	NAME	VOLUME OR MASS	1	2	3
1	VOLUME 1	1.000E+00 CC			
		REMOVAL RATES (FROM 1) =	0.000E+00	0.000E+00	0.000E+00
		FLOW RATES (CC /HR) F (1 TO 2) =	1.000E+00	1.000E+00	1.000E+00
		TRANSF. FRACTION (1 TO 2) =	1.000E+00	1.000E-01	1.000E-02

2 VOLUME 2 1.000E+00 CC

REMOVAL RATES (FROM 2) = 0.000E+00 0.000E+00 0.000E+00

*** 30 STEPS WERE USED REQUIRING AN AVERAGE OF .00 ITERATIONS PER STEP

STEP QUALIFICATION EXAMPLE 2A KEY LETTER Y

STEP ACTIVITIES AFTER 1 MONTH

ACTIVITIES AT END OF THE TIME STEP

		2
		VOLUME 2
NUCLIDE		
1	KR-85M	4.211E-49
2	KR-85	9.947E-01
3	KR-90	0.000E+00
4	KR-131M	1.729E-01
5	BR-85	0.000E+00
6	I-131	7.701E-03
7	RB-90M	0.000E+00
8	RB-90	0.000E+00
9	SR-90	9.980E-03
10	Y-90	9.983E-03
11	YR-131M	5.961E-10
12	YL-131	1.339E-10
VOLUME		1.000E+00 CC
TOTAL CLASS 1		1.168E+00
TOTAL CLASS 2		7.701E-03
TOTAL CLASS 3		1.996E-02
GRAND TOTAL		1.195E+00

*** PROGRAM STP (VERSION 1.1)

RAN ON 10/ 9/1992

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*** STP QUALIFICATION EXAMPLE 2A KEY LETTER X

*** STEP ACTIVITIES AFTER 1 MONTH

STP GAMMA SHIELDING INFORMATION CALCULATED

COMPONENT 1 VOLUME 1

CONVERSION FACTOR = 1.000E+00

VOLUME = 1.000E+00 CC

BETA SOURCE = 5.119-308 (MEV/SEC/)

	PARTICLE SOURCE (PHOTON/SEC/)	ENERGY SOURCE (MEV/SEC/)	GROUP ENERGY (MEV-EFFECTIVE)
--	-----------------------------------	------------------------------	---------------------------------

1	5.524-310	2.209-310	.40
2	6.506-311	5.856-311	.90
3	1.252-316	1.690-316	1.35
4	5.454-318	9.816-318	1.80
5	1.498-317	3.295-317	2.20
6	1.502-318	3.904-318	2.60
7	0.000E+00	0.000E+00	7.50 (VARIABLE)

TOTALS	6.174-310	2.795-310	.45
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COMPONENT 2 VOLUME 2

CONVERSION FACTOR = 1.000E+00

VOLUME = 1.000E+00 CC

BETA SOURCE = 1.062E+04 (MEV/SEC/)

	PARTICLE SOURCE (PHOTON/SEC/)	ENERGY SOURCE (MEV/SEC/)	GROUP ENERGY (MEV-EFFECTIVE)
--	-----------------------------------	------------------------------	---------------------------------

1	3.320E+02	1.328E+02	.40
2	1.110E+02	9.988E+01	.90
3	6.680E-06	9.019E-06	1.35
4	2.772E-07	4.990E-07	1.80
5	7.369E-07	1.621E-06	2.20
6	7.339E-08	1.921E-07	2.60
7	0.000E+00	0.000E+00	7.50 (VARIABLE)

TOTALS	4.430E+02	2.327E+02	.53
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*** END PROGRAM STP (VERSION 1.1)

TIME OFF = 9:53:47 DATE = 10/ 9/1992

*** PROGRAM STP-PC (THE SHELDER-S EDGE) IS AT YOUR SERVICE ***

Page 828 of 858

*** VERSION NUMBER = 1.1 REVISION DATE WAS 9/29/92

*** TODAY'S DATE = 10/ 9/1992 START TIME = 9:58:59

REPRODUCTION OF INPUT DATA DECK

+ + + + +

NV= 3 NS= 1

NI= 12 NR= 3 NG= 7 NL= 2

1XR-85M	1	4.2978E-05	54.0234E-03	10.0000E+00	10.0000E+00
2XR-85	1	2.0490E-09	19.0683E-06	56.5688E-06	10.0000E+00
3XR-90	1	2.1446E-02	10.0000E+00	10.0000E+00	10.0000E+00
4XR-131M	1	6.7758E-07	11.0836E-08	10.0000E+00	10.0000E+00
5XR-85	2	4.0299E-03	10.0000E+00	10.0000E+00	10.0000E+00
6I-131	2	9.9783E-07	114.9932E-06	124.6210E-04	10.0000E+00
7RB-90M	3	2.6866E-03	32.5521E-03	10.0000E+00	10.0000E+00
8RB-90	3	4.4149E-03	31.8894E-02	76.1792E-05	10.0000E+00
9SR-90	3	7.6801E-10	72.6248E-03	84.4149E-03	10.0000E+00
10Y-90	3	3.0038E-06	97.6801E-10	10.0000E+00	10.0000E+00
11YE-131M	3	6.4180E-06	10.0000E+00	10.0000E+00	10.0000E+00
12YE-131	3	4.6210E-04	111.4248E-06	10.0000E+00	10.0000E+00
		.40	.90	1.35	1.80
					2.20
					2.60
					7.50
1XR-85M		.255157+0123-3000+0000+0000+0000+0000+0581+0			+
2XR-85		.251000+0223-2000+0000+0000+0000+0000+0514+0			+
3XR-90		1.315766-1233+0462+0386+0491-1190-1448-1386+1			+
4XR-131M		.142664-2000+0000+0000+0000+0000+0000+0000+0			+
5XR-85		1.003000+0334-1233-1659-2275-2000+0000+0183+1			+
6I-131		.190317+0625-1000+0000+0000+0000+0000+0723+0			+
7RB-90M		1.388344-2855+0195+0472+0186+0118+0144+1473+1			+
8RB-90		1.960000+0277+0963-1192-1366-1111+0162+1533+1			+
9SR-90		.196000+0000+0000+0000+0000+0000+0000+0000+0			+
10Y-90		.935000+0000+0000+0000+0000+0000+0000+0000+0			+
11YE-131M		.190112+0828+0377+0219-1735-1871-2000+0227+1			+
12YE-131		.719110+0162+0142+0323-2000+0000+0000+0150+1			+

*** PROGRAM STP-PC (THE SHIELDER-S EDGE) IS AT YOUR SERVICE ***

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** VERSION NUMBER = 1.1 REVISION DATE WAS 9/29/92

* TODAY'S DATE = 10/9/1992 START TIME = 9:59.0

1 'SOURCE'

1 1.0 2 1.0 3 1.0 4 1.0 5 1.0 6 1.0

7 1.0 8 1.0 9 1.0 10 1.0 11 1.0 12 1.0

0

T

STP QUALIFICATION EXAMPLE 28 KEY LETTER U

WJ= 3

1 'VOLUME 1'

2 'VOLUME 2'

3 'VOLUME 3'

-1

SOURCE AND VOLUME INITIALIZATION

V 1 1.00 CC

V 2 1.00 CC

S 1 1 0 1.0

U 1 3 2 0.0 0.0 0.9 0.99

1 SECOND

ACTIVITIES AFTER 1 SECOND

1 MIN

ACTIVITIES AFTER 1 MIN

1 HOUR 150

ACTIVITIES AFTER 1 HOUR

24 HOUR

ACTIVITIES AFTER 1 DAY

30 D

ACTIVITIES AFTER 1 MONTH

T

T

+ + + + + + + +

....

PROGRAM S T P (VERSION 1.1)

RAN ON 10 9/1992

Page B3C of B5E

DATA FOR THIS RUN OR SERIES OF RUNS

NUMBER OF ISOTOPES (DATA CARDS) = 12

NUMBER OF COMPONENTS (ALL RUNS) = 3

NUMBER OF CLASSES OF ISOTOPES = 3

NUMBER OF SOURCES (MAXIMUM) = 1

NUMBER OF GAMMA GROUPS = 7

NUMBER OF PRECURSORS (MAXIMUM) = 2

STORAGE LOCATIONS REQUESTED =225000

STORAGE LOCATIONS USED = 1045

*** PROGRAM S T P (VERSION 1.1)

RAN ON 10 9 1992

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*** STP QUALIFICATION EXAMPLE 2B KEY LETTER U

NUCLIDE DATA INPUT (LIBRARY)

NUMBER	NAME	CLASS	LAMDA(1/HR)	PRECUSOR (NO.,RATE)-
1	XR-85M	1	1.5472E-01	5 1.5447E-01 1 0.0000E+00
2	XR-85	1	7.3764E-06	1 1.5564E-06 5 1.2024E-08
3	XR-9C	1	7.7206E+01	1 0.0000E+00 1 0.0000E+00
4	XR-131M	1	2.4393E-03	6 2.6490E-05 1 0.0000E+00
5	RR-85	2	1.4508E+01	1 0.0000E+00 1 0.0000E+00
6	I-131	2	3.5922E-03	11 2.7947E-03 12 3.5922E-03
7	RR-9CM	3	9.6718E+00	3 1.1510E+00 1 0.0000E+00
8	RR-90	3	1.5894E+01	3 1.4002E+01 7 3.6555E-01
9	SR-90	3	2.7648E-06	7 2.7012E-06 8 2.7648E-06
10	Y-90	3	1.0814E-02	9 1.0814E-02 1 0.0000E+00
11	YR-131M	3	2.3105E-02	1 0.0000E+00 1 0.0000E+00
12	YR-131	3	1.6636E+00	11 3.6931E-01 1 0.0000E+00

PROGRAM S T P (VERSION 1 1) RAN ON 10 3 1992

*** SFP QUALIFICATION EXAMPLE 2B KEY LETTER U

I	ISOTOPE	BETA MEV/DISC	GAMMA (MEV/DISC) BY GROUP AND MAX ENERGY (MEV)						
			1	2	3	4	5	6	7
	EFFECTIVE ENERGY		.400	.900	1.350	1.800	2.200	2.600	7.500
1	KR-85M	.255	.157	.000	.000	.000	.000	.000	.581
2	KR-85	.251	.000	.002	.000	.000	.000	.000	.514
3	KR-90	1.315	.077	.233	.462	.386	.049	.019	3.860
4	KR-131M	.142	.007	.000	.000	.000	.000	.000	.164
5	BR-85	1.003	.000	.033	.023	.007	.003	.000	1.830
6	I-131	.190	.317	.063	.000	.000	.000	.000	.723
7	RB-90M	1.388	.003	.855	.195	.472	.186	.118	4.730
8	RB-90	1.960	.000	.277	.096	.019	.037	.111	5.330
9	SR-90	.196	.000	.000	.000	.000	.000	.000	.000
10	Y-90	.935	.000	.000	.000	.000	.000	.000	.000
11	TK-131M	.190	.112	.828	.377	.022	.074	.009	2.270
12	TK-131	.719	.110	.162	.142	.003	.000	.000	1.500

*** STP QUALIFICATION EXAMPLE 2B KEY LETTER Q

RUN LOOP INFORMATION FOR THIS RUN FOLLOWS.

NC, NUMBER OF COMPONENTS USED IN THIS RUN LOOP = 3

KCCNC, CALC. TYPE (0/INVENTORY, 1/CONCENTRATION) = 0
 IE., -- ACT/COMP. --- ACT/GM.

NDECAY, CALCULATE DAUGHTER PRODUCTION (0/YES,1/NO) = 0
 (DEFAULT =0)

ITMAX, MAXIMUM NUMBER OF ITERATIONS PER TIME STEP = 0
 (DEFAULT = 10)

KDEBUG, DEBUG OPTION (0/NORMAL OUTPUT, 1/MUCHO) = 0

S T P QUALIFICATION EXAMPLE 2B KEY LETTER O

SOURCE LIBRARY

	1	
	SOURCE	
NOCLIDE		
1 KR-85M	1.000E+00	
2 KR-85	1.000E+00	
3 KR-90	1.000E+00	
4 KR-131M	1.000E+00	
5 BR-85	1.000E+00	
6 I-131	1.000E+00	
7 RB-90M	1.000E+00	
8 RB-90	1.000E+00	
9 SR-90	1.000E+00	
10 Y-90	1.000E+00	
11 YK-131M	1.000E+00	
12 YK-131	1.000E+00	
TOTAL CLASS 1	4.000E+00	
TOTAL CLASS 2	2.000E+00	
TOTAL CLASS 3	6.000E+00	
GRAND TOTAL	1.200E+01	

STEP QUALIFICATION EXAMPLE 2B KEY LETTER C

STEP SOURCE AND VOLUME INITIALIZATION

TIME END TIME = -1.000E+00 INTERVALS/STEP = 30
 START TIME = 0.000E+00 ERROR LIMIT = 1.0000E-05
 STEP DELTA T = 0.000E+00

***** COMPONENT *****		DATA READ (BY CLASS NUMBER)			
NO.	NAME	VOLUME OR MASS	1	2	3
1	VOLUME 1	1.000E+00 CC			
	REMOVAL RATES (FROM 1) =		0.000E+00	0.000E+00	0.000E+00
	FLOW RATES (CC /HR) F (1 TO 2) =		1.000E+00	1.000E-01	1.000E-02
	TRANSM. FRACTION (1 TO 2) =		1.000E+00	1.000E+00	1.000E+00
	FLOW RATES (CC /HR) F (1 TO 3) =		0.000E+00	9.000E-01	9.900E-01
	TRANSM. FRACTION (1 TO 3) =		1.000E+00	1.000E+00	1.000E+00
	STEP SOURCE FACTOR (FROM SOURCE 1) =		1.000E+00	1.000E+00	1.000E+00
2	VOLUME 2	1.000E+00 CC			
	REMOVAL RATES (FROM 2) =		0.000E+00	0.000E+00	0.000E+00
3	VOLUME 3	1.000E+00			
	REMOVAL RATES (FROM 3) =		0.000E+00	0.000E+00	0.000E+00
	FLOW RATES (/HR) F (3 TO 2) =		1.000E+06	0.000E+00	0.000E+00
	TRANSM. FRACTION (3 TO 2) =		1.000E+00	1.000E+00	1.000E+00

*** STEP QUALIFICATION EXAMPLE 28 KEY LETTER U

*** STEP SOURCE AND VOLUME INITIALIZATION

STEP SOURCE DATA FROM SOURCE INPUT

	1	
	VOLUME 1	
INCLUDE		
1	KR-85M	1.000E+00
2	KR-85	1.000E+00
3	KR-90	1.000E+00
4	KR-131M	1.000E+00
5	BR-85	1.000E+00
6	I-131	1.000E+00
7	RB-90M	1.000E+00
8	RB-90	1.000E+00
9	SR-90	1.000E+00
10	Y-90	1.000E+00
11	TR-131M	1.000E+00
12	TR-131	1.000E+00
VOLUME		
		1.000E+00 CC
TOTAL CLASS 1		
		4.000E+00
TOTAL CLASS 2		
		2.000E+00
TOTAL CLASS 3		
		6.000E+00
GRAND TOTAL		
		1.200E+01

PROGRAM S T P (VERSION 1.1)

RAN ON 10 9 1992

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STEP QUALIFICATION EXAMPLE 28 KEY LETTER C

STEP SOURCE AND VOLUME INITIALIZATION

ACTIVITIES AT END OF THE TIME STEP

VOLUME 1

NOCDICE

1	KR-85N	1.000E+00
2	KR-85	1.000E+00
3	KR-90	1.000E+00
4	XE-131M	1.000E+00
5	BR-85	1.000E+00
6	I-131	1.000E+00
7	RB-90N	1.000E+00
8	RB-90	1.000E+00
9	SR-90	1.000E+00
10	Y-90	1.000E+00
11	YR-131M	1.000E+00
12	YR-131	1.000E+00

VOLUME 1.000E+00 CC

TOTAL CLASS 1	4.000E+00
TOTAL CLASS 2	2.000E+00
TOTAL CLASS 3	6.000E+00
GRAND TOTAL	2.200E+01

STP QUALIFICATION EXAMPLE 28 KEY LETTER U

STP SOURCE AND VOLUME INITIALIZATION

STP GAMMA SHIELDING INFORMATION CALCULATED

COMPONENT 1 VOLUME 1

CONVERSION FACTOR = 1.000E+00

VOLUME = 1.000E+00 CC

BETA SOURCE = 3.161E+05 (MEV/SEC/)

	PARTICLE SOURCE (PHOTON/SEC/)	ENERGY SOURCE (MEV/SEC/)	GROUP ENERGY (MEV-EFFECTIVE)
--	-----------------------------------	------------------------------	---------------------------------

1	7.240E+04	2.896E+04	.40
2	1.009E+05	9.077E+04	.90
3	3.551E+04	4.794E+04	1.35
4	1.868E+04	3.363E+04	1.80
5	5.852E+03	1.287E+04	2.20
6	3.653E+03	9.498E+03	2.60
7	2.155E+04	1.149E+05	5.33 (VARIABLE)

TOTALS	2.585E+05	3.385E+05	1.31
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PROGRAM S T P (VERSION 1.1)

RAN ON 10 9 1992

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STP QUALIFICATION EXAMPLE 2B KEY LETTER C

STEP ACTIVITIES AFTER 1 SECOND

TIME END TIME = 1.000E+00 SECO INTERVALS/STEP = 30
 START TIME = 0.000E+00 ERROR LIMIT = 1.0000E-05
 STEP DELTA T = 1.000E+00 SECO

***** COMPONENT *****		DATA READ (BY CLASS NUMBER)			
NO.	NAME	VOLUME OR MASS	1	2	3
1	VOLUME 1	1.000E+00 CC			
	REMOVAL RATES (FROM 1) =		0.000E+00	0.000E+00	0.000E+00
	FLOW RATES (CC /HR) F (1 TO 2) =		1.000E+00	1.000E-01	1.000E-02
	TRANSM. FRACTION (1 TO 2) =		1.000E+00	1.000E+00	1.000E+00
	FLOW RATES (CC /HR) F (1 TO 3) =		0.000E+00	9.000E-01	9.900E-01
	TRANSM. FRACTION (1 TO 3) =		1.000E+00	1.000E+00	1.000E+00
2	VOLUME 2	1.000E+00 CC			
	REMOVAL RATES (FROM 2) =		0.000E+00	0.000E+00	0.000E+00
3	VOLUME 3	1.000E+00			
	REMOVAL RATES (FROM 3) =		0.000E+00	0.000E+00	0.000E+00
	FLOW RATES (/HR) F (3 TO 2) =		1.000E+06	0.000E+00	0.000E+00
	TRANSM. FRACTION (3 TO 2) =		1.000E+00	1.000E+00	1.000E+00

*** 30 STEPS WERE USED REQUIRING AN AVERAGE OF .00 ITERATIONS PER STEP

STEP QUALIFICATION EXAMPLE 2B KEY LETTER U

STEP ACTIVITIES AFTER 1 SECOND

ACTIVITIES AT END OF THE TIME STEP

	1 VOLUME 1	2 VOLUME 2	3 VOLUME 3
NUCLIDE			
1 KR-85M	9.997E-01	2.777E-04	3.832E-11
2 KR-85	9.997E-01	2.777E-04	2.983E-18
3 KR-90	9.785E-01	2.718E-04	0.000E+00
4 XR-131M	9.997E-01	2.777E-04	6.598E-15
5 BR-85	9.957E-01	2.766E-05	2.490E-04
6 I-131	9.997E-01	2.777E-05	2.500E-04
7 RB-90M	9.974E-01	2.814E-06	2.743E-04
8 RB-90	9.993E-01	3.303E-06	2.743E-04
9 SR-90	9.997E-01	2.777E-06	2.750E-04
10 Y-90	9.997E-01	2.777E-06	2.750E-04
11 TR-131M	9.997E-01	2.777E-06	2.750E-04
12 TR-131	9.994E-01	2.776E-06	2.749E-04
VOLUME	1.000E+00 CC	1.000E+00 CC	1.000E+00
TOTAL CLASS 1	3.978E+00	1.105E-03	3.833E-11
TOTAL CLASS 2	1.995E+00	5.544E-05	4.989E-04
TOTAL CLASS 3	5.995E+00	1.723E-05	1.648E-03
GRAND TOTAL	1.197E+01	1.178E-03	2.147E-03

S T P QUALIFICATION EXAMPLE 2B KEY LETTER U

S T P ACTIVITIES AFTER 1 SECOND

S T P GAMMA SHIELDING INFORMATION CALCULATED

COMPONENT 1 VOLUME 1

CONVERSION FACTOR = 1.000E+00

VOLUME = 1.000E+00 CC

BETA SOURCE = 3.147E+05 (MEV/SEC/)

	PARTICLE SOURCE (PHOTON/SEC/)	ENERGY SOURCE (MEV/SEC/)	GROUP ENERGY (MEV-EFFECTIVE)
--	-----------------------------------	------------------------------	---------------------------------

1	7.222E+04	2.889E+04	.40
2	1.005E+05	9.048E+04	.90
3	3.521E+04	4.754E+04	1.35
4	1.849E+04	3.328E+04	1.80
5	5.825E+03	1.281E+04	2.20
6	3.642E+03	9.468E+03	2.60
7	2.151E+04	1.147E+05	5.33 (VARIABLE)

TOTALS	2.574E+05	3.371E+05	1.31
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COMPONENT 2 VOLUME 2

CONVERSION FACTOR = 1.000E+00

VOLUME = 1.000E+00 CC

BETA SOURCE = 2.170E+01 (MEV/SEC/)

	PARTICLE SOURCE (PHOTON/SEC/)	ENERGY SOURCE (MEV/SEC/)	GROUP ENERGY (MEV-EFFECTIVE)
--	-----------------------------------	------------------------------	---------------------------------

1	7.003E+00	2.801E+00	.40
2	2.990E+00	2.691E+00	.90
3	3.523E+00	4.756E+00	1.35
4	2.191E+00	3.943E+00	1.80
5	2.400E-01	5.281E-01	2.20
6	8.379E-02	2.179E-01	2.60
7	1.498E-01	7.985E-01	5.33 (VARIABLE)

TOTALS	1.618E+01	1.574E+01	.97
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PROGRAM S T P (VERSION 1.1)

RAN ON 10 9 1962

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STEP QUALIFICATION EXAMPLE 28 KEY LETTER U

STEP ACTIVITIES AFTER 1 SECOND

STP GAMMA SHIELDING INFORMATION CALCULATED

COMPONENT 3 VOLUME 3

CONVERSION FACTOR = 1.000E+00

VOLUME = 1.000E+00

BETA SOURCE = 6.573E+01 (NEV/SEC/)

PARTICLE SOURCE ENERGY SOURCE GROUP ENERGY
(PHOTON/SEC/) (NEV/SEC/) (NEV-EFFECTIVE)

1	1.306E+01	5.225E+00	.40
2	2.494E+01	2.244E+01	.90
3	6.260E+00	8.450E+00	1.35
4	2.945E+00	5.301E+00	1.80
5	1.378E+00	3.032E+00	2.20
6	9.279E-01	2.413E+00	2.60
7	5.826E+00	3.105E+01	5.33 (VARIABLE)
TOTALS	5.534E+01	7.792E+01	1.41

• • • STEP QUALIFICATION EXAMPLE 2B KEY LETTER C

* 2 STEP ACTIVITIES AFTER 1 MIN

TIME	END TIME	=	1.000E+00 MIN	INTERVALS/STEP	=	30
STEP	START TIME	=	1.667E-02 MIN	ERROR LIMIT	=	1.0000E-05
	DELTA T	=	9.833E-01 MIN			

***** COMPONENT *****		DATA READ (BY CLASS NUMBER)			
NO.	NAME	VOLUME OR MASS	1	2	3
1	VOLUME 1	1.000E+00 CC			
	REMOVAL RATES (FROM 1) =		0.300E+00	0.000E+00	0.000E+00
	FLOW RATES (CC /HR) F (1 TO 2) =		1.000E+00	1.000E-01	1.000E-02
	TRANSM. FRACTION (1 TO 2) =		1.000E+00	1.000E+00	1.000E+00
	FLOW RATES (CC /HR) F (1 TO 3) =		0.000E+00	9.000E-01	9.900E-01
	TRANSM. FRACTION (1 TO 3) =		1.000E+00	1.000E+00	1.000E+00
2	VOLUME 2	1.000E+00 CC			
	REMOVAL RATES (FROM 2) =		0.000E+00	0.000E+00	0.000E+00
3	VOLUME 3	1.000E+00			
	REMOVAL RATES (FROM 3) =		0.000E+00	0.000E+00	0.000E+00
	FLOW RATES (/HR) F (3 TO 2) =		1.000E+06	0.000E+00	0.000E+00
	TRANSM. FRACTION (3 TO 2) =		1.000E+00	1.000E+00	1.000E+00
*** 30 STEPS WERE USED REQUIRING AN AVERAGE OF .00 ITERATIONS PER STEP					

*** STP QUALIFICATION EXAMPLE 2B KEY LETTER C

*** STEP ACTIVITIES AFTER 1 MIN

ACTIVITIES AT END OF THE TIME STEP

	1	2	3
	VOLUME 1	VOLUME 2	VOLUME 3
NUCLIDE			
1 KR-85M	9.832E-01	1.652E-02	1.804E-09
2 KR-85	9.835E-01	1.653E-02	1.404E-16
3 KR-90	2.716E-01	4.565E-03	0.000E+00
4 KR-131M	9.834E-01	1.653E-02	3.940E-13
5 BR-85	7.722E-01	1.298E-03	1.168E-02
6 I-131	9.835E-01	1.653E-03	1.488E-02
7 RB-90M	8.467E-01	2.080E-04	1.402E-02
8 RB-90	8.698E-01	9.129E-04	1.371E-02
9 SR-90	9.835E-01	1.653E-04	1.636E-02
10 Y-90	9.835E-01	1.653E-04	1.636E-02
11 TR-131M	9.831E-01	1.652E-04	1.636E-02
12 TR-131	9.625E-01	1.618E-04	1.602E-02
VOLUME	1.000E+00 CC	1.000E+00 CC	1.000E+00
TOTAL CLASS 1	3.222E+00	5.414E-02	1.805E-09
TOTAL CLASS 2	1.756E+00	2.951E-03	2.656E-02
TOTAL CLASS 3	5.629E+00	1.778E-03	9.283E-02
GRAND TOTAL	1.061E+01	5.887E-02	1.194E-01

*** STP QUALIFICATION EXAMPLE 2B KEY LETTER Q

*** STEP ACTIVITIES AFTER 1 MIN

STP GAMMA SHIELDING INFORMATION CALCULATED

COMPONENT 1 VOLUME 1

CONVERSION FACTOR = 1.000E+00

VOLUME = 1.000E+00 CC

BETA SOURCE = 2.526E+05 (MEV/SEC/)

	PARTICLE SOURCE (PHOTON/SEC/)	ENERGY SOURCE (MEV/SEC/)	GROUP ENERGY (MEV-EFFECTIVE)
--	-----------------------------------	------------------------------	---------------------------------

1	6.589E+04	2.636E+04	.40
2	8.583E+04	7.724E+04	.90
3	2.466E+04	3.329E+04	1.35
4	1.132E+04	2.038E+04	1.80
5	4.659E+03	1.025E+04	2.20
6	2.991E+03	7.777E+03	2.60
7	1.833E+04	9.770E+04	5.33 (VARIABLE)

TOTALS	2.137E+05	2.730E+05	1.28
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COMPONENT 2 VOLUME 2

CONVERSION FACTOR = 1.000E+00

VOLUME = 1.000E+00 CC

BETA SOURCE = 7.674E+02 (MEV/SEC/)

	PARTICLE SOURCE (PHOTON/SEC/)	ENERGY SOURCE (MEV/SEC/)	GROUP ENERGY (MEV-EFFECTIVE)
--	-----------------------------------	------------------------------	---------------------------------

1	3.343E+02	1.337E+02	.40
2	7.576E+01	6.818E+01	.90
3	6.448E+01	8.705E+01	1.35
4	3.886E+01	6.994E+01	1.80
5	5.246E+00	1.154E+01	2.20
6	3.046E+00	7.919E+00	2.60
7	1.376E+01	7.336E+01	5.33 (VARIABLE)

TOTALS	5.355E+02	4.517E+02	.84
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PROGRAM S T P (VERSION 1.1)

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*** STEP QUALIFICATION EXAMPLE 2B KEY LETTER C

*** STEP ACTIVITIES AFTER 1 MIN

STEP GAMMA SHIELDING INFORMATION CALCULATED

COMPONENT 3 VOLUME 3

CONVERSION FACTOR = 1.000E+00

VOLUME = 1.000E+00

BETA SOURCE = 3.478E+03 (MEV/SEC/)

	PARTICLE SOURCE (PECTON/SEC/)	ENERGY SOURCE (MEV/SEC/)	GROUP ENERGY (MEV-EFFECTIVE)
--	-----------------------------------	------------------------------	---------------------------------

1	7.731E+02	3.092E+02	.40
2	1.367E+03	1.230E+03	.90
3	3.499E+02	4.724E+02	1.35
4	1.515E+02	2.726E+02	1.80
5	7.306E+01	1.607E+02	2.20
6	4.722E+01	1.228E+02	2.60
7	2.943E+02	1.569E+03	5.33 (VARIABLE)

TOTALS	3.056E+03	4.136E+03	1.35
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* * * * * PROGRAM S T P (VERSION 1.1) * * * * *
* * * * * S T P QUALIFICATION EXAMPLE 2B KEY LETTER U * * * * *
* * * * * STEP ACTIVITIES AFTER 1 HOUR * * * * *

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TIME      END TIME   = 1.000E+00 HOUR      INTERVALS/STEP      = 150
STEP      START TIME = 1.667E-02 HOUR      ERROR LIMIT         = 2.0000E-06
STEP      DELTA T    = 9.833E-01 HOUR

```

```

***** COMPONENT ***** DATA READ (BY CLASS NUMBER)
NO.  NAME          VOLUME OR MASS      1          2          3

1  VOLUME 1        1.000E+00 CC

      REMOVAL RATES (FROM 1) = 0.000E+00  0.000E+00  0.000E+00
      FLOW RATES (CC /HR) F ( 1 TO 2) = 1.000E+00  1.000E-01  1.000E-02
      TRANSM. FRACTION ( 1 TO 2) = 1.000E+00  1.000E+00  1.000E+00
      FLOW RATES (CC /HR) F ( 1 TO 3) = 0.000E+00  9.000E-01  9.900E-01
      TRANSM. FRACTION ( 1 TO 3) = 1.000E+00  1.000E+00  1.000E+00

2  VOLUME 2        1.000E+00 CC

      REMOVAL RATES (FROM 2) = 0.000E+00  0.000E+00  0.000E+00

3  VOLUME 3        1.000E+00

      REMOVAL RATES (FROM 3) = 0.000E+00  0.000E+00  0.000E+00
      FLOW RATES ( /HR) F ( 3 TO 2) = 1.000E+06  0.000E+00  0.000E+00
      TRANSM. FRACTION ( 3 TO 2) = 1.000E+00  1.000E+00  1.000E+00

*** 150 STEPS WERE USED REQUIRING AN AVERAGE OF .00 ITERATIONS PER STEP

```

*** STEP QUALIFICATION EXAMPLE 2B KEY LETTER Q

*** STEP ACTIVITIES AFTER 1 HOUR

ACTIVITIES AT END OF THE TIME STEP

	1 VOLUME 1	2 VOLUME 2	3 VOLUME 3
NUCLIDE			
1 KR-85M	3.185E-01	5.473E-01	4.398E-14
2 KR-85	3.679E-01	6.321E-01	3.424E-21
3 KR-90	1.086E-34	1.866E-34	0.000E+00
4 TR-131M	3.670E-01	6.306E-01	1.509E-11
5 BR-85	1.841E-07	3.164E-08	2.847E-07
6 I-131	3.684E-01	6.314E-02	5.698E-01
7 BR-90M	2.359E-05	4.208E-07	4.011E-05
8 BR-90	1.440E-06	2.610E-08	2.447E-06
9 SR-90	3.679E-01	6.321E-03	6.258E-01
10 Y-90	3.679E-01	6.321E-03	6.258E-01
11 TR-131M	3.595E-01	6.177E-03	6.115E-01
12 TR-131	1.349E-01	2.319E-03	2.295E-01
VOLUME	1.000E+00 CC	1.000E+00 CC	1.000E+00
TOTAL CLASS 1	1.053E+00	1.810E+00	1.514E-11
TOTAL CLASS 2	3.684E-01	6.314E-02	5.698E-01
TOTAL CLASS 3	1.230E+00	2.114E-02	2.093E+00
GRAND TOTAL	2.652E+00	1.894E+00	2.662E+00

STEP QUALIFICATION EXAMPLE 2B KEY LETTER U

STEP ACTIVITIES AFTER 1 HOUR

STEP GAMMA SHIELDING INFORMATION CALCULATES

COMPONENT 1 VOLUME 1

CONVERSION FACTOR = 1.000E+00
 VOLUME = 1.000E+00 CC
 BETA SOURCE = 3.245E+04 (MEV/SEC/)
 PARTICLE SOURCE ENERGY SOURCE GROUP ENERGY
 (PHOTON/SEC/) (MEV/SEC/) (MEV-EFFECTIVE)

1	2.075E+04	8.300E+03	.40
2	1.412E+04	1.271E+04	.90
3	4.240E+03	5.723E+03	1.35
4	1.710E+02	3.078E+02	1.80
5	4.444E+02	9.778E+02	2.20
6	4.460E+01	1.160E+02	2.60
7	2.839E-01	1.343E+00	4.73 (VARIABLE)
TOTALS	3.977E+04	2.813E+04	.71

COMPONENT 2 VOLUME 2

CONVERSION FACTOR = 1.000E+00
 VOLUME = 1.000E+00 CC
 BETA SOURCE = 1.516E+04 (MEV/SEC/)
 PARTICLE SOURCE ENERGY SOURCE GROUP ENERGY
 (PHOTON/SEC/) (MEV/SEC/) (MEV-EFFECTIVE)

1	1.028E+04	4.110E+03	.40
2	4.487E+02	4.038E+02	.90
3	7.285E+01	9.835E+01	1.35
4	2.939E+00	5.290E+00	1.80
5	7.637E+00	1.680E+01	2.20
6	7.664E-01	1.993E+00	2.60
7	5.070E-03	2.398E-02	4.73 (VARIABLE)
TOTALS	1.081E+04	4.636E+03	.43

PROGRAM S T P (VERSION 1.1)

RAN ON 10/9/1992

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STP QUALIFICATION EXAMPLE 2B KEY LETTER U

STEP ACTIVITIES AFTER 1 HOUR

STP GAMMA SHIELDING INFORMATION CALCULATED

COMPONENT 3 VOLUME 3

CONVERSION FACTOR = 1.000E+00

VOLUME = 1.000E+00

BETA SOURCE = 4.060E+04 (MEV/SEC/)

	PARTICLE SOURCE (PHOTON/SEC/)	ENERGY SOURCE (MEV/SEC/)	GROUP ENERGY (MEV-EFFECTIVE)
--	-----------------------------------	------------------------------	---------------------------------

1	2.538E+04	1.015E+04	.40
2	2.381E+04	2.143E+04	.90
3	7.212E+03	9.736E+03	1.35
4	2.909E+02	5.236E+02	1.80
5	7.560E+02	1.663E+03	2.20
6	7.587E+01	1.973E+02	2.60
7	4.828E-01	2.284E+00	4.73 (VARIABLE)

TOTALS	5.752E+04	4.370E+04	.76
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• • • SEE QUALIFICATION EXAMPLE 28 KEY LETTER C

' • STEP ACTIVITIES AFTER 1 DAY:

TIME	END TIME = 2.400E-01 HOUR	INTERVALS/STEP	= 30
STEP	START TIME = 1.000E-03 HOUR	ERROR LIMIT	= 1.000E-05
	DELTA T = 2.300E-01 HOUR		

```

***** COMPONENT *****
PO.      NAME      VOLUME OR MASS      1      2      3

1  VOLUME 1      1.000E+00 CC

      REMOVAL RATES (FROM 1) =      0.000E+00      0.000E+00      0.000E+00
      FLOW RATES (CC /HR) F ( 1 TO 2) =      1.000E+00      1.000E-01      1.000E-02
      TRANSM. FRACTION ( 1 TO 2) =      1.000E+00      1.000E+00      1.000E+00
      FLOW RATES (CC /HR) F ( 1 TO 3) =      0.000E+00      9.000E-01      9.900E-01
      TRANSM. FRACTION ( 1 TO 3) =      1.000E+00      1.000E+00      1.000E+00

2  VOLUME 2      1.000E+00 CC

      REMOVAL RATES (FROM 2) =      0.000E+00      0.000E+00      0.000E+00

3  VOLUME 3      1.000E+00

      REMOVAL RATES (FROM 3) =      0.000E+00      0.000E+00      0.000E+00
      FLOW RATES (      /HR) F ( 3 TO 2) =      1.000E+06      0.000E+00      0.000E+00
      TRANSM. FRACTION ( 3 TO 2) =      1.000E+00      1.000E+00      1.000E+00

*** 30 STEPS WERE USED REQUIRING AN AVERAGE OF .00 ITERATIONS PER STEP

```

PROGRAM S T P (VERSION 1.1)

RAN ON 10/ 9/1992

STEP QUALIFICATION EXAMPLE 28 KEY LETTER U

STEP ACTIVITIES AFTER 1 DAY

ACTIVITIES AT END OF THE TIME STEP

	1 VOLUME 1	2 VOLUME 2	3 VOLUME 3
NUCLIDE			
1 KR-85M	9.309E-13	2.466E-02	0.000E+00
2 KR-85	3.775E-11	9.998E-01	0.000E+00
3 KR-90	0.000E+00	0.000E+00	0.000E+00
4 KR-131M	3.563E-11	9.438E-01	2.358E-11
5 RB-85	2.306-162	6.108-153	5.497-152
6 I-131	3.708E-11	9.278E-02	8.902E-01
7 RB-90M	5.955-112	1.615-103	1.561-101
8 RB-90	3.499-113	9.492-105	9.172-103
9 SR-90	3.775E-11	9.999E-03	9.899E-01
10 Y-90	3.775E-11	1.001E-02	9.914E-01
11 YR-131M	2.168E-11	5.744E-03	5.686E-01
12 YR-131	4.881E-12	1.293E-03	1.280E-01
VOLUME	1.000E+00 CC	1.000E+00 CC	1.000E+00
TOTAL CLASS 1	7.430E-11	1.968E+00	2.358E-11
TOTAL CLASS 2	3.708E-11	9.278E-02	8.902E-01
TOTAL CLASS 3	1.021E-10	2.705E-02	2.678E+00
GRAND TOTAL	2.135E-10	2.088E+00	3.568E+00

*** STP QUALIFICATION EXAMPLE 2B KEY LETTER C

*** STEP ACTIVITIES AFTER 1 DAY

STP GAMMA SHIELDING INFORMATION CALCULATED

COMPONENT 1 VOLUME 1

CONVERSION FACTOR = 1.000E+00

VOLUME = 1.000E+00 CC

BETA SOURCE = 2.669E-06 (MEV/SEC/)

	PARTICLE SOURCE (PHOTON/SEC/)	ENERGY SOURCE (MEV/SEC/)	GROUP ENERGY (MEV-EFFECTIVE)
--	-----------------------------------	------------------------------	---------------------------------

1	1.397E-06	5.588E-07	.40
2	8.693E-07	7.824E-07	.90
3	2.430E-07	3.281E-07	1.35
4	1.008E-08	1.815E-08	1.80
5	2.680E-08	5.897E-08	2.20
6	2.688E-09	6.988E-09	2.60
7	7.151E-10	3.382E-10	4.73 (VARIABLE)

TOTALS	2.549E-06	1.753E-06	.69
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COMPONENT 2 VOLUME 2

CONVERSION FACTOR = 1.000E+00

VOLUME = 1.000E+00 CC

BETA SOURCE = 1.562E+04 (MEV/SEC/)

	PARTICLE SOURCE (PHOTON/SEC/)	ENERGY SOURCE (MEV/SEC/)	GROUP ENERGY (MEV-EFFECTIVE)
--	-----------------------------------	------------------------------	---------------------------------

1	3.731E+03	1.492E+03	.40
2	5.343E+02	4.809E+02	.90
3	6.438E+01	8.691E+01	1.35
4	2.671E+00	4.808E+00	1.80
5	7.100E+00	1.562E+01	2.20
6	7.119E-01	1.851E+00	2.60
7	1.940E-99	9.176E-99	4.73 (VARIABLE)

TOTALS	4.340E+03	2.082E+03	.48
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PROGRAM S T P (VERSION 1.1)

RAN ON 10 9 1992

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*** STP QUALIFICATION EXAMPLE 2B KEY LETTER U

*** STP ACTIVITIES AFTER 1 DAY

STP GAMMA SHIELDING INFORMATION CALCULATED

COMPONENT 3 VOLUME 3

CONVERSION FACTOR = 1.000E+00

VOLUME = 1.000E+00

BETA SOURCE = 5.514E+04 (NEV/SEC/)

	PARTICLE SOURCE (PHOTON/SEC/)	ENERGY SOURCE (NEV/SEC/)	GROUP ENERGY (NEV-EFFECTIVE)
--	-----------------------------------	------------------------------	---------------------------------

1	3.330E+04	1.332E+04	.40
2	2.250E+04	2.025E+04	.90
3	6.373E+03	8.604E+03	1.35
4	2.645E+02	4.760E+02	1.80
5	7.029E+02	1.546E+03	2.20
6	7.048E+01	1.832E+02	2.60
7	1.875E-97	8.868E-97	4.73 (VARIABLE)

TOTALS-	6.320E+04	4.437E+04	.70
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PROGRAM S T P (VERSION 1.1)

RAN ON 10/ 9/1992

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STEP QUALIFICATION EXAMPLE 2B KEY LETTER U

STEP ACTIVITIES AFTER 1 MONTH

TIME	END TIME = 3.000E+01 D	INTERVALS/STEP	= 30
STEP	START TIME = 1.000E+00 D	ERROR LIMIT	= 1.0000E-05
	DELTA T = 2.900E+01 D		

***** COMPONENT *****		DATA READ (BY CLASS NUMBER)			
NO.	NAME	VOLUME OR MASS	1	2	3
1	VOLUME 1	1.000E+00 CC			
	REMOVAL RATES (FROM 1) =		0.000E+00	0.000E+00	0.000E+00
	FLOW RATES (CC /HR) F (1 TO 2) =		1.000E+00	1.000E-01	1.000E-02
	TRANSM. FRACTION (1 TO 2) =		1.000E+00	1.000E+00	1.000E+00
	FLOW RATES (CC /HR) F (1 TO 3) =		0.000E+00	9.000E-01	9.900E-01
	TRANSM. FRACTION (1 TO 3) =		1.000E+00	1.000E+00	1.000E+00
2	VOLUME 2	1.000E+00 CC			
	REMOVAL RATES (FROM 2) =		0.000E+00	0.000E+00	0.000E+00
3	VOLUME 3	1.000E+00			
	REMOVAL RATES (FROM 3) =		0.000E+00	0.000E+00	0.000E+00
	FLOW RATES (/HR) F (3 TO 2) =		1.000E+06	0.000E+00	0.000E+00
	TRANSM. FRACTION (3 TO 2) =		1.000E+00	1.000E+00	1.000E+00

*** 30 STEPS WERE USED REQUIRING AN AVERAGE OF .00 ITERATIONS PER STEP

PROGRAM S T P (VERSION 1.1)

RAN ON 10 9 1992

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S T P QUALIFICATION EXAMPLE 28 KEY LETTER U

STEP ACTIVITIES AFTER 1 MONTH

ACTIVITIES AT END OF THE TIME STEP

NUCLIDE	VOLUME 2	VOLUME 3
1 KR-85M	4.214E-49	0.000E+00
2 KR-85	9.947E-01	0.000E+00
3 KR-90	0.000E+00	0.000E+00
4 XZ-131M	1.753E-01	2.163E-12
5 BR-85	0.000E+00	0.000E+00
6 I-131	7.701E-03	8.167E-02
7 RB-90M	0.000E+00	0.000E+00
8 RB-90	0.000E+00	0.000E+00
9 SR-90	9.980E-03	9.880E-01
10 Y-90	9.983E-03	9.883E-01
11 TE-131M	5.961E-10	5.901E-08
12 TE-131	1.339E-10	1.326E-08
VOLUME	1.000E+00 CC	1.000E+00
TOTAL CLASS 1	1.170E+00	2.163E-12
TOTAL CLASS 2	7.701E-03	8.167E-02
TOTAL CLASS 3	1.996E-02	1.976E+00
GRAND TOTAL	1.198E+00	2.058E+00

PROGRAM S T P (VERSION 1.1)
 RUN ON 10/9/89
 *** SEP QUALIFICATION EXAMPLE 2B KEY LETTER C ***
 *** STEP ACTIVITIES AFTER 1 MONTH ***

SEP GAMMA SHIELDING INFORMATION CALCULATED

COMPONENT 1 VOLUME 1

CONVERSION FACTOR = 1.000E+00
 VOLUME = 1.000E+00 CC
 BETA SOURCE = 3.477-308 (MEV/SEC/)

	PARTICLE SOURCE (PHOTON/SEC/)	ENERGY SOURCE (MEV/SEC/)	GROUP ENERGY (MEV-EFFECTIVE)
1	4.299-310	1.720-310	.40
2	5.436-311	4.893-311	.90
3	1.252-316	1.690-316	1.35
4	5.454-318	9.816-318	1.80
5	1.498-317	3.295-317	2.20
6	1.502-318	3.904-318	2.60
7	0.000E+00	0.000E+00	7.50 (VARIABLE)
TOTALS	4.843-310	2.209-310	.46

COMPONENT 2 VOLUME 2

CONVERSION FACTOR = 1.000E+00
 VOLUME = 1.000E+00 CC
 BETA SOURCE = 1.063E+04 (MEV/SEC/)

	PARTICLE SOURCE (PHOTON/SEC/)	ENERGY SOURCE (MEV/SEC/)	GROUP ENERGY (MEV-EFFECTIVE)
1	3.335E+02	1.334E+02	.40
2	1.110E+02	9.988E+01	.90
3	6.680E-06	9.019E-06	1.35
4	2.772E-07	4.990E-07	1.80
5	7.369E-07	1.621E-06	2.20
6	7.389E-08	1.921E-07	2.60
7	0.000E+00	0.000E+00	7.50 (VARIABLE)
TOTALS	4.445E+02	2.333E+02	.52

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* * * PROGRAM S T P (VERSION 1.1 )
* * * STP QUALIFICATION EXAMPLE 2B KEY LETTER U
* * * STEP ACTIVITIES AFTER 1 MONTH

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STP GAMMA SHIELDING INFORMATION CALCULATED

COMPONENT 3 VOLUME 3

```

CONVERSION FACTOR = 1.000E+00
VOLUME            = 1.000E+00
BETA SOURCE       = 4.193E+04 (MEV/SEC/ )

```

	PARTICLE SOURCE (PHOTON/SEC/)	ENERGY SOURCE (MEV/SEC/)	GROUP ENERGY (MEV-EFFECTIVE)
1	2.395E+03	9.579E+02	.40
2	2.099E+02	1.889E+02	.90
3	6.614E-04	8.928E-04	1.35
4	2.745E-05	4.940E-05	1.80
5	7.295E-05	1.605E-04	2.20
6	7.315E-06	1.902E-05	2.60
7	0.000E+00	0.000E+00	7.50 (VARIABLE)
TOTALS	2.605E+03	1.147E+03	.44

* * * END PROGRAM S T P (VERSION 1.1)

TIME OFF = 10: 9:33 DATE = 10/ 9/1992

Title Verification of Computer Program Page C1 of C27

STP (PC) Version 1.1 EGS-TR-910600-18 Project All

Calculated by EMD

Date 10/23/92 Checked by DWW

Date 10/26/92

Appendix C
Example 3

*** PROGRAM STOP - PROGRAM SELECTION EDGE IS AT YOUR SERVICE ***

*** VERSION NUMBER = 1.1 REVISION DATE WAS 9/29/92

*** TODAY'S DATE = 10/9/1992 START TIME = 10:55:40

REPRODUCTION OF INPUT DATA DECK

+ + + + +

NV= 3 NS= 1

NI= 12 NK= 3 NG= 7 NL= 2

1KR-85M	1	4.2978E-05	54.0234E-03	10.0000E+00	10.0000E+00			
2KR-85	1	2.0490E-09	19.0683E-06	56.5688E-06	10.0000E+00			
3KR-90	1	2.1446E-02	10.0000E+00	10.0000E+00	10.0000E+00			
4XE-131M	1	6.7758E-07	61.0836E-08	10.0000E+00	10.0000E+00			
5BR-85	2	4.0299E-03	10.0000E+00	10.0000E+00	10.0000E+00			
61-131	2	9.9783E-07	114.9932E-06	124.6210E-04	10.0000E+00			
7RB-90M	3	2.6866E-03	32.5521E-03	10.0000E+00	10.0000E+00			
8RB-90	3	4.4149E-03	31.8894E-02	76.1792E-05	10.0000E+00			
9SR-90	3	7.6801E-10	72.6248E-03	84.4149E-03	10.0000E+00			
10Y-90	3	3.0038E-06	97.6801E-10	10.0000E+00	10.0000E+00			
11TX-131M	3	6.4180E-06	10.0000E+00	10.0000E+00	10.0000E+00			
12TX-131	3	4.6210E-04	111.4248E-06	10.0000E+00	10.0000E+00			
		.40	.90	1.35	1.80	2.20	2.60	7.50

1KR-85M	.255157+0123-3000+0000+0000+0000+0000+0581+0	+
2KR-85	.251000+0223-2000+0000+0000+0000+0000+0514+0	+
3KR-90	1.315766-1233+0462+0386+0491-1190-1448-1386+1	+
4XE-131M	.142664-2000+0000+0000+0000+0000+0000+0164+0	+
5BR-85	1.003000+0334-1233-1659-2275-2000+0000+0183+1	+
61-131	.190317+0625-1000+0000+0000+0000+0000+0723+0	+
7RB-90M	1.388344-2855+0195+0472+0186+0118+0144+1473+1	+
8RB-90	1.960000+0277+0963-1192-1366-1111+0162+1533+1	+
9SR-90	.196000+0000+0000+0000+0000+0000+0000+0000+0	+
10Y-90	.935000+0000+0000+0000+0000+0000+0000+0000+0	+
11TX-131M	.190112+0828+0377+0219-1735-1871-2000+0227+1	+
12TX-131	.719110+0162+0142+0323-2000+0000+0000+0150+1	+

*** PROGRAM STP-PC (THE SHIELDER-S EDGE) IS AT YOUR SERVICE ***

** VERSION NUMBER = 1.1 REVISION DATE WAS 9/29/92

* TODAY'S DATE = 10/9/1992 START TIME = 10:55:41

1 'SOURCE'
 1 1.0 2 1.0 3 1.0 4 1.0 5 1.0 6 1.0
 7 1.0 8 1.0 9 1.0 10 1.0 11 1.0 12 1.0

0

T

STP QUALIFICATION EXAMPLE 3 RECYCLE CAPABILITY

NJ= 2

1 'VOLUME 1'

2 'VOLUME 2'

-1

SOURCE AND VOLUME INITIALIZATION

V 1 1.00 CC

V 2 1.00 CC

S 1 1 0 1.0

F 1 2 0 1.0

F 2 1 0 1.0

1 SECOND

ACTIVITIES AFTER 1 SECOND

1 MIN

ACTIVITIES AFTER 1 MIN

1 HOUR

ACTIVITIES AFTER 1 HOUR

24 HOUR

ACTIVITIES AFTER 1 DAY

30 D

ACTIVITIES AFTER 1 MONTH

T

T

+ + + + + + + +

PROGRAM S T P (VERSION 1.1)

RAN ON 10/ 9/1992

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DATA FOR THIS RUN OR SERIES OF RUNS

NUMBER OF ISOTOPES (DATA CARDS) = 12

NUMBER OF COMPONENTS (ALL RUNS) = 3

NUMBER OF CLASSES OF ISOTOPES = 3

NUMBER OF SOURCES (MAXIMUM) = 1

NUMBER OF GAMMA GROUPS = 7

NUMBER OF PRECURSORS (MAXIMUM) = 2

STORAGE LOCATIONS REQUESTED =225000

STORAGE LOCATIONS USED = 1045

PROGRAM S T P (VERSION 1.1)

RAN ON 10-9-1992

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*** STEP QUALIFICATION EXAMPLE 3 RECYCLE CAPABILITY

NUCLIDE DATA INPUT (LIBRARY)

NUMBER	NAME	CLASS	LAMDA(1/HR)	PRECURSOR (NO.,RATE)-
1	KR-85M	1	1.5472E-01	5 1.5447E-01 1 0.0000E+00
2	KR-85	1	7.3764E-06	1 1.5564E-06 5 1.2024E-08
3	KR-90	1	7.7206E-01	1 0.0000E+00 1 0.0000E+00
4	XR-131M	1	2.4393E-03	6 2.6490E-05 1 0.0000E+00
5	RR-85	2	1.4508E-01	1 0.0000E+00 1 0.0000E+00
6	I-131	2	3.5922E-03	11 2.7947E-03 12 3.5922E-03
7	RR-90M	3	9.6718E-00	3 1.1510E+00 1 0.0000E+00
8	RR-90	3	1.5894E-01	3 1.4002E-01 7 3.6555E-01
9	SR-90	3	2.7648E-06	7 2.7012E-06 8 2.7648E-06
10	Y-90	3	1.0814E-02	9 1.0814E-02 1 0.0000E+00
11	TR-131M	3	2.3105E-02	1 0.0000E+00 1 0.0000E+00
12	TR-131	3	1.6636E+00	11 3.6931E-01 1 0.0000E+00

S T P QUALIFICATION EXAMPLE 3 RECYCLE CAPABILITY

I	ISOTOPE	BETA MEV/DISC	GAMMA (MEV/DISC) BY GROUP AND MAX ENERGY (MEV)						
			1	2	3	4	5	6	7
	EFFECTIVE ENERGY		.400	.900	1.350	1.800	2.200	2.600	7.500
1	KR-85M	.255	.157	.000	.000	.000	.000	.000	.581
2	KR-85	.251	.000	.002	.000	.000	.000	.000	.514
3	KR-90	1.315	.077	.233	.462	.386	.049	.019	3.860
4	KR-131M	.142	.007	.000	.000	.000	.000	.000	.164
5	BR-85	1.003	.000	.033	.023	.007	.003	.000	1.830
6	I-131	.190	.317	.063	.000	.000	.000	.000	.723
7	RB-90M	1.388	.003	.855	.195	.472	.186	.118	1.440
8	RB-90	1.960	.000	.277	.096	.019	.037	.111	1.620
9	SR-90	.196	.000	.000	.000	.000	.000	.000	.000
10	Y-90	.935	.000	.000	.000	.000	.000	.000	.000
11	TR-131M	.190	.112	.828	.377	.022	.074	.009	2.270
12	TR-131	.719	.110	.162	.142	.003	.000	.000	1.500

*** SEP QUALIFICATION EXAMPLE 3 RECYCLE CAPABILITY ***

RUN LOOP INFORMATION FOR THIS RUN FOLLOWS:

NJ. NUMBER OF COMPONENTS USED IN THIS RUN LOOP = 2

KCONC. CALC TYPE (0/INVENTORY, 1/CONCENTRATION) = 0
IN. -- ACT/COMP. --- ACT/GH.

NDECAY. CALCULATE DAUGHTER PRODUCTION (0/YES, 1/NO) = 0
(DEFAULT = 0)

ITMAX. MAXIMUM NUMBER OF ITERATIONS PER TIME STEP = 0
(DEFAULT = 10)

KDEBUG. DEBUG OPTION (0/NORMAL OUTPUT, 1/NOCHO) = 0

*** STP QUALIFICATION EXAMPLE 3 RECYCLE CAPABILITY

SOURCE LIBRARY

		1
		SOURCE
NUCLIDE		
1	KR-85M	1.000E+00
2	KR-85	1.000E+00
3	KR-90	1.000E+00
4	YX-131M	1.000E+00
5	BR-85	1.000E+00
6	I-131	1.000E+00
7	RB-90M	1.000E+00
8	RB-90	1.000E+00
9	SR-90	1.000E+00
10	Y-90	1.000E+00
11	YX-131M	1.000E+00
12	YX-131	1.000E+00
TOTAL CLASS 1		4.000E+00
TOTAL CLASS 2		2.000E+00
TOTAL CLASS 3		6.000E+00
GRAND TOTAL		1.200E+01

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*** STEP QUALIFICATION EXAMPLE 3 RECYCLE CAPABILITY

*** STEP SOURCE AND VOLUME INITIALIZATION

TIME END TIME = -1.000E+00 INTERVALS/STEP = 30
 STEP START TIME = 0.000E+00 ERROR LIMIT = 1.000E-05
 DELTA T = 0.000E+00

***** COMPONENT *****			DATA READ (BY CLASS NUMBER)		
NO.	NAME	VOLUME OR MASS	1	2	3
1	VOLUME 1	1.000E+00 CC			
	REMOVAL RATES (FROM 1) =		0.000E+00	0.000E+00	0.000E+00
	FLOW RATES (CC /HR) F (1 TO 2) =		1.000E+00	1.000E+00	1.000E+00
	TRANSM. FRACTION (1 TO 2) =		1.000E+00	1.000E+00	1.000E+00
	STEP SOURCE FACTOR (FROM SOURCE 1) =		1.000E+00	1.000E+00	1.000E+00
2	VOLUME 2	1.000E+00 CC			
	REMOVAL RATES (FROM 2) =		0.000E+00	0.000E+00	0.000E+00
	FLOW RATES (CC /HR) F (2 TO 1) =		1.000E+00	1.000E+00	1.000E+00
	TRANSM. FRACTION (2 TO 1) =		1.000E+00	1.000E+00	1.000E+00

* * * PROGRAM S T P VERSION 1.1
 * * * STEP QUALIFICATION EXAMPLE 3 RECYCLE CAPABILITY
 * * * STEP SOURCE AND VOLUME INITIALIZATION

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...

STEP SOURCE DATA FROM SOURCE INPUT

		1
		VOLUME 1
NUCLIDE		
1 KR-85M	1.000E+00	
2 KR-85	1.000E+00	
3 KR-90	1.000E+00	
4 KR-131M	1.000E+00	
5 BR-85	1.000E+00	
6 I-131	1.000E+00	
7 BR-90M	1.000E+00	
8 BR-90	1.000E+00	
9 SR-90	1.000E+00	
10 Y-90	1.000E+00	
11 TR-131M	1.000E+00	
12 TR-131	1.000E+00	
VOLUME	1.000E+00 CC	
TOTAL CLASS 1	4.000E+00	
TOTAL CLASS 2	2.000E+00	
TOTAL CLASS 3	6.000E+00	
GRAND TOTAL	1.200E+01	

*** STP QUALIFICATION EXAMPLE 3 RECYCLE CAPABILITY

*** STEP SOURCE AND VOLUME INITIALIZATION

ACTIVITIES AT END OF THE TIME STEP

	1
VOLUME :	
NUCLIDE	
1	KR-85M 1.000E+00
2	KR-85 1.000E+00
3	KR-90 1.000E+00
4	XX-131M 1.000E+00
5	RR-85 1.000E+00
6	I-131 1.000E+00
7	RR-90M 1.000E+00
8	RR-90 1.000E+00
9	SR-90 1.000E+00
10	Y-90 1.000E+00
11	YK-131M 1.000E+00
12	YK-131 1.000E+00
VOLUME	1.000E+00 CC
TOTAL CLASS 1	4.000E+00
TOTAL CLASS 2	2.000E+00
TOTAL CLASS 3	6.000E+00
GRAND TOTAL	1.200E+01

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*** STP QUALIFICATION EXAMPLE 3 RECYCLE CAPABILITY

*** STEP SOURCE AND VOLUME INITIALIZATION

STP GAMMA SHIELDING INFORMATION CALCULATED

COMPONENT 1 VOLUME 1

CONVERSION FACTOR = 1.000E+00

VOLUME = 1.000E+00 CC

BETA SOURCE = 3.161E+05 (NEV/SEC/)

	PARTICLE SOURCE (PHOTON/SEC/)	ENERGY SOURCE (NEV/SEC/)	GROUP ENERGY (NEV-EFFECTIVE)
--	-----------------------------------	------------------------------	---------------------------------

1	7.240E+04	2.896E+04	.40
2	1.009E+05	9.077E+04	.90
3	3.551E+04	4.794E+04	1.35
4	1.868E+04	3.363E+04	1.80
5	5.852E+03	1.287E+04	2.20
6	3.653E+03	9.498E+03	2.60
7	2.155E+04	1.149E+05	5.33 (VARIABLE)

TOTALS	2.585E+05	3.385E+05	1.31
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• • • STP QUALIFICATION EXAMPLE 3 RECYCLE CAPABILITY

• • STEP ACTIVITIES AFTER 1 SECOND

```

TIME      END TIME  =  1.000E+00 SECO      INTERVALS/STEP      =  30
STEP      START TIME =  0.000E+00          ERROR LIMIT      =  1.0000E-05
          DELTA T   =  1.000E+00 SECO

```

***** COMPONENT *****		DATA READ (BY CLASS NUMBER)			
NO.	NAME	VOLUME OR MASS	1	2	3
1	VOLUME 1	1.000E+00 CC			
	REMOVAL RATES (FROM 1) =		0.000E+00	0.000E+00	0.000E+00
	FLOW RATES (CC /HR) F (1 TO 2) =		1.000E+00	1.000E+00	1.000E+00
	TRANSM. FRACTION (1 TO 2) =		1.000E+00	1.000E+00	1.000E+00

2 VOLUME 2		1.000E+00 CC		
REMOVAL RATES (FROM 2) =		0.000E+00	0.000E+00	0.000E+00
FLOW RATES (CC /HR) F (2 TO 1) =		1.000E+00	1.000E+00	1.000E+00
TRANSM. FRACTION (2 TO 1) =		1.000E+00	1.000E+00	1.000E+00

```

***** CODE SENSES A FEEDBACK LOOP AND/OR VARIABLE VOLUME *****
***** NSTEP IS AUTOMATICALLY INCREASED BY A FACTOR OF 3 *****

```

*** 90 STEPS WERE USED REQUIRING AN AVERAGE OF 1.00 ITERATIONS PER STEP

*** STEP QUALIFICATION EXAMPLE 3 RECYCLE CAPABILITY

*** STEP ACTIVITIES AFTER 1 SECOND

ACTIVITIES AT END OF THE TIME STEP

	1	2
	VOLUME 1	VOLUME 2
NUCLIDE		
1 KR-85M	9.997E-01	2.777E-04
2 KR-85	9.997E-01	2.777E-04
3 KR-90	9.785E-01	2.718E-04
4 XK-131M	9.997E-01	2.777E-04
5 BR-85	9.957E-01	2.766E-04
6 I-131	9.997E-01	2.777E-04
7 RB-90M	9.974E-01	2.770E-04
8 RB-90	9.993E-01	2.776E-04
9 SR-90	9.997E-01	2.777E-04
10 Y-90	9.997E-01	2.777E-04
11 YK-131M	9.997E-01	2.777E-04
12 YK-131	9.994E-01	2.776E-04
VOLUME	1.000E+00 CC	1.000E+00 CC
TOTAL CLASS 1	3.978E+00	1.105E-03
TOTAL CLASS 2	1.995E+00	5.543E-04
TOTAL CLASS 3	5.995E+00	1.665E-03
GRAND TOTAL	1.197E+01	3.325E-03

*** STP QUALIFICATION EXAMPLE 3 RECYCLE CAPABILITY

*** STEP ACTIVITIES AFTER 1 SECOND

STP GAMMA SHIELDING INFORMATION CALCULATED

COMPONENT 1 VOLUME 1

CONVERSION FACTOR = 1.000E+00

VOLUME = 1.000E+00 CC

BETA SOURCE = 3.147E+05 (NEV/SEC/)

	PARTICLE SOURCE (PHOTON/SEC/)	ENERGY SOURCE (NEV/SEC/)	GROUP ENERGY (NEV-EFFECTIVE)
--	-----------------------------------	------------------------------	---------------------------------

1	7.222E+04	2.889E+04	.40
2	1.005E+05	9.048E+04	.90
3	3.521E+04	4.754E+04	1.35
4	1.849E+04	3.328E+04	1.80
5	5.825E+03	1.281E+04	2.20
6	3.642E+03	9.468E+03	2.60
7	2.151E+04	1.147E+05	5.33 (VARIABLE)

TOTALS	2.574E+05	3.371E+05	1.31
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COMPONENT 2 VOLUME 2

CONVERSION FACTOR = 1.000E+00

VOLUME = 1.000E+00 CC

BETA SOURCE = 8.742E+01 (NEV/SEC/)

	PARTICLE SOURCE (PHOTON/SEC/)	ENERGY SOURCE (NEV/SEC/)	GROUP ENERGY (NEV-EFFECTIVE)
--	-----------------------------------	------------------------------	---------------------------------

1	2.006E+01	8.025E+00	.40
2	2.792E+01	2.513E+01	.90
3	9.781E+00	1.320E+01	1.35
4	5.135E+00	9.243E+00	1.80
5	1.618E+00	3.560E+00	2.20
6	1.012E+00	2.630E+00	2.60
7	5.975E+00	3.185E+01	5.33 (VARIABLE)

TOTALS	7.151E+01	9.364E+01	1.31
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STEP QUALIFICATION EXAMPLE 3 RECYCLE CAPABILITY

STEP ACTIVITIES AFTER 1 MIN

TIME END TIME = 1.000E+00 MIN INTERVALS/STEP = 30
 STEP START TIME = 1.667E-02 MIN ERROR LIMIT = 1.0000E-05
 DELTA T = 9.833E-01 MIN

***** COMPONENT *****		DATA READ (BY CLASS NUMBER)			
NO.	NAME	VOLUME OR MASS	1	2	3
1	VOLUME 1	1.000E+00 CC			
	REMOVAL RATES (FROM 1) =		0.000E+00	0.000E+00	0.000E+00
	FLOW RATES (CC /HR) F (1 TO 2) =		1.000E+00	1.000E+00	1.000E+00
	TRANSM. FRACTION (1 TO 2) =		1.000E+00	1.000E+00	1.000E+00

2	VOLUME 2	1.000E+00 CC			
	REMOVAL RATES (FROM 2) =		0.000E+00	0.000E+00	0.000E+00
	FLOW RATES (CC /HR) F (2 TO 1) =		1.000E+00	1.000E+00	1.000E+00
	TRANSM. FRACTION (2 TO 1) =		1.000E+00	1.000E+00	1.000E+00

***** CODE SENSES A FEEDBACK LOOP AND/OR VARIABLE VOLUME *****
 ***** NSTEP IS AUTOMATICALLY INCREASED BY A FACTOR OF 3 *****

*** 90 STEPS WERE USED REQUIRING AN AVERAGE OF 1.01 ITERATIONS PER STEP

* * * PROGRAM S T P (VERSION 1.1)
 * * * STP QUALIFICATION EXAMPLE 3 RECYCLE CAPABILITY
 * * STEP ACTIVITIES AFTER 1 MIN

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ACTIVITIES AT END OF THE TIME STEP

	1 VOLUME 1	2 VOLUME 2
NUCLIDE		
1 KR-85M	9.833E-01	1.639E-02
2 KR-85	9.836E-01	1.639E-02
3 KR-90	2.716E-01	4.527E-03
4 KR-131M	9.836E-01	1.639E-02
5 BR-85	7.723E-01	1.287E-02
6 I-131	9.837E-01	1.639E-02
7 RB-90M	8.468E-01	1.411E-02
8 RB-90	8.699E-01	1.450E-02
9 SR-90	9.836E-01	1.639E-02
10 Y-90	9.836E-01	1.639E-02
11 TR-131M	9.832E-01	1.639E-02
12 TR-131	9.627E-01	1.604E-02
VOLUME	1.000E+00 CC	1.000E+00 CC
TOTAL CLASS 1	3.222E+00	5.370E-02
TOTAL CLASS 2	1.756E+00	2.926E-02
TOTAL CLASS 3	5.630E+00	9.382E-02
GRAND TOTAL	1.061E+01	1.768E-01

*** STP QUALIFICATION EXAMPLE 3 RECYCLE CAPABILITY

*** STEP ACTIVITIES AFTER 1 MIN

STP GAMMA SHIELDING INFORMATION CALCULATED

COMPONENT 1 VOLUME 1

CONVERSION FACTOR = 1.000E+00

VOLUME = 1.000E+00 CC

BETA SOURCE = 2.526E+05 (MEV/SEC/)

	PARTICLE SOURCE (PHOTON/SEC/)	ENERGY SOURCE (MEV/SEC/)	GROUP ENERGY (MEV-EFFECTIVE)
--	-----------------------------------	------------------------------	---------------------------------

1	6.590E+04	2.636E+04	.40
2	8.584E+04	7.725E+04	.90
3	2.466E+04	3.329E+04	1.35
4	1.133E+04	2.039E+04	1.80
5	4.660E+03	1.025E+04	2.20
6	2.991E+03	7.778E+03	2.60
7	1.833E+04	9.771E+04	5.33 (VARIABLE)

TOTALS	2.137E+05	2.730E+05	1.28
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COMPONENT 2 VOLUME 2

CONVERSION FACTOR = 1.000E+00

VOLUME = 1.000E+00 CC

BETA SOURCE = 4.210E+03 (MEV/SEC/)

	PARTICLE SOURCE (PHOTON/SEC/)	ENERGY SOURCE (MEV/SEC/)	GROUP ENERGY (MEV-EFFECTIVE)
--	-----------------------------------	------------------------------	---------------------------------

1	1.098E+03	4.393E+02	.40
2	1.430E+03	1.287E+03	.90
3	4.110E+02	5.548E+02	1.35
4	1.887E+02	3.397E+02	1.80
5	7.766E+01	1.708E+02	2.20
6	4.985E+01	1.296E+02	2.60
7	3.055E+02	1.628E+03	5.33 (VARIABLE)

TOTALS	3.562E+03	4.950E+03	1.28
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* * * PROGRAM S T P (VERSION 1.1)
 * * * STP QUALIFICATION EXAMPLE 3 RECYCLE CAPABILITY
 * * STEP ACTIVITIES AFTER 1 HOUR

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TIME END TIME = 1.000E+00 HOUR INTERVALS/STEP = 30
 START TIME = 1.667E-02 HOUR ERROR LIMIT = 1.0000E-05
 STEP DELTA T = 9.833E-01 HOUR

***** COMPONENT *****		DATA READ (BY CLASS NUMBER)			
NO.	NAME	VOLUME OR MASS	1	2	3
1	VOLUME 1	1.000E+00 CC			
	REMOVAL RATES (FROM 1) =		0.000E+00	0.000E+00	0.000E+00
	FLOW RATES (CC /HR) F (1 TO 2) =		1.000E+00	1.000E+00	1.000E+00
	TRANSM. FRACTION (1 TO 2) =		1.000E+00	1.000E+00	1.000E+00

2	VOLUME 2	1.000E+00 CC			
	REMOVAL RATES (FROM 2) =		0.000E+00	0.000E+00	0.000E+00
	FLOW RATES (CC /HR) F (2 TO 1) =		1.000E+00	1.000E+00	1.000E+00
	TRANSM. FRACTION (2 TO 1) =		1.000E+00	1.000E+00	1.000E+00

***** CODE SENSES A FEEDBACK LOOP AND/OR VARIABLE VOLUME *****
 ***** NSTEP IS AUTOMATICALLY INCREASED BY A FACTOR OF 3 *****

*** 90 STEPS WERE USED REQUIRING AN AVERAGE OF 1.22 ITERATIONS PER STEP

*** PROGRAM S T P (VERSION 1.1)

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*** STP QUALIFICATION EXAMPLE 3 RECYCLE CAPABILITY

*** STEP ACTIVITIES AFTER 1 HOUR

ACTIVITIES AT END OF THE TIME STEP

	1 VOLUME 1	2 VOLUME 2
NUCLIDE		
1 KR-85M	4.915E-01	3.743E-01
2 KR-85	5.677E-01	4.323E-01
3 KR-90	1.675E-34	1.276E-34
4 XE-131M	5.663E-01	4.313E-01
5 BR-85	2.841E-07	2.164E-07
6 I-131	5.684E-01	4.329E-01
7 RB-90M	3.640E-05	2.772E-05
8 RB-90	2.222E-06	1.692E-06
9 SR-90	5.677E-01	4.323E-01
10 Y-90	5.677E-01	4.323E-01
11 TE-131M	5.547E-01	4.225E-01
12 TE-131	2.082E-01	1.586E-01
VOLUME	1.000E+00 CC	1.000E+00 CC
TOTAL CLASS 1	1.625E+00	1.238E+00
TOTAL CLASS 2	5.684E-01	4.329E-01
TOTAL CLASS 3	1.898E+00	1.446E+00
GRAND TOTAL	4.092E+00	3.117E+00

*** STEP QUALIFICATION EXAMPLE 3 RECYCLE CAPABILITY

*** STEP ACTIVITIES AFTER 1 HOUR

STEP GAMMA SHIELDING INFORMATION CALCULATED

COMPONENT 1 VOLUME 1

CONVERSION FACTOR = 1.000E+00

VOLUME = 1.000E+00 CC

BETA SOURCE = 5.008E+04 (NEV/SEC/)

	PARTICLE SOURCE (PHOTON/SEC/)	ENERGY SOURCE (NEV/SEC/)	GROUP ENERGY (NEV-EFFECTIVE)
--	-----------------------------------	------------------------------	---------------------------------

1	3.202E+04	1.281E+04	.40
2	2.179E+04	1.961E+04	.90
3	6.542E+03	8.832E+03	1.35
4	2.639E+02	4.750E+02	1.80
5	6.858E+02	1.509E+03	2.20
6	6.882E+01	1.789E+02	2.60
7	4.381E-01	2.072E+00	4.73 (VARIABLE)

TOTALS	6.136E+04	4.341E+04	.71
--------	-----------	-----------	-----

COMPONENT 2 VOLUME 2

CONVERSION FACTOR = 1.000E+00

VOLUME = 1.000E+00 CC

BETA SOURCE = 3.814E+04 (NEV/SEC/)

	PARTICLE SOURCE (PHOTON/SEC/)	ENERGY SOURCE (NEV/SEC/)	GROUP ENERGY (NEV-EFFECTIVE)
--	-----------------------------------	------------------------------	---------------------------------

1	2.439E+04	9.754E+03	.40
2	1.659E+04	1.493E+04	.90
3	4.982E+03	6.726E+03	1.35
4	2.010E+02	3.618E+02	1.80
5	5.223E+02	1.149E+03	2.20
6	5.241E+01	1.363E+02	2.60
7	3.137E-01	1.578E+00	4.73 (VARIABLE)

TOTALS	4.674E+04	3.306E+04	.71
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*** STP QUALIFICATION EXAMPLE 3 RECYCLE CAPABILITY

*** STEP ACTIVITIES AFTER 1 DAY

TIME	END TIME = 2.400E+01 HOUR	INTERVALS/STEP	= 30
STEP	START TIME = 1.000E+00 HOUR	ERROR LIMIT	= 1.0000E-05
	DELTA T = 2.300E+01 HOUR		

***** COMPONENT *****		DATA READ (BY CLASS NUMBER)			
NO.	NAME	VOLUME OR MASS	1	2	3
1	VOLUME 1	1.000E+00 CC			
	REMOVAL RATES (FROM 1) =		0.000E+00	0.000E+00	0.000E+00
	FLOW RATES (CC /HR) F (1 TO 2) =		1.000E+00	1.000E+00	1.000E+00
	TRANSM. FRACTION (1 TO 2) =		1.000E+00	1.000E+00	1.000E+00

2	VOLUME 2	1.000E+00 CC			
	REMOVAL RATES (FROM 2) =		0.000E+00	0.000E+00	0.000E+00
	FLOW RATES (CC /HR) F (2 TO 1) =		1.000E+00	1.000E+00	1.000E+00
	TRANSM. FRACTION (2 TO 1) =		1.000E+00	1.000E+00	1.000E+00

***** CODE SENSES A FEEDBACK LOOP AND/OR VARIABLE VOLUME *****
 ***** NSTEP IS AUTOMATICALLY INCREASED BY A FACTOR OF 3 *****

*** 90 STEPS WERE USED REQUIRING AN AVERAGE OF 1.26 ITERATIONS PER STEP

*** PROGRAM S T P (VERSION 1.1)

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*** STP QUALIFICATION EXAMPLE 3 RECYCLE CAPABILITY

*** STEP ACTIVITIES AFTER 1 DAY

ACTIVITIES AT END OF THE TIME STEP

	1 VOLUME 1	2 VOLUME 2
NUCLIDE		
1 KR-85M	1.233E-02	1.233E-02
2 KR-85	4.999E-01	4.999E-01
3 KR-90	0.000E+00	0.000E+00
4 KR-131M	4.719E-01	4.719E-01
5 BR-85	3.054-152	3.054-152
6 I-131	4.911E-01	4.911E-01
7 RB-90M	7.887-102	7.887-102
8 RB-90	4.634-103	4.634-103
9 SR-90	5.000E-01	5.000E-01
10 Y-90	5.000E-01	5.000E-01
11 YR-131M	2.872E-01	2.872E-01
12 YR-131	6.465E-02	6.465E-02
VOLUME	1.000E+00 CC	1.000E+00 CC
TOTAL CLASS 1	9.841E-01	9.841E-01
TOTAL CLASS 2	4.911E-01	4.911E-01
TOTAL CLASS 3	1.352E+00	1.352E+00
GRAND TOTAL	2.827E+00	2.827E+00

STP QUALIFICATION EXAMPLE 3 RECYCLE CAPABILITY

STEP ACTIVITIES AFTER 1 DAY

STP GAMMA SHIELDING INFORMATION CALCULATED

COMPONENT 1 VOLUME 1

CONVERSION FACTOR = 1.000E+00

VOLUME = 1.000E+00 CC

BETA SOURCE = 3.535E+04 (MEV/SEC/)

	PARTICLE SOURCE (PHOTON/SEC/)	ENERGY SOURCE (MEV/SEC/)	GROUP ENERGY (MEV-EFFECTIVE)
--	-----------------------------------	------------------------------	---------------------------------

1	1.850E+04	7.401E+03	.40
2	1.151E+04	1.036E+04	.90
3	3.219E+03	4.345E+03	1.35
4	1.336E+02	2.404E+02	1.80
5	3.550E+02	7.809E+02	2.20
6	3.559E+01	9.254E+01	2.60
7	9.471E-98	4.480E-97	4.73 (VARIABLE)

TOTALS	3.376E+04	2.322E+04	.69
--------	-----------	-----------	-----

COMPONENT 2 VOLUME 2

CONVERSION FACTOR = 1.000E+00

VOLUME = 1.000E+00 CC

BETA SOURCE = 3.535E+04 (MEV/SEC/)

	PARTICLE SOURCE (PHOTON/SEC/)	ENERGY SOURCE (MEV/SEC/)	GROUP ENERGY (MEV-EFFECTIVE)
--	-----------------------------------	------------------------------	---------------------------------

1	1.850E+04	7.401E+03	.40
2	1.151E+04	1.036E+04	.90
3	3.219E+03	4.345E+03	1.35
4	1.336E+02	2.404E+02	1.80
5	3.550E+02	7.809E+02	2.20
6	3.559E+01	9.254E+01	2.60
7	9.471E-98	4.480E-97	4.73 (VARIABLE)

TOTALS	3.376E+04	2.322E+04	.69
--------	-----------	-----------	-----

```

* * * PROGRAM S T P (VERSION 1.1 )          RAN ON 10/ 9/1992  * * *
* * * STP QUALIFICATION EXAMPLE 3 RECYCLE CAPABILITY          * * *
* * STEP ACTIVITIES AFTER 1 MONTH

```

```

          END TIME = 3.000E+01 D          INTERVALS/STEP          = 30
TIME      START TIME = 1.000E+00 D          ERROR LIMIT          = 1.0000E-05
STEP      DELTA T   = 2.900E+01 D

```

```

***** COMPONENT *****
NO.  NAME          VOLUME OR MASS          DATA READ (BY CLASS NUMBER)
          1          2          3

1 VOLUME 1          1.000E+00 CC

          REMOVAL RATES (FROM 1) = 0.000E+00 0.000E+00 0.000E+00
          FLOW RATES (CC /HR) F ( 1 TO 2) = 1.000E+00 1.000E+00 1.000E+00
          TRANSM. FRACTION ( 1 TO 2) = 1.000E+00 1.000E+00 1.000E+00

2 VOLUME 2          1.000E+00 CC

          REMOVAL RATES (FROM 2) = 0.000E+00 0.000E+00 0.000E+00
          FLOW RATES (CC /HR) F ( 2 TO 1) = 1.000E+00 1.000E+00 1.000E+00
          TRANSM. FRACTION ( 2 TO 1) = 1.000E+00 1.000E+00 1.000E+00

***** CODE SENSES A FEEDBACK LOOP AND/OR VARIABLE VOLUME *****
***** NSTEP IS AUTOMATICALLY INCREASED BY A FACTOR OF 3 *****

*** 90 STEPS WERE USED REQUIRING AN AVERAGE OF 1.32 ITERATIONS PER STEP

```

*** PROGRAM S T P (VERSION 1.1)

RAN ON 10/ 9,1992

*** STP QUALIFICATION EXAMPLE 3 RECYCLE CAPABILITY

*** STEP ACTIVITIES AFTER 1 MONTH

ACTIVITIES AT END OF THE TIME STEP

	1	2
	VOLUME 1	VOLUME 2
NUCLIDE		
1 KR-85M	2.261E-49	2.261E-49
2 KR-85	4.974E-01	4.974E-01
3 KR-90	0.000E+00	0.000E+00
4 XE-131M	8.778E-02	8.778E-02
5 BR-85	0.000E+00	0.000E+00
6 I-131	4.473E-02	4.473E-02
7 RB-90M	0.000E+00	0.000E+00
8 RB-90	0.000E+00	0.000E+00
9 SR-90	4.990E-01	4.990E-01
10 Y-90	4.991E-01	4.991E-01
11 TE-131M	3.010E-08	3.010E-08
12 TE-131	6.776E-09	6.776E-09
VOLUME	1.000E+00 CC	1.000E+00 CC
TOTAL CLASS 1	5.851E-01	5.851E-01
TOTAL CLASS 2	4.473E-02	4.473E-02
TOTAL CLASS 3	9.981E-01	9.981E-01
GRAND TOTAL	1.628E+00	1.628E+00

*** PROGRAM S T P (VERSION 1.1)

RAN ON 10/ 9/1992

Page C27 of C27

*** STP QUALIFICATION EXAMPLE 3 RECYCLE CAPABILITY

*** STEP ACTIVITIES AFTER 1 MONTH

STP GAMMA SHIELDING INFORMATION CALCULATED

COMPONENT 1 VOLUME 1

CONVERSION FACTOR = 1.000E+00

VOLUME = 1.000E+00 CC

BETA SOURCE = 2.628E+04 (MEV/SEC/)

	PARTICLE SOURCE (PHOTON/SEC/)	ENERGY SOURCE (MEV/SEC/)	GROUP ENERGY (MEV-EFFECTIVE)
--	-----------------------------------	------------------------------	---------------------------------

1	1.366E+03	5.462E+02	.40
2	1.605E+02	1.445E+02	.90
3	3.374E-04	4.554E-04	1.35
4	1.400E-05	2.520E-05	1.80
5	3.721E-05	8.185E-05	2.20
6	3.731E-06	9.700E-06	2.60
7	0.000E+00	0.000E+00	7.50 (VARIABLE)

TOTALS	1.526E+03	6.907E+02	.45
--------	-----------	-----------	-----

COMPONENT 2 VOLUME 2

CONVERSION FACTOR = 1.000E+00

VOLUME = 1.000E+00 CC

BETA SOURCE = 2.628E+04 (MEV/SEC/)

	PARTICLE SOURCE (PHOTON/SEC/)	ENERGY SOURCE (MEV/SEC/)	GROUP ENERGY (MEV-EFFECTIVE)
--	-----------------------------------	------------------------------	---------------------------------

1	1.366E+03	5.462E+02	.40
2	1.605E+02	1.445E+02	.90
3	3.374E-04	4.554E-04	1.35
4	1.400E-05	2.520E-05	1.80
5	3.721E-05	8.185E-05	2.20
6	3.731E-06	9.700E-06	2.60
7	0.000E+00	0.000E+00	7.50 (VARIABLE)

TOTALS	1.526E+03	6.907E+02	.45
--------	-----------	-----------	-----

*** END PROGRAM S T P (VERSION 1.1)

TIME OFF = 11: 4:10

DATE = 10/ 9/1992

Title Verification of Computer Program Page D1 of D27

STP (PC) Version 1.1 EGS-TR-910600-18 Project All

Calculated by ELH

Date 10/23/92 Checked by DWW

Date 10/24/92

Appendix D
Example 4

*** PROGRAM STP-PC (THE SEELDER-S EDGE) IS AT YOUR SERVICE ***

Page D2 of D 27

*** VERSION NUMBER = 1.1 REVISION DATE WAS 9/29/92

*** TODAY'S DATE = 10/ 9/1992 START TIME = 12:57:28

REPRODUCTION OF INPUT DATA DECK

+ + + + + + + +

NV= 3 NS= 1

NI= 12 NK= 3 NG= 7 NL= 2

1KE-85M	1	4.2978E-05	54.0234E-03	10.0000E+00	10.0000E+00		
2KE-85	1	2.0490E-09	19.0683E-06	56.5688E-06	10.0000E+00		
3KE-90	1	2.1446E-02	10.0000E+00	10.0000E+00	10.0000E+00		
4KE-131M	1	6.7758E-07	61.0836E-08	10.0000E+00	10.0000E+00		
5KE-85	2	4.0299E-03	10.0000E+00	10.0000E+00	10.0000E+00		
6I-131	2	9.9783E-07	114.9932E-06	124.6210E-04	10.0000E+00		
7RE-90M	3	2.6866E-03	32.5521E-03	10.0000E+00	10.0000E+00		
8RE-90	3	4.4149E-03	31.8894E-02	76.1792E-05	10.0000E+00		
9SE-90	3	7.6801E-10	72.6248E-03	84.4149E-03	10.0000E+00		
10Y-90	3	3.0038E-06	97.6801E-10	10.0000E+00	10.0000E+00		
11YE-131M	3	6.4180E-06	10.0000E+00	10.0000E+00	10.0000E+00		
12YE-131	3	4.6210E-04	111.4248E-06	10.0000E+00	10.0000E+00		
		.40	.90	1.35	1.80	2.20	2.60 7.50
1KE-85M		.255157+0123-3000+0000+0000+0000+0581+0					+
2KE-85		.251000+0223-2000+0000+0000+0000+0000+0514+0					+
3KE-90		1.315766-1233+0462+0386+0491-1190-1448-1386+1					+
4KE-131M		.142664-2000+0000+0000+0000+0000+0000+0164+0					+
5KE-85		1.003000+0334-1233-1659-2275-2000+0000+0183+1					+
6I-131		.190317+0625-1000+0000+0000+0000+0000+0723+0					+
7RE-90M		1.388344-2855+0195+0472+0186+0118+0144+1473+1					+
8RE-90		1.960000+0277+0963-1192-1366-1111+0162+1533+1					+
9SE-90		.196000+0000+0000+0000+0000+0000+0000+0000+0					+
10Y-90		.935000+0000+0000+0000+0000+0000+0000+0000+0					+
11YE-131M		.190112+0828+0377+0219-1735-1871-2000+0227+1					+
12YE-131		.719110+0162+0142+0323-2000+0000+0000+0150+1					+

*** PROGRAM STP - PC (THE SHIELDER-S EDGE) IS AT YOUR SERVICE ***

** VERSION NUMBER = 1.1 REVISION DATE WAS 9/29/92

* TODAY'S DATE = 10/ 9/1992 START TIME = 12:57:29

1 'SOURCE'

1 1.0 2 1.0 3 1.0 4 1.0 5 1.0 6 1.0

7 1.0 8 1.0 9 1.0 10 1.0 11 1.0 12 1.0

0

T

STP QUALIFICATION EXAMPLE 4 KEY LETTER R REMOVAL RATE

BJ= 2

1 'VOLUME 1'

2 'VOLUME 2'

-1

SOURCE AND VOLUME INITIALIZATION

V 1 1.00 CC

V 2 1.00 CC

S 1 1 0 1.0

F 1 2 0 1.0

R 2 0 0.5

1 SECOND 90

ACTIVITIES AFTER 1 SECOND

1 MIN 90

ACTIVITIES AFTER 1 MIN

1 HOUR 270

ACTIVITIES AFTER 1 HOUR

24 HOUR

ACTIVITIES AFTER 1 DAY

30 D

ACTIVITIES AFTER 1 MONTH

T

T

+ + + + + + +

* * * *

PROGRAM S T P (VERSION 1.1)

RAN ON 10/ 9/1992

* * * *

DATA FOR THIS RUN OR SERIES OF RUNS

NUMBER OF ISOTOPES (DATA CARDS) = 12

NUMBER OF COMPONENTS (ALL RUNS) = 3

NUMBER OF CLASSES OF ISOTOPES = 3

NUMBER OF SOURCES (MAXIMUM) = 1

NUMBER OF GAMMA GROUPS = 7

NUMBER OF PRECURSORS (MAXIMUM) = 2

STORAGE LOCATIONS REQUESTED =225000

STORAGE LOCATIONS USED = 1045

*** PROGRAM S T P (VERSION 1.1) RAN ON 10/ 9/1992 ***
 *** STP QUALIFICATION EXAMPLE 4 KEY LETTER R REMOVAL RATE ***

NUCLIDE DATA INPUT (LIBRARY)

NUMBER	NAME	CLASS	LAMDA(1/HR)	PRECURSOR (NO.,RATE)-
1	KR-85M	1	1.5472E-01	5 1.5447E-01 1 0.0000E+00
2	KR-85	1	7.3764E-06	1 1.5564E-06 5 1.2024E-08
3	KR-90	1	7.7206E+01	1 0.0000E+00 1 0.0000E+00
4	XE-131M	1	2.4393E-03	6 2.6490E-05 1 0.0000E+00
5	BR-85	2	1.4508E+01	1 0.0030E+00 1 0.0000E+00
6	I-131	2	3.5922E-03	11 2.7947E-03 12 3.5922E-03
7	RB-90M	3	9.6718E+00	3 1.1510E+00 1 0.0000E+00
8	RB-90	3	1.5894E+01	3 1.4002E+01 7 3.6555E-01
9	SR-90	3	2.7648E-06	7 2.7012E-06 8 2.7648E-06
10	Y-90	3	1.0814E-02	9 1.0814E-02 1 0.0000E+00
11	TE-131M	3	2.3105E-02	1 0.0000E+00 1 0.0000E+00
12	TE-131	3	1.6636E+00	11 3.6931E-01 1 0.0000E+00

*** PROGRAM STP (VERSION 1.1) RAN ON 10/ 9/1992 ***
 *** STP QUALIFICATION EXAMPLE 4 KEY LETTER R REMOVAL RATE ***

I	ISOTOPE	BETA MEV/DISC	GAMMA (MEV/DISC) BY GROUP AND MAX.ENERGY (MEV)						
			1	2	3	4	5	6	7
	EFFECTIVE ENERGY		.400	.900	1.350	1.800	2.200	2.600	7.500
1	KR-85M	.255	.157	.000	.000	.000	.000	.000	.581
2	KR-85	.251	.000	.002	.000	.000	.000	.000	.514
3	KR-90	1.315	.077	.233	.462	.386	.049	.019	3.860
4	XE-131M	.142	.007	.000	.000	.000	.000	.000	.164
5	BR-85	1.003	.000	.033	.023	.007	.003	.000	1.830
6	I-131	.190	.317	.063	.000	.000	.000	.000	.723
7	RB-90M	1.388	.003	.855	.195	.472	.186	.118	4.730
8	RB-90	1.960	.000	.277	.096	.019	.037	.111	5.330
9	SR-90	.196	.000	.000	.000	.000	.000	.000	.000
10	Y-90	.935	.000	.000	.000	.000	.000	.000	.000
11	TR-131M	.190	.112	.828	.377	.022	.074	.009	2.270
12	TR-131	.719	.110	.162	.142	.003	.000	.000	1.500

```

* * * PROGRAM STP (VERSION 1.1) RAN ON 10/9/1992 * * *
* * * STP QUALIFICATION EXAMPLE 4 KEY LETTER R REMOVAL RATE * * *

```

RUN LOOP INFORMATION FOR THIS RUN FOLLOWS.

NJ, NUMBER OF COMPONENTS USED IN THIS RUN LOOP = 2

```
KCONC, CALC. TYPE (0/INVENTORY, 1/CONCENTRATION) = 0
IN., -- ACT/COMP. --- ACT/GM.
```

```

NDECAY, CALCULATE DAUGHTER PRODUCTION (0=YES,1=NO) = 0
                                         (DEFAULT =0)

```

```
ITMAX, MAXIMUM NUMBER OF ITERATIONS PER TIME STEP = 0
      (DEFAULT = 10)
```

```
KDEBUG,  DEBUG OPTION (0/NORMAL OUTPUT, 1/MUCHO) = 0
```


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PROGRAM S T P (VERSION 1.1) RAN ON 10/ 9/1992
 *** STP QUALIFICATION EXAMPLE 4 KEY LETTER R REMOVAL RATE ***

SOURCE LIBRARY

NUCLIDE	SOURCE	
	1	
1 KR-85M	1.000E+00	
2 KR-85	1.000E+00	
3 KR-90	1.000E+00	
4 KR-131M	1.000E+00	
5 BR-85	1.000E+00	
6 I-131	1.000E+00	
7 RB-90M	1.000E+00	
8 RB-90	1.000E+00	
9 SR-90	1.000E+00	
10 Y-90	1.000E+00	
11 YR-131M	1.000E+00	
12 YR-131	1.000E+00	
TOTAL CLASS 1	4.000E+00	
TOTAL CLASS 2	2.000E+00	
TOTAL CLASS 3	6.000E+00	
GRAND TOTAL	1.200E+01	

```

* * * PROGRAM S T P (VERSION 1.1 )          RAN ON 10/ 9/1992 * * *
* * * STP QUALIFICATION EXAMPLE 4 KEY LETTER R REMOVAL RATE * * *
* * * STEP SOURCE AND VOLUME INITIALIZATION

```

```

TIME      END TIME   = -1.000E+00          INTERVALS/STEP      = 30
          START TIME =  0.000E+00          ERROR LIMIT       = 1.0000E-05
STEP      DELTA T    =  0.000E+00

```

```

***** COMPONENT *****
NO.  NAME          VOLUME OR MASS          DATA READ (BY CLASS NUMBER)
          1          2          3

1 VOLUME 1          1.000E+00 CC

      REMOVAL RATES (FROM 1) =  0.000E+00  0.000E+00  0.000E+00
      FLOW RATES (CC /HR) P ( 1 TO 2) =  1.000E+00  1.000E+00  1.000E+00
      TRANSM. FRACTION ( 1 TO 2) =  1.000E+00  1.000E+00  1.000E+00
      STEP SOURCE FACTOR (FROM SOURCE 1) =  1.000E+00  1.000E+00  1.000E+00

2 VOLUME 2          1.000E+00 CC

      REMOVAL RATES (FROM 2) =  5.000E-01  5.000E-01  5.000E-01

```

***** PROGRAM S T P (VERSION 1.1) *****
***** STEP QUALIFICATION EXAMPLE 4 KEY LETTER B REMOVAL RATE *****
***** STEP SOURCE AND VOLUME INITIALIZATION *****

STEP SOURCE DATA FROM SOURCE INPUT

1
VOLUME 1

NUCLIDE	
1 KR-85M	1.000E+00
2 KR-85	1.000E+00
3 KR-90	1.000E+00
4 KR-131M	1.000E+00
5 KR-85	1.000E+00
6 I-131	1.000E+00
7 RB-90M	1.000E+00
8 RB-90	1.000E+00
9 SR-90	1.000E+00
10 Y-90	1.000E+00
11 TR-131M	1.000E+00
12 TR-131	1.000E+00

VOLUME 1.000E+00 CC

TOTAL CLASS 1	4.000E+00
TOTAL CLASS 2	2.000E+00
TOTAL CLASS 3	6.000E+00
GRAND TOTAL	1.200E+01

```

* * *      PROGRAM  S T P  (VERSION 1.1 )      RAN ON 10/ 9/1992      * * *
* * * STEP QUALIFICATION EXAMPLE 4 KEY LETTER R REMOVAL RATE      * * *
* * * STEP SOURCE AND VOLUME INITIALIZATION

```

ACTIVITIES AT END OF THE TIME STEP

		1
		VOLUME 1
NUCLIDE		
1	KE-85M	1.000E+00
2	KE-85	1.000E+00
3	KE-90	1.000E+00
4	KE-131M	1.000E+00
5	BR-85	1.000E+00
6	I-131	1.000E+00
7	RB-90M	1.000E+00
8	RB-90	1.000E+00
9	SR-90	1.000E+00
10	Y-90	1.000E+00
11	TE-131M	1.000E+00
12	TE-131	1.000E+00
VOLUME		1.000E+00 CC
TOTAL CLASS 1		4.000E+00
TOTAL CLASS 2		2.000E+00
TOTAL CLASS 3		6.000E+00
GRAND TOTAL		1.200E+01

* * * PROGRAM S T P (VERSION 1.1) RAN ON 10/ 9/1992 * * *
 * * * STP QUALIFICATION EXAMPLE 4 KEY LETTER R REMOVAL RATE * * *
 * * STEP SOURCE AND VOLUME INITIALIZATION

STP GAMMA SHIELDING INFORMATION CALCULATED

COMPONENT 1 VOLUME 1

CONVERSION FACTOR = 1.000E+00
 VOLUME = 1.000E+00 CC
 BETA SOURCE = 3.161E+05 (MEV/SEC/)
 PARTICLE SOURCE ENERGY SOURCE GROUP ENERGY
 (PHOTON/SEC/) (MEV/SEC/) (MEV-EFFECTIVE)

1	7.240E+04	2.896E+04	.40
2	1.009E+05	9.077E+04	.90
3	3.551E+04	4.794E+04	1.35
4	1.868E+04	3.363E+04	1.80
5	5.852E+03	1.287E+04	2.20
6	3.653E+03	9.498E+03	2.60
7	2.155E+04	1.149E+05	5.33 (VARIABLE)
TOTALS	2.585E+05	3.385E+05	1.31

```

* * * * * PROGRAM S T P (VERSION 1.1 ) RAN ON 10/ 9/1992 * * * * *
* * * STEP QUALIFICATION EXAMPLE 4 KEY LETTER R REMOVAL RATE * * *
* * STEP ACTIVITIES AFTER 1 SECOND

```

```

TIME      END TIME   =  1.000E+00 SECO      INTERVALS/STEP      =   90
STEP      START TIME =  0.000E+00          ERROR LIMIT       = 3.3333E-06
          DELTA T    =  1.000E+00 SECO

```

```

***** COMPONENT *****
NO.  NAME          VOLUME OR MASS      DATA READ (BY CLASS NUMBER)
                                     1          2          3
1  VOLUME 1        1.000E+00 CC
    REMOVAL RATES (FROM 1) =  0.000E+00  0.000E+00  0.000E+00
    FLOW RATES (CC /HR) P ( 1 TO 2) =  1.000E+00  1.000E+00  1.000E+00
    TRANSM. FRACTION ( 1 TO 2) =  1.000E+00  1.000E+00  1.000E+00

```

```

2  VOLUME 2        1.000E+00 CC
    REMOVAL RATES (FROM 2) =  5.000E-01  5.000E-01  5.000E-01

```

```

*** 90 STEPS WERE USED REQUIRING AN AVERAGE OF .00 ITERATIONS PER STEP

```

* * * PROGRAM S T P (VERSION 1.1) RAN ON 10/ 9/1992 * * *
 * * * STP QUALIFICATION EXAMPLE 4 KEY LETTER R REMOVAL RATE * * *
 * * * STEP ACTIVITIES AFTER 1 SECOND

ACTIVITIES AT END OF THE TIME STEP

	1 VOLUME 1	2 VOLUME 2
NUCLIDE		
1 KR-85M	9.997E-01	2.777E-04
2 KR-85	9.997E-01	2.777E-04
3 KR-90	9.785E-01	2.718E-04
4 XE-131M	9.997E-01	2.777E-04
5 BR-85	9.957E-01	2.766E-04
6 I-131	9.997E-01	2.777E-04
7 RB-90M	9.974E-01	2.771E-04
8 RB-90	9.993E-01	2.776E-04
9 SR-90	9.997E-01	2.777E-04
10 Y-90	9.997E-01	2.777E-04
11 TE-131M	9.997E-01	2.777E-04
12 TE-131	9.994E-01	2.776E-04
VOLUME	1.000E+00 CC	1.000E+00 CC
TOTAL CLASS 1	3.978E+00	1.105E-03
TOTAL CLASS 2	1.995E+00	5.543E-04
TOTAL CLASS 3	5.995E+00	1.665E-03
GRAND TOTAL	1.197E+01	3.325E-03

* * * PROGRAM S T P (VERSION 1.1) RAN ON 10/ 9/1992 * * *
 * * * STP QUALIFICATION EXAMPLE 4 KEY LETTER R REMOVAL RATE * * *
 * * * STEP ACTIVITIES AFTER 1 SECOND

DIS of D 27

STP GAMMA SHIELDING INFORMATION CALCULATED

COMPONENT 1 VOLUME 1

CONVERSION FACTOR = 1.000E+00
 VOLUME = 1.000E+00 CC
 BETA SOURCE = 3.147E+05 (MEV/SEC/)

	PARTICLE SOURCE (PHOTON/SEC/)	ENERGY SOURCE (MEV/SEC/)	GROUP ENERGY (MEV-EFFECTIVE)
1	7.222E+04	2.889E+04	.40
2	1.005E+05	9.048E+04	.90
3	3.521E+04	4.754E+04	1.35
4	1.849E+04	3.328E+04	1.80
5	5.825E+03	1.281E+04	2.20
6	3.642E+03	9.468E+03	2.60
7	2.151E+04	1.147E+05	5.33 (VARIABLE)
TOTALS	2.574E+05	3.371E+05	1.31

COMPONENT 2 VOLUME 2

CONVERSION FACTOR = 1.000E+00
 VOLUME = 1.000E+00 CC
 BETA SOURCE = 8.742E+01 (MEV/SEC/)

	PARTICLE SOURCE (PHOTON/SEC/)	ENERGY SOURCE (MEV/SEC/)	GROUP ENERGY (MEV-EFFECTIVE)
1	2.006E+01	8.025E+00	.40
2	2.793E+01	2.513E+01	.90
3	9.782E+00	1.321E+01	1.35
4	5.135E+00	9.244E+00	1.80
5	1.618E+00	3.560E+00	2.20
6	1.012E+00	2.630E+00	2.60
7	5.976E+00	3.185E+01	5.33 (VARIABLE)
TOTALS	7.151E+01	9.365E+01	1.31

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```

* * * * * PROGRAM S T P (VERSION 1.1 )          RAN ON 10/ 9/1992 * * * * *
* * * STP QUALIFICATION EXAMPLE 4 KEY LETTER R REMOVAL RATE * * *
* * * STEP ACTIVITIES AFTER 1 MIN

```

```

TIME      END TIME   = 1.000E+00 MIN      INTERVALS/STEP      = 90
          START TIME = 1.667E-02 MIN      ERROR LIMIT       = 3.3333E-06
STEP      DELTA T    = 9.833E-01 MIN

```

```

***** COMPONENT *****
NO.  NAME          VOLUME OR MASS      DATA READ (BY CLASS NUMBER)
          1          2          3
1  VOLUME 1      1.000E+00 CC
      REMOVAL RATES (FROM 1) = 0.000E+00 0.000E+00 0.000E+00
      FLOW RATES (CC /HR) F ( 1 TO 2) = 1.000E+00 1.000E+00 1.000E+00
      TRANSM. FRACTION ( 1 TO 2) = 1.000E+00 1.000E+00 1.000E+00

```

```

2  VOLUME 2      1.000E+00 CC
      REMOVAL RATES (FROM 2) = 5.000E-01 5.000E-01 5.000E-01

```

```

*** 90 STEPS WERE USED REQUIRING AN AVERAGE OF .00 ITERATIONS PER STEP

```

* * * PROGRAM S T P (VERSION 1.1) RAN ON 10/ 9/1992 * * *
 * * * STP QUALIFICATION EXAMPLE 4 KEY LETTER R REMOVAL RATE * * *
 * * STEP ACTIVITIES AFTER 1 MIN

ACTIVITIES AT END OF THE TIME STEP

	1	2
	VOLUME 1	VOLUME 2
NUCLIDE		
1 KR-85M	9.832E-01	1.645E-02
2 KR-85	9.835E-01	1.646E-02
3 KR-90	2.716E-01	4.546E-03
4 ZE-131M	9.834E-01	1.646E-02
5 BR-85	7.722E-01	1.292E-02
6 I-131	9.835E-01	1.646E-02
7 RB-90M	8.467E-01	1.417E-02
8 RB-90	8.698E-01	1.456E-02
9 SR-90	9.835E-01	1.646E-02
10 Y-90	9.835E-01	1.646E-02
11 TR-131M	9.831E-01	1.645E-02
12 TR-131	9.625E-01	1.611E-02
VOLUME	1.000E+00 CC	1.000E+00 CC
TOTAL CLASS 1	3.222E+00	5.392E-02
TOTAL CLASS 2	1.756E+00	2.938E-02
TOTAL CLASS 3	5.629E+00	9.421E-02
GRAND TOTAL	1.061E+01	1.775E-01

* * * PROGRAM S T P (VERSION 1.1) RAN ON 10/ 9/1992 * * *
 * * * STP QUALIFICATION EXAMPLE 4 KEY LETTER R REMOVAL RATE * * *
 * * STEP ACTIVITIES AFTER 1 MIN

STP GAMMA SHIELDING INFORMATION CALCULATED

COMPONENT 1 VOLUME 1

CONVERSION FACTOR = 1.000E+00
 VOLUME = 1.000E+00 CC
 BETA SOURCE = 2.526E+05 (MEV/SEC/)
 PARTICLE SOURCE ENERGY SOURCE GROUP ENERGY
 (PHOTON/SEC/) (MEV/SEC/) (MEV-EFFECTIVE)

1	6.589E+04	2.636E+04	.40
2	8.583E+04	7.724E+04	.90
3	2.466E+04	3.329E+04	1.35
4	1.132E+04	2.038E+04	1.80
5	4.659E+03	1.025E+04	2.20
6	2.991E+03	7.777E+03	2.60
7	1.833E+04	9.770E+04	5.33 (VARIABLE)
TOTALS	2.137E+05	2.730E+05	1.28

COMPONENT 2 VOLUME 2

CONVERSION FACTOR = 1.000E+00
 VOLUME = 1.000E+00 CC
 BETA SOURCE = 4.228E+03 (MEV/SEC/)
 PARTICLE SOURCE ENERGY SOURCE GROUP ENERGY
 (PHOTON/SEC/) (MEV/SEC/) (MEV-EFFECTIVE)

1	1.103E+03	4.411E+02	.40
2	1.436E+03	1.293E+03	.90
3	4.127E+02	5.571E+02	1.35
4	1.895E+02	3.411E+02	1.80
5	7.798E+01	1.716E+02	2.20
6	5.006E+01	1.302E+02	2.60
7	3.068E+02	1.635E+03	5.33 (VARIABLE)
TOTALS	3.576E+03	4.569E+03	1.28

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*** PROGRAM S T P (VERSION 1.1) RAN ON 10/ 9/1992 ***

*** STP QUALIFICATION EXAMPLE 4 KEY LETTER R REMOVAL RATE ***

*** STEP ACTIVITIES AFTER 1 HOUR

TIME END TIME = 1.000E+00 HOUR INTERVALS/STEP = 270
 START TIME = 1.667E-02 HOUR ERROR LIMIT = 1.111E-06
 STEP DELTA T = 9.833E-01 HOUR

***** COMPONENT *****		DATA READ (BY CLASS NUMBER)			
NO.	NAME	VOLUME OR MASS	1	2	3
1	VOLUME 1	1.000E+00 CC			
	REMOVAL RATES (FROM 1) =		0.000E+00	0.000E+00	0.000E+00
	FLOW RATES (CC /HR) F (1 TO 2) =		1.000E+00	1.000E+00	1.000E+00
	TRANSM. FRACTION (1 TO 2) =		1.000E+00	1.000E+00	1.000E+00

2 VOLUME 2 1.000E+00 CC

REMOVAL RATES (FROM 2) = 5.000E-01 5.000E-01 5.000E-01

*** 270 STEPS WERE USED REQUIRING AN AVERAGE OF .00 ITERATIONS PER STEP

* * * * PROGRAM S T P (VERSION 1.1) RAN ON 10/9/1992 * * * *
 * * * STP QUALIFICATION EXAMPLE 4 KEY LETTER R REMOVAL RATE * * *
 * * STEP ACTIVITIES AFTER 1 HOUR

ACTIVITIES AT END OF THE TIME STEP

	1	2
	VOLUME 1	VOLUME 2
NUCLIDE		
1 KR-85M	3.185E-01	4.133E-01
2 KR-85	3.679E-01	4.773E-01
3 KR-90	1.086E-34	1.409E-34
4 XR-131M	3.670E-01	4.762E-01
5 BR-85	1.841E-07	2.389E-07
6 I-131	3.684E-01	4.779E-01
7 RB-90M	2.359E-05	3.060E-05
8 RB-90	1.440E-06	1.868E-06
9 SR-90	3.679E-01	4.773E-01
10 Y-90	3.679E-01	4.773E-01
11 YR-131M	3.595E-01	4.664E-01
12 YR-131	1.349E-01	1.751E-01
VOLUME	1.000E+00 CC	1.000E+00 CC
TOTAL CLASS 1	1.053E+00	1.367E+00
TOTAL CLASS 2	3.684E-01	4.779E-01
TOTAL CLASS 3	1.230E+00	1.596E+00
GRAND TOTAL	2.652E+00	3.441E+00

*** PROGRAM S T P (VERSION 1.1) RAN ON 10/ 9/1992 ***

*** STP QUALIFICATION EXAMPLE 4 KEY LETTER R REMOVAL RATE ***

*** STEP ACTIVITIES AFTER 1 HOUR

STP GAMMA SHIELDING INFORMATION CALCULATED

COMPONENT 1 VOLUME 1

CONVERSION FACTOR = 1.000E+00
 VOLUME = 1.000E+00 CC
 BETA SOURCE = 3.245E+04 (MEV/SEC/)
 PARTICLE SOURCE ENERGY SOURCE GROUP ENERGY
 (PHOTON/SEC/) (MEV/SEC/) (MEV-EFFECTIVE)

1	2.075E+04	8.300E+03	.40
2	1.412E+04	1.271E+04	.90
3	4.240E+03	5.723E+03	1.35
4	1.710E+02	3.078E+02	1.80
5	4.444E+02	9.778E+02	2.20
6	4.460E+01	1.160E+02	2.60
7	2.839E-01	1.343E+00	4.73 (VARIABLE)
TOTALS	3.977E+04	2.813E+04	.71

COMPONENT 2 VOLUME 2

CONVERSION FACTOR = 1.000E+00
 VOLUME = 1.000E+00 CC
 BETA SOURCE = 4.211E+04 (MEV/SEC/)
 PARTICLE SOURCE ENERGY SOURCE GROUP ENERGY
 (PHOTON/SEC/) (MEV/SEC/) (MEV-EFFECTIVE)

1	2.692E+04	1.077E+04	.40
2	1.832E+04	1.649E+04	.90
3	5.501E+03	7.426E+03	1.35
4	2.219E+02	3.994E+02	1.80
5	5.766E+02	1.269E+03	2.20
6	5.786E+01	1.504E+02	2.60
7	3.684E-01	1.742E+00	4.73 (VARIABLE)
TOTALS	5.160E+04	3.650E+04	.71

```

* * *   PROGRAM S T P (VERSION 1.1 )   RAN ON 10/ 9/1992   * * *
* * * STEP QUALIFICATION EXAMPLE 4 KEY LETTER R REMOVAL RATE   * * *
* * * STEP ACTIVITIES AFTER 1 DAY

```

```

TIME      END TIME = 2.400E+01 HOUR      INTERVALS/STEP      = 30
STEP      START TIME = 1.000E+00 HOUR      ERROR LIMIT          = 1.0000E-05
          DELTA T   = 2.300E+01 HOUR

```

```

***** COMPONENT *****
NO.  NAME      VOLUME OR MASS      DATA READ (BY CLASS NUMBER)
                                     1      2      3

1  VOLUME 1      1.000E+00 CC

      REMOVAL RATES (FROM 1) = 0.000E+00  0.000E+00  0.000E+00
      FLOW RATES (CC /HR) F ( 1 TO 2) = 1.000E+00  1.000E+00  1.000E+00
      TRANSM. FRACTION ( 1 TO 2) = 1.000E+00  1.000E+00  1.000E+00

```

```

2  VOLUME 2      1.000E+00 CC

      REMOVAL RATES (FROM 2) = 5.000E-01  5.000E-01  5.000E-01

```

```

*** 30 STEPS WERE USED REQUIRING AN AVERAGE OF .00 ITERATIONS PER STEP

```

* * * PROGRAM S T P (VERSION 1.1) RUN ON 10/ 9/1992 * * *
 * * * STP QUALIFICATION EXAMPLE 4 KEY LETTER R REMOVAL RATE * * *
 * * * STEP ACTIVITIES AFTER 1 DAY

ACTIVITIES AT END OF THE TIME STEP

	1	2
	VOLUME 1	VOLUME 2
NUCLIDE		
1 KR-85M	9.309E-13	3.030E-07
2 KR-85	3.775E-11	1.229E-05
3 KR-90	0.000E+00	0.000E+00
4 KR-131M	3.563E-11	1.160E-05
5 BR-85	2.306-162	7.506-157
6 I-131	3.708E-11	1.207E-05
7 RB-90M	5.955-112	1.938-106
8 RB-90	3.499-113	1.139-107
9 SR-90	3.775E-11	1.229E-05
10 Y-90	3.775E-11	1.230E-05
11 YR-131M	2.168E-11	7.058E-06
12 YR-131	4.881E-12	1.589E-06
VOLUME	1.000E+00 CC	1.000E+00 CC
TOTAL CLASS 1	7.430E-11	2.419E-05
TOTAL CLASS 2	3.708E-11	1.207E-05
TOTAL CLASS 3	1.021E-10	3.323E-05
GRAND TOTAL	2.135E-10	6.949E-05

* * * PROGRAM S T P (VERSION 1.1) RAN ON 10/ 9/1992 * * *
 * * * STP QUALIFICATION EXAMPLE 4 KEY LETTER R REMOVAL RATE * * *
 * * STEP ACTIVITIES AFTER 1 DAY

STP GAMMA SHIELDING INFORMATION CALCULATED

COMPONENT 1 VOLUME 1

CONVERSION FACTOR = 1.000E+00
 VOLUME = 1.000E+00 CC
 BETA SOURCE = 2.669E-06 (MEV/SEC/)
 PARTICLE SOURCE ENERGY SOURCE GROUP ENERGY
 (PHOTON/SEC/) (MEV/SEC/) (MEV-EFFECTIVE)

1	1.397E-06	5.588E-07	.40
2	8.693E-07	7.824E-07	.90
3	2.430E-07	3.281E-07	1.35
4	1.008E-08	1.815E-08	1.80
5	2.680E-08	5.897E-08	2.20
6	2.688E-09	6.988E-09	2.60
7	7.151E-10	3.382E-10	4.73 (VARIABLE)
TOTALS	2.549E-06	1.753E-06	.69

COMPONENT 2 VOLUME 2

CONVERSION FACTOR = 1.000E+00
 VOLUME = 1.000E+00 CC
 BETA SOURCE = 8.692E-01 (MEV/SEC/)
 PARTICLE SOURCE ENERGY SOURCE GROUP ENERGY
 (PHOTON/SEC/) (MEV/SEC/) (MEV-EFFECTIVE)

1	4.549E-01	1.819E-01	.40
2	2.830E-01	2.547E-01	.90
3	7.911E-02	1.068E-01	1.35
4	3.283E-03	5.909E-03	1.80
5	8.724E-03	1.919E-02	2.20
6	8.748E-04	2.275E-03	2.60
7	2.328E-10	1.101E-10	4.73 (VARIABLE)
TOTALS	8.298E-01	5.708E-01	.69

```

* * * PROGRAM S T P (VERSION 1.1 ) RAN ON 10/ 9/1992 * * *
* * * STP QUALIFICATION EXAMPLE 4 KEY LETTER R REMOVAL RATE * * *
* * STEP ACTIVITIES AFTER 1 MONTH

```

```

TIME      END TIME   =  3.000E+01 D      INTERVALS/STEP      =  30
          START TIME =  1.000E+00 D      ERROR LIMIT         =  1.0000E-05
STEP      DELTA T    =  2.900E+01 D

```

```

***** COMPONENT ***** DATA READ (BY CLASS NUMBER)
NO.  NAME      VOLUME OR MASS      1      2      3
1 VOLUME 1      1.000E+00 CC
      REMOVAL RATES (FROM 1) =  0.000E+00  0.000E+00  0.000E+00
      FLOW RATES (CC /HR) F ( 1 TO 2) =  1.000E+00  1.000E+00  1.000E+00
      TRANSM. FRACTION ( 1 TO 2) =  1.000E+00  1.000E+00  1.000E+00

```

```

2 VOLUME 2      1.000E+00 CC
      REMOVAL RATES (FROM 2) =  5.000E-01  5.000E-01  5.000E-01

```

```

*** 30 STEPS WERE USED REQUIRING AN AVERAGE OF .00 ITERATIONS PER STEP

```

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*** PROGRAM S T P (VERSION 1.1)

RAN ON 10/ 9/1992 ***

*** WRITSO FOUND ALL VALUES TO BE ZERO FOR WF= 0

*** PROGRAM S T P (VERSION 1.1) RAN ON 10/ 9/1992 ***

*** STP QUALIFICATION EXAMPLE 4 KEY LETTER R REMOVAL RATE ***

*** STEP ACTIVITIES AFTER 1 MONTH

STP GAMMA SHIELDING INFORMATION CALCULATED

COMPONENT 1 VOLUME 1

CONVERSION FACTOR = 1.000E+00

VOLUME = 1.000E+00 CC

BETA SOURCE = 3.064-308 (MEV/SEC/)

	PARTICLE SOURCE (PHOTON/SEC/)	ENERGY SOURCE (MEV/SEC/)	GROUP ENERGY (MEV-EFFECTIVE)
--	-----------------------------------	------------------------------	---------------------------------

1	6.985-310	2.794-310	.40
2	7.790-311	7.011-311	.90
3	1.252-316	1.690-316	1.35
4	5.454-318	9.816-318	1.80
5	1.498-317	3.295-317	2.20
6	1.502-318	3.904-318	2.60
7	0.000E+00	0.000E+00	7.50 (VARIABLE)

TOTALS	7.764-310	3.495-310	.45
--------	-----------	-----------	-----

COMPONENT 2 VOLUME 2

CONVERSION FACTOR = 1.000E+00

VOLUME = 1.000E+00 CC

BETA SOURCE = 4.738-152 (MEV/SEC/)

	PARTICLE SOURCE (PHOTON/SEC/)	ENERGY SOURCE (MEV/SEC/)	GROUP ENERGY (MEV-EFFECTIVE)
--	-----------------------------------	------------------------------	---------------------------------

1	2.417-153	9.669-154	.40
2	2.855-154	2.570-154	.90
3	5.553-160	7.497-160	1.35
4	2.419-161	4.355-161	1.80
5	6.643-161	1.462-160	2.20
6	6.662-162	1.732-161	2.60
7	0.000E+00	0.000E+00	7.50 (VARIABLE)

TOTALS	2.703-153	1.224-153	.45
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*** END PROGRAM S T P (VERSION 1.1)

TIME OFF = 13: 5:12 DATE = 10/ 9/1992

Title Verification of Computer Program Page 21 of 38

STP (PC) Version 1.1 EGS-TR-910600-18 Project All

Calculated by ELD Date 10/23/92 Checked by DWD Date 10/24/92

Appendix E
Examples 5A and 5B

*** PROGRAM STP-PC (THE SHIELDER-S EDGE) IS AT YOUR SERVICE ***

*** VERSION NUMBER = 1.1 REVISION DATE WAS 9/29/92

*** TODAY'S DATE = 10/9/1992 START TIME = 13:8:29

REPRODUCTION OF INPUT DATA DECK

+ + + + + + + +

NV= 3 NS= 1

NI= 12 NK= 3 NG= 7 NL= 2

1KR-85M	1	4.2978E-05	54.0234E-03	10.0000E+00	10.0000E+00	
2KR-85	1	2.0490E-09	19.0683E-06	56.5688E-06	10.0000E+00	
3KR-90	1	2.1446E-02	10.0000E+00	10.0000E+00	10.0000E+00	
4XR-131M	1	6.7758E-07	61.0836E-08	10.0000E+00	10.0000E+00	
5BR-85	2	4.0299E-03	10.0000E+00	10.0000E+00	10.0000E+00	
6I-131	2	9.9783E-07	114.9932E-06	124.6210E-04	10.0000E+00	
7RB-90M	3	2.6866E-03	32.5521E-03	10.0000E+00	10.0000E+00	
8RB-90	3	4.4149E-03	31.8894E-02	76.1792E-05	10.0000E+00	
9SR-90	3	7.6801E-10	72.6248E-03	84.4149E-03	10.0000E+00	
10Y-90	3	3.0038E-06	97.6801E-10	10.0000E+00	10.0000E+00	
11YE-131M	3	6.4180E-06	10.0000E+00	10.0000E+00	10.0000E+00	
12YE-131	3	4.6210E-04	111.4246E-06	10.0000E+00	10.0000E+00	
		.40	.90	1.35	1.80	2.20
						2.60
						7.50
1KR-85M		.255157+0123-3000+0000+0000+0000+0000+0581+0				+
2KR-85		.251000+0223-2000+0000+0000+0000+0000+0514+0				+
3KR-90		1.315766-1233+0462+0386+0491-1190-1448-1386+1				+
4XR-131M		.142664-2000+0000+0000+0000+0000+0000+0164+0				+
5BR-85		1.003000+0334-1233-1659-2275-2000+0000+0183+1				+
6I-131		.190317+0625-1000+0000+0000+0000+0000+0723+0				+
7RB-90M		1.388344-2855+0195+0472+0186+0118+0144+1473+1				+
8RB-90		1.960000+0277+0963-1192-1366-1111+0162+1533+1				+
9SR-90		.196000+0000+0000+0000+0000+0000+0000+0000+0				+
10Y-90		.935000+0000+0000+0000+0000+0000+0000+0000+0				+
11YE-131M		.190112+0828+0377+0219-1735-1871-2030+0227+1				+
12YE-131		.719110+0162+0142+0323-2000+0000+0000+0150+1				+

*** PROGRAM STP-PC (THE SHIELDER-S EDGE) IS AT YOUR SERVICE ***

** VERSION NUMBER = 1.1 REVISION DATE WAS 9/29/92

* TODAY'S DATE = 10/ 9/1992 START TIME = 13: 8:30

1 'SOURCE'
1 1.0 2 1.0 3 1.0 4 1.0 5 1.0 6 1.0
7 1.0 8 1.0 9 1.0 10 1.0 11 1.0 12 1.0

0

T

STP QUALIFICATION EXAMPLE 5A KEY LETTER PF

NJ= 3

1 'VOLUME 1'

2 'VOLUME 2'

3 'VOLUME 3'

-1

SOURCE AND VOLUME INITIALIZATION

V 1 1.00 CC

V 2 1.00 CC

V 3 1.00 CC

S 1 1 0 1.0

F 1 2 0 1.0

F 2 3 0 1.0

PF 2 2 1.0E+6

1 HOUR

ACTIVITIES AFTER 1 HOUR

2 HOUR

ACTIVITIES AFTER 2 HOUR

T

T

+ + + + + + +

PROGRAM S T P (VERSION 1.1)

RAN ON 10/ 9/1992 ***

E4 of E38

DATA FOR THIS RUN OR SERIES OF RUNS

NUMBER OF ISOTOPES (DATA CARDS) = 12

NUMBER OF COMPONENTS (ALL RUNS) = 3

NUMBER OF CLASSES OF ISOTOPES = 3

NUMBER OF SOURCES (MAXIMUM) = 1

NUMBER OF GAMMA GROUPS = 7

NUMBER OF PRECURSORS (MAXIMUM) = 2

STORAGE LOCATIONS REQUESTED =225000

STORAGE LOCATIONS USED = 1045

* * * PROGRAM S T P (VERSION 1.1) RAN ON 10/ 9/1992 * * *
 * * * STP QUALIFICATION EXAMPLE 5A KEY LETTER PF * * *

NUCLIDE DATA INPUT (LIBRARY)

NUMBER	NAME	CLASS	LAMDA(1/HR)	PRECURSOR (NO.,RATE)-
1	KR-85M	1	1.5472E-01	5 1.5447E-01 1 0.0000E+00
2	KR-85	1	7.3764E-06	1 1.5564E-06 5 1.2024E-08
3	KR-90	1	7.7206E+01	1 0.0000E+00 1 0.0000E+00
4	XE-131M	1	2.4393E-03	6 2.6490E-05 1 0.0000E+00
5	BR-85	2	1.4508E+01	1 0.0000E+00 1 0.0000E+00
6	I-131	2	3.5922E-03	11 2.7947E-03 12 3.5922E-03
7	RB-90M	3	9.6718E+00	3 1.1510E+00 1 0.0000E+00
8	RB-90	3	1.5894E+01	3 1.4002E+01 7 3.6555E-01
9	SR-90	3	2.7648E-06	7 2.7012E-06 8 2.7648E-06
10	Y-90	3	1.0814E-02	9 1.0814E-02 1 0.0000E+00
11	TE-131M	3	2.3105E-02	1 0.0000E+00 1 0.0000E+00
12	TE-131	3	1.6636E+00	11 3.6931E-01 1 0.0000E+00

*** PROGRAM S T P (VERSION 1.1) RAN ON 10/ 9/1992 ***

*** STP QUALIFICATION EXAMPLE 5A KEY LETTER PF ***

I	ISOTOPE	BETA MEV/DISC	GAMMA (MEV/DISC) BY GROUP AND MAX ENERGY (MEV)						
			1	2	3	4	5	6	7
	EFFECTIVE ENERGY		.400	.900	1.350	1.800	2.200	2.600	7.500
1	KR-85M	.255	.157	.000	.000	.000	.000	.000	.581
2	KR-85	.251	.000	.002	.000	.000	.000	.000	.514
3	KR-90	1.315	.077	.233	.462	.386	.049	.019	3.860
4	XE-131M	.142	.007	.000	.000	.000	.000	.000	.164
5	BR-85	1.003	.000	.033	.023	.007	.003	.000	1.830
6	I-131	.190	.317	.063	.000	.000	.000	.000	.723
7	RB-90M	1.388	.003	.855	.195	.472	.186	.118	4.730
8	RB-90	1.960	.000	.277	.096	.019	.037	.111	5.330
9	SR-90	.196	.000	.000	.000	.000	.000	.000	.000
10	Y-90	.935	.000	.000	.000	.000	.000	.000	.000
11	TE-131M	.190	.112	.828	.377	.022	.074	.009	2.270
12	TE-131	.719	.110	.162	.142	.003	.000	.000	1.500

*** PROGRAM S T P (VERSION 1.1) RAN ON 10/ 9/1992 ***
*** STP QUALIFICATION EXAMPLE 5A KEY LETTER PF ***

RUN LOOP INFORMATION FOR THIS RUN FOLLOWS.

NJ, NUMBER OF COMPONENTS USED IN THIS RUN LOOP = 3
KCONC, CALC. TYPE (0/INVENTORY, 1/CONCENTRATION) = 0
IX., -- ACT/COMP. --- ACT/GM.
NDECAY, CALCULATE DAUGHTER PRODUCTION (0/YES,1/NO) = 0
(DEFAULT =0)
ITMAX, MAXIMUM NUMBER OF ITERATIONS PER TIME STEP = 0
(DEFAULT = 10)
KDEBUG, DEBUG OPTION (0/NORMAL OUTPUT, 1/MUCHO) = 0

PROGRAM S T P (VERSION 1.1)

RAN ON 10/ 9/1992

E8 of E38

STP QUALIFICATION EXAMPLE 5A KEY LETTER PF

SOURCE LIBRARY

NUCLIDE	SOURCE
1 KR-85M	1.000E+00
2 KR-85	1.000E+00
3 KR-90	1.000E+00
4 IE-131M	1.000E+00
5 BR-85	1.000E+00
6 I-131	1.000E+00
7 RB-90M	1.000E+00
8 RB-90	1.000E+00
9 SR-90	1.000E+00
10 Y-90	1.000E+00
11 TE-131M	1.000E+00
12 TE-131	1.000E+00
TOTAL CLASS 1	4.000E+00
TOTAL CLASS 2	2.000E+00
TOTAL CLASS 3	6.000E+00
GRAND TOTAL	1.200E+01

```

* * * PROGRAM S T P (VERSION 1.1 )          RAN ON 10/ 9/1992 * * *
* * * STP QUALIFICATION EXAMPLE SA KEY LETTER PV * * *
* * * STEP SOURCE AND VOLUME INITIALIZATION

```

```

TIME      END TIME = -1.000E+00      INTERVALS/STEP      = 30
STEP      START TIME = 0.000E+00      ERROR LIMIT        = 1.0000E-05
          DELTA T = 0.000E+00

```

```

***** COMPONENT *****
NO.  NAME          VOLUME OR MASS      DATA READ (BY CLASS NUMBER)
                                     1         2         3

1  VOLUME 1        1.000E+00 CC

      REMOVAL RATES (FROM 1) = 0.000E+00  0.000E+00  0.000E+00
      FLOW RATES (CC /HR) F ( 1 TO 2) = 1.000E+00  1.000E+00  1.000E+00
      TRANSM. FRACTION ( 1 TO 2) = 1.000E+00  1.000E+00  1.000E+00
      STEP SOURCE FACTOR (FROM SOURCE 1) = 1.000E+00  1.000E+00  1.000E+00

2  VOLUME 2        1.000E+00 CC

      REMOVAL RATES (FROM 2) = 0.000E+00  0.000E+00  0.000E+00
      FLOW RATES (CC /HR) F ( 2 TO 3) = 1.000E+00  1.000E+00  1.000E+00
      TRANSM. FRACTION ( 2 TO 3) = 1.000E+00  1.000E+00  1.000E+00
      PLATECUT FACTORS          1.000E+00  1.000E+06  1.000E+00

3  VOLUME 3        1.000E+00 CC

      REMOVAL RATES (FROM 3) = 0.000E+00  0.000E+00  0.000E+00

```

***** PROGRAM S T P (VERSION 1.1)

RAN ON 10/ 9/1992 *****

E10 of E38

*** STP QUALIFICATION EXAMPLE 5A KEY LETTER PF

*** STEP SOURCE AND VOLUME INITIALIZATION

STEP SOURCE DATA FROM SOURCE INPUT

		1
		VOLUME 1
NUCLIDE		
1	KR-85M	1.000E+00
2	KR-85	1.000E+00
3	KR-90	1.000E+00
4	KR-131M	1.000E+00
5	BR-85	1.000E+00
6	I-131	1.000E+00
7	RB-90M	1.000E+00
8	RB-90	1.000E+00
9	SR-90	1.000E+00
10	Y-90	1.000E+00
11	TE-131M	1.000E+00
12	TE-131	1.000E+00
VOLUME		1.000E+00 CC
TOTAL CLASS 1 4.000E+00		
TOTAL CLASS 2 2.000E+00		
TOTAL CLASS 3 6.000E+00		
GRAND TOTAL 1.200E+01		

*** PROGRAM S T P (VERSION 1.1)

RAN ON 10/ 9/1992

E11 of E38

*** STP QUALIFICATION EXAMPLE 5A KEY LETTER PF

*** STEP SOURCE AND VOLUME INITIALIZATION

ACTIVITIES AT END OF THE TIME STEP

		1
		VOLUME 1
NUCLIDE		
1	KR-85M	1.000E+00
2	KR-85	1.000E+00
3	KR-90	1.000E+00
4	XE-131M	1.000E+00
5	RR-85	1.000E+00
6	I-131	1.000E+00
7	RB-90M	1.000E+00
8	RB-90	1.000E+00
9	SR-90	1.000E+00
10	Y-90	1.000E+00
11	YK-131M	1.000E+00
12	YK-131	1.000E+00
VOLUME		1.000E+00 CC
TOTAL CLASS 1		4.000E+00
TOTAL CLASS 2		2.000E+00
TOTAL CLASS 3		6.000E+00
GRAND TOTAL		1.200E+01

```

* * * PROGRAM S T P (VERSION 1.1 )
* * * STP QUALIFICATION EXAMPLE 5A KEY LETTER PF
* * * STEP SOURCE AND VOLUME INITIALIZATION

```

RAN ON 10/ 9/1992

E12 of E35

STP GAMMA SHIELDING INFORMATION CALCULATED

COMPONENT 1 VOLUME 1

```

CONVERSION FACTOR = 1.000E+00
VOLUME             = 1.000E+00 CC
BETA SOURCE        = 3.161E+05 (MEV/SEC/ )
PARTICLE SOURCE    ENERGY SOURCE  GROUP ENERGY
(PHOTON/SEC/ ) (MEV/SEC/ ) (MEV-EFFECTIVE)

1  7.240E+04      2.896E+04      .40
2  1.009E+05      9.077E+04      .90
3  3.551E+04      4.794E+04      1.35
4  1.868E+04      3.363E+04      1.80
5  5.852E+03      1.287E+04      2.20
6  3.653E+03      9.498E+03      2.60
7  2.155E+04      1.149E+05      5.33 (VARIABLE)

TOTALS  2.585E+05      3.385E+05      1.31

```



```

* * * * * PROGRAM S T P (VERSION 1.1 )          RAN ON 10/ 9/1992 * * * * *
* * * STP QUALIFICATION EXAMPLE 5A KEY LETTER PF * * *
* * STEP ACTIVITIES AFTER 1 HOUR

```

```

TIME      END TIME   = 1.000E+00 HOUR      INTERVALS/STEP      = 30
STEP      START TIME = 0.000E+00          ERROR LIMIT      = 1.0000E-05
          DELTA T    = 1.000E+00 HOUR

```

```

***** COMPONENT *****
NO.  NAME          VOLUME OR MASS      DATA READ (BY CLASS NUMBER)
                                     1         2         3

1 VOLUME 1          1.000E+00 CC

      REMOVAL RATES (FROM 1) = 0.000E+00  0.000E+00  0.000E+00
      FLOW RATES (CC /HR) F ( 1 TO 2) = 1.000E+00  1.000E+00  1.000E+00
      TRANSM. FRACTION ( 1 TO 2) = 1.000E+00  1.000E+00  1.000E+00

2 VOLUME 2          1.000E+00 CC

      REMOVAL RATES (FROM 2) = 0.000E+00  0.000E+00  0.000E+00
      FLOW RATES (CC /HR) F ( 2 TO 3) = 1.000E+00  1.000E+00  1.000E+00
      TRANSM. FRACTION ( 2 TO 3) = 1.000E+00  1.000E+00  1.000E+00

      PLATNOT FACTORS          1.000E+00  1.000E+06  1.000E+00

3 VOLUME 3          1.000E+00 CC

      REMOVAL RATES (FROM 3) = 0.000E+00  0.000E+00  0.000E+00

*** 30 STEPS WERE USED REQUIRING AN AVERAGE OF .00 ITERATIONS PER STEP

```

* * * PROGRAM S I P (VERSION 1.1) RAN ON 10/ 9/1992 * * *
 * * * STP QUALIFICATION EXAMPLE 5A KEY LETTER PF * * *
 * * STEP ACTIVITIES AFTER 1 HOUR

ACTIVITIES AT END OF THE TIME STEP

	1	2	3
	VOLUME 1	VOLUME 2	VOLUME 3
NUCLIDE			
1 KR-85M	3.185E-01	3.186E-01	2.288E-01
2 KR-85	3.679E-01	3.679E-01	2.642E-01
3 KR-90	1.086E-34	0.000E+00	2.492E-52
4 KR-131M	3.670E-01	3.670E-01	2.636E-01
5 BR-85	1.841E-07	3.164E-07	1.840E-13
6 I-131	3.684E-01	6.325E-01	4.590E-04
7 RB-90M	2.359E-05	1.257E-05	1.357E-05
8 RB-90	1.440E-06	9.908E-07	8.661E-07
9 SR-90	3.679E-01	3.679E-01	2.642E-01
10 Y-90	3.679E-01	3.679E-01	2.642E-01
11 TR-131M	3.595E-01	3.595E-01	2.582E-01
12 TR-131	1.349E-01	1.349E-01	9.692E-02
VOLUME	1.000E+00 CC	1.000E+00 CC	1.000E+00 CC
TOTAL CLASS 1	1.053E+00	1.053E+00	7.566E-01
TOTAL CLASS 2	3.684E-01	6.325E-01	4.55E-04
TOTAL CLASS 3	1.230E+00	1.230E+00	8.836E-01
GRAND TOTAL	2.652E+00	2.916E+00	1.641E+00

*** PROGRAM S T P (VERSION 1.1)

RAN ON 10/ 9/1992

E15 of E38

*** STP QUALIFICATION EXAMPLE 5A KEY LETTER PF

*** STEP ACTIVITIES AFTER 1 HOUR

STEP GAMMA SHIELDING INFORMATION CALCULATED

COMPONENT 1 VOLUME 1

CONVERSION FACTOR = 1.000E+00

VOLUME = 1.000E+00 CC

BETA SOURCE = 3.245E+04 (MEV/SEC/)

	PARTICLE SOURCE (PHOTON/SEC/)	ENERGY SOURCE (MEV/SEC/)	GROUP ENERGY (MEV-EFFECTIVE)
--	-----------------------------------	------------------------------	---------------------------------

1	2.075E+04	8.300E+03	.40
2	1.412E+04	1.271E+04	.90
3	4.240E+03	5.723E+03	1.35
4	1.710E+02	3.076E+02	1.80
5	4.444E+02	9.778E+02	2.20
6	4.460E+01	1.160E+02	2.60
7	2.839E-01	1.343E+00	4.73 (VARIABLE)

TOTALS	3.977E+04	2.813E+04	.71
--------	-----------	-----------	-----

COMPONENT 2 VOLUME 2

CONVERSION FACTOR = 1.000E+00

VOLUME = 1.000E+00 CC

BETA SOURCE = 3.431E+04 (MEV/SEC/)

	PARTICLE SOURCE (PHOTON/SEC/)	ENERGY SOURCE (MEV/SEC/)	GROUP ENERGY (MEV-EFFECTIVE)
--	-----------------------------------	------------------------------	---------------------------------

1	2.850E+04	1.140E+04	.40
2	1.480E+04	1.332E+04	.90
3	4.240E+03	5.723E+03	1.35
4	1.709E+02	3.076E+02	1.80
5	4.444E+02	9.777E+02	2.20
6	4.458E+01	1.159E+02	2.60
7	1.542E-01	7.292E-01	4.73 (VARIABLE)

TOTALS	4.819E+04	3.184E+04	.66
--------	-----------	-----------	-----

*** PROGRAM S T P (VERSION 1.1) ***
 *** S T P QUALIFICATION EXAMPLE 5A KEY LETTER PF ***
 *** STEP ACTIVITIES AFTER 1 HOUR ***

S T P GAMMA SHIELDING INFORMATION CALCULATED

COMPONENT 3 VOLUME 3

CONVERSION FACTOR = 1.000E+00
 VOLUME = 1.000E+00 CC
 BETA SOURCE = 2.145E+04 (MEV/SEC/)
 PARTICLE SOURCE ENERGY SOURCE GROUP ENERGY
 (PHOTON/SEC/) (MEV/SEC/) (MEV-EFFECTIVE)

1	7.159E+03	2.864E+03	.40
2	9.462E+03	8.516E+03	.90
3	3.045E+03	4.111E+03	1.35
4	1.228E+02	2.210E+02	1.80
5	3.192E+02	7.023E+02	2.20
6	3.203E+01	8.327E+01	2.60
7	1.638E-01	7.750E-01	4.73 (VARIABLE)
TOTALS	2.014E+04	1.650E+04	.82

```

* * * * * PROGRAM S T P (VERSION 1.1 )          RAN ON 10/ 9/1992 * * * * *
* * * STEP QUALIFICATION EXAMPLE 5A KEY LETTER PF * * *
* * STEP ACTIVITIES AFTER 2 HOUR

```

```

TIME      END TIME = 2.000E+00 HOUR      INTERVALS/STEP      = 30
STEP      START TIME = 1.000E+00 HOUR      ERROR LIMIT      = 1.0000E-05
          DELTA T   = 1.000E+00 HOUR

```

```

***** COMPONENT *****
NO.   NAME      VOLUME OR MASS      DATA READ (BY CLASS NUMBER)
          1      2      3

1 VOLUME 1      1.000E+00 CC

      REMOVAL RATES (FROM 1) = 0.000E+00 0.000E+00 0.000E+00
      FLOW RATES (CC /HR) F ( 1 TO 2) = 1.000E+00 1.000E+00 1.000E+00
      TRANSM. FRACTION ( 1 TO 2) = 1.000E+00 1.000E+00 1.000E+00

2 VOLUME 2      1.000E+00 CC

      REMOVAL RATES (FROM 2) = 0.000E+00 0.000E+00 0.000E+00
      FLOW RATES (CC /HR) F ( 2 TO 3) = 1.000E+00 1.000E+00 1.000E+00
      TRANSM. FRACTION ( 2 TO 3) = 1.000E+00 1.000E+00 1.000E+00

      PLATROUT FACTORS      1.000E+00 1.000E+00 1.000E+00

3 VOLUME 3      1.000E+00 CC

      REMOVAL RATES (FROM 3) = 0.000E+00 0.000E+00 0.000E+00

```

*** 30 STEPS WERE USED REQUIRING AN AVERAGE OF .00 ITERATIONS PER STEP

* * * PROGRAM S T P (VERSION 1.1) RAN ON 10/ 9/1952 * * *
 * * * STP QUALIFICATION EXAMPLE 5A KEY LETTER PF * * *
 * * * STEP ACTIVITIES AFTER 2 HOUR

E18 of E 38

ACTIVITIES AT END OF THE TIME STEP

	1 VOLUME 1	2 VOLUME 2	3 VOLUME 3
NUCLIDE			
1 KR-85M	1.004E-01	2.008E-01	4.406E-01
2 KR-85	1.353E-01	2.707E-01	5.940E-01
3 KR-90	0.000E+00	0.000E+00	0.000E+00
4 XE-131M	1.347E-01	2.694E-01	5.911E-01
5 BR-85	3.390E-14	2.166E-13	2.844E-19
6 I-131	1.355E-01	8.639E-01	2.078E-03
7 RB-90M	5.470E-10	2.915E-10	1.356E-09
8 RB-90	3.214E-11	2.230E-11	8.069E-11
9 SR-90	1.353E-01	2.707E-01	5.940E-01
10 Y-90	1.353E-01	2.707E-01	5.940E-01
11 TE-131M	1.292E-01	2.584E-01	5.672E-01
12 TE-131	3.286E-02	6.571E-02	1.442E-01
VOLUME	1.000E+00 CC	1.000E+00 CC	1.000E+00 CC
TOTAL CLASS 1	3.704E-01	7.408E-01	1.626E+00
TOTAL CLASS 2	1.355E-01	8.639E-01	2.078E-03
TOTAL CLASS 3	4.327E-01	8.655E-01	1.899E+00
GRAND TOTAL	9.387E-01	2.470E+00	3.527E+00

*** PROGRAM S T P (VERSION 1.1)

RAN ON 10-9/1992

E19 of E38

*** STP QUALIFICATION EXAMPLE 5A KEY LETTER PF

*** STEP ACTIVITIES AFTER 2 HOUR

STP GAMMA SHIELDING INFORMATION CALCULATED

COMPONENT 1 VOLUME 1

CONVERSION FACTOR = 1.000E+00

VOLUME = 1.000E+00 CC

BETA SOURCE = 1.131E+04 (MEV/SEC/)

	PARTICLE SOURCE (PHOTON/SEC/)	ENERGY SOURCE (MEV/SEC/)	GROUP ENERGY (MEV-EFFECTIVE)
--	-----------------------------------	------------------------------	---------------------------------

1	7.188E+03	2.875E+03	.40
2	4.979E+03	4.481E+03	.90
3	1.463E+03	1.975E+03	1.35
4	6.035E+01	1.086E+02	1.80
5	1.597E+02	3.514E+02	2.20
6	1.602E+01	4.164E+01	2.60
7	6.569E-06	3.107E-05	4.73 (VARIABLE)

TOTALS	1.387E+04	9.833E+03	.71
--------	-----------	-----------	-----

COMPONENT 2 VOLUME 2

CONVERSION FACTOR = 1.000E+00

VOLUME = 1.000E+00 CC

BETA SOURCE = 2.679E+04 (MEV/SEC/)

	PARTICLE SOURCE (PHOTON/SEC/)	ENERGY SOURCE (MEV/SEC/)	GROUP ENERGY (MEV-EFFECTIVE)
--	-----------------------------------	------------------------------	---------------------------------

1	3.176E+04	1.270E+04	.40
2	1.148E+04	1.033E+04	.90
3	2.926E+03	3.950E+03	1.35
4	1.207E+02	2.173E+02	1.80
5	3.195E+02	7.028E+02	2.20
6	3.203E+01	8.329E+01	2.60
7	3.566E-06	1.687E-05	4.73 (VARIABLE)

TOTALS	4.664E+04	2.799E+04	.60
--------	-----------	-----------	-----

* * * PROGRAM S T P (VERSION 1.1) RAN ON 10/ 9/1992 * * *
 * * * STP QUALIFICATION EXAMPLE 5A KEY LETTER PF * * *
 * * STEP ACTIVITIES AFTER 2 HOUR

E20 of E3.

STP GAMMA SHIELDING INFORMATION CALCULATED

COMPONENT 3 VOLUME 3

CONVERSION FACTOR = 1.000E+00
 VOLUME = 1.000E+00 CC
 BETA SOURCE = 4.547E+04 (MEV/SEC/)
 PARTICLE SOURCE ENERGY SOURCE GROUP ENERGY
 (PHOTON/SEC/) (MEV/SEC/) (MEV-EFFECTIVE)

1	1.417E+04	5.666E+03	.40
2	2.033E+04	1.830E+04	.90
3	6.422E+03	8.669E+03	1.35
4	2.649E+02	4.768E+02	1.80
5	7.011E+02	1.542E+03	2.20
6	7.030E+01	1.828E+02	2.60
7	1.630E-05	7.711E-05	4.73 (VARIABLE)
TOTALS	4.195E+04	3.483E+04	.83

* * * END PROGRAM S T P (VERSION 1.1)
 TIME OFF = 13:13:45 DATE = 10/ 9/1992

*** PROGRAM STP-PC (THE SHELDON-S EDGE) IS AT YOUR SERVICE ***

E21 of E38

** VERSION NUMBER = 1.1 REVISION DATE WAS 9/29/92

* TODAY'S DATE = 10/9/1992 START TIME = 13:16:26

REPRODUCTION OF INPUT DATA DECK

+ + + + +

UV= 3 NS= 1

NI= 12 NR= 3 NG= 7 NL= 2

1KR-85M	1	4.2978E-05	54.0234E-03	10.0000E+00	10.0000E+00			
2KR-85	1	2.0490E-09	19.0683E-06	56.5688E-06	10.0000E+00			
3KR-90	1	2.1446E-02	10.0000E+00	10.0000E+00	10.0000E+00			
4KR-131M	1	6.7758E-07	61.0836E-08	10.0000E+00	10.0000E+00			
5KR-85	2	4.0799E-03	10.0000E+00	10.0000E+00	10.0000E+00			
6I-131	2	9.9785E-07	114.9932E-06	124.6210E-04	10.0000E+00			
7RB-90M	3	2.6866E-03	32.5521E-03	10.0000E+00	10.0000E+00			
8RB-90	3	4.4149E-03	31.8894E-02	76.1792E-05	10.0000E+00			
9SR-90	3	7.6801E-10	72.6248E-03	84.4149E-03	10.0000E+00			
10Y-90	3	3.0038E-06	97.6801E-10	10.0000E+00	10.0000E+00			
11YE-131M	3	6.4180E-06	10.0000E+00	10.0000E+00	10.0000E+00			
12TE-131	5	4.6210E-04	111.4248E-06	10.0000E+00	10.0000E+00			
		.40	.90	1.35	1.80	2.20	2.60	7.50
1KR-85M		.255157+0173-3000+0000+0000+0000+0000+0581+0						
2KR-85		.251000+0123-2000+0000+0000+0000+0000+0514+0						
3KR-90		1.315766-1233+0462+0386+0491-1190-1448-1386+1						
4KR-131M		.142664-2000+0000+0000+0000+0000+0000+0164+0						
5KR-85		1.003000+0334-1233-1659-2275-2000+0000+0183+1						
6I-131		.190317+0625-1000+0000+0000+0000+0000+0723+0						
7RB-90M		1.388344-2855+0195+0472+0186+0118+0144+1473+1						
8RB-90		1.960000+0277+0963-1192-1366-1111+0162+1533+1						
9SR-90		.196000+0000+0000+0000+0000+0000+0000+0000+0						
10Y-90		.935000+0000+0000+0000+0000+0000+0000+0000+0						
11YE-131M		.190112+0828+0377+0219-1735-1871-2000+0227+1						
12TE-131		.719110+0162+0142+0323-2000+0000+0000+0150+1						

*** PROGRAM STP-PC (TEE SHIELDER-S EDGE) IS AT YOUR SERVICE ***

E22 of E 38

*** VERSION NUMBER=1.1 REVISION DATE WAS 9/29/92

*** TODAY'S DATE = 10/ 9/1992 START TIME = 13:16:26

1 'SOURCE'

1 1.0 2 1.0 3 1.0 4 1.0 5 1.0 6 1.0

7 1.0 8 1.0 9 1.0 10 1.0 11 1.0 12 1.0

0

T

STP QUALIFICATION EXAMPLE 5B CHECK OF EXAMPLE 5A

NJ= 3

1 'VOLUME 1'

2 'VOLUME 2'

3 'VOLUME 3'

-1

SOURCE AND VOLUME INITIALIZATION

V 1 1.00 CC

V 2 1.00 CC

V 3 1.00 CC

S 1 1 0 1.0

F 1 2 0 1.0

F 2 3 1 1.0

F 2 3 2 1.0E-6

F 2 3 3 1.0

1 HOUR

ACTIVITIES AFTER 1 HOUR

2 HOUR

ACTIVITIES AFTER 2 H.

T

T

+ + + + + + + +

* * *

PROGRAM S T P (VERSION 1.1)

RAN ON 10/ 9/1992

* * *

DATA FOR THIS RUN OR SERIES OF RUNS

NUMBER OF ISOTOPE (DATA CARDS) = 12

NUMBER OF COMPONENTS (ALL RUNS) = 3

NUMBER OF CLASSES OF ISOTOPE = 3

NUMBER OF SOURCES (MAXIMUM) = 1

NUMBER OF GAMMA GROUPS = 7

NUMBER OF PRECURSORS (MAXIMUM) = 2

STORAGE LOCATIONS REQUESTED = 225000

STORAGE LOCATIONS USED = 1045

PROGRAM S T P (VERSION 1.1)
 S T P QUALIFICATION EXAMPLE 5B CHECK OF EXAMPLE 5A

RAN ON 10/ 9/1992

E 24 of E 38

NUCLIDE DATA INPUT (LIBRARY)

NUMBER	NAME	CLASS	LAMDA(1/HR)	PRECURSOR (NO.,RATE)-
1	KR-85M	1	1.5472E-01	5 1.5447E-01 1 0.0000E+00
2	KR-85	1	7.3764E-06	1 1.5564E-06 5 1.2024E-08
3	KR-90	1	7.7206E+01	1 0.0000E+00 1 0.0000E+00
4	XE-131M	1	2.4393E-03	6 2.6490E-05 1 0.0000E-00
5	BR-85	2	1.4508E+01	1 0.0000E+00 1 0.0000E+00
6	I-131	2	3.5922E-03	11 2.7947E-03 12 3.5922E-03
7	RB-90M	3	9.6718E+00	3 1.1510E+00 1 0.0000E+00
8	RB-90	3	1.5894E+01	3 1.4002E+01 7 3.6555E-01
9	SR-90	3	2.7648E-06	7 2.7012E-06 8 2.7648E-06
10	Y-90	3	1.0814E-02	9 1.0814E-02 1 0.0000E+00
11	TE-131M	3	2.3105E-02	1 0.0000E+00 1 0.0000E+00
12	TE-131	3	1.6636E+00	11 3.6931E-01 1 0.0000E+00

*** PROGRAM STP (VERSION 1.1) RAN ON 10/ 9/1992 ***
 *** STP QUALIFICATION EXAMPLE 5B CHECK OF EXAMPLE 5A ***

I	ISOTOPE	BETA MEV/DISC	GAMMA (MEV/DISC) BY GROUP AND MAX.ENERGY (MEV)						
			1	2	3	4	5	6	7
	EFFECTIVE ENERGY		.400	.900	1.350	1.800	2.200	2.600	7.500
1	KR-85M	.255	.157	.000	.000	.000	.000	.000	.581
2	KR-85	.251	.000	.002	.000	.000	.000	.000	.514
3	KR-90	1.315	.077	.233	.462	.386	.049	.019	3.860
4	XE-131M	.142	.007	.000	.000	.000	.000	.000	.164
5	BR-85	1.003	.000	.033	.023	.007	.003	.000	1.830
6	I-131	.190	.317	.063	.000	.000	.000	.000	.723
7	RB-90M	1.388	.003	.855	.195	.472	.186	.118	4.730
8	RB-90	1.960	.000	.277	.096	.019	.037	.111	5.330
9	SR-90	.196	.000	.000	.000	.000	.000	.000	.000
10	Y-90	.935	.000	.000	.000	.000	.000	.000	.000
11	TE-131M	.190	.112	.828	.377	.022	.074	.009	2.270
12	TE-131	.719	.110	.162	.142	.003	.000	.000	1.500

E26 of E38

*** PROGRAM S T P (VERSION 1.1) RAN ON 10/ 9/1992 ***
*** STP QUALIFICATION EXAMPLE 5B CHECK OF EXAMPLE 5A ***

RUN LOOP INFORMATION FOR THIS RUN FOLLOWS.

NJ, NUMBER OF COMPONENTS USED IN THIS RUN LOOP = 3
KCONC, CALC. TYPE (0/INVENTORY, 1/CONCENTRATION) = 0
IB, -- ACT/COMP. --- ACT/GM.
NDECAY, CALCULATE DAUGHTER PRODUCTION (0/YES,1/NO) = 0
(DEFAULT =0)
ITMAX, MAXIMUM NUMBER OF ITERATIONS PER TIME STEP = 0
(DEFAULT = 10)
KDEBUG, DEBUG OPTION (0/NORMAL OUTPUT, 1/MUCHO) = 0

*** PROGRAM S T P (VERSION 1.1) ***
*** STP QUALIFICATION EXAMPLE 5B CHECK OF EXAMPLE 5A ***

SOURCE LIBRARY

NUCLIDE	SOURCE	
1 KR-85M	1.000E+00	
2 KR-85	1.000E+00	
3 KR-90	1.000E+00	
4 KR-131M	1.000E+00	
5 KR-85	1.000E+00	
6 I-131	1.000E+00	
7 RB-90M	1.000E+00	
8 RB-90	1.000E+00	
9 SR-90	1.000E+00	
10 Y-90	1.000E+00	
11 TR-131M	1.000E+00	
12 TR-131	1.000E+00	
TOTAL CLASS 1	4.000E+00	
TOTAL CLASS 2	2.000E+00	
TOTAL CLASS 3	6.000E+00	
GRAND TOTAL	1.200E+01	

```

* * * PROGRAM S T P (VERSION 1.1 ) RAN ON 10/ 9/1992 * * *
* * * STP QUALIFICATION EXAMPLE 5B CHECK OF EXAMPLE 5A * * *
* * STEP SOURCE AND VOLUME INITIALIZATION

```

```

TIME      END TIME = -1.000E+00      INTERVALS/STEP      = 30
STEP      START TIME = 0.000E+00      ERROR LIMIT        = 1.0000E-05
          DELTA T   = 0.000E+00

```

```

***** COMPONENT *****
NO.  NAME      VOLUME OR MASS      DATA READ (BY CLASS NUMBER)
          1          2          3

1 VOLUME 1      1.000E+00 CC

      REMOVAL RATES (FROM 1) = 0.000E+00 0.000E+00 0.000E+00
      FLOW RATES (CC /HR) F ( 1 TO 2) = 1.000E+00 1.000E+00 1.000E+00
      TRANSM. FRACTION ( 1 TO 2) = 1.000E+00 1.000E+00 1.000E+00
      STEP SOURCE FACTOR (FROM SOURCE 1) = 1.000E+00 1.000E+00 1.000E+00

2 VOLUME 2      1.000E+00 CC

      REMOVAL RATES (FROM 2) = 0.000E+00 0.000E+00 0.000E+00
      FLOW RATES (CC /HR) F ( 2 TO 3) = 1.000E+00 1.000E-06 1.000E+00
      TRANSM. FRACTION ( 2 TO 3) = 1.000E+00 1.000E+00 1.000E+00

3 VOLUME 3      1.000E+00 CC

      REMOVAL RATES (FROM 3) = 0.000E+00 0.000E+00 0.000E+00

```


***** PROGRAM S T P (VERSION 1.1)

RAN ON 10/ 9/1992

*** STP QUALIFICATION EXAMPLE 5B CHECK OF EXAMPLE 5A

** STEP SOURCE AND VOLUME INITIALIZATION

STEP SOURCE DATA FROM SOURCE INPUT

1
VOLUME 1

NUCLIDE	
1 KR-85M	1.000E+00
2 KR-85	1.000E+00
3 KR-90	1.000E+00
4 KR-131M	1.000E+00
5 BR-85	1.000E+00
6 I-131	1.000E+00
7 RB-90M	1.000E+00
8 RB-90	1.000E+00
9 SR-90	1.000E+00
10 Y-90	1.000E+00
11 TR-131M	1.000E+00
12 TR-131	1.000E+00

VOLUME 1.000E+00 CC

TOTAL CLASS 1	4.000E+00
TOTAL CLASS 2	2.000E+00
TOTAL CLASS 3	6.000E+00
GRAND TOTAL	1.200E+01

E29 of E38

***** PROGRAM S T P (VERSION 1.1) RAN ON 10/ 9/1992 *****
*** STP QUALIFICATION EXAMPLE 5B CHECK OF EXAMPLE 5A ***
** STEP SOURCE AND VOLUME INITIALIZATION

ACTIVITIES AT END OF THE TIME STEP

1
VOLUME 1

NUCLIDE	
1 KR-85M	1.000E+00
2 KR-85	1.000E+00
3 KR-90	1.000E+00
4 KR-131M	1.000E+00
5 KR-85	1.000E+00
6 I-131	1.000E+00
7 RB-90M	1.000E+00
8 RB-90	1.000E+00
9 SR-90	1.000E+00
10 Y-90	1.000E+00
11 TR-131M	1.000E+00
12 TR-131	1.000E+00

VOLUME 1.000E+00 CC

TOTAL CLASS 1	4.000E+00
TOTAL CLASS 2	2.000E+00
TOTAL CLASS 3	6.000E+00
GRAND TOTAL	1.200E+01

```

* * *      PROGRAM  S T P  (VERSION 1.1 )      RAN ON 10/ 9/1992      * * *
* * * STP QUALIFICATION EXAMPLE 5B CHECK OF EXAMPLE 5A      * * *
* * STEP SOURCE AND VOLUME INITIALIZATION

```

STP GAMMA SHIELDING INFORMATION CALCULATED

COMPONENT 1 VOLUME 1

```

CONVERSION FACTOR = 1.000E+00
VOLUME             = 1.000E+00 CC
BETA SOURCE        = 3.161E+05 (MEV/SEC/ )
  PARTICLE SOURCE  ENERGY SOURCE  GROUP ENERGY
  (PHOTON/SEC/    ) (MEV/SEC/    ) (MEV-EFFECTIVE)

  1  7.240E+04      2.896E+04      .40
  2  1.009E+05      9.077E+04      .90
  3  3.551E+04      4.794E+04      1.35
  4  1.868E+04      3.363E+04      1.80
  5  5.852E+03      1.287E+04      2.20
  6  3.653E+03      9.498E+03      2.60
  7  2.155E+04      1.149E+05      5.33 (VARIABLE)

TOTALS  2.585E+05  3.385E+05  1.31

```

```

* * * * * PROGRAM S T P (VERSION 1.1 )          RAN ON 10/ 9/1992 * * * * *
* * * STP QUALIFICATION EXAMPLE 5B CHECK OF EXAMPLE 5A * * *
* * STEP ACTIVITIES AFTER 1 HOUR

```

```

TIME      END TIME = 1.000E+00 HOUR      INTERVALS/STEP      = 30
STEP      START TIME = 0.000E+00          ERROR LIMIT          = 1.0000E-05
          DELTA T   = 1.000E+00 HOUR

```

```

***** COMPONENT *****
NO.  NAME          VOLUME OR MASS      DATA READ (BY CLASS NUMBER)
                                     1          2          3

1  VOLUME 1        1.000E+00 CC

      REMOVAL RATES (FROM 1) = 0.000E+00  0.000E+00  0.000E+00
      FLOW RATES (CC /HR) F ( 1 TO 2) = 1.000E+00  1.000E+00  1.000E+00
      TRANSM. FRACTION ( 1 TO 2) = 1.000E+00  1.000E+00  1.000E+00

2  VOLUME 2        1.000E+00 CC

      REMOVAL RATES (FROM 2) = 0.000E+00  0.000E+00  0.000E+00
      FLOW RATES (CC /HR) F ( 2 TO 3) = 1.000E+00  1.000E-06  1.000E+00
      TRANSM. FRACTION ( 2 TO 3) = 1.000E+00  1.000E+00  1.000E+00

3  VOLUME 3        1.000E+00 CC

      REMOVAL RATES (FROM 3) = 0.000E+00  0.000E+00  0.000E+00

*** 30 STEPS WERE USED REQUIRING AN AVERAGE OF .00 ITERATIONS PER STEP

```

* * * PROGRAM S T P (VERSION 1.1) RAN ON 10/ 9/1992 * * *
 * * * STP QUALIFICATION EXAMPLE 5B CHECK OF EXAMPLE 5A * * *
 * * STEP ACTIVITIES AFTER 1 HOUR

E33 of E38

ACTIVITIES AT END OF THE TIME STEP

	1	2	3
	VOLUME 1	VOLUME 2	VOLUME 3
NUCLIDE			
1 KR-85M	3.185E-01	3.186E-01	2.288E-01
2 KR-85	3.679E-01	3.679E-01	2.642E-01
3 KR-90	1.086E-34	0.000E+00	2.492E-52
4 XE-131M	3.670E-01	3.670E-01	2.636E-01
5 BR-85	1.841E-07	3.164E-07	1.840E-13
6 I-131	3.684E-01	6.325E-01	4.590E-04
7 RB-90M	2.359E-05	1.257E-05	1.357E-05
8 RB-90	1.440E-06	9.908E-07	8.661E-07
9 SR-90	3.679E-01	3.679E-01	2.642E-01
10 Y-90	3.679E-01	3.679E-01	2.642E-01
11 TE-131M	3.595E-01	3.595E-01	2.582E-01
12 TE-131	1.349E-01	1.349E-01	9.692E-02
VOLUME	1.000E+00 CC	1.000E+00 CC	1.000E+00 CC
TOTAL CLASS 1	1.053E+00	1.053E+00	7.566E-01
TOTAL CLASS 2	3.684E-01	6.325E-01	4.590E-04
TOTAL CLASS 3	1.230E+00	1.230E+00	8.836E-01
GRAND TOTAL	2.652E+00	2.916E+00	1.641E+00

*** PROGRAM S T P (VERSION 1.1) ***
 *** STP QUALIFICATION EXAMPLE 5B CHECK OF EXAMPLE 5A ***
 *** STEP ACTIVITIES AFTER 1 HOUR ***

STP GAMMA SHIELDING INFORMATION CALCULATED

COMPONENT 1 VOLUME 1

CONVERSION FACTOR = 1.000E+00
 VOLUME = 1.000E+00 CC
 BETA SOURCE = 3.245E+04 (MEV/SEC/)
 PARTICLE SOURCE ENERGY SOURCE GROUP ENERGY
 (PHOTON/SEC/) (MEV/SEC/) (MEV-EFFECTIVE)

1	2.075E+04	8.300E+03	.40
2	1.412E+04	1.271E+04	.90
3	4.240E+03	5.723E+03	1.35
4	1.710E+02	3.078E+02	1.80
5	4.444E+02	9.778E+02	2.20
6	4.460E+01	1.160E+02	2.60
7	2.839E-01	1.343E+00	4.73 (VARIABLE)
TOTALS	3.977E+04	2.813E+04	.71

COMPONENT 2 VOLUME 2

CONVERSION FACTOR = 1.000E+00
 VOLUME = 1.000E+00 CC
 BETA SOURCE = 3.431E+04 (MEV/SEC/)
 PARTICLE SOURCE ENERGY SOURCE GROUP ENERGY
 (PHOTON/SEC/) (MEV/SEC/) (MEV-EFFECTIVE)

1	2.850E+04	1.140E+04	.40
2	1.480E+04	1.332E+04	.90
3	4.240E+03	5.723E+03	1.35
4	1.709E+02	3.076E+02	1.80
5	4.444E+02	9.777E+02	2.20
6	4.458E+01	1.159E+02	2.60
7	1.542E-01	7.292E-01	4.73 (VARIABLE)
TOTALS	4.819E+04	3.184E+04	.66

PROGRAM S T P (VERSION 1.1)

RAN ON 10/ 9/1992

E 34 of E 38

*** STP QUALIFICATION EXAMPLE 5B CHECK OF EXAMPLE 5A

*** STEP ACTIVITIES AFTER 1 HOUR

STP GAMMA SHIELDING INFORMATION CALCULATED

COMPONENT 3 VOLUME 3

CONVERSION FACTOR = 1.000E+00

VOLUME = 1.000E+00 CC

BETA SOURCE = 2.145E+04 (MEV/SEC/)

	PARTICLE SOURCE (PROTON/SEC/)	ENERGY SOURCE (MEV/SEC/)	GROUP ENERGY (MEV-EFFECTIVE)
--	-----------------------------------	------------------------------	---------------------------------

1	7.159E+03	2.864E+03	.40
2	9.462E+03	8.516E+03	.90
3	3.845E+03	4.111E+03	1.35
4	1.228E+02	2.210E+02	1.80
5	3.192E+02	7.023E+02	2.20
6	3.203E+01	8.327E+01	2.60
7	1.638E-01	7.750E-01	4.73 (VARIABLE)

TOTALS	2.014E+04	1.650E+04	.82
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*** PROGRAM S T P (VERSION 1.1) RAN ON 10/ 9/1992 ***

*** STP QUALIFICATION EXAMPLE 5B CHECK OF EXAMPLE 5A ***

*** STEP ACTIVITIES AFTER 2 HOUR

TIME END TIME = 2.000E+00 HOUR INTERVALS/STEP = 30
 STEP START TIME = 1.000E+00 HOUR ERROR LIMIT = 1.0000E-05
 DELTA T = 1.000E+00 HOUR

***** COMPONENT *****		DATA READ (BY CLASS NUMBER)			
NO.	NAME	VOLUME OR MASS	1	2	3
1	VOLUME 1	1.000E+00 CC			
	REMOVAL RATES (FROM 1) =		0.000E+00	0.000E+00	0.000E+00
	FLOW RATES (CC /HR) F (1 TO 2) =		1.000E+00	1.000E+00	1.000E+00
	TRANSM. FRACTION (1 TO 2) =		1.000E+00	1.000E+00	1.000E+00
2	VOLUME 2	1.000E+00 CC			
	REMOVAL RATES (FROM 2) =		0.000E+00	0.000E+00	0.000E+00
	FLOW RATES (CC /HR) F (2 TO 3) =		1.000E+00	1.000E+00	1.000E+00
	TRANSM. FRACTION (2 TO 3) =		1.000E+00	1.000E+00	1.000E+00
3	VOLUME 3	1.000E+00 CC			
	REMOVAL RATES (FROM 3) =		0.000E+00	0.000E+00	0.000E+00

*** 30 STEPS WERE USED REQUIRING AN AVERAGE OF .00 ITERATIONS PER STEP

* * * PROGRAM S T P (VERSION 1.1) RAN ON 10/ 9/1992 * * *
 * * * STEP QUALIFICATION EXAMPLE 5B CHECK OF EXAMPLE 5A * * *
 * * STEP ACTIVITIES AFTER 2 HOUR

ACTIVITIES AT END OF THE TIME STEP

	1 VOLUME 1	2 VOLUME 2	3 VOLUME 3
NUCLIDE			
1 KR-85M	1.004E-01	2.008E-01	4.406E-01
2 KR-85	1.353E-01	2.707E-01	5.940E-01
3 KR-90	0.000E+00	0.000E+00	0.000E+00
4 KR-131M	1.347E-01	2.694E-01	5.911E-01
5 BR-85	3.390E-14	2.166E-13	2.844E-19
6 I-131	1.355E-01	8.639E-01	2.078E-03
7 BR-90M	5.470E-10	2.915E-10	1.356E-09
8 BR-90	3.214E-11	2.230E-11	8.069E-11
9 SR-90	1.353E-01	2.707E-01	5.940E-01
10 Y-90	1.353E-01	2.707E-01	5.940E-01
11 TE-131M	1.292E-01	2.584E-01	5.672E-01
12 TE-131	3.286E-02	6.571E-02	1.442E-01
VOLUME	1.000E+00 CC	1.000E+00 CC	1.000E+00 CC
TOTAL CLASS 1	3.704E-01	7.408E-01	1.626E+00
TOTAL CLASS 2	1.355E-01	8.639E-01	2.078E-03
TOTAL CLASS 3	4.327E-01	8.655E-01	1.899E+00
GRAND TOTAL	9.387E-01	2.470E+00	3.527E+00

* * * PROGRAM S T P (VERSION 1.1) RAN ON 10/ 9/1992 * * *
 * * * STP QUALIFICATION EXAMPLE 5B CHECK OF EXAMPLE 5A * * *
 * * STEP ACTIVITIES AFTER 2 HOUR

STP GAMMA SHIELDING INFORMATION CALCULATED

COMPONENT 1 VOLUME 1

CONVERSION FACTOR = 1.000E+00
 VOLUME = 1.000E+00 CC
 BETA SOURCE = 1.131E+04 (NEV/SEC/)
 PARTICLE SOURCE ENERGY SOURCE GROUP ENERGY
 (PHOTON/SEC/) (NEV/SEC/) (NEV-EFFECTIVE)

1	7.188E+03	2.875E+03	.40
2	4.979E+03	4.481E+03	.90
3	1.463E+03	1.975E+03	1.35
4	6.035E+01	1.086E+02	1.80
5	1.597E+02	3.514E+02	2.20
6	1.602E+01	4.164E+01	2.60
7	6.569E-06	3.107E-05	4.73 (VARIABLE)
TOTALS	1.387E+04	9.833E+03	.71

COMPONENT 2 VOLUME 2

CONVERSION FACTOR = 1.000E+00
 VOLUME = 1.000E+00 CC
 BETA SOURCE = 2.679E+04 (NEV/SEC/)
 PARTICLE SOURCE ENERGY SOURCE GROUP ENERGY
 (PHOTON/SEC/) (NEV/SEC/) (NEV-EFFECTIVE)

1	3.176E+04	1.270E+04	.40
2	1.148E+04	1.033E+04	.90
3	2.926E+03	3.950E+03	1.35
4	1.207E+02	2.173E+02	1.80
5	3.195E+02	7.028E+02	2.20
6	3.203E+01	8.329E+01	2.60
7	3.566E-06	1.687E-05	4.73 (VARIABLE)
TOTALS	4.664E+04	2.799E+04	.60

* * * PROGRAM S T P (VERSION 1.1) RAN ON 10/ 9/1992 * * *
 * * * STP QUALIFICATION EXAMPLE 5B CHECK OF EXAMPLE 5A * * *
 * * STP ACTIVITIES AFTER 2 HOUR

STP GAMMA SHIELDING INFORMATION CALCULATED

COMPONENT 3 VOLUME 3

CONVERSION FACTOR = 1.000E+00

VOLUME = 1.000E+00 CC

BETA SOURCE = 4.547E+04 (NEV/SEC/)

	PARTICLE SOURCE (PHOTON/SEC/)	ENERGY SOURCE (NEV/SEC/)	GROUP ENERGY (NEV-EFFECTIVE)
--	-----------------------------------	------------------------------	---------------------------------

1	1.417E+04	5.666E+03	.40
2	2.033E+04	1.830E+04	.90
3	6.422E+03	8.669E+03	1.35
4	2.649E+02	4.768E+02	1.80
5	7.011E+02	1.542E+03	2.20
6	7.030E+01	1.826E+02	2.60
7	1.630E-05	7.711E-05	4.73 (VARIABLE)

TOTALS	4.195E+04	3.483E+04	.83
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* * * END PROGRAM STP (VERSION 1.1)

TIME OFF = 13:21:39 DATE = 10/ 9/1992

Title Verification of Computer Program Page F1 of F38

STP (PC) Version 1.1 EGS-TR-910600-18 Project All

Calculated by EKL Date 10/23/92 Checked by QWW Date 10/26/92

Appendix F
Examples 6A and 6B

*** PROGRAM STP-PC (THE SHIELDER-S EDGE) IS AT YOUR SERVICE ***

F2 of F38

*** VERSION NUMBER=1.1 REVISION DATE WAS 9/29/92

* TODAY'S DATE = 10/ 9/1992 START TIME = 13:25: 8

REPRODUCTION OF INPUT DATA DECK

+ + + + +

NV= 3 NS= 1

N1= 12 NK= 3 NG= 7 NL= 2

1KR-85M	1	4.2978E-05	54.0234E-03	10.0000E+00	10.0000E+00		
2KR-85	1	2.0490E-09	19.0683E-06	56.5688E-06	10.0000E+00		
3KR-90	1	2.1446E-02	10.0000E+00	10.0000E+00	10.0000E+00		
4XE-131M	1	6.7758E-07	61.0836E-08	10.0000E+00	10.0000E+00		
5BR-85	2	4.5299E-03	10.0000E+00	10.0000E+00	10.0000E+00		
6I-131	2	9.9783E-07	114.9932E-06	124.6210E-04	10.0000E+00		
7RB-90M	3	2.6866E-03	32.5521E-03	10.0000E+00	10.0000E+00		
8RB-90	3	4.4149E-03	31.8894E-02	76.1792E-05	10.0000E+00		
9SR-90	3	7.6801E-10	72.6248E-03	84.4149E-03	10.0000E+00		
10Y-90	3	3.0038E-06	97.6801E-10	10.0000E+00	10.0000E+00		
11YE-131M	3	6.4180E-06	10.0000E+00	10.0000E+00	10.0000E+00		
12YE-131	3	4.6210E-04	111.4248E-06	10.0000E+00	10.0000E+00		
		.40	.90	1.35	1.80	2.20	2.60
							7.50
1KR-85M		.255157+0123-3000+0000+0000+0000+0000+0581+0					+
2KR-85		.251000+0223-2000+0000+0000+0000+0000+0514+0					+
3KR-90		1.315766-1233+0462+0386+0491-1190-1448-1386+1					+
4XE-131M		.142664-2000+0000+0000+0000+0000+0000+0164+0					+
5BR-85		1.003000+0334-1233-1659-2275-2000+0000+0183+1					+
6I-131		.190317+0625-1000+0000+0000+0000+0000+0723+0					+
7RB-90M		1.388344-2855+0195+0472+0186+0118+0144+1473+1					+
8RB-90		1.960000+0277+0963-1192-1366-1111+0162+1533+1					+
9SR-90		.196000+0000+0000+0000+0000+0000+0000+0000+0					+
10Y-90		.935000+0000+0000+0000+0000+0000+0000+0000+0					+
11YE-131M		.190112+0828+0377+0219-1735-1871-2000+0227+1					+
12YE-131		.719110+0162+0142+0323-2000+0000+0000+0150+1					+

*** PROGRAM STP-PC (THE SHIELDER-S EDGE) IS AT YOUR SERVICE ***

** VERSION NUMBER=1.1 REVISION DATE WAS 9/29/92

* TODAY'S DATE = 10/ 9/1992 START TIME = 13:25: 8

1 'SOURCE'
 1 1.0 2 1.0 3 1.0 4 1.0 5 1.0 6 1.0
 7 1.0 8 1.0 9 1.0 10 1.0 11 1.0 12 1.0

0

T

STP QUALIFICATION EXAMPLE 6A KEY LETTER B

NJ= 3

1 'VOLUME 1'

2 'VOLUME 2'

3 'VOLUME 3'

-1

SOURCE AND VOLUME INITIALIZATION

V 1 1.00 CC

V 2 1.00 CC

V 3 1.00 CC

S 1 1 0 1.0

F 1 2 0 1.0

E 2 3 1 1.0E+6 1.0E-12

E 2 3 2 1.0E-6 1.0E+12

E 2 3 3 1.0E-6 1.0E+12

1 HOUR

ACTIVITIES AFTER 1 HOUR

2 HOUR

ACTIVITIES AFTER 2 HOUR

T

T

+ + + + + + +

PROGRAM S T P (VERSION 1.1)

RAN ON 10/ 9/1992

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DATA FOR THIS RUN OR SERIES OF RUNS

NUMBER OF ISOTOPES (DATA CARDS) = 12

NUMBER OF COMPONENTS (ALL RUNS) = 3

NUMBER OF CLASSES OF ISOTOPES = 3

NUMBER OF SOURCES (MAXIMUM) = 1

NUMBER OF GAMMA GROUPS = 7

NUMBER OF PRECURSORS (MAXIMUM) = 2

STORAGE LOCATIONS REQUESTED =225000

STORAGE LOCATIONS USED = 1045

* * * PROGRAM S T P (VERSION 1.1)

RAN ON 10/ 9/1992 * * *

* * * STP QUALIFICATION EXAMPLE 6A KEY LETTER B

* * *

NUCLIDE DATA INPUT (LIBRARY)

NUMBER	NAME	CLASS	LAMDA(1/HR)	PRECURSOR (NO.,RATE)-
1	KR-85M	1	1.5472E-01	5 1.5447E-01 1 0.0000E+00
2	KR-85	1	7.3764E-06	1 1.5564E-06 5 1.2024E-08
3	KR-90	1	7.7206E+01	1 0.0000E+00 1 0.0000E+00
4	XE-131M	1	2.4393E-03	6 2.6490E-05 1 0.0000E+00
5	BR-85	2	1.4508E+01	1 0.0000E+00 1 0.0000E+00
6	I-131	2	3.5922E-03	11 2.7947E-03 12 3.5922E-03
7	RB-90M	3	9.6718E+00	3 1.1510E+00 1 0.0000E+00
8	RB-90	3	1.5894E+01	3 1.4002E+01 7 3.6555E-01
9	SR-90	3	2.7648E-06	7 2.7012E-06 8 2.7648E-06
10	Y-90	3	1.0814E-02	9 1.0814E-02 1 0.0000E+00
11	TE-131M	3	2.3105E-02	1 0.0000E+00 1 0.0000E+00
12	TE-131	3	1.6636E+00	11 3.6931E-01 1 0.0000E+00

* * * PROGRAM S T P (VERSION 1.1)

RAN ON 10/ 9/1992

* * *

* * * STP QUALIFICATION EXAMPLE 6A KEY LETTER B

* * *

I	ISOTOPE	BETA MEV/DISC	GAMMA (MEV/DISC) BY GROUP AND MAX.ENERGY (MEV)						
			1	2	3	4	5	6	7
	EFFECTIVE ENERGY		.400	.900	1.350	1.800	2.200	2.600	7.500
1	KR-85M	.255	.157	.000	.000	.000	.000	.000	.581
2	KR-85	.251	.000	.002	.000	.000	.000	.000	.514
3	KR-90	1.315	.077	.233	.462	.386	.049	.019	3.860
4	XE-131M	.142	.007	.000	.000	.000	.000	.000	.164
5	BR-85	1.003	.000	.033	.023	.007	.003	.000	1.830
6	I-131	.190	.317	.063	.000	.000	.000	.000	.723
7	RB-90M	1.388	.003	.855	.195	.472	.186	.118	1.440 4.730
8	RB-90	1.960	.000	.277	.096	.019	.037	.111	1.620 5.330
9	SR-90	.196	.000	.000	.000	.000	.000	.000	.000
10	Y-90	.935	.000	.000	.000	.000	.000	.000	.000
11	TE-131M	.190	.112	.828	.377	.022	.074	.009	.000 2.270
12	TE-131	.719	.110	.162	.142	.003	.000	.000	.000 1.500

*** PROGRAM S T P (VERSION 1.1) RAN ON 10/ 9/1992 ***
*** STP QUALIFICATION EXAMPLE 6A KEY LETTER B ***

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RUN LOOP INFORMATION FOR THIS RUN FOLLOWS.

NJ, NUMBER OF COMPONENTS USED IN THIS RUN LOOP = 3
KCONC, CALC. TYPE (0/INVENTORY, 1/CONCENTRATION) = 0
IR, -- ACT/COMP. --- ACT/GM.
NDECAY, CALCULATE DAUGHTER PRODUCTION (0/YES,1/NO) = 0
(DEFAULT =0)
ITMAX, MAXIMUM NUMBER OF ITERATIONS PER TIME STEP = 0
(DEFAULT = 10)
KDEBUG, DEBUG OPTION (0/NORMAL OUTPUT, 1/MUCHO) = 0

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*** PROGRAM S T P (VERSION 1.1)

RAN ON 10/ 9/1992

*** STP QUALIFICATION EXAMPLE 6A KEY LETTER B

SOURCE LIBRARY

NUCLIDE	SOURCE
	1
1 KR-85M	1.000E+00
2 KR-85	1.000E+00
3 KR-90	1.000E+00
4 KR-131M	1.000E+00
5 RB-85	1.000E+00
6 I-131	1.000E+00
7 RB-90M	1.000E+00
8 RB-90	1.000E+00
9 SR-90	1.000E+00
10 Y-90	1.000E+00
11 YR-131M	1.000E+00
12 YR-131	1.000E+00
TOTAL CLASS 1	4.000E+00
TOTAL CLASS 2	2.000E+00
TOTAL CLASS 3	6.000E+00
GRAND TOTAL	1.200E+01

***** PROGRAM S T P (VERSION 1.1) RAN ON 10/ 9/1992 *****

***** STP QUALIFICATION EXAMPLE 6A KEY LETTER B *****

***** STEP SOURCE AND VOLUME INITIALIZATION

TIME END TIME = -1.000E+00 INTERVALS/STEP = 30
 START TIME = 0.000E+00 ERROR LIMIT = 1.000E-05
 STEP DELTA T = 0.000E+00

***** COMPONENT *****		DATA READ (BY CLASS NUMBER)			
NO.	NAME	VOLUME OR MASS	1	2	3
1	VOLUME 1	1.000E+00 CC			
	REMOVAL RATES (FROM 1) =		0.000E+00	0.000E+00	0.000E+00
	FLOW RATES (CC /HR) F (1 TO 2) =		1.000E+00	1.000E+00	1.000E+00
	TRANSM. FRACTION (1 TO 2) =		1.000E+00	1.000E+00	1.000E+00
	STEP SOURCE FACTOR (FROM SOURCE 1) =		1.000E+00	1.000E+00	1.000E+00
2	VOLUME 2	1.000E+00 CC			
	REMOVAL RATES (FROM 2) =		0.000E+00	0.000E+00	0.000E+00
	FLOW RATES (CC /HR) F (2 TO 3) =		1.000E+06	1.000E+06	1.000E+06
	TRANSM. FRACTION (2 TO 3) =		1.000E+00	1.000E+00	1.000E+00
3	VOLUME 3	1.000E+00 CC			
	REMOVAL RATES (FROM 3) =		0.000E+00	0.000E+00	0.000E+00
	FLOW RATES (CC /HR) F (3 TO 2) =		1.000E+06	1.000E+06	1.000E+06
	TRANSM. FRACTION (3 TO 2) =		1.000E+00	1.000E+00	1.000E+00

* * * PROGRAM S T P (VERSION 1.1)

RAN ON 10/ 9/1992

* * * *

* * * STP QUALIFICATION EXAMPLE 6A KEY LETTER B

* * *

* * STEP SOURCE AND VOLUME INITIALIZATION

STEP SOURCE DATA FROM SOURCE INPUT

1
VOLUME 1

NUCLIDE	
1 KR-85M	1.000E+00
2 KR-85	1.000E+00
3 KR-90	1.000E+00
4 XR-131M	1.000E+00
5 BR-85	1.000E+00
6 I-131	1.000E+00
7 RB-90M	1.000E+00
8 RB-90	1.000E+00
9 SR-90	1.000E+00
10 Y-90	1.000E+00
11 TR-131M	1.000E+00
12 TR-131	1.000E+00

VOLUME 1.000E+00 CC

TOTAL CLASS 1	4.000E+00
TOTAL CLASS 2	2.000E+00
TOTAL CLASS 3	6.000E+00
GRAND TOTAL	1.200E+01

*** PROGRAM S T P (VERSION 1.1)

RAN ON 10/ 9/1992

*** STP QUALIFICATION EXAMPLE 6A KEY LETTER B

*** STEP SOURCE AND VOLUME INITIALIZATION

ACTIVITIES AT END OF THE TIME STEP

	1	
	VOLUME 1	
NUCLIDE		
1 KR-85K	1.000E+00	
2 KR-85	1.000E+00	
3 KR-90	1.000E+00	
4 KR-131K	1.000E+00	
5 KR-85	1.000E+00	
6 I-131	1.000E+00	
7 RB-90K	1.000E+00	
8 RB-90	1.000E+00	
9 SR-90	1.000E+00	
10 Y-90	1.000E+00	
11 YR-131K	1.000E+00	
12 YR-131	1.000E+00	
VOLUME	1.000E+00 CC	
TOTAL CLASS 1	4.000E+00	
TOTAL CLASS 2	2.000E+00	
TOTAL CLASS 3	6.000E+00	
GRAND TOTAL	1.200E+01	

* * * PROGRAM S T P (VERSION 1.1) RAN ON 10/ 9/1992 * * *
 * * * STP QUALIFICATION EXAMPLE 6A KEY LETTER B * * *
 * * STEP SOURCE AND VOLUME INITIALIZATION

STP GAMMA SHIELDING INFORMATION CALCULATED

COMPONENT 1 VOLUME 1

CONVERSION FACTOR = 1.000E+00
 VOLUME = 1.000E+00 CC
 BETA SOURCE = 3.161E+05 (MEV/SEC/)
 PARTICLE SOURCE ENERGY SOURCE GROUP ENERGY
 (PHOTON/SEC/) (MEV/SEC/) (MEV-EFFECTIVE)

1	7.240E+04	2.896E+04	.40
2	1.009E+05	9.077E+04	.90
3	3.551E+04	4.794E+04	1.35
4	1.868E+04	3.363E+04	1.80
5	5.852E+03	1.287E+04	2.20
6	3.653E+03	9.498E+03	2.60
7	2.155E+04	1.149E+05	5.33 (VARIABLE)
TOTALS	2.585E+05	3.385E+05	1.31

```

* * * PROGRAM S T P (VERSION 1.1 )          RAN ON 10/ 9/1992  * * *
* * * STP QUALIFICATION EXAMPLE 6A KEY LETTER B          * * *
* * STEP ACTIVITIES AFTER 1 HOUR

```

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```

TIME      END TIME = 1.000E+00 HOUR          INTERVALS/STEP          = 30
STEP      START TIME = 0.000E+00          ERROR LIMIT          = 1.0000E-05
          DELTA T = 1.000E+00 HOUR

```

```

***** COMPONENT *****
NO.  NAME          VOLUME OR MASS          DATA READ (BY CLASS NUMBER)
          1          2          3

1 VOLUME 1          1.000E+00 CC

      REMOVAL RATES (FROM 1) = 0.000E+00 0.000E+00 0.000E+00
      FLOW RATES (CC /HR) F ( 1 TO 2) = 1.000E+00 1.000E+00 1.000E+00
      TRANSM. FRACTION ( 1 TO 2) = 1.000E+00 1.000E+00 1.000E+00

2 VOLUME 2          1.000E+00 CC

      REMOVAL RATES (FROM 2) = 0.000E+00 0.000E+00 0.000E+00
      FLOW RATES (CC /HR) F ( 2 TO 3) = 1.000E+06 1.000E+06 1.000E+06
      TRANSM. FRACTION ( 2 TO 3) = 1.000E+00 1.000E+00 1.000E+00

3 VOLUME 3          1.000E+00 CC

      REMOVAL RATES (FROM 3) = 0.000E+00 0.000E+00 0.000E+00
      FLOW RATES (CC /HR) F ( 3 TO 2) = 1.000E+06 1.000E+06 1.000E+06
      TRANSM. FRACTION ( 3 TO 2) = 1.000E+00 1.000E+00 1.000E+00

***** CODE SENSES A FEEDBACK LOOP AND/OR VARIABLE VOLUME *****
***** NSTEP IS AUTOMATICALLY INCREASED BY A FACTOR OF 3 *****

```

```

*** 90 STEPS WERE USED REQUIRING AN AVERAGE OF 1.70 ITERATIONS PER STEP

```


***** PROGRAM S T P (VERSION 1.1) RAN ON 10/ 9/1992 *****
 *** STEP QUALIFICATION EXAMPLE 6A KEY LETTER B ***

*** STEP ACTIVITIES AFTER 1 HOUR

ACTIVITIES AT END OF THE TIME STEP

	1	2	3
	VOLUME 1	VOLUME 2	VOLUME 3
NUCLIDE			
1 KR-85M	3.185E-01	3.185E-07	5.434E-01
2 KR-85	3.679E-01	3.679E-07	6.275E-01
3 KR-90	1.086E-34	1.086E-40	1.845E-34
4 ZX-131M	3.670E-01	3.670E-07	6.260E-01
5 BR-85	1.841E-07	3.164E-07	3.164E-19
6 I-131	3.684E-01	6.330E-01	6.330E-13
7 BR-90M	2.359E-05	4.052E-05	4.052E-17
8 BR-90	1.440E-06	2.473E-06	2.473E-18
9 SR-90	3.679E-01	6.321E-01	6.321E-13
10 Y-90	3.679E-01	6.321E-01	6.321E-13
11 YK-131M	3.595E-01	6.177E-01	6.177E-13
12 YK-131	1.349E-01	2.319E-01	2.319E-13
VOLUME	1.000E+00 CC	1.000E+00 CC	1.000E+00 CC
TOTAL CLASS 1	1.053E+00	1.053E-06	1.797E+00
TOTAL CLASS 2	3.684E-01	6.330E-01	6.330E-13
TOTAL CLASS 3	1.230E+00	2.114E+00	2.114E-12
GRAND TOTAL	2.652E+00	2.747E+00	1.797E+00

*** PROGRAM S T P (VERSION 1.1) ***
 *** S T P QUALIFICATION EXAMPLE 6A KEY LETTER B ***

*** STEP ACTIVITIES AFTER 1 HOUR

S T P GAMMA SHIELDING INFORMATION CALCULATED

COMPONENT 1 VOLUME 1

CONVERSION FACTOR = 1.000E+00
 VOLUME = 1.000E+00 CC
 BETA SOURCE = 3.245E+04 (MEV/SEC/)
 PARTICLE SOURCE ENERGY SOURCE GROUP ENERGY
 (PHOTON/SEC/) (MEV/SEC/) (MEV-EFFECTIVE)

1	2.075E+04	8.300E+03	.40
2	1.412E+04	1.271E+04	.90
3	4.240E+03	5.723E+03	1.35
4	1.710E+02	3.078E+02	1.80
5	4.444E+02	9.778E+02	2.20
6	4.460E+01	1.160E+02	2.60
7	2.839E-01	1.343E+00	4.73 (VARIABLE)
TOTALS	3.977E+04	2.813E+04	.71

COMPONENT 2 VOLUME 2

CONVERSION FACTOR = 1.000E+00
 VOLUME = 1.000E+00 CC
 BETA SOURCE = 4.141E+04 (MEV/SEC/)
 PARTICLE SOURCE ENERGY SOURCE GROUP ENERGY
 (PHOTON/SEC/) (MEV/SEC/) (MEV-EFFECTIVE)

1	2.732E+04	1.093E+04	.40
2	2.420E+04	2.178E+04	.90
3	7.285E+03	9.835E+03	1.35
4	2.938E+02	5.289E+02	1.80
5	7.637E+02	1.680E+03	2.20
6	7.663E+01	1.992E+02	2.60
7	4.878E-01	2.307E+00	4.73 (VARIABLE)
TOTALS	5.994E+04	4.495E+04	.75

*** PROGRAM S T P (VERSION 1.1)

RAN ON 10/ 9/1992

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*** STP QUALIFICATION EXAMPLE 6A KEY LETTER B

** STEP ACTIVITIES AFTER 1 HOUR

STP GAMMA SHIELDING INFORMATION CALCULATED

COMPONENT 3 VOLUME 3

CONVERSION FACTOR = 1.000E+00

VOLUME = 1.000E+00 CC

BETA SOURCE = 1.424E+04 (MEV/SEC/)

PARTICLE SOURCE ENERGY SOURCE GROUP ENERGY
(PHOTON/SEC/) (MEV/SEC/) (MEV-EFFECTIVE)

1	8.276E+03	3.310E+03	.40
2	6.027E+01	5.425E+01	.90
3	7.285E-09	9.835E-09	1.35
4	2.938E-10	5.289E-10	1.80
5	7.637E-10	1.680E-09	2.20
6	7.663E-11	1.992E-10	2.60
7	4.878E-13	2.307E-12	4.73 (VARIABLE)
TOTALS	8.336E+03	3.364E+03	.40

```

* * * * * PROGRAM S T P (VERSION 1.1 )          RAN ON 10/ 9/1992 * * * * *
* * * STP QUALIFICATION EXAMPLE 6A KEY LETTER B * * *
* * STEP ACTIVITIES AFTER 2 HOUR

```

```

TIME      END TIME = 2.000E+00 HOUR      INTERVALS/STEP      = 30
STEP      START TIME = 1.000E+00 HOUR      ERROR LIMIT      = 1.0000E-05
          DELTA T   = 1.000E+00 HOUR

```

```

***** COMPONENT *****
NO.  NAME      VOLUME OR MASS      DATA READ (BY CLASS NUMBER)
                                     1          2          3

1 VOLUME 1      1.000E+00 CC

      REMOVAL RATES (FROM 1) = 0.000E+00  0.000E+00  0.000E+00
      FLOW RATES (CC /HR) F ( 1 TO 2) = 1.000E+00  1.000E+00  1.000E+00
      TRANSM. FRACTION ( 1 TO 2) = 1.000E+00  1.000E+00  1.000E+00

2 VOLUME 2      1.000E+00 CC

      REMOVAL RATES (FROM 2) = 0.000E+00  0.000E+00  0.000E+00
      FLOW RATES (CC /HR) F ( 2 TO 3) = 1.000E+06  1.000E-06  1.000E-06
      TRANSM. FRACTION ( 2 TO 3) = 1.000E+00  1.000E+00  1.000E+00

3 VOLUME 3      1.000E+00 CC

      REMOVAL RATES (FROM 3) = 0.000E+00  0.000E+00  0.000E+00
      FLOW RATES (CC /HR) F ( 3 TO 2) = 1.000E-06  1.000E+06  1.000E+06
      TRANSM. FRACTION ( 3 TO 2) = 1.000E+00  1.000E+00  1.000E+00

***** CODE SENSES A FEEDBACK LOOP AND/OR VARIABLE VOLUME *****
***** NSTEP IS AUTOMATICALLY INCREASED BY A FACTOR OF 3 *****

```

```

*** 90 STEPS WERE USED REQUIRING AN AVERAGE OF 1.59 ITERATIONS PER STEP

```

```

* * *      PROGRAM  S T P   (VERSION 1.1 )      RAN ON 10/ 9/1992      * * *
* * * STP QUALIFICATION EXAMPLE 6A KEY LETTER B      * * *
* * STEP ACTIVITIES AFTER 2 HOUR

```

ACTIVITIES AT END OF THE TIME STEP

	1	2	3
	VOLUME 1	VOLUME 2	VOLUME 3
NUCLIDE			
1 KR-85M	1.004E-01	1.004E-07	6.380E-01
2 KR-85	1.353E-01	1.353E-07	8.600E-01
3 KR-90	0.000E+00	0.000E+00	0.000E+00
4 XR-131M	1.347E-01	1.347E-07	8.559E-01
5 BR-85	3.390E-14	2.166E-13	2.166E-25
6 I-131	1.355E-01	8.659E-01	8.659E-13
7 RB-90M	5.470E-10	3.494E-09	3.494E-21
8 RB-90	3.214E-11	2.053E-10	2.053E-22
9 SR-90	1.353E-01	8.647E-01	8.647E-13
10 Y-90	1.353E-01	8.647E-01	8.647E-13
11 YR-131M	1.292E-01	8.256E-01	8.256E-13
12 YR-131	3.286E-02	2.099E-01	2.099E-13
VOLUME	1.000E+00 CC	1.000E+00 CC	1.000E+00 CC
TOTAL CLASS 1	3.704E-01	3.704E-07	2.354E+00
TOTAL CLASS 2	1.355E-01	8.659E-01	8.659E-13
TOTAL CLASS 3	4.327E-01	2.765E+00	2.765E-12
GRAND TOTAL	9.387E-01	3.631E+00	2.354E+00

*** PROGRAM S T P (VERSION 1.1)

RAW ON 10/ 9/1992

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*** STP QUALIFICATION EXAMPLE 6A KEY LETTER B

*** STEP ACTIVITIES AFTER 2 HOUR

STP GAMMA SHIELDING INFORMATION CALCULATED

COMPONENT 1 VOLUME 1

CONVERSION FACTOR = 1.000E+00

VOLUME = 1.000E+00 CC

BETA SOURCE = 1.131E+04 (NEV/SEC/)

	PARTICLE SOURCE (PHOTON/SEC/)	ENERGY SOURCE (NEV/SEC/)	GROUP ENERGY (NEV-EFFECTIVE)
--	-----------------------------------	------------------------------	---------------------------------

1	7.188E+03	2.875E+03	.40
2	4.979E+03	4.481E+03	.90
3	1.463E+03	1.975E+03	1.35
4	6.035E+01	1.086E+02	1.80
5	1.597E+02	3.514E+02	2.20
6	1.602E+01	4.164E+01	2.60
7	6.569E-06	3.107E-05	4.73 (VARIABLE)

TOTALS	1.387E+04	9.833E+03	.71
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COMPONENT 2 VOLUME 2

CONVERSION FACTOR = 1.000E+00

VOLUME = 1.000E+00 CC

BETA SOURCE = 5.366E+04 (NEV/SEC/)

	PARTICLE SOURCE (PHOTON/SEC/)	ENERGY SOURCE (NEV/SEC/)	GROUP ENERGY (NEV-EFFECTIVE)
--	-----------------------------------	------------------------------	---------------------------------

1	3.608E+04	1.443E+04	.40
2	3.173E+04	2.855E+04	.90
3	9.348E+03	1.262E+04	1.35
4	3.856E+02	6.941E+02	1.80
5	1.021E+03	2.245E+03	2.20
6	1.023E+02	2.661E+02	2.60
7	4.196E-05	1.985E-04	4.73 (VARIABLE)

TOTALS	7.866E+04	5.881E+04	.75
--------	-----------	-----------	-----

* * * PROGRAM S T P (VERSION 1.1) RAN ON 10/ 9/1992 * * *
 * * * STP QUALIFICATION EXAMPLE 6A KEY LETTER B * * *
 * * * STEP ACTIVITIES AFTER 2 HOUR

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STP GAMMA SHIELDING INFORMATION CALCULATED

COMPONENT 3 VOLUME 3

CONVERSION FACTOR = 1.000E+00
 VOLUME = 1.000E+00 CC
 BETA SOURCE = 1.850E+04 (MEV/SEC/)

	PARTICLE SOURCE (PHOTON/SEC/)	ENERGY SOURCE (MEV/SEC/)	GROUP ENERGY (MEV-EFFECTIVE)
1	9.791E+03	3.916E+03	.40
2	8.207E+01	7.386E+01	.90
3	9.348E-09	1.262E-08	1.35
4	3.856E-10	6.941E-10	1.80
5	1.021E-09	2.245E-09	2.20
6	1.023E-10	2.661E-10	2.60
7	4.196E-17	1.985E-16	4.73 (VARIABLE)
TOTALS	9.873E+03	3.990E+03	.40

* * * E N D PROGRAM S T P (VERSION 1.1)
 TIME OFF = 13:30:34 DATE = 10/ 9/1992

*** PROGRAM STP-PC (THE SHOULDER-S EDGE) IS AT YOUR SERVICE ***

*** VERSION NUMBER=1.1 REVISION DATE WAS 9/29/92

*** TODAY'S DATE = 10/ 9/1992 START TIME = 13:34:19

REPRODUCTION OF INPUT DATA DECK

+ + + + + + + +

NY= 3 NS= 1

NI= 12 NK= 3 NG= 7 NL= 2

1KR-85M	1	4.2978E-05	54.0234E-03	10.0000E+00	10.0000E+00
2KR-85	1	2.0490E-09	19.0683E-06	56.5688E-06	10.0000E+00
3KR-90	1	2.1446E-02	10.0000E+00	10.0000E+00	10.0000E+00
4XE-131M	1	6.7758E-07	61.0836E-08	10.0000E+00	10.0000E+00
5BR-85	2	4.0299E-03	10.0000E+00	10.0000E+00	10.0000E+00
6I-131	2	9.9783E-07	114.9932E-06	124.6210E-04	10.0000E+00
7RB-90M	3	2.6866E-03	32.5521E-03	10.0000E+00	10.0000E+00
8RB-90	3	4.4149E-03	31.8894E-02	76.1792E-05	10.0000E+00
9SR-90	3	7.6801E-10	72.6248E-03	84.4149E-03	10.0000E+00
10Y-90	3	3.0038E-06	97.6801E-10	10.0000E+00	10.0000E+00
11YE-131M	3	6.4180E-06	10.0000E+00	10.0000E+00	10.0000E+00
12YE-131	3	4.6210E-04	111.4248E-06	10.0000E+00	10.0000E+00
		.40	.90	1.35	1.80
				2.20	2.60
					7.50
1KR-85M		.255157+0123-3000+0000+0000+0000+0000+0581+0			+
2KR-85		.251000+0223-2000+0000+0000+0000+0000+0514+0			+
3KR-90		1.315766-1233+0462+0386+0491-1190-1448-1386+1			+
4XE-131M		.142664-2000+0000+0000+0000+0000+0000+0164+0			+
5BR-85		1.003000+0334-1233-1659-2275-2000+0000+0183+1			+
6I-131		.190317+0625-1000+0000+0000+0000+0000+0723+0			+
7RB-90M		1.388344-2855+0195+0472+0186+0118+0144+1473+1			+
8RB-90		1.960000+0277+0963-1192-1366-1111+0162+1533+1			+
9SR-90		.196000+0000+0000+0000+0000+0000+0000+0000+0			+
10Y-90		.935000+0000+0000+0000+0000+0000+0000+0000+0			+
11YE-131M		.190112+0828+0377+0219-1735-1871-2000+0227+1			+
12YE-131		.719110+0162+0142+0323-2000+0000+0000+0150+1			+

*** PROGRAM STP-PC (THE SHIELDER-S EDGE) IS AT YOUR SERVICE ***

** VERSION NUMBER=1.1 REVISION DATE WAS 9/29/92

* TODAY'S DATE = 10/ 9/1992 START TIME = 13:34:20

1 'SOURCE'
 1 1.0 2 1.0 3 1.0 4 1.0 5 1.0 6 1.0
 7 1.0 8 1.0 9 1.0 10 1.0 11 1.0 12 1.0

0

T

STP QUALIFICATION EXAMPLE 6B CHECK OF EXAMPLE 6A

NJ= 3

1 'VOLUME 1'

2 'VOLUME 2'

3 'VOLUME 3'

-1

SOURCE AND VOLUME INITIALIZATION

V 1 1.00 CC

V 2 1.00 CC

V 3 1.00 CC

S 1 1 0 1.0

F 1 2 0 1.0

F 2 3 1 1.0E+6

F 2 3 2 1.0E-6

F 2 3 3 1.0E-6

F 3 2 1 1.0E-6

F 3 2 2 1.0E+6

F 3 2 3 1.0E+6

1 HOUR

ACTIVITIES AFTER 1 HOUR

2 HOUR

ACTIVITIES AFTER 2 HOUR

T

T

+ + + + + + +

PROGRAM S T P (VERSION 1.1)

RAN ON 10/ 9/1992

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DATA FOR THIS RUN OR SERIES OF RUNS

NUMBER OF ISOTOPES (DATA CARDS) = 12

NUMBER OF COMPONENTS (ALL RUNS) = 3

NUMBER OF CLASSES OF ISOTOPES = 3

NUMBER OF SOURCES (MAXIMUM) = 1

NUMBER OF GAMMA GROUPS = 7

NUMBER OF PRECURSORS (MAXIMUM) = 2

STORAGE LOCATIONS REQUESTED = 225000

STORAGE LOCATIONS USED = 1045

* * * PROGRAM S T P (VERSION 1.1) RUN ON 10/ 9/1992 * * *
 * * * STP QUALIFICATION EXAMPLE 6B CHECK OF EXAMPLE 6A * * *

NUCLIDE DATA INPUT (LIBRARY)

NUMBER	NAME	CLASS	LAMDA(1/HR)	PRECURSOR (NO.,RATE)-
1	KE-85M	1	1.5472E-01	5 1.5447E-01 1 0.0000E+00
2	KE-85	1	7.11764E-06	1 1.5564E-06 5 1.2024E-08
3	KE-90	1	7.7206E+01	1 0.0000E+00 1 0.0000E+00
4	KE-131M	1	2.4393E-03	6 2.6490E-05 1 0.0000E+00
5	KE-85	2	1.4508E+01	1 0.0000E+00 1 0.0000E+00
6	I-131	2	3.5922E-03	11 2.7947E-03 12 3.5922E-03
7	KE-90M	3	9.6718E+00	3 1.1510E+00 1 0.0000E+00
8	KE-90	3	1.5894E+01	3 1.4902E+01 7 3.6555E-01
9	KE-90	3	2.7648E-06	7 2.7012E-06 8 2.7648E-06
10	Y-90	3	1.0814E-02	9 1.0814E-02 1 0.0000E+00
11	TE-131M	3	2.3105E-02	1 0.0000E+00 1 0.0000E+00
12	TE-131	3	1.6636E-00	11 3.6931E-01 1 0.0000E+00

*** PROGRAM S T P (VERSION 1.1)

RAN ON 10/ 9/1992

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*** STP QUALIFICATION EXAMPLE 6B CHECK OF EXAMPLE 6A

I	ISOTOPE	BETA NEV/DISC	GAMMA (NEV/DISC) BY GROUP AND MAX.ENERGY (NEV)						
			1	2	3	4	5	6	7
	EFFECTIVE ENERGY		.400	.900	1.350	1.800	2.200	2.600	7.500
1	KR-85M	.255	.157	.000	.000	.000	.000	.000	.581
2	KR-85	.251	.000	.002	.000	.000	.000	.000	.514
3	KR-90	1.315	.077	.233	.462	.386	.049	.019	3.860
4	KR-131M	.142	.007	.000	.000	.000	.000	.000	.164
5	BR-85	1.003	.000	.033	.023	.007	.003	.000	1.830
6	I-131	.190	.317	.063	.000	.000	.000	.000	.723
7	RB-90M	1.388	.003	.055	.195	.472	.166	.118	4.730
8	RB-90	1.960	.000	.277	.096	.019	.037	.111	5.330
9	SR-90	.196	.000	.000	.000	.000	.000	.000	.000
10	Y-90	.935	.000	.000	.000	.000	.000	.000	.000
11	TE-131M	.190	.112	.028	.377	.022	.074	.009	2.270
12	TE-131	.719	.110	.162	.142	.003	.000	.000	1.500

*** PROGRAM S T P (VERSION 1.1)

RAN ON 10/ 9/1992

*** STP QUALIFICATION EXAMPLE 6B CHECK OF EXAMPLE 6A

RUN LOOP INFORMATION FOR THIS RUN FOLLOWS.

NJ, NUMBER OF COMPONENTS USED IN THIS RUN LOOP = 3

KCONC, CALC. TYPE (0/INVENTORY, 1/CONCENTRATION) = 0
IE., -- ACT/COMP. --- ACT/GM.

KDECAY, CALCULATE DAUGHTER PRODUCTION (0/YES,1/NO) = 0
(DEFAULT =0)

ITMAX, MAXIMUM NUMBER OF ITERATIONS PER TIME STEP = 0
(DEFAULT = 10)

KDEBUG, DEBUG OPTION (0/NORMAL OUTPUT, 1/MUCHO) = 0

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* * *      PROGRAM  S T P   (VERSION 1.1 )      * * *
* * * STP QUALIFICATION EXAMPLE 6B CHECK OF EXAMPLE 6A      * * *

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SOURCE LIBRARY

		1
		SOURCE
NUCLIDE		
1	HR-85M	1.000E+00
2	HR-85	1.000E+00
3	HR-90	1.000E+00
4	HR-131M	1.000E+00
5	HR-85	1.000E+00
6	I-131	1.000E+00
7	HR-90M	1.000E+00
8	HR-90	1.000E+00
9	HR-90	1.000E+00
10	Y-90	1.000E+00
11	TR-131M	1.000E+00
12	TR-131	1.000E+00
TOTAL CLASS	1	4.000E+00
TOTAL CLASS	2	2.000E+00
TOTAL CLASS	3	6.000E+00
GRAND TOTAL		1.200E+01

* * * * PROGRAM S T P (VERSION 1.1) RAN ON 10/ 9/1992 * * * *
 * * * STEP QUALIFICATION EXAMPLE 6B CHECK OF EXAMPLE 6A * * * *
 * * STEP SOURCE AND VOLUME INITIALIZATION

TIME END TIME = -1.000E+00 INTERVALS/STEP = 30
 START TIME = 0.000E+00 ERROR LIMIT = 1.0000E-05
 STEP DELTA T = 0.000E+00

***** COMPONENT *****		DATA READ (BY CLASS NUMBER)			
NO.	NAME	VOLUME OR MASS	1	2	3
1	VOLUME 1	1.000E+00 CC			
	REMOVAL RATES (FROM 1) =		0.000E+00	0.000E+00	0.000E+00
	FLOW RATES (CC /HR) F (1 TO 2) =		1.000E+00	1.000E+00	1.000E+00
	TRANSM. FRACTION (1 TO 2) =		1.000E+00	1.000E+00	1.000E+00
	STEP SOURCE FACTOR (FROM SOURCE 1) =		1.000E+00	1.000E+00	1.000E+00
2	VOLUME 2	1.000E+00 CC			
	REMOVAL RATES (FROM 2) =		0.000E+00	0.000E+00	0.000E+00
	FLOW RATES (CC /HR) F (2 TO 3) =		1.000E+06	1.000E+06	1.000E+06
	TRANSM. FRACTION (2 TO 3) =		1.000E+00	1.000E+00	1.000E+00
3	VOLUME 3	1.000E+00 CC			
	REMOVAL RATES (FROM 3) =		0.000E+00	0.000E+00	0.000E+00
	FLOW RATES (CC /HR) F (3 TO 2) =		1.000E+06	1.000E+06	1.000E+06
	TRANSM. FRACTION (3 TO 2) =		1.000E+00	1.000E+00	1.000E+00

***** PROGRAM S T P (VERSION 1.1) *****
***** STP QUALIFICATION EXAMPLE 6B CHECK OF EXAMPLE 6A *****
***** STEP SOURCE AND VOLUME INITIALIZATION *****

STEP SOURCE DATA FROM SOURCE INPUT

NUCLIDE	VOLUME 1
1 KR-85M	1.000E+00
2 KR-85	1.000E+00
3 KR-90	1.000E+00
4 KR-131M	1.000E+00
5 KR-85	1.000E+00
6 I-131	1.000E+00
7 RB-90M	1.000E+00
8 RB-90	1.000E+00
9 SR-90	1.000E+00
10 Y-90	1.000E+00
11 TR-131M	1.000E+00
12 TR-131	1.000E+00
VOLUME	1.000E+00 CC
TOTAL CLASS 1	4.000E+00
TOTAL CLASS 2	2.000E+00
TOTAL CLASS 3	6.000E+00
GRAND TOTAL	1.200E+01

***** PROGRAM S T P (VERSION 1.1)

RAN ON 10/ 9/1992 *****

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*** STEP QUALIFICATION EXAMPLE 6B CHECK OF EXAMPLE 6A

*** STEP SOURCE AND VOLUME INITIALIZATION

ACTIVITIES AT END OF THE TIME STEP

1
VOLUME 1

NUCLIDE

1	KR-85M	1.000E+00
2	KR-85	1.000E+00
3	KR-90	1.000E+00
4	KR-131M	1.000E+00
5	BR-85	1.000E+00
6	I-131	1.000E+00
7	RB-90M	1.000E+00
8	RB-90	1.000E+00
9	SR-90	1.000E+00
10	Y-90	1.000E+00
11	TR-131M	1.000E+00
12	TR-131	1.000E+00

VOLUME 1.000E+00 CC

TOTAL CLASS 1	4.000E+00
TOTAL CLASS 2	2.000E+00
TOTAL CLASS 3	6.000E+00
GRAND TOTAL	1.200E+01

*** PROGRAM S T P (VERSION 1.1) ***
 *** STP QUALIFICATION EXAMPLE 6B CHECK OF EXAMPLE 6A ***

*** STEP SOURCE AND VOLUME INITIALIZATION

STP GAMMA SHIELDING INFORMATION CALCULATED

COMPONENT 1 VOLUME 1

CONVERSION FACTOR = 1.000E+00

VOLUME = 1.000E+00 CC

DATA SOURCE = 3.161E+05 (NEV/SEC/)

	PARTICLE SOURCE (PHOTON/SEC/)	ENERGY SOURCE (NEV/SEC/)	GROUP ENERGY (NEV-EFFECTIVE)
--	-----------------------------------	------------------------------	---------------------------------

1	7.240E+04	2.896E+04	.40
2	1.009E+05	9.077E+04	.90
3	3.551E+04	4.794E+04	1.35
4	1.868E+04	3.363E+04	1.80
5	5.852E+03	1.287E+04	2.20
6	3.653E+03	9.498E+03	2.60
7	2.155E+04	1.149E+05	5.33 (VARIABLE)

TOTALS	2.585E+05	3.385E+05	1.31
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* * * PROGRAM S T P (VERSION 1.1 )          RAN ON 10/ 9/1992  * * *
* * * STP QUALIFICATION EXAMPLE 6B CHECK OF EXAMPLE 6A          * * *
* * STEP ACTIVITIES AFTER 1 HOUR

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TIME      END TIME = 1.000E+00 HOUR          INTERVALS/STEP          = 30
START TIME = 0.000E+00                      ERROR LIMIT              = 1.0000E-05
STEP      DELTA T  = 1.000E+00 HOUR

```

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***** COMPONENT ***** DATA READ (BY CLASS NUMBER)
NO.  NAME          VOLUME OR MASS      1          2          3

1 VOLUME 1          1.000E+00 CC

      REMOVAL RATES (FROM 1) = 0.000E+00  0.000E+00  0.000E+00
      FLOW RATES (CC /HR) F ( 1 TO 2) = 1.000E+00  1.000E+00  1.000E+00
      TRANSM. FRACTION ( 1 TO 2) = 1.000E+00  1.000E+00  1.000E+00

2 VOLUME 2          1.000E+00 CC

      REMOVAL RATES (FROM 2) = 0.000E+00  0.000E+00  0.000E+00
      FLOW RATES (CC /HR) F ( 2 TO 3) = 1.000E+06  1.000E+06  1.000E+06
      TRANSM. FRACTION ( 2 TO 3) = 1.000E+00  1.000E+00  1.000E+00

3 VOLUME 3          1.000E+00 CC

      REMOVAL RATES (FROM 3) = 0.000E+00  0.000E+00  0.000E+00
      FLOW RATES (CC /HR) F ( 3 TO 2) = 1.000E+06  1.000E+06  1.000E+06
      TRANSM. FRACTION ( 3 TO 2) = 1.000E+00  1.000E+00  1.000E+00

***** CODE SENSES A FEEDBACK LOOP AND/OR VARIABLE VOLUME *****
***** NSTEP IS AUTOMATICALLY INCREASED BY A FACTOR OF 3 *****

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*** 90 STEPS WERE USED REQUIRING AN AVERAGE OF 1.70 ITERATIONS PER STEP

```

* * * PROGRAM S T P (VERSION 1.1) RAN ON 10/ 9/1992 * * *
 * * * STP QUALIFICATION EXAMPLE 6B CHECK OF EXAMPLE 6A * * *
 * * STEP ACTIVITIES AFTER 1 HOUR

ACTIVITIES AT END OF THE TIME STEP

	1	2	3
NUCLIDE	VOLUME 1	VOLUME 2	VOLUME 3
1 KR-85M	3.185E-01	3.185E-07	5.434E-01
2 KR-85	3.679E-01	3.679E-07	6.275E-01
3 KR-90	1.086E-34	1.086E-40	1.845E-34
4 KR-131M	3.670E-01	3.670E-07	6.260E-01
5 BR-85	1.841E-07	3.164E-07	3.164E-19
6 I-131	3.684E-01	6.330E-01	6.330E-13
7 RB-90M	2.359E-05	4.052E-05	4.052E-17
8 RB-90	1.440E-06	2.473E-06	2.473E-18
9 SR-90	3.679E-01	6.321E-01	6.321E-13
10 Y-90	3.679E-01	6.321E-01	6.321E-13
11 YK-131M	3.595E-01	6.177E-01	6.177E-13
12 YK-131	1.349E-01	2.319E-01	2.319E-13
VOLUME	1.000E+00 CC	1.000E+00 CC	1.000E+00 CC
TOTAL CLASS 1	1.053E+00	1.053E-06	1.797E+00
TOTAL CLASS 2	3.684E-01	6.330E-01	6.330E-13
TOTAL CLASS 3	1.230E+00	2.114E+00	2.114E-12
GRAND TOTAL	2.652E+00	2.747E+00	1.797E+00

* * * PROGRAM S T P (VERSION 1.1) RAN ON 10/ 9/1992 * * *
 * * * STP QUALIFICATION EXAMPLE 6B CHECK OF EXAMPLE 6A * * *
 * * STEP ACTIVITIES AFTER 1 HOUR

STP GAMMA SHIELDING INFORMATION CALCULATED

COMPONENT 1 VOLUME 1

CONVERSION FACTOR = 1.000E+00
 VOLUME = 1.000E+00 CC
 BETA SOURCE = 3.245E+04 (MEV/SEC/)
 PARTICLE SOURCE ENERGY SOURCE GROUP ENERGY
 (PHOTON/SEC/) (MEV/SEC/) (MEV-EFFECTIVE)

1	2.075E+04	8.300E+03	.40
2	1.412E+04	1.271E+04	.90
3	4.240E+03	5.723E+03	1.35
4	1.710E+02	3.078E+02	1.80
5	4.444E+02	9.778E+02	2.20
6	4.460E+01	1.160E+02	2.60
7	2.839E-01	1.343E+00	4.73 (VARIABLE)
TOTALS	3.977E+04	2.813E+04	.71

COMPONENT 2 VOLUME 2

CONVERSION FACTOR = 1.000E+00
 VOLUME = 1.000E+00 CC
 BETA SOURCE = 4.141E+04 (MEV/SEC/)
 PARTICLE SOURCE ENERGY SOURCE GROUP ENERGY
 (PHOTON/SEC/) (MEV/SEC/) (MEV-EFFECTIVE)

1	2.732E+04	1.093E+04	.40
2	2.420E+04	2.178E+04	.90
3	7.285E+03	9.835E+03	1.35
4	2.938E+02	5.289E+02	1.80
5	7.637E+02	1.680E+03	2.20
6	7.663E+01	1.992E+02	2.60
7	4.878E-01	2.307E+00	4.73 (VARIABLE)
TOTALS	5.994E+04	4.495E+04	.75

* * * PROGRAM S T P (VERSION 1.1) RAN ON 10/ 9/1992 * * *
 * * * STP QUALIFICATION EXAMPLE 6B CHECK OF EXAMPLE 6A * * *
 * * STP ACTIVITIES AFTER 1 HOUR

STP GAMMA SHIELDING INFORMATION CALCULATED

COMPONENT 3 VOLUME 3

CONVERSION FACTOR = 1.000E+00

VOLUME = 1.000E+00 CC

BETA SOURCE = 1.424E+04 (MEV/SEC/)

	PARTICLE SOURCE (PHOTON/SEC/)	ENERGY SOURCE (MEV/SEC/)	GROUP ENERGY (MEV-EFFECTIVE)
--	-----------------------------------	------------------------------	---------------------------------

1	8.276E+03	3.310E+03	.40
2	6.027E+01	5.425E+01	.90
3	7.285E-09	9.835E-09	1.35
4	2.938E-10	5.289E-10	1.80
5	7.637E-10	1.680E-09	2.20
6	7.663E-11	1.992E-10	2.60
7	4.878E-13	2.307E-12	4.73 (VARIABLE)

TOTALS	8.336E+03	3.364E+03	.40
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* * * PROGRAM S T P (VERSION 1.1) RUN ON 10/ 9/1992 * * *
 * * * STEP QUALIFICATION EXAMPLE 6B CHECK OF EXAMPLE 6A * * *
 * * * STEP ACTIVITIES AFTER 2 HOUR

TIME END TIME = 2.000E+00 HOUR INTERVALS/STEP = 30
 START TIME = 1.000E+00 HOUR ERROR LIMIT = 1.0000E-05
 STEP DELTA T = 1.000E+00 HOUR

***** COMPONENT *****		DATA READ (BY CLASS NUMBER)			
NO.	NAME	VOLUME OR MASS	1	2	3
1	VOLUME 1	1.000E+00 CC			
	REMOVAL RATES (FROM 1) =		0.000E+00	0.000E+00	0.000E+00
	FLOW RATES (CC /HR) F (1 TO 2) =		1.000E+00	1.000E+00	1.000E+00
	TRANSM. FRACTION (1 TO 2) =		1.000E+00	1.000E+00	1.000E+00
2	VOLUME 2	1.000E+00 CC			
	REMOVAL RATES (FROM 2) =		0.000E+00	0.000E+00	0.000E+00
	FLOW RATES (CC /HR) F (2 TO 3) =		1.000E+06	1.000E-06	1.000E-06
	TRANSM. FRACTION (2 TO 3) =		1.000E+00	1.000E+00	1.000E+00
3	VOLUME 3	1.000E+00 CC			
	REMOVAL RATES (FROM 3) =		0.000E+00	0.000E+00	0.000E+00
	FLOW RATES (CC /HR) F (3 TO 2) =		1.000E-06	1.000E+06	1.000E+06
	TRANSM. FRACTION (3 TO 2) =		1.000E+00	1.000E+00	1.000E+00
***** CODE SENSES A FEEDBACK LOOP AND/OR VARIABLE VOLUME ***** ***** NSTEP IS AUTOMATICALLY INCREASED BY A FACTOR OF 3 *****					

*** 90 STEPS WERE USED REQUIRING AN AVERAGE OF 1.59 ITERATIONS PER STEP

*** PROGRAM S T P (VERSION 1.1)

RAN ON 10/ 9/1992

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*** STP QUALIFICATION EXAMPLE 6B CHECK OF EXAMPLE 6A

*** STEP ACTIVITIES AFTER 2 HOUR

ACTIVITIES AT END OF THE TIME STEP

	1	2	3
	VOLUME 1	VOLUME 2	VOLUME 3
NUCLIDE			
1 KR-85M	1.004E-01	1.004E-07	6.380E-01
2 KR-85	1.353E-01	1.353E-07	8.600E-01
3 KR-90	0.000E+00	0.000E+00	0.000E+00
4 KR-131M	1.347E-01	1.347E-07	8.559E-01
5 BR-85	3.390E-14	2.166E-13	2.166E-25
6 I-131	1.355E-01	8.659E-01	8.659E-13
7 BR-90M	5.470E-10	3.494E-09	3.494E-21
8 BR-90	3.214E-11	2.053E-10	2.053E-22
9 SR-90	1.353E-01	8.647E-01	8.647E-13
10 Y-90	1.353E-01	8.647E-01	8.647E-13
11 YR-131M	1.292E-01	8.256E-01	8.256E-13
12 YR-131	3.286E-02	2.099E-01	2.099E-13
VOLUME	1.000E+00 CC	1.000E+00 CC	1.000E+00 CC
TOTAL CLASS 1	3.704E-01	3.704E-07	2.354E+00
TOTAL CLASS 2	1.355E-01	8.659E-01	8.659E-13
TOTAL CLASS 3	4.327E-01	2.765E+00	2.765E-12
GRAND TOTAL	9.387E-01	3.631E+00	2.354E+00

PROGRAM S T P (VERSION 1.1)

RAN ON 10/ 9/1992

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S T P QUALIFICATION EXAMPLE 6B CHECK OF EXAMPLE 6A

S T P ACTIVITIES AFTER 2 HOUR

S T P GAMMA SHIELDING INFORMATION CALCULATED

COMPONENT 1 VOLUME 1

CONVERSION FACTOR = 1.000E+00

VOLUME = 1.000E+00 CC

BETA SOURCE = 1.131E+04 (MEV/SEC/)

	PARTICLE SOURCE (PHOTON/SEC/)	ENERGY SOURCE (MEV/SEC/)	GROUP ENERGY (MEV-EFFECTIVE)
--	-----------------------------------	------------------------------	---------------------------------

1	7.188E+03	2.875E+03	.40
2	4.979E+03	4.481E+03	.90
3	1.463E+03	1.975E+03	1.35
4	6.035E+01	1.086E+02	1.80
5	1.597E+02	3.514E+02	2.20
6	1.602E+01	4.164E+01	2.60
7	4.569E-06	3.107E-05	4.73 (VARIABLE)

TOTALS	1.387E+04	9.833E+03	.71
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COMPONENT 2 VOLUME 2

CONVERSION FACTOR = 1.000E+00

VOLUME = 1.000E+00 CC

BETA SOURCE = 5.366E+04 (MEV/SEC/)

	PARTICLE SOURCE (PHOTON/SEC/)	ENERGY SOURCE (MEV/SEC/)	GROUP ENERGY (MEV-EFFECTIVE)
--	-----------------------------------	------------------------------	---------------------------------

1	3.608E+04	2.443E+04	.40
2	3.73E+04	2.855E+04	.90
3	9.348E+03	1.262E+04	1.35
4	3.856E+02	6.941E+02	1.80
5	1.021E+03	2.245E+03	2.20
6	1.023E+02	2.661E+02	2.60
7	4.196E-05	1.985E-04	4.73 (VARIABLE)

TOTALS	7.866E+04	5.881E+04	.75
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```

* * * PROGRAM S T P (VERSION 1.1 )          RAN ON 10/ 9/1992 * * *
* * * STP QUALIFICATION EXAMPLE 6B CHECK OF EXAMPLE 6A          * * *
* * * STEP ACTIVITIES AFTER 2 HOUR

```

STP GAMMA SHIELDING INFORMATION CALCULATED

COMPONENT 3 VOLUME 3

```

CONVERSION FACTOR = 1.000E+00
VOLUME           = 1.000E+00 CC
BETA SOURCE      = 1.850E+04 (MEV/SEC/ )
PARTICLE SOURCE  ENERGY SOURCE  GROUP ENERGY
(PHOTON/SEC/ ) (MEV/SEC/ ) (MEV-EFFECTIVE)

  1  9.791E+03      3.916E+03      .40
  2  8.207E+01      7.386E+01      .90
  3  9.348E-09      1.262E-08      1.35
  4  3.856E-10      6.941E-10      1.80
  5  1.021E-09      2.245E-09      2.20
  6  1.023E-10      2.661E-10      2.60
  7  4.196E-17      1.985E-16      4.73 (VARIABLE)

TOTALS  9.873E+03      3.990E+03      .40

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* * * E N D   P R O G R A M   S T P (VERSION 1.1 )
TIME OFF = 13:39:46      DATE = 10/ 9/1992

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Title Verification of Computer Program Page G1 of G18

STP (PC) Version 1.1 EGS-TR-910600-18 Project All

Calculated by ESL Date 10/23/92 Checked by DW Date 10/24/92

Appendix G
Example 7

*** PROGRAM STP-PC (THE SHILDER-S EDGE) IS AT YOUR SERVICE ***

** VERSION NUMBER = 1.1 REVISION DATE WAS 9/29/92

* TODAY'S DATE = 10/ 9/1992 START TIME = 13:59:42

REPRODUCTION OF INPUT DATA DECK

+ + + + + + + +

NV= 3 NS= 1

NI= 12 NK= 3 NG= 7 NL= 2

1KR-85M	1	4.2978E-05	54.0234E-03	10.0000E+00	10.0000E+00
2KR-85	1	2.0490E-09	19.0623E-06	56.5688E-06	10.0000E+00
3KR-90	1	2.1446E-02	10.0000E+00	10.0000E+00	10.0000E+00
4XE-131M	1	6.7758E-07	61.0836E-08	10.0000E+00	10.0000E+00
5NR-85	2	4.0299E-03	10.0000E+00	10.0000E+00	10.0000E+00
6I-131	2	9.9783E-07	114.9932E-06	124.6210E-04	10.0000E+00
7RB-90M	3	2.6866E-03	32.5521E-03	10.0000E+00	10.0000E+00
8RB-90	3	4.4149E-03	31.8894E-02	76.1792E-05	10.0000E+00
9SR-90	3	7.6801E-10	72.6248E-03	84.4149E-03	10.0000E+00
10Y-90	3	3.0038E-06	97.6801E-10	10.0000E+00	10.0000E+00
11TR-131M	3	6.4180E-06	10.0000E+00	10.0000E+00	10.0000E+00
12TE-131	3	4.6210E-04	111.4248E-06	10.0000E+00	10.0000E+00
		.40	.90	1.35	1.80
				2.20	2.60
					7.50
1KR-85M		.255157+0123-3000+0000+0000+0000+0000+0581+0			+
2KR-85		.251000+0223-2000+0000+0000+0000+0000+0514+0			+
3KR-90		1.315766-1233+0462+0386+0491-1190-1448-1386+1			+
4XE-131M		.142664-2000+0000+0000+0000+0000+0000+0164+0			+
5NR-85		1.003000+0334-1233-1659-2275-2000+0000+0183+1			+
6I-131		.190317+0625-1000+0000+0000+0000+0000+0723+0			+
7RB-90M		1.388344-2855+0195+0472+0186+0118+0144+1473+1			+
8RB-90		1.960000+0277+0963-1192-1366-1111+0162+1533+1			+
9SR-90		.196000+0000+0000+0000+0000+0000+0000+0000+0			+
10Y-90		.935000+0000+0000+0000+0000+0000+0000+0000+0			+
11TR-131M		.190112+0828+0377+0219-1735-1871-2000+0227+1			+
12TE-131		.719110+0162+0142+0323-2000+0000+0000+0150+1			+

*** PROGRAM SFP-PC (THE SHIELDER-S EDGE) IS AT YOUR SERVICE ***

** VERSION NUMBER=1.1 REVISION DATE WAS 9/29/92

* TODAY'S DATE = 10/ 9/1992 START TIME = 13:59:50

1 'SOURCE'

1 1.0 2 1.0 3 1.0 4 1.0 5 1.0 6 1.0

7 1.0 8 1.0 9 1.0 10 1.0 11 1.0 12 1.0

0

T

SFP QUALIFICATION EXAMPLE 7 KEY LETTER A (DECAY SUPPRESSED)

HJ= 2

1 'VOLUME 1'

2 'VOLUME 2'

-1

SOURCE AND VOLUME INITIALIZATION

V 1 1.00 CC

V 2 1.00 CC

S 1 1 0 1.0

F 1 2 0 1.0

A 2

1 HOUR 90

ACTIVITIES AFTER 1 HOUR

2 HOUR 90

ACTIVITIES AFTER 2 HOUR

T

T

+ + + + + + +

* * * *

PROGRAM S T P (VERSION 1.1)

RAN ON 10/ 9/1992

* * * *

DATA FOR THIS RUN OR SERIES OF RUNS

NUMBER OF ISOTOPE (DATA CARDS) = 12

NUMBER OF COMPONENTS (ALL RUNS) = 3

NUMBER OF CLASSES OF ISOTOPE = 3

NUMBER OF SOURCES (MAXIMUM) = 1

NUMBER OF GAMMA GROUPS = 7

NUMBER OF PRECURSORS (MAXIMUM) = 2

STORAGE LOCATIONS REQUESTED = 225000

STORAGE LOCATIONS USED = 1045

*** PROGRAM S T P (VERSION 1.1) RAN ON 10/ 9/1992 ***
 *** STP QUALIFICATION EXAMPLE 7 KEY LETTER A (DECAY SUPPRESSED) ***

NUCLIDE DATA INPUT (LIBRARY)

NUMBER	NAME	CLASS	LAMDA(1/HR)	PRECURSOR (NO.,RATE)-
1	KR-85M	1	1.5472E-01	5 1.5447E-01 1 0.0000E+00
2	KR-85	1	7.3764E-06	1 1.5564E-06 5 1.2024E-08
3	KR-90	1	7.7206E+01	1 0.0000E+00 1 0.0000E+00
4	XE-131M	1	2.4393E-03	6 2.6490E-05 1 0.0000E+00
5	BR-85	2	1.4508E+01	1 0.0000E+00 1 0.0000E+00
6	I-131	2	3.5922E-03	11 2.7947E-03 12 3.5922E-03
7	RB-90M	3	9.6718E+00	3 1.1510E+00 1 0.0000E+00
8	RB-90	3	1.5894E+01	3 1.4002E+01 7 3.6555E-01
9	SR-90	3	2.7648E-06	7 2.7012E-06 8 2.7648E-06
10	Y-90	3	1.0814E-02	9 1.0814E-02 1 0.0000E+00
11	TE-131M	3	2.3105E-02	1 0.0000E+00 1 0.0000E+00
12	TE-131	3	1.6636E+00	11 3.6931E-01 1 0.0000E+00

* * * PROGRAM S T P (VERSION 1.1) RAN ON 10/ 9/1992 * * *
 * * * STP QUALIFICATION EXAMPLE 7 KEY LETTER A (DECAY SUPPRESSED) * * *

I	ISOTOPE	BETA MEV/DISC	GAMMA (MEV/DISC) BY GROUP AND MAX. ENERGY (MEV)						
			1	2	3	4	5	6	7
	EFFECTIVE ENERGY		.400	.900	1.350	1.800	2.200	2.600	7.500
1	KR-85M	.255	.157	.000	.000	.000	.000	.000	.581
2	KR-85	.251	.000	.002	.000	.000	.000	.000	.514
3	KR-90	1.315	.077	.233	.462	.386	.049	.019	3.860
4	KR-131M	.142	.007	.000	.000	.000	.000	.000	.164
5	BR-85	1.003	.000	.033	.023	.007	.003	.000	1.830
6	I-131	.190	.317	.063	.000	.000	.000	.000	.723
7	RB-90M	1.388	.003	.855	.195	.472	.186	.118	4.730
8	RB-90	1.960	.000	.277	.096	.019	.037	.111	5.330
9	SR-90	.196	.000	.000	.000	.000	.000	.000	.000
10	Y-90	.935	.000	.000	.000	.000	.000	.000	.000
11	TE-131M	.190	.112	.828	.377	.022	.074	.009	2.270
12	TE-131	.719	.110	.162	.142	.003	.000	.000	1.500

*** PROGRAM S T P (VERSION 1.1) RAN ON 10/ 9/1992 ***
*** STP QUALIFICATION EXAMPLE 7 KEY LETTER A (DECAY SUPPRESSED) ***

RUN LOOP INFORMATION FOR THIS RUN FOLLOWS.

NJ, NUMBER OF COMPONENTS USED IN THIS RUN LOOP = 2
KCONC, CALC. TYPE (0/INVENTORY, 1/CONCENTRATION) = 0
IE., -- ACT/COMP. --- ACT/GM.
NDECAY, CALCULATE DAUGHTER PRODUCTION (0/YES,1/NO) = 0
(DEFAULT =0)
ITMAX, MAXIMUM NUMBER OF ITERATIONS PER TIME STEP = 0
(DEFAULT = 10)
KDEBUG, DEBUG OPTION (0/NORMAL OUTPUT, 1/NUCHC) = 0

* * * * *
 PROGRAM S T P (VERSION 1.1) RAN ON 10/ 9/1992 * * * * *
 * * * STP QUALIFICATION EXAMPLE 7 KEY LETTER A (DECAY SUPPRESSED) * * *

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SOURCE LIBRARY

NUCLIDE	SOURCE	
	1	
1 KR-85M	1.000E+00	
2 KR-85	1.000E+00	
3 KR-90	1.000E+00	
4 KR-131M	1.000E+00	
5 BR-85	1.000E+00	
6 I-131	1.000E+00	
7 RB-90M	1.000E+00	
8 RB-90	1.000E+00	
9 SR-90	1.000E+00	
10 Y-90	1.000E+00	
11 TE-131M	1.000E+00	
12 TE-131	1.000E+00	
TOTAL CLASS 1	4.000E+00	
TOTAL CLASS 2	2.000E+00	
TOTAL CLASS 3	6.000E+00	
GRAND TOTAL	1.200E+01	

***** PROGRAM S T P (VERSION 1.1) RUN ON 10/ 9/1992 *****

*** STP QUALIFICATION EXAMPLE 7 KEY LETTER A (DECAY SUPPRESSED) ***

*** STEP SOURCE AND VOLUME INITIALIZATION

TIME	END TIME = -1.000E+00	INTERVALS/STEP	= 30
STEP	START TIME = 0.000E+00	ERROR LIMIT	= 1.0000E-05
	DELTA T = 0.000E+00		

***** COMPONENT *****		DATA READ (BY CLASS NUMBER)			
NO.	NAME	VOLUME OR MASS	1	2	3
1	VOLUME 1	1.000E+00 CC			
	REMOVAL RATES (FROM 1) =		0.000E+00	0.000E+00	0.000E+00
	FLOW RATES (CC /HR) F (1 TO 2) =		1.000E+00	1.000E+00	1.000E+00
	TRANSM. FRACTION (1 TO 2) =		1.000E+00	1.000E+00	1.000E+00
	STEP SOURCE FACTOR (FROM SOURCE 1) =		1.000E+00	1.000E+00	1.000E+00

2 VOLUME 2 1.000E+00 CC

***** ACCUMULATOR DECAY IS IGNORED *****

REMOVAL RATES (FROM 2) =	0.000E+00	0.000E+00	0.000E+00
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G 10 of G 18

*** PROGRAM S T P (VERSION 1.1) RAN ON 10/ 9/1992 ***

*** STEP QUALIFICATION EXAMPLE 7 KEY LETTER A (DECAY SUPPRESSED) ***

*** STEP SOURCE AND VOLUME INITIALIZATION

STEP SOURCE DATA FROM SOURCE INPUT

	1	
	VOLUME 1	
NUCLIDE		
1 KR-85M	1.000E+00	
2 KR-85	1.000E+00	
3 KR-90	1.000E+00	
4 XR-131M	1.000E+00	
5 BR-85	1.000E+00	
6 I-131	1.000E+00	
7 RB-90M	1.000E+00	
8 RB-90	1.000E+00	
9 SR-90	1.000E+00	
10 Y-90	1.000E+00	
11 YR-131M	1.000E+00	
12 YR-131	1.000E+00	
VOLUME	1.000E+00 CC	
TOTAL CLASS 1	4.000E+00	
TOTAL CLASS 2	2.000E+00	
TOTAL CLASS 3	6.000E+00	
GRAND TOTAL	1.200E+01	

* * * * PROGRAM S T P (VERSION 1.1) RAN ON 10/ 9/1992 * * * *
 * * * STP QUALIFICATION EXAMPLE 7 KEY LETTER A (DECAY SUPPRESSED) * * *
 * * STEP SOURCE AND VOLUME INITIALIZATION

ACTIVITIES AT END OF THE TIME STEP

NUCLIDE	VOLUME 1
1 KR-85M	1.000E+00
2 KR-85	1.000E+00
3 KR-90	1.000E+00
4 XR-131M	1.000E+00
5 BR-85	1.000E+00
6 I-131	1.000E+00
7 RB-90M	1.000E+00
8 RB-90	1.000E+00
9 SR-90	1.000E+00
10 Y-90	1.000E+00
11 TR-131M	1.000E+00
12 TR-131	1.000E+00
VOLUME	1.000E+00 CC
TOTAL CLASS 1	4.000E+00
TOTAL CLASS 2	2.000E+00
TOTAL CLASS 3	6.000E+00
GRAND TOTAL	1.200E+01

*** PROGRAM S T P (VERSION 1.1) RAN ON 10/ 9/1992 ***

*** STP QUALIFICATION EXAMPLE 7 KEY LETTER A (DECAY SUPPRESSED) ***

** STEP SOURCE AND VOLUME INITIALIZATION

STP GAMMA SHIELDING INFORMATION CALCULATED

COMPONENT 1 VOLUME 1

CONVERSION FACTOR = 1.000E+00

VOLUME = 1.000E+00 CC

BETA SOURCE = 3.161E+05 (MEV/SEC/)

	PARTICLE SOURCE (PHOTON/SEC/)	ENERGY SOURCE (MEV/SEC/)	GROUP ENERGY (MEV-EFFECTIVE)
--	-----------------------------------	------------------------------	---------------------------------

1	7.240E+04	2.896E+04	.40
2	1.009E+05	9.077E+04	.90
3	3.551E+04	4.794E+04	1.35
4	1.868E+04	3.363E+04	1.80
5	5.852E+03	1.287E+04	2.20
6	3.653E+03	9.498E+03	2.60
7	2.155E+04	1.149E+05	5.33 (VARIABLE)

TOTALS	2.585E+05	3.385E+05	1.31
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* * * * * PROGRAM S T P (VERSION 1.1 )      RAN ON 10/ 9/1992      * * * * *
* * * STP QUALIFICATION EXAMPLE 7 KEY LETTER A (DECAY SUPPRESSED)      * * *
* * STEP ACTIVITIES AFTER 1 HOUR

```

```

TIME      END TIME = 1.000E+00 HOUR      INTERVALS/STEP      = 90
STEP      START TIME = 0.000E+00      ERROR LIMIT      = 3.3333E-06
          DELTA T = 1.000E+00 HOUR

```

```

***** COMPONENT ***** DATA READ (BY CLASS NUMBER)
NO.  NAME      VOLUME OR MASS      1      2      3
1  VOLUME 1      1.000E+00 CC
      REMOVAL RATES (FROM 1) = 0.000E+00 0.000E+00 0.000E+00
      FLOW RATES (CC /HR) F ( 1 TO 2) = 1.000E+00 1.000E+00 1.000E+00
      TRANSM. FRACTION ( 1 TO 2) = 1.000E+00 1.000E+00 1.000E+00

```

```

2  VOLUME 2      1.000E+00 CC

```

```

***** ACCUMULATOR DECAY IS IGNORED *****

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```

      REMOVAL RATES (FROM 2) = 0.000E+00 0.000E+00 0.000E+00

```

```

*** 90 STEPS WERE USED REQUIRING AN AVERAGE OF .00 ITERATIONS PER STEP

```

* * * PROGRAM S T P (VERSION 1.1) RAN ON 10/ 9/1992 * * *
 * * * STP QUALIFICATION EXAMPLE 7 KEY LETTER A (DECAY SUPPRESSED) * * *
 * * STEP ACTIVITIES AFTER 1 HOUR

ACTIVITIES AT END OF THE TIME STEP

	1 VOLUME 1	2 VOLUME 2
NUCLIDE		
1 KR-85M	3.185E-01	5.988E-01
2 KR-85	3.679E-01	6.321E-01
3 KR-90	1.086E-34	1.275E-02
4 KR-131M	3.670E-01	6.315E-01
5 KR-85	1.841E-07	6.448E-02
6 I-131	3.684E-01	6.326E-01
7 RB-90M	2.359E-05	9.507E-02
8 RB-90	1.440E-06	7.177E-02
9 SR-90	3.679E-01	6.321E-01
10 Y-90	3.679E-01	6.321E-01
11 YK-131M	3.595E-01	6.261E-01
12 YK-131	1.349E-01	4.116E-01
VOLUME	1.000E+00 CC	1.000E+00 CC
TOTAL CLASS 1	1.053E+00	1.875E+00
TOTAL CLASS 2	3.684E-01	6.971E-01
TOTAL CLASS 3	1.230E+00	2.469E+00
GRAND TOTAL	2.652E+00	5.041E+00

*** PROGRAM STP (VERSION 1.1) RAN ON 10/ 9/1992 ***
 *** STP QUALIFICATION EXAMPLE 7 KEY LETTER A (DECAY SUPPRESSED) ***
 ** STEP ACTIVITIES AFTER 1 HOUR

STP GAMMA SHIELDING INFORMATION CALCULATED

COMPONENT 1 VOLUME 1

CONVERSION FACTOR = 1.000E+00
 VOLUME = 1.000E+00 CC
 BETA SOURCE = 3.245E+04 (MEV/SEC/)
 PARTICLE SOURCE ENERGY SOURCE GROUP ENERGY
 (PHOTON/SEC/) (MEV/SEC/) (MEV-EFFECTIVE)

1	2.075E+04	8.300E+03	.40
2	1.412E+04	1.271E+04	.90
3	4.240E+03	5.723E+03	1.35
4	1.710E+02	3.078E+02	1.80
5	4.444E+02	9.778E+02	2.20
6	4.460E+01	1.160E+02	2.60
7	2.839E-01	1.343E+00	4.73 (VARIABLE)
TOTALS	3.977E+04	2.813E+04	.71

COMPONENT 2 VOLUME 2

CONVERSION FACTOR = 1.000E+00
 VOLUME = 1.000E+00 CC
 BETA SOURCE = 7.419E+04 (MEV/SEC/)
 PARTICLE SOURCE ENERGY SOURCE GROUP ENERGY
 (PHOTON/SEC/) (MEV/SEC/) (MEV-EFFECTIVE)

1	3.843E+04	1.537E+04	.40
2	3.011E+04	2.710E+04	.90
3	8.971E+03	1.211E+04	1.35
4	1.370E+03	2.466E+03	1.80
5	1.129E+03	2.484E+03	2.20
6	3.541E+02	9.206E+02	2.60
7	1.761E+03	9.388E+03	5.33 (VARIABLE)
TOTALS	8.212E+04	6.964E+04	.85

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```

* * * PROGRAM S T P (VERSION 1.1 )          RAN ON 10/ 9/1992 * * *
* * * STP QUALIFICATION EXAMPLE 7 KEY LETTER A (DECAY SUPPRESSED) * * *
* * * STEP ACTIVITIES AFTER 2 HOUR

```

```

TIME      END TIME = 2.000E+00 HOUR      INTERVALS/STEP      = 90
STEP      START TIME = 1.000E+00 HOUR      ERROR LIMIT          = 3.3333E-06
          DELTA T   = 1.000E+00 HOUR

```

```

***** COMPONENT ***** DATA READ (BY CLASS NUMBER)
NO.  NAME          VOLUME OR MASS      1          2          3

1 VOLUME 1          1.000E+00 CC

      REMOVAL RATES (FROM 1) = 0.000E+00  0.000E+00  0.000E+00
      FLOW RATES (CC /HR) F ( 1 TO 2) = 1.000E+00  1.000E+00  1.000E+00
      TRANSM. FRACTION ( 1 TO 2) = 1.000E+00  1.000E+00  1.000E+00

```

```

2 VOLUME 2          1.000E+00 CC

***** ACCUMULATOR DECAY IS IGNORED *****

      REMOVAL RATES (FROM 2) = 0.000E+00  0.000E+00  0.000E+00

*** 90 STEPS WERE USED REQUIRING AN AVERAGE OF .00 ITERATIONS PER STEP

```

*** PROGRAM S T P (VERSION 1.1) RAN ON 10/ 9/1992 ***

*** STP QUALIFICATION EXAMPLE 7 KEY LETTER A (DECAY SUPPRESSED) ***

** STEP ACTIVITIES AFTER 2 HOUR

ACTIVITIES AT END OF THE TIME STEP

	1	2
	VOLUME 1	VOLUME 2
NUCLIDE		
1 KR-85M	1.004E-01	7.877E-01
2 KR-85	1.353E-01	8.647E-01
3 KR-90	0.000E+00	1.279E-02
4 XR-131M	1.347E-01	8.632E-01
5 BR-85	3.390E-14	6.446E-02
6 I-131	1.355E-01	8.655E-01
7 BR-90M	5.470E-10	9.507E-02
8 BR-90	3.214E-11	7.177E-02
9 SR-90	1.353E-01	8.647E-01
10 Y-90	1.353E-01	8.647E-01
11 YR-131M	1.292E-01	8.511E-01
12 YR-131	3.286E-02	4.811E-01
VOLUME	1.000E+00 CC	1.000E+00 CC
TOTAL CLASS 1	3.704E-01	2.528E+00
TOTAL CLASS 2	1.355E-01	9.299E-01
TOTAL CLASS 3	4.327E-01	3.228E+00
GRAND TOTAL	9.387E-01	6.687E+00

*** PROGRAM S T P (VERSION 1.1) RAN ON 10/ 9/1992 ***
 *** STP QUALIFICATION EXAMPLE 7 KEY LETTER A (DECAY SUPPRESSED) ***
 ** STEP ACTIVITIES AFTER 2 HOUR

STP GAMMA SHIELDING INFORMATION CALCULATED

COMPONENT 1 VOLUME 1

CONVERSION FACTOR = 1.000E+00
 VOLUME = 1.000E+00 CC
 BETA SOURCE = 1.131E+04 (MEV/SEC/)

	PARTICLE SOURCE (PHOTON/SEC/)	ENERGY SOURCE (MEV/SEC/)	GROUP ENERGY (MEV-EFFECTIVE)
1	7.188E+03	2.875E+03	.40
2	4.979E+03	4.481E+03	.90
3	1.463E+03	1.975E+03	1.35
4	6.035E+01	1.086E+02	1.80
5	1.597E+02	3.514E+02	2.20
6	1.602E+01	4.164E+01	2.60
7	6.569E-06	3.107E-05	4.73 (VARIABLE)
TOTALS	1.387E+04	9.833E+03	.71

COMPONENT 2 VOLUME 2

CONVERSION FACTOR = 1.000E+00
 VOLUME = 1.000E+00 CC
 BETA SOURCE = 9.415E+04 (MEV/SEC/)

	PARTICLE SOURCE (PHOTON/SEC/)	ENERGY SOURCE (MEV/SEC/)	GROUP ENERGY (MEV-EFFECTIVE)
1	5.118E+04	2.047E+04	.40
2	3.885E+04	3.497E+04	.90
3	1.157E+04	1.562E+04	1.35
4	1.476E+03	2.657E+03	1.80
5	1.407E+03	3.096E+03	2.20
6	3.820E+02	9.931E+02	2.60
7	1.761E+03	9.388E+03	5.33 (VARIABLE)
TOTALS	1.066E+05	8.719E+04	.82

*** END PROGRAM S T P (VERSION 1.1)

TIME OFF = 14: 4: 7 DATE = 10/ 9/1992

Title Verification of Computer Program Page H1 of H17

STP (PC) Version 1.1 EGS-TR-910600-18 Project All

Calculated by ELD Date 10/23/92 Checked by QW Date 10/26/92

Appendix H
Example 8

*** PROGRAM STP-PC (THE SHIELDER-S EDGE) IS AT YOUR SERVICE ***

H2 of H17

** VERSION NUMBER = 1.1 REVISION DATE WAS 9/29/92

* TODAY'S DATE = 10/9/1992 START TIME = 15:4:28

REPRODUCTION OF INPUT DATA DECK

+ + + + +

NV= 3 NS= 1

NI= 12 NK= 3 NG= 7 NL= 2

1KR-85M	1	4.2978E-05	54.0234E-03	10.0000E+00	10.0000E+00			
2KR-85	1	2.0490E-09	19.0683E-06	56.5688E-06	10.0000E+00			
3KR-90	1	2.1446E-02	10.0000E+00	10.0000E+00	10.0000E+00			
4XE-131M	1	6.7758E-07	61.0636E-08	10.0000E+00	10.0000E+00			
5BR-85	2	4.0299E-03	10.0000E+00	10.0000E+00	10.0000E+00			
6I-131	2	9.9783E-07	114.9932E-06	124.6210E-04	10.0000E+00			
7RB-90M	3	2.6866E-03	32.5521E-03	10.0000E+00	10.0000E+00			
8RB-90	3	4.4149E-03	31.8894E-02	76.1792E-05	10.0000E+00			
9SR-90	3	7.6801E-10	72.6248E-03	84.4149E-03	10.0000E+00			
10Y-90	3	3.0038E-06	97.6801E-10	10.0000E+00	10.0000E+00			
11TR-131M	3	6.4180E-06	10.0000E+00	10.0000E+00	10.0000E+00			
12TE-131	3	4.6210E-04	111.4246E-06	10.0000E+00	10.0000E+00			
		.40	.90	1.35	1.80	2.20	2.60	7.50
1KR-85M		.255157+0123-3000+0000+0000+0000+0000+0581+0						+
2KR-85		.251000+0223-2000+0000+0000+0000+0000+0514+0						+
3KR-90		1.315766-1233+0462+0386+0491-1190-1448-1386+1						+
4XE-131M		.142664-2000+0000+0000+0000+0000+0000+0164+0						+
5BR-85		1.003000+0334-1233-1659-2275-2000+0000+0183+1						+
6I-131		.190317+0625-1000+0000+0000+0000+0000+0723+0						+
7RB-90M		1.388344-2855+0195+0472+0186+0118+0144+1473+1						+
8RB-90		1.960000+0277+0963-1192-1366-1111+0162+1533+1						+
9SR-90		.196000+0000+0000+0000+0000+0000+0000+0000+0						+
10Y-90		.935000+0000+0000+0000+0000+0000+0000+0000+0						+
11TR-131M		.190112+0828+0377+0219-1735-1871-2000+0227+1						+
12TE-131		.719110+0162+0142+0323-2000+0000+0000+0150+1						+

*** PROGRAM STP-PC (THE SHIELDER-S EDGE) IS AT YOUR SERVICE ***

H3 of H17

** VERSION NUMBER = 1.1 REVISION DATE WAS 9/29/92

* TODAY'S DATE = 10/ 9/1992 START TIME = 15: 4:28

1 'SOURCE'

1 1.0 2 1.0 3 1.0 4 1.0 5 1.0 6 1.0

7 1.0 8 1.0 9 1.0 10 1.0 11 1.0 12 1.0

0

T

STP QUALIFICATION EXAMPLE 8 KEY LETTER C CONTINUOUS SOURCE

NJ= 2

1 'VOLUME 1'

2 'VOLUME 2'

-1

SOURCE AND VOLUME INITIALIZATION

V 1 1.00 CC

V 2 1.00 CC

F 1 2 0 1.0

C 1 1 0 1.0

A 1 2

1 HOUR

ACTIVITIES AFTER 1 HOUR

2 HOUR

ACTIVITIES AFTER 2 HOUR

T

T

+ + + + + + +

PROGRAM S T P (VERSION 1.1)

RAN ON 10/ 9/1992

H 4 of H 17

DATA FOR THIS RUN OR SERIES OF RUNS

NUMBER OF ISOTOPES (DATA CARDS) = 12

NUMBER OF COMPONENTS (ALL RUNS) = 3

NUMBER OF CLASSES OF ISOTOPES = 3

NUMBER OF SOURCES (MAXIMUM) = 1

NUMBER OF GAMMA GROUPS = 7

NUMBER OF PRECURSORS (MAXIMUM) = 2

STORAGE LOCATIONS REQUESTED =225000

STORAGE LOCATIONS USED = 1045

* * * PROGRAM S T P (VERSION 1.1) RAN ON 10/ 9/1992 * * *
 * * * STP QUALIFICATION EXAMPLE 8 KEY LETTER C CONTINUOUS SOURCE * * *

H 5 of H 17

NUCLIDE DATA INPUT (LIBRARY)

NUMBER	NAME	CLASS	LAMDA(1/HR)	PRECURSOR (NO.,RATE)-
1	KR-85M	1	1.5472E-01	5 1.5447E-01 1 0.0000E+00
2	KR-85	1	7.3764E-06	1 1.5564E-06 5 1.2024E-08
3	KR-90	1	7.7206E+01	1 0.0000E+00 1 0.0000E+00
4	XE-131M	1	2.4393E-03	6 2.6490E-05 1 0.0000E+00
5	BR-85	2	1.4508E+01	1 0.0000E+00 1 0.0000E+00
6	I-131	2	3.5922E-03	11 2.7947E-03 12 3.5922E-03
7	RB-90M	3	9.6718E+00	3 1.1510E+00 1 0.0000E+00
8	RB-90	3	1.5894E+01	3 1.4002E+01 7 3.6555E-01
9	SR-90	3	2.7648E-06	7 2.7012E-06 8 2.7648E-06
10	Y-90	3	1.0814E-02	9 1.0814E-02 1 0.0000E+00
11	TE-131M	3	2.3105E-02	1 0.0000E+00 1 0.0000E+00
12	TE-131	3	1.6636E+00	11 3.6931E-01 1 0.0000E+00

PROGRAM S T P (VERSION 1.1)

RAN ON 10/ 9/1992

H6 of H17

*** STP QUALIFICATION EXAMPLE 8 KEY LETTER C CONTINUOUS SOURCE

I	ISOTOPE	BETA MEV/DISC	GAMMA (MEV/DISC) BY GROUP AND MAX.ENERGY (MEV)						
			1	2	3	4	5	6	7
	EFFECTIVE ENERGY		.400	.900	1.350	1.800	2.200	2.600	7.500
1	KR-85M	.255	.157	.000	.000	.000	.000	.000	.581
2	KR-85	.251	.000	.002	.000	.000	.000	.000	.514
3	KR-90	1.315	.077	.233	.462	.386	.049	.019	3.860
4	XE-131M	.142	.007	.000	.000	.000	.000	.000	.164
5	BR-85	1.003	.000	.033	.023	.007	.003	.000	1.830
6	I-131	.190	.317	.063	.000	.000	.000	.000	.723
7	RB-90M	1.388	.003	.855	.195	.472	.186	.118	1.440 4.730
8	RB-90	1.960	.000	.277	.096	.019	.037	.111	1.620 5.330
9	SR-90	.196	.000	.000	.000	.000	.000	.000	.000
10	Y-90	.935	.000	.000	.000	.000	.000	.000	.000
11	TE-131M	.190	.112	.828	.377	.022	.074	.009	.000 2.270
12	TE-131	.719	.110	.162	.142	.003	.000	.000	.000 1.500

*** PROGRAM S T P (VERSION 1.1) RAN ON 10/ 9/1992 ***
*** STP QUALIFICATION EXAMPLE 8 KEY LETTER C CONTINUOUS SOURCE ***

17 of 17

RUN LOOP INFORMATION FOR THIS RUN FOLLOWS.

NJ, NUMBER OF COMPONENTS USED IN THIS RUN LOOP = 2
KCONC, CALC. TYPE (0/INVENTORY, 1/CONCENTRATION) = 0
IR., -- ACT/COMP. --- ACT/GM.
NDECAY, CALCULATE DAUGHTER PRODUCTION (0/YES,1/NO) = 0
(DEFAULT =0)
ITMAX, MAXIMUM NUMBER OF ITERATIONS PER TIME STEP = 0
(DEFAULT = 10)
KDEBUG, DEBUG OPTION (0/NORMAL OUTPUT, 1/MUCH0) = 0

* * * PROGRAM S T P (VERSION 1.1) RAN ON 10/ 9/1992 * * *
 * * * STP QUALIFICATION EXAMPLE 8 KEY LETTER C CONTINUOUS SOURCE * * *

H8 of H17

SOURCE LIBRARY

NUCLIDE	SOURCE	
	1	
1 KR-85M	1.000E+00	
2 KR-85	1.000E+00	
3 KR-90	1.000E+00	
4 XE-131M	1.000E+00	
5 BR-85	1.000E+00	
6 I-131	1.000E+00	
7 RB-90M	1.000E+00	
8 RB-90	1.000E+00	
9 SR-90	1.000E+00	
10 Y-90	1.000E+00	
11 TR-131M	1.000E+00	
12 TR-131	1.000E+00	
TOTAL CLASS 1	4.000E+00	
TOTAL CLASS 2	2.000E+00	
TOTAL CLASS 3	6.000E+00	
GRAND TOTAL	1.200E+01	

* * * PROGRAM S T P (VERSION 1.1) RAN ON 10/ 9/1992 * * *
 * * * STP QUALIFICATION EXAMPLE 8 KEY LETTER C CONTINUOUS SOURCE * * *
 * * STEP SOURCE AND VOLUME INITIALIZATION

H9 of H17

END TIME = -1.000E+00 INTERVALS/STEP = 30
 TIME START TIME = 0.000E+00 ERROR LIMIT = 1.0000E-05
 STEP DELTA T = 0.300E+00

***** COMPONENT ***** DATA READ (BY CLASS NUMBER)

NO.	NAME	VOLUME OR MASS	1	2	3
1	VOLUME 1	1.000E+00 CC			
***** ACCUMULATOR DECAY IS IGNORED *****					
	REMOVAL RATES (FROM 1) =		0.000E+00	0.000E+00	0.000E+00
	FLOW RATES (CC /HR) P (1 TO 2) =		1.000E+00	1.000E+00	1.000E+00
	TRANSM. FRACTION (1 TO 2) =		1.000E+00	1.000E+00	1.000E+00
C	SOURCE RATE FACTOR (FROM SOURCE 1) =		1.000E+00	1.000E+00	1.000E+00
2	VOLUME 2	1.000E+00 CC			
***** ACCUMULATOR DECAY IS IGNORED *****					
	REMOVAL RATES (FROM 2) =		0.000E+00	0.000E+00	0.000E+00

H10 of H17

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* * *      PROGRAM  S T P   (VERSION 1.1 )      RAN ON 10/ 9/1992      * * *
* * * STP QUALIFICATION EXAMPLE 8 KEY LETTER C CONTINUOUS SOURCE      * * *
* * STEP SOURCE AND VOLUME INITIALIZATION

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CONTINUOUS SOURCE DATA FROM SOURCE INPUT (/HR)

VOLUME 1	
NUCLIDE	
1	KR-85M 1.000E+00
2	KR-85 1.000E+00
3	KR-90 1.000E+00
4	KR-131M 1.000E+00
5	KR-85 1.000E+00
6	I-131 1.000E+00
7	RB-90M 1.000E+00
8	RB-90 1.000E+00
9	SR-90 1.000E+00
10	Y-90 1.000E+00
11	YR-131M 1.000E+00
12	YR-131 1.000E+00
VOLUME 1.000E+00 CC	
TOTAL CLASS 1 4.000E+00	
TOTAL CLASS 2 2.000E+00	
TOTAL CLASS 3 6.000E+00	
GRAND TOTAL 1.200E+01	

PROGRAM S T P (VERSION 1.1)

RAN ON 10/ 9/1992

H 11 of H 17

*** WRITSO FOUND ALL VALUES TO BE ZERO FOR NF= 0

H12 of H17

```

* * * * PROGRAM S T P (VERSION 1.1 )          RAN ON 10/ 9/1992  * * * *
* * * STP QUALIFICATION EXAMPLE 8 KEY LETTER C CONTINUOUS SOURCE  * * *
* * STEP ACTIVITIES AFTER 1 HOUR

```

```

          END TIME = 1.000E+00 HOUR          INTERVALS/STEP          = 30
TIME      START TIME = 0.000E+00          ERROR LIMIT          = 1.0000E-05
STEP      DELTA T   = 1.000E+00 HOUR

```

```

***** COMPONENT *****
NO.    NAME          VOLUME OR MASS          1          2          3
DATA READ (BY CLASS NUMBER)

1 VOLUME 1          1.000E+00 CC
***** ACCUMULATOR DECAY IS IGNORED *****
      REMOVAL RATES (FROM 1) = 0.000E+00  0.000E+00  0.000E+00
      FLOW RATES (CC /HR) F ( 1 TO 2) = 1.000E+00  1.000E+00  1.000E+00
      TRANSM. FRACTION ( 1 TO 2) = 1.000E+00  1.000E+00  1.000E+00
C SOURCE RATE FACTOR (FROM SOURCE 1) = 1.000E+00  1.000E+00  1.000E+00

2 VOLUME 2          1.000E+00 CC
***** ACCUMULATOR DECAY IS IGNORED *****
      REMOVAL RATES (FROM 2) = 0.000E+00  0.000E+00  0.000E+00
*** 30 STEPS WERE USED REQUIRING AN AVERAGE OF .00 ITERATIONS PER STEP

```


* * * PROGRAM S T P (VERSION 1.1) RAN ON 10/ 9/1992 * * *
 * * * STP QUALIFICATION EXAMPLE 8 KEY LETTER C CONTINUOUS SOURCE * * *
 * * STEP ACTIVITIES AFTER 1 HOUR

ACTIVITIES AT END OF THE TIME STEP

	1 VOLUME 1	2 VOLUME 2
NUCLIDE		
1 KR-85K	6.321E-01	3.679E-01
2 KR-85	6.321E-01	3.679E-01
3 KR-90	6.321E-01	3.679E-01
4 KR-131K	6.321E-01	3.679E-01
5 KR-85	6.321E-01	3.679E-01
6 I-131	6.321E-01	3.679E-01
7 KR-90K	6.321E-01	3.679E-01
8 KR-90	6.321E-01	3.679E-01
9 SR-90	6.321E-01	3.679E-01
10 Y-90	6.321E-01	3.679E-01
11 TR-131K	6.321E-01	3.679E-01
12 TR-131	6.321E-01	3.679E-01
VOLUME	1.000E+00 CC	1.000E+00 CC
TOTAL CLASS 1	2.528E+00	1.472E+00
TOTAL CLASS 2	1.264E+00	7.358E-01
TOTAL CLASS 3	3.793E+00	2.207E+00
GRAND TOTAL	7.585E+00	4.415E+00

*** PROGRAM S T P (VERSION 1.1) RAN ON 10/ 9/1992 ***

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*** STP QUALIFICATION EXAMPLE 8 KEY LETTER C CONTINUOUS SOURCE ***

** STEP ACTIVITIES AFTER 1 HOUR

STP GAMMA SHIELDING INFORMATION CALCULATED

COMPONENT 1 VOLUME 1

CONVERSION FACTOR = 1.000E+00

VOLUME = 1.000E+00 CC

BETA SOURCE = 1.998E+05 (MEV/SEC/)

	PARTICLE SOURCE (PHOTON/SEC/)	ENERGY SOURCE (MEV/SEC/)	GROUP ENERGY (MEV-EFFECTIVE)
--	-----------------------------------	------------------------------	---------------------------------

1	4.576E+04	1.831E+04	.40
2	6.375E+04	5.738E+04	.90
3	2.245E+04	3.030E+04	1.35
4	1.181E+04	2.126E+04	1.80
5	3.699E+03	8.138E+03	2.20
6	2.309E+03	6.004E+03	2.60
7	1.362E+04	7.262E+04	5.33 (VARIABLE)

TOTALS	1.634E+05	2.140E+05	1.31
--------	-----------	-----------	------

COMPONENT 2 VOLUME 2

CONVERSION FACTOR = 1.000E+00

VOLUME = 1.000E+00 CC

BETA SOURCE = 1.163E+05 (MEV/SEC/)

	PARTICLE SOURCE (PHOTON/SEC/)	ENERGY SOURCE (MEV/SEC/)	GROUP ENERGY (MEV-EFFECTIVE)
--	-----------------------------------	------------------------------	---------------------------------

1	2.663E+04	1.065E+04	.40
2	3.710E+04	3.339E+04	.90
3	1.306E+04	1.764E+04	1.35
4	6.873E+03	1.237E+04	1.80
5	2.153E+03	4.736E+03	2.20
6	1.344E+03	3.494E+03	2.60
7	7.929E+03	4.226E+04	5.33 (VARIABLE)

TOTALS	9.510E+04	1.245E+05	1.31
--------	-----------	-----------	------

***** PROGRAM S T P (VERSION 1.1) RAN ON 10/ 9/1992 *****

*** STP QUALIFICATION EXAMPLE 8 KEY LETTER C CONTINUOUS SOURCE ***

** STEP ACTIVITIES AFTER 2 HOUR

TIME	END TIME = 2.000E+00 HOUR	INTERVALS/STEP	= 30
STEP	START TIME = 1.000E+00 HOUR	ERROR LIMIT	= 1.0000E-05
	DELTA T = 1.000E+00 HOUR		

***** COMPONENT *****		DATA READ (BY CLASS NUMBER)			
NO.	NAME	VOLUME OR MASS	1	2	3
1	VOLUME 1	1.000E+00 CC			
***** ACCUMULATOR DECAY IS IGNORED *****					
	REMOVAL RATES (FROM 1) =		0.000E+00	0.000E+00	0.000E+00
	FLOW RATES (CC /HR) F (1 TO 2) =		1.000E+00	1.000E+00	1.000E+00
	TRANSM. FRACTION (1 TO 2) =		1.000E+00	1.000E+00	1.000E+00
C	SOURCE RATE FACTOR (FROM SOURCE 1) =		1.000E+00	1.000E+00	1.000E+00
2	VOLUME 2	1.000E+00 CC			
***** ACCUMULATOR DECAY IS IGNORED *****					
	REMOVAL RATES (FROM 2) =		0.000E+00	0.000E+00	0.000E+00
*** 30 STEPS WERE USED REQUIRING AN AVERAGE OF .00 ITERATIONS PER STEP					

*** PROGRAM S T P (VERSION 1.1) RAN ON 10/ 9/1992 ***

H 16 of H17

*** STP QUALIFICATION EXAMPLE 8 KEY LETTER C CONTINUOUS SOURCE ***

** STEP ACTIVITIES AFTER 2 HOUR

ACTIVITIES AT END OF THE TIME STEP

	1	2
NUCLIDE	VOLUME 1	VOLUME 2
1 KR-85M	8.647E-01	1.135E+00
2 KR-85	8.647E-01	1.135E+00
3 KR-90	8.647E-01	1.135E+00
4 XE-131M	8.647E-01	1.135E+00
5 BR-85	8.647E-01	1.135E+00
6 I-131	8.647E-01	1.135E+00
7 RB-90M	8.647E-01	1.135E+00
8 RB-90	8.647E-01	1.135E+00
9 SR-90	8.647E-01	1.135E+00
10 Y-90	8.647E-01	1.135E+00
11 YR-131M	8.647E-01	1.135E+00
12 YR-131	8.647E-01	1.135E+00
VOLUME	1.000E+00 CC	1.000E+00 CC
TOTAL CLASS 1	3.459E+00	4.541E+00
TOTAL CLASS 2	1.729E+00	2.271E+00
TOTAL CLASS 3	5.188E+00	6.812E+00
GRAND TOTAL	1.038E+01	1.362E+01

H 17 of H 17

*** PROGRAM S T P (VERSION 1.1) RAN ON 10/ 9/1992 ***
 *** STP QUALIFICATION EXAMPLE 8 KEY LETTER C CONTINUOUS SOURCE ***
 ** STEP ACTIVITIES AFTER 2 HOUR

STP GAMMA SHIELDING INFORMATION CALCULATED

COMPONENT 1 VOLUME 1

CONVERSION FACTOR = 1.000E+00
 VOLUME = 1.000E+00 CC
 BETA SOURCE = 2.733E+05 (MEV/SEC/)
 PARTICLE SOURCE ENERGY SOURCE GROUP ENERGY
 (PHOTON/SEC/) (MEV/SEC/) (MEV-EFFECTIVE)

1	6.260E+04	2.504E+04	.40
2	8.721E+04	7.849E+04	.90
3	3.070E+04	4.145E+04	1.35
4	1.615E+04	2.908E+04	1.80
5	5.060E+03	1.113E+04	2.20
6	3.159E+03	8.213E+03	2.60
7	1.864E+04	9.933E+04	5.33 (VARIABLE)
TOTALS	2.235E+05	2.927E+05	1.31

COMPONENT 2 VOLUME 2

CONVERSION FACTOR = 1.000E+00
 VOLUME = 1.000E+00 CC
 BETA SOURCE = 3.589E+05 (MEV/SEC/)
 PARTICLE SOURCE ENERGY SOURCE GROUP ENERGY
 (PHOTON/SEC/) (MEV/SEC/) (MEV-EFFECTIVE)

1	8.220E+04	3.288E+04	.40
2	1.145E+05	1.031E+05	.90
3	4.031E+04	5.442E+04	1.35
4	2.121E+04	3.818E+04	1.80
5	6.644E+03	1.462E+04	2.20
6	4.148E+03	1.078E+04	2.60
7	2.447E+04	1.304E+05	5.33 (VARIABLE)
TOTALS	2.935E+05	3.844E+05	1.31

*** END PROGRAM S T P (VERSION 1.1)

TIME OFF = 15: 8:19 DATE = 10/ 9/1992

Title Verification of Computer Program Page I 1 of I 22

STP (PC) Version 1.1 EGS-TR-910600-18 Project All

Calculated by EKA Date 10/23/92 Checked by QWW Date 10/26/92

Appendix I
Example 9

*** PROGRAM STP-PC (THE SHIELDER-S EDGE) IS AT YOUR SERVICE ***

I 2 of I 22

*** VERSION NUMBER=1.1 REVISION DATE WAS 9/29/92

*** TODAY'S DATE = 10/ 9/1992 START TIME = 15:14:58

REPRODUCTION OF INPUT DATA DECK

+ + + + +

NV= 3 MS= 2

NI= 12 WK= 3 NG= 7 NL= 2

1KR-85M	1	4.2978E-05	54.0234E-03	10.0000E+00	10.0000E+00
2KR-85	1	2.0490E-09	19.0683E-06	56.5688E-06	10.0000E+00
3KR-90	1	2.1446E-02	10.0000E+00	10.0000E+00	10.0000E+00
4XE-131M	1	6.7758E-07	61.0836E-08	10.0000E+00	10.0000E+00
5BR-85	2	4.0299E-03	10.0000E+00	10.0000E+00	10.0000E+00
6I-131	2	9.9783E-07	114.9932E-06	124.6210E-04	10.0000E+00
7RB-90M	3	2.6866E-03	32.5521E-03	10.0000E+00	10.0000E+00
8RB-90	3	4.4149E-03	31.8894E-02	76.1792E-05	10.0000E+00
9SR-90	3	7.6801E-10	72.6248E-03	84.4149E-03	10.0000E+00
10Y-90	3	3.0038E-06	97.6801E-10	10.0000E+00	10.0000E+00
11YE-131M	3	6.4180E-06	10.0000E+00	10.0000E+00	10.0000E+00
12YE-131	3	4.6210E-04	111.4248E-06	10.0000E+00	10.0000E+00
		.40	.90	1.35	1.80
					2.20
					2.60
					7.50
1KR-85M		.255157+0123-3000+0000+0000+0000+0000+0581+0			+
2KR-85		.251000+0223-2000+0000+0000+0000+0000+0514+0			+
3KR-90		1.315766-1233+0462+0386+0491-1190-1448-1386+1			+
4XE-131M		.142664-2000+0000+0000+0000+0000+0000+0164+0			+
5BR-85		1.003000+0334-1233-1659-2275-2000+0000+0183+1			+
6I-131		.190317+0625-1000+0000+0000+0000+0000+0723+0			+
7RB-90M		1.388344-2855+0195+0472+0186+0118+0144+1473+1			+
8RB-90		1.960000+0277+0963-1192-1366-1111+0162+1533+1			+
9SR-90		.196000+0000+0000+0000+0000+0000+0000+0000+0			+
10Y-90		.935000+0000+0000+0000+0000+0000+0000+0000+0			+
11YE-131M		.190112+0828+0377+0219-1735-1871-2000+0227+1			+
12YE-131		.719110+0162+0142+0323-2000+0000+0000+0153+1			+

*** PROGRAM STP-PC (THE SHELDER-S EDGE) IS AT YOUR SERVICE ***

I3 of I 22

*** VERSION NUMBER=1.1 REVISION DATE WAS 9/29/92

* TODAY'S DATE = 10/ 9/1992 START TIME = 15:14:59

1 'SOURCE'

1 1.0 2 1.0 3 1.0 4 1.0 5 1.0 6 1.0

7 1.0 8 1.0 9 1.0 10 1.0 11 1.0 12 1.0

0

2 'SOURCE T= 2H'

0

T

STP QUALIFICATION EXAMPLE 9 KEY LETTER N CREATES A NEW SOURCE

NJ= 2

1 'VOLUME 1'

2 'VOLUME 2'

-1

SOURCE AND VOLUME INITIALIZATION

V 1 1.00 CC

V 2 1.00 CC

F 1 2 0 1.0

S 1 1 0 1.0

1 HOUR

ACTIVITIES AFTER 1 HOUR

N 2 2

2 HOUR

ACTIVITIES AFTER 2 HOUR

S 2 1 0 1.0

T

T

+ + + + + + +

PROGRAM S T P (VERSION 1.1)

RAN ON 10/ 9/1992

I 4 of I 22

DATA FOR THIS RUN OR SERIES OF RUNS

NUMBER OF ISOTOPIES (DATA CARDS) = 12

NUMBER OF COMPONENTS (ALL RUNS) = 3

NUMBER OF CLASSES OF ISOTOPIES = 3

NUMBER OF SOURCES (MAXIMUM) = 2

NUMBER OF GAMMA GROUPS = 7

NUMBER OF PRECURSORS (MAXIMUM) = 2

STORAGE LOCATIONS REQUESTED = 225000

STORAGE LOCATIONS USED = 1074

* * * PROGRAM S T P (VERSION 1.1) RUN ON 10/ 9/1992 * * *
 * * * STP QUALIFICATION EXAMPLE 9 KEY LETTER W CREATES A NEW SOURCE * * *

I5 of I22

NUCLIDE DATA INPUT (LIBRARY)

NUMBER	NAME	CLASS	LAMDA(1/HR)	PRECURSOR (NO.,RATE)-
1	KR-85M	1	1.5472E-01	5 1.5447E-01 1 0.0000E+00
2	KR-85	1	7.3764E-06	1 1.5564E-06 5 1.2024E-08
3	KR-90	1	7.7206E-01	1 0.0000E+00 1 0.0000E+00
4	KR-131M	1	2.4393E-03	6 2.6490E-05 1 0.0000E+00
5	BR-85	2	1.4508E-01	1 0.0000E+00 1 0.0000E+00
6	I-131	2	3.5922E-03	11 2.7947E-03 12 3.5922E-03
7	RB-90M	3	9.6718E+00	3 1.1510E+00 1 0.0000E+00
8	RB-90	3	1.5894E+01	3 1.4002E+01 7 3.6555E-01
9	SR-90	3	2.7648E-06	7 2.7012E-06 8 2.7648E-06
10	Y-90	3	1.0814E-02	9 1.0814E-02 1 0.0000E+00
11	TK-131M	3	2.3105E-02	1 0.0000E+00 1 0.0000E+00
12	TK-131	3	1.6636E+00	11 3.6931E-01 1 0.0000E+00

*** PROGRAM S Y P (VERSION 1.1) RAN ON 10/ 9/1992 ***

I 6 of I 22

*** STP QUALIFICATION EXAMPLE 9 KEY KETTER N CREATES A NEW SOURCE ***

I	ISOTOPE	BETA MEV/DISC	GAMMA (MEV/DISC) BY GROUP AND MAX.ENERGY (MEV)						
			1	2	3	4	5	6	7
	EFFECTIVE ENERGY		.400	.900	1.350	1.800	2.200	2.600	7.500
1	KR-85M	.255	.157	.000	.000	.000	.000	.000	.581
2	KR-85	.251	.000	.002	.000	.000	.000	.000	.514
3	KR-90	1.315	.077	.233	.462	.386	.049	.019	3.860
4	XE-131M	.142	.007	.000	.000	.000	.000	.000	.164
5	BR-85	1.003	.000	.033	.023	.007	.003	.000	1.830
6	I-131	.190	.317	.063	.000	.000	.000	.000	.723
7	BR-90M	1.388	.003	.855	.195	.472	.186	.118	4.730
8	BR-90	1.960	.000	.277	.096	.019	.037	.111	5.330
9	SR-90	.196	.000	.000	.000	.000	.000	.000	.000
10	Y-90	.935	.000	.000	.000	.000	.000	.000	.000
11	TR-131M	.190	.112	.828	.377	.022	.074	.009	2.270
12	TR-131	.719	.110	.162	.142	.003	.000	.000	1.500

*** PROGRAM S T P (VERSION 1.1) RAN ON 10/ 9/1992 ***
*** STP QUALIFICATION EXAMPLE 9 KEY LETTER N CREATES A NEW SOURCE ***

I 7 of I 22

RUN LOOP INFORMATION FOR THIS RUN FOLLOWS.

NJ, NUMBER OF COMPONENTS USED IN THIS RUN LOOP = 2
KCONC, CALC. TYPE (0/INVENTORY, 1/CONCENTRATION) = 0
IN., -- ACT/COMP. --- ACT/GM.
NDECAY, CALCULATE DAUGHTER PRODUCTION (0/YES,1/NO) = 0
(DEFAULT =0)
ITMAX, MAXIMUM NUMBER OF ITERATIONS PER TIME STEP = 0
(DEFAULT = 10)
KDEBEG, DEBUG OPTION (0/NORMAL OUTPUT, 1/MUCHO) = 0

* * * PROGRAM S T P (VERSION 1.1) RAN ON 10/ 9/1992 * * *
 * * * STP QUALIFICATION EXAMPLE 9 KEY LETTER N CREATES A NEW SOURCE * * *

± 8 of 22

SOURCE LIBRARY

NUCLIDE	SOURCE	
	1	
1 KR-85M	1.000E+00	
2 KR-85	1.000E+00	
3 KR-90	1.000E+00	
4 KR-131M	1.000E+00	
5 KR-85	1.000E+00	
6 I-131	1.000E+00	
7 RB-90M	1.000E+00	
8 RB-90	1.000E+00	
9 SR-90	1.000E+00	
10 Y-90	1.000E+00	
11 TR-131M	1.000E+00	
12 TR-131	1.000E+00	
TOTAL CLASS 1	4.000E+00	
TOTAL CLASS 2	2.000E+00	
TOTAL CLASS 3	6.000E+00	
GRAND TOTAL	1.200E+01	

***** PROGRAM S T P (VERSION 1.1) RAN ON 10/ 9/1992 *****

*** STP QUALIFICATION EXAMPLE 9 KEY LETTER W CREATES A NEW SOURCE ***

** STEP SOURCE AND VOLUME INITIALIZATION

TIME	END TIME = -1.000E+00	INTERVALS/STEP	= 30
STEP	START TIME = 0.000E+00	ERROR LIMIT	= 1.0000E-05
	DELTA T = 0.000E+00		

***** COMPONENT *****		DATA READ (BY CLASS NUMBER)			
NO.	NAME	VOLUME OR MASS	1	2	3
1	VOLUME 1	1.000E+00 CC			
	REMOVAL RATES (FROM 1) =		0.000E+00	0.000E+00	0.000E+00
	FLOW RATES (CC /HR) F (1 TO 2) =		1.000E+00	1.000E+00	1.000E+00
	TRANSM. FRACTION (1 TO 2) =		1.000E+00	1.000E+00	1.000E+00
	STEP SOURCE FACTOR (FROM SOURCE 1) =		1.000E+00	1.000E+00	1.000E+00

2 VOLUME 2 1.000E+00 CC

REMOVAL RATES (FROM 2) =	0.000E+00	0.000E+00	0.000E+00
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***** PROGRAM S T P (VERSION 1.1) RAN ON 10/ 9/1992 *****

#10 of 22

*** STP QUALIFICATION EXAMPLE 9 KEY LETTER W CREATES A NEW SOURCE ***

** STEP SOURCE AND VOLUME INITIALIZATION

STEP SOURCE DATA FROM SOURCE INPUT

		1
		VOLUME 1
NUCLIDE		
1	XR-85M	1.000E+00
2	XR-85	1.000E+00
3	XR-90	1.000E+00
4	XR-131M	1.000E+00
5	XR-85	1.000E+00
6	I-131	1.000E+00
7	RB-90M	1.000E+00
8	RB-90	1.000E+00
9	SR-90	1.000E+00
10	Y-90	1.000E+00
11	YR-131M	1.000E+00
12	YR-131	1.000E+00
VOLUME		1.000E+00 CC
TOTAL CLASS 1 4.000E+00		
TOTAL CLASS 2 2.000E+00		
TOTAL CLASS 3 6.000E+00		
GRAND TOTAL 1.200E+01		

*** PROGRAM S T P (VERSION 1.1) RAN ON 10/ 9/1992 ***

I 11 of I 22

*** STP QUALIFICATION EXAMPLE 9 KEY LETTER N CREATES A NEW SOURCE ***

** STEP SOURCE AND VOLUME INITIALIZATION

ACTIVITIES AT END OF THE TIME STEP

		1
		VOLUME 1
NUCLIDE		
1	KR-85M	1.000E+00
2	Ki-85	1.000E+00
3	KR-90	1.000E+00
4	XE-131M	1.000E+00
5	BR-85	1.000E+00
6	I-131	1.000E+00
7	RB-90M	1.000E+00
8	RB-90	1.000E+00
9	SR-90	1.000E+00
10	Y-90	1.000E+00
11	TE-131M	1.000E+00
12	TE-131	1.000E+00
VOLUME		1.000E+00 CC
TOTAL CLASS 1 4.000E+00		
TOTAL CLASS 2 2.000E+00		
TOTAL CLASS 3 6.000E+00		
GRAND TOTAL 1.200E+01		


```

* * * * *      PROGRAM  S T P   (VERSION 1.1 )      RAN ON 10/ 9/1992      * * * * *
* * * STP QUALIFICATION EXAMPLE 9 KEY LETTER N CREATES A NEW SOURCE      * * *
* * STEP SOURCE AND VOLUME INITIALIZATION
      STP GAMMA SHIELDING INFORMATION CALCULATED

```

COMPONENT 1 VOLUME 1

```

CONVERSION FACTOR = 1.000E+00
VOLUME            = 1.000E+00 CC
BETA SOURCE       = 3.161E+05 (MEV/SEC/ )
      PARTICLE SOURCE  ENERGY SOURCE  GROUP ENERGY
      (PHOTON/SEC/ )  (MEV/SEC/ )  (MEV-EFFECTIVE)

```

1	7.240E+04	2.896E+04	.40
2	1.009E+05	9.077E+04	.90
3	3.551E+04	4.794E+04	1.35
4	1.868E+04	3.363E+04	1.80
5	5.852E+03	1.287E+04	2.20
6	3.653E+03	9.498E+03	2.60
7	2.155E+04	1.149E+05	5.33 (VARIABLE)
TOTALS	2.585E+05	3.385E+05	1.31

* * * * PROGRAM S T P (VERSION 1.1) RAN ON 10/ 9/1992 * * * *
 * * * STP QUALIFICATION EXAMPLE 9 KEY LETTER N CREATES A NEW SOURCE * * *
 * * STEP ACTIVITIES AFTER 1 HOUR

TIME END TIME = 1.000E+00 HOUR INTERVALS/STEP = 30
 START TIME = 0.000E+00 ERROR LIMIT = 1.0000E-05
 STEP DELTA T = 1.000E+00 HOUR

***** COMPONENT *****		DATA READ (BY CLASS NUMBER)			
NO.	NAME	VOLUME OR MASS	1	2	3
1	VOLUME 1	1.000E+00 CC			
	REMOVAL RATES (FROM 1) =		0.000E+00	0.000E+00	0.000E+00
	FLOW RATES (CC /HR) F (1 TO 2) =		1.000E+00	1.000E+00	1.000E+00
	TRANSM. FRACTION (1 TO 2) =		1.000E+00	1.000E+00	1.000E+00

2 VOLUME 2 1.000E+00 CC

REMOVAL RATES (FROM 2) = 0.000E+00 0.000E+00 0.000E+00

*** 30 STEPS WERE USED REQUIRING AN AVERAGE OF .00 ITERATIONS PER STEP

I 13 of I 22

***** PROGRAM S T P (VERSION 1.1) RAN ON 10/ 9/1992 *****

*** STP QUALIFICATION EXAMPLE 9 KEY LETTER N CREATES A NEW SOURCE ***

*** STEP ACTIVITIES AFTER 1 HOUR

ACTIVITIES AT END OF THE TIME STEP

	1 VOLUME 1	2 VOLUME 2
NUCLIDE		
1 KR-85M	3.185E-01	5.473E-01
2 KR-85	3.679E-01	6.321E-01
3 KR-90	1.086E-34	1.066E-34
4 KR-131M	3.670E-01	6.306E-01
5 BR-85	1.841E-07	3.164E-07
6 I-131	3.684E-01	6.330E-01
7 RB-90M	2.359E-05	4.052E-05
8 RB-90	1.440E-06	2.474E-06
9 SR-90	3.679E-01	6.321E-01
10 Y-90	3.679E-01	6.321E-01
11 TR-131M	3.595E-01	6.177E-01
12 TR-131	1.349E-01	2.319E-01
VOLUME	1.000E+00 CC	1.000E+00 CC
TOTAL CLASS 1	1.053E+00	1.810E+00
TOTAL CLASS 2	3.684E-01	6.330E-01
TOTAL CLASS 3	1.230E+00	2.114E+00
GRAND TOTAL	2.652E+00	4.557E+00

* * * PROGRAM S T P (VERSION 1.1) RAN ON 10/ 9/1992 * * *
 * * * STP QUALIFICATION EXAMPLE 9 KEY KETTER W CREATES A NEW SOURCE * * *
 * * STEP ACTIVITIES AFTER 1 HOUR

I 15 of I 22

STP GAMMA SHIELDING INFORMATION CALCULATED

COMPONENT 1 VOLUME 1

CONVERSION FACTOR = 1.000E+00
 VOLUME = 1.000E+00 CC
 BETA SOURCE = 3.245E+04 (NEV/SEC/)
 PARTICLE SOURCE ENERGY SOURCE GROUP ENERGY
 (PHOTON/SEC/) (NEV/SEC/) (NEV-EFFECTIVE)

1	2.075E+04	8.300E+03	.40
2	1.412E+04	1.271E+04	.90
3	4.240E+03	5.723E+03	1.35
4	1.710E+02	3.078E+02	1.80
5	4.444E+02	9.778E+02	2.20
6	4.460E+01	1.160E+02	2.60
7	2.839E-01	1.343E+00	4.73 (VARIABLE)
TOTALS	3.977E+04	2.813E+04	.71

COMPONENT 2 VOLUME 2

CONVERSION FACTOR = 1.000E+00
 VOLUME = 1.000E+00 CC
 BETA SOURCE = 5.576E+04 (NEV/SEC/)
 PARTICLE SOURCE ENERGY SOURCE GROUP ENERGY
 (PHOTON/SEC/) (NEV/SEC/) (NEV-EFFECTIVE)

1	3.565E+04	1.426E+04	.40
2	2.426E+04	2.183E+04	.90
3	7.285E+03	9.835E+03	1.35
4	2.938E+02	5.289E+02	1.80
5	7.637E+02	1.680E+03	2.20
6	7.663E+01	1.992E+02	2.60
7	4.877E-01	2.307E+00	4.73 (VARIABLE)
TOTALS	6.833E+04	4.834E+04	.71

*** PROGRAM S T P (VERSION 1.1) RAN ON 10/ 9/1992 ***

*** STP QUALIFICATION EXAMPLE 9 KEY LETTER N CREATES A NEW SOURCE ***

* * STEP ACTIVITIES AFTER 1 HOUR

ACTIVITY IN COMPONENT 2 BECOMES SOURCE 2

I16 of I22

PROGRAM S T P (VERSION 1.1)

RAN ON 10/ 9/1992 ***

I 17 of I 22

* * * PROGRAM S T P (VERSION 1.1) RAN ON 10/ 9/1992 * * *
 * * * ST/ QUALIFICATION EXAMPLE 9 KEY LETTER W CREATES A NEW SOURCE * * *
 * * STEP ACTIVITIES AFTER 1 HOUR

I 18 of I 22

SOURCE LIBRARY

	1	2
NUCLIDE	SOURCE	SOURCE T= 2H
1 KR-85M	1.000E+00	5.473E-01
2 KR-85	1.000E+00	6.321E-01
3 KR-90	1.000E+00	0.000E+00
4 KR-131M	1.000E+00	6.306E-01
5 BR-85	1.000E+00	3.164E-07
6 I-131	1.000E+00	6.330E-01
7 RB-90M	1.000E+00	4.052E-05
8 RB-90	1.000E+00	2.474E-06
9 SR-90	1.000E+00	6.321E-01
10 Y-90	1.000E+00	6.321E-01
11 YR-131M	1.000E+00	6.177E-01
12 YR-131	1.000E+00	2.319E-01
TOTAL CLASS 1	4.000E+00	1.010E+00
TOTAL CLASS 2	2.000E+00	5.330E-01
TOTAL CLASS 3	6.000E+00	2.114E+00
GRAND TOTAL	1.200E+01	4.557E+00

```

* * * PROGRAM S T P (VERSION 1.1 ) RAN ON 10/ 9/1992 * * *
* * * STP QUALIFICATION EXAMPLE 9 KEY LETTER W CREATES A NEW SOURCE * * *
* * STEP ACTIVITIES AFTER 2 HOUR

```

```

TIME      END TIME = 2.000E+00 HOUR      INTERVALS/STEP      = 30
          START TIME = 1.000E+00 HOUR      ERROR LIMIT      = 1.0000E-05
STEP      DELTA T   = 1.000E+00 HOUR

```

```

***** COMPONENT *****
NO. NAME VOLUME OR MASS DATA READ (BY CLASS NUMBER)
      1      2      3
1 VOLUME 1 1.000E+00 CC
      REMOVAL RATES (FROM 1) = 0.000E+00 0.000E+00 0.000E+00
      FLOW RATES (CC /HR) F ( 1 TO 2) = 1.000E+00 1.000E+00 1.000E+00
      TRANSM. FRACTION ( 1 TO 2) = 1.000E+00 1.000E+00 1.000E+00
      STEP SOURCE FACTOR (FROM SOURCE 2) = 1.000E+00 1.000E+00 1.000E+00

```

```

2 VOLUME 2 1.000E+00 CC
      REMOVAL RATES (FROM 2) = 0.000E+00 0.000E+00 0.000E+00

```


I 20 of I 22

*** PROGRAM S T P (VERSION 1.1) RUN ON 10/ 9/1992 ***

*** STP QUALIFICATION EXAMPLE 9 KEY LETTER N CREATES A NEW SOURCE ***

*** STEP ACTIVITIES AFTER 2 HOUR

STEP SOURCE DATA FROM SOURCE INPUT

		1
		VOLUME 1
NUCLIDE		
1	KR-85M	5.473E-01
2	KR-85	6.321E-01
3	KR-90	0.000E+00
4	KR-131M	6.306E-01
5	KR-85	3.164E-07
6	I-131	6.330E-01
7	RB-90M	4.052E-05
8	RB-90	2.474E-06
9	SR-90	6.321E-01
10	Y-90	6.321E-01
11	YK-131M	6.177E-01
12	YK-131	2.319E-01
VOLUME		1.000E+00 CC
TOTAL CLASS 1		1.810E+00
TOTAL CLASS 2		6.330E-01
TOTAL CLASS 3		2.114E+00
GRAND TOTAL		4.557E+00

*** 30 STEPS WERE USED REQUIRING AN AVERAGE OF .00 ITERATIONS PER STEP

***** PROGRAM S T P (VERSION 1.1) RUN ON 10/ 9/1992 *****

*** STF QUALIFICATION EXAMPLE 9 KEY LETTER W CREATES A NEW SOURCE ***

*** STEP ACTIVITIES AFTER 2 HOUR

ACTIVITIES AT END OF THE TIME STEP

	1 VOLUME 1	2 VOLUME 2
NUCLIDE		
1 KR-85M	2.729E-01	4.689E-01
2 KR-85	3.679E-01	6.321E-01
3 KR-90	0.000E+00	0.000E+00
4 KR-131M	3.661E-01	6.291E-01
5 BR-85	9.216E-14	1.584E-13
6 I-131	3.684E-01	6.330E-01
7 RB-90M	1.487E-09	2.554E-09
8 RB-90	8.735E-11	1.501E-10
9 SR-90	3.679E-01	6.321E-01
10 Y-90	3.679E-01	6.321E-01
11 YR-131M	3.513E-01	6.036E-01
12 YR-131	8.931E-02	1.535E-01
VOLUME	1.000E+00 CC	1.000E+00 CC
TOTAL CLASS 1	1.007E+00	1.730E+00
TOTAL CLASS 2	3.684E-01	6.330E-01
TOTAL CLASS 3	1.176E+00	2.021E+00
GRAND TOTAL	2.552E+00	4.384E+00

*** PROGRAM S T P (VERSION 1.1) RAN ON 10/ 9/1992 ***
 *** STP QUALIFICATION EXAMPLE 9 KEY KETTER N CREATES A NEW SOURCE ***
 ** STEP ACTIVITIES AFTER 2 HOUR

STP GAMMA SHIELDING INFORMATION CALCULATED

COMPONENT 1 VOLUME 1

CONVERSION FACTOR = 1.000E+00
 VOLUME = 1.000E+00 CC
 BETA SOURCE = 3.074E+04 (NEV/SEC/)
 PARTICLE SOURCE ENERGY SOURCE GROUP ENERGY
 (PHOTON/SEC/) (NEV/SEC/) (NEV-EFFECTIVE)

1	1.954E+04	7.815E+03	.40
2	1.353E+04	1.218E+04	.90
3	3.977E+03	5.369E+03	1.35
4	1.641E+02	2.953E+02	1.80
5	4.342E+02	9.553E+02	2.20
6	4.354E+01	1.132E+02	2.60
7	1.785E-05	8.444E-05	4.73 (VARIABLE)
TOTALS	3.769E+04	2.673E+04	.71

COMPONENT 2 VOLUME 2

CONVERSION FACTOR = 1.000E+00
 VOLUME = 1.000E+00 CC
 BETA SOURCE = 5.283E+04 (NEV/SEC/)
 PARTICLE SOURCE ENERGY SOURCE GROUP ENERGY
 (PHOTON/SEC/) (NEV/SEC/) (NEV-EFFECTIVE)

1	3.357E+04	1.343E+04	.40
2	2.325E+04	2.093E+04	.90
3	6.834E+03	9.226E+03	1.35
4	2.819E+02	5.074E+02	1.80
5	7.461E+02	1.641E+03	2.20
6	7.481E+01	1.945E+02	2.60
7	3.067E-05	1.451E-04	4.73 (VARIABLE)
TOTALS	6.476E+04	4.593E+04	.71

*** END PROGRAM S T P (VERSION 1.1)

TIME OFF = 15:19:58 DATE = 10/ 9/1992

Title Verification of Computer Program Page J1 of J49

STP (PC) Version 1.1 EGS-TR-910600-18 Project All

Calculated by ELD Date 10/23/92 Checked by BWW Date 10/26/92

Appendix J
Examples 10A and 10B

J2 J49

*** PROGRAM STP-PC (THE SKIPLER-S EDGE) IS AT YOUR SERVICE ***

** VERSION NUMBER = 1.1 REVISION DATE WAS 9/29/92

* TODAY'S DATE = 10/ 9/1992 START TIME = 15:24:42

REPRODUCTION OF INPUT DATA DECK

+ + + + + + + +

NV= 3 NS= 2

NI= 12 NK= 3 NG= 7 NL= 2

1KR-85M	1	4.2978E-05	54.0234E-03	10.0000E+00	10.0000E+00
2KR-85	1	2.0490E-09	19.0683E-06	56.5688E-06	10.0000E+00
3KR-90	1	2.1446E-02	10.0000E+00	10.0000E+00	10.0000E+00
4XE-131M	1	6.7758E-07	61.0836E-08	10.0000E+00	10.0000E+00
5BR-85	2	4.0299E-03	10.0000E+00	10.0000E+00	10.0000E+00
6I-131	2	9.9783E-07	114.9932E-06	124.6210E-04	10.0000E+00
7RB-90M	3	2.6866E-03	32.5521E-03	10.0000E+00	10.0000E+00
8RB-90	3	4.4149E-03	31.8994E-02	76.1792E-05	10.0000E+00
9SE-90	3	7.6801E-10	72.6248E-03	84.4149E-03	10.0000E+00
10Y-90	3	3.0038E-06	97.6801E-10	10.0000E+00	10.0000E+00
11TE-131M	3	6.4186E-06	10.0000E+00	10.0000E+00	10.0000E+00
12TE-131	3	4.6210E-04	111.4248E-06	10.0000E+00	10.0000E+00

.40 .90 1.35 1.80 2.20 2.60 7.50

1KR-85M	.255157+0123-3000+0000+0000+0000+0000+0581+0	+
2KR-85	.251000+0223-2000+0000+0000+0000+0000+0514+0	+
3KR-90	1.315766-1233+0462+0386+0491-1190-1448-1386+1	+
4XE-131M	.142664-2000+0000+0000+0000+0000+0000+0164+0	+
5BR-85	1.003000+0334-1233-1659-2275-2000+0000+0183+1	+
6I-131	.99317+0625-1000+0000+0000+0000+0000+0723+0	+
7RB-90M	1.380344-2855+0195+0472+0186+0118+C144+1473+1	+
8RB-90	1.960000+0277+0963-1192-1366-1111+0162+1533+1	+
9SE-90	.196000+0000+0000+0000+0000+0000+0000+0000+0	+
10Y-90	.935000+0000+0000+0000+0000+0000+0000+0000+0	+
11TE-131M	.190112+0828+0377+0219-1735-1871-2000+0227+1	+
12TE-131	.719110+0162+0142+0323-2000+0000+0000+0150+1	+

J3 of J49

*** PROGRAM STP-PC (THE SHIELDER-S EDGE) IS AT YOUR SERVICE ***

** VERSION NUMBER = 1.1 REVISION DATE WAS 9/29/92

* TODAY'S DATE = 10/ 9/1992 START TIME = 15:24:43

1 'SOURCE'

1 1.0 2 1.0 3 1.0 4 1.0 5 1.0 6 1.0

7 1.0 8 1.0 9 1.0 10 1.0 11 1.0 12 1.0

0

T

STP QUALIFICATION EXAMPLE 10A KEY LETTER B VARIABLE VOLUME

NJ= 1 KCONC= 1 NDECAT= 1

1 'VOLUME 1'

-1

SOURCE AND VOLUME INITIALIZATION

V 1 1.0

S 1 1 0 1.0

C 1 1 0 1.0

1 SEC 120

ACTIVITY AFTER 1 SEC

B 1 1.00027777778

1 MIN 120

ACTIVITY AFTER 1 MIN

B 1 1.016666666667

30 MIN 240

ACTIVITY AFTER 30 MIN

B 1 1.5

1 HOUR 240

ACTIVITY AFTER 1 HOUR

B 1 2.0

T

T

+ + + + + + +

PROGRAM S T P (VERSION 1.1)

RAN ON 10/ 9/1992

J 4 of J 49

DATA FOR THIS RUN OR SERIES OF RUNS

NUMBER OF ISOTOPES (DATA CARDS) = 12

NUMBER OF COMPONENTS (ALL RUNS) = 3

NUMBER OF CLASSES OF ISOTOPES = 3

NUMBER OF SOURCES (MAXIMUM) = 2

NUMBER OF GAMMA GROUPS = 7

NUMBER OF PRECURSORS (MAXIMUM) = 2

STORAGE LOCATIONS REQUESTED =225000

STORAGE LOCATIONS USED = 1074

J5dJ49

* * * PROGRAM S T P (VERSION 1.1) RAN ON 10/ 9/1992 * * *
 * * * STP QUALIFICATION EXAMPLE 10A KEY LETTER B VARIABLE VOLUME * * *

NUCLIDE DATA INPUT (LIBRARY)

NUMBER	NAME	CLASS	LAMDA(1/HR)	PRECURSOR (NO.,RATE)-		
1	KR-85M	1	1.5472E-01	5	1.5447E-01	1 0.0000E+00
2	KR-85	1	7.3764E-06	1	1.5564E-06	5 1.2024E-08
3	KR-90	1	7.7206E+01	1	0.0000E+00	1 0.0000E+00
4	XE-131M	1	2.4393E-03	6	2.6490E-05	1 0.0000E+00
5	BR-85	2	1.4508E+01	1	0.0000E+00	1 0.0000E+00
6	I-131	2	3.5922E-03	11	2.7947E-03	12 3.5922E-03
7	RB-90M	3	9.6718E+00	3	1.1510E+00	1 0.0000E+00
8	RB-90	3	1.5894E+01	3	1.4002E+01	7 3.6555E-01
9	SR-90	3	2.7648E-06	7	2.7012E-06	8 2.7648E-06
10	Y-90	3	1.0814E-02	9	1.0814E-02	1 0.0000E+00
11	YR-131M	3	2.3105E-02	1	0.0000E+00	1 0.0000E+00
12	YR-131	3	1.6636E+00	11	3.6931E-01	1 0.0000E+00

J6 of J 49

*** PROGRAM S T P (VERSION 1.1) RAN ON 10/ 9/1992 ***
 *** STP QUALIFICATION EXAMPLE 10A KEY LETTER B VARIABLE VOLUME ***

I	ISOTOPE	BETA MEV/DISC	GAMMA (MEV/DISC) BY GROUP AND MAX.ENERGY (MEV)						
			1	2	3	4	5	6	7
	EFFECTIVE ENERGY		.400	.900	1.350	1.800	2.200	2.600	7.500
1	KR-85M	.255	.157	.000	.000	.000	.000	.000	.581
2	KR-85	.251	.000	.002	.000	.000	.000	.000	.514
3	KR-90	1.315	.077	.233	.462	.386	.049	.019	3.860
4	KR-131M	.142	.007	.000	.000	.000	.000	.000	.164
5	BR-85	1.003	.000	.033	.023	.007	.003	.000	1.830
6	I-131	.190	.317	.063	.000	.000	.000	.000	.723
7	RB-90M	1.388	.003	.855	.195	.472	.186	.118	1.440
8	RB-90	1.960	.000	.277	.096	.019	.037	.111	1.620
9	SR-90	.196	.000	.000	.000	.000	.000	.000	.000
10	Y-90	.935	.000	.000	.000	.000	.000	.000	.000
11	TR-131M	.190	.112	.828	.377	.022	.074	.005	2.270
12	TR-131	.719	.110	.162	.142	.003	.000	.000	1.500

J7 of J49

*** PROGRAM S T P (VERSION 1.1) RAN ON 10/ 9/1992 ***
*** STP QUALIFICATION EXAMPLE 10A KEY LETTER B VARIABLE VOLUME ***

RUN LOOP INFORMATION FOR THIS RUN FOLLOWS.

NJ, NUMBER OF COMPONENTS USED IN THIS RUN LOOP = 1
RCONC, CALC. TYPE (0/INVENTORY, 1/CONCENTRATION) = 1
IX, -- ACT/COMP. --- ACT/GM.
NDECAY, CALCULATE DAUGHTER PRODUCTION (0/YES,1/NO) = 1
(DEFAULT =0)
ITMAX, MAXIMUM NUMBER OF ITERATIONS PER TIME STEP = 0
(DEFAULT = 10)
KDEBUG, DEBUG OPTION (0/NORMAL OUTPUT, 1/NUCRO) = 0

J8 of J49

***** PROGRAM S T P (VERSION 1.1) RAN ON 10/ 9/1992 *****
*** STP QUALIFICATION EXAMPLE 10A KEY LETTER B VARIABLE VOLUME ***

SOURCE LIBRARY

NUCLIDE	SOURCE
1 KR-85M	1.000E+00
2 KR-85	1.000E+00
3 KR-90	1.000E+00
4 KR-131M	1.000E+00
5 RB-85	1.000E+00
6 I-131	1.000E+00
7 RB-90M	1.000E+00
8 RB-90	1.000E+00
9 SR-90	1.000E+00
10 Y-90	1.000E+00
11 TR-131M	1.000E+00
12 TR-131	1.000E+00
TOTAL CLASS 1	4.000E+00
TOTAL CLASS 2	2.000E+00
TOTAL CLASS 3	6.000E+00
GRAND TOTAL	1.200E+01

```

* * * * *      PROGRAM  S T P   (VERSION 1.1 )      RAN ON 10/ 9/1992      * * * * *
* * * STP QUALIFICATION EXAMPLE 10A KEY LETTER B VARIABLE VOLUME      * * *
* * STEP SOURCE AND VOLUME INITIALIZATION

```

```

          END TIME   = -1.000E+00          INTERVALS/STEP          = 30
TIME      START TIME =  0.000E+00          ERROR LIMIT              = 1.0000E-05
STEP      DELTA T    =  0.000E+00

```

```

***** COMPONENT *****
NO.   NAME          VOLUME OR MASS      DATA READ (BY CLASS NUMBER)
          1          2          3
1 VOLUME 1          1.000E+00

          REMOVAL RATES (FROM 1) =    0.000E+00    0.000E+00    0.000E+00
          STEP SOURCE FACTOR (FROM SOURCE 1) =  1.000E+00  1.000E+00  1.000E+00
          C SOURCE RATE FACTOR (FROM SOURCE 1) =  1.000E+00  1.000E+00  1.000E+00

```

J10 of J49

*** PROGRAM S T P (VERSION 1.1) RAN ON 10/ 9/1992 ***

*** STEP QUALIFICATION EXAMPLE 10A KEY LETTER B VARIABLE VOLUME ***

*** STEP SOURCE AND VOLUME INITIALIZATION

STEP SOURCE DATA FROM SOURCE INPUT

	1
	VOLUME 1
NUCLIDE	
1 KR-85M	1.000E+00
2 KR-85	1.000E+00
3 KR-90	1.000E+00
4 XE-131M	1.000E+00
5 KR-85	1.000E+00
6 I-131	1.0695+00
7 RB-90M	1.000E+00
8 RB-90	1.000E+00
9 SR-90	1.000E+00
10 Y-90	1.000E+00
11 TE-131M	1.000E+00
12 TE-131	1.000E+00
VOLUME	1.000E+00
TOTAL CLASS 1	4.000E+00
TOTAL CLASS 2	2.000E+00
TOTAL CLASS 3	6.000E+00
GRAND TOTAL	1.200E+01

J11 of J49

```

* * * PROGRAM S T P (VERSION 1.1 )      RAN ON 10/ 9/1992      * * *
* * * STEP QUALIFICATION EXAMPLE 10A KEY LETTER B VARIABLE VOLUME      * * *
* * * STEP SOURCE AND VOLUME INITIALIZATION

```

CONTINUOUS SOURCE DATA FROM SOURCE INPUT (/HR)

		¹
		VOLUME 1
NUCLIDE		
1	KR-85M	1.000E+00
2	KR-85	1.000E+00
3	KR-90	1.000E+00
4	KR-131M	1.000E+00
5	BR-85	1.000E+00
6	I-131	1.000E+00
7	BR-90M	1.000E+00
8	BR-90	1.000E+00
9	SR-90	1.000E+00
10	Y-90	1.000E+00
11	TR-131M	1.000E+00
12	TR-131	1.000E+00
VOLUME		1.000E+00
TOTAL CLASS 1		4.000E+00
TOTAL CLASS 2		2.000E+00
TOTAL CLASS 3		6.000E+00
GRAND TOTAL		1.200E+01

```

* * *      PROGRAM  S T P   (VERSION 1.1 )      RAN ON 10/ 9/1992      * * *
* * * STEP QUALIFICATION EXAMPLE 10A KEY LETTER B VARIABLE VOLUME      * * *
* * STEP SOURCE AND VOLUME INITIALIZATION

```

ACTIVITIES AT END OF THE TIME STEP

NUCLIDE	VOLUME 1
1 KR-85M	1.000E+00
2 KR-85	1.000E+00
3 KR-90	1.000E+00
4 KR-131M	1.000E+00
5 BR-85	1.000E+00
6 I-131	1.000E+00
7 BR-90M	1.000E+00
8 BR-90	1.000E+00
9 SR-90	1.000E+00
10 Y-90	1.000E+00
11 YR-131M	1.000E+00
12 YR-131	1.000E+00
VOLUME	1.000E+00
TOTAL CLASS 1	4.000E+00
TOTAL CLASS 2	2.000E+00
TOTAL CLASS 3	6.000E+00
GRAND TOTAL	1.200E+01

J13 of J49

```

* * *      PROGRAM  S T P   (VERSION 1.1 )      RAN ON 10/ 9/1992      * * *
* * * STP QUALIFICATION EXAMPLE 10A KEY LETTER B VARIABLE VOLUME      * * *
* * STEP SOURCE AND VOLUME INITIALIZATION

```

STP GAMMA SHIELDING INFORMATION CALCULATED

COMPONENT 1 VOLUME 1

```

CONVERSION FACTOR = 1.000E+00
VOLUME             = 1.000E+00
BETA SOURCE        = 3.161E+05 (MEV/SEC/ )
  PARTICLE SOURCE  ENERGY SOURCE  GROUP ENERGY
  (PHOTON/SEC/ )   (MEV/SEC/ )   (MEV-EFFECTIVE)

  1  7.240E+04      2.896E+04      .40
  2  1.009E+05      9.077E+04      .90
  3  3.551E+04      4.794E+04      1.35
  4  1.868E+04      3.363E+04      1.80
  5  5.852E+03      1.287E+04      2.20
  6  3.653E+03      9.498E+03      2.60
  7  2.155E+04      1.149E+05      5.33 (VARIABLE)

TOTALS  2.585E+05    3.385E+05    1.31

```



```

* * *      PROGRAM  S T P   (VERSION 1.1 )      RAK ON 10/ 9/1992      * * *
* * * STP QUALIFICATION EXAMPLE 10A KEY LETTER B VARIABLE VOLUME      * * *
* * STEP ACTIVITY AFTER 1 SEC

```

```

TIME      END TIME   =  1.000E+00 SEC      INTERVALS/STEP      =  120
STEP      START TIME =  0.000E+00          ERROR LIMIT        =  2.5000E-06
          DELTA T    =  1.000E+00 SEC

```

```

***** COMPONENT *****
NO.   NAME      VOLUME OR MASS      DATA READ (BY CLASS NUMBER)
          1          2          3

1 VOLUME 1      1.000E+00
                1.000E+00

      REMOVAL RATES (FROM 1) =  0.000E+00  0.000E+00  0.000E+00

C SOURCE RATE FACTOR (FROM SOURCE 1) =  1.000E+00  1.000E+00  1.000E+00

***** CODE SENSES A FEEDBACK LOOP AND/OR VARIABLE VOLUME *****
***** NSTEP IS AUTOMATICALLY INCREASED BY A FACTOR OF 3 *****

```

```

*** 360 STEPS WERE USED REQUIRING AN AVERAGE OF .00 ITERATIONS PER STEP

```

* * * PROGRAM S T P (VERSION 1.1) RUN ON 10/ 9/1992 * * *
 * * * STEP QUALIFICATION EXAMPLE 10A KEY LETTER B VARIABLE VOLUME * * *
 * * STEP ACTIVITY AFTER 1 SEC

ACTIVITIES AT END OF THE TIME STEP

		1
		VOLUME 1
NUCLIDE		
1	KR-85M	1.000E+00
2	KR-85	1.000E+00
3	KR-90	9.788E-01
4	XE-131M	1.000E+00
5	BR-85	9.960E-01
6	I-131	1.000E+00
7	BB-90M	9.973E-01
8	BB-90	9.956E-01
9	SR-90	1.000E+00
10	Y-90	1.000E+00
11	TE-131M	1.000E+00
12	TE-131	9.995E-01
VOLUME		1.000E+00
TOTAL CLASS 1		3.979E+00
TOTAL CLASS 2		1.996E+00
TOTAL CLASS 3		5.992E+00
GRAND TOTAL		1.197E+01

J 16 of J 49

*** PROGRAM S T P (VERSION 1.1) RAN ON 10/ 9/1992 ***
 *** STP QUALIFICATION EXAMPLE 10A KEY LETTER B VARIABLE VOLUME ***
 *** STEP ACTIVITY AFTER 1 SEC

STP GAMMA SHIELDING INFORMATION CALCULATED

COMPONENT 1 VOLUME 1

CONVERSION FACTOR = 1.000E+00
 VOLUME = 1.000E+00
 BETA SOURCE = 3.145E+05 (MEV/SEC/)
 PARTICLE SOURCE ENERGY SOURCE GROUP ENERGY
 (PHOTON/SEC/) (MEV/SEC/) (MEV-EFFECTIVE)

1	7.224E+04	2.890E+04	.40
2	1.005E+05	9.045E+04	.90
3	3.521E+04	4.753E+04	1.35
4	1.849E+04	3.328E+04	1.80
5	5.823E+03	1.2E1E+04	2.20
6	3.636E+03	9.454E+03	2.60
7	2.147E+04	1.144E+05	5.33 (VARIABLE)
TOTALS	2.574E+05	3.369E+05	1.31

J17 of J49

```

* * *      PROGRAM  S T F   (VERSION 1.1 )      RAN ON 10/ 9/1992   * * *
* * * STP QUALIFICATION EXAMPLE 10A KEY LETTER B VARIABLE VOLUME   * * *
* * STEP ACTIVITY AFTER 1 MIN

```

```

TIME      END TIME  =  1.000E+00 MIN      INTERVALS/STEP      =  120
STEP      START TIME =  1.667E-02 MIN      ERROR LIMIT        =  2.500E-06
          DELTA T   =  9.833E-01 MIN

```

```

***** COMPONENT *****
NO.  NAME      VOLUME OR MASS      DATA READ (BY CLASS NUMBER)
          1          2          3

1 VOLUME 1      1.000E+00
                1.017E+00

          REMOVAL RATES (FROM 1) =   0.000E+00   0.000E+00   0.000E+00
C SOURCE RATE FACTOR (FROM SOURCE 1) =   1.000E+00   1.000E+00   1.000E+00

***** CODE SENSES A FEEDBACK LOOP AND/OR VARIABLE VOLUME *****
***** NSTEP IS AUTOMATICALLY INCREASED BY A FACTOR OF 3 *****

```

```

*** 360 STEPS WERE USED REQUIRING AN AVERAGE OF .00 ITERATIONS PER STEP

```

J18 of J49

***** PROGRAM S T P (VERSION 1.1) RAN ON 10/ 9/1992 *****
*** STP QUALIFICATION EXAMPLE 10A KEY LETTER B VARIABLE VOLUME ***
** STEP ACTIVITY AFTER 1 MIN

ACTIVITIES AT END OF THE TIME STEP

		1
		VOLUME 1
NUCLIDE		
1	KR-85M	9.974E-01
2	KR-85	1.000E+00
3	KR-90	2.809E-01
4	XE-131M	1.000E+00
5	BR-85	7.869E-01
6	I-131	9.995E-01
7	RB-90M	8.523E-01
8	RB-90	7.691E-01
9	SR-90	1.000E+00
10	Y-90	9.998E-01
11	TE-131M	9.996E-01
12	TE-131	9.729E-01
VOLUME		1.017E+00
TOTAL CLASS 1		3.278E+00
TOTAL CLASS 2		1.787E+00
TOTAL CLASS 3		5.594E+00
GRAND TOTAL		1.066E+01

* * * PROGRAM S T P (VERSION 1.1) RAN ON 10/ 9/1992 * * *
 * * * STP QUALIFICATION EXAMPLE 10A KEY LETTER B VARIABLE VOLUME * * *
 * * STEP ACTIVITY AFTER 1 MIN

J19 of J49

STP GAMMA SHIELDING INFORMATION CALCULATED

COMPONENT 1 VOLUME 1

CONVERSION FACTOR = 1.000E+00
 VOLUME = 1.017E+06
 BETA SOURCE = 2.481E+05 (MEV/SEC/)
 PARTICLE SOURCE ENERGY SOURCE GROUP ENERGY
 (PHOTON/SEC/) (MEV/SEC/) (MEV-EFFECTIVE)

1	6.694E+04	2.677E+04	.40
2	8.566E+04	7.709E+04	.90
3	2.476E+04	3.342E+04	1.35
4	1.142E+04	2.056E+04	1.80
5	4.644E+03	1.022E+04	2.20
6	2.846E+03	7.400E+03	2.60
7	1.726E+04	9.198E+04	5.33 (VARIABLE)
TOTALS	2.135E+05	2.674E+05	1.25

J20 of J49

```

* * * PROGRAM S T P (VERSION 1.1 ) RAN ON 10/ 9/1992 * * *
* * * STP QUALIFICATION EXAMPLE 10A KEY LETTER B VARIABLE VOLUME * * *
* * STEP ACTIVITY AFTER 30 MIN

```

```

TIME      END TIME = 3.000E+01 MIN      INTERVALS/STEP      = 240
STEP      START TIME = 1.000E+00 MIN      ERROR LIMIT          = 1.2500E-06
          DELTA T   = 2.900E+01 MIN

```

```

***** COMPONENT *****
NO.  NAME          VOLUME OR MASS      DATA READ (BY CLASS NUMBER)
                                     1          2          3

1 VOLUME 1          1.017E+00
                   1.500E+00

      REMOVAL RATES (FROM 1) =    0.000E+00    0.000E+00    0.000E+00
C SOURCE RATE FACTOR (FROM SOURCE 1) =    1.000E+00    1.000E+00    1.000E+00

***** CODE SENSES A FEEDBACK LOOP AND/OR VARIABLE VOLUME *****
***** NSTEP IS AUTOMATICALLY INCREASED BY A FACTOR OF 3 *****

*** 720 STEPS WERE USED REQUIRING AN AVERAGE OF .00 ITERATIONS PER STEP

```

* * * PROGRAM S T P (VERSION 1.1) RAN ON 10/ 9/1992 * * *

* * * STP QUALIFICATION EXAMPLE 10A KEY LETTER B VARIABLE VOLUME * * *

* * STEP ACTIVITY AFTER 30 MIN

ACTIVITIES AT END OF THE TIME STEP

		1
		VOLUME 1
NUCLIDE		
1	KR-85M	9.379E-01
2	KR-85	1.000E+00
3	KR-90	8.635E-03
4	XE-131M	9.991E-01
5	BR-85	4.639E-02
6	I-131	9.986E-01
7	BR-90M	7.368E-02
8	BR-90	4.217E-02
9	SR-90	1.000E+00
10	Y-90	9.956E-01
11	TE-131M	9.905E-01
12	TE-131	5.165E-01
VOLUME		1.500E+00
TOTAL CLASS 1 2.946E+00		
TOTAL CLASS 2 1.045E+00		
TOTAL CLASS 3 3.619E+00		
GRAND TOTAL 7.609E+00		

J 22 of J 49

```

* * * PROGRAM S T P (VERSION 1.1 ) RAN ON 10/ 9/1992 * * *
* * * STP QUALIFICATION EXAMPLE 10A KEY LETTER B VARIABLE VOLUME * * *
* * STEP ACTIVITY AFTER 30 MIN

```

STP GAMMA SHIELDING INFORMATION CALCULATED

COMPONENT 1 VOLUME 1

```

CONVERSION FACTOR = 1.000E+00
VOLUME            = 1.500E+00
BETA SOURCE       = 1.018E+05 (MEV/SEC/ )
PARTICLE SOURCE   ENERGY SOURCE  GROUP ENERGY
(PHOTON/SEC/ ) (MEV/SEC/ ) (MEV-EFFECTIVE)

  1  5.912E+04      2.365E+04      .40
  2  4.304E+04      3.873E+04      .90
  3  1.289E+04      1.740E+04      1.35
  4  1.286E+03      2.316E+03      1.80
  5  1.490E+03      3.278E+03      2.20
  6  3.154E+02      8.201E+02      2.60
  7  1.213E+03      6.467E+03      5.33 (VARIABLE)

TOTALS  1.193E+05  9.266E+04      .78

```

J23 of J49

```

* * *      PROGRAM  S T P   (VERSION 1.1 )      RAN ON 10/ 9/1992   * * *
* * * STP QUALIFICATION EXAMPLE 10A KEY LETTER B VARIABLE VOLUME      * * *
* * STEP ACTIVITY AFTER 1 HOUR

```

```

          END TIME   =  1.000E+00 HOUR          INTERVALS/STEP          =  240
TIME
          START TIME =  5.000E-01 HOUR          ERROR LIMIT             =  1.2500E-06
STEP
          DELTA T    =  5.000E-01 HOUR

```

```

***** COMPONENT *****
NO.   NAME          VOLUME OR MASS          DATA READ (BY CLASS NUMBER)
          1          2          3

1 VOLUME 1          1.500E+00
          2.000E+00

```

```

          REMOVAL RATES (FROM 1) =  0.000E+00  0.000E+00  0.000E+00

```

```

C SOURCE RATE FACTOR (FROM SOURCE 1) =  1.000E+00  1.000E+00  1.000E+00

```

```

***** CODE SENSES A FEEDBACK LOOP AND/OR VARIABLE VOLUME *****
***** NSTEP IS AUTOMATICALLY INCREASED BY A FACTOR OF 3 *****

```

```

*** 720 STEPS WERE USED REQUIRING AN AVERAGE OF .00 ITERATIONS PER STEP

```

* * * PROGRAM S T P (VERSION 1.1) RAN ON 10/ 9/1992 * * *
 * * * STP QUALIFICATION EXAMPLE 10A KEY LETTER B VARIABLE VOLUME * * *
 * * STEP ACTIVITY AFTER 1 HOUR

J24 of J49

ACTIVITIES AT END OF THE TIME STEP

NUCLIDE	VOLUME 1
1 KR-85M	8.917E-01
2 KR-85	1.000E+00
3 KR-90	6.476E-03
4 XE-131M	9.593E-01
5 BR-85	3.447E-02
6 I-131	9.974E-01
7 BR-90M	5.173E-02
8 BR-90	3.146E-02
9 SR-90	1.000E+00
10 Y-90	9.920E-01
11 TE-131M	9.830E-01
12 TE-131	3.364E-01
VOLUME	2.000E+00
TOTAL CLASS 1	2.897E+00
TOTAL CLASS 2	1.032E+00
TOTAL CLASS 3	3.397E+00
GRAND TOTAL	7.325E+00

J 25 of 49

*** PROGRAM S T P (VERSION 1.1) RAN ON 10/ 9/1992 ***
 *** STP QUALIFICATION EXAMPLE 10A KEY LETTER B VARIABLE VOLUME ***

*** STEP ACTIVITY AFTER 1 HOUR

STP GAMMA SHIELDING INFORMATION CALCULATED

COMPONENT 1 VOLUME 1

CONVERSION FACTOR = 1.000E+00

VOLUME = 2.000E+00

BETA SOURCE = 9.397E+04 (MEV/SEC/)

	PARTICLE SOURCE (PROTON/SEC/)	ENERGY SOURCE (MEV/SEC/)	GROUP ENERGY (MEV-EFFECTIVE)
--	-----------------------------------	------------------------------	---------------------------------

1	5.650E+04	2.260E+04	.40
2	4.066E+04	3.659E+04	.90
3	1.194E+04	1.611E+04	1.35
4	1.035E+03	1.864E+03	1.80
5	1.403E+03	3.087E+03	2.20
6	2.601E+02	6.764E+02	2.60
7	8.729E+02	4.652E+03	5.33 (VARIABLE)

TOTALS	1.127E+05	8.559E+04	.76
--------	-----------	-----------	-----

*** END PROGRAM S T P (VERSION 1.1)

TIME OFF = 15:30:33 DATE = 10/ 9/1992

*** PROGRAM STP-PC (THE SHELFEE-S EDGE) IS AT YOUR SERVICE ***

*** VERSION NUMBER=1.1 REVISION DATE WAS 9/29/92

*** TODAY'S DATE = 10/ 9/1992 START TIME = 15:33:59

J26 of J49

REPRODUCTION OF INPUT DATA DECK

+ + + + +

NV= 3 NS= 2

NI= 12 NK= 3 NG= 7 NL= 2

1KR-85M	1	4.2976E-05	54.0234E-03	10.0000E+00	10.0000E+00
2KR-85	1	2.0490E-09	19.0683E-06	56.5688E-06	10.0000E+00
3KR-90	1	2.1446E-02	10.0000E+00	10.0000E+00	10.0000E+00
4XE-131M	1	6.7756E-07	61.0631E-08	10.0000E+00	10.0000E+00
5BR-85	2	4.0299E-03	10.0000E+00	10.0000E+00	10.0000E+00
6I-131	2	9.9783E-07	114.9932E-06	124.6210E-04	10.0000E+00
7RE-90M	3	2.6866E-03	32.5521E-03	10.0000E+00	10.0000E+00
8RD-90	3	4.4149E-03	31.8294E-02	76.1792E-05	10.0000E+00
9SR-90	3	7.6601E-10	72.6248E-03	84.4149E-03	10.0000E+00
10Y-90	3	3.0038E-06	97.6801E-10	10.0000E+00	10.0000E+00
11TE-131M	3	6.4180E-06	10.0000E+00	10.0000E+00	10.0000E+00
12TE-131	3	4.6210E-04	111.4248E-06	10.0000E+00	10.0000E+00
		.40	.90	1.35	1.80
				2.20	2.60
					7.50
1KR-85M		.255157+0123-3000+0000+0000+0000+0000+0581+0			
2KR-85		.251000+0223-2000+0000+0000+0000+0000+0514+0			
3KR-90		1.315766-1233+0462+0386+0491-1190-1448-1386+1			
4XE-131M		.142664-2000+0000+0000+0000+0000+0000+0164+0			
5BR-85		1.003000+0334-1233-1659-2275-2000+0000+0183+1			
6I-131		.190317+0625-1000+0000+0000+0000+0000+0723+0			
7RE-90M		1.388344-2855+0195+0472+0186+0118+0144+1473+1			
8RE-90		1.960000+0277+0963-1192-1366-1111+0162+1533+1			
9SR-90		.196000+0000+0000+0000+0000+0000+0000+0000+0			
10Y-90		.935000+0000+0000+0000+0000+0000+0000+0000+0			
11TE-131M		.190112+0826+0377+0219-1735-1871-2000+0227+1			
12TE-131		.719110+0162+0142+0323-2000+0000+0000+0150+1			

*** PROGRAM STP-PC (THE SHIELDER-S EDGE) IS AT YOUR SERVICE ***

J27 of J49

** VERSION NUMBER = 1.1 REVISION DATE WAS 9/29/92

* TODAY'S DATE = 10/9/1992 START TIME = 15:34:0

1 'SOURCE'

1 1.0 2 1.0 3 1.0 4 1.0 5 1.0 6 1.0
7 1.0 8 1.0 9 1.0 10 1.0 11 1.0 12 1.0

0

T

STP QUALIFICATION EXAMPLE 10B KEY LETTER B VARIABLE VOLUME

RJ= 2 RCONC= 0 WDECAT= 1

1 'VOLUME 1'

2 'VOLUME 2'

-1

SOURCE AND VOLUME INITIALIZATION

V 1 1.00 CC

S 1 1 0 1.0

C 1 1 0 1.0

1 SEC 240

ACTIVITIES AFTER 1 SEC

B 1 1.00027777778

1 MIN 240

ACTIVITIES AFTER 1 MIN

B 1 1.016666667

30 MIN 240

ACTIVITIES AFTER 30 MIN

B 1 1.5

1 HOUR 240

ACTIVITIES AFTER 1 HOUR

B 1 2.0

T

T

+ + + + + + + +

* * * *

PROGRAM S T P (VERSION 1.1)

RAN ON 10/ 9/1992

* * * *

DATA FOR THIS RUN OR SERIES OF RUNS

NUMBER OF ISOTOPES (DATA CARDS) = 12

NUMBER OF COMPONENTS (ALL RUNS) = 3

NUMBER OF CLASSES OF ISOTOPES = 3

NUMBER OF SOURCES (MAXIMUM) = 2

NUMBER OF GAMMA GROUPS = 7

NUMBER OF PRECURSORS (MAXIMUM) = 2

STORAGE LOCATIONS REQUESTED = 225000

STORAGE LOCATIONS USED = 1074

J29 of J49

*** PROGRAM S T P (VERSION 1.1) NAF ON 10/ 9/1992 ***
 *** STP QUALIFICATION EXAMPLE 10B KEY LETTER B VARIABLE VOLUME ***

NUCLIDE DATA INPUT (LIBRARY)

NUMBER	NAME	CLASS	LAMDA(1/HR)	PRECURSOR (NO.,RATE)-
1	KE-85M	1	1.5472E-01	5 1.5447E-01 1 0.0000E+00
2	KE-85	1	7.3764E-06	1 1.5564E-06 5 1.2024E-08
3	KE-90	1	7.7206E-01	1 0.0000E+00 1 0.0000E+00
4	XE-131M	1	2.4393E-03	6 2.6490E-05 1 0.0030E+00
5	BE-85	2	1.4508E-01	1 0.0000E+00 1 0.0030E+00
6	I-131	2	3.5922E-03	11 2.7947E-03 12 3.5922E-03
7	RE-90M	3	9.6710E+00	3 1.1510E+00 1 0.0000E+00
8	RE-90	3	1.5894E+01	3 1.4002E+01 7 3.6555E-01
9	SR-90	3	2.7648E-06	7 2.7012E-06 8 2.7648E-06
10	Y-90	3	1.0814E-02	9 1.0814E-02 1 0.0000E+00
11	TE-131M	3	2.3105E-02	1 0.0000E+00 1 0.0000E+00
12	TE-131	3	1.6636E+00	11 3.6931E-01 1 0.0000E+00

*** PROGRAM S T P (VERSION 1.1) RAN ON 10/ 9/1952 ***

J30 of J49

*** STP QUALIFICATION EXAMPLE 108 KEY LETTER B VARIABLE VOLUME ***

I	ISOTOPE	BETA	GAMMA (MEV/DISC) BY GROUP AND MAX.ENERGY (MEV)						
		MEV/DISC	1	2	3	4	5	6	7
	EFFECTIVE ENERGY		.400	.900	1.350	1.800	2.200	2.600	7.500
1	KR-85M	.255	.157	.000	.000	.000	.000	.000	.000
2	KR-85	.251	.000	.002	.000	.000	.000	.000	.514
3	KR-90	1.315	.077	.233	.462	.356	.049	.019	3.860
4	KR-131M	.142	.007	.000	.000	.000	.000	.000	.164
5	BR-85	1.003	.000	.033	.023	.007	.003	.000	1.830
6	I-131	.190	.317	.063	.000	.000	.000	.000	.723
7	RB-90M	1.388	.003	.855	.195	.472	.186	.118	1.440
8	RB-90	1.960	.000	.277	.096	.019	.037	.111	1.620
9	SR-90	.196	.000	.000	.000	.000	.000	.000	.000
10	Y-90	.935	.000	.000	.000	.000	.000	.000	.000
11	TE-131M	.190	.112	.826	.377	.022	.074	.009	2.270
12	TE-131	.719	.110	.162	.142	.003	.000	.000	1.500

J31 & J49

***** PROGRAM S T P (VERSION 1.1) RAN ON 10/ 9/1992 *****
*** STP QUALIFICATION EXAMPLE 108 KEY LETTER B VARIABLE VOLUME ***

RUN LOOP INFORMATION FOR THIS RUN FOLLOWS.

NJ, NUMBER OF COMPONENTS USED IN THIS RUN LOOP = 2
KCONC, CALC. TYPE (0/INVENTORY, 1/CONCENTRATION) = 0
IE., -- ACT/COMP. --- ACT/GM.
NDECAY, CALCULATE DAUGHTER PRODUCTION (0/YES,1/NO) = 1
(DEFAULT =0)
ITMAX, MAXIMUM NUMBER OF ITERATIONS PER TIME STEP = 0
(DEFAULT = 13)
KDEBUG, DEBUG OPTION (0/NORMAL OUTPUT, 1/NUCBO) = 0

*** PROGRAM S T P (VERSION 1.1) RUN ON 10/ 9/1992 ***
*** STP QUALIFICATION EXAMPLE 10E KEY LETTER E VARIABLE VOLUME ***

SOURCE LIBRARY

NUCLIDE	SOURCE
1 KR-85M	1.000E+00
2 KR-85	1.000E+00
3 KR-90	1.000E+00
4 XE-131M	1.000E+00
5 KR-85	1.000E+00
6 I-131	1.000E+00
7 RB-90M	1.000E+00
8 RB-90	1.000E+00
9 SR-90	1.000E+00
10 Y-90	1.000E+00
11 TE-131M	1.000E+00
12 TE-131	1.000E+00
TOTAL CLASS 1	4.000E-00
TOTAL CLASS 2	2.000E-00
TOTAL CLASS 3	6.000E+00
GRAND TOTAL	1.200E+01

```

* * * PROGRAM S T P (VERSION 1.1 )      RAN ON 10/ 9/1992 * * *
* * * STP QUALIFICATION EXAMPLE 10B KEY LETTER B VARIABLE VOLUME * * *
* * * STEP SOURCE AND VOLUME INITIALIZATION

```

```

          END TIME = -1.000E+00      INTERVALS/STEP      = 30
TIME      START TIME = 0.000E+00      BRECK LIMIT        = 1.0000E-05
STEP      DELTA T   = 0.000E+00

```

```

***** COMPONENT *****
NO.  NAME          VOLUME OR MASS      DATA READ (BY CLASS NUMBER)
          1          2          3

1 VOLUME 1          1.000E+00 CC

      REMOVAL RATES (FROM 1) = 0.000E+00 0.000E+00 0.000E+00
STEP SOURCE FACTOR (FROM SOURCE 1) = 1.000E+00 1.000E+00 1.000E+00
C SOURCE RATE FACTOR (FROM SOURCE 1) = 1.000E+00 1.000E+00 1.000E+00

2 VOLUME 2          1.000E+00

      REMOVAL RATES (FROM 2) = 0.000E+00 0.000E+00 0.000E+00

```

*** PROGRAM S T P (VERSION 1.1) RAN ON 10/ 9/1992 ***
*** STP QUALIFICATION EXAMPLE JOB KEY LETTER B VARIABLE VOLUME ***
*** STEP SOURCE AND VOLUME INITIALIZATION

STEP SOURCE DATA FROM SOURCE INPUT

		1
		VOLUME 1
NUCLIDE		
1	KR-85M	1.000E+00
2	KR-85	1.000E+00
3	KR-90	1.000E+00
4	XE-131M	1.000E+00
5	BR-85	1.000E+00
6	I-131	1.000E+00
7	RB-90M	1.000E+00
8	RB-90	1.000E+00
9	SR-90	1.000E+00
10	Y-90	1.000E+00
11	TE-131M	1.000E+00
12	TE-131	1.000E+00
VOLUME		1.000E+00 CC
TOTAL CLASS 1		4.000E+00
TOTAL CLASS 2		2.000E+00
TOTAL CLASS 3		6.000E+00
GRAND TOTAL		1.200E+01

* * * PROGRAM S T P (VERSION 1.1) RAN ON 10/ 9/1972 * * *
 * * * STP QUALIFICATION EXAMPLE 10B KEY LETTER B VARIABLE VOLUME * * *
 * * STEP SOURCE AND VOLUME INITIALIZATION

J35 of J49

CONTINUOUS SOURCE DATA FROM SOURCE INPUT (/HE)

		1
		VOLUME 1
NUCLIDE		
1	KR-85M	1.000E+00
2	KR-85	1.000E+00
3	KR-90	1.000E+00
4	XE-131M	1.000E+00
5	BR-85	1.000E+00
6	I-131	1.000E+00
7	RB-90M	1.000E+00
8	RB-90	1.000E+00
9	SR-90	1.000E+00
10	Y-90	1.000E+00
11	TE-131M	1.000E+00
12	TE-131	1.000E+00
VOLUME		1.000E+00 CC
TOTAL CLASS 1		4.000E+00
TOTAL CLASS 2		2.000E+00
TOTAL CLASS 3		6.000E+00
GRAND TOTAL		1.200E+01

J36 of J49

***** PROGRAM S T P (VERSION 1.1) RAN ON 10/ 9/1992 *****

*** STP QUALIFICATION EXAMPLE 10B KEY LETTER E VARIABLE VOLUME ***

*** STEP SOURCE AND VOLUME INITIALIZATION

ACTIVITIES AT END OF THE TIME STEP

		1
		VOLUME 1
NUCLIDE		
1	KR-85M	1.000E+00
2	KR-85	1.000E+00
3	KR-90	1.000E+00
4	XE-131M	1.000E+00
5	BR-85	1.000E+00
6	I-131	1.000E+00
7	RB-90M	1.000E+00
8	RB-90	1.000E+00
9	SR-90	1.000E+00
10	Y-90	1.000E+00
11	TE-131M	1.000E+00
12	TE-131	1.000E+00
VOLUME		1.000E+00 CC
TOTAL CLASS 1		4.000E+00
TOTAL CLASS 2		2.000E+00
TOTAL CLASS 3		6.000E+00
GRAND TOTAL		1.200E+01

```

* * * PROGRAM S T P (VERSION 1.1 )      RAN ON 10/ 9/1992 * * *
* * * STP QUALIFICATION EXAMPLE 10B KEY LETTER B VARIABLE VOLUME * * *
* * STEP SOURCE AND VOLUME INITIALIZATION

```

STP GAMMA SHIELDING INFORMATION CALCULATED

COMPONENT 1 VOLUME 1

```

CONVERSION FACTOR = 1.000E+00
VOLUME             = 1.000E+00 CC
BETA SOURCE        = 3.161E+05 (MEV/SEC/ )
  PARTICLE SOURCE  ENERGY SOURCE  GROUP ENERGY
  (PHOTON/SEC/ )   (MEV/SEC/ )     (MEV-EFFECTIVE)

```

1	7.240E+04	2.896E+04	.40
2	1.009E+05	9.077E+04	.90
3	3.551E+04	4.794E+04	1.35
4	1.868E+04	3.363E+04	1.80
5	5.852E+03	1.287E+04	2.20
6	3.653E+03	9.498E+03	2.60
7	2.155E+04	1.149E+05	5.33 (VARIABLE)
TOTALS	2.585E+05	3.385E+05	1.31

* * * PROGRAM S T P (VERSION 1.1) RUN ON 10/ 9/1992 * * *
 * * * STEP QUALIFICATION EXAMPLE 108 KEY LETTER B VARIABLE VOLUME * * *
 * * STEP ACTIVITIES AFTER 1 SEC

J 38 of J 49

TIME END TIME = 1.000E+00 SEC INTERVALS/STEP = 240
 START TIME = 0.000E+00 ERROR LIMIT = 1.2500E-06
 STEP DELTA T = 1.000E+00 SEC

***** COMPONENT ***** DATA READ (BY CLASS NUMBER)

NO.	NAME	VOLUME OR MASS	1	2	3
1	VOLUME 1	1.000E+00 CC 1.000E+00 CC			
	REMOVAL RATES (FROM 1) =		0.000E+00	0.000E+00	0.000E+00
C	SOURCE RATE FACTOR (FROM SOURCE 1) =		1.000E+00	1.000E+00	1.000E+00
2	VOLUME 2	1.000E+00			
	REMOVAL RATES (FROM 2) =		0.000E+00	0.000E+00	0.000E+00

***** CODE SENSES A FEEDBACK LOOP AND/OR VARIABLE VOLUME *****
 ***** STEP IS AUTOMATICALLY INCREASED BY A FACTOR OF 3 *****

*** 720 STEPS WERE USED REQUIRING AN AVERAGE OF .00 ITERATIONS PER STEP

***** PROGRAM S T P (VERSION 1.1) RAN ON 10/ 9/1992 *****
*** STP QUALIFICATION EXAMPLE 10E KEY LETTER B VARIABLE VOLUME ***
** STEP ACTIVITIES AFTER 1 SEC

ACTIVITIES AT END OF THE TIME STEP

1
VOLUME 1

NUCLIDE	
1 FE-85M	1.000E+00
2 KR-85	1.000E+00
3 KR-90	9.791E-01
4 KR-131M	1.000E+00
5 BR-85	9.963E-01
6 I-131	1.000E+00
7 RB-90M	9.976E-01
8 RB-90	9.959E-01
9 SR-90	1.000E+00
10 Y-90	1.000E+00
11 TE-131M	1.000E+00
12 TE-131	9.995E-01

VOLUME 1.000E+00 CC

TOTAL CLASS 1	3.960E+00
TOTAL CLASS 2	1.997E+00
TOTAL CLASS 3	5.994E+00
GRAND TOTAL	1.197E+01

J 40 of J 49

*** PROGRAM S T P (VERSION 1.1) RAN ON 10/ 9/1992 ***

*** STP QUALIFICATION EXAMPLE 10E KEY LETTER B VARIABLE VOLUME ***

*** STEP ACTIVITIES AFTER 1 SEC

STP GAMMA SHIELDING INFORMATION CALCULATED

COMPONENT 1 VOLUME 1

CONVERSION FACTOR = 1.000E+00

VOLUME = 1.000E+00 CC

BETA SOURCE = 3.146E+05 (MEV/SEC/)

	PARTICLE SOURCE (PHOTON/SEC/)	ENERGY SOURCE (MEV/SEC/)	GROUP ENERGY (MEV-EFFECTIVE)
--	-----------------------------------	------------------------------	---------------------------------

1	7.226E+04	2.890E+04	.40
2	1.005E+05	9.047E+04	.90
3	3.522E+04	4.755E+04	1.35
4	1.849E+04	3.329E+04	1.80
5	5.825E+03	1.281E+04	2.20
6	3.637E+03	9.456E+03	2.60
7	2.148E+04	1.145E+05	5.33 (VARIABLE)

TOTALS	2.574E+05	3.369E+05	1.31
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J41 of J49

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* * *   PROGRAM   S T P   (VERSION 1.1 )   RAN ON 10/ 9/1992   * * *
* * * STP QUALIFICATION EXAMPLE 108 KEY LETTER B VARIABLE VOLUME   * * *
* * STEP ACTIVITIES AFTER 1 MIN

```

```

TIME      END TIME   =   1.000E+00 MIN      INTERVALS/STEP      =   240
STEP      START TIME =   1.667E-02 MIN      ERROR LIMIT        = 1.2500E-06
          DELTA T    =   9.833E-01 MIN

```

```

***** COMPONENT ***** DATA READ (BY CLASS NUMBER)
NO.   NAME      VOLUME OR MASS      1      2      3

1 VOLUME 1      1.000E+00 CC
                1.017E+00 CC

      REMOVAL RATES (FROM 1) =   0.000E+00   0.000E+00   0.000E+00
C SOURCE RATE FACTOR (FROM SOURCE 1) =   1.000E+00   1.000E+00   1.000E+00

2 VOLUME 2      1.000E+00

      REMOVAL RATES (FROM 2) =   0.000E+00   0.000E+00   0.000E+00

***** CODE SENSES A FEEDBACK LOOP AND/OR VARIABLE VOLUME *****
***** NSTEP IS AUTOMATICALLY INCREASED BY A FACTOR OF 3 *****

*** 720 STEPS WERE USED REQUIRING AN AVERAGE OF .00 ITERATIONS PER STEP

```

* * * PROGRAM S T P (VERSION 1.1) RAN ON 10/ 9/1992 * * *

* * * STP QUALIFICATION EXAMPLE 10B KEY LETTER B VARIABLE VOLUME * * *

* * STEP ACTIVITIES AFTER 1 MIN

ACTIVITIES AT END OF THE TIME STEP

1
VOLUME 1

NUCLIDE	
1 KE-85M	1.014E+00
2 KE-85	1.017E+00
3 KE-90	2.855E-01
4 KE-131M	1.017E+00
5 KE-85	8.000E-01
6 I-131	1.017E+00
7 KE-90M	8.665E-01
8 KE-90	7.819E-01
9 SE-90	1.017E+00
10 Y-90	1.016E+00
11 YR-131M	1.016E+00
12 YR-131	9.891E-01

VOLUME 1.017E+00 CC

TOTAL CLASS 1	3.333E+00
TOTAL CLASS 2	1.817E+00
TOTAL CLASS 3	5.687E+00
GRAND TOTAL	1.084E+01

* * * PROGRAM S T P (VERSION 1.1) RAN ON 10/ 9/1992 * * *
 * * * STP QUALIFICATION EXAMPLE 108 KEY LETTER B VARIABLE VOLUME * * *
 * * STEP ACTIVITIES AFTER 1 MIN

STP GAMMA SHIELDING INFORMATION CALCULATED

COMPONENT 1 VOLUME 1

CONVERSION FACTOR = 1.000E+00

VOLUME = 1.017E+00 CC

BETA SOURCE = 2.523E+05 (MEV/SEC/)

	PARTICLE SOURCE (PHOTON/SEC/)	ENERGY SOURCE (MEV/SEC/)	GROUP ENERGY (MEV-EFFECTIVE)
--	-----------------------------------	------------------------------	---------------------------------

1	6.805E+04	2.722E+04	.40
2	8.709E+04	7.838E+04	.90
3	2.517E+04	3.398E+04	1.35
4	1.161E+04	2.090E+04	1.80
5	4.721E+03	1.039E+04	2.20
6	2.893E+03	7.523E+03	2.60
7	1.754E+04	9.351E+04	5.33 (VARIABLE)
TOTALS	2.171E+05	2.719E+05	1.25

*** PROGRAM S T P (VERSION 1.1) BAF ON 10/ 9/1992 ***

J 44 of J 49

*** STEP QUALIFICATION EXAMPLE 106 KEY LETTER B VARIABLE VOLUME ***

*** STEP ACTIVITIES AFTER 30 MIN

TIME END TIME = 3.000E+01 MIN INTERVALS/STEP = 240
STEP START TIME = 1.000E+00 MIN ERROR LIMIT = 1.2500E-06
 DELTA T = 2.900E+01 MIN

***** COMPONENT *****
NO. NAME VOLUME OR MASS 1 2 3

1 VOLUME 1 1.017E+00 CC
 1.500E+00 CC

 REMOVAL RATES (FROM 1) = 0.000E+00 0.000E+00 0.000E+00
C SOURCE RATE FACTOR (FROM SOURCE 1) = 1.000E+00 1.000E+00 1.000E+00

2 VOLUME 2 1.000E+00

 REMOVAL RATES (FROM 2) = 0.000E+00 0.000E+00 0.000E+00

***** CODE SENSES A FEEDBACK LOOP AND/OR VARIABLE VOLUME *****
***** NSTEP IS AUTOMATICALLY INCREASED BY A FACTOR OF 3 *****

*** 720 STEPS WERE USED REQUIRING AN AVERAGE OF .00 ITERATIONS PER STEP

J45 of J49

***** PROGRAM S T P (VERSION 1.1) RAN ON 10/ 9/1992 *****

***** STP QUALIFICATION EXAMPLE 10B KEY LETTER B VARIABLE VOLUME *****

***** STEP ACTIVITIES AFTER 30 MIN

ACTIVITIES AT END OF THE TIME STEP

	1
	VOLUME 1
NUCLIDE	
1 KR-85M	1.407E+00
2 KR-85	1.500E+00
3 KR-90	1.295E-02
4 KE-131M	1.498E+00
5 BR-85	6.959E-02
6 I-131	1.498E+00
7 RB-90M	1.105E-01
8 RB-90	6.325E-02
9 SR-90	1.500E+00
10 Y-90	1.493E+00
11 TE-131M	1.486E+00
12 TE-131	7.747E-01
VOLUME	1.500E+00 CC
TOTAL CLASS 1	4.418E+00
TOTAL CLASS 2	1.567E+00
TOTAL CLASS 3	5.427E+00
GRAND TOTAL	1.141E+01

*** PROGRAM S T P (VERSION 1.1) RAN ON 10/ 9/1992 ***

*** STP QUALIFICATION EXAMPLE 10B KEY LETTER B VARIABLE VOLUME ***

** STEP ACTIVITIES AFTER 30 MIN

STP GAMMA SHIELDING INFORMATION CALCULATED

COMPONENT 1 VOLUME 1

CONVERSION FACTOR = 1.000E+00

VOLUME = 1.500E+00 CC

BETA SOURCE = 1.527E-05 (MEV/SEC/)

	PARTICLE SOURCE (PHOTON/SEC/)	ENERGY SOURCE (MEV/SEC/)	GROUP ENERGY (MEV-EFFECTIVE)
--	-----------------------------------	------------------------------	---------------------------------

1	8.867E+04	3.547E+04	.40
2	6.455E+04	5.809E+04	.90
3	1.933E+04	2.610E+04	1.35
4	1.930E+03	3.473E+03	1.80
5	2.235E+03	4.917E+03	2.20
6	4.731E+02	1.230E+03	2.60
7	1.820E+03	9.701E+03	5.33 (VARIABLE)

TOTALS	1.790E+05	1.390E-05	.78
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```

* * * PROGRAM S T P (VERSION 1.1 ) RAN ON 10/ 9/1952 * * *
* * * STP QUALIFICATION EXAMPLE 10B KEY LETTER B VARIABLE VOLUME * * *
* * STEP ACTIVITIES AFTER 1 HOUR

```

```

TIME      END TIME = 1.000E+00 HOUR      INTERVALS/STEP      = 240
STEP      START TIME = 5.000E-01 HOUR      ERROR LIMIT          = 1.2500E-06
          DELTA T   = 5.000E-01 HOUR

```

```

***** COMPONENT *****
NO.  NAME      VOLUME OR MASS      DATA READ (BY CLASS NUMBER)
          1          2          3

1 VOLUME 1      1.500E+00 CC
                2.000E+00 CC

          REMOVAL RATES (FROM 1) = 0.000E+00 0.000E+00 0.000E+00
C SOURCE RATE FACTOR (FROM SOURCE 1) = 1.000E+00 1.000E+00 1.000E+00

2 VOLUME 2      1.000E+00

```

```

          REMOVAL RATES (FROM 2) = 0.000E+00 0.000E+00 0.000E+00

```

```

***** CODE SENSES A FEEDBACK LOOP AND/OR VARIABLE VOLUME *****
***** NSTEP IS AUTOMATICALLY INCREASED BY A FACTOR OF 3 *****

```

```

*** 720 STEPS WERE USED REQUIRING AN AVERAGE OF .00 ITERATIONS PER STEP

```

*** PROGRAM S T P (VERSION 1.1) RAN ON 10/ 9/1992 ***

*** STP QUALIFICATION EXAMPLE 10B KEY LETTER B VARIABLE VOLUME ***

*** STEP ACTIVITIES AFTER 1 HOUR

ACTIVITIES AT END OF THE TIME STEP

VOLUME 1	
NUCLIDE	
1 KR-85M	1.783E+00
2 KR-85	2.000E+00
3 KR-90	1.295E-02
4 XE-131M	1.996E+00
5 BR-85	6.893E-02
6 I-131	1.995E+00
7 RB-90M	1.035E-01
8 RB-90	6.292E-02
9 SR-90	2.000E+00
10 Y-90	1.984E+00
11 TE-131M	1.966E+00
12 TE-131	6.767E-01
VOLUME	2.000E+00 CC
TOTAL CLASS 1	5.792E+00
TOTAL CLASS 2	2.064E+00
TOTAL CLASS 3	6.793E+00
GRAND TOTAL	1.465E+01

*** PROGRAM S T P (VERSION 1.1) RAN ON 10/ 9/1992 ***
 *** STP QUALIFICATION EXAMPLE 10B KEY LETTER B VARIABLE VOLUME ***

J49 of J49

*** STEP ACTIVITIES AFTER 1 HOUR

STP GAMMA SEIELDING INFORMATION CALCULATED

COMPONENT 1 VOLUME 1

CONVERSION FACTOR = 1.000E+00

VOLUME = 2.000E+00 CC

BETA SOURCE = 1.879E+05 (MEV/SEC/)

	PARTICLE SOURCE (PROTON/SEC/)	ENERGY SOURCE (MEV/SEC/)	GROUP ENERGY (MEV-EFFECTIVE)
--	-----------------------------------	------------------------------	---------------------------------

1	1.130E+05	4.519E+04	.40
2	8.131E+04	7.318E+04	.90
3	2.387E+04	3.223E+04	1.35
4	2.070E+03	3.727E+03	1.80
5	2.806E+03	6.173E+03	2.20
6	5.203E+02	1.353E+03	2.60
7	1.746E+03	9.305E+03	5.33 (VARIABLE)

TOTALS	2.253E+05	1.712E+05	.76
--------	-----------	-----------	-----

*** END PROGRAM S T P (VERSION 1.1)

TIME C P F = 15:39:50 DATE = 10/ 9/1992

Title Verification of Computer Program Page K1 of K8

STP (PC) Version 1.1 EGS-TR-910600-18 Project All

Calculated by ELL Date 10/23/92 Checked by QWW Date 10/26/92

Appendix K
Example 11

*** PROGRAM STP-PC (THE SHELLER-S EDGE) IS AT YOUR SERVICE ***

K2 of K18

** VERSION NUMBER=1.1 REVISION DATE WAS 9/29/92

* TODAY'S DATE = 10/ 9/1992 START TIME = 15:45:35

REPRODUCTION OF INPUT DATA DECK

+ + + + +

NV= 3 NS= 2

NI= 12 NK= 3 NG= 7 NL= 2

1KR-85M	1	4.7978E-05	54.0234E-03	10.0000E+00	10.0000E+00
2KR-85	1	2.0490E-09	19.0663E-06	56.5686E-06	10.0000E+00
3KR-90	1	2.1446E-02	10.0000E+00	10.0000E+00	10.0000E+00
4XE-131M	1	6.7758E-07	61.0836E-08	10.0000E+00	10.0000E+00
5BE-85	2	4.0299E-03	10.0000E+00	10.0000E+00	10.0000E+00
6I-131	2	9.9783E-07	114.9932E-06	124.6210E-04	10.0000E+00
7RB-90M	3	2.6866E-03	32.5521E-03	10.0000E+00	10.0000E+00
8RB-90	3	4.4149E-03	31.8894E-02	76.1792E-05	10.0000E+00
9SE-90	3	7.6801E-10	72.6248E-03	84.4145E-03	10.0000E+00
10Y-90	3	3.0038E-06	97.6801E-10	10.0000E+00	10.0000E+00
11TE-131M	3	6.4180E-06	10.0000E+00	10.0000E+00	10.0000E+00
12TE-131	3	4.6210E-04	111.4248E-06	10.0000E+00	10.0000E+00
		.40	.90	1.35	1.80
				2.20	2.60
					7.50
1KR-85M		.255157+0123-3000+0000+0000+0000+0000+0581+0			+
2KR-85		.251000+0223-2000+0000+0000+0000+0000+0514+0			+
3KR-90		1.315766-1233+0462+0386+0491-1190-1446-1366+1			+
4XE-131M		.142664-2000+0000+0000+0000+0000+0000+0164+0			+
5BE-85		1.003000+0334-1233-1659-2275-2000-0000-0183+1			+
6I-131		.190317+0625-1000+0000+0000+0000+0000+0723+0			+
7RB-90M		1.388344-2855+0195+0472+0186+C118+C144+1473+1			+
8RB-90		1.960000+0277+0963-1192-1366-1111+0162+1533+1			+
9SE-90		.196000+0000+0000-0000+0000+0000+0000+0000+0			+
10Y-90		.935000+0000+0000+0000+0000+0000+0000+0000+0			+
11TE-131M		.190112+0828+0377+C219-1735-1671-2000+0227+1			+
12TE-131		.719110+0162+C142+0323-2000+0000+0000+0150+1			+

*** PROGRAM STP-PC (THE SHELLER-S EDGE) IS AT YOUR SERVICE ***

** VERSION NUMBER=1.1 REVISION DATE WAS 9/29/92

* TODAY'S DATE = 10/ 9/1992 START TIME = 15:45:36

1 'SOURCE'

1 1.0 2 1.0 3 1.0 4 1.0 5 1.0 6 1.0
7 1.0 8 1.0 9 1.0 10 1.0 11 1.0 12 1.0

0

T

STP QUALIFICATION EXAMPLE 11 KEY KETTER G GAMMA SOURCE

NJ= 2

1 'VOLUME 1'

2 'VOLUME 2'

-1

SOURCE AND VOLUME INITIALIZATION

V 1 1.00 CC

V 2 1.00 CC

F 1 2 0 1.0

S 1 1 0 1.0

G 2 2 TEST

1 HOUR

ACTIVITIES AFTER 1 HOUR

2 HOUR

ACTIVITIES AFTER 2 HOUR

T

T

+ + + + + + +

PROGRAM S T P (VERSION 1.1)

RAN ON 10/ 9/1952

K4 of K18

DATA FOR THIS RUN OR SERIES OF RUNS

NUMBER OF ISOTOPES (DATA CARDS) = 12

NUMBER OF COMPONENTS (ALL RUNS) = 3

NUMBER OF CLASSES OF ISOTOPES = 3

NUMBER OF SOURCES (MAXIMUM) = 2

NUMBER OF GAMMA GROUPS = 7

NUMBER OF PRECURSORS (MAXIMUM) = 2

STORAGE LOCATIONS REQUESTED = 225000

STORAGE LOCATIONS USED = 1074

*** PROGRAM S T P (VERSION 1.1) RAN ON 10/ 9/1992 ***
 *** STP QUALIFICATION EXAMPLE 11 KEY KEYTEE G GAMMA SOURCE ***

NUCLIDE DATA INPUT (LIBRARY)

NUMEEE	NAME	CLASS	LAMDA(1/HR)	PERCUESOR (NO.,RATE:-
1	KE-25M	1	1.5472E-01	5 1.5447E-01 1 0.0000E+00
2	KE-85	1	7.3764E-06	1 1.5564E-06 5 1.2024E-06
3	KE-90	1	7.7206E+01	1 0.0000E+00 1 0.0000E+00
4	KE-131M	1	2.4393E-03	6 2.6490E-05 1 0.0000E+00
5	BE-65	2	1.4508E+01	1 0.0000E+00 1 0.0000E+00
6	I-131	2	3.5922E-03	11 2.7947E-03 12 3.5922E-03
7	RE-90M	3	9.6718E+00	3 1.1510E+00 1 0.0000E+00
8	RE-90	3	1.5894E+01	3 1.4002E+01 7 3.6555E-01
9	SE-90	3	2.7648E-06	7 2.7012E-05 8 2.7648E-06
10	Y-90	3	1.0814E-02	9 1.0814E-02 1 0.0000E+00
11	TE-131M	3	2.3105E-02	1 0.0000E+00 1 0.0000E+00
12	TE-131	3	1.6636E+00	11 3.6931E-01 1 0.0000E+00

* * * PROGRAM S T P (VERSION 1.1) RAN ON 10/ 9/1992 * * *
 * * * STP QUALIFICATION EXAMPLE 11 KEY LETTER G GAMMA SOURCE * * *

K6 of K 18

I	ISOTOPE	BETA MEV/DISC	GAMMA (MEV/DISC) BY GROUP AND MAX. ENERGY (MEV)						
			1	2	3	4	5	6	7
	EFFECTIVE ENERGY		.400	.900	1.350	1.800	2.200	2.600	7.500
1	KR-85M	.255	.157	.000	.000	.000	.000	.000	.581
2	KR-85	.251	.000	.002	.000	.000	.000	.000	.514
3	KR-90	1.315	.077	.233	.462	.386	.049	.019	3.850
4	XE-131M	.142	.007	.000	.000	.000	.000	.000	.164
5	BR-85	1.003	.000	.033	.023	.007	.003	.000	1.830
6	I-131	.190	.317	.063	.000	.000	.000	.000	.723
7	RB-90M	1.368	.003	.855	.195	.472	.186	.118	1.440
8	RB-90	1.960	.000	.277	.096	.019	.037	.111	1.620
9	SR-90	.196	.000	.000	.000	.000	.000	.000	.000
10	Y-90	.935	.000	.000	.000	.000	.000	.000	.000
11	TE-131M	.190	.112	.028	.377	.022	.074	.009	2.270
12	TE-131	.719	.110	.162	.142	.003	.000	.000	1.500

***** PROGRAM S T P (VERSION 1.1) RAN ON 10/ 9/1952 *****
*** STP QUALIFICATION EXAMPLE 11 KEY LETTER G GAMMA SOURCE ***

K7 of K18

RUN LOOP INFORMATION FOR THIS RUN FOLLOWS.

NJ, NUMBER OF COMPONENTS USED IN THIS RUN LOOP = 2
KCONC, CALC. TYPE (0/INVENTORY, 1/CONCENTRATION) = 0
IE., -- ACT/COMP. --- ACT/GM.
NDECAY, CALCULATE DAUGHTER PRODUCTION (0/YES,1/NO) = 0
(DEFAULT =0)
ITMAX, MAXIMUM NUMBER OF ITERATIONS PER TIME STEP = 0
(DEFAULT = 10)
KDEBUG, DEBUG OPTION (0/NORMAL OUTPUT, 1/MUCHO) = 0

* * * PROGRAM S T P (VERSION 1.1) RAN ON 10/ 9/1992 * * *
 * * * STP QUALIFICATION EXAMPLE 11 KEY KETTER G GAMMA SOURCE * * *

K8 of K 18

SOURCE LIBRARY

NUCLIDE	SOURCE	
	1	
1 KR-85M	1.000E+00	
2 KR-85	1.000E+00	
3 KR-90	1.000E+00	
4 KE-131M	1.000E+00	
5 BE-85	1.000E+00	
6 I-131	1.000E+00	
7 BB-90M	1.000E+00	
8 RB-90	1.000E+00	
9 SR-90	1.000E+00	
10 Y-90	1.000E+00	
11 TE-131M	1.000E+00	
12 TE-131	1.000E+00	
TOTAL CLASS 1	4.000E+00	
TOTAL CLASS 2	2.000E+00	
TOTAL CLASS 3	6.000E+00	
GRAND TOTAL	1.200E+01	

K9 of K 18

```

* * *      PROGRAM  S T P      (VERSION 1.1 )      RAN ON 10/ 9/1992      * * *
* * * STP QUALIFICATION EXAMPLE 11 KEY LETTER G GAMMA SOURCE      * * *
* * STEP SOURCE AND VOLUME INITIALIZATION

```

```

                END TIME   = -1.000E+00      INTERVALS/STEP      =   30
TIME
                START TIME =  0.000E+00      ERROR LIMIT          = 1.0000E-05
STEP
                DELTA T    =  0.000E+00

```

```

***** COMPONENT *****
NO.   NAME          VOLUME OR MASS      DATA READ (BY CLASS NUMBER)
                                     1         2         3

1 VOLUME 1          1.000E+00 CC

      REMOVAL RATES (FROM 1) =    0.000E+00    0.000E+00    0.000E+00
      FLOW RATES (CC /HR, F ( 1 TO 2) =    1.000E+00    1.000E+00    1.000E+00
      TRANSM. FRACTION ( 1 TO 2) =    1.000E+00    1.000E+00    1.000E+00
      STEP SOURCE FACTOR (FROM SOURCE 1) =    1.000E+00    1.000E+00    1.000E+00

```

```

2 VOLUME 2          1.000E+00 CC

      REMOVAL RATES (FROM 2) =    0.000E+00    0.000E+00    0.000E+00

```

K10 of K18

```

* * * * *      PROGRAM  S T P   (VERSION 1.1 )      RAN ON 10/ 9/1992      * * * * *
* * * STP QUALIFICATION EXAMPLE 11 KEY KETTER G GAMMA SOURCE      * * *
* * STEP SOURCE AND VOLUME INITIALIZATION

```

STEP SOURCE DATA FROM SOURCE INPUT

```

              1
          VOLUME 1
NUCLIDE
1  KR-85M      1.000E+00
2  KR-85       1.000E+00
3  KR-90       1.000E+00
4  KR-131M     1.000E+00
5  BR-85       1.000E+00
6  I-131       1.000E+00
7  RB-90M      1.000E+00
8  RB-90       1.000E+00
9  SR-90       1.000E+00
10 Y-90        1.000E+00
11 TE-131M     1.000E+00
12 TE-131      1.000E+00

VOLUME        1.000E+00 CC

TOTAL CLASS 1  4.000E+00
TOTAL CLASS 2  2.000E+00
TOTAL CLASS 3  6.000E+00
GRAND TOTAL    1.200E+01

```

* * * PROGRAM S T P (VERSION 1.1) RAN ON 10/ 9/1992 * * *
 * * * STP QUALIFICATION EXAMPLE 11 KEY KETTER G GAMMA SOURCE * * *
 * * STEP SOURCE AND VOLUME INITIALIZATION

K11 of K18

ACTIVITIES AT END OF THE TIME STEP

NUCLIDE	VOLUME 1
1 KR-85M	1.000E+00
2 KR-85	1.000E+00
3 KR-90	1.000E+00
4 KE-131M	1.000E+00
5 BR-85	1.000E+00
6 I-131	1.000E+00
7 RB-90M	1.000E+00
8 RB-90	1.000E+00
9 SE-90	1.000E+00
10 Y-90	1.000E+00
11 TE-131M	1.000E+00
12 TE-131	1.000E+00
VOLUME	1.000E+00 CC
TOTAL CLASS 1	4.000E+00
TOTAL CLASS 2	2.000E+00
TOTAL CLASS 3	6.000E+00
GRAND TOTAL	1.200E+01

* * * PROGRAM S T P (VERSION 1.1)
 * * * STP QUALIFICATION EXAMPLE 11 KEY KETTER G GAMMA SOURCE
 * * STEP SOURCE AND VOLUME INITIALIZATION

RAF ON 10/ 9/1992

* * *

K12 of K18

STP GAMMA SHIELDING INFORMATION CALCULATED

COMPONENT 1 VOLUME 1

CONVERSION FACTOR = 1.000E+00
 VOLUME = 1.000E+00 CC
 BETA SOURCE = 3.161E+05 (MEV/SEC/TEST)
 PARTICLE SOURCE ENERGY SOURCE GROUP ENERGY
 (PHOTON/SEC/TEST) (MEV/SEC/TEST) (MEV-EFFECTIVE)

1	7.240E+04	2.896E+04	.40
2	1.009E+05	9.077E+04	.90
3	3.551E+04	4.794E+04	1.35
4	1.868E+04	3.363E+04	1.80
5	5.852E+03	1.287E+04	2.20
6	3.653E+03	9.498E+03	2.60
7	2.155E+04	1.149E+05	5.33 (VARIABLE)
TOTALS	2.585E+05	3.385E+05	1.31

K13 of K18

```

* * *   PROGRAM  S T F   (VERSION 1.1 )   RAN ON 10. 9/1992   * * *
* * *   STEP QUALIFICATION EXAMPLE 11 KEY KETTER G GAMMA SOURCE   * * *
* * *   STEP ACTIVITIES AFTER 1 HOUR

```

```

TIME      END TIME   =   1.000E+00 HOUR      INTERVALS/STEP      =   30
STEP      START TIME =   0.000E+00           ERROR LIMIT       = 1.0000E-05
          DELTA T    =   1.000E+00 HOUR

```

```

***** COMPONENT *****
NO.   NAME      VOLUME OR MASS      DATA READ (BY CLASS NUMBER)
          1          2          3

1 VOLUME 1      1.000E+00 CC

      REMOVAL RATES (FROM 1) =   0.000E+00   0.000E+00   0.000E+00
      FLOW RATES (CC /HR) F ( 1 TO 2) =   1.000E+00   1.000E+00   1.000E+00
      TRANSM. FRACTION ( 1 TO 2) =   1.000E+00   1.000E+00   1.000E+00

```

```

2 VOLUME 2      1.000E+00 CC

      REMOVAL RATES (FROM 2) =   0.000E+00   0.000E+00   0.000E+00

```

```

***   30 STEPS WERE USED REQUIRING AN AVERAGE OF   .00  ITERATIONS PER STEP

```

* * * PROGRAM S T P (VEESION 1.1) RAN ON 10/ 9/1992 * * *
 * * * STEP QUALIFICATION EXAMPLE 11 KEY LETTER G GAMMA SOURCE * * *
 * * * STEP ACTIVITIES AFTER 1 HOUR

K14 of K 18

ACTIVITIES AT END OF THE TIME STEP

	1 VOLUME 1	2 VOLUME 2
NUCLIDE		
1 KR-85M	3.185E-01	5.473E-01
2 KR-85	3.679E-01	6.321E-01
3 KR-90	1.086E-34	1.866E-34
4 KR-131M	3.670E-01	6.306E-01
5 BR-85	1.841E-07	3.164E-07
6 I-131	3.684E-01	6.330E-01
7 RB-90M	2.359E-05	4.052E-05
8 RB-90	1.440E-06	2.474E-06
9 SR-90	3.679E-01	6.321E-01
10 Y-90	3.679E-01	6.321E-01
11 TE-131M	3.595E-01	6.177E-01
12 TE-131	1.349E-01	2.319E-01
VOLUME	1.000E+00 CC	1.000E+00 CC
TOTAL CLASS 1	1.053E+00	1.810E+00
TOTAL CLASS 2	3.684E-01	6.330E-01
TOTAL CLASS 3	1.230E+00	2.114E+00
GRAND TOTAL	2.652E+00	4.557E+00

K15 of K18

*** PROGRAM S T P (VERSION 1.1) BAK ON 10/ 9/1992 ***

*** STP QUALIFICATION EXAMPLE 11 KEY KETTER 6 GAMMA SOURCE ***

* = STEP ACTIVITIES AFTER 1 HOUP

STP GAMMA SHIELDING INFORMATION CALCULATED

COMPONENT 1 VOLUME 1

CONVERSION FACTOR = 1.000E+00

VOLUME = 1.000E+00 CC

BETA SOURCE = 3.245E+04 (MEV/SEC/TEST)

	PARTICLE SOURCE (PHOTON/SEC/TEST)	ENERGY SOURCE (MEV/SEC/TEST)	GROUP ENERGY (MEV-EFFECTIVE)
--	--------------------------------------	---------------------------------	---------------------------------

1	2.075E+04	8.300E+03	.40
2	1.412E+04	1.271E+04	.90
3	4.240E+03	5.723E+03	1.35
4	1.710E+02	3.078E+02	1.80
5	4.444E+02	9.778E+02	2.20
6	4.460E+01	1.160E+02	2.60
7	2.839E-01	1.343E+00	4.73 (VARIABLE)

TOTALS	3.977E+04	2.813E+04	.71
--------	-----------	-----------	-----

COMPONENT 2 VOLUME 2

CONVERSION FACTOR = 2.000E+00

VOLUME = 1.000E+00 CC

BETA SOURCE = 2.788E+04 (MEV/SEC/TEST)

	PARTICLE SOURCE (PHOTON/SEC/TEST)	ENERGY SOURCE (MEV/SEC/TEST)	GROUP ENERGY (MEV-EFFECTIVE)
--	--------------------------------------	---------------------------------	---------------------------------

1	1.783E+04	7.131E+03	.40
2	1.213E+04	1.092E+04	.90
3	3.642E+03	4.917E+03	1.35
4	1.469E+02	2.645E+02	1.80
5	3.818E+02	8.400E+02	2.20
6	3.832E+01	9.962E+01	2.60
7	2.439E-01	1.153E+00	4.73 (VARIABLE)

TOTALS	3.417E+04	2.417E+04	.71
--------	-----------	-----------	-----

* * * PROGRAM S T P (VERSION 1.1) RAN ON 10/ 9/1992 * * *
 * * * STP QUALIFICATION EXAMPLE 11 KEY KETTER 6 GAMMA SOURCE * * *
 * * STEP ACTIVITIES AFTER 2 HOUR

K16 of K 18

TIME END TIME = 2.000E+00 HOUR INTERVALS/STEP = 30
 START TIME = 1.000E+00 HOUR ERROR LIMIT = 1.0000E-05
 STEP DELTA T = 1.000E+00 HOUR

***** COMPONENT *****
 NO. NAME VOLUME OR MASS 1 2 3

 1 VOLUME 1 1.000E+00 CC

 REMOVAL RATES (FROM 1) = 0.000E+00 0.000E+00 0.000E+00
 FLOW RATES (CC /HR) F (1 TO 2) = 1.000E+00 1.000E+00 1.000E+00
 TRANSM. FRACTION (1 TO 2) = 1.000E+00 1.000E+00 1.000E+00

2 VOLUME 2 1.000E+00 CC

 REMOVAL RATES (FROM 2) = 0.000E+00 0.000E+00 0.000E+00

*** 30 STEPS WERE USED REQUIRING AN AVERAGE OF .00 ITERATIONS PER STEP

* * * PROGRAM S T P (VERSION 1.1) RAN ON 10/ 9/1992 * * *
 * * * STP QUALIFICATION EXAMPLE 11 KEY KETTER G GAMMA SOURCE * * *
 * * STEP ACTIVITIES AFTER 2 HOUR

K17 of K18

ACTIVITIES AT END OF THE TIME STEP

	1 VOLUME 1	2 VOLUME 2
NUCLIDE		
1 KR-85M	1.004E-01	6.414E-01
2 KR-85	1.353E-01	8.647E-01
3 KR-9C	0.000E+00	0.000E+00
4 KR-131M	1.347E-01	8.605E-01
5 KR-85	3.390E-14	2.166E-13
6 I-131	1.355E-01	8.659E-01
7 RB-90M	5.470E-10	3.494E-09
8 RB-90	3.214E-11	2.053E-10
9 SR-90	1.353E-01	8.647E-01
10 Y-90	1.353E-01	8.647E-01
11 YR-131M	1.292E-01	8.256E-01
12 YR-131	3.286E-02	2.099E-01
VOLUME	1.000E+00 CC	1.000E+00 CC
TOTAL CLASS 1	3.704E-01	2.367E-00
TOTAL CLASS 2	1.355E-01	8.659E-01
TOTAL CLASS 3	4.327E-01	2.765E+00
GRAND TOTAL	9.387E-01	5.997E+00

*** PROGRAM S T P (VERSION 1.1) JAN ON 10/ 9/1992 ***

K18 of K18

*** STP QUALIFICATION EXAMPLE 11 KEY LETTER G GAMMA SOURCE ***

** STEP ACTIVITIES AFTER 2 HOUR

STP GAMMA SHIELDING INFORMATION CALCULATED

COMPONENT 1 VOLUME 1

CONVERSION FACTOR = 1.000E+00

VOLUME = 1.000E+00 CC

BETA SOURCE = 1.131E+04 (MEV/SEC/TEST)

	PARTICLE SOURCE (PHOTON/SEC/TEST)	ENERGY SOURCE (MEV/SEC/TEST)	GROUP ENERGY (MEV-EFFECTIVE)
--	--------------------------------------	---------------------------------	---------------------------------

1	7.166E+03	2.875E+03	.40
2	4.979E+03	4.481E+03	.90
3	1.463E+03	1.975E+03	1.35
4	6.035E+01	1.086E+02	1.80
5	1.597E+02	3.514E+02	2.20
6	1.602E+01	4.164E+01	2.60
7	6.569E-06	3.107E-05	4.73 (VARIABLE)

TOTALS	1.387E+04	9.833E+03	.71
--------	-----------	-----------	-----

COMPONENT 2 VOLUME 2

CONVERSION FACTOR = 2.000E+00

VOLUME = 1.000E+00 CC

BETA SOURCE = 3.613E+04 (MEV/SEC/TEST)

	PARTICLE SOURCE (PHOTON/SEC/TEST)	ENERGY SOURCE (MEV/SEC/TEST)	GROUP ENERGY (MEV-EFFECTIVE)
--	--------------------------------------	---------------------------------	---------------------------------

1	2.296E+04	9.185E+03	.40
2	1.590E+04	1.431E+04	.90
3	4.674E+03	6.310E+03	1.35
4	1.928E+02	3.470E+02	1.80
5	5.103E+02	1.123E+03	2.20
6	5.117E+01	1.330E+02	2.60
7	2.098E-05	9.923E-05	4.73 (VARIABLE)

TOTALS	4.429E+04	3.141E+04	.71
--------	-----------	-----------	-----

*** END PROGRAM S T P (VERSION 1.1)

TIME OFF = 15:49:48 DATE = 10/ 9/1992

EGS Corporation

Title Verification and Validation of Page ~ of ~

RADMODL Code Ver. 1.0 EGS-TR-910600-08 Project WSRC

Calculated by W.Z.

Date 11/16/92 Checked by

W.P.
Qark

Date 11/13/92
11/15/92

Annex C

Verification of QADSR

Verification of Computer Program QAD-P5Z (PC)
Version 1.1

by

Janet Davidson
EGS Corporation
Knoxville, Tennessee

Submitted to
Westinghouse Savannah River Company

October 1992

Contract #AA30194P
EGS Report #910600-19
Revision 0

TECHNICAL DOCUMENT	
DOCUMENT TYPE: (REPORT/PLAN/PROCEDURE)	Report
DOCUMENT NUMBER:	EGS-TR-910600-19
ORIGINAL ISSUE DATE:	October 20, 1992
TITLE:	Verification of Computer Program OAD-P5Z (PC) Version 1.1
PREPARATION	
PROJECT ENGINEER:	<u>Janet Davidson</u> Janet Davidson
TECHNICAL REVIEWS	
PROGRAM MANAGER:	<u>Douglas W. Wilson</u> Douglas W. Wilson
ENGINEERING VERIFIER:	<u>Douglas W. Wilson</u> Douglas W. Wilson
QUALITY ASSURANCE:	<u>Carter Pope</u> Carter Pope
APPROVAL	
GROUP/DIVISION DIRECTOR:	<u>R. D. Guthrie</u> Ronald D. Guthrie

EGS Form 611-10/89

*Justification for Project Manager performing engineering verification: Due to his technical competence in the subject and theory, Program Manager D. W. Wilson performed the engineering verification for this report. Mr. Wilson did not participate in the program development, technical input, nor selection of sample problems.

Disclaimer

Program Name QAD-P5Z (PC) Version 1.1

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October 1992

Title Verification of Computer Program Page (V) of V
QAD-P5Z (PC) Version 1.1 EGS-TR-910600-19 Project All

Calculated by JD Date 10/19/92 Checked by QW Date 10/20/92

ABSTRACT

This report documents the verification of the computer program QAD-P5Z (PC) Version 1.1. Version 1.1 is also called QADSR because this version was created to facilitate the radiation model development for Westinghouse Savannah River Company. QAD-P5Z is a computer code which is used to perform gamma dose rate calculations.

Title Verification of Computer Program Page V of V
QAD-P5Z (PC) Version 1.1 EGS-TR-910600-19 Project All

Calculated by HP Date 10/19/92 Checked by QW Date 10/20/92

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APPENDIX B - QAD- P5Z SAMPLE PROBLEM INPUT FILES	B1 of B3
APPENDIX C - FIGURES OF GEOMETRY TYPE 5 - BOX, SLAB SHIELD PARALLEL TO FACE	C1 of C3
APPENDIX D - QADSR OUTPUT OF SAMPLE PROBLEMS	D1 of D27

Contents of Appendix A intentionally deleted.

Title Verification of Computer Program Page 1 of 6

QAD-P5Z (PC) Version 1.1 EGS-TR-910600-19 Project All

Calculated by JD

Date 10/19/92 Checked by QAD

Date 10/20/92

INTRODUCTION

This report was prepared to verify the computer code QAD-P5Z (PC) version 1.1 which is used to perform gamma dose rate calculations. Version 1.1 of QAD-P5Z is also referred to as QADSR because the modifications made to create this version resulted from work on a radiation model being developed for Westinghouse Savannah River Corporation (WSRC). A listing of the computer code QAD-P5Z version 1.1 is found in Appendix A.

QADSR was developed to facilitate modeling rooms with water levels which vary as a function of time. The location of the origin for one of the "standard configurations", a slab with a shield parallel with a face, was shifted (refer to figures in Appendix C). Also, for these standard configurations a detector location was added at the inner face of the shield closest to the source. In addition, in order to work within the framework of the radiation model the user interaction capabilities were removed.

In order to verify QAD-P5Z version 1.1 for use, the sample problems from reference 1 which were used to verify version 1.0 will be run using QADSR. Then a comparison of results will be made with the results using version 1.0 in reference 1. If the results match it may be assumed that the code QADSR will provide correct answers consistent with the input and that the code is verified.

Calculated by

LD

Date 10/19/92 Checked by

QAD

Date

10/20/92

SAMPLE PROBLEMS INPUT

QAD-P5Z can simulate any geometry configuration using the general geometry option. QAD-P5Z will generate the geometry for six standard source-shield configurations. These six configurations are: a slab with a shield parallel with a face, a cylinder or an annular cylinder with a slab either parallel or perpendicular to its axis, and a sphere with a slab shield. These configurations are selected by choosing the proper configuration number.

One general geometry problem and sample problems for each of the six standard configurations will be run. A listing of the QAD-P5Z input to the sample problems may be found in Appendix B. Note that the physical dimensions are entered into the input files in units of centimeters.

Sample Problem 1: General Geometry - Shipping Cask Analysis

The physical situation modeled is a single drum of radwaste being shielded by three other 'clean' drums. In this example the detector is located in the same medium as the source (room).

Sample Problem 2: Geometry Type 6 - Cylinder Shield At Side

The physical situation being modeled in Sample Problem 2A is an "unshielded" 12-inch pipe filled with contaminated sump water running through a room. To obtain the desired numbers of detectors at the appropriate spacing, an air "shield" was specified.

In Sample Problem 2B the physical situation being modeled is a 16-inch pipe filled with contaminated sump water located parallel to a wall. The dose rate from this pipe for a detector located at the wall in an adjacent room is being calculated.

Sample Problem 3: Geometry Type 7 - Cylinder, Shield At End

The physical situation in this case is similar to Sample Problem 2B except that the pipe is now perpendicular to the wall. Only, the geometry configuration number had to be changed in the QAD-P5Z input file for sample problem 2B.

Calculated by JLD Date 10/19/92 Checked by QWD Date 10/20/92

Sample Problem 4: Geometry Type 12 - Annular Cylinder, Shield at Side

The input files used in Sample 2B were modified to include an annular space in the cylinder. Effectively, a concrete cylinder with a radius of 2-inches was inserted in the pipe. The source is located in the contaminated sump water surrounding the concrete cylinder.

Sample Problem 5: Geometry Type 13 - Annular Cylinder, Shield at End

The change in Sample Problem 5 from Sample Problem 4 is analogous to the change in Sample Problem 3 from 2B. The geometry configuration number was changed in the QAD-P5Z input file for sample problem 12 to 13.

Sample Problem 6: Geometry Type 5 - Box, Slab Shield Parallel to Face

A rectangular box with the inner dimensions of 20 cm long by 25 cm high by 10 cm thick is modeled. The clad thickness is 1 cm. The shield (10 cm thick) is located 50 cm from the right face (20 cm long by 25 cm high) of the box. The detector is located a distance of 5 cm from the shield at a height of 10 cm and it is displaced from the centerline of the box by 5 cm. In addition to verifying the type 5 geometry, this problem also verifies the distance from the shield to the detector (DD), the height of the detector (H_1), and the displacement distance (Disp) features of QAD-P5Z.

Sample Problem 7: Geometry Type 8 - Sphere

A sphere with a radius of 10 cm, filled with contaminated water, is modeled. A concrete shield 10 cm thick is located 50 cm from the sphere. One detector is located on the surface of the sphere and a second detector is located on the shield wall surface away from the sphere.

Title Verification of Computer Program Page 4 of 6

QAD-P5Z (PC) Version 1.1 EGS-TR-910600-19 Project All

Calculated by MD Date 10/19/92 Checked by QWW Date 10/19/92

SAMPLE PROBLEMS OUTPUT

The QAD-P5Z sample problems were entered into version 1.1 of QAD-P5Z and the resulting output is found in Appendix D.

One of the modifications to QAD-P5Z which were made for version 1.1 was to add a detector at the face of the shield closest to the source. Therefore, for sample problems 2A through 7, detector 3 in the QADSR output corresponds to detector 2 in the QAD-P5Z version 1.0 output.

The QAD-P5Z version 1.0 output for each sample problem varies in length depending on the selection of KDEBUG in the input files. KDEBUG values of 1, 2, or 3 signal the computer code to print out additional information. The higher values cause progressively more information to be printed. The default value for KDEBUG is 0. KDEBUG is entered in column 72 on the second line of the input. KDEBUG is set at 3 for sample problem 2A, at 2 for sample problems 1 and 2B, at 1 for sample problem 3, and left at the default (0) for the remaining sample problems. The KDEBUG in the QADSR input was selected as default (0) therefore the output is minimal.

The corresponding results were then compared. This comparison shows no differences.

Title Verification of Computer Program Page 5 of 6

QAD-P5Z (PC) Version 1.1 EGS-TR-910600-19 Project All

Calculated by

h.D

Date 10/19/92 Checked by

QWW

Date

10/20/92

CONCLUSION

To qualify QADSR, the same sample problems were run and the results were compared to the results in reference 1 obtained using version 1.0 of QAD-P5Z. Therefore, based on this analysis, QADSR (QAD-P5Z version 1.1) may be considered qualified and valid for use in safety related calculations.

Title Verification of Computer Program Page 6 of 6

QAD-P5Z (PC) Version 1.1 EGS-TR-910600-19 Project All

Calculated by JD

Date 10/19/92 Checked by JDW

Date 10/20/92

REFERENCES

- 1) "Verification of Computer Program QAD-P5Z Version 1.0",
EGS-TR-910600-07 Revision A, Janet Davidson, October
19, 1992.

Title Verification of Computer Program Page A1 of A911
QAD-P5Z (PC) Version 1.1 EGS-TR-910600-19 Project All

Calculated by AKD Date 10/19/92 Checked by QWW Date 10/20/92

APPENDIX A

QADSR COMPUTER CODE
OCTOBER 1992

Contents intentionally deleted

Title Verification of Computer Program Page B1 of B3

QAD-P5Z (PC) Version 1.1 EGS-TR-910600-19 Project All

Calculated by JDS

Date 10/19/92 Checked by QWD

Date 10/20/92

APPENDIX B

QAD-P5Z SAMPLE PROBLEM INPUT FILES

Calculated by HPDate 10/19/92 Checked by QWWDate 10/20/92

SHIPPING CASK ANALYSIS QAD-P5Z(PC) VERSION 1

1	18	61.0	30.4	1	1
0	6	5			
1	5	12	0 30.5	0	30.5
2	5	12	61.0 30.5	0	30.5
3	5	12	61.0 30.5	61.0	30.5
4	5	12	61.0 30.5	-61.0	30.5
5	3	3	76.25		
6	3	3	0		
1	0	1	1 5 6	0	38.2
2	0	1	2 5 6	61.0	0 38.2
3	0	1	3 5 6	61.0	61.0 38.2
4	0	1	4 5 6	61.0	-61.0 38.2
5	0	5	1 2 3 4 5 6	304.8	0 38.2

1.3

4	1	8	13	14	20	26			
.00916	.899	.12	.617	.0797	.0255				

1.3

24	23	24	0						
0	1.270833	0	0.261792	0	3.315217				

3.7D+10

304.8	0	38.2	0	3000	12100	3000			
-------	---	------	---	------	-------	------	--	--	--

12-IN PIPE, 0.375-IN WALL, 3 FT LONG, SUMP WATER DOSE RATE, T=0 HR

6	171311	60.96	91.449	1.4415.24	.9525	118	1		
								6489-10	

0.05 0.1 0.2 0.3 0.4 0.5 0.6 0.8 1.0 1.2 1.5 1.8 2.2 2.6

3.0 3.5 4.0 5.0 6.0 7.5

4605+164713+162480+174289+171219+187390+173914+185570+186565+182164+18

1667+189887+173059+177274+165097+157837+147167+144606+130

16-IN PIPE, 0.25-IN WALL, 7.5 FT LONG, SUMP WATER DOSE RATE, T=0 HR

6	161311	60.96	5.08	228.6	19.68	.635	118	1	
									6489-10

0.05 0.1 0.2 0.3 0.4 0.5 0.6 0.8 1.0 1.2 1.5 1.8 2.2 2.6

3.0 3.5 4.0 5.0 6.0 7.5

4605+164713+162480+174289+171219+187390+173914+185570+186565+182164+18

1667+189887+173059+177274+165097+157837+147167+144606+130

GEOMETRY TYPE 7 - CYLINDER SHIELD AT TOP (16-IN PIPE, 0.25-IN WALL)

7	161311	60.96	5.08	228.6	19.68	.635	118	1	
									6489-10

0.05 0.1 0.2 0.3 0.4 0.5 0.6 0.8 1.0 1.2 1.5 1.8 2.2 2.6

3.0 3.5 4.0 5.0 6.0 7.5

4605+164713+162480+174289+171219+187390+173914+185570+186565+182164+18

1667+189887+173059+177274+165097+157837+147167+144606+13

Title Verification of Computer Program Page 63 of 63

OAD-P5Z (PC) Version 1.1 EGS-TR-910600-19 Project All

Calculated by JD

Date 10/19/92 Checked by DWW

Date 10/20/92

GEOMETRY TYPE 12 - ANNULAR CYLINDER, SAS (16-IN PIPE, 0.25-IN WALL)

12 16131116 60.96 5.08 228.6 19.68 .635 118 1
5.08 6489-10

0.05 0.1 0.2 0.3 0.4 0.5 0.6 0.8 1.0 1.2 1.5 1.8 2.2 2.6

3.0 3.5 4.0 5.0 6.0 7.5

4605+164713+162480+174289+171219+187390+173914+185570+186565+182164+18

1667+189887+173059+177274+165097+157837+147167+144606+13

GEOMETRY TYPE 13 - ANNULAR CYLINDER, SAE (16-IN PIPE, 0.25-IN WALL)

13 16131116 60.96 5.08 228.6 19.68 .635 118 1
5.08 6489-10

0.05 0.1 0.2 0.3 0.4 0.5 0.6 0.8 1.0 1.2 1.5 1.8 2.2 2.6

3.0 3.5 4.0 5.0 6.0 7.5

4605+164713+162480+174289+171219+187390+173914+185570+186565+182164+18

1667+189887+173059+177274+165097+157837+147167+144606+13

GEOMETRY TYPE 5 - SLAB SHIELD PARALLEL TO FACE

5 161311 20.0 5.0 50.0 5.0 25.0 10.0 10.0 5.0 1.0 118 1
6489-10

0.05 0.1 0.2 0.3 0.4 0.5 0.6 0.8 1.0 1.2 1.5 1.8 2.2 2.6

3.0 3.5 4.0 5.0 6.0 7.5

4605+164713+162480+174289+171219+187390+173914+185570+186565+182164+18

1667+189887+173059+177274+165097+157837+147167+144606+13

GEOMETRY TYPE 8 - SPHERE

8 161311 10.0 50.0 5.0 10.0 1.0 118 1
6489-10

0.05 0.1 0.2 0.3 0.4 0.5 0.6 0.8 1.0 1.2 1.5 1.8 2.2 2.6

3.0 3.5 4.0 5.0 6.0 7.5

4605+164713+162480+174289+171219+187390+173914+185570+186565+182164+18

1667+189887+173059+177274+165097+157837+147167+144606+13

Title Verification of Computer Program Page 21 of 23

QAD-P5Z (PC) Version 1.1 EGS-TR-910600-19 Project All

Calculated by HL

Date 10/19/92 Checked by QW

Date 10/20/92

APPENDIX C

FIGURES OF GEOMETRY TYPE 5 - BOX, SLAB
SHIELD PARALLEL TO FACE

Geometry Type 5

Origin Location QAD-P5Z Version 1.0

Geometry Type 5

Origin Location QAD-P5Z Version 1.1

Title Verification of Computer Program Page D1 of D27

QAD-P5Z (PC) Version 1.1 EGS-TR-910600-19 Project All

Calculated by JD

Date 10/19/92 Checked by QWW

Date 10/20/92

APPENDIX D
QADSR OUTPUT OF SAMPLE PROBLEMS

*** PROGRAM QAD-P5Z (PC) IS AT YOUR SERVICE ***

** VERSION NUMBER=1.1 REVISION DATE WAS 6/22/92

* TODAY'S DATE = 10/09/1992 START TIME = 09:56:44

REPRODUCTION OF INPUT DATA DECK

-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+
SHIPPING CASK ANALYSIS QAD-P5Z(PC) VERSION 1

1	18	61.0	30.4	1 1
0	6	5		
1	5	12	0 30.5	0 30.5
2	5	12	61.0 30.5	0 30.5
3	5	12	61.0 30.5	61.0 30.5
4	5	12	61.0 30.5	-61.0 30.5
5	3	3	76.25	
6	3	3	0	
1	0	1	1 5 6	0 0 38.2
2	0	1	2 5 6	61.0 0 38.2
3	0	1	3 5 6	61.0 61.0 38.2
4	0	1	4 5 6	61.0 -61.0 38.2
5	0	5	1 2 3 4 5 6	304.8 0 38.2

1.3

4	1	8	13	14	20	26			
.00916	.899	.12	.617	.0797	.0255				
1.3									
24	23	24	0						
0	1.270833	0	0.261792	0	3.315217				
3.7D+10									
304.8	0	38.2	0	300012100	3000				

12-IN PIPE, 0.375-IN WALL, 3 FT LONG, SUMP WATER DOSE RATE, T=0 HR

6	171311	60.96	91.4491.4415.24	.9525	118	1
						6489-10

0.05	0.1	0.2	0.3	0.4	0.5	0.6	0.8	1.0	1.2	1.5	1.8	2.2	2.6
3.0	3.5	4.0	5.0	6.0	7.5								
4605+164713+162480+174289+171219+187390+173914+185570+186565+182164+18													
1667+189887+173059+177274+165097+157837+147167+144606+130													

16-IN PIPE, 0.25-IN WALL, 7.5 FT LONG, SUMP WATER DOSE RATE, T=0 HR

6	161311	60.96	5.08	228.6	19.68	.635	118	1
								6489-10

0.05	0.1	0.2	0.3	0.4	0.5	0.6	0.8	1.0	1.2	1.5	1.8	2.2	2.6
3.0	3.5	4.0	5.0	6.0	7.5								
4605+164713+162480+174289+171219+187390+173914+185570+186565+182164+18													
1667+189887+173059+177274+165097+157837+147167+144606+130													

GEOMETRY TYPE 7 - CYLINDER SHIELD AT TOP (16-IN PIPE, 0.25-IN WALL)

7	161311	60.96	5.08	228.6	19.68	.635	118	1
								6489-10

0.05	0.1	0.2	0.3	0.4	0.5	0.6	0.8	1.0	1.2	1.5	1.8	2.2	2.6
3.0	3.5	4.0	5.0	6.0	7.5								
4605+164713+162480+174289+171219+187390+173914+185570+186565+182164+18													
1667+189887+173059+177274+165097+157837+147167+144606+13													

GEOMETRY TYPE 12 - ANNULAR CYLINDER, SAS (16-IN PIPE, 0.25-IN WALL)

12	16131116	60.96	5.08	228.6	19.68	.635	118	1
						5.08		6489-10

0.05	0.1	0.2	0.3	0.4	0.5	0.6	0.8	1.0	1.2	1.5	1.8	2.2	2.6
------	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

SHIPPING CASK ANALYSIS QAD-P52(PC) VERSION 1

RCVR 1 R= 3.0480D+02 Z= 3.8200D+01 PHI= 0.0000D+00 SOURCE POINT 3000 LOCATION 11 10 6

GRP NO.	SOURCE STRENGTH (PHOTONS/SEC)	(VI/VOL)/ 4*PI*(R**2) (CM**2)	E**(-UT)	B*E**(-UT)	PARTICLE FLUX (PHOTONS/CM**2/SEC)		GAMMA DOSE RATE (MR/HR)	
					WITHOUT BUILDUP	WITH BUILDUP	WITHOUT BUILDUP	WITH BUILDUP
					1	1.3000D+00	2.1123D+00	2.8979D-04

THE GAMMA DOSE RATE WITH BUILDUP FROM THIS SOURCE POINT = 6.8143D-06 MR/HR

RCVR 1 R= 3.0480D+02 Z= 3.8200D+01 PHI= 0.0000D+00 SOURCE POINT 6000 LOCATION 21 20 11

GRP NO.	SOURCE STRENGTH (PHOTONS/SEC)	(VI/VOL)/ 4*PI*(R**2) (CM**2)	E**(-UT)	B*E**(-UT)	PARTICLE FLUX (PHOTONS/CM**2/SEC)		GAMMA DOSE RATE (MR/HR)	
					WITHOUT BUILDUP	WITH BUILDUP	WITHOUT BUILDUP	WITH BUILDUP
					1	1.3000D+00	3.4848D+00	1.6301D-05

THE GAMMA DOSE RATE WITH BUILDUP FROM THIS SOURCE POINT = 7.7859D-07 MR/HR

RCVR 1 R= 3.0480D+02 Z= 3.8200D+01 PHI= 0.0000D+00 SOURCE POINT 9000 LOCATION 8 7 17

GRP NO.	SOURCE STRENGTH (PHOTONS/SEC)	(VI/VOL)/ 4*PI*(R**2) (CM**2)	E**(-UT)	B*E**(-UT)	PARTICLE FLUX (PHOTONS/CM**2/SEC)		GAMMA DOSE RATE (MR/HR)	
					WITHOUT BUILDUP	WITH BUILDUP	WITHOUT BUILDUP	WITH BUILDUP
					1	1.3000D+00	1.4546D+00	1.1834D-04

THE GAMMA DOSE RATE WITH BUILDUP FROM THIS SOURCE POINT = 2.0544D-06 MR/HR

RCVR 1 R= 3.0480D+02 Z= 3.8200D+01 PHI= 0.0000D+00 SOURCE POINT 12000 LOCATION 18 17 22

GRP NO.	SOURCE STRENGTH (PHOTONS/SEC)	(VI/VOL)/ 4*PI*(R**2) (CM**2)	E**(-UT)	B*E**(-UT)	PARTICLE FLUX (PHOTONS/CM**2/SEC)		GAMMA DOSE RATE (MR/HR)	
					WITHOUT BUILDUP	WITH BUILDUP	WITHOUT BUILDUP	WITH BUILDUP
					1	1.3000D+00	3.9090D+00	1.5129D-03

THE GAMMA DOSE RATE WITH BUILDUP FROM THIS SOURCE POINT = 5.6960D-05 NR/HR

RCVR 1 R= 3.0480D+02 Z= 3.8200D+01 PHI= 0.0000D+00 SOURCE POINT 12100 LOCATION 23 2 22

GRP NO.	SOURCE STRENGTH (PHOTONS/SEC)	(VI/VOL)/ 4*PI*(R**2) (CM**2)	E**(-UT)	B*E**(-UT)	PARTICLE FLUX (PHOTONS/CM**2/SEC)		GAMMA DOSE RATE (NR/HR)	
					WITHOUT BUILDUP	WITH BUILDUP	WITHOUT BUILDUP	WITH BUILDUP
1	1.3000D+00	5.1448D+00	4.2559D-03	1.2110D-02	2.8464D-02	8.0993D-02	6.6729D-05	1.8987D-04

THE GAMMA DOSE RATE WITH BUILDUP FROM THIS SOURCE POINT = 1.8987D-04 NR/HR

PROGRAM Q A D (VERSION 1.1)

RAN ON 10/09/1992

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SHIPPING CASK ANALYSIS QAD-P51(PC) VERSION 1

GEOMETRY TYPE: GENERAL GEOMETRY

SOURCE VOLUME:

MATERIAL 1: SPECIAL	DENSITY FACTOR: 1.000	SOURCE VOLUME: 2.2283D+05
MATERIAL 2: VOID	DENSITY FACTOR: 1.000	
MATERIAL 3: VOID	DENSITY FACTOR: 1.000	

DISTANCES:

CLAD-TO-SHIELD	=	.00 CM
SHIELD-TO-DETECTOR	=	.00 CM
DISPLACEMENT	=	.00 CM

DETECTOR NUMBER 1

COORDINATES - R 3.0480D+02 PHI 0.0000D+00 Z 3.8200D+01

GMP NO	MEAN ENERGY MEV	SOURCE STRENGTH PHOTONS/SEC	MEAN BUILDUP FACTORS	PARTICLE FLUX DIRECT BEAM PHOTONS PER CM**2-SEC	GAMMA DOSE RATE WITH BUILDUP (MR/HR)
1	1.3000	1.300D+00	2.9018D+00	5.6231D+01	3.8252D-01
	TOTAL:	1.300D+00		5.6231D+01	3.8252D-01

PROGRAM Q A D (VERSION 1.1)

RAN ON 10/09/1992

12-IN PIPE, 0.375-IN WALL, 3 FT LONG, SUMP WATER DOSE RATE, T=0 HR

GEOMETRY TYPE: CYLINDER, SHIELD AT SIDE

SOURCE VOLUME:

MATERIAL: WATER

RADIUS:

15.24

HEIGHT:

91.44

VOLUME: 6.6720D+04

CLADDING:

MATERIAL: IRON

THICKNESS:

.95

SHIELD:

MATERIAL: AIR

THICKNESS:

.00

DISTANCES:

CLAD-TO-SHIELD = .00 CM

SHIELD-TO-DETECTOR = .00 CM

DISPLACEMENT = .00 CM

DETECTOR NUMBER 1 SURFACE OF VOLUME COORDINATES - X 1.6192D+01 Y 0.0000D+00 Z 4.5720D+01

GRP NO	MEAN ENERGY KEV	SOURCE STRENGTH PROTONS/SEC	MEAN BUILDUP FACTORS	PARTICLE FLUX DIRECT BEAM PHOTONS PER CM**2-SEC	GAMMA DOSE RATE WITH BUILDUP (MR/HR)
1	.0500	1.994D+12	2.3615D+02	1.7467D+00	1.1978D-01
2	.1000	2.040D+12	5.3300D+01	1.4092D+06	2.1256D+04
3	.2000	1.074D+13	1.2755D+01	7.2746D+07	4.6487D+05
4	.3000	1.857D+13	7.5885D+00	2.0402D+08	1.1751D+06
5	.4000	5.278D+13	5.6594D+00	7.5405D+08	4.2035D+06
6	.5000	3.199D+13	4.6416D+00	5.4945D+08	2.9839D+06
7	.6000	1.695D+14	3.9922D+00	3.3565D+09	1.8224D+07
8	.8000	2.412D+14	3.2254D+00	5.9294D+09	3.2129D+07
9	1.0000	2.842D+14	2.7842D+00	8.2113D+09	4.5267D+07
10	1.2000	9.369D+13	2.4987D+00	3.0764D+09	1.7175D+07
11	1.5000	7.217D+13	2.2228D+00	2.7408D+09	1.5413D+07
12	1.8000	4.281D+13	2.0433D+00	1.8134D+09	1.0810D+07
13	2.2000	1.324D+13	1.8812D+00	6.2586D+08	4.0436D+06
14	2.6000	3.149D+12	1.7677D+00	1.6165D+08	1.0989D+06
15	3.0000	2.207D+11	1.6819D+00	1.2110D+07	8.5136D+04
16	3.5000	3.393D+10	1.6023D+00	1.9802D+06	1.4650D+04
17	4.0000	3.103D+10	1.5397D+00	1.9050D+06	1.4724D+04
18	5.0000	1.994D+09	1.4510D+00	1.3139D+05	1.1458D+03
TOTAL:		1.038D+15		2.7513D+10	1.5312D+08

***** PROGRAM Q A D (VERSION 1.1) RAN ON 10/09/1992 *****

12-IN PIPE, 0.375-IN WALL, 3 FT LONG, SUMP WATER DOSE RATE, T=0 HR

GEOMETRY TYPE: CYLINDER, SHIELD AT SIDE

SOURCE VOLUME:

MATERIAL: WATER RADIUS: 15.24 HEIGHT: 91.44 VOLUME: 6.6720D+04

CLADDING:

MATERIAL: IRON THICKNESS: .95

SHIELD:

MATERIAL: AIR THICKNESS: .00

DISTANCES:

CLAD-TO-SHIELD = .00 CM

SHIELD-TO-DETECTOR = .00 CM

DISPLACEMENT = .00 CM

DETECTOR NUMBER 2 CM TO SHLD COORDINATES - X 1.6192D+01 Y 0.0000D+00 Z 4.5720D+01

GRP NO	MEAN ENERGY MEV	SOURCE STRENGTH PHOTONS/SEC	MEAN BUILDUP FACTORS	PARTICLE FLUX DIRECT BEAM PHOTONS PER CM**2-SEC	GAMMA DOSE RATE WITH BUILDUP (MR/HR)
1	.0500	1.994D+12	2.3615D+02	1.7467D+00	1.1978D-01
2	.1000	2.040D+12	5.3300D+01	1.4092D+06	2.1256D+04
3	.2000	1.074D+13	1.2755D+01	7.2746D+07	4.6487D+05
4	.3000	1.857D+13	7.5885D+00	2.0402D+08	1.1751D+06
5	.4000	5.278D+13	5.6594D+00	7.5405D+08	4.2035D+06
6	.5000	3.199D+13	4.6416D+00	5.4945D+08	2.9839D+06
7	.6000	1.695D+14	3.9922D+00	3.3565D+09	1.8224D+07
8	.8000	2.412D+14	3.2254D+00	5.9294D+09	3.2129D+07
9	1.0000	2.842D+14	2.7842D+00	8.2113D+09	4.5267D+07
10	1.2000	9.369D+13	2.4987D+00	3.0764D+09	1.7175D+07
11	1.5000	7.217D+13	2.2228D+00	2.7408D+09	1.5413D+07
12	1.8000	4.281D+13	2.0433D+00	1.8134D+09	1.0810D+07
13	2.2000	1.324D+13	1.8812D+00	6.2586D+08	4.0436D+06
14	2.6000	3.149D+12	1.7677D+00	1.6165D+08	1.0989D+06
15	3.0000	2.207D+11	1.6819D+00	1.2110D+07	8.5136D+04
16	3.5000	3.393D+10	1.6023D+00	1.9802D+06	1.4650D+04
17	4.0000	3.103D+10	1.5397D+00	1.9050D+06	1.4724D+04
18	5.0000	1.994D+09	1.4510D+00	1.3139D+05	1.1458D+03
TOTAL:		1.038D+15		2.7513D+10	1.5312D+08

***** PROGRAM Q A D (VERSION 1.1) RAN ON 10/09/1992 *****

12-IN PIPE, 0.375-IN WALL, 3 FT LONG, SUMP WATER DOSE RATE, T=0 HR

GEOMETRY TYPE: CYLINDER, SHIELD AT SIDE

SOURCE VOLUME:

MATERIAL: WATER RADIUS: 15.24 HEIGHT: 91.44 VOLUME: 6.6720D+04

CLADDING:

MATERIAL: IRON THICKNESS: .95

SHIELD:

MATERIAL: AIR THICKNESS: 60.96

DISTANCES:

CLAD-TO-SHIELD = .00 CM
SHIELD-TO-DETECTOR = .00 CM
DISPLACEMENT = .00 CM

DETECTOR NUMBER 3 AT /O OF SHLD COORDINATES - X 7.7152D+01 Y 0.0000D+00 Z 9.1440D+01

GRP #	MEAN ENERGY KEV	SOURCE STRENGTH PHOTONS/SEC	MEAN BUILDUP FACTORS	PARTICLE FLUX DIRECT BEAM PHOTONS PER CM**2-SEC	GAMMA DOSE RATE WITH BUILDUP (MR/HR)
1	.0500	1.994D+12	2.0725D+02	3.9107D-01	2.3537D-02
2	.1000	2.040D+12	4.7213D+01	1.4523D+05	1.9405D+03
3	.2000	1.074D+13	1.1420D+01	6.4322D+06	3.6801D+04
4	.3000	1.857D+13	6.8290D+00	1.7405D+07	9.0212D+04
5	.4000	5.278D+13	5.1235D+00	6.3078D+07	3.1833D+05
6	.5000	3.199D+13	4.2235D+00	4.5320D+07	2.2395D+05
7	.6000	1.695D+14	3.6476D+00	2.7374D+08	1.3580D+06
8	.8000	2.412D+14	2.9666D+00	4.7496D+08	2.3671D+06
9	1.0000	2.842D+14	2.5745D+00	6.4839D+08	3.3052D+06
10	1.2000	9.369D+13	2.3204D+00	2.4003D+08	1.2444D+06
11	1.5000	7.217D+13	2.0748D+00	2.1077D+08	1.1064D+06
12	1.8000	4.281D+13	1.9147D+00	1.3789D+08	7.7028D+05
13	2.2000	1.324D+13	1.7704D+00	4.7035D+07	2.8598D+05
14	2.6000	3.149D+12	1.6695D+00	1.2037D+07	7.7282D+04
15	3.0000	2.207D+11	1.5933D+00	8.9485D+05	5.9597D+03
16	3.5000	3.393D+10	1.5228D+00	1.4530D+05	1.0217D+03
17	4.0000	3.103D+10	1.4675D+00	1.3895D+05	1.0236D+03
18	5.0000	1.994D+09	1.3896D+00	9.5051D+03	7.9384D+01
TOTAL:		1.038D+15		2.1784D+09	1.1194D+07

***** PROGRAM Q A D (VERSION 1.1) RUN ON 10/09/1992 *****

16-IN PIPE, 0.25-IN WALL, 7.5 FT LONG, SUMP WATER DOSE RATE, T=0 HR

GEOMETRY TYPE: CYLINDER, SHIELD AT SIDE

SOURCE VOLUME:

MATERIAL: WATER RADIUS: 19.68 HEIGHT: 228.60 VOLUME: 2.7815D+05

CLADDING:

MATERIAL: IRON THICKNESS: .64

SHIELD:

MATERIAL: CONCRETE THICKNESS: .00

DISTANCES:

CLAD-TO-SHIELD = 5.08 CM

SHIELD-TO-DETECTOR = .00 CM

DISPLACEMENT = .00 CM

DETECTOR NUMBER 1 SURFACE OF VOLUM COORDINATES - X 2.0315D+01 Y 0.0000D+00 Z 1.1430D+02

GRP NO	MEAN ENERGY MEV	SOURCE STRENGTH PHOTONS/SEC	MEAN BUILDUP FACTORS	PARTICLE FLUX DIRECT BEAM PHOTONS PER CM**2-SEC	GAMMA DOSE RATE WITH BUILDUP (MR/HR)
1	.0500	8.312D+12	1.3321D+02	2.6369D+02	1.0201D+01
2	.1000	8.507D+12	3.4897D+01	4.2780D+06	4.2249D+04
3	.2000	4.476D+13	1.0376D+01	1.2452D+08	6.4727D+05
4	.3000	7.741D+13	6.5480D+00	3.1983D+08	1.5895D+06
5	.4000	2.200D+14	5.0374D+00	1.1395D+09	5.6541D+06
6	.5000	1.334D+14	4.2163D+00	8.1245D+08	4.0079D+06
7	.6000	7.064D+14	3.6805D+00	4.8897D+09	2.4475D+07
8	.8000	1.005D+15	3.0354D+00	8.4690D+09	4.3187D+07
9	1.0000	1.185D+15	2.6566D+00	1.1582D+10	6.0923D+07
10	1.2000	3.906D+14	2.4078D+00	4.3037D+09	2.3153D+07
11	1.5000	3.009D+14	2.1639D+00	3.8041D+09	2.0826D+07
12	1.8000	1.785D+14	2.0024D+00	2.5081D+09	1.4653D+07
13	2.2000	5.521D+13	1.8544D+00	8.6429D+08	5.5045D+06
14	2.6000	1.313D+13	1.7491D+00	2.2332D+08	1.5021D+06
15	3.0000	9.200D+11	1.6688D+00	1.6744D+07	1.1680D+05
16	3.5000	1.415D+11	1.5929D+00	2.7459D+06	2.0197D+04
17	4.0000	1.294D+11	1.5329D+00	2.6487D+06	2.0382D+04
18	5.0000	8.313D+09	1.4464D+00	1.8386D+05	1.5983D+03
TOTAL:		4.329D+15		3.9067D+10	2.0632D+08

***** PROGRAM Q A D (VERSION 1.1) RAN ON 10/09/1992 *****

16-IN PIPE, 0.25-IN WALL, 7.5 FT LONG, SUMP WATER DOSE RATE, T=0 HR

GEOMETRY TYPE: CYLINDER, SHIELD AT SIDE

SOURCE VOLUME:

MATERIAL: WATER RADIUS: 19.68 HEIGHT: 228.60 VOLUME: 2.7815D+05

CLADDING:

MATERIAL: IRON THICKNESS: .64

SHIELD:

MATERIAL: CONCRETE THICKNESS: .00

DISTANCES:

CLAD-TO-SHIELD = 5.08 CM
SHIELD-TO-DETECTOR = .00 CM
DISPLACEMENT = .00 CM

DETECTOR NUMBER 2 CM TO SHLD COORDINATES - X 2.5395D+01 Y 0.0000D+00 Z 1.1430D+02

GRP NO	MEAN ENERGY MEV	SOURCE STRENGTH PHOTONS/SEC	MEAN BUILDUP FACTORS	PARTICLE FLUX DIRECT BEAM PHOTONS PER CM**2-SEC	GAMMA DOSE RATE WITH BUILDUP (MR/HR)
1	.0500	8.312D+12	1.1265D+02	4.4338D+02	1.4505D+01
2	.1000	8.507D+12	3.1437D+01	3.5991D+06	3.2020D+04
3	.2000	4.476D+13	9.8983D+00	9.5597D+07	4.7407D+05
4	.3000	7.741D+13	6.3324D+00	2.4177D+08	1.1620D+06
5	.4000	2.200D+14	4.9071D+00	8.5510D+08	4.1331D+06
6	.5000	1.334D+14	4.1266D+00	6.0689D+08	2.9301D+06
7	.6000	7.064D+14	3.6142D+00	3.6409D+09	1.7896D+07
8	.8000	1.005D+15	2.9941D+00	6.2790D+09	3.1584D+07
9	1.0000	1.185D+15	2.6279D+00	8.5635D+09	4.4558D+07
10	1.2000	3.906D+14	2.3863D+00	3.1760D+09	1.6934D+07
11	1.5000	3.009D+14	2.1485D+00	2.8019D+09	1.5230D+07
12	1.8000	1.785D+14	1.9904D+00	1.8450D+09	1.0714D+07
13	2.2000	5.521D+13	1.8449D+00	6.3515D+08	4.0245D+06
14	2.6000	1.313D+13	1.7411D+00	1.6400D+08	1.0981D+06
15	3.0000	9.200D+11	1.6618D+00	1.2290D+07	8.5370D+04
16	3.5000	1.415D+11	1.5866D+00	2.0147D+06	1.4760D+04
17	4.0000	1.294D+11	1.5271D+00	1.9428D+06	1.4894D+04
18	5.0000	8.313D+09	1.4413D+00	1.3481D+05	1.1677D+03
TOTAL:		4.329D+15		2.8925D+10	1.5089D+08

*** PROGRAM Q A D (VERSION 1.1) RAN ON 10/09/1992 ***

16-IN PIPE, 0.25-IN WALL, 7.5 FT LONG, SUMP WATER DOSE RATE, T=0 HR

GEOMETRY TYPE: CYLINDER, SHIELD AT SIDE

SOURCE VOLUME:

MATERIAL: WATER RADIUS: 19.68 HEIGHT: 228.60 VOLUME: 2.7815D+05

CLADDING:

MATERIAL: IRON THICKNESS: .64

SHIELD:

MATERIAL: CONCRETE THICKNESS: 60.96

DISTANCES:

CLAD-TO-SHIELD = 5.08 CM
SHIELD-TO-DETECTOR = .00 CM
DISPLACEMENT = .00 CM

DETECTOR NUMBER 3 AT % OF SHLD COORDINATES - X 8.6355D+01 Y 0.0000D+00 Z 1.1430D+02

GRP NO	MEAN ENERGY MEV	SOURCE STRENGTH PHOTONS/SEC	MEAN BUILDUP FACTORS	PARTICLE FLUX DIRECT BEAM PHOTONS PER CM**2-SEC	GAMMA DOSE RATE WITH BUILDUP (MR/HR)
1	.0500	8.312D+12	0.0000D+00	0.0000D+00	0.0000D+00
2	.1000	8.507D+12	1.2012D+02	5.0349D-06	1.7115D-07
3	.2000	4.476D+13	2.0104D+02	1.8795D-01	1.8931D-02
4	.3000	7.741D+13	1.4316D+02	6.3463D+00	6.8956D-01
5	.4000	2.200D+14	9.6260D+01	1.1873D+02	1.1257D+01
6	.5000	1.334D+14	6.8129D+01	2.8425D+02	2.2658D+01
7	.6000	7.064D+14	5.0741D+01	4.4064D+03	3.0408D+02
8	.8000	1.005D+15	3.1859D+01	3.1473D+04	1.6845D+03
9	1.0000	1.185D+15	2.2349D+01	1.2111D+05	5.3591D+03
10	1.2000	3.906D+14	1.6930D+01	1.0121D+05	3.8287D+03
11	1.5000	3.009D+14	1.2383D+01	2.1961D+05	6.8804D+03
12	1.8000	1.785D+14	9.8395D+00	2.8428D+05	8.1609D+03
13	2.2000	5.521D+13	7.8034D+00	1.9105D+05	5.1202D+03
14	2.6000	1.313D+13	6.5186D+00	8.1528D+04	2.0438D+03
15	3.0000	9.200D+11	5.6340D+00	9.1038D+03	2.1440D+02
16	3.5000	1.415D+11	4.8778D+00	2.1714D+03	4.8906D+01
17	4.0000	1.294D+11	4.3286D+00	2.8373D+03	6.1655D+01
18	5.0000	8.313D+09	3.5870D+00	3.0297D+02	6.5314D+00
TOTAL:		4.329D+15		1.0495D+06	3.3748D+04

PROGRAM Q A D (VERSION 1.1)

RAN ON 10/09/1992

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GEOMETRY TYPE 7 - CYLINDER SHIELD AT TOP (16-IN PIPE, 0.25-IN WALL)

GEOMETRY TYPE: CYLINDER, SHIELD AT END

SOURCE VOLUME:

MATERIAL: WATER

RADIUS:

19.68

HEIGHT:

228.60

VOLUME: 2.7815D+05

CLADDING:

MATERIAL: IRON

THICKNESS:

.64

SHIELD:

MATERIAL: CONCRETE

THICKNESS:

.00

DISTANCES:

CLAD-TO-SHIELD = 5.08 CM

SHIELD-TO-DETECTOR = .00 CM

DISPLACEMENT = .00 CM

DETECTOR NUMBER 1 SURFACE OF VOLUM COORDINATES - X 0.0000D+00 Y 0.0000D+00 Z 2.2924D+02

GRP NO	MEAN ENERGY KEV	SOURCE STRENGTH PHOTONS/SEC	MEAN BUILDUP FACTORS	PARTICLE FLUX DIRECT BEAM PHOTONS PER CM**2-SEC	GAMMA DOSE RATE WITH BUILDUP (MR/HR)
1	.0500	8.312D+12	1.2532D+02	5.0753D+02	1.8471D+01
2	.1000	8.507D+12	2.8946D+01	5.7509D+06	4.7110D+04
3	.2000	4.476D+13	9.1235D+00	1.4865D+08	6.7946D+05
4	.3000	7.741D+13	5.8453D+00	3.7175D+08	1.6493D+06
5	.4000	2.200D+14	4.5384D+00	1.3022D+09	5.8214D+06
6	.5000	1.334D+14	3.8241D+00	9.1650D+08	4.1005D+06
7	.6000	7.064D+14	3.3551D+00	5.4571D+09	2.4900D+07
8	.8000	1.005D+15	2.7884D+00	9.2892D+09	4.3515D+07
9	1.0000	1.185D+15	2.4547D+00	1.2528D+10	6.0888D+07
10	1.2000	3.906D+14	2.2350D+00	4.5997D+09	2.2969D+07
11	1.5000	3.009D+14	2.0194D+00	4.0073D+09	2.0473D+07
12	1.8000	1.785D+14	1.8765D+00	2.6099D+09	1.4289D+07
13	2.2000	5.521D+13	1.7460D+00	8.8743D+08	5.3213D+06
14	2.6000	1.313D+13	1.6534D+00	2.2679D+08	1.4420D+06
15	3.0000	9.200D+11	1.5829D+00	1.6848D+07	1.1148D+05
16	3.5000	1.415D+11	1.5168D+00	2.7368D+06	1.9167D+04
17	4.0000	1.294D+11	1.4645D+00	2.6189D+06	1.9253D+04
18	5.0000	8.313D+09	1.3897D+00	1.7955D+05	1.4996D+03
TOTAL:		4.329D+15		4.2372D+10	2.0625D+08

***** PROGRAM Q A D (VERSION 1.1) RAN ON 10/09/1992 *****

GEOMETRY TYPE 7 - CYLINDER SHIELD AT TOP (16-IN PIPE, 0.25-IN WALL)

GEOMETRY TYPE: CYLINDER, SHIELD AT END

SOURCE VOLUME:

MATERIAL: WATER RADIUS: 19.68 HEIGHT: 228.60 VOLUME: 2.7815D+05

CLADDING:

MATERIAL: IRON THICKNESS: .64

SHIELD:

MATERIAL: CONCRETE THICKNESS: .00

DISTANCES:

CLAD-TO-SHIELD = 5.08 CM

SHIELD-TO-DETECTOR = .00 CM

DISPLACEMENT = .00 CM

DETECTOR NUMBER 2 CM TO SHLD COORDINATES - X 0.0000D+00 Y 0.0000D+00 Z 2.3432D+02

GRP	MEAN ENERGY KEV	SOURCE STRENGTH PHOTONS/SEC	MEAN BUILDUP FACTORS	PARTICLE FLUX DIRECT BEAM PHOTONS PER CM**2-SEC	GAMMA DOSE RATE WITH BUILDUP (MR/HR)
0					
1	.0500	8.312D+12	1.0921D+02	6.4891D+02	2.0579D+01
2	.1000	8.507D+12	2.8582D+01	4.7887D+06	3.8735D+04
3	.2000	4.476D+13	8.1024D+00	1.1971D+08	4.8595D+05
4	.3000	7.741D+13	5.1334D+00	2.9197D+08	1.1376D+06
5	.4000	2.200D+14	4.0023D+00	1.0045D+09	3.9600D+06
6	.5000	1.334D+14	3.3943D+00	6.9680D+08	2.7672D+06
7	.6000	7.064D+14	2.9972D+00	4.0987D+09	1.6707D+07
8	.8000	1.005D+15	2.5201D+00	6.8392D+09	2.8956D+07
9	1.0000	1.185D+15	2.2407D+00	9.0784D+09	4.0276D+07
10	1.2000	3.906D+14	2.0571D+00	3.2900D+09	1.5121D+07
11	1.5000	3.009D+14	1.8768D+00	2.8231D+09	1.3405D+07
12	1.8000	1.785D+14	1.7571D+00	1.8179D+09	9.3198D+06
13	2.2000	5.521D+13	1.6475D+00	6.1130D+08	3.4589D+06
14	2.6000	1.313D+13	1.5696D+00	1.5496D+08	9.3531D+05
15	3.0000	9.200D+11	1.5100D+00	1.1437D+07	7.2187D+04
16	3.5000	1.415D+11	1.4537D+00	1.8477D+06	1.2403D+04
17	4.0000	1.294D+11	1.4090D+00	1.7604D+06	1.2452D+04
18	5.0000	8.313D+09	1.3448D+00	1.2006D+05	9.7032D+02
TOTAL:					
		4.329D+15		3.0846D+10	1.3667D+08

***** PROGRAM Q A D (VERSION 1.1) RAN ON 10/09/1992 *****

GEOMETRY TYPE 7 - CYLINDER SHIELD AT TOP (16-IN PIPE, 0.25-IN WALL)

GEOMETRY TYPE: CYLINDER, SHIELD AT END

SOURCE VOLUME:

MATERIAL: WATER RADIUS: 19.68 HEIGHT: 228.60 VOLUME: 2.7815D+05

CLADDING:

MATERIAL: IRON THICKNESS: .64

SHIELD:

MATERIAL: CONCRETE THICKNESS: 60.96

DISTANCES:

CLAD-TO-SHIELD = 5.08 CM
SHIELD-TO-DETECTOR = .00 CM
DISPLACEMENT = .00 CM

DETECTOR NUMBER 3 AT 0 / 0 OF SHLD COORDINATES - X 0.0000D+00 Y 0.0000D+00 Z 2.9527D+02

GRP	MEAN ENERGY MEV	SOURCE STRENGTH PHOTONS/SEC	MEAN BUILDUP FACTORS	PARTICLE FLUX DIRECT BEAM PHOTONS PER CM**2-SEC	GAMMA DOSE RATE WITH BUILDUP (MR/HR)
0					
1	.0500	8.312D+12	0.0000D+00	0.0000D+00	0.0000D+00
2	.1000	8.507D+12	1.1710D+02	5.7214D-06	1.8960D-07
3	.2000	4.476D+13	1.9061D+02	1.6682D-01	1.5930D-02
4	.3000	7.741D+13	1.3495D+02	5.1782D+00	5.3041D-01
5	.4000	2.200D+14	9.0688D+01	9.1685D+01	8.1900D+00
6	.5000	1.334D+14	6.4211D+01	2.1045D+02	1.5810D+01
7	.6000	7.064D+14	4.7872D+01	3.1519D+03	2.0521D+02
8	.8000	1.005D+15	3.0144D+01	2.1321D+04	1.0798D+03
9	1.0000	1.185D+15	2.1205D+01	7.8676D+04	3.3032D+03
10	1.2000	3.906D+14	1.6104D+01	6.3560D+04	2.2869D+03
11	1.5000	3.009D+14	1.1820D+01	1.3266D+05	3.9672D+03
12	1.8000	1.785D+14	9.4206D+00	1.6680D+05	4.5847D+03
13	2.2000	5.521D+13	7.4976D+00	1.0895D+05	2.8053D+03
14	2.6000	1.313D+13	6.2819D+00	4.5532D+04	1.0999D+03
15	3.0000	9.200D+11	5.4437D+00	5.0019D+03	1.1382D+02
16	3.5000	1.415D+11	4.7263D+00	1.1767D+03	2.5680D+01
17	4.0000	1.294D+11	4.2043D+00	1.5211D+03	3.2105D+01
18	5.0000	8.313D+09	3.4972D+00	1.6040D+02	3.3714D+00
TOTAL:		4.329D+15		6.2882D+05	1.9532D+04

PROGRAM Q A D (VERSION 1.1)

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GEOMETRY TYPE 12 - ANNULAR CYLINDER, SAS (16-IN PIPE, 0.25-IN WALL)

GEOMETRY TYPE: ANNULUS , SHIELD AT SIDE

SOURCE VOLUME:

MATERIAL: WATER

RADIUS:

19.68

HEIGHT:

228.60

VOLUME: 2.5961D+05

CLADDING:

MATERIAL: IRON

THICKNESS:

.64

SHIELD:

MATERIAL: CONCRETE

THICKNESS:

.00

CENTER CYLINDER:

MATERIAL: CONCRETE

RADIUS:

5.08

HEIGHT:

228.60

DISTANCES:

CLAD-TO-SHIELD = 5.08 CM

SHIELD-TO-DETECTOR = .00 CM

DISPLACEMENT = .00 CM

DETECTOR NUMBER 1 SURFACE OF VOLUME COORDINATES - X 2.0315D+01 Y 0.0000D+00 Z 1.1430D+02

GRP NO	MEAN ENERGY KEV	SOURCE STRENGTH PHOTONS/SEC	MEAN BUILDUP FACTORS	PARTICLE FLUX DIRECT BEAM PHOTONS PER CM**2-SEC	GAMMA DOSE RATE WITH BUILDUP (MR/HR)
1	.0500	7.758D+12	1.3003D+02	2.6861D+02	1.0143D+01
2	.1000	7.940D+12	3.3541D+01	4.2419D+06	4.0265D+04
3	.2000	4.178D+13	9.9597D+00	1.2277D+08	6.1261D+05
4	.3000	7.225D+13	6.3044D+00	3.1351D+08	1.5002D+06
5	.4000	2.054D+14	4.8677D+00	1.1113D+09	5.3285D+06
6	.5000	1.245D+14	4.0874D+00	7.8906D+08	3.7735D+06
7	.6000	6.594D+14	3.5778D+00	4.7324D+09	2.3027D+07
8	.8000	9.383D+14	2.9639D+00	8.1516D+09	4.0590D+07
9	1.0000	1.106D+15	2.6030D+00	1.1102D+10	5.7219D+07
10	1.2000	3.646D+14	2.3657D+00	4.1116D+09	2.1733D+07
11	1.5000	2.808D+14	2.1326D+00	3.6211D+09	1.9538D+07
12	1.8000	1.666D+14	1.9780D+00	2.3806D+09	1.3739D+07
13	2.2000	5.153D+13	1.8361D+00	8.1803D+08	5.1583D+06
14	2.6000	1.225D+13	1.7348D+00	2.1091D+08	1.4071D+06
15	3.0000	8.587D+11	1.6575D+00	1.5787D+07	1.0938D+05
16	3.5000	1.320D+11	1.5842D+00	2.5846D+06	1.8906D+04
17	4.0000	1.207D+11	1.5261D+00	2.4898D+06	1.9074D+04
18	5.0000	7.759D+09	1.4421D+00	1.7247D+05	1.4948D+03
TOTAL:		4.040D+15		3.7490D+10	1.9381D+08

***** PROGRAM Q A D (VERSION 1.1) RAN ON 10/09/1992 *****

GEOMETRY TYPE 12 - ANNULAR CYLINDER, SAS (16-IN PIPE, 0.25-IN WALL)

GEOMETRY TYPE: ANNULUS , SHIELD AT SIDE

SOURCE VOLUME:

MATERIAL: WATER RADIUS: 19.68 HEIGHT: 228.60 VOLUME: 2.5961D+05

CLADDING:

MATERIAL: IRON THICKNESS: .64

SHIELD:

MATERIAL: CONCRETE THICKNESS: .00

CENTER CYLINDER:

MATERIAL: CONCRETE RADIUS: 5.08 HEIGHT: 228.60

DISTANCES:

CLAD-TO-SHIELD = 5.08 CM
SHIELD-TO-DETECTOR = .00 CM
DISPLACEMENT = .00 CM

DETECTOR NUMBER 2 CM TO SHLD COORDINATES - X 2.5395D+01 Y 0.0000D+00 Z 1.1430D+02

GRP NO	MEAN ENERGY MEV	SOURCE STRENGTH PROTONS/SEC	MEAN BUILDUP FACTORS	PARTICLE FLUX DIRECT BEAM PROTONS PER CM**2-SEC	GAMMA DOSE RATE WITH BUILDUP (MR/HR)
1	.0500	7.758D+12	1.1113D+02	4.3812D+02	1.4139D+01
2	.1000	7.940D+12	3.0280D+01	3.5409D+06	3.0343D+04
3	.2000	4.178D+13	9.4809D+00	9.3715D+07	4.4514D+05
4	.3000	7.225D+13	6.0813D+00	2.3561D+08	1.0875D+06
5	.4000	2.054D+14	4.7298D+00	8.2894D+08	3.8619D+06
6	.5000	1.245D+14	3.9909D+00	5.8576D+08	2.7351D+06
7	.6000	6.594D+14	3.5055D+00	3.5011D+09	1.6692D+07
8	.8000	9.383D+14	2.9179D+00	6.0029D+09	2.9427D+07
9	1.0000	1.106D+15	2.5706D+00	8.1506D+09	4.1485D+07
10	1.2000	3.646D+14	2.3413D+00	3.0121D+09	1.5757D+07
11	1.5000	2.808D+14	2.1150D+00	2.6470D+09	1.4164D+07
12	1.8000	1.666D+14	1.9643D+00	1.7377D+09	9.9590D+06
13	2.2000	5.153D+13	1.8254D+00	5.9639D+08	3.7388D+06
14	2.6000	1.225D+13	1.7260D+00	1.5364D+08	1.0198D+06
15	3.0000	8.587D+11	1.6498D+00	1.1494D+07	7.9261D+04
16	3.5000	1.320D+11	1.5775D+00	1.8808D+06	1.3699D+04
17	4.0000	1.207D+11	1.5200D+00	1.8111D+06	1.3820D+04
18	5.0000	7.759D+09	1.4369D+00	1.2541D+05	1.0830D+03
TOTAL:		4.040D+15		2.7564D+10	1.4051D+08

***** PROGRAM Q A D (VERSION 1.1) RAN ON 10/09/1992 *****

GEOMETRY TYPE 12 - ANNULAR CYLINDER, SAS (16-IN PIPE, 0.25-IN WALL)

GEOMETRY TYPE: ANNULUS , SHIELD AT SIDE

SOURCE VOLUME:
MATERIAL: WATER RADIUS: 19.68 HEIGHT: 228.60 VOLUME: 2.5961D+05

CLADDING:
MATERIAL: IRON THICKNESS: .64

SHIELD:
MATERIAL: CONCRETE THICKNESS: 60.96

CENTER CYLINDER:
MATERIAL: CONCRETE RADIUS: 5.08 HEIGHT: 228.60

ISTANCES:
CLAD-TO-SHIELD = 5.08 CM
SHIELD-TO-DETECTOR = .00 CM
DISPLACEMENT = .00 CM

DETECTOR NUMBER 3 AT 0 OF SHLD COORDINATES - X 8.6355D+01 Y 0.0000D+00 Z 1.1430D+02

JRP NO	MEAN ENERGY MEV	SOURCE STRENGTH PHOTONS/SEC	MEAN BUILDUP FACTORS	PARTICLE FLUX DIRECT BEAM PHOTONS PER CM**2-SEC	GAMMA DOSE RATE WITH BUILDUP (MR/HR)
1	.0500	7.758D+12	0.0000D+00	0.0000D+00	0.0000D+00
2	.1000	7.940D+12	1.1966D+02	4.9043D-06	1.6607D-07
3	.2000	4.178D+13	1.9959D+02	1.8163D-01	1.8162D-02
4	.3000	7.225D+13	1.4204D+02	6.0845D+00	6.5594D-01
5	.4000	2.054D+14	9.5524D+01	1.1310D+02	1.0642D+01
6	.5000	1.245D+14	6.7632D+01	2.6940D+02	2.1317D+01
7	.6000	6.594D+14	5.0392D+01	4.1589D+03	2.8503D+02
8	.8000	9.383D+14	3.1669D+01	2.9521D+04	1.5706D+03
9	1.0000	1.106D+15	2.2233D+01	1.1309D+05	4.9785D+03
10	1.2000	3.646D+14	1.6855D+01	9.4196D+04	3.5473D+03
11	1.5000	2.808D+14	1.2339D+01	2.0368D+05	6.3582D+03
12	1.8000	1.666D+14	9.8107D+00	2.6299D+05	7.5277D+03
13	2.2000	5.153D+13	7.7862D+00	1.7633D+05	4.7153D+03
14	2.6000	1.225D+13	6.5079D+00	7.5124D+04	1.8801D+03
15	3.0000	8.587D+11	5.6272D+00	8.3792D+03	1.9709D+02
16	3.5000	1.320D+11	4.8740D+00	1.9963D+03	4.4927D+01
17	4.0000	1.207D+11	4.3268D+00	2.6064D+03	5.6613D+01
18	5.0000	7.759D+09	3.5873D+00	2.7798D+02	5.9932D+00
TOTAL:		4.040D+15		9.7274D+05	3.1200D+04

PROGRAM Q A D (VERSION 1.1)

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GEOMETRY TYPE 13 - ANNULAR CYLINDER, SAE (16-IN PIPE, 0.25-IN WALL)

GEOMETRY TYPE: ANNULUS , SHIELD AT END

SOURCE VOLUME:

MATERIAL: WATER RADIUS: 19.68 HEIGHT: 228.60

VOLUME: 2.5961D+05

CLADDING:

MATERIAL: IRON THICKNESS: .64

SHIELD:

MATERIAL: CONCRETE THICKNESS: .00

CENTER CYLINDER:

MATERIAL: CONCRETE RADIUS: 5.08 HEIGHT: 228.60

DISTANCES:

CLAD-TO-SHIELD = 5.08 CM

SHIELD-TO-DETECTOR = .00 CM

DISPLACEMENT = .00 CM

DETECTOR NUMBER 1 SURFACE OF VOLUME COORDINATES - X 0.0000D+00 Y 0.0000D+00 Z 2.2924D+02

GRP NO	MEAN ENERGY MEV	SOURCE STRENGTH PHOTONS/SEC	MEAN BUILDUP FACTORS	PARTICLE FLUX DIRECT BEAM PHOTONS PER CM**2-SEC	GAMMA DOSE RATE WITH BUILDUP (MR/HR)
1	.0500	7.758D+12	3.4075D+02	7.2023D-02	7.1269D-03
2	.1000	7.940D+12	1.1233D+02	2.4275D+05	7.7164D+03
3	.2000	4.178D+13	2.5373D+01	2.0895D+07	2.6561D+05
4	.3000	7.225D+13	1.3541D+01	7.1080D+07	7.3052D+05
5	.4000	2.054D+14	9.3008D+00	2.9551D+08	2.7073D+06
6	.5000	1.245D+14	7.1783D+00	2.3402D+08	1.9655D+06
7	.6000	6.594D+14	5.8954D+00	1.5233D+09	1.2213D+07
8	.8000	9.383D+14	4.4554D+00	2.9522D+09	2.2098D+07
9	1.0000	1.106D+15	3.6713D+00	4.3662D+09	3.1739D+07
10	1.2000	3.646D+14	3.1839D+00	1.7202D+09	1.2237D+07
11	1.5000	2.808D+14	2.7320D+00	1.6186D+09	1.1188D+07
12	1.8000	1.666D+14	2.4492D+00	1.1146D+09	7.9648D+06
13	2.2000	5.153D+13	2.2020D+00	3.9996D+08	3.0247D+06
14	2.6000	1.225D+13	2.0336D+00	1.0632D+08	8.3149D+05
15	3.0000	8.587D+11	1.9092D+00	8.1491D+06	6.5034D+04
16	3.5000	1.320D+11	1.7961D+00	1.3611D+06	1.1288D+04
17	4.0000	1.207D+11	1.7086D+00	1.3322D+06	1.1427D+04
18	5.0000	7.759D+09	1.5865D+00	9.4168D+04	8.9786D+02
TOTAL:		4.040D+13		1.4434D+10	1.0706D+08

***** PROGRAM QAD (VERSION 1.1) RAN ON 10/09/1992 *****

GEOMETRY TYPE 13 - ANNULAR CYLINDER, SAE (16-IN PIPE, 0.25-IN WALL)

GEOMETRY TYPE: ANNULUS , SHIELD AT END

SOURCE VOLUME:

MATERIAL: WATER RADIUS: 19.68 HEIGHT: 228.60 VOLUME: 2.5961D+05

CLADDING:

MATERIAL: IRON THICKNESS: .64

SHIELD:

MATERIAL: CONCRETE THICKNESS: .00

CENTER CYLINDER:

MATERIAL: CONCRETE RADIUS: 5.08 HEIGHT: 228.60

DISTANCES:

CLAD-TO-SHIELD = 5.08 CM
SHIELD-TO-DETECTOR = .00 CM
DISPLACEMENT = .00 CM

DETECTOR NUMBER 2 CM TO SHLD COORDINATES - X 0.0000D+00 Y 0.0000D+00 Z 2.3432D+02

GRP NO	MEAN ENERGY KEV	SOURCE STRENGTH PHOTONS/SEC	MEAN BUILDUP FACTORS	PARTICLE FLUX DIRECT BEAM PHOTONS PER CM**2-SEC	GAMMA DOSE RATE WITH BUILDUP (MR/HR)
1	.0500	7.758D+12	1.6183D+07	4.3196D+01	2.0300D+00
2	.1000	7.940D+12	3.6378D+01	2.4708D+06	2.5437D+04
3	.2000	4.178D+13	9.2966D+00	7.8560D+07	3.6590D+05
4	.3000	7.225D+13	5.7357D+00	1.9944D+08	8.6825D+05
5	.4000	2.054D+14	4.4049D+00	6.9979D+08	3.0362D+06
6	.5000	1.245D+14	3.6973D+00	4.0290D+08	2.1279D+06
7	.6000	6.594D+14	3.2399D+00	2.9225D+09	1.2877D+07
8	.8000	9.383D+14	2.6947D+00	4.9497D+09	2.2408D+07
9	1.0000	1.106D+15	2.3779D+00	6.6428D+09	3.1276D+07
10	1.2000	3.646D+14	2.1710D+00	2.4283D+09	1.1779D+07
11	1.5000	2.408D+14	1.9691D+00	2.1045D+09	1.0484D+07
12	1.8000	1.666D+14	1.8361D+00	1.3650D+09	7.3124D+06
13	2.2000	5.153D+13	1.7148D+00	4.6232D+08	2.7227D+06
14	2.6000	1.225D+13	1.6288D+00	1.1782D+08	7.3799D+05
15	3.0000	8.587D+11	1.5632D+00	8.7348D+06	5.7075D+04
16	3.5000	1.320D+11	1.5015D+00	1.4164D+06	9.8201D+03
17	4.0000	1.207D+11	1.4525D+00	1.3537D+06	9.8711D+03
18	5.0000	7.759D+09	1.3822D+00	9.2687D+04	7.6994D+02
TOTAL:		4.040D+15		2.2477D+10	1.0610D+08

***** PROGRAM Q A D (VERSION 1.1) RAN ON 10/09/1992 *****

GEOMETRY TYPE 13 - ANNULAR CYLINDER, SAE (16-IN PIPE, 0.25-IN WALL)

GEOMETRY TYPE: ANNULUS , SHIELD AT END

SOURCE VOLUME:

MATERIAL: WATER RADIUS: 19.68 HEIGHT: 228.60 VOLUME: 2.5961D+05

CLADDING:

MATERIAL: IRON THICKNESS: .64

SHIELD:

MATERIAL: CONCRETE THICKNESS: 60.96

CENTER CYLINDER:

MATERIAL: CONCRETE RADIUS: 5.08 HEIGHT: 228.60

DISTANCES:

CLAD-TO-SHIELD = 5.08 CM
SHIELD-TO-DETECTOR = .00 CM
DISPLACEMENT = .00 CM

DETECTOR NUMBER 3 ATO /O OF SHLD COORDINATES - X 0.0000D+00 Y 0.0000D+00 Z 2.9527D+02

JRP NO	MEAN ENERGY KEV	SOURCE STRENGTH PHOTONS/SEC	MEAN BUILDUP FACTORS	PARTICLE FLUX DIRECT BEAM PHOTONS PER CM**2-SEC	GAMMA DOSE RATE WITH BUILDUP (MR/HR)
1	.0500	7.758D+12	0.0000D+00	0.0000D+00	0.0000D+00
2	.1000	7.940D+12	1.1737D+02	5.1187D-06	1.7003D-07
3	.2000	4.178D+13	1.9111D+02	1.5121D-01	1.4477D-02
4	.3000	7.225D+13	1.3525D+02	4.7101D+00	4.8350D-01
5	.4000	2.054D+14	9.0845D+01	8.3554D+01	7.4766D+00
6	.5000	1.245D+14	6.4299D+01	1.9201D+02	1.4445D+01
7	.6000	6.594D+14	4.7924D+01	2.8780D+03	1.8758D+02
8	.8000	9.383D+14	3.0164D+01	1.9486D+04	9.8746D+02
9	1.0000	1.106D+15	2.1212D+01	7.1936D+04	3.0212D+03
10	1.2000	3.646D+14	1.6105D+01	5.8124D+04	2.0915D+03
11	1.5000	2.808D+14	1.1817D+01	1.2132D+05	3.6270D+03
12	1.8000	1.666D+14	9.4165D+00	1.5249D+05	4.1895D+03
13	2.2000	5.153D+13	7.4927D+00	9.9550D+04	2.5617D+03
14	2.6000	1.225D+13	6.2767D+00	4.1580D+04	1.0036D+03
15	3.0000	8.587D+11	5.4385D+00	4.5650D+03	1.0378D+02
16	3.5000	1.320D+11	4.7212D+00	1.0730D+03	2.3392D+01
17	4.0000	1.207D+11	4.1993D+00	1.3860D+03	2.9219D+01
18	5.0000	7.759D+09	3.4926D+00	1.4593D+02	3.0631D+00
TOTAL:		4.040D+15		5.7481D+05	1.7852D+04

PROGRAM Q A D (VERSION 1.1)

RAN ON 10/09/1992

GEOMETRY TYPE 5 - SLAB SHIELD PARALLEL TO FACE

GEOMETRY TYPE: RECTANGULAR BOX

SOURCE VOLUME:

MATERIAL: WATER LENGTH: 20.00 HEIGHT: 25.00 DEPTH: 10.00 VOLUME: 5.0000D+03

LOADING:

MATERIAL: IRON THICKNESS: 1.00

SHIELD:

MATERIAL: CONCRETE THICKNESS: .00

DISTANCES:

CLAD-TO-SHIELD = 50.00 CM

SHIELD-TO-DETECTOR = 5.00 CM

DISPLACEMENT = 5.00 CM

DETECTOR NUMBER 1 SURFACE OF VOLUM COORDINATES - X 1.1000D+01 Y 0.0000D+00 Z 1.2500D+01

GRP #0	MEAN ENERGY MEV	SOURCE STRENGTH PROTONS/SEC	MEAN BUILDUP FACTORS	PARTICLE FLUX DIRECT BEAM PROTONS PER CM**2-SEC	GAMMA DOSE RATE WITH BUILDUP (MR/HR)
1	.0500	1.494D+11	2.2582D+02	1.4906D+00	9.7749D-02
2	.1000	1.529D+11	4.4515D+01	1.2112D+06	1.5258D+04
3	.2000	8.046D+11	1.0178D+01	6.1796D+07	3.1509D+05
4	.3000	1.392D+12	6.0419D+00	1.6841D+08	7.7230D+05
5	.4000	3.955D+12	4.5486D+00	6.0490D+08	2.7102D+06
6	.5000	2.398D+12	3.7698D+00	4.2995D+08	1.8964D+06
7	.6000	1.270D+13	3.2735D+00	2.5699D+09	1.1441D+07
8	.8000	1.807D+13	2.6890D+00	4.3780D+09	1.9778D+07
9	1.0000	2.130D+13	2.3537D+00	5.8862D+09	2.7432D+07
10	1.2000	7.021D+12	2.1370D+00	2.1498D+09	1.0265D+07
11	1.5000	5.409D+12	1.9276D+00	1.8582D+09	9.0620D+06
12	1.8000	3.208D+12	1.7919D+00	1.1982D+09	6.2644D+06
13	2.2000	9.925D+11	1.6702D+00	4.0222D+08	2.3072D+06
14	2.6000	2.360D+11	1.5855D+00	1.0156D+08	6.1922D+05
15	3.0000	1.654D+10	1.5214D+00	7.4680D+06	4.7492D+04
16	3.5000	2.543D+09	1.4629D+00	1.1973D+06	8.0876D+03
17	4.0000	2.325D+09	1.4166D+00	1.1333D+06	8.0591D+03
18	5.0000	1.494D+08	1.3521D+00	7.6182D+04	6.1907D+02
TOTAL:		7.781D+13		1.9820D+10	9.2942D+07

PROGRAM Q A D (VERSION 1.1)

RAM ON 10/09/1992

page D23 of D27

GEOMETRY TYPE 5 - SLAB SHIELD PARALLEL TO FACE

GEOMETRY TYPE: RECTANGULAR BOX

SOURCE VOLUME:

MATERIAL: WATER LENGTH: 20.00 HEIGHT: 25.00 DEPTH: 10.00 VOLUME: 5.0000D+03

CLADDING:

MATERIAL: IRON THICKNESS: 1.00

SHIELD:

MATERIAL: CONCRETE THICKNESS: .00

DISTANCES:

CLAD-TO-SHIELD = 50.00 CM

SHIELD-TO-DETECTOR = 5.00 CM

DISPLACEMENT = 5.00 CM

DETECTOR NUMBER 2

CM TO SHLD

COORDINATES - X

6.6000D+01

Y

5.0000D+00

Z

1.2500D+01

GRP NO	MEAN ENERGY MEV	SOURCE STRENGTH PHOTONS/SEC	MEAN BUILDUP FACTORS	PARTICLE FLUX DIRECT BEAM PHOTONS PER CM**2-SEC	GAMMA DOSE RATE WITH BUILDUP (MR/HR)
1	.0500	1.494D+11	1.9832D+02	5.0035D-01	2.8816D-02
2	.1000	1.529D+11	2.8848D+01	1.0302D+05	8.4108D+02
3	.2000	8.046D+11	6.2881D+00	3.1011D+06	9.7696D+03
4	.3000	1.392D+12	3.9148D+00	7.4106D+06	2.2020D+04
5	.4000	3.955D+12	3.0796D+00	2.4821D+07	7.5291D+04
6	.5000	2.398D+12	2.6429D+00	1.6806D+07	5.1968D+04
7	.6000	1.270D+13	2.3600D+00	9.6749D+07	3.1053D+05
8	.8000	1.807D+13	2.0233D+00	1.5564D+08	5.2906D+05
9	1.0000	2.130D+13	1.8279D+00	2.0045D+08	7.2548D+05
10	1.2000	7.021D+12	1.7002D+00	7.0755D+07	2.6879D+05
11	1.5000	5.409D+12	1.5754D+00	5.8810D+07	2.3441D+05
12	1.8000	3.208D+12	1.4931D+00	3.6858D+07	1.6056D+05
13	2.2000	9.925D+11	1.4186D+00	1.2031D+07	5.8618D+04
14	2.6000	2.360D+11	1.3665D+00	2.9758D+06	1.5638D+04
15	3.0000	1.654D+10	1.3268D+00	2.1519D+05	1.1934D+03
16	3.5000	2.543D+09	1.2903D+00	3.4017D+04	2.0267D+02
17	4.0000	2.325D+09	1.2614D+00	3.1821D+04	2.0150D+02
18	5.0000	1.494D+08	1.2212D+00	2.1077D+03	1.5469D+01
TOTAL:		7.781D+13		6.8680D+08	2.4646D+06

PROGRAM Q A D (VERSION 1.1)

RAN ON 10/09/1992

page D24 of D27

GEOMETRY TYPE 5 - SLAB SHIELD PARALLEL TO FACE

GEOMETRY TYPE: RECTANGULAR BOX

SOURCE VOLUME:

MATERIAL: WATER LENGTH: 20.00 HEIGHT: 25.00 DEPTH: 10.00 VOLUME: 5.0000D+03

CLADDING:

MATERIAL: IRON THICKNESS: 1.00

SHIELD:

MATERIAL: CONCRETE THICKNESS: 5.00

DISTANCES:

CLAD-TO-SHIELD = 50.00 CM

SHIELD-TO-DETECTOR = 5.00 CM

DISPLACEMENT = 5.00 CM

DETECTOR NUMBER 3 AT % OF SHLD COORDINATES - X 7.1000D+01 Y 5.0000D+00 Z 1.0000D+01

JRP NO	MEAN ENERGY MEV	SOURCE STRENGTH PHOTONS/SEC	MEAN BUILDUP FACTORS	PARTICLE FLUX DIRECT BEAM PHOTONS PER CM**2-SEC	GAMMA DOSE RATE WITH BUILDUP (MR/HR)
1	.0500	1.494D+11	3.3452D+02	2.9800D-03	2.8949D-04
2	.1000	1.529D+11	7.6514D+01	1.1163D+04	2.4172D+02
3	.2000	8.046D+11	1.6711D+01	6.1401D+05	5.1405D+03
4	.3000	1.392D+12	9.2154D+00	1.8148D+06	1.2694D+04
5	.4000	3.955D+12	6.5221D+00	6.9623D+06	4.4727D+04
6	.5000	2.398D+12	5.1578D+00	5.2035D+06	3.1402D+04
7	.6000	1.270D+13	4.3195D+00	3.2351D+07	1.9004D+05
8	.8000	1.807D+13	3.3674D+00	5.8379D+07	3.3026D+05
9	1.0000	2.130D+13	2.8429D+00	8.1739D+07	4.6011D+05
10	1.2000	7.021D+12	2.5133D+00	3.0800D+07	1.7295D+05
11	1.5000	5.409D+12	2.2049D+00	2.7515D+07	1.5349D+05
12	1.8000	3.208D+12	2.0091D+00	1.8201D+07	1.0669D+05
13	2.2000	9.925D+11	1.8370D+00	6.2664D+06	3.9535D+04
14	2.6000	2.360D+11	1.7195D+00	1.6130D+06	1.0666D+04
15	3.0000	1.654D+10	1.6323D+00	1.2039D+05	8.2141D+02
16	3.5000	2.543D+09	1.5530D+00	1.9602D+04	1.4057D+02
17	4.0000	2.325D+09	1.4917D+00	1.8781D+04	1.4064D+02
18	5.0000	1.494D+08	1.4068D+00	1.2868D+03	1.0880D+01
TOTAL:		7.781D+13		2.7163D+08	1.5591D+06

PROGRAM Q A D (VERSION 1.1)

RAN ON 10/09/1992

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GEOMETRY TYPE 8 - SPHERE

GEOMETRY TYPE: SPHERE

SOURCE VOLUME:

MATERIAL: WATER

RADIUS: 10.00

VOLUME: 4.1888D+03

CLADDING:

MATERIAL: IRON

THICKNESS: 1.00

SHIELD:

MATERIAL: CONCRETE

THICKNESS: .00

DISTANCES:

CLAD-TO-SHIELD = 50.00 CM

SHIELD-TO-DETECTOR = 5.00 CM

DISPLACEMENT = .00 CM

DETECTOR NUMBER 1 SURFACE OF VOLUME COORDINATES - X 1.1000D+01 Y 0.0000D+00 Z 0.0000D+00

GRP NO	MEAN ENERGY KEV	SOURCE STRENGTH PROTONS/SEC	MEAN BUILDUP FACTORS	PARTICLE FLUX DIRECT BEAM PROTONS PER CM**2-SEC	GAMMA DOSE RATE WITH BUILDUP (MR/HR)
1	.0500	1.252D+11	2.3903D+02	1.1772D+00	8.1713D-02
2	.1000	1.281D+11	4.6477D+01	1.1365D+06	1.4948D+04
3	.2000	6.741D+11	9.6330D+00	5.4649D+07	2.6374D+05
4	.3000	1.166D+12	5.6403D+00	1.4521D+08	6.2164D+05
5	.4000	3.313D+12	4.2391D+00	5.1484D+08	2.1497D+06
6	.5000	2.009D+12	3.5163D+00	3.6259D+08	1.4917D+06
7	.6000	1.064D+13	3.0577D+00	2.1513D+09	8.9461D+06
8	.8000	1.514D+13	2.5203D+00	3.6208D+09	1.5331D+07
9	1.0000	1.784D+13	2.2139D+00	4.8203D+09	2.1130D+07
10	1.2000	5.882D+12	2.0163D+00	1.7463D+09	7.8670D+06
11	1.5000	4.531D+12	1.8261D+00	1.4943D+09	6.9038D+06
12	1.8000	2.687D+12	1.7027D+00	9.5687D+08	4.7534D+06
13	2.2000	8.315D+11	1.5922D+00	3.1903D+08	1.7445D+06
14	2.6000	1.977D+11	1.5155D+00	8.0164D+07	4.6720D+05
15	3.0000	1.385D+10	1.4576D+00	5.8706D+06	3.5767D+04
16	3.5000	2.130D+09	1.4046D+00	9.3869D+05	6.0882D+03
17	4.0000	1.948D+09	1.3630D+00	8.8635D+05	6.0645D+03
18	5.0000	1.252D+08	1.3051D+00	5.9465D+04	4.6641D+02
TOTAL:		6.519D+13		1.6275D+10	7.1733D+07

PROGRAM Q A D (VERSION 1.1)

RAN ON 10/09/1992

GEOMETRY TYPE 8 - SPHERE

GEOMETRY TYPE: SPHERE

SOURCE VOLUME:

MATERIAL: WATER RADIUS: 10.00

VOLUME: 4.1888D+03

CLADDING:

MATERIAL: IRON THICKNESS: 1.00

SHIELD:

MATERIAL: CONCRETE THICKNESS: .00

DISTANCES:

CLAD-TO-SHIELD = 50.00 CM

SHIELD-TO-DETECTOR = 5.00 CM

DISPLACEMENT = .00 CM

DETECTOR NUMBER 2 CM TO SHLD COORDINATES - X 6.6000D+01 Y 0.0000D+00 Z 0.0000D+00

GRP NO	MEAN ENERGY KEV	SOURCE STRENGTH PHOTONS/SEC	MEAN BUILDUP FACTORS	PARTICLE FLUX DIRECT BEAM PHOTONS PER CM**2-SEC	GAMMA DOSE RATE WITH BUILDUP (MR/HR)
1	.0500	1.252D+11	2.2102D+02	4.6301D-02	2.9718D-03
2	.1000	1.281D+11	4.4066D+01	2.7789D+04	3.4654D+02
3	.2000	6.741D+11	9.4336D+00	1.2444D+06	5.8816D+03
4	.3000	1.166D+12	5.5663D+00	3.2751D+06	1.3837D+04
5	.4000	3.313D+12	4.1978D+00	1.1571D+07	4.7843D+04
6	.5000	2.009D+12	3.4890D+00	8.1334D+06	3.3202D+04
7	.6000	1.064D+13	3.0381D+00	4.8198D+07	1.9914D+05
8	.8000	1.514D+13	2.5085D+00	8.0997D+07	3.4134D+05
9	1.0000	1.784D+13	2.2058D+00	1.0773D+08	4.7051D+05
10	1.2000	5.882D+12	2.0104D+00	3.9005D+07	1.7520D+05
11	1.5000	4.531D+12	1.8219D+00	3.3359D+07	1.5376D+05
12	1.8000	2.687D+12	1.6994D+00	2.1356D+07	1.0589D+05
13	2.2000	8.315D+11	1.5896D+00	7.1196D+06	3.8867D+04
14	2.6000	1.977D+11	1.5132D+00	1.7890D+06	1.0411D+04
15	3.0000	1.385D+10	1.4555D+00	1.3102D+05	7.9714D+02
16	3.5000	2.130D+09	1.4027D+00	2.0954D+04	1.3572D+02
17	4.0000	1.948D+09	1.3612D+00	1.9788D+04	1.3522D+02
18	5.0000	1.252D+08	1.3034D+00	1.3281D+03	1.0403D+01
TOTAL:		6.519D+13		3.6398D+08	1.5973D+06

***** PROGRAM QAD (VERSION 1.1) RAN ON 10/09/1992 *****

GEOMETRY TYPE 8 - SPHERE

GEOMETRY TYPE: SPHERE

SOURCE VOLUME:

MATERIAL: WATER RADIUS: 10.00

VOLUME: 4.1888D+03

CLADDING:

MATERIAL: IRON THICKNESS: 1.00

SHIELD:

MATERIAL: CONCRETE THICKNESS: 10.00

DISTANCES:

CLAD-TO-SHIELD = 50.00 CM

SHIELD-TO-DETECTOR = 5.00 CM

DISPLACEMENT = .00 CM

DETECTOR NUMBER 3 AT 0 OF SHLD COORDINATES - X 7.6000D+01 Y 0.0000D+00 Z 0.0000D+00

GRP NO	MEAN ENERGY MEV	SOURCE STRENGTH PHOTONS/SEC	MEAN BUILDUP FACTORS	PARTICLE FLUX DIRECT BEAM PHOTONS PER CM**2-SEC	GAMMA DOSE RATE WITH BUILDUP (MR/HR)
1	.0500	1.252D+11	5.6353D+02	1.8189D-06	2.9766D-07
2	.1000	1.281D+11	2.0268D+02	3.4957D+02	2.0050D+01
3	.2000	6.741D+11	4.3070D+01	5.1717D+04	1.1160D+03
4	.3000	1.166D+12	2.1344D+01	2.0731D+05	3.3585D+03
5	.4000	3.313D+12	1.3772D+01	9.5819D+05	1.2998D+04
6	.5000	2.009D+12	1.0131D+01	8.1893D+05	9.7071D+03
7	.6000	1.064D+13	8.0176D+00	5.6510D+06	6.1618D+04
8	.8000	1.514D+13	5.7367D+00	1.1920D+07	1.1488D+05
9	1.0000	1.784D+13	4.5463D+00	1.8707D+07	1.6840D+05
10	1.2000	5.882D+12	3.8287D+00	7.7075D+06	6.5933D+04
11	1.5000	4.531D+12	3.1841D+00	7.6035D+06	6.1251D+04
12	1.8000	2.687D+12	2.7912D+00	5.4167D+06	4.4111D+04
13	2.2000	8.315D+11	2.4560D+00	2.0066D+06	1.6925D+04
14	2.6000	1.977D+11	2.2326D+00	5.4564D+05	4.6846D+03
15	3.0000	1.385D+10	2.0708D+00	4.2538D+04	3.6821D+02
16	3.5000	2.130D+09	1.9259D+00	7.2135D+03	6.4150D+01
17	4.0000	1.948D+09	1.8158D+00	7.1429D+03	6.5110D+01
18	5.0000	1.252D+08	1.6648D+00	5.1261D+02	5.1288D+00
TOTAL:		6.519D+13		6.1652D+07	5.6550D+05

*** END PROGRAM QAD (VERSION 1.1)

TIME OFF = 10:08:02 DATE = 10/09/1992

EGS Corporation

Title Verification and Validation of Page ~ of ~
RADMODL Code Ver. 1.0 EGS-TR-910600-08 Project WSRC
Calculated by W.S. Date 12 Nov 92 Checked by HP Date 11/13/92

Annex D

Verification of PARABINT

Verification of Computer Program PARABINT
Version 1.2

by

Walter Zobel
EGS Corporation
Knoxville, Tennessee

Submitted to
Westinghouse Savannah River Company

October 1992

Contract #AA30194P
EGS Report #910600-20

TECHNICAL DOCUMENT	
DOCUMENT TYPE: (REPORT/PLAN/PROCEDURE)	<u>Report</u>
DOCUMENT NUMBER:	<u>EGS-TR-910600-20</u>
ORIGINAL ISSUE DATE:	<u>October 19, 1992</u>
TITLE:	<u>Verification of Computer Program</u> <u>PARABINT Version 1.2</u>
PREPARATION	
PROJECT ENGINEER:	<u><i>Walter Zobel</i></u> Walter Zobel
TECHNICAL REVIEWS	
PROGRAM MANAGER:	<u><i>Douglas W. Wilson</i></u> Douglas W. Wilson
ENGINEERING VERIFIER:	<u><i>Douglas W. Wilson</i></u> Douglas W. Wilson
QUALITY ASSURANCE:	<u><i>Carter Pope</i></u> Carter Pope
APPROVAL	
GROUP/DIVISION DIRECTOR:	<u><i>R.D. Guthrie</i></u> Ronald D. Guthrie

EGS Form 611-10/89

*Justification for Program Manager performing engineering verification: Due to his technical competence in the subject and theory, Program Manager D. W. Wilson performed the engineering verification for this report. Mr. Wilson did not participate in the program development, technical input, nor selection of sample problems.

Disclaimer

Program Name

PARABINT Version 1.2

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October 1992

EGS Corporation

Title Verification of Computer Program Page iv of v

PARABINT Version 1.2 EGS-TR-910600-20 Project ALL

Calculated by H.2.

Date 19 Oct 92 Checked by [Signature]

Date 10/19/92

Abstract

Computer program PARABINT version 1.2 was created for use in the RADMODL system. The RADMODL system was developed to calculate the radiation environment in various areas of the Savannah River K reactor following a radiologically significant accident. This report documents the verification of that version by showing that the same results are obtained as are calculated with version 1.1

EGS Corporation

Title Verification of Computer Program Page v of v

PARABINT Version 1.2 EGS-TR-910600-20 Project ALL

Calculated by W.E.

Date 10 Oct 92

Checked by

Date

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Purpose	1
Verification	1
Conclusion	2
References	8
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EGS Corporation

Title Verification of Computer Program Page 1 of 8

PARABINT Version 1.2 EGS-TR-210600-20 Project ALL

Calculated by H.Z.

Date 11/06/92

Checked by Quu

Date 10/14/92

Purpose: To verify PARABINT Version 1.2.

Verification: PARABINT version 1.2 was generated for use with RADMODL. RADMODL is a computer code system developed to calculate the radiation environment in various areas of the Savannah River K reactor following a radiologically significant accident. Since PARABINT is a module in this code system which takes its input from the output of preceding modules, user options which are available in version 1.1 (ref. 1) were replaced in version 1.2 with fixed information related to the code system. PARABINT version 1.2 was tested with the same test input data as were used in version 1.1. These test inputs are listed below.

1. These test data represent one quarter of a circle of radius 2. Only seven points are used.

0.0000E+00	2.0000E+00
0.51763809	1.931851653
1.0000E+00	1.7321E+00
1.414213562	1.414213562
1.7321E+00	1.0000E+00
1.931851653	0.51763809
2.0000E+00	0.0000E+00

2. In this test the area under a decreasing exponential (e^{-x}) is calculated between the limits of zero (0) and one (1). Six points are used in this case.

0.0000E+00	1.0000E+00
2.0000E-01	8.1873E-01
4.0000E-01	6.7032E-01
6.0000E-01	5.4881E-01
8.0000E-01	4.4933E-01
1.0000E+00	3.6788E-01

EGS Corporation

Title Verification of Computer Program Page 2 of 8

PARABINT Version 1.2 EGS-TR-910600-20 Project ALL

Calculated by WZ

Date 19 Oct 92

Checked by

WU

Date

10/19/92

3. In this test the same quarter circle is used as in test 1, with a rectangle added before the quarter circle. Twelve points are used.

0.0000E+00	2.0000E+00
1.0000E-01	2.0000E+00
2.0000E-01	2.0000E+00
3.0000E-01	2.0000E+00
4.0000E-01	2.0000E+00
5.0000E-01	2.0000E+00
1.01763809	1.931851653
1.5000E+00	1.7321E+00
1.914213562	1.414213562
2.0000E+00	1.0000E+00
2.431851653	0.51763809
2.5000E+00	0.0000E+00

The results are shown in tables 1-3, resp. Note that the original output does not have the table numbers but instead has "N", just as does the title. To differentiate the test cases the table numbers were inserted manually. For comparison, the output of version 1.1 is shown in tables 4-6.

A listing of program PARABINT version 1.2 is provided in Appendix A.

Conclusion: The results in tables 1-3 are identical to those in tables 4-6. On the basis of these results it is concluded that version 1.2 is verified.

EGS Corporation

Title Verification of Computer Program Page 3 of 8

PARABINT Version 1.2 EGS-TR-910600-20 Project ALL

Calculated by WZ

Date 10/2/92 Checked by QW

Date 10/19/92

*** PROGRAM P A R A B I N T (PC) IS AT YOUR SERVICE ***
 ** VERSION NUMBER = 1.2 REVISION DATE WAS 7/22/92 **
 * TODAY'S DATE = 10/02/1992 START TIME = 11:46:43 *

Table 1

N

Time	Dose Rate	Integral	Total
0.000E+00	2.000E+00		
5.176E-01	1.932E+00	1.024E+00	1.024E+00
1.000E+00	1.732E+00	8.911E-01	1.915E+00
1.414E+00	1.414E+00	6.603E-01	2.576E+00
1.732E+00	1.000E+00	3.952E-01	2.971E+00
1.932E+00	5.176E-01	1.774E-01	3.148E+00
2.000E+00	0.000E+00	1.864E-02	3.167E+00

*** END PROGRAM PARABINT (VERSION 1.2) ***
 TIME OFF = 11:46:43 DATE = 10/02/1992

EGS Corporation

Title Verification of Computer Program Page 4 of 8

PARABINT Version 1.2 EGS-TR-910600-20 Project ALL

Calculated by 6.2

Date 10/02/92 Checked by QW

Date 10/19/92

* * * PROGRAM P A R A B I N T (PC) IS AT YOUR SERVICE * * *
* * VERSION NUMBER = 1.2 REVISION DATE WAS 7/22/92 * *
* TODAY'S DATE = 10/02/1992 START TIME = 11:59:34 *

Table 2

N

Time	Dose Rate	Integral	Total
0.000E+00	1.000E+00		
2.000E-01	8.187E-01	1.813E-01	1.813E-01
4.000E-01	6.703E-01	1.485E-01	3.298E-01
6.000E-01	5.488E-01	1.215E-01	4.513E-01
8.000E-01	4.493E-01	9.951E-02	5.508E-01
1.000E+00	3.679E-01	8.142E-02	6.323E-01

* * * E N D P R O G R A M PARABINT (VERSION 1.2) * * *
T I M E O F F = 11:59:34 D A T E = 10/02/1992

EGS Corporation

Title Verification of Computer Program Page 5 of 8

PARABINT Version 1.2 EGS-TR-910600-20 Project ALL

Calculated by 4.2

Date 10/2/92 Checked by QW

Date 10/20/92

* * * PROGRAM P A R A B I N T (PC) IS AT YOUR SERVICE * * *
 * * VERSION NUMBER = 1.2 REVISION DATE WAS 7/22/92 * *
 * TODAY'S DATE = 10/02/1992 START TIME = 11:59:54 *

Table 3

N

Time	Dose Rate	Integral	Total
0.000E+00	2.000E+00		
1.000E-01	2.000E+00	2.000E-01	2.000E-01
2.000E-01	2.000E+00	2.000E-01	4.000E-01
3.000E-01	2.000E+00	2.000E-01	6.000E-01
4.000E-01	2.000E+00	2.000E-01	8.000E-01
5.000E-01	2.000E+00	2.000E-01	1.000E+00
1.018E+00	1.932E+00	1.024E+00	2.024E+00
1.500E+00	1.732E+00	8.911E-01	2.915E+00
1.914E+00	1.414E+00	6.603E-01	3.576E+00
2.232E+00	1.000E+00	3.952E-01	3.971E+00
2.432E+00	5.176E-01	1.774E-01	4.148E+00
2.500E+00	0.000E+00	1.864E-02	4.167E+00

* * * E N D P R O G R A M PARABINT (VERSION 1.2) * * *
 T I M E O F F = 11:59:55 D A T E = 10/02/1992

EGS Corporation

Title Verification of Computer Program Page 6 of 8

PARABINT Version 1.2 EGS-TR-910600-20 Project ALL

Calculated by W.2.

Date 19 Oct 92

Checked by QWW

Date 10/20/92

*** PROGRAM P A R A B I N T (PC) IS AT YOUR SERVICE ***
 ** VERSION NUMBER = 1.1 REVISION DATE WAS 7/22/92 **
 * TODAY'S DATE = 07/24/1992 START TIME = 12:37:26 *

Table 4

FIRST PARABINT TEST CASE

Time	Dose Rate	Integral	Total
0.000E+00	2.000E+00		
5.176E-01	1.932E+00	1.024E+00	1.024E+00
1.000E+00	1.732E+00	8.911E-01	1.915E+00
1.414E+00	1.414E+00	6.603E-01	2.576E+00
1.732E+00	1.000E+00	3.952E-01	2.971E+00
1.932E+00	5.176E-01	1.774E-01	3.148E+00
2.000E+00	0.000E+00	1.864E-02	3.167E+00

***** PROGRAM PARABINT (VERSION 1.1) RAN ON 07/24/1992 ***
 *

Table 5

Second PARABINT Test Case

Time	Dose Rate	Integral	Total
0.000E+00	1.000E+00		
2.000E-01	8.187E-01	1.813E-01	1.813E-01
4.000E-01	6.703E-01	1.485E-01	3.298E-01
6.000E-01	5.488E-01	1.215E-01	4.513E-01
8.000E-01	4.493E-01	9.951E-02	5.508E-01
1.000E+00	3.679E-01	8.142E-02	6.323E-01

EGS Corporation

Title Verification of Computer Program Page 7 of 8

PARABINT Version 1.2 EGS-TR-910600-20 Project ALL

Calculated by #12

Date 19 Oct 92 Checked by DWW

Date 10/20/92

* * * * PROGRAM PARABINT (VERSION 1.1) RAN ON 07/24/1992 * * * *

Table 6

THIRD PARABINT TEST CASE

Time	Dose Rate	Integral	Total
0.000E+00	2.000E+00		
1.000E-01	2.000E+00	2.000E-01	2.000E-01
2.000E-01	2.000E+00	2.000E-01	4.000E-01
3.000E-01	2.000E+00	2.000E-01	6.000E-01
4.000E-01	2.000E+00	2.000E-01	8.000E-01
5.000E-01	2.000E+00	2.000E-01	1.000E+00
1.018E+00	1.932E+00	1.024E+00	2.024E+00
1.500E+00	1.732E+00	8.911E-01	2.915E+00
1.914E+00	1.414E+00	6.603E-01	3.576E+00
2.232E+00	1.000E+00	3.952E-01	3.971E+00
2.432E+00	5.176E-01	1.774E-01	4.148E+00
2.500E+00	0.000E+00	1.864E-02	4.167E+00

* * * E N D P R O G R A M PARABINT (VERSION 1.1) * * *

T I M E O F F = 12:39:34

D A T E = 07/24/1992

EGS Corporation

Title Verification of Computer Program Page 8 of 8

PARABINT Version 1.2 EGS-TR-910600-20 Project ALL

Calculated by W.Z.

Date 19 Oct 92 Checked by

WZ

Date 10/20/92

References

1. "Computer Program PARABINT", W. Zobel, EGS-TR-091200-05 Rev. A, 6 August 1992

EGS Corporation

Title Verification and Validation of Page ~ of ~

RADMODL Code Ver. 1.0 EGS-TR-910600-08 Project WSRC

Calculated by H.Z.

Date 13 Nov 92 Checked by

H.D.
Qare

Date 11/13/92
11/13/92

Annex E

Verification of DOSE

**Verification of Computer Program DOSE
Version 1.0**

by

**Dave Gore
EGS Corporation
Knoxville, Tennessee**

**Submitted to
Westinghouse Savannah River Company**

November 1992

**Contract #AA30194P
EGS Report #910600-21**

TECHNICAL DOCUMENT	
DOCUMENT TYPE: (REPORT/PLAN/PROCEDURE)	<u>Report</u>
DOCUMENT NUMBER:	<u>EGS-TR-910600-21</u>
ORIGINAL ISSUE DATE:	<u>November 13, 1992</u>
TITLE:	<u>Verification of Computer Program</u> <u>DOSE Version 1.0</u>
PREPARATION	
PROJECT ENGINEER:	<u>Janet Davidson</u> Janet Davidson
TECHNICAL REVIEWS.	
PROGRAM MANAGER:	<u>Douglas W. Wilson</u> Douglas W. Wilson
ENGINEERING VERIFIER:	<u>Douglas W. Wilson</u> Douglas W. Wilson
QUALITY ASSURANCE:	<u>Carter Pope</u> Carter Pope
APPROVAL	
GROUP/DIVISION DIRECTOR:	<u>Ronald D. Guthrie</u> Ronald D. Guthrie

EGS Form 611-10/89

*Justification for Project Manager performing engineering verification: Due to his technical competence in the subject and theory, Program Manager D. W. Wilson performed the engineering verification for this report. Mr. Wilson did not participate in the program development, technical input, nor selection of sample problems.

Disclaimer

Program Name DOSE Version 1.0

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November 1992

Title Verification of Computer Program

Page iv of v

DOSE (PC) Version 1.0 EGS-TR-910600-21

Project ALL

Calculated by DQD

Date 11/13/92 Checked by ELD

Date 11/13/92

Abstract

This report documents the verification of the computer program DOSE (PC) Version 1.0. DOSE is the last module of the RADMODL system. This system is designed to calculate the dose at certain areas of the Savannah River K reactor. DOSE allows the user to vary such parameters as the reactor power level, the failed fuel fraction, and the isotopic release fraction.

Title Verification of Computer Program

Page ✓ of ✓

DOSE (PC) Version 1.0 EGS-TR-910600-21

Project ALL

Calculated by Dee

Date 11/13/92 Checked by ELP

Date 11/13/92

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1.0 Introduction	1
2.0 Program Description	2
3.0 Alternate Calculation	3
4.0 Conclusion	4
5.0 References	5
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Title Verification of Computer Program

Page 1 of 5

DOSE (PC) Version 1.0 EGS-TR-910600-21

Project ALL

Calculated by DAG

Date 11/13/92 Checked by ELD

Date 11/13/92

1.0 Introduction

DOSE is the last module of the RADMODL system. This system is designed to calculate the dose at certain areas of the Savannah River K reactor. DOSE allows the user to vary such parameters as the reactor power level, the failed fuel fraction, and the isotopic release fraction. The DOSE program is valid for both the liquid and airborne model.

DOSE combines the dose calculated at each detector for each class. A class is a group of isotopes which behave in a similar manner, and a "detector" is the point at which the dose is calculated. For the radiation model, RADMODL, the following classes were established: Te, Br, Cs/Rb, I, noble gases, and particulates (all other isotopes present). For the LOCA liquid flow model for the 16-inch break (reference 1), the following classes were used: Te, Br, Cs/Rb, I, and particulates (all other non-gaseous isotopes present). Photon spectra were calculated for each of these classes, and dose rates were determined from these spectra. For the LOCA air flow model for the 16-inch break (reference 2), the same classes were used with the addition of noble gases. However, (except for the filters for which only iodine or particulates, resp., were used), only spectra due to noble gases and iodine were generated, and dose rates calculated. DOSE uses output from the computer program PARABINT (reference 3) and from user input to determine the total dose (dose due to all of the classes) for this particular case. The radiation model is set up so that the PARABINT output is specified on a per class basis.

To verify DOSE, a test case was calculated with Lotus 1-2-3 and compared with the output from the computer program DOSE.

Title Verification of Computer Program

Page 2 of 5

DOSE (PC) Version 1.0 EGS-TR-910600-21

Project ALL

Calculated by DGB

Date 11/13/92 Checked by ELB

Date 11/13/92

2.0 Program Description

The total dose of each detector in the computer program DOSE is determined by the following method. For each class, multiply the total dose (taken from the output of computer program PARABINT under the column labeled "Total") at a particular time by the release fraction, the failed fuel fraction, and ratio of the power levels (desired power level divided by the power level for which the radiation model is based, which is 1250 MW for this model). Note that the results from DOSE are rounded to the nearest whole number. The release fraction is the percentage of the total assembly inventory for that class which is released to primary coolant. The failed fuel fraction is that damaged portion of the reactor core which contributed this fraction of the total power output. The sum of the product calculated above for all of the classes at that particular time yields the total dose (dose due to all of the classes) at that time. Note that the dose at a particular time is the total for all time intervals up to and including the time shown. The user inputs the release fraction and the failed fuel fraction.

A listing of the computer code for the DOSE program can be found in reference 5 in Source Code Listing.

Title Verification of Computer Program

Page 3 of 5

DOSE (PC) Version 1.0 EGS-TR-910600-21

Project ALL

Calculated by DAG

Date 11/13/92 Checked by ELG

Date 11/13/92

3.0 Alternate Calculation

Lotus spreadsheets were made to perform the calculations described in the previous section. These spreadsheets can be found in Appendix C, while the output from the computer program DOSE can be found in Appendix B. The output files from PARABINT from which the LOTUS spreadsheets and the DOSE output were derived are found in Appendix D.

Two cases for the LOCA liquid model were calculated on Lotus spreadsheets and compared to the DOSE output. Both cases were based on detector 2, located in motor room #1.

In case one, a 1250 MW case was computed. The failed fuel fraction was taken to be 0.03. The release fractions were taken to be the following for each class: Te = 0.2, Br = 0.8, Cs/Rb = 0.5, I = 0.4, Particulates = 0.01. Refer to reference 4 for the release fraction and the failed fuel fraction. The ratio of power levels for this case is 1250 MW / 1250 MW.

In case two, a 1750 MW case was examined. All of the values that were used in the 1250 MW case were used, except for the ratio of power levels. The power level fraction changes to 1750 MW / 1250 MW.

The third case calculated was for the LOCA air model. This case was based on detector 2, in pump room #1. The failed fuel fraction was taken to be 0.03, and the power level was 1250 MW. The release fractions for each class were taken to be 1.0. Note that in the air model the release fractions are incorporated in the STP model as discussed in reference 2.

Title Verification of Computer Program

Page 4 of 5

DOSE (PC) Version 1.0 EGS-TR-910600-21

Project ALL

Calculated by DAB

Date 11/13/92 Checked by ESD

Date 11/13/92

4.0 Conclusion

The alternative calculations were compared with the output from the computer program DOSE. The results matched, and the computer program DOSE can be considered valid.

Title Verification of Computer Program

Page 5 of 5

DOSE (PC) Version 1.0 EGS-TR-910600-21

Project ALL

Calculated by Dad

Date 11/13/92 Checked by ELH

Date 11/13/92

5.0 References

- 1) "LOCA Liquid Flow Model for the 16-Inch Break", Evelyn Downey, EGS-TR-910600-22, October 22, 1992.
- 2) "LOCA Air Flow Model for the 16-Inch Break", Walter Zobel, EGS-TR-910600-24, October 28, 1992.
- 3) "Verification of Computer Program PARABINT Version 1.2", Walter Zobel, EGS-TR-910600-20, October 19, 1992.
- 4) "Source Term Basis and Recommendations for the Long Term Environmental Qualification Program", M. H. Fletcher, D. L. Bell, and L. A. Wooten, draft report WSRC-TR-92-168, May 15, 1992.
- 5) "RADMODL Programmer's Manual", EGS Corporation International and Infinite Software Solutions, Inc. September 1992.

Title Verification of Computer Program

Page A1 of A4

DOSE (PC) Version 1.0 EGS-TR-910600-21

Project ALL

Calculated by DGB

Date 11/13/92 Checked by ELD

Date 11/12/92

APPENDIX A
DOSE Output Files
November 1992

LIQUID MODEL 1250 MW

**** PROGRAM DOSE (Version 1.0) REVISION DATE 09/31/92 RAN ON 10/28/92****

VOLUME = MOTOR ROOM #1

DET	T	N.G.	I	BR	TE	CS/RB	PART	TOTAL DOSE
2	7.978E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
2	2.833E-01	0.00E+00	5.10E+01	2.00E+00	9.00E+00	2.30E+01	2.00E+00	8.70E+01
2	5.558E-01	0.00E+00	1.29E+02	6.00E+00	2.20E+01	5.40E+01	6.00E+00	2.17E+02
2	1.000E+00	0.00E+00	2.44E+02	9.00E+00	4.10E+01	8.10E+01	1.20E+01	3.87E+02
2	1.733E+00	0.00E+00	5.17E+02	1.40E+01	8.70E+01	1.14E+02	2.50E+01	7.58E+02
2	3.675E+00	0.00E+00	1.65E+03	1.90E+01	3.47E+02	1.70E+02	9.90E+01	2.29E+03
2	8.000E+00	0.00E+00	4.54E+03	2.10E+01	1.30E+03	2.57E+02	3.35E+02	6.45E+03
2	1.600E+01	0.00E+00	7.16E+03	2.10E+01	2.95E+03	3.97E+02	6.54E+02	1.12E+04
2	2.380E+01	0.00E+00	8.85E+03	2.10E+01	4.51E+03	5.34E+02	9.32E+02	1.49E+04
2	9.600E+01	0.00E+00	1.70E+04	2.10E+01	1.50E+04	1.81E+03	3.10E+03	3.69E+04
2	7.200E+02	0.00E+00	3.36E+04	2.10E+01	4.64E+04	1.28E+04	9.74E+03	1.02E+05

LIQUID MODEL 1750 MW

**** PROGRAM DOSE (Version 1.0) REVISION DATE 09/31/92 RAN ON 10/28/92****

VOLUME = MOTOR ROOM #1

DET	T	N.G.	I	BR	TE	CS/RB	PART	TOTAL DOSE
2	7.978E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
2	2.833E-01	0.00E+00	7.10E+01	3.00E+00	1.20E+01	3.20E+01	3.00E+00	1.22E+02
2	5.558E-01	0.00E+00	1.80E+02	8.00E+00	3.10E+01	7.60E+01	9.00E+00	3.04E+02
2	1.000E+00	0.00E+00	3.41E+02	1.30E+01	5.80E+01	1.13E+02	1.60E+01	5.41E+02
2	1.733E+00	0.00E+00	7.24E+02	1.90E+01	1.22E+02	1.60E+02	3.50E+01	1.06E+03
2	3.675E+00	0.00E+00	2.31E+03	2.60E+01	4.86E+02	2.38E+02	1.38E+02	3.20E+03
2	8.000E+00	0.00E+00	6.35E+03	2.90E+01	1.82E+03	3.59E+02	4.70E+02	9.03E+03
2	1.600E+01	0.00E+00	1.00E+04	3.00E+01	4.13E+03	5.55E+02	9.15E+02	1.57E+04
2	2.380E+01	0.00E+00	1.24E+04	3.00E+01	6.32E+03	7.47E+02	1.31E+03	2.08E+04
2	9.600E+01	0.00E+00	2.38E+04	3.00E+01	2.10E+04	2.53E+03	4.34E+03	5.17E+04
2	7.200E+02	0.00E+00	4.70E+04	3.00E+01	6.49E+04	1.79E+04	1.36E+04	1.43E+05

AIR MODEL
**** PROGRAM DOSE (Version 1.0) REVISION DATE 09/31/92 RAN ON 11/11/92****

VOLUME = PUMP ROOM #1

DET	T	N.G.	I	BR	TE	CS/RB	PART	TOTAL DOSE
2	7.978E-03	3.70E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.70E+01
2	2.833E-01	1.62E+04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.62E+04
2	5.558E-01	1.76E+04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.76E+04
2	1.000E+00	1.96E+04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.96E+04
2	1.733E+00	2.24E+04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.24E+04
2	3.675E+00	2.79E+04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.79E+04
2	8.000E+00	3.42E+04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.42E+04
2	1.600E+01	3.94E+04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.94E+04
2	2.380E+01	4.22E+04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.22E+04
2	9.600E+01	6.03E+04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.03E+04
2	7.200E+02	1.21E+05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.21E+05

Title Verification of Computer Program

Page B1 of B9

DOSE (PC) Version 1.0 EGS-TR-910600-21

Project ALL

Calculated by DGB

Date 11/15/92 Checked by ELD

Date 11/13/92

APPENDIX B

Alternate Calculations

November 1992

LIQUID MODEL FOR 1250 MW POWER LEVEL

VOLUME 8 (TE)

TIME	TOTAL DOSE RATE	FAILED FUEL FRACTION	RELEASE FRACTION	
2.778E-05	0.000E+00	0.03	0	0
7.978E-03	0.000E+00	0.03	0.2	0.00E+00
2.833E-01	1.467E+03	0.03	0.2	8.80E+00
5.558E-01	3.696E+03	0.03	0.2	2.22E+01
1.000E+00	6.887E+03	0.03	0.2	4.13E+01
1.733E+00	1.451E+04	0.03	0.2	8.71E+01
3.675E+00	5.789E+04	0.03	0.2	3.47E+02
8.000E+00	2.166E+05	0.03	0.2	1.30E+03
1.600E+01	4.915E+05	0.03	0.2	2.95E+03
2.380E+01	7.521E+05	0.03	0.2	4.51E+03
9.600E+01	2.499E+06	0.03	0.2	1.50E+04
7.200E+02	7.725E+06	0.03	0.2	4.64E+04

VOLUME 44 (BR)

TIME	TOTAL DOSE RATE	FAILED FUEL FRACTION	RELEASE FRACTION	
2.778E-05	0.000E+00	0.03	0.8	0.00E+00
7.978E-03	0.000E+00	0.03	0.8	0.00E+00
2.833E-01	1.004E+02	0.03	0.8	2.41E+00
5.558E-01	2.430E+02	0.03	0.8	5.83E+00
1.000E+00	3.834E+02	0.03	0.8	9.20E+00
1.733E+00	5.721E+02	0.03	0.8	1.37E+01
3.675E+00	7.832E+02	0.03	0.8	1.88E+01
8.000E+00	8.745E+02	0.03	0.8	2.10E+01
1.600E+01	8.807E+02	0.03	0.8	2.11E+01
2.380E+01	8.813E+02	0.03	0.8	2.12E+01
9.600E+01	8.818E+02	0.03	0.8	2.12E+01
7.200E+02	8.818E+02	0.03	0.8	2.12E+01

VOLUME 20 (CS/RB)

TIME	TOTAL DOSE RATE	FAILED FUEL FRACTION	RELEASE FRACTION	
2.778E-05	0.000E+00	0.03	0.5	0.00E+00
7.978E-03	0.000E+00	0.03	0.5	0.00E+00
2.833E-01	1.532E+03	0.03	0.5	2.30E+01
5.558E-01	3.618E+03	0.03	0.5	5.43E+01
1.000E+00	5.382E+03	0.03	0.5	8.07E+01
1.733E+00	7.625E+03	0.03	0.5	1.14E+02
3.675E+00	1.134E+04	0.03	0.5	1.70E+02
8.000E+00	1.710E+04	0.03	0.5	2.57E+02
1.600E+01	2.645E+04	0.03	0.5	3.97E+02
2.380E+01	3.558E+04	0.03	0.5	5.34E+02
9.600E+01	1.206E+05	0.03	0.5	1.81E+03
7.200E+02	8.500E+05	0.03	0.5	1.28E+04

VOLUME 32 (I)

TIME	TOTAL DOSE RATE	FAILED FUEL FRACTION	RELEASE FRACTION	
2.778E-05	0.000E+00	0.03	0.4	0.00E+00
7.978E-03	0.000E+00	0.03	0.4	0.00E+00
2.833E-01	4.230E+03	0.03	0.4	5.08E+01
5.558E-01	1.071E+04	0.03	0.4	1.29E+02
1.000E+00	2.032E+04	0.03	0.4	2.44E+02
1.733E+00	4.312E+04	0.03	0.4	5.17E+02
3.675E+00	1.376E+05	0.03	0.4	1.65E+03
8.000E+00	3.780E+05	0.03	0.4	4.54E+03
1.600E+01	5.968E+05	0.03	0.4	7.16E+03
2.380E+01	7.375E+05	0.03	0.4	8.85E+03
9.600E+01	1.418E+06	0.03	0.4	1.70E+04
7.200E+02	2.800E+06	0.03	0.4	3.36E+04

VOLUME 56 (PARTICULATES)

TIME	TOTAL DOSE RATE	FAILED FUEL FRACTION	RELEASE FRACTION	
2.778E-05	0.000E+00	0.03	0.01	0.00E+00
7.978E-03	0.000E+00	0.03	0.01	0.00E+00
2.833E-01	8.275E+03	0.03	0.01	2.48E+00
5.558E-01	2.074E+04	0.03	0.01	6.22E+00
1.000E+00	3.869E+04	0.03	0.01	1.16E+01
1.733E+00	8.378E+04	0.03	0.01	2.51E+01
3.675E+00	3.285E+05	0.03	0.01	9.85E+01
8.000E+00	1.118E+06	0.03	0.01	3.35E+02
1.600E+01	2.179E+06	0.03	0.01	6.54E+02
2.380E+01	3.107E+06	0.03	0.01	9.32E+02
9.600E+01	1.033E+07	0.03	0.01	3.10E+03
7.200E+02	3.247E+07	0.03	0.01	9.74E+03

	TE	BR	CS/RB	I	PART	TOTAL
	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	8.80E+00	2.41E+00	2.30E+01	5.08E+01	2.48E+00	8.74E+01
	2.22E+01	5.83E+00	5.43E+01	1.29E+02	6.22E+00	2.17E+02
	4.13E+01	9.20E+00	8.07E+01	2.44E+02	1.16E+01	3.87E+02
	8.71E+01	1.37E+01	1.14E+02	5.17E+02	2.51E+01	7.58E+02
	3.47E+02	1.88E+01	1.70E+02	1.65E+03	9.86E+01	2.29E+03
	1.30E+03	2.10E+01	2.57E+02	4.54E+03	3.35E+02	6.45E+03
	2.95E+03	2.11E+01	3.97E+02	7.16E+03	6.54E+02	1.12E+04
	4.51E+03	2.12E+01	5.34E+02	8.85E+03	9.32E+02	1.48E+04
	1.50E+04	2.12E+01	1.81E+03	1.70E+04	3.10E+03	3.69E+04
	4.64E+04	2.12E+01	1.28E+04	3.36E+04	9.74E+03	1.02E+05

LIQUID MODEL FOR 1750 MW POWER LEVEL

VOLUME 8 (TE)

TIME	TOTAL DOSE RATE	FAILED FUEL FRACTION	RELEASE FRACTION	1750/1250 RATIO
2.778E-05	0.000E+00	0.03	0	0
7.978E-03	0.000E+00	0.03	0.2	0.00E+00
2.833E-01	1.467E+03	0.03	0.2	8.80E+00
5.558E-01	3.696E+03	0.03	0.2	2.22E+01
1.000E+00	6.887E+03	0.03	0.2	4.13E+01
1.733E+00	1.451E+04	0.03	0.2	8.71E+01
3.675E+00	5.789E+04	0.03	0.2	3.47E+02
8.000E+00	2.166E+05	0.03	0.2	1.30E+03
1.600E+01	4.915E+05	0.03	0.2	2.95E+03
2.380E+01	7.521E+05	0.03	0.2	4.51E+03
9.600E+01	2.499E+06	0.03	0.2	1.50E+04
7.200E+02	7.725E+06	0.03	0.2	4.64E+04

VOLUME 44 (BR)

TIME	TOTAL DOSE RATE	FAILED FUEL FRACTION	RELEASE FRACTION	1750/1250 RATIO
2.778E-05	0.000E+00	0.03	0.8	0.00E+00
7.978E-03	0.000E+00	0.03	0.8	0.00E+00
2.833E-01	1.004E+02	0.03	0.8	2.41E+00
5.558E-01	2.430E+02	0.03	0.8	5.83E+00
1.000E+00	3.834E+02	0.03	0.8	9.20E+00
1.733E+00	5.721E+02	0.03	0.8	1.37E+01
3.675E+00	7.832E+02	0.03	0.8	1.88E+01
8.000E+00	8.745E+02	0.03	0.8	2.10E+01
1.600E+01	8.807E+02	0.03	0.8	2.11E+01
2.380E+01	8.813E+02	0.03	0.8	2.12E+01
9.600E+01	8.818E+02	0.03	0.8	2.12E+01
7.200E+02	8.818E+02	0.03	0.8	2.12E+01

VOLUME 20 (CS/RB)

TIME	TOTAL DOSE RATE	FAILED FUEL FRACTION	RELEASE FRACTION	1750/1250 RATIO
2.778E-05	0.000E+00	0.03	0.5	0.00E+00
7.978E-03	0.000E+00	0.03	0.5	0.00E+00
2.833E-01	1.532E+03	0.03	0.5	2.30E+01
5.558E-01	3.618E+03	0.03	0.5	5.43E+01
1.000E+00	5.382E+03	0.03	0.5	8.07E+01
1.733E+00	7.625E+03	0.03	0.5	1.14E+02
3.675E+00	1.134E+04	0.03	0.5	1.70E+02
8.000E+00	1.710E+04	0.03	0.5	2.57E+02
1.600E+01	2.645E+04	0.03	0.5	3.97E+02
2.380E+01	3.558E+04	0.03	0.5	5.34E+02
9.600E+01	1.206E+05	0.03	0.5	1.81E+03
7.200E+02	8.500E+05	0.03	0.5	1.28E+04

VOLUME 32 (I)

TIME	TOTAL DOSE RATE	FAILED FUEL FRACTION	RELEASE FRACTION		1750/1250 RATIO
2.778E-05	0.000E+00	0.03	0.4	0.00E+00	0
7.978E-03	0.000E+00	0.03	0.4	0.00E+00	0
2.833E-01	4.230E+03	0.03	0.4	5.08E+01	71.064
5.558E-01	1.071E+04	0.03	0.4	1.29E+02	179.928
1.000E+00	2.032E+04	0.03	0.4	2.44E+02	341.376
1.733E+00	4.312E+04	0.03	0.4	5.17E+02	724.416
3.675E+00	1.376E+05	0.03	0.4	1.65E+03	2311.68
8.000E+00	3.780E+05	0.03	0.4	4.54E+03	6350.4
1.600E+01	5.968E+05	0.03	0.4	7.16E+03	10026.24
2.380E+01	7.375E+05	0.03	0.4	8.85E+03	12390
9.600E+01	1.418E+06	0.03	0.4	1.70E+04	23822.4
7.200E+02	2.800E+06	0.03	0.4	3.36E+04	47040

VOLUME 56 (PARTICULATES)

TIME	TOTAL DOSE RATE	FAILED FUEL FRACTION	RELEASE FRACTION		1750/1250 RATIO
2.778E-05	0.000E+00	0.03	0.01	0.00E+00	0
7.978E-03	0.000E+00	0.03	0.01	0.00E+00	0
2.833E-01	8.275E+03	0.03	0.01	2.48E+00	3.4755
5.558E-01	2.074E+04	0.03	0.01	6.22E+00	8.7108
1.000E+00	3.869E+04	0.03	0.01	1.16E+01	16.2498
1.733E+00	8.378E+04	0.03	0.01	2.51E+01	35.1876
3.675E+00	3.285E+05	0.03	0.01	9.85E+01	137.97
8.000E+00	1.118E+06	0.03	0.01	3.35E+02	469.56
1.600E+01	2.179E+06	0.03	0.01	6.54E+02	915.18
2.380E+01	3.107E+06	0.03	0.01	9.32E+02	1304.94
9.600E+01	1.033E+07	0.03	0.01	3.10E+03	4338.6
7.200E+02	3.247E+07	0.03	0.01	9.74E+03	13637.4

1750/1250 RATIO	TE	BR	CS/RB	I	PART	TOTAL
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	1.23E+01	3.37E+00	3.22E+01	7.11E+01	3.48E+00	1.22E+02
	3.10E+01	8.16E+00	7.60E+01	1.80E+02	8.71E+00	3.04E+02
	5.79E+01	1.29E+01	1.13E+02	3.41E+02	1.62E+01	5.41E+02
	1.22E+02	1.92E+01	1.60E+02	7.24E+02	3.52E+01	1.06E+03
	4.86E+02	2.63E+01	2.38E+02	2.31E+03	1.38E+02	3.20E+03
	1.82E+03	2.94E+01	3.59E+02	6.35E+03	4.70E+02	9.03E+03
	4.13E+03	2.96E+01	5.55E+02	1.00E+04	9.15E+02	1.57E+04
	6.32E+03	2.96E+01	7.47E+02	1.24E+04	1.30E+03	2.08E+04
	2.10E+04	2.96E+01	2.53E+03	2.38E+04	4.34E+03	5.17E+04
	6.49E+04	2.96E+01	1.79E+04	4.70E+04	1.36E+04	1.43E+05

VOLUME 3 (I)

TIME	TOTAL DOSE RATE	FAILED FUEL FRACTION	RELEASE FRACTION	
2.778E-05	0.000E+00	0.03	1.0	0.00E+00
7.978E-03	6.087E-04	0.03	1.0	1.83E-05
2.833E-01	2.763E-01	0.03	1.0	8.29E-03
5.558E-01	3.160E-01	0.03	1.0	9.48E-03
1.000E+00	3.772E-01	0.03	1.0	1.13E-02
1.733E+00	4.692E-01	0.03	1.0	1.41E-02
3.675E+00	6.651E-01	0.03	1.0	2.00E-02
8.000E+00	9.407E-01	0.03	1.0	2.82E-02
1.600E+01	1.257E+00	0.03	1.0	3.77E-02
2.380E+01	1.462E+00	0.03	1.0	4.39E-02
9.600E+01	2.442E+00	0.03	1.0	7.33E-02
7.200E+02	4.404E+00	0.03	1.0	1.32E-01

VOLUME NOBLE GASES

TIME	TOTAL DOSE RATE	FAILED FUEL FRACTION	RELEASE FRACTION	
2.778E-05	0.000E+00	0.03	1.0	0.00E+00
7.978E-03	1.218E+03	0.03	1.0	3.65E+01
2.833E-01	5.408E+05	0.03	1.0	1.62E+04
5.558E-01	5.854E+05	0.03	1.0	1.76E+04
1.000E+00	6.521E+05	0.03	1.0	1.96E+04
1.733E+00	7.467E+05	0.03	1.0	2.24E+04
3.675E+00	9.308E+05	0.03	1.0	2.79E+04
8.000E+00	1.141E+06	0.03	1.0	3.42E+04
1.600E+01	1.313E+06	0.03	1.0	3.94E+04
2.380E+01	1.408E+06	0.03	1.0	4.22E+04
9.600E+01	2.010E+06	0.03	1.0	6.03E+04
7.200E+02	4.020E+06	0.03	1.0	1.21E+05

I	NOBLE GASES	TOTAL
0.00E+00	0.00E+00	0.00E+00
1.81E-05	3.65E+01	3.65E+01
8.23E-03	1.62E+04	1.62E+04
9.40E-03	1.76E+04	1.76E+04
1.12E-02	1.96E+04	1.96E+04
1.39E-02	2.24E+04	2.24E+04
1.98E-02	2.79E+04	2.79E+04
2.80E-02	3.42E+04	3.42E+04
3.74E-02	3.94E+04	3.94E+04
4.35E-02	4.22E+04	4.22E+04
7.26E-02	6.03E+04	6.03E+04
1.31E-01	1.21E+05	1.21E+05

Title Verification of Computer Program

Page C1 of C8

DOSE (PC) Version 1.0 EGS-TR-910600-21

Project ALL

Calculated by DAD

Date 11/13/92 Checked by ELD

Date 11/13/92

APPENDIX C

PARABINT Output

November 1992

1 (Particulates) Volume 56 - Liquid Model
 * * * PROGRAM P A R A B I N T (PC) IS AT YOUR SERVICE * * *
 * * VERSION NUMBER = 1.2 REVISION DATE WAS 7/22/92 * *
 * TODAY'S DATE = 10/24/1992 START TIME = 21:31:55 *

Table N

N

Time	Dose Rate	Integral	Total
2.778E-05	0.000E+00		
7.978E-03	0.000E+00	0.000E+00	0.000E+00
2.833E-01	4.897E+04	8.275E+03	8.275E+03
5.558E-01	3.161E+04	1.247E+04	2.074E+04
1.000E+00	4.890E+04	1.795E+04	3.869E+04
1.733E+00	7.324E+04	4.508E+04	8.378E+04
3.675E+00	1.679E+05	2.447E+05	3.285E+05
8.000E+00	1.428E+05	7.892E+05	1.118E+06
1.600E+01	1.240E+05	1.061E+06	2.179E+06
2.380E+01	1.143E+05	9.284E+05	3.107E+06
9.600E+01	8.657E+04	7.222E+06	1.033E+07
7.200E+02	4.284E+04	2.214E+07	3.247E+07

0 * * * E N D P R O G R A M PARABINT (VERSION 1.2) * * *
 T I M E O F F = 21:31:55 D A T E = 10/24/1992

(CS/RB)

1

Volume 20 - Liquid Model

*** PROGRAM P A R A B I N T (PC) IS AT YOUR SERVICE ***

*** VERSION NUMBER = 1.2 REVISION DATE WAS 7/22/92 ***

*** TODAY'S DATE = 10/24/1992 START TIME = 21:31:33 ***

Table N

N

Time	Dose Rate	Integral	Total
2.778E-05	0.000E+00		
7.978E-03	0.000E+00	0.000E+00	0.000E+00
2.833E-01	8.859E+03	1.532E+03	1.532E+03
5.558E-01	4.229E+03	2.086E+03	3.618E+03
1.000E+00	3.683E+03	1.765E+03	5.382E+03
1.733E+00	2.346E+03	2.243E+03	7.625E+03
3.675E+00	1.543E+03	3.712E+03	1.134E+04
8.000E+00	1.168E+03	5.766E+03	1.710E+04
1.600E+01	1.169E+03	9.346E+03	2.645E+04
2.380E+01	1.172E+03	9.132E+03	3.558E+04
9.600E+01	1.174E+03	8.501E+04	1.206E+05
7.200E+02	1.157E+03	7.294E+05	8.500E+05

0

*** END PROGRAM PARABINT (VERSION 1.2) ***

TIME OFF = 21:31:33 DATE = 10/24/1992

1 (TE) *Volume 8 - Liquid Model*
 *** PROGRAM PARABINT (PC) IS AT YOUR SERVICE ***
 ** VERSION NUMBER = 1.2 REVISION DATE WAS 7/22/92 **
 * TODAY'S DATE = 10/24/1992 START TIME = 21:31:26 *

Table N

N

Time	Dose Rate	Integral	Total
2.778E-05	0.000E+00		
7.978E-03	0.000E+00	0.000E+00	0.000E+00
2.833E-01	8.700E+03	1.467E+03	1.467E+03
5.558E-01	5.742E+03	2.229E+03	3.696E+03
1.000E+00	8.537E+03	3.190E+03	6.887E+03
1.733E+00	1.203E+04	7.624E+03	1.451E+04
3.675E+00	3.082E+04	4.337E+04	5.789E+04
8.000E+00	3.357E+04	1.587E+05	2.166E+05
1.600E+01	3.420E+04	2.749E+05	4.915E+05
2.380E+01	3.218E+04	2.606E+05	7.521E+05
9.600E+01	1.668E+04	1.747E+06	2.499E+06
7.200E+02	7.327E+01	5.226E+06	7.725E+06

0 *** END PROGRAM PARABINT (VERSION 1.2) ***
 TIME OFF = 21:31:26 DATE = 10/24/1992

1 (BR)

Volume 44 - Liquid Model

* * * PROGRAM P A R A B I N T (PC) IS AT YOUR SERVICE * * *

* * VERSION NUMBER = 1.2 REVISION DATE WAS 7/22/92 * *

* TODAY'S DATE = 10/24/1992 START TIME = 21:31:48 *

Table N

N

Time	Dose Rate	Integral	Total
2.778E-05	0.000E+00		
7.978E-03	0.000E+00	0.000E+00	0.000E+00
2.833E-01	5.861E+02	1.004E+02	1.004E+02
5.558E-01	3.200E+02	1.426E+02	2.430E+02
1.000E+00	3.055E+02	1.405E+02	3.834E+02
1.733E+00	1.903E+02	1.887E+02	5.721E+02
3.675E+00	4.076E+01	2.111E+02	7.832E+02
8.000E+00	1.430E+00	9.123E+01	8.745E+02
1.600E+01	1.329E-01	6.253E+00	8.807E+02
2.380E+01	1.489E-02	5.763E-01	8.813E+02
9.600E+01	2.786E-08	5.377E-01	8.818E+02
7.200E+02	6.847E-09	1.083E-05	8.818E+02

0 * * * E N D P R O G R A M P A R A B I N T (VERSION 1.2) * * *

T I M E O F F = 21:31:48 D A T E = 10/24/1992

1 (I) Volume 32 - Liquid Model
 * * * PROGRAM P A R A B I N T (PC) IS AT YOUR SERVICE * * *
 * * VERSION NUMBER = 1.2 REVISION DATE WAS 7/22/92 * *
 * TODAY'S DATE = 10/24/1992 START TIME = 21:31:40 *

Table N

N

Time	Dose Rate	Integral	Total
2.778E-05	0.000E+00		
7.978E-03	0.000E+00	0.000E+00	0.000E+00
2.833E-01	2.513E+04	4.230E+03	4.230E+03
5.558E-01	1.692E+04	6.477E+03	1.071E+04
1.000E+00	2.594E+04	9.616E+03	2.032E+04
1.733E+00	3.508E+04	2.280E+04	4.312E+04
3.675E+00	5.870E+04	9.450E+04	1.376E+05
8.000E+00	3.487E+04	2.404E+05	3.780E+05
1.600E+01	2.112E+04	2.188E+05	5.968E+05
2.380E+01	1.512E+04	1.407E+05	7.375E+05
9.600E+01	4.085E+03	6.801E+05	1.418E+06
7.200E+02	3.450E+02	1.382E+06	2.800E+06

0 * * * E N D P R O G R A M P A R A B I N T (VERSION 1.2) * * *
 T I M E O F F = 21:31:40 D A T E = 10/24/1992

Noble Gases

Volume 15 - Air Model

*** PROGRAM PARABINT (PC) IS AT YOUR SERVICE ***
 ** VERSION NUMBER = 1.2 REVISION DATE WAS 7/22/92 **
 * TODAY'S DATE = 11/10/1992 START TIME = 16:27:18 *

Table N

N

Time	Dose Rate	Integral	Total
2.778E-05	9.921E+00		
7.978E-03	3.035E+05	1.218E+03	1.218E+03
2.833E-01	1.679E+05	5.396E+05	5.408E+05
5.558E-01	1.590E+05	4.459E+04	5.854E+05
1.000E+00	1.406E+05	6.672E+04	6.521E+05
1.733E+00	1.201E+05	9.551E+04	7.476E+05
3.675E+00	6.924E+04	1.831E+05	9.308E+05
8.000E+00	3.125E+04	2.101E+05	1.141E+06
1.600E+01	1.399E+04	1.717E+05	1.313E+06
2.380E+01	1.058E+04	9.543E+04	1.408E+06
9.600E+01	6.235E+03	6.025E+05	2.010E+06
7.200E+02	2.053E+02	2.009E+06	4.020E+06

*** END PROGRAM PARABINT (VERSION 1.2) ***
 TIME OFF = 16:27:19 DATE = 11/10/1992

1 (I)

Volume 3- Air Model

*** PROGRAM PARABINT (PC) IS AT YOUR SERVICE ***
 ** VERSION NUMBER = 1.2 REVISION DATE WAS 7/22/92 **
 * TODAY'S DATE = 11/10/1992 START TIME = 20:02:56 *

Table N

N

Time	Dose Rate	Integral	Total
2.778E-05	3.187E-06		
7.978E-03	1.517E-01	6.087E-04	6.087E-04
2.833E-01	1.475E-01	2.757E-01	2.763E-01
5.558E-01	1.433E-01	3.969E-02	3.160E-01
1.000E+00	1.311E-01	6.120E-02	3.772E-01
1.733E+00	1.197E-01	9.205E-02	4.692E-01
3.675E+00	7.960E-02	1.959E-01	6.651E-01
8.000E+00	5.008E-02	2.756E-01	9.407E-01
1.600E+01	3.074E-02	3.164E-01	1.257E+00
2.380E+01	2.190E-02	2.044E-01	1.462E+00
9.600E+01	5.793E-03	9.805E-01	2.442E+00
7.200E+02	4.952E-04	1.962E+00	4.404E+00

0 *** END PROGRAM PARABINT (VERSION 1.2) ***
 TIME OFF = 20:02:56 DATE = 11/10/1992

EGS Corporation

Title Verification and Validation of Page 2 of 2

RADMODL Code Ver. 1.0 EGS-TR-910600-08 Project WSRC

Calculated by WZ

Date 13 Nov 92 Checked by

HD
WZ

Date 11/13/92

11/13/92

Annex F

Verification of Post-Processor

Verification of Computer Program Post Processor RADSIM
Version 1.0

by

David Guthrie
Walter Zobel
EGS Corporation
Knoxville, Tennessee

Submitted to
Westinghouse Savannah River Company

November 1992

Contract #AA30194P
EGS Report #910600-26
Revision 0

TECHNICAL DOCUMENT	
DOCUMENT TYPE: (REPORT/PLAN/PROCEDURE)	<u>Report</u>
DOCUMENT NUMBER:	<u>EGS-TR-910600-26</u>
ORIGINAL ISSUE DATE:	<u>November 13, 1992</u>
TITLE:	<u>Verification of Computer Program Post Processor RADSIM</u>
PREPARATION	
PROJECT ENGINEER:	<u> </u> Walter Zobel
TECHNICAL REVIEWS	
PROGRAM MANAGER:	<u> </u> Douglas W. Wilson
ENGINEERING VERIFIER:	<u> </u> Douglas W. Wilson
QUALITY ASSURANCE:	<u> </u> Carter Pope
APPROVAL	
GROUP/DIVISION DIRECTOR:	<u> </u> Ronald D. Guthrie

EGS Form 611-10/89

*Justification for Project Manager performing engineering verification: Due to his technical competence in the subject and theory, Program Manager D. W. Wilson performed the engineering verification for this report. Mr. Wilson did not participate in the program development, technical input, nor selection of sample problems.

Disclaimer

Program Name

RADSIM Version 1.0

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November 1992

Title Verification of Computer Program Page iv of v

Post Processor RADSIM EGS-TR-910600-26 Project WSRC

Calculated by DMG

Date 11/13/92 Checked by WCEW

Date 11/13/92

ABSTRACT

This report verifies computer code RADSIM Version 1.0, prepared for Westinghouse Savannah River Company. RADSIM (PC) is a computer code which is used to graphically display the dose values for RADMODL. Two sample cases are used to confirm the output from DOSE with the input file POST.DAT for RADSIM. Subsequently, the graphic display doses and detector locations are verified against the input file POST.DAT.

Title Verification of Computer Program Page v of v

Post Processor RADSIM EGS-TR-910600-26 Project WSRC

Calculated by DMG Date 11/13/92 Checked by DWW Date 11/13/92

Introduction	1
Sample Input	3
Sample Output	4
Conclusion	5
References	6
Appendix A - Sample Problem One	A1 of A17
Motor Room #1 Liquid Model all detectors	
Appendix B - Sample Problem Two	B1 of B18
Pump Room #1 Air Model all detectors	
Appendix C - Computer Program Listing for RADSIM . .	C1 of C43
Appendix D - Computer Program Listing for RADPOST . .	D1 of D21

Appendices C and D intentionally deleted.

Title Verification of Computer Program Page 1 of 6

Post Processor RADSIM EGS-TR-910600-26 Project WSRC

Calculated by DMS

Date 11/13/92 Checked by QWW

Date 11/13/92

Introduction

This report has been prepared to verify the display of the computer code RADSIM. RADSIM is a post processor code that is used in conjunction with RADMODL. RADSIM displays the dose for respective volumes defined within RADMODL. An input file named POST.DAT is prepared by RADMODL for input into RADSIM. POST.DAT is created by RADMODL after the user selects the desired input parameters for DOSE. The computer code that creates the POST.DAT input for the post processor is called RADPOST.

Two sample runs will be verified to ensure the accuracy of the dose values and the detector locations. For each sample problem the following information will be analyzed and verified:

- User Input parameters for DOSE
- DOSE's input table
- POST.DAT prepared by RADPOST from DOSE's input information
- QADLIQ.EL reference elevation file for determining detector locations
- QADAIR.EL reference elevation file for determining detector locations
- QAD Output Files for Volume (see Appendices 5 and 6 of the Verification and Validation report).

The following screen dumps will be included for the elevation page being verified:

- -40 Elevation Screen Dump
- -40 Elevation Screen Dump with Volume Names (Color)
- -40 Elevation Screen Dump with Numbers
- -40 Elevation Screen Dump with Maximum Doses for Volumes

Calculated by OM6Date 11/13/72 Checked by QWDate 11/13/72

The dose values for the volumes are taken directly from the DOSE modules output. To check this, the dose values are verified between the DOSE output and the POST.DAT post processor input. Additionally, the detector locations are determined by extracting the X value from the QAD output files for a detector. The X value is converted from centimeters to feet by performing the following calculations.

Liquid
(X / 30.40) + conv.

Air
bottomval - (X / 30.48)

The bottomval for a liquid model is the bottom elevation for a volume. The bottomval for an air model is the reference location above the nominal floor. The bottomval is determined by searching the QADLIQ.EL and the QADA/R.EL data files. The conv variable is derived by taking the value of the elevation page for a volume and subtracting the bottomval from it. Note: conv is only utilized in a liquid model run. The detector locations for both sample problems are compared with hand calculations to ensure accuracy. When viewing the detectors, remember the first detector is not used by the post processor.

The compartment numbers utilized in RADSIM are consistent with the compartment numbers used in FLOODNET (see Reference 1). The volume numbers in RADMODL may differ from the compartment numbers found in RADSIM. This is a result of maintaining consistency with FLOODNET. The compartment number conversions are handled automatically by RADMODL.

For any coding descriptions concerning RADSIM, please see the RADMODL Programmer's Manual. The RADPOST source code is included in the RAD section of the RADMODL Programmer's Manual (see Reference 2). Additionally, a full description of the features available in RADSIM are available in the RADMODL User's Manual.

Title Verification of Computer Program Page 3 of 6

Post Processor RADSIM EGS-TR-910600-26 Project WSRC

Calculated by OM6

Date 11/13/92 Checked by DW

Date 11/13/92

Sample Input

The two sample problems for verifying RADSIM are the Motor Room #1 Liquid Model and the Pump Room #1 Air Model. Input parameters for DOSE are included for each problem. Additionally, the DOSE input tables for each problem are included. This table is used to build the POST.DAT input file for the post processor. The QAD output files and QAD bottom elevation files are included as well.

Sample Problem One - Appendix A

Motor Room #1 Liquid Model all detectors

Sample Problem Two - Appendix B

Pump Room #1 Air Model all detectors

Title Verification of Computer Program Page 4 of 6

Post Processor RADSIM EGS-TR-910600-26 Project WSRC

Calculated by D46

Date 11/13/92 Checked by

DWW

Date 11/13/92

Sample Output

The output generated by the post processor is displayed with an EGA video graphics card on an IBM PC or compatible. Screen dumps have been utilized to represent this output. Each sample problem has a printout of all the inputs and outputs generated when using RADSIM.

Title Verification of Computer Program Page 5 of 6

Post Processor RADSIM EGS-TR-910600-26 Project WSRC

Calculated by DMG

Date 11/13/92 Checked by QWW

Date 11/13/92

Conclusion

Verification of RADSIM has been provided by demonstrating the results from two separate sample problems. Both runs provided consistent results with their respective DOSE input tables. Screen dumps for both sample problems verify the correctness of RADSIM's DOSE levels and detector locations display. Therefore, the RADSIM code may be considered qualified and valid for use in RADMODL.

Title Verification of Computer Program Page 6 of 6

Post Processor RADSIM EGS-TR-910600-26 Project WSRC

Calculated by QMG

Date 11/13/92 Checked by DW

Date 11/13/92

References

1. Clift, D. T., "Development and Verification of Building 105-K Physical Model for FLOODNET Program", Report No. EGS-TR-910600-11, Revision 1, September 1992
2. EGS Corporation International and Infinite Software Solutions, Inc. RADMODL PROGRAMMER'S MANUAL, September 1992

ENGINEERING VERIFIER (EV) LOG

CUSTOMER: Washington Savannah River Co. JOB NUMBER: 9106PLAN/PROCEDURE NUMBER: Verification of Computer Program Post Processor
RADSIM, ver. 1.0" EGS-TR-910600-26

MANDATORY CHECK POINTS	EV INITIALS AND DATE	QA AUDIT INITIALS AND DATE	REMARKS, ANOMALIES, AND DEFICIENCIES
1. Review Methodology	<u>DW</u> <u>10/26/92</u>	<u>CF</u> <u>10/26/92</u>	No. runs to be verified document and Analyzed and Verified
2. Review Samples	<u>DW</u> <u>11/13/92</u>	<u>CF</u> <u>11/13/92</u>	Appropriately chosen Two done
3. Check Results	<u>DW</u> <u>11/13/92</u>	<u>CF</u> <u>11/13/92</u>	Indicator proper operation available and
4. Check References	<u>DW</u> <u>11/13/92</u>	<u>CF</u> <u>11/13/92</u>	Appropriately used
5. Check Calculations	<u>DW</u> <u>11/13/92</u>	<u>CF</u> <u>11/13/92</u>	Appropriately checked & Calculated
6. sign off present	<u>X</u>	<u>CF</u> <u>11/13/92</u>	appropriate signatures are present
7.			
8.			
9.			
10.			
11.			
12.			
13.			
14.			
15.			
16.			
17.			
PREPARED BY: <u>DW</u>	DATE: <u>10/26/92</u>		
APPROVED BY: <u>CF</u>	DATE: <u>10/26/92</u>		
Q.A. ADMINISTRATOR			

EGS CORPORATION

Title Verification of Computer Program

Page A1 of A17

Post Processor RADSIM EGS-TR-910600-26

Project WSRC

Calculated by DAG

Date 11/15/92

Checked by JD

Date 11/13/92

Appendix A

Sample Problem One Verification

Motor Room #1 Liquid Model all detectors

EGS CORPORATION

Title Verification of Computer Program

Page A2 of A17

Post Processor RADSIM EGS-TR-910600-26

Project WSRC

Calculated by DM6

Date 11/13/92

Checked by MD

Date 11/13/92

Sample Problem One Verification

Motor Room #1 Liquid Model all detectors

Verify Detector Locations

Detector #	X	bottomval	conv	(X/30.48)+conv	Location
1	1.3400D+01	-40	0	.4396325	.4396
2	3.2300D+01	-40	0	1.0597113	1.0597
3	9.7357D+01	-40	0	3.1941273	3.1941
4	1.6241D+02	-40	0	5.3284121	5.3284
5	2.2747D+02	-40	0	7.4629265	7.4629
6	2.9253D+02	-40	0	9.5974409	9.5974
7	3.5759D+02	-40	0	11.731955	11.7320
8	4.2264D+02	-40	0	13.866142	13.8661
9	4.8770D+02	-40	0	16.000656	16.0007

Verification of maximum dose values for volume

Detector #	DOSE	Color on Display
1	0	N/A
2	1320000	Pink
3	867000	Purple
4	663000	Purple
5	533000	Purple
6	441000	Purple
7	372000	Purple
8	318000	Purple
9	275000	Purple

Maximum 1320000

**** PROGRAM DOSE (Version 1.0) REVISION DATE 09/31/92

Page A3 of A17
RAN ON 11/11/92****

VOLUME = MOTOR ROOM #1

DET T	N.G.	I	BR	TE	CS/RB	PART	TOTAL DOSE
-------	------	---	----	----	-------	------	------------

**** PROGRAM DOSE (Version 1.0) REVISION DATE 09/31/92 RAN ON 11/11/92****

VOLUME = MOTOR ROOM #1

DET	T	N.G.	I	BR	TE	CS/RB	PART	TOTAL DOSE
2	7.978E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
2	2.833E-01	0.00E+00	1.27E+02	3.00E+00	4.40E+01	4.60E+01	2.48E+02	4.68E+02
2	5.558E-01	0.00E+00	3.21E+02	7.00E+00	1.11E+02	1.09E+02	6.22E+02	1.17E+03
2	1.000E+00	0.00E+00	6.10E+02	1.20E+01	2.07E+02	1.61E+02	1.16E+03	2.15E+03
2	1.733E+00	0.00E+00	1.29E+03	1.70E+01	4.35E+02	2.29E+02	2.51E+03	4.49E+03
2	3.675E+00	0.00E+00	4.13E+03	2.30E+01	1.74E+03	3.40E+02	9.86E+03	1.61E+04
2	8.000E+00	0.00E+00	1.13E+04	2.60E+01	6.50E+03	5.13E+02	3.35E+04	5.19E+04
2	1.600E+01	0.00E+00	1.79E+04	2.60E+01	1.47E+04	7.94E+02	6.54E+04	9.88E+04
2	2.380E+01	0.00E+00	2.21E+04	2.60E+01	2.26E+04	1.07E+03	9.32E+04	1.39E+05
2	9.600E+01	0.00E+00	4.25E+04	2.60E+01	7.50E+04	3.62E+03	3.10E+05	4.31E+05
2	7.200E+02	0.00E+00	8.40E+04	2.60E+01	2.32E+05	2.55E+04	9.74E+05	1.32E+06

**** PROGRAM DOSE (Version 1.0) REVISION DATE 09/31/92 RAN ON 11/11/92****

VOLUME = MOTOR ROOM #1

DET	T	N.G.	I	BR	TE	CS/RB	PART	TOTAL DOSE
3	7.978E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
3	2.833E-01	0.00E+00	1.13E+02	3.00E+00	4.00E+01	4.10E+01	2.21E+02	4.18E+02
3	5.558E-01	0.00E+00	2.95E+02	7.00E+00	1.03E+02	9.80E+01	5.69E+02	1.07E+03
3	1.000E+00	0.00E+00	5.77E+02	1.10E+01	1.97E+02	1.49E+02	1.10E+03	2.03E+03
3	1.733E+00	0.00E+00	1.22E+03	1.60E+01	4.13E+02	2.12E+02	2.37E+03	4.23E+03
3	3.675E+00	0.00E+00	3.40E+03	2.10E+01	1.36E+03	3.01E+02	7.71E+03	1.28E+04
3	8.000E+00	0.00E+00	7.83E+03	2.30E+01	4.38E+03	4.16E+02	2.26E+04	3.53E+04
3	1.600E+01	0.00E+00	1.22E+04	2.30E+01	9.80E+03	6.00E+02	4.36E+04	6.61E+04
3	2.380E+01	0.00E+00	1.49E+04	2.30E+01	1.49E+04	7.81E+02	6.19E+04	9.25E+04
3	9.600E+01	0.00E+00	2.83E+04	2.30E+01	4.94E+04	2.46E+03	2.04E+05	2.85E+05
3	7.200E+02	0.00E+00	5.54E+04	2.30E+01	1.53E+05	1.69E+04	6.43E+05	8.67E+05

**** PROGRAM DOSE (Version 1.0) REVISION DATE 09/31/92

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RAN ON 11/11/92****

VOLUME = MOTOR ROOM #1

DET	T	N.G.	I	BR	TE	CS/RB	PART	TOTAL DOSE
		0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
4	7.978E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
4	2.833E-01	0.00E+00	9.70E+01	2.00E+00	3.40E+01	3.40E+01	1.89E+02	3.56E+02
4	5.558E-01	0.00E+00	2.56E+02	6.00E+00	9.00E+01	8.40E+01	4.93E+02	9.28E+02
4	1.000E+00	0.00E+00	5.12E+02	9.00E+00	1.76E+02	1.30E+02	9.70E+02	1.80E+03
4	1.733E+00	0.00E+00	1.09E+03	1.40E+01	3.69E+02	1.86E+02	2.10E+03	3.76E+03
4	3.675E+00	0.00E+00	2.89E+03	1.80E+01	1.12E+03	2.60E+02	6.46E+03	1.08E+04
4	8.000E+00	0.00E+00	6.15E+03	2.00E+01	3.38E+03	3.47E+02	1.76E+04	2.75E+04
4	1.600E+01	0.00E+00	9.45E+03	2.00E+01	7.53E+03	4.89E+02	3.35E+04	5.10E+04
4	2.380E+01	0.00E+00	1.16E+04	2.00E+01	1.15E+04	6.26E+02	4.75E+04	7.12E+04
4	9.600E+01	0.00E+00	2.18E+04	2.00E+01	3.78E+04	1.91E+03	1.56E+05	2.18E+05
4	7.200E+02	0.00E+00	4.24E+04	2.00E+01	1.17E+05	1.29E+04	4.91E+05	6.63E+05

**** PROGRAM DOSE (Version 1.0) REVISION DATE 09/31/92 RAN ON 11/11/92****

VOLUME = MOTOR ROOM #1

DET	T	N.G.	I	BR	TE	CS/RB	PART	TOTAL DOSE
5	7.978E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
5	2.833E-01	0.00E+00	8.20E+01	2.00E+00	2.90E+01	2.90E+01	1.61E+02	3.03E+02
5	5.558E-01	0.00E+00	2.20E+02	5.00E+00	7.80E+01	7.20E+01	4.25E+02	7.99E+02
5	1.000E+00	0.00E+00	4.48E+02	8.00E+00	1.54E+02	1.13E+02	8.48E+02	1.57E+03
5	1.733E+00	0.00E+00	9.53E+02	1.20E+01	3.25E+02	1.61E+02	1.84E+03	3.30E+03
5	3.675E+00	0.00E+00	2.48E+03	1.60E+01	9.52E+02	2.25E+02	5.50E+03	9.17E+03
5	8.000E+00	0.00E+00	5.03E+03	1.70E+01	2.75E+03	2.95E+02	1.43E+04	2.24E+04
5	1.600E+01	0.00E+00	7.68E+03	1.70E+01	6.08E+03	4.08E+02	2.72E+04	4.13E+04
5	2.380E+01	0.00E+00	9.38E+03	1.70E+01	9.23E+03	5.19E+02	3.84E+04	5.75E+04
5	9.600E+01	0.00E+00	1.76E+04	1.70E+01	3.04E+04	1.55E+03	1.26E+05	1.75E+05
5	7.200E+02	0.00E+00	3.42E+04	1.70E+01	9.37E+04	1.04E+04	3.95E+05	5.33E+05

**** PROGRAM DOSE (Version 1.0) REVISION DATE 09/31/92 RAN ON 11/11/92****

VOLUME = MOTOR ROOM #1

DET	T	N.G.	I	BR	TE	CS/RB	PART	TOTAL DOSE
6	7.978E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
6	2.833E-01	0.00E+00	7.00E+01	2.00E+00	2.50E+01	2.50E+01	1.37E+02	2.59E+02
6	5.558E-01	0.00E+00	1.90E+02	4.00E+00	6.70E+01	6.20E+01	3.67E+02	6.90E+02
6	1.000E+00	0.00E+00	3.92E+02	7.00E+00	1.35E+02	9.80E+01	7.41E+02	1.37E+03
6	1.733E+00	0.00E+00	8.35E+02	1.00E+01	2.85E+02	1.40E+02	1.61E+03	2.89E+03
6	3.675E+00	0.00E+00	2.14E+03	1.40E+01	8.19E+02	1.94E+02	4.73E+03	7.89E+03
6	8.000E+00	0.00E+00	4.21E+03	1.50E+01	2.29E+03	2.52E+02	1.19E+04	1.87E+04
6	1.600E+01	0.00E+00	6.40E+03	1.50E+01	5.05E+03	3.46E+02	2.26E+04	3.44E+04
6	2.380E+01	0.00E+00	7.81E+03	1.50E+01	7.66E+03	4.38E+02	3.19E+04	4.78E+04
6	9.600E+01	0.00E+00	1.46E+04	1.50E+01	2.52E+04	1.29E+03	1.04E+05	1.45E+05
6	7.200E+02	0.00E+00	2.83E+04	1.50E+01	7.75E+04	8.61E+03	3.27E+05	4.41E+05

**** PROGRAM DOSE (Version 1.0) REVISION DATE 09/31/92 RAN ON 11/11/92****

VOLUME = MOTOR ROOM #1

DET	T	N.G.	I	BR	TE	CS/RB	PART	TOTAL DOSE
7	7.978E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
7	2.833E-01	0.00E+00	6.10E+01	1.00E+00	2.20E+01	2.10E+01	1.18E+02	2.24E+02
7	5.558E-01	0.00E+00	1.65E+02	4.00E+00	5.90E+01	5.30E+01	3.18E+02	5.99E+02
7	1.000E+00	0.00E+00	3.43E+02	6.00E+00	1.19E+02	8.50E+01	6.49E+02	1.20E+03
7	1.733E+00	0.00E+00	7.33E+02	9.00E+00	2.51E+02	1.23E+02	1.42E+03	2.53E+03
7	3.675E+00	0.00E+00	1.86E+03	1.20E+01	7.10E+02	1.69E+02	4.10E+03	6.84E+03
7	8.000E+00	0.00E+00	3.58E+03	1.30E+01	1.94E+03	2.18E+02	1.01E+04	1.59E+04
7	1.600E+01	0.00E+00	5.43E+03	1.30E+01	4.27E+03	2.97E+02	1.91E+04	2.91E+04
7	2.380E+01	0.00E+00	6.62E+03	1.30E+01	6.47E+03	3.74E+02	2.69E+04	4.04E+04
7	9.600E+01	0.00E+00	1.23E+04	1.30E+01	2.12E+04	1.09E+03	8.79E+04	1.23E+05
7	7.200E+02	0.00E+00	2.39E+04	1.30E+01	6.54E+04	7.27E+03	2.75E+05	3.72E+05

VOLUME = MOTOR ROOM #1

DET	T	N.G.	I	BR	TE	CS/RB	PART	TOTAL DOSE
8	7.978E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
8	2.833E-01	0.00E+00	5.30E+01	1.00E+00	1.90E+01	1.90E+01	1.03E+02	1.94E+02
8	5.558E-01	0.00E+00	1.44E+02	3.00E+00	5.10E+01	4.60E+01	2.78E+02	5.23E+02
8	1.000E+00	0.00E+00	3.02E+02	5.00E+00	1.05E+02	7.50E+01	5.71E+02	1.06E+03
8	1.733E+00	0.00E+00	6.46E+02	8.00E+00	2.21E+02	1.08E+02	1.25E+03	2.23E+03
8	3.675E+00	0.00E+00	1.62E+03	1.00E+01	6.20E+02	1.48E+02	3.57E+03	5.97E+03
8	8.000E+00	0.00E+00	3.08E+03	1.10E+01	1.67E+03	1.90E+02	8.70E+03	1.37E+04
8	1.600E+01	0.00E+00	4.66E+03	1.10E+01	3.65E+03	2.58E+02	1.64E+04	2.50E+04
8	2.380E+01	0.00E+00	5.68E+03	1.10E+01	5.54E+03	3.24E+02	2.31E+04	3.46E+04
8	9.600E+01	0.00E+00	1.06E+04	1.10E+01	1.82E+04	9.39E+02	7.52E+04	1.05E+05
8	7.200E+02	0.00E+00	2.05E+04	1.10E+01	5.59E+04	6.22E+03	2.36E+05	3.18E+05

**** PROGRAM DOSE (Version 1.0) REVISION DATE 09/31/92 RAN ON 11/11/92****

VOLUME = MOTOR ROOM #1

DET T	N.G.	I	BR	TE	CS/RB	PART	TOTAL DOSE
9	7.978E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
9	2.833E-01	0.00E+00	4.60E+01	1.00E+00	1.70E+01	1.60E+01	9.00E+01
9	5.558E-01	0.00E+00	1.27E+02	3.00E+00	4.50E+01	4.10E+01	2.44E+02
9	1.000E+00	0.00E+00	2.67E+02	5.00E+00	9.30E+01	6.60E+01	5.05E+02
9	1.733E+00	0.00E+00	5.71E+02	7.00E+00	1.96E+02	9.50E+01	1.10E+03
9	3.675E+00	0.00E+00	1.43E+03	9.00E+00	5.45E+02	1.30E+02	3.14E+03
9	8.000E+00	0.00E+00	2.68E+03	1.00E+01	1.45E+03	1.67E+02	7.55E+03
9	1.600E+01	0.00E+00	4.05E+03	1.00E+01	3.17E+03	2.25E+02	1.42E+04
9	2.380E+01	0.00E+00	4.93E+03	1.00E+01	4.80E+03	2.82E+02	2.00E+04
9	9.600E+01	0.00E+00	9.16E+03	1.00E+01	1.57E+04	8.14E+02	6.51E+04
9	7.200E+02	0.00E+00	1.78E+04	1.00E+01	4.84E+04	5.38E+03	2.04E+05

EGS CORPORATION

Title Verification of Computer Program Page B1 of B18
Post Processor RADSIM EGS-TR-910600-26 Project WSRC

Calculated by DMG

Date 11/13/92

Checked by JND

Date 11/13/92

Appendix B

Sample Problem Two Verification

Pump Room #1 Air Model all detectors

EGS CORPORATION

Title Verification of Computer Program

Page B2 of B18

Post Processor RADSIM EGS-TR-910600-26Project WSRCCalculated by DMBDate 11/15/92

Checked by

Date

Sample Problem Two Verification

Pump Room #1 Air Model all detectors

Verify Detector Locations

Detector #	X	bottomval	bottomval-(X/30.48)	Location
1	3.7890D+02	16	3.5688976	3.5688976
2	3.7890D+02	16	3.5688976	3.5688976
3	3.1630D+02	16	5.6227034	5.6227034
4	2.5370D+02	16	7.6765092	7.6765092
5	1.9110D+02	16	9.730315	9.7303150
6	1.2850D+02	16	11.7841207	11.7841207
7	6.5900D+01	16	13.8379265	13.8379265
8	3.3000D+00	16	15.8917323	15.8917323
9	-5.9300D+01	16	17.945538	17.9455381
10	-1.2190D+02	16	19.9993438	19.9993438

Verification of maximum dose values for volume

Detector #	DOSE	Color on Display
1	0	N/A
2	121000	Purple
3	129000	Purple
4	132000	Purple
5	130000	Purple
6	125000	Purple
7	114000	Purple
8	93100	Yellow
9	69900	Yellow
10	56800	Yellow

Maximum	132000
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**** PROGRAM DOSE (Version 1.0) REVISION DATE 09/31/92 RAN ON 11/11/92****

VOLUME = PUMP ROOM #1

DET T	N.G.	I	BR	TE	CS/RB	PART	TOTAL DOSE
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**** PROGRAM DOSE (Version 1.0) REVISION DATE 09/31/92 RAN ON11/11/92****

VOLUME = PUMP ROOM #1

DET T		N.G.	I	BR	TE	CS/RB	PART	TOTAL DOSE
2	7.978E-03	3.70E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.70E+01
2	2.833E-01	1.62E+04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.62E+04
2	5.558E-01	1.76E+04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.76E+04
2	1.000E+00	1.96E+04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.96E+04
2	1.733E+00	2.24E+04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.24E+04
2	3.675E+00	2.79E+04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.79E+04
2	8.000E+00	3.42E+04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.42E+04
2	1.600E+01	3.94E+04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.94E+04
2	2.380E+01	4.22E+04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.22E+04
2	9.600E+01	6.03E+04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.03E+04
2	7.200E+02	1.21E+05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.21E+05

**** PROGRAM DOSE (Version 1.0) REVISION DATE 09/31/92 RAN ON11/11/92****

VOLUME = PUMP ROOM #1

DET	T	N.G.	I	BR	TE	CS/RB	PART	TOTAL DOSE
3	7.978E-03	3.80E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.80E+01
3	2.833E-01	1.71E+04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.71E+04
3	5.558E-01	1.87E+04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.87E+04
3	1.000E+00	2.09E+04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.09E+04
3	1.733E+00	2.41E+04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.41E+04
3	3.675E+00	2.98E+04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.98E+04
3	8.000E+00	3.66E+04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.66E+04
3	1.600E+01	4.21E+04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.21E+04
3	2.380E+01	4.51E+04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.51E+04
3	9.600E+01	6.44E+04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.44E+04
3	7.200E+02	1.29E+05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.29E+05

**** PROGRAM DOSE (Version 1.0) REVISION DATE 09/31/92 RAN ON11/11/92****

VOLUME = PUMP ROOM #1

DET	T	N.G.	I	BR	TE	CS/RB	PART	TOTAL DOSE
5	7.978E-03	3.90E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.90E+01
5	2.833E-01	1.73E+04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.73E+04
5	5.558E-01	1.89E+04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.89E+04
5	1.000E+00	2.13E+04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.13E+04
5	1.733E+00	2.45E+04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.45E+04
5	3.675E+00	3.04E+04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.04E+04
5	8.000E+00	3.72E+04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.72E+04
5	1.600E+01	4.27E+04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.27E+04
5	2.380E+01	4.58E+04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.58E+04
5	9.600E+01	6.53E+04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.53E+04
5	7.200E+02	1.30E+05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.30E+05

**** PROGRAM DOSE (Version 1.0) REVISION DATE 09/31/92 RAN ON11/11/92****

VOLUME = PUMP ROOM #1

DET	T	N.G.	I	BR	TE	CS/RB	PART	TOTAL DOSE
6	7.978E-03	3.70E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.70E+01
6	2.833E-01	1.65E+04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.65E+04
6	5.558E-01	1.81E+04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.81E+04
6	1.000E+00	2.04E+04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.04E+04
6	1.733E+00	2.35E+04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.35E+04
6	3.675E+00	2.91E+04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.91E+04
6	8.000E+00	3.56E+04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.56E+04
6	1.600E+01	4.10E+04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.10E+04
6	2.380E+01	4.39E+04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.39E+04
6	9.600E+01	6.26E+04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.26E+04
6	7.200E+02	1.25E+05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.25E+05

**** PROGRAM DOSE (Version 1.0) REVISION DATE 09/31/92 RAN ON11/11/92****

VOLUME = PUMP ROOM #1

DET	T	N.G.	I	BR	TE	CS/RB	PART	TOTAL DOSE
7	7.978E-03	3.40E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.40E+01
7	2.833E-01	1.51E+04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.51E+04
7	5.558E-01	1.66E+04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.66E+04
7	1.000E+00	1.87E+04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.87E+04
7	1.733E+00	2.15E+04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.15E+04
7	3.675E+00	2.66E+04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.66E+04
7	8.000E+00	3.25E+04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.25E+04
7	1.600E+01	3.74E+04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.74E+04
7	2.380E+01	4.01E+04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.01E+04
7	9.600E+01	5.71E+04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.71E+04
7	7.200E+02	1.14E+05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.14E+05

**** PROGRAM DOSE (Version 1.0) REVISION DATE 09/31/92 RAN ON11/11/92****

VOLUME = PUMP ROOM #1

DET	T	N.G.	I	BR	TE	CS/RB	PART	TOTAL DOSE
8	7.978E-03	2.70E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.70E+01
8	2.833E-01	1.22E+04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.22E+04
8	5.558E-01	1.34E+04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.34E+04
8	1.000E+00	1.51E+04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.51E+04
8	1.733E+00	1.74E+04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.74E+04
8	3.675E+00	2.15E+04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.15E+04
8	8.000E+00	2.63E+04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.63E+04
8	1.600E+01	3.03E+04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.03E+04
8	2.380E+01	3.25E+04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.25E+04
8	9.600E+01	4.64E+04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.64E+04
8	7.200E+02	9.31E+04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.31E+04

**** PROGRAM DOSE (Version 1.0) REVISION DATE 09/31/92 RAN ON11/11/92****

VOLUME = PUMP ROOM #1

DET	T	N.G.	I	BR	TE	CS/RB	PART	TOTAL DOSE
9	7.978E-03	2.00E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.00E+01
9	2.833E-01	9.07E+03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.07E+03
9	5.558E-01	9.93E+03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.93E+03
9	1.000E+00	1.12E+04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.12E+04
9	1.733E+00	1.28E+04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.28E+04
9	3.675E+00	1.59E+04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.59E+04
9	8.000E+00	1.95E+04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.95E+04
9	1.600E+01	2.24E+04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.24E+04
9	2.380E+01	2.41E+04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.41E+04
9	9.600E+01	3.46E+04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.46E+04
9	7.200E+02	6.99E+04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.99E+04

**** PROGRAM DOSE (Version 1.0) REVISION DATE 09/31/92 RAN ON 11/11/92****

VOLUME = PUMP ROOM #1

DET T		N.G.	I	BR	TE	CS/RB	PART	TOTAL DOSE
10	7.978E-03	1.60E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.60E+01
10	2.833E-01	7.28E+03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.28E+03
10	5.558E-01	7.97E+03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.97E+03
10	1.000E+00	8.95E+03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.95E+03
10	1.733E+00	1.03E+04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.03E+04
10	3.675E+00	1.27E+04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.27E+04
10	8.000E+00	1.56E+04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.56E+04
10	1.600E+01	1.80E+04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.80E+04
10	2.380E+01	1.93E+04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.93E+04
10	9.600E+01	2.79E+04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.79E+04
10	7.200E+02	5.68E+04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.68E+04

END

**DATE
FILMED**

9/15/93