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DEVELOPMENT OF A COMPUTERIZED DATA BASE FOR LOW-LEVEL RADIOACTIVE WASTE LEACHING DATA

TOPICAL REPORT

D.R. Dougherty and P. Colombo

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NUCLEAR WASTE RESEARCH GROUP
DEPARTMENT OF NUCLEAR ENERGY
BROOKHAVEN NATIONAL LABORATORY
ASSOCIATED UNIVERSITIES, INC.
UPTON, LONG ISLAND, NEW YORK 11973

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ABSTRACT

A computerized data base (db) of low-level waste (LLW) leaching data is being compiled by Brookhaven National Laboratory under contract to the DOE Low-Level Waste Management Program. Although this db is being compiled as part of an effort to develop accelerated leach test procedures for LLW forms, others involved in LLW management may find it useful. The db is implemented on an IBM PC XT and is self-contained in that its data manipulation and analysis programs are not proprietary (i.e., need not be purchased). The db includes data from the Accelerated Leach Test(s) Program plus selected literature data, which have been selected based on criteria that include completeness of the experimental description and elucidation of leaching mechanisms.

DEVELOPMENT OF A COMPUTERIZED DATA BASE FOR LOW-LEVEL RADIOACTIVE WASTE LEACHING DATA

1. INTRODUCTION

This report documents the development of a computerized data base (db) of leaching data for solidified low-level radioactive waste (LLW) forms. Brookhaven National Lab performed this work under contract with the U.S. Department of Energy's Low-Level Waste Management Program as part of an effort to develop an accelerated leach test(s) that can be used to predict leachabilities of LLW forms over long time periods, i.e., hundreds of years. The accelerated leach test(s) is (are) to be developed based on knowledge of leaching mechanisms and factors that affect leaching. Although developed specifically for the Accelerated Leach Test(s) Program, this db may be useful to others concerned with the management of low-level waste.

The db is being developed to provide efficient data compilation and analysis capabilities. The data compiled in the db, which include data from the Accelerated Leach Test(s) Program and selected data from the literature, have been selected to elucidate leaching mechanisms and factors that affect leaching and are not meant to be a comprehensive compilation of leaching data. This report presents the data compilation aspect of the db. It does not present the programmatic results obtained from analysis of the data regarding leaching mechanisms and factors that affect leaching, which will be presented in reports from the Accelerated Leach Test(s) Program.

1.1 Purpose And Scope

This data base was developed for the following reasons:

- (i) to provide an efficient management vehicle for collecting, analyzing and presenting data obtained in this program,
- (ii) to provide an efficient and usable compilation of data from the literature to allow full advantage to be taken of previous work in this area, and
- (iii) to provide data for validation of leaching release models.

Selected leaching data on all currently-used solidification agents are being included in the db, not just those under experimental investigation in this program (i.e., portland cement, bitumen, vinyl ester-styrene and soda-lime glass). Of particular interest are data from replicate samples, which provide some measure of the statistical variability of leaching, and from nominally identical samples of varying size, from which scaling effects can be gauged. The most relevant data are from long-term experiments on full scale waste forms containing actual waste and it is of interest to compare these data to results obtained using simulated wastes and/or tracers from laboratory leaching experiments.

Since the data base contains several sections, a "road map" is provided in Appendix A to both introduce the structure of the information available in the data base and to efficiently guide users to the sections which interest them.

1.2 Philosophical Context Under Which The Data Base Was Developed

Efficient use of a data base requires that the user be aware of what the compiler had in mind for the intended use of the data. For data which are completely straightforward in informational content, e.g., mailing addresses, there can be no confusion in either information content or interpretation. Unfortunately, leaching data are not so unambiguous since the meaning of any specific set of data also depends on knowledge of sample composition, size and shape, leachant composition, temperature, etc. Thus, leaching data are not useful without additional information on the sample, leachant and leaching conditions - which immediately raises the issue of how detailed the additional description need be to unambiguously define the informational content of the data. Rather than formally attempt to address this question, which would probably be futile anyway, we quote two sentences from the ANS 16.1 leach test procedure [1] which succinctly summarize the difficulties with waste forms,

"The characteristics of radioactive wastes (radwastes) from the nuclear industry are dependent on many diverse factors, most of which do not lend themselves to simple definition and standardization", and with leach testing itself,

"Leachability, however, is a property which is difficult to define precisely, measure by a generally acceptable procedure, and interpret in an unambiguous theoretical manner."

Given this, we are including a discussion of the philosophical bent (as opposed to the functional organization) that was followed in developing the data base and selecting the analyses incorporated into it. The functional organization is presented in Section 2.

Since this data base is a collection of leaching data meant to be interpreted by various types of analysis, we first define what we mean by a leaching experiment in a way that is consistent with analyses commonly found in the literature. A survey of leaching experiments indicates that there are basically four bounding scenarios for leaching and that real leach testing often assumes that one of these scenarios holds for purposes of analysis. These scenarios are listed in Table 1.1 along with brief comments on the initial and boundary conditions generally assumed for each.

Scenario (1) has generally been considered to be the worst case for leaching. However, scenario (2) has been shown to be worse for alkaline glasses since the leachant becomes more corrosive to glass as it becomes more alkaline due to leaching the glass. Although glass is not currently used to solidify LLW, developmental research has been sponsored by DOE into the possible

TABLE 1.1

Leaching Scenarios

- (1) Leaching of a bare waste form into a leachant which remains infinitely dilute with respect to the species of interest and is of effectively unlimited volume.
 - * This is the general scenario assumed for analysing data obtained from leach tests such as the ANS 16.1 [1] and IAEA [2] leach tests which are commonly used for LLW.
 - * Leachant aging from chemical interaction with the waste form does not occur in this scenario.
 - * The dilute-leachant condition is approximated by replacing the leachant at specified intervals in [1] and [2]. The same effect is obtained in flow tests at high flow rates.
- (2) Leaching into a static and relatively small volume of leachant.
 - * Such static tests are meant to measure leaching which is affected by leachant aging due to accumulation of leached material and possibly chemical reaction between the sample and the aged leachant.
 - * Waste forms which contain soluble material and/or which can change the pH or Eh of the static leachant may significantly affect the leachability over long time periods.
- (3) Varying leaching conditions by wet/dry cycling.
 - * This has not been commonly done in leach testing, but it has been shown that wet/dry cycling of leaching conditions can affect measured leachabilities compared to continuously saturated conditions as in scenarios (1) and (2) above [3,4].
 - * For soluble substances the effect of wet/dry cycling appears to be due to efflorescence, i.e., soluble substances are transported to and then deposited on or near the surface by the evaporating leachant during the dry cycle. The increased concentration of these substances at the surface results in increased leaching during the following wet cycle.
 - * Wet/dry cycling of leaching conditions may be more representative of actual leaching conditions than continuously saturated conditions.
- (4) Leaching the waste package, i.e., the waste form in its container.
 - * Clearly, this is the most realistic leaching scenario. The reason that leaching of the complete waste package is not done is that the function of the container has been assumed to be limited to delaying the onset of leaching until the container is breached by corrosion or failure. Thus, removing the container has generally been assumed to provide worst-case leaching conditions.
 - * If the waste form swells, due to hydration of waste salts or other reasons, then interaction between the swelling waste form and the container may increase leachability [5].

use of glass solidification for selected LLW streams [6]. For cemented waste forms, which, because of their inherent porosity, can absorb a great deal of water under saturated conditions and then release it in unsaturated (dry) conditions, scenario (3) may be the worst case. Finally, scenario (4) may ultimately be the worst case for any waste form which undergoes mechanical damage due to interaction with the container which results in an increase in surface available for leaching. Although the effects in scenarios (3) and (4) may be important under actual leaching conditions, cognizance of their importance appears to be relatively recent. As a result, all of the data currently in the data base is from leach testing which approximates scenarios (1) and (2).

The leaching conditions listed under scenario (1) can only be approached in actual leach testing. However, leaching data obtained from the ANS 16.1 and IAEA standard leach tests are typically analysed based on the assumed boundary conditions in scenario (1). Since the measured leach rate may be affected by the buildup of leached substance necessary for measurement, the possible effect of such departure from the ideal boundary conditions should be recognized and either shown to be insignificant or corrected for, if possible. In general, leachability is expected to decrease as concentration increases. For many cases in which the concentration of leached material is not effectively zero, the possibility that the leach rate is a function of concentration should be examined. This has not been done to any meaningful extent in the literature. Meaningful modeling of leaching data cannot be done without knowledge of the boundary conditions under which the data were obtained.

Since all leaching studies are, of necessity, limited to relatively short times compared to the time required for radionuclide decay to innocuous levels of activity, the effects of long-term environmental aging must be well enough understood to allow confident prediction of leaching behavior over long periods. The use of "conservative" or "worst case" conditions in testing, which is sometimes claimed, would be of great interest - if it were certain that the given test conditions were in fact "worst case". However, it is not clear that such scenarios can be specified given the current state of knowledge.

1.3 Availability And Expandability

The db consists of: (i) this report, which provides a written description of the organization and contents of the db as of the publication date, and, (ii) a 5 1/4 inch, 360 kb floppy disc which contains the data, cross-referencing tables and programs for data manipulation and analysis. The programs are coded in IBM Basica and are not proprietary (i.e., need not be purchased). Further, the programs are not compiled. Therefore, the user can edit the programs, which allows both the analytical procedures and the data structure itself to be changed. Since the user has complete editing capability and the programs are, in fact, still undergoing revision as additional analytical capabilities are needed, the db cannot be considered to be a "standard" db. Although standardization of this db into a commercial data base management system may ultimately be desirable, this is not in the scope of this program.

The functional capabilities of the db are provided in two programs, a file program and a program for plotting and analysis. The file program is used to create new data files, update existing data files and print data files to either the screen or a line printer. The plotting and analysis program plots one or more sets of data on selected axes (linear or log scales) and provides least-squares curve fits of selected functions (linear, log, square root of time, etc.) over any selected range of the data.

This report presents the data compilation aspect of the db. It does not present the programmatic results obtained from analysis of the data regarding leaching mechanisms and factors that affect leaching, which will be presented in reports from the Accelerated Leach Test(s) Program.

2. DATA BASE ORGANIZATION

A summary of data base organization including data entry, experimental information and cross-referencing subdivisions is presented and discussed in the subsections below. A brief overview is presented in the remainder of this introduction.

A requirement of the data base is that each set of data be uniquely identified within the data base. A TESTID has been assigned to each set of data included in the data base to do this. The TESTID also identifies the literature reference from which the data were obtained for data not generated in the experimental part of this program.

To be meaningful and usable, leaching data require additional information on waste form and leachant compositions and test conditions which provide the context for analysis and interpretation of the data. Within the data base, this contextual information and the data are contained in three "information sheets".

Within the data base the data have been cross-referenced according to the five parameters:

- Solidification Agent
- Waste Type
- Radionuclide/Element Leached
- Leachant Type
- Size and Shape

The subdivisions under each of these parameters, such as portland cement, masonry cement, etc. under Solidification Agent, provide efficient access to specific data types within the data base.

Appendix A and B contain the data and other information. Appendix A provides an overview of the data base in the "road map" in Table A.1.1 and the cross-references in Tables A.2 - A.3.7. Appendix B contains the data along with brief abstracts of the experimental details taken from each literature reference. In Appendix B the data are organized by reference.

2.1 Data File Specification - The TESTID and SAMPLEID

Each data set is assigned a TESTID which contains the number of the reference from which the data were taken and identifies the specific data set within the data base. The TESTID is a four digit number for references 1 thru 9 and a five digit number for references 10 and above. The first one, or two, digits specify the reference. The next digit is normally zero but may be given a non-zero value for special purposes. The last two digits, 01-99, identify the leaching data reported for each sample within the reference.

The SAMPLEID provides a brief overview of waste form and leachant compositions in a coded format consisting of four parameters. These parameters, separated by hyphens, indicate, Solidification Agent-Waste Type-Size-Leachant, according to the code listed in APPENDIX A. The SAMPLEID listing in Table A.2 allows specific types of data to be readily identified.

2.2 Data Organization And Experimental Context

The most useful way to organize the data appears to be by separating the data itself and the accompanying sample information onto three pages. Thus, each set of leaching data (i.e., the data for each sample leached, which includes data on one or more radionuclides and/or other species measured) has three associated pages of information:

- (i) A one-page abstract summarizing experimental information and conclusions from the reference from which the data were taken.
- (ii) A summary sheet of specific information on waste form and leachant composition and pertinent experimental parameters.
- (iii) Data sheets of cumulative fraction released (CFR) versus time (Days) for each radionuclide and/or other species measured in the experiment.

The abstract applies to all data files (TESTIDs) from the listed reference. The experimental summary sheet applies to individual or replicate leaching experiments. Data sheets list the data for each leaching experiment individually.

2.3 Division Of Data Into Groups

Since different waste forms have differing physicochemical properties and, therefore, possibly different leaching mechanisms, it is necessary to separate the data into groups based on these different properties for analysis. These groups may change. Data has been grouped initially according to what seems logical from experience. Future analysis of data using models and statistical correlations may modify these initial groupings. These initial groupings are based on five parameters which are thought to be important for leaching behavior of waste forms which are otherwise nominally identical. These five parameters plus detailed breakdowns of each are listed in Table 2.1.

2.4 Cross-Referencing Tables

The usefulness of the data in the data base depends to a large degree on the accessibility of the data from various 'directions'. We have previously identified five major parameters for grouping data and their subdivisions. Since specific uses of the data base are most efficiently accomplished using different groupings of the data, tables are included in the data base which

TABLE 2.1

The Five Primary Parameters and Their Subdivisions by Which Data are Divided into Groups

- (i) Solidification Agent
 - portland cement
 - masonry cement
 - other cement (e.g. pozzolan cement)
 - bitumen
 - vinyl ester - styrene emulsion (DOW process)
 - vinyl ester - styrene dry (i.e., dry wastes)
- (ii) Waste Types
 - sulfate wastes (e.g. BWR evaporator bottoms)
 - boric acid wastes (e.g. PWR evaporator bottoms)
 - nitrate wastes (e.g. reprocessing wastes)
 - incinerator ash
 - ion exchange resins
 - tracers only (i.e., no bulk waste)
- (iii) Element Leached
 - radionuclides (Cs, Sr and Co are the radionuclides of most concern in LLW)
 - other elements (e.g. other elements of interest from the solidification agent matrix or the bulk waste, such as Ca, Fe, sulfate and organic carbon)
- (iv) Leachant Type
 - DIW (i.e., deionized water, which is the usual leachant in standard leach tests)
 - ground water (may be typical of a specific site)
 - sea water
 - brine (i.e., a saturated or highly concentrated solution of a salt or mixture of salts)
- (v) Size and Shape
 - cylinders with height-to-diameter ratios from approximately 1:1 to 2:1 are the most common
 - cubes and/or spheres are less common but may be useful for modeling purposes
 - powders of approximately uniform size (sieved powders) have proved useful for HLW glass studies and may be useful for some types of LLW
 - the effects of size differences, as between laboratory size test samples and full scale waste forms, have not been fully accounted for in modelling efforts.

cross-reference the data in different ways based on the above-listed parameters. The cross-referencing tables are collected in Appendix A beginning with Table A.3.1. By way of example, the parametric breakdown in Table A.3.1 is itemized as follows:

- (i) Solidification Agent and Leachant Type are the principal sort parameters - portland cement and deionized water in Table A.3.1.
- (ii) Waste Type versus Radionuclide/Element Leached are the parameter breakdowns within the table.
- (iii) Sizes of the (cylindrical) samples tested are included parenthetically to complete the parametric information.

Similar tables exist for other solidification agents and/or leachant types as principal sort parameters.

Data from replicate samples are considered especially significant for obtaining statistical parameters and so are listed in a readily identifiable manner in the tables. For example, replicate samples 1001, 1002 and 1003 are listed as 1001,2,3. Similarly, replicates 8112, 8113 and 8114 are listed as 8112,13,14.

3. REFERENCES

1. American Nuclear Society, "Measurement of the Leachability of Solidified Low-Level Radioactive Wastes," ANS Standards Committee, ANS 16.1, June 20, 1984.
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6. Armstrong, K.M. and L.M. Klingler, "Evaluation of a Processing Technique for Immobilization of Low-Level Radioactive Waste," Mound Laboratory, MLM-3149, July 13, 1984.

APPENDIX A

Data Base Cross-Reference Tables

Appendix A contains a "road map", which schematically illustrates the organization of the data base, and sets of tables in which the data, by TESTID, are cross-referenced according to various combinations of:

Solidification Agent
Waste Type
Radionuclide or Element Leached
Leachant
Waste Form (Sample) Size

The road map provides a schematic picture of the organization of the data base and is designed to assist users in locating those sections of the data base which are of specific interest. The cross-referencing tables group the data by TESTID according to various subsets of the parameters listed above. The data, along with detailed descriptions of the sample, leachant and leaching conditions taken from the reference, are compiled in Appendix B.

The TESTID is the "label" attached to each set of leaching data (i.e., all of the data from a leached waste form). It is a four or five digit number which contains: (i) the literature reference number, (ii) a digit which is normally zero but may be changed and, (iii) a number assigned to the data from individual leaching experiments within the cited reference.

The literature reference from which any particular leaching curve was taken is obtained from the first one (or two) digits of the TESTID. For References 1-9 the TESTID is four digits with the first digit identifying the reference. For References 10 and above the TESTID is five digits with the first two digits identifying the reference. The third digit is normally zero but may be given another value for special purposes (e.g., Reference 8 contains data for cemented boric acid wastes and cemented ion-exchange resin wastes; the boric acid data have TESTIDs 8002-8012 while the resin waste data have TESTIDs 8101-8117). Individual leaching experiments are identified by the last two digits of the TESTID.

The SAMPLEID provides a brief overview of waste form composition and leachant type in an abbreviated format consisting of four parameters,

Solidification Agent-Waste Type-Size-Leachant

represented by the following code:

Solidification Agent

C = hydraulic cement (portland, masonry, blends, etc.)
B = bitumen
P = polymer
G = glass

Waste Type

T = tracers only (i.e., no bulk waste)
S = simulated waste
R = real waste

Size

SS = small scale (anything less than full scale)
FS = full scale waste form (typically 55-gallon drum)

Leachant

DIW = deionized or distilled water
GW = ground water (real or synthetic)
TW = "tap" water
BRN = brine
NS = not specified

Data from replicate samples are considered especially significant for obtaining statistical parameters and so are listed in a readily identifiable manner in the tables. For example, replicate samples 1001, 1002 and 1003 are listed in the Tables as 1001,2,3. Similarly, replicates 8112, 8113 and 8114 are listed in the Tables as 8112,13,14.

The radionuclides of most concern in low-level waste - i.e., those of cesium, strontium and cobalt - are specifically listed in most of the Tables. Other radionuclides, elements or other species reported from leaching experiments are typically listed as "other" and may be identified from the listing in Table A.2.

TABLE A.1

"ROAD MAP" FOR THE DATA BASE

TEXT: DEVELOPMENT OF A COMPUTERIZED DATA BASE FOR LOW-LEVEL RADIOACTIVE WASTE
LEACHING DATA

1. INTRODUCTION
 - 1.1 Purpose & Scope
 - 1.2 Philosophical Context
 - 1.3 Availability & Expandability
2. DATA BASE ORGANIZATION
 - 2.1 TESTID - File Specification
 - 2.2 Organization
 - 2.3 Division Of Data Into Groups
 - 2.4 Cross-Referencing
3. REFERENCES

APPENDIX A: CROSS-REFERENCING TABLES

- Table A.1 - Road Map
- Tables A.2 - Radionuclide/Element Leached Listed
in Order by Data Reference and TESTID
- Tables A.3.1 - A.3.7 - Cross-Referencing Tables

APPENDIX B: DATA AND INFORMATION SUMMARY SHEETS

- References & Abstracts
- Experimental Summary Sheets
- Leaching Data Sheets

TABLE A.2

Radionuclide/Element or Other Species Measured in the Leaching Experiment
Listed by TESTID

TESTID	SAMPLEID	REFER- ENCE	RADIONUCLIDE/ELEMENT LEACHED			
			Cs	Sr	Co	Other
1001,2,3	C-T-SS-DIW	1	x	x	x	
1004,5,6	B-T-SS-DIW		x	x	x	
1007,8,9	P-T-SS-DIW		x	x	x	
2001	B-S-SS-DIW	2				Sulfate
2002	"					"
2003	"					"
2004	B-S-SS-GW					"
2005	"					"
2006	B-S-SS-DIW					"
3001	C-S-SS-NS	3				CsNO ₃
3002	C-S-FS-NS					"
3003	C-S-SS-NS					"
3004	"					"
3005	"					"
3006	"					"
3007	C-SS-S-NS	3				CsNO ₃
3008	C-S-FS-NS					"
3009	C-S-SS-NS					"

TABLE A.2 (continued)

Radionuclide/Element or Other Species Measured in the Leaching Experiment
Listed by TESTID

TESTID	SAMPLEID	REFER- ENCE	RADIONUCLIDE/ELEMENT LEACHED			
			Cs	Sr	Co	Other
3010	C-S-SS-NS					CsNO ₃
3011	"					"
3012	"					"
3013	C-S-SS- NS	3				CsNO ₃
3014	C-S-FS- NS					"
3015	C-S-SS- NS					"
3016	"					"
3017	"					"
3018	"					"
4001	C-R-FS-DIW	4	x			(H3,Tc99,Ru106, Sb125,Na,Nitrate, Nitrite,Sulfate)
4002	"		x			"
5001	C-S-SS-DIW	5				(Cs,Sr,Al,Ca, Co,Cu,Si,Na,Fe)
5002	"					"
5003	"					"
5004	"					Cs,Sr
5005	"					"
5006	"					"
5007	C-S-SS-GW					Cs

TABLE A.2 (continued)

Radionuclide/Element or Other Species Measured in the Leaching Experiment
Listed by TESTID

TESTID	SAMPLEID	REFER- ENCE	RADIONUCLIDE/ELEMENT LEACHED			
			Cs	Sr	Co	Other
6001	C-R-FS-DIW	6	x		x	
6002	"		x		x	
6003	"		x		x	
6004	P-R-FS-DIW		x		x	Mn54
7001,2	C-R-SS-DIW	7	x		x	
7003,4	"		x		x	
7005,6	"		x		x	
7007,8	P-R-SS-DIW		x		x	
7009,10	B-R-SS-DIW		x		x	
8001,2,3	C-S-SS-DIW	8	x			
8004,5,6	"		x			
8007,8	"		x			
8009,10,11	"		x			
8101,2,3	C-S-SS-DIW	8	x			
8104,5,6	"		x			
8107,8,9	"		x			
8110,11	"		x			
8112,13,14	"		x			
8115,16	"		x			
8117	C-S-FS-DIW		x			

TABLE A.3.1

TESTIDs Listed By Waste Type/Element Leached
 Solidification Agent: PC (Portland Cement)
 Leachant: DIW (Deionized Water)

Waste Type	<u>Radionuclide/Element Measured</u>			Other (see Table A.2)
	Cs	Sr	Co	
Tracer Only	1001,2,3 (4.8x6.4)	1001,2,3	1001,2,3	
Incinerator Ash	5001 (5.1x10.2) 5002 (") 5003 (") 5004 (5.1x5.8) 5005 (15.2x17.3) 5006 (30.5x34.5)	5001 5002 5003 5004 5005 5006	5001 5002 5003 5004 5005 5006	5001 5002 5003
Boric Acid	8001,2,3 (4.65x4.8) 8004,5,6 (4.72x9.19) 8007,8 (7.77x8.31) 8009,10,11 (15x15.3)			
Sodium Sulfate	6001 (55x67.5)* 6002 (")* 7001,2 (2.5x5) 7003,4 (")		6001 6002 7001,2 7003,4	
Sodium Nitrate	3001 (5x5) 3002 (55x93)* 3003 (5.5x5.5) 3004 (") 3005 (") 3006 (") 3007 (5x5) 3008 (55x93)* 3009 (5.5x5.5) 3010 (") 3011 (") 3012 (")			
Ion Exchange Resins	8101,2,3 (4.65x4.8) 8104,5,6 (4.69x9.19) 8107,8,9 (7.62x8.48) 8110,11 (15.4x14.6) 8112,13,14 (15.2x29.8) 8115,16 (31.2x29.2) 8117 (54.6x54.6)			

*Estimated, dimensions not reported.

TABLE A.3.2

TESTIDs Listed By Waste Type/Element Leached
 Solidification Agent: PC (Portland Cement)
 Leachant: GW (Ground Water)

Waste Type	<u>Radionuclide/Element Measured</u>				Other (see Table A.2)
	Cs	Size(cm) (dxh)	Sr	Co	
Tracer Only					
Incinerator Ash	5007	(5.1x10.2)			5007
Boric Acid					
Sodium Sulfate					
Sodium Nitrate					
Ion Exchange Resins					

TABLE A.3.3

TESTIDs Listed By Waste Type/Element Leached
 Solidification Agent: MC (Masonry Cement)
 Leachant: DIW (Deionized Water)

Waste Type	Radionuclide/Element Measured			Other (see Table A.2)
	Cs	Sr	Co	
Tracer Only				
Incinerator Ash				
Boric Acid	6003 (55x58.3)* 7005,6 (2.5x5)		6003 7005,6	
Sodium Sulfate				
Sodium Nitrate				
Ion Exchange Resins				

*Estimated, dimensions not reported.

TABLE A.3.4

TESTIDs Listed By Waste Type/Element Leached
 Solidification Agent: OC (Other Cement)
 Leachant: DIW (Deionized Water)

Waste Type	Radionuclide/Element Measured			Other (see Table A.2)
	Size(cm) Cs (dxh)	Sr	Co	
Tracers Only				
Incinerator Ash				
Boric Acid				
Sodium Sulfate				
Sodium Nitrate	3013 ^a (5x5)			
	3014 (55x93)*			
	3015 (5.5x5.5)			
	3016 (")			
	3017 (")			
	3018 (")			
	4001 ^b (54.9x45)			4001
	4002 ^c (54.6x44.5)			4002
Ion Exchange Resins				

a. Solidification agent consisted of (by weight): 1 part ordinary portland cement + 10 parts BFS (blast furnace slag) for samples 3013-3018.

b. Solidification agent consisted of: 20 wt% class H cement plus 80 wt% class C flyash.

c. Solidification agent consisted of: 48 wt% slag cement plus 50 wt% ESP flyash plus 2 wt% hydrated lime.

TABLE A.3.5

TESTIDs Listed By Waste Type/Element Leached
 Solidification Agent: B (Bitumen)
 Leachant: DIW (Deionized Water)

Waste Type	<u>Radionuclide/Element Measured</u>				Other (see Table A.2)
	Cs	Size(cm) (dxh)	Sr	Co	
Tracers Only	1004,5,6	(4.8x6.4)	1004,5,6	1004,5,6	
Incinerator Ash					
Boric Acid	7009,10	(2.5x5)		7009,10	
Sodium Sulfate					2001 (5x10) 2002 (") 2003 (") 2006 (7.6x15.2)
Sodium Nitrate					
Ion Exchange Resins					

TABLE A.3.6

TESTIDs Listed By Waste Type/Element Leached
 Solidification Agent: B (Bitumen)
 Leachant: GW (Ground Water)

Waste Type	Radionuclide/Element Measured				Other (see Table A.2)
	Cs	Size(cm) (dxh)	Sr	Co	
Tracers Only					
Incinerator Ash					
Boric Acid					
Sodium Sulfate					2004 (5x10) 2005 (5x10)
Sodium Nitrate					
Ion Exchange Resins					

TABLE A.3.7

TESTIDs Listed By Waste Type/Element Leached
 Solidification Agent: VES-E (Vinyl Ester-Styrene Emulsion)
 Leachant: DIW (Deionized Water)

Waste Type	<u>Radionuclide/Element Measured</u>			
	Cs	Sr	Co	Other (see Table A.2)
Tracers Only	Size(cm) 1007,8,9 (4.8x6.4)	1007,8,9	1007,8,9	
Incinerator Ash				
Boric Acid				
Sodium Sulfate	6004 (55x60.4)* 7007,8 (2.5x5)		6004 7007,8	6004
Sodium Nitrate				
Ion Exchange Resins				

*Estimated, dimensions not reported.

APPENDIX B

Data

Appendix B contains the data plus the experimental details which provide the context that gives the data meaning beyond the simple listing of the data. The data plus the experimental and other information deemed necessary to completely describe the informational content of each set of data are contained in three information sheets:

- (i) Reference/Abstract Sheet - The reference from which the data were taken plus an abstract of experimental information and any conclusions stated by the authors are listed on one page. Any experimental information included in the abstract is in addition to or expansion of that listed in the experimental details sheet, described in item (ii).
- (ii) Experimental Details Sheet - Specific experimental details on waste form composition, leachant type and leaching conditions as reported in the reference are listed in this information sheet. Information on replicate samples, which are nominally identical and vary only slightly in dimensions or weight, is included on one sheet. Parameters which vary are listed separately, separated by a comma; otherwise the listed value applies to all replicates.
- (iii) Data Sheets - The leaching data, recorded as cumulative fraction released (CFR) versus time for each radionuclide and/or other species of interest from a sample, are recorded on the data sheets. CFR was chosen as the one value to be recorded because it provides the total amount leached at each point. Only one measure of the release, i.e., CFR, is reported for the sake of simplicity and because other parameters, such as diffusion coefficients, are calculated from the data using various assumptions. Although incremental fraction released (IFR) has certain advantages over CFR, it can be readily obtained from listings of CFR.

APPENDIX B: DATA REFERENCES

1. Dougherty, D.R., M. Fuhrmann and P. Colombo, "Accelerated Leach Test(s) Program Annual Report," Brookhaven National Laboratory, BNL-51955, September 1985; Dougherty D.R., R. Pietrzak, M. Fuhrmann and P. Colombo, "Accelerated Leach Test(s) Program Annual Report," Brookhaven National Laboratory, in preparation, September 1986.
2. Colombo, P. and R.M. Neilson, Jr., "Properties of Radioactive Wastes and Waste Containers," October-December 1977, Brookhaven National Laboratory, BNL-NUREG-50837, May 1978.
3. Lee, D.J. and D.J. Brown, "The Effects of Large Scale Processing of Cesium Leaching From Cemented Simulant Sodium Nitrate Waste," United Kingdom Atomic Energy Authority, Winfrith, AEEW-R1496, January 1982.
4. Franz, E.M. and P. Colombo, "Full Scale Leaching of Saltstone Waste Forms," Brookhaven National Laboratory, BNL-37329, Informal Report, August 1985.
5. Westic, J.H., compiler, "Characterization of Cement and Bitumen Waste Forms Containing Simulated Low-Level Waste Incinerator Ash," Pacific Northwest Laboratory, NUREG/CR-3798, PNL-5153, August 1984.
6. Kalb, P.D. and P. Colombo, Full Scale Leaching Of Commercial Reactor Waste Forms," Brookhaven National Laboratory, BNL-355 61, September 1984.
7. Fuhrmann, M. and P. Colombo, "Special Waste Form - Arid Program, Waste Form Aquisition and Laboratory Leaching Studies Final Report," Brookhaven National Laboratory, BNL-37620, January 1986.
8. Dayal, R., H. Arora and N. Morcos, "Estimation of Cesium-137 Release From Waste/Cement Composites Using Data From Small-Scale Specimens," Brookhaven National Laboratory, NUREG/CR-3382, BNL-NUREG-516 90, July 1983.

REFERENCE 1

TESTID: 1001-1009

- [1] Dougherty, D.R., M. Fuhrmann and P. Colombo, Accelerated Leach Test(s) Program Annual Report, Brookhaven National Laboratory, BNL-51955, September 1985; Dougherty D.R., R. Pietrzak, M. Fuhrmann and P. Colombo, Accelerated Leach Test(s) Program Annual Report, Brookhaven National Laboratory, in preparation, September 1986.

ABSTRACT

Results are reported for leaching Cs, Sr and Co radiotracers from small-scale (4.8 cm diameter x 6.4 cm high) test samples of portland I cement, bitumen and vinyl ester-styrene copolymer. These were "baseline" tests to determine the leaching behavior of the pure solidification agent matrices independent of the effects of incorporated wastes. The vinyl ester-styrene copolymer was used to solidify both wet wastes (DOW process of high shear mixing to form an emulsion) and dry wastes. Leach testing was performed according to the ANS 16.1 Leach Test procedure modified to include more frequent leachant replacement and extended beyond ninety days duration. The leaching of selected matrix elements such as Ca from cement and organic carbon from bitumen, was also measured in these experiments. Tests were run in triplicate to obtain statistical variabilities. Correlation matrices of radionuclide and elemental leaching releases are calculated to determine which releases are correlated, and thus may be related, and which are uncorrelated and thus probably independent.

TESTID	1001,2,3
SAMPLEID	C-T-SS-DIW
COMMENTS	Baseline leach tests on pure portland I cement. Co tracer not detected in leachates from these samples.
WASTE TYPE	Tracers
SOLIDIFICATION AGENT	Portland I Cement
WASTE BINDER RATIO(W/W)	Effectively zero
SAMPLE	
WEIGHT(G)	199.5, 198.6, 198.6
DIAMETER(CM)	4.8
HEIGHT(CM)	6.3, 6.3, 6.5
SURFACE AREA(CM**2)	133.
VOLUME(CM**3)	116.
CURE TIME, T(C)	54 days, ambient
LEACHANT	
TYPE	DIW
VOLUME(CM**3)	1300.
TEMPERATURE(C)	20 $\pm$ 1
REFERENCE	1

DATA FILE : 1001.DTA

TESTID : 1001 rep 1002 1003

NO. OF VARIABLES = 3

NO. OF OBSERVATIONS = 32

VARIABLE LABELS

VAR. 1 : Time(Days)

VAR. 2 : CFR(Ca137)

VAR. 3 : CFR(Sr85)

OBS.	VAR. 1	2	3
1	0.830E-01	0.203E-01	0.288E-02
2	0.290E+00	0.351E-01	0.551E-02
3	0.100E+01	0.627E-01	0.929E-02
4	0.200E+01	0.903E-01	0.126E-01
5	0.300E+01	0.113E+00	0.151E-01
6	0.400E+01	0.131E+00	0.171E-01
7	0.500E+01	0.149E+00	0.192E-01
8	0.110E+02	0.220E+00	0.248E-01
9	0.180E+02	0.258E+00	0.277E-01
10	0.320E+02	0.340E+00	0.314E-01
11	0.460E+02	0.397E+00	0.341E-01
12	0.670E+02	0.446E+00	0.354E-01
13	0.880E+02	0.491E+00	0.378E-01
14	0.107E+03	0.525E+00	0.401E-01
15	0.130E+03	0.556E+00	0.420E-01
16	0.144E+03	0.571E+00	0.436E-01
17	0.179E+03	0.595E+00	
18	0.200E+03	0.619E+00	
19	0.221E+03	0.636E+00	
20	0.242E+03	0.654E+00	
21	0.263E+03	0.671E+00	
22	0.287E+03	0.688E+00	
23	0.305E+03	0.700E+00	
24	0.326E+03	0.714E+00	
25	0.347E+03	0.723E+00	
26	0.368E+03	0.734E+00	
27	0.393E+03	0.747E+00	
28	0.410E+03	0.755E+00	
29	0.435E+03	0.766E+00	
30	0.452E+03	0.773E+00	
31	0.483E+03	0.793E+00	
32	0.511E+03	0.805E+00	

DATA FILE : 1002.DTA

TESTID : 1002 rep 1001 1003
NO. OF VARIABLES = 3
NO. OF OBSERVATIONS = 32

VARIABLE LABELS
VAR. 1 : Time(Days)
VAR. 2 : CFR(Cs137)
VAR. 3 : CFR(Sr85)

OBS.	VAR. 1	2	3
1	0.830E-01	0.214E-01	0.289E-02
2	0.290E+00	0.347E-01	0.519E-02
3	0.100E+01	0.618E-01	0.866E-02
4	0.200E+01	0.917E-01	0.119E-01
5	0.300E+01	0.117E+00	0.145E-01
6	0.400E+01	0.139E+00	0.168E-01
7	0.500E+01	0.160E+00	0.188E-01
8	0.110E+02	0.244E+00	0.248E-01
9	0.180E+02	0.287E+00	0.274E-01
10	0.320E+02	0.361E+00	0.317E-01
11	0.460E+02	0.410E+00	0.346E-01
12	0.670E+02	0.471E+00	0.373E-01
13	0.860E+02	0.517E+00	0.393E-01
14	0.109E+03	0.554E+00	0.410E-01
15	0.130E+03	0.590E+00	0.430E-01
16	0.144E+03	0.600E+00	0.439E-01
17	0.179E+03	0.619E+00	
18	0.200E+03	0.643E+00	
19	0.221E+03	0.659E+00	
20	0.242E+03	0.677E+00	
21	0.263E+03	0.692E+00	
22	0.287E+03	0.710E+00	
23	0.305E+03	0.735E+00	
24	0.326E+03	0.748E+00	
25	0.347E+03	0.756E+00	
26	0.368E+03	0.766E+00	
27	0.393E+03	0.776E+00	
28	0.410E+03	0.783E+00	
29	0.435E+03	0.792E+00	
30	0.452E+03	0.798E+00	
31	0.483E+03	0.814E+00	
32	0.511E+03	0.823E+00	

DATA FILE : 1003.DTA

TESTID : 1003 rep 1001 1002

NO. OF VARIABLES = 3

NO. OF OBSERVATIONS = 32

VARIABLE LABELS

VAR. 1 : Time(Days)

VAR. 2 : CFR(Cs137)

VAR. 3 : CFR(Sr85)

OBS.	VAR. 1	2	3
1	0.830E-01	0.208E-01	0.309E-02
2	0.290E+00	0.339E-01	0.544E-02
3	0.100E+01	0.607E-01	0.867E-02
4	0.200E+01	0.923E-01	0.119E-01
5	0.300E+01	0.118E+00	0.145E-01
6	0.400E+01	0.142E+00	0.168E-01
7	0.500E+01	0.163E+00	0.186E-01
8	0.110E+02	0.247E+00	0.254E-01
9	0.180E+02	0.298E+00	0.293E-01
10	0.320E+02	0.385E+00	0.344E-01
11	0.460E+02	0.440E+00	0.375E-01
12	0.670E+02	0.494E+00	0.409E-01
13	0.880E+02	0.539E+00	0.441E-01
14	0.109E+03	0.575E+00	0.477E-01
15	0.130E+03	0.610E+00	0.498E-01
16	0.144E+03	0.622E+00	0.516E-01
17	0.179E+03	0.645E+00	
18	0.200E+03	0.668E+00	
19	0.221E+03	0.684E+00	
20	0.242E+03	0.699E+00	
21	0.263E+03	0.714E+00	
22	0.287E+03	0.729E+00	
23	0.305E+03	0.739E+00	
24	0.326E+03	0.751E+00	
25	0.347E+03	0.760E+00	
26	0.368E+03	0.769E+00	
27	0.393E+03	0.779E+00	
28	0.410E+03	0.786E+00	
29	0.435E+03	0.794E+00	
30	0.452E+03	0.800E+00	
31	0.483E+03	0.816E+00	
32	0.511E+03	0.824E+00	

TESTID	1004,5,6
SAMPLEID	B-T-SS-DIW
COMMENTS	Baseline leach tests on pure bitumen
WASTE TYPE	Tracers
SOLIDIFICATION AGENT	Bitumen (Pioneer 321)
WASTE BINDER RATIO(W/W)	Effectively zero
SAMPLE	
WEIGHT(G)	111.00, 107.24, 108.66
DIAMETER(CM)	4.8
HEIGHT(CM)	6.4
SURFACE AREA(CM**2)	133.
VOLUME(CM**3)	116.
CURE TIME, T(C)	
LEACHANT	
TYPE	DIW
VOLUME(CM**3)	1300.
TEMPERATURE(C)	20° <u>±</u> 1°C
REFERENCE	1

DATA FILE : 1004.DTA

TESTID : 1004 rep 1005 1006

NO. OF VARIABLES = 4

NO. OF OBSERVATIONS = 32

VARIABLE LABELS

VAR. 1 : Time(Days)

VAR. 2 : CFR(Ca137)

VAR. 3 : CFR(Sr85)

VAR. 4 : CFR(Co60)

OBS.	VAR. 1	2	3	4
1	0.830E-01	0.350E-03	0.200E-03	0.150E-03
2	0.290E+00	0.650E-03	0.390E-03	0.280E-03
3	0.100E+01	0.920E-03	0.620E-03	0.410E-03
4	0.200E+01	0.107E-02	0.750E-03	0.470E-03
5	0.300E+01	0.117E-02	0.870E-03	0.520E-03
6	0.400E+01	0.121E-02	0.910E-03	0.540E-03
7	0.500E+01	0.126E-02	0.960E-03	0.560E-03
8	0.110E+02	0.142E-02	0.110E-02	0.570E-03
9	0.180E+02	0.152E-02	0.120E-02	0.610E-03
10	0.320E+02	0.161E-02	0.133E-02	0.660E-03
11	0.460E+02	0.168E-02	0.140E-02	0.690E-03
12	0.670E+02	0.172E-02	0.144E-02	0.720E-03
13	0.880E+02	0.179E-02	0.150E-02	0.750E-03
14	0.109E+03	0.183E-02	0.154E-02	0.780E-03
15	0.130E+03	0.188E-02	0.158E-02	0.810E-03
16	0.144E+03	0.191E-02	0.163E-02	0.820E-03
17	0.179E+03	0.195E-02		0.840E-03
18	0.200E+03	0.201E-02		0.870E-03
19	0.221E+03	0.205E-02		0.890E-03
20	0.242E+03	0.215E-02		0.950E-03
21	0.263E+03	0.220E-02		0.970E-03
22	0.287E+03	0.222E-02		0.990E-03
23	0.305E+03	0.226E-02		0.101E-02
24	0.326E+03	0.234E-02		0.104E-02
25	0.347E+03	0.237E-02		0.105E-02
26	0.367E+03	0.239E-02		0.106E-02
27	0.392E+03	0.243E-02		0.108E-02
28	0.409E+03	0.245E-02		0.110E-02
29	0.434E+03	0.248E-02		0.110E-02
30	0.451E+03	0.250E-02		0.111E-02
31	0.482E+03	0.255E-02		0.112E-02
32	0.510E+03	0.257E-02		0.113E-02

DATA FILE : 1005.DTA

TESTID : 1005 rep 1004 1006

NO. OF VARIABLES = 4

NO. OF OBSERVATIONS = 32

VARIABLE LABELS

VAR. 1 : Time(Days)

VAR. 2 : CFR(Cs137)

VAR. 3 : CFR(Sr85)

VAR. 4 : CFR(Co60)

OBS.	VAR. 1	2	3	4
1	0.830E-01	0.400E-03	0.240E-03	0.190E-03
2	0.290E+00	0.630E-03	0.420E-03	0.290E-03
3	0.100E+01	0.940E-03	0.650E-03	0.430E-03
4	0.200E+01	0.114E-02	0.800E-03	0.530E-03
5	0.300E+01	0.124E-02	0.880E-03	0.580E-03
6	0.400E+01	0.128E-02	0.910E-03	0.590E-03
7	0.500E+01	0.132E-02	0.930E-03	0.610E-03
8	0.110E+02	0.151E-02	0.113E-02	0.700E-03
9	0.180E+02	0.161E-02	0.121E-02	0.750E-03
10	0.320E+02	0.170E-02	0.129E-02	0.780E-03
11	0.460E+02	0.174E-02	0.132E-02	0.800E-03
12	0.670E+02	0.181E-02	0.136E-02	0.830E-03
13	0.880E+02	0.186E-02	0.140E-02	0.860E-03
14	0.109E+03	0.191E-02	0.142E-02	0.870E-03
15	0.130E+03	0.198E-02		0.920E-03
16	0.144E+03	0.200E-02		0.939E-03
17	0.179E+03	0.203E-02		0.948E-03
18	0.202E+03	0.212E-02		0.100E-02
19	0.223E+03	0.215E-02		0.102E-02
20	0.241E+03	0.219E-02		0.104E-02
21	0.262E+03	0.222E-02		0.105E-02
22	0.286E+03	0.226E-02		0.107E-02
23	0.304E+03	0.228E-02		0.107E-02
24	0.325E+03	0.229E-02		0.108E-02
25	0.346E+03	0.232E-02		0.110E-02
26	0.367E+03	0.233E-02		0.110E-02
27	0.392E+03	0.236E-02		0.111E-02
28	0.409E+03	0.237E-02		0.111E-02
29	0.434E+03	0.240E-02		0.113E-02
30	0.451E+03	0.242E-02		0.114E-02
31	0.482E+03	0.247E-02		0.115E-02
32	0.510E+03	0.253E-02		0.116E-02

DATA FILE : 1006.DTA

TESTID : 1006 rep 1004 1005

NO. OF VARIABLES = 4

NO. OF OBSERVATIONS = 32

VARIABLE LABELS

VAR. 1 : Time(Days)

VAR. 2 : CFR(Ca137)

VAR. 3 : CFR(Sr85)

VAR. 4 : CFR(Co60)

OBS.	VAR. 1	2	3	4
1	0.830E-01	0.580E-03	0.280E-03	0.250E-03
2	0.290E+00	0.109E-02	0.670E-03	0.480E-03
3	0.100E+01	0.133E-02	0.980E-03	0.600E-03
4	0.200E+01	0.148E-02	0.116E-02	0.690E-03
5	0.300E+01	0.163E-02	0.130E-02	0.760E-03
6	0.400E+01	0.167E-02	0.134E-02	0.780E-03
7	0.500E+01	0.177E-02	0.142E-02	0.840E-03
8	0.110E+02	0.193E-02	0.167E-02	0.920E-03
9	0.180E+02	0.204E-02	0.176E-02	0.980E-03
10	0.320E+02	0.216E-02	0.190E-02	0.101E-02
11	0.460E+02	0.222E-02	0.195E-02	0.106E-02
12	0.670E+02	0.232E-02	0.205E-02	0.112E-02
13	0.880E+02	0.242E-02	0.212E-02	0.117E-02
14	0.109E+03	0.246E-02		0.120E-02
15	0.130E+03	0.251E-02		0.122E-02
16	0.144E+03	0.252E-02		0.124E-02
17	0.179E+03	0.257E-02		0.126E-02
18	0.202E+03	0.262E-02		0.127E-02
19	0.223E+03	0.266E-02		0.129E-02
20	0.241E+03	0.268E-02		0.130E-02
21	0.262E+03	0.273E-02		0.133E-02
22	0.286E+03	0.279E-02		0.136E-02
23	0.304E+03	0.283E-02		0.137E-02
24	0.325E+03	0.285E-02		0.138E-02
25	0.346E+03	0.288E-02		0.139E-02
26	0.367E+03	0.292E-02		0.141E-02
27	0.392E+03	0.298E-02		0.144E-02
28	0.409E+03	0.298E-02		0.145E-02
29	0.434E+03	0.300E-02		0.145E-02
30	0.451E+03	0.301E-02		0.146E-02
31	0.482E+03	0.309E-02		0.148E-02
32	0.510E+03	0.314E-02		0.152E-02

TESTID	1007,8,9
SAMPLEID	P-T-SS-DIW
COMMENTS	Baseline leach tests on vinyl ester-styrene polymer emulsion of tracers in DIW
WASTE TYPE	Tracers in DIW
SOLIDIFICATION AGENT	Vinyl ester-styrene (Dow process)
WASTE BINDER RATIO(W/W)	1.0
SAMPLE	
WEIGHT(G)	98.06, 102.70, 99.05
DIAMETER(CM)	4.8
HEIGHT(CM)	6.0
SURFACE AREA(CM**2)	127.
VOLUME(CM**3)	116.
CURE TIME, T(C)	
LEACHANT	
TYPE	DIW
VOLUME(CM**3)	1300.
TEMPERATURE(C)	20°C <u>±</u> 1
REFERENCE	1

DATA FILE : 1007.DTA

TESTID : 1007 rep 1008 1009

NO. OF VARIABLES = 4

NO. OF OBSERVATIONS = 32

VARIABLE LABELS

VAR. 1 : Time(Days)

VAR. 2 : CFR(Cs137)

VAR. 3 : CFR(Sr85)

VAR. 4 : CFR(Co60)

OBS.	VAR. 1	2	3	4
1	0.830E-01	0.380E-03	0.390E-03	0.350E-03
2	0.290E+00	0.990E-03	0.103E-02	0.970E-03
3	0.100E+01	0.133E-02	0.131E-02	0.129E-02
4	0.200E+01	0.151E-02	0.149E-02	0.144E-02
5	0.300E+01	0.164E-02	0.158E-02	0.154E-02
6	0.400E+01	0.172E-02	0.165E-02	0.161E-02
7	0.500E+01	0.181E-02	0.170E-02	0.168E-02
8	0.110E+02	0.201E-02	0.189E-02	0.186E-02
9	0.180E+02	0.215E-02	0.200E-02	0.199E-02
10	0.320E+02	0.231E-02	0.212E-02	0.214E-02
11	0.460E+02	0.240E-02	0.220E-02	0.223E-02
12	0.670E+02	0.250E-02	0.228E-02	0.233E-02
13	0.880E+02	0.272E-02	0.247E-02	0.255E-02
14	0.109E+03	0.278E-02	0.252E-02	0.261E-02
15	0.130E+03	0.292E-02	0.259E-02	0.271E-02
16	0.144E+03	0.293E-02	0.262E-02	0.274E-02
17	0.179E+03	0.302E-02	0.268E-02	0.282E-02
18	0.200E+03	0.309E-02		0.287E-02
19	0.221E+03	0.313E-02		0.291E-02
20	0.242E+03	0.328E-02		0.304E-02
21	0.263E+03	0.344E-02		0.318E-02
22	0.287E+03	0.349E-02		0.323E-02
23	0.305E+03	0.352E-02		0.327E-02
24	0.326E+03	0.356E-02		0.330E-02
25	0.347E+03	0.360E-02		0.333E-02
26	0.368E+03	0.363E-02		0.339E-02
27	0.389E+03	0.369E-02		0.343E-02
28	0.409E+03	0.383E-02		0.356E-02
29	0.434E+03	0.413E-02		0.384E-02
30	0.451E+03	0.430E-02		0.399E-02
31	0.482E+03	0.446E-02		0.412E-02
32	0.510E+03	0.457E-02		0.419E-02

DATA FILE : 1008.DTA

TESTID : 1008 rep 1007 1009

NO. OF VARIABLES = 4

NO. OF OBSERVATIONS = 32

VARIABLE LABELS

VAR. 1 : Time(Days)

VAR. 2 : CFR(Cs137)

VAR. 3 : CFR(Sr85)

VAR. 4 : CFR(Co60)

OBS.	VAR. 1	2	3	4
1	0.830E-01	0.430E-03	0.430E-03	0.460E-03
2	0.290E+00	0.130E-02	0.124E-02	0.124E-02
3	0.100E+01	0.173E-02	0.163E-02	0.160E-02
4	0.200E+01	0.194E-02	0.178E-02	0.177E-02
5	0.300E+01	0.205E-02	0.189E-02	0.185E-02
6	0.400E+01	0.213E-02	0.195E-02	0.192E-02
7	0.500E+01	0.219E-02	0.198E-02	0.197E-02
8	0.110E+02	0.238E-02	0.215E-02	0.214E-02
9	0.180E+02	0.251E-02	0.226E-02	0.226E-02
10	0.320E+02	0.266E-02	0.238E-02	0.239E-02
11	0.460E+02	0.276E-02	0.246E-02	0.247E-02
12	0.670E+02	0.284E-02	0.253E-02	0.256E-02
13	0.880E+02	0.307E-02	0.274E-02	0.276E-02
14	0.109E+03	0.315E-02	0.282E-02	0.283E-02
15	0.130E+03	0.326E-02	0.294E-02	0.295E-02
16	0.144E+03	0.327E-02		0.298E-02
17	0.179E+03	0.335E-02		0.306E-02
18	0.202E+03	0.339E-02		0.313E-02
19	0.223E+03	0.343E-02		0.317E-02
20	0.241E+03	0.362E-02		0.341E-02
21	0.262E+03	0.377E-02		0.356E-02
22	0.286E+03	0.379E-02		0.361E-02
23	0.304E+03	0.383E-02		0.365E-02
24	0.325E+03	0.385E-02		0.369E-02
25	0.346E+03	0.386E-02		0.371E-02
26	0.367E+03	0.391E-02		0.379E-02
27	0.392E+03	0.395E-02		0.385E-02
28	0.409E+03	0.407E-02		0.396E-02
29	0.434E+03	0.433E-02		0.422E-02
30	0.451E+03	0.449E-02		0.436E-02
31	0.482E+03	0.461E-02		0.448E-02
32	0.510E+03	0.468E-02		0.455E-02

DATA FILE : 1009.DTA

TESTID : 1009 rep 1007 1008

NO. OF VARIABLES = 4

NO. OF OBSERVATIONS = 32

VARIABLE LABELS

VAR. 1 : Time(Days)

VAR. 2 : CFR(Cs137)

VAR. 3 : CFR(Sr85)

VAR. 4 : CFR(Co60)

OBS.	VAR. 1	2	3	4
1	0.830E-01	0.390E-03	0.290E-03	0.360E-03
2	0.290E+00	0.140E-02	0.111E-02	0.120E-02
3	0.100E+01	0.207E-02	0.159E-02	0.168E-02
4	0.200E+01	0.238E-02	0.182E-02	0.195E-02
5	0.300E+01	0.257E-02	0.196E-02	0.211E-02
6	0.400E+01	0.272E-02	0.204E-02	0.222E-02
7	0.500E+01	0.284E-02	0.213E-02	0.229E-02
8	0.110E+02	0.317E-02	0.240E-02	0.260E-02
9	0.180E+02	0.334E-02	0.258E-02	0.281E-02
10	0.320E+02	0.353E-02	0.278E-02	0.303E-02
11	0.460E+02	0.366E-02	0.290E-02	0.315E-02
12	0.670E+02	0.377E-02	0.304E-02	0.329E-02
13	0.880E+02	0.405E-02	0.326E-02	0.355E-02
14	0.109E+03	0.415E-02	0.333E-02	0.365E-02
15	0.130E+03	0.431E-02	0.347E-02	0.379E-02
16	0.144E+03	0.435E-02		0.382E-02
17	0.179E+03	0.447E-02		0.394E-02
18	0.202E+03	0.456E-02		0.401E-02
19	0.223E+03	0.461E-02		0.407E-02
20	0.241E+03	0.470E-02		0.415E-02
21	0.262E+03	0.479E-02		0.422E-02
22	0.286E+03	0.491E-02		0.431E-02
23	0.304E+03	0.506E-02		0.438E-02
24	0.325E+03	0.517E-02		0.444E-02
25	0.346E+03	0.525E-02		0.448E-02
26	0.367E+03	0.537E-02		0.458E-02
27	0.392E+03	0.549E-02		0.467E-02
28	0.409E+03	0.565E-02		0.480E-02
29	0.434E+03	0.592E-02		0.497E-02
30	0.451E+03	0.613E-02		0.512E-02
31	0.482E+03	0.639E-02		0.527E-02
32	0.510E+03	0.652E-02		0.535E-02

REFERENCE 2

TESTID: 2001-2006

- [2] Colombo, P. and R.M. Neilson, Jr., Properties of Radioactive Wastes and Waste Containers, October-December 1977, Brookhaven National Laboratory, BNL-NUREG-50837, May 1978.

ABSTRACT

Reference [2] reports leaching results for six small-scale bitumenized waste forms containing from 17.5 to 44.3 wt.% sodium sulfate salt. The waste forms were fabricated using a twin-screw extruder. Leachants included DIW and ground water. Maximum test duration was 21 days as all of the salt leached from the samples within this time. All samples swelled, cracked extensively and fell apart during the leach testing. Reported results were based on measurement of the sulfate anion.

TESTID	2001
SAMPLEID	B-S-SS-DIV
COMMENTS	
WASTE TYPE	Sodium Sulfate Salt
SOLIDIFICATION AGENT	Pioneer 221 Asphlat
WASTE BINDER RATIO(W/W)	0.40
SAMPLE	
WEIGHT(G)	284.4
DIAMETER(CM)	5.
HEIGHT(CM)	10.
SURFACE AREA(CM**2)	200.3
VOLUME(CM**3)	202.3
CURE TIME, T(C)	
LEACHANT	
TYPE	DW
VOLUME(CM**3)	2027.
TEMPERATURE(C)	20-30
REFERENCE	2

DATA FILE : 2001.DTA

TESTID : 2001

NO. OF VARIABLES = 2

NO. OF OBSERVATIONS = 7

VARIABLE LABELS

VAR. 1 : Time(Days)

VAR. 2 : CFR(SO4)

OBS.	VAR. 1	2
1	0.100E+01	0.470E-02
2	0.200E+01	0.830E-01
3	0.300E+01	0.337E+00
4	0.400E+01	0.613E+00
5	0.700E+01	0.913E+00
6	0.800E+01	0.988E+00
7	0.900E+01	0.100E+01

TESTID	2002
SAMPLEID	B-S-SS-DIW
COMMENTS	
WASTE TYPE	Sodium Sulfate Salt
SOLIDIFICATION AGENT	Bitumen (Pioneer 221 Asphalt)
WASTE/BINDER RATIO(W/W)	0.219
SAMPLE	
WEIGHT(G)	289.1
DIAMETER(CM)	5.
HEIGHT(CM)	10.
SURFACE AREA(CM**2)	191.7
VOLUME(CM**3)	188.6
CURE TIME, T(C)	
LEACHANT	
TYPE	DIW
VOLUME(CM**3)	2 027.
TEMPERATURE(C)	20-30
REFERENCE	2

DATA FILE : 2002.DTA

TESTID : 2002

NO. OF VARIABLES = 2

NO. OF OBSERVATIONS = 12

VARIABLE LABELS

VAR. 1 : Time(Days)

VAR. 2 : CFR(SO4)

OBS.	VAR. 1	2
1	0.100E+01	0.260E-02
2	0.200E+01	0.890E-01
3	0.300E+01	0.230E+00
4	0.400E+01	0.557E+00
5	0.700E+01	0.849E+00
6	0.800E+01	0.981E+00
7	0.900E+01	0.992E+00
8	0.140E+02	0.998E+00
9	0.150E+02	0.999E+00
10	0.160E+02	0.999E+00
11	0.170E+02	0.999E+00
12	0.180E+02	0.100E+01

TESTID	2003
SAMPLEID	B-S-SS-DIW
COMMENTS	
WASTE TYPE	Sodium Sulfate
SOLIDIFICATION AGENT	Pioneer 221 Asphalt
WASTE BINDER RATIO(W/W)	.795
SAMPLE	
WEIGHT(G)	282.8
DIAMETER(CM)	5.
HEIGHT(CM)	10.
SURFACE AREA(CM**2)	197.1
VOLUME(CM**3)	198.3
CURE TIME, T(C)	
LEACHANT	
TYPE	DIW
VOLUME(CM**3)	2027.
TEMPERATURE(C)	20-30
REFERENCE	2

DATA FILE : 2003.DTA

TESTID : 2003

NO. OF VARIABLES = 2

NO. OF OBSERVATIONS = 10

VARIABLE LABELS

VAR. 1 : Time(Days)

VAR. 2 : CFR(SO4)

OBS.	VAR. 1	2
1	0.100E+01	0.000E+00
2	0.200E+01	0.470E-02
3	0.300E+01	0.910E-01
4	0.400E+01	0.212E+00
5	0.700E+01	0.778E+00
6	0.800E+01	0.820E+00
7	0.900E+01	0.940E+00
8	0.140E+02	0.990E+00
9	0.150E+02	0.990E+00
10	0.160E+02	0.100E+01

TESTID	2004
SAMPLEID	B-S-SS-GW
COMMENTS	
WASTE TYPE	Sodium Sulfate
SOLIDIFICATION AGENT	Pioneer 221 Asphalt
WASTE BINDER RATIO(W/W)	.325
SAMPLE	
WEIGHT(G)	283.6
DIAMETER(CM)	5.
HEIGHT(CM)	10.
SURFACE AREA(CM**2)	194.8
VOLUME(CM**3)	194.4
CURE TIME, T(C)	
LEACHANT	
TYPE	Ground Water
VOLUME(CM**3)	2027.
TEMPERATURE(C)	20-30
REFERENCE	2

DATA FILE : 2004.DTA

TESTID : 2004

NO. OF VARIABLES = 2

NO. OF OBSERVATIONS = 13

VARIABLE LABELS

VAR. 1 : Time(Days)

VAR. 2 : CFR(S04)

OBS.	VAR. 1	2
1	0.100E+01	0.664E-01
2	0.200E+01	0.199E+00
3	0.300E+01	0.496E+00
4	0.400E+01	0.539E+00
5	0.700E+01	0.683E+00
6	0.800E+01	0.858E+00
7	0.900E+01	0.964E+00
8	0.140E+02	0.984E+00
9	0.150E+02	0.995E+00
10	0.160E+02	0.998E+00
11	0.170E+02	0.999E+00
12	0.180E+02	0.999E+00
13	0.210E+02	0.100E+01

TESTID	2005
SAMPLEID	B-S-SS-GW
COMMENTS	
WASTE TYPE	Sodium Sulfate
SOLIDIFICATION AGENT	Pioneer 221 Asphalt
WASTE BINDER RATIO(W/W)	.506
SAMPLE	
WEIGHT(G)	285.4
DIAMETER(CM)	5.
HEIGHT(CM)	10.
SURFACE AREA(CM**2)	194.8
VOLUME(CM**3)	194.4
CURE TIME, T(C)	
LEACHANT	
TYPE	Ground Water
VOLUME (CM**3)	2027.
TEMPERATURE(C)	20-30
REFERENCE	2

DATA FILE : 2005.DTA

TESTID : 2005

NO. OF VARIABLES = 2

NO. OF OBSERVATIONS = 12

VARIABLE LABELS

VAR. 1 : Time(Days)

VAR. 2 : CFR(SO4)

OBS.	VAR. 1	2
1	0.100E+01	0.181E-01
2	0.200E+01	0.491E-01
3	0.300E+01	0.168E+00
4	0.400E+01	0.237E+00
5	0.700E+01	0.312E+00
6	0.800E+01	0.799E+00
7	0.900E+01	0.918E+00
8	0.140E+02	0.971E+00
9	0.150E+02	0.980E+00
10	0.160E+02	0.999E+00
11	0.170E+02	0.999E+00
12	0.180E+02	0.100E+01

TESTID

2006

SAMPLEID

B-S-SS-DIW

COMMENTS

WASTE TYPE

Sodium Sulfate

SOLIDIFICATION AGENT

Pioneer 221 Asphalt

WASTE BINDER RATIO(W/W)

.707

SAMPLE

WEIGHT(G)

939.3

DIAMETER(CM)

7.6

HEIGHT(CM)

15.2

SURFACE AREA(CM**2)

428.0

VOLUME(CM**3)

638.5

CURE TIME, T(C)

LEACHANT

TYPE

DIW

VOLUME(CM**3)

4560.

TEMPERATURE(C)

20-30

REFERENCE

2

DATA FILE : 2006.DTA

TESTID : 2006

NO. OF VARIABLES = 2

NO. OF OBSERVATIONS = 12

VARIABLE LABELS

VAR. 1 : Time(Days)

VAR. 2 : CFR(S04)

OBS.	VAR. 1	2
1	0.100E+01	0.569E-01
2	0.200E+01	0.684E-01
3	0.300E+01	0.878E-01
4	0.400E+01	0.107E+00
5	0.700E+01	0.495E+00
6	0.800E+01	0.664E+00
7	0.900E+01	0.730E+00
8	0.140E+02	0.918E+00
9	0.150E+02	0.965E+00
10	0.160E+02	0.985E+00
11	0.170E+02	0.985E+00
12	0.180E+02	0.992E+00

REFERENCE 3

TESTID: 3001-3018

- [3] Lee, D.J. and D.J. Brown, The Effects of Large Scale Processing of Cesium Leaching From Cemented Simulant Sodium Nitrate Waste, United Kingdom Atomic Energy Authority, Winfrith, AEEW-R1496, January 1982.

ABSTRACT

Results are presented for cesium leaching from three types of cemented waste forms containing simulated sodium nitrate waste doped with nonradioactive cesium nitrate as tracer. The cement solidification agents included ordinary portland cement (OPC), sulfate-resisting portland cement and a blend consisting of 90 wt% ground blast furnace slag plus 10 wt% OPC. Small-scale samples, full-scale waste forms and cores taken from full-scale waste forms were leach tested for 112 days. Leachant composition was not specified but appears to have been tap water. Leachability differences between fabricated small-scale samples and cores were rationalized from measured temperature increases during solidification of the full scale waste forms from which the cores were taken.

TESTID	3001
SAMPLEID	C-S-SS
COMMENTS	
WASTE TYPE	Sodium Nitrate, 36 wt% solution
SOLIDIFICATION AGENT	Portland Cement
WASTE BINDER RATIO(W/W)	0.55
SAMPLE	
WEIGHT(G)	
DIAMETER(CM).....	5.
HEIGHT(CM)	5.
SURFACE AREA(CM**2)	116.
VOLUME(CM**3)	96.
CURE TIME, T(C)	28 days, 25
LEACHANT	
TYPE	
VOLUME(CM**3)	250.
TEMPERATURE(C)	25
REFERENCE	3

DATA FILE : 3001.DTA

TESTID : 3001

NO. OF VARIABLES = 2

NO. OF OBSERVATIONS = 12

VARIABLE LABELS

VAR. 1 : Time(Days)

VAR. 2 : CFR(Ca)

OBS.	VAR. 1	2
1	0.100E+01	0.340E-01
2	0.200E+01	0.500E-01
3	0.300E+01	0.600E-01
4	0.500E+01	0.780E-01
5	0.600E+01	0.850E-01
6	0.700E+01	0.890E-01
7	0.140E+02	0.120E+00
8	0.210E+02	0.150E+00
9	0.280E+02	0.170E+00
10	0.560E+02	0.240E+00
11	0.840E+02	0.300E+00
12	0.112E+03	0.340E+00

TESTID	3002
SAMPLEID	C-S-FS
COMMENTS	
WASTE TYPE	Sodium Nitrate, 36 wt% solution
SOLIDIFICATION AGENT	Portland Cement
WASTE BINDER RATIO(W/W)	0.55
SAMPLE	
WEIGHT(G)	
DIAMETER(CM).....	~ 55.
HEIGHT(CM)	~ 93.
SURFACE AREA(CM**2)	20 300.
VOLUME(CM**3)	217 000.
CURE TIME, T(C)	28 days, 106
LEACHANT	
TYPE	
VOLUME(CM**3)	450 000.
TEMPERATURE(C)	25
REFERENCE	3

DATA FILE : 3002.DTA

TESTID : 3002

NO. OF VARIABLES = 2

NO. OF OBSERVATIONS = 12

VARIABLE LABELS

VAR. 1 : Time(Days)

VAR. 2 : CFR(Cs)

OBS.	VAR. 1	2
1	0.100E+01	0.360E-02
2	0.200E+01	0.490E-02
3	0.300E+01	0.590E-02
4	0.500E+01	0.740E-02
5	0.600E+01	0.770E-02
6	0.700E+01	0.830E-02
7	0.140E+02	0.960E-02
8	0.210E+02	0.110E-01
9	0.280E+02	0.130E-01
10	0.560E+02	0.180E-01
11	0.840E+02	0.230E-01
12	0.112E+03	0.260E-01

TESTID	3003
SAMPLEID	C-S-SS
COMMENTS	Core from drum
WASTE TYPE	Sodium Nitrate, 36 wt% solution
SOLIDIFICATION AGENT	Portland Cement
WASTE BINDER RATIO(W/W)	0.55
SAMPLE	
WEIGHT(G)	
DIAMETER(CM)	5.5
HEIGHT(CM)	5.5
SURFACE AREA(CM**2)	143.
VOLUME(CM**3)	131.
CURE TIME, T(C)	28 days, 82
LEACHANT	
TYPE	
VOLUME(CM**3)	250.
TEMPERATURE(C)	25
REFERENCE	3

DATA FILE : 3003.DTA

TESTID : 3003

NO. OF VARIABLES = 2

NO. OF OBSERVATIONS = 10

VARIABLE LABELS

VAR. 1 : Time(Days)

VAR. 2 : CFR(Cs)

OBS.	VAR. 1	2
1	0.100E+01	0.840E-01
2	0.200E+01	0.110E+00
3	0.300E+01	0.130E+00
4	0.400E+01	0.150E+00
5	0.700E+01	0.180E+00
6	0.140E+02	0.240E+00
7	0.210E+02	0.280E+00
8	0.280E+02	0.320E+00
9	0.560E+02	0.410E+00
10	0.840E+02	0.480E+00

TESTID	3004
SAMPLEID	C-S-SS
COMMENTS	core from drum
WASTE TYPE	Sodium Nitrate, 36 wt% solution
SOLIDIFICATION AGENT	Portland Cement
WASTE BINDER RATIO(W/W)	0.55
SAMPLE	
WEIGHT(G)	
DIAMETER(CM)	5.5
HEIGHT(CM)	5.5
SURFACE AREA(CM**2)	144.
VOLUME(CM**3)	133.
CURE TIME, T(C)	28 days, 94
LEACHANT	
TYPE	
VOLUME(CM**3)	250.
TEMPERATURE(C)	25
REFERENCE	3

DATA FILE : 3004.DTA

TESTID : 3004

NO. OF VARIABLES = 2

NO. OF OBSERVATIONS = 11

VARIABLE LABELS

VAR. 1 : Time(Days)

VAR. 2 : CFR(Cs)

OBS.	VAR. 1	2
1	0.100E+01	0.970E-01
2	0.200E+01	0.140E+00
3	0.300E+01	0.160E+00
4	0.400E+01	0.190E+00
5	0.700E+01	0.230E+00
6	0.140E+02	0.310E+00
7	0.210E+02	0.360E+00
8	0.280E+02	0.390E+00
9	0.560E+02	0.490E+00
10	0.840E+02	0.560E+00
11	0.112E+03	0.630E+00

TESTID	3005
SAMPLEID	C-S-SS
COMMENTS	core from drum
WASTE TYPE	Sodium Nitrate, 36 wt% solution
SOLIDIFICATION AGENT	Portland Cement
WASTE BINDER RATIO(W/W)	0.55
SAMPLE	
WEIGHT(G)	
DIAMETER(CM)	5.5
HEIGHT(CM)	5.5
SURFACE AREA(CM**2)	143.
VOLUME(CM**3)	131.
CURE TIME, T(C)	28 days, 106
LEACHANT	
TYPE	
VOLUME(CM**3)	250.
TEMPERATURE(C)	25
REFERENCE	3

DATA FILE : 3005.DTA

TESTID : 3005

NO. OF VARIABLES = 2

NO. OF OBSERVATIONS = 11

VARIABLE LABELS

VAR. 1 : Time(Days)

VAR. 2 : CFR(Cs)

OBS.	VAR. 1	2
1	0.100E+01	0.120E+00
2	0.200E+01	0.170E+00
3	0.300E+01	0.220E+00
4	0.400E+01	0.260E+00
5	0.700E+01	0.320E+00
6	0.140E+02	0.430E+00
7	0.210E+02	0.490E+00
8	0.280E+02	0.520E+00
9	0.560E+02	0.630E+00
10	0.840E+02	0.690E+00
11	0.112E+03	0.740E+00

TESTID	3006
SAMPLEID	C-S-SS
COMMENTS	core from drum
WASTE TYPE	Sodium Nitrate, 36 wt% solution
SOLIDIFICATION AGENT	Portland Cement
WASTE BINDER RATIO(W/W)	0.55
SAMPLE	
WEIGHT(G)	
DIAMETER(CM)	5.5
HEIGHT(CM)	5.5
SURFACE AREA(CM**2)	144.
VOLUME(CM**3)	133.
CURE TIME, T(C)	28 days, 91
LEACHANT	
TYPE	
VOLUME(CM**3)	250.
TEMPERATURE(C)	25
REFERENCE	3

DATA FILE : 3006.DTA

TESTID : 3006

NO. OF VARIABLES = 2

NO. OF OBSERVATIONS = 10

VARIABLE LABELS

VAR. 1 : Time(Days)

VAR. 2 : CFR(Ca)

OBS.	VAR. 1	2
1	0.100E+01	0.940E-01
2	0.200E+01	0.140E+00
3	0.300E+01	0.160E+00
4	0.400E+01	0.190E+00
5	0.700E+01	0.230E+00
6	0.140E+02	0.300E+00
7	0.210E+02	0.350E+00
8	0.280E+02	0.380E+00
9	0.560E+02	0.470E+00
10	0.840E+02	0.540E+00

TESTID	3007
SAMPLEID	C-S-SS
COMMENTS	
WASTE TYPE	Sodium Nitrate, 36 wt% solution
SOLIDIFICATION AGENT	Portland Cement
WASTE BINDER RATIO(W/W)	0.55
SAMPLE	
WEIGHT(G)	
DIAMETER(CM)	5.
HEIGHT(CM)	5.
SURFACE AREA(CM**2)	116.
VOLUME(CM**3)	96.
CURE TIME, T(C)	28 days, 25
LEACHANT	
TYPE	
VOLUME (CM**3)	250.
TEMPERATURE(C)	25
REFERENCE	3

DATA FILE : 3007.DTA

TESTID : 3007

NO. OF VARIABLES = 2

NO. OF OBSERVATIONS = 12

VARIABLE LABELS

VAR. 1 : Time(Days)

VAR. 2 : CFR(Ca)

OBS.	VAR. 1	2
1	0.100E+01	0.470E-01
2	0.200E+01	0.690E-01
3	0.300E+01	0.830E-01
4	0.400E+01	0.950E-01
5	0.500E+01	0.110E+00
6	0.700E+01	0.120E+00
7	0.140E+02	0.170E+00
8	0.210E+02	0.200E+00
9	0.280E+02	0.220E+00
10	0.560E+02	0.310E+00
11	0.860E+02	0.380E+00
12	0.114E+03	0.430E+00

TESTID	3008
SAMPLEID	C-S-FS
COMMENTS	
WASTE TYPE	Sodium Nitrate, 36 wt% solution
SOLIDIFICATION AGENT	Portland Cement
WASTE BINDER RATIO(W/W)	0.55
SAMPLE	
WEIGHT(G)	
DIAMETER(CM)	~ 55.
HEIGHT(CM)	~ 93.
SURFACE AREA(CM**2)	21 600.
VOLUME(CM**3)	236 000.
CURE TIME, T(C)	28 days, 79
LEACHANT	
TYPE	
VOLUME(CM**3)	450 000.
TEMPERATURE(C)	25
REFERENCE	3

DATA FILE : 3008.DTA

TESTID : 3008

NO. OF VARIABLES = 2

NO. OF OBSERVATIONS = 12

VARIABLE LABELS

VAR. 1 : Time(Days)

VAR. 2 : CFR(Cs)

OBS.	VAR. 1	2
1	0.100E+01	0.440E-02
2	0.200E+01	0.600E-02
3	0.300E+01	0.710E-02
4	0.400E+01	0.800E-02
5	0.500E+01	0.880E-02
6	0.700E+01	0.100E-01
7	0.140E+02	0.130E-01
8	0.210E+02	0.140E-01
9	0.280E+02	0.160E-01
10	0.560E+02	0.210E-01
11	0.860E+02	0.280E-01
12	0.114E+03	0.320E-01

TESTID	3009
SAMPLEID	C-S-SS
COMMENTS	core from drum
WASTE TYPE	Sodium Nitrate, 36 wt% solution
SOLIDIFICATION AGENT	Portland Cement
WASTE BINDER RATIO(W/W)	0.55
SAMPLE	
WEIGHT(G)	
DIAMETER(CM)	5.5
HEIGHT(CM)	5.5
SURFACE AREA(CM**2)	144.
VOLUME(CM**3)	133.
CURE TIME, T(C)	28 days, 67
LEACHANT	
TYPE	
VOLUME(CM**3)	250.
TEMPERATURE(C)	25
REFERENCE	3

DATA FILE : 3009.DTA

TESTID : 3009

NO. OF VARIABLES = 2

NO. OF OBSERVATIONS = 12

VARIABLE LABELS

VAR. 1 : Time(Days)

VAR. 2 : CFR(Ca)

OBS.	VAR. 1	2
1	0.100E+01	0.630E-01
2	0.200E+01	0.960E-01
3	0.300E+01	0.120E+00
4	0.400E+01	0.130E+00
5	0.500E+01	0.150E+00
6	0.800E+01	0.180E+00
7	0.900E+01	0.190E+00
8	0.160E+02	0.230E+00
9	0.230E+02	0.270E+00
10	0.310E+02	0.310E+00
11	0.590E+02	0.400E+00
12	0.870E+02	0.460E+00

TESTID	3010
SAMPLEID	C-S-SS
COMMENTS	core from drum
WASTE TYPE	Sodium Nitrate, 36 wt% solution
SOLIDIFICATION AGENT	Portland Cement
WASTE BINDER RATIO(W/W)	0.55
SAMPLE	
WEIGHT(G)	
DIAMETER(CM)	5.5
HEIGHT(CM)	5.5
SURFACE AREA(CM**2)	146.
VOLUME(CM**3)	135.
CURE TIME, T(C)	28 days, 74
LEACHANT	
TYPE	
VOLUME(CM**3)	250.
TEMPERATURE(C)	25
REFERENCE	3

DATA FILE : 3010.DTA

TESTID : 3010

NO. OF VARIABLES = 2

NO. OF OBSERVATIONS = 13

VARIABLE LABELS

VAR. 1 : Time(Days)

VAR. 2 : CFR(Ca)

OBS.	VAR. 1	2
1	0.100E+01	0.840E-01
2	0.200E+01	0.120E+00
3	0.300E+01	0.140E+00
4	0.400E+01	0.160E+00
5	0.500E+01	0.180E+00
6	0.800E+01	0.210E+00
7	0.900E+01	0.220E+00
8	0.160E+02	0.280E+00
9	0.230E+02	0.330E+00
10	0.310E+02	0.380E+00
11	0.590E+02	0.490E+00
12	0.870E+02	0.570E+00
13	0.115E+03	0.640E+00

TESTID	3011
SAMPLEID	C-S-SS
COMMENTS	core from drum
WASTE TYPE	Sodium Nitrate, 36 wt% solution
SOLIDIFICATION AGENT	Portland Cement
WASTE BINDER RATIO(W/W)	0.55
SAMPLE	
WEIGHT(G)	
DIAMETER(CM)	5.5
HEIGHT(CM)	5.5
SURFACE AREA(CM**2)	143.
VOLUME(CM**3)	131.
CURE TIME, T(C)	28 days, 79
LEACHANT	
TYPE	
VOLUME(CM**3)	250.
TEMPERATURE(C)	25
REFERENCE	3

DATA FILE : 3011.DTA

TESTID : 3011

NO. OF VARIABLES = 2

NO. OF OBSERVATIONS = 13

VARIABLE LABELS

VAR. 1 : Time(Days)

VAR. 2 : CFR(Ca)

OBS.	VAR. 1	2
1	0.100E+01	0.110E+00
2	0.200E+01	0.190E+00
3	0.300E+01	0.230E+00
4	0.400E+01	0.270E+00
5	0.500E+01	0.300E+00
6	0.800E+01	0.370E+00
7	0.900E+01	0.390E+00
8	0.160E+02	0.480E+00
9	0.230E+02	0.560E+00
10	0.310E+02	0.640E+00
11	0.590E+02	0.770E+00
12	0.870E+02	0.840E+00
13	0.115E+03	0.890E+00

TESTID	3012
SAMPLEID	C-S-SS
COMMENTS	core from drum
WASTE TYPE	Sodium Nitrate, 36 wt% solution
SOLIDIFICATION AGENT	Portland Cement
WASTE BINDER RATIO(W/W)	0.55
SAMPLE	
WEIGHT(G)	
DIAMETER(CM)	5.5
HEIGHT(CM)	5.5
SURFACE AREA(CM**2)	143.
VOLUME(CM**3)	131.
CURE TIME, T(C)	28 days, 22
LEACHANT	
TYPE	
VOLUME(CM**3)	250.
TEMPERATURE(C)	25
REFERENCE	3

DATA FILE : 3012.DTA

TESTID : 3012

NO. OF VARIABLES = 2

NO. OF OBSERVATIONS = 12

VARIABLE LABELS

VAR. 1 : Time(Days)

VAR. 2 : CFR(Cs)

OBS.	VAR. 1	2
1	0.100E+01	0.690E-01
2	0.200E+01	0.100E+00
3	0.300E+01	0.120E+00
4	0.400E+01	0.140E+00
5	0.500E+01	0.150E+00
6	0.800E+01	0.220E+00
7	0.900E+01	0.230E+00
8	0.160E+02	0.280E+00
9	0.230E+02	0.330E+00
10	0.310E+02	0.380E+00
11	0.590E+02	0.480E+00
12	0.870E+02	0.550E+00

TESTID	3013
SAMPLEID	C-S-SS
COMMENTS	
WASTE TYPE	Sodium Nitrate, 36 wt% solution
SOLIDIFICATION AGENT	Portland Cement
WASTE BINDER RATIO(W/W)	0.55
SAMPLE	
WEIGHT(G)	
DIAMETER(CM)	5.0
HEIGHT(CM)	5.0
SURFACE AREA(CM**2)	116.
VOLUME(CM**3)	96.
CURE TIME, T(C)	28 days, 25
LEACHANT	
TYPE	
VOLUME(CM**3)	250.
TEMPERATURE(C)	25
REFERENCE	3

DATA FILE : 3013.DTA

TESTID : 3013

NO. OF VARIABLES = 2

NO. OF OBSERVATIONS = 11

VARIABLE LABELS

VAR. 1 : Time(Days)

VAR. 2 : CFR(Ca)

OBS.	VAR. 1	2
1	0.100E+01	0.310E-01
2	0.200E+01	0.390E-01
3	0.500E+01	0.510E-01
4	0.600E+01	0.530E-01
5	0.700E+01	0.550E-01
6	0.140E+02	0.640E-01
7	0.210E+02	0.720E-01
8	0.280E+02	0.760E-01
9	0.560E+02	0.890E-01
10	0.840E+02	0.100E+00
11	0.112E+03	0.110E+00

TESTID	3014
SAMPLEID	C-S-FS
COMMENTS	
WASTE TYPE	Sodium Nitrate, 36 wt% solution
SOLIDIFICATION AGENT	Portland Cement
WASTE BINDER RATIO(W/W)	0.55
SAMPLE	
WEIGHT(G)	
DIAMETER(CM)	~ 55.
HEIGHT(CM)	~ 93.
SURFACE AREA(CM**2)	20 300.
VOLUME(CM**3)	217 000.
CURE TIME, T(C)	28 days, 60
LEACHANT	
TYPE	
VOLUME(CM**3)	450 000.
TEMPERATURE(C)	25
REFERENCE	3

DATA FILE : 3014.DTA

TESTID : 3014

NO. OF VARIABLES = 2

NO. OF OBSERVATIONS = 11

VARIABLE LABELS

VAR. 1 : Time(Days)

VAR. 2 : CFR(Cs)

OBS.	VAR. 1	2
1	0.100E+01	0.370E-02
2	0.200E+01	0.510E-02
3	0.500E+01	0.720E-02
4	0.600E+01	0.780E-02
5	0.700E+01	0.820E-02
6	0.140E+02	0.110E-01
7	0.210E+02	0.120E-01
8	0.350E+02	0.120E-01
9	0.560E+02	0.120E-01
10	0.840E+02	0.130E-01
11	0.112E+03	0.130E-01

TESTID	3015
SAMPLEID	C-S-SS
COMMENTS	core from drum
WASTE TYPE	Sodium Nitrate, 36 wt% solution
SOLIDIFICATION AGENT	Portland Cement
WASTE BINDER RATIO(W/W)	0.55
SAMPLE	
WEIGHT(G)	
DIAMETER(CM)	5.5
HEIGHT(CM)	5.5
SURFACE AREA(CM**2)	138.
VOLUME(CM**3)	124.
CURE TIME, T(C)	28 days, 48
LEACHANT	
TYPE	
VOLUME(CM**3)	250.
TEMPERATURE(C)	25
REFERENCE	3

DATA FILE : 3015.DTA

TESTID : 3015

NO. OF VARIABLES = 2

NO. OF OBSERVATIONS = 11

VARIABLE LABELS

VAR. 1 : Time(Days)

VAR. 2 : CFR(Cs)

OBS.	VAR. 1	2
1	0.100E+01	0.130E-01
2	0.200E+01	0.180E-01
3	0.500E+01	0.270E-01
4	0.600E+01	0.290E-01
5	0.700E+01	0.310E-01
6	0.140E+02	0.390E-01
7	0.210E+02	0.450E-01
8	0.280E+02	0.480E-01
9	0.560E+02	0.580E-01
10	0.840E+02	0.660E-01
11	0.112E+03	0.710E-01

TESTID	3016
SAMPLEID	C-S-SS
COMMENTS	core from drum
WASTE TYPE	Sodium Nitrate, 36 wt% solution
SOLIDIFICATION AGENT	Portland Cement
WASTE BINDER RATIO(W/W)	0.55
SAMPLE	
WEIGHT(G)	
DIAMETER(CM)	5.5
HEIGHT(CM)	5.5
SURFACE AREA(CM**2)	133.
VOLUME(CM**3)	118.
CURE TIME, T(C)	28 days, 53
LEACHANT	
TYPE	
VOLUME(CM**3)	250.
TEMPERATURE(C)	25
REFERENCE	3

DATA FILE : 3016.DTA

TESTID : 3016

NO. OF VARIABLES = 2

NO. OF OBSERVATIONS = 9

VARIABLE LABELS

VAR. 1 : Time(Days)

VAR. 2 : CFR(Cs)

OBS.	VAR. 1	2
1	0.100E+01	0.150E-01
2	0.200E+01	0.190E-01
3	0.500E+01	0.270E-01
4	0.600E+01	0.290E-01
5	0.700E+01	0.300E-01
6	0.140E+02	0.370E-01
7	0.210E+02	0.410E-01
8	0.280E+02	0.420E-01
9	0.560E+02	0.510E-01

TESTID	3017
SAMPLEID	C-S-SS
COMMENTS	core from drum
WASTE TYPE	Sodium Nitrate, 36 wt% solution
SOLIDIFICATION AGENT	Portland Cement
WASTE BINDER RATIO(W/W)	0.55
SAMPLE	
WEIGHT(G)	
DIAMETER(CM)	5.5
HEIGHT(CM)	5.5
SURFACE AREA(CM**2)	131.
VOLUME(CM**3)	115.
CURE TIME, T(C)	28 days, 60
LEACHANT	
TYPE	
VOLUME(CM**3)	250.
TEMPERATURE(C)	25
REFERENCE	3

DATA FILE : 3017.DTA

TESTID : 3017

NO. OF VARIABLES = 2

NO. OF OBSERVATIONS = 11

VARIABLE LABELS

VAR. 1 : Time(Days)

VAR. 2 : CFR(Ca)

OBS.	VAR. 1	2
1	0.100E+01	0.310E-01
2	0.200E+01	0.390E-01
3	0.500E+01	0.470E-01
4	0.600E+01	0.490E-01
5	0.700E+01	0.510E-01
6	0.140E+02	0.580E-01
7	0.210E+02	0.630E-01
8	0.280E+02	0.660E-01
9	0.560E+02	0.750E-01
10	0.840E+02	0.830E-01
11	0.112E+03	0.890E-01

TESTID	3018
SAMPLEID	C-S-SS
COMMENTS	core from drum
WASTE TYPE	Sodium Nitrate, 36 wt% solution
SOLIDIFICATION AGENT	Portland Cement
WASTE BINDER RATIO(W/W)	0.55
SAMPLE	
WEIGHT(G)	
DIAMETER(CM)	5.5
HEIGHT(CM)	5.5
SURFACE AREA(CM**2)	134.
VOLUME(CM**3)	118.
CURE TIME, T(C)	28 days, 51
LEACHANT	
TYPE	
VOLUME(CM**3)	250.
TEMPERATURE(C)	25
REFERENCE	3

DATA FILE : 3018.DTA

TESTID : 3018

NO. OF VARIABLES = 2

NO. OF OBSERVATIONS = 9

VARIABLE LABELS

VAR. 1 : Time(Days)

VAR. 2 : CFR(Ca)

OBS.	VAR. 1	2
1	0.100E+01	0.150E-01
2	0.200E+01	0.220E-01
3	0.500E+01	0.310E-01
4	0.600E+01	0.330E-01
5	0.700E+01	0.350E-01
6	0.140E+02	0.440E-01
7	0.210E+02	0.490E-01
8	0.280E+02	0.530E-01
9	0.560E+02	0.650E-01

REFERENCE 4

TESTID: 4001-4002

- [4] Franz, E.M. and P. Colombo, Full Scale Leaching of Saltstone Waste Forms, Brookhaven National Laboratory, BNL-37329, Informal Report, August 1985.

ABSTRACT

Reference [4] presents leaching data from two full-scale waste forms containing actual nitrate salt reprocessing waste solution solidified with a blended cement solidification agent tailored for this waste stream. Leach testing was performed using the ANS 16.1 Leach Test modified such that the thirty second rinse was not taken and an additional leachant replacement was included. The report lists leaching results for radionuclides including Cs-137, tritium, Tc-99, Ru-106 and Sb-125. Leach data for sodium and calcium cations and for nitrate, nitrite and sulfate anions were also listed. Other measurements were reported for pH, for organics and for toxic heavy metals present in the waste stream.

TESTID	4001
SAMPLEID	C-R-FS-DIW
COMMENTS	Solids content of salt solution not given. Density of saltstone given as 1.66 g/cc. Sample weight calculated from density.
WASTE TYPE	Nitrate reprocessing waste solution
SOLIDIFICATION AGENT	Blend: 20 wt% class H cement and 80 wt% class C flyash.
WASTE/BINDER RATIO(W/W)	0.67 salt solution to cement blend.
SAMPLE	
WEIGHT(G)	176 830.
DIAMETER(CM)	54.9
HEIGHT(CM)	45.
SURFACE AREA(CM**2)	12 496.
VOLUME(CM**3)	106 524.
CURE TIME, T(C)	not reported
LEACHANT	
TYPE	DIW
VOLUME(CM**3)	135 500.
TEMPERATURE(C)	21 $\pm$ 2
REFERENCE	4

DATA FILE : 4001.DTA

TESTID : 4001

NO. OF VARIABLES = 10

NO. OF OBSERVATIONS = 11

VARIABLE LABELS

VAR. 1 : Time(Days)

VAR. 2 : CFR(Cs137)

VAR. 3 : CFR(H3)

VAR. 4 : CFR(Tc99)

VAR. 5 : CFR(Ru106)

VAR. 6 : CFR(Sb125)

VAR. 7 : CFR(Na)

VAR. 8 : CFR(NO3)

VAR. 9 : CFR(NO2)

VAR. 10 : CFR(SO4)

OBS.	VAR. 1	2	3	4	5
1	0.830E-01	0.500E-04	0.240E-02	0.140E-02	0.800E-04
2	0.290E+00	0.140E-03	0.470E-02	0.270E-02	0.130E-03
3	0.100E+01	0.290E-03	0.960E-02	0.500E-02	0.200E-03
4	0.200E+01	0.460E-03	0.150E-01	0.800E-02	0.270E-03
5	0.300E+01	0.590E-03	0.200E-01	0.100E-01	0.340E-03
6	0.400E+01	0.700E-03	0.240E-01	0.130E-01	0.410E-03
7	0.500E+01	0.800E-03	0.270E-01	0.140E-01	0.470E-03
8	0.190E+02	0.150E-02	0.610E-01	0.300E-01	0.820E-03
9	0.480E+02	0.240E-02	0.110E+00	0.520E-01	0.140E-02
10	0.890E+02	0.360E-02	0.140E+00	0.670E-01	0.230E-02
11	0.149E+03	0.490E-02	0.160E+00		0.310E-02

OBS.	VAR. 6	7	8	9	10
1	0.280E-04	0.205E-02	0.226E-02	0.221E-02	0.603E-02
2	0.760E-04	0.395E-02	0.418E-02	0.418E-02	0.110E-01
3	0.150E-03	0.718E-02	0.797E-02	0.800E-02	0.177E-01
4	0.220E-03	0.108E-01	0.124E-01	0.127E-01	0.232E-01
5	0.260E-03	0.137E-01	0.159E-01	0.163E-01	0.289E-01
6	0.300E-03	0.163E-01	0.189E-01	0.194E-01	0.336E-01
7	0.340E-03	0.196E-01	0.218E-01	0.223E-01	0.381E-01
8	0.520E-03	0.373E-01	0.471E-01	0.488E-01	0.714E-01
9	0.960E-03	0.706E-01	0.812E-01	0.846E-01	0.118E+00
10	0.170E-02	0.101E+00	0.114E+00	0.114E+00	0.159E+00
11	0.250E-02	0.123E+00	0.137E+00		

TESTID	4002
SAMPLEID	C-R-FS-DIW
COMMENTS	Solids content of salt solution not given. Density of saltstone given as 1.72 g/cc. Sample weight calculated from density.
WASTE TYPE	Nitrate reprocessing waste solution
SOLIDIFICATION AGENT	Blend: 48 wt% slag cement, 50 wt% ESP flyash and 2 wt% hydrated lime.
WASTE/BINDER RATIO(W/W)	.85 salt solution to blend.
SAMPLE	
WEIGHT(G)	179 210.
DIAMETER(CM)	54.6
HEIGHT(CM)	44.5
SURFACE AREA(CM**2)	12 316.
VOLUME(CM**3)	104 192.
CURE TIME, T(C)	not reported
LEACHANT	
TYPE	DIW
VOLUME(CM**3)	135 500.
TEMPERATURE(C)	21 $\pm$ 2
REFERENCE	4

DATA FILE : 4002.DTA

TESTID : 4002

NO. OF VARIABLES = 10

NO. OF OBSERVATIONS = 11

VARIABLE LABELS

VAR. 1 : Time(Days)

VAR. 2 : CFR(Cs137)

VAR. 3 : CFR(H3)

VAR. 4 : CFR(Tc99)

VAR. 5 : CFR(Ru106)

VAR. 6 : CFR(Sb125)

VAR. 7 : CFR(Na)

VAR. 8 : CFR(NO3)

VAR. 9 : CFR(NO2)

VAR. 10 : CFR(SO4)

OBS.	VAR. 1	2	3	4	5
1	0.830E-01	0.710E-04	0.330E-02	0.100E-02	0.650E-03
2	0.290E+00	0.140E-03	0.620E-02	0.110E-02	0.960E-03
3	0.100E+01	0.300E-03	0.110E-01	0.110E-02	0.140E-02
4	0.200E+01	0.440E-03	0.160E-01	0.140E-02	0.170E-02
5	0.300E+01	0.550E-03	0.190E-01	0.160E-02	0.180E-02
6	0.400E+01	0.630E-03	0.220E-01	0.180E-02	0.200E-02
7	0.500E+01	0.710E-03	0.240E-01	0.200E-02	0.210E-02
8	0.190E+02	0.990E-03	0.370E-01	0.290E-02	0.250E-02
9	0.480E+02	0.130E-02	0.540E-01	0.420E-02	0.300E-02
10	0.890E+02	0.160E-02	0.680E-01	0.550E-02	0.400E-02
11	0.149E+03	0.190E-02	0.830E-01		0.510E-02

OBS.	VAR. 6	7	8	9	10
1	0.300E-03	0.570E-02	0.847E-02	0.801E-02	0.220E-01
2	0.570E-03	0.907E-02	0.128E-01	0.123E-01	0.337E-01
3	0.960E-03	0.136E-01	0.187E-01	0.177E-01	0.487E-01
4	0.130E-02	0.172E-01	0.235E-01	0.222E-01	0.612E-01
5	0.150E-02	0.199E-01	0.270E-01	0.254E-01	0.704E-01
6	0.170E-02	0.219E-01	0.294E-01	0.277E-01	0.770E-01
7	0.180E-02	0.239E-01	0.318E-01	0.298E-01	0.834E-01
8	0.240E-02	0.328E-01	0.430E-01	0.404E-01	0.110E+00
9	0.320E-02	0.428E-01	0.572E-01	0.532E-01	0.144E+00
10	0.430E-02	0.518E-01	0.710E-01	0.644E-01	0.226E+00
11	0.550E-02	0.616E-01	0.820E-01		

REFERENCE 5

TESTID: 5001-5007

- [5] Westic, J.H., compiler, Characterization of Cement and Bitumen Waste Forms Containing Simulated Low-Level Waste Incinerator Ash, Pacific Northwest Laboratory, NUREG/CR-3798, PNL-5153, August 1984.

ABSTRACT

Reference [5] presents leaching data for incinerator ash solidified with portland II cement and Pioneer 221 bitumen. The ash was produced from the incineration of general trash (plastics, paper, wood, rubber and cloth) and ion exchange resins which had been spiked with nonradioactive Cs, Sr, Co and I salts. The I apparently went up with the offgas and was not measured. Small-scale waste forms were produced using industrial-scale equipment. The ash content of cemented samples was 20 wt% while that of the bitumenized samples was 40 wt%. Several of the leach tests were performed using replicate samples and the results of these tests were reported as an average + or - the standard deviation. Leach test procedures included the ANS 16.1 and IAEA procedures and static tests with no leachant replacement. The data on the bitumenized samples is not included in this data base since reported analytical difficulties precluded accurate analysis.

TESTID	5001
SAMPLEID	C-S-SS-DIW
COMMENTS	Data are average of 6 replicates, ANS 16.1 leach test
WASTE TYPE	Incinerator Ash
SOLIDIFICATION AGENT	Portland II Cement
WASTE BINDER RATIO(W/W)	0.20
SAMPLE	
WEIGHT(G)	
DIAMETER(CM)	5.1
HEIGHT(CM)	10.2
SURFACE AREA(CM**2)	204.3
VOLUME(CM**3)	208.4
CURE TIME, T(C)	28 days, ambient
LEACHANT	
TYPE	DIW
VOLUME(CM**3)	2043.
TEMPERATURE(C)	23 $\pm$ 5
REFERENCE	5

DATA FILE : 5001.DTA

TESTID : 5001

NO. OF VARIABLES = 10

NO. OF OBSERVATIONS = 49

VARIABLE LABELS

VAR. 1 : Time(Days)

VAR. 2 : CFR(Cs)

VAR. 3 : CFR(Sr)

VAR. 4 : CFR(Co)

VAR. 5 : CFR(Al)

VAR. 6 : CFR(Ca)

VAR. 7 : CFR(Cu)

VAR. 8 : CFR(Fe)

VAR. 9 : CFR(Si)

VAR. 10 : CFR(Na)

OBS.	VAR. 1	2	3	4	5
1	0.347E-03	0.184E-02	0.244E-04		
2	0.830E-01	0.213E-01	0.466E-03		0.141E-04
3	0.292E+00	0.366E-01	0.144E-02		0.334E-04
4	0.100E+01	0.831E-01	0.599E-02		0.155E-03
5	0.200E+01	0.110E+00	0.963E-02		0.239E-03
6	0.300E+01	0.134E+00	0.130E-01		0.307E-03
7	0.400E+01	0.150E+00	0.157E-01		0.362E-03
8	0.500E+01	0.171E+00	0.193E-01		0.362E-03
9	0.600E+01	0.180E+00	0.211E-01		0.379E-03
10	0.700E+01	0.191E+00	0.232E-01		0.419E-03
11	0.800E+01	0.200E+00	0.248E-01		0.456E-03
12	0.900E+01	0.210E+00	0.267E-01		0.485E-03
13	0.100E+02	0.210E+00	0.285E-01		0.530E-03
14	0.110E+02	0.210E+00	0.302E-01		0.581E-03
15	0.120E+02	0.219E+00	0.318E-01		0.626E-03
16	0.130E+02	0.219E+00	0.334E-01		0.660E-03
17	0.140E+02	0.227E+00	0.348E-01		0.682E-03
18	0.150E+02	0.232E+00	0.360E-01		0.725E-03
19	0.160E+02	0.232E+00	0.372E-01		0.761E-03
20	0.170E+02	0.237E+00	0.384E-01		0.808E-03
21	0.180E+02	0.242E+00	0.395E-01		0.848E-03
22	0.190E+02	0.247E+00	0.405E-01		0.893E-03
23	0.200E+02	0.253E+00	0.415E-01		0.927E-03
24	0.210E+02	0.257E+00	0.424E-01		0.948E-03
25	0.280E+02	0.287E+00	0.462E-01		0.112E-02
26	0.350E+02	0.315E+00	0.494E-01		0.128E-02
27	0.420E+02	0.342E+00	0.528E-01		0.144E-02
28	0.490E+02	0.364E+00	0.559E-01		0.160E-02
29	0.560E+02	0.383E+00	0.588E-01		0.176E-02
30	0.630E+02	0.401E+00	0.614E-01		0.192E-02
31	0.700E+02	0.417E+00	0.640E-01		0.209E-02
32	0.770E+02	0.432E+00	0.665E-01		0.225E-02
33	0.840E+02	0.444E+00	0.687E-01		0.240E-02
34	0.910E+02	0.457E+00	0.709E-01		0.254E-02
35	0.980E+02	0.469E+00	0.730E-01		0.270E-02
36	0.105E+03	0.480E+00	0.750E-01		0.287E-02
37	0.112E+03	0.489E+00	0.770E-01		0.302E-02
38	0.119E+03	0.497E+00	0.789E-01		0.317E-02

39	0.126E+03	0.506E+00	0.807E-01		0.332E-02
40	0.133E+03	0.515E+00	0.824E-01		0.347E-02
41	0.140E+03	0.523E+00	0.840E-01		0.361E-02
42	0.154E+03	0.536E+00	0.867E-01	0.279E-05	0.386E-02
43	0.168E+03	0.549E+00	0.896E-01		0.413E-02
44	0.196E+03	0.565E+00	0.927E-01		0.439E-02
45	0.224E+03	0.568E+00	0.933E-01	0.539E-05	0.444E-02
46	0.252E+03	0.572E+00	0.943E-01	0.906E-05	0.453E-02
47	0.280E+03	0.576E+00	0.953E-01	0.137E-04	0.461E-02
48	0.308E+03	0.584E+00	0.967E-01		0.471E-02
49	0.336E+03	0.586E+00	0.975E-01		0.478E-02

OBS.	VAR. 6	7	8	9	10
1	0.348E-04		0.154E-05	0.147E-04	0.297E-03
2	0.499E-03		0.452E-05	0.598E-04	0.349E-02
3	0.100E-02		0.606E-05	0.121E-03	0.577E-02
4	0.243E-02		0.713E-05	0.442E-03	0.126E-01
5	0.362E-02			0.770E-03	0.166E-01
6	0.469E-02		0.151E-04	0.111E-02	0.202E-01
7	0.555E-02		0.182E-04	0.142E-02	0.231E-01
8	0.668E-02			0.184E-02	0.267E-01
9	0.726E-02			0.208E-02	0.282E-01
10	0.804E-02			0.242E-02	0.303E-01
11	0.864E-02			0.268E-02	0.318E-01
12	0.936E-02			0.302E-02	0.337E-01
13	0.101E-01			0.335E-02	0.356E-01
14	0.108E-01			0.372E-02	0.377E-01
15	0.115E-01			0.407E-02	0.395E-01
16	0.122E-01			0.444E-02	0.411E-01
17	0.128E-01			0.477E-02	0.425E-01
18	0.133E-01			0.508E-02	0.437E-01
19	0.139E-01			0.540E-02	0.450E-01
20	0.145E-01			0.574E-02	0.463E-01
21	0.150E-01			0.606E-02	0.475E-01
22	0.155E-01			0.635E-02	0.486E-01
23	0.160E-01			0.667E-02	0.497E-01
24	0.165E-01			0.693E-02	0.505E-01
25	0.179E-01	0.330E-05	0.193E-04	0.770E-02	0.560E-01
26	0.193E-01	0.660E-05	0.220E-04	0.840E-02	0.601E-01
27	0.206E-01	0.108E-04	0.229E-04	0.913E-02	0.644E-01
28	0.218E-01		0.250E-04	0.987E-02	0.683E-01
29	0.230E-01		0.273E-04	0.106E-01	0.715E-01
30	0.242E-01		0.289E-04	0.113E-01	0.743E-01
31	0.253E-01		0.310E-04	0.120E-01	0.771E-01
32	0.264E-01		0.332E-04	0.127E-01	0.797E-01
33	0.274E-01	0.144E-04	0.355E-04	0.135E-01	0.818E-01
34	0.283E-01	0.227E-04	0.446E-04	0.141E-01	0.839E-01
35	0.293E-01	0.262E-04	0.471E-04	0.148E-01	0.858E-01
36	0.303E-01	0.312E-04	0.509E-04	0.155E-01	0.876E-01
37	0.312E-01	0.350E-04	0.547E-04	0.161E-01	0.894E-01
38	0.321E-01		0.624E-04	0.167E-01	0.910E-01
39	0.329E-01	0.380E-04	0.657E-04	0.174E-01	0.924E-01
40	0.338E-01	0.410E-04	0.693E-04	0.180E-01	0.939E-01
41	0.346E-01		0.732E-04	0.186E-01	0.953E-01

42	0.361E-01	0.486E-04	0.860E-04	0.197E-01	0.977E-01
43	0.378E-01	0.549E-04	0.989E-04	0.209E-01	0.100E+00
44	0.393E-01	0.581E-04	0.107E-03	0.219E-01	0.105E+00
45	0.396E-01	0.593E-04	0.110E-03	0.221E-01	0.106E+00
46	0.401E-01	0.610E-04	0.114E-03	0.224E-01	0.107E+00
47	0.406E-01	0.629E-04	0.119E-03	0.227E-01	0.108E+00
48	0.414E-01	0.657E-04	0.124E-03	0.231E-01	0.110E+00
49	0.418E-01	0.679E-04	0.128E-03	0.234E-01	0.110E+00

TESTID	5002
SAMPLEID	C-S-SS-DIW
COMMENTS	Data are average of 5 replicates, IAEA Leach Test
WASTE TYPE	Incinerator Ash
SOLIDIFICATION AGENT	Portland II Cement
WASTE BINDER RATIO(W/W)	0.20
SAMPLE	
WEIGHT(G)	
DIAMETER(CM)	5.1
HEIGHT(CM)	10.2
SURFACE AREA(CM**2)	204.3
VOLUME(CM**3)	208.4
CURE TIME, T(C)	28 days, ambient
LEACHANT	
TYPE	DIW
VOLUME(CM**3)	2043.
TEMPERATURE(C)	23 $\pm$ 5
REFERENCE	5

DATA FILE : 5002.DTA

TESTID : 5002

NO. OF VARIABLES = 10

NO. OF OBSERVATIONS = 32

VARIABLE LABELS

VAR. 1 : Time(Days)

VAR. 2 : CFR(Cs)

VAR. 3 : CFR(Sr)

VAR. 4 : CFR(Co)

VAR. 5 : CFR(Al)

VAR. 6 : CFR(Ca)

VAR. 7 : CFR(Cu)

VAR. 8 : CFR(Fe)

VAR. 9 : CFR(Si)

VAR. 10 : CFR(Na)

OBS.	VAR. 1	2	3	4	5
1	0.694E-02	0.802E-02	0.176E-03		0.132E-04
2	0.694E-01	0.226E-01	0.118E-02		0.319E-04
3	0.250E+00	0.412E-01	0.329E-02		0.612E-04
4	0.100E+01	0.851E-01	0.913E-02		0.199E-03
5	0.200E+01	0.127E+00	0.150E-01		0.343E-03
6	0.300E+01	0.162E+00	0.200E-01		0.472E-03
7	0.400E+01	0.179E+00	0.240E-01		0.588E-03
8	0.700E+01	0.217E+00	0.315E-01		0.773E-04
9	0.800E+01	0.228E+00	0.341E-01		0.837E-03
10	0.900E+01	0.236E+00	0.364E-01		0.884E-03
11	0.100E+02	0.245E+00	0.385E-01		0.946E-03
12	0.110E+02	0.254E+00	0.405E-01		0.998E-03
13	0.140E+02	0.278E+00	0.450E-01		0.114E-02
14	0.150E+02	0.286E+00	0.468E-01		0.119E-02
15	0.160E+02	0.292E+00	0.482E-01		0.124E-02
16	0.170E+02	0.299E+00	0.494E-01		0.130E-02
17	0.180E+02	0.306E+00	0.506E-01		0.135E-02
18	0.210E+02	0.325E+00	0.532E-01		0.145E-02
19	0.220E+02	0.332E+00	0.544E-01		0.150E-02
20	0.230E+02	0.339E+00	0.555E-01		0.155E-02
21	0.240E+02	0.346E+00	0.565E-01		0.160E-02
22	0.250E+02	0.352E+00	0.576E-01		0.164E-02
23	0.280E+02	0.367E+00	0.599E-01		0.175E-02
24	0.350E+02	0.395E+00	0.639E-01		0.192E-02
25	0.420E+02	0.417E+00	0.675E-01		0.208E-02
26	0.490E+02	0.433E+00	0.706E-01		0.224E-02
27	0.560E+02	0.451E+00	0.737E-01		0.241E-02
28	0.630E+02	0.466E+00	0.767E-01	0.877E-04	0.259E-02
29	0.700E+02	0.481E+00	0.795E-01		0.276E-02
30	0.770E+02	0.492E+00	0.819E-01		0.291E-02
31	0.840E+02	0.504E+00	0.843E-01		0.308E-02
32	0.910E+02	0.514E+00	0.866E-01		0.324E-02

OBS.	VAR. 6	7	8	9	10
1	0.227E-03	0.257E-04		0.204E-04	0.139E-02
2	0.891E-03	0.360E-04	0.215E-05	0.555E-04	0.362E-02
3	0.182E-02			0.103E-03	0.597E-02

4	0.402E-02	0.421E-04	0.727E-05	0.270E-03	0.111E-01
5	0.613E-02		0.912E-05	0.497E-03	0.160E-01
6	0.794E-02		0.232E-04	0.749E-03	0.205E-01
7	0.945E-02	0.461E-04	0.244E-04	0.101E-02	0.242E-01
8	0.119E-01	0.503E-04	0.263E-04	0.140E-02	0.307E-01
9	0.130E-01	0.545E-04	0.279E-04	0.167E-02	0.330E-01
10	0.139E-01		0.288E-04	0.198E-02	0.351E-01
11	0.148E-01	0.580E-04	0.303E-04	0.230E-02	0.372E-01
12	0.157E-01	0.604E-04	0.314E-04	0.262E-02	0.391E-01
13	0.174E-01	0.636E-04	0.326E-04	0.320E-02	0.445E-01
14	0.182E-01	0.665E-04	0.333E-04	0.351E-02	0.457E-01
15	0.189E-01	0.717E-04	0.344E-04	0.382E-02	0.471E-01
16	0.196E-01	0.768E-04	0.357E-04	0.412E-02	0.479E-01
17	0.202E-01	0.802E-04	0.368E-04	0.442E-02	0.491E-01
18	0.214E-01	0.834E-04	0.376E-04	0.499E-02	0.520E-01
19	0.220E-01	0.875E-04	0.388E-04	0.524E-02	0.531E-01
20	0.226E-01	0.913E-04	0.406E-04	0.550E-02	0.543E-01
21	0.231E-01	0.937E-04	0.420E-04	0.580E-02	0.554E-01
22	0.236E-01		0.428E-04	0.612E-02	0.564E-01
23	0.247E-01		0.447E-04	0.671E-02	0.591E-01
24	0.263E-01	0.966E-04	0.475E-04	0.743E-02	0.642E-01
25	0.277E-01		0.504E-04	0.810E-02	0.688E-01
26	0.290E-01		0.540E-04	0.880E-02	0.724E-01
27	0.303E-01	0.997E-04	0.555E-04	0.947E-02	0.757E-01
28	0.316E-01	0.107E-03	0.590E-04	0.102E-01	0.788E-01
29	0.328E-01	0.119E-03	0.617E-04	0.109E-01	0.815E-01
30	0.339E-01		0.639E-04	0.115E-01	0.839E-01
31	0.350E-01	0.126E-03	0.662E-04	0.122E-01	0.864E-01
32	0.361E-01	0.133E-03	0.685E-04	0.129E-01	0.885E-01

TESTID	5003
SAMPLEID	C-S-SS-DIW
COMMENTS	Data is average of 5 replicates, equilibrium (static) leach test
WASTE TYPE	Incinerator Ash
SOLIDIFICATION AGENT	Portland II Cement
WASTE BINDER RATIO(W/W)	0.20
SAMPLE	
WEIGHT(G)	
DIAMETER(CM)	5.1
HEIGHT(CM)	10.2
SURFACE AREA(CM**2)	204.3
VOLUME.....	208.4
CURE TIME, T(C)	28 days, ambient
LEACHANT	
TYPE	DIW
VOLUME(CM**3)	2043.
TEMPERATURE(C)	23 $\pm$ 5
REFERENCE	5

DATA FILE : 5003.DTA

TESTID : 5003

NO. OF VARIABLES = 10

NO. OF OBSERVATIONS = 45

VARIABLE LABELS

VAR. 1 : Time(Days)

VAR. 2 : CFR(Cs)

VAR. 3 : CFR(Sr)

VAR. 4 : CFR(Co)

VAR. 5 : CFR(Al)

VAR. 6 : CFR(Ca)

VAR. 7 : CFR(Cu)

VAR. 8 : CFR(Fe)

VAR. 9 : CFR(Si)

VAR. 10 : CFR(Na)

OBS.	VAR. 1	2	3	4	5
1	0.200E+01	0.782E-01	0.379E-02		0.988E-04
2	0.300E+01	0.106E+00	0.128E-01		0.185E-03
3	0.400E+01	0.130E+00	0.171E-01		0.220E-03
4	0.700E+01	0.187E+00	0.278E-01		0.253E-03
5	0.800E+01	0.197E+00	0.272E-01		0.241E-03
6	0.900E+01	0.210E+00	0.304E-01		0.198E-03
7	0.100E+02	0.214E+00	0.331E-01		0.243E-03
8	0.110E+02	0.219E+00	0.343E-01		0.248E-03
9	0.140E+02	0.280E+00	0.407E-01		0.277E-03
10	0.150E+02	0.271E+00	0.407E-01		0.279E-03
11	0.160E+02	0.290E+00	0.416E-01	0.408E-03	0.284E-03
12	0.170E+02	0.295E+00	0.430E-01	0.413E-03	0.283E-03
13	0.180E+02	0.295E+00	0.430E-01		0.269E-03
14	0.210E+02	0.311E+00	0.448E-01		0.258E-03
15	0.220E+02	0.318E+00	0.473E-01	0.816E-03	0.247E-03
16	0.230E+02	0.332E+00	0.504E-01		0.283E-03
17	0.240E+02	0.335E+00	0.501E-01		0.277E-03
18	0.250E+02	0.322E+00	0.503E-01		0.289E-03
19	0.280E+02	0.348E+00	0.524E-01		0.278E-03
20	0.350E+02	0.369E+00	0.587E-01		0.278E-03
21	0.420E+02	0.395E+00	0.636E-01		0.295E-03
22	0.490E+02	0.414E+00	0.669E-01		0.282E-03
23	0.560E+02	0.169E+00	0.702E-01		0.291E-03
24	0.630E+02	0.416E+00	0.681E-01		0.293E-03
25	0.700E+02	0.407E+00	0.704E-01		0.325E-03
26	0.770E+02	0.433E+00	0.732E-01		0.325E-03
27	0.840E+02	0.174E+00	0.741E-01		0.437E-03
28	0.910E+02	0.185E+00	0.744E-01		0.322E-03
29	0.980E+02	0.429E+00	0.772E-01		0.315E-03
30	0.105E+03	0.439E+00	0.781E-01		0.324E-03
31	0.112E+03	0.436E+00	0.793E-01		0.301E-03
32	0.119E+03	0.436E+00	0.807E-01		0.355E-03
33	0.126E+03	0.461E+00	0.816E-01		0.306E-03
34	0.133E+03	0.551E+00	0.828E-01		0.395E-03
35	0.140E+03	0.486E+00	0.835E-01		0.288E-03
36	0.147E+03	0.471E+00	0.847E-01		0.286E-03
37	0.154E+03	0.495E+00	0.832E-01		0.268E-03
38	0.161E+03	0.525E+00	0.868E-01		0.277E-03

39	0.168E+03	0.494E+00	0.877E-01	0.270E-03
40	0.196E+03	0.495E+00	0.876E-01	0.272E-03
41	0.224E+03	0.548E+00	0.954E-01	0.302E-03
42	0.252E+03	0.549E+00	0.973E-01	0.293E-03
43	0.280E+03	0.504E+00	0.964E-01	0.295E-03
44	0.308E+03		0.976E-01	0.293E-03
45	0.336E+03	0.576E+00	0.992E-01	0.303E-03

OBS.	VAR. 6	7	8	9	10
1	0.111E-02	0.653E-04	0.329E-05	0.134E-03	0.953E-02
2	0.310E-02			0.200E-03	0.178E-01
3	0.424E-02			0.198E-03	0.231E-01
4	0.742E-02		0.113E-05	0.177E-03	0.332E-01
5	0.449E-02		0.659E-05	0.140E-03	0.345E-01
6	0.749E-02	0.211E-04	0.138E-04	0.165E-03	0.295E-01
7	0.783E-02	0.152E-04	0.461E-05	0.155E-03	0.369E-01
8	0.780E-02	0.138E-04	0.175E-05	0.148E-03	0.383E-01
9	0.979E-02	0.385E-04	0.468E-05	0.155E-03	0.418E-01
10	0.872E-02	0.170E-04	0.315E-05	0.133E-03	0.431E-01
11	0.882E-02	0.166E-04	0.621E-05	0.140E-03	0.445E-01
12	0.882E-02	0.198E-04	0.341E-05	0.128E-03	0.450E-01
13	0.925E-02	0.222E-04	0.585E-05	0.135E-03	0.464E-01
14	0.927E-02	0.175E-04	0.219E-05	0.114E-03	0.461E-01
15	0.930E-02	0.769E-04	0.394E-05	0.111E-03	0.497E-01
16	0.992E-02	0.206E-04	0.291E-05	0.116E-03	0.559E-01
17	0.981E-02	0.659E-04	0.472E-05	0.113E-03	0.647E-01
18	0.810E-02	0.299E-04	0.200E-05	0.115E-03	0.673E-01
19	0.975E-02	0.207E-04	0.431E-05	0.102E-03	0.696E-01
20	0.113E-01	0.685E-04	0.911E-05	0.112E-03	0.740E-01
21	0.113E-01	0.486E-04	0.529E-05	0.107E-03	0.797E-01
22	0.113E-01	0.680E-04	0.172E-04	0.105E-03	0.902E-01
23	0.999E-02	0.606E-04	0.353E-05	0.933E-04	0.832E-01
24	0.109E-01	0.576E-04	0.937E-05	0.900E-04	0.889E-01
25	0.110E-01	0.659E-04	0.398E-05	0.887E-04	0.920E-01
26	0.112E-01	0.811E-04	0.381E-05	0.892E-04	0.937E-01
27	0.115E-01	0.118E-03	0.324E-05	0.974E-04	0.964E-01
28	0.112E-01	0.346E-04	0.561E-04	0.858E-04	0.999E-01
29	0.111E-01	0.410E-04	0.709E-05	0.892E-04	0.999E-01
30	0.973E-02	0.532E-04	0.442E-05	0.869E-04	0.105E+00
31	0.112E-01	0.487E-04	0.367E-05	0.915E-04	0.104E+00
32	0.113E-01	0.902E-04	0.278E-05	0.960E-04	0.104E+00
33	0.112E-01	0.479E-04	0.273E-05	0.900E-04	0.109E+00
34	0.110E-01	0.387E-04	0.341E-05	0.864E-04	0.106E+00
35	0.112E-01	0.519E-04	0.230E-05	0.895E-04	0.110E+00
36	0.111E-01	0.590E-04	0.236E-05	0.868E-04	0.107E+00
37	0.106E-01	0.422E-04	0.861E-05	0.780E-04	0.797E-01
38	0.103E-01	0.919E-04	0.320E-05	0.989E-04	0.920E-01
39	0.105E-01	0.342E-04	0.885E-06	0.751E-04	0.933E-01
40	0.104E-01	0.403E-04		0.726E-04	0.982E-01
41	0.972E-02	0.280E-04	0.156E-05	0.769E-04	0.106E+00
42	0.111E-01	0.686E-04	0.211E-05	0.120E-03	0.990E-01
43	0.118E-01	0.124E-03	0.368E-05	0.158E-03	0.107E+00
44	0.910E-02	0.458E-04	0.142E-05	0.847E-04	0.109E+00
45	0.868E-02	0.141E-03	0.164E-05	0.123E-03	0.111E+00

TESTID	5004
SAMPLEID	C-S-SS-DIW
COMMENTS	15-20% swelling
WASTE TYPE	Incinerator Ash
SOLIDIFICATION AGENT	Portland II Cement
WASTE BINDER RATIO(W/W)	0.20

SAMPLE

WEIGHT(G)	
DIAMETER(CM)	5.1
HEIGHT(CM)	5.8
SURFACE AREA(CM**2)	133.8
VOLUME(CM**3).....	118.5
CURE TIME, T(C)	28 days, ambient

LEACHANT

TYPE	DIW
VOLUME(CM**3)	1340.
TEMPERATURE(C)	23 $\pm$ 5

REFERENCE	5
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DATA FILE : 5004.DTA

TESTID : 5004

NO. OF VARIABLES = 3

NO. OF OBSERVATIONS = 29

VARIABLE LABELS

VAR. 1 : Time(Days)

VAR. 2 : CFR(Cs)

VAR. 3 : CFR(Sr)

OBS.	VAR. 1	2	3
1	0.100E+01	0.340E-01	0.461E-02
2	0.200E+01	0.332E-01	0.673E-02
3	0.300E+01	0.401E-01	0.810E-02
4	0.400E+01	0.463E-01	0.910E-02
5	0.700E+01	0.510E-01	0.121E-01
6	0.800E+01	0.556E-01	0.125E-01
7	0.900E+01	0.571E-01	0.137E-01
8	0.100E+02	0.556E-01	0.150E-01
9	0.110E+02	0.556E-01	0.162E-01
10	0.140E+02	0.625E-01	0.187E-01
11	0.150E+02	0.649E-01	0.199E-01
12	0.160E+02	0.649E-01	0.199E-01
13	0.170E+02	0.733E-01	0.212E-01
14	0.180E+02	0.741E-01	0.212E-01
15	0.210E+02	0.772E-01	0.224E-01
16	0.220E+02	0.849E-01	0.224E-01
17	0.230E+02	0.849E-01	0.224E-01
18	0.240E+02	0.849E-01	0.237E-01
19	0.250E+02	0.926E-01	0.249E-01
20	0.280E+02	0.100E+00	0.262E-01
21	0.350E+02	0.100E+00	0.262E-01
22	0.420E+02	0.117E+00	0.274E-01
23	0.490E+02	0.131E+00	0.287E-01
24	0.560E+02	0.139E+00	0.299E-01
25	0.630E+02	0.170E+00	0.299E-01
26	0.700E+02	0.170E+00	0.312E-01
27	0.770E+02	0.178E+00	0.312E-01
28	0.840E+02	0.185E+00	0.324E-01
29	0.910E+02	0.178E+00	0.324E-01

TESTID	5005
SAMPLEID	C-S-SS-DIW
COMMENTS	15-20% swelling
WASTE TYPE	Incinerator Ash
SOLIDIFICATION AGENT	Portland II Cement
WASTE BINDER RATIO(W/W)	0.20
SAMPLE	
WEIGHT(G)	
DIAMETER(CM)	15.2
HEIGHT(CM)	17.3
SURFACE AREA(CM**2)	1189.
VOLUME(CM**3).....	3139.
CURE TIME, T(C)	28 days, ambient
LEACHANT	
TYPE	DIW
VOLUME(CM**3)	11 890.
TEMPERATURE(C)	23 $\pm$ 5
REFERENCE	5

DATA FILE : 5005.DTA

TESTID : 5005

NO. OF VARIABLES = 3

NO. OF OBSERVATIONS = 29

VARIABLE LABELS

VAR. 1 : Time(Days)

VAR. 2 : CFR(Ca)

VAR. 3 : CFR(Sr)

OBS.	VAR. 1	2	3
1	0.100E+01	0.676E-02	0.569E-03
2	0.200E+01	0.852E-02	0.901E-03
3	0.300E+01	0.119E-01	0.114E-02
4	0.400E+01	0.129E-01	0.147E-02
5	0.700E+01	0.132E-01	0.213E-02
6	0.800E+01	0.153E-01	0.204E-02
7	0.900E+01	0.153E-01	0.109E-02
8	0.100E+02	0.150E-01	0.209E-02
9	0.110E+02	0.156E-01	0.218E-02
10	0.140E+02	0.170E-01	0.232E-02
11	0.150E+02	0.188E-01	0.232E-02
12	0.160E+02	0.179E-01	0.232E-02
13	0.170E+02	0.209E-01	0.299E-02
14	0.180E+02	0.203E-01	0.266E-02
15	0.210E+02	0.214E-01	0.232E-02
16	0.220E+02	0.226E-01	0.232E-02
17	0.230E+02	0.235E-01	0.232E-02
18	0.240E+02	0.244E-01	0.237E-02
19	0.250E+02	0.247E-01	0.261E-02
20	0.280E+02	0.253E-01	0.270E-02
21	0.350E+02	0.294E-01	0.313E-02
22	0.420E+02	0.364E-01	0.270E-02
23	0.490E+02	0.411E-01	0.270E-02
24	0.560E+02	0.458E-01	0.322E-02
25	0.630E+02	0.411E-01	0.251E-02
26	0.700E+02	0.529E-01	0.194E-02
27	0.770E+02	0.558E-01	0.194E-02
28	0.840E+02	0.587E-01	0.185E-02
29	0.910E+02	0.617E-01	0.175E-02

TESTID	5006
SAMPLEID	C-S-SS-DIW
COMMENTS	15-20% swelling
WASTE TYPE	Incinerator Ash
SOLIDIFICATION AGENT	Portland II Cement
WASTE BINDER RATIO(W/W)	0.20
SAMPLE	
WEIGHT(G)	
DIAMETER(CM)	30.5
HEIGHT(CM)	34.5
SURFACE AREA(CM**2)	4767.
VOLUME(CM**3).....	25 206.
CURE TIME, T(C)	28 days, ambient
LEACHANT	
TYPE	DIW
VOLUME(CM**3)	47 670.
TEMPERATURE(C)	23 <u>±</u> 5
REFERENCE	5

DATA FILE : 5006.DTA

TESTID : 5006

NO. OF VARIABLES = 3

NO. OF OBSERVATIONS = 29

VARIABLE LABELS

VAR. 1 : Time(Days)

VAR. 2 : CFR(Ca)

VAR. 3 : CFR(Sr)

OBS.	VAR. 1	2	3
1	0.100E+01	0.235E-02	0.124E-03
2	0.200E+01	0.897E-03	0.155E-03
3	0.300E+01	0.436E-02	0.306E-03
4	0.400E+01	0.531E-02	0.286E-03
5	0.700E+01	0.821E-02	0.408E-03
6	0.800E+01	0.897E-02	0.530E-03
7	0.900E+01	0.897E-02	0.530E-03
8	0.100E+02	0.960E-02	0.612E-03
9	0.110E+02	0.985E-02	0.673E-03
10	0.140E+02	0.120E-01	0.836E-03
11	0.150E+02	0.131E-01	0.857E-03
12	0.160E+02	0.126E-01	0.918E-03
13	0.170E+02	0.149E-01	0.918E-03
14	0.180E+02	0.152E-01	0.938E-03
15	0.210E+02	0.177E-01	0.112E-02
16	0.220E+02	0.177E-01	0.999E-03
17	0.230E+02	0.177E-01	0.110E-02
18	0.240E+02	0.202E-01	0.116E-02
19	0.250E+02	0.202E-01	0.131E-02
20	0.280E+02	0.215E-01	0.169E-02
21	0.350E+02	0.253E-01	0.200E-02
22	0.420E+02	0.318E-01	0.245E-02
23	0.490E+02	0.303E-01	0.388E-02
24	0.560E+02	0.389E-01	0.428E-02
25	0.630E+02	0.379E-01	0.530E-02
26	0.700E+02	0.430E-01	0.551E-02
27	0.770E+02	0.467E-01	0.530E-02
28	0.840E+02	0.480E-01	0.510E-02
29	0.910E+02	0.480E-01	0.428E-02

TESTID	5007
SAMPLEID	C-S-SS-GW
COMMENTS	Average of 3 replicates
WASTE TYPE	Incinerator Ash
SOLIDIFICATION AGENT	Portland II Cement
WASTE BINDER RATIO(W/W)	0.20
SAMPLE	
WEIGHT(G)	
DIAMETER(CM)	5.1
HEIGHT(CM)	10.2
SURFACE AREA(CM**2)	204.3
VOLUME(CM**3).....	208.4
CURE TIME, T(C)	28 days, ambient
LEACHANT	
TYPE	Synthetic Groundwater
VOLUME(CM**3)	2043.
TEMPERATURE(C)	23 <u>+</u> 5
REFERENCE	5

DATA FILE : 5007.DTA

TESTID : 5007

NO. OF VARIABLES = 2

NO. OF OBSERVATIONS = 34

VARIABLE LABELS

VAR. 1 : Time(Days)

VAR. 2 : CFR(Cs)

OBS.	VAR. 1	2
1	0.347E-03	0.186E-03
2	0.830E-01	0.152E-02
3	0.292E+00	0.287E-02
4	0.100E+01	0.110E-01
5	0.200E+01	0.140E-01
6	0.300E+01	0.166E-01
7	0.400E+01	0.210E-01
8	0.500E+01	0.245E-01
9	0.600E+01	0.268E-01
10	0.700E+01	0.299E-01
11	0.800E+01	0.310E-01
12	0.900E+01	0.321E-01
13	0.100E+02	0.336E-01
14	0.110E+02	0.353E-01
15	0.120E+02	0.370E-01
16	0.130E+02	0.400E-01
17	0.140E+02	0.410E-01
18	0.150E+02	0.424E-01
19	0.160E+02	0.434E-01
20	0.170E+02	0.447E-01
21	0.180E+02	0.460E-01
22	0.190E+02	0.471E-01
23	0.200E+02	0.491E-01
24	0.210E+02	0.518E-01
25	0.280E+02	0.569E-01
26	0.350E+02	0.635E-01
27	0.420E+02	0.677E-01
28	0.490E+02	0.743E-01
29	0.560E+02	0.796E-01
30	0.630E+02	0.856E-01
31	0.700E+02	0.918E-01
32	0.770E+02	0.961E-01
33	0.840E+02	0.105E+00
34	0.910E+02	0.106E+00

REFERENCE 6

TESTID: 6001 - 6004

- [6] Kalb, P.D. and P. Colombo, Full Scale Leaching Of Commercial Reactor Waste Forms, Brookhaven National Laboratory, BNL-35561, September 1984.

ABSTRACT

Brookhaven National Lab (BNL) and Savannah River Lab (SRL) collaborated to investigate the leaching behavior of commercial power reactor waste forms in both a shallow land burial environment and in standard laboratory leach tests. Full-scale (55-gallon drum) waste forms from two commercial reactors, one BWR and one PWR, were acquired for this task. BNL performed leach testing using the ANS 16.1 Leach Test procedure on one each of the waste form types listed below.

- BWR sulfate evaporator concentrate solidified with portland cement,
- BWR sulfate evaporator concentrate plus ion exchange resin solidified with portland cement,
- BWR sulfate evaporator concentrate plus ion exchange resin solidified as an emulsion with vinyl ester-styrene copolymer (DOW process) and,
- PWR boric acid evaporator concentrate solidified with masonry cement.

The activity in the waste forms was reported from radiochemical analysis. However, the solids content of the wastes, the waste-to-binder ratios for the waste forms and the weight of the waste forms were not reported.

Replicates of these waste form types were shipped to SRL for burial in lysimeters to measure the leaching from these waste forms under burial conditions over a long time period and to compare the leaching in the lysimeters to that measured from the standard leach testing on the nominally identical full-scale waste forms at BNL.

TESTID	6001
SAMPLEID	C-R-FS-DIW
COMMENTS	
WASTE TYPE	BWR Concentrate
SOLIDIFICATION AGENT	Portland III Cement
WASTE BINDER RATIO(W/W)	
SAMPLE	
WEIGHT(G)	
DIAMETER(CM)	55. (estimated)
HEIGHT(CM)	67.5 (estimated)
SURFACE AREA(CM**2)	16 860.
VOLUME(CM**3)	160 250.
CURE TIME, T(C)	
LEACHANT	
TYPE	DIW
VOLUME(CM**3)	216 000.
TEMPERATURE(C)	22 <u>±</u> 2
REFERENCE	6

DATA FILE : 6001.DTA

TESTID : 6001

NO. OF VARIABLES = 4

NO. OF OBSERVATIONS = 27

VARIABLE LABELS

VAR. 1 : Time(Days)

VAR. 2 : CFR(Cs137)

VAR. 3 : CFR(Co60)

VAR. 4 : CFR(Cs134)

OBS.	VAR. 1	2	3	4
1	0.900E-01	0.281E-02	0.118E-04	0.289E-02
2	0.210E+00	0.523E-02	0.273E-04	0.541E-02
3	0.970E+00	0.470E-01	0.152E-03	0.467E-01
4	0.200E+01	0.698E-01	0.216E-03	0.700E-01
5	0.300E+01	0.886E-01	0.274E-03	0.892E-01
6	0.400E+01	0.917E-01	0.283E-03	0.923E-01
7	0.700E+01	0.103E+00	0.316E-03	0.104E+00
8	0.100E+02	0.107E+00	0.326E-03	0.107E+00
9	0.150E+02	0.112E+00	0.343E-03	0.113E+00
10	0.220E+02	0.117E+00	0.362E-03	0.118E+00
11	0.290E+02	0.124E+00	0.389E-03	0.125E+00
12	0.360E+02	0.124E+00	0.415E-03	0.131E+00
13	0.430E+02	0.128E+00	0.433E-03	0.135E+00
14	0.500E+02	0.132E+00	0.450E-03	0.139E+00
15	0.570E+02	0.136E+00	0.468E-03	0.143E+00
16	0.710E+02	0.140E+00	0.488E-03	0.147E+00
17	0.850E+02	0.144E+00	0.510E-03	0.152E+00
18	0.990E+02	0.149E+00	0.533E-03	0.157E+00
19	0.113E+03	0.154E+00	0.559E-03	0.162E+00
20	0.127E+03	0.158E+00	0.582E-03	0.166E+00
21	0.155E+03	0.165E+00	0.613E-03	0.172E+00
22	0.183E+03	0.171E+00	0.658E-03	0.179E+00
23	0.211E+03	0.178E+00	0.705E-03	0.185E+00
24	0.239E+03	0.183E+00	0.754E-03	0.191E+00
25	0.267E+03	0.189E+00	0.805E-03	0.197E+00
26	0.295E+03	0.194E+00	0.857E-03	0.202E+00
27	0.316E+03	0.199E+00	0.914E-03	0.207E+00

TESTID	6002
SAMPLEID	C-R-FS-DIW
COMMENTS	
WASTE TYPE	BWR Concentrate + IX Resin
SOLIDIFICATION AGENT	Portland III Cement
WASTE BINDER RATIO(W/W)	
SAMPLE	
WEIGHT(G)	
DIAMETER(CM)	55. (estimated)
HEIGHT(CM)	67.5 (estimated)
SURFACE AREA(CM**2)	15 850.
VOLUME(CM**3)	160 570.
CURE TIME, T(C)	
LEACHANT	
TYPE	DIW
VOLUME(CM**3)	240 000.
TEMPERATURE(C)	22 $\pm$ 2
REFERENCE	6

DATA FILE : 6002.DTA

TESTID : 6002

NO. OF VARIABLES = 4

NO. OF OBSERVATIONS = 27

VARIABLE LABELS

VAR. 1 : Time(Days)

VAR. 2 : CFR(Ca137)

VAR. 3 : CFR(Co60)

VAR. 4 : CFR(Ca134)

OBS.	VAR. 1	2	3	4
1	0.900E-01	0.228E-02	0.177E-04	0.215E-02
2	0.210E+00	0.374E-02	0.271E-04	0.356E-02
3	0.970E+00	0.131E-01	0.451E-04	0.123E-01
4	0.200E+01	0.212E-01	0.997E-04	0.198E-01
5	0.300E+01	0.273E-01	0.119E-03	0.256E-01
6	0.400E+01	0.323E-01	0.133E-03	0.305E-01
7	0.700E+01	0.410E-01	0.154E-03	0.387E-01
8	0.100E+02	0.481E-01	0.170E-03	0.454E-01
9	0.150E+02	0.562E-01	0.188E-03	0.531E-01
10	0.220E+02	0.655E-01	0.213E-03	0.619E-01
11	0.290E+02	0.743E-01	0.239E-03	0.700E-01
12	0.360E+02	0.803E-01	0.261E-03	0.757E-01
13	0.430E+02	0.880E-01	0.289E-03	0.831E-01
14	0.500E+02	0.953E-01	0.323E-03	0.900E-01
15	0.570E+02	0.101E+00	0.355E-03	0.961E-01
16	0.710E+02	0.108E+00	0.392E-03	0.102E+00
17	0.850E+02	0.118E+00	0.445E-03	0.112E+00
18	0.990E+02	0.128E+00	0.503E-03	0.121E+00
19	0.113E+03	0.138E+00	0.565E-03	0.131E+00
20	0.127E+03	0.154E+00	0.637E-03	0.146E+00
21	0.155E+03	0.229E+00	0.857E-03	0.223E+00
22	0.183E+03	0.304E+00	0.106E-02	0.300E+00
23	0.211E+03	0.393E+00	0.134E-02	0.395E+00
24	0.239E+03	0.483E+00	0.163E-02	0.488E+00
25	0.267E+03	0.567E+00	0.187E-02	0.573E+00
26	0.295E+03	0.643E+00	0.210E-02	0.652E+00
27	0.316E+03	0.705E+00	0.232E-02	0.716E+00

TESTID	6003
SAMPLEID	C-R-FS-DIW
COMMENTS	
WASTE TYPE	PWR Concentrate
SOLIDIFICATION AGENT	Masonry Cement
WASTE BINDER RATIO(W/W)	
SAMPLE	
WEIGHT(G)	
DIAMETER(CM)	55. (estimated)
HEIGHT(CM)	58.3 (estimated)
SURFACE AREA(CM**2)	14 140.
VOLUME(CM**3)	138 600.
CURE TIME, T(C)	
LEACHANT	
TYPE	DIW
VOLUME(CM**3)	240 000.
TEMPERATURE(C)	22 ± 2
REFERENCE	6

DATA FILE : 6003.DTA

TESTID : 6003

NO. OF VARIABLES = 4

NO. OF OBSERVATIONS = 27

VARIABLE LABELS

VAR. 1 : Time(Days)

VAR. 2 : CFR(Ca137)

VAR. 3 : CFR(Co60)

VAR. 4 : CFR(Ca134)

OBS.	VAR. 1	2	3	4
1	0.900E-01	0.686E-02	0.361E-04	0.716E-02
2	0.210E+00	0.979E-02	0.282E-03	0.101E-01
3	0.970E+00	0.273E-01	0.375E-03	0.277E-01
4	0.200E+01	0.446E-01	0.460E-03	0.453E-01
5	0.300E+01	0.549E-01	0.515E-03	0.559E-01
6	0.400E+01	0.605E-01	0.626E-03	0.617E-01
7	0.700E+01	0.967E-01	0.996E-03	0.981E-01
8	0.100E+02	0.123E+00	0.116E-02	0.124E+00
9	0.150E+02	0.155E+00	0.132E-02	0.157E+00
10	0.220E+02	0.197E+00	0.154E-02	0.200E+00
11	0.290E+02	0.231E+00	0.168E-02	0.234E+00
12	0.360E+02	0.263E+00	0.191E-02	0.267E+00
13	0.430E+02	0.285E+00	0.221E-02	0.286E+00
14	0.500E+02	0.305E+00	0.230E-02	0.306E+00
15	0.570E+02	0.330E+00	0.244E-02	0.333E+00
16	0.710E+02	0.351E+00	0.257E-02	0.355E+00
17	0.850E+02	0.382E+00	0.274E-02	0.387E+00
18	0.990E+02	0.411E+00	0.287E-02	0.417E+00
19	0.113E+03	0.443E+00	0.302E-02	0.449E+00
20	0.127E+03	0.472E+00	0.315E-02	0.478E+00
21	0.155E+03	0.517E+00	0.334E-02	0.523E+00
22	0.183E+03	0.561E+00	0.352E-02	0.567E+00
23	0.211E+03	0.603E+00	0.370E-02	0.608E+00
24	0.239E+03	0.636E+00	0.384E-02	0.642E+00
25	0.267E+03	0.665E+00	0.399E-02	0.671E+00
26	0.295E+03	0.696E+00	0.415E-02	0.702E+00
27	0.316E+03	0.716E+00	0.424E-02	0.722E+00

TESTID	6004
SAMPLEID	P-R-FS-DIW
COMMENTS	
WASTE TYPE	BWR Concentrate
SOLIDIFICATION AGENT	VES (Dow Process)
WASTE BINDER RATIO(W/W)	
SAMPLE	
WEIGHT(G)	
DIAMETER(CM)	55. (estimated)
HEIGHT(CM)	60.4 (estimated)
SURFACE AREA(CM**2)	15 190.
VOLUME(CM**3)	143 370.
CURE TIME, T(C)	
LEACHANT	
TYPE	DIW
VOLUME(CM**3)	162 000.
TEMPERATURE(C)	22 $\pm$ 2
REFERENCE	6

DATA FILE : 6004.DTA

TESTID : 6004

NO. OF VARIABLES = 5

NO. OF OBSERVATIONS = 27

VARIABLE LABELS

VAR. 1 : Time(Days)

VAR. 2 : CFR(Cs137)

VAR. 3 : CFR(Co60)

VAR. 4 : CFR(Ca134)

VAR. 5 : CFR(Mn54)

OBS.	VAR. 1	2	3	4	5
1	0.900E-01	0.212E-03	0.106E-03	0.197E-03	0.111E-03
2	0.210E+00	0.249E-03	0.119E-03	0.231E-03	0.124E-03
3	0.970E+00	0.432E-03	0.154E-03	0.412E-03	0.149E-03
4	0.200E+01	0.660E-03	0.219E-03	0.638E-03	0.201E-03
5	0.300E+01	0.858E-03	0.279E-03	0.836E-03	0.256E-03
6	0.400E+01	0.103E-02	0.332E-03	0.101E-02	0.303E-03
7	0.700E+01	0.153E-02	0.433E-03	0.152E-02	0.349E-03
8	0.100E+02	0.197E-02	0.507E-03	0.196E-02	0.372E-03
9	0.150E+02	0.261E-02	0.617E-03	0.262E-02	0.406E-03
10	0.220E+02	0.343E-02	0.759E-03	0.345E-02	0.451E-03
11	0.290E+02	0.418E-02	0.897E-03	0.422E-02	0.502E-03
12	0.360E+02	0.477E-02	0.100E-02	0.481E-02	0.539E-03
13	0.430E+02	0.528E-02	0.111E-02	0.534E-02	0.575E-03
14	0.500E+02	0.574E-02	0.119E-02	0.581E-02	0.605E-03
15	0.570E+02	0.622E-02	0.128E-02	0.633E-02	0.641E-03
16	0.710E+02	0.677E-02	0.138E-02	0.689E-02	0.673E-03
17	0.850E+02	0.751E-02	0.151E-02	0.766E-02	0.722E-03
18	0.990E+02	0.818E-02	0.163E-02	0.834E-02	0.760E-03
19	0.113E+03	0.883E-02	0.173E-02	0.901E-02	0.791E-03
20	0.127E+03	0.934E-02	0.180E-02	0.961E-02	0.832E-03
21	0.155E+03	0.105E-01	0.189E-02	0.107E-01	0.883E-03
22	0.183E+03	0.114E-01	0.196E-02	0.116E-01	0.932E-03
23	0.211E+03	0.121E-01	0.203E-02	0.123E-01	0.988E-03
24	0.239E+03	0.129E-01	0.212E-02	0.131E-01	0.107E-02
25	0.267E+03	0.136E-01	0.223E-02	0.138E-01	0.115E-02
26	0.295E+03	0.143E-01	0.233E-02	0.146E-01	0.123E-02
27	0.316E+03	0.150E-01	0.247E-02	0.153E-01	0.132E-02

REFERENCE 7

TESTID: 7001 - 7010

- [7] Fuhrmann, M. and P. Colombo, Special Waste Form - Arid Program, Waste Form Acquisition and Laboratory Leaching Studies Final Report, Brookhaven National Laboratory, BNL-37620, January 1986.

ABSTRACT

Reference [7] presents leaching data on five sets of duplicate small-scale samples (2.5 cm diameter x 5 cm height) incorporating actual power reactor wastes in various solidification agents, as listed below.

- BWR sulfate salt evaporator concentrate solidified with portland III cement,
- BWR sulfate salt evaporator concentrate plus ion exchange resin solidified with portland III cement,
- PWR boric acid evaporator concentrate solidified with masonry cement,
- BWR sulfate salt evaporator concentrate plus ion exchange resin solidified as an emulsion with vinyl ester-styrene copolymer (DOW process) and
- PWR boric acid evaporator concentrate solidified with bitumen. Leach testing was performed using the ANS 16.1 Leach Test procedure.

TESTID	7001,2
SAMPLEID	C-R-SS-DIW
COMMENTS	
WASTE TYPE	BWR sulfate evaporator bottoms, 26 wt% solids
SOLIDIFICATION AGENT	Portland III Cement
WASTE BINDER RATIO(W/W)	1.25
SAMPLE	
WEIGHT(G)	37.1
DIAMETER(CM)	2.5
HEIGHT(CM)	5.1
SURFACE AREA(CM**2)	50.
VOLUME(CM**3)	25.
CURE TIME, T(C)	60 days
LEACHANT	
TYPE	DIW
VOLUME(CM**3)	507.
TEMPERATURE(C)	21 $\pm$ 0.5
REFERENCE	7

DATA FILE : 7001.DTA

TESTID : 7001

NO. OF VARIABLES = 4

NO. OF OBSERVATIONS = 10

VARIABLE LABELS

VAR. 1 : Time(Days)

VAR. 2 : CFR(Cs137)

VAR. 3 : CFR(Cs134)

VAR. 4 : CFR(Co60)

OBS.	VAR. 1	2	3	4
1	0.830E-01	0.290E-01	0.310E-01	0.700E-04
2	0.290E+00	0.103E+00	0.110E+00	0.170E-03
3	0.100E+01	0.216E+00	0.230E+00	0.300E-03
4	0.200E+01	0.329E+00	0.350E+00	0.490E-03
5	0.300E+01	0.408E+00	0.430E+00	0.630E-03
6	0.400E+01	0.471E+00	0.500E+00	0.730E-03
7	0.500E+01	0.524E+00	0.550E+00	0.820E-03
8	0.190E+02	0.842E+00	0.890E+00	0.151E-02
9	0.470E+02	0.961E+00	0.990E+00	0.178E-02
10	0.900E+02	0.990E+00	0.999E+00	0.194E-02

DATA FILE : 7002.DTA

TESTID : 7002

NO. OF VARIABLES = 4

NO. OF OBSERVATIONS = 10

VARIABLE LABELS

VAR. 1 : Time(Days)

VAR. 2 : CFR(Ca137)

VAR. 3 : CFR(Ca134)

VAR. 4 : CFR(Co60)

OBS.	VAR. 1	2	3	4
1	0.830E-01	0.220E-01	0.230E-01	0.800E-04
2	0.290E+00	0.950E-01	0.102E+00	0.180E-03
3	0.100E+01	0.199E+00	0.213E+00	0.340E-03
4	0.200E+01	0.312E+00	0.334E+00	0.530E-03
5	0.300E+01	0.393E+00	0.419E+00	0.660E-03
6	0.400E+01	0.458E+00	0.488E+00	0.770E-03
7	0.500E+01	0.511E+00	0.545E+00	0.880E-03
8	0.190E+02	0.840E+00	0.889E+00	0.160E-02
9	0.470E+02	0.960E+00	0.980E+00	0.187E-02
10	0.900E+02	0.990E+00	0.990E+00	0.200E-02

TESTID	7003,4
SAMPLEID	C-R-SS-DIW
COMMENTS	
WASTE TYPE	BWR sulfate evaporator bottoms, + IX resin, 38.4 wt% solids
SOLIDIFICATION AGENT	Portland III Cement
WASTE BINDER RATIO(W/W)	1.40
SAMPLE	
WEIGHT(G)	39.6
DIAMETER(CM)	2.5
HEIGHT(CM)	5.1
SURFACE AREA(CM**2)	50.
VOLUME(CM**3)	25.
CURE TIME, T(C)	60 days
LEACHANT	
TYPE	DIW
VOLUME(CM**3)	507.
TEMPERATURE(C)	21 $\pm$ 0.5
REFERENCE	7

DATA FILE : 7003.DTA

TESTID : 7003

NO. OF VARIABLES = 4

NO. OF OBSERVATIONS = 10

VARIABLE LABELS

VAR. 1 : Time(Days)

VAR. 2 : CFR(Cs137)

VAR. 3 : CFR(Cs134)

VAR. 4 : CFR(Co60)

OBS.	VAR. 1	2	3	4
1	0.830E-01	0.200E-01	0.220E-01	0.110E-03
2	0.290E+00	0.670E-01	0.720E-01	0.440E-03
3	0.100E+01	0.149E+00	0.156E+00	0.100E-02
4	0.200E+01	0.226E+00	0.238E+00	0.170E-02
5	0.300E+01	0.284E+00	0.299E+00	0.220E-02
6	0.400E+01	0.331E+00	0.349E+00	0.260E-02
7	0.500E+01	0.373E+00	0.393E+00	0.290E-02
8	0.190E+02	0.617E+00	0.649E+00	0.550E-02
9	0.470E+02	0.807E+00	0.843E+00	0.790E-02
10	0.900E+02	0.874E+00	0.909E+00	0.910E-02

DATA FILE : 7004.DTA

TESTID : 7004

NO. OF VARIABLES = 4

NO. OF OBSERVATIONS = 10

VARIABLE LABELS

VAR. 1 : Time(Days)

VAR. 2 : CFR(Cs137)

VAR. 3 : CFR(Cs134)

VAR. 4 : CFR(Co60)

OBS.	VAR. 1	2	3	4
1	0.830E-01	0.310E-01	0.330E-01	0.200E-03
2	0.290E+00	0.930E-01	0.100E+00	0.800E-03
3	0.100E+01	0.190E+00	0.200E+00	0.190E-02
4	0.200E+01	0.280E+00	0.290E+00	0.300E-02
5	0.300E+01	0.340E+00	0.360E+00	0.370E-02
6	0.400E+01	0.389E+00	0.410E+00	0.420E-02
7	0.500E+01	0.431E+00	0.455E+00	0.470E-02
8	0.190E+02	0.648E+00	0.653E+00	0.760E-02
9	0.470E+02	0.805E+00	0.813E+00	0.960E-02
10	0.900E+02	0.856E+00	0.862E+00	0.100E-01

TESTID

7005,6

SAMPLEID

C-R-SS-DIW

COMMENTS

WASTE TYPE

PWR boric acid evaporator bottoms,
9.4 wt% solids

SOLIDIFICATION AGENT

Masonry Cement

WASTE BINDER RATIO(W/W)

0.58

SAMPLE

WEIGHT(G)

39.6

DIAMETER(CM)

2.5

HEIGHT(CM)

5.1

SURFACE AREA(CM**2)

50.

VOLUME(CM**3)

25.

CURE TIME, T(C)

25 days

LEACHANT

TYPE

DIW

VOLUME(CM**3)

507.

TEMPERATURE(C)

21 $\pm$ 0.5

REFERENCE

7

DATA FILE : 7005.DTA

TESTID : 7005

NO. OF VARIABLES = 4
NO. OF OBSERVATIONS = 10

VARIABLE LABELS

VAR. 1 : Time(Days)
VAR. 2 : CFR(Cs137)
VAR. 3 : CFR(Cs134)
VAR. 4 : CFR(Co60)

OBS.	VAR. 1	2	3	4
1	0.830E-01	0.470E-01	0.470E-01	0.970E-03
2	0.290E+00	0.153E+00	0.154E+00	0.184E-02
3	0.100E+01	0.324E+00	0.324E+00	0.345E-02
4	0.200E+01	0.454E+00	0.455E+00	0.560E-02
5	0.300E+01	0.538E+00	0.540E+00	0.700E-02
6	0.400E+01	0.600E+00	0.600E+00	0.100E-01
7	0.500E+01	0.654E+00	0.655E+00	0.130E-01
8	0.190E+02	0.883E+00	0.883E+00	0.160E-01
9	0.470E+02	0.963E+00	0.960E+00	0.180E-01
10	0.900E+02	0.981E+00	0.977E+00	0.210E-01

DATA FILE : 7006.DTA

TESTID : 7006

NO. OF VARIABLES = 4

NO. OF OBSERVATIONS = 10

VARIABLE LABELS

VAR. 1 : Time(Days)

VAR. 2 : CFR(Cs137)

VAR. 3 : CFR(Cs134)

VAR. 4 : CFR(Co60)

OBS.	VAR. 1	2	3	4
1	0.830E-01	0.410E-01	0.420E-01	0.400E-03
2	0.290E+00	0.143E+00	0.144E+00	0.160E-02
3	0.100E+01	0.306E+00	0.312E+00	0.310E-02
4	0.200E+01	0.452E+00	0.461E+00	0.490E-02
5	0.300E+01	0.551E+00	0.564E+00	0.630E-02
6	0.400E+01	0.626E+00	0.642E+00	0.710E-02
7	0.500E+01	0.686E+00	0.704E+00	0.780E-02
8	0.190E+02	0.909E+00	0.931E+00	0.110E-01
9	0.470E+02	0.952E+00	0.974E+00	0.140E-01
10	0.900E+02	0.959E+00	0.980E+00	0.170E-01

TESTID	7007,8
SAMPLEID	P-R-SS-DIW
COMMENTS	
WASTE TYPE	BWR sulfate evaporator bottoms + IX resin, 38.4 wt% solids
SOLIDIFICATION AGENT	Vinyl Ester-Styrene Emulsion
WASTE BINDER RATIO(W/W)	1.0
SAMPLE	
WEIGHT(G)	
DIAMETER(CM)	2.5
HEIGHT(CM)	5.0
SURFACE AREA(CM**2)	49.1
VOLUME(CM**3)	24.5
CURE TIME, T(C)	
LEACHANT	
TYPE	DIW
VOLUME(CM**3)	507.
TEMPERATURE(C)	19-20
REFERENCE	7

DATA FILE : 7007.DTA

TESTID : 7007

NO. OF VARIABLES = 4

NO. OF OBSERVATIONS = 10

VARIABLE LABELS

VAR. 1 : Time(Days)

VAR. 2 : CFR(Cs137)

VAR. 3 : CFR(Cs134)

VAR. 4 : CFR(Co60)

OBS.	VAR. 1	2	3	4
1	0.830E-01	0.210E-02	0.230E-02	0.600E-03
2	0.290E+00	0.480E-02	0.470E-02	0.800E-03
3	0.100E+01	0.190E-01	0.220E-01	0.170E-02
4	0.200E+01	0.330E-01	0.360E-01	0.240E-02
5	0.300E+01	0.430E-01	0.470E-01	0.290E-02
6	0.400E+01	0.510E-01	0.540E-01	0.330E-02
7	0.500E+01	0.570E-01	0.610E-01	0.380E-02
8	0.190E+02	0.770E-01	0.820E-01	0.490E-02
9	0.470E+02	0.800E-01	0.870E-01	0.580E-02
10	0.900E+02	0.820E-01	0.890E-01	0.850E-02

DATA FILE : 7008.DTA

TESTID : 7008

NO. OF VARIABLES = 4

NO. OF OBSERVATIONS = 10

VARIABLE LABELS

VAR. 1 : Time(Days)

VAR. 2 : CFR(Cs137)

VAR. 3 : CFR(Cs134)

VAR. 4 : CFR(Co60)

OBS.	VAR. 1	2	3	4
1	0.830E-01	0.120E-02	0.110E-02	0.200E-03
2	0.290E+00	0.770E-02	0.750E-02	0.600E-03
3	0.100E+01	0.200E-01	0.210E-01	0.140E-02
4	0.200E+01	0.320E-01	0.320E-01	0.210E-02
5	0.300E+01	0.410E-01	0.420E-01	0.260E-02
6	0.400E+01	0.490E-01	0.500E-01	0.310E-02
7	0.500E+01	0.550E-01	0.560E-01	0.360E-02
8	0.190E+02	0.790E-01	0.790E-01	0.500E-02
9	0.470E+02	0.820E-01	0.830E-01	0.560E-02
10	0.900E+02	0.830E-01	0.840E-01	0.820E-02

TESTID	7009,10
SAMPLEID	B-R-SS-DIW
COMMENTS	
WASTE TYPE	PWR boric acid evaporator bottoms
SOLIDIFICATION AGENT	Bitumen
WASTE BINDER RATIO(W/W)	1.09 (45.7 wt% solid waste)
SAMPLE	
WEIGHT(G)	
DIAMETER(CM)	2.5
HEIGHT(CM)	5.0
SURFACE AREA(CM**2)	49.1
VOLUME(CM**3)	24.5
CURE TIME, T(C)	
LEACHANT	
TYPE	DIW
VOLUME(CM**3)	507.
TEMPERATURE(C)	19-20
REFERENCE	7

DATA FILE : 7009.DTA

TESTID : 7009

NO. OF VARIABLES = 4

NO. OF OBSERVATIONS = 10

VARIABLE LABELS

VAR. 1 : Time(Days)

VAR. 2 : CFR(Cs137)

VAR. 3 : CFR(Cs134)

VAR. 4 : CFR(Co60)

OBS.	VAR. 1	2	3	4
1	0.830E-01	0.134E-02	0.331E-03	0.139E-03
2	0.290E+00	0.133E-01	0.689E-02	0.125E-02
3	0.100E+01	0.241E-01	0.729E-02	0.499E-02
4	0.200E+01	0.384E-01	0.762E-02	0.111E-01
5	0.300E+01	0.495E-01	0.119E-01	0.158E-01
6	0.400E+01	0.707E-01	0.281E-01	0.257E-01
7	0.500E+01	0.884E-01	0.387E-01	0.323E-01
8	0.190E+02	0.166E+00	0.112E+00	0.452E-01
9	0.470E+02	0.281E+00	0.217E+00	0.594E-01
10	0.900E+02	0.440E+00	0.365E+00	0.811E-01

DATA FILE : 7010.DTA

TESTID : 7010

NO. OF VARIABLES = 4

NO. OF OBSERVATIONS = 10

VARIABLE LABELS

VAR. 1 : Time(Days)

VAR. 2 : CFR(Cs137)

VAR. 3 : CFR(Cs134)

VAR. 4 : CFR(Co60)

OBS.	VAR. 1	2	3	4
1	0.830E-01	0.153E-01	0.202E-01	0.971E-03
2	0.290E+00	0.269E-01	0.278E-01	0.596E-02
3	0.100E+01	0.453E-01	0.281E-01	0.943E-02
4	0.200E+01	0.573E-01	0.341E-01	0.137E-01
5	0.300E+01	0.724E-01	0.444E-01	0.153E-01
6	0.400E+01	0.911E-01	0.576E-01	0.165E-01
7	0.500E+01	0.101E+00	0.580E-01	0.234E-01
8	0.190E+02	0.180E+00	0.122E+00	0.349E-01
9	0.470E+02	0.283E+00	0.213E+00	0.577E-01
10	0.900E+02	0.428E+00	0.351E+00	0.814E-01

REFERENCE 8

TESTID: 8001 - 8011 and 8101 - 8117

- [8] Dayal, R., H. Arora and N. Morcos, Estimation of Cesium-137 Release From Waste/Cement Composites Using Data From Small-Scale Specimens, Brookhaven National Laboratory, NUREG/CR-3382, BNL-NUREG-516 90, July 1983.

ABSTRACT

Reference [8] presents data on the leachability of Cs-137 from:
(i) simulant boric acid evaporator bottoms, neutralized with sodium hydroxide, solidified with portland III cement and, (ii) ion exchange resins solidified with portland I cement.

TESTID	8001,2,3
SAMPLEID	C-S-SS-DIW
COMMENTS	
WASTE TYPE	Boric Acid, 12 wt% solution
SOLIDIFICATION AGENT	Portland III Cement
WASTE BINDER RATIO(W/W)	0.7 (waste solution to dry cement)
SAMPLE	
WEIGHT(G)	149.
DIAMETER(CM).....	4.65
HEIGHT(CM)	4.80
SURFACE AREA(CM**2)	104.1
VOLUME(CM**3)	81.5
CURE TIME, T(C)	31 days, 77-25
LEACHANT	
TYPE	DIW
VOLUME(CM**3)	1041.
TEMPERATURE(C)	25 <u>±</u> 5
REFERENCE	8

DATA FILE : b:8001.DTA

TESTID : 8001 rep 8002 8003

NO. OF VARIABLES = 2

NO. OF OBSERVATIONS = 24

VARIABLE LABELS

VAR. 1 : Time(Days)

VAR. 2 : CFR(Ca137)

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OBS.	VAR. 1	2
1	0.700E-01	0.326E-01
2	0.100E+01	0.110E+00
3	0.200E+01	0.154E+00
4	0.300E+01	0.186E+00
5	0.400E+01	0.212E+00
6	0.700E+01	0.265E+00
7	0.110E+02	0.315E+00
8	0.140E+02	0.342E+00
9	0.180E+02	0.372E+00
10	0.210E+02	0.391E+00
11	0.250E+02	0.415E+00
12	0.280E+02	0.429E+00
13	0.320E+02	0.452E+00
14	0.350E+02	0.466E+00
15	0.390E+02	0.484E+00
16	0.420E+02	0.496E+00
17	0.490E+02	0.517E+00
18	0.560E+02	0.538E+00
19	0.640E+02	0.555E+00
20	0.710E+02	0.571E+00
21	0.770E+02	0.580E+00
22	0.840E+02	0.592E+00
23	0.122E+03	0.644E+00
24	0.150E+03	0.672E+00

DATA FILE : b:8002.DTA

TESTID : 8002 rep 8001 8003
NO. OF VARIABLES = 2
NO. OF OBSERVATIONS = 24

VARIABLE LABELS
VAR. 1 : Time(Days)
VAR. 2 : CFR(Cs137)

OBS.	VAR. 1	2
1	0.700E-01	0.333E-01
2	0.100E+01	0.108E+00
3	0.200E+01	0.155E+00
4	0.300E+01	0.190E+00
5	0.400E+01	0.216E+00
6	0.700E+01	0.268E+00
7	0.110E+02	0.316E+00
8	0.140E+02	0.342E+00
9	0.180E+02	0.370E+00
10	0.210E+02	0.387E+00
11	0.250E+02	0.409E+00
12	0.280E+02	0.422E+00
13	0.320E+02	0.445E+00
14	0.350E+02	0.459E+00
15	0.390E+02	0.476E+00
16	0.420E+02	0.488E+00
17	0.490E+02	0.509E+00
18	0.560E+02	0.527E+00
19	0.640E+02	0.545E+00
20	0.710E+02	0.560E+00
21	0.770E+02	0.571E+00
22	0.840E+02	0.582E+00
23	0.122E+03	0.638E+00
24	0.150E+03	0.667E+00

DATA FILE : 8003.DTA

TESTID : 8003 rep 8001 8002

NO. OF VARIABLES = 2

NO. OF OBSERVATIONS = 24

VARIABLE LABELS

VAR. 1 : Time(Days)

VAR. 2 : CFR(Cs137)

OBS.	VAR. 1	2
1	0.700E-01	0.345E-01
2	0.100E+01	0.111E+00
3	0.200E+01	0.155E+00
4	0.300E+01	0.187E+00
5	0.400E+01	0.214E+00
6	0.700E+01	0.266E+00
7	0.110E+02	0.311E+00
8	0.140E+02	0.336E+00
9	0.180E+02	0.361E+00
10	0.210E+02	0.377E+00
11	0.250E+02	0.398E+00
12	0.280E+02	0.411E+00
13	0.320E+02	0.432E+00
14	0.350E+02	0.446E+00
15	0.390E+02	0.460E+00
16	0.420E+02	0.471E+00
17	0.490E+02	0.492E+00
18	0.560E+02	0.510E+00
19	0.640E+02	0.528E+00
20	0.710E+02	0.543E+00
21	0.770E+02	0.553E+00
22	0.840E+02	0.564E+00
23	0.122E+03	0.618E+00
24	0.150E+03	0.646E+00

TESTID	8004,5,6
SAMPLEID	C-S-SS-DIW
COMMENTS	
WASTE TYPE	Boric Acid, 12 wt% solution
SOLIDIFICATION AGENT	Portland III Cement
WASTE BINDER RATIO(W/W)	0.7 (waste solution to dry cement)
SAMPLE	
WEIGHT(G)	288.
DIAMETER(CM).....	4.72
HEIGHT(CM)	9.19
SURFACE AREA(CM**2)	171.3
VOLUME(CM**3)	160.8
CURE TIME, T(C)	31 days, 77-25
LEACHANT	
TYPE	DIW
VOLUME(CM**3)	1713.
TEMPERATURE(C)	25 $\pm$ 5
REFERENCE	8

DATA FILE : 8004.DTA

TESTID : 8004 rep 8005 8006

NO. OF VARIABLES = 2

NO. OF OBSERVATIONS = 24

VARIABLE LABELS

VAR. 1 : Time(days)

VAR. 2 : CFR(Ca137)

OBS.	VAR. 1	2
1	0.700E-01	0.304E-01
2	0.100E+01	0.970E-01
3	0.200E+01	0.134E+00
4	0.300E+01	0.164E+00
5	0.400E+01	0.189E+00
6	0.700E+01	0.237E+00
7	0.110E+02	0.281E+00
8	0.140E+02	0.305E+00
9	0.180E+02	0.329E+00
10	0.210E+02	0.345E+00
11	0.250E+02	0.364E+00
12	0.280E+02	0.376E+00
13	0.320E+02	0.397E+00
14	0.350E+02	0.409E+00
15	0.390E+02	0.425E+00
16	0.420E+02	0.436E+00
17	0.490E+02	0.456E+00
18	0.560E+02	0.473E+00
19	0.640E+02	0.490E+00
20	0.710E+02	0.505E+00
21	0.770E+02	0.515E+00
22	0.840E+02	0.526E+00
23	0.122E+03	0.585E+00
24	0.150E+03	0.614E+00

DATA FILE : 8005.DTA

TESTID : 8005 rep 8004 8006

NO. OF VARIABLES = 2

NO. OF OBSERVATIONS = 24

VARIABLE LABELS

VAR. 1 : Time(Days)

VAR. 2 : CFR(Ca137)

OBS.	VAR. 1	2
1	0.700E-01	0.287E-01
2	0.100E+01	0.935E-01
3	0.200E+01	0.127E+00
4	0.300E+01	0.156E+00
5	0.400E+01	0.180E+00
6	0.700E+01	0.226E+00
7	0.110E+02	0.268E+00
8	0.140E+02	0.289E+00
9	0.180E+02	0.312E+00
10	0.210E+02	0.326E+00
11	0.250E+02	0.346E+00
12	0.280E+02	0.356E+00
13	0.320E+02	0.375E+00
14	0.350E+02	0.387E+00
15	0.390E+02	0.402E+00
16	0.420E+02	0.412E+00
17	0.490E+02	0.431E+00
18	0.560E+02	0.447E+00
19	0.640E+02	0.463E+00
20	0.710E+02	0.477E+00
21	0.770E+02	0.487E+00
22	0.840E+02	0.497E+00
23	0.122E+03	0.550E+00
24	0.150E+03	0.578E+00

DATA FILE : 8006.DTA

TESTID : 8006 rep 8004 8005

NO. OF VARIABLES = 2

NO. OF OBSERVATIONS = 24

VARIABLE LABELS

VAR. 1 : Time(Days)

VAR. 2 : CFR(Cs137)

OBS.	VAR. 1	2
1	0.700E-01	0.296E-01
2	0.100E+01	0.959E-01
3	0.200E+01	0.134E+00
4	0.300E+01	0.163E+00
5	0.400E+01	0.186E+00
6	0.700E+01	0.233E+00
7	0.110E+02	0.276E+00
8	0.140E+02	0.300E+00
9	0.180E+02	0.325E+00
10	0.210E+02	0.340E+00
11	0.250E+02	0.360E+00
12	0.280E+02	0.372E+00
13	0.320E+02	0.393E+00
14	0.350E+02	0.405E+00
15	0.390E+02	0.421E+00
16	0.420E+02	0.432E+00
17	0.490E+02	0.452E+00
18	0.560E+02	0.469E+00
19	0.640E+02	0.485E+00
20	0.710E+02	0.500E+00
21	0.770E+02	0.510E+00
22	0.840E+02	0.520E+00
23	0.122E+03	0.576E+00
24	0.150E+03	0.604E+00

TESTID	8007,8
SAMPLEID	C-S-SS-DIW
COMMENTS	
WASTE TYPE	Boric Acid, 12 wt% solution
SOLIDIFICATION AGENT	Portland III Cement
WASTE BINDER RATIO(W/W)	0.7 (waste solution to dry cement)
SAMPLE	
WEIGHT(G)	697.
DIAMETER(CM).....	7.77
HEIGHT(CM)	8.31
SURFACE AREA(CM**2)	297.7
VOLUME(CM**3)	394.
CURE TIME, T(C)	31 days, 77-25
LEACHANT	
TYPE	DIW
VOLUME(CM**3)	2977.
TEMPERATURE(C)	25 $\pm$ 5
REFERENCE	8

DATA FILE : 8007.DTA

TESTID : 8007 rep 8008

NO. OF VARIABLES = 2

NO. OF OBSERVATIONS = 24

VARIABLE LABELS

VAR. 1 : Time(Days)

VAR. 2 : CFR(Cs137)

OBS.	VAR. 1	2
1	0.700E-01	0.212E-01
2	0.100E+01	0.714E-01
3	0.200E+01	0.101E+00
4	0.300E+01	0.125E+00
5	0.400E+01	0.145E+00
6	0.700E+01	0.184E+00
7	0.110E+02	0.219E+00
8	0.140E+02	0.238E+00
9	0.180E+02	0.259E+00
10	0.210E+02	0.272E+00
11	0.250E+02	0.288E+00
12	0.280E+02	0.298E+00
13	0.320E+02	0.313E+00
14	0.350E+02	0.324E+00
15	0.390E+02	0.337E+00
16	0.420E+02	0.347E+00
17	0.490E+02	0.364E+00
18	0.560E+02	0.379E+00
19	0.640E+02	0.394E+00
20	0.710E+02	0.407E+00
21	0.770E+02	0.416E+00
22	0.840E+02	0.424E+00
23	0.122E+03	0.473E+00
24	0.150E+03	0.498E+00

DATA FILE : 8008.DTA

TESTID : 8008 rep 8007

NO. OF VARIABLES = 2

NO. OF OBSERVATIONS = 24

VARIABLE LABELS

VAR. 1 : Time(Days)

VAR. 2 : CFR(Cs137)

OBS.	VAR. 1	2
1	0.700E-01	0.221E-01
2	0.100E+01	0.707E-01
3	0.200E+01	0.989E-01
4	0.300E+01	0.121E+00
5	0.400E+01	0.140E+00
6	0.700E+01	0.177E+00
7	0.110E+02	0.210E+00
8	0.140E+02	0.229E+00
9	0.180E+02	0.249E+00
10	0.210E+02	0.260E+00
11	0.250E+02	0.276E+00
12	0.280E+02	0.285E+00
13	0.320E+02	0.300E+00
14	0.350E+02	0.310E+00
15	0.390E+02	0.322E+00
16	0.420E+02	0.330E+00
17	0.490E+02	0.345E+00
18	0.560E+02	0.359E+00
19	0.640E+02	0.372E+00
20	0.710E+02	0.384E+00
21	0.770E+02	0.391E+00
22	0.840E+02	0.400E+00
23	0.122E+03	0.446E+00
24	0.150E+03	0.469E+00

TESTID	8009,10,11
SAMPLEID	C-S-SS-DIW
COMMENTS	
WASTE TYPE	Boric Acid, 12 wt% solution
SOLIDIFICATION AGENT	Portland III Cement
WASTE BINDER RATIO(W/W)	0.7 (waste solution to dry cement)
SAMPLE	
WEIGHT(G)	
DIAMETER(CM).....	15.01
HEIGHT(CM)	15.29
SURFACE AREA(CM**2)	1076.3
VOLUME(CM**3)	2710.9
CURE TIME, T(C)	31 days, 77-25
LEACHANT	
TYPE	DIW
VOLUME(CM**3)	10 763.
TEMPERATURE(C)	25 <u>±</u> 5
REFERENCE	8

DATA FILE : 8009.DTA

TESTID : 8009 rep 8010 8011
NO. OF VARIABLES = 2
NO. OF OBSERVATIONS = 24

VARIABLE LABELS
VAR. 1 : Time(Days)
VAR. 2 : CFR(Cs137)

OBS.	VAR. 1	2
1	0.700E-01	0.887E-02
2	0.100E+01	0.310E-01
3	0.200E+01	0.441E-01
4	0.300E+01	0.544E-01
5	0.400E+01	0.628E-01
6	0.700E+01	0.793E-01
7	0.110E+02	0.948E-01
8	0.140E+02	0.103E+00
9	0.180E+02	0.112E+00
10	0.210E+02	0.118E+00
11	0.250E+02	0.127E+00
12	0.280E+02	0.132E+00
13	0.320E+02	0.140E+00
14	0.350E+02	0.145E+00
15	0.390E+02	0.151E+00
16	0.420E+02	0.155E+00
17	0.490E+02	0.163E+00
18	0.560E+02	0.170E+00
19	0.640E+02	0.177E+00
20	0.710E+02	0.183E+00
21	0.770E+02	0.188E+00
22	0.840E+02	0.192E+00
23	0.122E+03	0.219E+00
24	0.150E+03	0.233E+00

DATA FILE : 8010.DTA

TESTID : 8010 rep 8009 8011

NO. OF VARIABLES = 2

NO. OF OBSERVATIONS = 24

VARIABLE LABELS

VAR. 1 : Time(Days)

VAR. 2 : CFR(Ca137)

OBS.	VAR. 1	2
1	0.700E-01	0.927E-02
2	0.100E+01	0.329E-01
3	0.200E+01	0.463E-01
4	0.300E+01	0.570E-01
5	0.400E+01	0.656E-01
6	0.700E+01	0.829E-01
7	0.110E+02	0.984E-01
8	0.140E+02	0.107E+00
9	0.180E+02	0.116E+00
10	0.210E+02	0.122E+00
11	0.250E+02	0.130E+00
12	0.280E+02	0.136E+00
13	0.320E+02	0.145E+00
14	0.350E+02	0.150E+00
15	0.390E+02	0.158E+00
16	0.420E+02	0.163E+00
17	0.490E+02	0.173E+00
18	0.560E+02	0.183E+00
19	0.640E+02	0.194E+00
20	0.710E+02	0.202E+00
21	0.770E+02	0.208E+00
22	0.840E+02	0.214E+00
23	0.122E+03	0.247E+00
24	0.150E+03	0.264E+00

DATA FILE : 8011.DTA

TESTID : 8011 rep 8009 8010
NO. OF VARIABLES = 2
NO. OF OBSERVATIONS = 24

VARIABLE LABELS
VAR. 1 : Time(Days)
VAR. 2 : CFR(Ca137)

OBS.	VAR. 1	2
1	0.700E-01	0.966E-02
2	0.100E+01	0.349E-01
3	0.200E+01	0.489E-01
4	0.300E+01	0.603E-01
5	0.400E+01	0.691E-01
6	0.700E+01	0.872E-01
7	0.110E+02	0.103E+00
8	0.140E+02	0.112E+00
9	0.180E+02	0.121E+00
10	0.210E+02	0.127E+00
11	0.250E+02	0.135E+00
12	0.280E+02	0.140E+00
13	0.320E+02	0.149E+00
14	0.350E+02	0.155E+00
15	0.390E+02	0.162E+00
16	0.420E+02	0.166E+00
17	0.490E+02	0.175E+00
18	0.560E+02	0.184E+00
19	0.640E+02	0.192E+00
20	0.710E+02	0.199E+00
21	0.770E+02	0.204E+00
22	0.840E+02	0.209E+00
23	0.122E+03	0.241E+00
24	0.150E+03	0.259E+00

TESTID	8101,2,3
SAMPLEID	C-S-SS-DIW
COMMENTS	
WASTE TYPE	IX Resin
SOLIDIFICATION AGENT	Portland I Cement
WASTE BINDER RATIO(W/W)	.145
SAMPLE	
WEIGHT(G)	150.
DIAMETER(CM)	4.65
HEIGHT(CM)	4.80
SURFACE AREA(CM**2)	104.1
VOLUME(CM**3)	81.5
CURE TIME, T(C)	28 days, ambient
LEACHANT	
TYPE	DIW
VOLUME(CM**3)	1041.
TEMPERATURE(C)	25 $\pm$ 5
REFERENCE	8

DATA FILE : 8101.DTA

TESTID : 8101 rep 8102 8103

NO. OF VARIABLES = 2

NO. OF OBSERVATIONS = 32

VARIABLE LABELS

VAR. 1 : Time(Days)

VAR. 2 : CFR(Ca137)

OBS.	VAR. 1	2
1	0.700E-01	0.225E-01
2	0.100E+01	0.990E-01
3	0.200E+01	0.131E+00
4	0.300E+01	0.153E+00
5	0.400E+01	0.170E+00
6	0.500E+01	0.184E+00
7	0.600E+01	0.196E+00
8	0.700E+01	0.206E+00
9	0.800E+01	0.214E+00
10	0.900E+01	0.222E+00
11	0.120E+02	0.240E+00
12	0.160E+02	0.264E+00
13	0.190E+02	0.277E+00
14	0.230E+02	0.295E+00
15	0.260E+02	0.307E+00
16	0.300E+02	0.322E+00
17	0.330E+02	0.332E+00
18	0.370E+02	0.346E+00
19	0.400E+02	0.354E+00
20	0.420E+02	0.361E+00
21	0.490E+02	0.378E+00
22	0.560E+02	0.393E+00
23	0.630E+02	0.406E+00
24	0.700E+02	0.422E+00
25	0.770E+02	0.434E+00
26	0.840E+02	0.447E+00
27	0.112E+03	0.482E+00
28	0.140E+03	0.516E+00
29	0.169E+03	0.545E+00
30	0.197E+03	0.568E+00
31	0.232E+03	0.593E+00
32	0.260E+03	0.612E+00

DATA FILE : 8102.DTA

TESTID : 8102 rep 8101 8103
NO. OF VARIABLES = 2
NO. OF OBSERVATIONS = 32

VARIABLE LABELS
VAR. 1 : Time(Days)
VAR. 2 : CFR(Cs137)

OBS.	VAR. 1	2
1	0.700E-01	0.147E-01
2	0.100E+01	0.710E-01
3	0.200E+01	0.975E-01
4	0.300E+01	0.117E+00
5	0.400E+01	0.133E+00
6	0.500E+01	0.147E+00
7	0.600E+01	0.158E+00
8	0.700E+01	0.168E+00
9	0.800E+01	0.176E+00
10	0.900E+01	0.184E+00
11	0.120E+02	0.203E+00
12	0.160E+02	0.226E+00
13	0.190E+02	0.239E+00
14	0.230E+02	0.257E+00
15	0.260E+02	0.268E+00
16	0.300E+02	0.283E+00
17	0.330E+02	0.295E+00
18	0.370E+02	0.309E+00
19	0.400E+02	0.317E+00
20	0.420E+02	0.325E+00
21	0.490E+02	0.341E+00
22	0.560E+02	0.357E+00
23	0.630E+02	0.372E+00
24	0.700E+02	0.387E+00
25	0.770E+02	0.400E+00
26	0.840E+02	0.413E+00
27	0.112E+03	0.451E+00
28	0.140E+03	0.488E+00
29	0.169E+03	0.517E+00
30	0.197E+03	0.541E+00
31	0.232E+03	0.568E+00
32	0.260E+03	0.587E+00

DATA FILE : 8103.DTA

TESTID : 8103 rep 8101 8102

NO. OF VARIABLES = 2

NO. OF OBSERVATIONS = 32

VARIABLE LABELS

VAR. 1 : Time(Days)

VAR. 2 : CFR(Cs137)

OBS.	VAR. 1	2
1	0.700E-01	0.109E-01
2	0.100E+01	0.625E-01
3	0.200E+01	0.931E-01
4	0.300E+01	0.115E+00
5	0.400E+01	0.132E+00
6	0.500E+01	0.147E+00
7	0.600E+01	0.159E+00
8	0.700E+01	0.170E+00
9	0.800E+01	0.179E+00
10	0.900E+01	0.188E+00
11	0.120E+02	0.208E+00
12	0.160E+02	0.234E+00
13	0.190E+02	0.248E+00
14	0.230E+02	0.267E+00
15	0.260E+02	0.281E+00
16	0.300E+02	0.299E+00
17	0.330E+02	0.311E+00
18	0.370E+02	0.324E+00
19	0.400E+02	0.334E+00
20	0.420E+02	0.342E+00
21	0.490E+02	0.360E+00
22	0.560E+02	0.378E+00
23	0.630E+02	0.395E+00
24	0.700E+02	0.413E+00
25	0.770E+02	0.427E+00
26	0.840E+02	0.442E+00
27	0.112E+03	0.484E+00
28	0.140E+03	0.525E+00
29	0.169E+03	0.557E+00
30	0.197E+03	0.583E+00
31	0.232E+03	0.613E+00
32	0.260E+03	0.633E+00

TESTID 8104,5,6
SAMPLEID C-S-SS-DIW

COMMENTS

WASTE TYPE IX Resin

SOLIDIFICATION AGENT Portland I Cement

WASTE BINDER RATIO(W/W)141

SAMPLE

WEIGHT(G) 290.
DIAMETER(CM) 4.69
HEIGHT(CM) 9.19
SURFACE AREA(CM**2) 170.0
VOLUME(CM**3) 158.8
CURE TIME, T(C) 28 days, ambient

LEACHANT

TYPE DIW
VOLUME(CM**3) 1700.
TEMPERATURE(C) 25 ± 5

REFERENCE 8

DATA FILE : 8104.DTA

TESTID : 8104 rep 8105 8106

NO. OF VARIABLES = 2

NO. OF OBSERVATIONS = 32

VARIABLE LABELS

VAR. 1 : Time(Days)

VAR. 2 : CFR(Cs137)

OBS.	VAR. 1	2
1	0.700E-01	0.103E-01
2	0.100E+01	0.472E-01
3	0.200E+01	0.701E-01
4	0.300E+01	0.784E-01
5	0.400E+01	0.933E-01
6	0.500E+01	0.105E+00
7	0.600E+01	0.116E+00
8	0.700E+01	0.125E+00
9	0.800E+01	0.134E+00
10	0.900E+01	0.143E+00
11	0.120E+02	0.162E+00
12	0.160E+02	0.187E+00
13	0.190E+02	0.202E+00
14	0.230E+02	0.223E+00
15	0.260E+02	0.236E+00
16	0.300E+02	0.255E+00
17	0.330E+02	0.267E+00
18	0.370E+02	0.284E+00
19	0.400E+02	0.295E+00
20	0.420E+02	0.303E+00
21	0.490E+02	0.323E+00
22	0.560E+02	0.342E+00
23	0.630E+02	0.359E+00
24	0.700E+02	0.376E+00
25	0.770E+02	0.391E+00
26	0.840E+02	0.406E+00
27	0.112E+03	0.448E+00
28	0.140E+03	0.485E+00
29	0.169E+03	0.516E+00
30	0.197E+03	0.540E+00
31	0.232E+03	0.568E+00
32	0.260E+03	0.587E+00

DATA FILE : 8105.DTA

TESTID : 8105 rep 8104 8106

NO. OF VARIABLES = 2

NO. OF OBSERVATIONS = 32

VARIABLE LABELS

VAR. 1 : Time(Days)

VAR. 2 : CFR(Ca137)

OBS.	VAR. 1	2
1	0.700E-01	0.945E-02
2	0.100E+01	0.498E-01
3	0.200E+01	0.742E-01
4	0.300E+01	0.933E-01
5	0.400E+01	0.108E+00
6	0.500E+01	0.121E+00
7	0.600E+01	0.132E+00
8	0.700E+01	0.142E+00
9	0.800E+01	0.150E+00
10	0.900E+01	0.158E+00
11	0.120E+02	0.177E+00
12	0.160E+02	0.202E+00
13	0.190E+02	0.216E+00
14	0.230E+02	0.236E+00
15	0.260E+02	0.249E+00
16	0.300E+02	0.266E+00
17	0.330E+02	0.278E+00
18	0.370E+02	0.294E+00
19	0.400E+02	0.303E+00
20	0.420E+02	0.311E+00
21	0.490E+02	0.329E+00
22	0.560E+02	0.347E+00
23	0.630E+02	0.363E+00
24	0.700E+02	0.380E+00
25	0.770E+02	0.394E+00
26	0.840E+02	0.408E+00
27	0.112E+03	0.447E+00
28	0.140E+03	0.484E+00
29	0.169E+03	0.515E+00
30	0.197E+03	0.539E+00
31	0.232E+03	0.568E+00
32	0.260E+03	0.587E+00

DATA FILE : 8106.DTA

TESTID : 8106 rep 8104 8105

NO. OF VARIABLES = 2

NO. OF OBSERVATIONS = 32

VARIABLE LABELS

VAR. 1 : Time(Days)

VAR. 2 : CFR(Ca137)

OBS.	VAR. 1	2
1	0.700E-01	0.885E-02
2	0.100E+01	0.490E-01
3	0.200E+01	0.725E-01
4	0.300E+01	0.915E-01
5	0.400E+01	0.106E+00
6	0.500E+01	0.119E+00
7	0.600E+01	0.130E+00
8	0.700E+01	0.139E+00
9	0.800E+01	0.147E+00
10	0.900E+01	0.155E+00
11	0.120E+02	0.174E+00
12	0.160E+02	0.199E+00
13	0.190E+02	0.214E+00
14	0.230E+02	0.233E+00
15	0.260E+02	0.244E+00
16	0.300E+02	0.261E+00
17	0.330E+02	0.273E+00
18	0.370E+02	0.289E+00
19	0.400E+02	0.299E+00
20	0.420E+02	0.306E+00
21	0.490E+02	0.309E+00
22	0.560E+02	0.327E+00
23	0.630E+02	0.343E+00
24	0.700E+02	0.360E+00
25	0.770E+02	0.375E+00
26	0.840E+02	0.390E+00
27	0.112E+03	0.431E+00
28	0.140E+03	0.471E+00
29	0.169E+03	0.502E+00
30	0.197E+03	0.528E+00
31	0.232E+03	0.558E+00
32	0.260E+03	0.577E+00

TESTID 8107,8,9
SAMPLEID C-S-SS-DIW

COMMENTS

WASTE TYPE IX Resin

SOLIDIFICATION AGENT Portland I Cement

WASTE BINDER RATIO(W/W)143

SAMPLE

WEIGHT(G) 735.
DIAMETER(CM) 7.62
HEIGHT(CM) 8.48
SURFACE AREA(CM**2) 294.2
VOLUME(CM**3) 386.7
CURE TIME, T(C) 28 days, ambient

LEACHANT

TYPE DIW
VOLUME(CM**3) 2942.
TEMPERATURE(C) 25 $\pm$ 5

REFERENCE 8

DATA FILE : 8107.DTA

TESTID : 8107 rep 8108 8109
NO. OF VARIABLES = 2
NO. OF OBSERVATIONS = 32

VARIABLE LABELS
VAR. 1 : Time(Days)
VAR. 2 : CFR(Cs137)

OBS.	VAR. 1	2
1	0.700E-01	0.111E-01
2	0.100E+01	0.368E-01
3	0.200E+01	0.479E-01
4	0.300E+01	0.559E-01
5	0.400E+01	0.628E-01
6	0.500E+01	0.691E-01
7	0.600E+01	0.744E-01
8	0.700E+01	0.791E-01
9	0.800E+01	0.840E-01
10	0.900E+01	0.884E-01
11	0.120E+02	0.984E-01
12	0.160E+02	0.111E+00
13	0.190E+02	0.118E+00
14	0.230E+02	0.128E+00
15	0.260E+02	0.135E+00
16	0.300E+02	0.144E+00
17	0.330E+02	0.148E+00
18	0.370E+02	0.155E+00
19	0.400E+02	0.159E+00
20	0.420E+02	0.163E+00
21	0.490E+02	0.171E+00
22	0.560E+02	0.180E+00
23	0.630E+02	0.189E+00
24	0.700E+02	0.199E+00
25	0.770E+02	0.207E+00
26	0.840E+02	0.215E+00
27	0.112E+03	0.239E+00
28	0.140E+03	0.264E+00
29	0.169E+03	0.284E+00
30	0.197E+03	0.301E+00
31	0.232E+03	0.321E+00
32	0.260E+03	0.335E+00

DATA FILE : 8108.DTA

TESTID : 8108 rep 8107 8109

NO. OF VARIABLES = 2

NO. OF OBSERVATIONS = 32

VARIABLE LABELS

VAR. 1 : Time(Days)

VAR. 2 : CFR(Cs137)

OBS.	VAR. 1	2
1	0.700E-01	0.721E-02
2	0.100E+01	0.293E-01
3	0.200E+01	0.396E-01
4	0.300E+01	0.467E-01
5	0.400E+01	0.527E-01
6	0.500E+01	0.576E-01
7	0.600E+01	0.624E-01
8	0.700E+01	0.664E-01
9	0.800E+01	0.704E-01
10	0.900E+01	0.738E-01
11	0.120E+02	0.832E-01
12	0.160E+02	0.938E-01
13	0.190E+02	0.100E+00
14	0.230E+02	0.109E+00
15	0.260E+02	0.115E+00
16	0.300E+02	0.122E+00
17	0.330E+02	0.127E+00
18	0.370E+02	0.134E+00
19	0.400E+02	0.139E+00
20	0.420E+02	0.143E+00
21	0.490E+02	0.152E+00
22	0.560E+02	0.161E+00
23	0.630E+02	0.170E+00
24	0.700E+02	0.179E+00
25	0.770E+02	0.186E+00
26	0.840E+02	0.194E+00
27	0.112E+03	0.216E+00
28	0.140E+03	0.239E+00
29	0.169E+03	0.258E+00
30	0.197E+03	0.274E+00
31	0.232E+03	0.294E+00
32	0.260E+03	0.308E+00

DATA FILE : 8109.DTA

TESTID : 8109 rep 8107 8108

NO. OF VARIABLES = 2

NO. OF OBSERVATIONS = 32

VARIABLE LABELS

VAR. 1 : Time(Days)

VAR. 2 : CFR(Cs137)

OBS.	VAR. 1	2
1	0.700E-01	0.430E-02
2	0.100E+01	0.288E-01
3	0.200E+01	0.404E-01
4	0.300E+01	0.486E-01
5	0.400E+01	0.575E-01
6	0.500E+01	0.635E-01
7	0.600E+01	0.692E-01
8	0.700E+01	0.744E-01
9	0.800E+01	0.787E-01
10	0.900E+01	0.835E-01
11	0.120E+02	0.945E-01
12	0.160E+02	0.108E+00
13	0.190E+02	0.118E+00
14	0.230E+02	0.127E+00
15	0.260E+02	0.135E+00
16	0.300E+02	0.143E+00
17	0.330E+02	0.149E+00
18	0.370E+02	0.156E+00
19	0.400E+02	0.161E+00
20	0.420E+02	0.165E+00
21	0.490E+02	0.175E+00
22	0.560E+02	0.185E+00
23	0.630E+02	0.194E+00
24	0.700E+02	0.204E+00
25	0.770E+02	0.212E+00
26	0.840E+02	0.220E+00
27	0.112E+03	0.244E+00
28	0.140E+03	0.269E+00
29	0.169E+03	0.289E+00
30	0.197E+03	0.305E+00
31	0.232E+03	0.325E+00
32	0.260E+03	0.339E+00

TESTID

8110,11

SAMPLEID

C-S-SS-DIW

COMMENTS

WASTE TYPE

IX Resin

SOLIDIFICATION AGENT

Portland I Cement

WASTE BINDER RATIO(W/W)

SAMPLE

WEIGHT(G)

DIAMETER(CM)

15.4

HEIGHT(CM)

14.6

SURFACE AREA(CM**2)

1079.

VOLUME(CM**3)

2719.

CURE TIME, T(C)

28 days, 52-ambient

LEACHANT

TYPE

DIW

VOLUME(CM**3)

10 790.

TEMPERATURE(C)

25 $\pm$ 5

REFERENCE

8

DATA FILE : 8110.DTA

TESTID : 8110 rep 8111

NO. OF VARIABLES = 2

NO. OF OBSERVATIONS = 29

VARIABLE LABELS

VAR. 1 : Time(Days)

VAR. 2 : CFR(Cs137)

OBS.	VAR. 1	2
1	0.700E-01	0.478E-02
2	0.100E+01	0.242E-01
3	0.200E+01	0.360E-01
4	0.300E+01	0.453E-01
5	0.600E+01	0.646E-01
6	0.700E+01	0.699E-01
7	0.800E+01	0.743E-01
8	0.900E+01	0.788E-01
9	0.100E+02	0.828E-01
10	0.130E+02	0.935E-01
11	0.140E+02	0.970E-01
12	0.150E+02	0.100E+00
13	0.160E+02	0.103E+00
14	0.170E+02	0.106E+00
15	0.200E+02	0.113E+00
16	0.210E+02	0.116E+00
17	0.220E+02	0.118E+00
18	0.290E+02	0.131E+00
19	0.360E+02	0.143E+00
20	0.430E+02	0.154E+00
21	0.500E+02	0.165E+00
22	0.570E+02	0.174E+00
23	0.640E+02	0.184E+00
24	0.920E+02	0.210E+00
25	0.120E+03	0.234E+00
26	0.149E+03	0.255E+00
27	0.177E+03	0.274E+00
28	0.212E+03	0.294E+00
29	0.240E+03	0.309E+00

DATA FILE : 8111.DTA

TESTID : 8111 rep 8110

NO. OF VARIABLES = 2

NO. OF OBSERVATIONS = 29

VARIABLE LABELS

VAR. 1 : Time(Days)

VAR. 2 : CFR(Cs137)

OBS.	VAR. 1	2
1	0.700E-01	0.458E-02
2	0.100E+01	0.200E-01
3	0.200E+01	0.287E-01
4	0.300E+01	0.356E-01
5	0.600E+01	0.505E-01
6	0.700E+01	0.547E-01
7	0.800E+01	0.582E-01
8	0.900E+01	0.621E-01
9	0.100E+02	0.653E-01
10	0.130E+02	0.746E-01
11	0.140E+02	0.776E-01
12	0.150E+02	0.803E-01
13	0.160E+02	0.828E-01
14	0.170E+02	0.851E-01
15	0.200E+02	0.914E-01
16	0.210E+02	0.937E-01
17	0.220E+02	0.958E-01
18	0.290E+02	0.108E+00
19	0.360E+02	0.118E+00
20	0.430E+02	0.127E+00
21	0.500E+02	0.137E+00
22	0.570E+02	0.144E+00
23	0.640E+02	0.152E+00
24	0.920E+02	0.175E+00
25	0.120E+03	0.197E+00
26	0.149E+03	0.216E+00
27	0.177E+03	0.232E+00
28	0.212E+03	0.251E+00
29	0.240E+03	0.264E+00

TESTID 8112,13,14
SAMPLEID C-S-SS-DIW

COMMENTS

WASTE TYPE IX Resin
SOLIDIFICATION AGENT Portland I Cement
WASTE BINDER RATIO(W/W)147

SAMPLE

WEIGHT(G) 9620.
DIAMETER(CM) 15.24.
HEIGHT(CM) 29.8
SURFACE AREA(CM**2) 1780.
VOLUME(CM**3) 5400.
CURE TIME, T(C) 28 days, 65-ambient

LEACHANT

TYPE DIW
VOLUME(CM**3) 17 800.
TEMPERATURE(C) 25 $\pm$ 5

REFERENCE 8

DATA FILE : 8112.DTA

TESTID : 8112 rep 8113 8114

NO. OF VARIABLES = 2

NO. OF OBSERVATIONS = 29

VARIABLE LABELS

VAR. 1 : Time(Days)

VAR. 2 : CFR(Ca137)

OBS.	VAR. 1	2
1	0.700E-01	0.287E-02
2	0.100E+01	0.203E-01
3	0.200E+01	0.319E-01
4	0.300E+01	0.413E-01
5	0.400E+01	0.489E-01
6	0.800E+01	0.718E-01
7	0.900E+01	0.768E-01
8	0.100E+02	0.815E-01
9	0.110E+02	0.850E-01
10	0.140E+02	0.938E-01
11	0.180E+02	0.104E+00
12	0.210E+02	0.112E+00
13	0.250E+02	0.120E+00
14	0.280E+02	0.125E+00
15	0.320E+02	0.130E+00
16	0.350E+02	0.134E+00
17	0.390E+02	0.139E+00
18	0.420E+02	0.142E+00
19	0.490E+02	0.148E+00
20	0.560E+02	0.155E+00
21	0.630E+02	0.160E+00
22	0.700E+02	0.165E+00
23	0.770E+02	0.170E+00
24	0.840E+02	0.175E+00
25	0.910E+02	0.179E+00
26	0.980E+02	0.185E+00
27	0.105E+03	0.189E+00
28	0.113E+03	0.194E+00
29	0.119E+03	0.198E+00

DATA FILE : 8113.DTA

TESTID : 8113 rep 8112 8114

NO. OF VARIABLES = 2

NO. OF OBSERVATIONS = 29

VARIABLE LABELS

VAR. 1 : Time(Days)

VAR. 2 : CFR(Ca137)

OBS.	VAR. 1	2
1	0.700E-01	0.269E-02
2	0.100E+01	0.221E-01
3	0.200E+01	0.353E-01
4	0.300E+01	0.456E-01
5	0.400E+01	0.540E-01
6	0.800E+01	0.782E-01
7	0.900E+01	0.832E-01
8	0.100E+02	0.877E-01
9	0.110E+02	0.911E-01
10	0.140E+02	0.100E+00
11	0.180E+02	0.111E+00
12	0.210E+02	0.119E+00
13	0.250E+02	0.129E+00
14	0.280E+02	0.134E+00
15	0.320E+02	0.142E+00
16	0.350E+02	0.147E+00
17	0.390E+02	0.154E+00
18	0.420E+02	0.158E+00
19	0.490E+02	0.168E+00
20	0.560E+02	0.178E+00
21	0.630E+02	0.185E+00
22	0.700E+02	0.190E+00
23	0.770E+02	0.195E+00
24	0.840E+02	0.199E+00
25	0.910E+02	0.204E+00
26	0.980E+02	0.209E+00
27	0.105E+03	0.214E+00
28	0.113E+03	0.219E+00
29	0.119E+03	0.223E+00

DATA FILE : 8114.DTA

TESTID : 8114 rep 8112 8113

NO. OF VARIABLES = 2

NO. OF OBSERVATIONS = 29

VARIABLE LABELS

VAR. 1 : Time(Days)

VAR. 2 : CFR(Cs137)

OBS.	VAR. 1	2
1	0.700E-01	0.262E-02
2	0.100E+01	0.193E-01
3	0.200E+01	0.299E-01
4	0.300E+01	0.383E-01
5	0.400E+01	0.452E-01
6	0.800E+01	0.643E-01
7	0.900E+01	0.680E-01
8	0.100E+02	0.715E-01
9	0.110E+02	0.743E-01
10	0.140E+02	0.818E-01
11	0.180E+02	0.910E-01
12	0.210E+02	0.975E-01
13	0.250E+02	0.106E+00
14	0.280E+02	0.112E+00
15	0.320E+02	0.120E+00
16	0.350E+02	0.125E+00
17	0.390E+02	0.133E+00
18	0.420E+02	0.138E+00
19	0.490E+02	0.149E+00
20	0.560E+02	0.162E+00
21	0.630E+02	0.171E+00
22	0.700E+02	0.179E+00
23	0.770E+02	0.187E+00
24	0.840E+02	0.195E+00
25	0.910E+02	0.201E+00
26	0.980E+02	0.207E+00
27	0.105E+03	0.213E+00
28	0.113E+03	0.218E+00
29	0.119E+03	0.222E+00

TESTID 8115,16
SAMPLEID C-S-SS-DIW

COMMENTS

WASTE TYPE IX Resin

SOLIDIFICATION AGENT Portland I Cement

WASTE BINDER RATIO(W/W)143

SAMPLE

WEIGHT(G) 40 000.
DIAMETER(CM) 31.24
HEIGHT(CM) 29.21
SURFACE AREA(CM**2) 4400.
VOLUME(CM**3) 22 390.
CURE TIME, T(C) 28 days, 92-ambient

LEACHANT

TYPE DIW
VOLUME(CM**3) 44 000.
TEMPERATURE(C) 25 ± 5

REFERENCE 8

DATA FILE : 8115.DTA

TESTID : 8115 rep 8116

NO. OF VARIABLES = 2

NO. OF OBSERVATIONS = 31

VARIABLE LABELS

VAR. 1 : Time(Days)

VAR. 2 : CFR(Cs137)

OBS.	VAR. 1	2
1	0.700E-01	0.119E-02
2	0.100E+01	0.126E-01
3	0.200E+01	0.204E-01
4	0.300E+01	0.262E-01
5	0.400E+01	0.310E-01
6	0.700E+01	0.411E-01
7	0.110E+02	0.513E-01
8	0.140E+02	0.557E-01
9	0.180E+02	0.625E-01
10	0.210E+02	0.664E-01
11	0.250E+02	0.716E-01
12	0.280E+02	0.748E-01
13	0.320E+02	0.790E-01
14	0.350E+02	0.818E-01
15	0.390E+02	0.854E-01
16	0.420E+02	0.880E-01
17	0.460E+02	0.912E-01
18	0.500E+02	0.937E-01
19	0.530E+02	0.959E-01
20	0.560E+02	0.979E-01
21	0.600E+02	0.100E+00
22	0.630E+02	0.102E+00
23	0.670E+02	0.105E+00
24	0.700E+02	0.107E+00
25	0.740E+02	0.110E+00
26	0.770E+02	0.112E+00
27	0.810E+02	0.115E+00
28	0.840E+02	0.117E+00
29	0.880E+02	0.120E+00
30	0.910E+02	0.123E+00
31	0.950E+02	0.126E+00

DATA FILE : 8116.DTA

TESTID : 8116 rep 8115

NO. OF VARIABLES = 2

NO. OF OBSERVATIONS = 31

VARIABLE LABELS

VAR. 1 : Time(Days)

VAR. 2 : CFR(Cs137)

OBS.	VAR. 1	2
1	0.700E-01	0.144E-02
2	0.100E+01	0.115E-01
3	0.200E+01	0.180E-01
4	0.300E+01	0.230E-01
5	0.400E+01	0.274E-01
6	0.700E+01	0.370E-01
7	0.110E+02	0.469E-01
8	0.140E+02	0.518E-01
9	0.180E+02	0.583E-01
10	0.210E+02	0.620E-01
11	0.250E+02	0.671E-01
12	0.280E+02	0.707E-01
13	0.320E+02	0.749E-01
14	0.350E+02	0.777E-01
15	0.390E+02	0.813E-01
16	0.420E+02	0.841E-01
17	0.460E+02	0.873E-01
18	0.500E+02	0.902E-01
19	0.530E+02	0.923E-01
20	0.560E+02	0.940E-01
21	0.600E+02	0.964E-01
22	0.630E+02	0.978E-01
23	0.670E+02	0.101E+00
24	0.700E+02	0.102E+00
25	0.740E+02	0.105E+00
26	0.770E+02	0.106E+00
27	0.810E+02	0.109E+00
28	0.840E+02	0.111E+00
29	0.880E+02	0.113E+00
30	0.910E+02	0.115E+00
31	0.950E+02	0.118E+00

TESTID	8117
SAMPLEID	C-S-FS-DIW
COMMENTS	
WASTE TYPE	IX Resin
SOLIDIFICATION AGENT	Portland I Cement
WASTE BINDER RATIO(W/W)	.144
SAMPLE	
WEIGHT(G)	228 340.
DIAMETER(CM)	54.61
HEIGHT(CM)	54.61
SURFACE AREA(CM**2)	14 054.
VOLUME(CM**3)	127 910.
CURE TIME T(C)	28 days, ambient
LEACHANT	
TYPE	DIW
VOLUME(CM**3)	140 540.
TEMPERATURE(C)	25 $\pm$ 5
REFERENCE	8

DATA FILE : 8117.DTA

TESTID : 8117

NO. OF VARIABLES = 2

NO. OF OBSERVATIONS = 23

VARIABLE LABELS

VAR. 1 : Time(Days)

VAR. 2 : CFR(Cs137)

OBS.	VAR. 1	2
1	0.700E-01	0.420E-03
2	0.100E+01	0.474E-02
3	0.200E+01	0.781E-02
4	0.300E+01	0.104E-01
5	0.400E+01	0.125E-01
6	0.700E+01	0.174E-01
7	0.110E+02	0.223E-01
8	0.140E+02	0.254E-01
9	0.180E+02	0.285E-01
10	0.210E+02	0.304E-01
11	0.250E+02	0.329E-01
12	0.280E+02	0.346E-01
13	0.320E+02	0.369E-01
14	0.360E+02	0.392E-01
15	0.390E+02	0.412E-01
16	0.420E+02	0.431E-01
17	0.460E+02	0.462E-01
18	0.490E+02	0.485E-01
19	0.530E+02	0.520E-01
20	0.560E+02	0.543E-01
21	0.600E+02	0.579E-01
22	0.630E+02	0.604E-01
23	0.700E+02	0.671E-01